



**Hatfield**  
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*Environmental Specialist Since 1974*



# REGIONAL AQUATICS MONITORING

*in support of the*

## JOINT OIL SANDS MONITORING PLAN

Final 2014 Program Report – Appendices

**April 2015**

*Prepared for:*

**Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA)**  
Edmonton, Alberta



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### 2014 Program Report – Appendices

*Prepared for:*

**ALBERTA ENVIRONMENTAL MONITORING,  
EVALUATION AND REPORTING AGENCY**

*Prepared by:*

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and WESTERN RESOURCE SOLUTIONS**

**APRIL 2015**

JOMSP6784.2

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## **Appendix A**

### **Estimating Area of Land Change for the Athabasca Oil Sands Region**

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# A ESTIMATING AREA OF LAND CHANGE FOR THE ATHABASCA OIL SANDS REGION

## A.1 INTRODUCTION

This appendix documents the methods used to quantify the location, extent, and type of land change in the Athabasca oil sands region as of 2014 related to oil sands operations that were under construction or operational in 2014.

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

## A.2 METHODS

### A.2.1 Satellite Imagery Acquisition

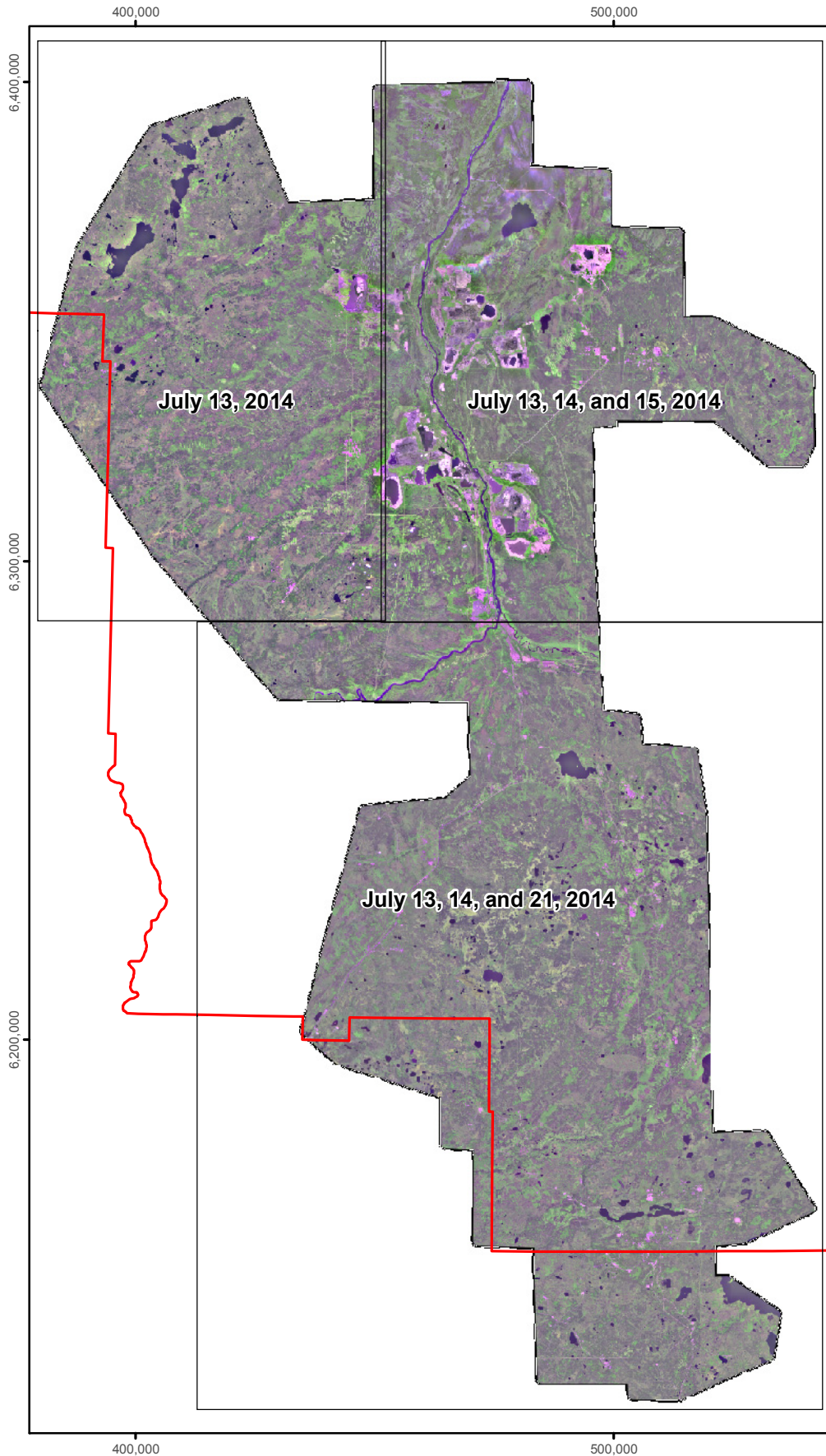
Since 2006, Hatfield has used SPOT-5 10-m satellite imagery for land change analysis. However, in 2014 satellite imagery was acquired from RapidEye, which provides multi-spectral imagery in 5-m resolution. The change to RapidEye was made in anticipation of the decommissioning of the SPOT-5 satellite scheduled in 2015 (<http://www.cesbio.upstlsefr/multitemp/?p=4571>), with the goal to use a similar spatial and spectral resolution sensor for consistent mapping. RapidEye offers higher spatial resolution imagery with additional “Blue” and “Red-Edge” bands, which provide consistency with SPOT-5, while providing improved confidence in the land-use mapping analysis.

A total of 74 satellite images (33 north of Fort McMurray and 41 south of Fort McMurray) were acquired on July 13, 14, 15, and 21, and August 17, 2014 (Figure A.2-1).


RapidEye imagery were obtained as a Level 3A ortho-rectified product, where radiometric, sensor, and geometric corrections were applied. The Level 3A products met a positional accuracy of six metres (12.7 m CE90), which was suitable for land use mapping.

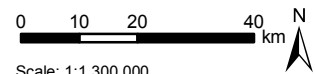
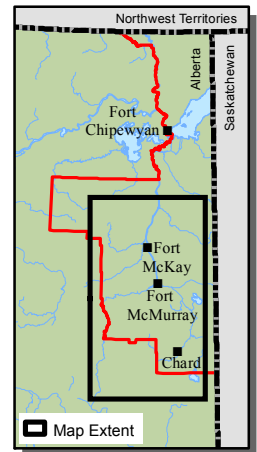


**Figure A.2-1 Illustration of the RapidEye scenes acquired in 2014.**



**Legend**

-  Regional Municipality of Wood Buffalo Boundary



Scale: 1:1,300,000

Projection: NAD 1983 UTM Zone 12N

Data Source:  
 RapidEye multispectral 5-m imagery acquired in July and August 2014. August 2014 RapidEye imagery was used only over the cloud covered areas on the July imagery (less than 5%).



## A.2.2 Atmospheric Correction

Atmospheric correction was applied to minimize atmospheric effects (e.g., haze). The objective of atmospheric correction was to retrieve the surface reflectance from satellite imagery by removing the atmospheric effects to improve image quality for visual interpretation and land use classification. Atmospheric correction was applied to the RapidEye images using industry standard tools within PCI Geomatica 2015 image processing software (PCI Geomatics).

## A.2.3 Colour-Balancing, Enhancement, and Mosaicking

Hatfield performed a process to produce a single image mosaic for the JOSMP Area of Interest (AOI), using an automatic mosaicking procedure available in PCI Geomatica 2015. Manual adjustment of the mosaic “cutlines” were conducted in order to create a seamless mosaic.

## A.2.4 Classification of Land Change

To ensure consistency, the areas of land use change in 2014 were digitized beginning with the 2013 classification product (RAMP 2014, Appendix A). The new digitized polygons were coded to the following two land-change classes:

1. Hydrologically Closed-Circuited – developed areas where there is no natural exchange of water with the rest of the watershed (e.g., mine open pit, mine infrastructure, tailings ponds, etc.); and
2. Not Hydrologically Closed-Circuited – developed areas where there is natural exchange of water with the rest of the watershed (e.g., cleared land and bare ground).

Draft land change maps were then distributed to oil sands operators in fall 2014 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 major watersheds of the Lower Athabasca River. The results of the overlay analysis were exported to MS Excel® for data summary, including:

1. The area of each watershed with land change as of 2014, summarized by land change type; and
2. The percentage of total watershed area with land change as of 2014, summarized by type of land change.

## A.3 RESULTS

Table A.3-1 provides a tabular summary of the land change in each of the major watersheds by each land change type, for oil sands projects within the Athabasca oil sands region. 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 2014 was estimated to be approximately 123,990 ha, which was an increase from 118,750 ha in 2013. The total area of land change represented approximately 3.5% of the total area, compared to 3.3% in 2013. The percentage of the area of watersheds with land change as of 2014 varied from less than 1% for many watersheds (MacKay River, Horse River, Pierre River, and Upper Beaver River watersheds), to 1% to 5% for the Steepbank River, Calumet River, Firebag River, Ells River,

Christina River, and Hangingstone River watersheds, to more than 10% for the Muskeg River, Fort Creek, Mills Creek, Tar River, Shipyard Lake, Poplar Creek, and McLean Creek watersheds, as well as for the smaller Athabasca River tributaries between Fort McMurray and the confluence of the Firebag River.

**Table A.3-1 Total area and percentage of land change in watersheds of the Athabasca oil sands region related to oil sands development in 2014.**

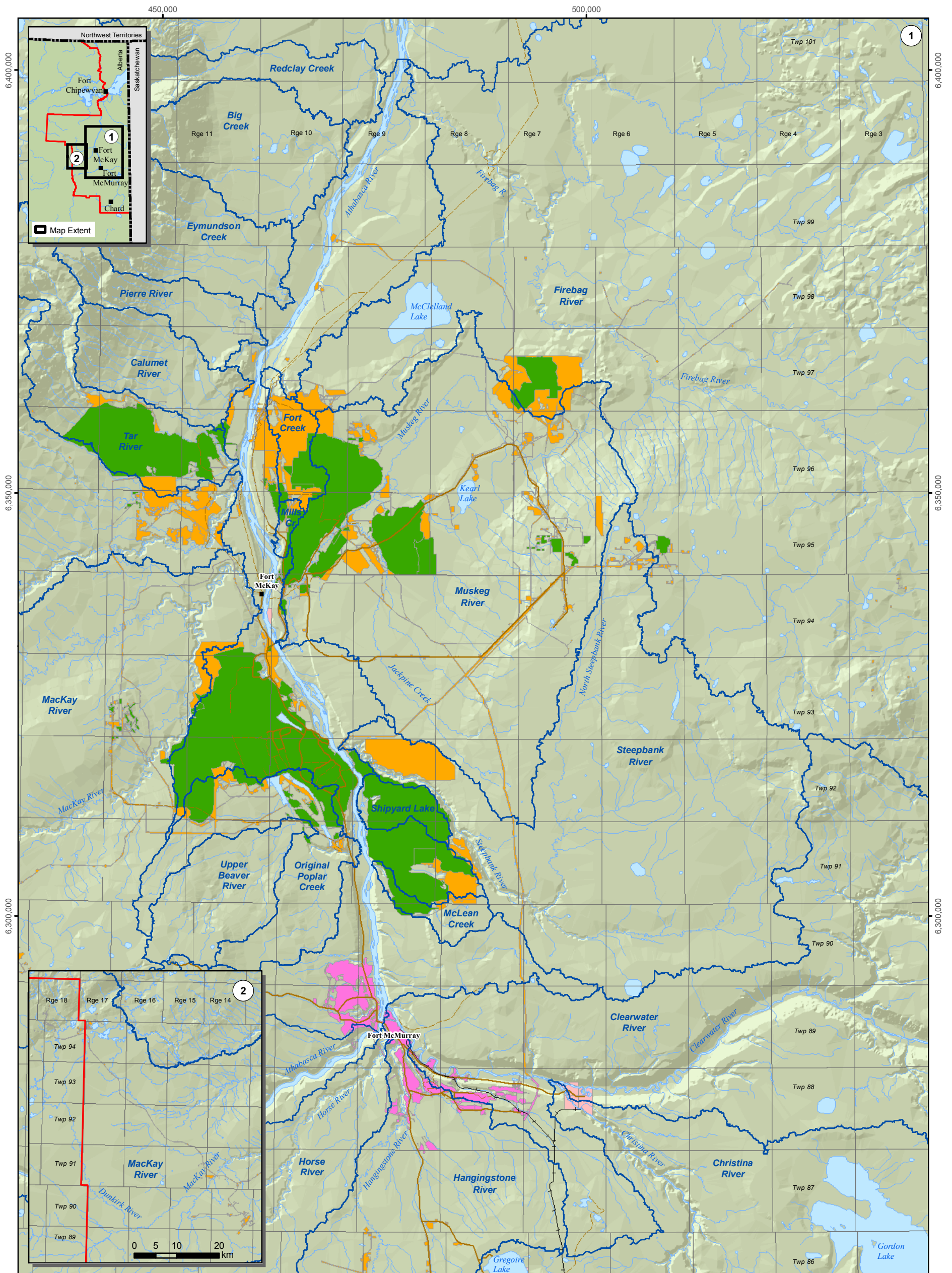
Watershed	Total Watershed Area (ha)	Watershed Area with Land Change (ha)					
		Not-Closed Circuited (ha)		Closed-Circuited (ha)		Watershed Total (ha and %)	
		Area (ha)	Percent	Area (ha)	Percent		
Calumet River	17,523	129	0.74	70	0.40	199	1.14
Christina River	1,312,160	12,356	0.94	1,400	0.11	13,756	1.05
Ells River	270,945	3,615	1.33	355	0.13	3,970	1.47
Firebag River	568,190	4,795	0.84	2,343	0.41	7,138	1.26
Hangingstone River	106,572	1,196	1.12	32	0.03	1,228	1.15
Fort Creek	6,640	3,548	53.43	2,001	30.14	5,549	83.57
Horse River	215,740	1,734	0.80	97	0.04	1,831	0.85
Mackay River	556,871	3,978	0.71	734	0.13	4,712	0.85
McLean Creek	4,643	347	7.47	1,071	23.07	1,418	30.54
Mills Creek	1,424	244	17.13	664	46.63	908	63.76
Muskeg River	143,304	8,575	5.98	14,758	10.30	23,333	16.28
Original Poplar <sup>1</sup>	28,388	1,586	5.59	3,802	13.39	5,388	18.98
Pierre River	13,824	18	0.13	0	0.00	18	0.13
Shipyard Lake	5,113	15	0.29	4,629	90.53	4,644	90.83
Steepbank River	136,395	4,913	3.60	538	0.39	5,451	4.00
Tar River	33,264	1,330	4.00	9,842	29.59	11,172	33.59
Upper Beaver River	18,796	39	0.21	82	0.44	121	0.64
Minor Athabasca River Tributaries <sup>2</sup>	135,132	5,834	4.32	27,319	20.22	33,153	24.53
<b>Total</b>	<b>3,574,924</b>	<b>55,224</b>	<b>1.54</b>	<b>68,766</b>	<b>1.92</b>	<b>123,990</b>	<b>3.47</b>
Lac La Biche <sup>3</sup>	864,496	588	0.07	0	0	588	0.07

<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 Lac La Biche watershed was added in 2011 given some of the Canadian Natural Kirby project is located within this watershed. This watershed; however, is not part of the Athabasca oil sands region currently monitored under the JOSMP.

**Figure A.3-1 Land change classes derived from 5-m RapidEye multispectral satellite imagery, north of Fort McMurray (July and August 2014).**



**Legend**

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2014<sup>d</sup>**
  - Not Hydrologically Closed-Circuited
  - Hydrologically Closed-Circuited

Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB). East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Areas Delineated from 5-m RapidEye (July and August 2014) Multispectral Imagery.

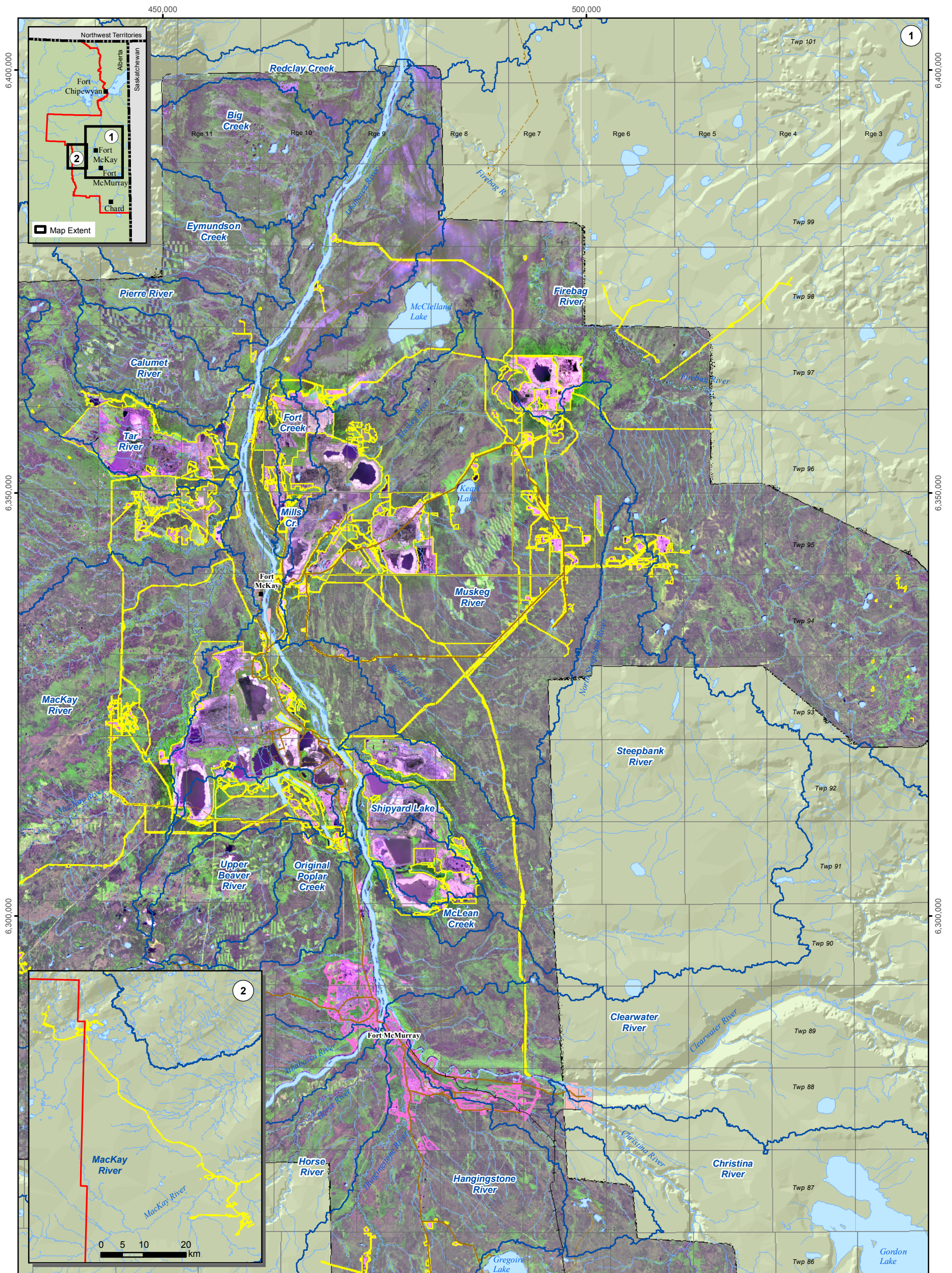
Township and Range designations are relative to W4M.

0 2.5 5 10 km











Scale: 1:450,000  
 Projection: NAD 1983 UTM Zone 12N



**Figure A.3-2 Land change classes overlaid on mosaics of RapidEye multispectral satellite imagery, north of Fort McMurray (July and August 2014).**

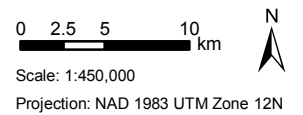


**Legend**

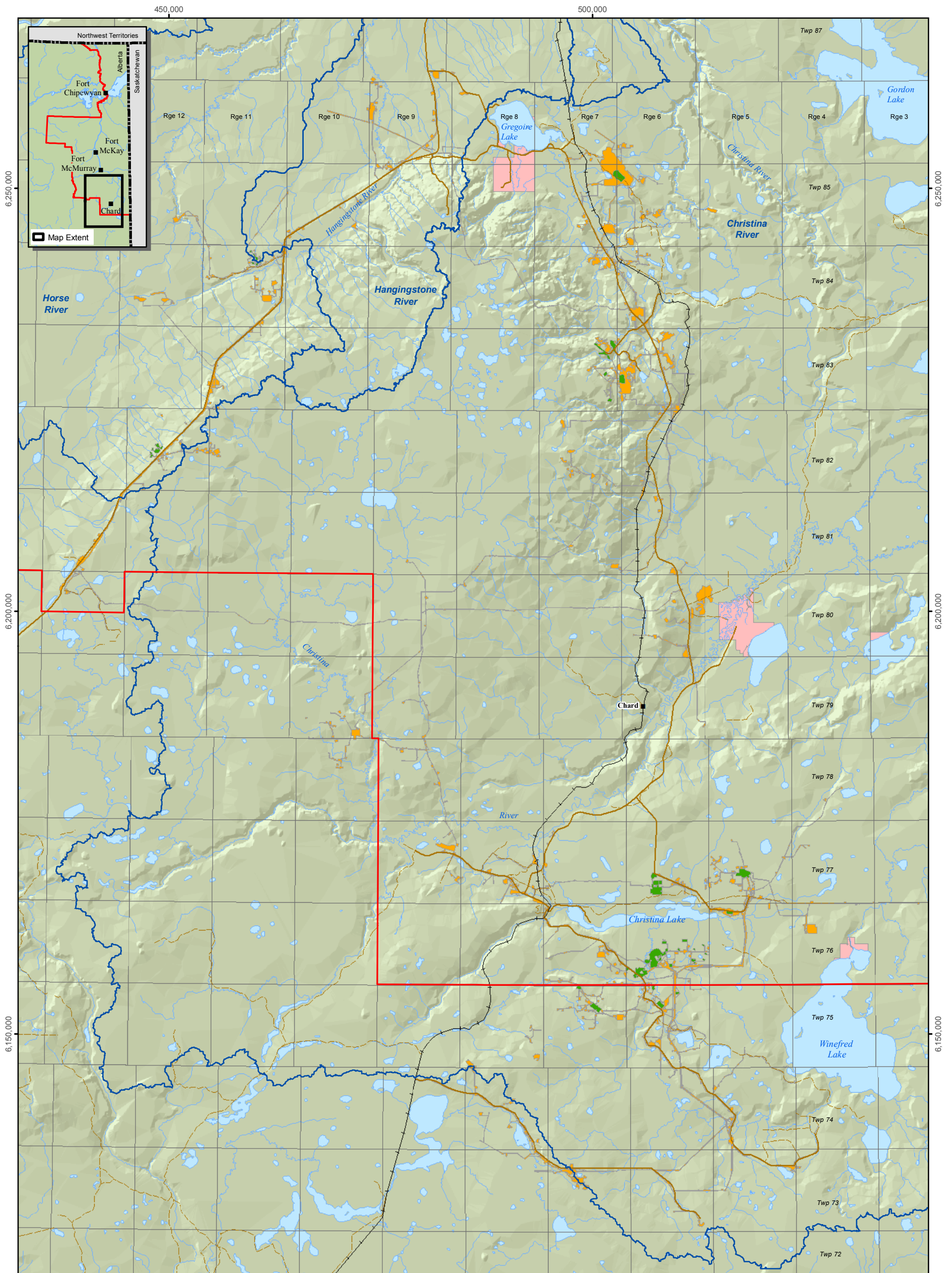
-  Lake/Pond
-  River/Stream
-  Watershed Boundary
-  Major Road
-  Secondary Road
-  Railway
-  First Nations Reserve
-  Regional Municipality of Wood Buffalo Boundary
-  Town of Fort McMurray
-  Land Change Area as of 2014<sup>d</sup>

Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB). East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Areas Delineated from 5-m RapidEye (July and August 2014) Multispectral Imagery.

Township and Range designations are relative to W4M.



**Figure A.3-3 Land change classes derived from 5-m RapidEye multispectral satellite imagery, south of Fort McMurray (July and August 2014).**



**Legend**

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Land Change Area as of 2014<sup>d</sup>**
- Not Hydrologically Closed-Circuited
- Hydrologically Closed-Circuited

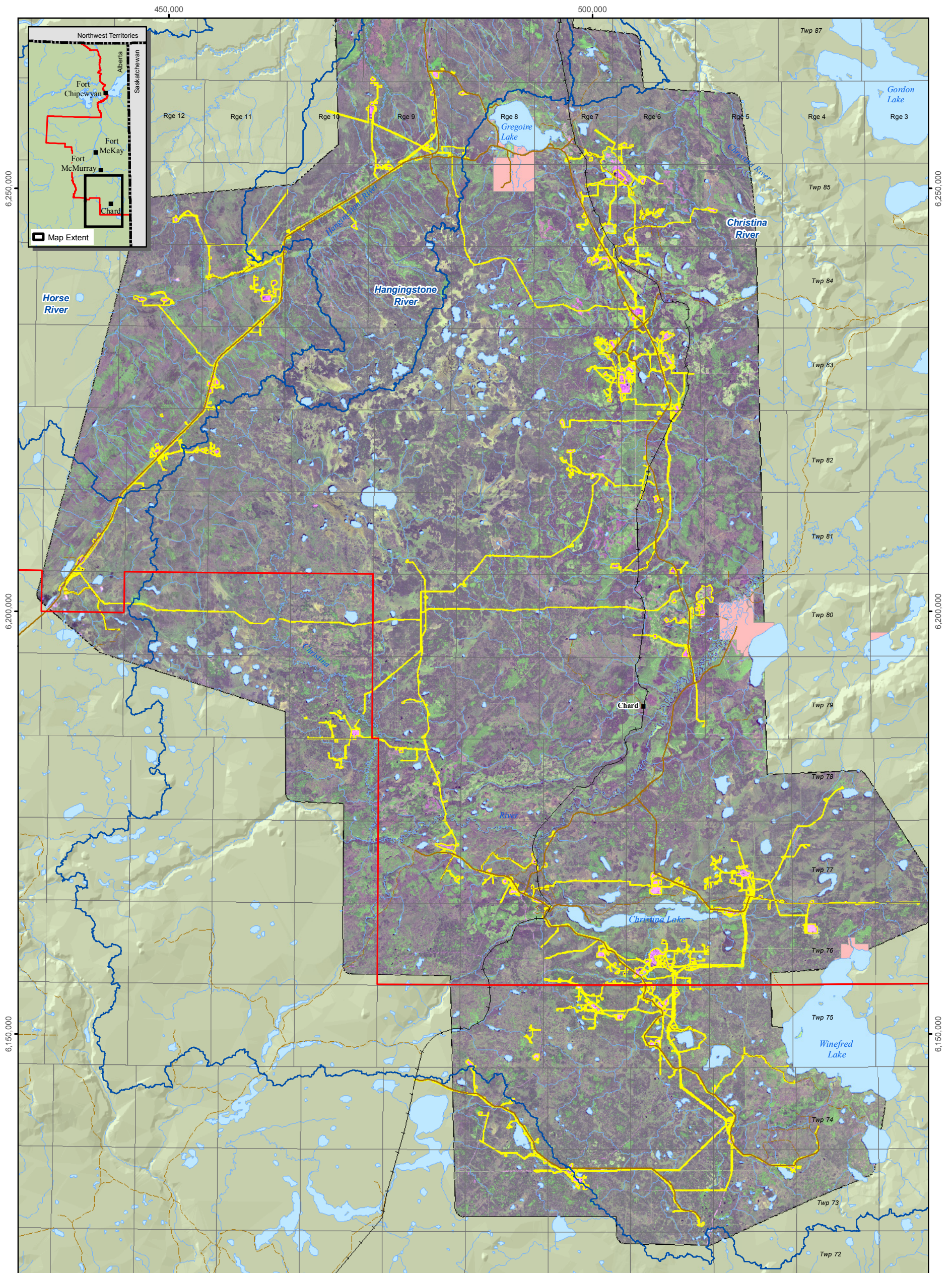
Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Areas Delineated from 5-m RapidEye (July and August 2014) Multispectral Imagery.  
 Township and Range designations are relative to W4M.

0 2.5 5 10 km










Scale: 1:450,000  
 Projection: NAD 1983 UTM Zone 12N



**Figure A.3-4 Land change classes overlaid on mosaics of RapidEye multispectral satellite imagery, south of Fort McMurray (July and August 2014).**




**Legend**

-  Lake/Pond
-  River/Stream
-  Watershed Boundary
-  Major Road
-  Secondary Road
-  Railway
-  First Nations Reserve
-  Regional Municipality of Wood Buffalo Boundary
-  Land Change Area as of 2014<sup>d</sup>

Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Areas Delineated from 5-m RapidEye (July and August 2014) Multispectral Imagery.

Township and Range designations are relative to W4M.

0 2.5 5 10 km 

Scale: 1:450,000  
 Projection: NAD 1983 UTM Zone 12N



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**Appendix B**

**Quality Assurance and Quality  
Control Procedures for 2014**

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## **B QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES FOR 2014**

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

Each technical monitoring component is required to complete a series of procedures to facilitate the collection of high quality data. 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 implementation team for all data collection, handling, and management. More detailed information regarding quality control for each technical component follows the presentation of this general information.

A more detailed explanation of the sampling procedures used by the 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 2014 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 2014 field-crew members had experience collecting data 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 methods, 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).

All 2014 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 related to the Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods (TDG) Regulations, Pleasure Craft Operator certification (as required by the Federal government), swift water rescue, ice safety training, and wilderness first aid.

## **B.1.2 Field Operations**

### **B.1.2.1 Equipment**

Sampling gear and equipment used for the field programs were maintained at the offices of the respective team members (i.e., Hatfield – Fort McMurray and North Vancouver). Each component manager (i.e., lead consultant responsible for a 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<sup>®</sup> 60CSx, 62s, 76CSx Global Positioning System (GPS) for obtaining data on sampling station position (latitude and longitude; accurate to approximately  $\pm 15$  m);
- digital camera (to record sampling areas, specimens captured, unusual features in the environment, etc.);
- instruments for measuring the following water quality variables in situ: temperature, dissolved oxygen, conductivity, pH, water velocity, and depth;
- miscellaneous equipment: tarpaulin, rope, measuring tape, coolers, plastic buckets, and tool box;
- waterproof clothing, including chest waders, 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 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 program is provided in the following sections.

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

Prior to every field program, fieldwork instructions (FWIs) were prepared by the component manager. These FWIs provided technical detail on all field data collection activities planned for the program and were reviewed by all members of the field crew prior to starting the field program. The following general data were typically recorded for field sampling activities (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 were collected 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 some fish tissue samples 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 sample analyses, such as benthic invertebrate sorting and taxonomy, fish tissue chemistry, and fish ageing, are conducted 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 are required to 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<sup>®</sup> 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, all entered data were checked for possible 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. Information 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 to confirm (via fax and/or e-mail) samples were received, the date of receipt, and analyses to be performed. To facilitate this process, a standard COC form was used by the Hatfield team, which simplified the management of sample processing and analysis.

### **B.1.6 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 continued to be used in 2014 by the Hatfield team to ensure consistency of methods among years. Activities covered in the QAP included:

- 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) 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 technical component used in 2014 are described below.

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

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

The collection and processing of climatic and hydrologic data was subject to the following field and in-office quality control 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 deployed at climatic and hydrologic monitoring stations were calibrated on a regular basis. Sensors at climatic stations have been rotated with spare units on a two-year frequency and the units retrieved from the field were recalibrated by the manufacturer. Calibration curves for pressure transducers were verified prior to installation. Consistency between water level surveys and pressure transducer readings was checked during every field visit for all stations. Pressure transducers were exchanged with calibrated sensors after being installed for two years at year-round stations unless a deviation from surveyed water levels was observed at which time sensors were exchanged prior to the standard two-year service;
- Manual discharge measurements and concurrent water levels were compared on a plot of stage versus discharge, to check for consistency between measurements and consistency with previously established stage-discharge relationships. Rating curve shifts due to changes in channel geometry, beaver dams and obstructions or roughness changes were accounted for by revision of stage-discharge rating curves or application of backwater shift corrections;
- Snow course surveys were performed according to standard protocols as presented in RAMP (2009b);
- Apparent transducer elevations were calculated after each field visit as the difference between the surveyed water surface elevation and the sensor reading. The history of apparent transducer elevations was plotted for each station to check for physical sensor movement or calibration drift. Continuous water levels measured by the transducer were subsequently converted to elevations, adjusting for movement or drift;
- Rainfall, snowfall, air temperature, humidity, and wind speed data from automated climate sensors were compared to other local and regional records, as well as manual observations recorded during station visits;
- All discharge measurements and site visit records were prepared by one person and checked by another;

- Velocity distributions at measurement cross sections were plotted and reviewed to ensure reasonable variation in velocity with flow depth and bed roughness;
- Hydrographs calculated from continuous water level measurements and the stage-discharge rating curve were compared to 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; and
- Hydrographs calculated 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 were provided to the sampling team as “certified clean” by the respective laboratories (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; and
- Samples for analysis of dissolved metals and nutrients were filtered in the lab instead of in the field, following laboratory direction.

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

dummy 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 JOSMP.

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

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

### **Sample Analysis**

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

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

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

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

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

Field blanks and trip blanks were collected and analyzed during all sampling months; one of each during each sampling month and three of each during the September (fall) sampling event. In field blanks, concentrations of all analytes were non-detectable or less than five times the detection limit during all sampling events in 2014, with the exception of conductivity in June and September, which was marginally greater than five times the detection limit of 0.2 µS/cm (Table B.2-1 and Table B.2-2).

In trip blanks, concentrations of all analytes were non-detectable or less than five times the detection limit during all sampling events in 2014, with the exception of conductivity in several months, ammonia in January, and oil-sands extractable acids in June (Table B.2-1 and Table B.2-2).

### ***Duplicate Samples***

There were 14 duplicate samples taken in 2014, one in each month and three during the September sampling event. Concentrations of conventional variables, major ions, nutrients, and hydrocarbons were generally quite similar between duplicate samples during all sampling events. The RPD for all conventional variables, major ions, nutrients, and hydrocarbons was less than 20% for most analytes where concentrations in both samples were greater than five times the detection limit, but there were several exceptions (Table B.2-3). Analytes showing a relatively high RPD included total suspended solids (TSS), sulphide, dissolved phosphorus, naphthenic acids, oil sands extractable acids, and various total and dissolved metals (particularly copper, nickel, titanium, and zinc).

In most months, differences between duplicate samples in concentrations of specific PAH species were for those with concentrations less than five times the detection limit, with the exception of June and July, when several PAH species showed greater differences between duplicate samples. The greater prevalence of high variability in PAHs between duplicate samples in June and July may relate to the high variability in suspended sediments between these duplicates in each month, given PAHs are generally highly hydrophobic and likely associated with particulates.

## **B.2.2.3 Conclusions**

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 the trip and field blank analyses suggested that laboratory-generated concentrations were reliable. While the analysis of duplicate samples indicated some variability within stations, this was likely related to local-scale heterogeneity among samples, particularly related to variability in suspended solids between duplicate samples in high-flow months.



**Table B.2-1 Results of analysis of field blanks prepared during water quality surveys conducted in support of the JOSMP, 2014.**

Variable	Laboratory	Unit	Detection Limit	Concentration in Field Blank														
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1	Sep #2	Sep #3	Oct	Nov	Dec	
<b>Conventional Variables</b>																		
Conductivity	ALS	µS/cm	0.2	0.8	0.8	<0.2	<0.2	0.66	#	0.98	0.54	#	#	0.94	0.83	1.7	0.77	
Dissolved Organic Carbon	ALS	mg/L	1	<1.0	<1.0	1	<1	<1	<1	<1	<1	<1	1.6	<1	<1	1.8	<1	1.8
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	-	<1.0	<1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	ALS	pH units	0.1	4.5	4.6	4.7	4.4	4.7	5.3	5.2	6.2	5.2	5.1	5.3	5.31	5.0	4.6	
Total Alkalinity	ALS	mg/L	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Dissolved Solids	ALS	mg/L	10	<10	<12	<12	<12	<12	<12	<12	<12	<10	<10	<10	<12	<12	<12	
Total Dissolved Solids (Calculated)	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	<1	<1	<1	
Total Organic Carbon	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	1.3	<1	<1	<1	<1	<1	
Total Suspended Solids	ALS	mg/L	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	
True Colour	ALS	T.C.U.	2	<2	<2	<2	<2	2.4	<2	<2	<2	3.2	<2	<2	<2	<2	<5	
<b>Major Ions</b>																		
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Calcium (Ca)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Chloride (Cl)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Hydroxide (OH)	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Magnesium (Mg)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Potassium (K)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Sodium (Na)	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Sulfate (SO <sub>4</sub> )	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.002	<0.002	
<b>Nutrients and BOD</b>																		
Ammonia-N	ALS	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Chlorophyll a	ALS	mg/L	0.01	-	-	-	-	<0.01	-	<0.01	-	-	-	-	-	-	-	
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	<0.071	<0.071	<0.054	<0.054	<0.054	<0.054	<0.054	<0.054	<0.054	<0.054	<0.054	<0.022	
Phosphorus, dissolved	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0017	<0.001	<0.001	<0.001	
Phosphorus, total	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
<b>Hydrocarbons</b>																		
Naphthenic Acids	AITF	mg/L	0.02	<0.020	<0.020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
OilSands Acid Extractable	AITF	mg/L	0.1	<0.100	<0.100	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Total Phenolics	ALS	mg/L	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total Rec. Hydrocarbons	ALS	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Hydrocarbons and Organic Compounds</b>																		
Benzene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	0.00051	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00051	<0.0005	<0.0005	<0.0005	<0.0005	
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	0.00097	0.00097	<0.0005	<0.0005	<0.0005	<0.0005	<0.001540	<0.00169	<0.0005	<0.0005	<0.0005	<0.0005	
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	

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

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

Variable	Laboratory	Unit	Detection Limit	Concentration in Field Blank													
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1	Sep #2	Sep #3	Oct	Nov	Dec
<b>Dissolved Metals</b>																	
Aluminum (Al)	AITF	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.00018	<0.00013	<0.00013	<0.00015	<0.00013	<0.00014	<0.00016	<0.00013	<0.00014	<0.00013
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.00001
Arsenic (As)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	0	0	0	0	0	0	<0.00001	<0.00000	<0.000003
Barium (Ba)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000003	<0.00001	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Boron (B)	AITF	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.00033	<0.00020	<0.00025	<0.00035	<0.00027	<0.00052	<0.00015	<0.00065	<0.00018	<0.00021
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Calcium (Ca)	AITF	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.03	<0.03	<0.04	<0.03	<0.03	<0.06	<0.03	<0.07	<0.1	0.1
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Copper (Cu)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Iron (Fe)	AITF	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.0006	<0.0008	<0.0006	<0.0006	<0.0006	<0.0008	<0.0007	<0.0007	<0.0006	<0.0007
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004
Lithium (Li)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Manganese (Mn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002	<0.00001
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	<0.00001	<0.000002	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.00001
Nickel (Ni)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000004	<0.000001	<0.000001	<0.000001	<0.000001
Strontium (Sr)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Sulphur (S)	AITF	mg/L	2	<2	<2	<2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	<0.000003	<0.000001	<0.00002	<0.000001	<0.000002	<0.000001	<0.00001	<0.000001	<0.000001
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00003	<0.00001	<0.00000	<0.00001	<0.00000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Titanium (Ti)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Vanadium (V)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Zinc (Zn)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00016	<0.00020	<0.00026	<0.00026	<0.00009	<0.00020	<0.00018	<0.00009	<0.00011	<0.00004
<b>Total Metals</b>																	
Aluminum (Al)	AITF	mg/L	0.003	<0.003	<0.003	<0.003	<0.003	<0.0005	<0.0004	<0.0002	<0.0003	<0.0004	<0.0002	<0.0004	<0.0044	<0.0003	<0.0004
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.000003	<0.000001	<0.000001	<0.000002	<0.000001	<0.000002	<0.00003	<0.00001
Arsenic (As)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.00001	<0.000004	<0.000004
Barium (Ba)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00003	<0.00005	<0.00001	<0.00005	<0.00003	<0.00003	<0.00004	<0.00002	<0.00002	<0.000004
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000001	<0.00001	<0.000001	<0.000001	<0.000001	<0.000002	<0.000001	<0.000001	<0.000001	<0.000001
Boron (B)	AITF	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.00090	<0.00020	<0.00030	<0.00040	<0.00040	<0.00060	<0.00020	<0.00066	<0.0003	<0.0004
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Calcium (Ca)	AITF	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.04	<0.04	<0.04	<0.04	<0.04	<0.06	<0.05	<0.07	<0.13	<0.1
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0001	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Copper (Cu)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00019	<0.00007	<0.00005	<0.00006	<0.00005	<0.00005	<0.00008	<0.00005	<0.00005	<0.00005
Iron (Fe)	AITF	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.0007	<0.0008	<0.0008	<0.0008	<0.0007	<0.0008	<0.0008	<0.0015	<0.00100	<0.00007

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

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

Variable	Laboratory	Unit	Detection Limit	Concentration in Field Blank													
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1	Sep #2	Sep #3	Oct	Nov	Dec
<b>Total Metals (Cont'd.)</b>																	
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Lithium (Li)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Manganese (Mn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00006	<0.00002	<0.00002	<0.00002	<0.000005
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.0001	<0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	<0.08	<0.08	<0.08	<0.08	0.33	0.26	<0.08	0.17	0.24	0.23	0.19	0.25	<0.1	<0.1
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	<0.000009	<0.000004	<0.000007	<0.000002	<0.000002	<0.000002	<0.000002	<0.000001	<0.000005
Nickel (Ni)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000008	<0.000014	<0.000008	<0.000008	<0.000008	<0.000021	<0.000008	<0.000008	<0.00001	<0.000008
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000004	<0.000002	<0.000002	<0.000002	<0.000002
Strontium (Sr)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00003	<0.00003	<0.00002	<0.00000	<0.00001	<0.00003	<0.00001	<0.000024	<0.000021
Sulphur (S)	AITF	mg/L	2	<2	<2	<2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000006	<0.000008	<0.000001	<0.000017	<0.000001	<0.000002	<0.000001	<0.000005	<0.000001	<0.000009
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000027	<0.000007	<0.000005	<0.000010	<0.000007	<0.000005	<0.000021	<0.000011	<0.000006	<0.000009
Titanium (Ti)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Zinc (Zn)	AITF	mg/L	0.0002	0.00034	<0.0002	<0.0002	<0.0002	<0.0001	<0.0002	<0.0003	<0.0004	<0.0001	<0.0002	<0.0003	<0.0001	<0.0003	<0.0001
<b>PAHs</b>																	
Acenaphthene	AXYS	ng/L	0.344	0.542	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344
Acenaphthylene	AXYS	ng/L	0.301	0.334	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	0.332	<0.301	<0.301
Anthracene	AXYS	ng/L	0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241
Benz[a]anthracene	AXYS	ng/L	0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094
Benzo[a]pyrene	AXYS	ng/L	0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171
Benzo[b,j,k]fluoranthene	AXYS	ng/L	0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111
Benzo[g,h,i]perylene	AXYS	ng/L	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Biphenyl	AXYS	ng/L	1.496	3.920	2.910	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496
C1-Acenaphthenes	AXYS	ng/L	0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.573	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	0.624	<0.573	<0.573	<0.573
C1-Biphenyls	AXYS	ng/L	4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	4.110	<4.062	<4.062
C1-Dibenzothiophenes	AXYS	ng/L	0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	0.362	<0.304
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719
C1-Fluorenes	AXYS	ng/L	2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	2.650	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582
C1-Naphthalenes	AXYS	ng/L	9.571	49.10	25.40	14.60	<9.571	<9.571	<9.571	<9.571	<9.571	<9.571	<9.571	<9.571	10.50	<9.571	<9.571
C1-Phenanthrenes/Anthracenes	AXYS	ng/L	0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336
C2-Biphenyls	AXYS	ng/L	18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	19.00	<18.832	<18.832
C2-Dibenzothiophenes	AXYS	ng/L	1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711
C2-Fluorenes	AXYS	ng/L	1.430	1.890	<1.430	<1.430	<1.430	<1.430	2.710	2.020	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430
C2-Naphthalenes	AXYS	ng/L	5.743	9.370	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743
C2-Phenanthrenes/Anthracenes	AXYS	ng/L	0.678	<0.678	<0.678	<0.678	<0.678	<0.678	<0.678	0.680	<0.678	<0.678	<0.678	<0.678	<0.678	<0.678	<0.678
C3-Dibenzothiophenes	AXYS	ng/L	1.256	<1.256	<1.256	<1.256	1.470	<1.256	<1.256	<1.256	<1.256	<1.256	<1.256	<1.256	<1.256	<1.256	<1.256
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666

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

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

Variable	Laboratory	Unit	Detection Limit	Concentration in Field Blank													
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1	Sep #2	Sep #3	Oct	Nov	Dec
<b>PAHs (Cont'd.)</b>																	
C3-Fluorenes	AXYS	ng/L	2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	2.570	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417
C3-Naphthalenes	AXYS	ng/L	2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621
C4-Dibenzothiophenes	AXYS	ng/L	1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093
C4-Naphthalenes	AXYS	ng/L	1.739	1.980	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988
Chrysene	AXYS	ng/L	0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162
Dibenz[a,h]anthracene	AXYS	ng/L	0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201
Dibenzothiophene	AXYS	ng/L	0.429	<0.429	<0.429	<0.429	<0.429	<0.429	0.57	0.4291	<0.429	<0.429	<0.429	<0.429	<0.429	0.429	<0.429
Fluoranthene	AXYS	ng/L	0.550	<0.550	<0.550	<0.550	<0.550	<0.550	<0.550	<0.550	0.985	<0.550	<0.550	<0.550	<0.550	<0.550	<0.550
Fluorene	AXYS	ng/L	0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	0.4	<0.353
Indeno[1,2,3-c,d]-pyrene	AXYS	ng/L	0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145
Naphthalene	AXYS	ng/L	7.210	123.0	72.1	93.3	7.2104	<7.21	12.10	<7.21	<7.21	<7.210	<7.210	7.860	<7.210	7.21	<7.21
Phenanthrene	AXYS	ng/L	1.394	1.75	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	1.394	1.440
Pyrene	AXYS	ng/L	0.359	<0.359	<0.359	<0.359	<0.359	<0.359	<0.359	<0.359	0.581	<0.359	<0.359	<0.359	<0.359	<0.359	<0.359
Retene	AXYS	ng/L	0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407

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

**Table B.2-2 Results of analysis of trip blanks prepared during water quality surveys conducted in support of the JOSMP, 2014.**

Variable	Laboratory	Unit	Detection Limit	Concentration in Trip Blank													
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1	Sep #2	Sep #3	Oct	Nov	Dec
<b>Conventional Variables</b>																	
Conductivity	ALS	µS/cm	0.2	0.73	0.6	<0.2	<0.2	0.56	0.85	0.95	#	1	0.63	#	1.62	1.65	1.47
Dissolved Organic Carbon	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hardness (as CaCO <sub>3</sub> )	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
pH	ALS	pH units	0.1	4.86	4.93	4.75	4.57	4.89	4.74	5.26	6.43	5.32	5.39	5.36	5.85	4.95	5.49
Total Alkalinity	ALS	mg/L	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Dissolved Solids	ALS	mg/L	10	<10	<12	<12	<12	<12	12	<12	<10	<10	<10	<10	<12	<12	<12
Total Dissolved Solids (calculated)	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	<1	<1	<1
Total Organic Carbon	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Suspended Solids	ALS	mg/L	3	3	<3	3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
True Colour	ALS	T.C.U.	2	<2	<2	2.2	<2	<2	<2	<2	<2	4.5	2.9	<2	<2	<2	<5
<b>Major Ions</b>																	
Bicarbonate (HCO <sub>3</sub> )	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Calcium (Ca)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO <sub>3</sub> )	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chloride (Cl)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide (OH)	ALS	mg/L	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<0.02	<5
Magnesium (Mg)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	ALS	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulfate (SO <sub>4</sub> )	ALS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3
Sulphide (S <sub>2</sub> )	ALS	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.002	<0.002
<b>Nutrients and BOD</b>																	
Ammonia-N	ALS	mg/L	0.05	#	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Biochemical Oxygen Demand	ALS	mg/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chlorophyll a	ALS	mg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	-	-	<0.01	-
Nitrate+Nitrite	ALS	mg/L	0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.05	<0.054	<0.054	<0.054	<0.054	<0.054	<0.054	<0.054	<0.022
Phosphorus, dissolved	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	ALS	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
<b>General Organics</b>																	
Naphthenic Acids	AITF	mg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.10	<0.02	<0.02	<0.03	<0.02	0	<0.02	<0.02	<0.02
OilSands Acid Extractable	AITF	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	#	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Phenolics	ALS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Rec. Hydrocarbons	ALS	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Hydrocarbons and Organic Compounds</b>																	
Benzene		mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
CCME Fraction 1 (BTEX)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 1 (C6-C10)	ALS	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CCME Fraction 2 (C10-C16)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 3 (C16-C34)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
CCME Fraction 4 (C34-C50)	ALS	mg/L	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Ethylbenzene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
m+p-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
o-Xylene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	ALS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylenes	ALS	mg/L	0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071

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

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

Variable	Laboratory	Unit	Detection Limit	Concentration in Trip Blank													
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1	Sep #2	Sep #3	Oct	Nov	Dec
<b>Dissolved Metals</b>																	
Aluminum (Al)	AITF	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.0003	0.00015	<0.00013	<0.00013	<0.00013	0.00015	<0.00013	<0.00013	<0.00016	<0.00013
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.000008	<0.000008	<0.000008	<0.000008	<0.00003	<0.00001
Arsenic (As)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	0	0	<0.000003	<0.000003	<0.000003	<0.000003	0.000005	<0.0000	<0.0000
Barium (Ba)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00007	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001	<0.0001
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.0000	<0.0000
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000003	<0.000003	<0.000003	0.000004	<0.000003	<0.000003	<0.000003	<0.000003	<0.0000	<0.0000
Boron (B)	AITF	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	0.00024	0.00018	0.00026	<0.00013	0.00037	<0.00013	0.00028	0.00255	<0.00018	<0.00014
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	0.00001	0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Calcium (Ca)	AITF	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	0.03	0.05	<0.03	0.05
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Copper (Cu)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.0001	<0.0001
Iron (Fe)	AITF	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.001	<0.001
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	0.000006	<0.000004	<0.000004
Lithium (Li)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00002	<0.00002	<0.00002	0.00003	0.00016	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Manganese (Mn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00002	<0.00001	<0.00001	0.00002	<0.00001	0.00002	0.00003	0.00002	<0.00002	<0.00001
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.00001	<0.00001
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	0.000003	0.000033	0.000004	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000005
Nickel (Ni)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000011	0.00001	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006	0.000006	<0.000006	<0.000006
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.000040	<0.000040
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001	<0.000001
Strontium (Sr)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.0001	<0.0001
Sulphur (S)	AITF	mg/L	2	<2	<2	<2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.0000004	<0.000004
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0000008	<0.0000008	<0.0000008	<0.0000008	<0.0000008	<0.0000008	<0.0000008	0.0000009	<0.000001	<0.000001
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000019	0.000022	<0.000003	0.000007	<0.000003	0.000024	<0.000003	0.000008	<0.000003	<0.000009
Titanium (Ti)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	0.000129	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.0001	<0.0001
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Vanadium (V)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020
Zinc (Zn)	AITF	mg/L	0.0002	<0.0002	<0.0002	0.000237	0.000297	<0.00009	0.00024	0.0001	0.00014	0.00013	<0.00009	0.00011	0.00036	0.00090	0.00090
<b>Total Metals</b>																	
Aluminum (Al)	AITF	mg/L	0.003	<0.003	<0.003	<0.003	<0.003	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003	0.0004	0.00466	<0.0002	<0.0004
Antimony (Sb)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000001	0.000002	0.000003	<0.000001	<0.000001	<0.000001	<0.000001	1.72E-06	<0.000041	<0.000002
Arsenic (As)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	<0.000004	7.89E-06	<0.000004	<0.000004
Barium (Ba)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000079	0.000068	0.000006	0.00005	<0.000004	0.000033	0.000035	0.0000334	<0.000008	<0.000004
Beryllium (Be)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Bismuth (Bi)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000001	0.000005	<0.000001	0.00001	<0.000001	<0.000001	<0.000001	4.95E-06	<0.000001	<0.000001
Boron (B)	AITF	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	0.0005	0.0003	0.0004	<0.0001	0.0004	0.0006	0.0007	0.00284	<0.0002	<0.0002
Cadmium (Cd)	AITF	mg/L	0.0001	<0.00001	<0.00001	<0.00001	<0.00001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Calcium (Ca)	AITF	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Chlorine (Cl)	AITF	mg/L	0.3	<0.3	<0.3	<0.3	<0.3	0.07	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.0552	<0.04	0.05
Chromium (Cr)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Cobalt (Co)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	3.25E-06	<0.000002	<0.000002
Copper (Cu)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	0.00009	<0.00005	0.00006	<0.00005	0.00005	0.00005	<0.00005	<0.0001	<0.0001
Iron (Fe)	AITF	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.0007	<0.0007	<0.0007	0.0008	<0.0007	0.0009	0.0008	0.001	<0.001	<0.001
Lead (Pb)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000003	<0.000003	<0.000003	0.000004	<0.000003	<0.000003	<0.000003	5.59E-06	<0.000003	<0.000003

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

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

Variable	Laboratory	Unit	Detection Limit	Concentration in Trip Blank													
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1	Sep #2	Sep #3	Oct	Nov	Dec
<b>Total Metals (Cont'd.)</b>																	
Lithium (Li)	AITF	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00005	<0.00005	<0.00005	0.00006	0.0003	<0.00005	<0.00005	<0.00005	<0.0001	<0.0001
Manganese (Mn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00002	<0.000005	<0.000005	0.000048	<0.000005	0.000017	0.000051	0.0000389	<0.00002	<0.00001
Mercury (Hg)	AITF	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000009	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.00001	<0.00001
Mercury (Hg), ultra-trace	AITF	ng/L	0.6	<0.08	<0.08	<0.08	0.661	<0.08	0.59	<0.08	0.14	0.49	0.22	<0.08	0.14	<0.1	0.12
Molybdenum (Mo)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00001	0.000004	0.000034	0.000004	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000005
Nickel (Ni)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000011	0.00001	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008	0.000031	<0.000008	<0.000008
Selenium (Se)	AITF	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.00006	<0.0001	<0.0001
Silver (Ag)	AITF	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000003	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000003
Strontium (Sr)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000024	0.00002	0.000016	0.000017	<0.000001	0.000024	0.00005	9.79E-06	<0.000016	<0.000012
Sulphur (S)	AITF	mg/L	2	<2	<2	<2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium (Tl)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000001
Thorium (Th)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	<0.000009	2.02E-06	<0.000001
Tin (Sn)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000019	0.000023	<0.000003	0.000037	<0.000003	0.000024	0.000006	8.12E-06	<0.000017	<0.000009
Titanium (Ti)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.0000579	<0.0001	<0.0001
Uranium (U)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	AITF	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Zinc (Zn)	AITF	mg/L	0.0002	<0.0002	<0.0002	0.000293	0.000317	0.0001	0.0002	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.00144	0.0001
<b>PAHs</b>																	
Acenaphthene	AXYS	ng/L	0.34	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344
Acenaphthylene	AXYS	ng/L	0.30	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301	<0.301
Anthracene	AXYS	ng/L	0.24	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241
Benz[a]anthracene	AXYS	ng/L	0.09	<0.094	<0.094	<0.094	<0.094	0.106	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094	<0.094
Benzo[a]pyrene	AXYS	ng/L	0.17	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171	<0.171
Benzo[b,j,k]fluoranthene	AXYS	ng/L	0.11	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111	<0.111
Benzo[g,h,i]perylene	AXYS	ng/L	0.13	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Biphenyl	AXYS	ng/L	1.50	<1.496	1.530	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496	<1.496
C1-Acenaphthenes	AXYS	ng/L	0.30	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.20	<0.202	<0.202	<0.202	<0.202	0.204	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202	<0.202
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.57	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	<0.573	0.629	<0.573	<0.573	<0.573	<0.573
C1-Biphenyls	AXYS	ng/L	4.06	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	<4.062	4.690	<4.062	<4.062
C1-Dibenzothiophenes	AXYS	ng/L	0.30	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304	<0.304
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	0.72	<0.719	<0.719	<0.719	<0.719	0.745	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719	<0.719
C1-Fluorenes	AXYS	ng/L	2.58	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582	<2.582
C1-Naphthalenes	AXYS	ng/L	9.57	<9.571	28.800	<9.571	<9.571	<9.571	<9.571	<9.571	<9.571	<9.571	<9.571	<9.571	10.200	10.100	<9.571
C1-Phenanthrenes/Anthracenes	AXYS	ng/L	0.83	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	<0.831	0.854
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.24	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243	<0.243
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.34	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336	<0.336
C2-Biphenyls	AXYS	ng/L	18.83	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	<18.832	21.900	<18.832	<18.832
C2-Dibenzothiophenes	AXYS	ng/L	1.05	<1.052	<1.052	<1.052	<1.052	<1.052	1.140	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052	<1.052
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	0.71	0.883	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711	<0.711
C2-Fluorenes	AXYS	ng/L	1.43	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430	<1.430
C2-Naphthalenes	AXYS	ng/L	5.74	<5.743	5.960	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743	<5.743
C2-Phenanthrenes/Anthracenes	AXYS	ng/L	0.68	<0.678	<0.678	<0.678	<0.678	<0.678	0.737	<0.678	<0.678	<0.678	<0.678	<0.678	<0.678	<0.678	<0.678
C3-Dibenzothiophenes	AXYS	ng/L	1.26	<1.256	<1.256	<1.256	<1.256	<1.256	1.600	<1.256	<1.256	<1.256	<1.256	<1.256	<1.256	<1.256	<1.256
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	0.67	0.697	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666	<0.666
C3-Fluorenes	AXYS	ng/L	2.42	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417	<2.417

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

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

Variable	Laboratory	Unit	Detection Limit	Concentration in Trip Blank													
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1	Sep #2	Sep #3	Oct	Nov	Dec
<b>PAHs (Cont'd.)</b>																	
C3-Naphthalenes	AXYS	ng/L	2.47	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467	<2.467
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	0.62	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621	<0.621
C4-Dibenzothiophenes	AXYS	ng/L	1.09	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093	<1.093
C4-Naphthalenes	AXYS	ng/L	1.74	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	<1.739	1.820	<1.739	<1.739	<1.739	<1.739	<1.739
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	1.99	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988	<1.988
Chrysene	AXYS	ng/L	0.16	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	<0.162	0.166
Dibenz[a,h]anthracene	AXYS	ng/L	0.20	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201	<0.201
Dibenzothiophene	AXYS	ng/L	0.43	<0.429	<0.429	<0.429	<0.429	<0.429	0.499	<0.429	<0.429	<0.429	<0.429	<0.429	<0.429	<0.429	<0.429
Fluoranthene	AXYS	ng/L	0.55	<0.550	<0.550	<0.550	<0.550	<0.550	<0.550	0.570	<0.550	<0.550	<0.550	<0.550	<0.550	<0.550	<0.550
Fluorene	AXYS	ng/L	0.35	<0.353	0.416	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353	<0.353
Indeno[1,2,3-c,d]-pyrene	AXYS	ng/L	0.14	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145	<0.145
Naphthalene	AXYS	ng/L	7.21	<7.210	<b>64.400</b>	<7.210	<7.210	<7.210	<7.210	<7.210	<7.210	<7.210	<7.210	<7.210	<7.210	<7.210	<7.210
Phenanthrene	AXYS	ng/L	1.39	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	<1.394	1.580
Pyrene	AXYS	ng/L	0.36	<0.359	<0.359	<0.359	<0.359	<0.359	<0.359	0.360	<0.359	<0.359	<0.359	<0.359	<0.359	<0.359	<0.359
Retene	AXYS	ng/L	0.41	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407

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



**Table B.2-3 Observations exceeding a relative percent difference of 20% between duplicate water quality samples collected in support of the JOSMP, 2014.**

Analyte	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1 (LUC-1)	Sep #2 (LUC-2)	Sep #3 (LUC-3)	Oct	Nov	Dec
<b>Conventional Variables</b>														
Conductivity	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness (as CaCO <sub>3</sub> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Alkalinity	-	-	-	-	-	-	-	-	-	-	-	-	200	-
Total Dissolved Solids	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids	-	-	-	-	-	31.6	66.7	-	27.4	31.0	28.6	-	33.3	33.3
True Colour	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Major Ions</b>														
Bicarbonate (HCO <sub>3</sub> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium (Ca)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbonate (CO <sub>3</sub> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydroxide (OH)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium (Mg)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (K)	-	-	-	-	-	-	-	-	-	-	-	-	196	-
Sodium (Na)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO <sub>4</sub> )	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphide (S <sub>2</sub> )	-	-	-	-	29.1	36.9	-	-	-	-	21.4	61.5	-	-
<b>Nutrients and BOD</b>														
Ammonia-N	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biochemical Oxygen Demand	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate+Nitrite	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus, dissolved	-	-	43.5	-	-	-	91.0	-	-	-	31.4	-	-	-
Phosphorus, total	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen	-	-	-	-	-	-	-	20.8	-	-	-	-	-	-
Total Nitrogen	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1 (LUC-1)	Sep #2 (LUC-2)	Sep #3 (LUC-3)	Oct	Nov	Dec
<b>Hydrocarbons and Organic Compounds</b>														
Naphthenic Acids	-	22.8	-	23.7	34.7	55.2	155.6	50.0	40.9	-	-	29.8	-	-
Oilsands Acid Extractable	-	26.9	20.4	-	-	57.1	73.4	88.0	-	-	-	-	-	-
Total Phenolics	-	-	-	-	-	-	24.8	27.2	51.2	48.3	-	54.0	-	-
Benzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CCME Fraction 1 (BTEX)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CCME Fraction 1 (C6-C10)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CCME Fraction 2 (C10-C16)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CCME Fraction 3 (C16-C34)	-	-	-	-	-	-	-	-	-	-	-	-	27.6	27.6
CCME Fraction 4 (C34-C50)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m+p-Xylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Dissolved Metals</b>														
Aluminum (Al)	24.2	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony (Sb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (As)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (Ba)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium (Be)	-	-	-	-	75.9	28.6	75.9	43.5	-	35.3	-	-	-	-
Bismuth (Bi)	-	-	-	-	97.9	28.6	120.0	85.7	-	-	120.0	-	50	53.3
Boron (B)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium (Cd)	-	-	-	-	-	-	22.2	-	-	28.6	50.0	-	33.3	22.2
Calcium (Ca)	-	-	25.2	-	-	-	-	-	-	-	-	-	-	-
Chlorine (Cl)	23.7	-	-	-	-	-	44.4	-	-	-	-	-	-	-
Chromium (Cr)	-	-	-	-	-	22.2	66.7	22.2	-	-	40.0	-	-	66.7
Cobalt (Co)	-	-	-	-	-	35.4	28.6	-	-	-	-	-	-	-
Copper (Cu)	-	20.5	-	-	-	28.0	46.3	-	-	-	37.2	25.0	-	-
Iron (Fe)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1 (LUC-1)	Sep #2 (LUC-2)	Sep #3 (LUC-3)	Oct	Nov	Dec
<b>Dissolved Metals (Cont'd.)</b>														
Lead (Pb)	-	-	-	-	-	-	-	-	-	-	-	116.7	-	-
Lithium (Li)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (Mn)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury (Hg)	-	-	-	-	-	-	-	-	-	-	-	-	28.6	-
Molybdenum (Mo)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (Ni)	-	-	-	-	-	-	-	-	21.6	-	-	-	-	-
Selenium (Se)	-	-	-	-	35.3	22.2	47.6	-	-	58.8	36.4	22.2	-	50.0
Silver (Ag)	-	-	-	-	28.6	66.7	-	-	-	-	66.7	-	28.6	-
Strontium (Sr)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphur (S)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (Tl)	-	-	-	-	85.7	35.6	-	-	-	24.0	-	-	40	21.4
Thorium (Th)	-	-	25.3	-	73.9	23.7	104.5	89.4	-	-	45.6	48.0	50	23.6
Tin (Sn)	-	-	-	-	50	35.3	80.0	-	-	40.0	37.5	71.0	43.1	62.5
Titanium (Ti)	-	-	-	-	-	23.2	-	-	-	-	-	-	-	-
Uranium (U)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (V)	-	-	-	-	-	-	-	-	-	-	-	37.0	-	-
Zinc (Zn)	-	38.6	-	-	-	44.9	85.7	-	113.5	-	53.1	65.6	23.8	-
<b>Total Metals</b>														
Aluminum (Al)	-	141	57.2	-	-	-	-	-	-	-	-	-	-	-
Antimony (Sb)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (As)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (Ba)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium (Be)	-	-	-	-	-	-	-	-	-	28.6	-	-	-	38.5
Bismuth (Bi)	-	-	-	-	61.8	40.0	66.7	50.0	-	22.2	82.4	-	-	84.2
Boron (B)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium (Cd)	-	-	-	-	-	-	-	44.4	-	-	-	-	22.2	-
Calcium (Ca)	-	-	21.4	-	-	-	-	-	-	-	-	-	-	-
Chlorine (Cl)	-	-	-	-	-	-	44.4	-	-	-	-	-	-	-
Chromium (Cr)	45.2	-	-	-	-	-	-	-	-	-	-	-	-	-

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1 (LUC-1)	Sep #2 (LUC-2)	Sep #3 (LUC-3)	Oct	Nov	Dec
<b>Total Metals (Cont'd.)</b>														
Cobalt (Co)	-	-	-	-	-	24.0	-	-	-	-	-	-	-	-
Copper (Cu)	24.5	24.1	-	-	-	-	-	-	-	28.9	43.2	-	-	-
Iron (Fe)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead (Pb)	-	118.4	24.2	-	-	-	-	-	25.9	-	-	-	-	-
Lithium (Li)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (Mn)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury (Hg)	-	-	-	-	-	-	-	-	-	-	-	-	22.2	-
Mercury (Hg), ultra-trace	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (Mo)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (Ni)	-	61.1	20.5	-	-	-	-	-	-	-	-	-	-	-
Selenium (Se)	-	-	-	-	-	-	42.4	-	52.6	73.7	43.5	-	-	50.0
Silver (Ag)	-	-	-	-	-	-	28.6	33.3	-	-	-	-	-	57.1
Strontium (Sr)	-	-	-	35.1	-	-	-	-	-	-	-	-	-	-
Sulphur (S)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium (Tl)	-	-	-	-	-	-	-	28.2	-	31.6	-	32.0	20.8	21.8
Thorium (Th)	-	-	26.1	-	-	-	-	49.4	-	-	45.2	-	-	-
Tin (Sn)	-	-	-	-	-	33.7	-	-	72.7	102.7	46.8	73.5	22.2	20.7
Titanium (Ti)	-	92.9	43	33	-	23.2	-	-	-	-	-	-	-	-
Uranium (U)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium (V)	-	58.9	23.4	-	-	-	-	-	-	-	-	-	-	-
Zinc (Zn)	-	-	-	-	-	-	-	-	-	27.0	63.4	-	30.6	-
<b>PAHs</b>														
Acenaphthene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benz[a]anthracene	-	68.9	-	54.4	37	-	28.7	22.6	-	-	-	-	-	-
Benzo[a]pyrene	-	-	-	-	-	44.8	-	-	-	-	-	-	-	-
Benzo[b,j,k]fluoranthene	-	-	-	34.3	33	-	30.8	76.1	-	-	-	-	29.5	-

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1 (LUC-1)	Sep #2 (LUC-2)	Sep #3 (LUC-3)	Oct	Nov	Dec
<b>PAHs (Cont'd.)</b>														
Benzo[g,h,i]perylene	-	56.8	-	-	-	-	-	-	-	-	-	-	-	-
Biphenyl	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C1-Acenaphthenes	-	-	-	-	-	80.3	-	-	-	-	-	-	-	-
C1-Benzo[a]anthracenes/Chrysenes	-	67	-	-	-	23.0	30.5	36.8	-	-	-	-	-	-
C1-Benzofluoranthenes/Benzopyrenes	-	44.7	-	118.6	-	26.4	59.2	80.1	-	-	-	-	34.8	-
C1-Biphenyls	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C1-Dibenzothiophenes	-	-	-	-	54.7	-	-	-	-	-	-	-	41.1	42.0
C1-Fluoranthenes/Pyrenes	-	35.1	-	-	-	25.2	34.9	-	90.7	-	33.7	-	-	1.6
C1-Fluorenes	-	-	-	-	-	29.1	-	-	-	-	-	-	-	0.0
C1-Naphthalenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C1-Phenanthrenes/Anthracenes	-	40.2	-	-	-	-	-	59.2	-	-	-	-	-	-
C2-Benzo[a]anthracenes/Chrysenes	-	56.5	-	29.5	-	27.6	23.8	-	-	-	-	-	-	-
C2-Benzofluoranthenes/Benzopyrenes	-	-	-	66	-	-	23.0	-	-	-	-	-	-	-
C2-Biphenyls	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C2-Dibenzothiophenes	-	60.2	-	24.3	22.1	-	-	-	-	-	-	-	20.4	-
C2-Fluoranthenes/Pyrenes	-	39.1	39.4	-	-	-	30.8	26.4	-	-	20.2	-	-	-
C2-Fluorenes	-	-	-	34.2	-	23.5	25.2	-	-	-	-	-	-	-
C2-Naphthalenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C2-Phenanthrenes/Anthracenes	-	50.4	-	-	-	-	26.3	-	-	-	-	-	-	-
C3-Dibenzothiophenes	-	35	-	-	-	21.0	39.2	-	-	-	-	-	-	-
C3-Fluoranthenes/Pyrenes	-	40.9	-	52.2	-	34.7	-	22.6	-	-	-	-	-	-
C3-Fluorenes	-	-	-	-	21.6	-	41.4	-	-	-	-	-	-	-
C3-Naphthalenes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C3-Phenanthrenes/Anthracenes	20.5	25.4	37.8	-	-	-	31.0	-	-	-	-	-	23.6	-
C4-Dibenzothiophenes	-	-	-	-	-	40.4	-	71.7	-	-	-	-	33.4	45.7
C4-Naphthalenes	-	-	-	-	43.9	-	69.7	-	35.8	-	-	-	-	26.8
C4-Phenanthrenes/Anthracenes	-	49.1	-	-	32.7	44.4	43.3	-	-	-	-	-	-	21.2
Chrysene	-	52.5	-	-	-	-	-	-	-	-	30.5	-	-	-

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep #1 (LUC-1)	Sep #2 (LUC-2)	Sep #3 (LUC-3)	Oct	Nov	Dec
<b>PAHs (Cont'd.)</b>														
Dibenz[a,h]anthracene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzothiophene	-	-	-	-	-	21.7	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	26.8	-
Fluorene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno[1,2,3-c,d]-pyrene	-	-	-	-	-	-	-	42.8	-	-	-	-	-	-
Naphthalene	36.3	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	-	-	-	20.5	-	-	-	-	-	-	-	-	-	-
Pyrene	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Retene	-	-	-	-	40.9	30.6	33.5	-	57.6	-	-	30.3	-	-

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

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

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

## B.2.3 Benthic Invertebrate Communities Component

### B.2.3.1 Quality Control Activities – Field

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

### B.2.3.2 Quality Control Activities – Laboratory

Taxonomic samples were sorted and identified by Dr. Jack Zloty of Summerland, BC, who has analyzed benthic invertebrate samples on behalf of RAMP and now under the JOSMP consistently since the RAMP began. Laboratory methods used by Dr. Zloty in 2014 included resorting of 5% of samples as a confirmation of the overall sorting efficiency of all samples. In 2014, a total of 24 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). Sorting efficiency was calculated based on the following formula:

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

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

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 2014 benthic invertebrate community component indicate that this objective was consistently achieved (Table B.2-4).

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

**Table B.2-4 Results of quality control checks on sorting efficiency of benthic invertebrate samples, 2014.**

Replicate Samples	% Sorting efficiency
GIC-1 #4	$[1-(0/(73+0))] * 100 = 100$
BPC-1 #5	$[1-(8/(474+8))] * 100 = 98.3$
CHL-1 #2	$[1-(4/(262+4))] * 100 = 98.5$
GAL-1 #2	$[1-(9/(386+9))] * 100 = 97.7$
GRL-1 #6	$[1-(7/(417+7))] * 100 = 98.4$
KEL-1 #8	$[1-(4/(180+4))] * 100 = 97.8$
ELR-D1 #3	$[1-(0/(19+0))] * 100 = 100$
CHR-D3 #2	$[1-(2/(101+2))] * 100 = 98.1$
CHR-D4 #1	$[1-(5/(223+5))] * 100 = 97.8$
BIC-D1 #7	$[1-(0/(25+0))] * 100 = 100$
SUC-D2 #5	$[1-(13/(414+13))] * 100 = 97.0$
UNC-D3 #9	$[1-(17/(638+17))] * 100 = 97.4$
HHR-E1 #5	$[1-(8/(265+8))] * 100 = 97.1$
MAR-E1 #6	$[1-(15/(766+15))] * 100 = 98.1$
MAR-E3 #1	$[1-(17/(554+17))] * 100 = 97.0$
STR-E1 #8	$[1-(8/(212+8))] * 100 = 96.4$
MUR-E1 #4	$[1-(40/(2359+40))] * 100 = 98.3$
MUR-E1 #8	$[1-(74/(1867+74))] * 100 = 96.2$
BER-D2 #1	$[1-(3/(74+3))] * 100 = 96.1$
CHR-D1 #6	$[1-(9/(261+9))] * 100 = 96.7$
CHR-D2 #7	$[1-(1/(81+1))] * 100 = 98.8$
CLR-D1 #8	$[1-(7/(123+7))] * 100 = 94.6$
FOC-D1 #3	$[1-(0/(43+0))] * 100 = 100$
MUR-D2 #2	$[1-(13/(204+13))] * 100 = 94.0$

Note: Mean efficiency – 97.7%; 24 samples - ~5% of all samples.

## B.2.4 Sediment Quality Component

The 2014 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<sup>®</sup> metals-free soap and rinsed with ambient site water, rinsed with hexane and then acetone, and triple-rinsed with ambient water prior to sample collection at a given station;
- Sample grabs were kept only if they contained no large foreign objects, obtained adequate sediment penetration depth, and were not overfilled or leaking; and
- Technicians wore powder-free latex gloves during equipment washing and sampling.

Split samples (in which a single, large sample was subsampled) and duplicate samples (in which two unique samples were taken from the same location) were collected from Poplar Creek (station POC-D1) and Muskeg River (station MUR-D2). SES-D1 and SED-D1 were split and duplicate samples, respectively, taken from station POC-D1, while SES-D2 and SED-D2 were split and duplicate samples, respectively, taken from station MUR-D2.

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

In addition, a sampling-equipment rinsate blank was collected at two sampling locations in fall, 2014. Sampling equipment (i.e., Ekman dredge, stainless-steel tray, and spoons) was washed with Liquinox<sup>®</sup> soap, ambient water, hexane, acetone, and deionized water as per the standard operating procedures. The rinsate sample was then 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 the rinsates (at ng/L) by AXYS Analytical Services (the same laboratory that analyzed PAHs in sediments), while metals were analyzed in this rinsate (at mg/L) by AITF in Edmonton, AB. Concentrations of metals in sediments were compared against five times their analytical detection limit and PAHs were assessed against five times the laboratory blank concentration, to assess potential sample contamination related to equipment.

In 2014, sediment toxicity results for several samples sent to the contracted toxicology laboratory (HydroQual) could not be obtained due to control-sample or culture failures at the laboratory. Correspondence from the laboratory, regarding these issues is provided at the end of this appendix.

### B.2.4.2 Results and Discussion

#### *Duplicate Samples*

Concentrations of several PAHs differed by greater than 20% between duplicate samples collected at stations POC-D1 and MUR-D2 but none were greater than five times the detection limit. Concentrations of all organic compounds, excluding PAHs, were within 20% of each duplicate sample collected at station MUR-D2; and only F4 hydrocarbons slightly exceeded this criterion (i.e., 20.1%) at station POC-D1 (Table B.2-5 and Table B.2-6).

Among metals measured in duplicate sediments, only total barium differed by greater than 20% between duplicate samples at station MUR-D2; however, concentrations of all metals differed by greater than 20% between duplicate samples at station POC-D1 (Table B.2-5 and Table B.2-6). The reason for the large discrepancy in concentrations of metals between duplicate samples was unknown, and was unexpected given the similarity in concentrations of other analytes, and the consistency in results observed in previous years. Further inquiry with the contracting laboratory did not yield any insight as to why these duplicates might be this different.

### ***Split Samples***

Concentrations of some PAHs differed by greater than 20% between split samples POC-D1 and SES-D1, but none of these were greater than five times detection limit. Most total metal concentrations in split sample SES-D1 differed by greater than 20% from POC-D1, with many greater than five times the detection limit. Of the PAHs and metals measured that were greater than five times the detection limit, only total calcium and total magnesium differed by >25% between split samples SES-D2 and MUR-D2. No hydrocarbons differed in concentration by more than 20% between split samples SES-D2 and MUR-D2; F2 hydrocarbons and total hydrocarbons differed by slightly more than 20% between split samples SES-D1 and POC-D1 (Table B.2-5 and Table B.2-6).

### ***Rinsate Samples***

Concentrations of all metals (total and dissolved) were less than five times the analytical detection limit in rinsate samples collected in fall 2014.

PAHs detected in the one rinsate sample (RIN-2) collected in September 2014 were all reported at less than five times the detection limits, while some of PAHs (C1-dibenzothiophenes, C1-naphthalenes, C3-dibenzothiophenes and retene) from the second rinsate sample (RIN-1) were detected at concentrations greater than five times the detection limit (Table B.2-7 and Table B.2-8).

### **B.2.4.3 Conclusions**

Results of QA/QC of sediment samples collected for the JOSMP in 2014 generally indicated some variability in PAHs among both duplicate and split samples, and contradictory results for metals, where two split samples and one duplicate samples generally indicated good agreement but one duplicate sample showed significant differences in metals relative to its corresponding sample.

Results of rinsate (equipment blank) samples in 2014 were consistent with those collected in previous years, showing no PAHs concentrations greater than five times the detection limit at one rinsate sample but higher concentrations of a few PAHs in a second rinsate sample. Results of the rinsate analyses suggested that rinsing of sampling equipment with deionized water and/or solvent, or scrubbing with Liquinox<sup>®</sup> may have been insufficient to remove all traces of ambient water and particulates prior to collecting the rinsate sample. However, rinsate 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) unlikely to substantially affect measured concentrations in sediment. Regardless, clean technique remains critical in sampling of sediments, particularly for strongly hydrophobic variables like many PAHs.

**Table B.2-5 Relative percent difference between duplicate and split sediment quality samples, Poplar Creek (POC-D1), September 2014.**

Analyte	Laboratory	Unit	DLs	Station POC-D1	Split SES-D1	Duplicate SED-D1	RPD <sup>1</sup> from POC-D1	
							Split SES-D1	Duplicate SED-D1
<b>Organic Compounds</b>								
Benzene	ALS	mg/kg	0.005	<0.005	<0.010	<0.005	-	-
CCME Fraction 1 (BTEX)	ALS	mg/kg	10	<10	<20	<10	-	-
CCME Fraction 1 (C6-C10)	ALS	mg/kg	10	<10	<20	<10	-	-
CCME Fraction 2 (C10-C16)	ALS	mg/kg	20	3,640	4,580	3,860	22.9	5.9
CCME Fraction 3 (C16-C34)	ALS	mg/kg	20	987	1,160	1,130	16.1	13.5
CCME Fraction 4 (C34-C50)	ALS	mg/kg	20	858	1,000	1,050	15.3	20.1
Total Hydrocarbons (C6-C50)	ALS	mg/kg	20	5,490	6,740	6,040	20.4	9.5
Ethylbenzene	ALS	mg/kg	0.015	<0.015	<0.03	<0.015	-	-
m+p-Xylene	ALS	mg/kg	0.05	<0.05	<0.1	<0.05	-	-
o-Xylene	ALS	mg/kg	0.05	<0.05	<0.1	<0.05	-	-
Toluene	ALS	mg/kg	0.05	<0.05	<0.1	<0.05	-	-
Xylenes	ALS	mg/kg	0.1	<0.1	<0.2	<0.1	-	-
<b>PAHs</b>								
Acenaphthene	AXYS	mg/kg	-	0.00196	0.00184	0.00247	6.3	23.0
Acenaphthylene	AXYS	mg/kg	-	0.000112	<0.000111	<0.000372	-	-
Anthracene	AXYS	mg/kg	-	0.000911	<0.001090	<0.003320	-	-
Benz[a]anthracene	AXYS	mg/kg	-	0.00664	<0.006620	0.00982	-	38.6
Benzo[a]pyrene	AXYS	mg/kg	-	0.00809	0.0057	<0.00894	34.7	-
Benzo[b,j,k]fluoranthene	AXYS	mg/kg	-	0.0161	0.0123	<0.00639	26.8	-
Benzo[g,h,i]perylene	AXYS	mg/kg	-	0.022	0.0256	0.0362	15.1	48.8
Biphenyl	AXYS	mg/kg	-	0.00313	0.00338	0.00224	7.7	33.1
C1-Acenaphthenes	AXYS	mg/kg	-	0.000727	<0.000594	<0.001210	-	-
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.139	0.132	0.153	5.2	9.6
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.139	0.116	0.163	18.0	15.9

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (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 duplicate/split but 1 or both concentrations are < 5 times the detection limit.

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

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

Analyte	Laboratory	Unit	DLs	Station POC-D1	Split SES-D1	Duplicate SED-D1	RPD <sup>1</sup> from POC-D1	
							Split SES-D1	Duplicate SED-D1
<b>PAHs (Cont'd.)</b>								
C1-Biphenyls	AXYS	mg/kg	-	0.00412	0.00476	0.00279	14.4	<b>38.5</b>
C1-Dibenzothiophenes	AXYS	mg/kg	-	0.0618	0.0514	0.0758	18.4	<b>20.3</b>
C1-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.202	0.163	0.229	<b>21.4</b>	12.5
C1-Fluorenes	AXYS	mg/kg	-	0.0155	0.0152	0.0154	2.0	0.6
C1-Naphthalenes	AXYS	mg/kg	-	0.0124	0.0132	0.00674	6.2	<b>59.1</b>
C1-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.0719	0.0799	0.0875	10.5	19.6
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.184	0.156	0.282	16.5	<b>42.1</b>
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.0897	0.0673	0.151	<b>28.5</b>	<b>50.9</b>
C2-Biphenyls	AXYS	mg/kg	-	0.0056	0.00787	0.00553	<b>33.7</b>	1.3
C2-Dibenzothiophenes	AXYS	mg/kg	-	0.388	0.388	0.431	0.0	10.5
C2-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.371	0.392	0.57	5.5	<b>42.3</b>
C2-Fluorenes	AXYS	mg/kg	-	0.0984	0.096	0.112	2.5	12.9
C2-Naphthalenes	AXYS	mg/kg	-	0.0284	0.038	0.0214	<b>28.9</b>	<b>28.1</b>
C2-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.163	0.17	0.17	4.2	4.2
C3-Dibenzothiophenes	AXYS	mg/kg	-	0.762	0.697	0.781	8.9	2.5
C3-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.279	0.224	0.416	<b>21.9</b>	<b>39.4</b>
C3-Fluorenes	AXYS	mg/kg	-	0.19	0.216	0.17	12.8	11.1
C3-Naphthalenes	AXYS	mg/kg	-	0.0525	0.0604	0.0599	14.0	13.2
C3-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.298	0.253	0.253	16.3	16.3
C4-Dibenzothiophenes	AXYS	mg/kg	-	0.468	0.505	0.831	7.6	<b>55.9</b>
C4-Naphthalenes	AXYS	mg/kg	-	0.105	0.0869	0.0923	18.9	12.9
C4-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.811	0.666	0.935	19.6	14.2
Chrysene	AXYS	mg/kg	-	0.0501	0.0508	0.0595	1.4	17.2
Dibenz[a,h]anthracene	AXYS	mg/kg	-	<0.00676	0.004720	0.00698	<b>35.5</b>	3.2
Dibenzothiophene	AXYS	mg/kg	-	0.00415	0.00544	0.00523	<b>26.9</b>	<b>23.0</b>

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (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 duplicate/split but 1 or both concentrations are < 5 times the detection limit.

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

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

Analyte	Laboratory	Unit	DLs	Station POC-D1	Split SES-D1	Duplicate SED-D1	RPD <sup>1</sup> from POC-D1	
							Split SES-D1	Duplicate SED-D1
<b>PAHs (Cont'd.)</b>								
Fluoranthene	AXYS	mg/kg	-	0.00406	0.00499	0.00406	20.6	0.0
Fluorene	AXYS	mg/kg	-	0.00222	0.002120	0.00202	4.6	9.4
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/kg	-	0.00979	0.0115	0.016	16.1	48.2
Naphthalene	AXYS	mg/kg	-	0.00341	0.0036	0.0023	5.4	38.9
Phenanthrene	AXYS	mg/kg	-	0.0188	0.0231	0.0264	20.5	33.6
Pyrene	AXYS	mg/kg	-	0.0162	0.0173	0.0174	6.6	7.1
Retene	AXYS	mg/kg	-	0.081	0.0681	0.0616	17.3	27.2
<b>Total Metals</b>								
Total Aluminum (Al)	ALS	mg/kg	50	5620	2690	3440	70.5	48.1
Total Antimony (Sb)	ALS	mg/kg	0.1	0.17	<0.1	0.1	-	51.9
Total Arsenic (As)	ALS	mg/kg	0.1	4.78	2.02	3.28	81.2	37.2
Total Barium (Ba)	ALS	mg/kg	0.5	85.2	40.5	51.6	71.1	49.1
Total Beryllium (Be)	ALS	mg/kg	0.2	0.39	<0.2	0.26	-	40.0
Total Bismuth (Bi)	ALS	mg/kg	0.2	<0.2	<0.2	<0.2	-	-
Total Cadmium (Cd)	ALS	mg/kg	0.1	0.1	<0.1	<0.1	-	-
Total Calcium (Ca)	ALS	mg/kg	100	8,370	4,190	4,770	66.6	54.8
Total Chromium (Cr)	ALS	mg/kg	0.5	9.73	5.07	6.63	63.0	37.9
Total Cobalt (Co)	ALS	mg/kg	0.1	5.74	2.46	3.64	80.0	44.8
Total Copper (Cu)	ALS	mg/kg	0.5	9.07	3.9	5.16	79.7	55.0
Total Iron (Fe)	ALS	mg/kg	50	12,800	5,330	8,900	82.4	35.9
Total Lead (Pb)	ALS	mg/kg	0.5	5.63	2.44	3.66	79.1	42.4
Total Lithium (Li)	ALS	mg/kg	0.5	7.55	3.33	4.48	77.6	51.0
Total Magnesium (Mg)	ALS	mg/kg	20	3,480	1,700	2,090	68.7	49.9
Total Manganese (Mn)	ALS	mg/kg	1	267	129	196	69.7	30.7

<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.

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 duplicates and concentrations are > 5 times the detection limit.

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

Analyte	Laboratory	Unit	DLs	Station POC-D1	Split SES-D1	Duplicate SED-D1	RPD <sup>1</sup> from POC-D1	
							Split SES-D1	Duplicate SED-D1
<b>Total Metals (Cont'd.)</b>								
Total Mercury (Hg)	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
Total Molybdenum (Mo)	ALS	mg/kg	0.1	0.52	0.24	0.38	73.7	31.1
Total Nickel (Ni)	ALS	mg/kg	0.5	11.9	5.47	7.77	74.0	42.0
Total Phosphorus (P)	ALS	mg/kg	50	364	175	237	70.1	42.3
Total Potassium (K)	ALS	mg/kg	50	964	427	592	77.2	47.8
Total Selenium (Se)	ALS	mg/kg	0.2	0.26	<0.2	<0.2	-	-
Total Silver (Ag)	ALS	mg/kg	0.2	<0.2	<0.2	<0.2	-	-
Total Sodium (Na)	ALS	mg/kg	100	170	<100	110	-	42.9
Total Strontium (Sr)	ALS	mg/kg	1	33.9	15.2	20.5	76.2	49.3
Total Thallium (Tl)	ALS	mg/kg	0.05	0.093	<0.05	0.057	-	48.0
Total Tin (Sn)	ALS	mg/kg	2	<2	<2	<2	-	-
Total Titanium (Ti)	ALS	mg/kg	1	50	13.9	29.7	113.0	50.9
Total Uranium (U)	ALS	mg/kg	0.05	0.532	0.241	0.308	75.3	53.3
Total Vanadium (V)	ALS	mg/kg	0.2	19.8	8.52	12.7	79.7	43.7
Total Zinc (Zn)	ALS	mg/kg	5	35.5	17.2	22.1	69.4	46.5

<sup>1</sup> Relative percent difference (RPD) = (difference between sample 1 and 2)/(average of sample 1 and 2) x 100%. RPD for undetectable variables (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 duplicate/split 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 difference between duplicate and split sediment quality samples, Muskeg River (MUR-D2), September 2014.**

Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from MUR-D2	
				Station MUR-D2	Split SES-D2	Duplicate SED-D2	Split SES-D2	Duplicate SED-D2
<b>Organic Compounds</b>								
Benzene	ALS	mg/kg	0.005	<0.005	<0.005	<0.005	-	-
CCME Fraction 1 (BTEX)	ALS	mg/kg	10	<10	<10	<10	-	-
CCME Fraction 1 (C6-C10)	ALS	mg/kg	10	<10	<10	<10	-	-
CCME Fraction 2 (C10-C16)	ALS	mg/kg	20	67	56	71	-	-
CCME Fraction 3 (C16-C34)	ALS	mg/kg	20	644	541	695	17.4	7.6
CCME Fraction 4 (C34-C50)	ALS	mg/kg	20	558	486	633	13.8	12.6
Total Hydrocarbons (C6-C50)	ALS	mg/kg	20	1270	1080	1400	16.2	9.7
Ethylbenzene	ALS	mg/kg	0.015	<0.015	<0.02	<0.015	-	-
m+p-Xylene	ALS	mg/kg	0.05	<0.05	<0.1	<0.05	-	-
o-Xylene	ALS	mg/kg	0.05	<0.05	<0.1	<0.05	-	-
Toluene	ALS	mg/kg	0.05	<0.05	<0.1	<0.05	-	-
Xylenes	ALS	mg/kg	0.1	<0.1	<0.1	<0.1	-	-
<b>PAHs</b>								
% Moisture_PAH sample	AXYS	mg/kg	-	20.5	17.8	20	14.1	2.5
Acenaphthene	AXYS	mg/kg	-	0.000703	<0.000648	<0.000703	8.1	0.0
Acenaphthylene	AXYS	mg/kg	-	0.000146	<0.000150	<0.000146	-	-
Anthracene	AXYS	mg/kg	-	0.000552	<0.001210	0.001	-	-
Benz[a]anthracene	AXYS	mg/kg	-	0.00352	0.00356	<0.00480	1.1	-
Benzo[a]pyrene	AXYS	mg/kg	-	0.0033	0.0034	<0.00336	-	1.8
Benzo[b,j,k]fluoranthene	AXYS	mg/kg	-	0.0068	0.00834	0.01	<b>20.3</b>	<b>38.1</b>
Benzo[g,h,i]perylene	AXYS	mg/kg	-	0.0109	0.00947	0.0111	14.0	1.8
Biphenyl	AXYS	mg/kg	-	0.00021	<0.000180	<0.000215	15.4	2.4
C1-Acenaphthenes	AXYS	mg/kg	-	0.000312	0.000143	0.000261	<b>74.3</b>	-

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

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 duplicates and concentrations are > 5 times the detection limit.

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

Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from MUR-D2	
				Station MUR-D2	Split SES-D2	Duplicate SED-D2	Split SES-D2	Duplicate SED-D2
<b>PAHs (Cont'd.)</b>								
C1-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.105	0.0988	0.133	6.1	<b>23.5</b>
C1-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.0864	0.082	0.111	5.2	<b>24.9</b>
C1-Biphenyls	AXYS	mg/kg	-	0.000453	0.000414	0.000227	9.0	<b>66.5</b>
C1-Dibenzothiophenes	AXYS	mg/kg	-	0.00584	0.00481	0.0055	19.3	6.0
C1-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.147	0.134	0.185	9.3	<b>22.9</b>
C1-Fluorenes	AXYS	mg/kg	-	0.00452	0.00349	0.00386	<b>25.7</b>	15.8
C1-Naphthalenes	AXYS	mg/kg	-	0.000603	0.000565	0.000465	6.5	<b>25.8</b>
C1-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.0425	0.0372	0.0419	13.3	1.4
C2-Benzo[a]anthracenes/Chrysenes	AXYS	mg/kg	-	0.165	0.146	0.196	12.2	17.2
C2-Benzofluoranthenes/Benzopyrenes	AXYS	mg/kg	-	0.0572	0.0537	0.0588	6.3	2.8
C2-Biphenyls	AXYS	mg/kg	-	0.00227	0.00171	0.00185	<b>28.1</b>	<b>20.4</b>
C2-Dibenzothiophenes	AXYS	mg/kg	-	0.216	0.21	0.259	2.8	18.1
C2-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.336	0.308	0.401	8.7	17.6
C2-Fluorenes	AXYS	mg/kg	-	0.0622	0.0569	0.0656	8.9	5.3
C2-Naphthalenes	AXYS	mg/kg	-	0.00405	0.00409	0.00402	1.0	0.7
C2-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.0163	0.116	0.154	<b>150.7</b>	<b>161.7</b>
C3-Dibenzothiophenes	AXYS	mg/kg	-	0.591	0.569	0.713	3.8	18.7
C3-Fluoranthenes/Pyrenes	AXYS	mg/kg	-	0.225	0.249	0.275	10.1	20.0
C3-Fluorenes	AXYS	mg/kg	-	0.156	0.152	0.179	2.6	13.7
C3-Naphthalenes	AXYS	mg/kg	-	0.0121	0.0117	0.013	3.4	7.2
C3-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.249	0.236	0.317	5.4	<b>24.0</b>
C4-Dibenzothiophenes	AXYS	mg/kg	-	0.426	0.435	0.588	2.1	<b>32.0</b>
C4-Naphthalenes	AXYS	mg/kg	-	0.0683	0.059	0.0649	14.6	5.1
C4-Phenanthrenes/Anthracenes	AXYS	mg/kg	-	0.636	0.585	0.827	8.4	<b>26.1</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.

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 duplicates and concentrations are > 5 times the detection limit.



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

Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from MUR-D2	
				Station MUR-D2	Split SES-D2	Duplicate SED-D2	Split SES-D2	Duplicate SED-D2
<b>PAHs (Cont'd.)</b>								
Chrysene	AXYS	mg/kg	-	<0.03420	0.034900	0.04450	2.0	<b>26.2</b>
Dibenz[a,h]anthracene	AXYS	mg/kg	-	0.00337	0.00205	0.00284	<b>48.7</b>	17.1
Dibenzothiophene	AXYS	mg/kg	-	0.00114	0.00107	0.00118	6.3	3.4
Fluoranthene	AXYS	mg/kg	-	0.00149	0.001290	0.00207	14.4	<b>32.6</b>
Fluorene	AXYS	mg/kg	-	0.000475	0.000424	0.000446	11.3	6.3
Indeno[1,2,3-c,d]-pyrene	AXYS	mg/kg	-	0.00462	0.00408	0.00437	12.4	5.6
Naphthalene	AXYS	mg/kg	-	0.000403	0.0004	0.000446	0.7	10.1
Phenanthrene	AXYS	mg/kg	-	0.00669	0.00614	0.00669	8.6	0.0
Pyrene	AXYS	mg/kg	-	0.0112	0.0102	0.013	9.3	14.9
Retene	AXYS	mg/kg	-	0.0455	0.0319	0.0344	<b>35.1</b>	<b>27.8</b>
<b>Total Metals</b>								
Total Aluminum (Al)	ALS	mg/kg	50	1,660	1,540	1,590	7.5	4.3
Total Antimony (Sb)	ALS	mg/kg	0.1	0.1	<0.1	0.1	-	-
Total Arsenic (As)	ALS	mg/kg	0.1	0.67	0.65	0.89	3.0	<b>28.2</b>
Total Barium (Ba)	ALS	mg/kg	0.5	22.5	20.7	13.2	8.3	<b>52.1</b>
Total Beryllium (Be)	ALS	mg/kg	0.2	0.2	<0.2	0.20	-	-
Total Bismuth (Bi)	ALS	mg/kg	0.2	<0.2	<0.2	<0.2	-	-
Total Cadmium (Cd)	ALS	mg/kg	0.1	0.1	<0.1	<0.1	-	-
Total Calcium (Ca)	ALS	mg/kg	100	1,950	1,420	1,620	<b>31.5</b>	18.5
Total Chromium (Cr)	ALS	mg/kg	0.5	3.26	2.79	2.96	15.5	9.6
Total Cobalt (Co)	ALS	mg/kg	0.1	1.03	1	1.13	3.0	9.3
Total Copper (Cu)	ALS	mg/kg	0.5	1.06	1.12	1.27	5.5	18.0
Total Iron (Fe)	ALS	mg/kg	50	3,940	3,780	4,070	4.1	3.2
Total Lead (Pb)	ALS	mg/kg	0.5	1.26	1.11	1.44	12.7	13.3

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

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 duplicates and concentrations are > 5 times the detection limit.

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

Analyte	Laboratory	Unit	DLs	Sample			RPD <sup>1</sup> from MUR-D2	
				Station MUR-D2	Split SES-D2	Duplicate SED-D2	Split SES-D2	Duplicate SED-D2
<b>Total Metals (Cont'd.)</b>								
Total Lithium (Li)	ALS	mg/kg	0.5	1.85	1.77	2.56	4.4	32.2
Total Magnesium (Mg)	ALS	mg/kg	20	817	541	676	40.6	18.9
Total Manganese (Mn)	ALS	mg/kg	1	121	117	131	3.4	7.9
Total Mercury (Hg)	ALS	mg/kg	0.05	<0.05	<0.05	<0.05	-	-
Total Molybdenum (Mo)	ALS	mg/kg	0.1	0.14	0.14	0.15	0.0	6.9
Total Nickel (Ni)	ALS	mg/kg	0.5	2.13	2.15	2.38	0.9	11.1
Total Phosphorus (P)	ALS	mg/kg	50	130	130	140	0.0	7.4
Total Potassium (K)	ALS	mg/kg	50	220	210	210	4.7	4.7
Total Selenium (Se)	ALS	mg/kg	0.2	0.2	<0.2	<0.2	-	-
Total Silver (Ag)	ALS	mg/kg	0.2	<0.2	<0.2	<0.2	-	-
Total Sodium (Na)	ALS	mg/kg	100	100	<100	100	-	-
Total Strontium (Sr)	ALS	mg/kg	1	8.6	7.8	8.3	9.8	3.6
Total Thallium (Tl)	ALS	mg/kg	0.05	0.05	<0.05	0.050	0.0	0.0
Total Tin (Sn)	ALS	mg/kg	2	<2	<2	<2	-	-
Total Titanium (Ti)	ALS	mg/kg	1	40.5	39.3	41.8	3.0	3.2
Total Uranium (U)	ALS	mg/kg	0.05	0.118	0.128	0.185	8.1	44.2
Total Vanadium (V)	ALS	mg/kg	0.2	5.44	5.21	6.0	4.3	9.3
Total Zinc (Zn)	ALS	mg/kg	5	8.4	7.7	7.3	8.7	14.0

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

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 duplicates and concentrations are > 5 times the detection limit.

**Table B.2-7 Concentration of metals in sediment sampling equipment rinsate blank, September 2014.**

Analyte	Laboratory	Units	DL	Rinsate sample	
				RIN-1	RIN-2
<b>Dissolved Metals</b>					
Aluminum (Al)	ALS	mg/L	0.00013	0.00731	0.00126
Antimony (Sb)	ALS	mg/L	0.000008	0.000011	<0.000008
Arsenic (As)	ALS	mg/L	0.000003	0.000004	<0.000003
Barium (Ba)	ALS	mg/L	0.00005	0.00072	0.00022
Beryllium (Be)	ALS	mg/L	0.000009	<0.000009	<0.000009
Bismuth (Bi)	ALS	mg/L	0.000003	<0.000003	<0.000003
Boron (B)	ALS	mg/L	0.00013	0.00323	0.00154
Cadmium (Cd)	ALS	mg/L	0.000002	0.000008	<0.000002
Calcium (Ca)	ALS	mg/L	0.00003	0.00017	0.00007
Chlorine (Cl)	ALS	mg/L	0.00003	0.0001	0.00008
Chromium (Cr)	ALS	mg/L	0.0001	0.0002	0.0001
Cobalt (Co)	ALS	mg/L	0.000002	0.000032	<0.000002
Copper (Cu)	ALS	mg/L	0.00008	0.00054	0.00011
Iron (Fe)	ALS	mg/L	0.0006	0.0212	0.0042
Lead (Pb)	ALS	mg/L	0.000004	0.000012	<0.000004
Lithium (Li)	ALS	mg/L	0.00002	0.00002	0.00002
Manganese (Mn)	ALS	mg/L	0.00001	0.00224	0.00059
Mercury (Hg)	ALS	mg/L	0.000009	<0.00001	<0.00001
Molybdenum (Mo)	ALS	mg/L	0.000002	0.000003	<0.000002
Nickel (Ni)	ALS	mg/L	0.000006	0.000418	0.000115
Selenium (Se)	ALS	mg/L	0.00004	<0.00004	<0.00004
Silver (Ag)	ALS	mg/L	0.000001	<0.000001	<0.000001
Strontium (Sr)	ALS	mg/L	0.00007	0.00108	0.00048
Sulphur (S)	ALS	mg/L	0.0002	<0.0002	<0.0002
Thallium (Tl)	ALS	mg/L	0.0000004	<0.0000004	<0.0000004
Thorium (Th)	ALS	mg/L	0.0000008	0.0000165	0.0000288
Tin (Sn)	ALS	mg/L	0.000003	0.000028	0.000019
Titanium (Ti)	ALS	mg/L	0.00008	0.00022	0.0001
Uranium (U)	ALS	mg/L	0.000002	<0.000002	<0.000002
Vanadium (V)	ALS	mg/L	0.00002	0.00005	0.00002
Zinc (Zn)	ALS	mg/L	0.00009	0.0157	0.0026
<b>Total Metals</b>					
Aluminum (Al)	ALS	mg/L	0.0002	0.146	0.0578
Antimony (Sb)	ALS	mg/L	0.000001	0.000011	0.000016
Arsenic (As)	ALS	mg/L	0.000004	0.00007	<0.000004
Barium (Ba)	ALS	mg/L	0.000004	0.00263	0.000675
Beryllium (Be)	ALS	mg/L	0.000008	0.00001	<0.000008
Bismuth (Bi)	ALS	mg/L	0.000001	<0.000001	<0.000001
Boron (B)	ALS	mg/L	0.0001	0.0033	0.0016
Cadmium (Cd)	ALS	mg/L	0.000002	0.000013	0.000002
Calcium (Ca)	ALS	mg/L	0.00001	0.00022	0.00011

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

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

Analyte	Laboratory	Units	DL	Rinsate sample	
				RIN-1	RIN-2
<b>Total Metals (Cont'd.)</b>					
Chlorine (Cl)	ALS	mg/L	0.00004	0.0001	0.00008
Chromium (Cr)	ALS	mg/L	0.00003	0.00074	0.0004
Cobalt (Co)	ALS	mg/L	0.000002	0.00007	0.000013
Copper (Cu)	ALS	mg/L	0.00005	0.001	0.00029
Iron (Fe)	ALS	mg/L	0.0007	0.141	0.0431
Lead (Pb)	ALS	mg/L	0.000003	0.00016	0.000042
Lithium (Li)	ALS	mg/L	0.00005	0.00005	0.00005
Manganese (Mn)	ALS	mg/L	0.000005	0.00355	0.00131
Mercury (Hg)	ALS	mg/L	0.000008	0.000008	0.000008
Molybdenum (Mo)	ALS	mg/L	0.000002	0.000026	0.000002
Nickel (Ni)	ALS	mg/L	0.000008	0.00061	0.000177
Selenium (Se)	ALS	mg/L	0.00006	0.00006	0.00006
Silver (Ag)	ALS	mg/L	0.000002	0.000002	0.000002
Strontium (Sr)	ALS	mg/L	0.000001	0.00161	0.000843
Sulphur (S)	ALS	mg/L	0.0002	<0.0002	<0.0002
Thallium (Tl)	ALS	mg/L	0.0000009	0.0000014	0.0000009
Thorium (Th)	ALS	mg/L	0.0000009	0.0000167	0.0000291
Tin (Sn)	ALS	mg/L	0.000003	0.000035	0.000029
Titanium (Ti)	ALS	mg/L	0.00005	0.00236	0.0009
Uranium (U)	ALS	mg/L	0.000003	0.000007	<0.000003
Vanadium (V)	ALS	mg/L	0.00001	0.00045	0.00013
Zinc (Zn)	ALS	mg/L	0.0001	0.0197	0.0199

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

**Table B.2-8 Concentration of PAHs in sediment sampling equipment rinsate blank, September 2014.**

	Laboratory	Units	RIN-1		RIN-2	
			DL	Rinsate	DL	Rinsate
Acenaphthene	AXYS	ng/L	0.344	0.733	0.344	<0.344
Acenaphthylene	AXYS	ng/L	0.301	0.421	0.301	<0.301
Anthracene	AXYS	ng/L	<0.241	<0.241	0.241	<0.241
Benz[a]anthracene	AXYS	ng/L	<0.094	0.109	0.094	<0.094
Benzo[a]pyrene	AXYS	ng/L	0.171	<0.171	0.171	<0.171
Benzo[b,j,k]fluoranthene	AXYS	ng/L	<0.111	<0.111	0.111	<0.111
Benzo[g,h,i]perylene	AXYS	ng/L	<0.125	0.22	0.125	<0.125
Biphenyl	AXYS	ng/L	1.496	1.55	1.496	<1.496
C1-Acenaphthenes	AXYS	ng/L	<0.296	<0.296	0.296	<0.296
C1-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.202	0.704	0.202	0.204
C1-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	0.573	<0.573	0.573	<0.573
C1-Biphenyls	AXYS	ng/L	4.062	<4.062	4.062	<4.062
C1-Dibenzothiophenes	AXYS	ng/L	<0.304	<b>1.79</b>	0.304	0.524
C1-Fluoranthenes/Pyrenes	AXYS	ng/L	0.719	2.3	0.719	<0.719
C1-Fluorenes	AXYS	ng/L	2.582	<2.582	2.582	<2.582
C1-Naphthalenes	AXYS	ng/L	<9.571	<b>119</b>	9.571	<b>59.4</b>
C1-Phenanthrenes/Anthracenes	AXYS	ng/L	0.831	3.94	0.831	2.00
C2-Benzo[a]anthracenes/Chrysenes	AXYS	ng/L	0.243	<b>1.95</b>	0.243	0.270
C2-Benzofluoranthenes/Benzopyrenes	AXYS	ng/L	<0.336	<0.336	0.336	<0.336
C2-Biphenyls	AXYS	ng/L	<18.832	<18.832	18.832	<18.832
C2-Dibenzothiophenes	AXYS	ng/L	1.052	3.49	1.052	1.87
C2-Fluoranthenes/Pyrenes	AXYS	ng/L	<0.711	2.61	0.711	<0.711
C2-Fluorenes	AXYS	ng/L	<1.430	2.98	1.430	<1.430
C2-Naphthalenes	AXYS	ng/L	5.743	18.7	5.743	10.3
C2-Phenanthrenes/Anthracenes	AXYS	ng/L	<0.678	3.21	0.678	1.10
C3-Dibenzothiophenes	AXYS	ng/L	<1.256	<b>20.1</b>	1.256	2.10
C3-Fluoranthenes/Pyrenes	AXYS	ng/L	0.666	1.59	0.666	<0.666
C3-Fluorenes	AXYS	ng/L	2.417	2.69	2.417	<2.417
C3-Naphthalenes	AXYS	ng/L	2.467	5.97	2.467	<2.467
C3-Phenanthrenes/Anthracenes	AXYS	ng/L	<0.621	<b>3.94</b>	0.621	1.37
C4-Dibenzothiophenes	AXYS	ng/L	1.093	<b>7.35</b>	1.093	1.38
C4-Naphthalenes	AXYS	ng/L	1.739	3.64	1.739	<1.739
C4-Phenanthrenes/Anthracenes	AXYS	ng/L	1.988	7.15	1.988	<1.988
Chrysene	AXYS	ng/L	0.162	0.354	0.162	0.170
Dibenz[a,h]anthracene	AXYS	ng/L	0.201	<0.201	0.201	<0.201
Dibenzothiophene	AXYS	ng/L	<0.429	0.811	0.429	<0.429
Fluoranthene	AXYS	ng/L	0.550	0.725	0.550	<0.550
Fluorene	AXYS	ng/L	<0.353	1.6	0.353	0.862
Indeno[1,2,3-c,d]-pyrene	AXYS	ng/L	<0.145	<0.145	0.145	<0.145
Naphthalene	AXYS	ng/L	7.210	<b>67.3</b>	7.210	<b>50.7</b>
Phenanthrene	AXYS	ng/L	1.394	4.6	1.394	2.51
Pyrene	AXYS	ng/L	0.359	1.19	0.359	0.359
Retene	AXYS	ng/L	0.407	<b>3.31</b>	0.407	<0.407

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

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

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

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

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

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

Results of fish tissue analysis from Flett Research Ltd. (Flett) included a description of QC techniques used. If relevant, comments on the results of the analyses were indicated on the printed results received from the laboratory. QC results had to meet acceptable guidelines for the laboratory's own internal quality procedures (a condition of membership in the Canadian Association for Environmental Analytical Laboratories [CAEAL]). In the event alternate procedures were required to achieve a result, this information was also detailed on the laboratory output. QC procedures used by Flett included laboratory duplicates, spike samples, calibration control, use of certified reference standards and internal standards. Duplicate samples for mercury analyses were completed for four individual tissue samples (Table B.2-9).

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

Results of 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.2-9 Relative percent difference in mercury concentrations measured in duplicate fish tissue samples collected from the Athabasca River, fall 2014.**

Waterbody	Sample ID	Units	Sample Date	Sample	Duplicate	Relative Percent Difference
Athabasca River	ATH-06	ng/g wet weight	12-Sep-14	141	144	2.1
Athabasca River	ATH-15	ng/g wet weight	18-Sep-14	412	418	1.4
Athabasca River	ATH-46	ng/g wet weight	13-Sep-14	85.5	85.3	0.2
Athabasca River	RAMP 21	ng/g wet weight	13-Sep-14	827	872	5.3

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

### **Fish Ageing**

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

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

Estimates of age exhibited low variability between the two readings. Out of the 149 structures that had QA/QC analyses performed, 16 age estimates had a confidence rating of “good”; 131 age estimates had a confidence rating of “fair”; and two age estimates had a confidence rating of “poor, indicating consistent laboratory procedures for analyzing ages in fin ray samples (Table B.2-10). An explanation of the confidence index for analyzing fish ageing structures is provided in Table B.2-11.

**Table B.2-10 QA/QC results for age estimates of fish captured during the Athabasca and Clearwater Inventory, spring, summer, and fall 2014.**

Waterbody	Reach ID	Date	Structure	Species	Fish #	Age	Con. Index	QA/QC Age
Athabasca River	01A	13-May-14	FR	WHSC	9	7	G	7
	01A	13-May-14	FR	LNSC	10	15	G	14
	01A	13-May-14	FR	WALL	11	12	F	13
	01A	13-May-14	FR	WHSC	12	11	F	11
	04A	14-May-14	FR	GOLD	9	7	F	7
	04A	14-May-14	FR	GOLD	10	6	F	7
	04A	14-May-14	FR	GOLD	11	6	F	7
	04A	14-May-14	FR	GOLD	12	7	F	7
	04B	15-May-14	FR	LNSC	13	9	F	9
	04B	15-May-14	FR	WALL	15	8	F	8
	04B	15-May-14	FR	GOLD	16	6	F	7
	04B	15-May-14	FR	GOLD	17	7	F	7
	05A	14-May-14	FR	GOLD	26	10	F	10
	05A	14-May-14	FR	GOLD	27	10	F	12
	05A	14-May-14	FR	GOLD	28	8	F	7
	05A	14-May-14	FR	GOLD	29	8	F	8
	05B	15-May-14	FR	GOLD	9	6	F	7
	05B	15-May-14	FR	WHSC	10	11	F	11
	05B	15-May-14	FR	WHSC	11	10	F	10
	05B	15-May-14	FR	LKWH	12	2	F	2
	11A	12-May-14	FR	WHSC	1	8	F	8
	11A	12-May-14	FR	WHSC	2	8	F	10
	11A	12-May-14	FR	WHSC	3	7	F	8
	11A	12-May-14	FR	WHSC	4	9	F	9
	11A	12-May-14	FR	GOLD	78	4	F	5
	11A	12-May-14	FR	GOLD	80	3	F	3
	11A	12-May-14	FR	GOLD	82	7	F	8
	11A	12-May-14	FR	GOLD	83	4	F	4
	16A	12-May-14	FR	WHSC	17	4	F	5
	16A	12-May-14	FR	WALL	18	10	F	10
	16A	12-May-14	FR	NRPK	19	4	F	4
	16A	12-May-14	FR	WHSC	21	10	F	10
	17A	11-May-14	FR	WHSC	45	6	F	6
	17A	11-May-14	FR	WALL	46	9	F	10
	17A	11-May-14	FR	WALL	47	16	F	14
	17A	11-May-14	FR	WALL	48	10	F	11
	19B	11-May-14	FR	WALL	9	10	F	10
	19B	11-May-14	FR	WALL	10	8	F	9
	19B	11-May-14	FR	WALL	11	9	F	9
	19B	11-May-14	FR	WALL	12	10	F	11
	01A	7/21/2014	FR	LNSC	2	2	F	3
	01A	7/21/2014	FR	GOLD	3	7	F	7
01A	7/21/2014	FR	GOLD	4	6	F	7	
01A	7/21/2014	FR	GOLD	5	10	F	10	
05B	7/21/2014	FR	GOLD	5	4	G	4	
05B	7/21/2014	FR	GOLD	6	3	G	3	
05B	7/21/2014	FR	WALL	7	5	G	4	
05B	7/21/2014	FR	GOLD	8	4	G	4	

Note: See Table B.2-11 for an explanation of the confidence index codes.

FR=fin ray; GOLD=goldeye; LNSC=longnose sucker; NRPK=northern pike; WALL=walleye; WHSC=white sucker.



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

Waterbody	Reach ID	Date	Structure	Species	Fish #	Age	Con. Index	QA/QC Age
Athabasca River (Cont'd.)	11A	7/19/2014	FR	GOLD	6	3	G	3
	11A	7/19/2014	FR	GOLD	7	4	G	3
	11A	7/19/2014	FR	WHSC	20	1	G	1
	01A	9/10/2014	FR	GOLD	1	3	G	3
	01A	9/10/2014	FR	WALL	2	7	G	7
	01A	9/10/2014	FR	WALL	3	12	F	10
	01A	9/10/2014	FR	LNSC	5	9	G	9
	05B	9/14/2014	FR	LKWH	1	6	G	8
	05B	9/14/2014	FR	LKWH	2	6	F	7
	05B	9/14/2014	FR	WALL	5	14	F	16
	05B	9/14/2014	FR	GOLD	6	8	G	8
	10B	9/12/2014	FR	GOLD	26	7	F	8
	10B	9/12/2014	FR	LNSC	27	3	F	3
	10B	9/12/2014	FR	WALL	31	2	F	2
	11A	9/12/2014	FR	WALL	59	2	F	2
	11A	9/12/2014	FR	GOLD	60	3	G	3
	11A	9/12/2014	FR	LNSC	62	3	G	3
	11A	9/12/2014	FR	WALL	63	4	G	3
Clearwater River	CR1A	11-Jun-14	FR	WHSC	10	5	F	5
	CR1A	11-Jun-14	FR	WHSC	12	4	F	4
	CR1A	11-Jun-14	FR	LNSC	13	10	F	11
	CR1A	11-Jun-14	FR	GOLD	14	5	F	5
	CR3A	12-Jun-14	FR	NRPK	1	2	F	2
	CR3A	12-Jun-14	FR	WALL	2	7	F	6
	CR3A	12-Jun-14	FR	WALL	3	6	F	6
	CR3A	12-Jun-14	FR	GOLD	4	11	F	12
	CR3B	12-Jun-14	FR	WHSC	10	8	F	8
	CR3B	12-Jun-14	FR	NRPK	11	3	F	3
	CR3B	12-Jun-14	FR	GOLD	12	9	F	8
	CR3B	12-Jun-14	FR	GOLD	13	6	F	7
	CR2A	7/24/2014	FR	WHSC	10	5	G	5
	CR2A	7/24/2014	FR	WHSC	11	6	F	7
	CR2A	7/24/2014	FR	GOLD	12	12	F	15
	CR2A	7/24/2014	FR	WHSC	13	6	G	7
	CR2C	7/24/2014	FR	WHSC	5	5	G	5
	CR2C	7/24/2014	FR	WHSC	6	7	F	8
	CR2C	7/24/2014	FR	WHSC	7	5	G	5
	CR2C	7/24/2014	FR	WHSC	8	3	G	3
	CR3B	7/24/2014	FR	WHSC	6	4	G	5
	CR3B	7/24/2014	FR	GOLD	7	7	G	7
	CR3B	7/24/2014	FR	NRPK	9	4	F	4
	CR3B	7/24/2014	FR	WALL	10	7	F	7
	CR3A	9/16/2014	FR	LNSC	14	6	G	6
	CR3A	9/16/2014	FR	WHSC	19	2	G	2
	CR3A	9/16/2014	FR	LNSC	20	2	G	2
	CR3B	9/16/2014	FR	LNSC	9	6	G	6
CR3B	9/16/2014	FR	LNSC	11	3	G	3	
CR3B	9/16/2014	FR	WHSC	12	8	F	10	
CR3B	9/16/2014	FR	LNSC	13	7	F	8	

Note: See Table B.2-11 for an explanation of the confidence index codes.

FR=fin ray; GOLD=goldeye; LNSC=longnose sucker; NRPK=northern pike; WALL=walleye; WHSC=white sucker.

**Table B.2-11 Explanation of the index used to classify confidence in estimates of fish age.**

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

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

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

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

The collection of water samples followed standard practices for quality control of samples to avoid contamination. Field instruments (e.g., water quality meters) were maintained 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 was thoroughly cleaned between lakes;
- Sample containers were tripled-rinsed prior to filling (cap included);
- Sample containers were filled to the top (i.e., no head space);
- Samples were stored under cool (4°C) conditions and in the dark (i.e., in a refrigerator); and
- Samples were submitted to the appropriate analytical laboratory within established maximum holding period (typically 48 hours).

Three duplicate samples were collected during the 2014 field program. The relative percent difference (RPD) for each analyte between the duplicate and station sample is provided in Table B.2-12 to Table B.2-14. In accordance with AENV (2006b), an RPD was only calculated when the mean of the two

values was less than five times the method detection limit or when the values in both samples were less than detection. Non-detectable values were assumed to be the value at one-half the method detection limit. High variability for each variable was indicated when the relative percent difference between the two samples was greater than 20%. Variability between samples was rated as:

- Low (<10% of the variables in the two samples differing by more than 20%);
- Moderate (10% to 30% of the variables in the two samples differing by more than 20%); and
- High (>30% of the variables in the two samples differing by more than 20%).

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

The University of Alberta Limnology Laboratory maintains an internal QA/QC program to maximize quality of analytical results. The program includes the 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 samples 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 were run along with standard laboratory reference samples to create a standard results curve. QC solutions were then run in duplicate. If results for control were consistent for a series of analyses, no additional QC testing was required. If results from QC samples were divergent from standards, corrective action was initiated to determine the cause and results that may be affected. When new QC samples were prepared, each one was tested against the previous QC sample (for a given variable) to assess comparability.

**Table B.2-12 Relative percent difference in dissolved metals between duplicate samples collected from three ASL component lakes, 2014.**

Dissolved Metal	Units	MDL	Lake ID WF1 21-Aug-14			Lake ID SM1 21-Aug-14			Lake ID NE10 21-Aug-14		
			Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)
Al	µg/L	-	9.38	9.45	0.7	8.02	8.01	0.1	-	-	-
As	µg/L	-	0.253	0.296	15.7	0.279	0.285	2.1	0.576	0.541	6.3
B	µg/L	-	5.63	6.34	11.9	9.34	9.68	3.6	17.7	18.8	6.0
Ba	µg/L	-	7.57	7.38	2.5	0.36	0.36	0.0	5.33	5.37	0.7
Be	µg/L	0.009	0.0045	0.0045	0.0	0.0045	0.0045	0.0	0.0045	0.0045	0.0
Bi	µg/L	0.003	-	-	-	0.0015	0.0015	0.0	0.0015	0.0015	0.0
Ca	mg/L	-	4.41	4.75	7.4	4.19	4.4	4.9	13.6	13.3	2.2
Cl	mg/L	0.03	-	-	-	-	-	-	0.23	0.13	55.6
Co	µg/L	0.002	0.046	0.041	11.5	-	-	-	0.011	0.015	30.8
Cr	µg/L	0.1	0.05	0.05	0.0	0.05	0.05	0.0	0.05	0.05	0.0
Fe	µg/L	-	24.5	5.9	122.4	16.7	16.8	0.6	-	-	-
Li	µg/L	0.02	1.43	1	35.4	1.55	0.83	60.5	3.44	2.66	25.6
Mb	µg/L	-	0.56	0.21	90.9	0.41	0.39	5.0	0.1	0.23	78.8
Mo	µg/L	0.002	0.001	0.001	0.0	0.001	0.001	0.0	0.001	0.001	0.0
Ni	µg/L	0.006	0.232	0.095	83.8	0.05	0.051	2.0	0.055	0.075	30.8
Pb	µg/L	0.004	0.065	0.034	62.6	-	-	-	-	-	-
Sb	µg/L	0.008	0.11	0.15	30.8	-	-	-	-	-	-
Se	µg/L	0.04	0.02	0.02	0.0	0.02	0.02	0.0	-	-	-
Sr	µg/L	-	26.7	25.5	4.6	2.6	2.8	7.4	37.4	37.4	0.0
Th	µg/L	0.0008	-	-	-	0.0004	0.0004	0.0	0.0004	0.0004	0.0
Ti	µg/L	0.08	-	-	-	0.04	0.04	0.0	0.55	0.52	5.6
Tl	µg/L	0.0004	-	-	-	0.0035	0.0033	5.9	-	-	-
U	µg/L	0.002	-	-	-	0.001	0.001	0.0	0.001	0.001	0.0
V	µg/L	0.02	-	-	-	-	-	-	-	-	-
Zn	µg/L	0.09	1.96	1.58	21.5	-	-	-	0.61	0.74	19.3
<b>Variability Rating (%)</b>			<b>High: 38.9%</b>			<b>Low: 5.3%</b>			<b>Moderate: 27.8%</b>		

**Table B.2-13 Relative percent difference in total metals between duplicate samples collected from three ASL component lakes, 2014.**

Total Metal	Units	MDL	Lake ID WF1			Lake ID SM1			Lake ID NE10		
			21-Aug-14			21-Aug-14			21-Aug-14		
			Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)
Ag	µg/L	0.002	0.001	0.001	0.0	0.001	0.001	0.0	0.001	0.001	0.0
Al	µg/L	-	79.4	68.6	14.6	41.1	27.5	39.7	17.6	15.3	14.0
As	µg/L	-	0.441	0.425	3.7	0.317	0.311	1.9	0.686	0.67	2.4
B	µg/L	-	15.9	20.4	24.8	20.4	18.9	7.6	30.8	28.5	7.8
Ba	µg/L	-	27.9	27.1	2.9	0.914	1.03	11.9	12.4	11.7	5.8
Be	µg/L	0.008	0.004	0.004	0.0	0.004	0.004	0.0	0.004	0.004	0.0
Ca	mg/L	-	5.91	5.94	0.5	4.83	4.83	0.0	15	14.9	0.7
Cl	mg/L	0.04	-	-	-	-	-	-	0.29	0.13	76.2
Co	µg/L	0.002	0.157	0.154	1.9	0.02	0.019	5.1	0.03	0.029	3.4
Cu	µg/L	0.05	0.19	0.39	69.0	-	-	-	-	-	-
Fe	µg/L	-	537	509	5.4	135	132	2.2	279	262	6.3
Li	µg/L	0.05	1.75	1.01	53.6	1.81	0.98	59.5	3.61	2.86	23.2
Mn	µg/L	-	135	128	5.3	52.6	51.6	1.9	199	186	6.8
Mo	µg/L	0.002	0.037	0.038	2.7	-	-	-	0.018	0.02	10.5
Ni	µg/L	0.008	0.235	0.221	6.1	0.054	0.061	12.2	0.081	0.104	24.9
Pb	µg/L	0.003	0.066	0.078	16.7	0.022	0.017	25.6	0.026	0.018	36.4
Se	µg/L	0.06	0.03	0.03	0.0	0.03	0.03	0.0	-	-	-
Sn	µg/L	0.003	0.018	0.064	112.2	0.024	0.016	40.0	0.029	0.014	69.8
Sr	µg/L	-	33.2	33.2	0.0	3.08	3.72	18.8	42.8	42.7	0.2
Th	µg/L	0.0009	-	-	-	0.00045	0.00045	0.0	0.00045	0.00045	0.0
Ti	µg/L	0.08	1.41	1.35	4.3	-	-	-	0.98	0.92	6.3
U	µg/L	0.003	-	-	-	0.0015	0.0015	0.0	-	-	-
V	µg/L	0.02	0.61	0.59	3.3	-	-	-	0.11	0.1	9.5
Zn	µg/L	0.1	2	2.4	18.2	0.6	0.5	18.2	2.4	0.7	109.7
<b>Variability Rating (%)</b>			<b>Moderate: 19.0%</b>			<b>Moderate: 21.1%</b>			<b>Moderate: 28.6%</b>		

**Table B.2-14 Relative percent difference in conventional variables between duplicate samples collected from three ASL component lakes, 2014.**

Variable	Units	MDL	Lake ID WF1			Lake ID SM1			Lake ID NE10		
			21-Aug-14			21-Aug-14			21-Aug-14		
			Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)	Sample	Duplicate	RPD (%)
Total Phosphorus	µg/L	1	132	137	3.7	17	14	19.4	46	44	4.4
Nitrate+Nitrite	µg/L	2	1	1	0.0	1	1	0.0	1	1	0.0
Nitrite	µg/L	1	0.5	0.5	0.0	0.5	0.5	0.0	0.5	0.5	0.0
Total Nitrogen	µg/L	7	3790	3650	3.8	1050	1040	1.0	1360	1390	2.2
Total Diss. Nitrogen	µg/L	7	879	1110	23.2	1000	998	0.2	943	939	0.4
Total Kjeldahl Nitrogen	µg/L	7	3790	3650	4	1050	1040	1	1360	1390	2
Diss. Sodium	mg/L	0.016	0.57	0.57	0.0	0.85	0.81	4.8	3.37	3.47	2.9
Diss. Potassium	mg/L	0.009	0.45	0.52	14.4	0.7	0.67	4.4	1.04	1.06	1.9
Diss. Calcium	mg/L	0.005	5.93	6.01	1.3	5.26	5.27	0.2	16.81	16.88	0.4
Diss. Magnesium	mg/L	0.010	1.37	1.42	3.6	1.82	1.79	1.7	4.56	4.59	0.7
Diss. Iron	mg/L	0.016	-	-	-	-	-	-	0.008	0.008	0.0
Chloride	mg/L	0.03	-	-	-	-	-	-	0.25	0.29	14.8
Sulphate	mg/L	0.04	0.02	0.02	0.0	0.02	0.02	0.0	0.02	0.02	0.0
Diss. Organic Carbon	mg/L	0.1	32.7	32.4	0.9	21.4	21.6	0.9	19.9	20.3	2.0
Diss. Inorganic Carbon	mg/L	0.2	1.1	1.2	8.7	2.9	2.7	7.1	12.6	13	3.1
Total Alkalinity	mg/L	2.5	14.24	14.56	2.2	16.9	17.21	1.8	61.35	61.71	0.6
Gran alkalinity	mg/L	0.3	13.22	13.54	2.4	15.71	15.89	1.1	60.39	60.47	0.1
pH	mg/L	N/A	7.2	7.22	0.3	7.46	7.44	0.3	8.03	8.04	0.1
Conductance	µS/cm	N/A	33.3	33.4	0.3	36.9	36.9	0.0	117.6	117.5	0.1
Color	mg/L PtCo	1.00	6.3	7	10.5	-	-	-	-	-	-
Turbidity	NTU	N/A	2.15	22.6	165.3	2.21	2.19	0.9	6.09	6.11	0.3
TDS	mg/L	0.04	63.5	13.0	132.2	42	45.3	7.6	79	75	5.2
TSS	mg/L	0.05	48.9	54	9.9	2	0.4	133.3	7	7	0.0
Chlorophyll a	µg/L	0.2	158	169	7.0	9.43	9.6	1.8	28.32	30.07	6.0
<b>Variability Rating (%)</b>			<b>Moderate: 13.6%</b>			<b>Low: 4.8%</b>			<b>Low: 0.0%</b>		



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## Transmittal

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**Date:** 2014/12/23

**From:** Jacklyn Poole, B. Sc.  
Laboratory Supervisor

Tamara McClure, B. Sc.  
Quality Assurance Manager

Tanya Kearney, B. Sc.  
Laboratory Manager

**To:** Martin Davie and Kristy Wade  
Hatfield Consultants

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Re: Sediment Toxicity Samples

Based on the conference call held on December 16, 2014 between Hatfield Consultants and HydroQual Laboratories, it was identified that there were technical/quality issues with the sediment reports submitted to Hatfield. Due to the technical issues encountered, HydroQual will be conducting a full review of the 2014 sediment testing in early 2015 to determine how to improve test procedures moving forward.

Please see the responses below to the questions regarding sediment toxicity samples that were conducted by HydroQual between August and November 2014.

**Control Sediment:**

During the period between August and November 2014, HydroQual was using two separate control sediments. Both sediments were appropriate for use, as they had been characterized appropriately and met the validity requirements for testing. For samples BER-D2, CHL-1, FOC-D1, GRL-1, ISL-1, POC-D1, SHL-1, and SUC-D2, it was not clear which of the control sediment was used to initiate testing on these samples. As a result, particle size analysis, total organic carbon and moisture content data were provided for both control sediments. HydroQual will be putting new processes in place, such as only having one control sediment for use, to reduce the likelihood of this occurring again in the future.

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## Ammonia Analysis

Due to technical error, initial and final ammonia readings were not completed for all samples and consequently, protocol deviations were reported on the affected reports. As part of the review process, HydroQual will be reviewing sediment testing procedures with all technicians. Additionally, new procedures, such as conducting ammonia analyses in house at the time of sampling rather than sending them to a subcontracted lab, will be implemented to reduce the likelihood of this occurring in the future.

## Hardness and Alkalinity Measurements

Although it is not a “must” requirement to measure hardness and alkalinity at test initiation and termination for sediment testing, these measurements were not measured for all samples, due to technical error. As part of the review process, HydroQual will be reviewing testing procedures with all technicians and procedures will be developed to reduce the likelihood of this occurring in the future

## Sediment Test Loading Technique

Due to technical error, it was noted on some test reports that less than 10 organisms or greater than 10 organisms were loaded at test initiation; the requirement is that 10 organisms are loaded into each test vessel. Because of these errors, the loading procedure was reviewed and a new loading process was implemented on October 10, 2014.

## *Hyaella* Culture Acclimation

As per the Environment Canada *Hyaella* Method, EPS 1RM33 second edition, which was published January 2013, the mortality rate for juvenile *Hyaella* must be monitored and must not exceed 20% prior to test initiation. As this was a new requirement, a procedure to monitor *Hyaella* culture health was developed and implemented on October 8, 2014. Any testing prior to this date had a protocol deviation noted on the report, as the culture health was not monitored prior to test initiation.

## Flies Observed at Chironomid Test Termination:

As per the Environment Canada method, EPS1 RM32, sediment toxicity testing must be initiated using either third instar *Chironomus tentans* or first instar *Chironomus riparius*. HydroQual initiates chironomid testing with third instar *C. tentans*, which are 9 – 13 days

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post hatch. *C. tentans* larvae tend to pupate at approximately 21 days; therefore, there is a chance that over the course of the 10-day test period, some chironomids may pupate. When this occurs, HydroQual's test reports included comments that these organisms had turned into flies and were not included in biomass data analysis. For future reports, this comment will be modified to state that these organisms have transitioned into the pupae life cycle stage and were not included in biomass data analysis. As these organisms were exposed to the sediment for the 10-day test duration, they were able to be included in survival data analysis. However, since they were no longer in the larval form, they could not be included in biomass data analysis.

### **Chironomid Test Validity**

Samples EMR-2; BPC-1; FLC-1 and GIC-1 were received in good condition on August 29, 2014 and chironomid testing was first initiated on September 5, 2014. This testing was concluded on September 15, 2014 and control validity for survival (<70% survival in the control) was not met. These samples were re-set on September 19, 2014, testing was completed on September 29, 2014, and once again, validity criteria for survival was not achieved. However, as there was no remaining sample, these samples could not be re-set and consequently no valid data was obtained for these four samples. Additionally, other samples had to be set multiple times, as control validity was not being met. In some cases, the samples were not able to be re-set with valid results within the six-week hold time and a protocol deviation was noted on the report that these tests were initiated outside of hold time.

Due to the invalid chironomid test results, HydroQual examined loading technique and loading vessels to help determine the cause of the invalid tests. After review, the use of a new loading vessel and loading technique was implemented on October 10, 2014. The new vessels and technique appeared to reduce the physical manipulations and stress on the organisms prior to test initiation thereby increasing the success of chironomid testing.

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If you have any questions or require any additional details, please do not hesitate to contact us.

Sincerely,

Jacklyn Poole

Tamara McClure

Tanya Kearney

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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 JOSMP Climate and Hydrology component in the 2014 water year (WY). The 2014 WY was defined as the period from November 1, 2013 to October 31, 2014. The appendix includes descriptions of the climate and hydrometric stations used to collect these data, along with other station-related information.

### C.1 2014 CLIMATE AND HYDROLOGY STATIONS

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

**Table C.1-1 JOSMP climate, hydrometric, and snowcourse stations monitored in the 2014 WY.**

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

<sup>1</sup> Station began operation during the 2014 open-water season.

<sup>2</sup> Station operated by WSC.

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

Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
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
07DA008/ S07	Muskeg River near Fort McKay	465552	6338804	all year <sup>2</sup>	water level, discharge, water temperature
S9	Kearl Lake Outlet	483983	6347020	all year	water level, discharge, water temperature
S10A	Wapasu Creek near the mouth	488573	6358554	all year	water level, discharge, water temperature
S11	Poplar Creek at Highway 63 (07DA007)	471972	6307825	all year	water level, discharge, water temperature
S12	Fort Creek at Highway 63	462620	6363554	open-water	water level, discharge, water temperature
S14A	Ells River at the Canadian Natural 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
S20A	Muskeg River Upland	492230	6354940	open-water	water level, discharge, water temperature
S22	Muskeg Creek near the mouth	480969	6349071	all year	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
07DB001/ S26	Mackay River near Fort McKay	458019	6341008	all year <sup>2</sup>	discharge
07DC001/ S27	Firebag River near the mouth	487914	6389855	all year <sup>2</sup>	discharge
07CE002/ S29	Christina River near Chard	508211	6187940	all year <sup>2</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 Horizon Lake	440745	6361662	all year	water level, discharge, water temperature
S36	McClelland Lake Outlet above Firebag River	490635	6384056	all year	water level, discharge, water temperature
S37	East Jackpine Creek near the 1300 ft. contour	487850	6325416	open-water	water level, discharge, water temperature

<sup>1</sup> Station began operation during the 2014 open-water season.

<sup>2</sup> Station operated by WSC.

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

Station	Name	UTM Coordinates (Zone 12 NAD83)		Operating Season	Variables Measured
		Easting	Northing		
07DA006/S38	Steepbank River near Fort McMurray	475296	6317398	all year <sup>2</sup>	discharge
07DA018/S39	Beaver River above Syncrude	465560	6311437	all year <sup>2</sup>	discharge
S40	MacKay River at Petro-Canada Bridge	444949	6314178	all year	water level, discharge, rainfall, water temperature
07DC005/S42	Clearwater River above Christina River	504427	6279666	all year <sup>2</sup>	discharge
S43	Firebag River above Suncor Firebag	531704	6354796	all year	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
S47A	Christina River near the mouth	505048	6272065	all year	water level, discharge, water temperature
S48	Big Creek	470817	6389113	open-water	water level, discharge, water temperature
S49	Eymundson Creek near the mouth	465473	6372694	open-water	water level, discharge, water temperature
S50A	Red Clay Creek	474881	6400224	open-water	water level, discharge, water temperature
S51	High Hills River near the mouth	533925	6291921	all year	water level, discharge, water temperature
S53	Dover River near the mouth	451453	6337015	all year	water level, discharge, water temperature
S54	Dunkirk River near Fort MacKay	395815	6302066	all year	water level, discharge, water temperature
S55	Gregoire River near the mouth	510184	6259986	all year	water level, discharge, water temperature
S56	Jackfish River below Christina Lake	493741	6169693	all year	water level, discharge, water temperature
S57	Sunday Creek above Christina Lake	506210	6158391	all year	water level, discharge, water temperature
S58	Sawbones Creek above Christina Lake	511412	6167165	open-water	water level, discharge, water temperature
S60	Unnamed Creek South of Christina Lake	511145	6159877	open-water	water level, discharge, water temperature
S61	Christina River Above Statoi Leismer	466037	6193791	all year	water level, discharge, water temperature
S62	Birch Creek at Highway 881	492149	6163182	all year	water level, discharge, water temperature
S63	Sunday Creek at Highway 881	494283	6157255	all year	water level, discharge, water temperature
S64	Unnamed Creek East of Christina Lake	517644	6163643	open-water	water level, discharge, water temperature
S65	North Green Stockings Creek at East Athabasca Highway	489845	6333039	open-water	water level, discharge, water temperature
S66	Steepbank River below North Steepbank Confluence	491458	6302625	all year <sup>1</sup>	water level, discharge, water temperature

<sup>1</sup> Station began operation during the 2014 open-water season.

<sup>2</sup> Station operated by WSC.

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

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

## C.2 CLIMATE DATA COLLECTED IN THE 2014 WATER YEAR

Climate data were collected in the region during the 2014 WY. Data were collected by Hatfield in support of the JOSMP, Environment Canada, and other organizations. This appendix focuses on JOSMP data and data obtained from government agencies to provide context and supplement the JOSMP information.

## C.2.1 Climate Data

In the 2014 WY, climate data were collected in support of the JOSMP from five comprehensive climate stations, climate sensors at two lake stations, and through the use of four additional rainfall stations located in conjunction with select hydrometric stations. The following sections present the data collected during the 2014 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 2014 WY. Table C.2-1 lists the data collected at the station. Monthly summary statistics for the 2014 WY are presented in Table C.2-2, and collected data are provided in the database on the RAMP website.

**Table C.2-1 Data collected at the Aurora Climate Station (C1), 2014 WY.**

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



**Table C.2-2 Summary of monthly climate data collected at the Aurora Climate Station (C1) during the 2014 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 Speed	
	Min (°C)	Mean (°C)	Max (°C)								2 min. (km/h)	10 min. (km/h)
Nov 2013	-32.7	-9.6	9.6	8.3	9.8	76.4	14.6	5.3	162	47.4	40.3	36.0
Dec 2013	-39.4	-23.4	1.0	25.4	34.8	69.2	2.6	3.9	134	39.2	42.4	36.4
Jan 2014	-39.1	-16.9	7.2	23.9	38.3	70.8	9.2	5.7	167	77.5	70.7	61.9
Feb 2014	-35.9	-19.5	-4.2	2.3	44.8	67.1	33.3	5.3	147	42.8	29.4	24.9
Mar 2014	-38.6	-11.2	11.6	6.8	24.8	60.3	102.0	5.9	164	48.0	33.8	28.9
Apr 2014	-21.4	1.1	23.4	9.6	0.0	59.3	149.8	7.7	123	50.0	35.7	31.0
May 2014	-8.0	8.4	29.5	84.6	0.0	62.5	178.9	7.7	153	47.6	45.5	39.8
June 2014	2.2	16.3	29.5	38.2	0.0	65.0	205.9	5.3	176	52.4	31.2	23.3
July 2014	5.0	19.7	34.3	94.2	0.0	65.5	218.7	4.2	186	55.3	51.3	42.9
Aug 2014	0.3	17.3	32.9	24.6	0.0	65.5	165.9	3.9	185	44.2	32.9	28.3
Sept 2014	-1.9	9.6	30.1	38.7	0.0	73.9	95.2	4.8	176	45.2	28.5	24.3
Oct-2014	-5.0	4.5	21.0	29.1	0.0	79.6	40.6	5.0	166	38.2	34.4	28.4
2014 WY Annual	-17.9	-0.3	18.8	385.6	-	67.9	101.4	5.4	161.7	49.0	39.7	33.8

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 2014 WY. Table C.2-3 lists the data collected at the station. Monthly summary statistics for 2014 WY are presented in Table C.2-4, and collected data are provided in the database on the RAMP website.

**Table C.2-3 Data collected at the Horizon Climate Station (C2), 2014 WY.**

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

**Table C.2-4 Summary of monthly climate data collected at the Horizon Climate Station (C2) during the 2014 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Global Solar Radiation (W/m <sup>2</sup> )	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speed	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov 2013	-30.1	-10.0	10.8	7.1	9.8	83.2	96.6	33.1	6.8	202	59.8	40.3	36.0
Dec 2013	-37.3	-22.9	1.9	21.2	31.2	79.1	97.0	16.1	6.1	203	68.4	42.4	36.4
Jan 2014	-37.2	-16.9	6.5	25.5	37.1	79.6	96.4	21.5	7.6	198	97.5	70.7	61.9
Feb 2014	-35.4	-19.5	-4.8	5.5	41.9	76.1	96.9	58.7	6.8	198	42.7	29.4	24.9
Mar 2014	-35.7	-11.3	12.1	14.3	31.6	67.1	96.7	141.5	8.4	217	50.4	33.8	28.9
Apr 2014	-23.5	0.2	21.3	10.5	0.0	63.6	96.5	183.5	9.2	152	54.9	35.7	31.0
May 2014	-8.0	7.8	27.6	105.1	0.0	64.0	96.6	208.5	9.5	177	62.7	45.5	39.8
June 2014	1.9	15.2	27.4	55.0	0.0	69.1	96.2	220.4	7.1	182	43.8	31.2	23.3
July 2014	5.8	18.8	33.4	73.4	0.0	70.3	96.3	244.8	7.0	218	67.1	51.3	42.9
Aug 2014	1.5	16.4	32.2	120.8	0.0	70.3	96.4	203.3	6.9	230	48.1	32.9	28.3
Sept 2014	-3.9	9.3	31.4	54.7	0.0	76.2	96.4	124.7	7.2	202	45.7	28.5	24.3
Oct 2014	-5.3	3.8	19.7	17.1	2.0	83.2	95.7	61.1	7.3	193	52.8	34.4	28.4
2014 WY Annual	-17.3	-0.8	18.3	510.1		73.5	96.5	126.4	7.5	198	57.8	39.7	33.8

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 2014 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 summary statistics for 2014 WY are presented in Table C.2-6, and collected data are provided in the database on the RAMP website.

**Table C.2-5 Data collected at the Steepbank Climate Station (C3), 2014 WY.**

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

**Table C.2-6 Summary of monthly climate data collected at the Steepbank Climate Station (C3) during the 2014 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m <sup>2</sup> )	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speed	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov 2013	-32.4	-9.2	10.4	5.1	7.7	74.1	25.4	96.8	8.3	153	44.4	34.1	29.8
Dec 2013	-41.2	-23.5	2.0	21.3	38.7	67.4	9.0	98.1	7.1	149	40.7	32.4	29.7
Jan 2014	-40.4	-16.8	7.2	18.5	45.0	69.5	19.8	97.5	8.4	157	64.7	49.9	43.0
Feb 2014	-38.8	-19.5	-2.1	2.1	58.0	66.2	50.8	98.0	7.7	139	50.9	38.2	32.5
Mar 2014	-39.1	-11.1	12.6	5.2	26.3	59.3	120.4	97.8	7.9	146	50.4	36.9	33.6
Apr 2014	-20.4	1.2	22.1	11.0	0.0	57.7	158.9	97.4	10.9	134	45.1	36.5	30.2
May 2014	-7.0	8.3	28.8	77.4	0.0	61.9	184.6	97.5	9.4	141	49.1	35.7	32.9
Jun 2014	2.7	16.0	27.7	44.8	0.0	64.9	223.3	97.1	9.2	148	45.0	34.1	30.1
Jul 2014	6.3	19.7	33.9	63.0	0.0	64.4	245.5	97.2	7.4	175	49.7	34.6	28.2
Aug 2014	-1.1	17.3	31.4	26.6	0.0	67.5	198.0	97.4	6.3	170	33.0	25.4	20.8
Sep 2014	-2.5	9.5	30.2	79.6	0.0	76.5	114.9	97.4	7.5	166	42.4	31.9	29.9
Oct 2014	-5.3	4.9	20.8	33.1	0.0	79.5	57.5	97.0	8.0	168	44.8	36.1	30.0
2014 WY Annual	-18.3	-0.3	18.7	387.6		67.4	117.3	97.4	8.2	154	46.7	35.5	30.9

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 in July 2011. This station monitored air temperature, wind speed and direction, solar radiation, relative humidity, barometric pressure, snow depth, and total precipitation from November 2013 to October 2014. Table C.2-7 provides a list of the data collected at the station. Monthly summary statistics for 2014 WY are presented in Table C.2-8, and collected data are provided in the database on the RAMP website.

**Table C.2-7 Data collected at the Pierre Climate Station (C4), 2014 WY.**

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

**Table C.2-8 Summary of monthly climate data collected at the Pierre Climate Station (C4) during the 2014 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m <sup>2</sup> )	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speed	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov 2013	-34.8	-10.4	10.7	9.4	9.2	83.8	24.1	98.2	4.0	162	63.8	39.6	30.7
Dec 2013	-41.2	-25.0	-6.1	26.7	29.9	79.1	6.3	98.7	3.1	168	34.3	19.1	16.9
Jan 2014	-41.8	-18.0	8.2	28.7	32.5	79.6	14.9	98.0	4.9	165	91.5	50.2	44.8
Feb 2014	-38.5	-20.6	-4.7	3.9	36.5	75.0	51.9	98.5	3.8	157	44.1	25.5	20.8
Mar 2014	-39.5	-12.2	13.3	10.1	27.9	66.9	118.2	98.3	5.1	178	41.9	27.3	21.4
Apr 2014	-26.3	0.0	22.7	11.7	0.0	63.6	163.0	98.0	6.2	146	46.0	30.3	23.3
May 2014	-9.4	7.7	28.6	98.6	0.0	66.3	183.2	98.1	6.3	157	49.5	29.5	25.2
June 2014	-1.1	15.3	28.2	44.4	0.0	70.3	208.1	97.6	4.7	178	40.2	26.6	19.9
July 2014	2.2	18.5	34.3	82.3	0.0	73.5	221.0	97.7	4.1	198	56.0	39.2	33.1
Aug 2014	-1.9	15.4	31.3	87.2	0.0	77.2	180.4	97.8	3.9	201	39.4	27.4	20.1
Sept 2014	-5.7	8.7	31.5	60.1	0.0	78.9	112.2	97.9	4.8	184	47.4	33.7	26.6
Oct 2014	-7.6	3.6	19.1	23.4	0.0	83.8	52.8	97.5	4.5	181	40.3	24.3	20.9
2014 WY Annual	-20.5	-1.4	18.1	486.4		74.8	111.3	98.0	4.6	173	49.5	31.1	25.3

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 2014 WY, air temperature, relative humidity, total precipitation, snow depth, wind speed and direction, and barometric pressure data were collected at this station as described in Table C.2-9. Monthly summary statistics for 2014 WY are presented in Table C.2-10 and collected data are provided in the database on the RAMP website.

**Table C.2-9 Data collected at the Surmont Climate Station (C5), 2014.**

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



**Table C.2-10 Summary of monthly climate data collected at the Surmont Climate Station (C5) during the 2014 WY.**

Month	Temperature			Total Precipitation (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Mean Total Global Solar Radiation (W/m <sup>2</sup> )	Mean Barometric Pressure (kPa)	Mean Wind Speed (km/h)	Mean Wind Direction (Deg.)	Peak Wind Speed (km/h)	Maximum Sustained Wind Speed	
	Min (°C)	Mean (°C)	Max (°C)									2 min. (km/h)	10 min. (km/h)
Nov 2013	-32.6	-9.1	8.6	17.0	10.6	79.8	27.9	94.9	6.4	207	60.5	37.6	31.3
Dec 2013	-39.1	-21.2	3.7	35.3	41.8	78.8	12.1	95.1	5.9	227	65.2	43.9	35.0
Jan 2014	-34.1	-14.2	7.3	22.7	39.5	76.1	20.0	94.6	8.1	242	73.4	47.2	39.7
Feb 2014	-35.5	-18.3	-1.8	7.9	42.9	75.5	54.1	95.0	6.4	244	44.3	33.8	29.0
Mar 2014	-37.2	-9.9	11.4	17.6	18.9	64.6	123.1	94.9	6.7	229	44.2	29.5	24.7
Apr 2014	-18.6	0.8	20.1	39.6	0.0	65.9	150.4	94.7	7.3	179	52.1	36.0	31.3
May 2014	-6.9	7.4	27.8	107.0	0.0	65.2	180.2	94.9	7.7	200	49.0	30.8	25.9
June 2014	0.1	14.5	26.7	80.2	0.0	69.2	195.1	94.6	6.5	201	43.0	32.5	27.0
July 2014	4.9	18.3	31.1	125.1	0.0	67.7	214.5	94.8	5.6	209	49.4	31.7	24.1
Aug 2014	-0.7	16.6	31.0	41.5	0.0	66.9	189.5	94.9	5.9	223	42.5	29.5	24.3
Sept 2014	-2.4	9.1	30.2	68.2	0.0	74.9	106.2	94.8	6.2	207	47.2	28.3	26.9
Oct 2014	-5.7	4.3	20.9	37.4	0.0	78.0	58.4	94.4	6.2	200	51.4	27.5	25.0
2014 WY Annual	-17.3	-0.2	18.1	599.5		71.9	111.0	94.8	6.6	214	51.9	34.0	28.7

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

### C.2.1.6 Climate Variables at Other Stations

Table C.2-11 summarizes the climate variables monitored at stations other than the Aurora, Horizon, Steepbank, Pierre, and Surmont climate stations.

Total precipitation was monitored at stations L1 (using Pluvio 2 weighing gauge) and L2 (using a Geonor weighing gauge), with rainfall also being measured from April to October 2014 at stations S3, S19, S40, and S43 using tipping bucket rain gauges.

Barometric pressure was monitored at Station S5A throughout the 2014 WY.

Table C.2-12 and Table C.2-13 provide a monthly summary of the climate data collected at these JOSMP stations. Collected data are included in the database on the RAMP website. Daily cumulative precipitation and rainfall depths at the various stations were compared to precipitation recorded at other regional stations in Figure C.2-1 and Table C.2-12.

**Table C.2-11 Climate data collected at other JOSMP stations, 2014.**

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

**Table C.2-12 Summary of climate data collected at McClelland Lake (station L1) and Kearl Lake (station L2) during the 2014 WY.**

Station	L1 McClelland Lake				L2 Kearl Lake			
Period of Operation	Nov 1, 2013 to Oct 31, 2014	Nov 1, 2013 to Oct 31, 2014	Nov 1, 2013 to Oct 31, 2014	Nov 1, 2013 to Oct 31, 2014	Nov 1, 2013 to Oct 31, 2014	Nov 1, 2013 to Oct 31, 2014	Nov 1, 2013 to Oct 31, 2014	Nov 1, 2013 to Oct 31, 2014
Month	Precipitation Depth	Water Temperature	Air Temperature	Relative Humidity	Precipitation Depth	Water Temperature	Air Temperature	Relative Humidity
	(mm)	(°C)	(°C)	(%)	(mm)	(°C)	(°C)	(%)
Nov 2013	11.9	1.6	-10.1	82.0	14.8	6.2	-9.9	80.5
Dec 2013	20.5	1.1	-24.5	76.9	16.0	4.1	-23.7	77.1
Jan 2014	17.8	0.8	-18.0	77.2	18.4	3.2	-17.1	76.3
Feb 2014	6.0	0.6	-21.0	74.4	11.6	2.7	-20.2	73.5
Mar 2014	9.1	0.4	-13.3	66.9	19.1	2.2	-12.1	63.7
Apr 2014	16.2	2.4	-0.5	63.8	17.3	2.0	0.1	62.2
May 2014	108.5	9.5	7.7	67.1	90.1	4.0	8.0	63.5
June 2014	41.6	18.0	16.4	67.3	63.1	10.1	16.1	67.9
July 2014	68.0	22.8	19.7	72.8	88.5	14.7	19.5	70.1
Aug 2014	43.4	21.3	16.9	75.2	39.9	16.4	16.8	72.6
Sept 2014	39.8	12.8	9.2	80.4	53.9	13.3	9.4	77.2
Oct 2014	34.3	6.9	3.9	86.0	35.2	10.0	4.6	80.7
Annual Sum	417.2	-	-	-	467.9	-	-	-
Annual Mean	-	8.2	-1.1	74.2	-	7.4	-0.7	72.1

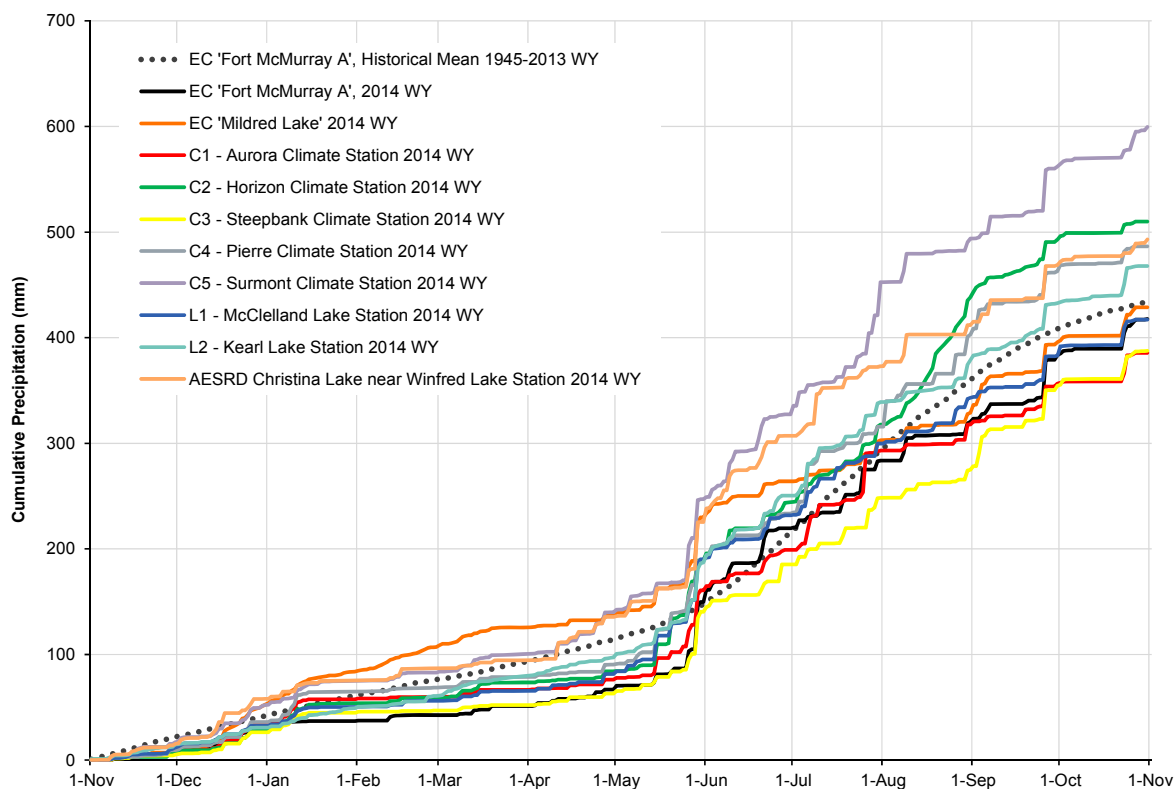
Note: M = Missing, P = Partial. See additional notes in sections C.1.1.1 and C.2.1.7.

**Table C.2-13 Summary of atmospheric pressure (kPa) data collected at other JOSMP stations during the 2014 WY.**

Month	S3	S19	S40	S43	S5A
	Iyininim Creek above Kearn Lake	Tar River Lowland Tributary near the mouth	MacKay River at Petro-Canada Bridge	Firebag River above Suncor Firebag	Muskeg River above Muskeg Creek
Nov 2013	-	-	12.45 P	0.90 P	98.2
Dec 2013	-	-	-	-	98.6
Jan 2014	-	-	-	-	98.0
Feb 2014	-	-	-	-	98.5
Mar 2014	-	-	-	-	98.2
Apr 2014	-	-	21.6 P	32.3 P	97.9
May 2014	79.2	84.4	74.2	73.2	98.0
June 2014	61.8	45.0	40.1	14.0	97.5
July 2014	50.6	48.6	33.3	90.7	97.6
Aug 2014	0.0 P	38.9	27.9	36.3	97.8
Sept 2014	M	46.0	57.2	0.0 P	97.8
Oct 2014	M	21.6	22.1	30.5 P	97.4
Annual Sum	191.6	284.5	276.4	276.9	-
Annual Mean	-	-	-	-	98.0

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

**Figure C.2-1 Cumulative precipitation measured at climate stations in the Athabasca oil sands region, 2014 WY.**



### C.2.1.7 Data Access

Climate and Hydrology provisional near real-time data collected in support of the JOSMP are available through the RAMP website ([www.ramp-alberta.org](http://www.ramp-alberta.org)) throughout the 2014 WY. The final 2014 WY data were published to the RAMP website in May 2015 upon the completion of the QA/QC process for data management. The following notes applied to the monthly climate data (summarized above) and to the daily data, which are publically available and provided in the RAMP database:

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

### C.2.1.8 2014 Snow Course Survey Results

Snow course surveys were completed at sites representing four general terrain types across the Athabasca oil sands region:

- 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 in Figure 3.1-1 of the main report.

Snow course surveys were completed from February 2 to 8, March 3 to 6, and March 28 to April 2, 2014. The results organized by land cover type are shown in Table C.2-14 and organized by region in Table C.2-15. Snow survey data are also available through the RAMP website.

**Table C.2-14 Summary of the JOSMP snow course surveys organized by land cover type, winter 2014.**

Terrain Type	Survey ID	February		March		April	
		Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)	Snow Depth (cm)	SWE (mm)
Flat Low Lying	CANR-FL-A	59	78	59	73	47	113
	CNRL-FL-A	46	50	54	50	49	90
	MCLL-FL-A	51	73	58	83	52	90
	NEX-FL-A	47	85	52	78	31	98
	Mean	51	72	56	71	45	<u>98</u>
Open Land/Lake Area	CANR-OP-A	17	37	22	43	9	25
	CNRL-OP-A	19	35	24	38	10	55
	MCLL-OP-A	20	33	28	48	22	65
	NEX-OP-A	14	30	19	36	8	14
	Mean	17	34	23	<u>41</u>	12	40
Mixed Deciduous	CANR-MD-A	45	73	48	53	39	100
	CNRL-MD-A	42	58	45	53	39	159
	MCLL-MD-A	43	63	49	70	43	95
	NEX-MD-A	43	53	48	56	38	93
	Mean	43	62	47	58	40	<u>112</u>
Jackpine	CANR-JP-A	40	45	45	68	40	88
	CNRL-JP-A	34	38	40	58	37	48
	MCLL-JP-A	34	65	42	58	33	68
	NEX-JP-A	38	43	39	46	31	65
	Mean	37	48	41	58	35	<u>67</u>

Note: Underlined mean values denote the maximum observed values for a given terrain type in 2014. These values are plotted in Figure 4.1-4 of the main report.

SWE=snow water equivalent.

**Table C.2-15 Summary of the snow course surveys organized by region, winter 2014.**

Region	Survey ID	February		March		April	
		Snow Depth	SWE	Snow Depth	SWE	Snow Depth	SWE
		[cm]	[mm]	[cm]	[mm]	[cm]	[mm]
Kearl Lake Area	CANR-FL-A	59	78	59	73	47	113
	CANR-OP-A	45	73	48	53	39	100
	CANR-MD-A	40	45	45	68	40	88
	CANR-JP-A	17	37	22	43	9	25
	Mean	40	58	43	59	34	82
Canadian Natural Horizon Lake Area	CNRL-FL-A	47	85	52	78	31	98
	CNRL-OP-A	43	53	48	56	38	93
	CNRL-MD-A	38	43	39	46	31	65
	CNRL-JP-A	14	30	19	36	8	14
	Mean	36	53	39	54	27	68
McClelland Lake Area	MCLL-FL-A	46	50	54	50	49	90
	MCLL-OP-A	42	58	45	53	39	159
	MCLL-MD-A	34	38	40	58	37	48
	MCLL-JP-A	19	35	24	38	10	55
	Mean	35	45	41	50	34	88
Sucker Lake Area	NEX-FL-A	51	73	58	83	52	90
	NEX-OP-A	43	63	49	70	43	95
	NEX-MD-A	34	65	42	58	33	68
	NEX-JP-A	20	33	28	48	22	65
	Mean	37	59	44	65	37	80

SWE=snow water equivalent.

## C.3 HYDROMETRIC DATA COLLECTED IN THE 2014 WY

Hydrometric data for the region were collected throughout the 2014 WY. Climate and Hydrology provisional near real-time data collected in support of the JOSMP are available through the RAMP website ([www.ramp-alberta.org](http://www.ramp-alberta.org)) throughout the 2014 WY. The final 2014 WY data were published to the RAMP website in May 2015 upon the completion of the QA/QC process for data management.

### C.3.1 Hydrometric Data

Hydrometric data, including water level and discharge, were collected at regional hydrometric stations during the 2014 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 derive streamflow values from the recorded water level data. Suspended sediment samples were also collected at hydrometric stations during the open-water period of the 2014 WY. Table C.3-1 provides a summary of the equipment at each JOSMP hydrometric station during the 2014 WY, including types of data loggers, pressure transducers, and telemetry equipment.

**Table C.3-1 Equipment deployed at hydrometric stations in support of JOSMP, 2014.**

Station	Data Logger Type	Pressure Transducer Type	Telemetry Type
L1	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
L2	Campbell Scientific CR-1000	Ott PLS	Raven X HSPA Cellular Modem
L3	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
L4	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter
S2	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S3	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S5	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S6	Campbell Scientific CR-800	Ott PLS	Raven X HSPA 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 X HSPA Cellular Modem
S16A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S19	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S20	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S20A	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S22	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S24	Campbell Scientific CR-800	Ott PLS (x2)	Raven X HSPA Cellular Modem
S25	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem with Campbell Scientific RF401 Radio Repeater



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

Station	Data Logger Type	Pressure Transducer Type	Telemetry Type
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 HSPA 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
S60	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S61	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S62	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S63	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S64	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S65	Campbell Scientific CR-800	Ott PLS	Raven X HSPA Cellular Modem
S66	Campbell Scientific CR-800	Ott PLS	Campbell Scientific TX320 GOES Transmitter

### C.3.1.1 Water Level and Discharge

Table C.3-2 provides a summary of hydrometric monitoring in support of the JOSMP in the 2014 WY. Data quality for the 2014 WY was generally good at 36 of 51 stations, with challenges encountered due to wildlife, high water levels, and equipment attrition affecting the 2014 WY hydrometric record at 15 stations as described below. The quality assessment of each station record was based on an assessment matrix

that considered the number and quality of discharge measurements made during the year, the quality and extent of the stage-discharge rating curve, and the completeness of the data record.

### ***Wildlife and Environmental Challenges***

The following wildlife and environmental challenges were addressed in 2014:

- Wildlife activity at Station S3 Iyininim Creek above Kears Lake, caused damage to the tipping bucket rain gauge and disconnected the power supply to the station on August 4, 2014. The station was reinstated without the tipping bucket during the next field visit on August 9. Another wildlife incident in late August disconnected telemetry cables, but resulted in no interruption to data collection. The tipping bucket rain gauge was reinstalled and telemetry repairs were completed during the next field visit on September 24, 2014.
- Wildlife activity caused the solar panel cables to be disconnected at Station S10A Wapasu Creek near the mouth, on August 10, 2014. Repairs were conducted during the next field visit on September 12, 2014, and there was no disruption to data collection.
- Low water level caused the pressure transducer at Station S11 Poplar Creek at Highway 63, to be out of the water from July 12 to July 18, 2014. As a result, the water level could not be measured during this period. The pressure transducer was moved to a deeper location during the next field visit on August 8, 2014 to avoid future data loss from low water levels.
- Bank erosion during the spring freshet caused the monitoring equipment at Station S16A Calumet River near the mouth, to fall into the river on May 31, 2014. Data collection was interrupted from May 31 to June 20, 2014 when the equipment was replaced and the station was reinstated.
- The pressure transducer at Station S24 Athabasca River below Eymundson Creek, was severed by ice movement during river break-up on April 23, 2014. Station monitoring was interrupted from April 23 to May 20, 2014 when the station was reinstated.
- The tipping bucket at Station S43 Firebag River upstream of Suncor Firebag, was damaged by wildlife following the September 12, 2014 field visit. Accordingly, data collected during this time was not considered reliable and was discarded for the period of September 12 to October 15, 2014. The instrument was repaired during the field visit on October 15, 2014.
- The pressure transducer at Station S46 Athabasca River near Embarras Airport was severed on April 27, 2014 by ice movement during river break-up. Station monitoring was interrupted from April 27 to May 16 when the station was reinstated.
- Ice movement during river break-up at Station S47A Christina River near the mouth, caused the pressure transducer to be disconnected from the data logger on April 28, 2014. Data were not collected until a new pressure transducer was installed on May 21, 2014, during the next field visit.

### ***Data Logger Malfunctions and Attrition***

The following data logger malfunctions and equipment challenges were addressed in 2014:

- Weak batteries, poor light conditions, and faulty power supplies caused intermittent data collection for portions of 2014 at stations L4 Namur Lake, S2 Jackpine Creek at Canterra Road, S36 McClelland Lake Outlet above Firebag River, S49 Eymundson Creek near the mouth, S58 Sawbones Creek above Christina Lake, S62 Birch Creek at Hwy 881, and S64 Unnamed Creek East of Christina Lake. Batteries were replaced or more batteries were added to stations where weak batteries or poor lighting conditions occurred, respectively. Components of faulty power supplies were replaced as necessary to reinstate station function; and
- A faulty data logger at Station S62 Birch Creek at Highway 881 caused monitoring to be intermittent from July 14, 2014 to October 10, 2014. The data logger was replaced during the October 10 field visit and full station function was restored.

### ***Data Quality***

Data quality at the following 11 stations was compromised due to backwater effects related to beaver activity:

- S09, Kearn Lake outlet;
- S15A, Tar River near the mouth;
- S16A, Calumet River Upland Tributary;
- S31, Hangingstone Creek at North Star Road;
- S36, McClelland Lake outlet above Firebag River;
- S37, East Jackpine Creek near the 1,300 ft. contour;
- S44, Pierre River near Fort McKay;
- S50A, Red Clay Creek;
- S58, Sawbones Creek above Christina Lake;
- S62, Birch Creek at Highway 881; and
- S64, Unnamed Creek, east of Christina Lake.

**Table C.3-2 Summary of hydrometric monitoring undertaken in support of JOSMP during the 2014 WY.**

Watershed and Station	Catchment Area (km <sup>2</sup> )	Monitored Period 2014 WY	Percent of Open-Water Period Record Available 2014 WY	Maximum Daily Discharge (Water Year)		Minimum Daily Discharge (Open-Water Season)		Catchment Runoff Depth (Open-Water Season)	
				2014 WY (m <sup>3</sup> /s)	Historical mean (m <sup>3</sup> /s)	2014 WY (m <sup>3</sup> /s)	Historical mean (m <sup>3</sup> /s)	2014 WY (mm)	Historical mean (mm)
<b>Athabasca River</b>									
S46 - Athabasca River near Embarras Airport	156,000	Nov 1-Oct 31	100	2464	2945	346	554	107	112
S24 - Athabasca River below Eymundson Creek	146,000	Nov 1-Oct 31	65	1922	2415	320	373	65.0	96.6
Athabasca River at Fort McMurray (07DA001)	133,000	Nov 1-Oct 31	100	2430	2545	334	424	114	116
<b>Athabasca River East Tributaries</b>									
S6 - Mills Creek at Highway 63	9.0	Nov 1-Oct 31	100	0.239	0.16	0.095	0.02	182	75.7
S12 - Fort Creek at Highway 63	63.8	Apr 28-Oct 31	100	0.412	0.5	0.041	0.02	36.8	23.7
S25 - Susan Lake Outlet	20.7	Apr 29-Oct 31	100	0.484	0.672	0.027	0.007	57.4	21.7
<b>Muskeg River Basin</b>									
S2 - Jackpine Creek at Canterra Road	342.0	Nov 1-Oct 31	100	16.3	10.0	0.07	0.26	110.9	84.3
S3 - Iyininim Creek above Kearl Lake	39.3	Apr 29-Oct 31	98	3.66	2.46	0.009	0.02	192	117
S5 - Muskeg River above Stanley Creek	396.0	Nov 1-Oct 31	100	12.2	8.57	0.322	0.18	95.6	71.2
S5A - Muskeg River above Muskeg Creek	521.0	Nov 1-Oct 31	100	19.1	8.38	0.453	0.34	104	63.0
S7 - Muskeg River near Fort McKay (07DA008)	1457	Nov 1-Oct 31	100	41.1	26.1	0.687	1.05	92.6	72.1
S9 - Kearl Lake Outlet	76.5	Nov 1-Oct 31	100	1.11	0.92	0.010	0.03	103	46.9
S10A - Wapasu Creek near the mouth	90.7	Nov 1-Oct 31	100	8.16	3.88	0.05	0.06	166	91.6
S20 - Muskeg River Upland	157.0	Apr 28-Oct 31	100	6.77	5.99	0.165	0.10	83.6	65.7
S22 - Muskeg Creek near the mouth	323.0	Nov 1-Oct 31	100	12.7	18.4	0.050	0.147	97.1	68.9
S33 - Muskeg River at Aurora/Albian Boundary	897.0	Nov 1-Oct 31	100	20.6	16.1	0.559	0.448	91.1	58.3
S37 - East Jackpine Creek near the 1300 m Contour	47.4	Apr 29-Oct 31	100	2.24	1.98	0.005	0.020	143	86.9
S65 - North Green Stockings Creek at East Athabasca Hwy	23.0	May 1-Oct 31	100	1.41	-	0.013	-	140	-
<b>Steepbank River Basin</b>									
S38 - Steepbank River near Fort McMurray (07DA006)	1,320	Nov 1-Oct 31	100	66	35.8	0.968	1.66	139	100
S66 - Steepbank River below North Steepbank River	1,193	May 23-Oct 31	88	48.459	-	0.967	-	106.9	-
<b>Firebag River Basin</b>									
S27 - Firebag River near the Mouth (07DC001)	5,987.6	Nov 1-Oct 31	100	166	128	15.9	15.7	142	98.4
S36 - McClelland Lake Outlet above Firebag River	367.0	Nov 1-Oct 31	99	3.63	3.11	0.504	0.349	42.7	19.8
S43 - Firebag River above Suncor Firebag	2,381.0	Nov 1-Oct 31	100	85.4	64.1	4.23	5.74	147	106
<b>Athabasca River West Tributaries</b>									
S44 - Pierre River near Fort McKay (07DA013)	123.0	May 3-Oct 31	99	4.81	2.41	0.017	0.04	77.4	41.3
S48 - Big Creek	304	May 1-Oct 31	100	3.73	2.19	0.164	0.199	40.7	30.2
S49 - Eymundson Creek near the mouth	320.0	Apr 30-Oct 31	100	15.8	9.56	0.254	0.160	68.4	52.3
S50A - Red Clay Creek	180.0	May 1-Oct 31	100	3.28	2.78	0.242	0.100	63.6	48.7

\* 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 2014 WY	Percent of Open-Water Period Record Available 2014 WY	Maximum Daily Discharge (Water Year)		Minimum Daily Discharge (Open-Water Season)		Catchment Runoff Depth (Open-Water Season)	
				2014 WY (m <sup>3</sup> /s)	Historical mean (m <sup>3</sup> /s)	2014 WY (m <sup>3</sup> /s)	Historical mean (m <sup>3</sup> /s)	2014 WY (mm)	Historical mean (mm)
<b>Ells River Basin</b>									
S14A - Ells River at Canadian Natural Bridge	2,420.0	Nov 1-Oct 31	100	83.9	48.2	2.08	2.5	109	68.8
S45 - Ells River above Joslyn Creek Diversion	2,231.0	Nov 1-Oct 31	100	63.9	29.7	2.21	3.46	101	68.1
L4/S52 - Namur Lake near the Outlet (Ells River Watershed)	164	Nov 1-Oct 31	100	1.49	-	0.045	-	66.1	-
<b>Mackay River Basin</b>									
S26 - MacKay River near Fort McKay (07DB001)	5,569	Nov 1-Oct 31	100	120	106	3.18	3.66	70.6	66.1
S40 - MacKay River at Petro-Canada Bridge	4,090	Nov 1-Oct 31	100	79.4	57.6	2.23	2.70	74.5	71.0
S53 - Dover River near the mouth	963	Nov 1-Oct 31	100	31.1	19.6	0.615	0.200	59.1	40.9
S54 - Dunkirk River near Fort McKay	1,570	Nov 1-Oct 31	100	21.6	38.0	1.11	0.600	73.9	68.2
<b>Tar River Basin</b>									
S15A - Tar River near the mouth	332.0	Apr 28-Oct 31	100	11.0	7.3	0.091	0.2	73.9	38.8
S19 - Tar River Lowland Tributary near the mouth	21.0	Apr 28-Oct 31	100	0.185	0.10	0.000	0.001	9.8	9.4
S34 - Tar River above Horizon Lake	146.0	Nov 1-Oct 31	99	11.7	6.31	0.102	0.09	152	75.0
<b>Calumet River Basin</b>									
S16A / S16A / CR-1 - Calumet River	169.0	Apr 30-Oct 31	90	12.3	4.0	0.012	0.02	39.1	18.5
<b>Poplar River Basin</b>									
S11 - Poplar Creek at Highway 63 (07DA007)	151	Nov 1-Oct 31	96	36.4	7.5	0.001	0.1	263.5	146.3
S39 - Beaver River above Syncrude (07DA018)	164.8	Nov 1-Oct 31	100	30.4	8.10	0.093	0.100	118	75.8
<b>Clearwater River Tributaries</b>									
S29 - Christina River near Chard (07CE002)	4,863	Nov 1-Oct 31	100	137	98.0	5.200	6.50	126	78.7
S31 - Hangingstone Creek near the mouth	119.0	Nov 1-Oct 31	100	6.12	10.1	0.160	0.181	143	115
S32 - Surmount Creek at Highway 881	157.0	May 1-Oct 31	100	9.11	7.05	0.201	0.12	132	108
S42 - Clearwater River above Christina River (07CD005)	17,017	Nov 1-Oct 31	100	254	193	57.6	59.9	102	86.6
S47A - Christina River near the mouth	13,284	Nov 1-Oct 31	89	308	174	16.8	16.9	103	74.4
S51 - High Hills River near the mouth	1,588	Nov 1-Oct 31	100	52.6	-	2.47	-	99.6	-
S55 - Gregoire River above the Christina River	1,015	Nov 1-Oct 31	100	35.3	-	0.156	-	61.0	-
S56 - Jackfish River below Christina Lake	1,290	Nov 1-Oct 31	100	44.1	65.2	1.270	0.82	122	48.1
S57 - Sunday Creek above Christina Lake	374.0	Nov 1-Oct 31	100	20.9	-	0.034	-	114	-
S58 - Sawbones Creek above Christina Lake	126.0	May 1-Oct 31	100	5.48	-	0.025	-	92.6	-
S60 - Unnamed Creek south of Christina Lake	140.0	May 1-Oct 31	97	5.92	-	0.020	-	104	-
S61 - Christina River above Statoil Leismer	1,028	May 10-Oct 31	84	31.2	-	1.410	-	139	-
S62 - Birch Creek at Hwy 881	197.0	May 18-Oct 31	91	7.79	-	0.214	-	87.0	-
S63 - Sunday Creek at Hwy 881	135.0	May 6-Oct 31	83	7.77	-	0.015	-	109	-
S64 - Unnamed Creek East of Christina Lake	171.0	Apr 30-Oct 31	100	9.69	-	0.064	-	119	-

\* 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.)**

Water Level Stations	Catchment Area (km <sup>2</sup> )	Monitored Period 2014 WY	Percent of Open-Water Period Record Available 2014 WY	Maximum Water Level		Minimum Water Level	
				2014 WY (m)	Historical mean (m)	2014 WY (m)	Historical mean (m)
L1 - McClelland Lake (Firebag River Watershed)	204.0	Nov 1-Oct 31	100	294.787	294.548	294.585	294.349
L2 - Kearn Lake (Muskeg River Watershed)	71.6	Nov 1-Oct 31	100	332.170	332.124	331.761	331.750
L3 - Isadore's Lake (Athabasca River Watershed)	14.2	Nov 1-Oct 31	100	234.023	234.038	233.730	233.706
L4/S52 - Namur Lake near the Outlet (Ells River Watershed)	164	Nov 1-Oct 31	100	98.142	-	97.899	-

\* 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 46 streamflow stations for a total of 174 measurements in the 2014 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.

**Table C.3-3 Suspended sediment data collected at JOSMP hydrometric stations during the 2014 WY.**

Station		April 29 to May 27	June 2 to June 25	Aug 5 to 19	Sept 4 to 24	Oct 7 to Nov 2
S02	TSS (mg/L)	*	*	<3.0	3.0	3.0
	Q (m <sup>3</sup> /s)	1.643	5.239**	0.429	0.110	0.452
S03	TSS (mg/L)	*	26.1	4.1	5.0	*
	Q (m <sup>3</sup> /s)	0.407	0.487	0.214	0.044	0.206
S5	TSS (mg/L)	*	<3.0	*	4.0	6.0
	Q (m <sup>3</sup> /s)	4.841	4.050	0.579	0.406	0.627
S5A	TSS (mg/L)	*	<3.0	*	*	*
	Q (m <sup>3</sup> /s)	3.944	15.216**	0.710	0.525	0.875
S6	TSS (mg/L)	*	*	*	6.0	*
	Q (m <sup>3</sup> /s)	0.005	0.072	0.070	0.132	0.147
S9	TSS (mg/L)	*	*	<3.0	5.0	6.0
	Q (m <sup>3</sup> /s)	-0.004	1.060	0.261	0.013	0.017
S10A	TSS (mg/L)	4.8	<3.0	<3.0	3.0	<3.0
	Q (m <sup>3</sup> /s)	1.295	1.120	0.256	0.079	0.149
S11	TSS (mg/L)	105	40.1	6.3	7.0	9.0
	Q (m <sup>3</sup> /s)	3.171	10.200	0.032	0.496	0.104
S12	TSS (mg/L)	*	<3.0	<3.0	4.0	*
	Q (m <sup>3</sup> /s)	0.157	0.267	0.063	0.122	0.129
S14A	TSS (mg/L)	142	33.8	25.1	3.0	3.0
	Q (m <sup>3</sup> /s)	30.914	27.00	4.163	2.450	2.990
S15A	TSS (mg/L)	*	18.6	7.4	9.0	11.0
	Q (m <sup>3</sup> /s)	0.311	1.830	0.143	0.192	0.343
S16A	TSS (mg/L)	*	3.7	16.3	7.0	*
	Q (m <sup>3</sup> /s)	0.352	0.499	0.043	0.015	0.065
S19	TSS (mg/L)	*	<3.0	14.0	5.0	*
	Q (m <sup>3</sup> /s)	0.030	0.020	0.000	0.001	0.010
S20A	TSS (mg/L)	*	>3.0	17.0	3.0	40.0
	Q (m <sup>3</sup> /s)	1.800	1.270	0.026	0.037	0.082
S22	TSS (mg/L)	*	9.0	<3.0	5.0	<3.0
	Q (m <sup>3</sup> /s)	1.990	4.552**	0.307	0.077	0.199
S24	TSS (mg/L)	86.3	*	22.2	14.0	13.0
	Q (m <sup>3</sup> /s)	1,293	1,810	651	400	355
S25	TSS (mg/L)	*	<3.0	<3.0	<3.0	*
	Q (m <sup>3</sup> /s)	0.085	0.095	0.038	0.042	0.061
S31	TSS (mg/L)	19.3	6.1	*	6.0	6.0
	Q (m <sup>3</sup> /s)	1.571	2.610	0.547	0.276	0.416
S32	TSS (mg/L)	59.6	55.1	*	4.0	10.0
	Q (m <sup>3</sup> /s)	1.944	2.390	0.363	0.304	0.699
S33	TSS (mg/L)	*	*	<3.0	10.0	6.0
	Q (m <sup>3</sup> /s)	5.466	18.137**	1.227	0.638	1.270
S34	TSS (mg/L)	70.5	44.1	*	7.0	11.0
	Q (m <sup>3</sup> /s)	2.720	0.944	0.157	0.171	0.194

\* Not measured due to logistical constraints.

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

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

Station		May 1 to 23	June 2 to July 2	Aug 7 to 21	Sept 9 to 23	Oct 16 to Nov 2
S36	TSS (mg/L)	46.9	<3.0	<3.0	3.0	9.0
	Q (m <sup>3</sup> /s)	2.449	0.951	0.583	0.624	0.546
S37	TSS (mg/L)	*	<3.0	<3.0	5.0	*
	Q (m <sup>3</sup> /s)	0.510	0.903	0.047	0.012	0.219
S40	TSS (mg/L)	121	46.8	<3.0	4.0	6.0
	Q (m <sup>3</sup> /s)	38.434	57.914**	8.557	2.788	6.080
S43	TSS (mg/L)	7.9	13.0	<3.0	3.0	5.0
	Q (m <sup>3</sup> /s)	28.543**	32.500	5.760	5.770	11.300
S44	TSS (mg/L)	*	36.3	*	8.0	*
	Q (m <sup>3</sup> /s)	0.474	1.170	0.151	0.136	0.189
S45	TSS (mg/L)	171	145	*	4.0	4.0
	Q (m <sup>3</sup> /s)	25.327	30.300	5.710	2.820	2.750
S46	TSS (mg/L)	141	*	10.1	11.0	20.0
	Q (m <sup>3</sup> /s)	1,191	2,130	721	436	541
S47A	TSS (mg/L)	194	126	78.8	9.0	16.0
	Q (m <sup>3</sup> /s)	114.336	255.000	43.841	20.800	33.800
S48	TSS (mg/L)	*	*	10.0	6.0	*
	Q (m <sup>3</sup> /s)	*	0.793	0.325	0.281	0.443
S49	TSS (mg/L)	*	*	351	47.0	*
	Q (m <sup>3</sup> /s)	1.510	0.989	0.761	0.490	0.446
S50A	TSS (mg/L)	*	3.6	13.5	5.0	*
	Q (m <sup>3</sup> /s)	0.893	0.825	0.311	0.263	0.311
S51	TSS (mg/L)	129	93.0	33.4	8.0	12.0
	Q (m <sup>3</sup> /s)	14.180	7.410	3.470	3.830	5.210
S53	TSS (mg/L)	20.4	29.5	3.3	5.0	5.0
	Q (m <sup>3</sup> /s)	3.190	6.570	0.986	1.080	2.112
S54	TSS (mg/L)	28.2	12.3	<3.0	6.0	7.0
	Q (m <sup>3</sup> /s)	13.989	10.900	4.080	1.310	2.510
S55	TSS (mg/L)	128	*	17.9	10.0	8.0
	Q (m <sup>3</sup> /s)	9.206	8.230	3.177	0.773	3.551
S56	TSS (mg/L)	<3.0	<3.0	<3.0	*	<3.0
	Q (m <sup>3</sup> /s)	13.525	21.100	3.354	1.33	1.610
S57	TSS (mg/L)	*	13.7	<3.0	6.0	3.0
	Q (m <sup>3</sup> /s)	4.029	5.120	0.592	0.175	0.550
S58	TSS (mg/L)	23.3	<3.0	<3.0	<3.0	41.0
	Q (m <sup>3</sup> /s)	1.197	3.950	0.064	0.090	0.102
S60	TSS (mg/L)	*	22.0	<3.0	4.0	6.0
	Q (m <sup>3</sup> /s)	1.193	2.290	0.095	0.034	0.106
S61	TSS (mg/L)	19.0	9.1	10.7	22.0	5.0
	Q (m <sup>3</sup> /s)	16.201	20.600	3.620	1.585	3.551
S62	TSS (mg/L)	*	*	3.6	6.0	20.0
	Q (m <sup>3</sup> /s)	2.069	2.140	0.450	0.290	0.427
S63	TSS (mg/L)	*	5.3	<3.0	3.0	6.0
	Q (m <sup>3</sup> /s)	1.304	1.720	0.239	0.082	0.207
S64	TSS (mg/L)	11.0	<3.0	<3.0	<3.0	4.0
	Q (m <sup>3</sup> /s)	1.312	6.040	0.254	0.573	0.111
S65	TSS (mg/L)	*	269	35.7	23.0	18.0
	Q (m <sup>3</sup> /s)	0.419	0.565	0.052	0.025	0.044
S66	TSS (mg/L)	12.7	27.5	<3.0	<3.0	3.0
	Q (m <sup>3</sup> /s)	13.100	17.000	2.330	1.360	3.320

\* Not measured.

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



## C.3.2 Water Data from Industry

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

**Table C.3-4 Summary of water withdrawals and discharges for active (operating or under construction) oil sands projects, used in water balance analysis for the 2014 Water Year.**

Operator	Watershed	Activity	Annual Volume (Million m <sup>3</sup> )	Location	Timestep
Brion Energy Corp.	MacKay	Water withdrawals	0.072	Various	Monthly
Canadian Natural Resources Ltd.	Christina	Water withdrawals	0.021	Various	Daily
	Athabasca	Withdrawals from Athabasca River	20.39	459004 E 6353835 N	Daily
Imperial Oil Resources	Wapasu	Water withdrawals	0.003	490605 E 6355768 N	Daily
	Athabasca	Water withdrawals from Athabasca River	6.06	469833 E 63800519 N	Daily
MEG Energy Corp.	Christina	Water withdrawals	0.128	Various	Daily
Nexen	Christina	Water withdrawals	0.127	Various	Daily
	Hangingstone	Water withdrawals	0.009	Various	Daily
Shell Canada Energy	Athabasca	Withdrawals from Athabasca River	16.33	461422 E 6346082 N	Daily
	Muskeg	Jackpine Creek	0.385	469400 E 6357100 N	Daily
Statoil Canada Ltd.	Christina	Water withdrawals	0.022	Various	Daily
Suncor Energy Inc.	Muskeg	Water withdrawals	0.004	498344 E 6341477 N	Daily
	Steepbank	Water withdrawals	0.015	Various	Daily
	Firebag	Water withdrawals	0.013		Daily
	Athabasca	Withdrawals from Athabasca River	19.56	471864 E 6317853 N	Daily
		Releases to the Athabasca River	1.49	471771 E 6317958 N	Daily
	MacKay	Water withdrawals	0.007	Various	Daily
	Upper Beaver	Water withdrawals	0.008	Various	Daily
Syncrude Canada Ltd.	Athabasca	Treated Sewage Releases to Athabasca River	0.290	6321495 E 469241 N	Daily
		Water withdrawals from Athabasca River	38.35	469584 E 6320596 N	Daily
	Muskeg	Aurora Clean Water Diversion to Stanley Creek	6.42	472955 E 6355575 N	Daily
	Poplar Creek	Diversion from Beaver Creek into Poplar Creek	7.94	470853 E 6307683 N	Daily
	Upper Beaver	Water withdrawals	6.56	6315950 E 462240 N	Daily

Note: The above data were used in the water balance calculations described in Section 5. Further information was received from industry but not included in the water balance calculations, including: (i) data classified as muskeg dewatering, groundwater extraction, or other processes not affecting natural surface watercourses and waterbodies; (ii) operator withdrawal and discharge data located downstream of the corresponding observed *test* monitoring station; and (iii) 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.3.3 Hydrometric Data from Government Agencies

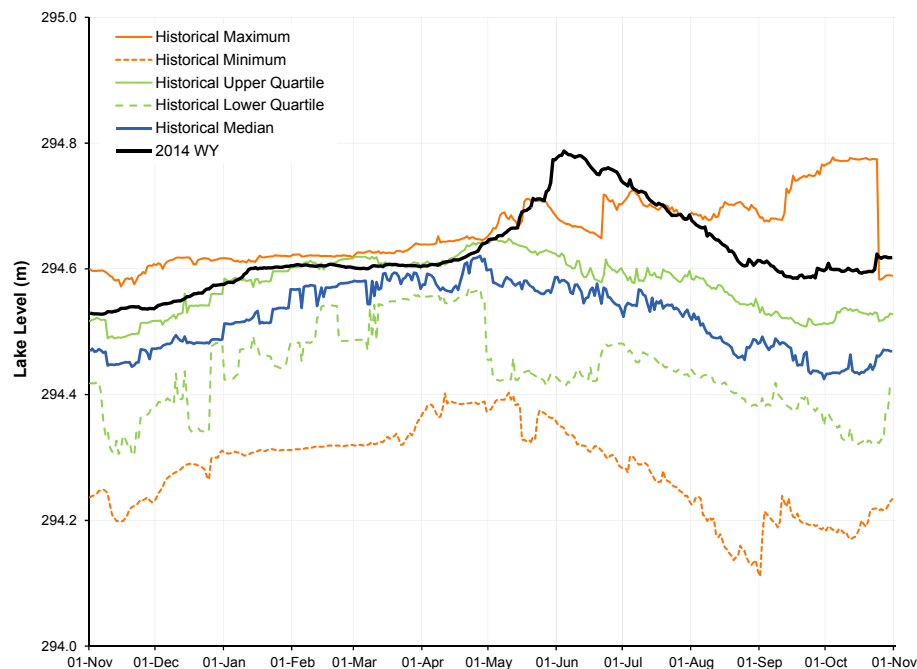
Daily discharge data are published by Environment Canada, including data for Water Survey of Canada (WSC) hydrometric stations that are within the JOSMP study area. Until January 2013, JOSMP/RAMP provided winter monitoring at seven seasonal WSC stations within the JOSMP/RAMP study area to extend the record to cover the full year. For stations where JOSMP/RAMP monitored to supplement the WSC data record, the annual record, including both RAMP/JOSMP and WSC data, has been incorporated into the database that is available on the RAMP website. Beginning on January 1, 2013, WSC took over full operation of these seven stations and JOSMP presents the provisional WSC data used in 2014 report on the RAMP website for completeness. Data flagging protocols are used in the database to identify data sources. An inventory of the data obtained for the stations is provided in Section C.5.

### C.3.4 2014 WY Hydrographs with Historical Context

Hydrographs of discharge and water level for the 2014 WY measured at lotic and lentic JOSMP stations, respectively are presented in Figure C.3-1 to

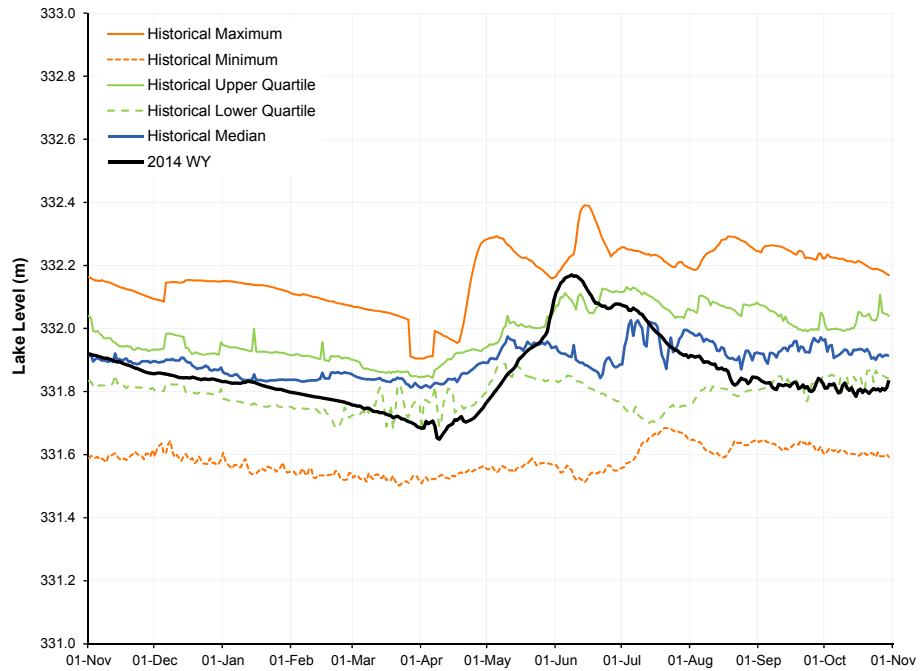
Figure C.3-49. Historical maximum, minimum, and median daily values are also provided to assist with interpretation. Stations L4, S50A, S51, S55, S57, S58, S60, S61, S62, S63, S64, S65, and S66 do not contain more than three years of historical data, and are shown as individual years for these stations. In all cases, the current year was excluded from the calculation of the historical context, so that the current year was compared to the previous years.

**Figure C.3-1 Water level of McClelland Lake (Station L1) during the 2014 WY, compared to historical values.**



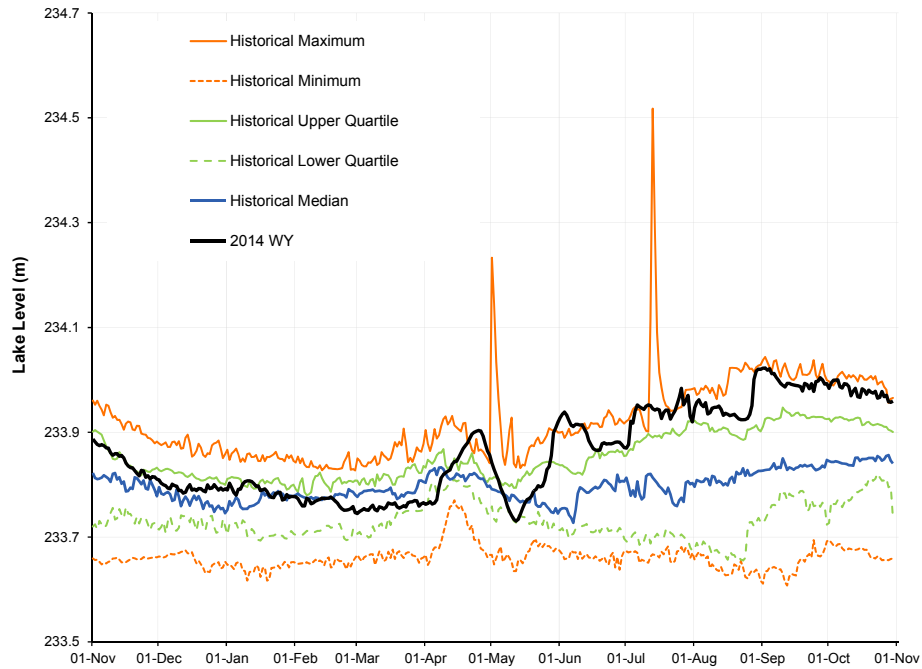
Note: Historical statistics were based on 11 years of data from 2003 to 2013.

**Figure C.3-2 Water level of Kearl Lake (Station L2) during the 2014 WY compared, to historical values.**



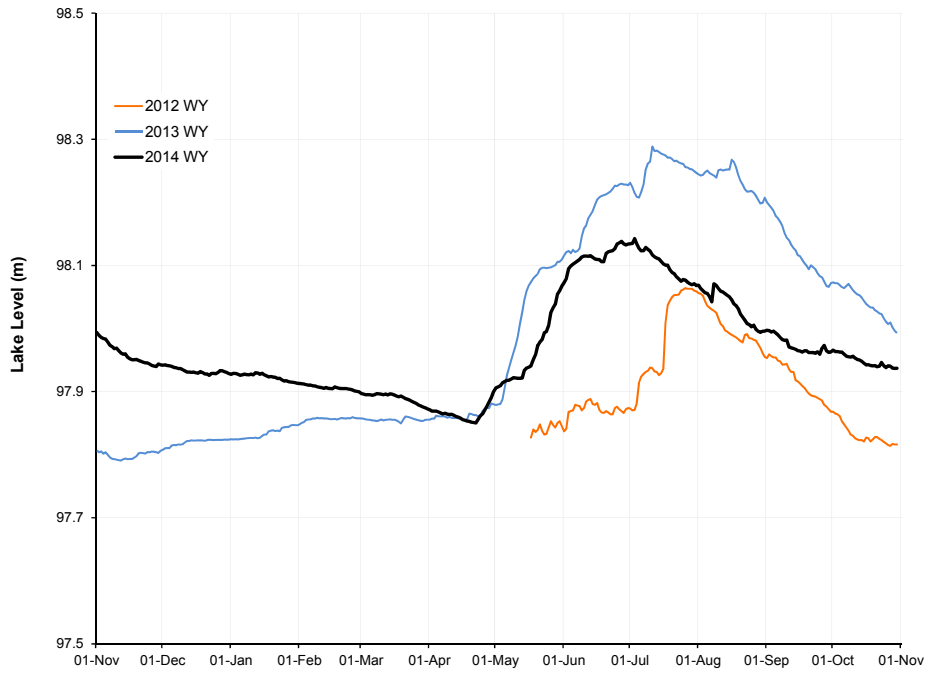
Note: Historical statistics were based on 15 years of data from 1999 to 2013.

**Figure C.3-3 Water level of Isadore’s lake (Station L3) during the 2014 WY, compared to historical values.**

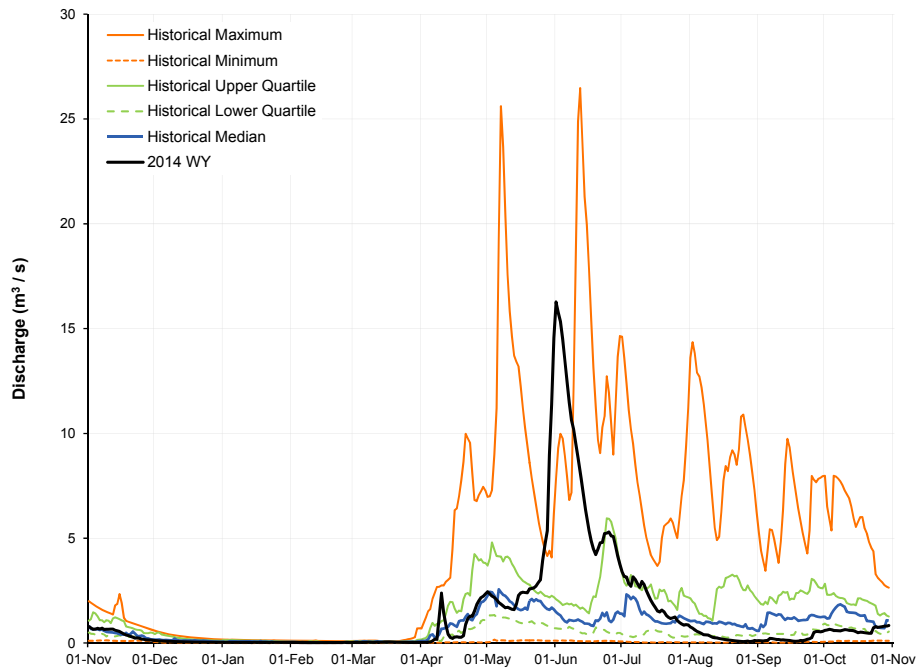


Note: Historical statistics were based on 14 years of data from 2000 to 2013.

**Figure C.3-4 Water level of Namur Lake near the outlet (Station L4) for the 2012 to 2014 WY.**

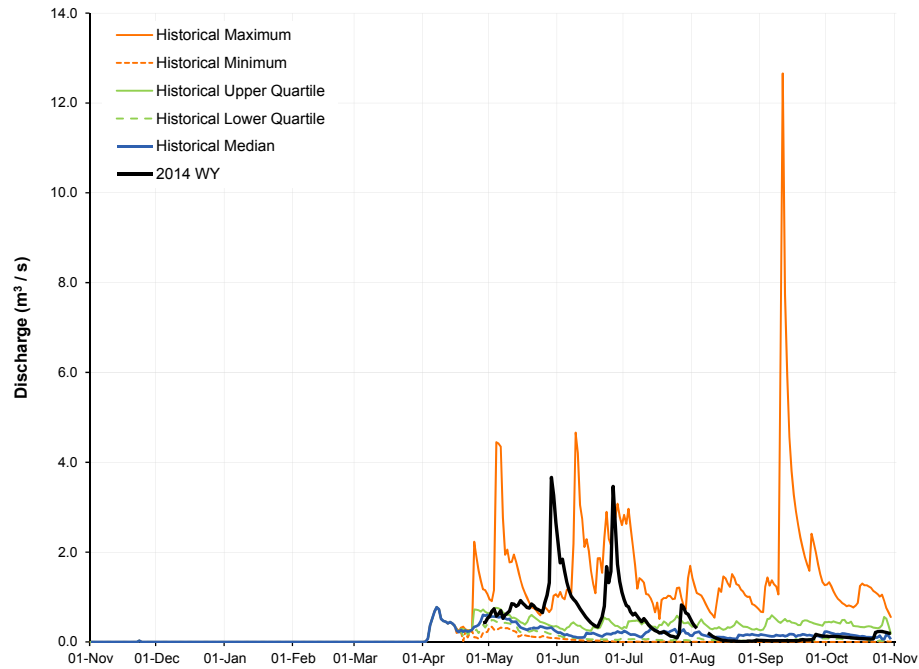


**Figure C.3-5 Discharge of Jackpine Creek at the Canterra Road (Station S2) during the 2014 WY, compared to historical values.**



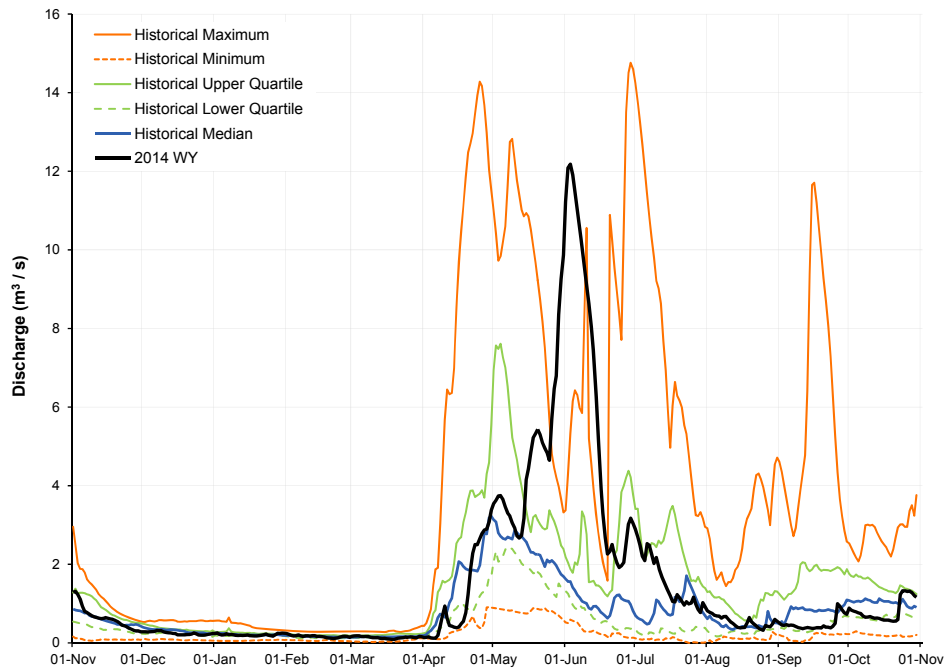
Note: Historical statistics were based on 19 years of data from 1995 to 2013.

**Figure C.3-6 Discharge of Iyininim Creek, located above Kears Lake (Station S3) during the 2014 WY, compared to historical values.**



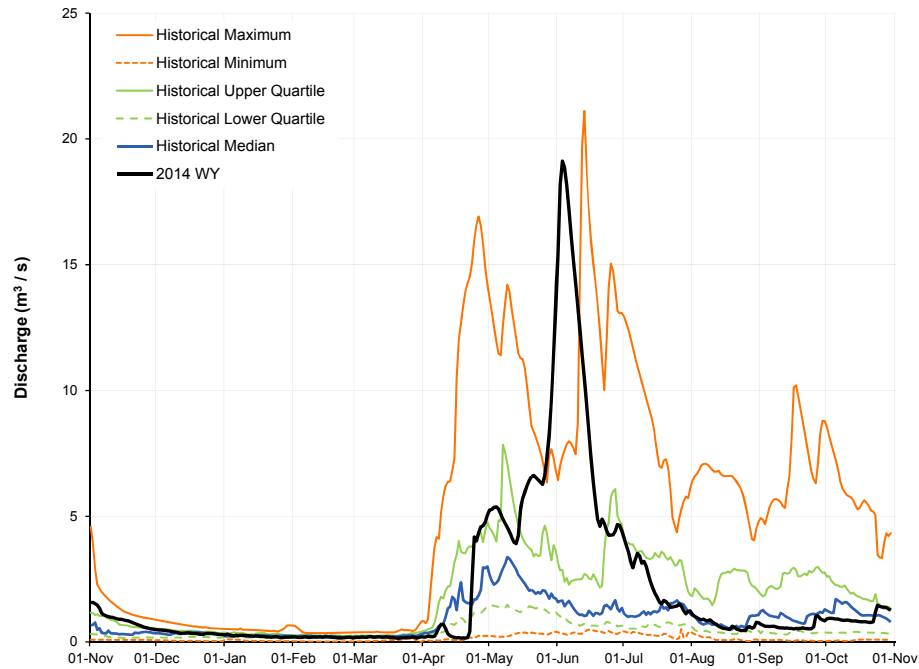
Note: Historical statistics were based on 16 years of data from 1996 to 1999 and 2001 to 2013.

**Figure C.3-7 Discharge of Muskeg River, located above Stanley Creek (Station S5) for the 2014 WY, compared to historical values.**



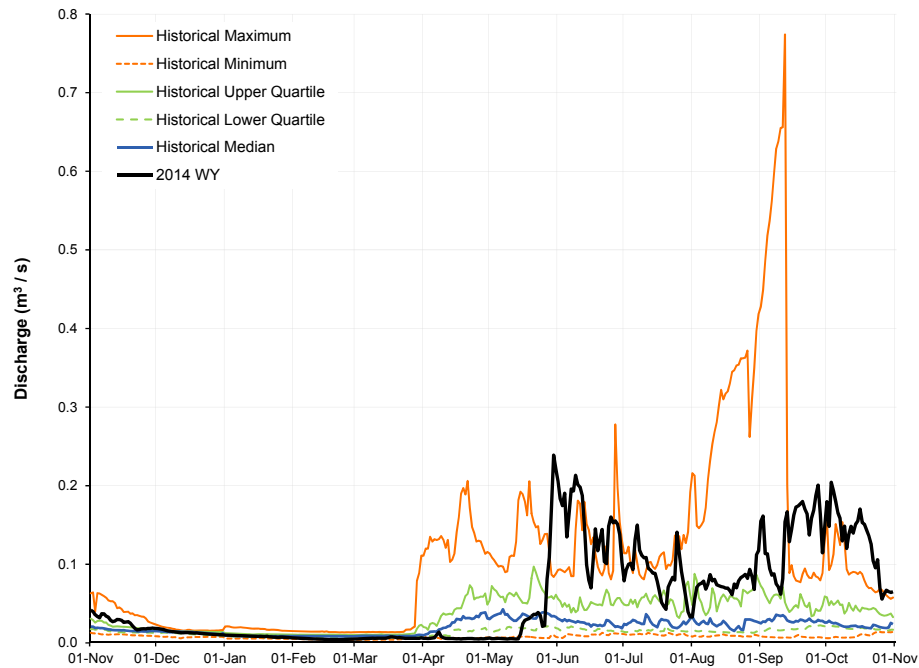
Note: Historical statistics were based on 11 years of data from 2003 to 2013.

**Figure C.3-8 Discharge of Muskeg River, located above Muskeg Creek (Station S5A) for the 2014 WY, compared to historical values.**



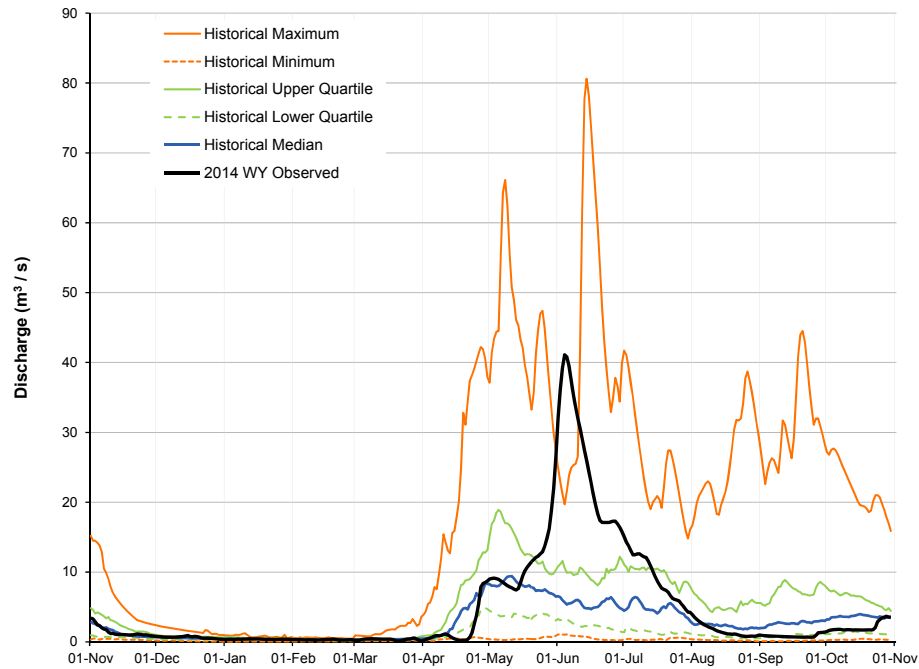
Note: Historical statistics were based on 19 years of data from 1995 to 2013.

**Figure C.3-9 Discharge of Mills Creek at Highway 63 (Station S6) for the 2014 WY, compared to historical values.**



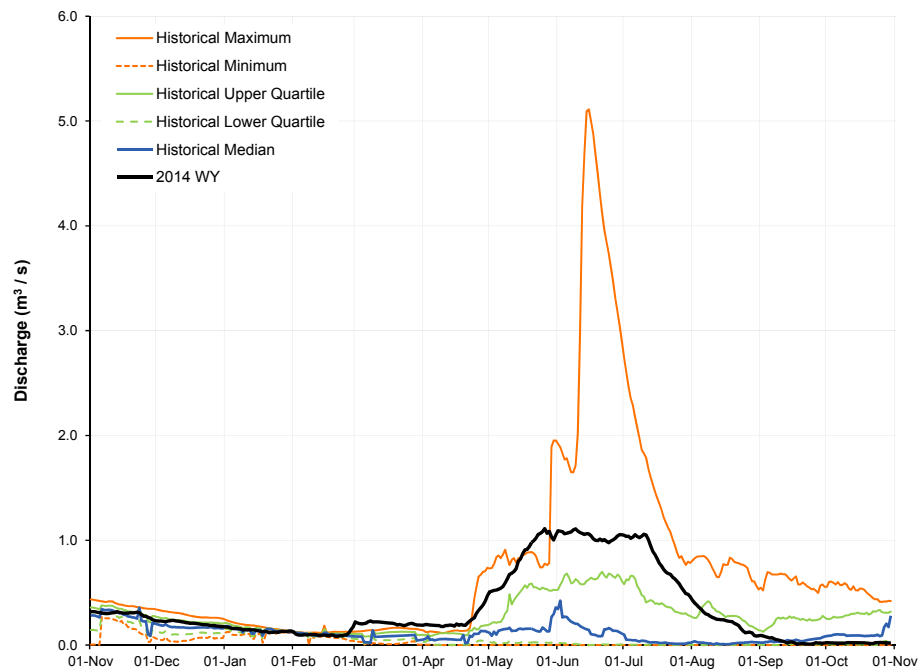
Note: Historical statistics were based on 17 years of data from 1997 to 2013.

**Figure C.3-10 Discharge of Muskeg River near Fort McKay (Station S7) for the 2014 WY, compared to historical values.**



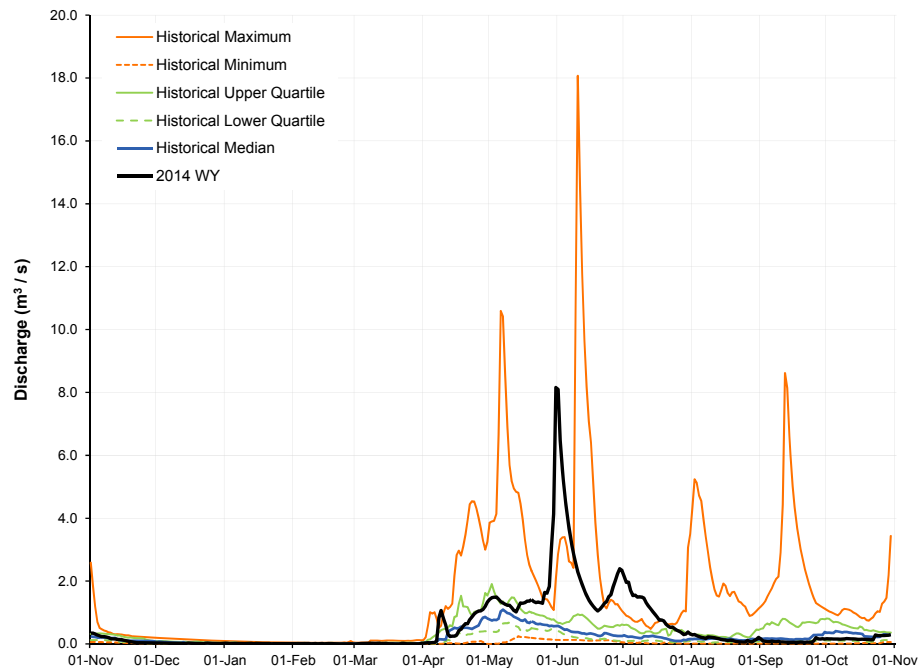
Note: Historical statistics were based on 40 years of data from 1974 to 2013 and provisional WSC data from station 07DA008 from November 1, 2013 to October 31, 2014

**Figure C.3-11 Discharge of the Kearl Lake Outlet (Station S9) for the 2014 WY, compared to historical values.**



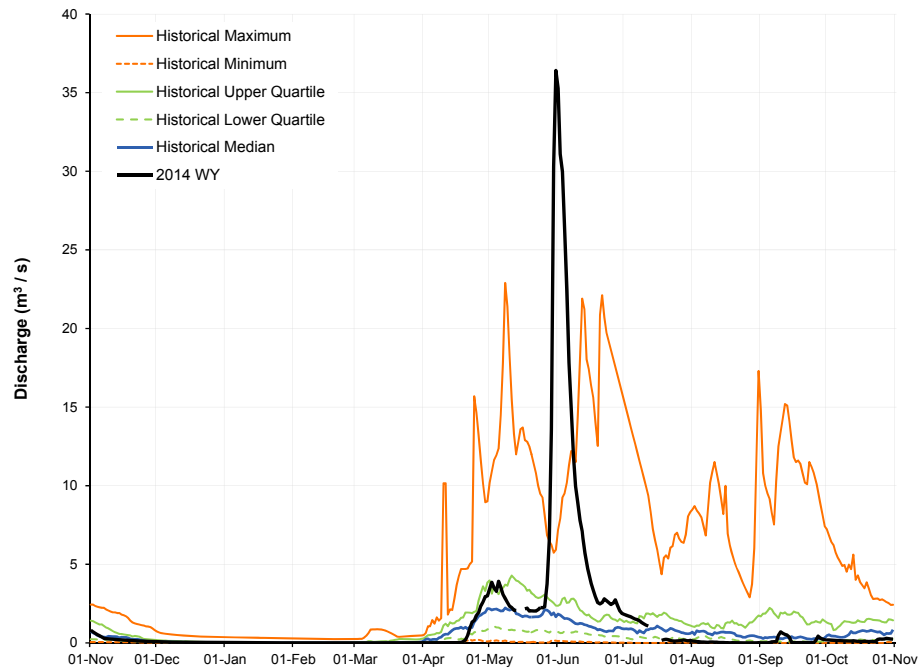
Note: Historical statistics were based on 15 years of data from 1998 to 1999 and 2001 to 2013.

**Figure C.3-12 Discharge of Wapasu Creek near the mouth at Canterra Road (Station S10A) for the 2014 WY, compared to historical values.**



Note: Historical statistics were based on 14 years of data from 1999 and 2001 to 2013.

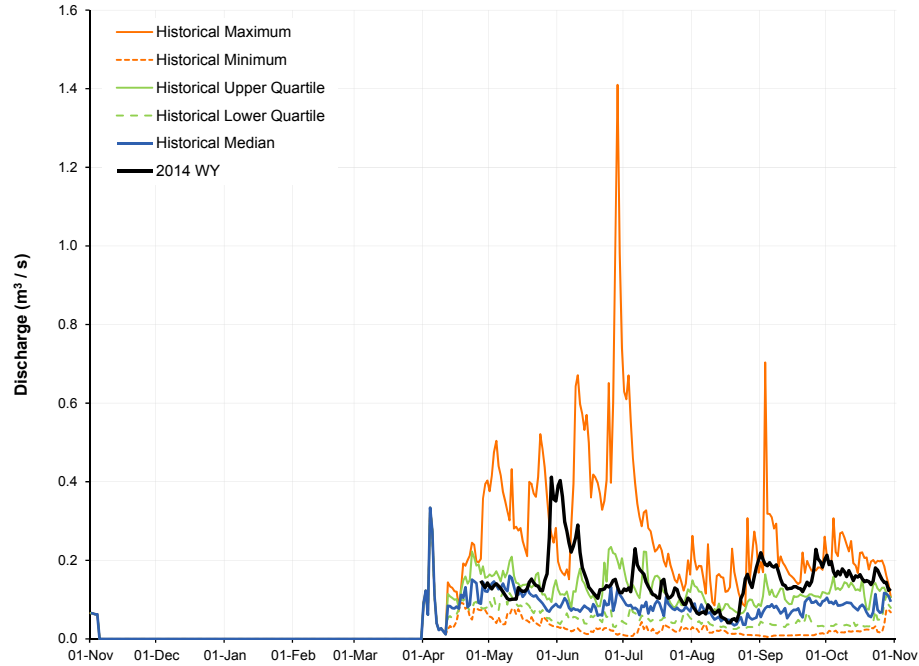
**Figure C.3-13 Discharge of Poplar Creek at Highway 63 (Station S11) for the 2014 WY, compared to historical values.**



Note: Historical statistics were based on 32 years of data from 1973 to 1986 (WSC 07DA007) and 1996 to 2013 (RAMP/JOSMP S11).

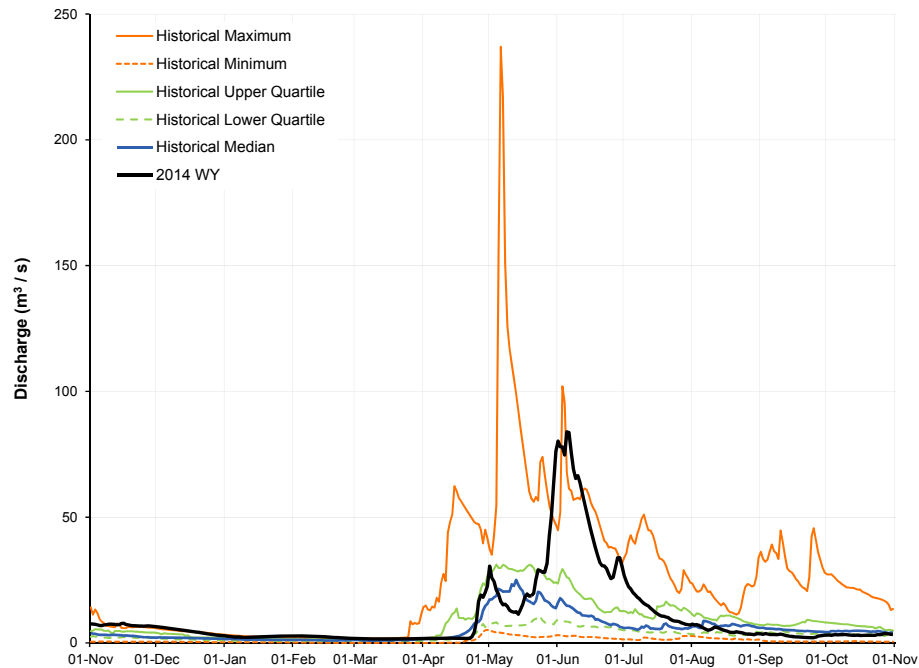


**Figure C.3-14 Discharge of Fort Creek at Highway 63 (Station S12) for the 2014 WY, compared to historical values.**



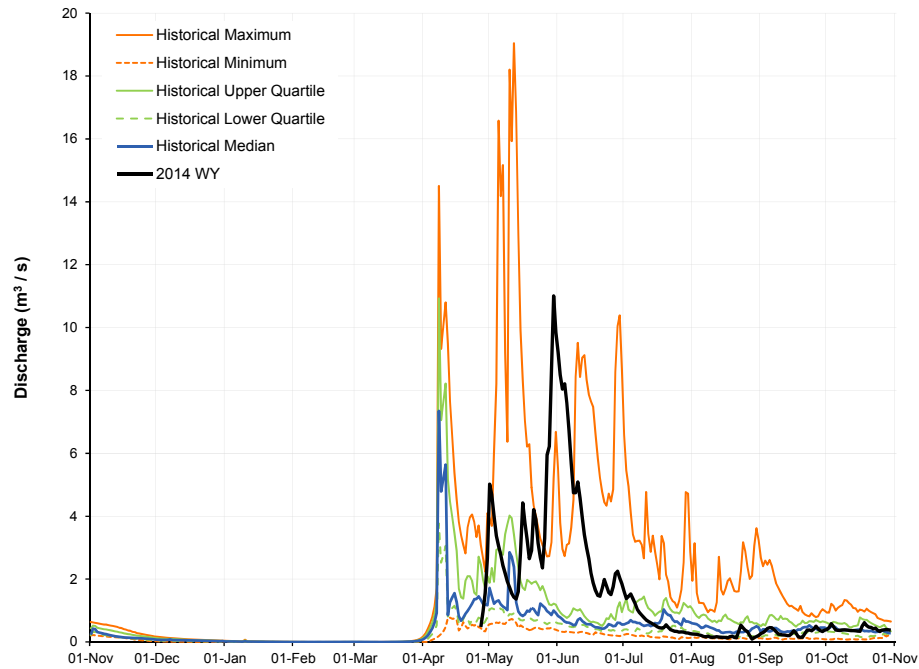
Note: Historical statistics were based on 11 years of data from 2000 to 2002 and 2006 to 2013.

**Figure C.3-15 Discharge of Ells River at the Canadian Natural Bridge (Station S14A) for the 2014 WY, compared to historical values.**



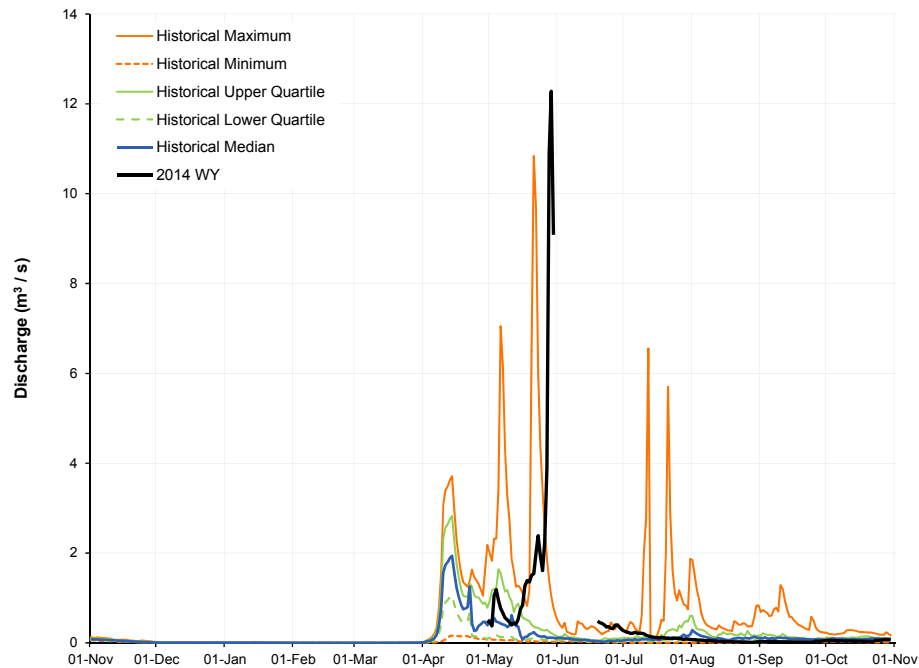
Note: Historical statistics were based on 22 years of data from 1975 to 1986 (WSC 07DA017) and 2004 to 2013 (RAMP/JOSMP S14/14A).

**Figure C.3-16 Discharge of Tar River near the mouth (Station S15A) for the 2014 WY, compared to historical values.**



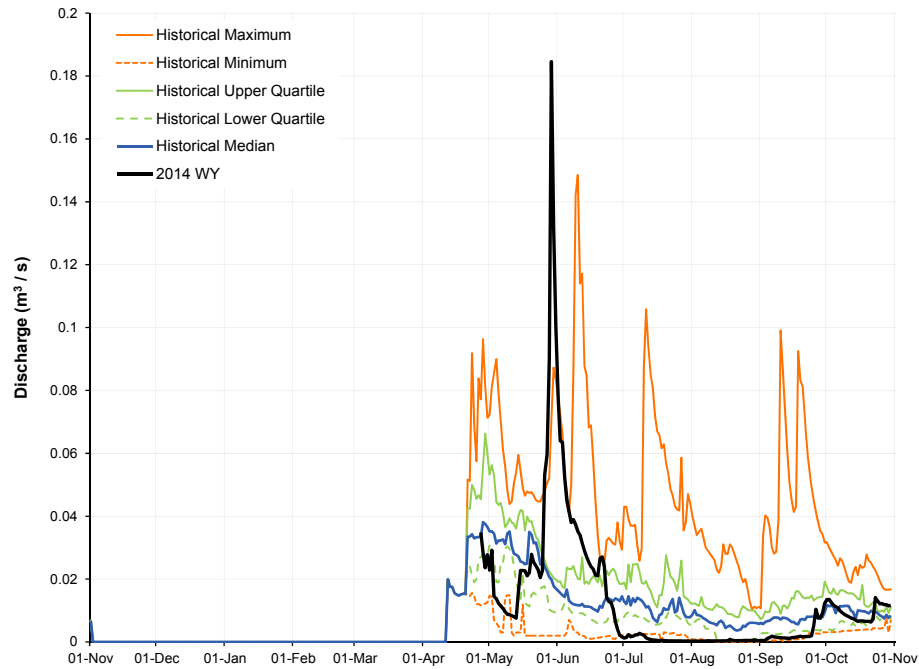
Note: Historical statistics were based on 15 years of data from 1975 to 1977 (WSC 07DA015) and 2001 to 2013 (RAMP/JOSMP S15/15A).

**Figure C.3-17 Discharge of Calumet River near the mouth (Station S16A) for the 2014 WY, compared to historical values.**



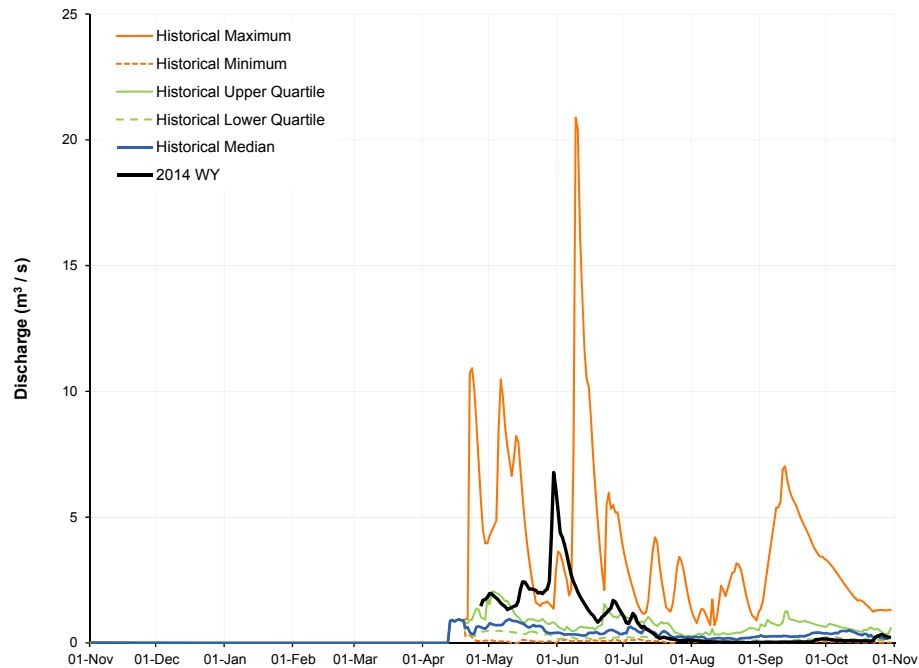
Note: Historical statistics were based on 16 years of data from 1975 to 1977 (WSC 07DA014), 2001 to 2005 (RAMP S16), 2006 to 2009 (Canadian Natural station CR1), and 2010 to 2013 (RAMP/JOSMP S16A).

**Figure C.3-18 Discharge of Tar River Lowland Tributary near the mouth (Station S19) for the 2014 WY, compared to historical values.**



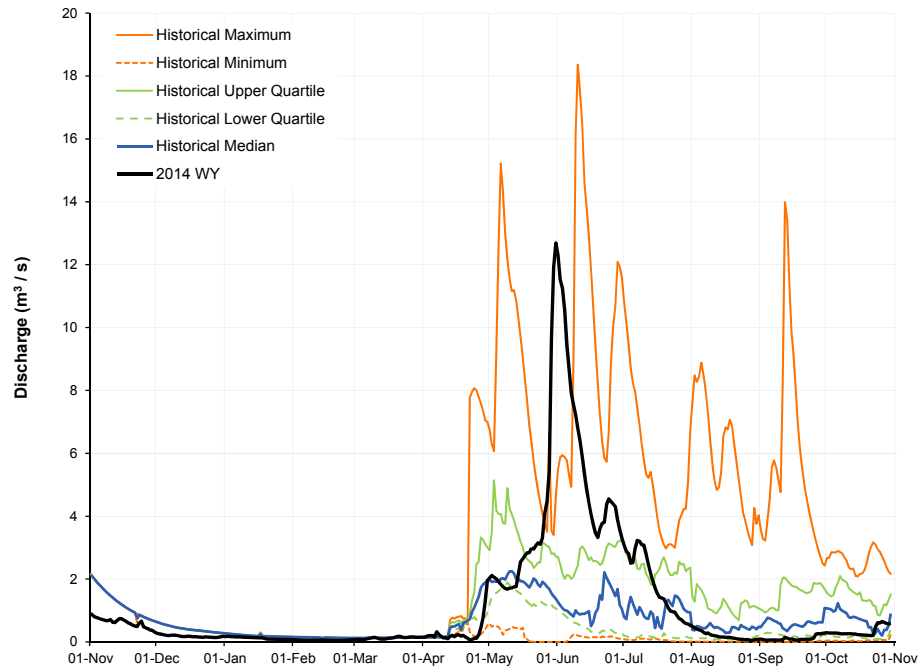
Note: Historical statistics were based on 12 years of data from 2002 to 2013.

**Figure C.3-19 Discharge of Muskeg River Upland (Station S20A) for the 2014 WY, compared to historical values.**



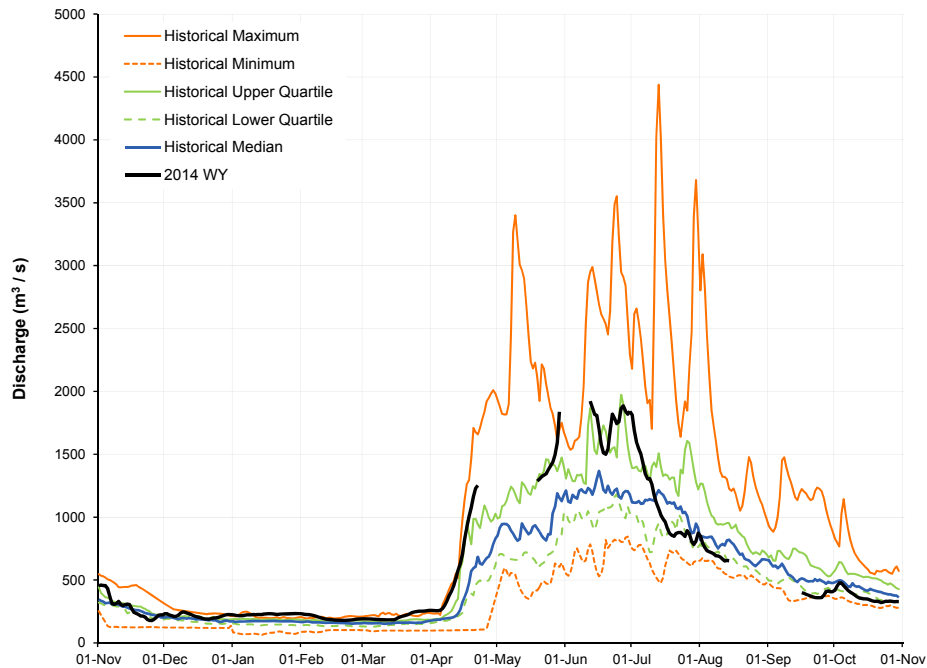
Note: Historical statistics were based on 13 years of data from 2001 to 2013.

**Figure C.3-20 Discharge of Muskeg Creek near the mouth (Station S22) for the 2014 WY, compared to historical values.**



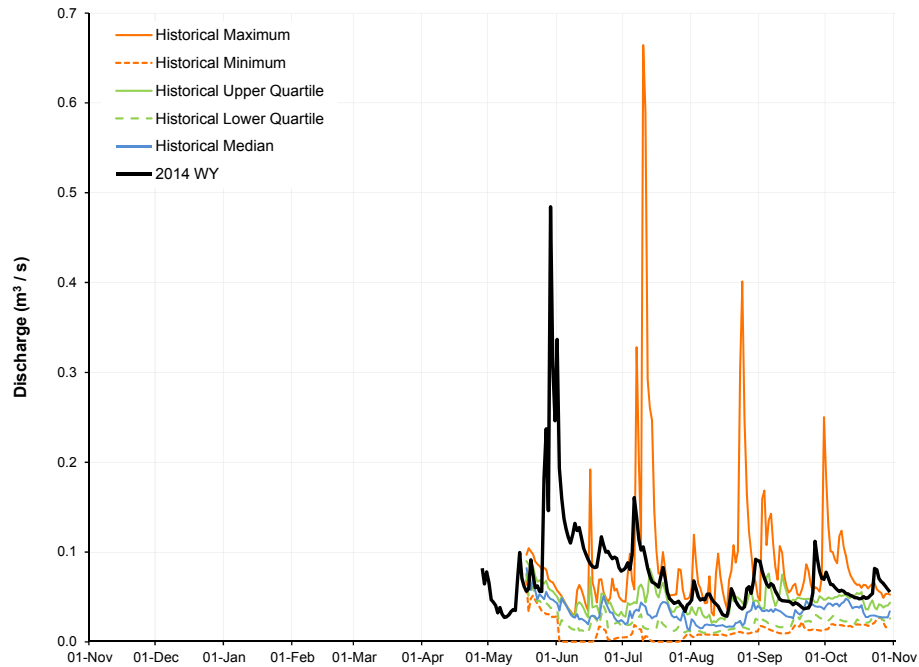
Note: Historical statistics were based on 13 years of data from 2001 to 2013.

**Figure C.3-21 Discharge of Athabasca River below Eymundson Creek (Station S24) for the 2014 WY, compared to historical values.**



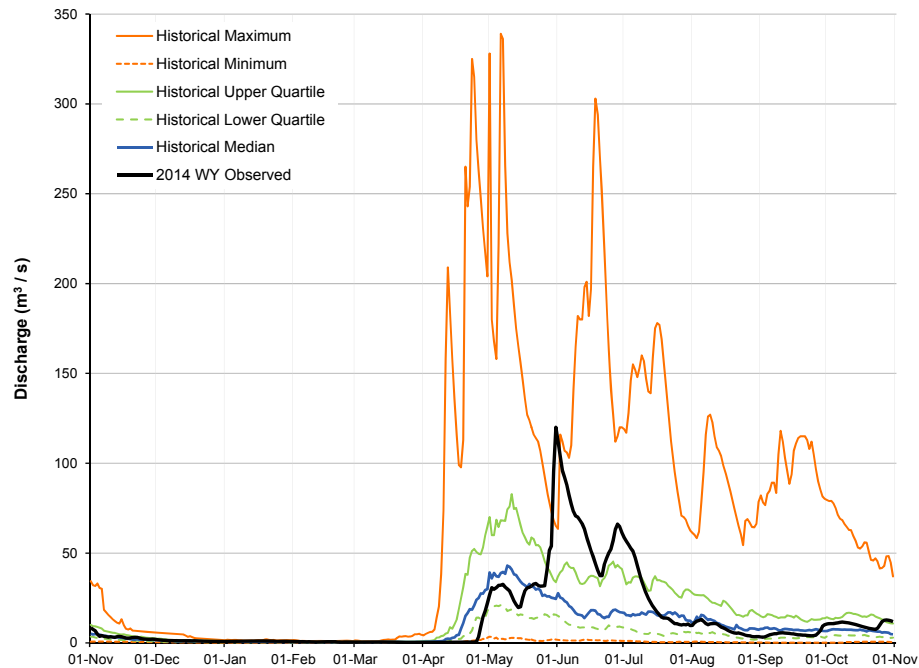
Note: Historical statistics were based on 13 years of data from 2001 to 2013.

**Figure C.3-22 Discharge for the Susan Lake Outlet (Station S25) for the 2014 WY, compared to historical values.**



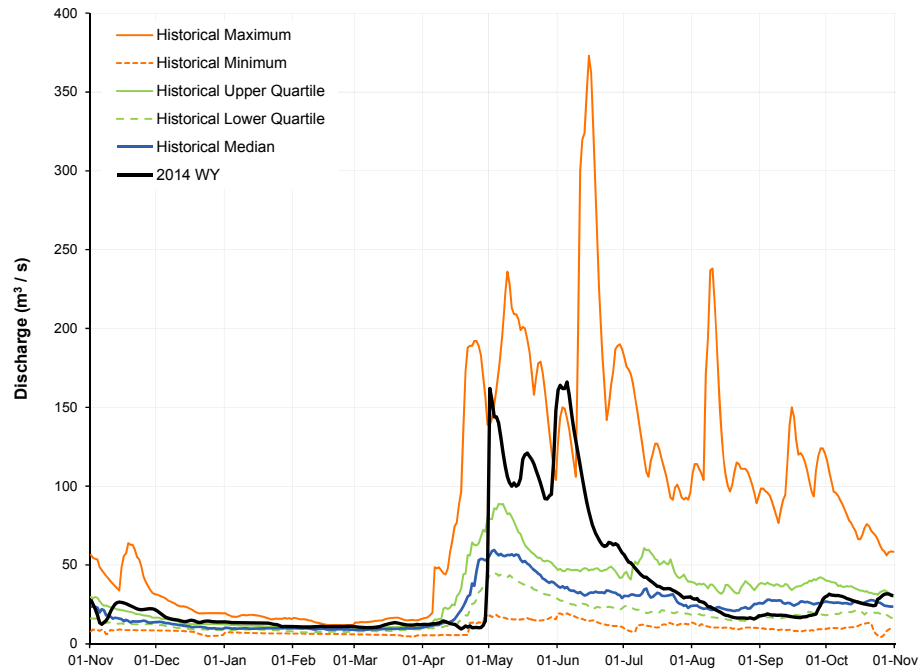
Note: Historical statistics were based on 9 years of data from 2002 and 2006 to 2013.

**Figure C.3-23 Discharge of MacKay River near Fort McKay (Station S26) for the 2014 WY, compared to historical values.**



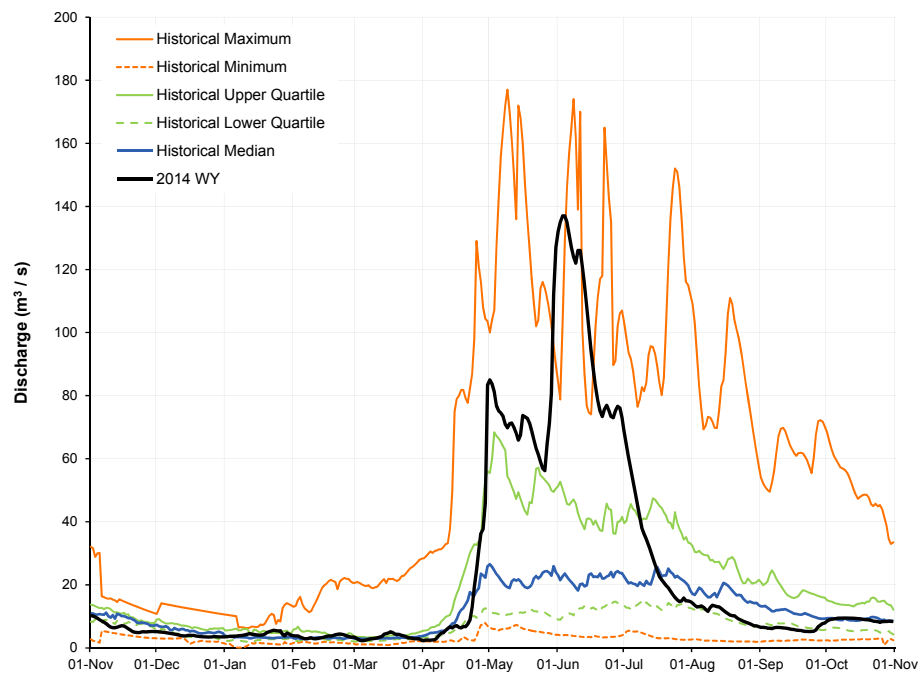
Note: Historical statistics were based on 42 years of data from 1972 to 2013 and provisional WSC data from station 07DB001 from November 1, 2013 to October 31, 2014

**Figure C.3-24 Discharge of Firebag River near the mouth (Station S27) for the 2014 WY, compared to historical values.**



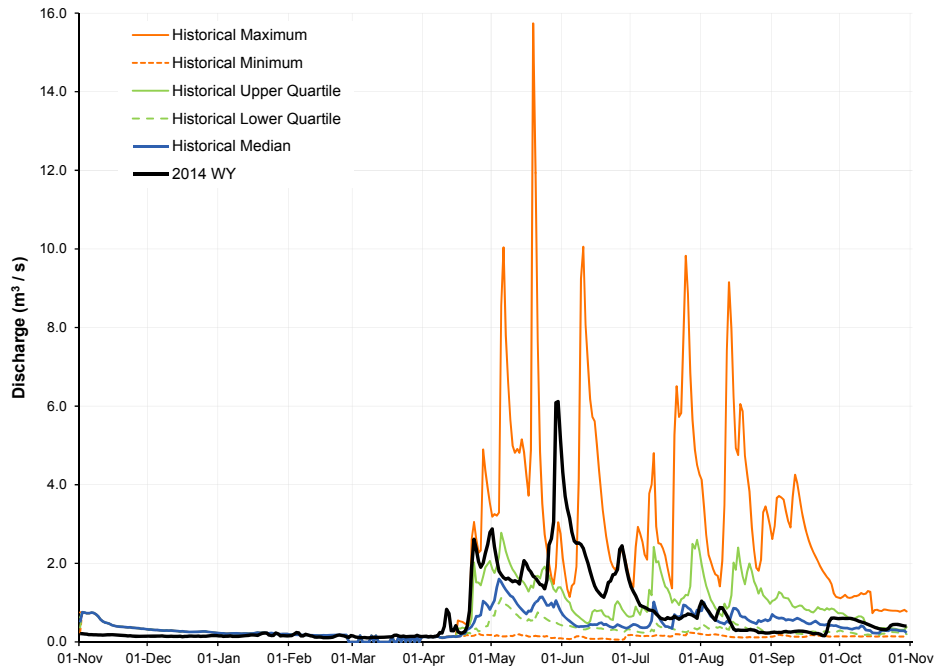
Note: Historical statistics were based on 42 years of data from 1972 to 2013 and provisional WSC data from station 07DB001 from November 1, 2013 to October 31, 2014

**Figure C.3-25 Discharge of Christina River near Chard (Station S29) for the 2014 WY, compared to historical values.**



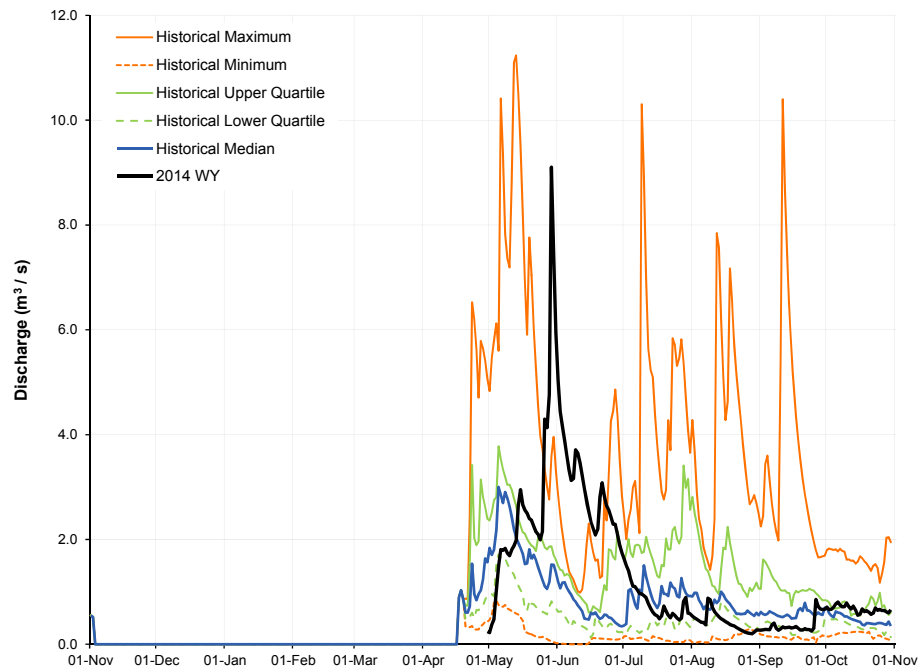
Note: Historical statistics were based on 32 years of data from 1982 to 2013 and provisional WSC data from station 07CE002 from November 1, 2013 to October 31, 2014

**Figure C.3-26 Discharge of Hangingstone Creek at North Star Road (Station S31) for the 2014 WY, compared to historical values.**



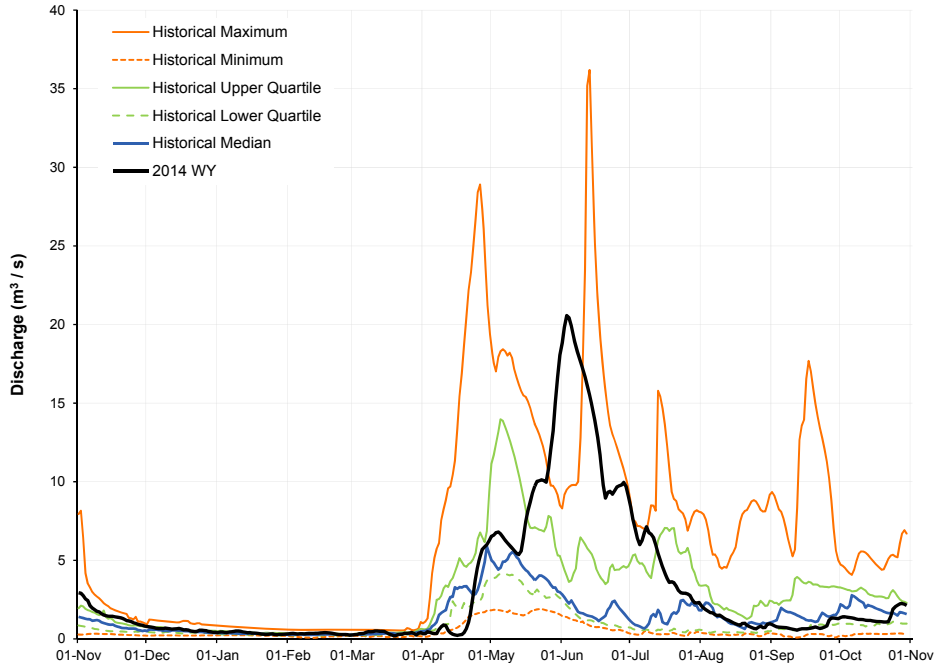
Note: Historical statistics were based on 11 years of data from 2002 and 2004 to 2013.

**Figure C.3-27 Discharge of Surmont Creek at Highway 881 (Station S32) for the 2014 WY, compared to historical values.**



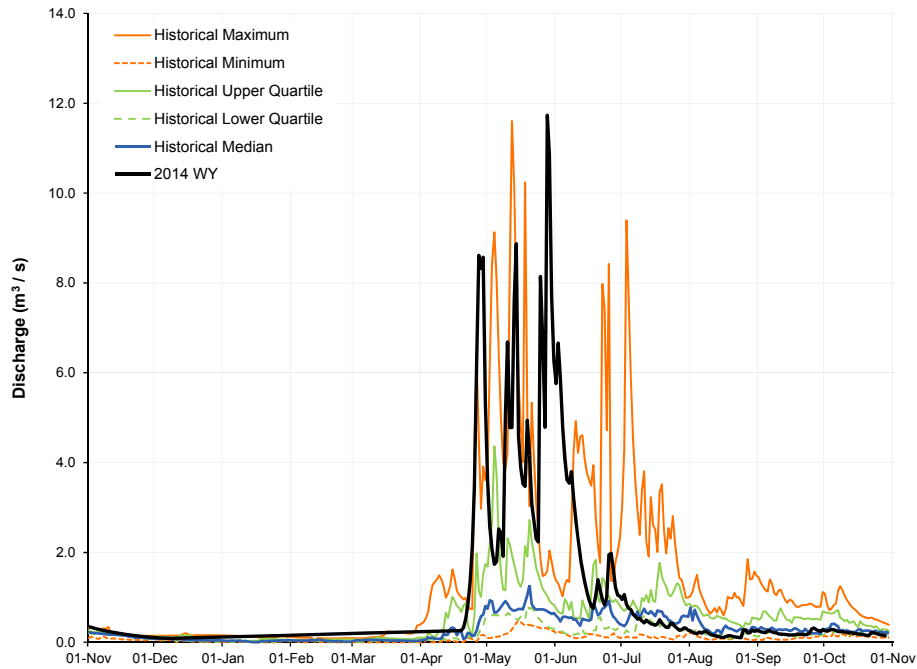
Note: Historical statistics were based on 11 years of data from 2002 and 2004 to 2013.

**Figure C.3-28 Discharge of Muskeg River at the Aurora North/MRM Boundary (Station S33) for the 2014 WY, compared to historical values.**



Note: Historical statistics were based on 11 years of data from 2003 to 2013.

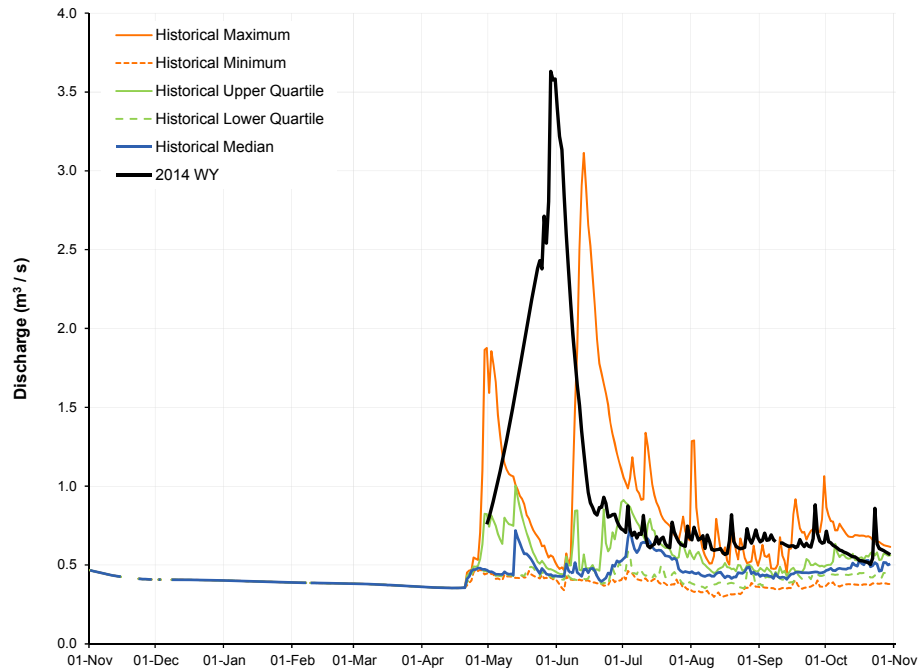
**Figure C.3-29 Discharge of Tar River above Horizon Lake (Station S34) for the 2014 WY, compared to historical values.**



Note: Historical statistics were based on 9 years of data from 2005 to 2013.

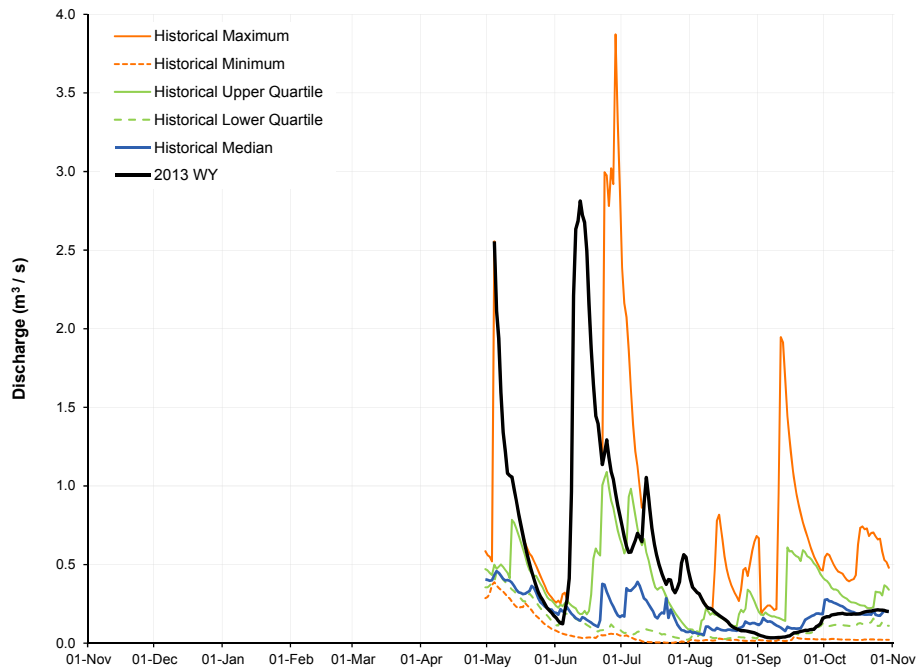


**Figure C.3-30 Discharge of the McClelland Lake Outlet above Firebag River (Station S36) for the 2014 WY, compared to historical values.**



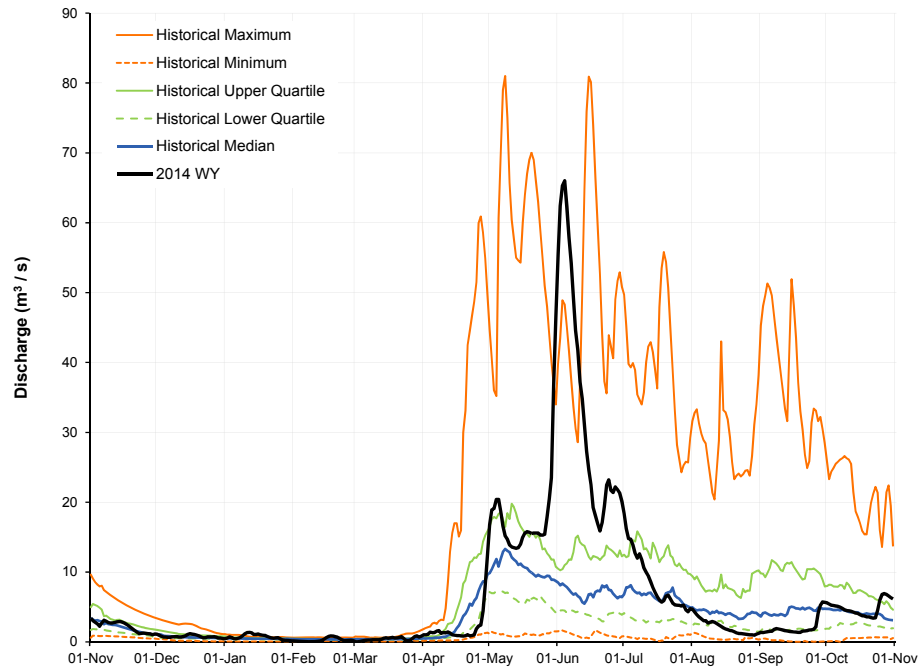
Note: Historical statistics were based on 6 years of data from 2008 to 2013.

**Figure C.3-31 Discharge of East Jackpine Creek near the 1,300 ft. contour (Station S37) for the 2013 WY, compared to historical values.**



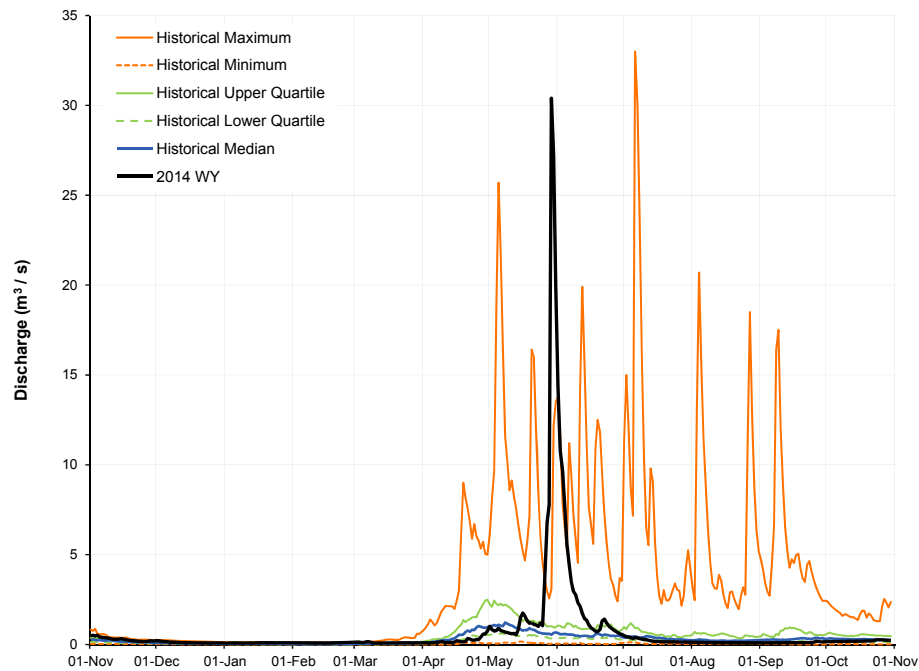
Note: Historical statistics were based on 7 years of data from 2007 to 2013.

**Figure C.3-32 Discharge of Steepbank River near Fort McMurray (Station S38) for the 2014 WY, compared to historical values.**



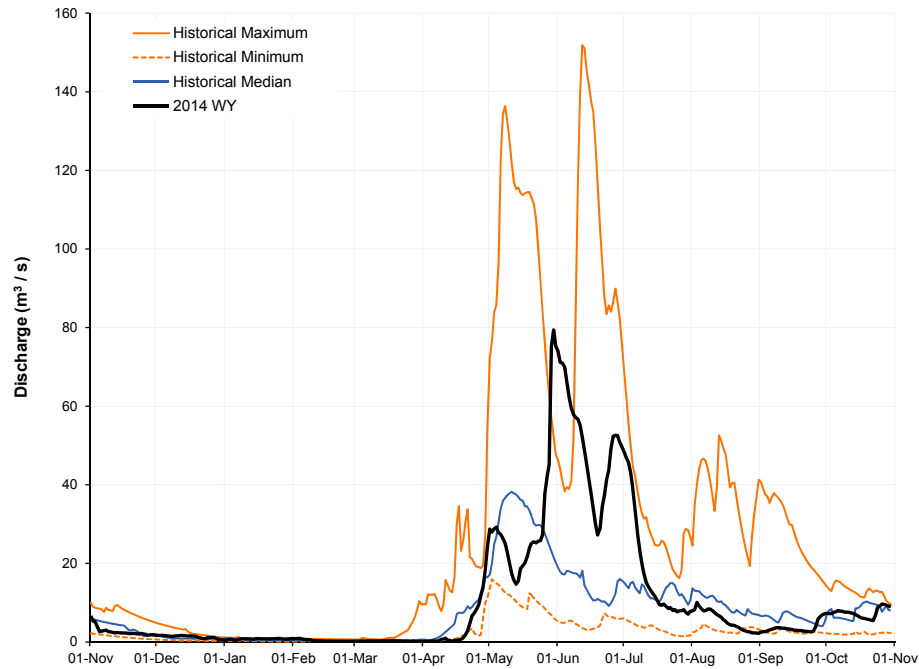
Note: Historical statistics were based on 40 years of data from 1974 to 2013 and provisional WSC data from station 07DA006 from November 1, 2013 to October 31, 2014

**Figure C.3-33 Discharge of Beaver River above Syncrude (Station S39) for the 2014 WY, compared to historical values.**



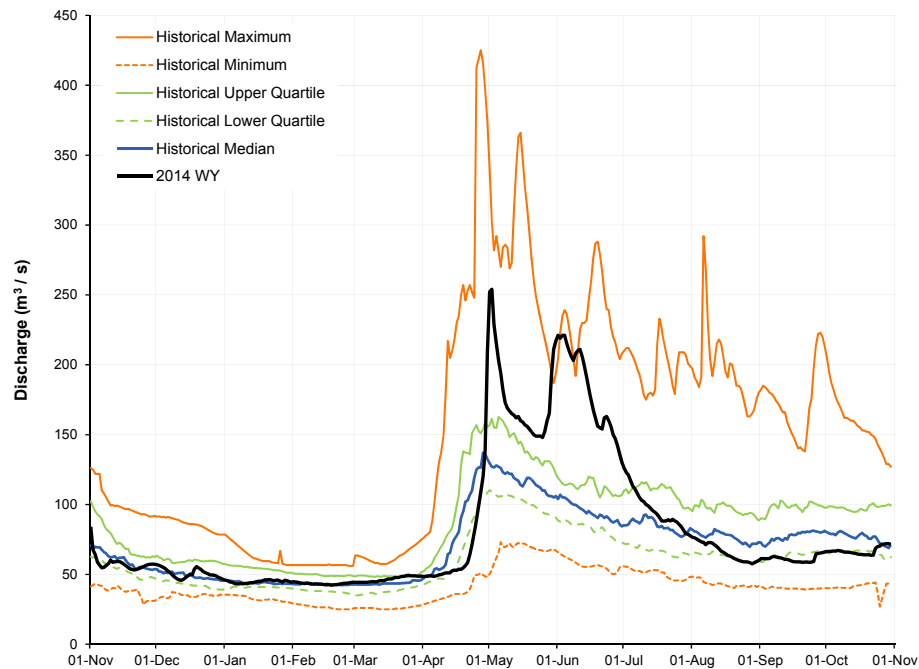
Note: Historical statistics were based on 38 years of data from 1976 to 2013 and provisional WSC data from station 07DA018 from November 1, 2013 to October 31, 2014

**Figure C.3-34 Discharge of Mackay River at the Petro-Canada Bridge (Station S40) for the 2014 WY, compared to historical values.**



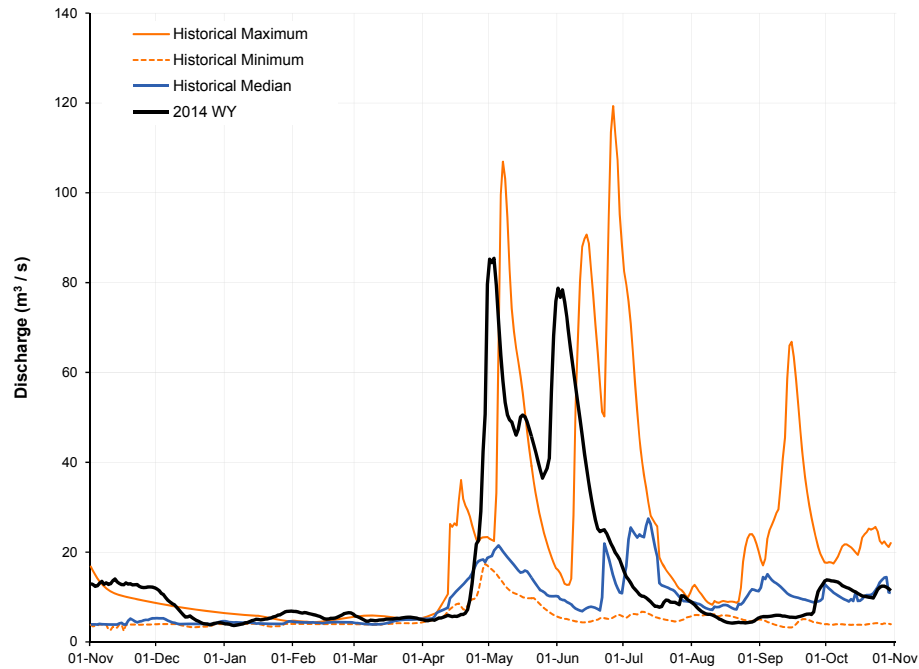
Note: Historical statistics were based on 6 years of data from 2008 to 2013.

**Figure C.3-35 Discharge of Clearwater River located above Christina River (Station S42) for the 2014 WY, compared to historical values.**



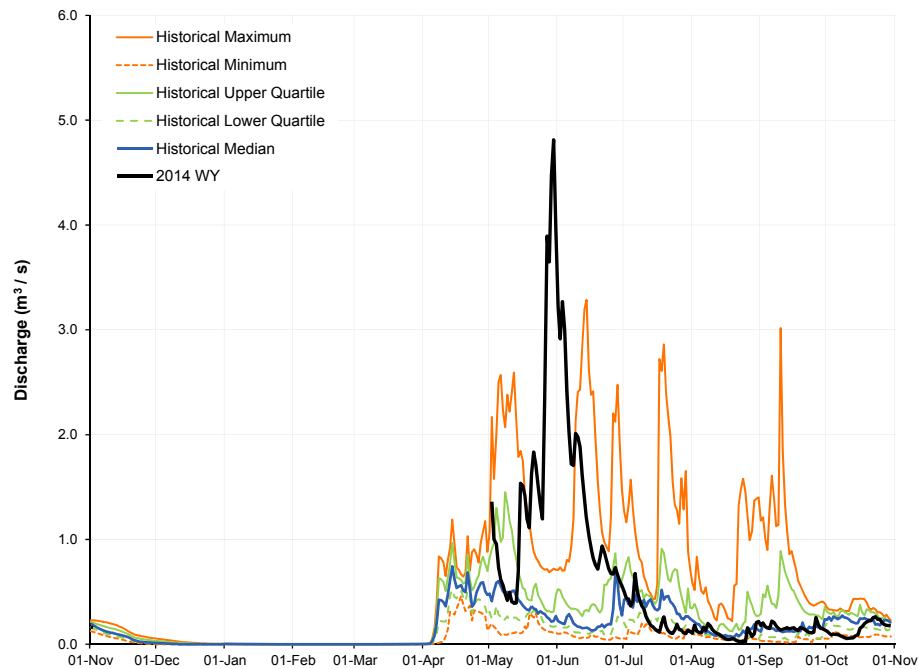
Note: Historical statistics were based on 46 years of data from 1967 to 2006 and 2008 to 2013, and provisional WSC data from station 07CD005 from November 1, 2013 to October 31, 2014

**Figure C.3-36 Discharge of Firebag River above the Suncor Firebag Project (Station S43) for the 2014 WY, compared to historical values.**



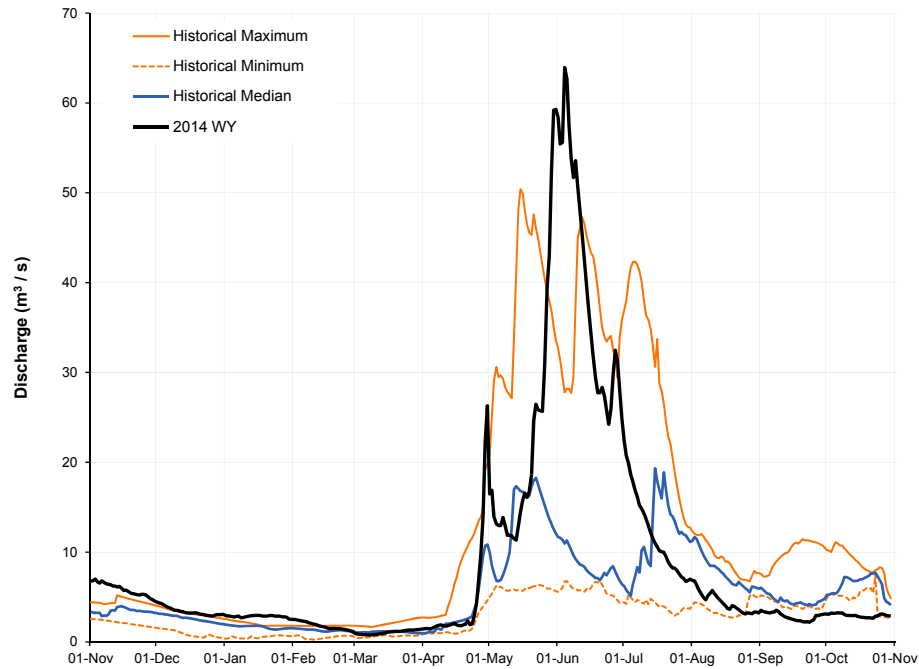
Note: Historical statistics were based on 5 years of data from 2009 to 2013.

**Figure C.3-37 Discharge of Pierre River near Fort McKay (Station S44) for the 2014 WY, compared to historical values.**



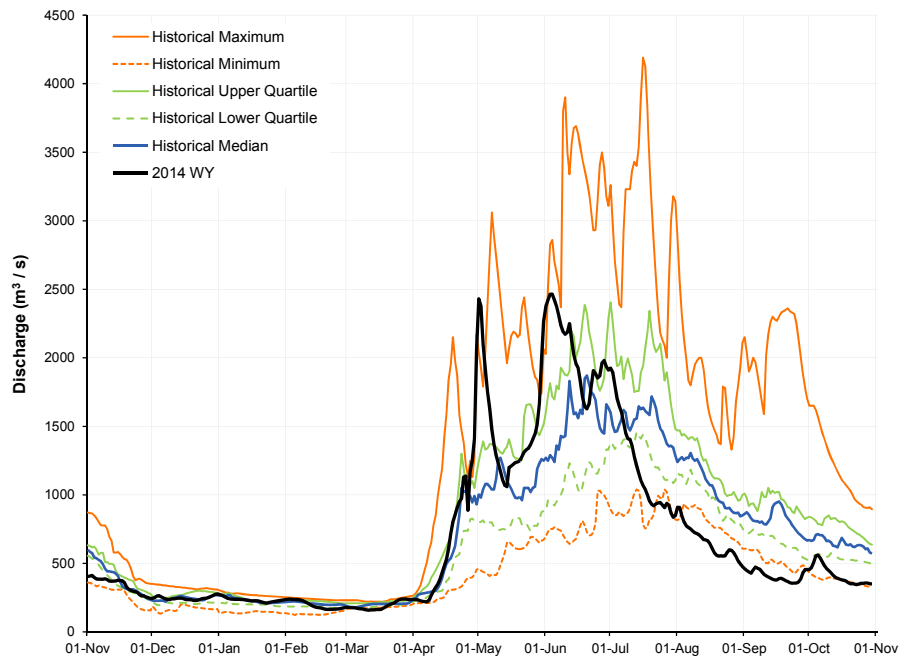
Note: Historical statistics were based on 8 years of data from 1975 to 1977 (WSC 07DA013) and 2009 to 2013 (RAMP/JOSMP S44).

**Figure C.3-38 Discharge of Ells River above the Joslyn Creek Diversion (Station S45) for the 2014 WY, compared to historical values.**



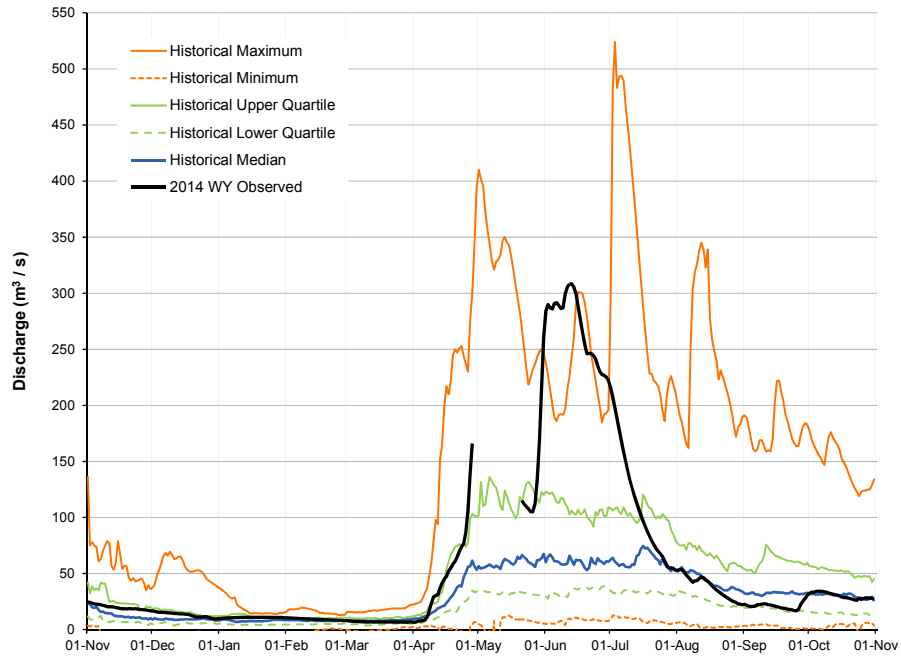
Note: Historical statistics were based on 5 years of data from 2009 to 2013.

**Figure C.3-39 Discharge of Athabasca River near the Embarras Airport (Station S46) for the 2014 WY, compared to historical values.**



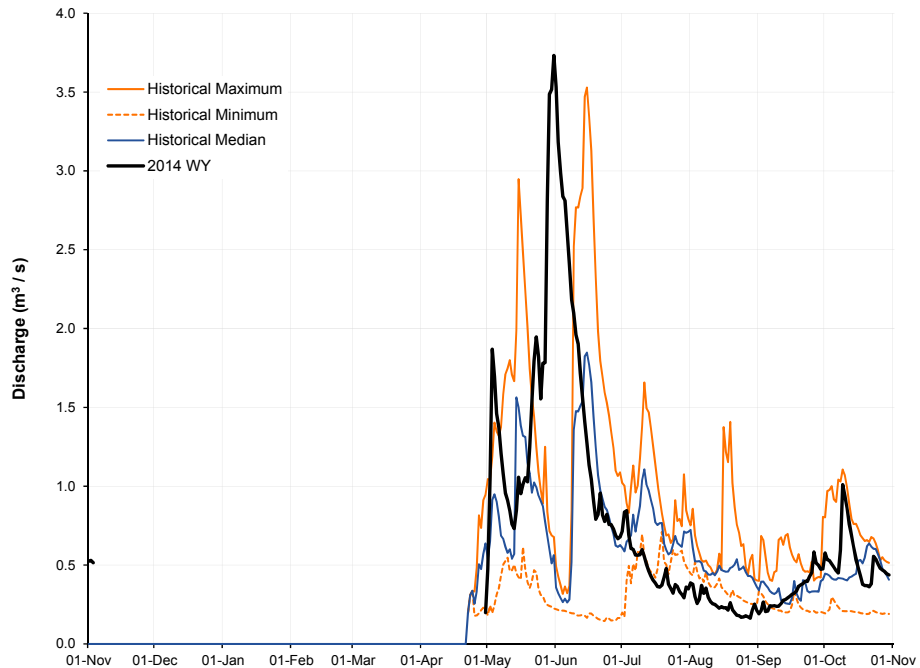
Note: Historical statistics were based on 17 years of data from 1971 to 1984 (WSC 07DD001) and 2011 to 2013 (RAMP/JOSMP S46).

**Figure C.3-40 Discharge of Christina River near the mouth (Station S47A) for the 2014 WY, compared to historical values.**



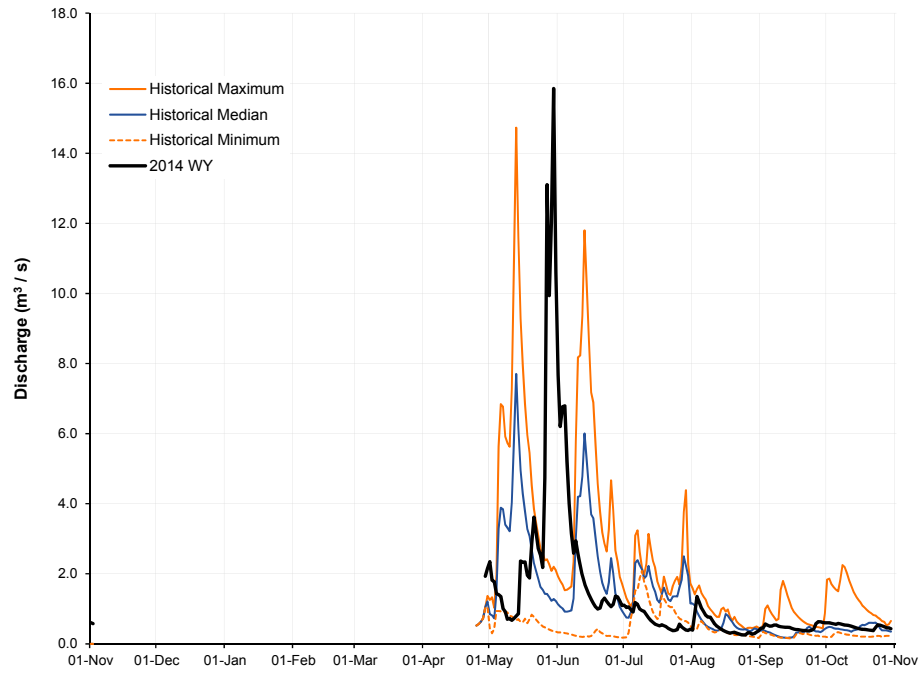
Note: Historical statistics were based on 47 years of data from 1967 to 2010 (estimated by calculating the difference between Clearwater River Stations WSC 07CD005 and WSC 07CD001) and 2011 to 2013 (RAMP/JOSMP S47/47A).

**Figure C.3-41 Discharge of Big Creek (Station S48) for the 2014 WY, compared to historical values.**



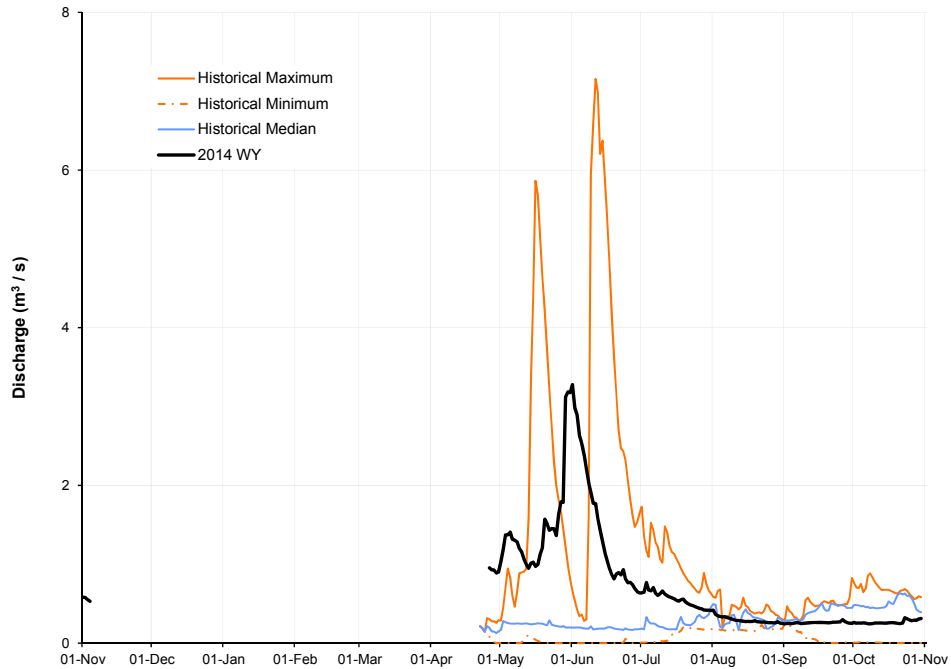
Note: Historical statistics were based on 3 years of data from 2011 to 2013.

**Figure C.3-42 Discharge of Eymundson Creek near the mouth (Station S49) for the 2014 WY, compared to historical values.**



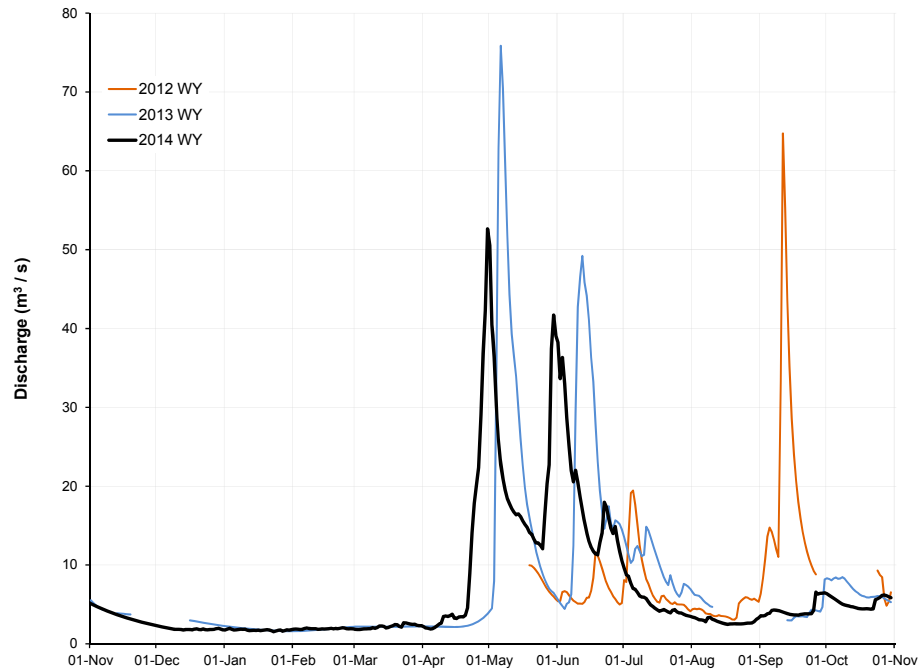
Note: Historical statistics were based on 3 years of data from 2011 to 2013.

**Figure C.3-43 Discharge of Red Clay Creek (Station S50A) for the 2014 WY, compared to historical values.**

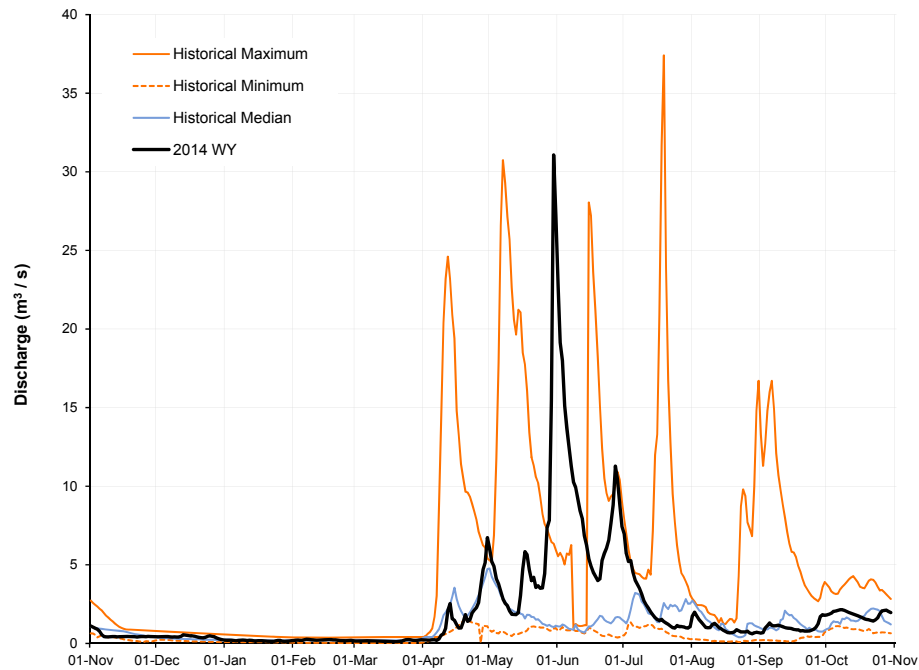


Note: Historical statistics were based on 3 years of data from 2011 to 2013.

**Figure C.3-44 Discharge of High Hills River above the Clearwater River (Station S51) for the 2012 to 2014 WY.**



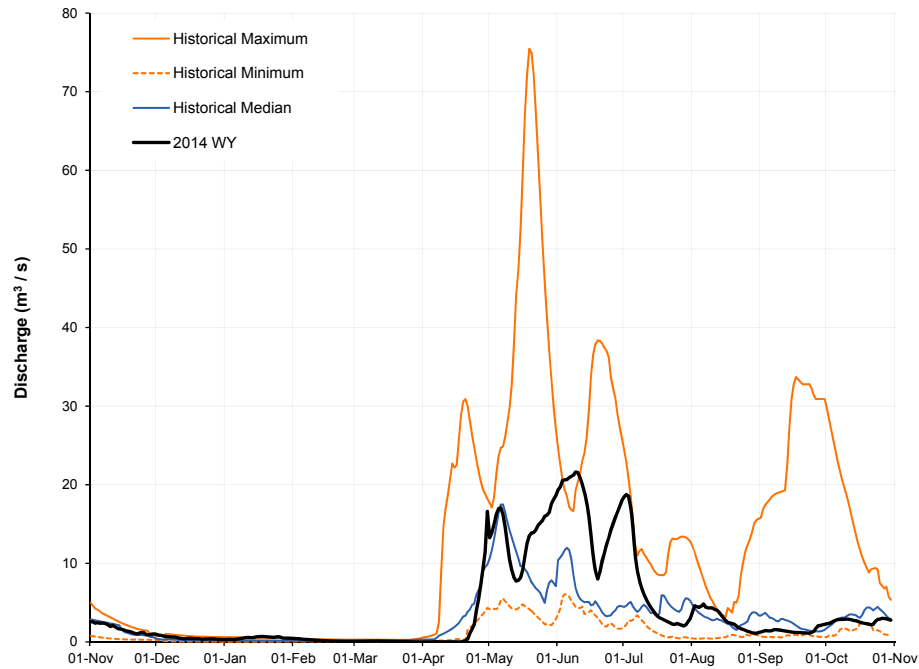
**Figure C.3-45 Discharge of Dover River near the mouth (Station S53) for the 2014 WY, compared to historical values.**



Note: Historical statistics were based on 5 years of data from 1975 to 1977 (WSC 07DB002) and 2012 to 2013 (RAMP/JOSMP S53).

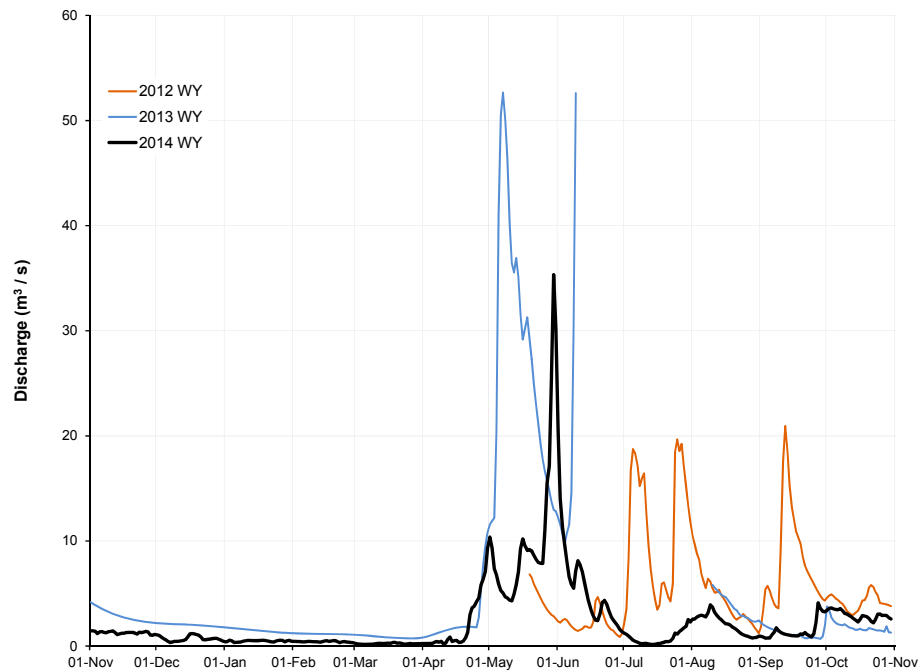


**Figure C.3-46 Discharge of Dunkirk River near Fort MacKay (Station S54) for the 2014 WY, compared to historical values.**

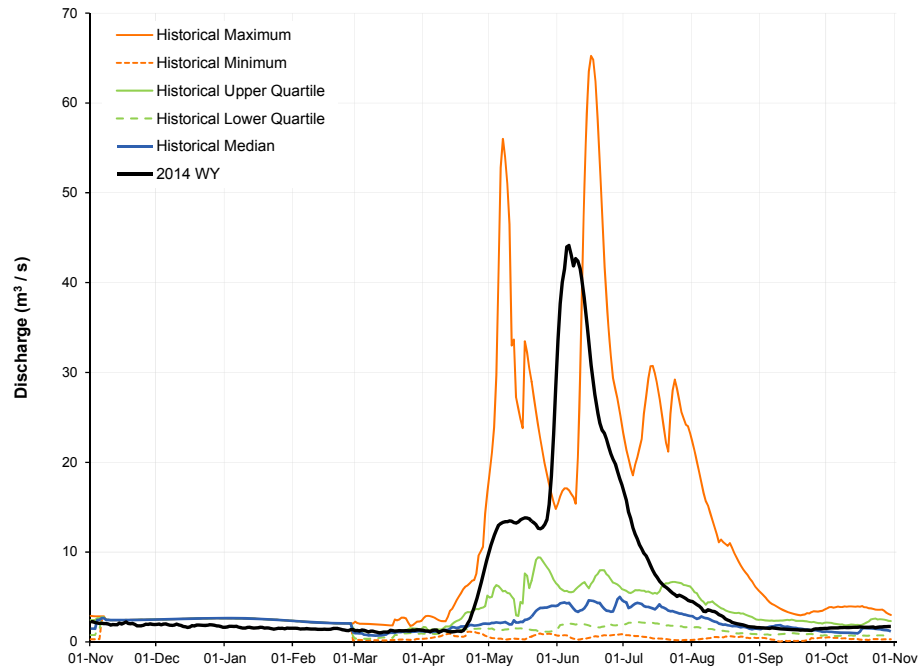


Note: Historical statistics were based on 6 years of data from 1975 to 1978 (WSC 07DB003) and 2012 to 2013 (RAMP/JOSMP S54).

**Figure C.3-47 Discharge of Gregoire River above Christina River (Station S55) for the 2012 to 2014 WY.**

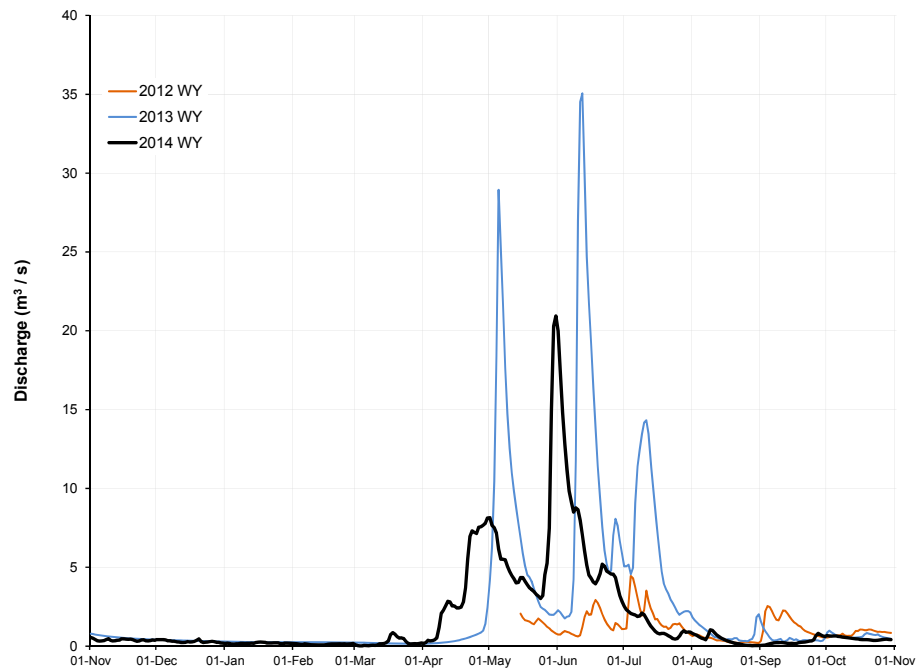


**Figure C.3-48 Discharge of Jackfish River below Christina (Station S56) for the 2014 WY, compared to historical values.**

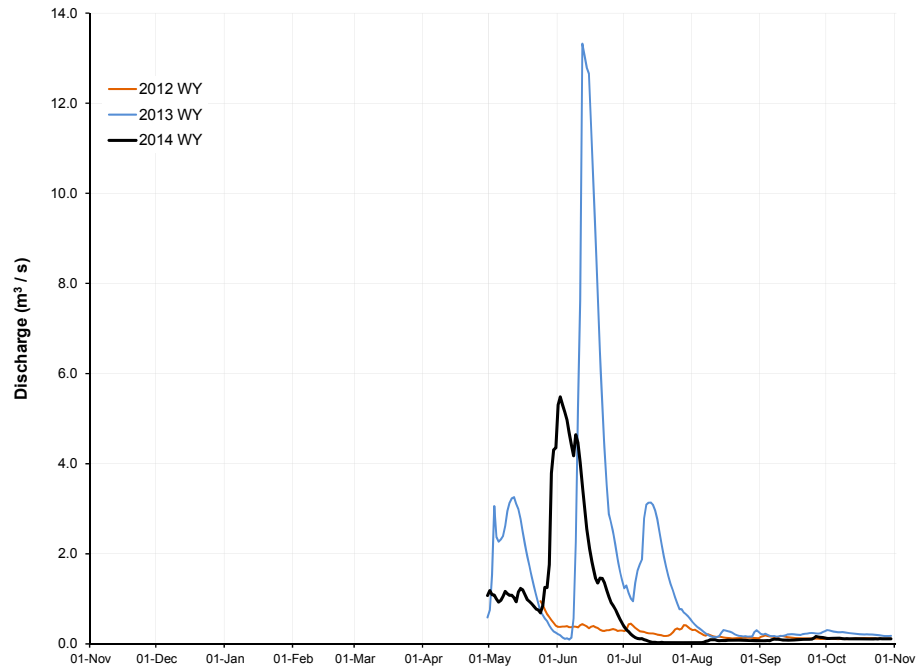


Note: Historical statistics were based on 16 years of data from 1982 to 1995 (WSC 07CE005) and 2012 to 2013 (RAMP/JOSMP S56).

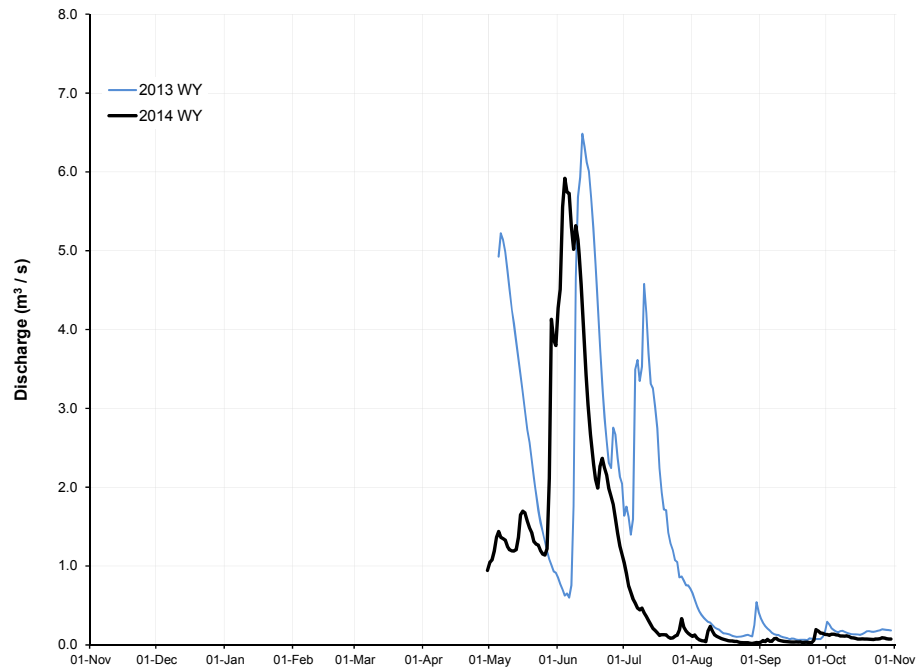
**Figure C.3-49 Discharge of Sunday Creek above Christina Lake (Station S57) for the 2012 to 2014 WY.**



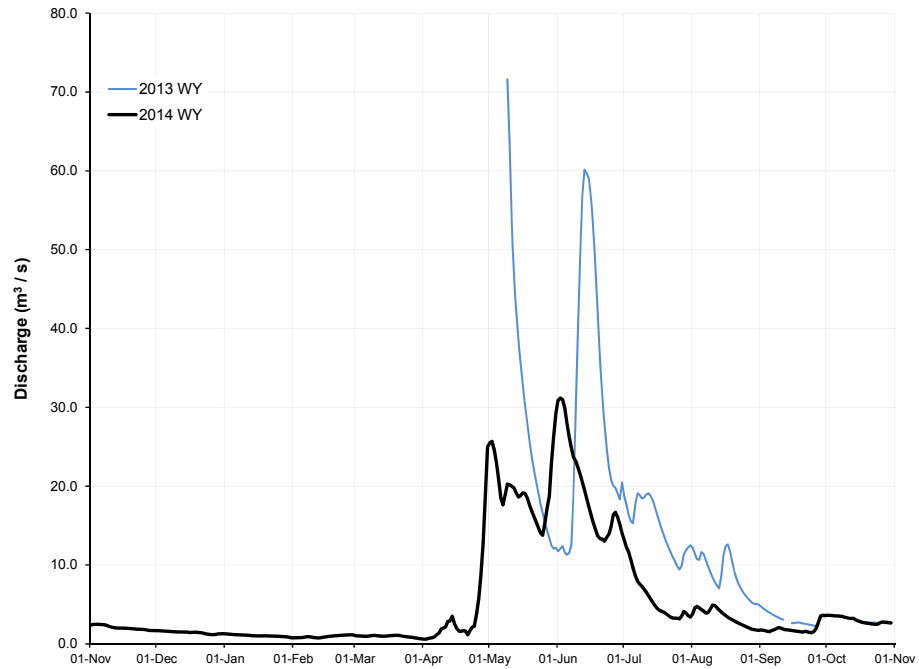
**Figure C.3-50 Discharge of Sawbones Creek above Christina Lake (Station S58) for the 2012 to 2014 WY.**



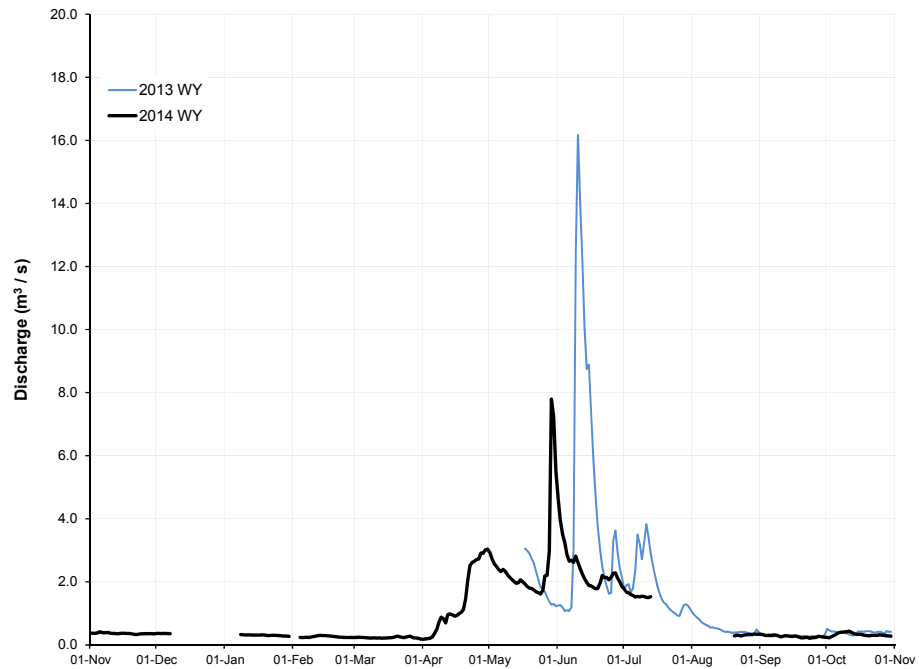
**Figure C.3-51 Discharge of Unnamed Creek south of Christina Lake (Station S60) for the 2013 and 2014 WY.**



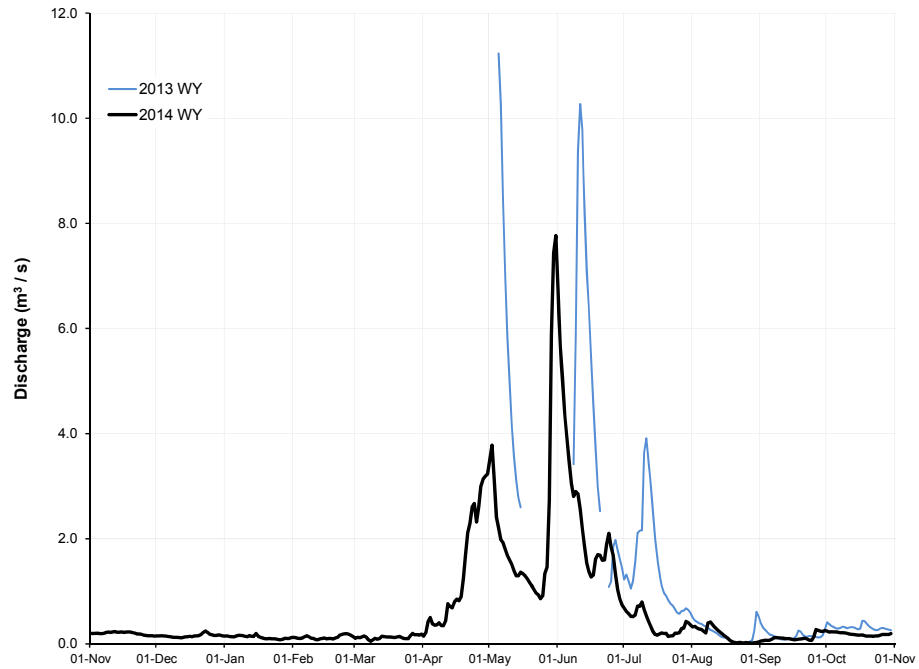
**Figure C.3-52 Discharge of Christina River above the Statoi Leismer Project (Station S61) for the 2013 and 2014 WY.**



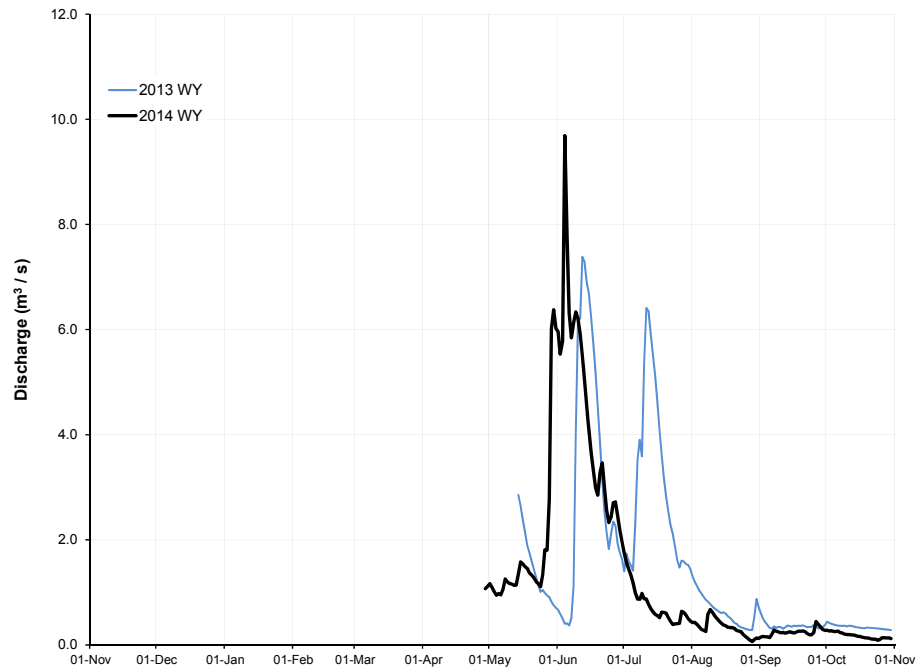
**Figure C.3-53 Discharge of Birch Creek at Highway 881 (Station S62) for the 2013 and 2014 WY.**



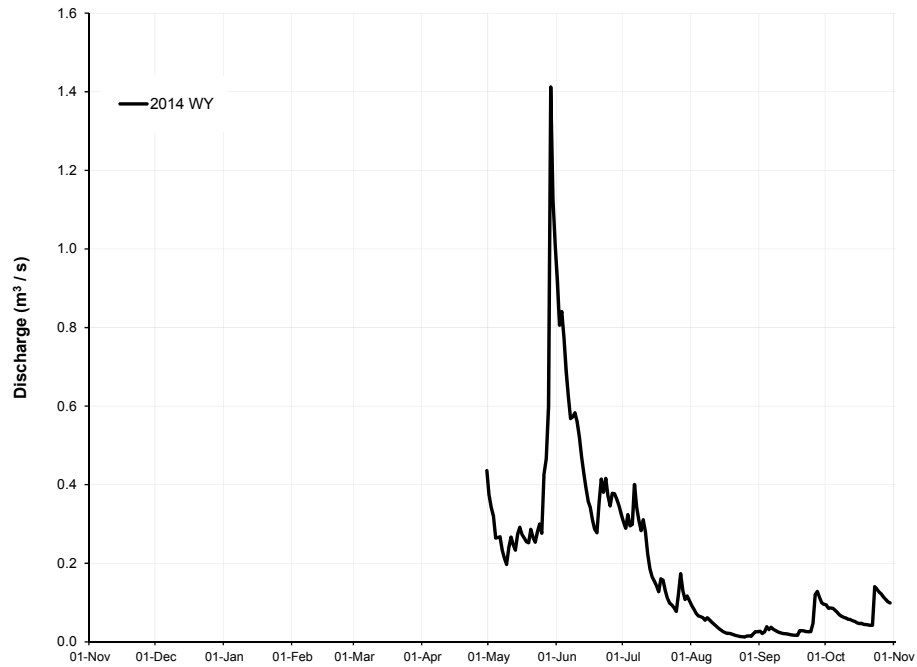
**Figure C.3-54 Discharge of Sunday Creek at Highway 881 (Station S63) for the 2013 and 2014 WY.**



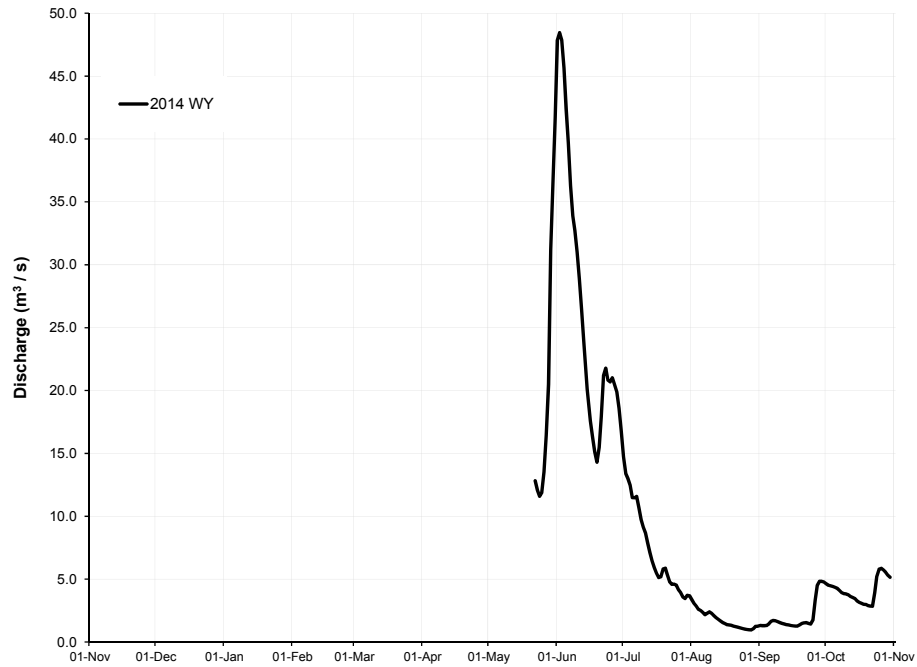
**Figure C.3-55 Discharge of Unnamed Creek east of Christina Lake (Station S64) for the 2013 and 2014 WY.**



**Figure C.4-56 Discharge of North Green Stockings Creek at East Athabasca Hwy (Station S65) for the 2014 WY.**



**Figure C.4-57 Discharge of Steepbank River below the North Steepbank River (Station S66) for the 2014 WY.**



## 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 to the Athabasca River within the oil sands region. This analytical approach is considered useful in that the difference between observed and naturalized flows can be calculated using recorded and calculated flow inputs and outputs.

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

### C.4.2 Rationale

#### C.4.2.1 Water Balance

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

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

Where,

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

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

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

The natural flow,  $Q_{nat}$  was initially unknown and estimated by solving Equation 1 using information on the other components of the water balance. Because some of the other components were not known precisely, and because the water balance equation omits factors such as changes in surface water discharge in response to groundwater extraction,  $Q_{nat}$  was referred to as “naturalized”, rather than “natural”.

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

#### **C.4.2.2 Effect of Clearing**

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

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

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

#### **C.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-circuited areas.

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



**Table C.4-1 Area of each watershed that was cleared or hydrologically closed-circuited, 2014.**

<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>	156,000	366.9	87.3
Muskeg River	1,457	147.6	85.8
Steepbank River	1,320	5.4	49.1
Tar River	332	98.4	13.3
Mackay River	5,569	7.3	39.8
Calumet River	169	0.7	1.3
Firebag River	5,988	23.5	48.0
Ells River	2,420	3.6	36.2
Christina River <sup>2</sup>	13,038	14.0	123.6
Hangingstone River	962	0.3	12.0
Poplar Creek	151	3.1	1.9
Fort Creek	63.8	20.0	35.5

<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 discharges. The resulting discharge represented the observed runoff (R) from the contributing portion of the watershed. The observed runoff was then converted to a naturalized runoff depth (d), accounting for the effects of land clearing. The naturalized runoff depth was used to calculate the naturalized discharge for the watershed (Q<sub>nat</sub>). The natural flow that would have occurred from industrially closed-circuited areas (R<sub>n</sub>), and the incremental flow from cleared areas (R<sub>i</sub>) were also calculated. This process was as follows:

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

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

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

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

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

where,

- A is the total watershed area (km<sup>2</sup>);
- A<sub>C</sub> is the cleared area in the watershed (km<sup>2</sup>);

- $A_E$  is the effective area (i.e.,  $A - A_{HI}$ ) ( $\text{km}^2$ );
- $A_{HI}$  is the closed-circuited area ( $\text{km}^2$ );
- $C$  is the conversion factor from  $\text{m}^3/\text{s}/\text{km}^2$  to  $\text{mm}/\text{yr}$ ;
- $d$  is the naturalized runoff depth (mm);
- $F$  is the adjustment factor to account for clearing (0.20); and
- $R$  is the observed runoff from the effective area adjusted for reported industrial withdrawals and discharges ( $\text{m}^3/\text{s}$ ).

The water balance calculation was 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 for 2008 to 2014, which reflected more accurately a naturalized water balance, and these revisions were presented in the RAMP 2008 report (RAMP 2009a). The assumption of differences in runoff response between upland and lowland terrain, previously applied to closed-circuited areas, was not applied due to the lack of a reliable and consistent approach for all watersheds.

#### **C.4.5 Results of 2014 Water Year Naturalized Flow Calculation**

The results from these calculations for the 2014 WY are presented in Table C.4-2 to Table C.4-14.

**Table C.4-2 Summary of the naturalized flow calculation for Station S46, Athabasca River near the Embarras Airport.**

NOTES	

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	15,600,000	8,727	36,686	15,563,314
JOSMP site (km <sup>2</sup> )	156,000.0	87.3	366.9	155,633.1
Incremental Runoff from clearing			Factor	20%

Observed (m <sup>3</sup> /s)	Endpoint	Baseline	
		Baseline (m <sup>3</sup> /s)	% change of natural
21,313.154	Annual Sum (million cumecs)	21,489.091	-0.8%
1044.807	Mean open-water season (1-May: 31-Oct)	1052.108	-0.7%
241.729	Mean winter discharge (1-Nov: 31-Mar)	245.522	-1.5%
2463.985	Annual maximum daily discharge	2480.583	-0.7%
345.809	Open-water season minimum daily discharge	349.704	-1.1%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	21,313.15
Closed-circuit loss	million m <sup>3</sup>	-50.535
Incremental runoff from land clearing	million m <sup>3</sup>	2.404
Withdrawals from the stream	million m <sup>3</sup>	-100.685
Releases into the stream	million m <sup>3</sup>	1.783
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	-28.90
Incremental volume	million m <sup>3</sup>	-175.937
Naturalized Hydrograph	million m <sup>3</sup>	21,489.091
Incremental volume	% of natural	-0.819%
Naturalized Runoff Depth	mm	137.75

**Table C.4-3 Summary of the naturalized flow calculation for WSC Station 07DA008 (JOSMP Station S7), Muskeg River near Fort McKay.**

NOTES	

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	145,700	8,575	14,758	130,942
JOSMP site (km <sup>2</sup> )	1,457.0	85.8	147.6	1,309.4
<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
	147.667	Annual Sum (million cumecs)	154.740	-4.571%
	8.486	Mean open-water season (1-May : 31-Oct)	9.059	-6.324%
	0.639	Mean winter discharge (1-Nov : 31-Mar)	0.500	27.923%
	41.100	Annual maximum daily discharge	44.843	-8.346%
	0.687	Open-water season minimum daily discharge	0.319	115.130%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	147.667
Closed-circuit loss	million m <sup>3</sup>	-15.674
Incremental runoff from land clearing	million m <sup>3</sup>	1.821
Withdrawals from the stream	million m <sup>3</sup>	-0.007
Releases into the stream	million m <sup>3</sup>	6.808
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>	-7.051
Naturalized Hydrograph	million m <sup>3</sup>	154.740
Incremental volume	% of natural	-4.571%
Naturalized Runoff Depth	mm	106.20

**Table C.4-4 Summary of the naturalized flow calculation for WSC Station 07DA006 (JOSMP Station S38), Steepbank River near Fort McMurray.**

NOTES

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	132,000	4,913	538	131,462
JOSMP site (km <sup>2</sup> )	1,320.0	49.1	5.4	1,314.6
<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
	200.476	Annual Sum (million cumecs)	199.817	0.33%
	11.556	Mean open-water season (1-May : 31-Oct)	11.518	0.33%
	0.896	Mean winter discharge (1-Nov : 31-Mar)	0.893	0.34%
	66.000	Annual maximum daily discharge	65.778	0.34%
	0.968	Open-water season minimum daily discharge	0.968	0.02%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	200.476
Closed-circuit loss	million m <sup>3</sup>	-0.814
Incremental runoff from land clearing	million m <sup>3</sup>	1.487
Withdrawals from the stream	million m <sup>3</sup>	-0.015
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>	0.658
Naturalized Hydrograph	million m <sup>3</sup>	199.817
Incremental volume	% of natural	0.33%
Naturalized Runoff Depth	mm	151.38

**Table C.4-5 Summary of the naturalized flow calculation for JOSMP Station S15A, Tar River near the mouth.**

NOTES			

LAND AREAS				
	Total Area	Other Areas		
		Cleared	Closed-circuited	Effective
JOSMP site (ha)	33,200	1,330	9,842	23,358
JOSMP site (km <sup>2</sup> )	332.0	13.3	98.4	233.6
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
24.531	Annual Sum (million cumecs)		34.475	-28.84%
1.543	Mean open-water season (1-May : 31-Oct)		2.169	-28.84%
-	Mean winter discharge (1-Nov : 31-Mar)		-	-
11.004	Annual maximum daily discharge		15.464	-28.84%
0.091	Open-water season minimum daily discharge		0.128	-28.84%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	24.531
Closed-circuit loss	million m <sup>3</sup>	-10.220
Incremental runoff from land clearing	million m <sup>3</sup>	0.276
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>	-9.944
Naturalized Hydrograph	million m <sup>3</sup>	34.475
Incremental volume	% of natural	-28.84%
Naturalized Runoff Depth	mm	103.84

**Table C.4-6 Summary of the naturalized flow calculation for WSC Station 07DB001 (JOSMP Station S26), MacKay River near Fort McKay.**

NOTES	

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	556,930	3,978	734	556,196
JOSMP site (km <sup>2</sup> )	5,569.3	39.8	7.3	5,562.0
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY		Baseline	
Observed (m <sup>3</sup> / s)	Endpoint	Baseline (m <sup>3</sup> / s)	% change of natural
417.377	Annual Sum (million cumecs)	417.410	-0.01%
24.750	Mean open-water season (1-May : 31-Oct)	24.751	-0.004%
1.327	Mean winter discharge (1-Nov : 31-Mar)	1.327	-0.069%
120.000	Annual maximum daily discharge	119.992	0.007%
3.180	Open-water season minimum daily discharge	3.181	-0.045%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	417.377
Closed-circuit loss	million m <sup>3</sup>	-0.550
Incremental runoff from land clearing	million m <sup>3</sup>	0.596
Withdrawals from the stream	million m <sup>3</sup>	-0.079
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>	-0.033
Naturalized Hydrograph	million m <sup>3</sup>	417.410
Incremental volume	% of natural	-0.008%
Naturalized Runoff Depth	mm	74.95

**Table C.4-7 Summary of the naturalized flow calculation for JOSMP Station S16A, Calumet River near the mouth.**

NOTES	

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	16,900	129	70	16,830
JOSMP site (km <sup>2</sup> )	169.0	1.3	0.7	168.3
<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
	6.645	Annual Sum (million cumecs)	6662467.9057	-0.262%
	0.415	Mean open-water season (1-May: 31-Oct)	0.4165	-0.262%
	-	Mean winter discharge (1-Nov: 31-Mar)	0.0006	0.000%
	12.280	Annual maximum daily discharge	12.3124	-0.262%
	0.0117	Open-water season minimum daily discharge	0.0118	-0.262%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	6.645
Closed-circuit loss	million m <sup>3</sup>	-0.028
Incremental runoff from land clearing	million m <sup>3</sup>	0.010
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>	-0.017
Naturalized Hydrograph	million m <sup>3</sup>	6.662
Incremental volume	% of natural	-0.26%
Naturalized Runoff Depth	mm	39.42



**Table C.4-8 Summary of the naturalized flow calculation for WSC Station 07DC001 (JOSMP Station S27), Firebag River near the mouth.**

NOTES

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	598,760	4,795	2,345	596,415
JOSMP site (km <sup>2</sup> )	5,987.6	48.0	23.5	5,964.2
<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
	1,075.191	Annual Sum (million cumecs)	1,077.698	-0.233%
	53.567	Mean open-water season (1-May : 31-Oct)	53.692	-0.233%
	14.530	Mean winter discharge (1-Nov: 31-Mar)	14.564	-0.231%
	166.000	Annual maximum daily discharge	166.385	-0.231%
	15.900	Open-water season minimum daily discharge	15.937	-0.231%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	1,075.191
Closed-circuit loss	million m <sup>3</sup>	-4.221
Incremental runoff from land clearing	million m <sup>3</sup>	1.726
Withdrawals from the stream	million m <sup>3</sup>	-0.013
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>	-2.508
Naturalized Hydrograph	million m <sup>3</sup>	1,077.698
Incremental volume	% of natural	-0.233%
Naturalized Runoff Depth	mm	179.99

**Table C.4-9 Summary of the naturalized flow calculation for JOSMP Station S14A, Ells River at the Canadian Natural Bridge.**

NOTES	

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	242,000	3,615	355	241,645
JOSMP site (km <sup>2</sup> )	2,420.0	36.2	3.6	2,416.5
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY		Baseline	
Observed (m <sup>3</sup> / s)	Endpoint	Baseline (m <sup>3</sup> / s)	% change of natural
324.562	Annual Sum (million cumecs)	324.070	0.15%
16.585	Mean open-water season (1-May : 31-Oct)	16.560	0.15%
3.660	Mean winter discharge (1-Nov : 31-Mar)	3.655	0.15%
83.931	Annual maximum daily discharge	83.804	0.15%
2.080	Open-water season minimum daily discharge	2.076	0.15%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	324.5624
Closed-circuit loss	million m <sup>3</sup>	-0.4754
Incremental runoff from land clearing	million m <sup>3</sup>	0.9682
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>	0.493
Naturalized Hydrograph	million m <sup>3</sup>	324.070
Incremental volume	% of natural	0.15%
Naturalized Runoff Depth	mm	133.91

**Table C.4-10 Summary of the naturalized flow calculation for JOSMP Station S47A, Christina River near the mouth.**

NOTES

LAND AREAS	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	1,303,805	1,302,405	1,400	1,302,405
JOSMP site (km <sup>2</sup> )	13,038.0	13,024.0	14.0	13,024.0
Incremental Runoff from clearing			Factor	20%

RESULTS SUMMARY		Baseline	
Observed (m <sup>3</sup> /s)	Endpoint	Baseline (m <sup>3</sup> /s)	% change of natural
1,643.426	Annual Sum (million cumecs)	1,642.375	0.06%
86.045	Mean open-water season (1-May: 31-Oct)	85.980	0.08%
12.069	Mean winter discharge (1-Nov: 31-Mar)	12.074	-0.04%
308.332	Annual maximum daily discharge	308.091	0.08%
16.799	Open-water season minimum daily discharge	16.795	0.03%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	1,643.426
Closed-circuit loss	million m <sup>3</sup>	-1.764
Incremental runoff from land clearing	million m <sup>3</sup>	3.113
Withdrawals from the stream	million m <sup>3</sup>	-0.298
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>	1.051
Naturalized Hydrograph	million m <sup>3</sup>	1,642.375
Incremental volume	% of natural	0.06%
Naturalized Runoff Depth	mm	125.97

**Table C.4-11 Summary of the naturalized flow calculation for WSC Station 07CD004, Hangingstone River at Fort McMurray.**

NOTES

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	96,200	1,196	32	96,168
JOSMP site (km <sup>2</sup> )	962.0	12.0	0.3	961.7
<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
	96.133	Annual Sum (million cumecs)	95.936	0.21%
	5.721	Mean open-water season (1-May : 31-Oct)	5.709	0.21%
	0.229	Mean winter discharge (1-Nov : 31-Mar)	0.229	-0.07%
	48.100	Annual maximum daily discharge	47.997	0.22%
	0.637	Open-water season minimum daily discharge	0.636	0.22%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	96.133
Closed-circuit loss	million m <sup>3</sup>	-0.032
Incremental runoff from land clearing	million m <sup>3</sup>	0.239
Withdrawals from the stream	million m <sup>3</sup>	-0.009
Releases into the stream	million m <sup>3</sup>	0.000
Diversion into/out of watershed	million m <sup>3</sup>	0.000
Tributary changes	million m <sup>3</sup>	0.000
Incremental volume	million m <sup>3</sup>	0.197
Naturalized Hydrograph	million m <sup>3</sup>	95.936
Incremental volume	% of natural	0.21%
Naturalized Runoff Depth	mm	99.73

**Table C.4-12 Summary of the naturalized flow calculation for Station S11 (WSC Station 07DA007), Poplar Creek at Highway 63.**

NOTES	

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	15,100	193	314	14,786
JOSMP site (km <sup>2</sup> )	151.0	1.9	3.1	147.9
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	20%

RESULTS SUMMARY			Baseline	
Observed (m <sup>3</sup> / s)	Endpoint		Baseline (m <sup>3</sup> / s)	% change of natural
42.231	Annual Sum (million cumecs)		43.016	-1.82%
2.616	Mean open-water season (1-May : 31-Oct)		2.665	-1.82%
0.061	Mean winter discharge (1-Nov : 31-Mar)		0.062	-1.82%
36.402	Annual maximum daily discharge		37.079	-1.82%
0.001	Open-water season minimum daily discharge		0.001	-1.82%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	42.231
Closed-circuit loss	million m <sup>3</sup>	-0.895
Incremental runoff from land clearing	million m <sup>3</sup>	0.110
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>	-0.785
Naturalized Hydrograph	million m <sup>3</sup>	43.016
Incremental volume	% of natural	-1.82%
Naturalized Runoff Depth	mm	284.87

**Table C.4-13 Summary of the naturalized flow calculation for Station S12, Fort Creek at Highway 63.**

NOTES	

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	6,380	3,548	2,001	4,379
JOSMP site (km <sup>2</sup> )	63.8	35.5	20.0	43.8
<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
	2.386	Annual Sum (million cumecs)	2.992	-20.24%
	0.148	Mean open-water season (1-May : 31-Oct)	0.185	-20.24%
	-	Mean winter discharge (1-Nov : 31-Mar)	-	-
	0.412	Annual maximum daily discharge	0.516	-20.241%
	0.041	Open-water season minimum daily discharge	0.051	-20.241%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	2.386
Closed-circuit loss	million m <sup>3</sup>	-0.938
Incremental runoff from land clearing	million m <sup>3</sup>	0.333
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>	-0.606
Naturalized Hydrograph	million m <sup>3</sup>	2.992
Incremental volume	% of natural	-20.24%
Naturalized Runoff Depth	mm	46.90

**Table C.4-14 Summary of the naturalized flow calculation for Station S6, Mills Creek at Highway 63.**

NOTES	

	Total Area		Other Areas	
	Cleared	Effective	Closed-circuited	Effective
JOSMP site (ha)	900	244	664	236
JOSMP site (km <sup>2</sup> )	9.0	2.4	6.6	2.4
<i>Incremental Runoff from clearing</i>			<i>Factor</i>	<i>20%</i>

RESULTS SUMMARY		Baseline	
Observed (m <sup>3</sup> / s)	Endpoint	Baseline (m <sup>3</sup> / s)	% change of natural
1.813	Annual Sum (million cumecs)	5.729	-68.36%
0.103	Mean open-water season (1-May : 31-Oct)	0.326	-68.36%
0.012	Mean winter discharge (1-Nov : 31-Mar)	0.038	-68.36%
0.239	Annual maximum daily discharge	0.755	-68.36%
0.005	Open-water season minimum daily discharge	0.016	-68.36%

ANNUAL WATER BALANCE COMPONENTS		
Observed Hydrograph	million m <sup>3</sup>	1.813
Closed-circuit loss	million m <sup>3</sup>	-4.227
Incremental runoff from land clearing	million m <sup>3</sup>	0.311
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>	-3.916
Naturalized Hydrograph	million m <sup>3</sup>	5.729
Incremental volume	% of natural	-68.356%
Naturalized Runoff Depth	mm	636.55

## C.5 INVENTORY OF CLIMATE AND HYDROLOGIC DATA AVAILABILITY

An inventory of the climate and hydrologic data collected by JOSMP, and contained in the database, is provided on the following pages (Table C.5-1 and Table C.5-2). These data will be made available on the RAMP website, subsequent to this report being published. In addition to the data collected by JOSMP, data from the following sources contributed to the analyses in the 2014 WY JOSMP Technical Report:

- Water Survey of Canada (WSC) (<http://www.wsc.ec.gc.ca/>):
  - Provisional WSC hydrologic data have been used when final data were not yet available. In the database, data for a joint WSC/JOSMP station are provided starting with the year in which RAMP/JOSMP monitoring began. To provide regional context JOSMP stations are identified where historical WSC data are available to extend the record length.
- Environment Canada (EC) ([http://climate.weatheroffice.gc.ca/climateData/canada\\_e.html](http://climate.weatheroffice.gc.ca/climateData/canada_e.html)):
  - Provisional EC climate data have been used when final data were not yet available.
- Industry Data:
  - Volumes of water released and withdrawn, as part of oil sands development activities, were supplied by oil sands operators.



**Table C.5-1 Inventory of hydrologic data collected by the RAMP/JOSMP.**

<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	2014-10-31
	Water Level	1997-04-17	2014-10-31
	Water Temperature	2007-10-20	2014-10-31
S03 - Iyininim Creek above Kearl Lake	Total Rainfall	1999-04-30	2014-10-31
	Discharge	1989-01-18	2014-10-31
	Water Level	1989-04-20	2014-10-31
	Water Temperature	2011-08-15	2014-10-31
S04 - Blackfly Creek near the mouth	Discharge	1989-02-15	1998-10-27
S04A - Blackfly Creek near the mouth	Discharge	2007-04-25	2007-10-25
	Water Level	2007-04-25	2007-10-25
S05 - Muskeg River above Stanley Creek	Discharge	2003-05-04	2014-10-31
	Water Level	2003-02-12	2014-10-31
	Water Temperature	2010-06-26	2014-10-31
S05A - Muskeg River above Muskeg Creek	Station Pressure	2002-03-16	2014-10-31
	Discharge	1995-08-11	2014-10-31
	Water Level	1997-04-17	2014-10-31
	Water Temperature	2004-09-01	2014-10-31
S06 - Mills Creek at Highway 63	Discharge	1997-04-16	2014-10-31
	Water Level	1997-04-16	2014-10-31
	Water Temperature	2010-09-19	2014-10-31
S07 - Muskeg River near Fort McKay (07DA008)	Discharge <sup>1</sup>	1998-03-01	2014-10-31
	Water Level	2000-01-01	2014-10-31
	Water Temperature	2010-06-22	2014-10-31
S08 - Stanley Creek near the mouth	Water Level	1999-09-14	2003-10-14
S09 - Kearl Lake Outlet	Discharge	1989-01-18	2014-10-31
	Water Level	1989-01-18	2014-10-31
	Station Pressure	1999-04-07	2001-04-20
	Water Temperature	2011-04-26	2014-10-31
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	2014-10-31
	Water Level	2012-08-13	2014-10-31
	Water Temperature	2012-08-13	2014-10-31
S11 - Poplar Creek at Highway 63 (07DA007)	Discharge <sup>2</sup>	1996-04-20	2014-10-31
	Water Level	1995-05-05	2014-10-31
	Water Temperature	2008-05-14	2014-10-31
S12 - Fort Creek at Highway 63	Discharge	2000-04-02	2014-10-31
	Water Level	2000-04-02	2014-10-31
	Water Temperature	2011-08-08	2014-10-31
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

**Table C.5-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S14A - Ells River at Canadian Natural Bridge	Discharge <sup>3</sup>	2004-10-30	2014-10-31
	Water Level	2004-10-30	2014-10-31
	Water Temperature	2005-07-14	2014-10-31
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	2014-10-31
	Water Level	2007-05-01	2014-10-31
	Water Temperature	2007-09-21	2014-10-31
S16 - Calumet River near the mouth	Daily Maximum Temperature	2001-06-11	2005-10-11
	Daily Minimum Temperature	2001-06-11	2005-10-11
	Daily Mean Temperature	2001-06-11	2005-10-11
	Total Rainfall	2001-06-11	2005-05-02
	Total Snowfall	2001-06-11	2005-03-23
	Total Precipitation	2001-06-11	2005-05-02
	Discharge <sup>5</sup>	2001-05-12	2004-10-31
	Water Level	2001-05-12	2004-10-31
	Water Temperature	2003-05-27	2004-10-31
S16A - Calumet River near the mouth	Discharge <sup>5</sup>	2010-04-12	2014-10-31
	Water Level	2010-05-12	2014-10-31
	Water Temperature	2011-07-27	2014-10-31
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	2014-10-31
	Discharge	2001-05-09	2014-10-31
	Water Level	2001-05-09	2014-10-31
S20/S20A - Muskeg River Upland	Water Temperature	2012-04-23	2014-10-31
	Discharge	2001-05-08	2014-10-31
S21 - Shelley Creek near the mouth	Water Level	2001-05-08	2014-10-31
	Water Temperature	2012-04-24	2014-10-31
	Discharge	2001-05-14	2003-10-14
S22 - Muskeg Creek near the mouth	Water Level	1989-01-17	2014-10-31
	Water Level	1989-01-17	2014-10-31
	Water Temperature	2012-04-24	2014-10-31
S23 - Aurora Boundary Weir	Discharge	2001-01-01	2002-12-31
	Water Level	2001-01-01	2002-12-31
S24 - Athabasca River below Eymundson Creek	Discharge	2001-06-20	2014-10-31
	Water Level	2001-06-20	2014-10-31
	Water Temperature	2010-08-11	2014-10-31
S25 - Susan Lake Outlet	Discharge	2002-06-11	2014-10-31
	Water Level	2002-06-11	2014-10-31
	Water Temperature	2012-05-19	2014-10-31

**Table C.5-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S26 - MacKay River near Fort McKay (07DB001)	Discharge <sup>6</sup>	2001-03-01	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	2014-10-31
	Water Level	2002-04-10	2014-10-31
	Total Rainfall	2010-04-23	2014-10-31
S32 - Surmount Creek at Highway 881	Discharge	2002-05-18	2014-10-31
	Water Level	2002-01-14	2014-10-31
	Water Temperature	2008-06-24	2014-10-31
S33 - Muskeg River at Aurora/Shell Boundary	Discharge	2003-01-29	2014-10-31
	Water Level	2003-04-30	2014-10-31
	Water Temperature	2009-11-01	2014-10-31
S34 - Tar River above Horizon Lake	Discharge	2005-04-26	2014-10-31
	Water Level	2005-04-26	2014-10-31
	Water Temperature	2008-04-08	2014-10-31
S35 - McClelland Lake Outlet	Water Level	2008-06-29	2008-10-08
S36 - McClelland Lake Outlet above Firebag River	Discharge	2008-05-14	2014-10-31
	Water Level	2008-05-14	2014-10-31
	Water Temperature	2011-07-27	2014-10-31
S37 - East Jackpine Creek near the 1300 m Contour	Discharge	2007-09-22	2014-10-31
	Water Level	2007-09-22	2014-10-31
	Water Temperature	2012-04-25	2014-10-31
S38 - Steepbank River near Fort McMurray (07DA006)	Discharge <sup>9</sup>	2009-01-01	2014-10-31
S39 - Beaver River above Syncrude (07DA018)	Discharge <sup>10</sup>	2009-01-01	2014-10-31
S40 - MacKay River at Petro-Canada Bridge	Discharge	2008-01-01	2014-10-31
	Water Level	2008-01-01	2014-10-31
	Total Rainfall	2010-04-23	2014-10-31
	Water Temperature	2008-09-19	2014-10-31
S42 - Clearwater River above Christina River (07CD005)	Discharge <sup>11</sup>	2009-01-01	2014-10-31
S43 - Firebag River above Suncor Firebag	Discharge	2009-05-01	2014-10-31
	Water Level	2009-05-01	2014-10-31
	Total Rainfall	2010-04-12	2014-10-31
	Water Temperature	2009-09-18	2014-10-31
S44 - Pierre River near Fort McKay (07DA013)	Discharge <sup>12</sup>	2009-05-01	2014-10-31
	Water Level	2009-05-01	2014-10-31
	Water Temperature	2011-07-27	2014-10-31
S45 - Ells River above Joslyn Creek Diversion	Discharge	2009-06-13	2014-10-31
	Water Level	2009-06-13	2014-10-31
	Water Temperature	2009-06-13	2014-10-31

**Table C.5-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S46 - Athabasca River near Embarras Airport	Discharge <sup>13</sup>	2011-08-16	2014-10-31
	Water Level	2011-08-16	2014-10-31
	Water Temperature	2011-08-16	2014-10-31
S47/S47A - Christina River near the mouth	Discharge	2011-07-28	2014-10-31
	Water Level	2011-07-28	2014-10-31
	Water Temperature	2011-07-28	2014-10-31
S48 - Big Creek near the mouth	Discharge	2011-04-23	2014-10-31
	Water Level	2011-04-23	2014-10-31
	Water Temperature	2011-04-23	2014-10-31
S49 - Eymundson Creek near the mouth	Discharge	2011-07-27	2014-10-31
	Water Level	2011-07-27	2014-10-31
	Water Temperature	2011-07-27	2014-10-31
S50 - Red Clay Creek	Discharge	2011-04-23	2011-10-29
	Water Level	2011-04-23	2011-10-29
	Water Temperature	2011-04-23	2011-10-29
S50A - Red Clay Creek	Discharge	2012-04-26	2014-10-31
	Water Level	2012-04-26	2014-10-31
	Water Temperature	2012-04-26	2014-10-31
S51 - High Hills River near the Mouth	Discharge	2012-05-20	2014-10-31
	Water Level	2012-05-20	2014-10-31
	Water Temperature	2012-05-20	2014-10-31
S53 - Dover River near the Mouth	Discharge <sup>14</sup>	2012-05-18	2014-10-31
	Water Level	2012-05-18	2014-10-31
	Water Temperature	2012-05-18	2014-10-31
S54 - Dunkirk River near Fort MacKay	Discharge <sup>15</sup>	2012-05-17	2014-10-31
	Water Level	2012-05-17	2014-10-31
	Water Temperature	2012-05-17	2014-10-31
S55 - Gregoire River near the Mouth	Discharge	2012-05-20	2014-10-31
	Water Level	2012-05-20	2014-10-31
	Water Temperature	2012-05-20	2014-10-31
S56 - Jackfish River below Christina Lake	Discharge <sup>16</sup>	2012-05-16	2014-10-31
	Water Level	2012-05-16	2014-10-31
	Water Temperature	2012-05-16	2014-10-31
S57 - Sunday Creek above Christina Lake	Discharge	2012-05-16	2014-10-31
	Water Level	2012-05-16	2014-10-31
	Water Temperature	2012-05-16	2014-10-31
S58 - Sawbones Creek above Christina Lake	Discharge	2012-05-25	2014-10-31
	Water Level	2012-05-25	2014-10-31
	Water Temperature	2012-05-25	2014-10-31
S60 - Unnamed Creek South of Christina Lake	Discharge	2013-05-06	2014-10-31
	Water Level	2013-05-06	2014-10-31
	Water Temperature	2013-05-06	2014-10-31
S61 - Christina River above Statoil Leismer	Discharge	2013-05-10	2014-10-31
	Water Level	2013-05-10	2014-10-31
	Water Temperature	2013-05-10	2014-10-31

**Table C.5-1 (Cont'd.)**

<b>Hydrometric Station</b>	<b>Data Type</b>	<b>From</b>	<b>To</b>
S62 - Birch Creek at Highway 881	Discharge	2013-05-18	2014-10-31
	Water Level	2013-05-18	2014-10-31
	Water Temperature	2013-05-18	2014-10-31
S63 - Sunday Creek above Christina Lake	Discharge	2013-05-06	2014-10-31
	Water Level	2013-05-06	2014-10-31
	Water Temperature	2013-05-06	2014-10-31
S64 - Unnamed Creek East of Christina Lake	Discharge	2013-05-15	2014-10-31
	Water Level	2013-05-15	2014-10-31
	Water Temperature	2013-05-15	2014-10-31
S65 - North Green Stockings Creek at East Athabasca Highway	Discharge	2013-08-18	2014-10-31
	Water Level	2013-08-18	2014-10-31
	Water Temperature	2013-08-18	2014-10-31
S66 - Steepbank River below North Steepbank Confluence	Discharge	2014-05-23	2014-10-31
	Water Level	2014-05-23	2014-10-31
	Water Temperature	2014-05-23	2014-10-31
CR1 - Calumet River	Discharge <sup>5</sup>	2005-05-04	2009-10-18
L1 - McClelland Lake	Daily Maximum Temperature	2007-03-29	2014-10-31
	Daily Minimum Temperature	2007-03-29	2014-10-31
	Daily Mean Temperature	2007-02-09	2014-10-31
	Total Rainfall	2002-08-09	2014-10-31
	Total Precipitation	2006-04-15	2014-10-31
	Relative Humidity	2006-09-06	2014-10-31
	Discharge	1997-06-22	2006-09-02
	Water Level	1997-06-22	2014-10-31
	Water Temperature	2008-03-14	2014-10-31
	L2 - Kearl Lake	Daily Maximum Temperature	2008-01-01
Daily Minimum Temperature		2008-01-01	2014-10-31
Daily Mean Temperature		2007-09-25	2014-10-31
Total Precipitation		2008-01-01	2014-10-31
Relative Humidity		2007-09-25	2014-10-31
Discharge		2007-04-26	2007-10-17
Water Level		1989-01-19	2014-10-31
Water Temperature		2007-09-25	2014-10-31
L3 - Isadore's Lake		Water Level	2000-02-22
	Water Temperature	2011-10-31	2014-10-31
L4 - Namur Lake	Water Level	2012-05-18	2014-10-31
	Water Temperature	2012-05-18	2014-10-31

Historical discharge data were available from Water Survey of Canada for JOSMP stations at 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 the Canadian Natural Bridge (Ells River near the mouth 07DA017) 1975 to 1986.

<sup>4</sup> S15/S15A – Tar River near the mouth (Tar River near Fort McKay 07DA015) 1975 to 1977.

<sup>5</sup> S16/CR1/S16A – Calumet River near the mouth (Calumet River near Fort McKay 07DA014) 1975 to 1977.

<sup>6</sup> S26 – MacKay River near Fort McKay (07DB001) 1972 to present.

<sup>7</sup> S27 – Firebag River near the mouth (07DC001) 1971 to present.

<sup>8</sup> S29 – Christina River near Chard (07CE002) 1982 to present.

<sup>9</sup> S38 – Steepbank River near Fort McMurray (07DA006) 1972 to present.

- <sup>10</sup> S39 – Beaver River above Syncrude (07DA018) 1975 to present.
- <sup>11</sup> S42 – Clearwater River above Christina River (07CD005) 1966 to present.
- <sup>12</sup> S44 – Pierre River near Fort McKay (07DA013) 1975 to 1977.
- <sup>13</sup> S46 – Athabasca River near Embarras Airport (Athabasca River at Embarras Airport 07DD011) 1971 to 1984.
- <sup>14</sup> S53 – Dover River near the mouth (Dover River near the Mouth 07DB002) 1975 to 1977.
- <sup>15</sup> S54 – Dunkirk River near Fort McKay (Dunkirk River near Fort McKay 07DB003) 1975 to 1979.
- <sup>16</sup> S56 – Jackfish River below Christina Lake (Jackfish River below Christina Lake 07CE005) 1982 to 1995.

**Table C.5-2 Inventory of climate data collected by the RAMP/JOSMP.**

<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	2014-10-31
	Daily Minimum Temperature	1995-05-10	2014-10-31
	Daily Mean Temperature	1988-03-11	2014-10-31
	Total Rainfall	1995-05-10	2008-12-31
	Total Snowfall	1996-01-01	2008-12-31
	Total Precipitation	1988-03-10	2014-10-31
	Snow on the Ground	1995-10-26	2014-10-31
	Speed of Extreme Gust	1995-05-10	2014-10-31
	Global Solar Radiation (RF1)	1988-03-11	2014-10-31
	Relative Humidity	1995-05-10	2014-10-31
	Maximum 2-Minute Wind Speed	1995-05-10	2014-10-31
Maximum 10-Minute Wind Speed	1995-05-10	2014-10-31	
C2 - Horizon Climate Station	Daily Maximum Temperature	2008-10-16	2014-10-31
	Daily Minimum Temperature	2008-10-16	2014-10-31
	Daily Mean Temperature	2008-10-16	2014-10-31
	Snow on the Ground	2009-01-01	2014-10-31
	Speed of Extreme Gust	2008-10-16	2014-10-31
	Global Solar Radiation (RF1)	2008-10-16	2014-10-31
	Station pressure	2008-10-16	2014-10-31
	Relative Humidity	2008-10-16	2014-10-31
	Maximum 2-Minute Wind Speed	2008-10-16	2014-10-31
	Maximum 10-Minute Wind Speed	2008-10-16	2014-10-31
	Total Precipitation	2009-06-11	2014-10-31
C3 - Steepbank Climate Station	Daily Maximum Temperature	2010-11-03	2014-10-31
	Daily Minimum Temperature	2010-11-03	2014-10-31
	Daily Mean Temperature	2010-11-03	2014-10-31
	Snow on the Ground	2010-11-03	2014-10-31
	Speed of Extreme Gust	2010-11-03	2014-10-31
	Global Solar Radiation (RF1)	2010-11-03	2014-10-31
	Station pressure	2010-11-03	2014-10-31
	Relative Humidity	2010-11-03	2014-10-31
	Maximum 2-Minute Wind Speed	2010-11-03	2014-10-31
	Maximum 10-Minute Wind Speed	2010-11-03	2014-10-31
	Total Precipitation	2009-08-13	2014-10-31
C4 - Pierre Climate Station	Daily Maximum Temperature	2011-07-25	2014-10-31
	Daily Minimum Temperature	2011-07-25	2014-10-31
	Daily Mean Temperature	2011-07-25	2014-10-31
	Snow on the Ground	2011-07-25	2014-10-31
	Speed of Extreme Gust	2011-07-25	2014-10-31
	Global Solar Radiation (RF1)	2011-07-25	2014-10-31
	Station pressure	2011-07-25	2014-10-31
	Relative Humidity	2011-07-25	2014-10-31
	Maximum 2-Minute Wind Speed	2011-07-25	2014-10-31
	Maximum 10-Minute Wind Speed	2011-07-25	2014-10-31
	Total Precipitation	2011-07-25	2014-10-31

**Table C.5-12 (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	2014-10-31
	Daily Minimum Temperature	2011-10-16	2014-10-31
	Daily Mean Temperature	2011-10-16	2014-10-31
	Snow on the Ground	2011-10-16	2014-10-31
	Speed of Extreme Gust	2011-10-16	2014-10-31
	Global Solar Radiation (RF1)	2011-10-16	2014-10-31
	Station pressure	2011-10-16	2014-10-31
	Relative Humidity	2011-10-16	2014-10-31
	Maximum 2-Minute Wind Speed	2011-10-16	2014-10-31
	Maximum 10-Minute Wind Speed	2011-10-16	2014-10-31
Total Precipitation	2011-10-16	2014-10-31	

## **C.6 UPDATED STATION DESCRIPTION SHEETS**

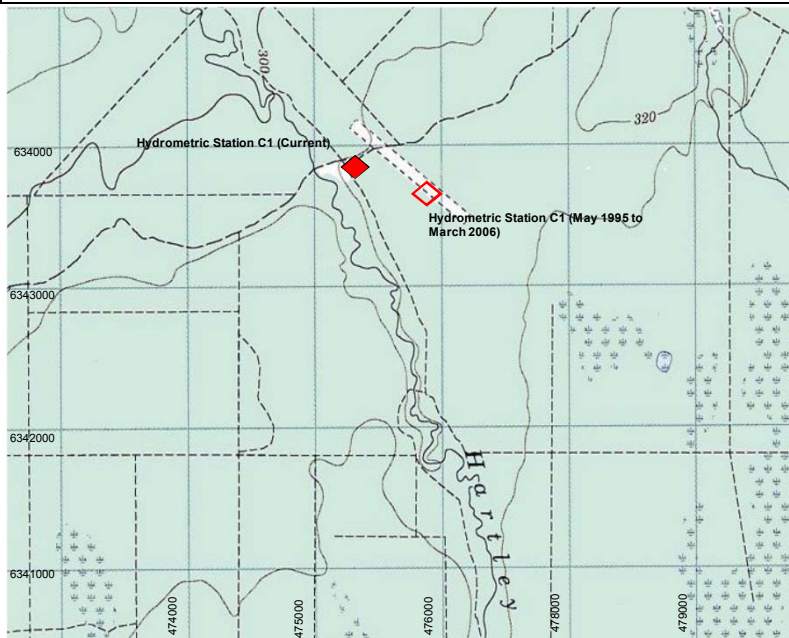
Updated station description sheets are provided below for all stations that were active in the 2014 WY.



Revised 24 March, 2014

### Location and Purpose:

Established in May 1995 to monitor climate conditions in the Muskeg River basin. Formerly Station 271 for the OSLO project-1988 data available.



Map Grid Based on UTM NAD 27

### Station Details

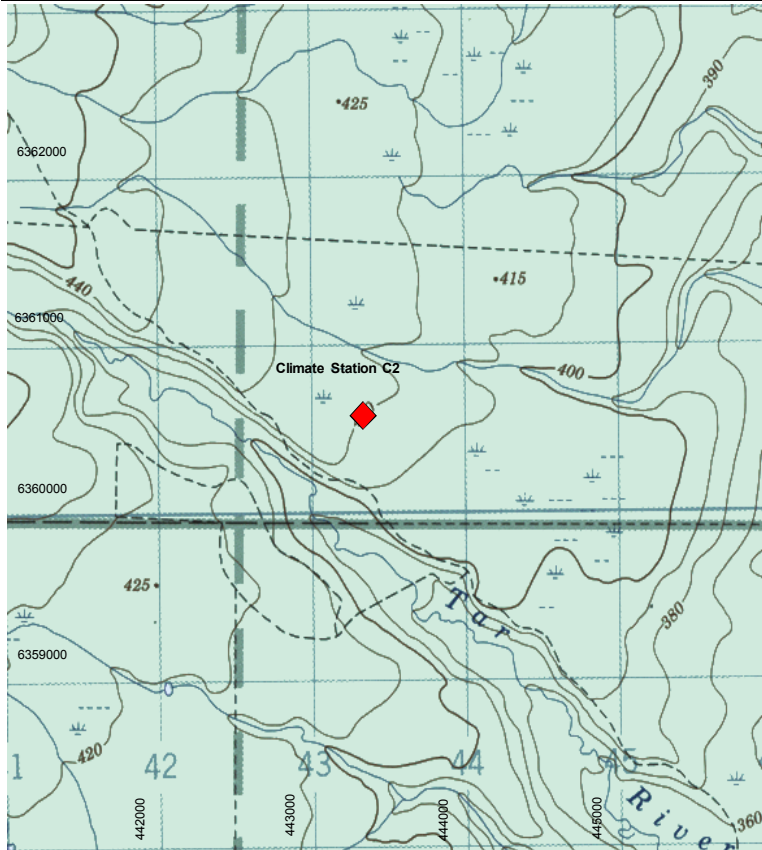
<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	March 1996 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Truck via Canterra Road/ Jackpine Mine
<b>UTM Coordinates:</b>	475230 E, 6344049 N (NAD83)
<b>Lat/Long:</b>	57°14'20" N, 111°24'37" W (NAD83)
<b>Station Elevation:</b>	308 m
<b>NTS Map:</b>	73M/10



Revised 24 March, 2014

### Location and Purpose:

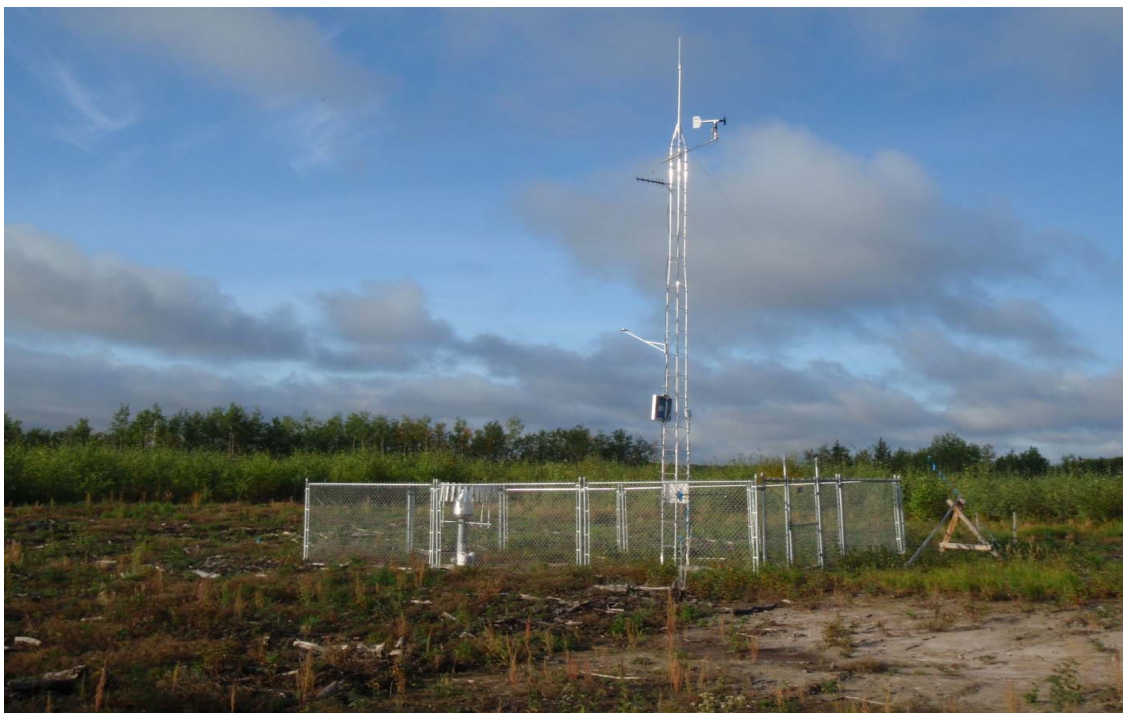
Established in October 2008 to monitor climate conditions in the Tar River basin.



Map Grid Based on UTM NAD 27

### Station Details

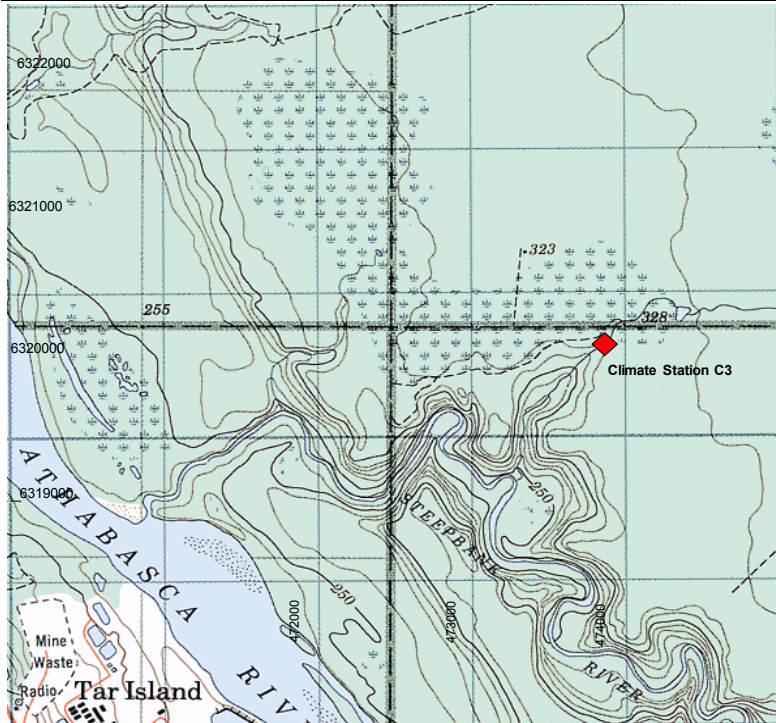
<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	October 1998 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	4WD truck via Canadian Natural Horizon
<b>UTM Coordinates:</b>	443364 E, 6360515 N (NAD83)
<b>Lat/Long:</b>	57°23'02" N, 111°56'31" W (NAD83)
<b>Station Elevation:</b>	412 m
<b>NTS Map:</b>	74E/05



Revised 24 March, 2014

### Location and Purpose:

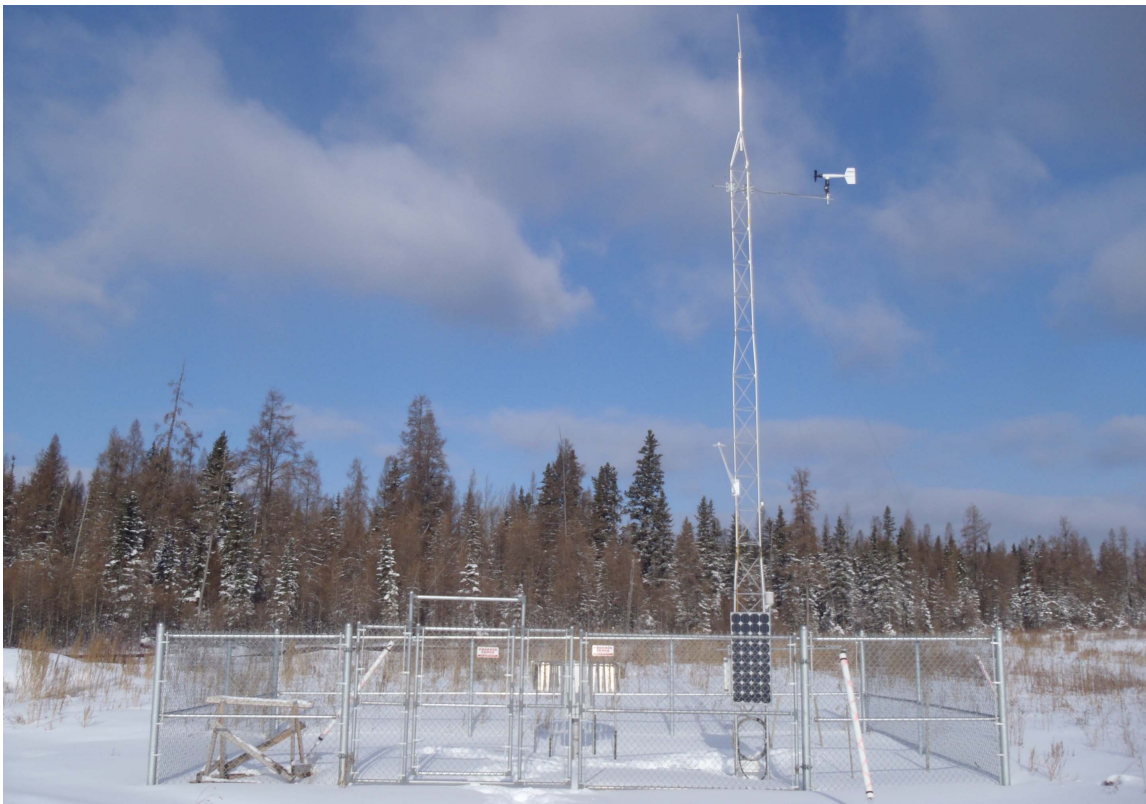
Established in August 2009 to monitor precipitation in the northwest Steepbank River area, and upgraded to a full climate station in November 2010.



Map Grid Based on UTM NAD 27

### Station Details

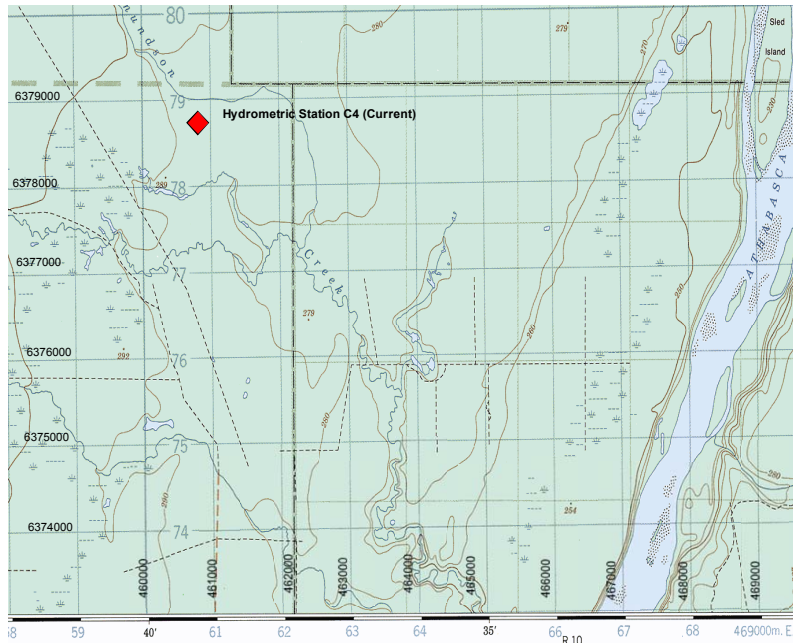
<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	August 2009 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	4WD truck via Suncor
<b>UTM Coordinates:</b>	473950 E, 6320500 N (NAD83)
<b>Lat/Long:</b>	57°01'38" N, 111°25'45" W (NAD83)
<b>Station Elevation:</b>	328 m
<b>NTS Map:</b>	74E/03



Revised 24 March, 2014

#### Location and Purpose:

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



Map Grid Based on UTM NAD 27

#### Station Details

##### 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:

291 m

##### NTS Map:

74E/12



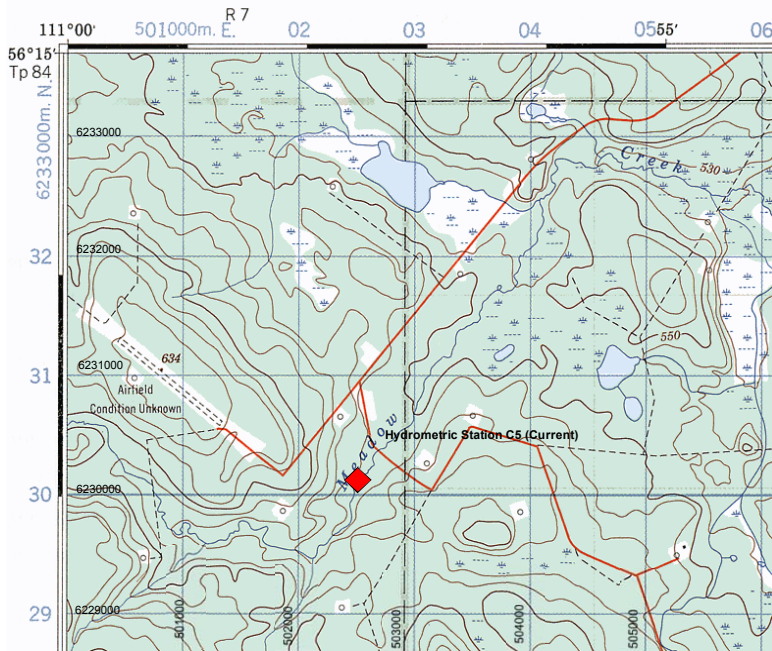
Revised 24 March, 2014

### Location and Purpose:

Established in October 2011 to monitor climate conditions between Fort McMurray and Christina Lake.

### Station Details

<b>Variables Measured:</b>	Air temperature, relative humidity, wind speed, wind direction, snow depth, precipitation, solar radiation, barometric pressure
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	October 2011 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Truck via Hwy 881 and Surmont Project
<b>UTM Coordinates:</b>	502542 E, 6230964 N (NAD83)
<b>Lat/Long:</b>	56°13'24" N, 110°57'32" W (NAD83)
<b>Station Elevation:</b>	555 m
<b>NTS Map:</b>	74D/02



Map Grid Based on UTM NAD 27



Revised February 23, 2015

**Location and Purpose:**

Established on the East side of McClelland Lake, 12 km North West of the Kearl project to monitor for Suncor Fort Hills EIA predictions.



Map Grid Based on UTM NAD 27



Looking North West across the lake from the station. June, 2013

**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:** 191 km<sup>2</sup>

**UTM Coordinates:** 483430 E, 6371950 N (NAD83)

**Lat/Long:** 57°29'30" N, 111°16'37" W (NAD83)

**NTS Map:** 74E/06

**Benchmark Information**

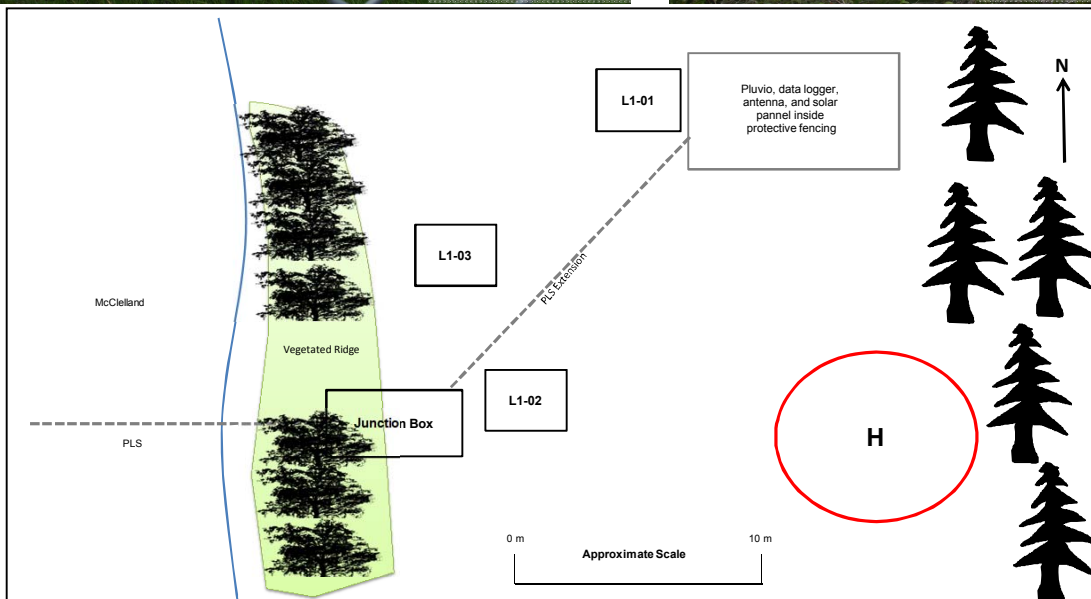
**BM1:** RAMP L1-01  
**Elevation:** 294.865 m  
**Basis:** Level survey RAMP L1-1  
**Location:** Next to Fence Enclosure  
**Description:** Iron Rod

**BM2:** RAMP L1-02  
**Elevation:** 295.051 m  
**Basis:** Level survey  
**Location:** 20m West of station  
**Description:** 3/4" Pipe

**BM3:** RAMP L1-03  
**Elevation:** 294.664  
**Basis:** Level survey RAMP L1-1  
**Location:** 10 m West of station  
**Description:** 3/4" Pipe



Looking North toward the Station near the junction box. August, 2013



**Location and Purpose:**

Established to monitor water levels in Kearl Lake, in order to assess potential effects of nearby oilsands activities and to aid in water balance calculations for the lake. Several climate variables are also measured to compliment data gathered at RAMP climate stations in the region.



Map Grid Based on UTM NAD 27



View across Kearl Lake at Station L2

**Station Details**

**Variables Measured:** Water Level, Water Temperature, Air Temperature, Precipitation, Relative Humidity

**Telemetry:** Cellular

**Period of Record:** May 1999 to Present

**Station Operation:** Year Round

**Access:** 2WD access via Canterra Road

**Relative Location:** Approx. 24 km SW (straight line) of Hwy 63 - East Athabasca Hwy intersection

**Drainage Area:** 71.6 km<sup>2</sup>

**UTM Coordinates:** 484839 E, 6351065 N (NAD83)

**Lat/Long:** 57°18'8.3" N, 111°15'5.8" W (NAD83)

**NTS Map:** 74E/06

**Benchmark Information**

**BM:** RAMP L2-03

**Elevation:** 332.417 m

**Basis:** Level Survey from L2-01

**Location:** South of lake access trail

**Description:** 3/4" Pipe with flagging

**BM:** RAMP L2-04

**Elevation:** 333.226 m

**Basis:** Level survey from L2-01

**Location:** South of lake access trail by previous Rebar BM

**Description:** 3/4" Pipe with coupling

**BM:** RAMP L2-05

**Elevation:** 332.812 m

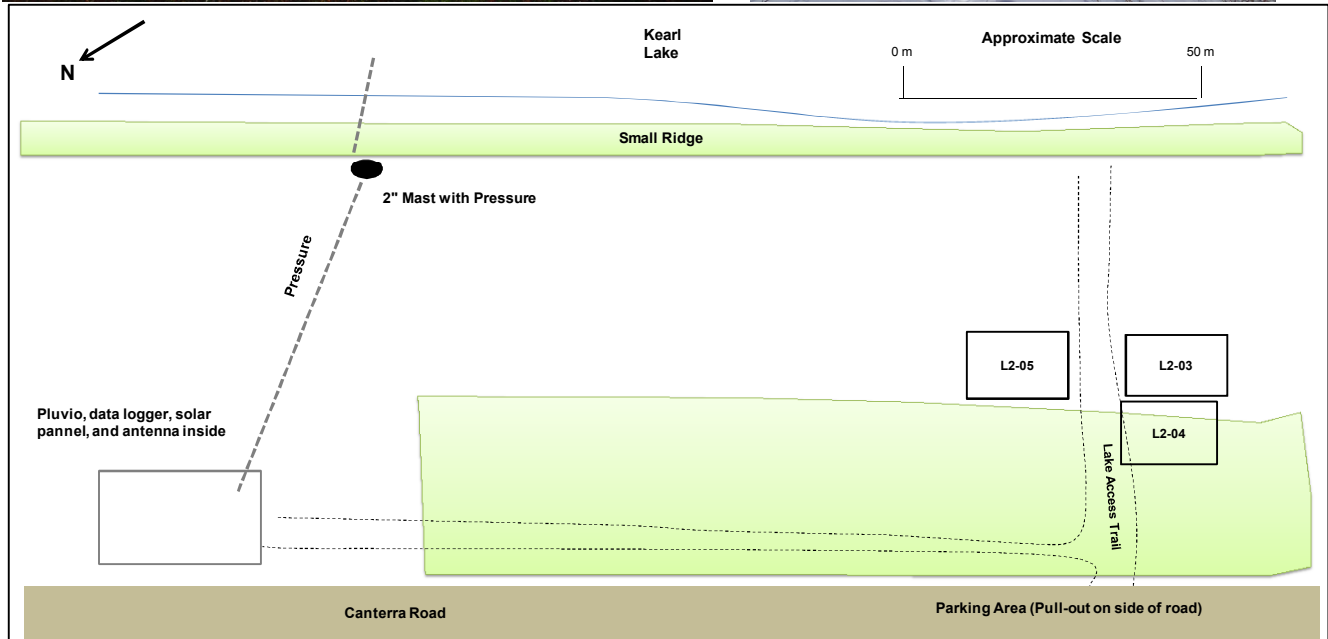
**Basis:** Level Survey from L2-01

**Location:** North of lake access trail

**Description:** 3/4" Pipe with flagging



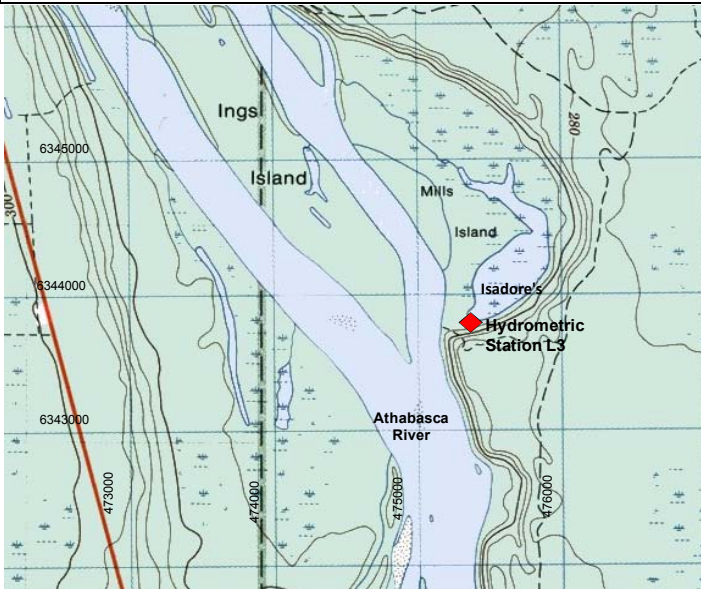
Equipment inside fencing at RAMP Lake Station L2, Kearl Lake



Revised 31 March, 2014

**Location and Purpose:**

Established to monitor water levels on Isadore's Lake, in order to assess the effects of nearby oilsands operations.



Map Grid Based on UTM NAD 27



View of the right shoreline of Isadore's Lake (RAMP L3)

**Station Details**

**Variables Measured:** Water level, Water Temperature  
**Telemetry:** Cellular  
**Period of Record:** February 2000 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Summer: Jet Boat via Athabasca River, footpath; Winter: Helicopter  
**Relative Location:** Approx. 2 km South of Hwy 63 - Sycrude Aurora Access intersection  
**Drainage Area:** 14.2 km<sup>2</sup>  
**UTM Coordinates:** 463305 E, 6342967 N (NAD83)  
**Lat/Long:** 57°13'42" N, 111°36'28" W (NAD83)  
**NTS Map:** 74E/04

**Benchmark Information**

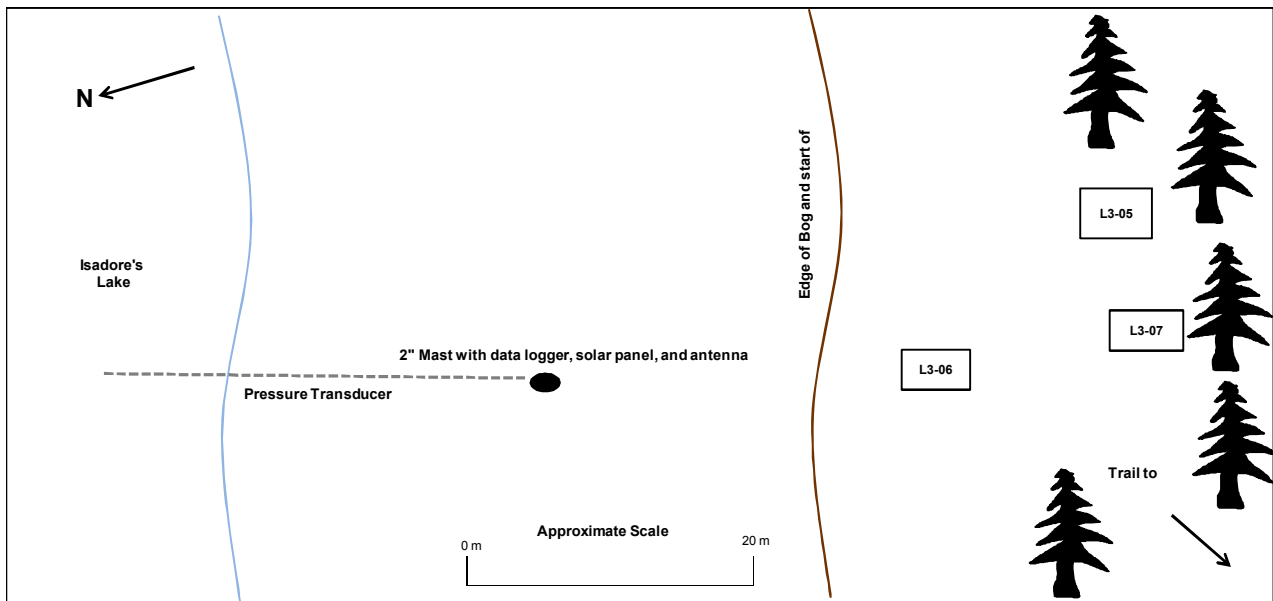
**BM:** RAMP L3-05  
**Elevation:** 235.537 m  
**Basis:** Level Survey from L3-02  
**Location:** 35 m SE of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP L3-06  
**Elevation:** 234.619 m  
**Basis:** Level Survey from L3-02  
**Location:** 30 m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP L3-07  
**Elevation:** 235.380 m  
**Basis:** Level Survey from L3-02  
**Location:** 35 m South of data logger  
**Description:** 3/4" Pipe with pink flagging



RAMP Lake Station L3, Isadore's Lake;  
 Foreground: BM L3-6 and 2" Pipe Equipment Mast  
 Background: View across Isadore's Lake

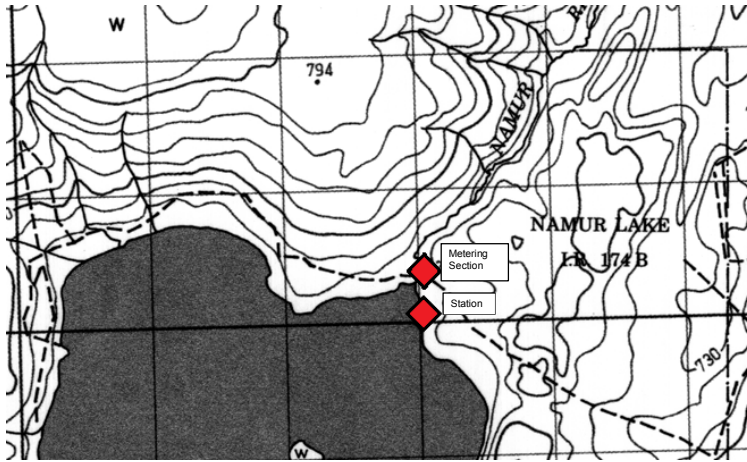




Revised February 23, 2015

**Location and Purpose:**

Established on the North-Eastern shore of Namur Lake. Located 300m South East of the outlet this station was established to monitor water levels and discharge from the Lake as part of the Joint Oilsands Monitoring Program.



Map Grid Based on UTM NAD 27



**Station Details**

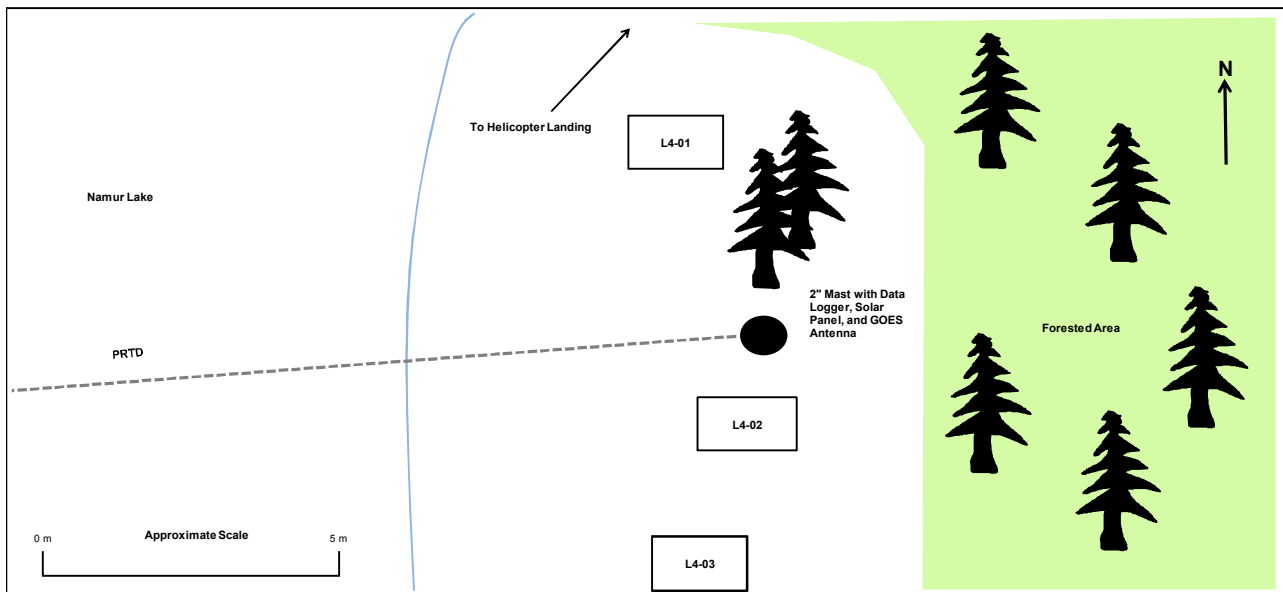
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES - 07DA909  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 164 km<sup>2</sup> (RAMP)  
**UTM Coordinates:** 402886 E, 6370260 N (NAD83)  
**Lat/Long:** 57°27'  
**NTS Map:** 84H/07

**Measurement Details**

**Channel:** The channel is approximately 7 m wide and it has trapezoidal edges. The substrate is made up of predominately sand. This river can be waded throughout most of the year. The lake is substrate is predominately cobble near the station.  
**Control:** Outlet of the lake acts as the control for this station.  
**Metering Section:** The metering section is located 20 m downstream from the outlet on the North end of the lake.

**Benchmark Information**

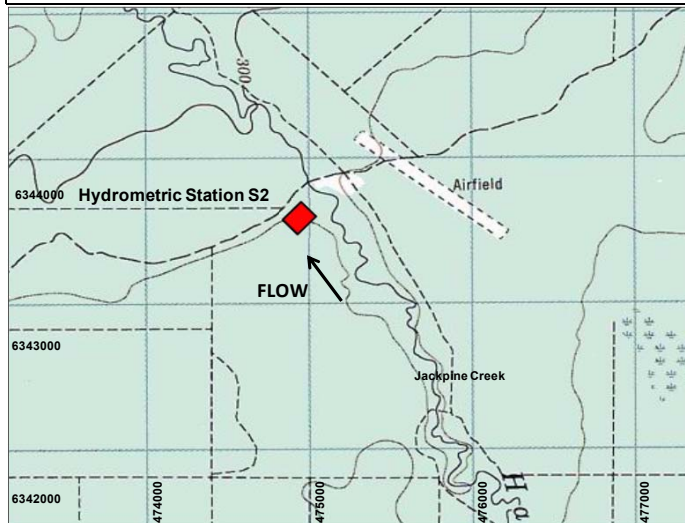
**BM:** RAMP L4-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 4 m North West of station  
**Description:** 3/4" Pipe  
**BM:** RAMP L4-02  
**Elevation:** 100.082 m  
**Basis:** Level Survey from RAMP L4-01  
**Location:** 5m South East of station  
**Description:** 3/4" Pipe  
**BM:** RAMP L4-03  
**Elevation:** 100.140 m  
**Basis:** Level Survey from RAMP L4-01  
**Location:** 2 m South East of station  
**Description:** 3/4" Pipe



Revised 23 February, 2015

#### Location and Purpose:

Established to monitor discharge on Jackpine Creek upstream of the Muskeg River. Replaced an Environment Canada hydrometric station (07DA009) that previously operated at the original site from 1975 to 1993. Station was moved to present location in 2000 to allow road access and avoid beaver dam activity.



Map Grid Based on UTM NAD 27



Upstream view of Jackpine Creek at RAMP hydrometric station S2

#### Station Details

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 1995 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via Shell Jackpine Mine  
**Relative Location:** Approx. 12 km SW of Hwy 63 - Shell MRM Access intersection  
**Drainage Area:** 342 km<sup>2</sup>  
**UTM Coordinates:** 474961 E, 6344087 N (NAD83)  
**Lat/Long:** 57°14'21" N, 111°24'53" W (NAD83)  
**NTS Map:** 74E/3

#### Measurement Details:

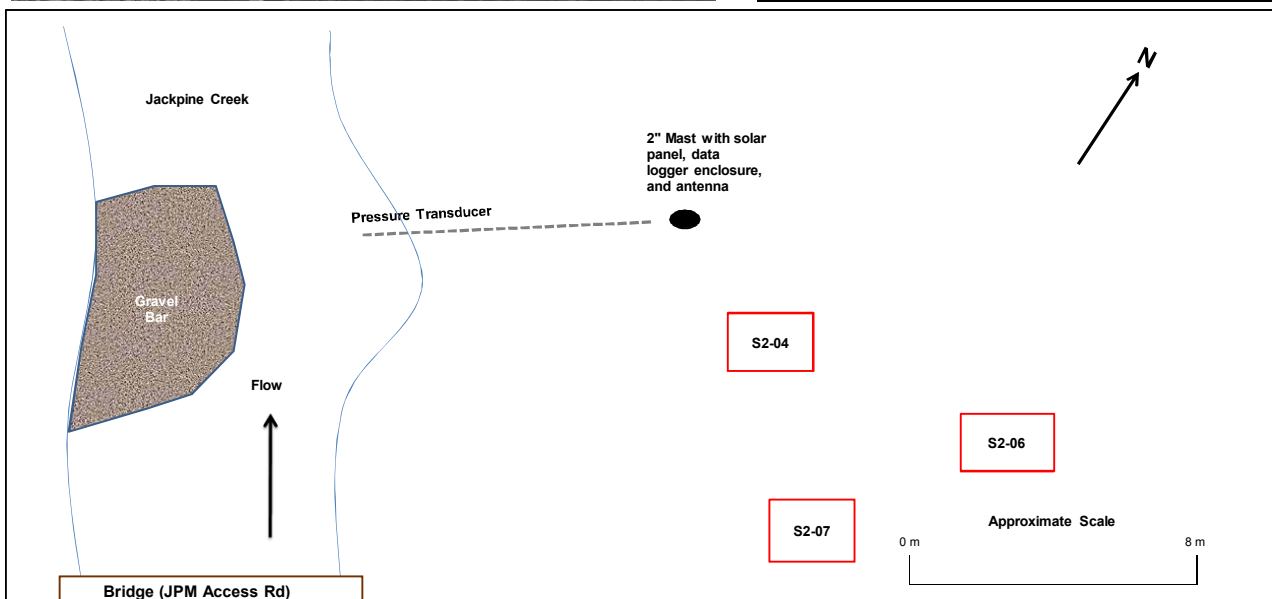
**Channel:** Trapezoidal channel edges, and approximately 10 m in width. Channel bed primarily made up of cobble, with subdominant sand.  
**Control:** A riffle approx. 20 m downstream of the station acts as the control  
**Metering Section:** The metering section is located approx. 10 m upstream of the station. Under most flow conditions, the channel can be waded, however during high water, due to fast flow and deep water, it may be necessary to use a kick boat or boat in order to perform a discharge measurement.

#### Benchmark Information

**BM:** RAMP S2-05  
**Elevation:** 297.670 m  
**Basis:** Level survey from S02-02  
**Location:** 3/4" pipe 5 metres south of logger  
**Description:** 3/4" Pipe

**BM:** RAMP S2-06  
**Elevation:** 298.420 m  
**Basis:** Level Survey from RAMP S2-04  
**Location:** 20m ESE of data logger  
**Description:** 3/4" Pipe

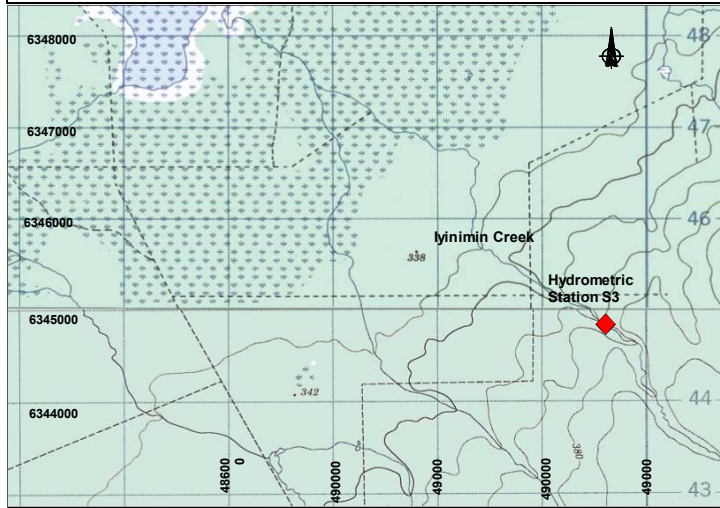
**BM:** RAMP S2-07  
**Elevation:** 298.432 m  
**Basis:** Level Survey from RAMP S2-06  
**Location:** 15 m SSE of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 23 February, 2015

### Location and Purpose:

Established to monitor discharge on Iyininim Creek upstream of Kearl Lake. This station was intended to characterize runoff from the North/West slopes of Muskeg Mountain and provide input to Kearl Lake water balance calculations. The station is located approx. 10 km (straight line) WNW of the intersection of the East Athabasca Hwy and Canterra Rd.



Map Grid Based on UTM NAD 27



RAMP Station S3, Iyininim Creek, cross-stream view

### Station Details

**Variables Measured:** Discharge, water level, water temperature, rainfall  
**Telemetry:** Cellular  
**Period of Record:** May 1995-Oct. 1999; May 2001-Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 39.3 km<sup>2</sup>  
**UTM Coordinates:** 489491 E, 6345029 N (NAD83)  
**Lat/Long:** 57° 15' 00" N, 111° 10' 27" W  
**NTS Map:** 74E/06

### Measurement Details:

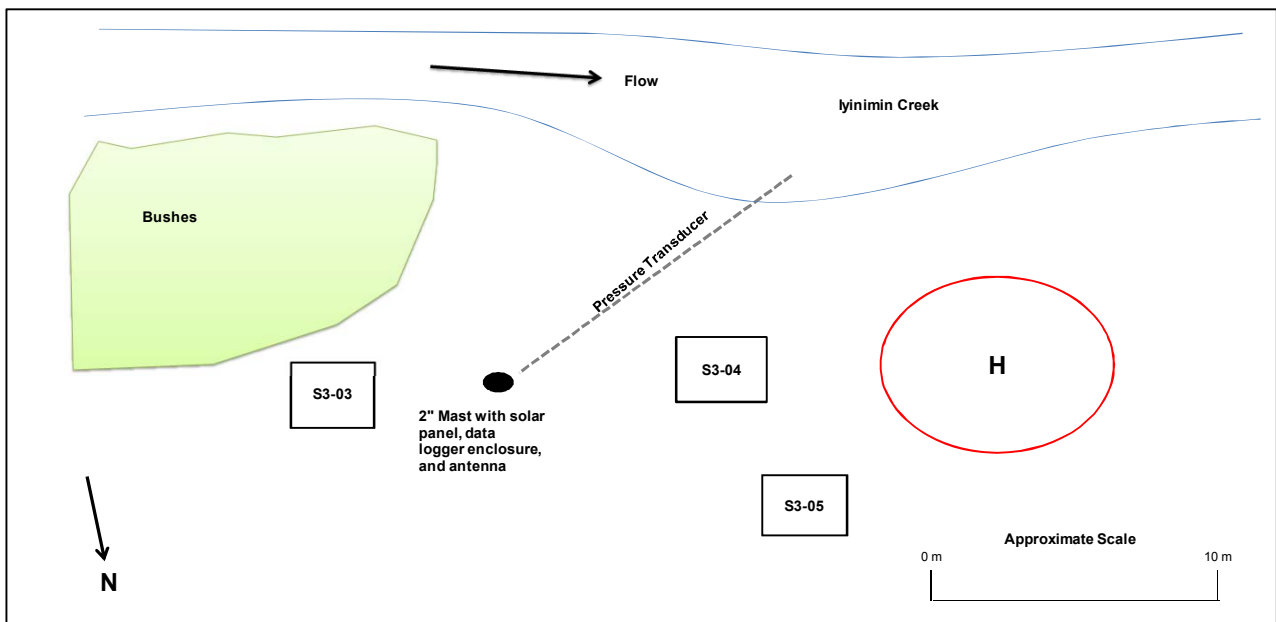
**Channel:** The channel is approx. 3 m wide with trapezoidal edges. The channel bed is composed mainly of silt, with some cobble-boulder sized rocks  
**Control:** A riffle, along with debris, located approx. 40 m downstream comprises the channel control  
**Metering Section:** Flow measured across from the station. During normal flow conditions the channel can be waded

### Benchmark Information

**BM:** RAMP S3-03  
**Elevation:** 361.382 m  
**Basis:** Level Survey from S3-02  
**Location:** 3 m East of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S3-04  
**Elevation:** 361.565 m  
**Basis:** Level Survey from RAMP S3-3  
**Location:** 5 m West of data logger  
**Description:** 3/4" Pipe with pink flagging

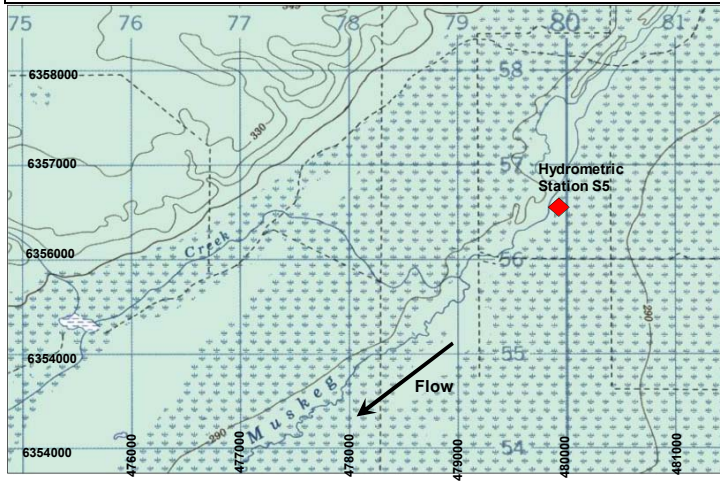
**BM:** RAMP S3-05  
**Elevation:** 361.588 m  
**Basis:** Level Survey from RAMP S3-3  
**Location:** 10 m NW of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 23 February, 2015

**Location and Purpose:**

Established to monitor discharge on the Muskeg River above disturbed watersheds. Decommissioned in 1996, station was reactivated in 2003 in accordance with regulatory monitoring of nearby oilsands operations. Station is located approx. 20 km NE of the Hwy 63 - Syncrude Aurora Access intersection.



Map Grid Based on UTM NAD 27



RAMP Station S5, Muskeg River Above Stanley Creek, view upstream of the station and the old stilling well

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** Aug 1995-Dec 1996, Feb 2003-Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 396 km<sup>2</sup>  
**UTM Coordinates:** 479760 E, 6356755 N (NAD83)  
**Lat/Long:** 57°21'11" N, 111°20'10" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details:**

**Channel:** Channel is approx. 10 m wide, with relatively straight edges. Channel bed composed mainly of silt/organics.

**Control:** The channel acts as the primary control.

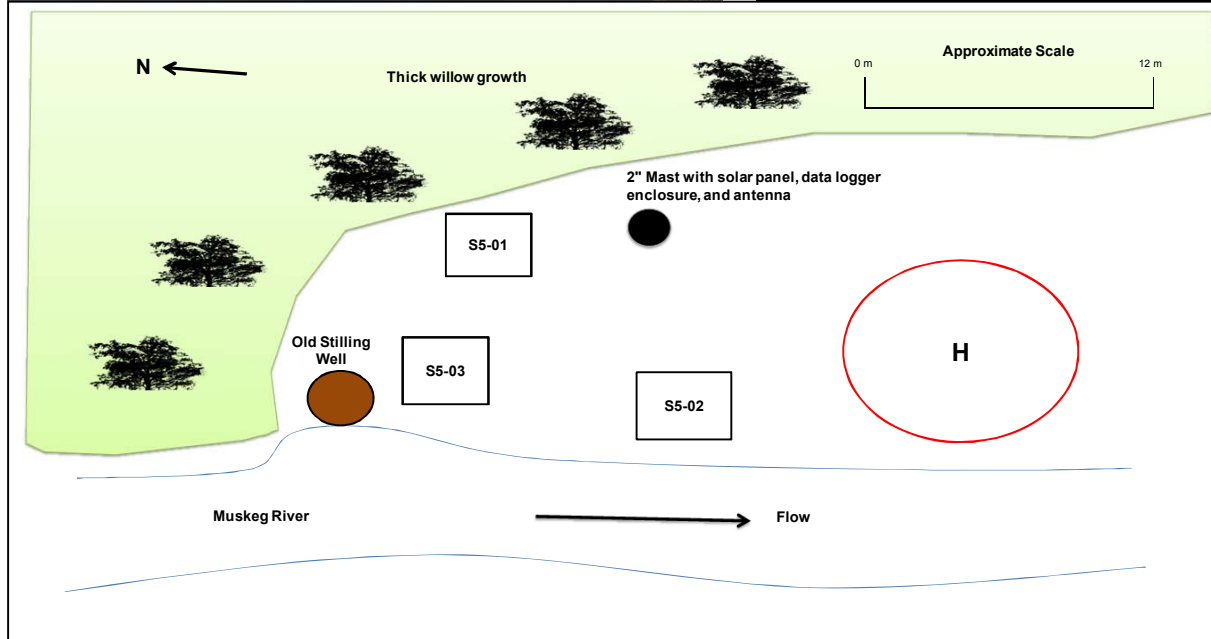
**Metering Section:** Flow measurements are conducted about 10 m downstream of the station, near the helicopter landing area. A kick-boat is needed during all water levels to measure flow, due to deep water.

**Benchmark Information**

**BM:** RAMP S5-01  
**Elevation:** 98.369 m  
**Basis:** Level survey from S5-03  
**Location:** 4 m North of data logger  
**Description:** Old 3/4" Pipe

**BM:** RAMP S5-02  
**Elevation:** 98.516 m  
**Basis:** Level Survey from RAMP S5-01  
**Location:** 8 m SW of data logger  
**Description:** 3/4" Pipe with pink flagging

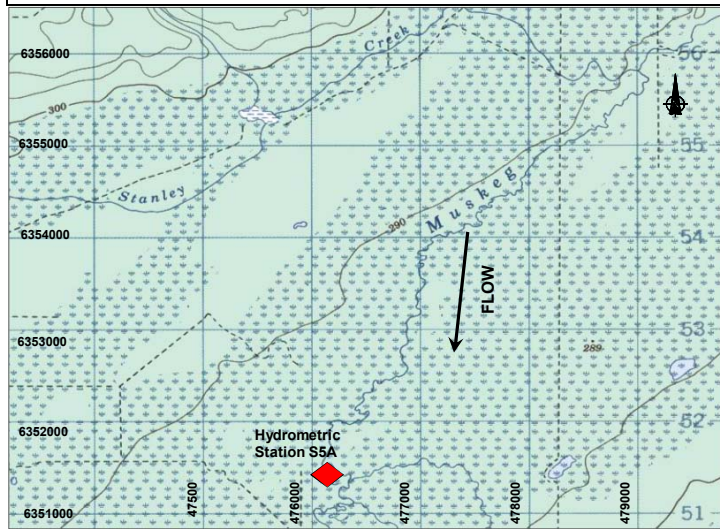
**BM:** RAMP S5-3  
**Elevation:** 98.400 m  
**Basis:** Unknown  
**Location:** Close to old stilling well  
**Description:** T-Post



Revised 23 February, 2015

### Location and Purpose:

Established to monitor discharge on the Muskeg River upstream of disturbed watersheds. The station was relocated in 1998 to allow road access, and is approximately 14 km ENE of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Looking downstream from Station S5A

### Station Details

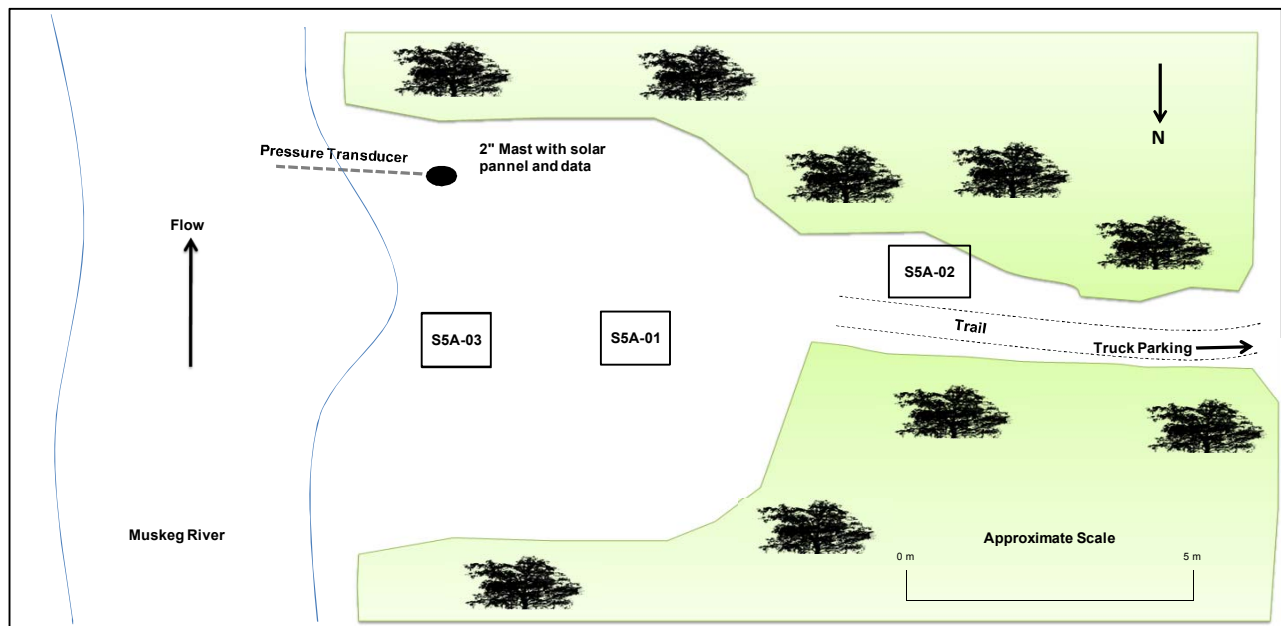
<b>Variables Measured:</b>	Discharge, water level, water temperature, barometric pressure
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	August 1995 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	2WD road via the Syncrude Aurora Mine
<b>Drainage Area:</b>	521 km <sup>2</sup>
<b>UTM Coordinates:</b>	476100 E, 6351600 N (NAD83)
<b>Lat/Long:</b>	57°18'30" N, 111°23'43" W (NAD83)
<b>NTS Map:</b>	74E/06

### Measurement Details:

<b>Channel:</b>	The channel is approx. 14 m wide and has relatively straight edges. The dominant bed material is silt, with layers of organics and woody debris present.
<b>Control:</b>	The channel morphology serves as the hydrologic control
<b>Metering Section:</b>	The metering section is located adjacent to the station, and a kick-boat is required to perform discharge measurements, due to deep water.

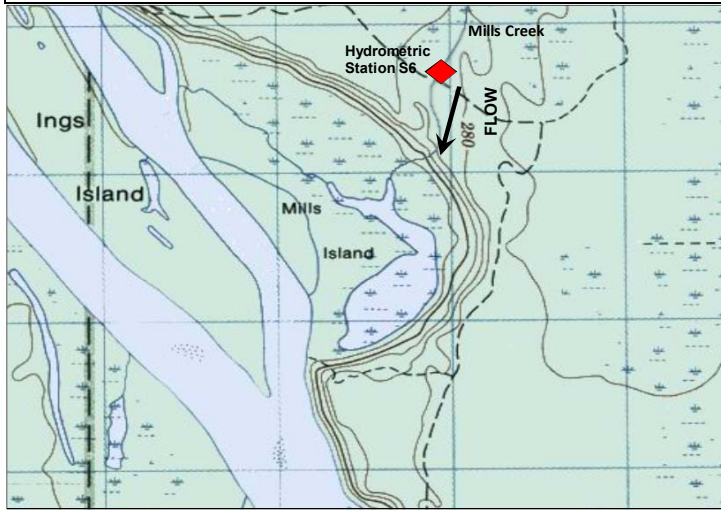
### Benchmark Information

<b>BM:</b>	RAMP S5A-01
<b>Elevation:</b>	282.697 m
<b>Basis:</b>	Geodetic survey
<b>Location:</b>	4 m NW of data logger
<b>Description:</b>	T-Post
<b>BM:</b>	RAMP S5A-02
<b>Elevation:</b>	282.159 m
<b>Basis:</b>	Level Survey from S5A-01
<b>Location:</b>	10 m West of data logger
<b>Description:</b>	3/4" Pipe with pink flagging
<b>BM:</b>	RAMP S5A-03
<b>Elevation:</b>	282.352 m
<b>Basis:</b>	Level Survey from RAMP S5A-01
<b>Location:</b>	3 m North of data logger
<b>Description:</b>	3/4" Pipe with pink flagging



**Location and Purpose:**

Established to monitor discharge on Mills Creek, downstream of the Mills Creek fen, to provide insight into water quality affects on Isadore's Lake. The original plywood and timber pile V-notch weir was replaced with steel piles and a sheet steel weir in October 2005. The station is located 500m SE of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



V-notch weir at Station S6, looking upstream at Mills Creek

**Station Details**

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

**Measurement Details:**

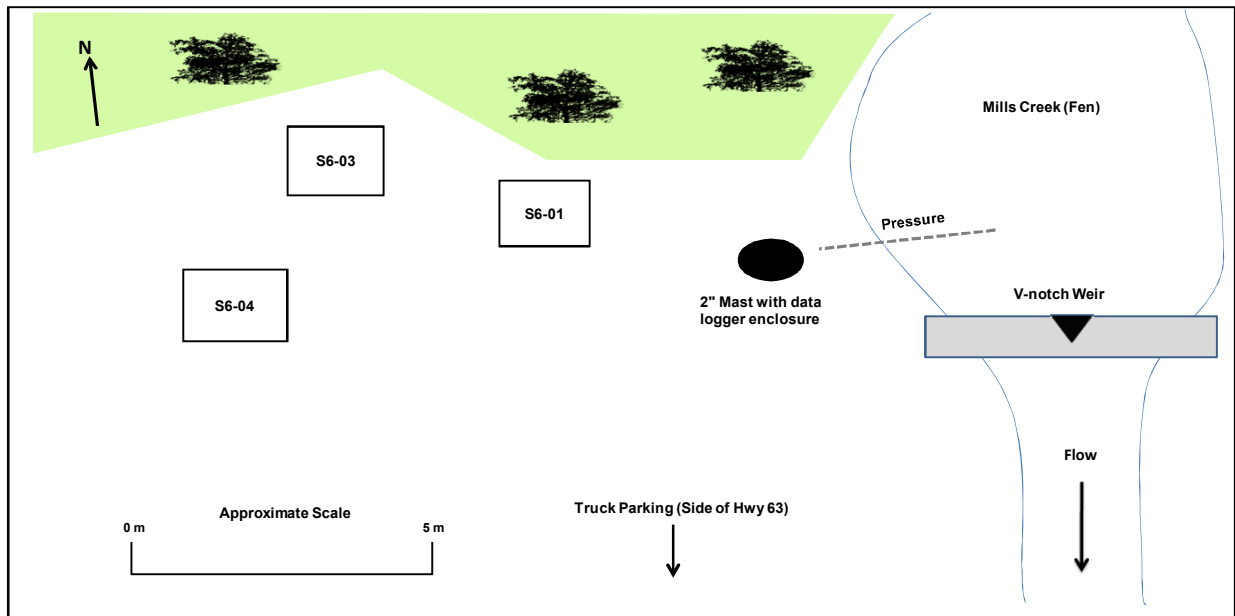
**Channel:** The channel is approx. 1 m wide and very shallow, with trapezoidal edges. The bed substrate is comprised of cobbles.  
**Control:** The v-notch weir (weir equation does not apply) provides majority of control.  
**Metering Section:** The metering section is located 3 m downstream of the weir, and the channel can be waded at all water levels.

**Benchmark Information**

**BM:** RAMP S6-01  
**Elevation:** 273.541 m  
**Basis:** Survey date unknown  
**Location:** 4 m NW of data logger  
**Description:** Rebar in white PVC

**BM:** RAMP S6-03  
**Elevation:** 274.105 m  
**Basis:** Level Survey from RAMP S6-01  
**Location:** 6 m NW of data logger  
**Description:** 3/4" Pipe with pink flagging

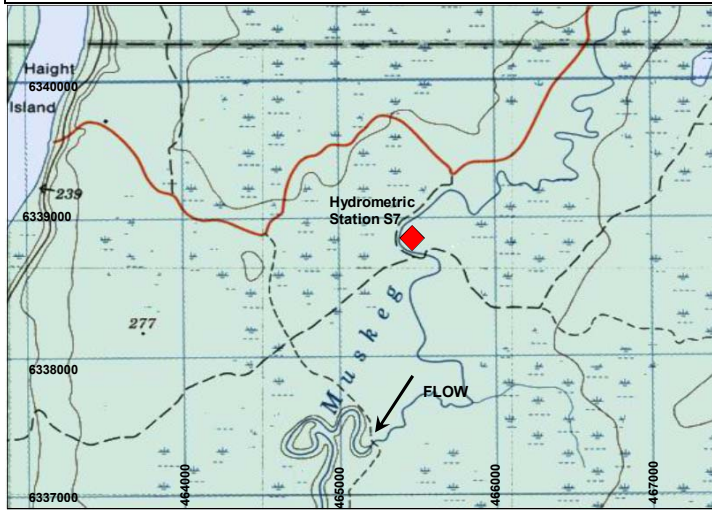
**BM:** RAMP S6-04  
**Elevation:** 274.113 m  
**Basis:** Level Survey from RAMP S6-01  
**Location:** 7 m West of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 23 February, 2015

### Location and Purpose:

Established to monitor winter discharge on the Muskeg River near Water Survey of Canada hydrometric station 07DA008. The WSC hydrometric station has operated since 1975 but discharges are only published for the March-October period. The station is located 1.4 km ESE of the Hwy 63 - MRM Access intersection.



Map Grid Based on UTM NAD 27



Looking downstream on the Muskeg River at Station S7

### Station Details

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** October 1999 to 2013  
**Station Operation:** Year Round  
**Access:** 2WD access via Canterra Road (gravel)  
**Drainage Area:** 1457 km<sup>2</sup>  
**UTM Coordinates:** 465408 E, 6338944 N (NAD83)  
**Lat/Long:** 57°11'32" N, 111°34'21" W (NAD83)  
**NTS Map:** 74E/04

### Measurement Details

**Channel:** The channel is approximately 20 m wide with trapezoidal edges. The channel bed is comprised of dominantly silt.

**Control:** A riffle located approx. 20 m downstream of the station provides hydrologic control.

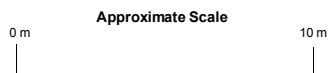
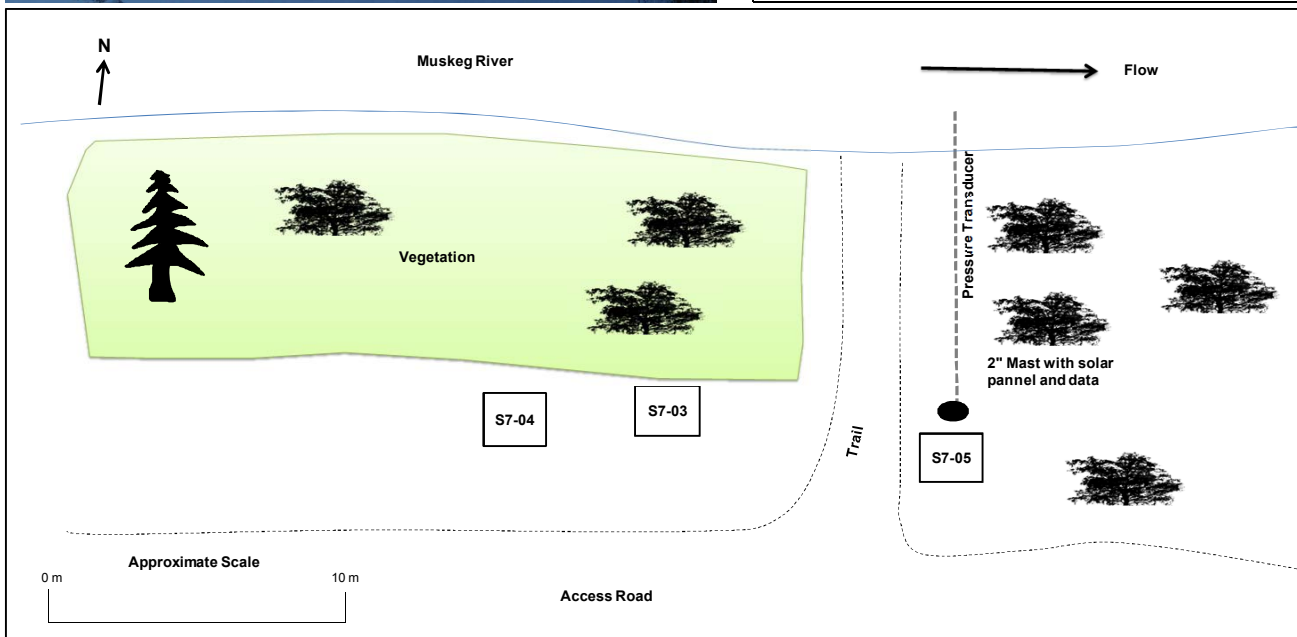
**Metering Section:** The metering section is located adjacent to the station. The channel can be waded under normal flow conditions, or with the aid of a kick-boat at higher water levels.

### Benchmark Information

**BM:** RAMP S7-03  
**Elevation:** 275.498 m  
**Basis:** Level Survey from S7-01  
**Location:** 8 m West of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S7-04  
**Elevation:** 274.826 m  
**Basis:** Level Survey from RAMP S7-03  
**Location:** 10 m West of data logger  
**Description:** 3/4" Pipe with pink flagging

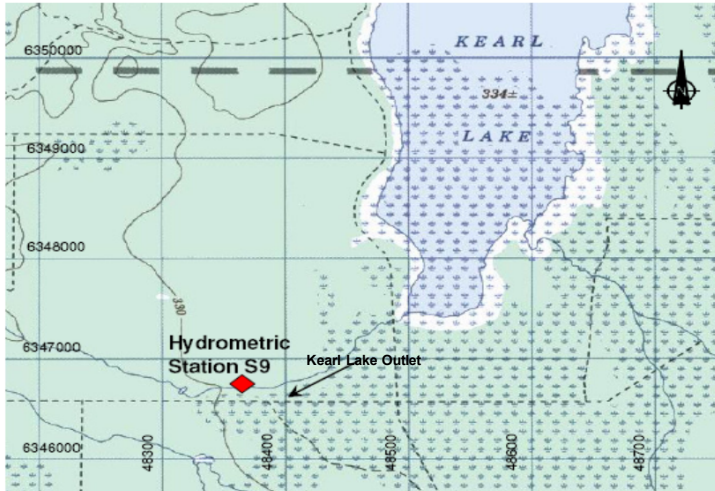
**BM:** RAMP S7-05  
**Elevation:** 275.208 m  
**Basis:** Level Survey from RAMP S7-03  
**Location:** 2 m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 23 February, 2015

**Location and Purpose:**

Established to monitor discharge on the Kearl Lake Outlet channel to provide data for the Kearl Lake water balance and to assess the effects of development on the lake. The station was relocated approximately 50m downstream in November 2005 to avoid the influence of beaver dams. The station is located approximately 15 km (straight line) NW of the Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Downstream view of RAMP Hydrometric Station S9, Kearl Lake Outlet

**Station Details**

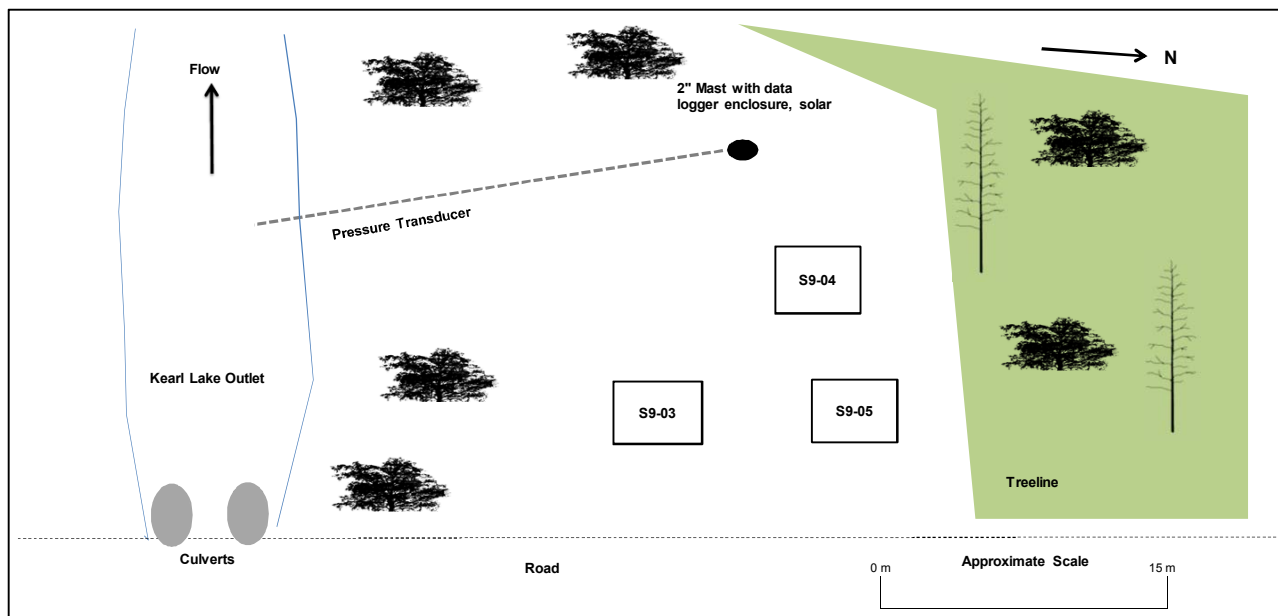
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2000-Oct. 2002, Apr. 2006-Present  
**Station Operation:** Year Round  
**Access:** 4WD road access  
**Drainage Area:** 76.5 km<sup>2</sup>  
**UTM Coordinates:** 483962 E, 6346990 N (NAD83)  
**Lat/Long:** 57°15'56.38" N, 111°15'57.27" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details**

**Channel:** The channel is approx. 7 m wide with trapezoidal edges. The bed material is dominantly silt and organics.  
**Control:** Downstream beaver activity provides the hydrologic control on this channel reach.  
**Metering Section:** Flow is measured adjacent to the station. The channel can be waded under normal flow conditions.

**Benchmark Information**

**BM:** RAMP S9-03  
**Elevation:** 330.294 m  
**Basis:** Level Survey from RAMP S9-04  
**Location:** 10 m East of data logger  
**Description:** 3/4" Pipe with pink flagging  
**BM:** RAMP S9-04  
**Elevation:** 330.299 m  
**Basis:** Level Survey from previous BM: RAMP S9-01  
**Location:** 6 m NE of data logger  
**Description:** 3/4" Pipe with pink flagging  
**BM:** RAMP S9-05  
**Elevation:** 330.635 m  
**Basis:** Level Survey from previous BM: RAMP S9-01  
**Location:** 10 m NE of data logger  
**Description:** 3/4" Pipe with pink flagging

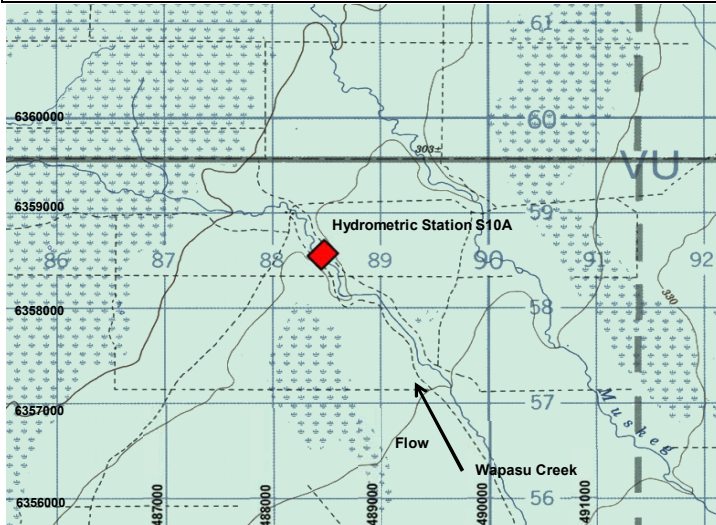




Revised 23 February, 2015

### Location and Purpose:

Established to measure discharge on Wapasu Creek upstream of the Muskeg River to monitor effects of nearby oilsands activity. Extensive beaver activity since 2009 has flooded most of the area around hydrometric station S10. As a result, in August 2012 the station was relocated (from 490350 m E 6355500 m N) approximately 3 km downstream. Located approx. 20 km NW of the East Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAL 27



Upstream view of Wapasu Creek at Station S10A

### Station Details

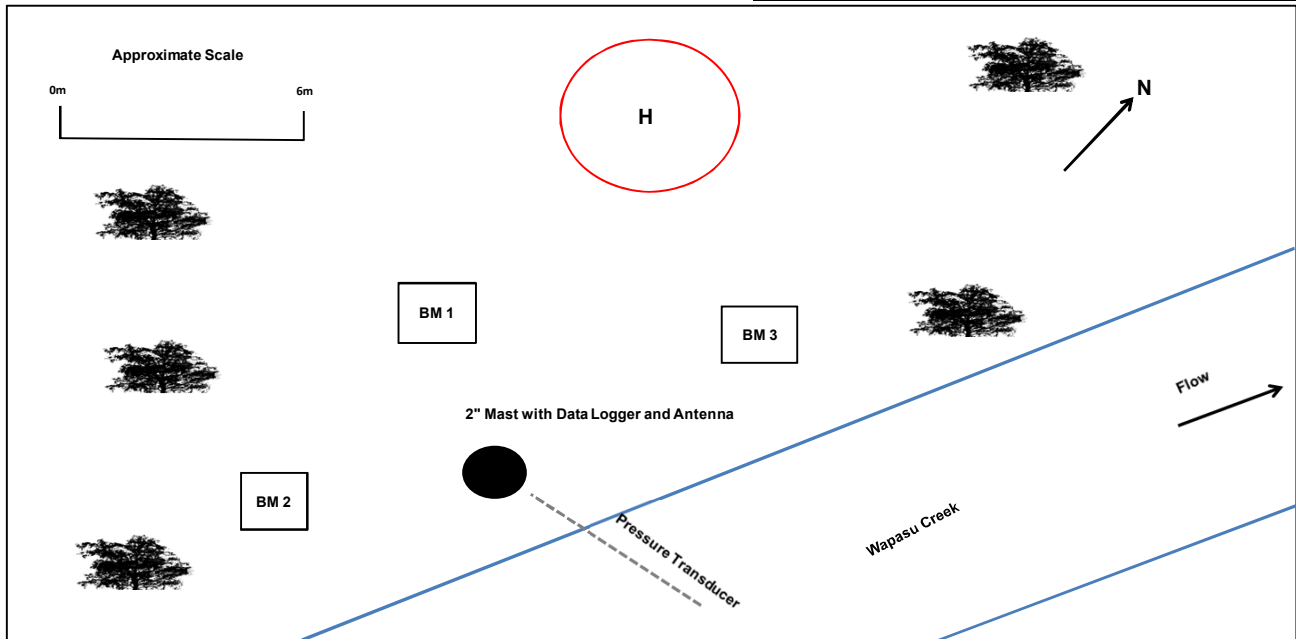
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	Mar 1998-Oct 1999; May 2001-Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	101 km <sup>2</sup>
<b>UTM Coordinates:</b>	488573 m E, 6358554 m N (NAD83)
<b>Lat/Long:</b>	57°22'11"N, 111°11'24"W (NAD83)
<b>NTS Map:</b>	74E/06

### Measurement Details

<b>Channel:</b>	The channel is approx. 6 m wide, with trapezoidal edges. The bed material is composed of a mixture of cobble and sand.
<b>Control:</b>	A riffle located approx. 30 m downstream serves as the hydrologic control for this reach.
<b>Metering Section:</b>	The metering section is located adjacent to the station. The channel can be waded under normal flow conditions.

### Benchmark Information

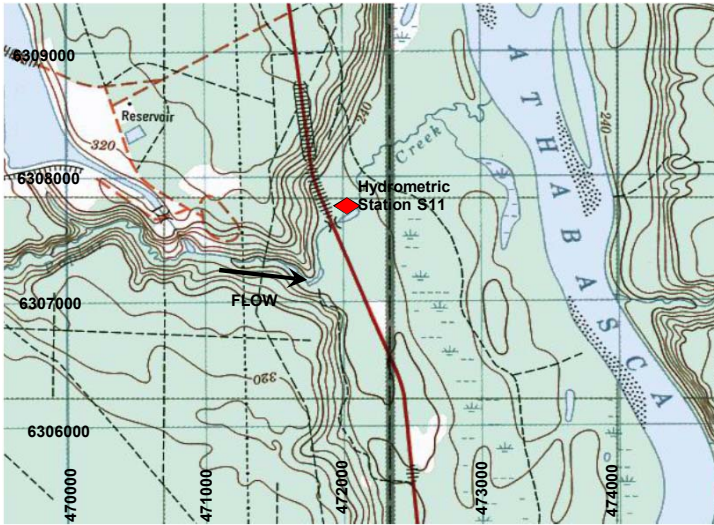
<b>BM:</b>	RAMP S10A-01
<b>Elevation:</b>	100.240 m
<b>Basis:</b>	Level Survey from RAMP S10A-02
<b>Location:</b>	5 m NW of data logger
<b>Description:</b>	3/4" Pipe with pink flagging
<b>BM:</b>	RAMP S10A-02
<b>Elevation:</b>	100.000 m
<b>Basis:</b>	Assumed
<b>Location:</b>	5 m West of data logger
<b>Description:</b>	3/4" Pipe with pink flagging
<b>BM:</b>	RAMP S10A-03
<b>Elevation:</b>	100.136 m
<b>Basis:</b>	Level Survey from RAMP S10A-02
<b>Location:</b>	6 m North of data logger
<b>Description:</b>	3/4" Pipe with pink flagging



Revised 23 February, 2015

### Location and Purpose:

Established to monitor discharge on Poplar Creek upstream of the Athabasca River. The station is located 50 m downstream of the bridge at Hwy 63. Water Survey of Canada station (07DA007) operated in this general location from 1973 to 1986. The rationale for this station is to extend the measurement record of WSC station 07DA007.



Map Grid Based on UTM NAD 27



RAMP Hydrometric Station S11, Poplar Creek at Hwy 63

### Station Details

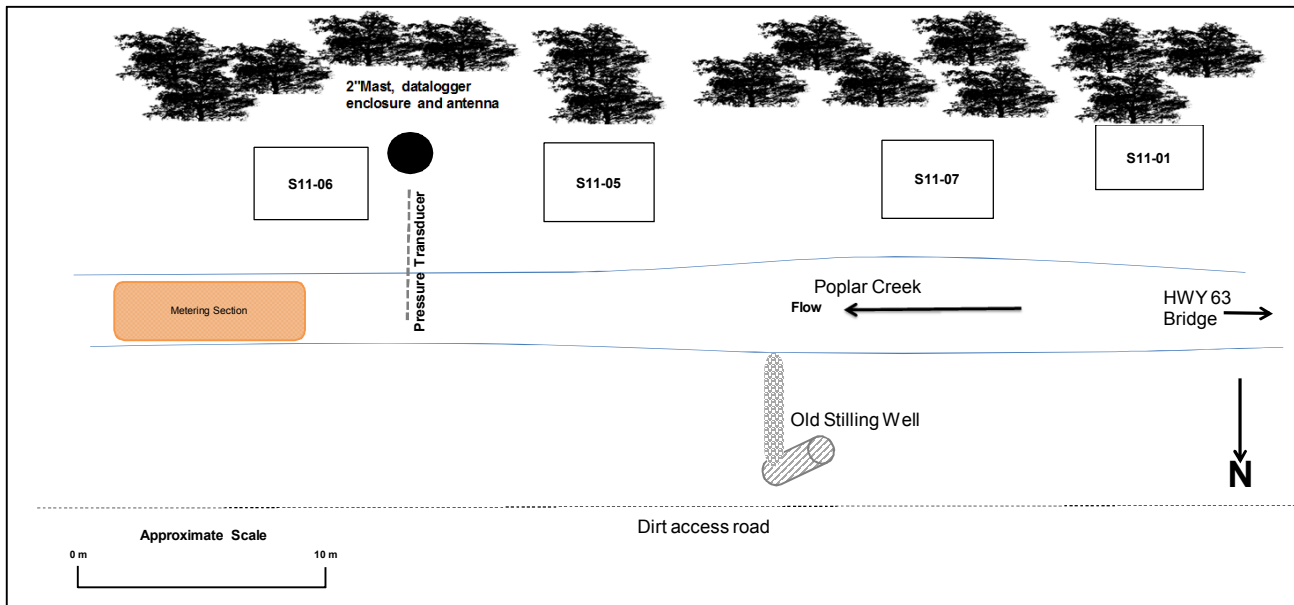
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Period of Record:</b>	May 1997 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Seasonal dirt road off Hwy 63
<b>Drainage Area:</b>	151 km <sup>2</sup> (WSC)
<b>UTM Coordinates:</b>	472000 E, 6307650 N (NAD83)
<b>Lat/Long:</b>	56°54'46" N, 111°27'44" W (NAD83)
<b>NTS Map:</b>	74D/14

### Measurement Details

<b>Channel</b>	The channel is a straight reach 7 m wide, the substrate is made up almost entirely of cobbles.
<b>Control</b>	The site is located 5 m downstream of a riffle with an additional riffle acting as a control 40 m downstream.
<b>Metering Section</b>	Measurements are conducted by wading across the river 5 m downstream of the station.

### Benchmark Information

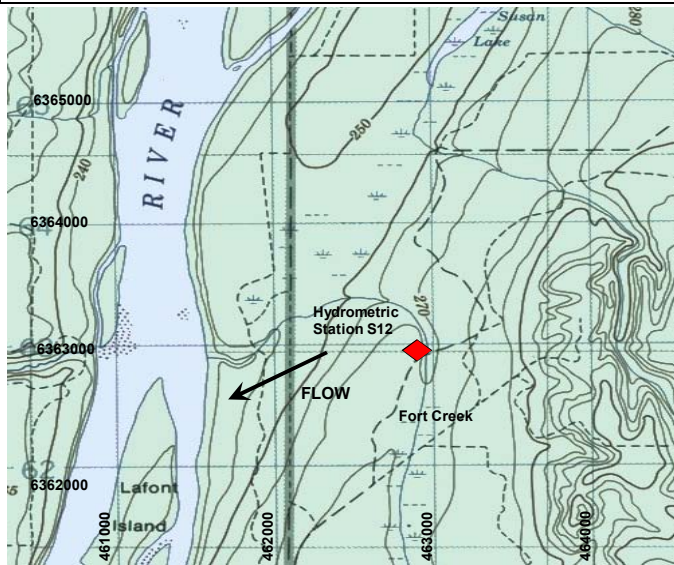
<b>BM:</b>	RAMP S11-01
<b>Elevation:</b>	242.081 m
<b>Basis:</b>	Level survey from decommissioned BM
<b>Location:</b>	On Right Bank, 30 m Upstream from logger
<b>Description:</b>	ASCM marker, square pin next to orange stake
<b>BM:</b>	RAMP S11-05
<b>Elevation:</b>	242.212 m
<b>Basis:</b>	Level Survey from RAMP S11-01
<b>Location:</b>	7 m W of datalogger
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S11-06
<b>Elevation:</b>	242.579 m
<b>Basis:</b>	Level Survey from RAMP S11-01
<b>Location:</b>	3 m E of datalogger
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S11-07
<b>Elevation:</b>	242.100 m
<b>Basis:</b>	Level Survey from RAMP S11-01
<b>Location:</b>	12 m W of datalogger
<b>Description:</b>	3/4" Pipe



Revised 23 February, 2015

### 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 50 m downstream due to road construction. The station is located approx. 18 km North of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Downstream view of Fort Creek and Highway culvert, at Station S12

### Station Details

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2000-Oct. 2002; Apr 2006-Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road access via Hwy 63 extension  
**Drainage Area:** 63.8 km<sup>2</sup>  
**UTM Coordinates:** 462600 E, 6363400 N (NAD83)  
**Lat/Long:** 57°24'48" N, 111°37'18" W (NAD83)  
**NTS Map:** 74E/05

### Measurement Details

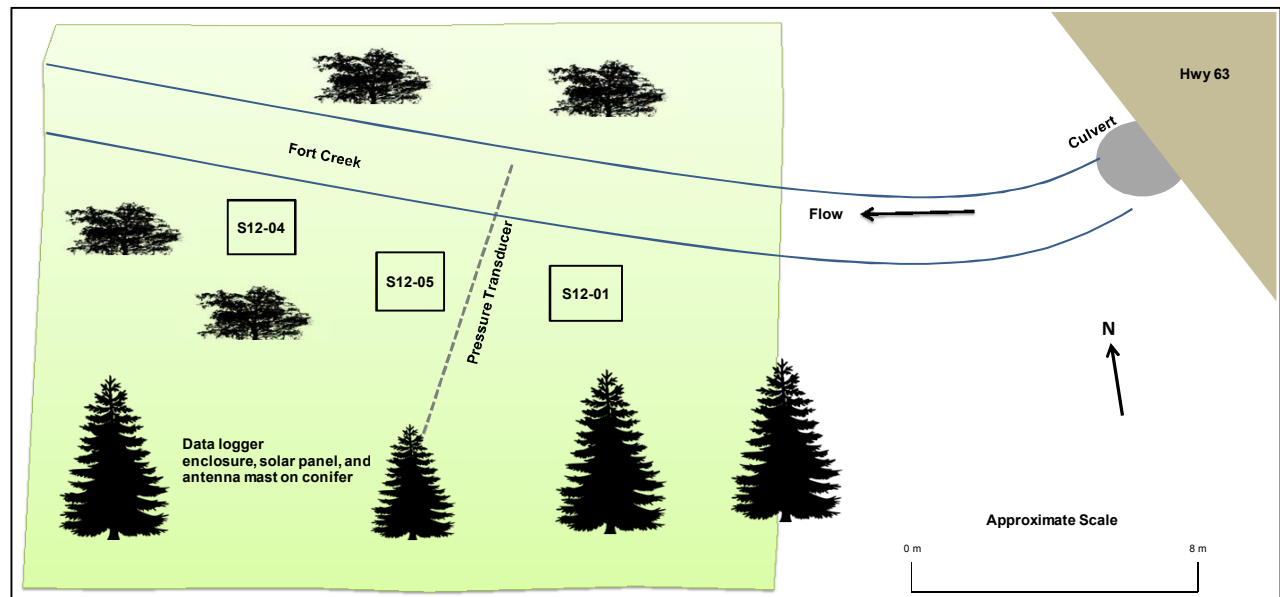
**Channel:** The channel is approx. 2 m wide with trapezoidal edges. The dominant bed substrate is cobble, with subdominant sand.  
**Control:** A riffle located approx. 5 m downstream provides the hydrologic control for this stream reach.  
**Metering Section:** The metering section is located 5 m downstream of the station and can be waded at all water levels.

### Benchmark Information

**BM:** RAMP S12-01  
**Elevation:** 98.729 m  
**Basis:** Assumed  
**Location:** 5 m Upstream of logger on Left Bank  
**Description:** T-Post

**BM:** RAMP S12-04  
**Elevation:** 99.093 m  
**Basis:** Level Survey from RAMP S12-01  
**Location:** 10 m NW of data logger  
**Description:** 3/4" Pipe with flagging

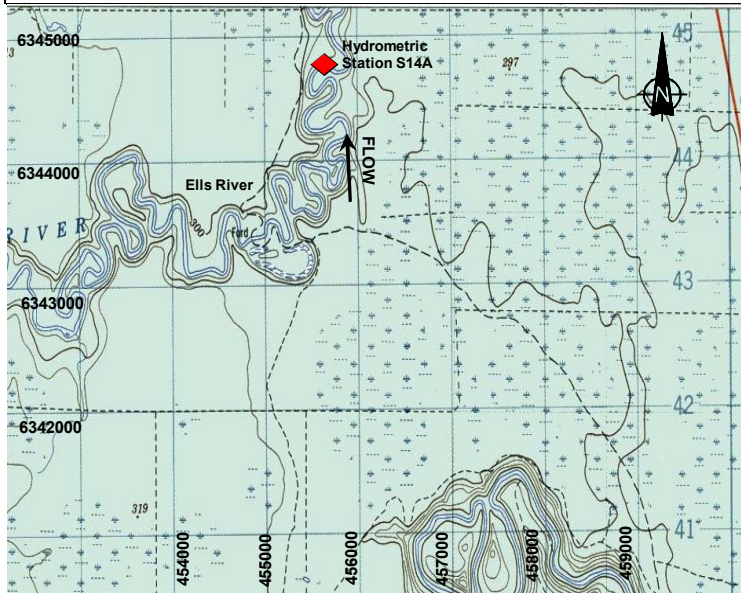
**BM:** RAMP S12-05  
**Elevation:** 99.058 m  
**Basis:** Level Survey from RAMP S12-01  
**Location:** 8 m North of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 23 February, 2015

### Location and Purpose:

Established in 2001 to monitor discharge in the vicinity of the inactive WSC station 07DA017. Replaced by station S14A in 2004 to utilize road access. Located 50 m upstream from the bridge that crosses the Ells river on the Canadian Natural highway.



Map Grid Based on UTM NAD 27



Looking Upstream 20 m North East of the station. August, 2013.

### Station Details

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

### Measurement Details

**Channel:** The Channel is approximately 27 m wide and made up of cobble and sand substrate. It can be waded at low water levels, otherwise a belly boat is required.

**Control:** A riffle downstream acts as the control for this station.

**Metering Section:** The metering section is located 15 m downstream from the station on a straight reach of the river. The banks are well defined on both sides

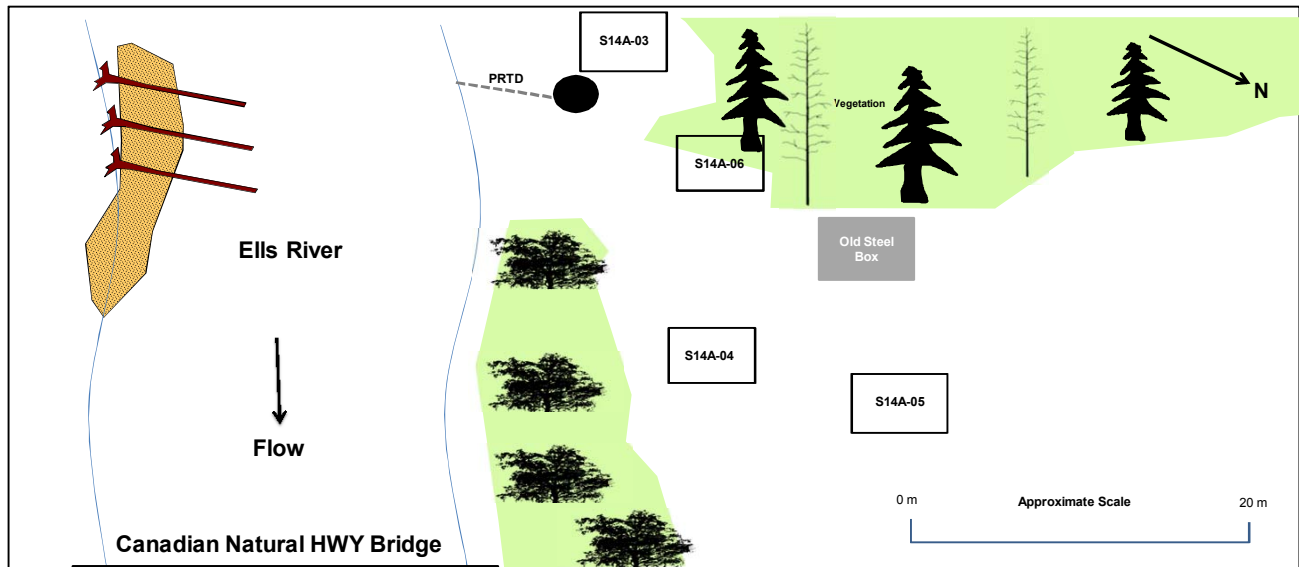
### Benchmark Information

**BM:** RAMP S14A-03  
**Elevation:** 100.053  
**Basis:** Level survey based on S14A-01  
**Location:** 3 m South West of station  
**Description:** 3/4" Pipe

**BM:** RAMP S14A-04  
**Elevation:** 100.407  
**Basis:** Level survey based on RAMP S14A-03  
**Location:** 5 m South East of station  
**Description:** 3/4" Pipe

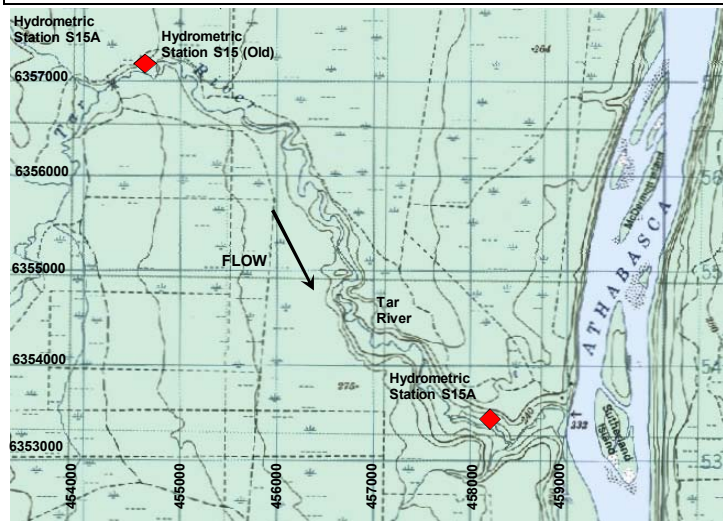
**BM:** RAMP S14A-05  
**Elevation:** 100.654  
**Basis:** Level survey based on RAMP S14A-03  
**Location:** 5 m North East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S14A-06  
**Elevation:** 99.935  
**Basis:** Level survey based on RAMP S14A-03  
**Location:** Lg Bolt in old logger tree  
**Description:** 3/4" Pipe



### Location and Purpose:

Established on May 1, 2007 to replace station S15 which had poor hydraulic conditions. The purpose of the station is to monitor for Canadian Natural EIA predictions by monitoring discharge and water level on the Tar River below development where flow is diverted out of the channel by Canadian Natural. Located 16km North of Fort McKay.



Map Grid Based on UTM NAD 27



### Station Details

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

### Measurement Details

**Channel:** The channel is approximately 7m wide and it has trapezoidal edges. The substrate is made up of predominately silt and sand. This station can be waded throughout most of the open water season.

**Control:** This river is controlled by the channel morphology at this station. During periods of high water in the Athabasca River this station can be effected by backwater.

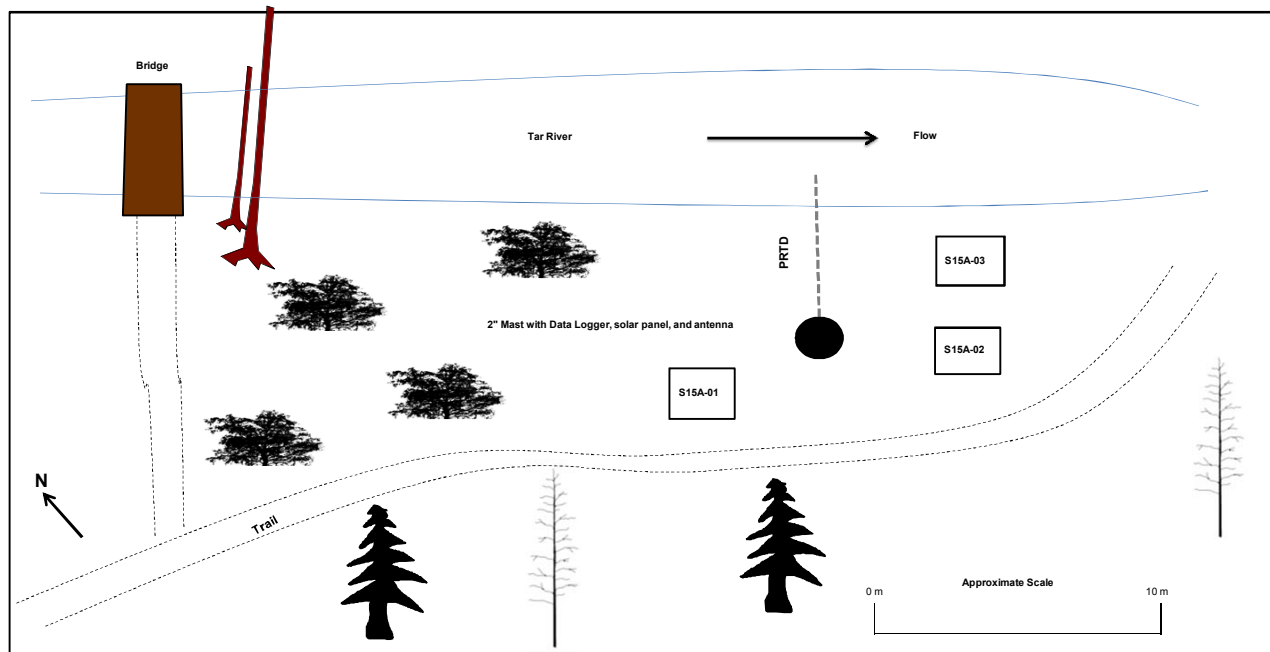
**Metering Section:** The metering section is located across from the station on a straight reach of the river. Both banks are well defined.

### Benchmark Information

**BM:** RAMP S15A-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 3 m South of station  
**Description:** 3/4" Pipe

**BM:** RAMP S15A-02  
**Elevation:** 99.815 m  
**Basis:** Level Survey from RAMP S15A-01  
**Location:** 2 m East of station  
**Description:** 3/4" Pipe

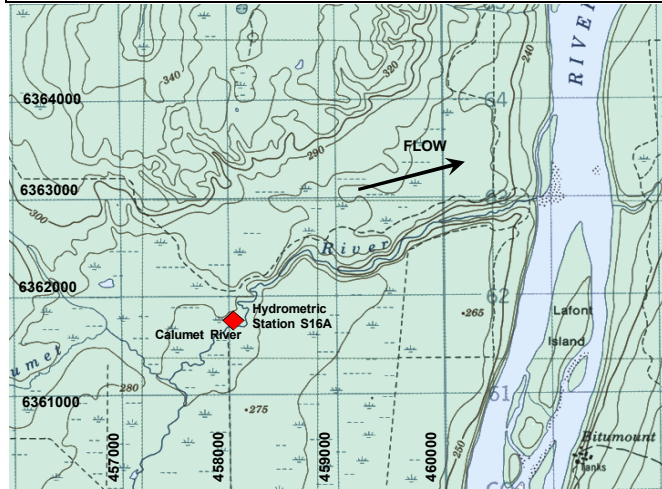
**BM:** RAMP S15A-03  
**Elevation:** 99.929 m  
**Basis:** Level Survey from RAMP S15A-01  
**Location:** 3 m North East of station  
**Description:** 3/4" Pipe



Revised March 26, 2014

**Location and Purpose:**

Established to monitor discharge on the Calumet River near the mouth. Located approximately 3 km East of Lafont Island on the Athabasca river and 2 km 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 Canadian Natural Horizon, and as S16A from 2010-Present.



Map Grid Based on UTM NAD 27



Looking upstream from near the station. August, 2013

**Station Details**

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

**Measurement Details**

**Channel:** The channel is approximately 4 m wide and it has trapezoidal edges. The substrate is made up of predominately silt and sand. There is weeds growing in the channel. This station can be waded throughout the open water season.  
**Control:** A small riffle acts as the hydrologic control for this station.  
**Metering Section:** The metering section is located downstream from the station near the river crossing from the heli pad.

**Benchmark Information**

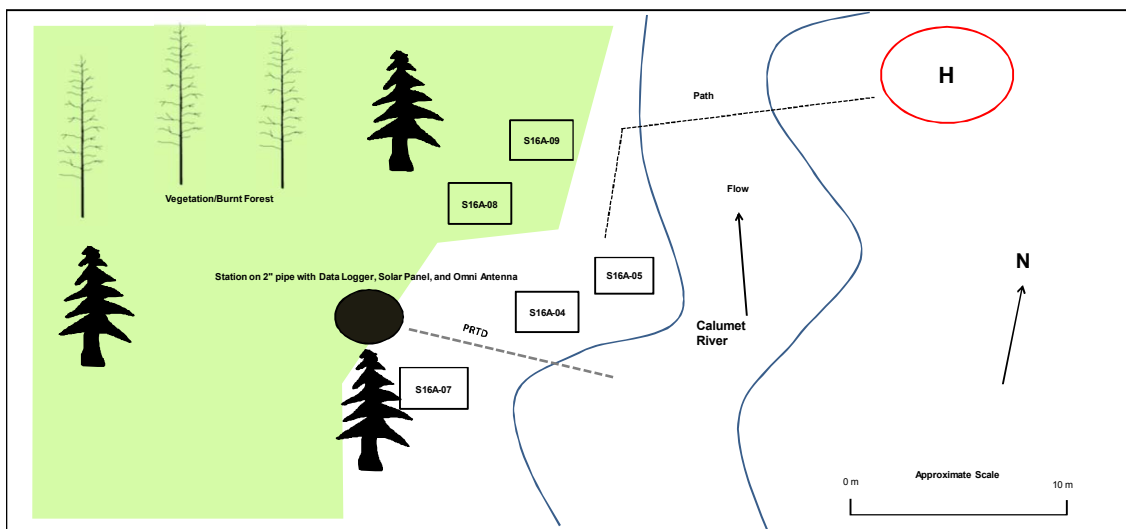
**BM:** RAMP S16A-04  
**Elevation:** 99.976 m  
**Basis:** Level Survey from RAMP S16A-01  
**Location:** 3/4" pipe 2.5 m NE of logger  
**Description:** 3/4" Pipe

**BM:** RAMP S16A-05  
**Elevation:** 99.567 m  
**Basis:** Level Survey from RAMP S16A-04  
**Location:** 3/4" pipe 4 m NE of logger  
**Description:** 3/4" Pipe

**BM:** RAMP S16A-07  
**Elevation:** 99.958 m  
**Basis:** Level Survey from RAMP S16A-04  
**Location:** Lag Bolt In Tree  
**Description:** 3/4" Pipe

**BM:** RAMP S16A-08  
**Elevation:** 100.065 m  
**Basis:** Level Survey from RAMP S16A-04  
**Location:** 3/4" pipe 8 m North of station  
**Description:** 3/4" Pipe

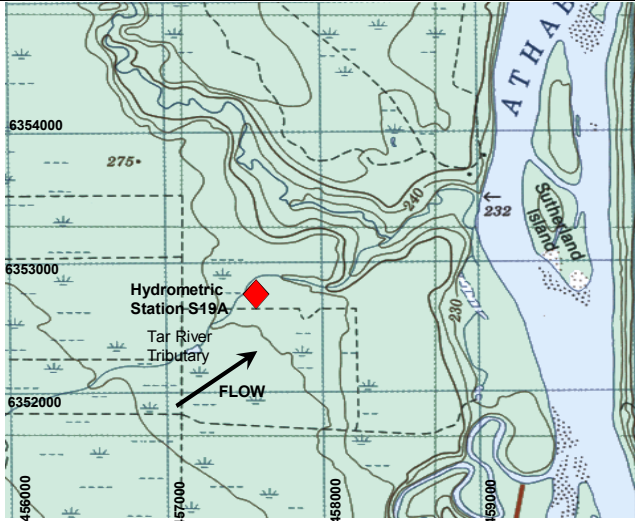
**BM:** RAMP S16A-09  
**Elevation:** 99.266 m  
**Basis:** Level Survey from RAMP S16A-04  
**Location:** 3/4" pipe 9 m North of station  
**Description:** 3/4" Pipe



Revised February 25, 2015

**Location and Purpose:**

Established to monitor discharge and rainfall on the Tar River Tributary for Canadian Natural Horizon EIA predictions. The station was relocated (from 457315 E, 6352863 N) in April 2012 approximately 200 meters downstream to avoid beaver dam activity. It is located 15 km North of Fort McKay.



Map Grid Based on UTM NAD 27



Looking downstream towards PT's location.

**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 Canadian Natural Horizon Mine  
**Drainage Area:** 11.5 km<sup>2</sup>  
**UTM Coordinates:** 457372 E, 6352880 N (NAD83)  
**Lat/Long:** 57°19'70"N, 111°42'28"W (NAD83)  
**NTS Map:** 74E/05

**Measurement Details**

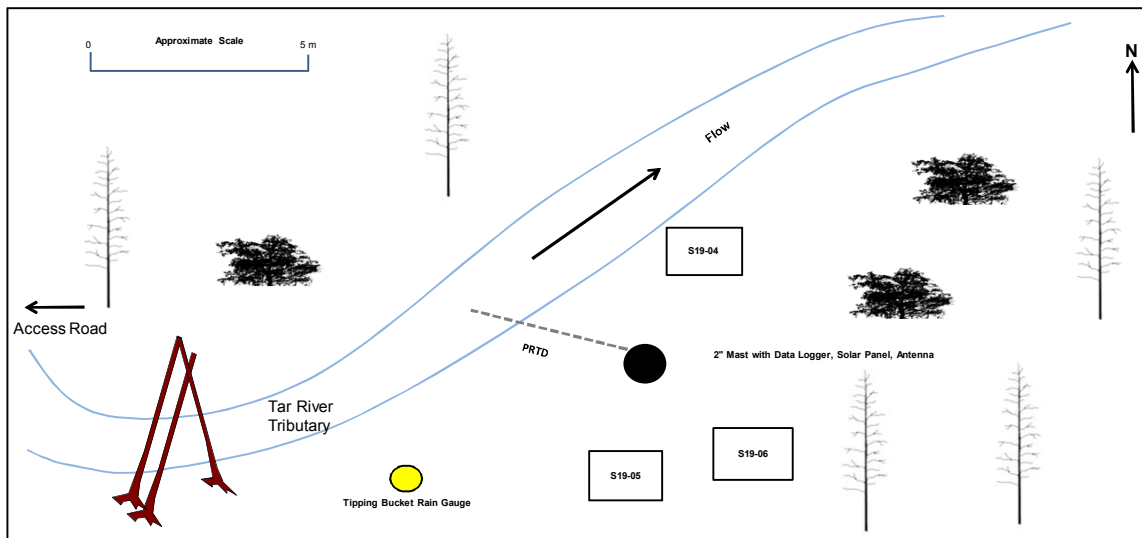
**Channel:** The channel is roughly 1.3 m wide and the dominant bed type is sand and cobble.  
**Control:** The channel morphology is the control for this site.  
**Metering Section:** Measurements are conducted by wading across the river near the station.

**Benchmark Information**

**BM:** RAMP S19A-04  
**Elevation:** 103.334 m  
**Basis:** Old station BM elevations  
**Location:** 5 m North of station  
**Description:** 3/4" Pipe

**BM:** RAMP S19A-05  
**Elevation:** 103.599 m  
**Basis:** Level Survey from RAMP S19A-04  
**Location:** 3 m South of station  
**Description:** 3/4" Pipe

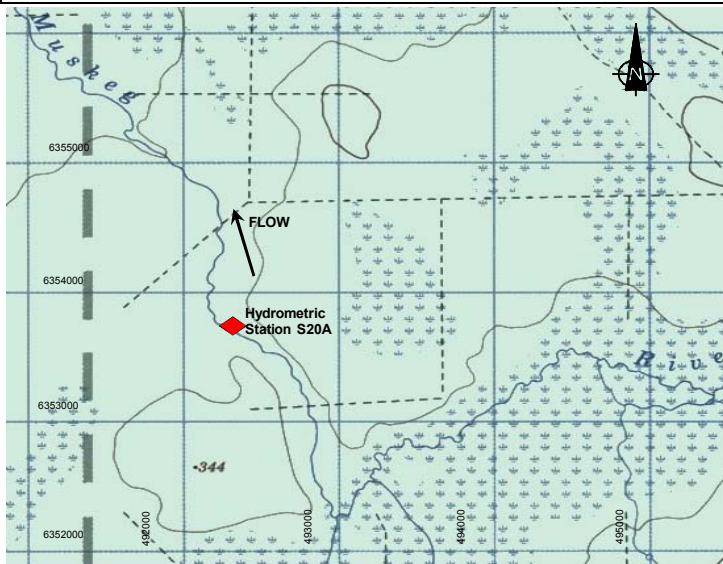
**BM:** RAMP S19A-06  
**Elevation:** 103.530 m  
**Basis:** Level Survey from RAMP S19A-04  
**Location:** 3 m South East of station  
**Description:** 3/4" Pipe



Revised February 25, 2015

### Location and Purpose:

Established to monitor discharge on the upper reach of the Muskeg River, upstream of oilsands operations. Station S20 (49178 E, 6354787 N) was relocated approximately 1 km upstream in May 2013, due to backwater effects caused by beaver activity. The station is located approx. 15 km NNW of the East Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Downstream view from RAMP Hydrometric Station S20A, Muskeg River Upland

### 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 Kearnl Project Access Road  
**Drainage Area:** 154 km<sup>2</sup>  
**UTM Coordinates:** 492230 E, 6354940 N (NAD83)  
**Lat/Long:** 57°20'14" N, 111°07'45" W (NAD83)  
**NTS Map:** 74E/06

### Measurement Details

**Channel:** The channel is approx. 8 m wide with trapezoidal, but steep edges. The dominant substrate on the channel bed is silt, with subdominant cobble present.

**Control:** A riffle about 30 m downstream of the station provides the hydrologic control.

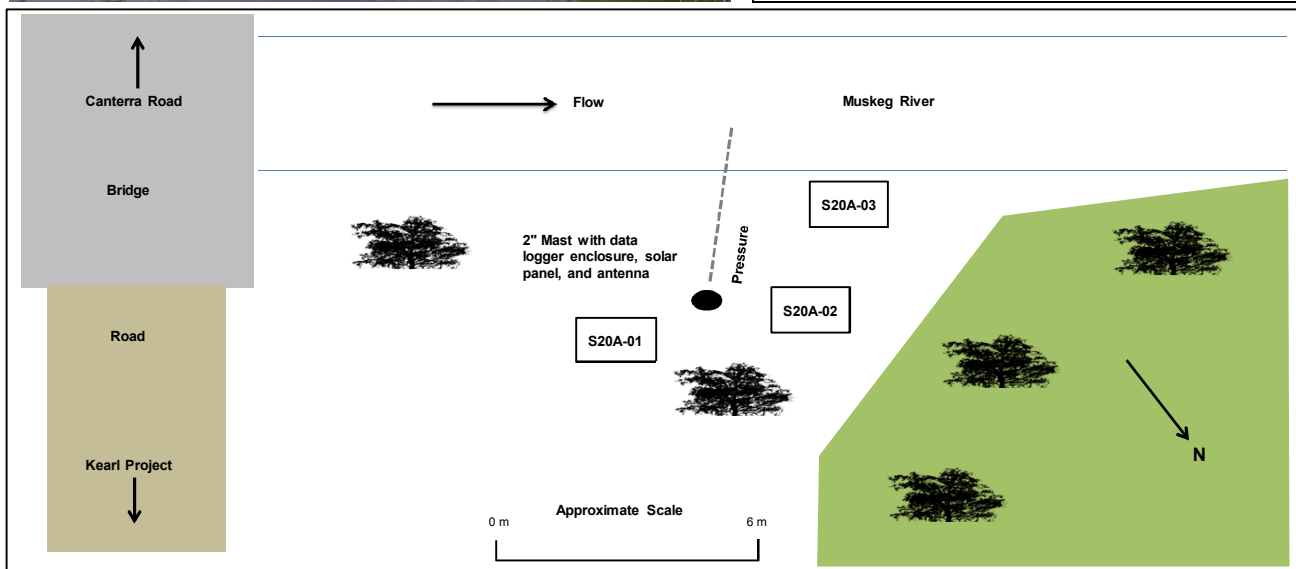
**Metering Section:** The metering section is located approx. 10 m downstream of the station, and can be waded safely during normal flow conditions.

### Benchmark Information

**BM:** RAMP S20A-01  
**Elevation:** 330.905 m  
**Basis:** Level survey from RAMP S20A-02  
**Location:** 2 m NE of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S20A-02  
**Elevation:** 330.902 m  
**Basis:** Assumed Local Datum  
**Location:** 2 m NW of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S20A-03  
**Elevation:** 330.820 m  
**Basis:** Level survey from RAMP S20A-02  
**Location:** 4 m West of data logger  
**Description:** 3/4" Pipe

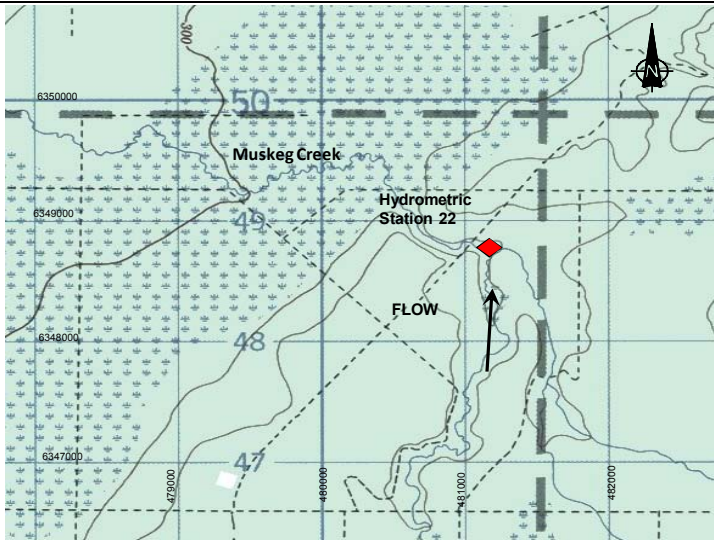




Revised February 25, 2015

**Location and Purpose:**

Established to monitor discharge on Muskeg Creek upstream of the Muskeg River, to provide predictions for effects of nearby oilsands operations. The station is located approximately 19 km NW of the East Athabasca Hwy - Canterra Rd. intersection.



Map Grid Based on UTM NAD 27



Looking upstream from Station S22  
Muskeg Creek near the Mouth

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2001 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road access on Canterra Road  
**Drainage Area:** 323 km<sup>2</sup>  
**UTM Coordinates:** 481036 E, 6348856 N (NAD83)  
**Lat/Long:** 57°17'3.5" N, 111°18'56.5" W (NAD83)  
**NTS Map:** 74E/06

**Measurement Details**

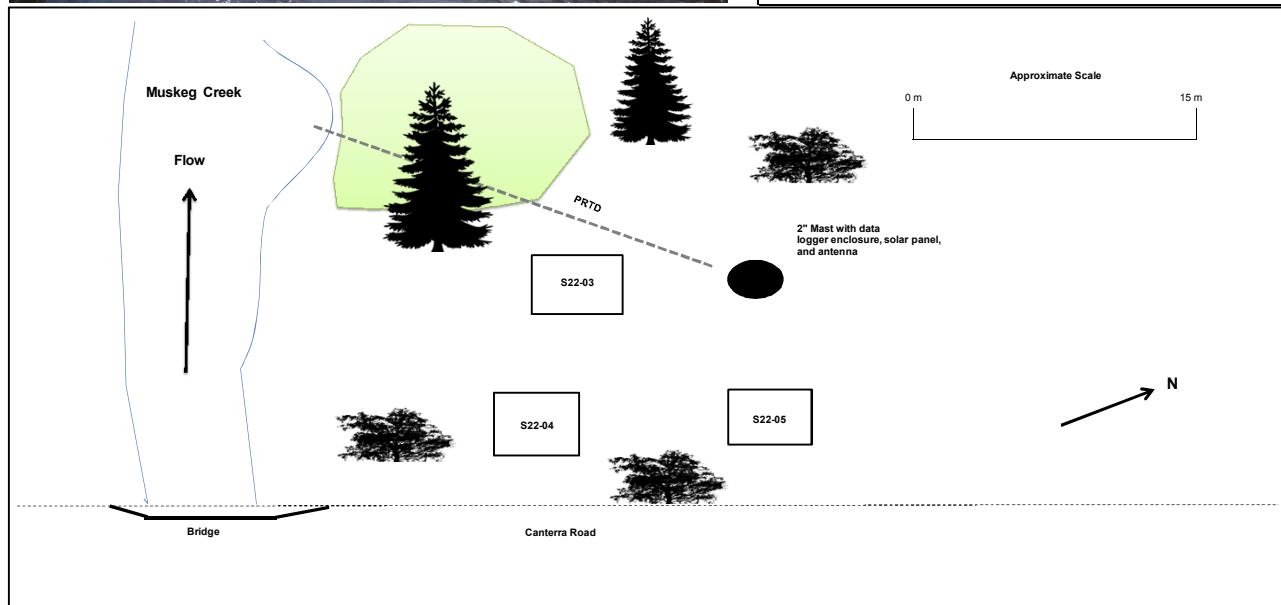
**Channel:** The channel is approx. 6 m wide, with trapezoidal edges. The dominant bed substrate is cobble, with sand.  
**Control:** A riffle approx. 50 m downstream of the station acts as the control for this reach.  
**Metering Section:** The open-water metering section is located 4 m upstream of the station and the winter metering section is approx. 40 m downstream. The channel can be waded during normal flow conditions.

**Benchmark Information**

**BM:** RAMP S22-03  
**Elevation:** 305.584 m  
**Basis:** Level Survey from S22-02  
**Location:** 3 m West of data logger  
**Description:** 3/4" Pipe with flagging

**BM:** RAMP S22-4  
**Elevation:** 305.697 m  
**Basis:** Level Survey from RAMP S22-01  
**Location:** 5 m SW of data logger  
**Description:** 3/4" Pipe with pink flagging

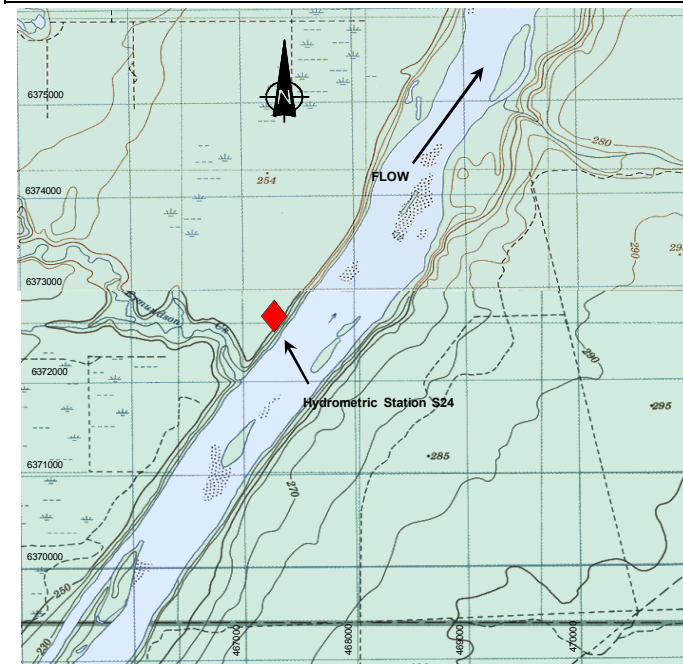
**BM:** RAMP S22-05  
**Elevation:** 306.078 m  
**Basis:** Level Survey from RAMP S22-01  
**Location:** 1 m SE of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 25 February, 2015

**Location and Purpose:**

Station is located 35 km downstream from Fort MacKay. This station was established as a downstream monitoring point of oil sands development in 2001.



Map Grid Based on UTM NAD 27



**Station Details**

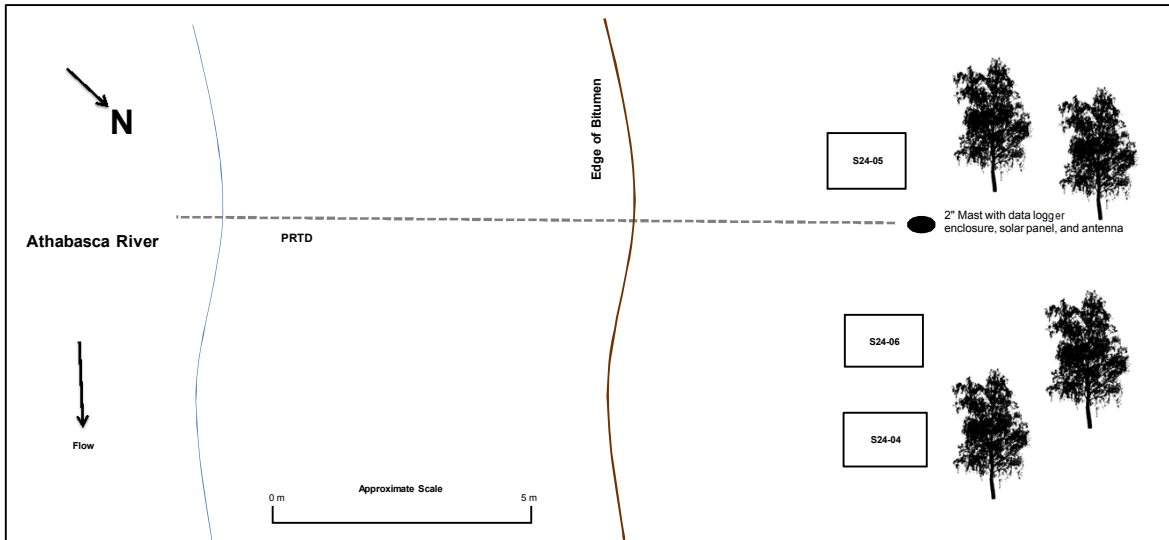
**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** May 2001 to Present  
**Station Operation:** Year Round  
**Access:** Boat (summer) or helicopter (winter)  
**Drainage Area:** 146,000 km<sup>2</sup>  
**Station Coordinates:** 466313 E, 6372760 N (NAD83)  
**Flow Coordinates:** 467570 E, 6375010 N (NAD 83)  
**Station Lat/Long:** 57°29'46  
**NTS Map:** 74E/05

**Measurement Details**

**Channel:** Channel width is about 600 m at the monitoring station, and 450 m at the flow measurement reach. The deepest part of the channel is near the left bank, and sand bars typically appear near the right bank across from the monitoring station during low flows. Banks are steep on both sides and reasonably stable.  
**Control:** Channel narrows 2.6 km downstream from continuous monitoring station.  
**Metering Section:** Located 2.6 km downstream from monitoring station where channel narrows to 450 m. Measurements are conducted from a boat.

**Benchmark Information**

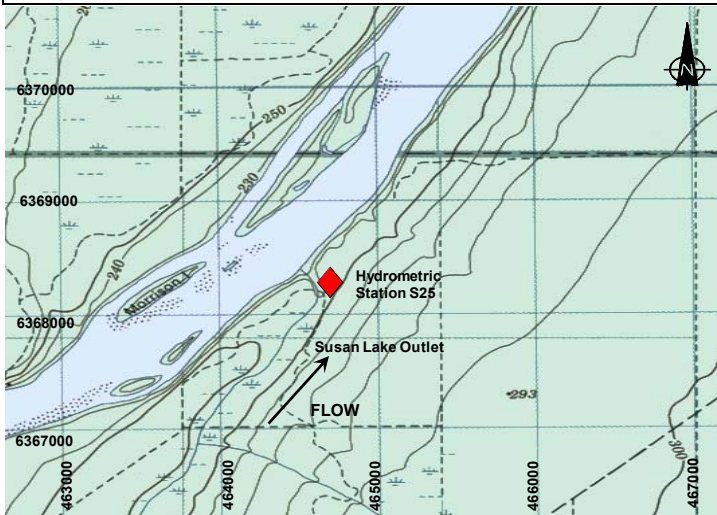
- BM:** RAMP S24-02
- Elevation:** 231.347
- Basis:** Geodetic
- Location:** 2 m North of data logger
- Description:** T-Post - Destroyed by ice, 05-2013
- BM:** RAMP S24-03
- Elevation:** 230.366 m
- Basis:** Level Survey from RAMP S24-02
- Location:** 8 m South of data logger
- Description:** 3/4" Pipe - Destroyed by ice, 05-2013
- BM:** RAMP S24-04
- Elevation:** 230.838 m
- Basis:** Level Survey from RAMP S24-02
- Location:** 5 m North of data logger
- Description:** 3/4" Pipe with pink flagging
- BM:** RAMP S24-05
- Elevation:** 231.065
- Basis:** Level Survey from RAMP S24-04
- Location:** 1.5 m South of data logger
- Description:** 3/4" Pipe with pink flagging
- BM:** RAMP S24-06
- Elevation:** 230.725 m
- Basis:** Level Survey from RAMP S24-04
- Location:** 8 m South of data logger
- Description:** 3/4" Pipe with pink flagging



Revised 25 February, 2015

### Location and Purpose:

Established in May 2002 to monitor discharge on Susan Lake Outlet upstream of the Athabasca River. The station was discontinued after the 2002 season, and was reactivated in May 2006 to monitor flows downstream of the Fort Hills development. The station is located approx. 23 km North of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Upstream view at RAMP Hydrometric Station S25, Susan Lake Outlet

### Station Details

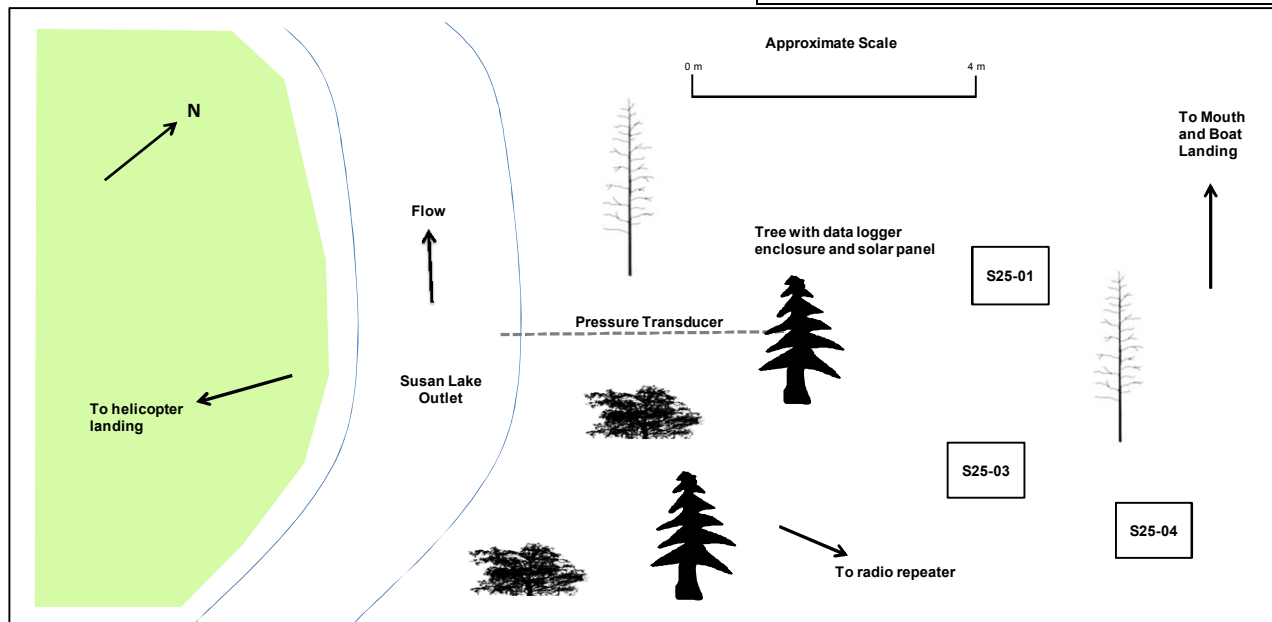
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular with radio relay
<b>Period of Record:</b>	Aug-Oct. 2002; May 2006-Present
<b>Station Operation:</b>	Open water (April-October)
<b>Access:</b>	Boat via the Athabasca River (Helicopter also)
<b>Drainage Area:</b>	20.7 km <sup>2</sup> (including Susan Lake)
<b>UTM Coordinates:</b>	464491 E, 6368503 N (NAD83)
<b>Lat/Long:</b>	57°27'28" N, 111°35'30" W (NAD83)
<b>NTS Map:</b>	74E/05

### Measurement Details

<b>Channel:</b>	The channel is approx. 1 m wide, with trapezoidal edges. The dominant bed substrate is cobble, with sand as subdominant.
<b>Control:</b>	A riffle located approx. 10 m downstream of the station serves as the control.
<b>Metering Section:</b>	The metering section is located adjacent to the station, and the channel can be waded during normal flow conditions.

### Benchmark Information

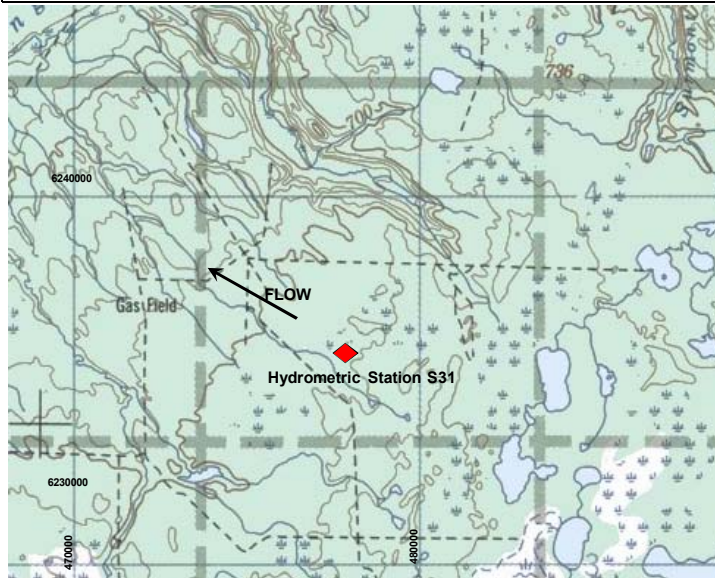
<b>BM:</b>	RAMP S25-01
<b>Elevation:</b>	100.000 m
<b>Basis:</b>	Assumed
<b>Location:</b>	2 m North of data logger
<b>Description:</b>	T-Post in PVC
<b>BM:</b>	RAMP S25-03
<b>Elevation:</b>	100.121 m
<b>Basis:</b>	Level Survey from RAMP S25-01
<b>Location:</b>	2 m East of data logger
<b>Description:</b>	3/4" Pipe with pink flagging
<b>BM:</b>	RAMP S25-04
<b>Elevation:</b>	100.261 m
<b>Basis:</b>	Level Survey from RAMP S25-01
<b>Location:</b>	4 m East of data logger
<b>Description:</b>	3/4" Pipe with pink flagging



Revised February 25, 2015

**Location and Purpose:**

Established to monitor discharge on Hangingsstone Creek. The site is accessed via North Star Road off Hwy 63, located 1.7 km North of the Algar Tower East rest stop. The rationale for this site is to monitor the Suncor Meadow Creek EIA predictions. Station was moved to south side of North Star Road in November 2014 due to power line construction on north side of North Star Road.



Map Grid Based on UTM NAD 27



Looking upstream on Hangingsstone Creek towards Station S31

**Station Details**

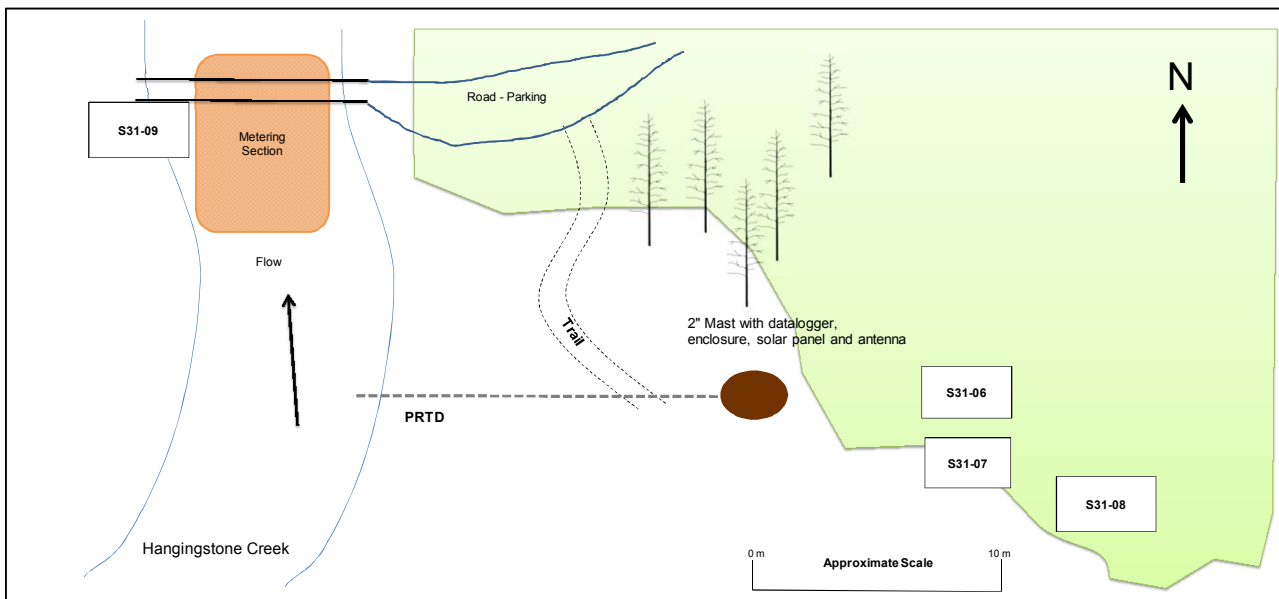
<b>Variables Measured:</b>	Discharge, water level, water temperature, rainfall
<b>Period of Record:</b>	April 2004 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	2WD road via North Star Road
<b>Drainage Area:</b>	119 km <sup>2</sup>
<b>UTM Coordinates:</b>	469793 E, 6236024 N (NAD83)
<b>Lat/Long:</b>	56°16'05"N, 111°29'15"W (NAD83)
<b>NTS Map:</b>	74D/06

**Measurement Details**

<b>Channel</b>	The channel is roughly 4 m wide and the bed mostly consists of silts.
<b>Control</b>	The channel pools at the top of a small riffle under the bridge downstream of monitoring station.
<b>Metering Section</b>	Measurements in winter are conducted at the bridge 10m downstream of the monitoring station.

**Benchmark Information**

<b>BM:</b>	RAMP S31-06
<b>Elevation:</b>	99.599 m
<b>Basis:</b>	Level Survey from RAMP S31-03
<b>Location:</b>	5 m E of data logger
<b>Description:</b>	Rebar
<b>BM:</b>	RAMP S31-07
<b>Elevation:</b>	99.423 m
<b>Basis:</b>	Level Survey from RAMP S31-01
<b>Location:</b>	5.5 m SE of data logger
<b>Description:</b>	Rebar
<b>BM:</b>	RAMP S31-08
<b>Elevation:</b>	100.000 m
<b>Basis:</b>	Level Survey from RAMP S31-01
<b>Location:</b>	10 m S of data logger
<b>Description:</b>	Tree bolt
<b>BM:</b>	RAMP S31-09
<b>Elevation:</b>	99.222 m
<b>Basis:</b>	Level Survey from RAMP S31-01
<b>Location:</b>	Left side of bridge (underneath)
<b>Description:</b>	Lag bolt



Revised 25 February, 2015

**Location and Purpose:**

Established to monitor discharge on Surmont Creek. The site is located 1.6 km East of the Stony Mountain Rd and Hwy 881 intersection. The rationale for this site is to monitor Suncor Meadow Creek EIA predictions.



Map Grid Based on UTM NAD 27



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Period of Record:** April 2004 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via Hwy 881  
**Drainage Area:** 157 km<sup>2</sup>  
**UTM Coordinates:** 490252 E, 6254511 N (NAD83)  
**Lat/Long:** 56°26'6"N, 111°9'29"W (NAD83)  
**NTS Map:** 74D/06

**Measurement Details**

**Channel:** The channel is roughly 7 m wide and the dominant bed type is sand and silt.  
**Control:** The channel morphology is the control for this site.  
**Metering Section:** Measurements are conducted by wading across at the straight reach downstream of the Hwy 881 bridge, 5 m upstream of the monitoring station.

**Benchmark Information**

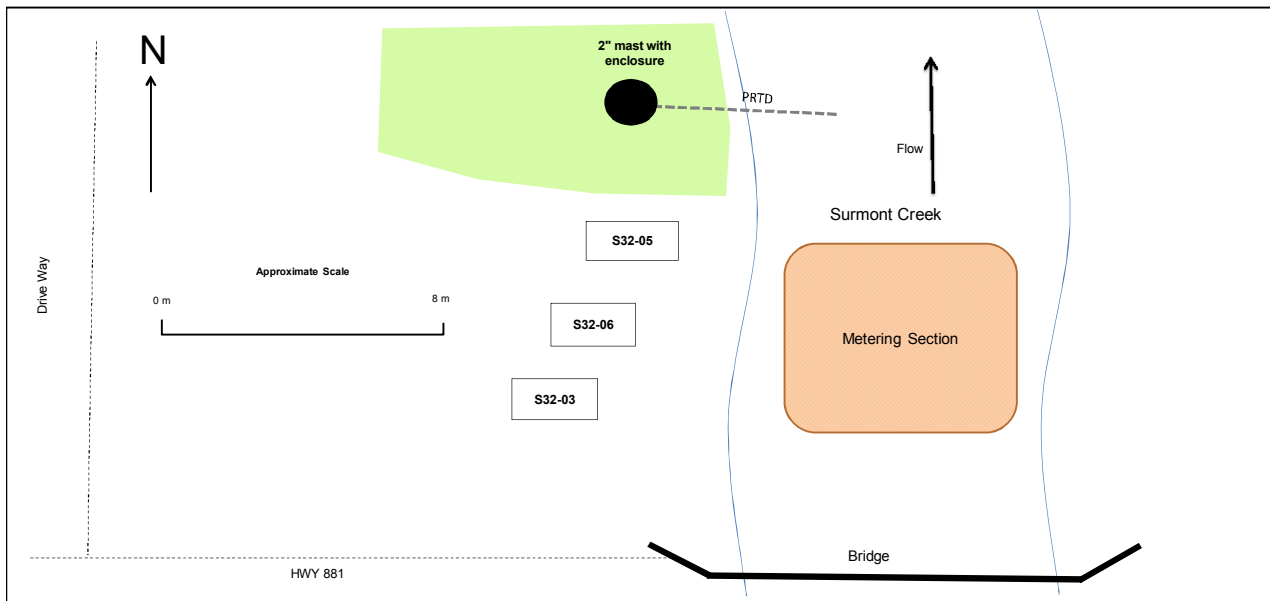
**BM:** RAMP S32-02  
**Elevation:** 98.981 m  
**Basis:** Assumed  
**Location:** 3 m South of data logger  
**Description:** Rebar, decommissioned

**BM:** RAMP S32-03  
**Elevation:** 99.118 m  
**Basis:** Level Survey from RAMP S32-02  
**Location:** 10 m South of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S32-04  
**Elevation:** 99.412 m  
**Basis:** Level Survey from RAMP S32-02  
**Location:** 15 m South of data logger  
**Description:** 3/4" Pipe, decommissioned

**BM:** RAMP S32-05  
**Elevation:** 98.807 m  
**Basis:** Level Survey from RAMP S32-02  
**Location:** 4 m South of data logger  
**Description:** 3/4" Pipe with pink flagging

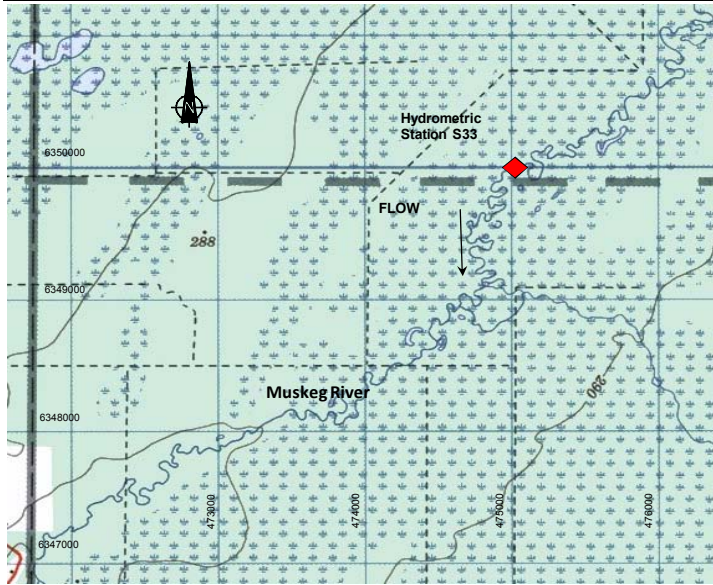
**BM:** RAMP S32-06  
**Elevation:** 98.664 m  
**Basis:** Level Survey from RAMP S32-02  
**Location:** 7 m South of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised 25 February, 2015

### Location and Purpose:

Established in April 2003 to monitor discharge on the Muskeg River at the Syncrude Aurora North -Shell Muskeg River Mine lease boundary, in compliance with monitoring requirements LOC # 040365. The station is located approx. 13 km NE of the Hwy 63 - Syncrude Aurora Mine Access intersection.



Map Grid Based on UTM NAD 27



Upstream view at RAMP Hydrometric Station S33, Muskeg River at the Aurora/Shell Boundary

### Station Details

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** April 2003 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via the Aurora North mine  
**Drainage Area:** 897 km<sup>2</sup>  
**UTM Coordinates:** 474876 E, 6350204 N (NAD83)  
**Lat/Long:** 57° 17'39" N, 111° 25'1" W (NAD83)  
**NTS Map:** 74E/06

### Measurement Details

**Channel:** The channel is approx. 8 m wide, with relatively straight edges. The dominant bed material is silt, with layers of organics and some woody debris

**Control:** The channel morphology serves as the hydrologic control for this stream reach.

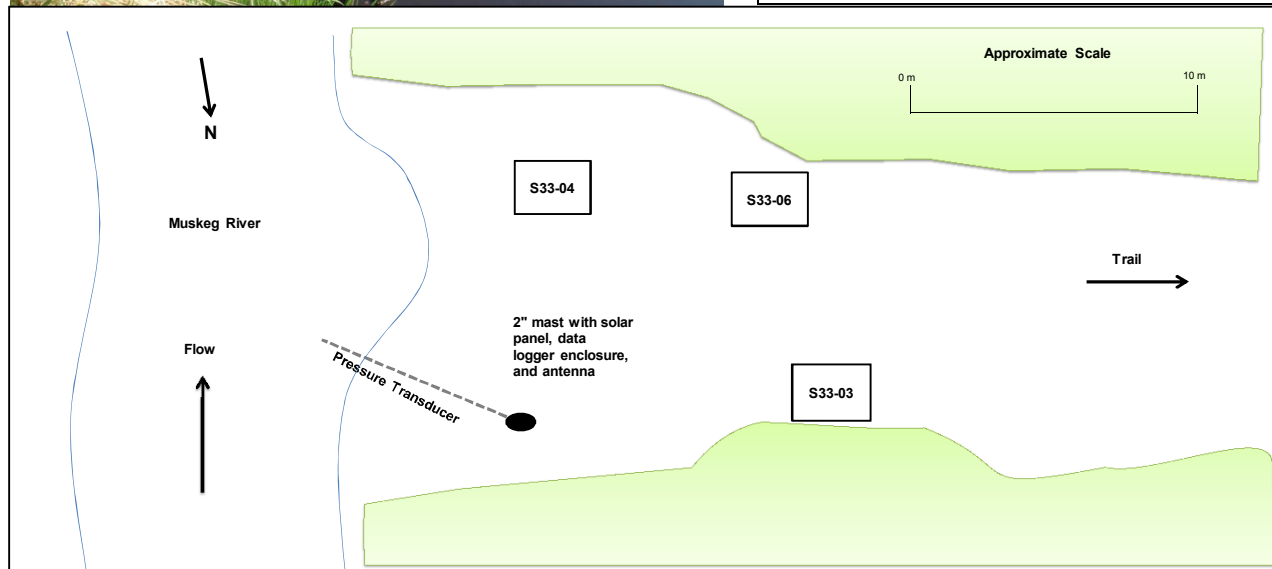
**Metering Section:** The metering section is located adjacent to the station, and the channel requires the use of a kick-boat to conduct a flow measurement, due to deep water.

### Benchmark Information

**BM:** RAMP S33-03  
**Elevation:** 281.308 m  
**Basis:** Level survey from RAMP S33-02  
**Location:** 3 m West of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S33-04  
**Elevation:** 281.472 m  
**Basis:** Level survey from previous RAMP S33-03  
**Location:** 8 m South of data logger  
**Description:** 3/4" Pipe with pink flagging

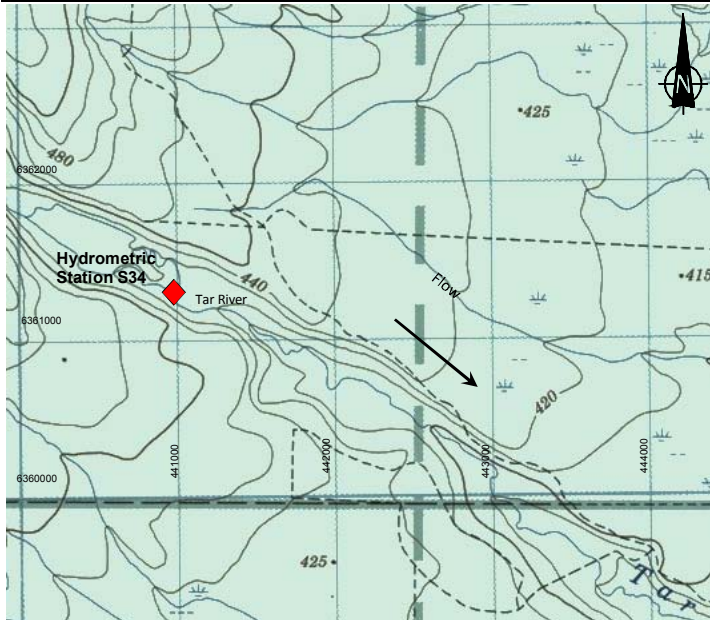
**BM:** RAMP S33-06  
**Elevation:** 281.510 m  
**Basis:** Level Survey from RAMP S33-03  
**Location:** 7 m SW of data logger  
**Description:** 3/4" Pipe with pink flagging



Revised February 25, 2015

**Location and Purpose:**

Established in April 2005 to monitor discharge on the Tar River above the Canadian Natural Compensation Lake (Horizon Lake) for management purposes. Located 1 km North East of the Canadian Natural compensation lake.



Map Grid Based on UTM NAD 27



Looking North toward the station, June, 2013

Looking upstream from near the station.

**Station Details**

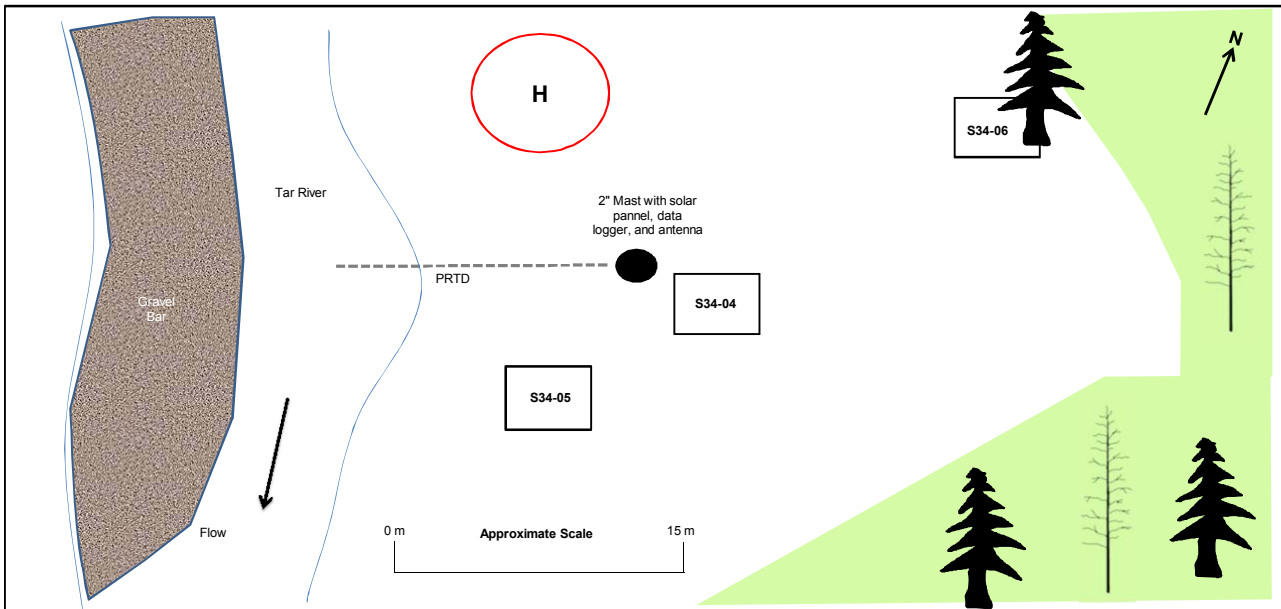
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	April 2005 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	134 km <sup>2</sup>
<b>UTM Coordinates:</b>	440712 E, 6361615 N (NAD83)
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

**Measurement Details**

<b>Channel</b>	The channel is roughly 4 m wide and the dominant bed type is sand and gravel. This river can be waded throughout the open water season.
<b>Control</b>	A downstream riffle is the control for this site.
<b>Metering Section</b>	Measurements are conducted by wading across near the station.

**Benchmark Information**

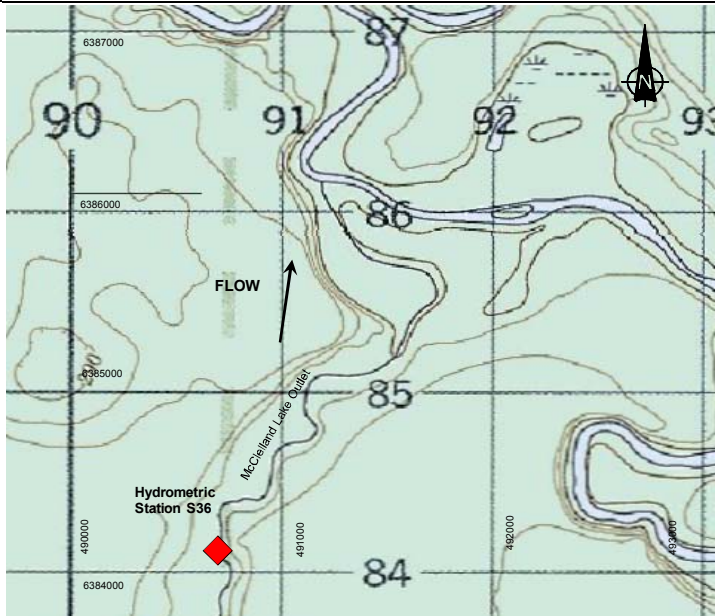
<b>BM:</b>	RAMP S34-04
<b>Elevation:</b>	98.659
<b>Basis:</b>	Level Survey from RAMP S34-01
<b>Location:</b>	2 m East of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S34-05
<b>Elevation:</b>	98.271
<b>Basis:</b>	Level Survey from RAMP S34-04
<b>Location:</b>	8 m South of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S34-06
<b>Elevation:</b>	99.401
<b>Basis:</b>	Level Survey from RAMP S34-04
<b>Location:</b>	30 m North of station
<b>Description:</b>	Lag Bolt in tree



Revised February 25, 2015

### Location and Purpose:

Established in May 2008 to assist in monitoring runoff from McClelland Lake and surrounding areas. Station is located 14 km NE of McClelland Lake.



Map Grid Based on UTM NAD 27



Looking downstream from 10m South West of the station. August, 2013.

Looking North West towards the station.

### Station Details

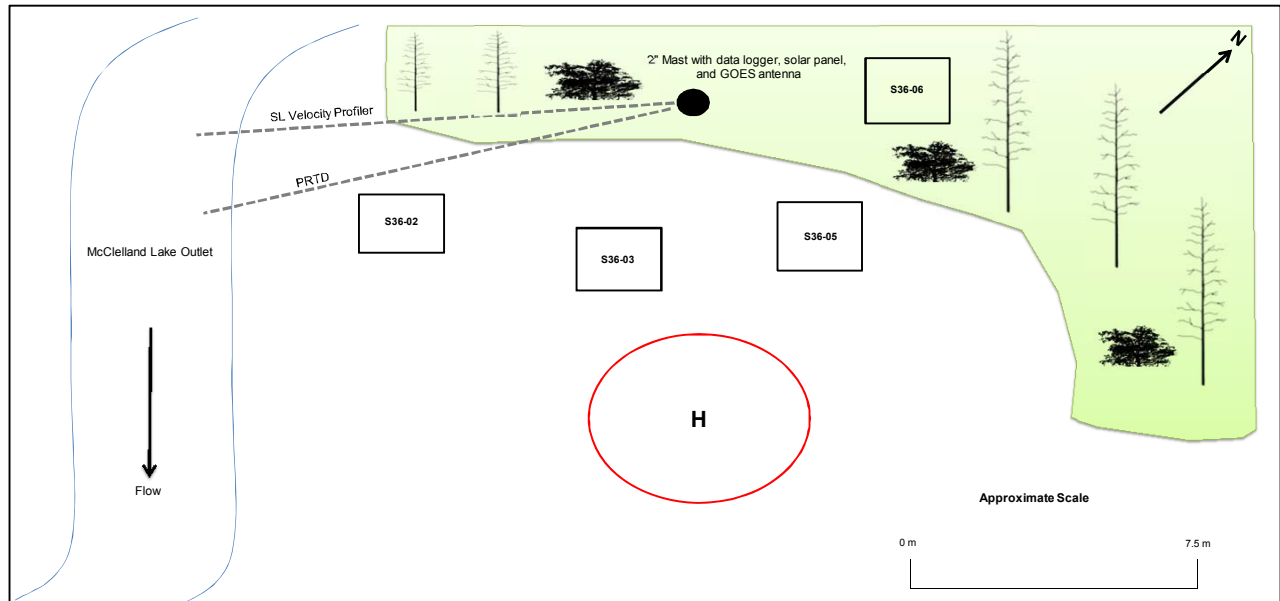
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	GOES-07DC902
<b>Period of Record:</b>	May 2008 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	368 km <sup>2</sup> (RAMP)
<b>UTM Coordinates:</b>	490626 E, 6384064 N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

### Measurement Details

<b>Channel</b>	The channel is roughly 7 m wide and the dominant bed type is sand and silt. There is some weeds growing along the banks. The river at this site can be waded throughout most of the open water season.
<b>Control</b>	The channel morphology is the control for this site.
<b>Metering Section</b>	Measurements are conducted by wading the river 5m downstream from the station

### Benchmark Information

<b>BM:</b>	RAMP S36-03
<b>Elevation:</b>	100.503 m
<b>Basis:</b>	Level Survey from RAMP S36-02
<b>Location:</b>	6 m North of station
<b>Description:</b>	Disc
<b>BM:</b>	RAMP S36-04
<b>Elevation:</b>	100.482 m
<b>Basis:</b>	Level Survey from RAMP S36-02
<b>Location:</b>	8 m West of logger
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S36-05
<b>Elevation:</b>	100.395 m
<b>Basis:</b>	Level Survey from RAMP S36-02
<b>Location:</b>	3/4" Pipe 6 m SW of Mast
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S36-06
<b>Elevation:</b>	100.530 m
<b>Basis:</b>	Level Survey from RAMP S36-02
<b>Location:</b>	6 m NE of station
<b>Description:</b>	Lag bolt

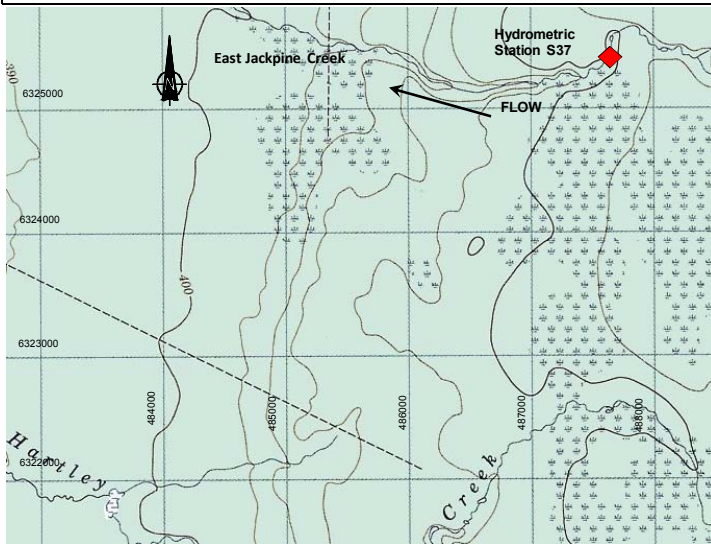




Revised 31 March, 2014

**Location and Purpose:**

Established to monitor discharge on an upland reference location in the Muskeg River catchment. The station is located approx. 28 km SE of the Hwy 63 - MRM Access Rd. intersection.



Map Grid Based on UTM NAD 27



Upstream view of East Jackpine Creek at Station S37

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** September 2007 to Present  
**Station Operation:** Open water (April-October)  
**Access:** Helicopter  
**Drainage Area:** 47.4 km<sup>2</sup>  
**UTM Coordinates:** 487840 E, 6325424 N (NAD83)  
**Lat/Long:** 57°4'19.4" N, 111°12'2.0" W (NAD83)  
**NTS Map:** 74E/03

**Measurement Details**

**Channel:** The channel is approx. 5 m wide at the measurement section, with trapezoidal edges. Dominant substrate includes cobble and gravel.

**Control:** A riffle approx. 6 m downstream of the measurement section serves as the hydrologic control for the reach.

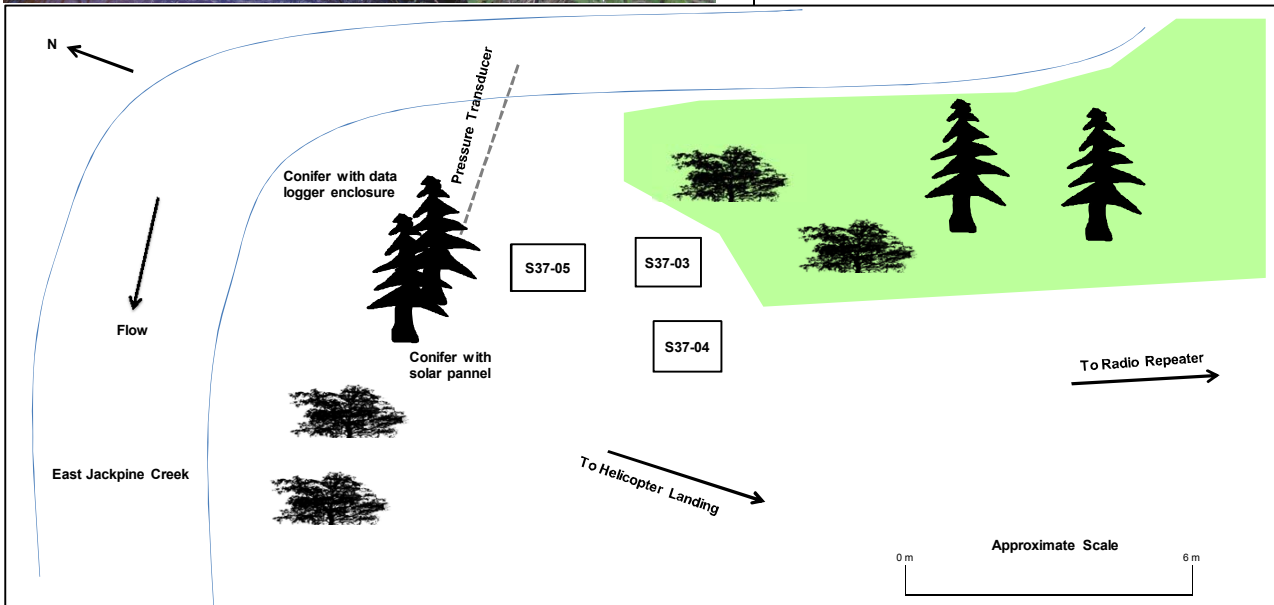
**Metering Section:** The measurement section is located approx. 30 m downstream of the station, and can be waded under normal flow conditions.

**Benchmark Information**

**BM:** RAMP S37-03  
**Elevation:** 100.838 m  
**Basis:** Assumed  
**Location:** 3 m South of data logger  
**Description:** 3/4" Pipe with pink flagging

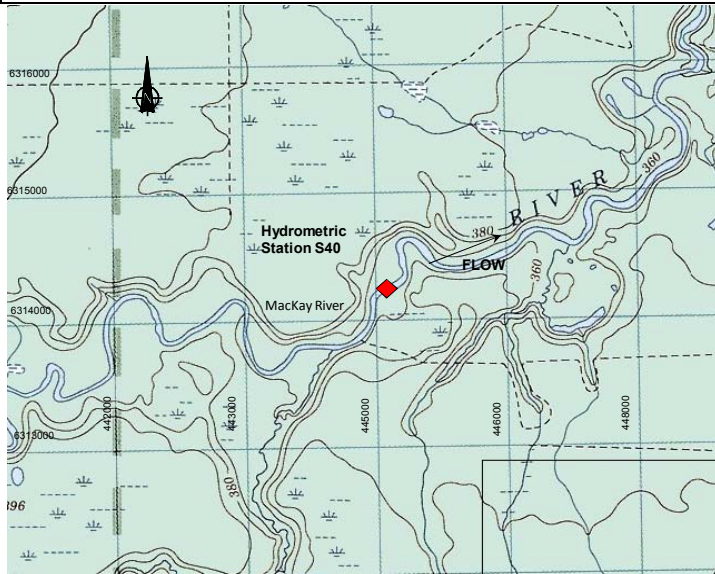
**BM:** RAMP S37-04  
**Elevation:** 101.078 m  
**Basis:** Level Survey from RAMP S37-03  
**Location:** 4 m SW of data logger  
**Description:** 3/4" Pipe with flagging

**BM:** RAMP S37-05  
**Elevation:** 101.178 m  
**Basis:** Level Survey from RAMP S37-03  
**Location:** 1.5 m from data logger  
**Description:** 3/4" Pipe with pink flagging



**Location and Purpose:**

Established to monitor discharge on the Mackay River as an upstream reference for the Suncor Dover and Mackay River developments. The station is located 30m downstream of the Petro-Canada Bridge, approximately 30 km west of the the HWY 63 and Suncor Road intersection.



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:** 5290 km<sup>2</sup>  
**UTM Coordinates:** 445023 E, 6314256 N (NAD83)  
**Lat/Long:** 56°58'7"N, 111°54'15"W (NAD83)  
**NTS Map:** 74D/13

**Measurement Details**

**Channel:** The channel is 30 m wide. The substrate is made up of mostly cobble. Channel is wadeable during low flows.  
**Control:** The control is a downstream riffle.  
**Metering Section:** Measurements are conducted on the straight reach downstream of the bridge near the station by wading or boat.

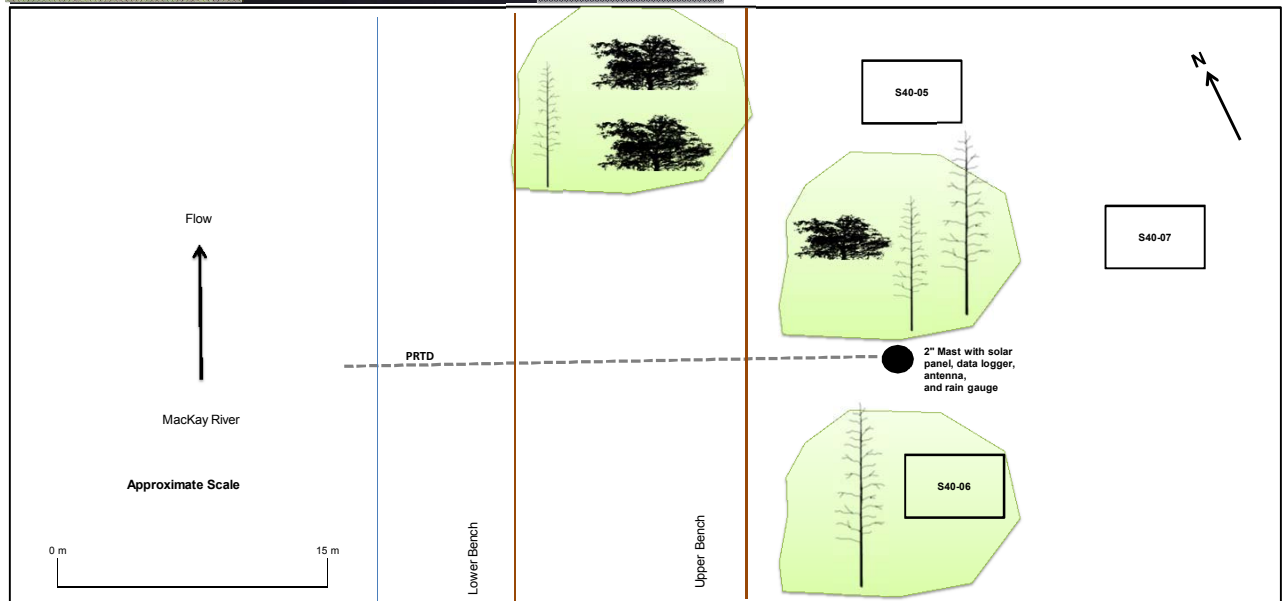
**Benchmark Information**

**BM:** RAMP S40-05  
**Elevation:** 100.135 m  
**Basis:** Assumed  
**Location:** Level Survey from RAMP S40-01  
**Description:** 3/4" Pipe  
**BM:** RAMP S40-06  
**Elevation:** 100.067 m  
**Basis:** Level Survey from RAMP S40-01  
**Location:** 3 m South of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S40-07  
**Elevation:** 100.232 m  
**Basis:** Level Survey from RAMP S40-01  
**Location:** 4 m South of station  
**Description:** 3/4" Pipe



Looking North West towards

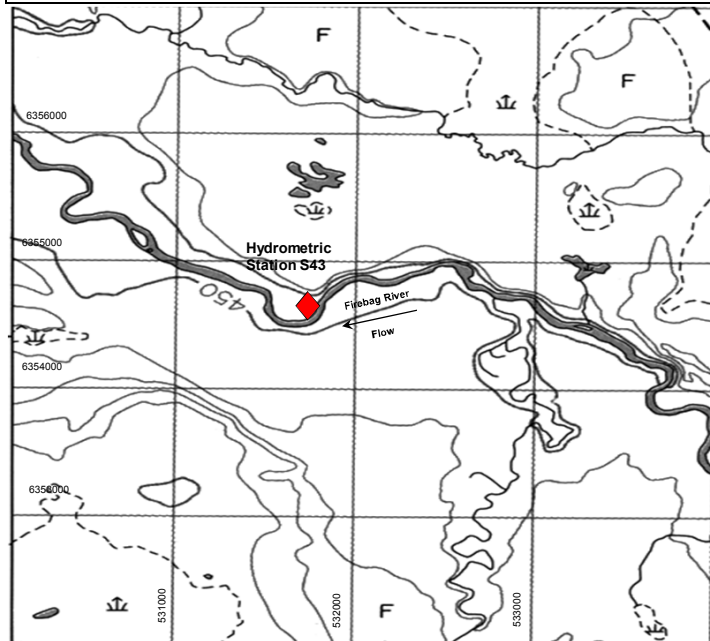
Looking upstream from



Revised February 25, 2015

### Location and Purpose:

Established in May 2009 to monitor discharge on the Firebag River upstream of oilsands operations. Located 45 km East of Kearl Lake.



Map Grid Based on UTM NAD 27



Looking downstream from near the station. August, 2013.

Looking South West towards the station. August, 2013.

### Station Details

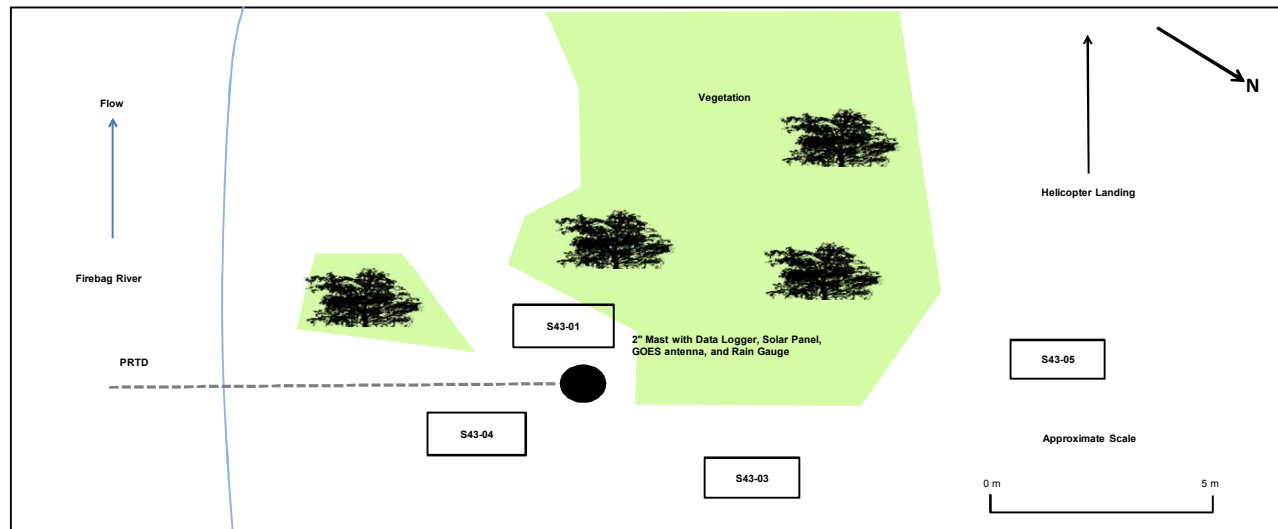
<b>Variables Measured:</b>	Discharge, water level, water temperature, rainfall
<b>Telemetry:</b>	GOES-07DC903
<b>Period of Record:</b>	May 2009 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	2,382 km <sup>2</sup> (RAMP)
<b>UTM Coordinates:</b>	531528 E,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

### Measurement Details

<b>Channel</b>	The channel is a straight reach 36m wide, the substrate is made up of mostly cobble and sand. Channel can only be waded during periods of low water levels in the open water season.
<b>Control</b>	The channel morphology acts as the control at this station.
<b>Metering Section</b>	Measurements are conducted near the station using a boat or by wading across the river during low water levels.

### Benchmark Information

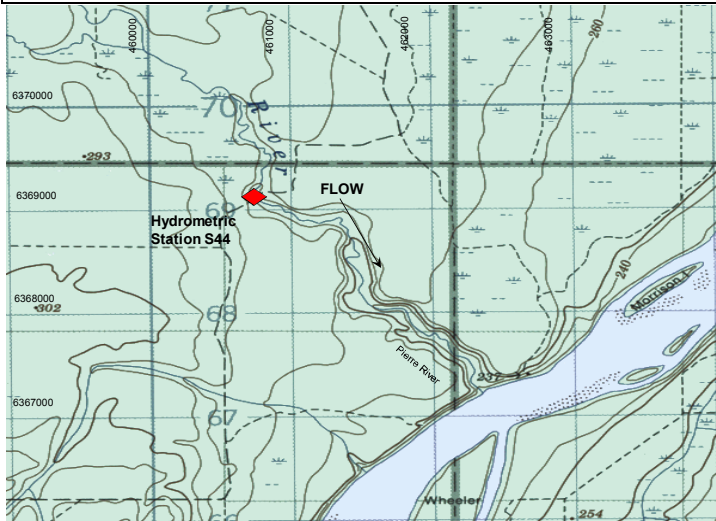
<b>BM:</b>	RAMP S43-01
<b>Elevation:</b>	100.270 m
<b>Basis:</b>	Assumed
<b>Location:</b>	1 m South of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S43-03
<b>Elevation:</b>	100.113 m
<b>Basis:</b>	Level Survey from RAMP S43-01
<b>Location:</b>	5 m North of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S43-04
<b>Elevation:</b>	100.338 m
<b>Basis:</b>	Level Survey from RAMP S43-01
<b>Location:</b>	1 m East of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S43-05
<b>Elevation:</b>	101.514 m
<b>Basis:</b>	Level Survey from RAMP S43-01
<b>Location:</b>	10 m NE of station
<b>Description:</b>	lag bolt



Revised February 25, 2015

### Location and Purpose:

Established to monitor baseline discharge on the Pierre River prior to the Shell Pierre River Mine development. Installed near the abandoned Environment Canada hydrometric station 07DA013 that operated from 1975 to 1977. Station is located 15 km north of the Canadian Natural Horizon Mine.



Map Grid Based on UTM NAD 27



Looking upstream from near the station. September, 2013.

Looking North towards the station September, 2013.

### Station Details

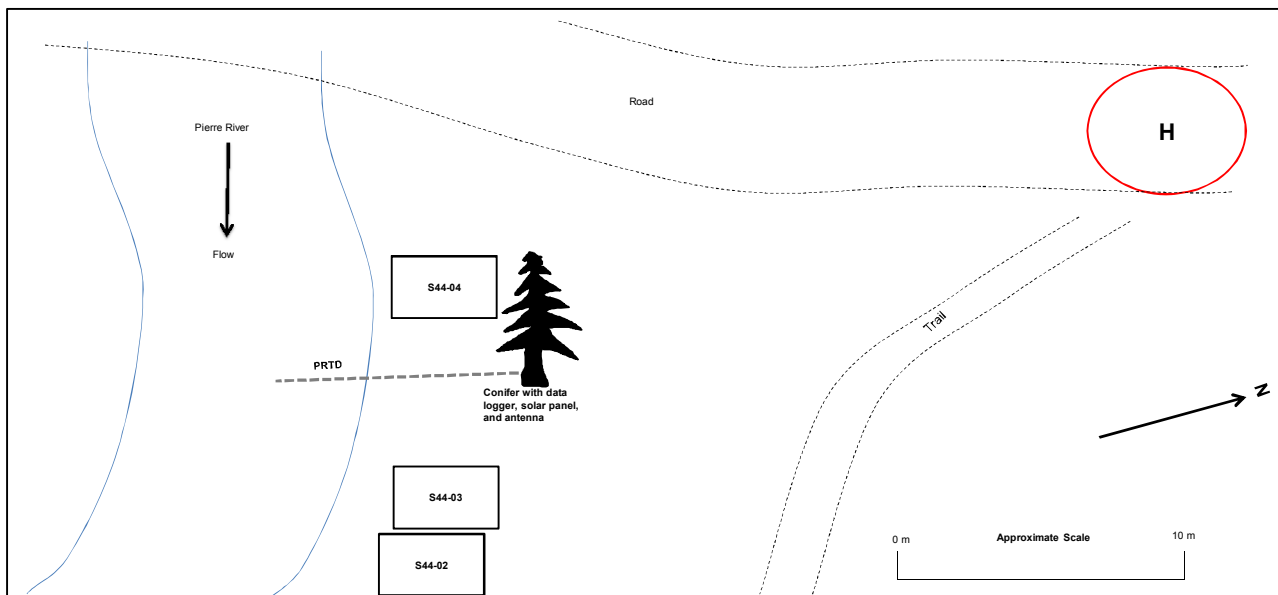
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	1975-77; May 2009-Present
<b>Station Operation:</b>	Open water (April-October)
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	123 km <sup>2</sup>
<b>UTM Coordinates:</b>	460775 E,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

### Measurement Details

<b>Channel</b>	The channel is approximately 3.5 m wide. The substrate is mostly made up of cobble. Water levels are generally very low and can be easily waded throughout the open water season.
<b>Control</b>	The control at this station is a downstream riffle.
<b>Metering Section</b>	Measurements are conducted by wading across the river near the station.

### Benchmark Information

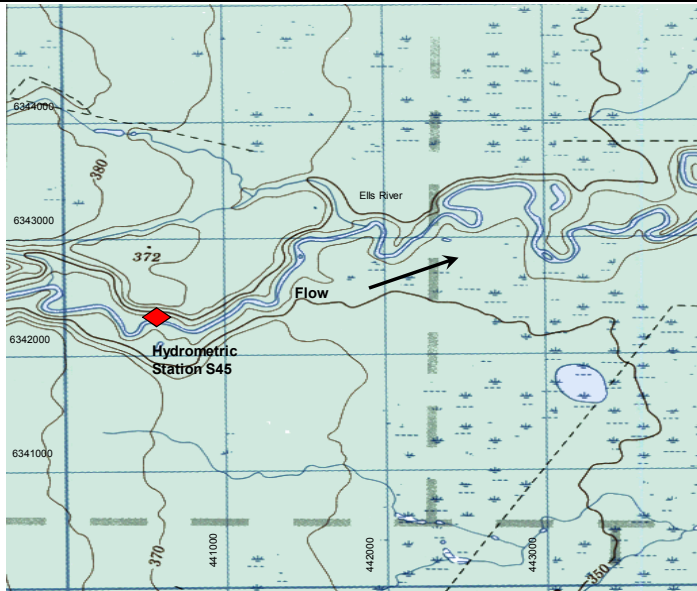
<b>BM:</b>	RAMP S44-02
<b>Elevation:</b>	99.878 m
<b>Basis:</b>	Assumed
<b>Location:</b>	8 m East of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S44-03
<b>Elevation:</b>	99.810 m
<b>Basis:</b>	Level Survey from RAMP S44-01
<b>Location:</b>	6 m East of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S44-04
<b>Elevation:</b>	100.073 m
<b>Basis:</b>	Level Survey from RAMP S44-01
<b>Location:</b>	2 m West of station
<b>Description:</b>	3/4" Pipe



Revised February 25, 2015

**Location and Purpose:**

Established to monitor discharge on the Ells River upstream of the proposed Joslyn Creek Diversion and the Fort McKay water intake. Located 19 km South West of the Canadian Natural Horizon mine.



Map Grid Based on UTM NAD 27



Looking upstream from near the station. September, 2013

Looking South towards the station. June, 2013

**Station Details**

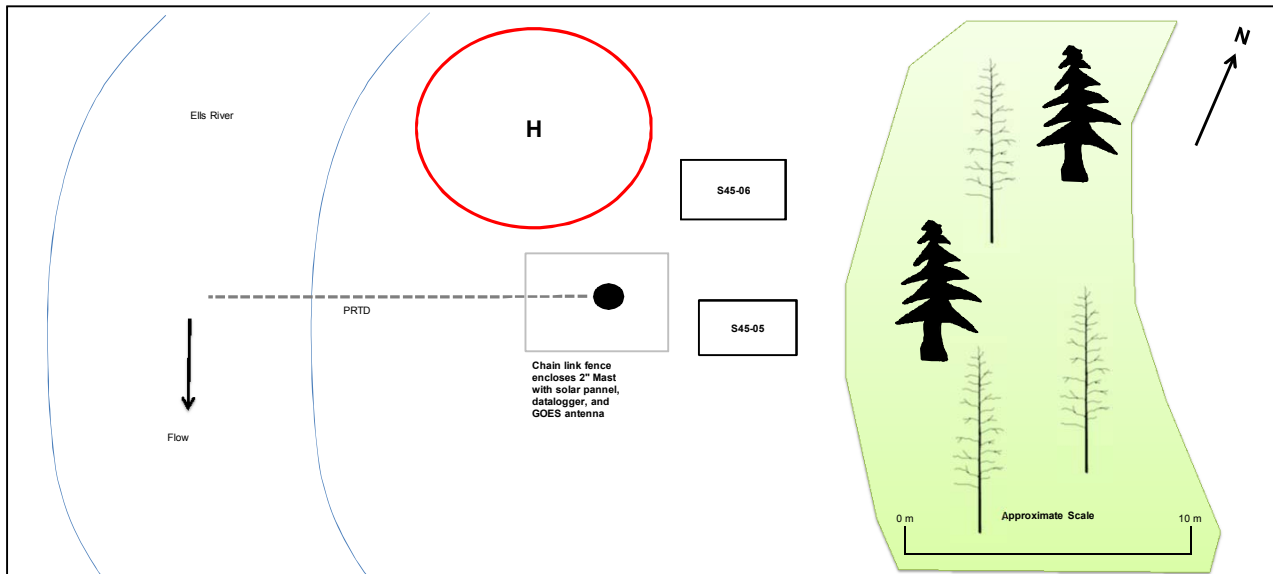
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	June 2009 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	2450 km <sup>2</sup>
<b>UTM Coordinates:</b>	440605 E, 6342459 N (NAD83)
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

**Measurement Details**

<b>Channel</b>	The channel is approximately 30 m wide. The substrate is mostly made up of cobbles. During the open water season the river can only be waded during periods of lower waterlevels at this location.
<b>Control</b>	This station has a downstream riffle that acts as the control.
<b>Metering Section</b>	The metering section is located near the station, upstream of the bend to the east.

**Benchmark Information**

<b>BM:</b>	RAMP S45-03
<b>Elevation:</b>	100.000 m
<b>Basis:</b>	Assumed
<b>Location:</b>	12 m West of station
<b>Description:</b>	3/4" Pipe - Destroyed by fallen tree
<b>BM:</b>	RAMP S45-05
<b>Elevation:</b>	99.809m
<b>Basis:</b>	Level Survey from RAMP S45-03
<b>Location:</b>	6 m West of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S45-06
<b>Elevation:</b>	99.880 m
<b>Basis:</b>	Level Survey from RAMP S45-03
<b>Location:</b>	3 m North of station
<b>Description:</b>	3/4" Pipe



Revised 25 February, 2015

**Location and Purpose:**

Station is located 14 km downstream from the Embarras airport. The station was established to monitor the Athabasca River downstream of all oil sands development.



Map Grid Based on UTM NAD 77

**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:** 156,000 km<sup>2</sup>  
**UTM Coordinates:** 470241 E, 6463206 N (NAD83)  
**Lat/Long:** 58° 18'32" N, 111° 30'28" W (NAD83)  
**NTS Map:** 74L/05/06

**Measurement Details**

**Channel:** Channel width is about 400 m. The deepest part of the channel is near the right bank, and sand bars typically occur in the centre of the channel at low flow periods.

**Control:** An island located 1.5 km downstream of monitoring station is likely the control.

**Metering Section:** Located adjacent to the monitoring station. Measurements are conducted from a boat in the open water season or under the ice in winter.

**Benchmark Information**

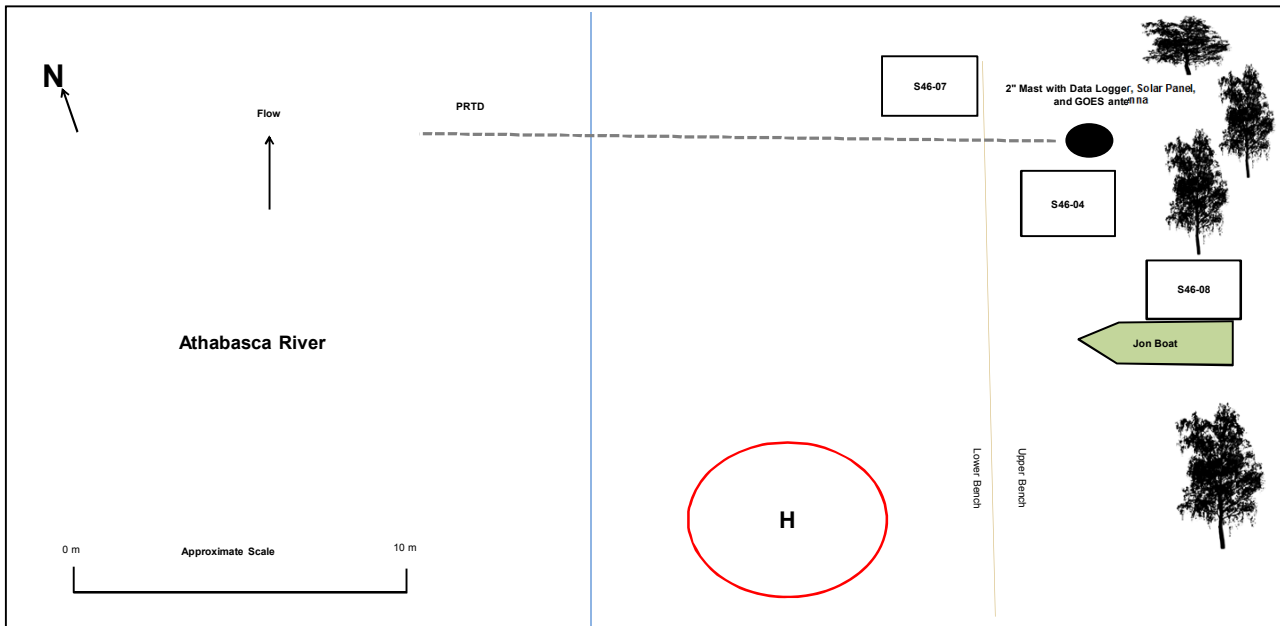
**BM:** RAMP S46-04  
**Elevation:** 99.748  
**Basis:** Datum transfer from previous S46-01  
**Location:** 2 m South of data logger  
**Description:** 3/4" Pipe with orange flagging

**BM:** RAMP S46-07  
**Elevation:** 99.860 m  
**Basis:** Level Survey from RAMP S46-04  
**Location:** Birch tree 5 m NE station  
**Description:** Lag bolt

**BM:** RAMP S46-08  
**Elevation:** 97.901  
**Basis:** Level Survey from RAMP S46-04  
**Location:** 3/4" Pipe behind berm near boat  
**Description:** 3/4" Pipe

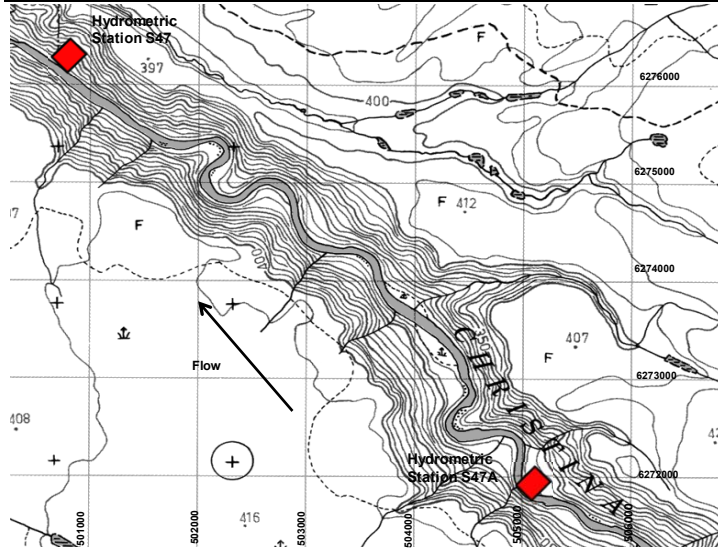


Looking across the Athabasca River from the right bank at station S46



**Location and Purpose:**

Established to monitor discharge on the Christina River near the mouth and downstream of all development in the Christina watershed. The station was moved from S47 to the current location in October 2012 to a location with better hydraulics. The station is located 12.3 km southwest of the Clearwater River confluence.



**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** May 2011 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 13,284 km<sup>2</sup>  
**UTM Coordinates:** 505048 E, 6272065 N (NAD83)  
**Lat/Long:** 56°35'34"N, 110°55'4"W (NAD83)  
**NTS Map:** 74D/10

**Measurement Details**

**Channel** The monitoring station is located on the inside of a large bend, out of the main flow. The channel is roughly 50 m across with a bed of cobbles and boulders.

**Control** A number of short riffle and runs beginning 200m downstream of the station appear during low flow, for the remainder of the year the channel morphology serves as a control.

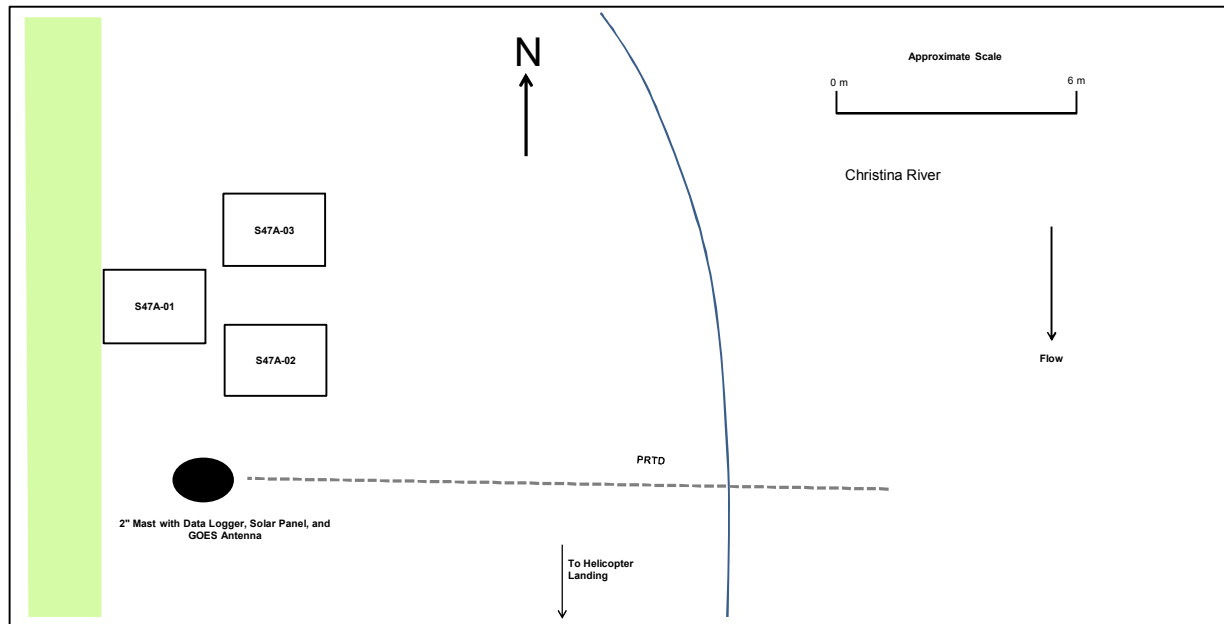
**Metering Section** The metering sections is located 9.9km downstream from the monitoring station. The channel at the metering section is very straight and roughly 70 m across, the bed consists of mostly cobbles. Measurements are conducted using a boat and wading, depending on water levels.

**Benchmark Information**

**BM:** RAMP S47A-01  
**Elevation:** 100.096 m  
**Basis:** Assumed  
**Location:** 6 m SE of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S47A-02  
**Elevation:** 99.884 m  
**Basis:** Level Survey from RAMP S47A-01  
**Location:** 5 m South of data logger  
**Description:** 3/4" Pipe

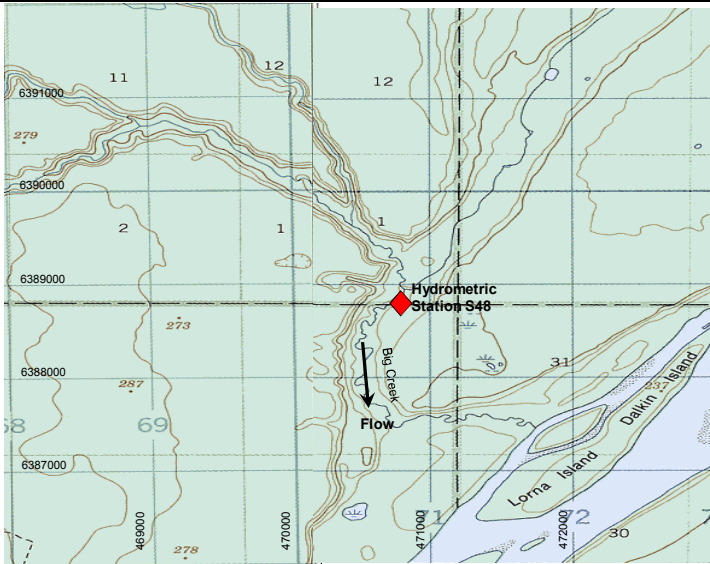
**BM:** RAMP S47A-03  
**Elevation:** 99.579 m  
**Basis:** Level Survey from RAMP S47A-01  
**Location:** 7 m South of data logger  
**Description:** 3/4" Pipe



Revised February 27, 2015

**Location and Purpose:**

Established to monitor water level and discharge on Big Creek near the mouth to establish baseline conditions prior to construction of the Pierre River and Teck Frontier mines. Located 2 km North West of Lorna Island on the Athabasca River.



Map Grid Based on UTM NAD 27



Looking South towards the station from the left bank of the river. September, 2013

Looking downstream from near the station. August, 2013

**Station Details**

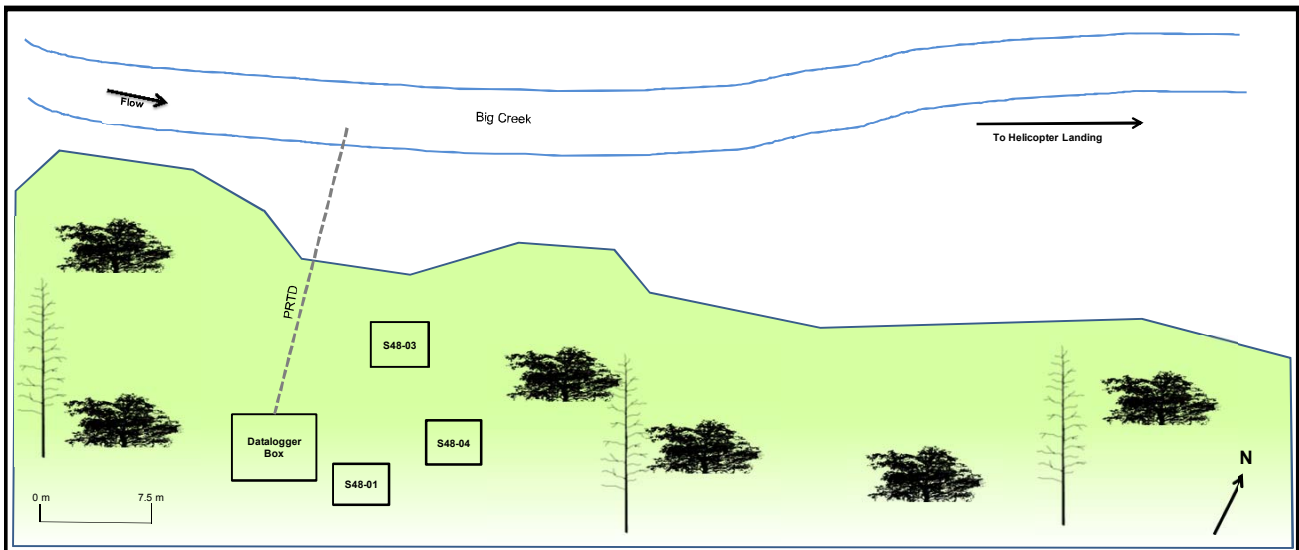
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular with radio relay
<b>Period of Record:</b>	May 2011 to Present
<b>Station Operation:</b>	Open water (April-October)
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	304 km <sup>2</sup>
<b>UTM Coordinates:</b>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

**Measurement Details**

<b>Channel</b>	The channel is approximately 5 m wide. The substrate is mostly made up of silt and sand. At this location the river can be waded throughout the open water season due to fairly low flows.
<b>Control</b>	This site is controlled by the channel morphology.
<b>Metering Section</b>	The metering section is located near the station.

**Benchmark Information**

<b>BM:</b>	RAMP S48-01
<b>Elevation:</b>	100.126 m
<b>Basis:</b>	Assumed
<b>Location:</b>	2 m SE of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S48-03
<b>Elevation:</b>	99.798 m
<b>Basis:</b>	Level Survey from RAMP S48-01
<b>Location:</b>	6 m North East of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S48-04
<b>Elevation:</b>	99.671 m
<b>Basis:</b>	Level Survey from RAMP S48-01
<b>Location:</b>	6 m East of station
<b>Description:</b>	3/4" Pipe

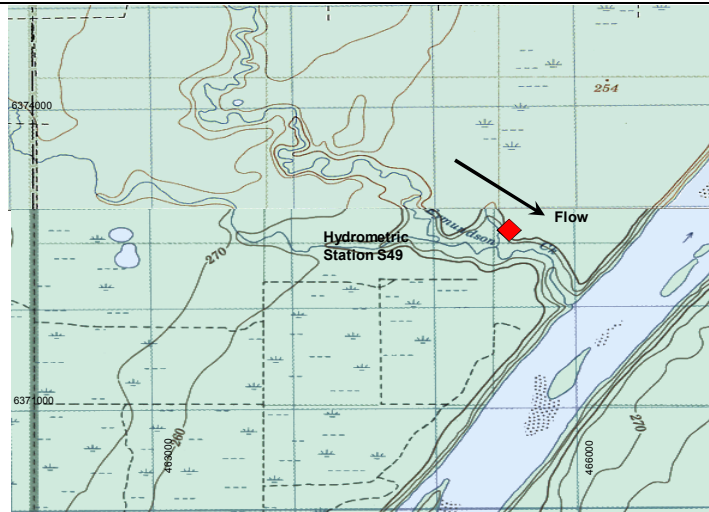




Revised February 25, 2015

**Location and Purpose:**

Established to monitor water level and discharge on Eymundson Creek near the mouth to establish baseline conditions prior to construction of the Pierre River Mine. Located 20 km North West of the Syncrude Arora Mine.



Map Grid Based on UTM NAD 27

**Station Details**

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

**Measurement Details**

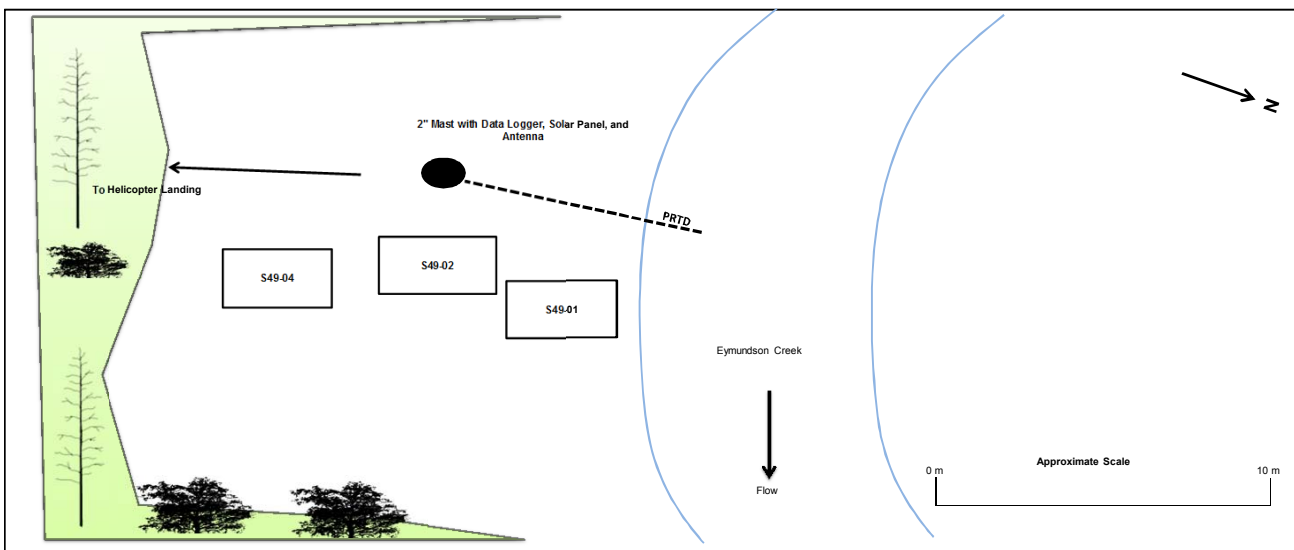
**Channel:** The channel has trapezoidal banks approximately 7 m wide. The substrate is mostly made silt and sand. During the open water season the river can be waded except during periods of high water levels.  
**Control:** The channel morphology is the control at this station.  
**Metering Section:** The metering section is located near the station.



Looking South West towards the station.

Looking upstream towards from near the station September, 2013

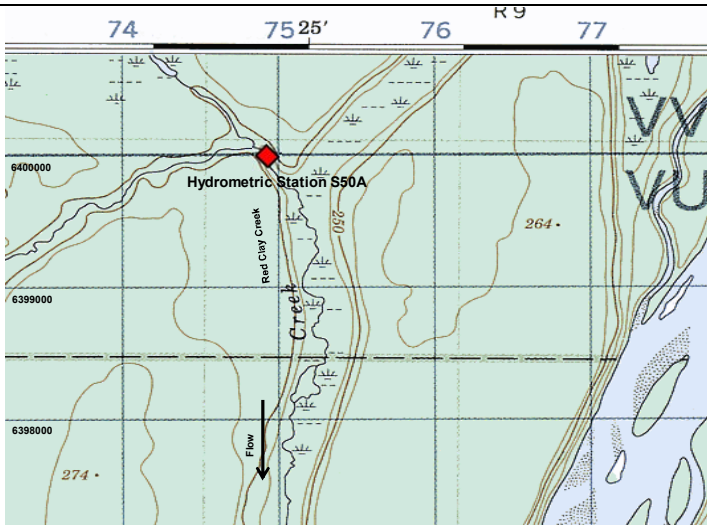
**BM:** RAMP S49-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 6 m North of station  
**Description:** 3/4" Pipe  
**BM:** RAMP S49-03  
**Elevation:** 99.935 m  
**Basis:** Level Survey from RAMP S49-01  
**Location:** 5 m NE of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S49-04  
**Elevation:** 100.290 m  
**Basis:** Level Survey from RAMP S49-01  
**Location:** 7 m East of station  
**Description:** 3/4" Pipe



Revised February 25, 2015

### Location and Purpose:

Established to monitor water level and discharge on Red Clay Creek near the mouth to establish baseline conditions prior to construction of the Pierre River Mine. The station was relocated (from 475701 E, 6395073 N) in April 2012 to avoid influence from beaver dams. Located 47 km North of the Syncrude Arora mine development.



Map Grid Based on UTM NAD 27



### Station Details

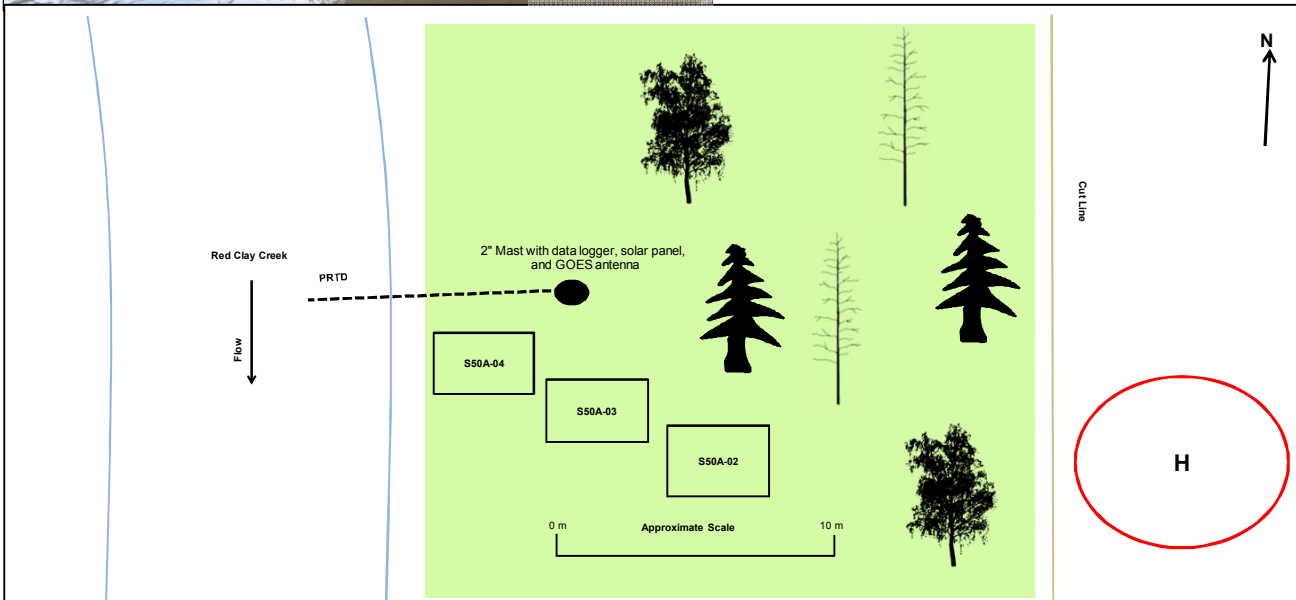
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	May 2011 to Present
<b>Station Operation:</b>	Open water (April-October)
<b>Access:</b>	Helicopter
<b>Drainage Area:</b>	187 km <sup>2</sup>
<b>UTM Coordinates:</b>	474881 E, 6400224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

### Measurement Details

<b>Channel</b>	The channel is roughly 8 m wide and the dominant bed type is sand. The river at this site can be waded throughout the open water season.
<b>Control</b>	The channel morphology is the control for this site.
<b>Metering Section</b>	Measurements are conducted by wading across the straight reach of the river 10 m upstream of the PT.

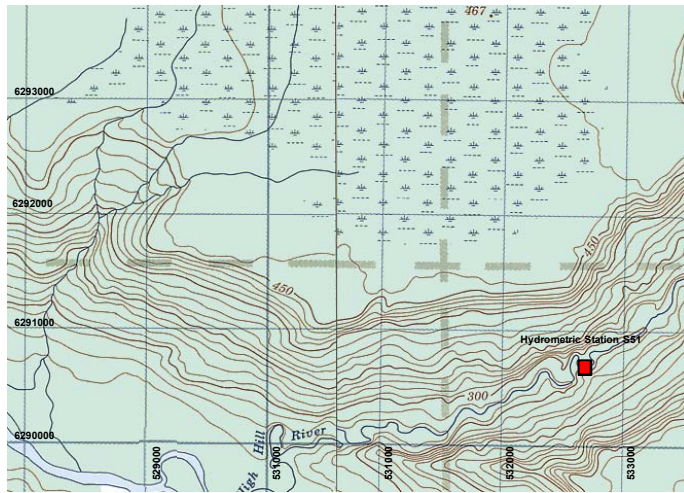
### Benchmark Information

<b>BM:</b>	RAMP S50A-02
<b>Elevation:</b>	100.160 m
<b>Basis:</b>	Level Survey from RAMP S50A-01
<b>Location:</b>	8 m South of station
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S50A-03
<b>Elevation:</b>	99.392 m
<b>Basis:</b>	Level Survey from RAMP S50A-02
<b>Location:</b>	7 m South West of Logger
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S50A-04
<b>Elevation:</b>	99.208
<b>Basis:</b>	Level Survey from RAMP S50A-02
<b>Location:</b>	10 m South East of Logger
<b>Description:</b>	3/4" Pipe



**Location and Purpose:**

Established to monitor discharge on High Hills River upstream of the confluence with the Clearwater River. The station was installed to act as an unaffected reference stream for the Alberta Oilsands Region. The monitoring station is located 5 km northeast of the Clearwater River confluence.



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:** 1,588 km<sup>2</sup>  
**UTM Coordinates:** 533925 mE, 6291921 mN (NAD83)  
**Lat/Long:** 56°45'42"N, 110°28'2"W (NAD83)  
**NTS Map:** 74D/16

**Measurement Details**

**Channel** The channel is roughly 19 m wide and the bed consists of cobbles and gravel.

**Control** A small riffle exists 25 m downstream of the station before the channel drastically turns along a steep cutbank.

**Metering Section** The metering section is located 40 m upstream of the station. The channel is shallow enough to be waded at low flow, but requires a kickboat or cableway at higher flows.

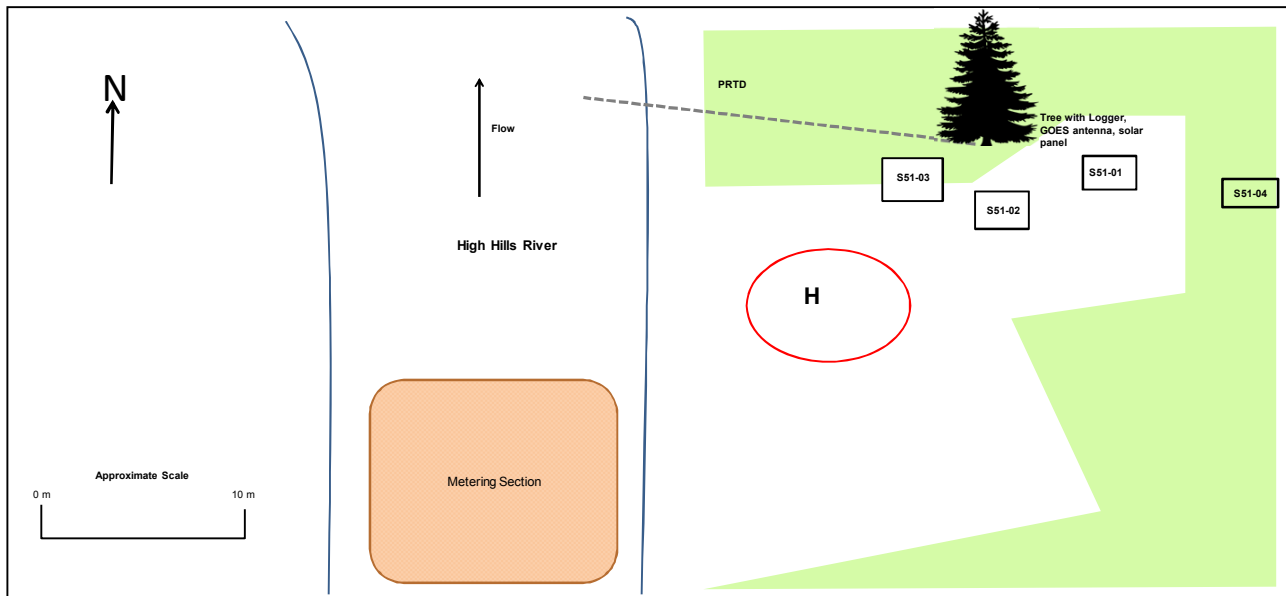
**Benchmark Information**

**BM:** RAMP S51-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 3 m SE of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S51-02  
**Elevation:** 100.076 m  
**Basis:** Level Survey from RAMP S51-01  
**Location:** 3 m S of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S51-03  
**Elevation:** 100.484 m  
**Basis:** Level Survey from RAMP S51-01  
**Location:** 2 m W of data logger  
**Description:** 3/4" Pipe

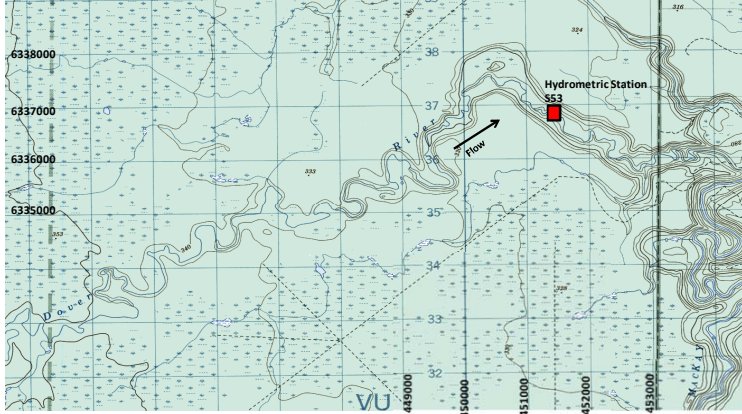
**BM:** RAMP S51-04  
**Elevation:** 100.025 m  
**Basis:** Level Survey from RAMP S51-01  
**Location:** 7 m W of data logger  
**Description:** Lag bolt in tree



Revised February 25, 2015

**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. The station is located 10 km West of the town Fort McKay.



Map Grid Based on UTM NAD 27



Looking West towards station. August, 2013

Looking downstream from near the station. September, 2013

**Station Details**

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

**Measurement Details**

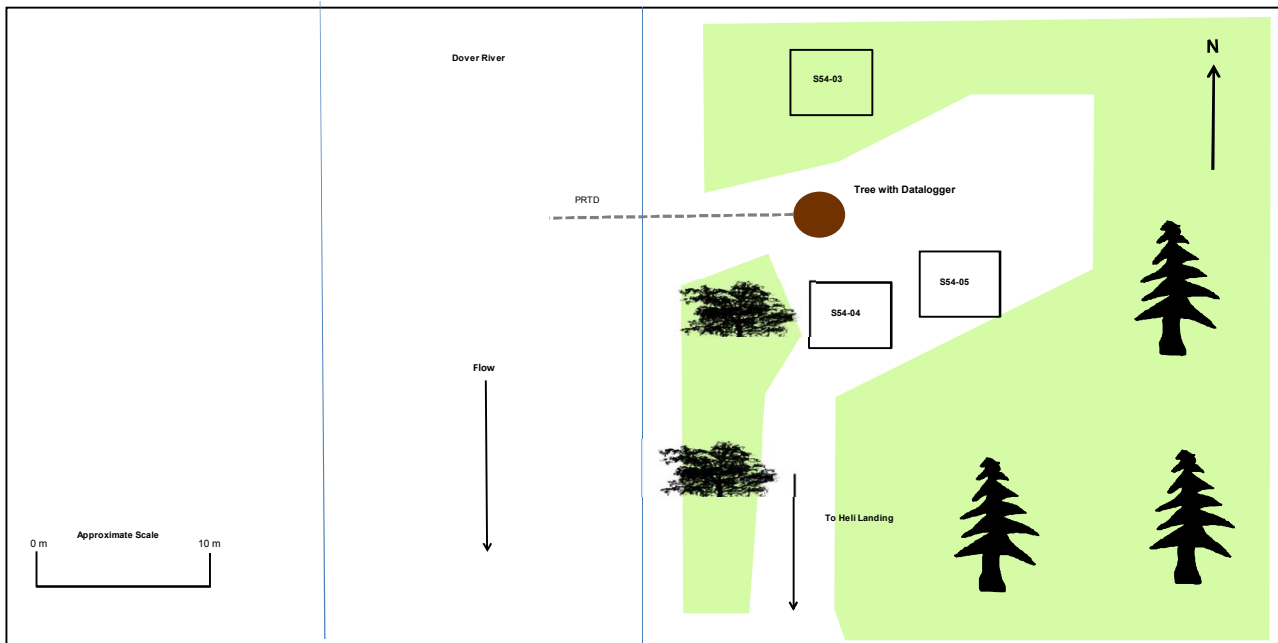
**Channel:** The channel is roughly 15 m wide and the dominant bed type is cobble and small boulder. The river at this site can be waded throughout most of the open water season.  
**Control:** There is a downstream riffle that acts as the control at this station.  
**Metering Section:** Measurements are conducted by wading across the straight reach of the river 5 m downstream from the station. A boat is required during high flow periods.

**Benchmark Information**

**BM:** RAMP S53-03  
**Elevation:** 100.361 m  
**Basis:** Assumed  
**Location:** Level Survey from RAMP S53-02  
**Description:** 3/4" Pipe

**BM:** RAMP S53-04  
**Elevation:** 100.165 m  
**Basis:** Level Survey from RAMP S53-03  
**Location:** 2 m South East of station  
**Description:** 3/4" Pipe

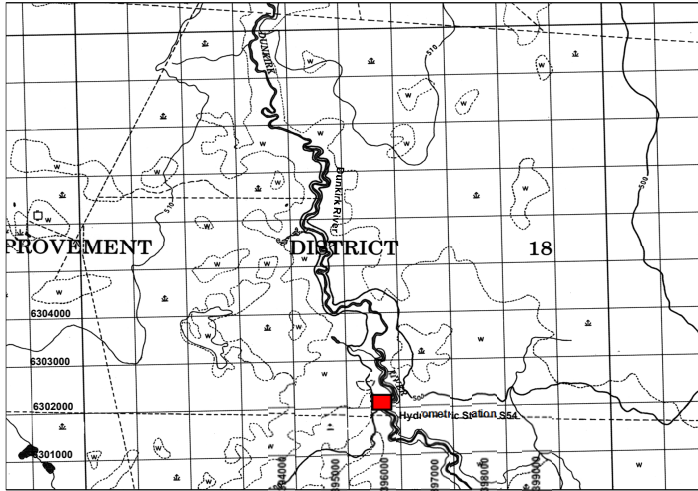
**BM:** RAMP S53-05  
**Elevation:** 100.388 m  
**Basis:** Level Survey from RAMP S53-03  
**Location:** 5 m East of station  
**Description:** 3/4" Pipe



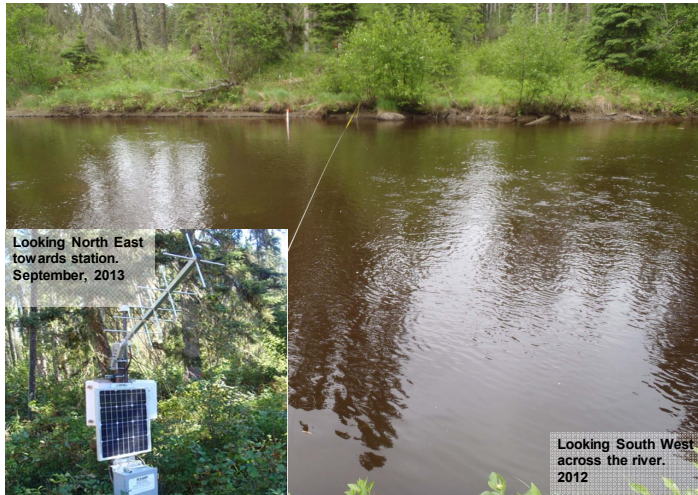
Revised February 25, 2015

**Location and Purpose:**

Established to monitor discharge on the Dunkirk River upstream of the confluence with the MacKay River. Water Survey of Canada operated a nearby hydrometric station 07DB003 (at 56°51'20" N, 112°42'40" W) between 1975 and 1979. The station is located approximately 80 km West of Fort McMurray.



Map Grid Based on UTM NAD 27



**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

**Measurement Details**

**Channel:** The channel is roughly 25 m wide and the dominant bed type is sand and silt. The river at this site can be waded during periods of lower water levels of the open water season.

**Control:** The channel morphology acts as the control at this site.

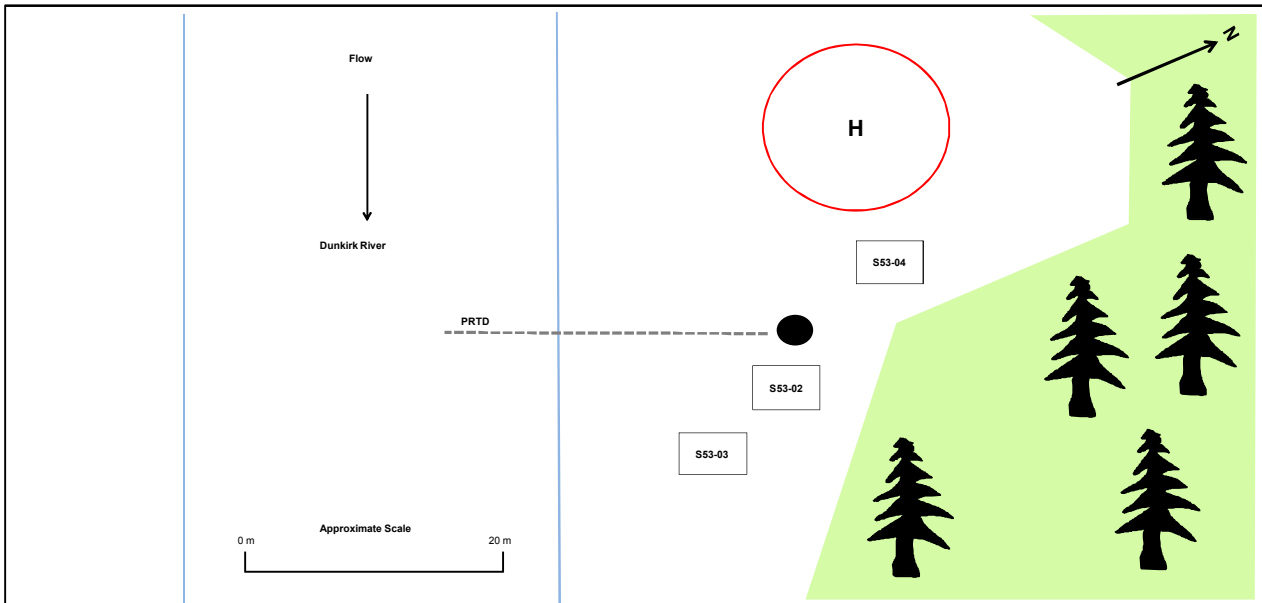
**Metering Section:** Measurements are conducted by wading across the straight reach of the river near the station. A boat is required during high flow.

**Benchmark Information**

**BM:** RAMP S54-02  
**Elevation:** 99.699 m  
**Basis:** Level Survey from RAMP S54-01  
**Location:** 2 m South East of station  
**Description:** 3/4" Pipe

**BM:** RAMP S54-03  
**Elevation:** 99.908 m  
**Basis:** Level Survey from RAMP S54-01  
**Location:** 6 m South East of station  
**Description:** 3/4" Pipe

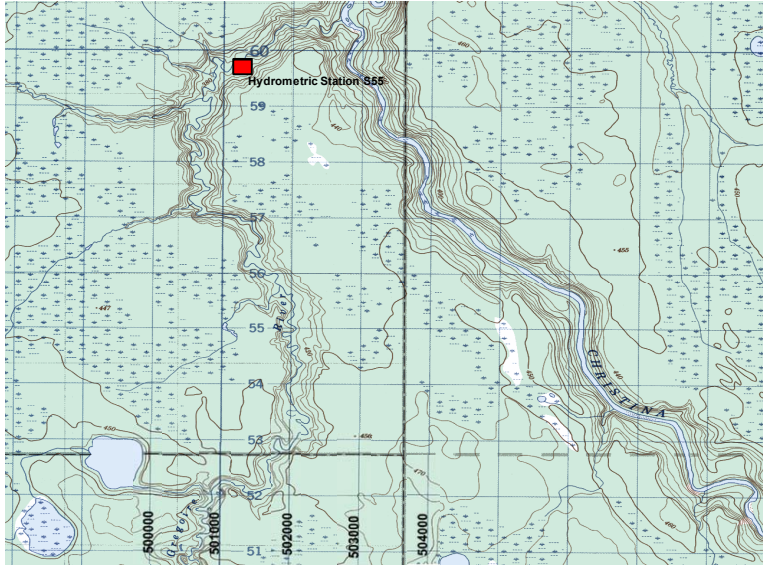
**BM:** RAMP S54-04  
**Elevation:** 100.062 m  
**Basis:** Level Survey from RAMP S54-01  
**Location:** 5 m NW of logger  
**Description:** Lag bolt



Revised 25 February, 2015

### Location and Purpose:

Established to monitor discharge on the Gregoire River downstream of the Nexen Long Lake development. The station is located 1.7 km southeast of the Christina River confluence.



Looking across Gregoire River from the left bank at Station S55

View of Station S55 and the helicopter landing area

### Station Details

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular with radio relay  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:** 1,015 km<sup>2</sup>  
**UTM Coordinates:** 510184 mE, 6259986 mN (NAD83)  
**Lat/Long:** 56°29'3"N, 110°50'4"W (NAD83)  
**NTS Map:** 74D/07

### Measurement Details

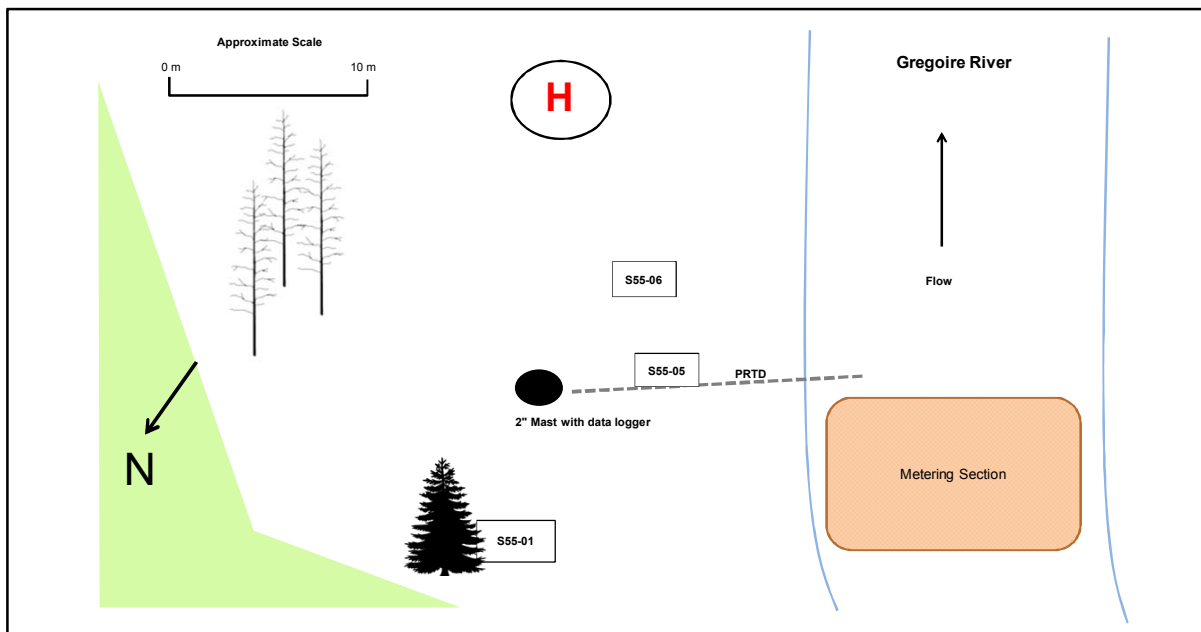
**Channel:** The channel is roughly 14 m wide and the substrate is dominated by boulders and cobbles.  
**Control:** A downstream riffle acts as channel control  
**Metering Section:** The metering section is near the station where the channel can be waded, during high flow a boat is required.

### Benchmark Information

**BM:** RAMP S55-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** Bolt in Spruce tree  
**Description:** 2" Bolt

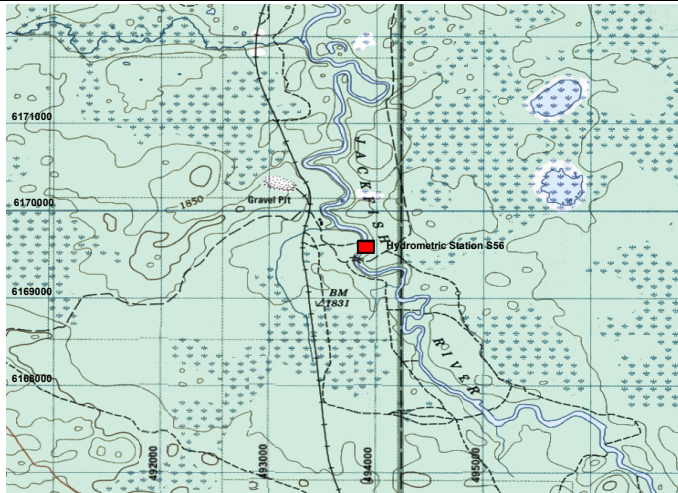
**BM:** RAMP S55-05  
**Elevation:** 99.811 m  
**Basis:** Level Survey from RAMP S55-01  
**Location:** 4 m N of data logger  
**Description:** 3/4" Pipe with pink flagging

**BM:** RAMP S55-06  
**Elevation:** 100.275 m  
**Basis:** Level Survey from RAMP S55-01  
**Location:** 2 m SE of data logger  
**Description:** 3/4" Pipe with pink flagging



### Location and Purpose:

Established to monitor discharge on the Jackfish River downstream of Christina Lake and upstream of the Christina River. The station is located 3.4 km NW of the town of Conklin, 100 m downstream of the Jackfish River bridge on Hwy 881. The Water Survey of Canada operated hydrometric station 07CE005 at this location between 1982 and 1995.



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 Hwy 881  
**Drainage Area:** 1,290 km<sup>2</sup> (WSC)  
**UTM Coordinates:** 493741 mE, 6169693 mN (NAD83)  
**Lat/Long:** 55°40'22"N, 111° 5'58"W (NAD83)  
**NTS Map:** 73M/11

### Benchmark Information

**Channel** The channel is roughly 22 m across, the bed is dominated by gravel with some boulders found throughout.

**Control** The channel morphology serves as a control for this station location.

**Metering Section** The metering section is located near the station and can be crossed by wading during low flows, a boat is required during high flow conditions.

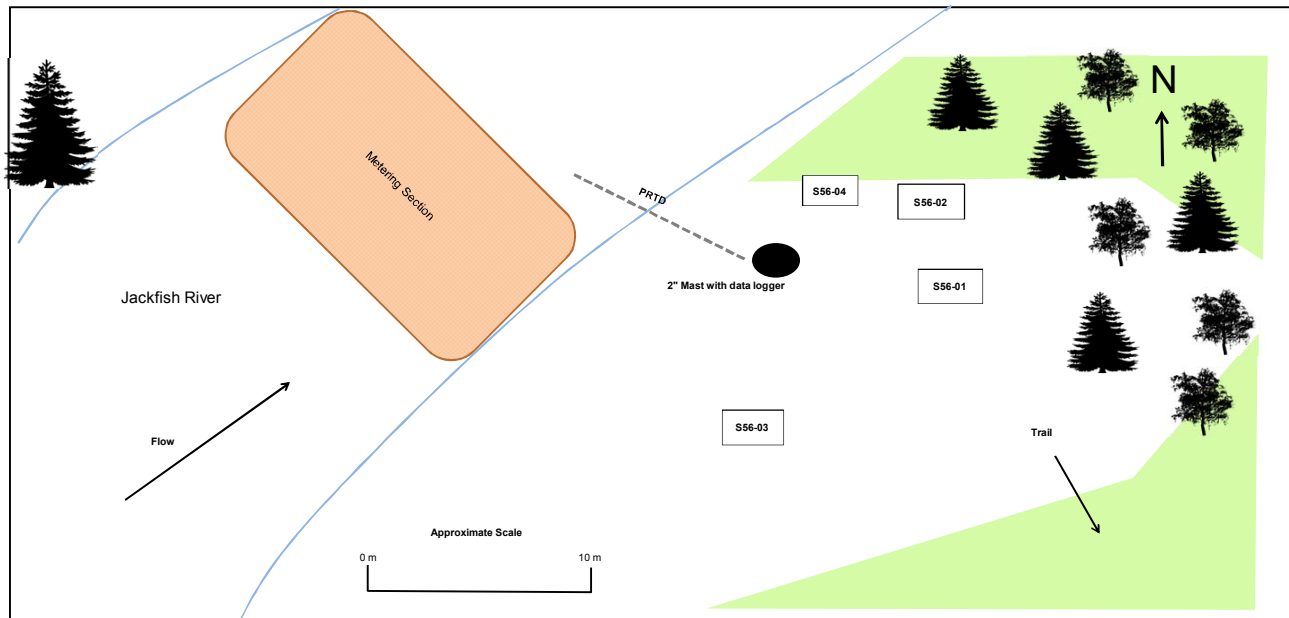
### Benchmark Information

**BM:** RAMP S56-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 3 m SE of data logger  
**Description:** T-post (damaged)

**BM:** RAMP S56-02  
**Elevation:** 99.967 m  
**Basis:** Level Survey from RAMP S56-01  
**Location:** 2 m E of data logger  
**Description:** 3/4" Pipe

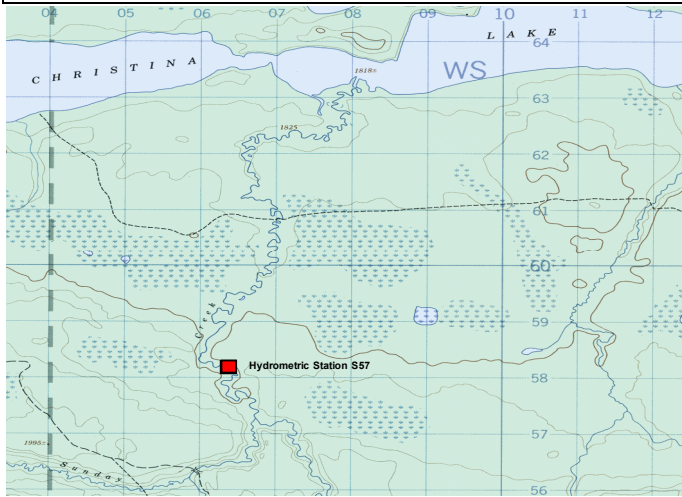
**BM:** RAMP S56-03  
**Elevation:** 100.051 m  
**Basis:** Level Survey from RAMP S56-01  
**Location:** 4 m S of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S56-04  
**Elevation:** 100.056 m  
**Basis:** Level Survey from RAMP S56-01  
**Location:** 3 m NW of data logger  
**Description:** 3/4" Pipe



**Location and Purpose:**

Established to monitor discharge on Sunday Creek upstream of Christina Lake and downstream of both Devon and Cenovus. This station is located 1.6 km northeast of Cenovus Christina Lake main security gate and 13 km from Conklin.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2012 to Present  
**Station Operation:** Year-round  
**Access:** 2WD road via Cenovus Christina Lake Mine  
**Drainage Area:** 374 km<sup>2</sup>  
**UTM Coordinates:** 506210 mE, 6158391 mN (NAD83)  
**Lat/Long:** 55°34'17"N, 110°54'46"W (NAD83)  
**NTS Map:** 73M/10

**Measurement Details**

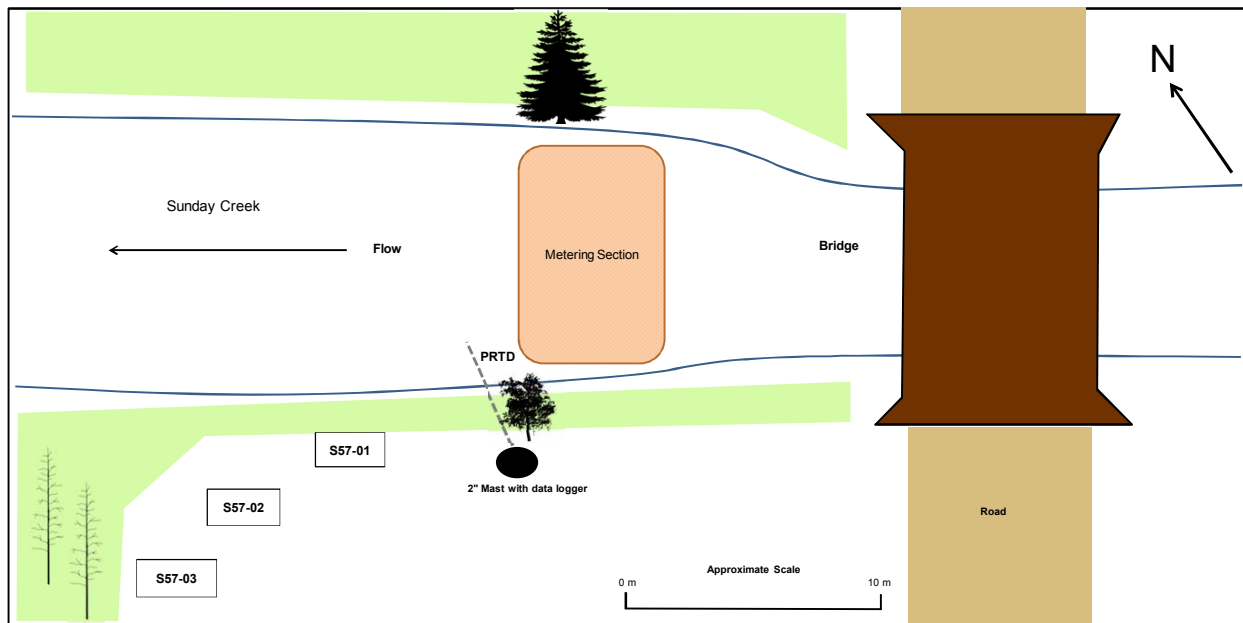
**Channel:** The channel is roughly 13 m wide with a dominant substrate of sand and silts.  
**Control:** The channel morphology serves as a control for this station.  
**Metering Section:** The metering section is located near the station. This straight reach can be easily crossed by wading.

**Benchmark Information**

**BM:** RAMP S57-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 2 m West of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S57-02  
**Elevation:** 99.961 m  
**Basis:** Level Survey from RAMP S57-01  
**Location:** 5 m West of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S57-03  
**Elevation:** 100.060 m  
**Basis:** Level Survey from RAMP S57-01  
**Location:** 8 m West of data logger  
**Description:** 3/4" Pipe

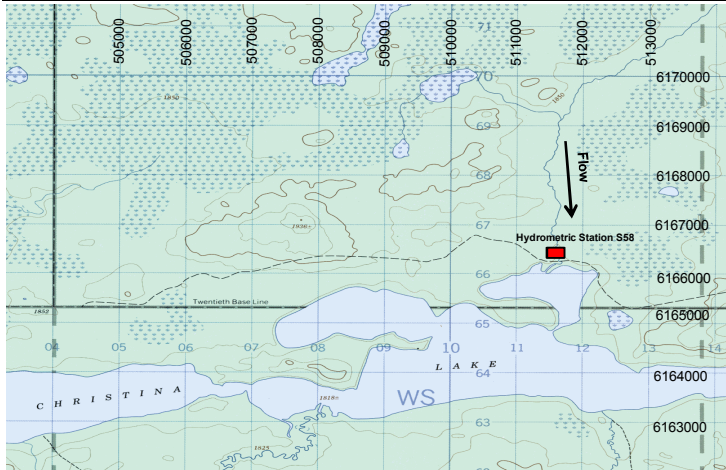




Revised 26 February 2015

**Location and Purpose:**

Established to monitor discharge on Sawbones Creek upstream of Christina Lake and downstream of both MEG and Cenovus. This station is located 4.5 km northwest of the MEG Energy Airport, 20 m upstream of the Sawbones Creek bridge on the main MEG Energy access road.



Map Grid Based on UTM NAD 27



Looking downstream from near the station. 2013.

**Station Details**

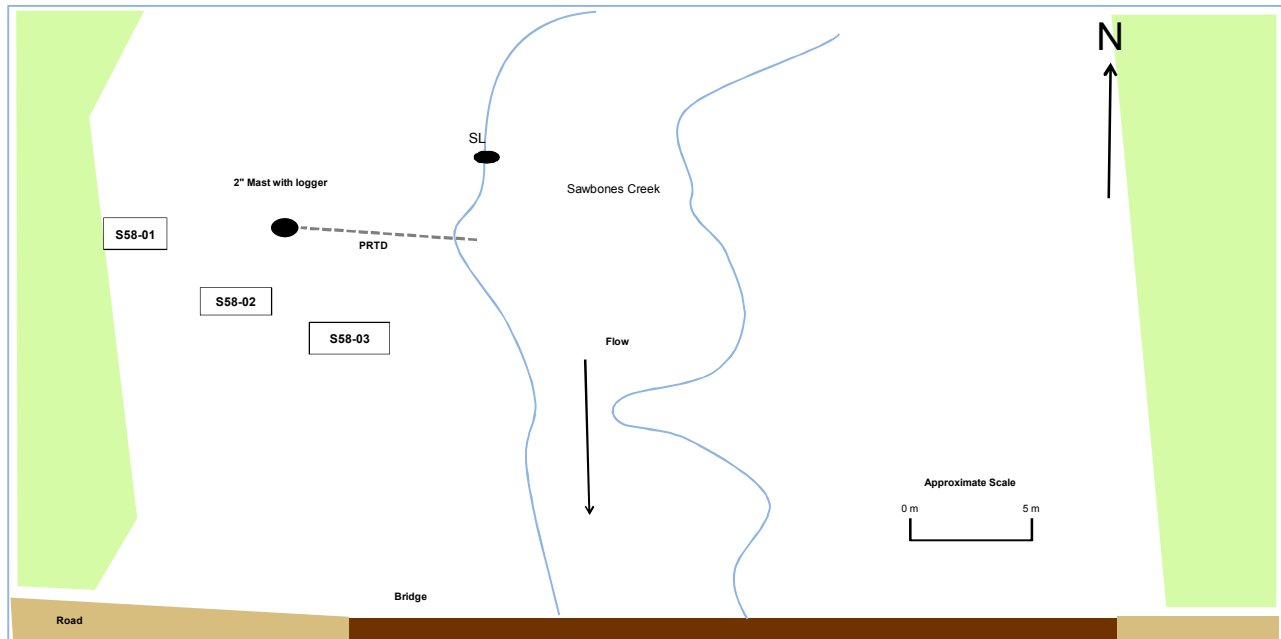
**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2012 to Present  
**Station Operation:** Open water (April-October)  
**Access:** 2WD road via the MEG Energy Mine  
**Drainage Area:** 126 km<sup>2</sup>  
**UTM Coordinates:** 511412 mE, 6167165 mN (NAD83)  
**Lat/Long:** 55°39'76"N, 110°49'16"W (NAD83)  
**NTS Map:** 73M/10

**Measurement Details**

**Channel:** The channel is roughly 5 m across and is generally too deep to wade. The monitoring station is located just past a large bend, the substrate is made up of organics.  
**Control:** The channel morphology serves as a control for this station.  
**Metering Section:** The metering section is located under the bridge 20 m downstream of the station. This is a straight reach and retains defined banks throughout the entire open water season, measurements are done from a boat.

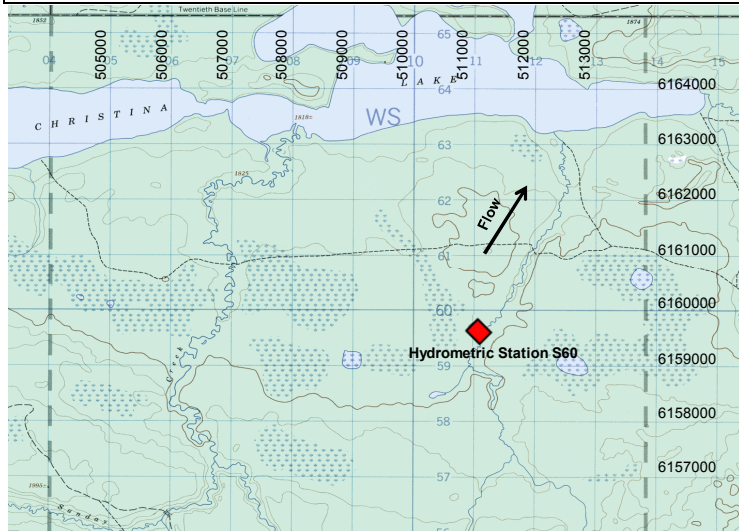
**Benchmark Information**

**BM:** RAMP S58-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 6 m W of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S58-02  
**Elevation:** 99.890 m  
**Basis:** Level Survey from RAMP S58-01  
**Location:** 5 m SW of data logger  
**Description:** 3/4" Pipe  
**BM:** RAMP S58-03  
**Elevation:** 99.969 m  
**Basis:** Level Survey from RAMP S58-01  
**Location:** 5 m S of data logger  
**Description:** 3/4" Pipe



**Location and Purpose:**

Established to monitor discharge on Unnamed Creek upstream of Christina Lake. The purpose of this station is to help define regional characteristics and inputs into Christina Lake. The Station is located approximately 16 km east of Conklin.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2013 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via Cenovus Christina Lake Site  
**Drainage Area:** 140 km<sup>2</sup>  
**UTM Coordinates:** 511145 E, 6159877 N (NAD83)  
**Lat/Long:** 55°35'5" N, 110°49'24" W (NAD83)  
**NTS Map:** 73M/10

**Measurement Details**

**Channel:** The channel is approximately 4 m across and too deep to wade most of the open water season. The substrate is predominately organics with some rock under and around the bridge.

**Control:** The bridge and bridge rip rap acts as the control at this station.

**Metering Section:** The metering section is located 40 m upstream around the bend where the river straightens out. During higher flows a boat is required.

**Benchmark Information**

**BM:** RAMP S60-01  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 8 m NE of data logger  
**Description:** 3/4" Pipe

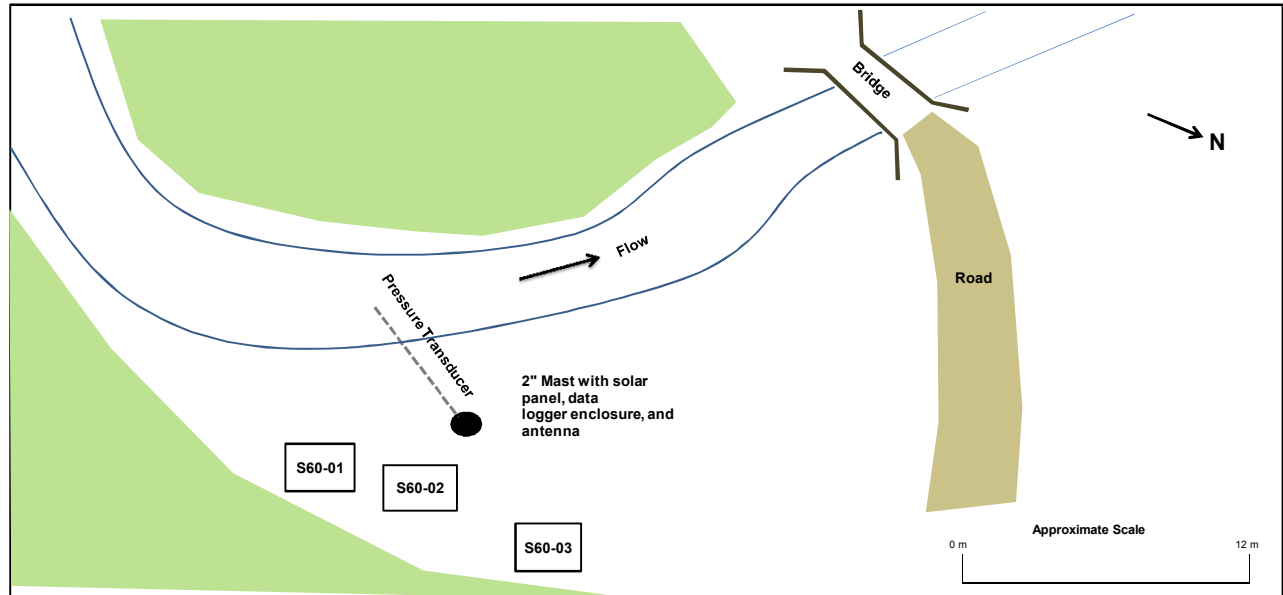
**BM:** RAMP S60-02  
**Elevation:** 99.947 m  
**Basis:** Level Survey from RAMP S60-01  
**Location:** 4 m East of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S60-03  
**Elevation:** 99.798 m  
**Basis:** Level Survey from RAMP S60-01  
**Location:** 6 m East of data logger  
**Description:** 3/4" Pipe



Equipment, benchmarks, and a cross-channel view of the flooded river in May, 2013. View from 8 m North of station

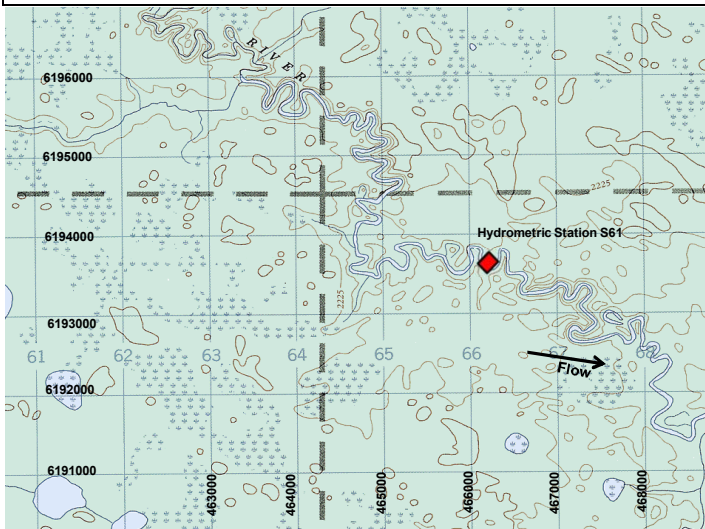
Upstream view at station S60, 2013



Revised 26 February 2015

**Location and Purpose:**

Established in May 2013 to monitor discharge in the upper reaches of the Christina River upstream of Statoil Leismer and to act as a reference site for the Christina River. The station is located 40 km northwest of Conklin.



Map Grid Based on UTM NAD 27

**Station Details**

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2013 to Present  
**Station Operation:** Year Round  
**Access:** Helicopter  
**Drainage Area:** 1.028 km<sup>2</sup>  
**UTM Coordinates:** 466037 E, 6193791 N (NAD83)  
**Lat/Long:** 55°53'18" N, 111°32'35" W (NAD83)  
**NTS Map:** 74M/13

**Measurement Details**

**Channel:** Trapezoidal edge and approximately 20 m across. The substrate is predominately made up of silt and sand.  
**Control:** The channel morphology acts as the control at this station.  
**Metering Section:** The metering section is across from the station. During high water a boat is needed to conduct flow measurements because of high velocity and deep water. During low flow periods the channel becomes shallow enough to wade.



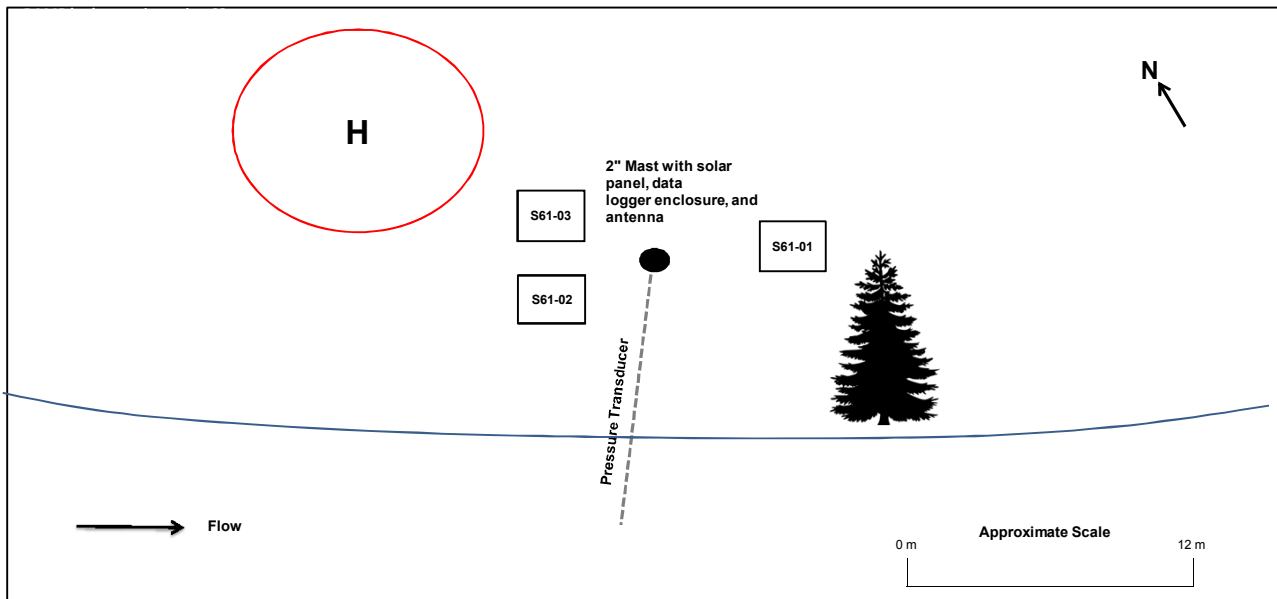
Upstream view at RAMP Hydrometric Station S61, Christina River above Statoil Leismer

**Benchmark Information**

**BM:** RAMP S61-01  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 6 m South of data logger  
**Description:** 3/4" Pipe

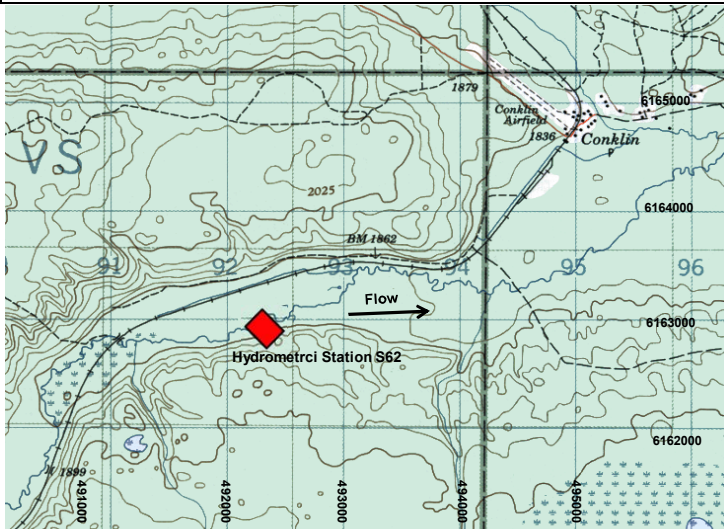
**BM:** RAMP S61-02  
**Elevation:** 100.525 m  
**Basis:** Level Survey from RAMP S61-01  
**Location:** 8 m SW of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S61-03  
**Elevation:** 100.020 m  
**Basis:** Level Survey from RAMP S61-01  
**Location:** 4 m NW of data logger  
**Description:** 3/4" Pipe



### Location and Purpose:

Established to monitor discharge on Birch Creek upstream of Christina Lake in order to increase understanding of regional characteristics and help define inputs into Christina Lake. The station is located 3 km southwest of Conklin.



Map Grid Based on UTM NAD 27

### Station Details

<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	May 2013 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	2WD road via Hwy 881
<b>Drainage Area:</b>	197 km <sup>2</sup>
<b>UTM Coordinates:</b>	492149 E, 6163182 N (NAD83)
<b>Lat/Long:</b>	55°36'53" N, 111°7'24" W (NAD83)
<b>NTS Map:</b>	74M/11

### Measurement Details

<b>Channel</b>	The channel is approximately 7 m wide and it has trapezoidal edges. The substrate is made up of predominately silt and sand.
<b>Control</b>	The culvert acts as the control at this station
<b>Metering Section</b>	The metering section is located across from the station on a straight reach of the river. The banks are steep on either side and the flow is well confined.

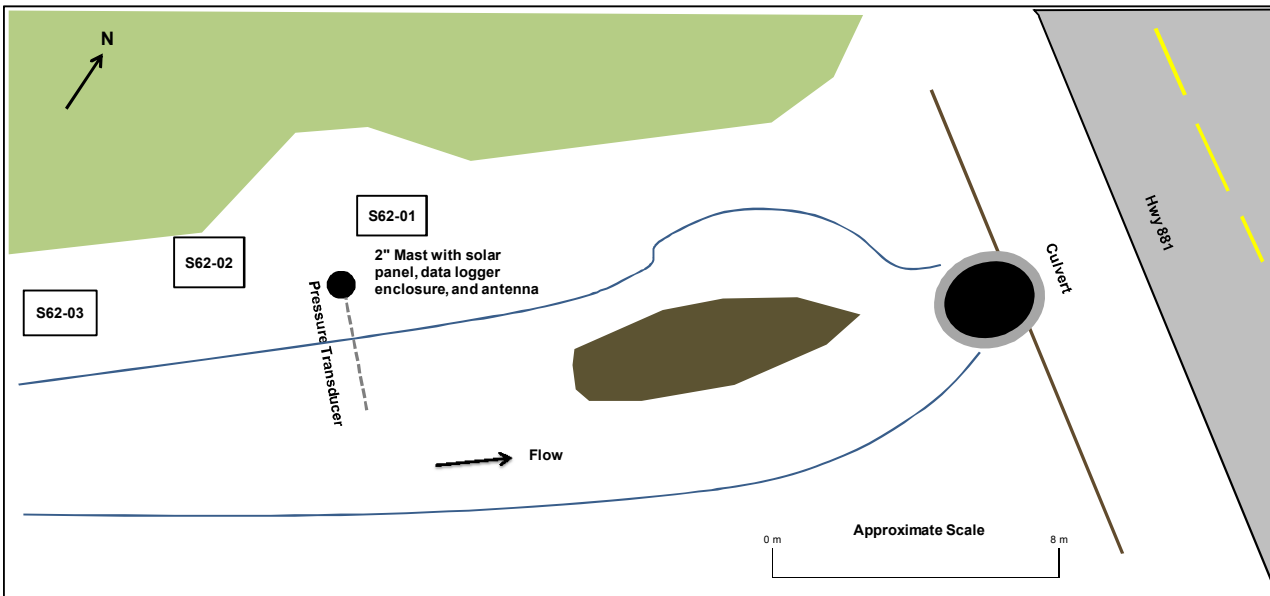
### Benchmark Information

<b>BM:</b>	RAMP S62-01
<b>Elevation:</b>	100.000 m
<b>Basis:</b>	Assumed Local Datum
<b>Location:</b>	2 m North of data logger
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S62-02
<b>Elevation:</b>	99.949 m
<b>Basis:</b>	Level Survey from RAMP S62-01
<b>Location:</b>	5 m West of data logger
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S2-03
<b>Elevation:</b>	100.034 m
<b>Basis:</b>	Level Survey from RAMP S62-01
<b>Location:</b>	8 m West of data logger
<b>Description:</b>	3/4" Pipe



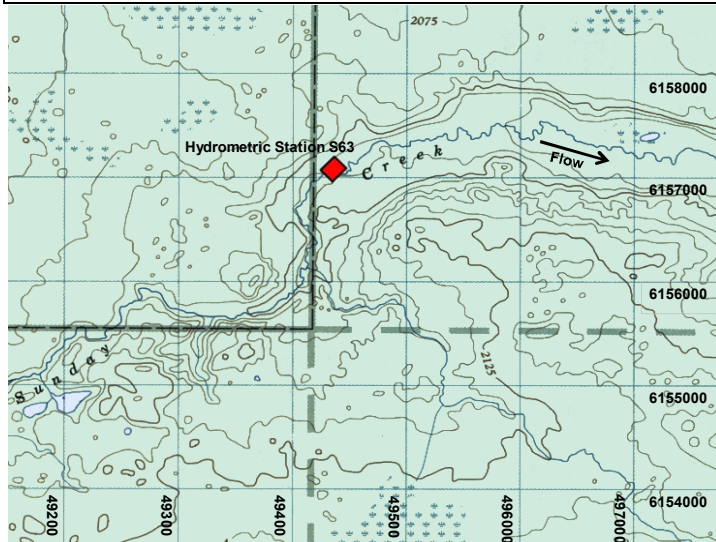
Looking North East towards station, September, 2013

Looking upstream from near the station.



**Location and Purpose:**

Established to monitor discharge on Sunday Creek upstream of Cenovus and Devon oilsands developments. The station is located along Hwy 881 approximately 8 km south of Conklin.



Map Grid Based on UTM NAD 27



Upstream view at Station S63

Downstream view at RAMP Hydrometric Station S63, Sunday Creek at Hwy 881

**Station Details**

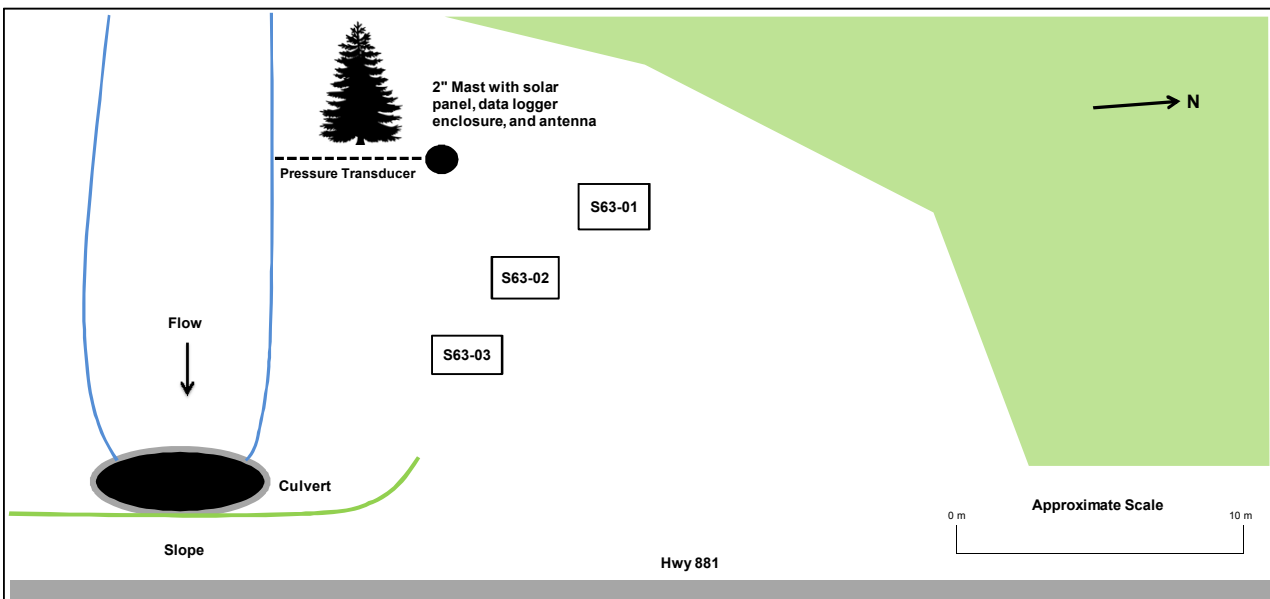
<b>Variables Measured:</b>	Discharge, water level, water temperature
<b>Telemetry:</b>	Cellular
<b>Period of Record:</b>	May 2013 to Present
<b>Station Operation:</b>	Year Round
<b>Access:</b>	2WD road via Hwy 881
<b>Drainage Area:</b>	135 km <sup>2</sup>
<b>UTM Coordinates:</b>	494283 E, 6157255 N (NAD83)
<b>Lat/Long:</b>	55°33'41" N, 111°5'26" W (NAD83)
<b>NTS Map:</b>	74M/10

**Measurement Details**

<b>Channel</b>	The channel is approximately 6 m wide and it has trapezoidal edges. The substrate is predominately sand cobble. There has been Beaver activity upstream of the station. This station can be waded for most of the open water season.
<b>Control</b>	The culvert acts as the control at this station
<b>Metering Section</b>	The metering section is located across from the station on a straight reach of the river. The banks are well defined.

**Benchmark Information**

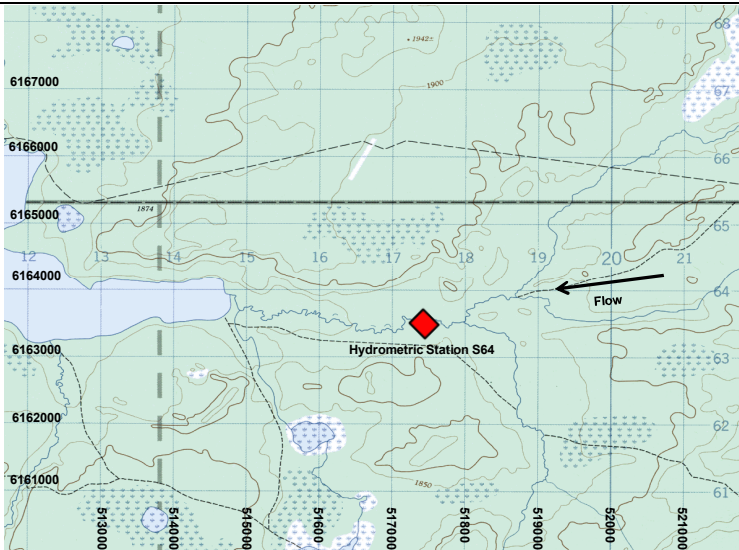
<b>BM:</b>	RAMP S63-01
<b>Elevation:</b>	100.000 m
<b>Basis:</b>	Assumed Local Datum
<b>Location:</b>	5 m NE of data logger
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S63-02
<b>Elevation:</b>	99.830 m
<b>Basis:</b>	Level Survey from RAMP S63-01
<b>Location:</b>	7 m East of data logger
<b>Description:</b>	3/4" Pipe
<b>BM:</b>	RAMP S63-03
<b>Elevation:</b>	99.459 m
<b>Basis:</b>	Level Survey from RAMP S63-01
<b>Location:</b>	10 m East of data logger
<b>Description:</b>	3/4" Pipe



Revised 26 February, 2015

### Location and Purpose:

Established to monitor discharge on Unnamed Creek East of Christina Lake, in order to help define regional characteristics and inputs into Christina Lake. The station is located approximately 3 km east of the eastern tip of Christina Lake.



Map Grid Based on UTM NAD 27

### Station Details

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2013 to Present  
**Station Operation:** Year Round  
**Access:** 2WD road via MEG Energy Mine Access, Argo  
**Drainage Area:** 171 km<sup>2</sup>  
**UTM Coordinates:** 517644 E, 6163643 N (NAD83)  
**Lat/Long:** 55°37'6" N, 110°43'11" W (NAD83)  
**NTS Map:** 73M/10

### Measurement Details

**Channel:** The channel is approximately 5 m across and too deep to wade most of the open water season. The substrate is predominately organics.  
**Control:** The channel morphology acts as the downstream control at this station.  
**Metering Section:** The metering section is located 40 m upstream around the bend where the river straightens out. Stream can be waded under lower flows.

### Benchmark Information

**BM:** RAMP S64-01  
**Elevation:** 100.000 m  
**Basis:** Assumed Local Datum  
**Location:** 6 m SE of data logger  
**Description:** 3/4" Pipe

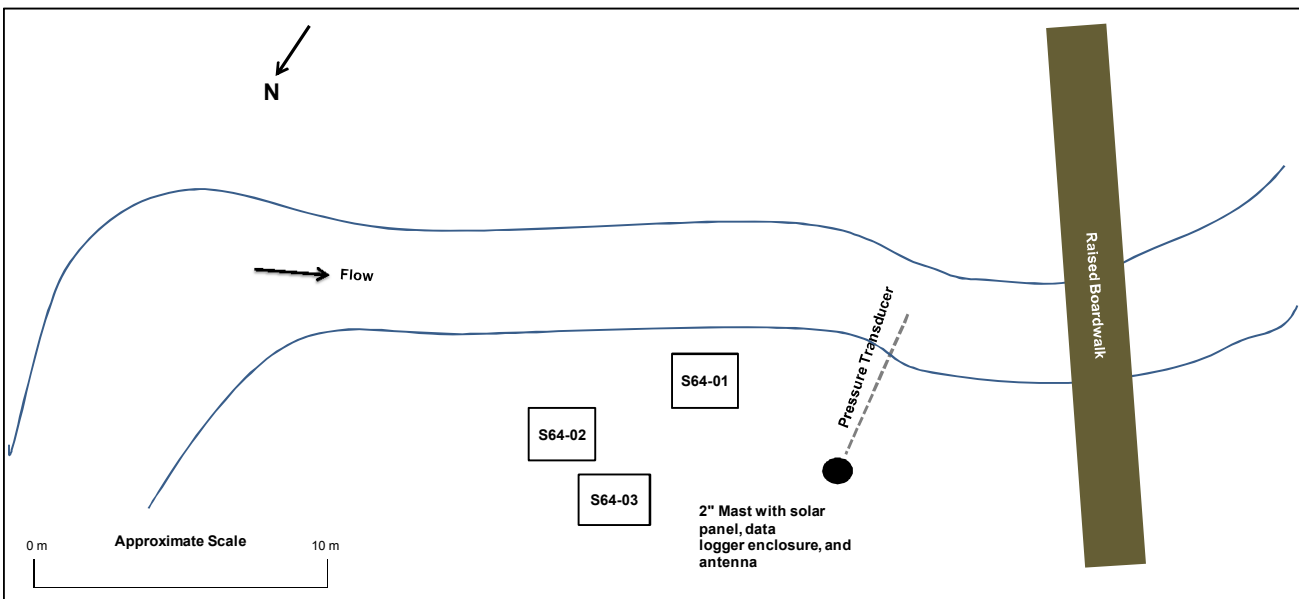
**BM:** RAMP S64-02  
**Elevation:** 99.800 m  
**Basis:** Level Survey from RAMP S64-01  
**Location:** 11 m East of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S64-03  
**Elevation:** 99.849 m  
**Basis:** Level Survey from RAMP S64-01  
**Location:** 8 m East of data logger  
**Description:** 3/4" Pipe



Downstream view at RAMP Hydrometric Station S64, Unnamed Creek East of Christina Lake

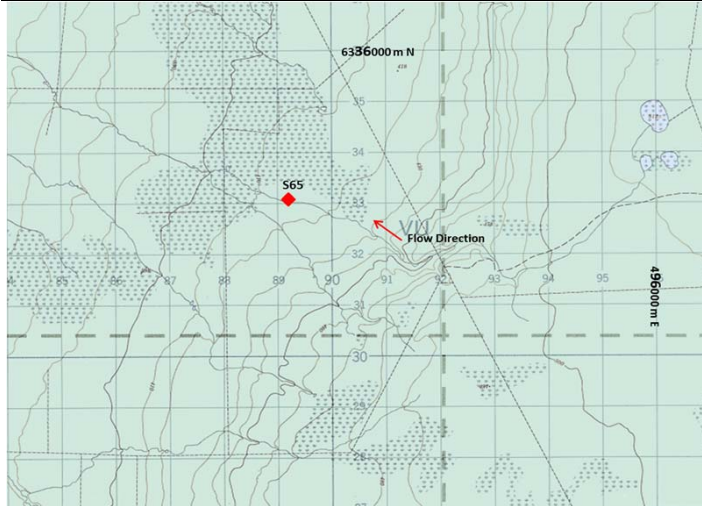
Looking West towards the station



Revised February 26, 2015

### Location and Purpose:

Established to monitor discharge on Green Stockings Creek in order to quantify upstream baseline inputs into the Muskeg Creek watershed. Station is located 25 km east of the Muskeg River Road and East Athabasca Highway intersection.



Map Grid Based on UTM NAD 27



Downstream view of North Green Stockings Creek at Station S65

### Station Details

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** Cellular  
**Period of Record:** May 2014 to Present  
**Station Operation:** Open water  
**Access:** Truck access via East Athabasca Hwy  
**Drainage Area:** 23 km<sup>2</sup>  
**UTM Coordinates:** 489845 mE, 6333039 mN (NAD83)  
**Lat/Long:** 57°8'25"N, 111°10'4"W (NAD83)  
**NTS Map:** 74E/3

### Measurement Details

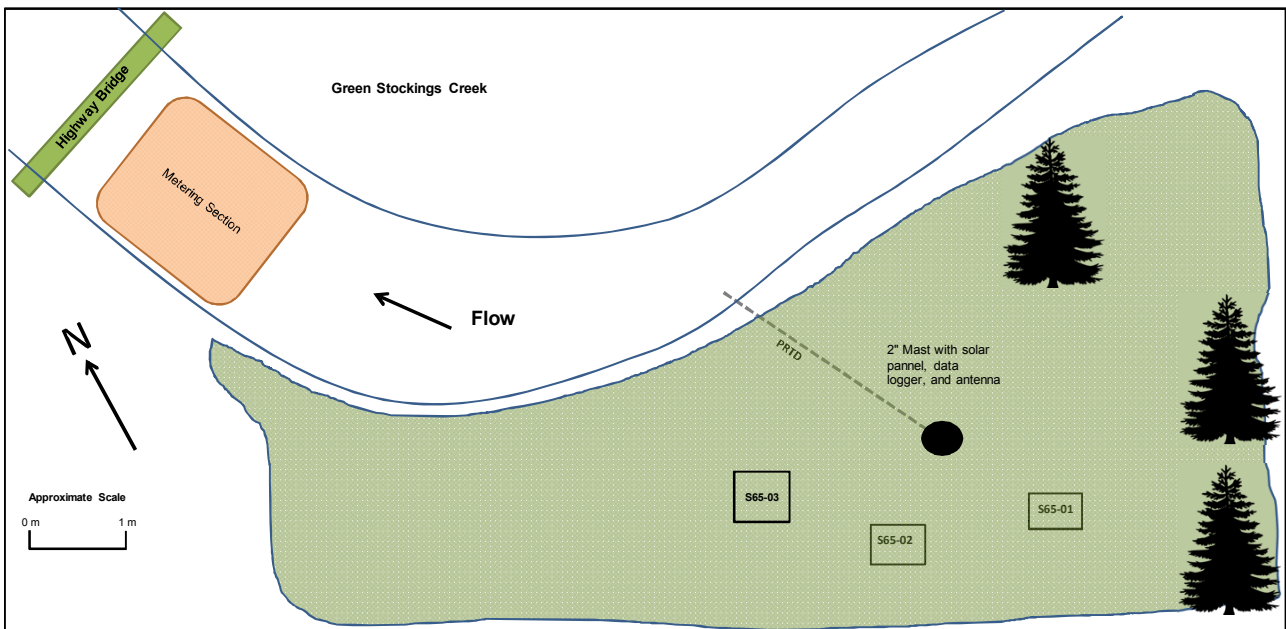
**Channel:** The channel is roughly 2 m wide and the bed consists of sand and gravel.  
**Control:** A small riffle and a narrowing channel exist 50 m downstream of the station under the bridge  
**Metering Section:** The metering section is located 30 m downstream of the station. The channel is shallow enough to be waded.

### Benchmark Information

**BM:** RAMP S65-01  
**Elevation:** 100.000 m  
**Basis:** Assumed  
**Location:** 5 m S of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S65-02  
**Elevation:** 99.731 m  
**Basis:** Level Survey from RAMP S65-01  
**Location:** 5 m SW of data logger  
**Description:** 3/4" Pipe

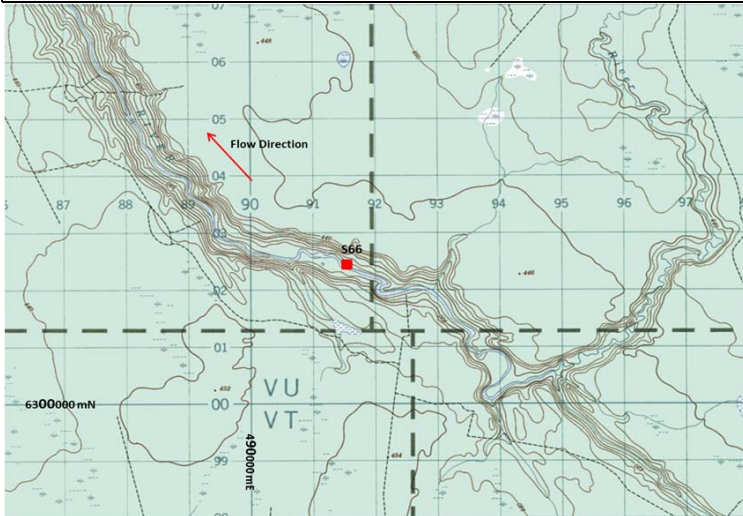
**BM:** RAMP S65-03  
**Elevation:** 99.621 m  
**Basis:** Level Survey from RAMP S65-01  
**Location:** 6 m W of data logger  
**Description:** 3/4" Pipe



Revised February 26, 2015

### Location and Purpose:

Established to monitor discharge on the Steepbank River below the North Steepbank confluence. The purpose of this station is to gather baseline data, upstream of oil sands operations, and to provide information used in lower Steepbank River flow and sediment transport modeling. The station is located 25 km north of the Fort McMurray Airport.



Map Grid Based on UTM NAD 27



Upstream view of the Steepbank River at Station S66

### Station Details

**Variables Measured:** Discharge, water level, water temperature  
**Telemetry:** GOES  
**Period of Record:** May 2014 to Present  
**Station Operation:** Year-round  
**Access:** Helicopter  
**Drainage Area:** 1,193 km<sup>2</sup>  
**UTM Coordinates:** 491458 mE, 6302625 mN (NAD83)  
**Lat/Long:** 56°51'47"N, 111°7'45"W (NAD83)  
**NTS Map:** 74E/14

### Measurement Details

**Channel** The channel is roughly 19m wide and the bed consists of boulders, cobbles, and gravel.  
**Control** A riffle made up of cobble and boulders exists approximately 20 m downstream of the station and adjacent to the helicopter landing area.  
**Metering Section** The metering section is located adjacent to the station. The channel is shallow enough to be waded during low flow, but a boat or kickboat is necessary in high flow.

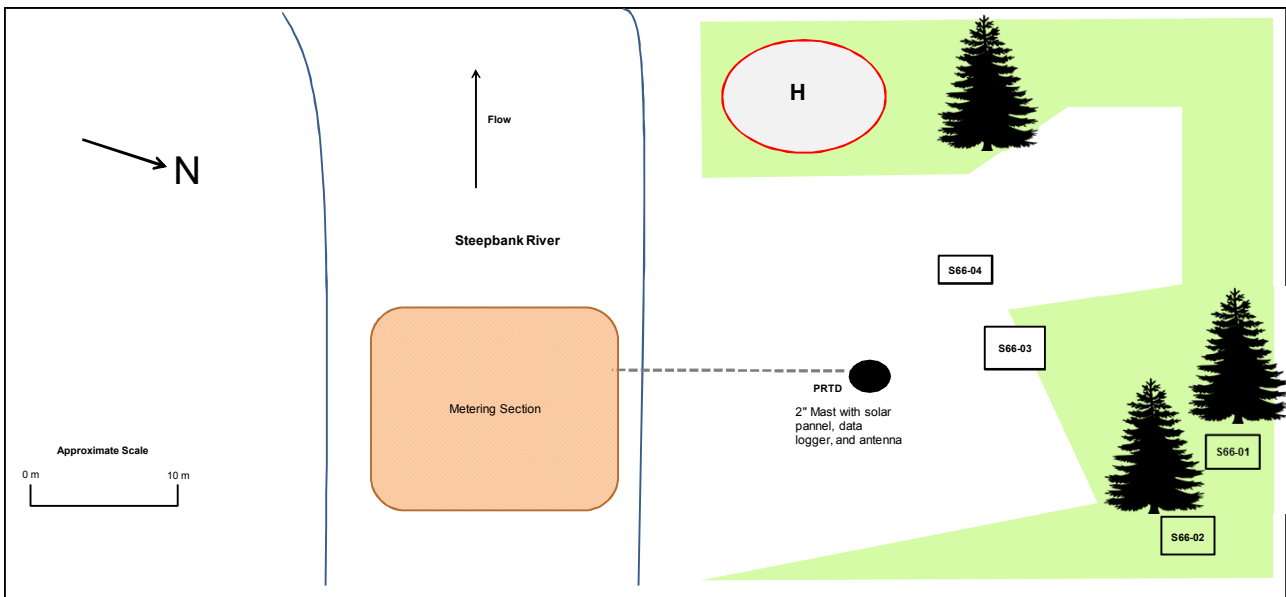
### Benchmark Information

**BM:** RAMP S66-01  
**Elevation:** 100.177 m  
**Basis:** Assumed  
**Location:** Tree 10 m E of data logger  
**Description:** Lag bolt

**BM:** RAMP S66-02  
**Elevation:** 100.064 m  
**Basis:** Level Survey from RAMP S66-01  
**Location:** Tree 12 m N of data logger  
**Description:** Lag bolt

**BM:** RAMP S66-03  
**Elevation:** 99.583 m  
**Basis:** Level Survey from RAMP S66-01  
**Location:** 5 m NW of data logger  
**Description:** 3/4" Pipe

**BM:** RAMP S66-04  
**Elevation:** 99.519 m  
**Basis:** Level Survey from RAMP S66-01  
**Location:** 7 m W of data logger  
**Description:** 3/4" Pipe





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

Records of the manual hydrometric measurements made during each station visit are provided below the station description sheets. The perceived quality and expected precision of each manual discharge measurement was assessed considering the hydraulic conditions, at the measurement section, at the time of the measurement.

# Climate Station Measurement / Site Visit Record

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

Site Visit Date:

January 30, 2014



**Hatfield**  
 CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	12.9	
Air Temperature °C:	-23.0	
RH (%):	64.2	
Snow Depth (cm):	38.4	
Wind Speed (km/h):	3.7	
Wind Direction (deg):	212	
Solar Radiation (W/m <sup>2</sup> ):	44.860	
Barometric Pressure (kpa):	-	
Precipitation (mm):	165.58	
Datalogger Clock:	9:43	
Laptop Clock:	9:43	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	9:40
End Time (MST):	10:15
Station Condition:	Good
Weather:	clear, calm, -22

**General Notes:**

Snow depth of 0.397 m measured at SR50 sensor.  
 Added antifreeze to precipitation gauge.

<b><u>Field Personnel:</u></b>	TR, RM	<b>Trip Date:</b>	30-Jan-14
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	30-Jan-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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:

March 18, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.8	
Air Temperature °C:	-1.1	
RH (%):	83.3	
Snow Depth (cm):	31.0	
Wind Speed (km/h):	2.0	
Wind Direction (deg):	192	
Solar Radiation (W/m <sup>2</sup> ):	127.593	
Barometric Pressure (kpa):	-	
Precipitation (mm):	0.00	
Datalogger Clock:	9:13	
Laptop Clock:	9:12	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	9:09
End Time (MST):	9:30
Station Condition:	Good
Weather:	overcast, calm
<b><u>General Notes:</u></b>	
Snow depth measurements: 31.0 cm, 31.5 cm, and 32.0 cm.	

<b><u>Field Personnel:</u></b>	SM TR	<b>Trip Date:</b>	18-Mar-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	18-Mar-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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:

May 12, 2014



<b><u>Datalogger Details:</u></b>	Before	After
Battery (Main):	13.5	
Air Temperature °C:	11.6	
RH (%):	37.5	
Snow Depth (cm):	0.5	
Wind Speed (km/h):	15.0	
Wind Direction (deg):	341	
Solar Radiation (W/m <sup>2</sup> ):	681.500	
Barometric Pressure (kpa):	-	
Precipitation (mm):	188.35	
Datalogger Clock:	14:28	
Laptop Clock:	14:27	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	14:25
End Time (MST):	14:35
Station Condition:	Good
Weather:	clear, light breeze
<b><u>General Notes:</u></b>	

<b><u>Field Personnel:</u></b>	TR, MP	<b>Trip Date:</b>	12-May-14
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	12-May-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C1 - Aurora Climate Station

UTM Location: 475734E, 6343967 N

Site Visit Date:

August 7, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.3	
Air Temperature °C:	24.0	
RH (%):	27.4	
Snow Depth (cm):	43.5	
Wind Speed (km/h):	8.9	
Wind Direction (deg):	267	
Solar Radiation (W/m <sup>2</sup> ):	136.630	
Barometric Pressure (kpa):	-	
Precipitation (mm):	411.65	
Datalogger Clock:	16:20	
Laptop Clock:	16:19	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	16:05
End Time (MST):	16:40
Station Condition:	Good
Weather:	p. cloudy, windy,
<b><u>General Notes:</u></b>	
Antifreeze was emptied from precipitation gauge.	

<b><u>Field Personnel:</u></b>	TR, MP	<b>Trip Date:</b>	7-Aug-14
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	7-Aug-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	15-Sep-14
<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:

Septemeber 22, 2014



**Hatfield**  
CONSULTANTS

<b><i>Datalogger Details:</i></b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.6	13.4
Air Temperature °C:	15.9	19.8
RH (%):	63.9	52.6
Snow Depth (cm):	-0.1	-0.7
Wind Speed (km/h):	2.2	0.4
Wind Direction (deg):	175	172
Solar Radiation (W/m <sup>2</sup> ):	27.739	54.121
Barometric Pressure (kpa):	-	-
Precipitation (mm):	252.90	254.37
Datalogger Clock:	8:59	10:41
Laptop Clock:	9:00	10:40
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b><i>Datalogger / Station Notes:</i></b>		

<b><i>Measurement Details:</i></b>	
Start Time (MST):	8:59
End Time (MST):	10:55
Station Condition:	good
Weather:	clear, breezy
<b><i>General Notes:</i></b>	
Exchanged sensors for calibration	
Replaced Licor pyranometer with SPLite pyranometer	
Replaced HC2-S3 temperature/RH sensor with HMP45C	
Tested precipitation gauge - good	
Tested SR50A snow depth sensor - good.	

<b><i>Field Personnel:</i></b>	SM TR	<b>Trip Date:</b>	22-Sep-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	22-Sep-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	10-Feb-15
<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 (Canadian Natural) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

February 3, 2014



**Hatfield**  
CONSULTANTS

<u><b>Datalogger Details:</b></u>	Before	After
Battery (Main):	12.1	13.1
Air Temperature °C:	-18.0	-
RH (%):	79.9	-
Snow Depth (cm):	36.6	-
Wind Speed (km/h):	13.6	-
Wind Direction (deg):	61	-
Solar Radiation (W/m <sup>2</sup> ):	0.000	-
Barometric Pressure (kpa):	97.73	-
Precipitation (mm):	154.94	-
Datalogger Clock:	7:39	-
Laptop Clock:	7:38	-
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<u><b>Datalogger / Station Notes:</b></u>		
Replaced station batteries.		

<u><b>Measurement Details:</b></u>	
Start Time (MST):	7:30
End Time (MST):	8:00
Station Condition:	Good
Weather:	light snow, breezy

**General Notes:**  
Snow depth measurements at SR50 sensor: 40 cm

<u><b>Field Personnel:</b></u>	SM TR	<b>Trip Date:</b>	3-Feb-14
<b>Data Entry Personnel:</b>	SM TR	<b>Date:</b>	3-Feb-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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 (Canadian Natural) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

April 1, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	12.8	
Air Temperature °C:	-9.4	
RH (%):	47.4	
Snow Depth (cm):	31.6	
Wind Speed (km/h):	9.7	
Wind Direction (deg):	52	
Solar Radiation (W/m <sup>2</sup> ):	444.767	
Barometric Pressure (kpa):	96.71	
Precipitation (mm):	0.00	
Datalogger Clock:	9:10	
Laptop Clock:	9:08	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	9:07
End Time (MST):	9:30
Station Condition:	Good
Weather:	clear, breezy

**General Notes:**  
Snow depth measurements at SR50 sensor: 32 cm, 31 cm

<b><u>Field Personnel:</u></b>	SM MP	<b>Trip Date:</b>	1-Apr-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	1-Apr-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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 (Canadian Natural) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

June 24, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.0	
Air Temperature °C:	17.5	
RH (%):	72.9	
Snow Depth (cm):	13.6	
Wind Speed (km/h):	0.0	
Wind Direction (deg):	123	
Solar Radiation (W/m <sup>2</sup> ):	321.017	
Barometric Pressure (kpa):	96.86	
Precipitation (mm):	332.91	
Datalogger Clock:	7:51	
Laptop Clock:	7:49	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	7:35
End Time (MST):	8:00
Station Condition:	good
Weather:	high cloud, calm

**General Notes:**

Geonor recorded precipitation within past 24 hours.  
Geonor bucket needs to be emptied next visit.

<b><u>Field Personnel:</u></b>	SM, GG	<b>Trip Date:</b>	24-Jun-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	24-Jun-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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 (Canadian Natural) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

September 16, 2014



**Hatfield**  
CONSULTANTS

<u><b>Datalogger Details:</b></u>	Before	After
Battery (Main):	12.8	
Air Temperature °C:	5.4	
RH (%):	93.4	
Snow Depth (cm):	0.3	
Wind Speed (km/h):	6.5	
Wind Direction (deg):	7	
Solar Radiation (W/m <sup>2</sup> ):	47.100	
Barometric Pressure (kpa):	96.40	
Precipitation (mm):	0.00	
Datalogger Clock:	6:58	
Laptop Clock:	6:57	
Dessicant:	new	
Logger# (if Δ):	-	
<u><b>Datalogger / Station Notes:</b></u>		

<u><b>Measurement Details:</b></u>	
Start Time (MST):	6:43
End Time (MST):	7:05
Station Condition:	good
Weather:	Overcast

**General Notes:**

<u><b>Field Personnel:</b></u>	MP, TR	<b>Trip Date:</b>	16-Sep-14
<b>Data Entry Personnel:</b>	MP	<b>Date:</b>	16-Sep-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	18-Mar-15
<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 (Canadian Natural) Climate Station

UTM Location: 443364 E, 6360515 N

Site Visit Date:

December 1, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	12.2	
Air Temperature °C:	-21.7	
RH (%):	81.3	
Snow Depth (cm):	11.4	
Wind Speed (km/h):	5.6	
Wind Direction (deg):	297	
Solar Radiation (W/m <sup>2</sup> ):	0.000	
Barometric Pressure (kpa):	96.00	
Precipitation (mm):	0.00	
Datalogger Clock:	8:02	
Laptop Clock:	8:00	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	7:45
End Time (MST):	8:15
Station Condition:	Good
Weather:	Clear sky

**General Notes:**  
 Antifreeze in precipitation gauge was frozen and could not be removed. Bucket was brought to the office for thawing. Precipitation gauge was temporarily disabled.

<b><u>Field Personnel:</u></b>	MP TR	<b>Trip Date:</b>	1-Dec-14
<b>Data Entry Personnel:</b>	MP	<b>Date:</b>	1-Dec-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	18-Mar-15
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

Site: C3 - Steepbank (Suncor) Climate Station

UTM Location: 473950 E, 6320500 N

Site Visit Date:

April 2, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	15.1	
Air Temperature °C:	-11.4	
RH (%):	50.3	
Snow Depth (cm):	26.0	
Wind Speed (km/h):	2.5	
Wind Direction (deg):	26	
Solar Radiation (W/m <sup>2</sup> ):	348.425	
Barometric Pressure (kpa):	98.07	
Precipitation (mm):	0.00	
Datalogger Clock:	9:09	
Laptop Clock:	9:09	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	9:07
End Time (MST):	9:35
Station Condition:	good
Weather:	clear-breezy

**General Notes:**  
 Precipitation gauge contents frozen. No antifreeze  
  
 Snow depth measurements at SR50 sensor:  
 22.0 cm, 21.5 cm

<b><u>Field Personnel:</u></b>	SM JB	<b>Trip Date:</b>	2-Apr-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	2:Apr-2014
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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:

May 26, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.5	
Air Temperature °C:	13.1	
RH (%):	46.7	
Snow Depth (cm):	-0.5	
Wind Speed (km/h):	15.4	
Wind Direction (deg):	130	
Solar Radiation (W/m <sup>2</sup> ):	181.345	
Barometric Pressure (kpa):	97.38	
Precipitation (mm):	0.00	
Datalogger Clock:	8:26	
Laptop Clock:	8:26	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	8:21
End Time (MST):	8:57
Station Condition:	good
Weather:	overcast, breezy
<b><u>General Notes:</u></b>	
Emptied water from precipitation bucket.	
Tested precipitation gauge - ok, 157.98 reading	

<b><u>Field Personnel:</u></b>	SM CJ	<b>Trip Date:</b>	26-May-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	26-May-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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:

August 19, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.2	14.1
Air Temperature °C:	20.6	22.7
RH (%):	69.5	48.7
Snow Depth (cm):	NAN	-0.4
Wind Speed (km/h):	11.4	11.8
Wind Direction (deg):	175	190
Solar Radiation (W/m <sup>2</sup> ):	609.328	694.770
Barometric Pressure (kpa):	96.295	96.36
Precipitation (mm):	419.70	245.21
Datalogger Clock:	10:16	12:03
Laptop Clock:	10:16	12:02
Dessicant:	replaced	-
Logger# (if Δ):	-	-
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	10:00
End Time (MST):	12:25
Station Condition:	good
Weather:	clear, breezy
<b><u>General Notes:</u></b>	
SR50A sensor appears to have failed. Replaced sensors for calibration.	

<b><u>Field Personnel:</u></b>	SM GG	<b>Trip Date:</b>	19-Aug-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	19-Aug-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	15-Sep-14
<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 12, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	15.1	-
Air Temperature °C:	-12.3	-
RH (%):	77.5	-
Snow Depth (cm):	1.7	-
Wind Speed (km/h):	13.1	-
Wind Direction (deg):	162	-
Solar Radiation (W/m <sup>2</sup> ):	310.090	-
Barometric Pressure (kpa):	100.21	-
Precipitation (mm):	357.58	570.12
Datalogger Clock:	12:25	-
Laptop Clock:	12:25	-
Dessicant:	replaced.	-
Logger# (if Δ):	-	-
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	12:15
End Time (MST):	12:34
Station Condition:	Good
Weather:	clear, light breeze
<b><u>General Notes:</u></b>	
Added antifreeze to precipitation gauge	
Installed new modem,	
Network RSSI -84	
Modem SN: 1336822004	

<b><u>Field Personnel:</u></b>	SM, GG	<b>Trip Date:</b>	12-Nov-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	12-Nov-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	11-Feb-15
<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:

December 18, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	15.0	-
Air Temperature °C:	-8.2	-
RH (%):	89.6	-
Snow Depth (cm):	15.8	-
Wind Speed (km/h):	1.9	-
Wind Direction (deg):	145	-
Solar Radiation (W/m <sup>2</sup> ):	89.071	-
Barometric Pressure (kpa):	97.13	-
Precipitation (mm):	0.00	-
Datalogger Clock:	10:24	-
Laptop Clock:	10:23	-
Dessicant:	Good	-
Logger# (if Δ):	-	-
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	10:20
End Time (MST):	10:40
Station Condition:	Good
Weather:	clear, calm

**General Notes:**  
 Snow depth measurements: 15.0 and 16.0 cm  
 Precipitation gauge antifreeze ok, none added.

<b><u>Field Personnel:</u></b>	SM GG	<b>Trip Date:</b>	18-Dec-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	18-Dec-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	11-Feb-15
<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:

March 16, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	14.1	
Air Temperature °C:	8.5	
RH (%):	46.1	
Snow Depth (cm):	33.3	
Wind Speed (km/h):	6.3	
Wind Direction (deg):	270	
Solar Radiation (W/m <sup>2</sup> ):	318.278	
Barometric Pressure (kpa):	96.34	
Precipitation (mm):	0.00	
Datalogger Clock:	11:40	
Laptop Clock:	11:39	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	11:20
End Time (MST):	11:50
Station Condition:	Good
weather	partly cloudy

**General Notes:**  
 Snow depth measurements at SR50 sensor: 33cm.

<b><u>Field Personnel:</u></b>	SM MP	<b>Trip Date:</b>	16-Mar-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	16-Mar-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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:

May 16, 2014



**Hatfield**  
 CONSULTANTS

<b><u>Datalogger Details:</u></b>	Before	After
Battery (Main):	13.8	
Air Temperature °C:	14.3	
RH (%):	28.1	
Snow Depth (cm):	-1.9	
Wind Speed (km/h):	12.6	
Wind Direction (deg):	138	
Solar Radiation (W/m <sup>2</sup> ):	695.977	
Barometric Pressure (kpa):	98.57	
Precipitation (mm):	0.00	
Datalogger Clock:	14:00	
Laptop Clock:	13:59	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	13:59
End Time (MST):	14:10
Station Condition:	Good
Weather:	clear, breezy

**General Notes:**  
 Precipitation was recorded in past 24 hours.

<b><u>Field Personnel:</u></b>	SM MP	<b>Trip Date:</b>	16-May-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	16-May-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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:

June 14, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	13.4	
Air Temperature °C:	25.9	
RH (%):	28.0	
Snow Depth (cm):	15.5	
Wind Speed (km/h):	2.0	
Wind Direction (deg):	190	
Solar Radiation (W/m <sup>2</sup> ):	725.900	
Barometric Pressure (kpa):	97.09	
Precipitation (mm):	0.00	
Datalogger Clock:	13:34	
Laptop Clock:	13:35	
Dessicant:	new	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	13:30
End Time (MST):	14:10
Station Condition:	Good
Weather:	Clear, breezy

**General Notes:**  
 Cleared shrubs around SR50 sensor.  
 Antifreeze needs to be emptied from precipitation bucket

<b><u>Field Personnel:</u></b>	TR NC	<b>Trip Date:</b>	14-Jun-14
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	14-Jun-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

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

Site Visit Date: September 14, 2014



Hatfield  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	Before	After
Battery (Main):	13.8	
Air Temperature °C:	16.1	
RH (%):	46.1	
Snow Depth (cm):	171.2	
Wind Speed (km/h):	8.0	
Wind Direction (deg):	176	
Solar Radiation (W/m <sup>2</sup> ):	532.920	
Barometric Pressure (kpa):	97.99	
Precipitation (mm):	44.70	
Datalogger Clock:	11:52	
Laptop Clock:	11:51	
Dessicant:	replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	11:44
End Time (MST):	11:57
Station Condition:	Good
Weather:	Clear

**General Notes:**  
 cleared vegetation from below SR50

<b><u>Field Personnel:</u></b>	GG TR	<b>Trip Date:</b>	14-Sep-14
<b>Data Entry Personnel:</b>	GG	<b>Date:</b>	14-Sep-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	18-Mar-15
<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 10, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	Before	After
Battery (Main):	14.3	
Air Temperature °C:	-3.1	
RH (%):	94.8	
Snow Depth (cm):	16.6	
Wind Speed (km/h):	2.3	
Wind Direction (deg):	53	
Solar Radiation (W/m <sup>2</sup> ):	250.360	
Barometric Pressure (kpa):	96.37	
Precipitation (mm):	115.42	
Datalogger Clock:	12:54	
Laptop Clock:	12:52	
Dessicant:	replaced	
Logger# (if Δ):	-	

**Datalogger / Station Notes:**

Installed updated modem

<b><u>Measurement Details:</u></b>	
Start Time (MST):	12:48
End Time (MST):	13:09
Station Condition:	Good
Weather:	Clear, light breeze

**General Notes:**

Added antifreeze to precipitation bucket

<b><u>Field Personnel:</u></b>	GG SM	<b>Trip Date:</b>	10-Dec-14
<b>Data Entry Personnel:</b>	GG	<b>Date:</b>	10-Dec-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	18-Mar-15
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	

# Climate Station Measurement / Site Visit Record

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

Site Visit Date:

February 12, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	<b>Before</b>	<b>After</b>
Battery (Main):	15.5	
Air Temperature °C:	-25.3	
RH (%):	76.7	
Snow Depth (cm):	42.6	
Wind Speed (km/h):	4.1	
Wind Direction (deg):	183	
Solar Radiation (W/m <sup>2</sup> ):	84.890	
Barometric Pressure (kpa):	93.96	
Precipitation (mm):	0.00	
Datalogger Clock:	9:57	
Laptop Clock:	9:57	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	9:55
End Time (MST):	10:15
Station Condition:	good
Weather:	overcast, light braze

**General Notes:**  
 Added antifreeze to precipitation bucket  
 Snow depth measurements at SR50 sensor: 46.0 cm 45.0 cm

<b><u>Field Personnel:</u></b>	SM MP	<b>Trip Date:</b>	12-Feb-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	12-Feb-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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:

April 11, 2014



<u>Datalogger Details:</u>	Before	After
Battery (Main):	14.9	
Air Temperature °C:	-4.6	
RH (%):	90.0	
Snow Depth (cm):	7.9	
Wind Speed (km/h):	2.5	
Wind Direction (deg):	56	
Solar Radiation (W/m <sup>2</sup> ):	123.010	
Barometric Pressure (kpa):	94.49	
Precipitation (mm):	0.00	
Datalogger Clock:	14:22	
Laptop Clock:	14:21	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<u>Measurement Details:</u>	
Start Time (MST):	14:15
End Time (MST):	14:25
Station Condition:	Good
Weather:	Snowing, calm
<b><u>General Notes:</u></b>	

<b><u>Field Personnel:</u></b>	TR MP	<b>Trip Date:</b>	11-Apr-14
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	11-Apr-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	4-Jul-14
<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:

August 8, 2014



**Hatfield**  
CONSULTANTS

<b><u>Datalogger Details:</u></b>	Before	After
Battery (Main):	14.2	-
Air Temperature °C:	19.8	-
RH (%):	43.9	-
Snow Depth (cm):	2.4	-
Wind Speed (km/h):	4.2	-
Wind Direction (deg):	130	-
Solar Radiation (W/m <sup>2</sup> ):	622.300	-
Barometric Pressure (kpa):	94.92	-
Precipitation (mm):	1.99	1.99
Datalogger Clock:	10:05	-
Laptop Clock:	10:04	-
Dessicant:	-	-
Logger# (if Δ):	-	-
<b><u>Datalogger / Station Notes:</u></b>		

<b><u>Measurement Details:</u></b>	
Start Time (MST):	10:00
End Time (MST):	10:53
Station Condition:	Good
Weather:	clear, calm, 20

**General Notes:**  
Emptied antifreeze from precipitation bucket

<b><u>Field Personnel:</u></b>	TR, SM	<b>Trip Date:</b>	8-Aug-14
<b>Data Entry Personnel:</b>	TR	<b>Date:</b>	8-Aug-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	18-Mar-15
<b>Entered Digitally in the Field:</b>	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	



# Climate Station Measurement / Site Visit Record

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

Site Visit Date:

September 29, 2014



**Hatfield**  
CONSULTANTS

<u>Datalogger Details:</u>	Before	After
Battery (Main):	14.4	
Air Temperature °C:	16.9	
RH (%):	51.2	
Snow Depth (cm):	7.7	
Wind Speed (km/h):	16.4	
Wind Direction (deg):	143	
Solar Radiation (W/m <sup>2</sup> ):	440.575	
Barometric Pressure (kpa):	93.87	
Precipitation (mm):	328.40	
Datalogger Clock:	12:51	
Laptop Clock:	12:51	
Dessicant:	Replaced	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<u>Measurement Details:</u>	
Start Time (MST):	12:47
End Time (MST):	13:07
Station Condition:	Good
Weather:	Clear, breezy

**General Notes:**  
 Station area was flooded with about 5.0 cm of water.  
 Precipitation was recorded within past 24 hours  
 SR50A snow depth sensor area under 5.0 cm of water

<b><u>Field Personnel:</u></b>	SM NC	<b>Trip Date:</b>	29-Sep-14
<b>Data Entry Personnel:</b>	SM	<b>Date:</b>	29-Sep-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	18-Mar-15
<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 8, 2014



**Hatfield**  
CONSULTANTS

<u>Datalogger Details:</u>	Before	After
Battery (Main):	13.3	
Air Temperature °C:	-8.6	
RH (%):	90.7	
Snow Depth (cm):	23.5	
Wind Speed (km/h):	10.7	
Wind Direction (deg):	200	
Solar Radiation (W/m <sup>2</sup> ):	0.000	
Barometric Pressure (kpa):	94.55	
Precipitation (mm):	0.00	
Datalogger Clock:	16:49	
Laptop Clock:	16:49	
Dessicant:	-	
Logger# (if Δ):	-	
<b><u>Datalogger / Station Notes:</u></b>		

<u>Measurement Details:</u>	
Start Time (MST):	16:48
End Time (MST):	17:10
Station Condition:	Good
Weather:	-

**General Notes:**  
 Added antifreeze to precipitation bucket

<b><u>Field Personnel:</u></b>	MP, NC	<b>Trip Date:</b>	8-Dec-14
<b>Data Entry Personnel:</b>	MP	<b>Date:</b>	8-Dec-14
<b>Data Check Personnel:</b>	SM	<b>Date:</b>	18-Mar-15
<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 13, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	-	
Water (°C):	-	
Air Temp (°C):	-	
RH (%):	-	
Precipitation (mm):	-	
Battery (Main):	-	
Datalogger Clock:	-	
Laptop Clock:	-	
Enclosure Dessicant	-	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	-	

<u>Measurement Details:</u>	
Start Time (MST):	14:50
End Time (MST):	15:05
Station Condition:	Good
Weather:	-

Datalogger / Station Notes:

General Notes:

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.247	296.112		294.865	294.865	Rod Beside Station
L1-03			1.445	294.667	294.664	3/4" Pipe 10m W of Station
L1-02			1.064	295.048	295.036	3/4" Pipe 20m W of station
Water Level:	Cut		1.511	294.601	Time WL Surveyed:	14:55
Temporary BM			1.524	294.588	0.000	-
<b>Turn</b>						
Temporary BM	1.518	296.106		294.588		-
Water Level:	Cut		1.506	294.600	Time WL Surveyed:	14:57
L1-02			1.056	295.050	295.036	3/4" Pipe 20m W of station
L1-03			1.439	294.667	294.664	3/4" Pipe 10m W of Station
L1-01			1.239	294.867	294.865	Rod Beside Station

<u>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</u>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	DW, TR	Trip Date:	13-Jan-2014
Average WL:	294.601	-	Data Entry Personnel:	DW	Date:	9-Apr-2014
Closing Error:	-0.002	-	Data Check Personnel:	CJ	Date:	9-Apr-2014
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	-	-				

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: February 4, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.691	
Water (oC):	0.7	
Air Temp (°C):	-17.0	
RH (%):	73.8%	
Precipitation (mm):	0.00	
Battery (Main):	13.3	
Datalogger Clock:	15:03	
Laptop Clock:	15:04	
Enclosure Dessicant	Good	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	12:00
End Time (MST):	12:45
Station Condition:	good
Weather:	Overcast, calm

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.280	296.145		294.865	294.865	Rod Beside Station
L1-03			1.484	294.661	294.664	3/4" Pipe 10m W of Station
L1-02			1.094	295.051	295.036	3/4" Pipe 20m W of station
<b>Water Level:</b>						
Water Level:	Cut		1.543	294.602	Time WL Surveyed:	15:21
Temporary BM			1.562	294.583	0.000	-
<b>Turn</b>						
Temporary BM	1.550	296.133		294.583		-
Water Level:	Cut		1.523	294.610	Time WL Surveyed:	15:25
L1-02			1.078	295.055	295.036	3/4" Pipe 20m W of station
L1-03			1.467	294.666	294.664	3/4" Pipe 10m W of Station
L1-01			1.266	294.867	294.865	Rod Beside Station

<u>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</u>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:

General Notes:

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	SM, MP	Trip Date:	4-Feb-2014
Average WL:	294.606	-	Data Entry Personnel:	SM	Date:	4-Feb-2014
Closing Error:	-0.002	-	Data Check Personnel:	DW	Date:	9-Apr-2014
WL Check:	0.008	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.915	-				

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: March 6, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.703	
Water (oC):	0.5	
Air Temp (°C):	-14.3	
RH (%):	57.6%	
Precipitation (mm):	0.00	
Battery (Main):	13.6	
Datalogger Clock:	11:40	
Laptop Clock:	11:39	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	11:35
End Time (MST):	12:00
Station Condition:	Good
Weather:	Clear, calm

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.316	296.181		294.865	294.865	Rod Beside Station
L1-03			1.518	294.663	294.664	3/4" Pipe 10m W of Station
L1-02			1.130	295.051	295.036	3/4" Pipe 20m W of station
<b>Turn</b>						
Temporary BM	1.532	296.164		294.632		
Water Level:	Cut		1.563	294.601	Time WL Surveyed:	11:55
Temporary BM			1.549	294.632		
Water Level:	Cut		1.563	294.601	Time WL Surveyed:	11:58
L1-02			1.113	295.051	295.036	3/4" Pipe 20m W of station
L1-03			1.503	294.661	294.664	3/4" Pipe 10m W of Station
L1-01			1.299	294.865	294.865	Rod Beside Station

<u>Secondary Water Level Survey</u> (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:

General Notes:

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	SM, MP	Trip Date:	6-Mar-2014
Average WL:	294.601	-	Data Entry Personnel:	SM	Date:	6-Mar-2014
Closing Error:	0.000	-	Data Check Personnel:	DW	Date:	9-Apr-2014
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.898	-				

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: March 31, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.709	
Water (oC):	0.4	
Air Temp (°C):	-13.9	
RH (%):	57.4%	
Precipitation (mm):	0.00	
Battery (Main):	13.5	
Datalogger Clock:	9:29	
Laptop Clock:	9:31	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	9:29
End Time (MST):	9:55
Station Condition:	Good
Weather:	Clear, breezy, -15C

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.394	296.259		294.865	294.865	Rod Beside Station
L1-03			1.594	294.665	294.664	3/4" Pipe 10m W of Station
L1-02			1.206	295.053	295.036	3/4" Pipe 20m W of station
<b>Turn</b>						
Temporary BM	1.588	296.249		294.661		-
Water Level:	Cut		1.656	294.603	Time WL Surveyed:	9:44
Temporary BM			1.598	294.661	0.000	-
<b>Turn</b>						
Temporary BM						
Water Level:	Cut		1.645	294.604	Time WL Surveyed:	9:48
L1-02			1.194	295.055	295.036	3/4" Pipe 20m W of station
L1-03			1.582	294.667	294.664	3/4" Pipe 10m W of Station
L1-01			1.383	294.866	294.865	Rod Beside Station

<u>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</u>						
L1-02						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	
L1-02						

Datalogger / Station Notes:

General Notes:

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	SM, MP	Trip Date:	31-Mar-2014
Average WL:	294.604	-	Data Entry Personnel:	SM	Date:	31-Mar-2014
Closing Error:	-0.001	-	Data Check Personnel:	DW	Date:	9-Apr-2014
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.895	-				

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: May 24, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.808	
Water (oC):	14.6	
Air Temp (°C):	12.7	
RH (%):	70.5%	
Precipitation (mm):	0.00	
Battery (Main):	13.2	
Datalogger Clock:	15:50	
Laptop Clock:	15:51	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	15:45
End Time (MST):	16:30
Station Condition:	Flooded ground
Weather:	Cloudy, breezy, 10C

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.422	296.287		294.865	294.865	Rod Beside Station
L1-03	5.000		1.617	294.670	294.664	3/4" Pipe 10m W of Station
L1-02			1.236	295.051	295.036	3/4" Pipe 20m W of station
Water Level:	Cut		1.579	294.708	Time WL Surveyed:	16:27
Temporary BM			0.817	295.470	0.000	-
<b>Turn</b>						
Temporary BM	0.810	296.280		295.470		-
Water Level:	Cut		1.570	294.710	Time WL Surveyed:	16:28
L1-02			1.230	295.050	295.036	3/4" Pipe 20m W of station
L1-03			1.611	294.669	294.664	3/4" Pipe 10m W of Station
L1-01			1.416	294.864	294.865	Rod Beside Station

<u>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</u>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:

General Notes:

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	CJ, GG	Trip Date:	24-May-2014
Average WL:	294.709	-	<u>Data Entry Personnel:</u>	CJ	Date:	24-May-2014
Closing Error:	0.001	-	<u>Data Check Personnel:</u>	CJ	Date:	4-May-2014
WL Check:	0.002	-	<u>Entered Digitally in the Field:</u>	Yes		
Transducer Elevation	293.901	-				

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: June 18, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.874	0.873
Water (oC):	19.7	19.8
Air Temp (°C):	23.3	24.9
RH (%):	43.1%	39.75
Precipitation (mm):	160.70	0.00
Battery (Main):	13.7	14.0
Datalogger Clock:	15:32	0.67
Laptop Clock:	15:34	0.67
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Replaced	

<u>Measurement Details:</u>	
Start Time (MST):	15:25
End Time (MST):	16:35
Station Condition:	Good, high WL, area flooded
Weather:	Sunny, 23C

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.882	296.747		294.865	294.865	Rod Beside Station
L1-03			2.077	294.670	294.664	3/4" Pipe 10m W of Station
L1-02			1.705	295.042	295.036	3/4" Pipe 20m W of station
Water Level:	Cut		1.998	294.749	Time WL Surveyed:	-
Temporary BM			1.945	294.802	0.000	-
<b>Turn</b>						
Temporary BM	1.938	296.740		294.802		-
Water Level:	Cut		1.988	294.752	Time WL Surveyed:	-
L1-02			1.698	295.042	295.036	3/4" Pipe 20m W of station
L1-03			2.068	294.672	294.664	3/4" Pipe 10m W of Station
L1-01			1.871	294.869	294.865	Rod Beside Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:

- Set clock at 15:35
- Replaced RH/temp probe hmp45C212 C2278 with hmp45C C3055

General Notes:

- 4cm waves
- no stable ground for tripod, wind and/or waves move ground

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	DW, MP	Trip Date:	18-Jun-2014
Average WL:	294.751	-	Data Entry Personnel:	DW, MP	Date:	18-Jun-2014
Closing Error:	-0.004	-	Data Check Personnel:	DW	Date:	25-Jun-2014
WL Check:	0.003	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.877	-				



# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: August 12, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.769	
Water (oC):	23.7	
Air Temp (°C):	28.0	
RH (%):	38.8%	
Precipitation (mm):	0.00	
Battery (Main):	13.9	
Datalogger Clock:	16:02	
Laptop Clock:	16:02	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	15:45
End Time (MST):	16:20
Station Condition:	Good
Weather:	Clear, 30C

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.817	296.682		294.865	294.865	Rod Beside Station
L1-03			2.018	294.664	294.664	3/4" Pipe 10m W of Station
L1-02			1.637	295.045	295.036	3/4" Pipe 20m W of station
<b>Water Level:</b>						
Water Level:	Cut		2.034	294.648	Time WL Surveyed:	16:13
Temporary BM			1.923	294.759	0.000	-
<b>Turn</b>						
Temporary BM	1.914	296.673		294.759		-
Water Level:	Cut		2.027	294.646	Time WL Surveyed:	16:16
L1-02			1.632	295.041	295.036	3/4" Pipe 20m W of station
L1-03			2.008	294.665	294.664	3/4" Pipe 10m W of Station
L1-01			1.809	294.864	294.865	Rod Beside Station

<u>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</u>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:

General Notes:

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	MP, CJ	Trip Date:	12-Aug-2014
Average WL:	294.647	-	Data Entry Personnel:	MP	Date:	12-Aug-2014
Closing Error:	0.001	-	Data Check Personnel:	DW	Date:	3-Oct-2014
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.878	-				

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: September 12, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.721	0.717
Water (oC):	11.1	11.2
Air Temp (°C):	12.9	11.58
RH (%):	48.2%	53.11
Precipitation (mm):	143.42	0.00
Battery (Main):	13.9	13.6
Datalogger Clock:	13:38	14:56
Laptop Clock:	13:43	15:00
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	13:40
End Time (MST):	15:00
Station Condition:	Flooded ground
Weather:	Partial cloud, breezy, 14C

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.811	296.676		294.865	294.865	Rod Beside Station
L1-03			2.012	294.664	294.664	3/4" Pipe 10m W of Station
L1-02			1.632	295.044	295.036	3/4" Pipe 20m W of station
Water Level:	Cut	0.527	2.613	294.590	Time WL Surveyed:	14:48
Temporary BM			2.613	294.063	0.000	-
<b>Turn</b>						
Temporary BM	2.583	296.646		294.063		-
Water Level:	Cut	0.527	2.583	294.590	Time WL Surveyed:	14:50
L1-02			1.597	295.049	295.036	3/4" Pipe 20m W of station
L1-03			1.976	294.670	294.664	3/4" Pipe 10m W of Station
L1-01			1.777	294.869	294.865	Rod Beside Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:  
 - Swapped out enclosure

General Notes:  
 - WL fluctuating 7cms in survey

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	TR, GG	Trip Date:	12-Sep-2014
Average WL:	294.590	-	Data Entry Personnel:	TR	Date:	12-Sep-2014
Closing Error:	-0.004	-	Data Check Personnel:	DW	Date:	3-Oct-2014
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.869	-				

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake  
 UTM Location: 483430 E, 6371950 N

Site Visit Date: October 15, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.734	-
Water (oC):	7.5	-
Air Temp (°C):	5.1	-
RH (%):	66.9%	-
Precipitation (mm):	0.00	-
Battery (Main):	12.9	-
Datalogger Clock:	13:58	-
Laptop Clock:	12:58	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Replaced	

<u>Measurement Details:</u>	
Start Time (MST):	13:00
End Time (MST):	14:00
Station Condition:	Flooded ground
Weather:	Partial cloud, 10C

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.142	296.007		294.865	294.865	Rod Beside Station
L1-03			1.340	294.667	294.664	3/4" Pipe 10m W of Station
L1-02			0.962	295.045	295.036	3/4" Pipe 20m W of station
<b>Water Level:</b>						
Water Level:	Cut	0.412	1.818	294.601	Time WL Surveyed:	13:09
Temporary BM			1.818	294.189	0.000	-
<b>Turn</b>						
Temporary BM	1.808	295.997		294.189		-
Water Level:	Cut	0.412	1.808	294.601	Time WL Surveyed:	13:11
L1-02			0.954	295.043	295.036	3/4" Pipe 20m W of station
L1-03			1.333	294.664	294.664	3/4" Pipe 10m W of Station
L1-01			1.134	294.863	294.865	Rod Beside Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

Datalogger / Station Notes:

General Notes:  
 Wavy conditions, 10cm waves

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	MP, DW	Trip Date:	15-Oct-2014
Average WL:	294.601	-	Data Entry Personnel:	MP, DW	Date:	15-Oct-2014
Closing Error:	0.002	-	Data Check Personnel:	MP	Date:	19-Nov-2014
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	293.867	-				

# Lake Site Measurement / Site Visit Record

Site: L1 - McClelland Lake

UTM Location: 483430 E, 6371950 N

Site Visit Date: December 8, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.764	
Water (oC):	1.2	
Air Temp (°C):	-9.5	
RH (%):	88.6%	
Precipitation (mm):	0.00	
Battery (Main):	12.8	
Datalogger Clock:	14:28	
Laptop Clock:	14:28	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:20
End Time (MST):	14:43
Station Condition:	Good, gate frozen shut
Weather:	Overcast, -10C

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L1-01	1.385	296.250		294.865	294.865	Rod Beside Station
L1-02			1.196	295.054	295.051	3/4" Pipe 20m W of station
L1-03			1.581	294.669	294.664	3/4" Pipe 10m W of Station
<b>Water Level:</b>						
Water Level:	Cut		1.614	294.636	<b>Time WL Surveyed:</b>	14:36
Temporary BM			1.688	294.562	0.000	-
<b>Turn</b>						
Temporary BM	1.646	296.208		294.562		-
Water Level:	Cut		1.571	294.637	<b>Time WL Surveyed:</b>	14:40
L1-03			1.543	294.665	294.664	3/4" Pipe 10m W of Station
L1-02			1.157	295.051	295.051	3/4" Pipe 20m W of station
L1-01			1.346	294.862	294.865	Rod Beside Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

**Datalogger / Station Notes:**

**General Notes:**

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	CJ, GG	Trip Date:	8-Dec-2014
Average WL:	294.637	-	<b>Data Entry Personnel:</b>	CJ	Date:	8-Dec-2014
Closing Error:	0.003	-	<b>Data Check Personnel:</b>	MP	Date:	26-Jan-2015
WL Check:	0.001	-	<b>Entered Digitally in the Field:</b>	Yes		
Transducer Elevation	293.873	-				

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: January 15, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.917	-
Water (°C):	3.2	-
Air Temp (°C):	-1.1	-
RH (%):	65.8%	-
Precipitation (mm):	0.11	-
Battery (Main):	13.0	12.8
Datalogger Clock:	14:16	14:25
Laptop Clock:	14:17	14:26
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:00
End Time (MST):	14:45
Station Condition:	Good
Weather:	Overcast, calm, -1.0 C

**Datalogger / Station Notes:**

-replaced batteries  
-stirred up geonor to melt snow sitting in top

**General Notes:**

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-04	1.094	334.320		333.226	333.226	Pipe with coupling by rebar
L2-03			1.915	332.405	332.394	Pipe w/flagging south by trail
L2-05			1.523	332.797	332.798	Pipe w/flagging north of trail
<b>Water Level:</b>						
Water Level:	Cut		2.490	331.830	<b>Time WL Surveyed:</b>	14:37
Temporary BM			2.507	331.813	0.000	-
<b>Turn</b>						
Temporary BM	2.482	334.295		331.813		-
Water Level:	Cut		2.469	331.826	<b>Time WL Surveyed:</b>	14:39
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L2-05			1.499	332.796	332.798	Pipe w/flagging north of trail
L2-03			1.890	332.405	332.394	Pipe w/flagging south by trail
L2-04			1.068	333.227	333.226	Pipe with coupling by rebar
<b>Water Level:</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

<b>WL Survey Summary</b>		Before	After	<b>Field Personnel:</b>		TR, DW	Trip Date:	15-Jan-2014
Average WL:	331.828	-		Data Entry Personnel:	TR		Date:	15-Jan-2014
Closing Error:	-0.001	-		Data Check Personnel:	CJ		Date:	4-Apr-2014
WL Check:	0.004	-		Entered Digitally in the Field:	Yes			
Transducer Elevation	330.911	-						

# Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: February 2, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.9	-
Water (°C):	2.9	-
Air Temp (°C):	-14.7	-
RH (%):	70.5%	-
Precipitation (mm):	0.00	32.46
Battery (Main):	15.2	-
Datalogger Clock:	14:04	-
Laptop Clock:	14:03	-
Enclosure Dessicant	Good	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	14:00
End Time (MST):	14:51
Station Condition:	Good
Weather:	Clear, calm

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-04	1.193	334.419		333.226	333.226	Pipe with coupling by rebar
L2-03			2.013	332.406	332.394	Pipe w/flagging south by trail
L2-05			1.623	332.796	332.798	Pipe w/flagging north of trail
<b>Water Level:</b>						
Water Level:	Cut		2.620	331.799	<b>Time WL Surveyed:</b>	14:32
Temporary BM			2.595	331.824	0.000	-
<b>Turn</b>						
Temporary BM	2.568	334.392		331.824		-
Water Level:	Cut		2.597	331.795	<b>Time WL Surveyed:</b>	14:45
L2-05			1.598	332.794	332.798	Pipe w/flagging north of trail
L2-03			1.989	332.403	332.394	Pipe w/flagging south by trail
L2-04			1.168	333.224	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

Datalogger / Station Notes:  
-added antifreeze to geonor

General Notes:

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	SM, RM, MP	Trip Date:
Average WL:	331.797	-	Data Entry Personnel:	SM	Date: 2-Feb-2014
Closing Error:	0.002	-	Data Check Personnel:	CJ	Date: 4-Apr-2014
WL Check:	0.004	-	Entered Digitally in the Field:	Yes	
Transducer Elevation	330.897	-			

# Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: March 3, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.878	
Water (°C):	2.4	
Air Temp (°C):	-16.9	
RH (%):	34.1%	
Precipitation (mm):	0.00	
Battery (Main):	15.2	
Datalogger Clock:	12:02	
Laptop Clock:	12:03	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	12:02
End Time (MST):	12:30
Station Condition:	Good
Weather:	Clear, calm

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-04	1.329	334.555		333.226	333.226	Pipe with coupling by rebar
L2-05			1.749	332.806	332.798	Pipe w/flagging north of trail
L2-03			2.142	332.413	332.394	Pipe w/flagging south by trail
<b>Water Level:</b>						
Water Level:	Cut		2.800	331.755	<b>Time WL Surveyed:</b>	12:22
Temporary BM			2.778	331.777	0.000	-
<b>Turn</b>						
Temporary BM	2.763	334.540		331.777		-
Water Level:	Cut		2.784	331.756	<b>Time WL Surveyed:</b>	12:25
L2-03			2.124	332.416	332.394	Pipe w/flagging south by trail
L2-05			1.732	332.808	332.798	Pipe w/flagging north of trail
L2-04			1.311	333.229	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

Datalogger / Station Notes:

General Notes:

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	SM, MP	Trip Date:	3-Mar-2014
Average WL:	331.756	-	Data Entry Personnel:	SM	Date:	3-Mar-2014
Closing Error:	-0.003	-	Data Check Personnel:	CJ	Date:	4-Apr-2014
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.878	-				

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: April 2, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.852	
Water (°C):	2.1	
Air Temp (°C):	-11.7	
RH (%):	49.8%	
Precipitation (mm):	0.00	
Battery (Main):	15.1	
Datalogger Clock:	10:46	
Laptop Clock:	11:12	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	11:09
End Time (MST):	11:35
Station Condition:	Good
Weather:	Overcast, -15 C

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-4	0.876	334.102		333.226	333.226	Pipe with coupling by rebar
L2-3			1.687	332.415	332.394	Pipe w/flagging south by trail
L2-5			1.293	332.809	332.798	Pipe w/flagging north of trail
<b>Turn</b>						
Temporary BM	2.340	334.094		331.754		-
Water Level:	Cut		2.405	331.689		Time WL Surveyed: 11:32
L2-5			1.279	332.815	332.798	Pipe w/flagging north of trail
L2-3			1.675	332.419	332.394	Pipe w/flagging south by trail
L2-4			0.865	333.229	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

<b>Datalogger / Station Notes:</b>

<b>General Notes:</b>

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	CJ, MP	Trip Date:	2-Apr-2014
Average WL:	331.688	-	<b>Data Entry Personnel:</b>	MP	Date:	2-Apr-2014
Closing Error:	-0.003	-	<b>Data Check Personnel:</b>	CJ	Date:	16-May-2014
WL Check:	0.003	-	<b>Entered Digitally in the Field:</b>	Yes		
Transducer Elevation	330.836	-				



# Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: May 1, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	0.864	
Water (°C):	1.9	
Air Temp (°C):	12.7	
RH (%):	35.2%	
Precipitation (mm):	0.00	
Battery (Main):	14.4	
Datalogger Clock:	10:51	
Laptop Clock:	10:53	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Replaced	

<u>Measurement Details:</u>	
Start Time (MST):	10:45
End Time (MST):	11:15
Station Condition:	Good
Weather:	Clear, windy, 12 C

<u>Level Survey:</u>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-4	0.399	333.625		333.226	333.226	Pipe with coupling by rebar
L2-5			0.816	332.809	332.798	Pipe w/flagging north of trail
L2-3			1.209	332.416	332.394	Pipe w/flagging south by trail
<b>Water Level:</b>						
Water Level:	Cut		1.862	331.763	<b>Time WL Surveyed:</b>	11:04
Temporary BM			1.594	332.031	0.000	-
<b>Turn</b>						
Temporary BM	1.571	333.602		332.031		-
<b>Water Level:</b>						
Water Level:	Cut		1.839	331.763	<b>Time WL Surveyed:</b>	11:07
L2-3			1.184	332.418	332.394	Pipe w/flagging south by trail
L2-5			0.791	332.811	332.798	Pipe w/flagging north of trail
L2-4			0.375	333.227	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
<b>Water Level:</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

Datalogger / Station Notes:

General Notes:

-On next visit, empty Geonor.

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	TR, GG	Trip Date:	1-May-2014
Average WL:	331.763	-	<u>Data Entry Personnel:</u>	TR	Date:	1-May-2014
Closing Error:	-0.001	-	<u>Data Check Personnel:</u>	CJ	Date:	16-May-2014
WL Check:	0.000	-	<u>Entered Digitally in the Field:</u>	Yes		
Transducer Elevation	330.899	-				

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: June 11, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.268	1.269
Water (oC):	9.0	9.0
Air Temp (°C):	17.1	16.7
RH (%):	54.6%	51.9%
Precipitation (mm):	0.00	2.10
Battery (Main):	14.0	14.3
Datalogger Clock:	12:08	12:38
Laptop Clock:	12:09	12:39
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	12:25
End Time (MST):	12:53
Station Condition:	Good
Weather:	Overcast, light breeze, 15 C

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-04	0.537	333.763		333.226	333.226	Pipe with coupling by rebar
L2-03			1.346	332.417	332.394	Pipe w/flagging south by trail
L2-05			0.952	332.811	332.798	Pipe w/flagging north of trail
Water Level:	Cut		1.599	332.164	Time WL Surveyed:	12:47
L2-05			0.952	332.811	332.798	Pipe w/flagging north of trail
<b>Turn</b>						
L2-05	0.869	333.680		332.811	332.798	Pipe w/flagging north of trail
Water Level:	Cut		1.515	332.165	Time WL Surveyed:	12:50
L2-05			0.869	332.811	332.798	Pipe w/flagging north of trail
L2-03			1.263	332.417	332.394	Pipe w/flagging south by trail
L2-04			0.454	333.226	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

<b>Datalogger / Station Notes:</b>
-HMP sensor replaced -grounded enclosure -emptied Geonor

<b>General Notes:</b>

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	TR, NC	Trip Date:	11-Jun-2014
Average WL:	332.165	-	Data Entry Personnel:	NC	Date:	11-Jun-2014
Closing Error:	0.000	-	Data Check Personnel:	CJ	Date:	16-Jul-2014
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.897	-				

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: August 11, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.042	
Water (°C):	16.6	
Air Temp (°C):	27.3	
RH (%):	41.1%	
Precipitation (mm):	0.00	
Battery (Main):	14.0	
Datalogger Clock:	14:22	
Laptop Clock:	14:23	
Enclosure Dessicant	-	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:22
End Time (MST):	14:44
Station Condition:	good
Weather:	Clear, light breeze, 30 C

<b>Datalogger / Station Notes:</b>
-geonor s/n: 22212 -hmp45c212 s/n: c2501

<b>General Notes:</b>

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-04	0.601	333.827		333.226	333.226	Pipe with coupling by rebar
L2-03			1.412	332.415	332.394	Pipe w/flagging south by trail
L2-05			1.014	332.813	332.798	Pipe w/flagging north of trail
Water Level:	Cut		1.943	331.884	Time WL Surveyed:	14:39
L2-05			1.014	332.813	332.798	Pipe w/flagging north of trail
<b>Turn</b>						
L2-05	0.983	333.796		332.813	332.798	Pipe w/flagging north of trail
Water Level:	Cut		1.909	331.887	Time WL Surveyed:	14:40
L2-05			0.983	332.813	332.798	Pipe w/flagging north of trail
L2-03			1.381	332.415	332.394	Pipe w/flagging south by trail
L2-04			0.568	333.228	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	TR, MP	Trip Date:	11-Aug-2014
Average WL:	331.886	-	<b>Data Entry Personnel:</b>	TR	Date:	11-Aug-2014
Closing Error:	-0.002	-	<b>Data Check Personnel:</b>	CJ	Date:	10-Aug-2014
WL Check:	0.003	-	<b>Entered Digitally in the Field:</b>	Yes		
Transducer Elevation	330.844	-				

# Lake Site Measurement / Site Visit Record

Site: L2 Kearn Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: September 20, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.945	
Water (°C):	12.3	
Air Temp (°C):	18.9	
RH (%):	43.6%	
Precipitation (mm):	0.00	
Battery (Main):	14.2	
Datalogger Clock:	12:23	
Laptop Clock:	12:24	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Replaced	

<b>Measurement Details:</b>	
Start Time (MST):	12:15
End Time (MST):	12:45
Station Condition:	Good
Weather:	Clear, calm

<b>Datalogger / Station Notes:</b>

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-04	0.688	333.914		333.226	333.226	Pipe with coupling by rebar
L2-05			1.103	332.811	332.798	Pipe w/flagging north of trail
L2-03			1.501	332.413	332.394	Pipe w/flagging south by trail
Water Level:	<b>Cut</b>		2.109	331.805	<b>Time WL Surveyed:</b> 12:43	
Temporary BM			1.992	331.922	0.000	-
<b>Turn</b>						
Temporary BM	1.983	333.905		331.922		-
Water Level:	<b>Cut</b>		2.097	331.808	<b>Time WL Surveyed:</b> 12:45	
L2-03			1.490	332.415	332.394	Pipe w/flagging south by trail
L2-05			1.093	332.812	332.798	Pipe w/flagging north of trail
L2-04			0.677	333.228	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

<b>General Notes:</b>

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	MP, SM	Trip Date:	20-Sep-2014
Average WL:	331.807	-	<b>Data Entry Personnel:</b>	MP, SM	Date:	20-Sep-2014
Closing Error:	-0.002	-	<b>Data Check Personnel:</b>	GG	Date:	10-Oct-2014
WL Check:	0.003	-	<b>Entered Digitally in the Field:</b>	Yes		
Transducer Elevation	330.862	-				

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: October 21, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.955	
Water (°C):	9.4	
Air Temp (°C):	11.8	
RH (%):	70.6%	
Precipitation (mm):	0.00	
Battery (Main):	14.5	
Datalogger Clock:	13:03	
Laptop Clock:	13:04	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	12:58
End Time (MST):	13:20
Station Condition:	Good
Weather:	Cloudy, 12 C

<b>Datalogger / Station Notes:</b>

<b>General Notes:</b>

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-04	0.623	333.849		333.226	333.226	Pipe with coupling by rebar
L2-05			1.036	332.813	332.812	Pipe w/flagging north of trail
L2-03			1.433	332.416	332.416	Pipe w/flagging south by trail
Water Level:	Cut		2.049	331.800		Time WL Surveyed: 13:13
L2-03			1.433	332.416	332.416	Pipe w/flagging south by trail
<b>Turn</b>						
L2-03	1.411	333.827		332.416	332.416	Pipe w/flagging south by trail
Water Level:	Cut		2.026	331.801		Time WL Surveyed: 13:15
L2-03			1.411	332.416	332.416	Pipe w/flagging south by trail
L2-05			1.013	332.814	332.812	Pipe w/flagging north of trail
L2-04			0.602	333.225	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	GG, TR	Trip Date:	21-Oct-2014
Average WL:	331.801	-	<b>Data Entry Personnel:</b>	GG	Date:	21-Oct-2014
Closing Error:	0.001	-	<b>Data Check Personnel:</b>	CJ	Date:	18-Nov-2014
WL Check:	0.001	-	<b>Entered Digitally in the Field:</b>	Yes		
Transducer Elevation	330.846	-				

# Lake Site Measurement / Site Visit Record

Site: L2 Kearl Lake

UTM Location: 484839 E, 6351065 N

Site Visit Date: December 2, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.939	
Water (°C):	4.8	
Air Temp (°C):	-17.7	
RH (%):	79.0%	
Precipitation (mm):	0.00	
Battery (Main):	15.3	
Datalogger Clock:	11:40	
Laptop Clock:	11:40	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	11:37
End Time (MST):	12:05
Station Condition:	Good
Weather:	Clear, calm, -20 C

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L2-04	0.438	333.664		333.226	333.226	Pipe with coupling by rebar
L2-03			1.244	332.420	332.394	Pipe w/flagging south by trail
L2-05			0.849	332.815	332.798	Pipe w/flagging north of trail
Water Level:	Cut		1.871	331.793	Time WL Surveyed:	12:04
L2-05			0.849	332.815	332.798	Pipe w/flagging north of trail
<b>Turn</b>						
L2-05	0.883	333.698		332.815	332.798	Pipe w/flagging north of trail
Water Level:	Cut		1.907	331.791	Time WL Surveyed:	11:57
L2-05			0.883	332.815	332.798	Pipe w/flagging north of trail
L2-03			1.279	332.419	332.394	Pipe w/flagging south by trail
L2-04			0.471	333.227	333.226	Pipe with coupling by rebar
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**Datalogger / Station Notes:**

**General Notes:**

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	TR, CJ	Trip Date:	2-Dec-2014
Average WL:	331.792	-	Data Entry Personnel:	CJ	Date:	2-Dec-2014
Closing Error:	-0.001	-	Data Check Personnel:	CJ	Date:	5-Jan-2015
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	330.853	-				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: January 12, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.293	-
Water (°C):	4.0	-
Battery (Main):	12.7	13.4
Datalogger Clock:	14:25	-
Laptop Clock:	14:24	-
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	14:20
End Time (MST):	14:40
Station Condition:	Good
Weather:	Clear, calm, -19 C

**Datalogger / Station Notes:**

-changed battery

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L3-05	0.811	236.348		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.696	234.652	234.619	3/4" Pipe 7m South of data logger
L3-07			0.961	235.387	235.380	3/4" Pipe 12m South of data logger
Water Level:	<b>Cut</b>		2.543	233.805	<b>Time WL Surveyed:</b>	14:35
Temporary BM			2.564	233.784	0.000	-
<b>Turn</b>						
Temporary BM	2.540	236.324		233.784		-
Water Level:	<b>Cut</b>		2.521	233.803	<b>Time WL Surveyed:</b>	14:37
L3-07			0.939	235.385	235.380	3/4" Pipe 12m South of data logger
L3-06			1.673	234.651	234.619	3/4" Pipe 7m South of data logger
L3-05			0.788	235.536	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

**General Notes:**

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	TR, DW	Trip Date:	12-Jan-2014
Average WL:	233.804	-	Data Entry Personnel:	TR	Date:	12-Jan-2014
Closing Error:	0.001	-	Data Check Personnel:	CJ	Date:	8-Apr-2014
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.511	-				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: February 11, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.252	
Water (°C):	3.3	
Battery (Main):	12.9	
Datalogger Clock:	9:20	
Laptop Clock:	9:19	
Enclosure Dessicant	Good	
Logger# (if Δ):	-	
Pt# (if Δ):	-	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	9:18
End Time (MST):	9:43
Station Condition:	Good
Weather:	Clear, calm, -27 C

**Datalogger / Station Notes:**

**General Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L3-05	0.653	236.190		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.526	234.664	234.619	3/4" Pipe 7m South of data logger
L3-07			0.800	235.390	235.380	3/4" Pipe 12m South of data logger
Water Level:	<b>Cut</b>		2.418	233.772	<b>Time WL Surveyed:</b>	9:33
Temporary BM			2.405	233.785	0.000	-
<b>Turn</b>						
Temporary BM	2.384	236.169		233.785		-
Water Level:	<b>Cut</b>		2.399	233.770	<b>Time WL Surveyed:</b>	9:37
L3-07			0.777	235.392	235.380	3/4" Pipe 12m South of data logger
L3-06			1.506	234.663	234.619	3/4" Pipe 7m South of data logger
L3-05			0.631	235.538	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	SM, MP	Trip Date:	11-Feb-2014
Average WL:	233.771	-	Data Entry Personnel:	SM	Date:	11-Feb-2014
Closing Error:	-0.001	-	Data Check Personnel:	CJ	Date:	8-Apr-2014
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.519	-				



# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: March 12, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.244	1.244
Water (°C):	2.9	2.8
Battery (Main):	14.1	13.3
Datalogger Clock:	15:34	15:48
Laptop Clock:	15:34	15:48
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	15:25
End Time (MST):	16:00
Station Condition:	Good
Weather:	Overcast, 6 C

**Datalogger / Station Notes:**

-Replaced battery

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
L3-05	0.657	236.194		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.491	234.703	234.619	3/4" Pipe 7m South of data logger
L3-07			0.793	235.401	235.380	3/4" Pipe 12m South of data logger
Water Level:	<b>Cut</b>		2.431	233.763	<b>Time WL Surveyed:</b>	15:55
Temporary BM			2.419	233.775		-
<b>Turn</b>						
Temporary BM	2.394	236.169		233.775		-
Water Level:	<b>Cut</b>		2.410	233.759	<b>Time WL Surveyed:</b>	15:57
L3-07			0.772	235.397	235.380	3/4" Pipe 12m South of data logger
L3-06			1.469	234.700	234.619	3/4" Pipe 7m South of data logger
L3-05			0.634	235.535	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

**General Notes:**

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	DW, MP	Trip Date:	12-Mar-2014
Average WL:	233.761	-	Data Entry Personnel:	DW	Date:	12-Mar-2014
Closing Error:	0.002	-	Data Check Personnel:	CJ	Date:	8-Apr-2014
WL Check:	0.004	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.517	-				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: April 6, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.236	
Water (°C):	2.6	
Battery (Main):	14.3	
Datalogger Clock:	12:31	
Laptop Clock:	12:31	
Enclosure Dessicant	Good	
Logger# (if Δ):	-	
Pt# (if Δ):	248902	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	12:30
End Time (MST):	12:49
Station Condition:	good
Weather:	Overcast, breezy, 2 C

**Datalogger / Station Notes:**

**General Notes:**

<b>Level Survey:</b>						
<b>Station</b>	<b>BS + (m)</b>	<b>HI (m)</b>	<b>FS - (m)</b>	<b>Elevation (m)</b>	<b>Elevation as given (m)</b>	<b>Description</b>
<b>Benchmark</b>						
L3-05	0.786	236.323		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-07			0.922	235.401	235.380	3/4" Pipe 12m South of data logger
L3-06			1.604	234.719	234.619	3/4" Pipe 7m South of data logger
Water Level:	<b>Cut</b>		2.560	233.763	<b>Time WL Surveyed:</b>	12:40
Temporary BM			2.461	233.862	0.000	-
<b>Turn</b>						
Temporary BM	2.447	236.309		233.862		-
Water Level:	<b>Cut</b>		2.542	233.767	<b>Time WL Surveyed:</b>	12:43
L3-06			1.589	234.720	234.619	3/4" Pipe 7m South of data logger
L3-07			0.905	235.404	235.380	3/4" Pipe 12m South of data logger
L3-05			0.770	235.539	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

<b>WL Survey Summary</b>	<b>Before</b>	<b>After</b>	<b>Field Personnel:</b>	<b>SM, CJ</b>	<b>Trip Date:</b>	<b>6-Apr-2014</b>
Average WL:	233.765	-	Data Entry Personnel:	SM	Date:	6-Apr-2014
Closing Error:	-0.002	-	Data Check Personnel:	CJ	Date:	16-May-2014
WL Check:	0.004	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.529	-				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: May 20, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.952	
Water (°C):	5.8	
Battery (Main):	14.5	
Datalogger Clock:	15:26	
Laptop Clock:	15:25	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
P.T.# (if Δ):	-	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	15:20
End Time (MST):	15:45
Station Condition:	Good
Weather:	Rain, breezy, 10

**Datalogger / Station Notes:**

**General Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L3-05	0.541	236.078		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.353	234.725	234.619	3/4" Pipe 7m South of data logger
L3-07			0.676	235.402	235.380	3/4" Pipe 12m South of data logger
Water Level:	<b>Cut</b>		2.301	233.777	<b>Time WL Surveyed:</b>	15:34
Temporary BM			2.088	233.990	0.000	-
<b>Turn</b>						
Temporary BM	2.067	236.057		233.990		-
Water Level:	<b>Cut</b>		2.279	233.778	<b>Time WL Surveyed:</b>	15:37
L3-07			0.653	235.404	235.380	3/4" Pipe 12m South of data logger
L3-06			1.328	234.729	234.619	3/4" Pipe 7m South of data logger
L3-05			0.517	235.540	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	TR, MP	Trip Date:	20-May-2014
Average WL:	233.778	-	Data Entry Personnel:	MP	Date:	20-May-2014
Closing Error:	-0.003	-	Data Check Personnel:	CJ	Date:	29-May-2014
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.826	-				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: June 15, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	0.889	1.009
Water (°C):	9.4	19.5
Battery (Main):	13.4	13.78
Datalogger Clock:	16:39	17:13
Laptop Clock:	16:38	17:12
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
Pt# (if Δ):	248903	346250
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	16:30
End Time (MST):	17:20
Station Condition:	Good
Weather:	Sunny, 25 C

**Datalogger / Station Notes:**

**General Notes:**

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L3-05	0.552	236.089		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.366	234.723	234.619	3/4" Pipe 7m South of data logger
L3-07			0.687	235.402	235.380	3/4" Pipe 12m South of data logger
Water Level:	<b>Cut</b>		2.206	233.883	<b>Time WL Surveyed:</b>	16:49
Temporary BM			2.106	233.983	0.000	-
<b>Turn</b>						
Temporary BM	2.083	236.066		233.983		-
Water Level:	<b>Cut</b>		2.183	233.883	<b>Time WL Surveyed:</b>	16:50
L3-07			0.668	235.398	235.380	3/4" Pipe 12m South of data logger
L3-06			1.346	234.720	234.619	3/4" Pipe 7m South of data logger
L3-05			0.533	235.533	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	DW, TR, NC	Trip Date:	15-Jun-2014
Average WL:	233.883	-	Data Entry Personnel:	DW	Date:	15-Jun-2014
Closing Error:	0.004	-	Data Check Personnel:	CJ	Date:	25-Jun-2014
WL Check:	0.000	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.994	-				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: August 15, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.122	1.062
Water (°C):	16.8	20.9
Battery (Main):	13.8	13.7
Datalogger Clock:	13:53	0.59
Laptop Clock:	13:53	0.59
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	13:50
End Time (MST):	14:15
Station Condition:	good
Weather:	clear, calm, 25

<b>Datalogger / Station Notes:</b>
-equipment mast secured
-repositioned PT

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L3-05	0.458	235.995		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-06			1.273	234.722	234.619	3/4" Pipe 7m South of data logger
L3-07			0.597	235.398	235.380	3/4" Pipe 12m South of data logger
Water Level:	<b>Cut</b>		2.061	233.934	<b>Time WL Surveyed:</b>	14:02
Temporary BM			1.273	234.722	0.000	-
<b>Turn</b>						
Temporary BM	1.246	235.968		234.722		-
Water Level:	<b>Cut</b>		2.032	233.936	<b>Time WL Surveyed:</b>	14:03
L3-07			0.569	235.399	235.380	3/4" Pipe 12m South of data logger
L3-06			1.246	234.722	234.619	3/4" Pipe 7m South of data logger
L3-05			0.432	235.536	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L3-06	1.247	235.969		234.722		
Water Level:	<b>Cut</b>		2.032	233.937	<b>Time WL Surveyed:</b>	14:11
Water Level:	<b>Cut</b>		2.008	233.936	<b>Time WL Surveyed:</b>	14:12
L3-06	1.222	235.944		234.722		

<b>General Notes:</b>

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	GG, TR, MP	Trip Date:	15-Aug-2014
Average WL:	233.935	233.937	Data Entry Personnel:	GG	Date:	15-Aug-2014
Closing Error:	0.001	-	Data Check Personnel:	CJ	Date:	10-Sep-2014
WL Check:	0.002	0.001	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.813	232.875				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: September 17, 2014



<u>Datalogger Details:</u>	Before	After
Transducer Reading (m):	1.208	
Water (°C):	12.6	
Battery (Main):	14.6	
Datalogger Clock:	14:11	
Laptop Clock:	14:10	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<u>Measurement Details:</u>	
Start Time (MST):	14:05
End Time (MST):	14:24
Station Condition:	Good
Weather:	Overcast, breezy, 15 C

<u>Datalogger / Station Notes:</u>

<u>Level Survey:</u>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L3-05	0.450	235.987		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-07			0.587	235.400	235.380	3/4" Pipe 12m South of data logger
L3-06			1.263	234.724	234.619	3/4" Pipe 7m South of data logger
Water Level:	<b>Cut</b>		1.999	233.988	<b>Time WL Surveyed:</b>	14:18
Temporary BM			1.929	234.058	0.000	-
<b>Turn</b>						
Temporary BM	1.917	235.975		234.058		-
Water Level:	<b>Cut</b>		1.985	233.990	<b>Time WL Surveyed:</b>	14:20
L3-06			1.252	234.723	234.619	3/4" Pipe 7m South of data logger
L3-07			0.574	235.401	235.380	3/4" Pipe 12m South of data logger
L3-05			0.437	235.538	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

<u>General Notes:</u>

<u>WL Survey Summary</u>	Before	After	<u>Field Personnel:</u>	SM, MP, TR	Trip Date:	17-Sep-2014
Average WL:	233.989	-	Data Entry Personnel:	SM	Date:	17-Sep-2014
Closing Error:	-0.001	-	Data Check Personnel:	GG	Date:	10-Oct-2014
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.781	-				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: October 14, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.214	-
Water (°C):	9.5	-
Battery (Main):	12.7	-
Datalogger Clock:	12:49	-
Laptop Clock:	12:50	-
Enclosure Dessicant	Good	
Logger# (if Δ):	-	-
PT# (if Δ):	-	-
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	12:45
End Time (MST):	13:00
Station Condition:	Good
Weather:	Overcast, light rain, 8 C

<b>Datalogger / Station Notes:</b>

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L3-05	0.430	235.967		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-07			0.568	235.399	235.380	3/4" Pipe 12m South of data logger
L3-06			1.246	234.721	234.619	3/4" Pipe 7m South of data logger
Water Level:	<b>Cut</b>		1.983	233.984	<b>Time WL Surveyed:</b>	12:57
L3-07			1.246	234.721	235.380	3/4" Pipe 12m South of data logger
<b>Turn</b>						
L3-07	1.228	235.949		234.721	235.380	3/4" Pipe 12m South of data logger
Water Level:	<b>Cut</b>		1.964	233.985	<b>Time WL Surveyed:</b>	12:59
L3-06			1.228	234.721	234.619	3/4" Pipe 7m South of data logger
L3-07			0.551	235.398	235.380	3/4" Pipe 12m South of data logger
L3-05			0.415	235.534	235.537	3/4" Pipe 12m SE of data logger

<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

<b>General Notes:</b>

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	TR, MP, GG	Trip Date:	14-Oct-2014
Average WL:	233.985	-	Data Entry Personnel:	TR	Date:	14-Oct-2014
Closing Error:	0.003	-	Data Check Personnel:	GG	Date:	20-Nov-2014
WL Check:	0.001	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.771	-				

# Lake Site Measurement / Site Visit Record

Site: L3 - Isadore's Lake

UTM Location: 463305 E, 6342967 N

Site Visit Date: December 3, 2014



<b>Datalogger Details:</b>	Before	After
Transducer Reading (m):	1.081	
Water (°C):	3.9	
Battery (Main):	13.0	
Datalogger Clock:	15:05	
Laptop Clock:	15:06	
Enclosure Dessicant	Replaced	
Logger# (if Δ):	-	
PT# (if Δ):	-	
Vent Tube Dessicant	Good	

<b>Measurement Details:</b>	
Start Time (MST):	15:00
End Time (MST):	15:35
Station Condition:	good
Weather:	Light snow, -20 C, calm

**Datalogger / Station Notes:**

-modem replaced

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L3-05	0.668	236.205		235.537	235.537	3/4" Pipe 12m SE of data logger
L3-07			0.803	235.402	235.400	3/4" Pipe 12m South of data logger
L3-06			1.482	234.723	234.722	3/4" Pipe 7m South of data logger
<b>Water Level:</b>						
Temporary BM	<b>Cut</b>		2.358	233.847	<b>Time WL Surveyed:</b>	15:08
			2.343	233.862		-
<b>Turn</b>						
Temporary BM	2.325	236.187		233.862		-
Water Level:	<b>Cut</b>		2.342	233.845	<b>Time WL Surveyed:</b>	15:10
L3-06			1.465	234.722	234.722	3/4" Pipe 7m South of data logger
L3-07			0.786	235.401	235.400	3/4" Pipe 12m South of data logger
L3-05			0.649	235.538	235.537	3/4" Pipe 12m SE of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

**General Notes:**

<b>WL Survey Summary</b>	Before	After	<b>Field Personnel:</b>	TR, CJ	Trip Date:	3-Dec-2014
Average WL:	233.846	-	Data Entry Personnel:	TR	Date:	3-Dec-2014
Closing Error:	-0.001	-	Data Check Personnel:	CJ	Date:	5-Jan-2015
WL Check:	0.002	-	Entered Digitally in the Field:	Yes		
Transducer Elevation	232.765	-				



# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:

January 17, 2014

Site Visit Time (MST):

13:00



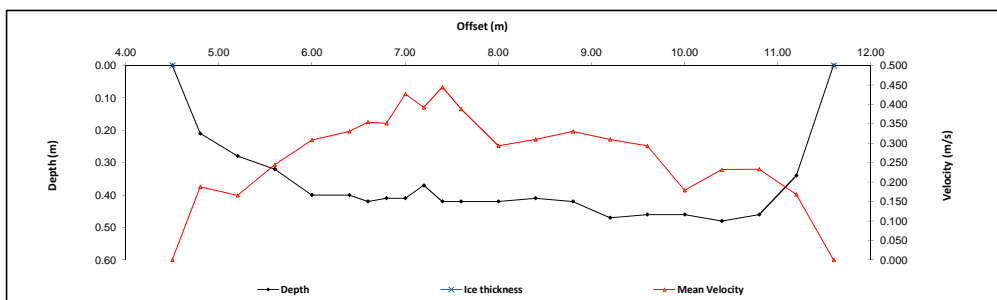
## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB	4.50	0.00														
1	4.80	0.21	0.13	0.188				1.00	0.15	0.00	0.000	0.00	0.000	0.000		
2	5.20	0.28	0.17	0.166				1.00	0.35	0.21	0.188	0.07	0.014	0.014	2%	
3	5.60	0.32	0.19	0.245				1.00	0.40	0.28	0.166	0.11	0.019	0.019	2%	
4	6.00	0.40	0.24	0.308				1.00	0.40	0.32	0.245	0.13	0.031	0.031	4%	
5	6.40	0.40	0.24	0.330				1.00	0.40	0.40	0.308	0.16	0.049	0.049	6%	
6	6.60	0.42	0.25	0.354				1.00	0.30	0.40	0.330	0.12	0.040	0.040	5%	
7	6.80	0.41	0.25	0.351				1.00	0.20	0.42	0.354	0.08	0.030	0.030	4%	
8	7.00	0.41	0.25	0.427				1.00	0.20	0.41	0.351	0.08	0.029	0.029	4%	
9	7.20	0.37	0.22	0.392				1.00	0.20	0.41	0.427	0.08	0.035	0.035	5%	
10	7.40	0.42	0.25	0.444				1.00	0.20	0.37	0.392	0.07	0.029	0.029	4%	
11	7.60	0.42	0.25	0.388				1.00	0.20	0.42	0.444	0.08	0.037	0.037	5%	
12	8.00	0.42	0.25	0.293				1.00	0.30	0.42	0.388	0.13	0.049	0.049	6%	
13	8.40	0.41	0.25	0.310				1.00	0.40	0.42	0.293	0.17	0.049	0.049	6%	
14	8.80	0.42	0.25	0.330				1.00	0.40	0.41	0.310	0.16	0.051	0.051	7%	
15	9.20	0.47	0.28	0.310				1.00	0.40	0.42	0.330	0.17	0.055	0.055	7%	
16	9.60	0.46	0.28	0.293				1.00	0.40	0.47	0.310	0.19	0.058	0.058	8%	
17	10.00	0.46	0.28	0.179				1.00	0.40	0.46	0.293	0.18	0.054	0.054	7%	
18	10.40	0.48	0.29	0.232				1.00	0.40	0.46	0.179	0.18	0.033	0.033	4%	
19	10.80	0.46	0.28	0.233				1.00	0.40	0.48	0.232	0.19	0.045	0.045	6%	
20	11.20	0.34	0.20	0.168				1.00	0.40	0.46	0.233	0.18	0.043	0.043	6%	
LB	11.60	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.40	0.34	0.168	0.14	0.023	0.023	3%	
								1.00	0.20	0.00	0.000	0.00	0.000	0.000		
<b>Total Flow</b>													<b>0.772</b>	<b>100%</b>		

## Flow Measurement Details:

Metering Section Location (describe):  
30m DS of outlet

Meas. Start Time (MST):	13:47
Meas. End Time (MST):	14:08
Equipment:	ADV
Method:	Wading
River Condition:	Fully open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, windy, 2 C



## Flow characteristics:

Total Flow:	0.772	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.69	(m <sup>2</sup> )
Wetted Width:	7.10	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.15	

## Logger Details:

	Before	After
Transducer Reading (m):	1.284	1.274
Water (°C):	0.6	0.6
Datalogger Clock:	13:12	14:27
Laptop Clock:	13:12	14:27
Battery (Main):	13.0	14.7
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L4-02	0.629	100.684		100.055	100.055	3/4" Pipe 5m SE of Station
L4-03			0.556	100.128	100.127	3/4" Pipe 2m SE of Station
L4-01			0.684	100.000	100.000	3/4" Pipe 4m NW of Station
Water Level:			2.735	97.949	<b>Time WL Surveyed:</b> 13:19	
Temporary BM			2.755	97.929	0.000	
<b>Turn</b>						
Temporary BM	2.734	100.663		97.929		
Water Level:			2.715	97.948	<b>Time WL Surveyed:</b> 13:22	
L4-01			0.662	100.001	100.000	3/4" Pipe 4m NW of Station
L4-03			0.534	100.129	100.127	3/4" Pipe 2m SE of Station
L4-02			0.608	100.055	100.055	3/4" Pipe 5m SE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L4-01	0.663	100.664		100.001		
Water Level:			2.730	97.934	<b>Time WL Surveyed:</b> 14:25	
Water Level:			2.717	97.930	<b>Time WL Surveyed:</b> 14:27	
L4-01	0.646	100.647		100.001		

## WL Survey Summary

	Before	After
Average WL:	97.949	97.932
Closing Error:	0.000	
WL Check:	0.001	0.004
Transducer Elevation	96.665	96.658

Field Personnel:	SM, TR	Trip Date:	17-Jan-14
Data Entry Personnel:	SM	Date:	17-Apr-14
Data Check Personnel:	DW	Date:	9-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: February 9, 2014

Site Visit Time (MST): 11:10



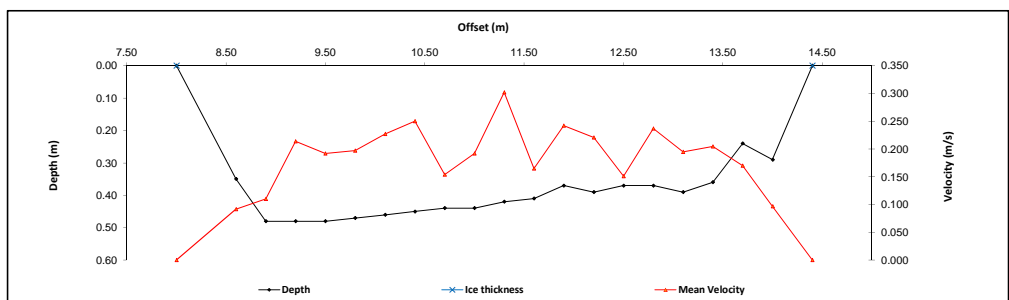
## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	14.40	0.00	0.00							1.00	0.20	0.00	0.000	0.00	0.000	
1	14.00	0.29		0.17	0.097					1.00	0.35	0.29	0.097	0.10	0.010	2%
2	13.70	0.24		0.14	0.170					1.00	0.30	0.24	0.170	0.07	0.012	3%
3	13.40	0.36		0.22	0.205					1.00	0.30	0.36	0.205	0.11	0.022	5%
4	13.10	0.39		0.23	0.195					1.00	0.30	0.39	0.195	0.12	0.023	5%
5	12.80	0.37		0.22	0.237					1.00	0.30	0.37	0.237	0.11	0.026	6%
6	12.50	0.37		0.22	0.151					1.00	0.30	0.37	0.151	0.11	0.017	4%
7	12.20	0.39		0.23	0.221					1.00	0.30	0.39	0.221	0.12	0.026	6%
8	11.90	0.37		0.22	0.242					1.00	0.30	0.37	0.242	0.11	0.027	6%
9	11.60	0.41		0.25	0.165					1.00	0.30	0.41	0.165	0.12	0.020	5%
10	11.30	0.42		0.25	0.302					1.00	0.30	0.42	0.302	0.13	0.038	8%
11	11.00	0.44		0.26	0.192					1.00	0.30	0.44	0.192	0.13	0.025	6%
12	10.70	0.44		0.26	0.154					1.00	0.30	0.44	0.154	0.13	0.020	5%
13	10.40	0.45		0.27	0.250					1.00	0.30	0.45	0.250	0.14	0.034	8%
14	10.10	0.46		0.28	0.227					1.00	0.30	0.46	0.227	0.14	0.031	7%
15	9.80	0.47		0.28	0.197					1.00	0.30	0.47	0.197	0.14	0.028	6%
16	9.50	0.48		0.29	0.192					1.00	0.30	0.48	0.192	0.14	0.028	6%
17	9.20	0.48		0.29	0.214					1.00	0.30	0.48	0.214	0.14	0.031	7%
18	8.90	0.48		0.29	0.110					1.00	0.30	0.48	0.110	0.14	0.016	4%
19	8.60	0.35		0.21	0.092					1.00	0.45	0.35	0.092	0.16	0.014	3%
LB	8.00	0.00	0.00							1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.448</b>	<b>100%</b>	

## Flow Measurement Details:

**Metering Section Location (describe):**  
30m DS of outlet

Meas. Start Time (MST):	12:11
Meas. End Time (MST):	12:31
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm



## Flow characteristics:

Total Flow:	0.448	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.37	(m <sup>2</sup> )
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.10	

## Logger Details:

	Before	After
Transducer Reading (m):	1.256	
Water (°C):	0.7	
Datalogger Clock:	11:17	
Laptop Clock:	11:18	
Battery (Main):	15.2	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

## Datalogger / Station Notes:

## General Notes:

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L4-02	1.035	101.090		100.055	100.055	3/4" Pipe 5m SE of Station
L4-03			0.965	100.125	100.127	3/4" Pipe 2m SE of Station
L4-01			1.095	99.995	100.000	3/4" Pipe 4m NW of Station
<b>Water Level:</b>						
Water Level:	Cut		3.186	97.904		<b>Time WL Surveyed:</b> 11:35
Temporary BM			3.141	97.949	0.000	-
<b>Turn</b>						
Temporary BM	3.128	101.077		97.949		-
Water Level:	Cut		3.174	97.903		<b>Time WL Surveyed:</b> 11:37
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					<b>Time WL Surveyed:</b>
Water Level:	Cut					<b>Time WL Surveyed:</b>

## WL Survey Summary

	Before	After
Average WL:	97.904	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	96.648	-

<b>Field Personnel:</b>	MP, SG	<b>Trip Date:</b>	9-Feb-14
<b>Data Entry Personnel:</b>	SG		9-Feb-14
<b>Data Check Personnel:</b>	DW	<b>Date:</b>	9-Apr-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:

March 12, 2014

Site Visit Time (MST):

13:15



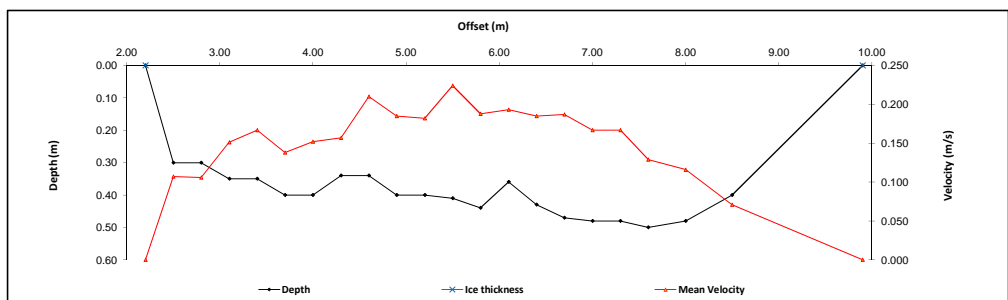
## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.50	0.30		0.18	0.107					1.00	0.30	0.30	0.107	0.09	0.010	2%
2	2.80	0.30		0.18	0.106					1.00	0.30	0.30	0.106	0.09	0.010	2%
3	3.10	0.35		0.21	0.151					1.00	0.30	0.35	0.151	0.11	0.016	4%
4	3.40	0.35		0.21	0.167					1.00	0.30	0.35	0.167	0.11	0.018	4%
5	3.70	0.40		0.24	0.138					1.00	0.30	0.40	0.138	0.12	0.017	4%
6	4.00	0.40		0.24	0.152					1.00	0.30	0.40	0.152	0.12	0.018	4%
7	4.30	0.34		0.20	0.157					1.00	0.30	0.34	0.157	0.10	0.016	4%
8	4.60	0.34		0.20	0.210					1.00	0.30	0.34	0.210	0.10	0.021	5%
9	4.90	0.40		0.24	0.185					1.00	0.30	0.40	0.185	0.12	0.022	5%
10	5.20	0.40		0.24	0.182					1.00	0.30	0.40	0.182	0.12	0.022	5%
11	5.50	0.41		0.25	0.224					1.00	0.30	0.41	0.224	0.12	0.028	7%
12	5.80	0.44		0.26	0.188					1.00	0.30	0.44	0.188	0.13	0.025	6%
13	6.10	0.36		0.22	0.193					1.00	0.30	0.36	0.193	0.11	0.024	5%
14	6.40	0.43		0.26	0.185					1.00	0.30	0.43	0.185	0.13	0.021	6%
15	6.70	0.47		0.28	0.187					1.00	0.30	0.47	0.187	0.14	0.026	6%
16	7.00	0.48		0.29	0.167					1.00	0.30	0.48	0.167	0.14	0.024	6%
17	7.30	0.48		0.29	0.167					1.00	0.30	0.48	0.167	0.14	0.024	6%
18	7.60	0.50		0.30	0.129					1.00	0.35	0.50	0.129	0.18	0.023	5%
19	8.00	0.48		0.29	0.116					1.00	0.45	0.48	0.116	0.22	0.025	6%
20	8.50	0.40		0.24	0.071					1.00	0.95	0.40	0.071	0.38	0.027	7%
LB	9.90	0.00	0.00		0.000		0.000			1.00	0.70	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.415</b>	<b>100%</b>	

## Flow Measurement Details:

**Metering Section Location (describe):**  
30m DS of outlet

Meas. Start Time (MST):	14:24
Meas. End Time (MST):	14:46
Equipment:	ADV
Method:	Wading
River Condition:	Fully open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, Windy, 2 C



## Flow characteristics:

Total Flow:	0.415	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.77	(m <sup>2</sup> )
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.08	

## Logger Details:

	Before	After
Transducer Reading (m):	1.253	
Water (°C):	0.6	
Datalogger Clock:	13:22	
Laptop Clock:	13:21	
Battery (Main):	14.5	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

## Datalogger / Station Notes:

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L4-03	0.804	100.931		100.127	100.127	3/4" Pipe 2m SE of Station
L4-01			0.942	99.989	100.000	3/4" Pipe 4m NW of Station
L4-02			0.871	100.060	100.055	3/4" Pipe 5m SE of Station
Water Level:	Cut	3.033		97.898		<b>Time WL Surveyed:</b>
Temporary BM		0.863		100.068	0.000	
<b>Turn</b>						
Temporary BM	0.840	100.908		100.068		
Water Level:	Cut		3.012	97.886		<b>Time WL Surveyed:</b>
L4-02			0.848	100.060	100.055	3/4" Pipe 5m SE of Station
L4-01			0.919	99.989	100.000	3/4" Pipe 4m NW of Station
L4-03			0.782	100.126	100.127	3/4" Pipe 2m SE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L4-01	0.663	100.663		100.000		
Water Level:	Cut		2.730	97.933		<b>Time WL Surveyed:</b>
Water Level:	Cut		2.717	97.929		<b>Time WL Surveyed:</b>
L4-01	0.646	100.646		100.000		

WL Survey Summary	Before	After
Average WL:	97.897	97.931
closing ERROR	0.001	-
WL Check:	0.002	0.004
Transducer Elevation	96.644	-

<b>Field Personnel:</b>	DW, MP	Trip Date:	12-Mar-14
<b>Data Entry Personnel:</b>	MP	Date:	12-Mar-14
<b>Data Check Personnel:</b>	DW	Date:	9-Apr-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: \_\_\_\_\_  
Site Visit Time (MST): \_\_\_\_\_

April 3, 2014

09:00



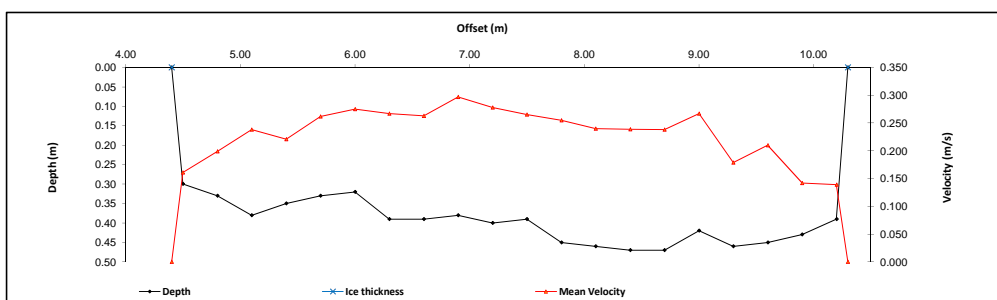
## Flow Measurement:

Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to W/S (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.40	0.00													
1	4.50	0.30	0.18	0.161					1.00	0.05	0.00	0.000	0.00	0.000	
2	4.80	0.33	0.20	0.199					1.00	0.20	0.30	0.161	0.06	0.010	2%
3	5.10	0.38	0.23	0.238					1.00	0.30	0.33	0.199	0.10	0.020	4%
4	5.40	0.35	0.21	0.221					1.00	0.30	0.38	0.238	0.11	0.027	5%
5	5.70	0.33	0.20	0.262					1.00	0.30	0.35	0.221	0.11	0.023	4%
6	6.00	0.32	0.19	0.275					1.00	0.30	0.33	0.262	0.10	0.026	5%
7	6.30	0.39	0.23	0.267					1.00	0.30	0.32	0.275	0.10	0.026	5%
8	6.60	0.39	0.23	0.263					1.00	0.30	0.39	0.267	0.12	0.031	6%
9	6.90	0.38	0.23	0.297					1.00	0.30	0.39	0.263	0.12	0.031	6%
10	7.20	0.40	0.24	0.278					1.00	0.30	0.38	0.297	0.11	0.034	6%
11	7.50	0.39	0.23	0.265					1.00	0.30	0.40	0.278	0.12	0.033	6%
12	7.80	0.45	0.27	0.255					1.00	0.30	0.39	0.265	0.12	0.031	6%
13	8.10	0.46	0.28	0.240					1.00	0.30	0.45	0.255	0.14	0.034	6%
14	8.40	0.47	0.28	0.239					1.00	0.30	0.46	0.240	0.14	0.033	6%
15	8.70	0.47	0.28	0.238					1.00	0.30	0.47	0.239	0.14	0.034	6%
16	9.00	0.42	0.25	0.267					1.00	0.30	0.47	0.238	0.14	0.034	6%
17	9.30	0.46	0.28	0.179					1.00	0.30	0.42	0.267	0.13	0.034	6%
18	9.60	0.45	0.27	0.210					1.00	0.30	0.46	0.179	0.14	0.025	5%
19	9.90	0.43	0.26	0.142					1.00	0.30	0.45	0.210	0.14	0.028	5%
20	10.20	0.39	0.23	0.139					1.00	0.30	0.43	0.142	0.13	0.018	3%
LB	10.30	0.00	0.00						1.00	0.20	0.39	0.139	0.08	0.011	2%
									1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>0.543</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 30m DS of outlet

Meas. Start Time (MST):	9:05
Meas. End Time (MST):	9:33
Equipment:	ADV
Method:	Wading
River Condition:	Ice at edges
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -15 C



**Flow characteristics:**

Total Flow:	0.543	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.32	(m <sup>2</sup> )
Wetted Width:	5.90	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.231	
Water (°C):	0.7	
Datalogger Clock:	08:21	
Laptop Clock:	08:20	
Battery (Main):	12.9	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L4-03	0.688	100.815		100.127	100.127	3/4" Pipe 2m SE of Station
L4-01			0.828	99.987	100.000	3/4" Pipe 4m NW of Station
L4-02			0.752	100.063	100.055	3/4" Pipe 5m SE of Station
<b>Water Level:</b>						
Temporary BM	Cut	2.947	2.909	97.868	97.906	Time WL Surveyed: 8:30
<b>Turn</b>						
Temporary BM	2.884	100.790		97.906		
Water Level:	Cut		2.919	97.871		Time WL Surveyed: 8:36
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L4-01						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:
L4-01						

**WL Survey Summary**

	Before	After
Average WL:	97.870	-
Closing Error:	-0.002	-
WL Check:	0.003	-
Transducer Elevation	96.639	-

**Field Personnel:**

	CJ, MP	Trip Date:	3-Apr-14
Data Entry Personnel:	CJ	Date:	3-Apr-14
Data Check Personnel:	DW	Date:	9-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: \_\_\_\_\_

May 24, 2014

Site Visit Time (MST): \_\_\_\_\_

07:45



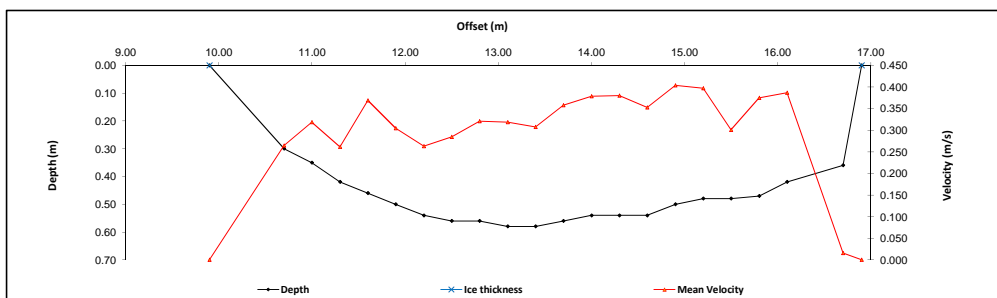
## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	9.90	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	10.70	0.30		0.18	0.265					1.00	0.55	0.30	0.265	0.17	0.044	4%
2	11.00	0.35		0.21	0.319					1.00	0.30	0.35	0.319	0.11	0.033	3%
3	11.30	0.42		0.25	0.262					1.00	0.30	0.42	0.262	0.13	0.033	3%
4	11.60	0.46		0.28	0.369					1.00	0.30	0.46	0.369	0.14	0.051	5%
5	11.90	0.50		0.30	0.305					1.00	0.30	0.50	0.305	0.15	0.046	5%
6	12.20	0.54		0.32	0.263					1.00	0.30	0.54	0.263	0.16	0.043	4%
7	12.50	0.56		0.34	0.285					1.00	0.30	0.56	0.285	0.17	0.048	5%
8	12.80	0.56		0.34	0.321					1.00	0.30	0.56	0.321	0.17	0.054	5%
9	13.10	0.58		0.35	0.319					1.00	0.30	0.58	0.319	0.17	0.056	6%
10	13.40	0.58		0.35	0.308					1.00	0.30	0.58	0.308	0.17	0.054	5%
11	13.70	0.56		0.34	0.358					1.00	0.30	0.56	0.358	0.17	0.060	6%
12	14.00	0.54		0.32	0.379					1.00	0.30	0.54	0.379	0.16	0.061	6%
13	14.30	0.54		0.32	0.380					1.00	0.30	0.54	0.380	0.16	0.062	6%
14	14.60	0.54		0.32	0.353					1.00	0.30	0.54	0.353	0.16	0.057	6%
15	14.90	0.50		0.30	0.404					1.00	0.30	0.50	0.404	0.15	0.061	6%
16	15.20	0.48		0.29	0.397					1.00	0.30	0.48	0.397	0.14	0.057	6%
17	15.50	0.48		0.29	0.301					1.00	0.30	0.48	0.301	0.14	0.043	4%
18	15.80	0.47		0.28	0.375					1.00	0.30	0.47	0.375	0.14	0.053	5%
19	16.10	0.42		0.25	0.387					1.00	0.45	0.42	0.387	0.19	0.073	7%
20	16.70	0.36		0.22	0.016					1.00	0.40	0.36	0.016	0.14	0.002	0%
LB	16.90	0.00	0.00		0.00		0.00			1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.990</b>	<b>100%</b>

### Flow Measurement Details:

**Metering Section Location (describe):**  
30m DS of outlet

Meas. Start Time (MST):	9:00
Meas. End Time (MST):	9:25
Equipment:	ADV
Method:	Wading
River Condition:	Fully open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 10 C



### Flow characteristics:

Total Flow:	0.990	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.10	(m <sup>2</sup> )
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.15	

### Logger Details:

	Before	After
Transducer Reading (m):	1.334	1.353
Water (°C):	4.8	4.7
Datalogger Clock:	07:53	09:57
Laptop Clock:	07:52	09:56
Battery (Main):	13.2	13.5
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

### General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L4-01	0.883	100.883		100.000	100.000	3/4" Pipe 4m NW of Station
L4-02			0.800	100.083	100.055	3/4" Pipe 5m SE of Station
<b>Water Level:</b>						
Cut		2.888		97.995	<b>Time WL Surveyed:</b> 8:29	
L4-03			0.741	100.142	100.127	3/4" Pipe 2m SE of Station
<b>Turn</b>						
L4-03	0.731	100.873		100.142	100.127	3/4" Pipe 2m SE of Station
<b>Water Level:</b>						
Cut		2.882		97.991	<b>Time WL Surveyed:</b> 8:32	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L4-1	0.902	100.902		100.000		
<b>Water Level:</b>						
Cut		2.904		97.998	<b>Time WL Surveyed:</b> 9:50	
L4-01			0.790	100.083	100.055	3/4" Pipe 5m SE of Station
L4-02			0.872	100.001	100.000	3/4" Pipe 4m NW of Station
<b>Water Level:</b>						
Cut		2.963		98.000	<b>Time WL Surveyed:</b> 9:53	
L4-1	0.963	100.963		100.000		

<b>WL Survey Summary</b>	Before	After
Average WL:	97.993	97.999
Closing Error:	-0.001	
WL Check:	0.004	-0.002
Transducer Elevation	96.659	96.646

<b>Field Personnel:</b>	GG, CJ	<b>Trip Date:</b>	24-May-14
<b>Data Entry Personnel:</b>	GG	<b>Date:</b>	24-May-14
<b>Data Check Personnel:</b>	CJ	<b>Date:</b>	4-Jun-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:

June 19, 2014

Site Visit Time (MST):

14:45



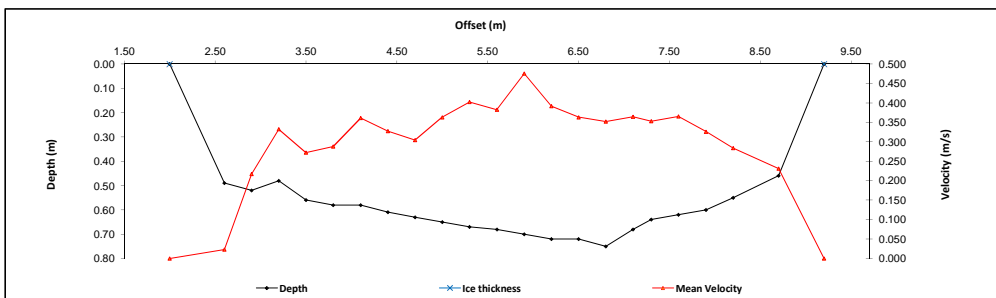
## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
LB	2.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	1.00	0.30	0.00	0.000	0.00	0.000		
1	2.60	0.49	0.29	0.023	0.217				1.00	0.45	0.49	0.023	0.22	0.005	0%	
2	2.90	0.52	0.31	0.217	0.332				1.00	0.30	0.52	0.217	0.16	0.034	3%	
3	3.20	0.48	0.29	0.332	0.272				1.00	0.30	0.48	0.332	0.14	0.048	4%	
4	3.50	0.56	0.34	0.272	0.288				1.00	0.30	0.56	0.272	0.17	0.046	4%	
5	3.80	0.58	0.35	0.288	0.361				1.00	0.30	0.58	0.288	0.17	0.050	4%	
6	4.10	0.58	0.35	0.361	0.327				1.00	0.30	0.58	0.361	0.17	0.063	5%	
7	4.40	0.61	0.37	0.327	0.304				1.00	0.30	0.61	0.327	0.18	0.060	5%	
8	4.70	0.63	0.38	0.304	0.363				1.00	0.30	0.63	0.304	0.19	0.057	4%	
9	5.00	0.65	0.39	0.363	0.402				1.00	0.30	0.65	0.363	0.20	0.071	5%	
10	5.30	0.67	0.40	0.402	0.382				1.00	0.30	0.67	0.402	0.20	0.081	6%	
11	5.60	0.68	0.41	0.382	0.475				1.00	0.30	0.68	0.382	0.20	0.078	6%	
12	5.90	0.70	0.42	0.475	0.391				1.00	0.30	0.70	0.475	0.21	0.100	8%	
13	6.20	0.72	0.43	0.391	0.43				1.00	0.30	0.72	0.391	0.22	0.084	7%	
14	6.50	0.72	0.43	0.43	0.363				1.00	0.30	0.72	0.363	0.22	0.078	6%	
15	6.80	0.75	0.45	0.352	0.352				1.00	0.30	0.75	0.352	0.22	0.079	6%	
16	7.10	0.68	0.41	0.364	0.353				1.00	0.25	0.68	0.364	0.17	0.062	5%	
17	7.30	0.64	0.38	0.353	0.365				1.00	0.25	0.64	0.353	0.16	0.056	4%	
18	7.60	0.62	0.37	0.365	0.326				1.00	0.30	0.62	0.365	0.19	0.068	5%	
19	7.90	0.60	0.36	0.326	0.284				1.00	0.30	0.60	0.326	0.18	0.059	5%	
20	8.20	0.55	0.33	0.284	0.231				1.00	0.40	0.55	0.284	0.22	0.062	5%	
21	8.70	0.46	0.28	0.231	0.000				1.00	0.50	0.46	0.231	0.23	0.053	4%	
RB	9.20	0.00	0.00	0.000	0.000	0.000	0.000	0.000	1.00	0.25	0.00	0.000	0.00	0.000		
<b>Total Flow</b>													<b>1.29</b>	<b>100%</b>		

## Flow Measurement Details:

**Metering Section Location (describe):**  
30m DS of outlet

Meas. Start Time (MST):	15:40
Meas. End Time (MST):	16:06
Equipment:	ADV
Method:	Wading
River Condition:	Moderate/high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Windy, overcast, 21 C



## Flow characteristics:

Total Flow:	1.29	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.02	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.56	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.14	

## Logger Details:

	Before	After
Transducer Reading (m):	1.455	1.454
Water (°C):	14.4	14.5
Datalogger Clock:	14:57	16:24
Laptop Clock:	14:57	16:24
Battery (Main):	13.9	13.8
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

- PT needs to be replaced on next trip

## General Notes:

- 2cm waves on the lake near the station
- Survey quality is fair
- Ladder and wood brought to stream.
- Left bank flooded to 10.8 m

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
L4-01	0.988	100.988		100.000	100.000	3/4" Pipe 4m NW of Station
L4-03			0.848	100.140	100.127	3/4" Pipe 2m SE of Station
L4-02			0.906	100.082	100.055	3/4" Pipe 5m SE of Station
Water Level:	Cut	0.329	3.212	98.105	Time WL Surveyed:	15:08
Temporary BM			3.218	97.770	0.000	
<b>Turn</b>						
Temporary BM	3.197	100.967		97.770		
Water Level:	Cut	0.326	3.192	98.101	Time WL Surveyed:	15:11
L4-02			0.885	100.082	100.055	3/4" Pipe 5m SE of Station
L4-03			0.826	100.141	100.127	3/4" Pipe 2m SE of Station
L4-01			0.967	100.000	100.000	3/4" Pipe 4m NW of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L4-01	0.967	100.967		100.000		
Water Level:	Cut	0.379	3.138	98.208	Time WL Surveyed:	16:20
Water Level:	Cut	0.379	3.123	98.208	Time WL Surveyed:	16:22
L4-01	0.952	100.952		100.000		

WL Survey Summary	Before	After
Average WL:	98.103	98.208
Closing Error:	0.000	-
WL Check:	0.004	0.000
Transducer Elevation	96.648	96.754

Field Personnel:	DW, MP	Trip Date:	19-Jun-14
Data Entry Personnel:	DW	Date:	19-Jun-14
Data Check Personnel:	DW	Date:	25-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:

August 13, 2014

Site Visit Time (MST):

08:00



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.10	0.00	0.00							1.00	0.20	0.00	0.000	0.00	0.000	
1	4.50	0.44		0.26	-0.012					1.00	0.30	0.44	-0.012	0.13	-0.002	0%
2	4.70	0.44		0.26	0.139					1.00	0.25	0.44	0.139	0.11	0.015	2%
3	5.00	0.43		0.26	0.219					1.00	0.30	0.43	0.219	0.13	0.028	4%
4	5.30	0.48		0.29	0.215					1.00	0.30	0.48	0.215	0.14	0.031	4%
5	5.60	0.50		0.30	0.221					1.00	0.30	0.50	0.221	0.15	0.033	5%
6	5.90	0.54		0.32	0.156					1.00	0.30	0.54	0.156	0.16	0.025	3%
7	6.20	0.54		0.32	0.242					1.00	0.30	0.54	0.242	0.16	0.039	5%
8	6.50	0.56		0.34	0.265					1.00	0.30	0.56	0.265	0.17	0.045	6%
9	6.80	0.58		0.35	0.185					1.00	0.30	0.58	0.185	0.17	0.032	4%
10	7.10	0.60		0.36	0.267					1.00	0.30	0.60	0.267	0.18	0.048	7%
11	7.40	0.60		0.36	0.278					1.00	0.30	0.60	0.278	0.18	0.050	7%
12	7.70	0.61		0.37	0.230					1.00	0.30	0.61	0.230	0.18	0.042	6%
13	8.00	0.66		0.40	0.226					1.00	0.30	0.66	0.226	0.20	0.045	6%
14	8.30	0.64		0.38	0.223					1.00	0.30	0.64	0.223	0.19	0.043	6%
15	8.60	0.64		0.38	0.221					1.00	0.30	0.64	0.221	0.19	0.042	6%
16	8.90	0.64		0.38	0.214					1.00	0.30	0.64	0.214	0.19	0.041	6%
17	9.20	0.61		0.37	0.208					1.00	0.30	0.61	0.208	0.18	0.038	5%
18	9.50	0.59		0.35	0.199					1.00	0.30	0.59	0.199	0.18	0.035	5%
19	9.80	0.55		0.33	0.164					1.00	0.30	0.55	0.164	0.16	0.027	4%
20	10.10	0.51		0.31	0.193					1.00	0.30	0.51	0.193	0.15	0.030	4%
21	10.40	0.44		0.26	0.181					1.00	0.30	0.44	0.181	0.13	0.024	3%
22	10.70	0.42		0.25	0.120					1.00	0.35	0.42	0.120	0.15	0.018	2%
LB	11.10	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.730</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
30m DS of outlet

Meas. Start Time (MST):	8:37
Meas. End Time (MST):	9:03
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 22 C

## Flow characteristics:

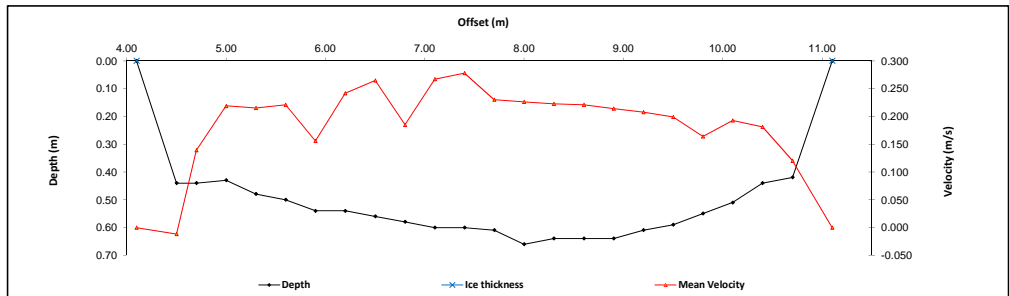
Total Flow:	0.730	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.61	(m <sup>2</sup> )
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.52	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.09	

## Logger Details:

	Before	After
Transducer Reading (m):	1.413	1.410
Water (°C):	20.0	20.3
Datalogger Clock:	08:07	09:30
Laptop Clock:	08:07	09:30
Battery (Main):	13.0	13.2
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L4-01	0.933	100.933		100.000	100.000	3/4" Pipe 4m NW of Station
L4-03			0.792	100.141	100.127	3/4" Pipe 2m SE of Station
L4-02			0.852	100.081	100.055	3/4" Pipe 5m SE of Station
<b>Water Level:</b>						
Temporary BM	Cut		2.874	98.059	Time WL Surveyed:	8:11
			3.116	97.817	0.000	
<b>Turn</b>						
Temporary BM	3.088	100.905		97.817		
Water Level:	Cut		2.845	98.060	Time WL Surveyed:	8:16
L4-02			0.823	100.082	100.055	3/4" Pipe 5m SE of Station
L4-03			0.765	100.140	100.127	3/4" Pipe 2m SE of Station
L4-01			0.905	100.000	100.000	3/4" Pipe 4m NW of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L4-01	0.905	100.905		100.000		
Water Level:	Cut		2.852	98.053	Time WL Surveyed:	9:21
Water Level:	Cut		2.870	98.057	Time WL Surveyed:	9:25
L4-01	0.927	100.927		100.000		

WL Survey Summary	Before	After
Average WL:	98.060	98.055
Closing Error:	0.000	-
WL Check:	0.001	-0.004
Transducer Elevation	96.647	96.645

Field Personnel:	CJ, GG	Trip Date:	13-Aug-14
Data Entry Personnel:	CJ	Date:	13-Aug-14
Data Check Personnel:	DW	Date:	27-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:  
Site Visit Time (MST):

September 15, 2014

09:45



## Flow Measurement:

Measured Data										Calculated Data					
Bank/ Mmt #	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	11.40	0.00													
1	10.20	0.28	0.17	0.005					1.00	0.60	0.00	0.000	0.00	0.000	2%
2	9.80	0.28	0.17	0.015					1.00	0.80	0.28	0.005	0.22	0.001	3%
3	9.40	0.30	0.18	0.023					1.00	0.40	0.28	0.015	0.11	0.002	4%
4	9.00	0.60	0.36	0.031					1.00	0.30	0.30	0.023	0.12	0.003	4%
5	8.80	0.48	0.29	0.032					1.00	0.30	0.60	0.031	0.18	0.006	9%
6	8.60	0.51	0.31	0.034					1.00	0.20	0.48	0.032	0.10	0.003	5%
7	8.20	0.53	0.32	0.028					1.00	0.30	0.51	0.034	0.15	0.005	8%
8	7.90	0.54	0.32	0.031					1.00	0.35	0.53	0.028	0.19	0.005	8%
9	7.60	0.54	0.32	0.028					1.00	0.30	0.54	0.031	0.16	0.005	8%
10	7.30	0.52	0.31	0.020					1.00	0.30	0.52	0.028	0.16	0.005	7%
11	7.00	0.50	0.30	0.022					1.00	0.30	0.50	0.020	0.16	0.003	5%
12	6.70	0.49	0.29	0.015					1.00	0.30	0.49	0.022	0.15	0.003	5%
13	6.40	0.48	0.29	0.021					1.00	0.30	0.48	0.015	0.15	0.002	4%
14	6.10	0.46	0.28	0.009					1.00	0.30	0.46	0.021	0.14	0.003	5%
15	5.80	0.45	0.27	0.014					1.00	0.30	0.45	0.009	0.14	0.001	2%
16	5.50	0.43	0.26	0.015					1.00	0.30	0.43	0.014	0.14	0.002	3%
17	5.20	0.44	0.26	0.010					1.00	0.30	0.44	0.015	0.13	0.002	3%
18	4.90	0.42	0.25	0.013					1.00	0.30	0.42	0.010	0.13	0.001	2%
19	4.60	0.42	0.25	0.021					1.00	0.30	0.42	0.013	0.13	0.002	3%
20	4.30	0.38	0.23	0.026					1.00	0.30	0.38	0.021	0.13	0.003	4%
21	4.00	0.35	0.21	0.021					1.00	0.30	0.35	0.026	0.11	0.003	5%
RB	3.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.20	0.00	0.000	0.00	0.000	4%
<b>Total Flow</b>													<b>0.062</b>	<b>100%</b>	

## Flow Measurement Details:

**Metering Section Location (describe):**  
25m from outlet of lake

Meas. Start Time (MST):	10:38
Meas. End Time (MST):	11:02
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 13 C

## Flow characteristics:

Total Flow:	0.062	(m <sup>3</sup> /s)
Parcelled Measurement Quality:	Excellent	
Cross Section Area:	3.01	(m <sup>2</sup> )
Wetted Width:	7.80	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

## Logger Details:

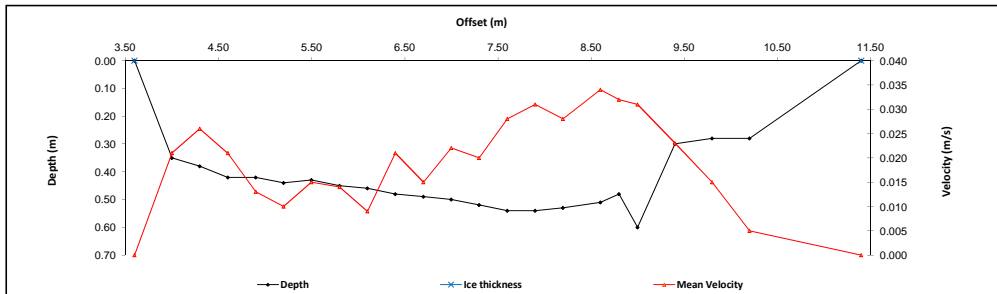
	Before	After
Transducer Reading (m):	1.310	0.735
Water (°C):	11.1	12.2
Datalogger Clock:	09:48	11:27
Laptop Clock:	09:48	11:26
Battery (Main):	13.1	13.5
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (if replaced):	298676	352306
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

- Changed PT between surveys

## General Notes:

- Left bank vegetation in outlet channel until offset 10.4m



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
L4-01	1.081	101.081		100.000	100.000	3/4" Pipe 4m NW of Station
L4-03			0.939	100.142	100.127	3/4" Pipe 2m SE of Station
L4-02			0.999	100.082	100.055	3/4" Pipe 5m SE of Station
Water Level:	Cut	0.281	3.396	97.966	Time WL Surveyed:	9:56
Temporary BM			3.396	97.685	0.000	-
Turn						
Temporary BM	3.384	101.069		97.685		-
Water Level:	Cut	0.281	3.384	97.966	Time WL Surveyed:	9:58
L4-02			0.987	100.082	100.055	3/4" Pipe 5m SE of Station
L4-03			0.927	100.142	100.127	3/4" Pipe 2m SE of Station
L4-01			1.069	100.000	100.000	3/4" Pipe 4m NW of Station
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
L4-01	1.067	101.067		100.000		
Water Level:	Cut	0.137	3.238	97.966	Time WL Surveyed:	11:30
Water Level:	Cut	1.038	3.222	97.965	Time WL Surveyed:	11:32
L4-01	1.049	101.049		100.000		

WL Survey Summary	Before	After
Average WL:	97.966	97.966
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	96.656	97.231

Field Personnel:	TR, MP	Trip Date:	15-Sep-14
Data Entry Personnel:	TR	Date:	15-Sep-14
Data Check Personnel:	DW	Date:	27-Oct-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake  
 UTM Location (Station): 402886 E, 6370260 N

Site Visit Date: October 17, 2014  
 Site Visit Time (MST): 07:55



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB	2.70	0.00														
1	3.00	0.38	0.23	-0.001					1.00	0.15	0.00	0.000	0.00	0.000		
2	3.30	0.24	0.14	0.082					1.00	0.30	0.38	-0.001	0.11	0.000	0%	
3	3.60	0.36	0.22	0.027					1.00	0.30	0.24	0.082	0.07	0.006	5%	
4	3.90	0.40	0.24	0.062					1.00	0.30	0.36	0.027	0.11	0.003	3%	
5	4.20	0.46	0.28	0.100					1.00	0.23	0.40	0.062	0.12	0.007	7%	
6	4.35	0.42	0.25	0.010					1.00	0.15	0.46	0.100	0.10	0.010	9%	
7	4.50	0.46	0.28	0.068					1.00	0.23	0.42	0.010	0.06	0.001	1%	
8	4.80	0.46	0.28	0.030					1.00	0.30	0.46	0.068	0.10	0.007	6%	
9	5.10	0.46	0.28	0.054					1.00	0.30	0.46	0.030	0.14	0.004	4%	
10	5.40	0.48	0.29	-0.003					1.00	0.30	0.48	0.054	0.14	0.007	7%	
11	5.70	0.50	0.30	0.069					1.00	0.30	0.48	-0.003	0.14	0.000	0%	
12	6.00	0.50	0.30	0.024					1.00	0.30	0.50	0.069	0.15	0.010	9%	
13	6.30	0.53	0.32	0.064					1.00	0.30	0.50	0.024	0.15	0.004	3%	
14	6.45	0.53	0.32	0.027					1.00	0.23	0.53	0.064	0.12	0.008	7%	
15	6.60	0.52	0.31	0.015					1.00	0.15	0.53	0.027	0.08	0.002	2%	
16	6.90	0.53	0.32	0.031					1.00	0.23	0.52	0.015	0.12	0.002	2%	
17	7.20	0.52	0.31	0.026					1.00	0.30	0.53	0.031	0.16	0.005	4%	
18	7.50	0.51	0.31	0.036					1.00	0.30	0.52	0.026	0.16	0.004	4%	
19	7.80	0.50	0.30	0.018					1.00	0.30	0.51	0.036	0.15	0.006	5%	
20	8.10	0.44	0.26	0.054					1.00	0.30	0.50	0.018	0.15	0.003	2%	
21	8.40	0.36	0.22	0.050					1.00	0.30	0.44	0.054	0.13	0.007	6%	
22	8.70	0.34	0.20	0.037					1.00	0.30	0.36	0.050	0.11	0.005	5%	
23	8.90	0.34	0.20	0.030					1.00	0.25	0.34	0.037	0.09	0.003	3%	
LB	10.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.95	0.30	0.030	0.32	0.010	9%	
									1.00	0.85	0.00	0.000	0.00	0.000		
<b>Total Flow</b>													<b>0.113</b>	<b>100%</b>		

## Flow Measurement Details:

Metering Section Location (describe):  
30m DS of outlet

Meas. Start Time (MST):	8:35
Meas. End Time (MST):	9:18
Equipment:	ADV
Method:	Wading
River Condition:	Open, low velocity
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Overcast, 4 C

## Flow characteristics:

Total Flow:	0.113	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	2.99	(m <sup>2</sup> )
Wetted Width:	7.90	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

## Logger Details:

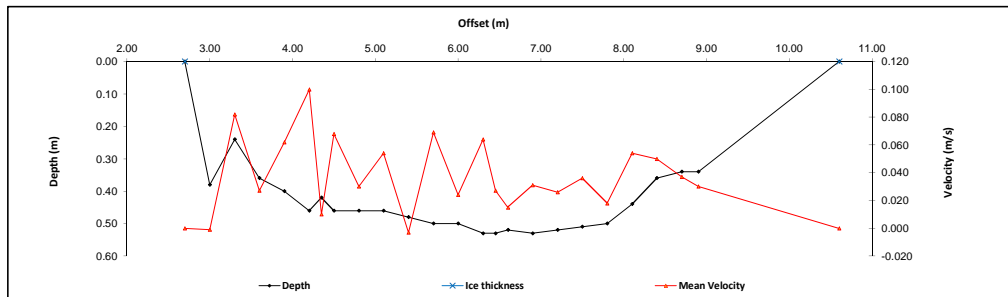
	Before	After
Transducer Reading (m):	0.714	0.719
Water (°C):	6.0	6.1
Datalogger Clock:	07:59	09:40
Laptop Clock:	07:58	09:39
Battery (Main):	12.7	13.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

- 5cm waves observed at flow mmt location  
 - Ladder set up for winter Q mmt's  
 - flow mmt graded as poor quality due to waves from lake affecting the direction of flow in the outlet channel - effect observed well downstream of the outlet

## General Notes:

- 5cm waves observed at flow mmt location  
 - Ladder set up for winter Q mmt's  
 - flow mmt graded as poor quality due to waves from lake affecting the direction of flow in the outlet channel - effect observed well downstream of the outlet



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L4-01	0.929	100.929		100.000	100.000	3/4" Pipe 4m NW of Station
L4-03			0.787	100.142	100.127	3/4" Pipe 2m SE of Station
L4-02			0.848	100.081	100.055	3/4" Pipe 5m SE of Station
<b>Water Level:</b>						
	Cut	0.124	3.100	97.953	Time WL Surveyed:	8:04
Temporary BM			2.887	98.042	0.000	
<b>Turn</b>						
Temporary BM	2.852	100.894		98.042		
<b>Water Level:</b>						
	Cut	0.132	3.076	97.950	Time WL Surveyed:	8:06
L4-02			0.817	100.077	100.055	3/4" Pipe 5m SE of Station
L4-03			0.757	100.137	100.127	3/4" Pipe 2m SE of Station
L4-01			0.898	99.996	100.000	3/4" Pipe 4m NW of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L4-01	0.898	100.896		99.998		
<b>Water Level:</b>						
	Cut	0.131	3.078	97.949	Time WL Surveyed:	9:45
	Cut	0.131	3.067	97.945	Time WL Surveyed:	9:45
L4-01	0.883	100.881		99.998		

## WL Survey Summary

	Before	After
Average WL:	97.951	97.947
Closing Error:	0.004	-
WL Check:	0.003	0.004
Transducer Elevation	97.237	97.228

## Field Personnel:

	DW, MP	Trip Date:	17-Oct-14
Data Entry Personnel:	DW, MP	Date:	17-Oct-14
Data Check Personnel:	DW	Date:	27-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: L4/S52 Namur Lake

UTM Location (Station): 402886 E, 6370260 N

Site Visit Date:  
Site Visit Time (MST):

December 5, 2014

11:40



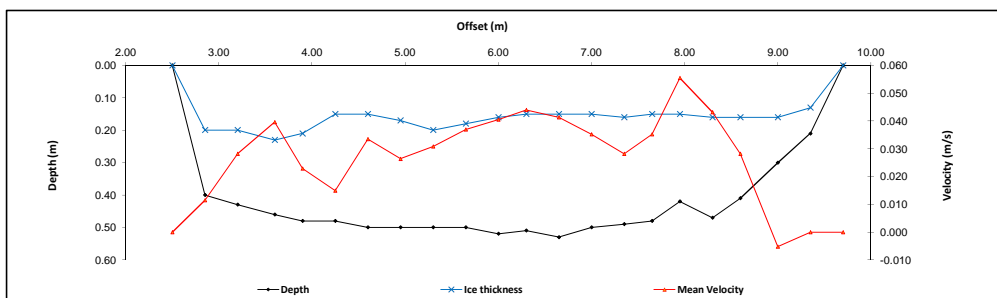
## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB	2.50	0.00														
1	2.85	0.40	0.20	0.30	0.013		0.000		0.88	0.18	0.00	0.000	0.00	0.000		
2	3.20	0.43	0.20	0.32	0.032				0.88	0.35	0.20	0.011	0.07	0.001	1%	
3	3.60	0.48	0.23	0.35	0.045				0.88	0.35	0.23	0.028	0.09	0.002	4%	
4	3.90	0.48	0.21	0.35	0.026				0.88	0.33	0.27	0.023	0.09	0.002	5%	
5	4.25	0.48	0.15	0.32	0.017				0.88	0.35	0.33	0.015	0.12	0.002	3%	
6	4.60	0.50	0.15	0.33	0.038				0.88	0.35	0.35	0.033	0.12	0.004	7%	
7	4.95	0.50	0.17	0.34	0.030				0.88	0.35	0.33	0.026	0.12	0.003	5%	
8	5.30	0.50	0.20	0.35	0.035				0.88	0.35	0.30	0.031	0.11	0.003	5%	
9	5.65	0.50	0.18	0.34	0.042				0.88	0.35	0.32	0.037	0.11	0.004	7%	
10	6.00	0.52	0.16	0.34	0.046				0.88	0.33	0.36	0.040	0.12	0.005	8%	
11	6.30	0.51	0.15	0.33	0.050				0.88	0.32	0.36	0.044	0.12	0.005	8%	
12	6.65	0.53	0.15	0.34	0.047				0.88	0.35	0.38	0.041	0.13	0.006	9%	
13	7.00	0.50	0.15	0.33	0.040				0.88	0.35	0.35	0.035	0.12	0.004	7%	
14	7.35	0.49	0.16	0.33	0.032				0.88	0.33	0.33	0.028	0.11	0.003	5%	
15	7.65	0.48	0.15	0.32	0.040				0.88	0.30	0.33	0.035	0.10	0.003	6%	
16	7.95	0.42	0.15	0.29	0.063				0.88	0.32	0.27	0.055	0.09	0.005	8%	
17	8.30	0.47	0.16	0.32	0.049				0.88	0.32	0.31	0.043	0.10	0.004	7%	
18	8.60	0.41	0.16	0.29	0.032				0.88	0.35	0.25	0.028	0.09	0.002	4%	
19	9.00	0.30	0.16	0.23	-0.006				0.88	0.38	0.14	-0.005	0.05	0.000	0%	
20	9.35	0.21	0.13	0.17	0.000				0.88	0.35	0.08	0.000	0.03	0.000	0%	
LB	9.70	0.00	0.00			0.00		0.00	0.88	0.18	0.00	0.000	0.00	0.000		
<b>Total Flow</b>													<b>0.062</b>	<b>100%</b>		

## Flow Measurement Details:

Metering Section Location (describe):  
35m DS of outlet

Meas. Start Time (MST):	12:20
Meas. End Time (MST):	12:50
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, calm, -10 C



## Flow characteristics:

Total Flow:	0.062	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.95	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.02	

## Logger Details:

	Before	After
Transducer Reading (m):	0.700	0.715
Water (°C):	1.1	1.1
Datalogger Clock:	11:45	13:01
Laptop Clock:	11:44	13:00
Battery (Main):	13.4	12.8
Battery:	-	Replaced
Battery Serial #:	-	10303011, 1305005
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
L4-01	1.023	101.023		100.000	100.000	3/4" Pipe 4m NW of Station
L4-03			0.883	100.140	100.127	3/4" Pipe 2m SE of Station
L4-02			0.943	100.080	100.055	3/4" Pipe 5m SE of Station
<b>Water Level:</b>						
Cut		3.100		97.923		<b>Time WL Surveyed:</b> 11:51
L4-02			0.943	100.080	100.055	3/4" Pipe 5m SE of Station
<b>Turn</b>						
L4-02	0.976	101.056		100.080	100.055	3/4" Pipe 5m SE of Station
<b>Water Level:</b>						
Cut			3.137	97.919		<b>Time WL Surveyed:</b> 11:54
L4-02			0.976	100.080	100.055	3/4" Pipe 5m SE of Station
L4-03			0.916	100.140	100.127	3/4" Pipe 2m SE of Station
L4-01			1.057	99.999	100.000	3/4" Pipe 4m NW of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
L4-01	1.023	101.023		100.000		
<b>Water Level:</b>						
Cut			3.091	97.932		<b>Time WL Surveyed:</b> 12:57
<b>Water Level:</b>						
Cut			3.065	97.932		<b>Time WL Surveyed:</b> 12:58
L4-01	0.997	100.997		100.000		

WL Survey Summary	Before	After
Average WL:	97.921	97.932
Closing Error:	0.001	
WL Check:	0.004	0.000
Transducer Elevation	97.221	97.217

Field Personnel:	TR, CJ	Trip Date:	5-Dec-14
Data Entry Personnel:	TR	Date:	5-Dec-14
Data Check Personnel:	DW	Date:	17-Dec-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: January 7, 2014  
 Site Visit Time (MST): 11:50



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.90	0.00	0.00		0.000		0.000		0.000	0.88	0.18	0.00	0.000	0.00	0.000	
1	3.25	0.32	0.10	0.21	0.001					0.88	0.43	0.22	0.001	0.09	0.000	0%
2	3.75	0.42	0.16	0.29	0.015					0.88	0.50	0.26	0.013	0.13	0.002	8%
3	4.25	0.49	0.23	0.36	0.022					0.88	0.45	0.26	0.019	0.12	0.002	8%
4	4.65	0.52	0.29	0.41	0.025					0.88	0.43	0.23	0.022	0.10	0.002	8%
5	5.10	0.59	0.31	0.45	-0.004					0.88	0.45	0.28	-0.004	0.13	0.000	-2%
6	5.55	0.62	0.33	0.48	0.008					0.88	0.43	0.29	0.007	0.12	0.001	3%
7	5.95	0.55	0.34	0.45	0.037					0.88	0.38	0.21	0.033	0.08	0.003	9%
8	6.30	0.63	0.33	0.48	0.033					0.88	0.35	0.30	0.029	0.11	0.003	11%
9	6.65	0.62	0.32	0.47	0.030					0.88	0.33	0.30	0.026	0.10	0.003	9%
10	6.95	0.61	0.44	0.53	0.045					0.88	0.20	0.17	0.040	0.03	0.001	5%
11	7.05	0.58	0.32	0.45	0.051					0.88	0.28	0.26	0.045	0.07	0.003	11%
12	7.50	0.51	0.33	0.42	0.041					0.88	0.45	0.18	0.036	0.08	0.003	10%
13	7.95	0.48	0.29	0.39	0.002					0.88	0.38	0.19	0.002	0.07	0.000	0%
14	8.25	0.22	0.16	0.19	-0.001					0.88	0.33	0.06	-0.001	0.02	0.000	0%
15	8.60	0.49	0.16	0.33	0.002					0.88	0.35	0.33	0.002	0.12	0.000	1%
16	8.95	0.43	0.14	0.29	0.001					0.88	0.33	0.29	0.001	0.09	0.000	0%
17	9.25	0.35	0.15	0.25	0.002					0.88	0.38	0.20	0.002	0.08	0.000	0%
18	9.70	0.38	0.13	0.26	0.008					0.88	0.38	0.25	0.007	0.09	0.001	2%
19	10.00	0.39	0.06	0.23	0.000					0.88	0.23	0.33	0.000	0.07	0.000	0%
20	10.15	0.39	0.06	0.23	0.046					0.88	0.35	0.33	0.040	0.12	0.005	17%
21	10.70	0.20	0.10	0.15	0.000					0.88	0.50	0.10	0.000	0.05	0.000	0%
22	11.15	0.28	0.10	0.19	0.001					0.88	0.35	0.18	0.001	0.06	0.000	0%
LB	11.40	0.00	0.00		0.00		0.00			0.88	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.028</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): -10m DS of bridge

Meas. Start Time (MST):	12:50
Meas. End Time (MST):	13:39
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, -25 C

**Flow characteristics:**

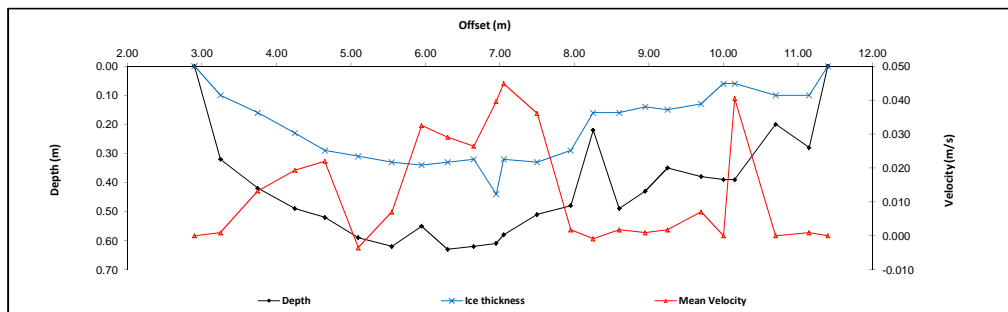
Total Flow:	0.028	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	1.93	(m <sup>2</sup> )
Wetted Width:	8.50	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.518	0.518
Water (°C):	0.0	0.0
Datalogger Clock:	11:58	13:52
Laptop Clock:	11:58	13:52
Battery:	14.1	13.9
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S02-06	2.255	300.654		298.399	298.399	3/4" Pipe 20m ESE of logger
S02-07			2.223	298.431	298.432	3/4" Pipe 15m SSE of logger
S02-05			3.004	297.650	297.648	3/4" Pipe 5m South of logger
Temporary BM			3.845	296.809	0.000	-
Water Level:	Cut		3.940	296.714	Time WL Surveyed:	12:36
Temporary BM			3.845	296.809	0.000	-
<b>Turn</b>						
Temporary BM	3.830	300.639		296.809	-	-
Water Level:	Cut		3.926	296.713	Time WL Surveyed:	12:40
Temporary BM			3.830	296.809	-	-
S02-05			2.989	297.650	297.648	3/4" Pipe 5m South of logger
S02-07			2.209	298.430	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.240	298.399	298.399	3/4" Pipe 20m ESE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S02-05	2.990	300.640		297.650	-	-
Water Level:	Cut		3.927	296.713	Time WL Surveyed:	13:44
Water Level:	Cut		3.915	296.711	Time WL Surveyed:	13:49
S02-05	2.976	300.626		297.650	-	-

**WL Survey Summary**

	Before	After
Average WL:	296.714	296.712
Closing Error:	0.000	-
WL Check:	0.001	0.002
Transducer Elevation	296.196	296.194

**Field Personnel:**

	SM, TR	Trip Date:	7-Jan-14
Data Entry Personnel:	SM, TR	Date:	7-Jan-14
Data Check Personnel:	CJ	Date:	4-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: January 30, 2014  
 Site Visit Time (MST): 10:25



Flow Measurement: Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.90	0.00	0.00		0.000		0.000		0.000	0.88	0.35	0.00	0.000	0.00	0.000	
1	3.60	0.40	0.16	0.28	-0.001					0.88	0.60	0.24	-0.001	0.14	0.000	0%
2	4.10	0.58	0.16	0.37	0.019					0.88	0.45	0.42	0.017	0.19	0.003	11%
3	4.50	0.50	0.31	0.41	0.030					0.88	0.28	0.19	0.026	0.05	0.001	5%
4	4.65	0.63	0.44	0.54	0.033					0.88	0.35	0.19	0.029	0.07	0.002	7%
5	5.20	0.64	0.39	0.52	0.040					0.88	0.30	0.25	0.035	0.07	0.003	9%
6	5.25	0.68	0.41	0.55	0.029					0.88	0.20	0.27	0.026	0.05	0.001	5%
7	5.60	0.78	0.41	0.60	0.004					0.88	0.35	0.37	0.004	0.13	0.000	2%
8	5.95	0.71	0.40	0.56	0.015					0.88	0.35	0.31	0.013	0.11	0.001	5%
9	6.30	0.69	0.39	0.54	0.000					0.88	0.23	0.30	0.000	0.07	0.000	0%
10	6.40	0.69	0.40	0.55	0.001					0.88	0.10	0.29	0.001	0.03	0.000	0%
11	6.50	0.65	0.37	0.51	0.018					0.88	0.13	0.28	0.016	0.04	0.001	2%
12	6.65	0.72	0.40	0.56	0.002					0.88	0.15	0.32	0.002	0.05	0.000	0%
13	6.80	0.69	0.36	0.53	0.002					0.88	0.20	0.33	0.002	0.07	0.000	0%
14	7.05	0.73	0.36	0.55	0.002					0.88	0.27	0.37	0.002	0.10	0.000	1%
15	7.35	0.62	0.35	0.49	0.002					0.88	0.23	0.27	0.002	0.06	0.000	0%
16	7.50	0.75	0.36	0.56	-0.001					0.88	0.15	0.39	-0.001	0.06	0.000	0%
17	7.65	0.58	0.35	0.47	0.001					0.88	0.23	0.23	0.001	0.05	0.000	0%
18	7.95	0.72	0.35	0.54	0.035					0.88	0.23	0.37	0.031	0.08	0.003	9%
19	8.10	0.56	0.34	0.45	0.054					0.88	0.28	0.22	0.048	0.06	0.003	10%
20	8.50	0.59	0.31	0.45	0.030					0.88	0.40	0.28	0.026	0.11	0.003	11%
21	8.90	0.52	0.27	0.40	0.058					0.88	0.30	0.25	0.051	0.08	0.004	14%
22	9.10	0.59	0.25	0.42	0.015					0.88	0.18	0.34	0.013	0.06	0.001	3%
23	9.25	0.58	0.22	0.40	0.007					0.88	0.15	0.36	0.006	0.05	0.000	1%
24	9.40	0.52	0.22	0.37	0.006					0.88	0.18	0.30	0.004	0.05	0.000	1%
25	9.60	0.50	0.17	0.34	0.005					0.88	0.25	0.33	0.004	0.08	0.000	1%
26	9.90	0.32	0.10	0.21	0.007					0.88	0.35	0.22	0.006	0.08	0.000	2%
27	10.30	0.48	0.15	0.32	0.002					0.88	0.38	0.33	0.002	0.12	0.000	1%
28	10.65	0.31	0.14	0.23	0.001					0.88	0.50	0.17	0.001	0.09	0.000	0%
RB	11.30	0.00	0.00		0.00		0.00		0.00	0.88	0.33	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.028</b>	<b>100%</b>	

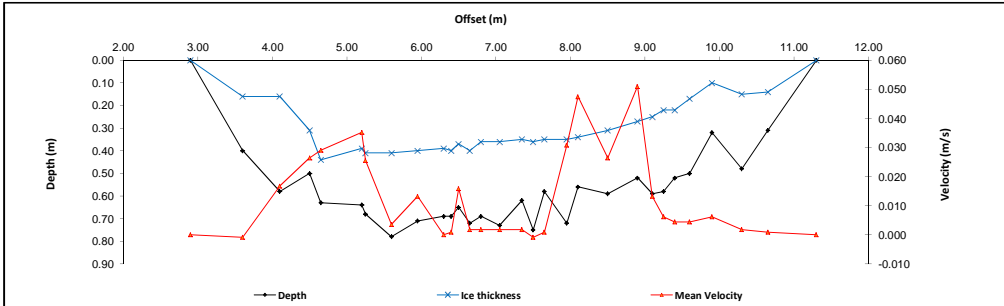
**Flow Measurement Details:**

Metering Section Location (describe):  
8m DS of Bridge

Meas. Start Time (MST):	11:15
Meas. End Time (MST):	12:00
Equipment:	ADC
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, -25 C

**Flow characteristics:**

Total Flow:	0.028	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	2.20	(m <sup>2</sup> )
Wetted Width:	8.40	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S02-07	2.284	300.716		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.316	298.400	298.399	3/4" Pipe 20m ESE of logger
S02-05			3.064	297.652	297.648	3/4" Pipe 5m South of logger
Water Level:	Cut		3.999	296.717	296.717	Time WL Surveyed: 10:54
Temporary BM			3.931	296.785	296.785	
<b>Turn</b>						
Temporary BM	3.889	300.674		296.785	296.785	
Water Level:	Cut		3.958	296.716	296.716	Time WL Surveyed: 10:58
S02-05			3.025	297.649	297.648	3/4" Pipe 5m South of logger
S02-06			2.279	298.395	298.399	3/4" Pipe 20m ESE of logger
S02-07			2.246	298.428	298.432	3/4" Pipe 15m SSE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S02-05	3.026	300.677		297.651	297.651	
Water Level:	Cut		3.968	296.709	296.709	Time WL Surveyed: 12:07
Water Level:	Cut		3.940	296.708	296.708	Time WL Surveyed: 12:10
S02-05	2.997	300.648		297.651	297.651	

**WL Survey Summary**

	Before	After
Average WL:	296.717	296.709
Closing Error:	0.004	-
WL Check:	0.001	0.001
Transducer Elevation	296.205	296.198

**Field Personnel:**

Field Personnel:	TR, RM	Trip Date:	30-Jan-14
Data Entry Personnel:	TR	Date:	30-Jan-14
Data Check Personnel:	CJ	Date:	4-Apr-14
Entered Digitally in the Field:	Yes		

**General Notes:**

-slush present under the ice, which may be affecting the flow measurement

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: March 18, 2014  
 Site Visit Time (MST): 09:20

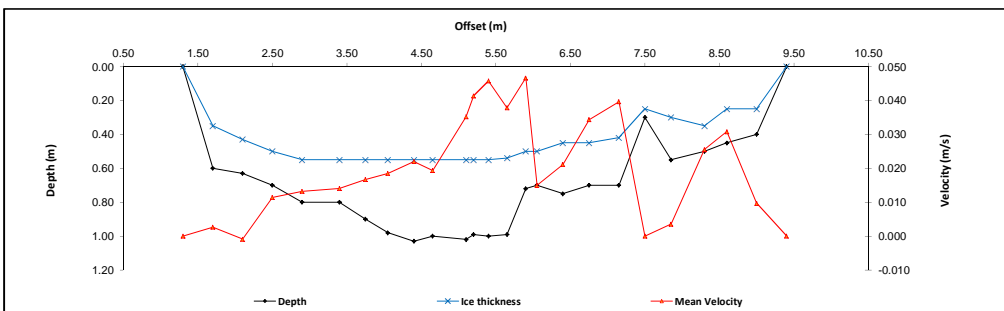


Flow Measurement:										Measured Data					Calculated Data				
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)			
LB	1.30	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000				
1	1.70	0.60	0.35	0.48	0.003					0.88	0.40	0.25	0.003	0.10	0.000	1%			
2	2.10	0.63	0.43	0.53	-0.001					0.88	0.40	0.20	-0.001	0.08	0.000	0%			
3	2.50	0.70	0.50	0.60	0.013					0.88	0.40	0.20	0.011	0.08	0.001	2%			
4	2.90	0.80	0.55	0.68	0.015					0.88	0.45	0.25	0.013	0.11	0.001	3%			
5	3.40	0.80	0.55	0.68	0.016					0.88	0.43	0.25	0.014	0.11	0.001	3%			
6	3.75	0.90	0.55	0.73	0.019					0.88	0.33	0.35	0.017	0.11	0.002	4%			
7	4.05	0.98	0.55	0.77	0.021					0.88	0.33	0.43	0.018	0.14	0.003	5%			
8	4.40	1.03	0.55	0.79	0.025					0.88	0.30	0.48	0.022	0.14	0.003	7%			
9	4.65	1.00	0.55	0.78	0.022					0.88	0.35	0.45	0.019	0.16	0.003	6%			
10	5.10	1.02	0.55	0.79	0.040					0.88	0.28	0.47	0.035	0.13	0.005	9%			
11	5.20	0.99	0.55	0.77	0.047					0.88	0.15	0.44	0.041	0.07	0.003	6%			
12	5.40	1.00	0.55	0.78	0.052					0.88	0.23	0.45	0.046	0.10	0.005	10%			
13	5.65	0.99	0.54	0.77	0.043					0.88	0.25	0.45	0.038	0.11	0.004	9%			
14	5.90	0.72	0.50	0.61	0.053					0.88	0.20	0.22	0.047	0.04	0.002	4%			
15	6.05	0.70	0.50	0.60	0.017					0.88	0.25	0.20	0.015	0.05	0.001	2%			
16	6.40	0.75	0.45	0.60	0.024					0.88	0.35	0.30	0.021	0.11	0.002	5%			
17	6.75	0.70	0.45	0.58	0.039					0.88	0.38	0.25	0.034	0.09	0.003	7%			
18	7.15	0.70	0.42	0.56	0.045					0.88	0.38	0.28	0.040	0.11	0.004	9%			
19	7.50	0.30	0.25	0.28	0.000					0.88	0.35	0.05	0.000	0.02	0.000	0%			
20	7.85	0.55	0.30	0.43	0.004					0.88	0.40	0.25	0.004	0.10	0.000	1%			
21	8.30	0.50	0.35	0.43	0.029					0.88	0.38	0.15	0.026	0.06	0.001	3%			
22	8.60	0.45	0.25	0.35	0.035					0.88	0.35	0.20	0.031	0.07	0.002	5%			
23	9.00	0.40	0.25	0.33	0.011					0.88	0.40	0.15	0.010	0.06	0.001	1%			
RB	9.40	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000				
<b>Total Flow</b>														<b>0.048</b>	<b>100%</b>				

**Flow Measurement Details:**

Measuring Section Location (describe):  
5m DS of bridge

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:18
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze



**Flow characteristics:**

Total Flow:	0.048	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.14	(m <sup>2</sup> )
Wetted Width:	8.10	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.512	-
Water (°C):	0.0	-
Datalogger Clock:	09:31	-
Laptop Clock:	9:31	-
Battery:	14.8	-
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Good
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Slush under the ice along LB, clear after fourth hole

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S02-07	2.197	300.629		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.222	298.407	298.399	3/4" Pipe 20m ESE of logger
S02-05			2.979	297.650	297.648	3/4" Pipe 5m South of logger
Water Level:	Cut		3.934	296.695		Time WL Surveyed: 10:21
Temporary BM			3.914	296.715	0.000	
<b>Turn</b>						
Temporary BM	3.900	300.615		296.715		
Water Level:	Cut		3.920	296.695		Time WL Surveyed: 10:24
S02-05			2.964	297.651	297.648	3/4" Pipe 5m South of logger
S02-06			2.206	298.409	298.399	3/4" Pipe 20m ESE of logger
S02-07			2.182	298.433	298.432	3/4" Pipe 15m SSE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	296.695	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	296.183	-

**Field Personnel:**

	SM, TR	Trip Date:	18-Mar-14
Data Entry Personnel:	SM	Date:	18-Mar-14
Data Check Personnel:	CJ	Date:	4-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: April 15, 2014  
 Site Visit Time (MST): 12:05



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Flow Measurement Conducted																
															<b>Total Flow</b>	-

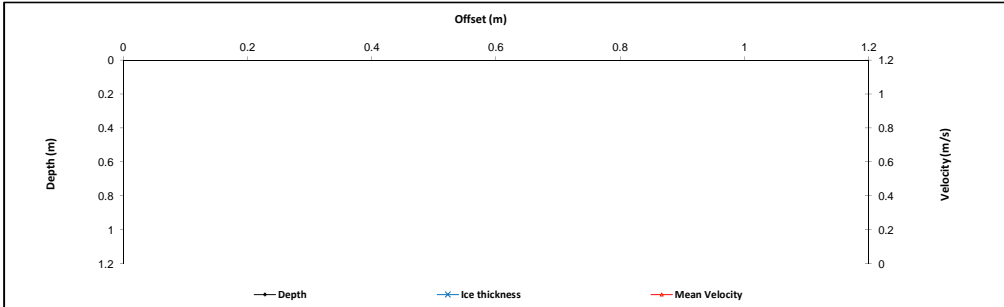
**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	



**Logger Details:**

	Before	After
Transducer Reading (m):	0.597	-
Water (°C):	0.0	-
Datalogger Clock:	12:07	-
Laptop Clock:	12:07	-
Battery:	14.0	-
Battery Condition:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- ice conditions poor, open lead in centre of channel, no discharge measurement attempted due to safety concerns

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S02-06	2.259	300.658		298.399	298.399	3/4" Pipe 20m ESE of logger
S02-07			2.236	298.422	298.432	3/4" Pipe 15m SSE of logger
S02-05			3.018	297.640	297.648	3/4" Pipe 5m South of logger
Water Level:	Cut		3.887	296.771	<b>Time WL Surveyed:</b> 12:21	
Temporary BM			3.933	296.725	0.000	-
<b>Turn</b>						
Temporary BM	3.902	300.627		296.725		-
Water Level:	Cut		3.856	296.771	<b>Time WL Surveyed:</b> 12:24	
S02-05			2.987	297.640	297.648	3/4" Pipe 5m South of logger
S02-07			2.203	298.424	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.227	298.400	298.399	3/4" Pipe 20m ESE of logger

**Secondary Water Level Survey (pick any BM e.g. closest to water's edge)**

Water Level:	Cut			<b>Time WL Surveyed:</b>	
Water Level:	Cut			<b>Time WL Surveyed:</b>	

**WL Survey Summary**

	Before	After
Average WL:	296.771	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	296.174	-

**Field Personnel:**

	TR, RM	Trip Date:	15-Apr-14
Data Entry Personnel:	TR	Date:	15-Apr-14
Data Check Personnel:	CJ	Date:	24-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road

UTM Location: 474961 E, 6344087 N

Site Visit Date: May 12, 2014

Site Visit Time (MST): 12:00



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): -5m DS of bridge	
Meas. Start Time (MST):	12:45
Meas. End Time (MST):	14:45
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 12 C

<b>Flow characteristics:</b>		
Total Flow:	1.64	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.70	(m <sup>2</sup> )
Wetted Width:	8.56	(m)
Hydraulic Depth:	0.90	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.07	

<b>Logger Details:</b>		
Transducer Reading (m):	Before	After
	0.771	0.775
Water (°C):	5.1	6.0
Datalogger Clock:	12:25	14:01
Laptop Clock:	12:25	14:01
Battery (Main):	12.9	12.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Flow measurement completed using ADCP

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	-	
Serial Number:	1802		Salinity (ppt):	-		RB:	-	
Firmware Version:	3.50		Magnetic Declination (°):	14.33				
Software Version:	3.70		Measured Temperature (°C):	-				
			ADCP Temperature (°C):					
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	8.79	7.71	0.205	1.583	-3.62%
Coordinate System:	ENU		3	9.15	8.36	0.217	1.813	10.38%
Left Method:	Sloped Bank		4	8.27	7.31	0.204	1.488	-9.41%
Right Method:	Sloped Bank		5	8.05	7.41	0.228	1.686	2.65%
Top Fit Type:	Power Fit							
Bottom Fit Type:	Power Fit		<b>Mean:</b>	8.56	7.70	0.214	<b>1.64</b>	
			<b>SD:</b>	0.43	0.41	0.010	0.121	
			<b>COV:</b>	0.05	0.05	0.046	0.074	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S02-07	1.926	300.358		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			1.949	298.409	298.399	3/4" Pipe 20m ESE of logger
S02-05			2.698	297.660	297.648	3/4" Pipe 5m South of logger
Water Level:	Cut		3.582	296.776		<b>Time WL Surveyed:</b> 12:34
Temporary BM			3.582	296.776	0.000	-
<b>Turn</b>						
Temporary BM	3.565	300.341		296.776		-
Water Level:	Cut		3.565	296.776		<b>Time WL Surveyed:</b> 12:36
S02-05			2.678	297.663	297.648	3/4" Pipe 5m South of logger
S02-06			1.928	298.413	298.399	3/4" Pipe 20m ESE of logger
S02-07			1.905	298.436	298.432	3/4" Pipe 15m SSE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S02-05	2.675	300.335		297.660		
Water Level:	Cut		3.536	296.799		<b>Time WL Surveyed:</b> 14:07
Water Level:	Cut		3.515	296.802		<b>Time WL Surveyed:</b> 14:09
S02-05	2.657	300.317		297.660		

<b>WL Survey Summary</b>	Before	After
Average WL:	296.776	296.801
Closing Error:	-0.004	-
WL Check:	0.000	-0.003
Transducer Elevation	296.005	296.026

<b>Field Personnel:</b>	TR, MP	Trip Date:	12-May-14
Data Entry Personnel:	TR	Date:	12-May-14
Data Check Personnel:	CJ	Date:	17-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: June 25, 2014  
 Site Visit Time (MST): 11:00



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Flow Measurement Conducted																
															<b>Total Flow</b>	-

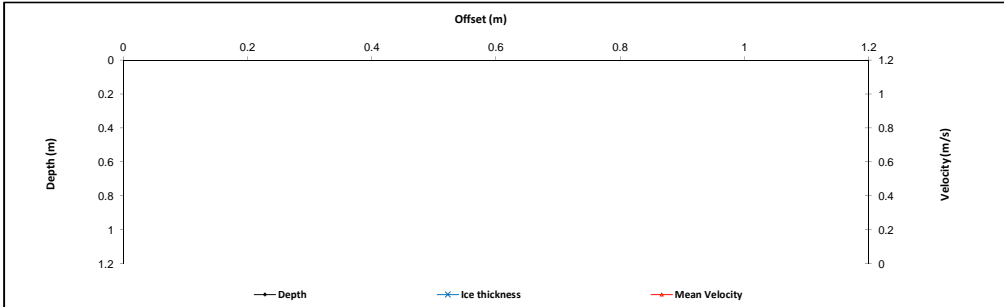
**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	



**Logger Details:**

	Before	After
Transducer Reading (m):	1.061	1.067
Water (°C):	17.2	17.5
Datalogger Clock:	11:03	12:06
Laptop Clock:	11:03	12:06
Battery:	11.8	13.0
Battery Condition:	-	Replaced
Battery Serial #:	-	1205003
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Flow was too fast for wading or fishcat flow measurement. No flow measurement conducted due to safety concerns. See photos.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S02-07	1.960	300.392		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			1.972	298.420	298.399	3/4" Pipe 20m ESE of logger
S02-05			2.722	297.670	297.648	3/4" Pipe 5m South of logger
<b>Water Level:</b>	<b>Cut</b>		3.165	297.227	<b>Time WL Surveyed:</b> 12:36	
S02-05			2.722	297.670	297.648	3/4" Pipe 5m South of logger
<b>Turn</b>						
S02-05	2.709	300.379		297.670	297.648	3/4" Pipe 5m South of logger
<b>Water Level:</b>	<b>Cut</b>		3.152	297.227	<b>Time WL Surveyed:</b> 12:38	
S02-05			2.709	297.670	297.648	3/4" Pipe 5m South of logger
S02-06			1.958	298.421	298.399	3/4" Pipe 20m ESE of logger
S02-07			1.946	298.433	298.432	3/4" Pipe 15m SSE of logger

**Secondary Water Level Survey (pick any BM e.g. closest to water's edge)**

<b>Water Level:</b>	<b>Cut</b>			<b>Time WL Surveyed:</b>	
<b>Water Level:</b>	<b>Cut</b>			<b>Time WL Surveyed:</b>	

**WL Survey Summary**

	Before	After
Average WL:	297.227	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	296.166	-

**Field Personnel:**

SM, GG	Trip Date:	25-Jun-14
SM	Date:	25-Jun-14
CJ	Date:	16-Jul-14
Entered Digitally in the Field:	Yes	





# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: September 22, 2014  
 Site Visit Time (MST): 14:10

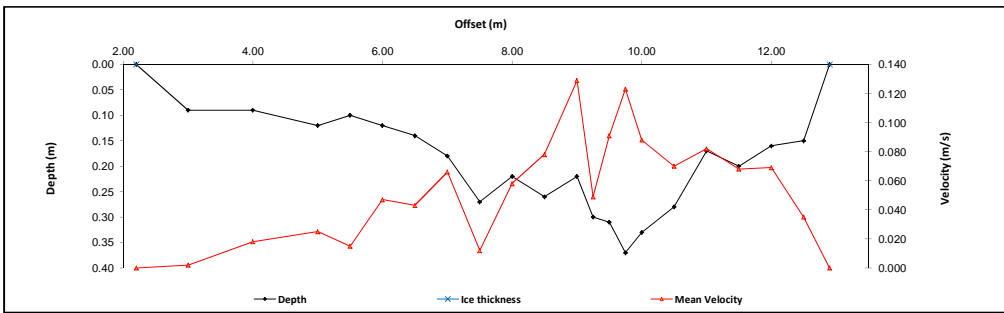


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	3.00	0.09		0.05	0.002					1.00	0.90	0.09	0.002	0.08	0.000	0%
2	4.00	0.09		0.05	0.018					1.00	1.00	0.09	0.018	0.09	0.002	1%
3	5.00	0.12		0.07	0.025					1.00	0.75	0.12	0.025	0.09	0.002	2%
4	5.50	0.10		0.06	0.015					1.00	0.50	0.10	0.015	0.05	0.001	1%
5	6.00	0.12		0.07	0.047					1.00	0.50	0.12	0.047	0.06	0.003	3%
6	6.50	0.14		0.08	0.043					1.00	0.50	0.14	0.043	0.07	0.003	3%
7	7.00	0.18		0.11	0.066					1.00	0.50	0.18	0.066	0.09	0.006	5%
8	7.50	0.27		0.16	0.012					1.00	0.50	0.27	0.012	0.14	0.002	1%
9	8.00	0.22		0.13	0.058					1.00	0.50	0.22	0.058	0.11	0.006	6%
10	8.50	0.26		0.16	0.078					1.00	0.50	0.26	0.078	0.13	0.010	9%
11	9.00	0.22		0.13	0.129					1.00	0.38	0.22	0.129	0.08	0.011	10%
12	9.25	0.30		0.18	0.049					1.00	0.25	0.30	0.049	0.08	0.004	3%
13	9.50	0.31		0.19	0.091					1.00	0.25	0.31	0.091	0.08	0.007	6%
14	9.75	0.37		0.22	0.123					1.00	0.25	0.37	0.123	0.09	0.011	10%
15	10.00	0.33		0.20	0.088					1.00	0.38	0.33	0.088	0.12	0.011	10%
16	10.50	0.28		0.17	0.070					1.00	0.50	0.28	0.070	0.14	0.010	9%
17	11.00	0.17		0.10	0.082					1.00	0.50	0.17	0.082	0.09	0.007	6%
18	11.50	0.20		0.12	0.068					1.00	0.50	0.20	0.068	0.10	0.007	6%
19	12.00	0.16		0.10	0.069					1.00	0.50	0.16	0.069	0.08	0.006	5%
20	12.50	0.15		0.09	0.035					1.00	0.45	0.15	0.035	0.07	0.002	2%
LB	12.90	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.110</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
7m Upstream of PT

Meas. Start Time (MST):	14:45
Meas. End Time (MST):	15:07
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 28



**Flow characteristics:**

Total Flow:	0.110	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.83	(m <sup>2</sup> )
Wetted Width:	10.70	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.783	0.782
Water (°C):	11.4	11.4
Datalogger Clock:	14:43	15:08
Laptop Clock:	14:43	15:08
Battery:	13.2	13.3
Battery Condition:		Replaced
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Logger appears to shut off between midnight and 07:00
- Replaced battery, checked solar controller and solar panel.
- All ok
- If problem persists, replace logger

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S02-07	2.351	300.783		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.363	298.420	298.399	3/4" Pipe 20m ESE of logger
S02-05			3.114	297.669	297.648	3/4" Pipe 5m South of logger
Water Level:	Cut	0.201	4.035	296.949		Time WL Surveyed: 14:37
Temporary BM			4.035	296.748	0.000	-
<b>Turn</b>						
Temporary BM	4.022	300.770		296.748		-
Water Level:	Cut	0.201	4.022	296.949		Time WL Surveyed: 14:39
S02-05			3.101	297.669	297.648	3/4" Pipe 5m South of logger
S02-06			2.349	298.421	298.399	3/4" Pipe 20m ESE of logger
S02-07			2.337	298.433	298.432	3/4" Pipe 15m SSE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S02-05	3.100	300.769		297.669		
Water Level:	Cut	0.201	4.021	296.949		Time WL Surveyed: 15:11
Water Level:	Cut	0.201	4.004	296.950		Time WL Surveyed: 15:12
S02-05	3.084	300.753		297.669		

**WL Survey Summary**

	Before	After
Average WL:	296.949	296.950
Closing Error:	-0.001	-
WL Check:	0.000	-0.001
Transducer Elevation	296.166	296.168

**Field Personnel:**

	SM, TR	Trip Date:	22-Sep-14
Data Entry Personnel:	SM	Date:	22-Sep-14
Data Check Personnel:	GG	Date:	10-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: October 22, 2014  
 Site Visit Time (MST): 13:05



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	14.20	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	13.00	0.26		0.16	0.208					1.00	0.85	0.26	0.208	0.22	0.046	10%
2	12.50	0.29		0.17	0.221					1.00	0.50	0.29	0.221	0.15	0.032	7%
3	12.00	0.28		0.17	0.223					1.00	0.50	0.28	0.223	0.14	0.031	7%
4	11.50	0.31		0.19	0.239					1.00	0.50	0.31	0.239	0.16	0.037	8%
5	11.00	0.33		0.20	0.283					1.00	0.38	0.33	0.283	0.12	0.035	8%
6	10.75	0.40		0.24	0.122					1.00	0.25	0.40	0.122	0.10	0.012	3%
7	10.50	0.38		0.23	0.260					1.00	0.38	0.38	0.260	0.14	0.037	8%
8	10.00	0.31		0.19	0.208					1.00	0.50	0.31	0.208	0.16	0.032	7%
9	9.50	0.26		0.16	0.271					1.00	0.50	0.26	0.271	0.13	0.035	8%
10	9.00	0.33		0.20	0.161					1.00	0.50	0.33	0.161	0.17	0.027	6%
11	8.50	0.25		0.15	0.195					1.00	0.50	0.25	0.195	0.13	0.024	5%
12	8.00	0.25		0.15	0.210					1.00	0.50	0.25	0.210	0.13	0.026	6%
13	7.50	0.24		0.14	0.115					1.00	0.50	0.24	0.115	0.12	0.014	3%
14	7.00	0.28		0.17	0.094					1.00	0.50	0.28	0.094	0.14	0.013	3%
15	6.50	0.21		0.13	0.083					1.00	0.50	0.21	0.083	0.11	0.009	2%
16	6.00	0.29		0.17	0.119					1.00	0.50	0.29	0.119	0.15	0.017	4%
17	5.50	0.24		0.14	0.078					1.00	0.50	0.24	0.078	0.12	0.009	2%
18	5.00	0.14		0.08	0.111					1.00	0.50	0.14	0.111	0.07	0.008	2%
19	4.50	0.14		0.08	0.066					1.00	0.50	0.14	0.066	0.07	0.005	1%
20	4.00	0.19		0.11	0.021					1.00	0.50	0.19	0.021	0.10	0.002	0%
21	3.50	0.11		0.07	0.001					1.00	0.40	0.11	0.001	0.04	0.000	0%
LB	3.20	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.452</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
6m US OF PT

Meas. Start Time (MST):	13:30
Meas. End Time (MST):	14:00
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 15

**Flow characteristics:**

Total Flow:	0.452	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.64	(m <sup>2</sup> )
Wetted Width:	11.00	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.11	

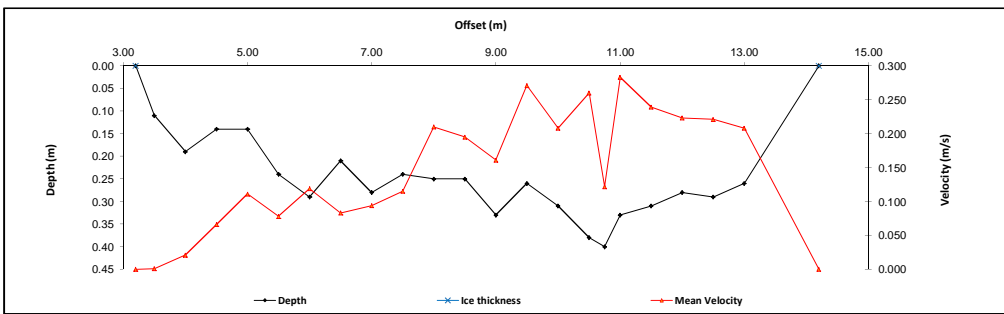
**Logger Details:**

	Before	After
Transducer Reading (m):	0.881	0.881
Water (°C):	4.3	4.4
Datalogger Clock:	13:07	14:01
Laptop Clock:	13:07	14:01
Battery:	13.9	13.8
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Power supply issues look to be corrected

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S02-07	2.372	300.804		298.432	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.384	298.420	298.420	3/4" Pipe 20m ESE of logger
S02-05			3.136	297.668	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut	0.294	4.048	297.050	<b>Time WL Surveyed:</b> 13:23	
S02-05			3.136	297.668	297.670	3/4" Pipe 5m South of logger
<b>Turn</b>						
S02-05	3.139	300.807		297.668	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut	0.363	4.139	297.051	<b>Time WL Surveyed:</b> 13:24	
S02-05			3.139	297.668	297.670	3/4" Pipe 5m South of logger
S02-06			2.387	298.420	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.375	298.432	298.432	3/4" Pipe 15m SSE of logger
<b>Secondary Water Level Survey (pick any BM e.g. cl A)</b>						
S02-05	3.139	300.807		297.668		
Water Level:	Cut	0.340	4.098	297.049	<b>Time WL Surveyed:</b> 14:05	
Water Level:	Cut	0.340	4.072	297.047	<b>Time WL Surveyed:</b> 14:06	
S02-05	3.111	300.779		297.668		

**WL Survey Summary**

Average WL:	297.051	297.048
Closing Error:	0.000	-
WL Check:	0.001	0.002
Transducer Elevation	296.170	296.167

**Field Personnel:**

Field Personnel:	TR, GG	Trip Date:	22-Oct-14
Data Entry Personnel:	TR	Date:	22-Oct-14
Data Check Personnel:	MY	Date:	23-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S2 Jackpine Creek at Canterra Road  
 UTM Location: 474961 E, 6344087 N

Site Visit Date: December 11, 2014  
 Site Visit Time (MST): 14:20

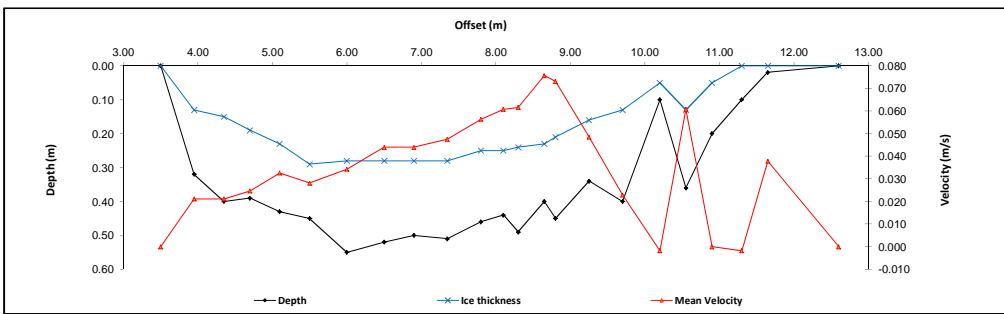


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.50	0.00	0.00		0.000		0.000		0.000	0.88	0.23	0.00	0.000	0.00	0.000	
1	3.95	0.32	0.13	0.23	0.024					0.88	0.43	0.19	0.021	0.08	0.002	3%
2	4.35	0.40	0.15	0.28	0.024					0.88	0.38	0.25	0.021	0.09	0.002	3%
3	4.70	0.39	0.19	0.29	0.028					0.88	0.38	0.20	0.025	0.08	0.002	3%
4	5.10	0.43	0.23	0.33	0.037					0.88	0.40	0.20	0.033	0.08	0.003	4%
5	5.50	0.45	0.29	0.37	0.032					0.88	0.45	0.16	0.028	0.07	0.002	3%
6	6.00	0.55	0.28	0.42	0.039					0.88	0.50	0.27	0.034	0.14	0.005	8%
7	6.50	0.52	0.28	0.40	0.050					0.88	0.45	0.24	0.044	0.11	0.005	8%
8	6.90	0.50	0.28	0.39	0.050					0.88	0.43	0.22	0.044	0.09	0.004	7%
9	7.35	0.51	0.28	0.40	0.054					0.88	0.45	0.23	0.048	0.10	0.005	8%
10	7.80	0.46	0.25	0.36	0.064					0.88	0.38	0.21	0.056	0.08	0.004	7%
11	8.10	0.44	0.25	0.35	0.069					0.88	0.25	0.19	0.061	0.05	0.003	5%
12	8.30	0.49	0.24	0.37	0.070					0.88	0.28	0.25	0.062	0.07	0.004	7%
13	8.65	0.40	0.23	0.32	0.086					0.88	0.25	0.17	0.076	0.04	0.003	5%
14	8.80	0.45	0.21	0.33	0.083					0.88	0.30	0.24	0.073	0.07	0.005	9%
15	9.25	0.34	0.16	0.25	0.055					0.88	0.45	0.18	0.048	0.08	0.004	6%
16	9.70	0.40	0.13	0.27	0.026					0.88	0.48	0.27	0.023	0.13	0.003	5%
17	10.20	0.10	0.05	0.08	-0.002					0.88	0.43	0.05	-0.002	0.02	0.000	0%
18	10.55	0.36	0.13	0.25	0.069					0.88	0.35	0.23	0.061	0.08	0.005	8%
19	10.90	0.20	0.05	0.13	0.000					0.88	0.38	0.15	0.000	0.06	0.000	0%
20	11.30	0.10	0.00	0.05	-0.002					0.88	0.38	0.10	-0.002	0.04	0.000	0%
21	11.65	0.02	0.00	0.01	0.043					0.88	0.65	0.02	0.038	0.01	0.000	1%
RB	12.60	0.00	0.00		0.00		0.00		0.00	0.88	0.48	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.061</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m downstream of bridge

Mess. Start Time (MST):	14:50
Mess. End Time (MST):	15:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, light breeze, -6 C



**Flow characteristics:**

Total Flow:	0.061	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.57	(m <sup>2</sup> )
Wetted Width:	9.10	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.744	
Water (°C):	0.2	
Datalogger Clock:	14:22	
Laptop Clock:	14:22	
Battery:	13.0	
Battery Condition:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S02-06	2.243	300.663		298.420	298.420	3/4" Pipe 20m ESE of logger
S02-07			2.233	298.430	298.432	3/4" Pipe 15m SSE of logger
S02-05			2.993	297.670	297.670	3/4" Pipe 5m South of logger
Water Level:	Cut		3.752	296.911		<b>Time WL Surveyed:</b> 14:37
Temporary BM			3.665	296.998	0.000	
<b>Turn</b>						
Temporary BM	3.643	300.641		296.998		
Water Level:	Cut		3.733	296.908		<b>Time WL Surveyed:</b> 14:41
S02-05			2.970	297.671	297.670	3/4" Pipe 5m South of logger
S02-07			2.211	298.430	298.432	3/4" Pipe 15m SSE of logger
S02-06			2.222	298.419	298.420	3/4" Pipe 20m ESE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					<b>Time WL Surveyed:</b>
Water Level:	Cut					<b>Time WL Surveyed:</b>

**WL Survey Summary**

	Before	After
Average WL:	296.910	-
Closing Error:	0.001	-
WL Check:	0.003	-
Transducer Elevation	296.166	-

**Field Personnel:**

SM, GG	Trip Date:	11-Dec-14
SM	Date:	11-Dec-14
MY	Date:	17-Dec-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: April 29, 2014  
 Site Visit Time (MST): 13:10

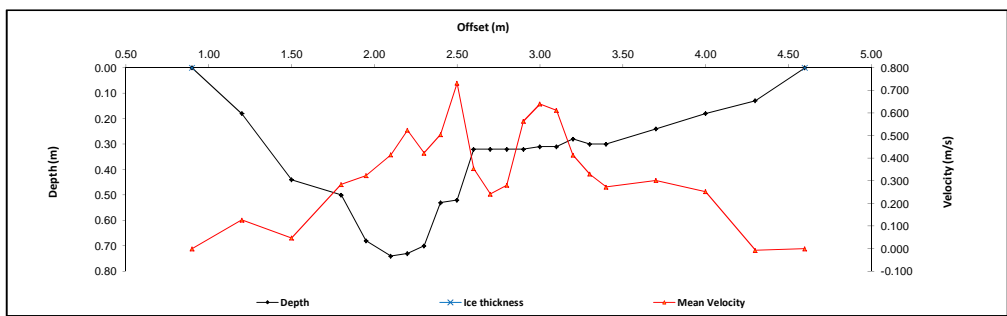


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.90	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.20	0.18		0.11	0.127					1.00	0.30	0.18	0.127	0.05	0.007	2%
2	1.50	0.44		0.26	0.047					1.00	0.30	0.44	0.047	0.13	0.006	2%
3	1.80	0.50		0.30	0.284					1.00	0.23	0.50	0.284	0.11	0.032	8%
4	1.95	0.68		0.41	0.323					1.00	0.15	0.68	0.323	0.10	0.033	8%
5	2.10	0.74		0.44	0.415					1.00	0.13	0.74	0.415	0.09	0.038	9%
6	2.20	0.73		0.44	0.524					1.00	0.10	0.73	0.524	0.07	0.038	9%
7	2.30	0.70		0.42	0.423					1.00	0.10	0.70	0.423	0.07	0.030	7%
8	2.40	0.53		0.32	0.504					1.00	0.10	0.53	0.504	0.05	0.027	7%
9	2.50	0.52		0.31	0.732					1.00	0.10	0.52	0.732	0.05	0.038	9%
10	2.60	0.32		0.19	0.354					1.00	0.10	0.32	0.354	0.03	0.011	3%
11	2.70	0.32		0.19	0.242					1.00	0.10	0.32	0.242	0.03	0.008	2%
12	2.80	0.32		0.19	0.281					1.00	0.10	0.32	0.281	0.03	0.009	2%
13	2.90	0.32		0.19	0.564					1.00	0.10	0.32	0.564	0.03	0.018	4%
14	3.00	0.31		0.19	0.640					1.00	0.10	0.31	0.640	0.03	0.020	5%
15	3.10	0.31		0.19	0.612					1.00	0.10	0.31	0.612	0.03	0.019	5%
16	3.20	0.28		0.17	0.414					1.00	0.10	0.28	0.414	0.03	0.012	3%
17	3.30	0.30		0.18	0.330					1.00	0.10	0.30	0.330	0.03	0.010	2%
18	3.40	0.30		0.18	0.273					1.00	0.20	0.30	0.273	0.06	0.016	4%
19	3.70	0.24		0.14	0.302					1.00	0.30	0.24	0.302	0.07	0.022	5%
20	4.00	0.18		0.11	0.252					1.00	0.30	0.18	0.252	0.05	0.014	3%
21	4.30	0.13		0.08	-0.007					1.00	0.30	0.13	-0.007	0.04	0.000	0%
LB	4.60	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.407</b>	<b>100%</b>	

**Flow Measurement Details:**

**Metering Section Location (describe):**  
3m upstream of old stilling well

Mess. Start Time (MST):	13:35
Mess. End Time (MST):	14:20
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow, edge ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 10 C



**Flow characteristics:**

Total Flow:	0.407	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.21	(m <sup>2</sup> )
Wetted Width:	3.70	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.19	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.701	
Water (°C):	0.2	
Datalogger Clock:	14:25	
Laptop Clock:	14:25	
Battery:	13.2	
Battery Condition:		New
Battery Serial #:	1403007	
Enclosure Desiccant:		New
Vent Tube Desiccant:		New
PTH (if replaced):	248958	
Logger# (if replaced):	18202	

**Datalogger / Station Notes:**

-reinstated TBRG

**General Notes:**

-some ice remains in channel where measurement was completed

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S03-03	1.232	362.614		361.382	361.382	3/4" Pipe 3m East of logger
S03-04			1.048	361.566	361.565	3/4" Pipe 5m West of logger
<b>Turn</b>						
S03-05	1.007	362.596		361.589	361.588	3/4" Pipe 10m NW of logger
Water Level:	Cut		3.109	359.487		Time WL Surveyed: 13:28
S03-04			1.029	361.567	361.565	3/4" Pipe 5m West of logger
S03-03			1.214	361.382	361.382	3/4" Pipe 3m East of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S03-04	1.029	362.595		361.566		
Water Level:	Cut		3.112	359.483		Time WL Surveyed: 14:21
Water Level:	Cut		3.092	359.495		Time WL Surveyed: 14:22
S03-04	1.011	362.577		361.566		

**WL Survey Summary**

	Before	After
Average WL:	359.488	359.484
Closing Error:	0.000	-
WL Check:	0.001	-0.002
Transducer Elevation	358.787	-

**Field Personnel:**

Data Entry Personnel:	TR, GG	Trip Date:	29-Apr-14
Data Check Personnel:	TR	Date:	29-Apr-14
Entered Digitally in the Field:	CJ	Date:	29-Apr-14

# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: June 16, 2014  
 Site Visit Time (MST): 09:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
1	2.70	0.30		0.18	0.000					1.00	0.28	0.30	0.000	0.08	0.000	0%
2	2.95	0.41		0.25	0.028					1.00	0.25	0.41	0.028	0.10	0.003	1%
3	3.20	0.45		0.27	0.058					1.00	0.18	0.45	0.058	0.08	0.005	1%
4	3.30	0.44		0.26	0.058					1.00	0.10	0.44	0.058	0.04	0.003	1%
5	3.40	0.51		0.31	0.176					1.00	0.10	0.51	0.176	0.05	0.009	2%
6	3.50	0.52		0.31	0.270					1.00	0.10	0.52	0.270	0.05	0.014	3%
7	3.60	0.54		0.32	0.338					1.00	0.10	0.54	0.338	0.05	0.018	4%
8	3.70	0.54		0.32	0.570					1.00	0.10	0.54	0.570	0.05	0.031	6%
9	3.80	0.55		0.33	0.615					1.00	0.10	0.55	0.615	0.05	0.034	7%
10	3.90	0.53		0.32	0.619					1.00	0.10	0.53	0.619	0.05	0.033	7%
11	4.00	0.56		0.34	0.640					1.00	0.10	0.56	0.640	0.06	0.036	7%
12	4.10	0.58		0.35	0.648					1.00	0.10	0.58	0.648	0.06	0.038	8%
13	4.20	0.68		0.41	0.366					1.00	0.10	0.68	0.366	0.07	0.025	5%
14	4.30	0.68		0.41	0.356					1.00	0.10	0.68	0.356	0.07	0.024	5%
15	4.40	0.65		0.39	0.392					1.00	0.10	0.65	0.392	0.07	0.025	5%
16	4.50	0.62		0.37	0.479					1.00	0.10	0.62	0.479	0.06	0.030	6%
17	4.60	0.55		0.33	0.435					1.00	0.13	0.55	0.435	0.07	0.030	6%
18	4.75	0.53		0.32	0.427					1.00	0.15	0.53	0.427	0.08	0.034	7%
19	4.90	0.54		0.32	0.449					1.00	0.20	0.54	0.449	0.11	0.048	10%
20	5.15	0.39		0.23	0.575					1.00	0.20	0.39	0.575	0.08	0.045	9%
21	5.30	0.30		0.18	0.067					1.00	0.18	0.30	0.067	0.05	0.004	1%
RB	5.50	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.487</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -adjacent to station

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:26
Equipment:	ADV
Method:	Wading
River Condition:	Moderate-High Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 18C

**Flow characteristics:**

Total Flow:	0.487	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.39	(m²)
Wetted Width:	3.10	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.17	

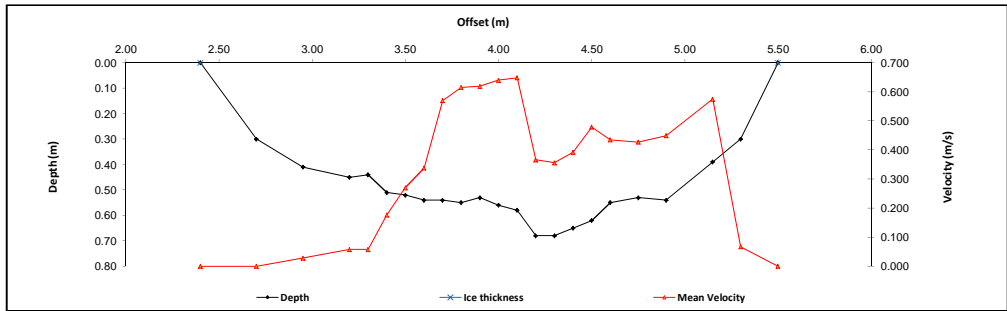
**Logger Details:**

	Before	After
Transducer Reading (m):	0.524	0.526
Water (°C):	12.0	12.4
Datalogger Clock:	09:23	10:35
Laptop Clock:	09:23	10:34
Battery:	13.7	13.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Station mast is leaning
- Straightend mast by jamming pipe into base of station.
- Need to install TBRG on own mast, it is not level
- Grounded station
- Vent tube hose was pinched, fixed

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S03-05	1.069	362.657		361.588	361.588	3/4" Pipe 10m NW of logger
S03-03			1.277	361.380	361.382	3/4" Pipe 3m East of logger
S03-04			1.094	361.563	361.565	3/4" Pipe 5m West of logger
Water Level:	<b>Cut</b>		3.345	359.312	<b>Time WL Surveyed:</b> 9:43	
Temporary BM			3.153	359.504	0.000	
<b>Turn</b>						
Temporary BM	3.143	362.647		359.504		
Water Level:	<b>Cut</b>		3.334	359.313	<b>Time WL Surveyed:</b> 9:45	
S03-04			1.084	361.563	361.565	3/4" Pipe 5m West of logger
S03-03			1.267	361.380	361.382	3/4" Pipe 3m East of logger
S03-05			1.060	361.587	361.588	3/4" Pipe 10m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S03-04	1.084	362.647		361.563		
Water Level:	<b>Cut</b>		3.332	359.315	<b>Time WL Surveyed:</b> 10:39	
Water Level:	<b>Cut</b>		3.317	359.316	<b>Time WL Surveyed:</b> 10:40	
S03-04	1.070	362.633		361.563		

**WL Survey Summary**

	Before	After
Average WL:	359.313	359.316
Closing Error:	0.001	-
WL Check:	0.001	-0.001
Transducer Elevation	358.789	358.790

**Field Personnel:**

	DW, NC	Trip Date:	16-Jun-14
Data Entry Personnel:	DW	Date:	16-Jun-14
Data Check Personnel:	CJ	Date:	25-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: August 9, 2014  
 Site Visit Time (MST): 14:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	32.50	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	33.00	0.32		0.19	0.207					1.00	0.35	0.32	0.207	0.11	0.023	11%
2	33.20	0.31		0.19	0.306					1.00	0.20	0.31	0.306	0.06	0.019	9%
3	33.40	0.34		0.20	0.143					1.00	0.15	0.34	0.143	0.05	0.007	3%
4	33.50	0.40		0.24	0.168					1.00	0.10	0.40	0.168	0.04	0.007	3%
5	33.60	0.42		0.25	0.098					1.00	0.15	0.42	0.098	0.06	0.006	3%
6	33.80	0.42		0.25	0.038					1.00	0.20	0.42	0.038	0.08	0.003	1%
7	34.00	0.40		0.24	0.023					1.00	0.20	0.40	0.023	0.08	0.002	1%
8	34.20	0.40		0.24	0.008					1.00	0.20	0.40	0.008	0.08	0.001	0%
9	34.40	0.32		0.19	0.012					1.00	0.20	0.32	0.012	0.06	0.001	0%
10	34.60	0.48		0.29	-0.004					1.00	0.20	0.48	-0.004	0.10	0.000	0%
11	34.80	0.48		0.29	0.094					1.00	0.20	0.48	0.094	0.10	0.009	4%
12	35.00	0.46		0.28	0.223					1.00	0.20	0.46	0.223	0.09	0.021	10%
13	35.20	0.50		0.30	0.317					1.00	0.15	0.50	0.317	0.07	0.024	11%
14	35.30	0.52		0.31	0.386					1.00	0.10	0.52	0.386	0.05	0.020	9%
15	35.40	0.55		0.33	0.354					1.00	0.10	0.55	0.354	0.06	0.019	9%
16	35.50	0.51		0.31	0.254					1.00	0.10	0.51	0.254	0.05	0.013	6%
17	35.60	0.48		0.29	0.163					1.00	0.15	0.48	0.163	0.07	0.012	5%
18	35.80	0.42		0.25	0.187					1.00	0.20	0.42	0.187	0.08	0.016	7%
19	36.00	0.36		0.22	0.123					1.00	0.20	0.36	0.123	0.07	0.009	4%
20	36.20	0.32		0.19	0.038					1.00	0.30	0.32	0.038	0.10	0.004	2%
RB	36.60	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>0.214</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -adjacent to station

Meas. Start Time (MST):	15:13
Meas. End Time (MST):	15:44
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Cloudy, 24 C

**Flow characteristics:**

Total Flow:	0.214	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	1.48	(m <sup>2</sup> )
Wetted Width:	4.10	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.08	

**Logger Details:**

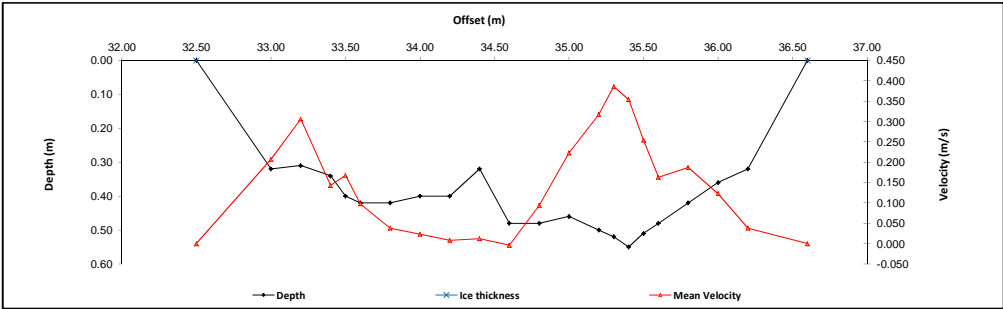
	Before	After
Transducer Reading (m):	0.368	0.386
Water (°C):	15.6	15.7
Datalogger Clock:	14:33	15:55
Laptop Clock:	14:33	15:54
Battery:	12.5	13.5
Battery Condition:	Replaced	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

Station damaged by wildlife. Solar panel cable, TBRG cable, and PLS sheath pulled out. Power cable also pulled. Need new antenna cable and TBRG cable due to damage. Solar panel and PLS cables reconnected

**General Notes**

Lots of large woody debris on left bank, large rock 2m upstream creating some eddy effects on flow



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S03-05	1.038	362.626		361.588	361.588	3/4" Pipe 10m NW of logger
S03-03			1.246	361.380	361.382	3/4" Pipe 3m East of logger
S03-04			1.063	361.563	361.565	3/4" Pipe 5m West of logger
Water Level:	Cut		3.453	359.173	Time WL Surveyed: 15:02	
Temporary BM			1.063	361.563	0.000	
<b>Turn</b>						
Temporary BM	1.053	362.616		361.563		
Water Level:	Cut		3.443	359.173	Time WL Surveyed: 15:05	
S03-04			1.053	361.563	361.565	3/4" Pipe 5m West of logger
S03-03			1.236	361.380	361.382	3/4" Pipe 3m East of logger
S03-05			1.028	361.588	361.588	3/4" Pipe 10m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S03-05	1.028	362.616		361.588		
Water Level:	Cut		3.444	359.172	Time WL Surveyed: 15:48	
Water Level:	Cut		3.436	359.170	Time WL Surveyed: 15:50	
S03-05	1.018	362.606		361.588		

**WL Survey Summary**

	Before	After
Average WL:	359.173	359.171
Closing Error:	0.000	-
WL Check:	0.000	0.002
Transducer Elevation	358.605	358.785

**Field Personnel:**

Field Personnel:	CJ, MP	Trip Date:	9-Aug-14
Data Entry Personnel:	CJ	Date:	9-Aug-14
Data Check Personnel:	CJ	Date:	8-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kears Lake  
 UTM Location: 489491 E, 6345029 N

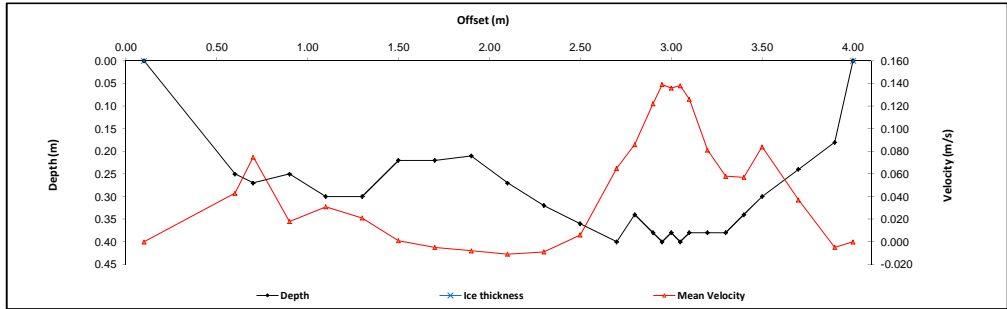
Site Visit Date: September 24, 2014  
 Site Visit Time (MST): 13:24



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.00	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	3.90	0.18		0.11	-0.005					1.00	0.15	0.18	-0.005	0.03	0.000	0%
2	3.70	0.24		0.14	0.037					1.00	0.20	0.24	0.037	0.05	0.002	4%
3	3.50	0.30		0.18	0.084					1.00	0.15	0.30	0.084	0.05	0.004	9%
4	3.40	0.34		0.20	0.057					1.00	0.10	0.34	0.057	0.03	0.002	4%
5	3.30	0.38		0.23	0.058					1.00	0.10	0.38	0.058	0.04	0.002	5%
6	3.20	0.38		0.23	0.081					1.00	0.10	0.38	0.081	0.04	0.003	7%
7	3.10	0.38		0.23	0.126					1.00	0.08	0.38	0.126	0.03	0.004	8%
8	3.05	0.40		0.24	0.138					1.00	0.05	0.40	0.138	0.02	0.003	6%
9	3.00	0.38		0.23	0.136					1.00	0.05	0.38	0.136	0.02	0.003	6%
10	2.95	0.40		0.24	0.139					1.00	0.05	0.40	0.139	0.02	0.003	6%
11	2.90	0.38		0.23	0.122					1.00	0.08	0.38	0.122	0.03	0.003	8%
12	2.80	0.34		0.20	0.086					1.00	0.10	0.34	0.086	0.03	0.003	7%
13	2.70	0.40		0.24	0.065					1.00	0.15	0.40	0.065	0.06	0.004	9%
14	2.50	0.36		0.22	0.006					1.00	0.20	0.36	0.006	0.07	0.000	1%
15	2.30	0.32		0.19	-0.009					1.00	0.20	0.32	-0.009	0.06	-0.001	-1%
16	2.10	0.27		0.16	-0.011					1.00	0.20	0.27	-0.011	0.05	-0.001	-1%
17	1.90	0.21		0.13	-0.008					1.00	0.20	0.21	-0.008	0.04	0.000	-1%
18	1.70	0.22		0.13	-0.005					1.00	0.20	0.22	-0.005	0.04	0.000	-1%
19	1.50	0.22		0.13	0.001					1.00	0.20	0.22	0.001	0.04	0.000	0%
20	1.30	0.30		0.18	0.021					1.00	0.20	0.30	0.021	0.06	0.001	3%
21	1.10	0.30		0.18	0.031					1.00	0.20	0.30	0.031	0.06	0.002	4%
22	0.90	0.25		0.15	0.018					1.00	0.20	0.25	0.018	0.05	0.001	2%
23	0.70	0.27		0.16	0.075					1.00	0.15	0.27	0.075	0.04	0.003	7%
24	0.60	0.25		0.15	0.043					1.00	0.30	0.25	0.043	0.08	0.003	7%
LB	0.10	0.00	0.00		0.000		0.000			1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.044</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 1m US of old stilling well

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:10
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 10 C



**Flow characteristics:**

Total Flow:	0.044	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.05	(m <sup>2</sup> )
Wetted Width:	3.90	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.299	0.301
Water (°C):	10.0	10.2
Datalogger Clock:	13:27	14:18
Laptop Clock:	13:26	14:17
Battery:	12.6	12.8
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Reinstated TBRG, needs screen
- Guy wired mast
- Fixed wiring that was pulled by wildlife
- Needs an omni antenna cable
- RSS1 = (-101)

**General Notes:**

- Station damaged by Wildlife
- Precip gauge reading: 0mm

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S03-05	1.109	362.697		361.588	361.588	3/4" Pipe 10m NW of logger
S03-03			1.315	361.382	361.382	3/4" Pipe 3m East of logger
S03-04			1.132	361.565	361.565	3/4" Pipe 5m West of logger
Water Level:	Cut	0.393	3.994	359.096	Time WL Surveyed:	13:33
Temporary BM			3.994	358.703	0.000	-
<b>Turn</b>						
Temporary BM	3.972	362.675		358.703		-
Water Level:	Cut	0.393	3.972	359.096	Time WL Surveyed:	13:34
S03-04			1.111	361.564	361.565	3/4" Pipe 5m West of logger
S03-03			1.295	361.380	361.382	3/4" Pipe 3m East of logger
S03-05			1.087	361.588	361.588	3/4" Pipe 10m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S03-04	1.112	362.677		361.565		
Water Level:	Cut	0.296	3.868	359.095	Time WL Surveyed:	14:14
Water Level:	Cut	0.248	3.807	359.095	Time WL Surveyed:	14:15
S03-04	1.089	362.654		361.565		

**WL Survey Summary**

	Before	After
Average WL:	359.096	359.095
Closing Error:	0.000	-
WL Check:	0.000	0.000
Transducer Elevation	358.797	358.794

**Field Personnel:**

MP, TR	Trip Date:	24-Sep-14
MP, TR	Date:	24-Sep-14
GG	Date:	10-Oct-14
Entered Digitally in the Field:	Yes	



# Hydrometric Measurement / Site Visit Record

Site: S3 Iyininim Creek above Kearl Lake  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: November 2, 2014  
 Site Visit Time (MST): 10:25



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.95	0.00	0.00		0.000				0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	1.20	0.06		0.04	0.077					1.00	0.20	0.06	0.077	0.01	0.001	0%
2	1.35	0.23		0.14	0.005					1.00	0.15	0.23	0.005	0.03	0.000	0%
3	1.50	0.30		0.18	0.006					1.00	0.15	0.30	0.006	0.05	0.000	0%
4	1.65	0.34		0.20	0.091					1.00	0.15	0.34	0.091	0.05	0.005	2%
5	1.80	0.37		0.22	0.140					1.00	0.15	0.37	0.140	0.06	0.008	4%
6	1.95	0.40		0.24	0.174					1.00	0.15	0.40	0.174	0.06	0.010	5%
7	2.10	0.38		0.23	0.157					1.00	0.15	0.38	0.157	0.06	0.009	4%
8	2.25	0.40		0.24	0.175					1.00	0.15	0.40	0.175	0.06	0.011	5%
9	2.40	0.38		0.23	0.170					1.00	0.15	0.38	0.170	0.06	0.010	5%
10	2.55	0.38		0.23	0.162					1.00	0.15	0.38	0.162	0.06	0.009	4%
11	2.70	0.40		0.24	0.178					1.00	0.15	0.40	0.178	0.06	0.011	5%
12	2.85	0.44		0.26	0.175					1.00	0.15	0.44	0.175	0.07	0.012	6%
13	3.00	0.49		0.29	0.196					1.00	0.15	0.49	0.196	0.07	0.014	7%
14	3.15	0.52		0.31	0.236					1.00	0.15	0.52	0.236	0.08	0.018	9%
15	3.30	0.48		0.29	0.262					1.00	0.15	0.48	0.262	0.07	0.019	9%
16	3.45	0.45		0.27	0.197					1.00	0.15	0.45	0.197	0.07	0.013	6%
17	3.60	0.40		0.24	0.138					1.00	0.15	0.40	0.138	0.06	0.008	4%
18	3.75	0.40		0.24	0.224					1.00	0.15	0.40	0.224	0.06	0.013	7%
19	3.90	0.36		0.22	0.235					1.00	0.15	0.36	0.235	0.05	0.013	6%
20	4.05	0.36		0.22	0.231					1.00	0.15	0.36	0.231	0.05	0.012	6%
21	4.20	0.32		0.19	0.158					1.00	0.18	0.32	0.158	0.06	0.009	4%
RB	4.40	0.00	0.00		0.00	0.00		0.00		1.00	0.10	0.00	0.000	0.000		
<b>Total Flow</b>														<b>0.206</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -at old stilling well

Mess. Start Time (MST):	10:47
Mess. End Time (MST):	11:06
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow, ice on edges
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, -5 C

**Flow characteristics:**

Total Flow:	0.206	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	3.45	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.09	

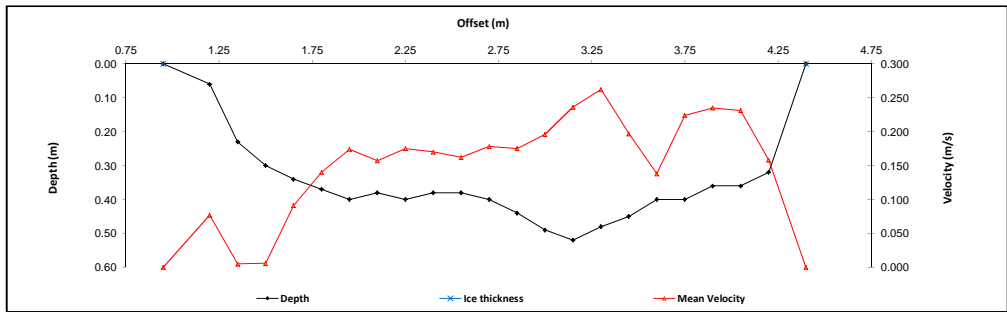
**Logger Details:**

	Before	After
Transducer Reading (m):	0.412	0.412
Water (°C):	0.2	0.3
Datalogger Clock:	10:29	11:13
Laptop Clock:	10:28	11:12
Battery:	12.6	12.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Removed transducer (s/n: 248958), modem (for sim card replacement), and tipping bucket for winter

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S03-05	0.905	362.493		361.588	361.588	3/4" Pipe 10m NW of logger
S03-03			1.111	361.382	361.382	3/4" Pipe 3m East of logger
S03-04			0.927	361.566	361.565	3/4" Pipe 5m West of logger
Water Level:	Cut		3.284	359.209	Time WL Surveyed:	10:41
S03-04			0.927	361.566	361.565	3/4" Pipe 5m West of logger
<b>Turn</b>						
S03-04	0.937	362.503		361.566	361.565	3/4" Pipe 5m West of logger
Water Level:	Cut		3.294	359.209	Time WL Surveyed:	10:44
S03-04			0.937	361.566	361.565	3/4" Pipe 5m West of logger
S03-03			1.119	361.384	361.382	3/4" Pipe 3m East of logger
S03-05			0.913	361.590	361.588	3/4" Pipe 10m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S03-04	0.927	362.493		361.566		
Water Level:	Cut		3.287	359.206	Time WL Surveyed:	11:05
Water Level:	Cut		3.273	359.210	Time WL Surveyed:	11:06
S03-04	0.917	362.483		361.566		

**WL Survey Summary**

	Before	After
Average WL:	359.209	359.208
Closing Error:	-0.002	-
WL Check:	0.000	-0.004
Transducer Elevation	358.797	358.796

**Field Personnel:**

	MP, TR	Trip Date:	2-Nov-14
Data Entry Personnel:	MP	Date:	2-Nov-14
Data Check Personnel:	GG	Date:	20-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: January 12, 2014  
 Site Visit Time (MST): 12:20

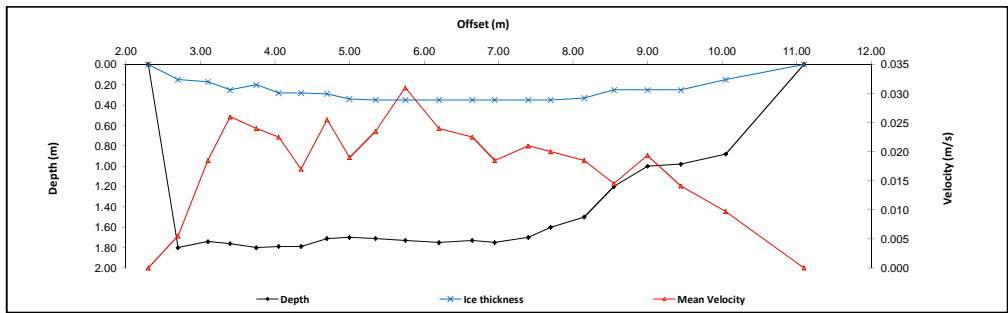


Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
LB	2.30	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000		
1	2.70	1.80	0.15			1.47	-0.008	0.48	0.019	1.00	0.40	1.65	0.006	0.66	0.004	2%	
2	3.10	1.74	0.17			1.43	0.022	0.48	0.015	1.00	0.35	1.57	0.019	0.55	0.010	5%	
3	3.40	1.76	0.25			1.46	0.025	0.55	0.027	1.00	0.33	1.51	0.026	0.49	0.013	6%	
4	3.75	1.80	0.20			1.48	0.023	0.52	0.025	1.00	0.33	1.60	0.024	0.52	0.012	6%	
5	4.05	1.79	0.28			1.49	0.017	0.58	0.028	1.00	0.30	1.51	0.023	0.45	0.010	5%	
6	4.35	1.79	0.28			1.49	0.011	0.58	0.023	1.00	0.33	1.51	0.017	0.49	0.008	4%	
7	4.70	1.71	0.29			1.43	0.022	0.57	0.029	1.00	0.32	1.42	0.026	0.46	0.012	6%	
8	5.00	1.70	0.34			1.43	0.015	0.61	0.023	1.00	0.33	1.36	0.019	0.44	0.008	4%	
9	5.35	1.71	0.35			1.44	0.014	0.62	0.033	1.00	0.38	1.36	0.024	0.51	0.012	6%	
10	5.75	1.73	0.35			1.45	0.028	0.63	0.034	1.00	0.43	1.38	0.031	0.59	0.018	9%	
11	6.20	1.75	0.35			1.47	0.025	0.63	0.023	1.00	0.45	1.40	0.024	0.63	0.015	8%	
12	6.65	1.73	0.35			1.45	0.019	0.63	0.026	1.00	0.38	1.38	0.023	0.52	0.012	6%	
13	6.95	1.75	0.35			1.47	0.026	0.63	0.011	1.00	0.38	1.40	0.019	0.53	0.010	5%	
14	7.40	1.70	0.35			1.43	0.016	0.62	0.026	1.00	0.38	1.35	0.021	0.51	0.011	5%	
15	7.70	1.60	0.35			1.35	0.014	0.60	0.026	1.00	0.38	1.25	0.020	0.47	0.009	5%	
16	8.15	1.50	0.33			1.27	0.014	0.56	0.023	1.00	0.43	1.17	0.019	0.50	0.009	5%	
17	8.55	1.20	0.25			1.01	0.008	0.44	0.021	1.00	0.42	0.95	0.015	0.40	0.006	3%	
18	9.00	1.00	0.25	0.63	0.022					0.88	0.45	0.75	0.019	0.34	0.007	3%	
19	9.45	0.98	0.25	0.62	0.016					0.88	0.53	0.73	0.014	0.38	0.005	3%	
20	10.05	0.88	0.15	0.52	0.011					0.88	0.82	0.73	0.010	0.60	0.006	3%	
RB	11.10	0.00	0.00		0.000		0.000		0.000	0.88	0.52	0.00	0.000	0.00	0.000		
<b>Total Flow</b>															<b>0.197</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 2m upstream of transducer

Meas. Start Time (MST):	12:50
Meas. End Time (MST):	13:46
Equipment:	ADV
Method:	Ice
River Condition:	Ice covered
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -19 C



**Flow characteristics:**

Total Flow:	0.197	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.04	(m <sup>2</sup> )
Wetted Width:	8.80	(m)
Hydraulic Depth:	1.14	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.186	1.183
Water (°C):	0.3	0.3
Datalogger Clock:	12:28	13:53
Laptop Clock:	12:28	13:53
Battery (Main):	15.0	15.0
Battery:		Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Replaced battery

**General Notes:**

-Ran ADV Test, results good

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05-02	1.111	99.627		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.263	98.364	98.369	Old 3/4" Pipe, 4m West of logger
S05-03			1.177	98.450	98.400	T-post close to old stilling well
Water Level:	<b>Cut</b>		2.419	97.208	<b>Time WL Surveyed:</b> 12:42	
Temporary BM			2.432	97.195	0.000	-
<b>Turn</b>						
Temporary BM	2.411	99.606		97.195	-	
Water Level:	<b>Cut</b>		2.399	97.207	<b>Time WL Surveyed:</b> 12:45	
S05-03			1.155	98.451	98.400	T-post close to old stilling well
S05-01			1.240	98.366	98.369	Old 3/4" Pipe, 4m West of logger
S05-02			1.088	98.518	98.516	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water)</b>				<b>98.365</b>		
S05-1	1.238	99.603		98.365		
Water Level:	<b>Cut</b>		2.398	97.205	<b>Time WL Surveyed:</b> 13:48	
Water Level:	<b>Cut</b>		2.371	97.208	<b>Time WL Surveyed:</b> 13:51	
S05-1	1.214	99.579		98.365		

**WL Survey Summary**

	Before	After
Average WL:	97.208	97.207
Closing Error:	-0.002	-
WL Check:	0.001	-0.003
Transducer Elevation	96.022	96.024

**Field Personnel:**

	TR, DW	Trip Date:	12-Jan-14
Data Entry Personnel:	TR	Date:	12-Jan-14
Data Check Personnel:	CJ	Date:	8-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

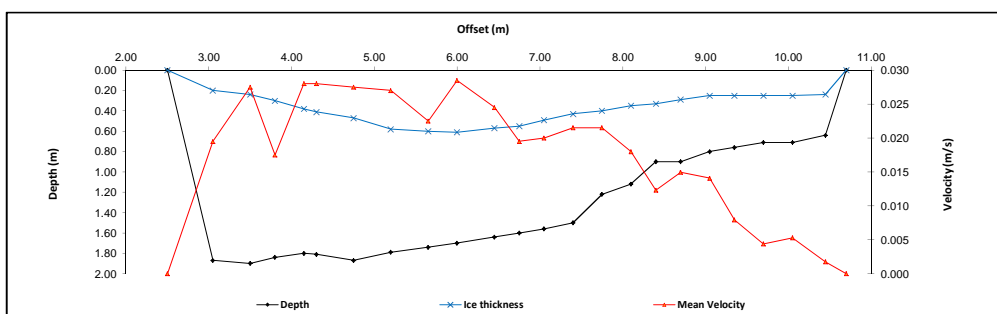
Site Visit Date: February 11, 2014  
 Site Visit Time (MST): 11:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	2.50	0.00	0.00		0.000		0.000		0.000	1.00	0.28	0.00	0.000	0.00	0.000	
1	3.05	1.87	0.20			1.54	0.019	0.53	0.020	1.00	0.50	1.67	0.020	0.84	0.016	10%
2	3.50	1.90	0.24			1.57	0.026	0.57	0.029	1.00	0.38	1.66	0.028	0.62	0.017	10%
3	3.80	1.84	0.30			1.53	0.007	0.61	0.028	1.00	0.33	1.54	0.018	0.50	0.009	5%
4	4.15	1.80	0.38			1.52	0.020	0.66	0.036	1.00	0.25	1.42	0.028	0.35	0.010	6%
5	4.30	1.81	0.41			1.53	0.021	0.69	0.035	1.00	0.30	1.40	0.028	0.42	0.012	7%
6	4.75	1.87	0.47			1.59	0.025	0.75	0.030	1.00	0.45	1.40	0.028	0.63	0.017	10%
7	5.20	1.79	0.58			1.55	0.027	0.82	0.027	1.00	0.45	1.21	0.027	0.54	0.015	9%
8	5.65	1.74	0.60			1.51	0.020	0.83	0.025	1.00	0.40	1.14	0.023	0.46	0.010	6%
9	6.00	1.70	0.61			1.48	0.030	0.83	0.027	1.00	0.40	1.09	0.029	0.44	0.012	7%
10	6.45	1.64	0.57			1.43	0.023	0.78	0.026	1.00	0.38	1.07	0.025	0.40	0.010	6%
11	6.75	1.60	0.55			1.39	0.021	0.76	0.018	1.00	0.30	1.05	0.020	0.32	0.006	4%
12	7.05	1.56	0.49			1.35	0.018	0.70	0.022	1.00	0.32	1.07	0.020	0.35	0.007	4%
13	7.40	1.50	0.43			1.29	0.022	0.64	0.021	1.00	0.35	1.07	0.022	0.37	0.008	5%
14	7.75	1.22	0.40			1.06	0.019	0.56	0.024	1.00	0.35	0.82	0.022	0.29	0.006	4%
15	8.10	1.12	0.35			0.97	0.017	0.50	0.019	1.00	0.33	0.77	0.018	0.25	0.005	3%
16	8.40	0.90	0.33	0.62	0.014					0.88	0.30	0.57	0.012	0.17	0.002	1%
17	8.70	0.90	0.29	0.60	0.017					0.88	0.32	0.61	0.015	0.20	0.003	2%
18	9.05	0.80	0.25	0.53	0.016					0.88	0.32	0.55	0.014	0.18	0.003	1%
19	9.35	0.76	0.25	0.51	0.009					0.88	0.32	0.51	0.008	0.17	0.001	1%
20	9.70	0.71	0.25	0.48	0.005					0.88	0.35	0.46	0.004	0.16	0.001	0%
21	10.05	0.71	0.25	0.48	0.006					0.88	0.38	0.46	0.005	0.17	0.001	1%
22	10.45	0.64	0.24	0.44	0.002					0.88	0.32	0.40	0.002	0.13	0.000	0%
RB	10.70	0.00	0.00							0.88	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.171</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe): 5m upstream of transducer

Meas. Start Time (MST):	11:30
Meas. End Time (MST):	12:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Straight Edge (e.g. bridge/piers)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -22 C



**Flow characteristics:**

Total Flow:	0.171	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.95	(m²)
Wetted Width:	8.20	(m)
Hydraulic Depth:	0.97	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.197	
Water (°C):	0.3	
Datalogger Clock:	11:11	
Laptop Clock:	11:11	
Battery (Main):	15.0	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Good
Vent Tube Deseccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05-02	1.213	99.729		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.367	98.362	98.369	Old 3/4" Pipe, 4m West of logger
S05-03			1.286	98.443	98.400	T-post close to old stilling well
Water Level:	Cut		2.520	97.209	Time WL Surveyed: 12:25	
Temporary BM			2.478	97.251	0.000	-
<b>Turn</b>						
Temporary BM	2.458	99.709		97.251		
Water Level:	Cut		2.500	97.209	Time WL Surveyed: 12:27	
S05-03			1.266	98.443	98.400	T-post close to old stilling well
S05-01			1.344	98.365	98.369	Old 3/4" Pipe, 4m West of logger
S05-02			1.193	98.516	98.516	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.209	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	96.012	-

**Field Personnel:**

	SM, MP	Trip Date:	11-Feb-14
Data Entry Personnel:	SM	Date:	11-Feb-14
Data Check Personnel:	CJ	Date:	8-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: March 10, 2014  
 Site Visit Time (MST): 13:00

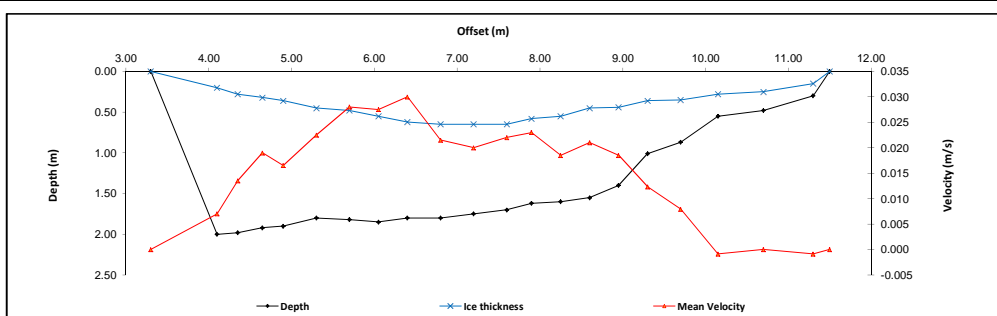


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.30	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	4.10	2.00	0.20			1.64	-0.004	0.56	0.018	1.00	0.53	1.80	0.007	0.95	0.007	5%
2	4.35	1.98	0.28			1.64	0.002	0.62	0.025	1.00	0.28	1.70	0.014	0.47	0.006	4%
3	4.65	1.92	0.32			1.60	0.001	0.64	0.037	1.00	0.28	1.60	0.019	0.44	0.008	6%
4	4.90	1.90	0.36			1.59	0.007	0.67	0.026	1.00	0.32	1.54	0.017	0.50	0.008	6%
5	5.30	1.80	0.45			1.53	0.012	0.72	0.033	1.00	0.40	1.35	0.023	0.54	0.012	9%
6	5.70	1.82	0.48			1.55	0.027	0.75	0.029	1.00	0.38	1.34	0.028	0.50	0.014	10%
7	6.05	1.85	0.55			1.59	0.027	0.81	0.028	1.00	0.35	1.30	0.028	0.46	0.013	9%
8	6.40	1.80	0.62			1.56	0.030	0.86	0.030	1.00	0.38	1.18	0.030	0.44	0.013	9%
9	6.80	1.80	0.65			1.57	0.017	0.88	0.026	1.00	0.40	1.15	0.022	0.46	0.010	7%
10	7.20	1.75	0.65			1.53	0.014	0.87	0.026	1.00	0.40	1.10	0.020	0.44	0.009	6%
11	7.60	1.70	0.65			1.49	0.021	0.86	0.023	1.00	0.35	1.05	0.022	0.37	0.008	6%
12	7.90	1.62	0.58			1.41	0.024	0.79	0.022	1.00	0.32	1.04	0.023	0.34	0.008	5%
13	8.25	1.60	0.55			1.39	0.017	0.76	0.020	1.00	0.35	1.05	0.019	0.37	0.007	5%
14	8.60	1.55	0.45			1.33	0.020	0.67	0.022	1.00	0.35	1.10	0.021	0.38	0.008	6%
15	8.95	1.40	0.44			1.21	0.018	0.63	0.019	1.00	0.35	0.96	0.019	0.34	0.006	4%
16	9.30	1.01	0.36	0.69	0.014					0.88	0.38	0.65	0.012	0.24	0.003	2%
17	9.70	0.87	0.35	0.61	0.009					0.88	0.43	0.52	0.008	0.22	0.002	1%
18	10.15	0.55	0.28	0.42	-0.001					0.88	0.50	0.27	-0.001	0.14	0.000	0%
19	10.70	0.48	0.25	0.37	0.000					0.88	0.57	0.23	0.000	0.13	0.000	0%
20	11.30	0.30	0.15	0.23	-0.001					0.88	0.40	0.15	-0.001	0.06	0.000	0%
RB	11.50	0.00	0.00		0.000		0.000		0.000	0.88	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.142</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 6m upstream of transducer

Meas. Start Time (MST):	12:28
Meas. End Time (MST):	13:20
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Good
Weather:	Overcast, -10 C



**Flow characteristics:**

Total Flow:	0.142	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.78	(m <sup>2</sup> )
Wetted Width:	8.20	(m)
Hydraulic Depth:	0.95	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.190	
Water (°C):	0.3	
Datalogger Clock:	12:08	
Laptop Clock:	12:08	
Battery (Main):	14.7	
Battery:	Good	
Battery Serial #:	-	
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05-01	1.312	99.681		98.369	98.369	Old 3/4" Pipe, 4m West of logger
S05-02			1.161	98.520	98.516	3/4" Pipe 8m SW of logger
S05-03			1.242	98.439	98.400	T-post close to old stilling well
Water Level:	Cut		2.492			Time WL Surveyed: 13:38
Temporary BM			2.425		0.000	
<b>Turn</b>						
Temporary BM	2.409	99.665	97.256	97.256	-	
Water Level:	Cut		2.479	97.186		Time WL Surveyed: 13:40
S05-03			1.227	98.438	98.400	T-post close to old stilling well
S05-02			1.148	98.517	98.516	3/4" Pipe 8m SW of logger
S05-01			1.298	98.367	98.369	Old 3/4" Pipe, 4m West of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	97.188	-
Closing Error:	0.002	-
WL Check:	0.003	-
Transducer Elevation	95.998	-

**Field Personnel:**

	DW, MP	Trip Date:	10-Mar-14
Data Entry Personnel:	DW	Date:	10-Mar-14
Data Check Personnel:	CJ	Date:	8-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: April 6, 2014  
 Site Visit Time (MST): 10:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.70	0.00	0.00		0.000		0.000		0.000	1.00	0.23	0.00	0.000	0.00	0.000	
1	4.15	1.40	0.25			1.17	-0.003	0.48	0.026	1.00	0.45	1.15	0.012	0.52	0.006	5%
2	4.60	1.63	0.35			1.37	-0.006	0.61	0.030	1.00	0.38	1.28	0.012	0.48	0.006	5%
3	4.90	1.82	0.43			1.54	-0.003	0.71	0.032	1.00	0.35	1.39	0.015	0.49	0.007	6%
4	5.30	1.84	0.52			1.58	0.017	0.78	0.033	1.00	0.33	1.32	0.025	0.43	0.011	9%
5	5.55	1.84	0.75			1.62	0.022	0.97	0.024	1.00	0.15	1.09	0.023	0.16	0.004	3%
6	5.60	1.90	0.60			1.64	0.021	0.86	0.036	1.00	0.20	1.30	0.029	0.26	0.007	6%
7	5.95	1.91	0.65			1.66	0.028	0.90	0.030	1.00	0.32	1.26	0.029	0.41	0.012	10%
8	6.25	1.80	0.72			1.58	0.022	0.94	0.036	1.00	0.38	1.08	0.029	0.41	0.012	10%
9	6.70	1.82	0.75			1.61	0.026	0.96	0.026	1.00	0.28	1.07	0.026	0.29	0.008	6%
10	6.80	1.80	0.75			1.59	0.016	0.96	0.026	1.00	0.23	1.05	0.021	0.24	0.005	4%
11	7.15	1.75	0.75			1.55	0.011	0.95	0.024	1.00	0.33	1.00	0.018	0.33	0.006	5%
12	7.45	1.70	0.72			1.50	0.011	0.92	0.024	1.00	0.32	0.98	0.018	0.32	0.006	5%
13	7.80	1.65	0.64			1.45	0.009	0.84	0.024	1.00	0.38	1.01	0.017	0.38	0.006	5%
14	8.20	1.54	0.55			1.34	0.012	0.75	0.020	1.00	0.32	0.99	0.016	0.32	0.005	4%
15	8.45	1.49	0.53			1.30	0.019	0.72	0.016	1.00	0.30	0.96	0.018	0.29	0.005	4%
16	8.80	1.39	0.45			1.20	0.018	0.64	0.008	1.00	0.35	0.94	0.013	0.33	0.004	4%
17	9.15	1.27	0.40			1.10	0.015	0.57	0.015	1.00	0.32	0.87	0.015	0.28	0.004	4%
18	9.45	1.09	0.35	0.72	0.012					0.88	0.32	0.74	0.011	0.24	0.003	2%
19	9.80	0.90	0.30	0.60	0.012					0.88	0.32	0.60	0.011	0.20	0.002	2%
20	10.10	0.74	0.33	0.54	0.009					0.88	0.30	0.41	0.008	0.12	0.001	1%
21	10.40	0.60	0.33	0.47	0.005					0.88	0.40	0.27	0.004	0.11	0.000	0%
RB	10.90	0.00	0.00		0.00		0.00		0.00	0.88	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.119</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
7m upstream of transducer

Mess. Start Time (MST):	11:12
Mess. End Time (MST):	11:56
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 0 C

**Flow characteristics:**

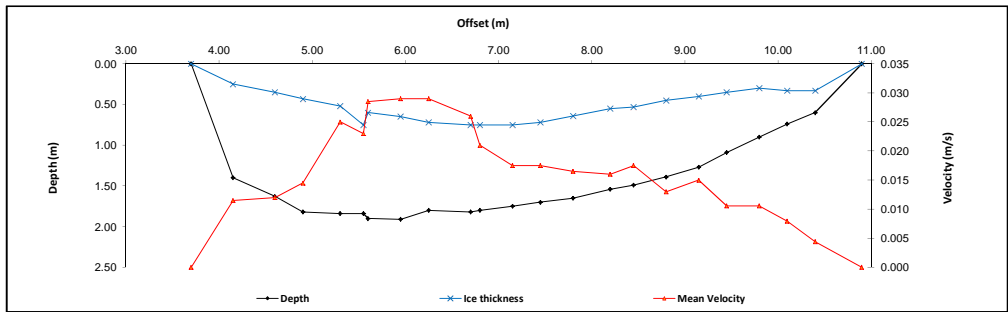
Total Flow:	0.119	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	6.59	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.92	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.183	
Water (°C):	0.3	
Datalogger Clock:	10:46	
Laptop Clock:	10:46	
Battery (Main):	14.3	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessoricant:		Good
Vent Tube Dessoricant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05-02	1.216	99.732		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.372	98.360	98.369	Old 3/4" Pipe, 4m West of logger
S05-03			1.297	98.435	98.400	T-post close to old stilling well
Water Level:	Cut		2.566	97.166	Time WL Surveyed: 11:04	
Temporary BM			2.500	97.232	0.000	
<b>Turn</b>						
Temporary BM	2.483	99.715		97.232		
Water Level:	Cut		2.550	97.165	Time WL Surveyed: 11:06	
S05-03			1.279	98.436	98.400	T-post close to old stilling well
S05-01			1.351	98.364	98.369	Old 3/4" Pipe, 4m West of logger
S05-02			1.197	98.518	98.516	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.166	-
Closing Error:	-0.002	-
WL Check:	0.001	-
Transducer Elevation	95.983	-

**Field Personnel:**

SM, CJ	Trip Date:	6-Apr-14
SM	Date:	6-Apr-14
CJ	Date:	29-May-14
Entered Digitally in the Field:	Yes	



# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: June 17, 2014  
 Site Visit Time (MST): 12:45

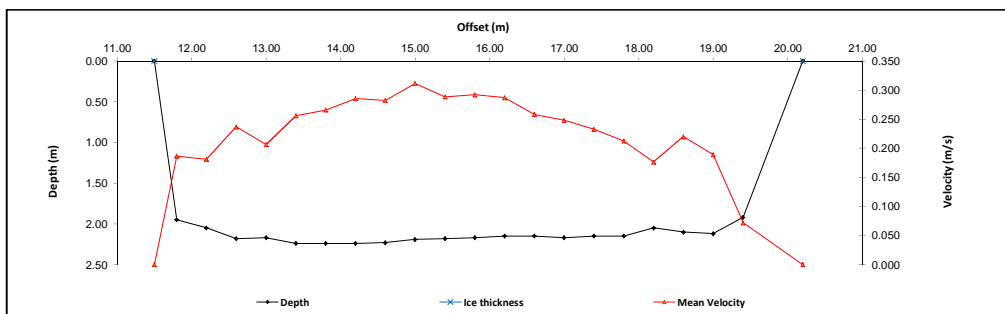


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	11.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	11.80	1.95				1.56	0.190	0.39	0.183	1.00	0.35	1.95	0.187	0.68	0.127	3%
2	12.20	2.05				1.64	0.185	0.41	0.177	1.00	0.40	2.05	0.181	0.82	0.148	4%
3	12.60	2.18				1.74	0.232	0.44	0.242	1.00	0.40	2.18	0.237	0.87	0.207	5%
4	13.00	2.17				1.74	0.239	0.43	0.174	1.00	0.40	2.17	0.207	0.87	0.179	4%
5	13.40	2.24				1.79	0.282	0.45	0.230	1.00	0.40	2.24	0.256	0.90	0.229	6%
6	13.80	2.24				1.79	0.265	0.45	0.267	1.00	0.40	2.24	0.266	0.90	0.238	6%
7	14.20	2.24				1.79	0.301	0.45	0.270	1.00	0.40	2.24	0.286	0.90	0.256	6%
8	14.60	2.23				1.78	0.285	0.45	0.280	1.00	0.40	2.23	0.283	0.89	0.252	6%
9	15.00	2.19				1.75	0.338	0.44	0.285	1.00	0.40	2.19	0.312	0.88	0.273	7%
10	15.40	2.18				1.74	0.297	0.44	0.280	1.00	0.40	2.18	0.289	0.87	0.252	6%
11	15.80	2.17				1.74	0.332	0.43	0.252	1.00	0.40	2.17	0.292	0.87	0.253	6%
12	16.20	2.15				1.72	0.329	0.43	0.245	1.00	0.40	2.15	0.287	0.86	0.247	6%
13	16.60	2.15				1.72	0.277	0.43	0.239	1.00	0.40	2.15	0.258	0.86	0.222	5%
14	17.00	2.17				1.74	0.270	0.43	0.226	1.00	0.40	2.17	0.248	0.87	0.215	5%
15	17.40	2.15				1.72	0.272	0.43	0.193	1.00	0.40	2.15	0.233	0.86	0.200	5%
16	17.80	2.15				1.72	0.244	0.43	0.181	1.00	0.40	2.15	0.213	0.86	0.183	5%
17	18.20	2.05				1.64	0.128	0.41	0.225	1.00	0.40	2.05	0.177	0.82	0.145	4%
18	18.60	2.10				1.68	0.156	0.42	0.284	1.00	0.40	2.10	0.220	0.84	0.185	5%
19	19.00	2.12				1.70	0.131	0.42	0.247	1.00	0.40	2.12	0.189	0.85	0.160	4%
20	19.40	1.92				1.54	0.112	0.38	0.032	1.00	0.60	1.92	0.072	1.15	0.083	2%
LB	20.20	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>4.05</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -3m downstream of PT

Meas. Start Time (MST):	13:41
Meas. End Time (MST):	14:42
Equipment:	ADV
Method:	Fishcat
River Condition:	High stage
Channel Edges:	Straight Edge (e.g. bridge/pier)
Quality/Error (see reverse):	Excellent
Weather:	Partly sunny, 18 C



**Flow characteristics:**

Total Flow:	4.05	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	17.41	(m²)
Wetted Width:	8.70	(m)
Hydraulic Depth:	2.00	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	2.069	2.061
Water (°C):	16.7	16.9
Datalogger Clock:	13:03	14:44
Laptop Clock:	13:03	14:44
Battery (Main):	13.8	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	284728	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Banks are slightly flooded

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05-02	1.177	99.693		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.337	98.356	98.369	Old 3/4" Pipe, 4m West of logger
S05-03			1.226	98.467	98.400	T-post close to old stilling well
Water Level:	Cut		1.707	97.986	Time WL Surveyed: 13:11	
Temporary BM			1.343	98.350	0.000	-
<b>Turn</b>						
Temporary BM	1.328	99.678		98.350	-	
Water Level:	Cut		1.691	97.987	Time WL Surveyed: 13:14	
S05-03			1.210	98.468	98.400	T-post close to old stilling well
S05-01			1.322	98.356	98.369	Old 3/4" Pipe, 4m West of logger
S05-02			1.161	98.517	98.516	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05-03	1.208	99.676		98.468		
Water Level:	Cut		1.701	97.975	Time WL Surveyed: 14:46	
Water Level:	Cut		1.684	97.978	Time WL Surveyed: 14:47	
S05-03	1.194	99.662		98.468		

**WL Survey Summary**

	Before	After
Average WL:	97.987	97.977
Closing Error:	-0.001	-
WL Check:	0.001	-0.003
Transducer Elevation	95.918	95.916

**Field Personnel:**

	DW, MP	Trip Date:	17-Jun-14
Data Entry Personnel:	DW	Date:	17-Jun-14
Data Check Personnel:	CJ	Date:	25-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: August 11, 2014  
 Site Visit Time (MST): 14:20



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	1.00	1.10				0.88	-0.003	0.22	0.000	1.00	0.45	1.10	-0.002	0.50	-0.001	0%
2	1.40	1.46				1.17	0.009	0.29	0.014	1.00	0.40	1.46	0.012	0.58	0.007	1%
3	1.80	1.58				1.26	0.026	0.32	0.024	1.00	0.40	1.58	0.025	0.63	0.016	3%
4	2.20	1.58				1.26	0.035	0.32	0.035	1.00	0.40	1.58	0.035	0.63	0.022	4%
5	2.60	1.58				1.26	0.002	0.32	0.048	1.00	0.40	1.58	0.025	0.63	0.016	3%
6	3.00	1.56				1.25	0.019	0.31	0.050	1.00	0.40	1.56	0.035	0.62	0.022	4%
7	3.40	1.60				1.28	0.037	0.32	0.046	1.00	0.40	1.60	0.042	0.64	0.027	5%
8	3.80	1.52				1.22	0.044	0.30	0.047	1.00	0.40	1.52	0.046	0.61	0.028	5%
9	4.20	1.53				1.22	0.053	0.31	0.047	1.00	0.40	1.53	0.050	0.61	0.031	5%
10	4.60	1.53				1.22	0.049	0.31	0.053	1.00	0.40	1.53	0.051	0.61	0.031	5%
11	5.00	1.68				1.34	0.049	0.34	0.049	1.00	0.40	1.68	0.049	0.67	0.033	6%
12	5.40	1.70				1.36	0.054	0.34	0.057	1.00	0.40	1.70	0.056	0.68	0.038	7%
13	5.80	1.70				1.36	0.052	0.34	0.063	1.00	0.40	1.70	0.058	0.68	0.039	7%
14	6.20	1.72				1.38	0.055	0.34	0.067	1.00	0.40	1.72	0.061	0.69	0.042	7%
15	6.60	1.74				1.39	0.066	0.35	0.067	1.00	0.40	1.74	0.067	0.70	0.046	8%
16	7.00	1.75				1.40	0.054	0.35	0.066	1.00	0.40	1.75	0.060	0.70	0.042	7%
17	7.40	1.72				1.38	0.035	0.34	0.051	1.00	0.40	1.72	0.043	0.69	0.030	5%
18	7.80	1.70				1.36	0.059	0.34	0.052	1.00	0.40	1.70	0.056	0.68	0.038	7%
19	8.20	1.62				1.30	0.042	0.32	0.050	1.00	0.40	1.62	0.046	0.65	0.030	5%
20	8.60	1.52				1.22	0.031	0.30	0.042	1.00	0.40	1.52	0.037	0.61	0.022	4%
21	9.00	1.48				1.18	0.022	0.30	0.038	1.00	0.50	1.48	0.030	0.74	0.022	4%
LB	9.60	0.00	0.00		0.00				0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.579</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 - adjacent to landing pad

Mess. Start Time (MST):	14:53
Mess. End Time (MST):	15:46
Equipment:	ADV
Method:	Fishcat
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, breezy, 25 C

**Flow characteristics:**

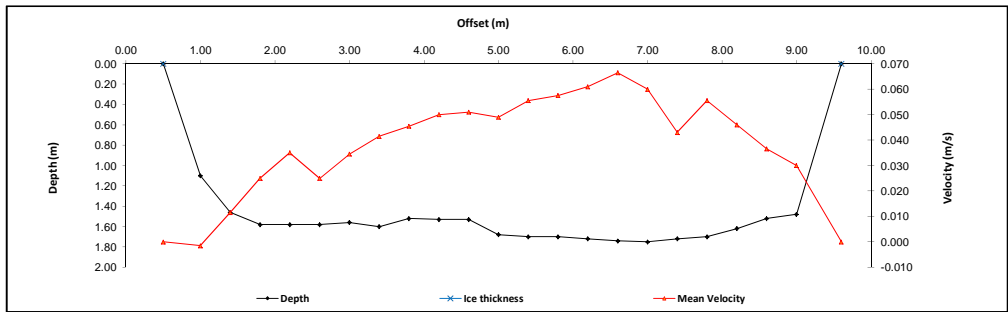
Total Flow:	0.579	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	13.55	(m <sup>2</sup> )
Wetted Width:	9.10	(m)
Hydraulic Depth:	1.49	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.517	1.517
Water (°C):	17.5	17.8
Datalogger Clock:	14:24	15:55
Laptop Clock:	14:24	15:55
Battery (Main):	13.6	13.6
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05-02	0.872	99.388		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.027	98.361	98.369	Old 3/4" Pipe, 4m West of logger
S05-03			0.913	98.475	98.400	T-post close to old stilling well
Water Level:	Cut		1.999	97.389	Time WL Surveyed: 14:34	
Temporary BM			0.913	98.475	0.000	
<b>Turn</b>						
Temporary BM	0.902	99.377		98.475		
Water Level:	Cut		1.985	97.392	Time WL Surveyed: 14:35	
S05-03			0.902	98.475	98.400	T-post close to old stilling well
S05-01			1.018	98.359	98.369	Old 3/4" Pipe, 4m West of logger
S05-02			0.863	98.514	98.516	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05-03	0.902	99.377		98.475		
Water Level:	Cut		1.989	97.388	Time WL Surveyed: 15:53	
Water Level:	Cut		1.981	97.389	Time WL Surveyed: 15:54	
S05-03	0.895	99.370		98.475		

**WL Survey Summary**

	Before	After
Average WL:	97.391	97.389
Closing Error:	0.002	-
WL Check:	0.003	-0.001
Transducer Elevation	95.874	95.872

**Field Personnel:**

SM, CJ	Trip Date:	11-Aug-14
CJ	Date:	11-Aug-14
GG	Date:	8-Sep-14
Entered Digitally in the Field:	Yes	



# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek

UTM Location: 489491 E, 6345029 N

Site Visit Date: \_\_\_\_\_

September 25, 2014

Site Visit Time (MST): \_\_\_\_\_

07:50



<b>Flow Measurement Details:</b>	
<b>Metering Section Location (describe):</b> 6m down stream of heli landing	
Meas. Start Time (MST):	8:30
Meas. End Time (MST):	8:55
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, light breeze, 15 C

<b>Flow characteristics:</b>		
Total Flow:	0.406	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	12.59	(m <sup>2</sup> )
Wetted Width:	11.21	(m)
Hydraulic Depth:	1.12	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.01	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	1.621	1.622
Water (°C):	10.7	10.6
Datalogger Clock:	07:54	09:03
Laptop Clock:	07:54	09:03
Battery (Main):	12.8	13.4
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
installed cableway, needs anchor cable and cable fasteners

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	2.80	
Serial Number:	4712		Salinity (ppt):	0.0		RB:	13.40	
Firmware Version:	3.50		Magnetic Declination (°):	14				
Software Version:	3.70		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	19.2				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	11.03	12.65	0.032	0.407	0.37%
Coordinate System:	ENU		3	11.17	12.48	0.032	0.401	-1.11%
Left Method:	Sloped bank		5	11.27	12.59	0.032	0.406	0.12%
Right Method:	Sloped bank		7	11.37	12.63	0.032	0.408	0.62%
Top Fit Type:	Power fit		-	-	-	-	-	-
Bottom Fit Type:	Power fit		-	-	-	-	-	-
			<b>Mean:</b>	11.21	12.59	0.032	<b>0.406</b>	
			<b>SD:</b>	0.13	0.07	0.000	0.003	
			<b>COV:</b>	0.01	0.01	0.000	0.007	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S05-02	0.928	99.444		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.085	98.359	98.369	Old 3/4" Pipe, 4m West of logger
S05-03			0.969	98.475	98.400	T-post close to old stilling well
Water Level:	Cut		1.958	97.486	<b>Time WL Surveyed:</b>	8:01
S05-03			0.969	98.475	98.400	T-post close to old stilling well
<b>Turn</b>						
S05-03	0.947	99.422		98.475	98.400	T-post close to old stilling well
Water Level:	Cut		1.935	97.487	<b>Time WL Surveyed:</b>	8:02
S05-03			0.947	98.475	98.400	T-post close to old stilling well
S05-01			1.062	98.360	98.369	Old 3/4" Pipe, 4m West of logger
S05-02			0.903	98.519	98.516	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05-03	0.946	99.421		98.475		
Water Level:	Cut		1.934	97.487	<b>Time WL Surveyed:</b>	9:00
Water Level:	Cut		1.907	97.489	<b>Time WL Surveyed:</b>	9:02
S05-03	0.921	99.396		98.475		

<b>WL Survey Summary</b>	Before	After
Average WL:	97.487	97.488
Closing Error:	-0.003	-
WL Check:	0.001	-0.002
Transducer Elevation	95.866	95.866

<b>Field Personnel:</b>	TR, MP	Trip Date:	25-Sep-14
Data Entry Personnel:	TR	Date:	25-Sep-14
Data Check Personnel:	GG	Date:	20-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: October 15, 2014  
 Site Visit Time (MST): 13:45

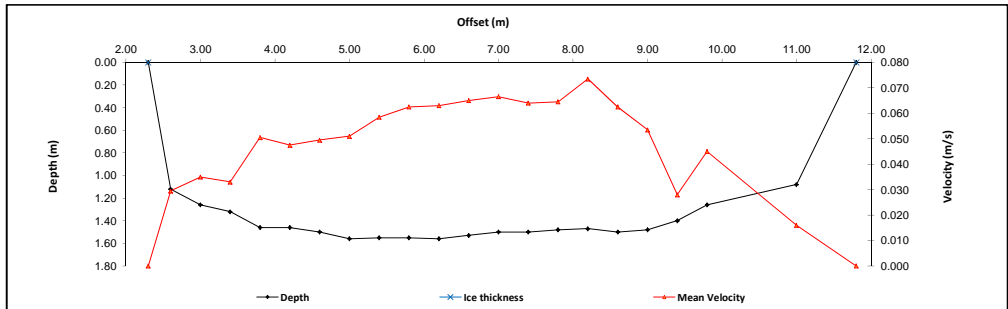


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	2.30	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.60	1.12			0.90	0.032	0.22	0.027		1.00	0.35	1.12	0.030	0.39	0.012	2%
2	3.00	1.26			1.01	0.020	0.25	0.050		1.00	0.40	1.26	0.035	0.50	0.018	3%
3	3.40	1.32			1.06	0.020	0.26	0.046		1.00	0.40	1.32	0.033	0.53	0.017	3%
4	3.80	1.46			1.17	0.047	0.29	0.054		1.00	0.40	1.46	0.051	0.58	0.029	5%
5	4.20	1.46			1.17	0.045	0.29	0.050		1.00	0.40	1.46	0.048	0.58	0.028	4%
6	4.60	1.50			1.20	0.046	0.30	0.053		1.00	0.40	1.50	0.050	0.60	0.030	5%
7	5.00	1.56			1.25	0.045	0.31	0.057		1.00	0.40	1.56	0.051	0.62	0.032	5%
8	5.40	1.55			1.24	0.051	0.31	0.068		1.00	0.40	1.55	0.059	0.62	0.036	6%
9	5.80	1.55			1.24	0.066	0.31	0.059		1.00	0.40	1.55	0.063	0.62	0.039	6%
10	6.20	1.56			1.25	0.074	0.31	0.052		1.00	0.40	1.56	0.063	0.62	0.039	6%
11	6.60	1.53			1.22	0.068	0.31	0.062		1.00	0.40	1.53	0.065	0.61	0.040	6%
12	7.00	1.50			1.20	0.072	0.30	0.061		1.00	0.40	1.50	0.067	0.60	0.040	6%
13	7.40	1.50			1.20	0.072	0.30	0.056		1.00	0.40	1.50	0.064	0.60	0.038	6%
14	7.80	1.48			1.18	0.063	0.30	0.066		1.00	0.40	1.48	0.065	0.59	0.038	6%
15	8.20	1.47			1.18	0.071	0.29	0.076		1.00	0.40	1.47	0.074	0.59	0.043	7%
16	8.60	1.50			1.20	0.068	0.30	0.057		1.00	0.40	1.50	0.063	0.60	0.038	6%
17	9.00	1.48			1.18	0.047	0.30	0.060		1.00	0.40	1.48	0.054	0.59	0.032	5%
18	9.40	1.40			1.12	-0.001	0.28	0.057		1.00	0.40	1.40	0.028	0.56	0.016	3%
19	9.80	1.26			1.01	0.052	0.25	0.038		1.00	0.80	1.26	0.045	1.01	0.045	7%
20	11.00	1.08			0.86	0.000	0.22	0.032		1.00	1.00	1.08	0.016	1.08	0.017	3%
LB	11.80	0.00	0.00		0.000	0.000	0.000	0.000		1.00	0.40	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>0.627</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -5m downstream of heli. landing area

Meas. Start Time (MST):	14:15
Meas. End Time (MST):	15:07
Equipment:	ADV
Method:	Fishcat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 11 C



**Flow characteristics:**

Total Flow:	0.627	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	12.51	(m²)
Wetted Width:	9.50	(m)
Hydraulic Depth:	1.32	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.656	1.655
Water (°C):	5.9	6.0
Datalogger Clock:	13:54	15:18
Laptop Clock:	13:54	15:19
Battery (Main):	14.1	14.2
Battery:	-	Replaced
Battery Serial #:	-	1305001
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05-02	0.957	99.473		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.155	98.318	98.369	Old 3/4" Pipe, 4m West of logger
S05-03			0.997	98.476	98.400	T-post close to old stilling well
Water Level:	Cut		1.949	97.524	Time WL Surveyed: 14:08	
Temporary BM			1.925	97.548	0.000	-
<b>Turn</b>						
Temporary BM	1.914	99.462		97.548		
Water Level:	Cut		1.938	97.524	Time WL Surveyed: 14:10	
S05-03			0.987	98.475	98.400	T-post close to old stilling well
S05-01			1.104	98.358	98.369	Old 3/4" Pipe, 4m West of logger
S05-02			0.947	98.515	98.516	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05-03	0.987	99.462		98.475		
Water Level:	Cut		1.939	97.523	Time WL Surveyed: 15:14	
Water Level:	Cut		1.932	97.525	Time WL Surveyed: 15:16	
S05-03	0.982	99.457		98.475		

**WL Survey Summary**

	Before	After
Average WL:	97.524	97.524
Closing Error:	0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	95.868	95.869

**Field Personnel:**

	MP, DW	Trip Date:	15-Oct-14
Data Entry Personnel:	MP, DW	Date:	15-Oct-14
Data Check Personnel:	GG	Date:	21-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5 Muskeg River above Stanley Creek  
 UTM Location: 489491 E, 6345029 N

Site Visit Date: December 3, 2014  
 Site Visit Time (MST): 11:10

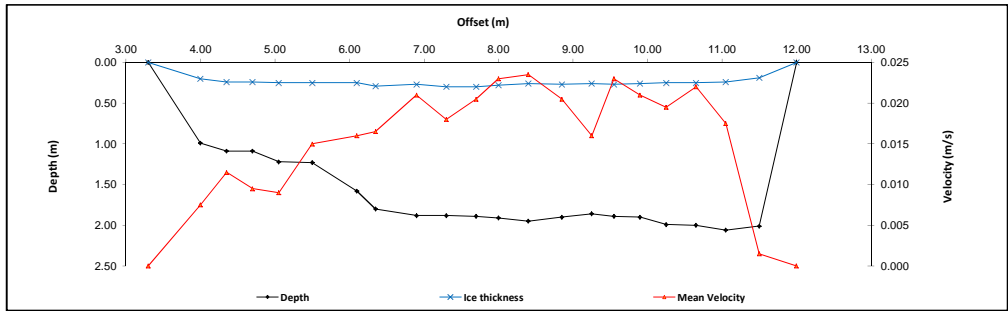


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	12.00	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	11.50	2.01	0.19			1.65	-0.004	0.55	0.007	1.00	0.48	1.82	0.002	0.86	0.001	1%
2	11.05	2.06	0.24			1.70	0.022	0.60	0.013	1.00	0.42	1.82	0.018	0.77	0.014	7%
3	10.65	2.00	0.25			1.65	0.023	0.60	0.021	1.00	0.40	1.75	0.022	0.70	0.015	8%
4	10.25	1.99	0.25			1.64	0.014	0.60	0.025	1.00	0.38	1.74	0.020	0.65	0.013	6%
5	9.90	1.90	0.26			1.57	0.014	0.59	0.028	1.00	0.35	1.64	0.021	0.57	0.012	6%
6	9.55	1.89	0.27			1.57	0.024	0.59	0.022	1.00	0.33	1.62	0.023	0.53	0.012	6%
7	9.25	1.86	0.26			1.54	0.009	0.58	0.023	1.00	0.35	1.60	0.016	0.56	0.009	5%
8	8.85	1.90	0.27			1.57	0.009	0.60	0.032	1.00	0.43	1.63	0.021	0.69	0.014	7%
9	8.40	1.95	0.26			1.61	0.026	0.60	0.021	1.00	0.43	1.69	0.024	0.72	0.017	8%
10	8.00	1.91	0.28			1.58	0.026	0.61	0.020	1.00	0.35	1.63	0.023	0.57	0.013	7%
11	7.70	1.89	0.30			1.57	0.018	0.62	0.023	1.00	0.35	1.59	0.021	0.56	0.011	6%
12	7.30	1.88	0.30			1.56	0.016	0.62	0.020	1.00	0.40	1.58	0.018	0.63	0.011	6%
13	6.90	1.88	0.27			1.56	0.017	0.59	0.025	1.00	0.48	1.61	0.021	0.76	0.016	8%
14	6.35	1.80	0.29			1.50	0.013	0.59	0.020	1.00	0.40	1.51	0.017	0.60	0.010	5%
15	6.10	1.58	0.25			1.31	0.010	0.52	0.022	1.00	0.43	1.33	0.016	0.57	0.009	5%
16	5.50	1.23	0.25			1.03	0.013	0.45	0.017	1.00	0.52	0.98	0.015	0.51	0.008	4%
17	5.05	1.22	0.25			1.03	0.005	0.44	0.013	1.00	0.40	0.97	0.009	0.39	0.003	2%
18	4.70	1.09	0.24			0.92	0.012	0.41	0.007	1.00	0.35	0.85	0.010	0.30	0.003	1%
19	4.35	1.09	0.24			0.92	0.013	0.41	0.010	1.00	0.35	0.85	0.012	0.30	0.003	2%
20	4.00	0.99	0.20			0.83	0.007	0.36	0.008	1.00	0.53	0.79	0.008	0.41	0.003	2%
LB	3.30	0.00	0.00		0.00		0.00		0.00	0.88	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.199</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from station

Meas. Start Time (MST):	11:42
Meas. End Time (MST):	12:23
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, -20 C



**Flow characteristics:**

Total Flow:	0.199	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.67	(m <sup>2</sup> )
Wetted Width:	8.70	(m)
Hydraulic Depth:	1.34	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.00	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.481	1.481
Water (°C):	0.3	0.3
Datalogger Clock:	11:12	12:30
Laptop Clock:	11:12	12:30
Battery (Main):	12.9	12.5
Battery:	Replaced	
Battery Serial #:	1305001	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Modem replaced

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05-02	1.049	99.565		98.516	98.516	3/4" Pipe 8m SW of logger
S05-01			1.203	98.362	98.360	Old 3/4" Pipe, 4m West of logger
S05-03			1.086	98.479	98.476	T-post close to old stilling well
Water Level:	Cut		2.223	97.342		Time WL Surveyed: 11:32
Temporary BM			2.144	97.421	0.000	
<b>Turn</b>						
Temporary BM	2.112	99.533		97.421		
Water Level:	Cut		2.195	97.338		Time WL Surveyed: 11:34
S05-03			1.055	98.478	98.476	T-post close to old stilling well
S05-01			1.173	98.360	98.360	Old 3/4" Pipe, 4m West of logger
S05-02			1.018	98.515	98.516	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05-01	1.173	99.534		98.361		
Water Level:	Cut		2.193	97.341		Time WL Surveyed: 12:26
Water Level:	Cut		2.158	97.342		Time WL Surveyed: 12:27
S05-01	1.139	99.500		98.361		

**WL Survey Summary**

	Before	After
Average WL:	97.340	97.342
Closing Error:	0.001	-
WL Check:	0.004	-0.001
Transducer Elevation	95.859	95.861

**Field Personnel:**

TR, CJ	Trip Date:	3-Dec-14
TR	Date:	3-Dec-14
CJ	Date:	5-Jan-15
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: January 29, 2014  
 Site Visit Time (MST): 09:50



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.30	0.00	0.00		0.000		0.000		0.000	0.88	0.10	0.00	0.000	0.00	0.000	
1	3.50	0.87	0.15	0.51	-0.001					0.88	0.35	0.72	-0.001	0.25	0.000	0%
2	4.00	0.90	0.16	0.53	0.001					0.88	0.58	0.74	0.001	0.43	0.000	0%
3	4.65	0.99	0.25	0.62	0.001					0.88	0.70	0.74	0.001	0.52	0.000	0%
4	5.40	1.16	0.36							1.00	0.73	0.80	0.001	0.58	0.000	0%
5	6.10	1.14	0.42	0.78	0.002	1.00	0.000	0.52	0.001	0.88	0.70	0.72	0.002	0.50	0.001	0%
6	6.80	1.51	0.46			1.30	0.009	0.67	0.017	1.00	0.78	1.05	0.013	0.81	0.011	5%
7	7.65	1.53	0.54			1.33	0.021	0.74	0.023	1.00	0.68	0.99	0.022	0.67	0.015	8%
8	8.15	1.56	0.55			1.36	0.021	0.75	0.032	1.00	0.42	1.01	0.027	0.43	0.011	6%
9	8.50	1.51	0.55			1.32	0.037	0.74	0.031	1.00	0.28	0.96	0.034	0.26	0.009	5%
10	8.70	1.50	0.56			1.31	0.041	0.75	0.038	1.00	0.33	0.94	0.040	0.31	0.012	6%
11	9.15	1.42	0.56			1.25	0.025	0.73	0.038	1.00	0.38	0.86	0.032	0.32	0.010	5%
12	9.45	1.42	0.55			1.25	0.045	0.72	0.055	1.00	0.22	0.87	0.050	0.20	0.010	5%
13	9.60	1.40	0.55			1.23	0.035	0.72	0.041	1.00	0.55	0.85	0.038	0.47	0.018	9%
14	10.55	1.42	0.53			1.24	0.028	0.71	0.039	1.00	0.68	0.89	0.034	0.60	0.020	10%
15	10.95	1.48	0.50			1.28	0.033	0.70	0.030	1.00	0.40	0.98	0.032	0.39	0.012	6%
16	11.35	1.48	0.46			1.28	0.025	0.66	0.033	1.00	0.68	1.02	0.029	0.69	0.020	10%
17	12.30	1.47	0.44			1.26	0.019	0.65	0.025	1.00	0.85	1.03	0.022	0.88	0.019	10%
18	13.05	1.48	0.36			1.26	0.016	0.58	0.019	1.00	0.73	1.12	0.018	0.81	0.014	7%
19	13.75	1.19	0.42			1.04	0.015	0.57	0.022	1.00	0.73	0.77	0.019	0.56	0.010	5%
20	14.50	0.95	0.26	0.61	0.005					0.88	0.70	0.69	0.004	0.48	0.002	1%
21	15.15	1.10	0.23			0.93	-0.001	0.40	0.001	1.00	0.93	0.87	0.000	0.80	0.000	0%
22	16.35	0.78	0.20	0.49	0.002					0.88	0.77	0.58	0.002	0.45	0.001	0%
LB	16.70	0.00	0.00		0.00		0.00		0.00	0.88	0.17	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.196</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Mess. Start Time (MST):	10:30
Mess. End Time (MST):	11:17
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, -20 C

**Flow characteristics:**

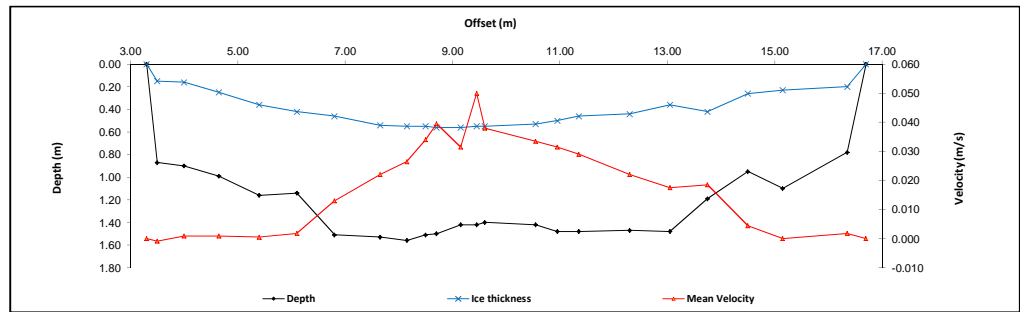
Total Flow:	0.196	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.41	(m <sup>2</sup> )
Wetted Width:	13.40	(m)
Hydraulic Depth:	0.85	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.384	1.384
Water (°C):	0.1	0.1
Barometric Pressure (kPa):	98.08	98.16
Datalogger Clock:	10:03	11:23
Laptop Clock:	10:03	11:23
Battery (Main):	12.9	15.0
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Good
Vent Tube Dessiccant:	-	Good
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05A-02	1.709	283.868		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			1.152	282.716	282.697	T-post 4m NW of logger
S05A-03			1.516	282.352	282.352	Pipe 3m N of logger
Water Level:	Cut		2.830	281.038	Time WL Surveyed:	10:23
Temporary BM			2.824	281.044	0.000	-
<b>Turn</b>						
Temporary BM	2.802	283.846		281.044		
Water Level:	Cut		2.808	281.038	Time WL Surveyed:	10:25
S05A-03			1.495	282.351	282.352	Pipe 3m N of logger
S05A-01			1.130	282.716	282.697	T-post 4m NW of logger
S05A-02			1.687	282.159	282.159	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05A-03	1.495	283.847		282.352		
Water Level:	Cut		2.804	281.043	Time WL Surveyed:	11:20
Water Level:	Cut		2.790	281.040	Time WL Surveyed:	11:22
S05A-03	1.478	283.830		282.352		

**WL Survey Summary**

	Before	After
Average WL:	281.038	281.042
Closing Error:	0.000	-
WL Check:	0.000	0.003
Transducer Elevation	279.654	279.658

**Field Personnel:**

SM,TR	Trip Date:	29-Jan-14
SM	Date:	29-Jan-14
DW	Date:	21-Feb-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: February 19, 2014  
 Site Visit Time (MST): 09:50

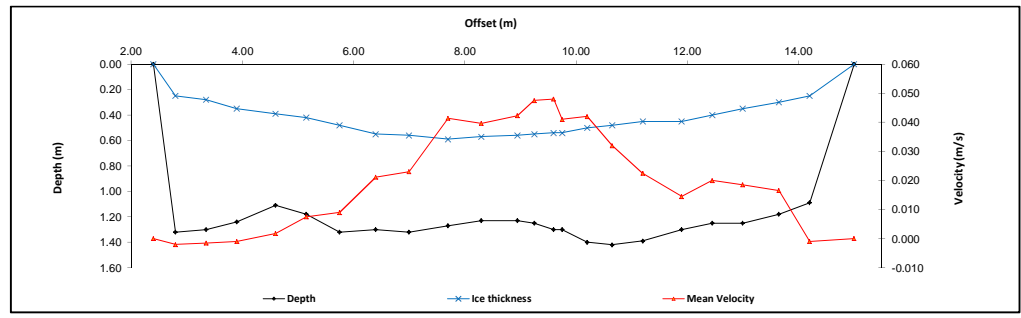


Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	2.80	1.32	0.25			1.11	-0.002	0.46	-0.002	1.00	0.48	1.07	-0.002	0.51	-0.001	-1%
2	3.35	1.30	0.28			1.10	-0.003	0.48	0.000	1.00	0.55	1.02	-0.002	0.56	-0.001	0%
3	3.90	1.24	0.35			1.06	-0.001	0.53	-0.001	1.00	0.63	0.89	-0.001	0.56	-0.001	0%
4	4.60	1.11	0.39	0.75	0.002					0.88	0.63	0.72	0.002	0.45	0.001	0%
5	5.15	1.18	0.42			1.03	0.003	0.57	0.012	1.00	0.58	0.76	0.008	0.44	0.003	2%
6	5.75	1.32	0.48			1.15	0.006	0.65	0.012	1.00	0.63	0.84	0.009	0.53	0.005	3%
7	6.40	1.30	0.55	0.93	0.024					0.88	0.63	0.75	0.021	0.47	0.010	5%
8	7.00	1.32	0.56			1.17	0.017	0.71	0.029	1.00	0.65	0.76	0.023	0.49	0.011	6%
9	7.70	1.27	0.59	0.93	0.047					0.88	0.65	0.68	0.041	0.44	0.018	10%
10	8.30	1.23	0.57	0.90	0.045					0.88	0.63	0.66	0.040	0.41	0.016	9%
11	8.95	1.23	0.56	0.90	0.048					0.88	0.48	0.67	0.042	0.32	0.013	7%
12	9.25	1.25	0.55	0.90	0.054					0.88	0.33	0.70	0.048	0.23	0.011	6%
13	9.60	1.30	0.54			1.15	0.044	0.69	0.052	1.00	0.25	0.76	0.048	0.19	0.009	5%
14	9.75	1.30	0.54			1.15	0.023	0.69	0.059	1.00	0.30	0.76	0.041	0.23	0.009	5%
15	10.20	1.40	0.50			1.22	0.039	0.68	0.045	1.00	0.45	0.90	0.042	0.41	0.017	9%
16	10.65	1.42	0.48			1.23	0.031	0.67	0.033	1.00	0.50	0.94	0.032	0.47	0.015	8%
17	11.20	1.39	0.45			1.20	0.019	0.64	0.026	1.00	0.63	0.94	0.023	0.59	0.013	7%
18	11.90	1.30	0.45			1.13	0.005	0.62	0.024	1.00	0.63	0.85	0.015	0.53	0.008	4%
19	12.45	1.25	0.40			1.08	0.019	0.57	0.021	1.00	0.55	0.85	0.020	0.47	0.009	5%
20	13.00	1.25	0.35			1.07	0.018	0.53	0.019	1.00	0.60	0.90	0.019	0.54	0.010	5%
21	13.65	1.18	0.30			1.00	0.009	0.48	0.024	1.00	0.60	0.88	0.017	0.53	0.009	5%
22	14.20	1.09	0.25			0.92	-0.002	0.42	0.000	1.00	0.67	0.84	-0.001	0.57	-0.001	0%
LB	15.00	0.00	0.00		0.00					0.88	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.185</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Mess. Start Time (MST):	10:35
Mess. End Time (MST):	11:35
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, light breeze, -10 C



**Flow characteristics:**

Total Flow:	0.185	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.91	(m <sup>2</sup> )
Wetted Width:	12.60	(m)
Hydraulic Depth:	0.79	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.359	-
Water (°C):	0.1	-
Barometric Pressure (kPa):	97.102	-
Datalogger Clock:	09:59	-
Laptop Clock:	09:59	-
Battery (Main):	13.2	13.2
Battery:		Replaced
Battery Serial #:	1005002	-
Enclosure Dessicant:		Good
Vent. Tube Dessicant:		Good
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05A-02	1.799	283.958		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			1.237	282.721	282.697	T-post 4m NW of logger
S05A-03			1.614	282.344	282.352	Pipe 3m N of logger
Water Level:	Cut		2.953	281.005	<b>Time WL Surveyed:</b>	10:26
Temporary BM			2.910	281.048	0.000	
<b>Turn</b>						
Temporary BM	2.899	283.947		281.048		
Water Level:	Cut		2.942	281.005	<b>Time WL Surveyed:</b>	10:31
S05A-03			1.602	282.345	282.352	Pipe 3m N of logger
S05A-01			1.226	282.721	282.697	T-post 4m NW of logger
S05A-02			1.788	282.159	282.159	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

**WL Survey Summary**

	Before	After
Average WL:	281.005	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	279.646	-

**Field Personnel:**

SM, MP	Trip Date:	19-Feb-14
Data Entry Personnel: SM	Date:	19-Feb-14
Data Check Personnel: DW	Date:	21-Feb-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: March 17, 2014  
 Site Visit Time (MST): 08:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.00	0.00	0.00		0.000		0.000		0.000	0.88	0.18	0.00	0.000	0.00	0.000	
1	3.35	1.05	0.40	0.73	0.003					0.88	0.55	0.65	0.003	0.36	0.001	0%
2	4.10	0.80	0.45	0.63	0.012					0.88	0.65	0.35	0.011	0.23	0.002	1%
3	4.65	1.00	0.53	0.77	0.011					0.88	0.55	0.47	0.010	0.26	0.003	1%
4	5.20	1.05	0.56	0.81	0.017					0.88	0.48	0.49	0.015	0.23	0.003	2%
5	5.60	1.12	0.60	0.86	0.019					0.88	0.38	0.52	0.017	0.20	0.003	2%
6	5.95	1.18	0.65	0.92	0.011					0.88	0.40	0.53	0.010	0.21	0.002	1%
7	6.40	1.24	0.65	0.95	0.017					0.88	0.48	0.59	0.015	0.28	0.004	2%
8	6.90	1.28	0.65	0.97	0.025					0.88	0.48	0.63	0.022	0.30	0.007	3%
9	7.35	1.25	0.65	0.95	0.033					0.88	0.43	0.60	0.029	0.26	0.007	4%
10	7.75	1.22	0.63	0.93	0.039					0.88	0.40	0.59	0.034	0.24	0.008	4%
11	8.15	1.22	0.60	0.91	0.033					0.88	0.37	0.62	0.029	0.23	0.007	4%
12	8.50	1.22	0.58	0.90	0.035					0.88	0.43	0.64	0.031	0.27	0.008	4%
13	9.00	1.25	0.55	0.90	0.046					0.88	0.48	0.70	0.040	0.33	0.013	7%
14	9.45	1.30	0.53			1.15	0.040	0.68	0.040	1.00	0.48	0.77	0.040	0.37	0.015	8%
15	9.95	1.30	0.50			1.14	0.032	0.66	0.050	1.00	0.45	0.80	0.041	0.36	0.015	8%
16	10.35	1.30	0.48			1.14	0.026	0.64	0.047	1.00	0.43	0.82	0.037	0.35	0.013	7%
17	10.80	1.28	0.45			1.11	0.017	0.62	0.049	1.00	0.43	0.83	0.033	0.35	0.012	6%
18	11.20	1.25	0.44			1.09	0.023	0.60	0.042	1.00	0.48	0.81	0.033	0.38	0.013	7%
19	11.75	1.22	0.43			1.06	0.035	0.59	0.033	1.00	0.60	0.79	0.034	0.47	0.016	8%
20	12.40	1.20	0.40			1.04	0.019	0.56	0.034	1.00	0.55	0.80	0.027	0.44	0.012	6%
21	12.85	1.20	0.35			1.03	0.024	0.52	0.036	1.00	0.48	0.85	0.030	0.40	0.012	6%
22	13.35	1.22	0.20			1.02	0.027	0.40	0.035	1.00	0.48	1.02	0.031	0.48	0.015	8%
LB	13.80	0.00	0.00		0.00		0.00		0.00	0.88	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.191</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Meas. Start Time (MST):	8:45
Meas. End Time (MST):	9:42
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, light breeze, 0 C

**Flow characteristics:**

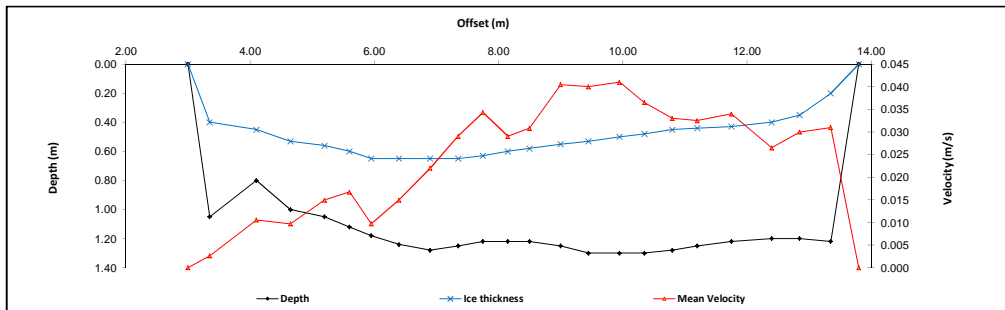
Total Flow:	0.191	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.00	(m <sup>2</sup> )
Wetted Width:	10.80	(m)
Hydraulic Depth:	0.65	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.334	
Water (°C):	0.2	
Barometric Pressure (kPa):	96.76	
Datalogger Clock:	08:23	
Laptop Clock:	08:23	
Battery (Main):	13.0	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PTH (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Note**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05A-02	1.820	283.979		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			1.253	282.726	282.697	T-post 4m NW of logger
S05A-03			1.638	282.341	282.352	Pipe 3m N of logger
Water Level:	Cut		3.002	280.977	Time WL Surveyed:	8:37
Temporary BM			2.947	281.032	0.000	-
<b>Turn</b>						
Temporary BM	2.930	283.962		281.032	-	-
Water Level:	Cut		2.985	280.977	Time WL Surveyed:	8:39
S05A-03			1.622	282.340	282.352	Pipe 3m N of logger
S05A-01			1.237	282.725	282.697	T-post 4m NW of logger
S05A-02			1.803	282.159	282.159	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	280.977	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	279.643	-

**Field Personnel:**

	SM, MP	Trip Date:	17-Mar-14
Data Entry Personnel:	SM	Date:	17-Mar-14
Data Check Personnel:	CJ	Date:	8-Apr-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: May 13, 2014  
 Site Visit Time (MST): 10:00



<b>Flow Measurement Details:</b>	
<b>Metering Section Location (describe):</b> -Across from station	
Meas. Start Time (MST):	10:40
Meas. End Time (MST):	12:00
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High water level
Channel Edges:	Trapezoidal Edge (e.g., stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 13 C

<b>Flow characteristics:</b>		
Total Flow:	3.94	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.17	(m <sup>2</sup> )
Wetted Width:	15.99	(m)
Hydraulic Depth:	0.01	(m)
Mean Velocity:	3.94	(m/s)
Froude Number:	12.21	

<b>Logger Details:</b>		
Transducer Reading (m):	1.920	1.920
Water (°C):	6.0	6.2
Barometric Pressure (kPa):	99.53	99.46
Datalogger Clock:	10:14	11:18
Laptop Clock:	10:14	11:18
Battery (Main):	14.0	13.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**  
 -Flow measured with ADCP

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	-	
Serial Number:	1802		Salinity (ppt):	-		RB:	-	
Firmware Version:	3.5		Magnetic Declination (°):	14.33				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	8.1				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	16.62	22.88	0.165	3.774	-4.30%
Coordinate System:	ENU		2	16.19	23.95	0.17	4.075	3.33%
Left Method:	Sloped Bank		3	16.21	23.63	0.167	3.936	-0.19%
Right Method:	Sloped Bank		4	14.95	22.33	0.179	3.989	1.15%
Top Fit Type:	Power Fit							
Bottom Fit Type:	Power Fit		<b>Mean:</b>	15.99	23.20	0.170	<b>3.94</b>	
			<b>SD:</b>	0.63	0.63	0.005	0.110	
			<b>COV:</b>	0.04	0.03	0.031	0.028	

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>	S05A-02	1.557	283.716		282.159	282.159	3/4" Pipe 10m W of logger
	S05A-01			0.987	282.729	282.697	T-post 4m NW of logger
	Water Level:	Cut		2.155	281.561		<b>Time WL Surveyed:</b> 10:21
	S05A-03			1.376	282.340	282.352	Pipe 3m N of logger
<b>Turn</b>	S05A-03	1.343	283.683		282.340	282.352	Pipe 3m N of logger
	Water Level:	Cut		2.122	281.561		<b>Time WL Surveyed:</b> 10:25
	S05A-01			0.956	282.727	282.697	T-post 4m NW of logger
	S05A-02			1.524	282.159	282.159	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
	S05A-03	1.341	283.681		282.340		
	Water Level:	Cut		2.125	281.556		<b>Time WL Surveyed:</b> 11:20
	Water Level:	Cut		2.103	281.554		<b>Time WL Surveyed:</b> 11:25
	S05A-03	1.317	283.657		282.340		

<b>WL Survey Summary</b>	Before	After
Average WL:	281.561	281.555
Closing Error:	0.000	-
WL Check:	0.000	0.002
Transducer Elevation	279.641	279.635

<b>Field Personnel:</b>	TR, MP	Trip Date:	13-May-14
Data Entry Personnel:	MP	Date:	13-May-14
Data Check Personnel:	CJ	Date:	2-Jun-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: June 9, 2014  
 Site Visit Time (MST): 11:00

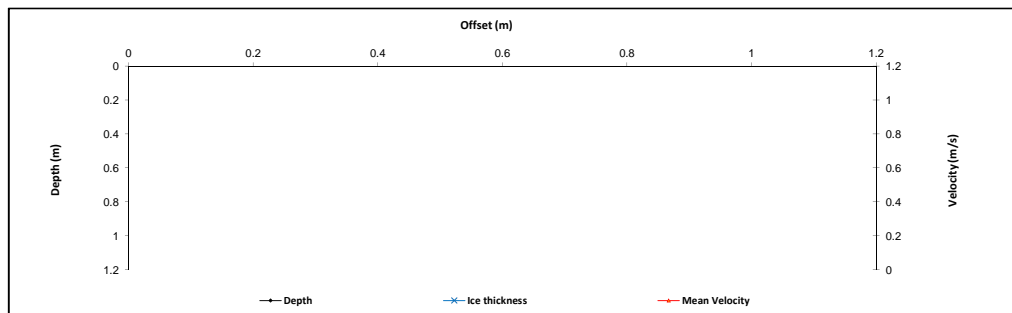


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
Flow Measurement Not Conducted																
															<b>Total Flow</b>	-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	2.705	2.703
Water (°C):	12.6	12.6
Barometric Pressure (kPa):	97.03	97.03
Datalogger Clock:	11:08	11:28
Laptop Clock:	11:08	11:28
Battery (Main):	13.7	13.7
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

General Notes:

- Station area flooded
- Flow measurement was not conducted because flow was not contained to channel and flowing through trees

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05A-02	1.520	283.679		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			0.949	282.730	282.697	T-post 4m NW of logger
<b>Water Level:</b>						
	<b>Cut</b>		1.330	282.349	<b>Time WL Surveyed:</b> 11:19	
S05A-03			1.335	282.344	282.352	Pipe 3m N of logger
<b>Turn</b>						
S05A-03	1.319	283.663		282.344	282.352	Pipe 3m N of logger
Water Level:	<b>Cut</b>		1.312	282.351	<b>Time WL Surveyed:</b> 11:22	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

**WL Survey Summary**

	Before	After
Average WL:	282.350	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	279.645	-

**Field Personnel:**

	SM, GG	Trip Date:	9-Jun-14
Data Entry Personnel:	SM	Date:	9-Jun-14
Data Check Personnel:	CJ	Date:	24-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek

UTM Location: 476100 E, 6351600 N

Site Visit Date: August 13, 2014

Site Visit Time (MST): 09:42



Flow Measurement Details:	
Metering Section Location (describe): -adjacent to station.	
Meas. Start Time (MST):	10:48
Meas. End Time (MST):	10:59
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow, turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm. +25

Flow characteristics:		
Total Flow:	0.710	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	15.62	(m <sup>2</sup> )
Wetted Width:	13.17	(m)
Hydraulic Depth:	1.19	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.01	

Logger Details:	Before	After
Transducer Reading (m):	1.469	1.659
Water (°C):	17.7	18.6
Datalogger Clock:	9:43	11:31
Laptop Clock:	09:43	11:31
Battery (Main):	13.6	13.5
Battery:	Good	
Battery Serial #:	1005002	352305
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	298577	352305
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
-PT replaced for calibration

**General Notes:**

ADCP Flow Measurement Summary:					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	17.50
Serial Number:	4712	Salinity (ppt):	-	RB:	4.20
Firmware Version:	3.5	Magnetic Declination (°):	14.33		
Software Version:	3.7	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	19.6		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	12.95	15.57	0.046
Coordinate System:	ENU	2	13.58	15.89	0.046
Left Method:	Sloped Bank	3	12.82	15.44	0.045
Right Method:	Sloped Bank	4	13.35	15.58	0.046
Top Fit Type:	Power Fit				
Bottom Fit Type:	Power Fit				
		<b>Mean:</b>	13.17	15.62	0.046
		<b>SD:</b>	0.31	0.16	0.000
		<b>COV:</b>	0.02	0.01	0.009
					0.017
					0.710
					0.012
					0.017

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S05A-02	1.495	283.654		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			0.927	282.727	282.697	T-post 4m NW of logger
S05A-03			1.306	282.348	282.352	Pipe 3m N of logger
Water Level:	Cut		2.544	281.110	Time WL Surveyed:	9:53
Temporary BM			1.306	282.348		0.000
<b>Turn</b>						
Temporary BM	1.292	283.640		282.348		-
Water Level:	Cut		2.532	281.108	Time WL Surveyed:	9:59
S05A-03			1.292	282.348	282.352	Pipe 3m N of logger
S05A-01			0.912	282.728	282.697	T-post 4m NW of logger
S05A-02			1.480	282.160	282.159	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05A-03	1.290	283.638		282.348		
Water Level:	Cut		2.524	281.114	Time WL Surveyed:	11:17
Water Level:	Cut		2.510	281.116	Time WL Surveyed:	11:18
S05A-03	1.278	283.626		282.348		

WL Survey Summary	Before	After
Average WL:	281.109	281.115
Closing Error:	-0.001	-
WL Check:	0.002	-0.002
Transducer Elevation	279.640	279.456

<b>Field Personnel:</b>	SM, MP	Trip Date:	13-Aug-14
Data Entry Personnel:	SM	Date:	13-Aug-14
Data Check Personnel:	MY	Date:	22-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek

UTM Location: 476100 E, 6351600 N

Site Visit Date: \_\_\_\_\_

September 23, 2014

Site Visit Time (MST): \_\_\_\_\_

08:45



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): -adjacent to station	
Meas. Start Time (MST):	9:20
Meas. End Time (MST):	9:40
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 15 C

<b>Flow characteristics:</b>		
Total Flow:	0.525	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	15.61	(m <sup>2</sup> )
Wetted Width:	13.42	(m)
Hydraulic Depth:	1.16	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.01	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	1.611	1.614
Water (°C):	11.9	12.0
Datalogger Clock:	08:56	09:46
Laptop Clock:	08:55	09:46
Battery (Main):	14.3	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**  
-Installed a 3/4" pipe on each bank for installation of a cableway.

<b>ADCP Flow Measurement Summary:</b>					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.08	LB:	15.20
Serial Number:	4712	Salinity (ppt):	-	RB:	2.20
Firmware Version:	3.5	Magnetic Declination (°):	14.33		
Software Version:	3.7	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	13.52	14.01	0.037
Coordinate System:	ENU	2	13.19	16.44	0.032
Left Method:	Sloped Bank	3	13.47	15.91	0.033
Right Method:	Sloped Bank	4	13.49	16.08	0.033
Top Fit Type:	Power Fit				
Bottom Fit Type:	Power Fit	<b>Mean:</b>	13.42	15.61	0.034
		<b>SD:</b>	0.13	0.94	0.002
		<b>COV:</b>	0.01	0.06	0.057
					0.005
					0.525
					0.522
					0.526
					0.528
					-0.48%
					-0.48%
					0.29%
					0.67%

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S05A-02	1.539	283.698		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			0.972	282.726	282.697	T-post 4m NW of logger
S05A-03			1.352	282.346	282.352	Pipe 3m N of logger
Water Level:	Cut		2.597	281.101	<b>Time WL Surveyed:</b>	9:15
S05A-03			1.352	282.346	282.352	Pipe 3m N of logger
<b>Turn</b>						
S05A-03	1.367	283.713		282.346	282.352	Pipe 3m N of logger
Water Level:	Cut		2.611	281.102	<b>Time WL Surveyed:</b>	9:07
S05A-03			1.367	282.346	282.352	Pipe 3m N of logger
S05A-01			0.986	282.727	282.697	T-post 4m NW of logger
S05A-02			1.554	282.159	282.159	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05A-03	1.352	283.698		282.346		
Water Level:	Cut		2.593	281.105	<b>Time WL Surveyed:</b>	9:49
Water Level:	Cut		2.578	281.105	<b>Time WL Surveyed:</b>	9:50
S05A-03	1.337	283.683		282.346		

<b>WL Survey Summary</b>	Before	After
Average WL:	281.102	281.105
Closing Error:	0.000	-
WL Check:	0.001	0.000
Transducer Elevation	279.491	279.491

<b>Field Personnel:</b>	TR, MP	Trip Date:	23-Sep-14
Data Entry Personnel:	TR	Date:	23-Sep-14
Data Check Personnel:	MY	Date:	15-Oct-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S5A Muskeg River above Muskeg Creek  
 UTM Location: 476100 E, 6351600 N

Site Visit Date: November 30, 2014  
 Site Visit Time (MST): 10:00

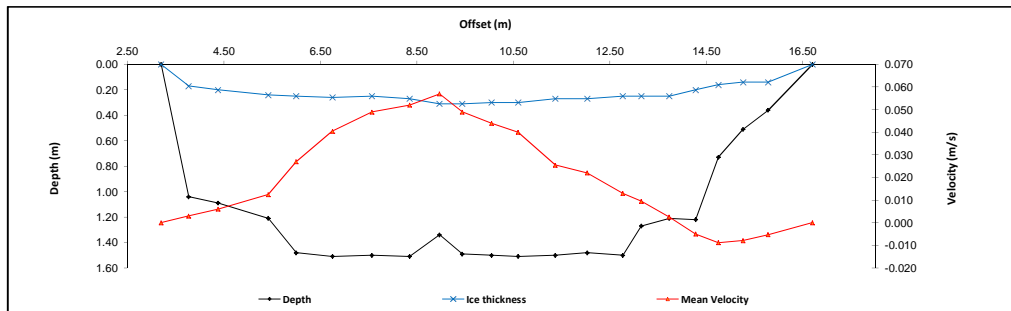


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	16.70	0.00	0.00		0.000		0.000		0.000	0.88	0.46	0.00	0.000	0.00	0.000	
1	15.78	0.36	0.14	0.25	-0.006					0.88	0.72	0.22	-0.005	0.16	-0.001	0%
2	15.26	0.51	0.14	0.33	-0.009					0.88	0.52	0.37	-0.008	0.19	-0.002	0%
3	14.75	0.73	0.16	0.45	-0.010					0.88	0.49	0.57	-0.009	0.28	-0.002	-1%
4	14.28	1.22	0.20			1.02	-0.005	0.40	-0.005	1.00	0.51	1.02	-0.005	0.52	-0.003	-1%
5	13.73	1.21	0.25			1.02	0.003	0.44	0.002	1.00	0.56	0.96	0.003	0.54	0.001	0%
6	13.15	1.27	0.25			1.07	0.001	0.45	0.018	1.00	0.48	1.02	0.010	0.49	0.005	1%
7	12.77	1.50	0.25			1.25	0.013	0.50	0.013	1.00	0.56	1.25	0.013	0.70	0.009	3%
8	12.03	1.48	0.27			1.24	0.023	0.51	0.021	1.00	0.70	1.21	0.022	0.85	0.019	5%
9	11.37	1.50	0.27			1.25	0.027	0.52	0.024	1.00	0.72	1.23	0.026	0.88	0.022	6%
10	10.60	1.51	0.30			1.27	0.040	0.54	0.040	1.00	0.66	1.21	0.040	0.80	0.032	9%
11	10.05	1.50	0.30			1.26	0.041	0.54	0.047	1.00	0.58	1.20	0.044	0.70	0.031	9%
12	9.44	1.49	0.31			1.25	0.044	0.55	0.054	1.00	0.54	1.18	0.049	0.64	0.031	9%
13	8.97	1.34	0.31			1.13	0.056	0.52	0.058	1.00	0.55	1.03	0.057	0.56	0.032	9%
14	8.35	1.51	0.27			1.26	0.053	0.52	0.051	1.00	0.70	1.24	0.052	0.87	0.045	13%
15	7.57	1.50	0.25			1.25	0.048	0.50	0.050	1.00	0.80	1.25	0.049	1.00	0.049	14%
16	6.75	1.51	0.26			1.26	0.033	0.51	0.048	1.00	0.79	1.25	0.041	0.98	0.040	11%
17	6.00	1.48	0.25			1.23	0.020	0.50	0.034	1.00	0.67	1.23	0.027	0.82	0.022	6%
18	5.42	1.21	0.24			1.02	0.007	0.43	0.018	1.00	0.81	0.97	0.013	0.79	0.010	3%
19	4.38	1.09	0.20			0.91	0.002	0.38	0.010	1.00	0.83	0.89	0.006	0.73	0.004	1%
20	3.77	1.04	0.17			0.87	-0.002	0.34	0.008	1.00	0.59	0.87	0.003	0.51	0.002	0%
LB	3.20	0.00	0.00		0.00					0.88	0.29	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.346</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m downstream of station

Meas. Start Time (MST):	10:35
Meas. End Time (MST):	11:20
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -30 C



**Flow characteristics:**

Total Flow:	0.346	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	13.00	(m <sup>2</sup> )
Wetted Width:	13.50	(m)
Hydraulic Depth:	0.96	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.519	1.519
Water (°C):	0.2	0.2
Barometric Pressure (kPa):	98.70	98.70
Datalogger Clock:	10:12	11:20
Laptop Clock:	10:13	11:21
Battery (Main):	14.9	14.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Desiccant:	-	New
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Note**

-Replaced modem

**General Notes:**

-Layers of ice along the bank

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S05A-02	1.663	283.822		282.159	282.159	3/4" Pipe 10m W of logger
S05A-01			1.093	282.729	282.726	T-post 4m NW of logger
S05A-03			1.478	282.344	282.344	Pipe 3m N of logger
<b>Water Level:</b>						
Water Level:	Cut		2.809	281.013	281.013	Time WL Surveyed: 10:24
Temporary BM			2.716	281.106	281.106	0.000
<b>Turn</b>						
Temporary BM	2.703	283.809		281.106	281.106	
Water Level:	Cut		2.797	281.012	281.012	Time WL Surveyed: 10:27
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S05A-03			1.464	282.345	282.344	Pipe 3m N of logger
S05A-01			1.077	282.732	282.726	T-post 4m NW of logger
S05A-02			1.649	282.160	282.159	3/4" Pipe 10m W of logger
<b>Water Level:</b>						
Water Level:	Cut	1.465	283.810	282.345	282.345	Time WL Surveyed: 11:26
Water Level:	Cut		2.799	281.011	281.011	Time WL Surveyed: 11:28
Water Level:	Cut		2.782	281.015	281.015	Time WL Surveyed: 11:28
S05A-03	1.452	283.797		282.345	282.345	

**WL Survey Summary**

	Before	After
Average WL:	281.013	281.013
Closing Error:	-0.001	-
WL Check:	0.001	-0.004
Transducer Elevation	279.494	279.494

**Field Personnel:**

	MP, TR	Trip Date:	30-Nov-14
Data Entry Personnel:	MP	Date:	30-Nov-14
Data Check Personnel:	MY	Date:	2-Dec-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: January 29, 2014  
 Site Visit Time (MST): 14:45

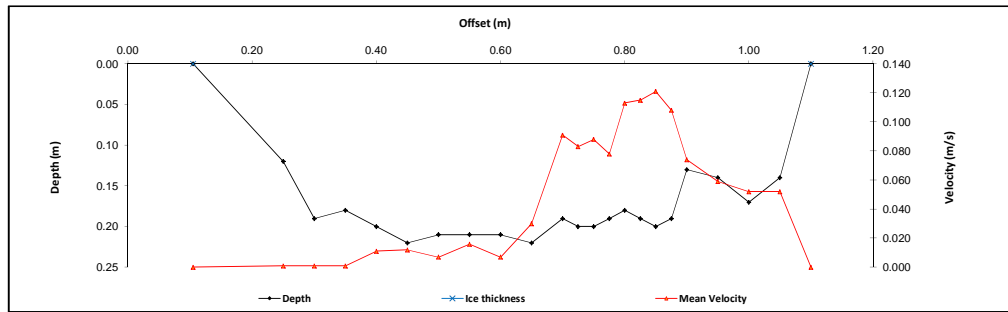


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.11	0.00	0.00		0.000		0.000		0.000	1.00	0.07	0.00	0.000	0.00	0.000	
1	0.25	0.12		0.07	0.001					1.00	0.10	0.12	0.001	0.01	0.000	0%
2	0.30	0.19		0.11	0.001					1.00	0.05	0.19	0.001	0.01	0.000	0%
3	0.35	0.18		0.11	0.001					1.00	0.05	0.18	0.001	0.01	0.000	0%
4	0.40	0.20		0.12	0.011					1.00	0.05	0.20	0.011	0.01	0.000	2%
5	0.45	0.22		0.13	0.012					1.00	0.05	0.22	0.012	0.01	0.000	2%
6	0.50	0.21		0.13	0.007					1.00	0.05	0.21	0.007	0.01	0.000	1%
7	0.55	0.21		0.13	0.016					1.00	0.05	0.21	0.016	0.01	0.000	3%
8	0.60	0.21		0.13	0.007					1.00	0.05	0.21	0.007	0.01	0.000	1%
9	0.65	0.22		0.13	0.030					1.00	0.05	0.22	0.030	0.01	0.000	5%
10	0.70	0.19		0.11	0.091					1.00	0.04	0.19	0.091	0.01	0.001	10%
11	0.73	0.20		0.12	0.083					1.00	0.03	0.20	0.083	0.01	0.000	6%
12	0.75	0.20		0.12	0.088					1.00	0.02	0.20	0.088	0.00	0.000	7%
13	0.78	0.19		0.11	0.078					1.00	0.03	0.19	0.078	0.00	0.000	6%
14	0.80	0.18		0.11	0.113					1.00	0.02	0.18	0.113	0.00	0.001	8%
15	0.83	0.19		0.11	0.115					1.00	0.02	0.19	0.115	0.00	0.001	8%
16	0.85	0.20		0.12	0.121					1.00	0.03	0.20	0.121	0.01	0.001	9%
17	0.88	0.19		0.11	0.108					1.00	0.02	0.19	0.108	0.00	0.001	8%
18	0.90	0.13		0.08	0.074					1.00	0.04	0.13	0.074	0.00	0.000	6%
19	0.95	0.14		0.08	0.059					1.00	0.05	0.14	0.059	0.01	0.000	6%
20	1.00	0.17		0.10	0.052					1.00	0.05	0.17	0.052	0.01	0.000	7%
21	1.05	0.14		0.08	0.052					1.00	0.05	0.14	0.052	0.01	0.000	6%
RB	1.10	0.00	0.00		0.00		0.00		0.00	1.00	0.03	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.007</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
7m downstream of weir

Meas. Start Time (MST):	15:20
Meas. End Time (MST):	15:45
Equipment:	ADV
Method:	Wading
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm



**Flow characteristics:**

Total Flow:	0.007	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.16	(m <sup>2</sup> )
Wetted Width:	1.00	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.654	0.654
Water (°C):	1.6	1.6
Datalogger Clock:	14:59	15:52
Laptop Clock:	14:59	15:52
Battery (Main):	15.5	15.6
Battery:		Good
Battery Serial #:	-	-
Enclosure Dissicant:		Good
Vent Tube Dissicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Ice was over an inch thick along banks

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-04	0.677	274.790		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.670	274.120	274.118	3/4" Pipe 6m NW of data logger
S06-01			1.238	273.552	273.600	Rebar
Water Level:	Cut	2.785		272.005		<b>Time WL Surveyed:</b> 15:16
Temporary BM			2.433	272.357	0.000	Wier
<b>Turn</b>						
Temporary BM	2.410	274.767		272.357		Wier
Water Level:	Cut	2.762		272.005		<b>Time WL Surveyed:</b> 15:18
S06-01			1.216	273.551	273.600	Rebar
S06-03			0.648	274.119	274.118	3/4" Pipe 6m NW of data logger
S06-04			0.655	274.112	274.113	3/4" Pipe 7m W of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S06-03	1.215	274.767		273.552		
Water Level:	Cut	2.763		272.004		<b>Time WL Surveyed:</b> 15:48
Water Level:	Cut	2.744		272.003		<b>Time WL Surveyed:</b> 15:50
S06-03	1.195	274.747		273.552		

**WL Survey Summary**

Average WL:	272.005	272.004
Closing Error:	0.001	-
WL Check:	0.000	0.001
Transducer Elevation	271.351	271.350

**Field Personnel:**

Data Entry Personnel:	SM, TR	Trip Date:	29-Jan-14
Data Check Personnel:	SM	Date:	29-Jan-14
Entered Digitally in the Field:	CJ	Date:	11-Apr-14

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: February 19, 2014  
 Site Visit Time (MST): 14:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.05	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.15	0.17		0.10	-0.008					1.00	0.08	0.17	-0.008	0.01	0.000	-3%
2	0.20	0.20		0.12	0.002					1.00	0.05	0.20	0.002	0.01	0.000	1%
3	0.25	0.20		0.12	0.011					1.00	0.05	0.20	0.011	0.01	0.000	3%
4	0.30	0.21		0.13	0.027					1.00	0.05	0.21	0.027	0.01	0.000	8%
5	0.35	0.21		0.13	0.002					1.00	0.05	0.21	0.002	0.01	0.000	1%
6	0.40	0.20		0.12	0.019					1.00	0.05	0.20	0.019	0.01	0.000	5%
7	0.45	0.20		0.12	0.032					1.00	0.05	0.20	0.032	0.01	0.000	9%
8	0.50	0.20		0.12	0.028					1.00	0.05	0.20	0.028	0.01	0.000	8%
9	0.55	0.22		0.13	0.030					1.00	0.05	0.22	0.030	0.01	0.000	9%
10	0.60	0.19		0.11	0.023					1.00	0.05	0.19	0.023	0.01	0.000	6%
11	0.65	0.22		0.13	0.032					1.00	0.04	0.22	0.032	0.01	0.000	8%
12	0.68	0.25		0.15	0.021					1.00	0.02	0.25	0.021	0.01	0.000	4%
13	0.70	0.23		0.14	0.037					1.00	0.02	0.23	0.037	0.00	0.000	5%
14	0.72	0.22		0.13	0.037					1.00	0.03	0.22	0.037	0.01	0.000	6%
15	0.75	0.23		0.14	0.042					1.00	0.03	0.23	0.042	0.01	0.000	8%
16	0.78	0.18		0.11	0.044					1.00	0.03	0.18	0.044	0.00	0.000	6%
17	0.80	0.19		0.11	0.036					1.00	0.03	0.19	0.036	0.01	0.000	7%
18	0.85	0.18		0.11	0.025					1.00	0.05	0.18	0.025	0.01	0.000	6%
19	0.90	0.18		0.11	0.013					1.00	0.05	0.18	0.013	0.01	0.000	3%
20	0.95	0.19		0.11	0.007					1.00	0.05	0.19	0.007	0.01	0.000	2%
21	1.00	0.19		0.11	-0.003					1.00	0.05	0.19	-0.003	0.01	0.000	-1%
RB	1.05	0.00	0.00		0.00		0.00		0.00	1.00	0.03	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.004</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m downstream of weir

Meas. Start Time (MST):	14:56
Meas. End Time (MST):	15:22
Equipment:	ADV
Method:	Wading
River Condition:	Partially frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -6 C

**Flow characteristics:**

Total Flow:	0.004	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.18	(m <sup>2</sup> )
Wetted Width:	1.00	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

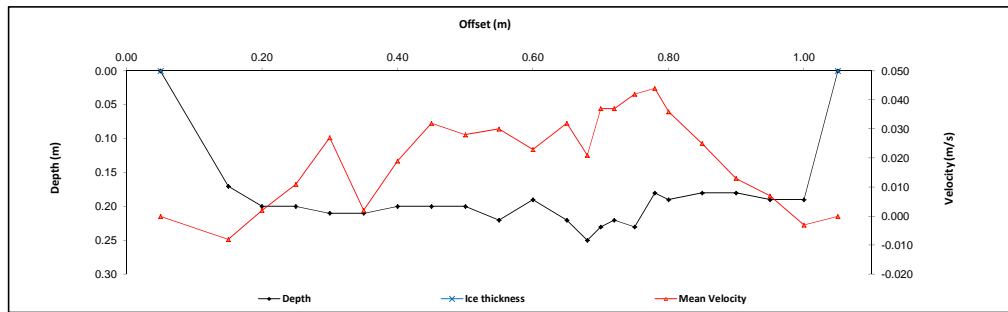
**Logger Details:**

	Before	After
Transducer Reading (m):	0.653	
Water (°C):	1.2	
Datalogger Clock:	14:34	
Laptop Clock:	14:34	
Battery (Main):	15.1	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Good
Vent Tube Deseccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-Ice jammed in channel downstream of flow mmt location



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-04	0.795	274.908		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.791	274.117	274.118	3/4" Pipe 6m NW of data logger
S06-01			1.372	273.536	273.600	Rebar
Water Level:	Cut		2.918	271.990	Time WL Surveyed: 14:45	
Temporary BM			2.540	272.368	0.000	
<b>Turn</b>						
Temporary BM	2.517	274.885		272.368		
Water Level:	Cut		2.893	271.992	Time WL Surveyed: 14:49	
S06-01			1.346	273.539	273.600	Rebar
S06-03			0.768	274.117	274.118	3/4" Pipe 6m NW of data logger
S06-04			0.772	274.113	274.113	3/4" Pipe 7m W of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	271.991	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	271.338	-

<b>Field Personnel:</b>	SM, MP	Trip Date:	19-Feb-14
<b>Data Entry Personnel:</b>	MP	Date:	19-Feb-14
<b>Data Check Personnel:</b>	CJ	Date:	11-Apr-14
<b>Entered Digitally in the Field:</b>	Yes		





# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: April 2, 2014  
 Site Visit Time (MST): 14:15

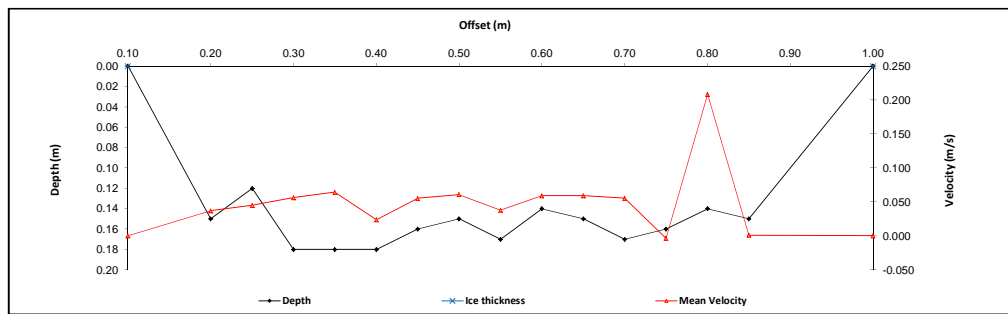


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.10	0.00	0.00		0.000				0.000	0.88	0.05	0.00	0.000	0.00	0.000	
1	0.20	0.15		0.08	0.042					0.88	0.08	0.15	0.037	0.01	0.000	7%
2	0.25	0.12		0.06	0.051					0.88	0.05	0.12	0.045	0.01	0.000	5%
3	0.30	0.18		0.09	0.064					0.88	0.05	0.18	0.056	0.01	0.001	8%
4	0.35	0.18		0.09	0.073					0.88	0.05	0.18	0.064	0.01	0.001	10%
5	0.40	0.18		0.09	0.027					0.88	0.05	0.18	0.024	0.01	0.000	4%
6	0.45	0.16		0.08	0.063					0.88	0.05	0.16	0.055	0.01	0.000	7%
7	0.50	0.15		0.08	0.069					0.88	0.05	0.15	0.061	0.01	0.000	8%
8	0.55	0.17		0.09	0.043					0.88	0.05	0.17	0.038	0.01	0.000	5%
9	0.60	0.14		0.07	0.067					0.88	0.05	0.14	0.059	0.01	0.000	7%
10	0.65	0.15		0.08	0.067					0.88	0.05	0.15	0.059	0.01	0.000	7%
11	0.70	0.17		0.09	0.063					0.88	0.05	0.17	0.055	0.01	0.000	8%
12	0.75	0.16		0.08	-0.004					0.88	0.05	0.16	-0.004	0.01	0.000	0%
13	0.80	0.14		0.07	0.237					0.88	0.05	0.14	0.209	0.01	0.001	24%
14	0.85	0.15		0.08	0.001					0.88	0.10	0.15	0.001	0.02	0.000	0%
LB	1.00	0.00	0.00		0.00				0.00	0.88	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.006</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -5m downstream of weir

Meas. Start Time (MST):	15:40
Meas. End Time (MST):	15:59
Equipment:	ADV
Method:	Ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Partial cloud, breezy, -10 C



**Flow characteristics:**

Total Flow:	0.006	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.12	(m <sup>2</sup> )
Wetted Width:	0.90	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.651	
Water (°C):	0.9	
Datalogger Clock:	14:21	
Laptop Clock:	14:21	
Battery (Main):	15.1	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-flow mmt quality poor due to poor ice conditions and limited effective water depths

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-03	1.052	275.170		274.118	274.118	3/4" Pipe 6m NW of data logger
S06-04			1.057	274.113	274.113	3/4" Pipe 7m W of data logger
S06-01			1.641	273.529	273.600	Rebar
<b>Water Level:</b>						
Water Level:	Cut		3.197	271.973		Time WL Surveyed: 14:30
Temporary BM			3.189	271.981	0.000	-
<b>Turn</b>						
Temporary BM	3.165	275.146		271.981		
Water Level:	Cut		3.175	271.971		Time WL Surveyed: 14:36
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	271.972	-
Closing Error:	-0.001	-
WL Check:	0.002	-
Transducer Elevation	271.321	-

**Field Personnel:**

Field Personnel:	CJ, MP	Trip Date:	2-Apr-14
Data Entry Personnel:	MP	Date:	2-Apr-14
Data Check Personnel:	CJ	Date:	11-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: May 13, 2014  
 Site Visit Time (MST): 15:30

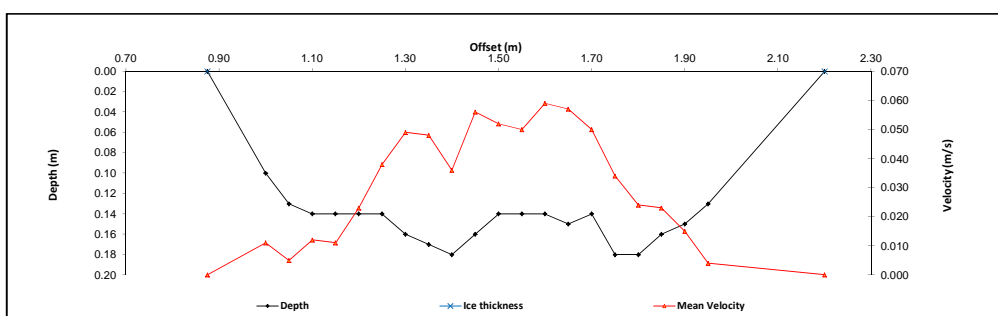


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.88	0.00	0.00		0.000		0.000		0.000	1.00	0.06	0.00	0.000	0.00	0.000	
1	1.00	0.10		0.06	0.011					1.00	0.09	0.10	0.011	0.01	0.000	2%
2	1.05	0.13		0.08	0.005					1.00	0.05	0.13	0.005	0.01	0.000	1%
3	1.10	0.14		0.08	0.012					1.00	0.05	0.14	0.012	0.01	0.000	2%
4	1.15	0.14		0.08	0.011					1.00	0.05	0.14	0.011	0.01	0.000	2%
5	1.20	0.14		0.08	0.023					1.00	0.05	0.14	0.023	0.01	0.000	3%
6	1.25	0.14		0.08	0.038					1.00	0.05	0.14	0.038	0.01	0.000	5%
7	1.30	0.16		0.10	0.049					1.00	0.05	0.16	0.049	0.01	0.000	8%
8	1.35	0.17		0.10	0.048					1.00	0.05	0.17	0.048	0.01	0.000	8%
9	1.40	0.18		0.11	0.036					1.00	0.05	0.18	0.036	0.01	0.000	6%
10	1.45	0.16		0.10	0.056					1.00	0.05	0.16	0.056	0.01	0.000	9%
11	1.50	0.14		0.08	0.052					1.00	0.05	0.14	0.052	0.01	0.000	7%
12	1.55	0.14		0.08	0.050					1.00	0.05	0.14	0.050	0.01	0.000	7%
13	1.60	0.14		0.08	0.059					1.00	0.05	0.14	0.059	0.01	0.000	8%
14	1.65	0.15		0.09	0.057					1.00	0.05	0.15	0.057	0.01	0.000	8%
15	1.70	0.14		0.08	0.050					1.00	0.05	0.14	0.050	0.01	0.000	7%
16	1.75	0.18		0.11	0.034					1.00	0.05	0.18	0.034	0.01	0.000	6%
17	1.80	0.18		0.11	0.024					1.00	0.05	0.18	0.024	0.01	0.000	4%
18	1.85	0.16		0.10	0.023					1.00	0.05	0.16	0.023	0.01	0.000	4%
19	1.90	0.15		0.09	0.015					1.00	0.05	0.15	0.015	0.01	0.000	2%
20	1.95	0.13		0.08	0.004					1.00	0.15	0.13	0.004	0.02	0.000	2%
LB	2.20	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.005</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 3m DS of weir

Meas. Start Time (MST):	15:50
Meas. End Time (MST):	16:08
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15 C



**Flow characteristics:**

Total Flow:	0.005	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.17	(m <sup>2</sup> )
Wetted Width:	1.33	(m)
Hydraulic Depth:	0.12	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.682	0.683
Water (°C):	3.4	3.4
Datalogger Clock:	15:38	16:14
Laptop Clock:	15:38	16:14
Battery (Main):	14.3	14.3
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-04	0.594	274.707		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.603	274.104	274.118	3/4" Pipe 6m NW of data logger
S06-01			1.167	273.540	273.600	Rebar
<b>Water Level:</b>						
Water Level:	Cut		2.708	271.999	Time WL Surveyed:	15:45
Temporary BM			2.140	272.567	0.000	-
<b>Turn</b>						
Temporary BM	2.118	274.685		272.567		
Water Level:	Cut		2.685	272.000	Time WL Surveyed:	15:48
S06-01			1.145	273.540	273.600	Rebar
S06-03			0.582	274.103	274.118	3/4" Pipe 6m NW of data logger
S06-04			0.573	274.112	274.113	3/4" Pipe 7m W of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S06-1	1.145	274.685		273.540		
Water Level:	Cut		2.684	272.001	Time WL Surveyed:	16:10
Water Level:	Cut		2.659	271.999	Time WL Surveyed:	16:13
S06-1	1.118	274.658		273.540		

**WL Survey Summary**

	Before	After
Average WL:	272.000	272.000
Closing Error:	0.001	-
WL Check:	0.001	0.002
Transducer Elevation	271.318	271.317

**Field Personnel:**

	MP, TR	Trip Date:	13-May-14
Data Entry Personnel:	MP	Date:	13-May-14
Data Check Personnel:	CJ	Date:	2-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: June 16, 2014  
 Site Visit Time (MST): 09:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.20	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	0.80	0.16		0.10	0.011					1.00	0.35	0.16	0.011	0.06	0.001	1%
2	0.90	0.20		0.12	0.175					1.00	0.10	0.20	0.175	0.02	0.004	5%
3	1.00	0.25		0.15	0.298					1.00	0.08	0.25	0.298	0.02	0.006	8%
4	1.05	0.24		0.14	0.302					1.00	0.05	0.24	0.302	0.01	0.004	5%
5	1.10	0.27		0.16	0.159					1.00	0.05	0.27	0.159	0.01	0.002	3%
6	1.15	0.28		0.17	0.578					1.00	0.03	0.28	0.578	0.01	0.006	8%
7	1.17	0.26		0.16	0.493					1.00	0.03	0.26	0.493	0.01	0.003	4%
8	1.20	0.26		0.16	0.496					1.00	0.04	0.26	0.496	0.01	0.005	7%
9	1.25	0.26		0.16	0.234					1.00	0.05	0.26	0.234	0.01	0.003	4%
10	1.30	0.26		0.16	0.289					1.00	0.05	0.26	0.289	0.01	0.004	5%
11	1.35	0.27		0.16	0.376					1.00	0.05	0.27	0.376	0.01	0.005	7%
12	1.40	0.23		0.14	0.420					1.00	0.05	0.23	0.420	0.01	0.005	7%
13	1.45	0.26		0.16	0.421					1.00	0.05	0.26	0.421	0.01	0.005	8%
14	1.50	0.20		0.12	0.454					1.00	0.08	0.20	0.454	0.02	0.007	9%
15	1.60	0.20		0.12	0.325					1.00	0.10	0.20	0.325	0.02	0.006	9%
16	1.70	0.14		0.08	0.258					1.00	0.10	0.14	0.258	0.01	0.004	5%
17	1.80	0.08		0.05	0.145					1.00	0.10	0.08	0.145	0.01	0.001	2%
18	1.90	0.11		0.07	0.108					1.00	0.10	0.11	0.108	0.01	0.001	2%
19	2.00	0.15		0.09	0.038					1.00	0.10	0.15	0.038	0.02	0.001	1%
20	2.10	0.10		0.06	0.028					1.00	0.10	0.10	0.028	0.01	0.000	0%
21	2.20	0.09		0.05	0.019					1.00	0.10	0.09	0.019	0.01	0.000	0%
RB	2.30	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.072</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m downstream of weir

Meas. Start Time (MST):	10:15
Meas. End Time (MST):	10:40
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 18 C

**Flow characteristics:**

Total Flow:	0.072	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.31	(m <sup>2</sup> )
Wetted Width:	2.10	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.19	

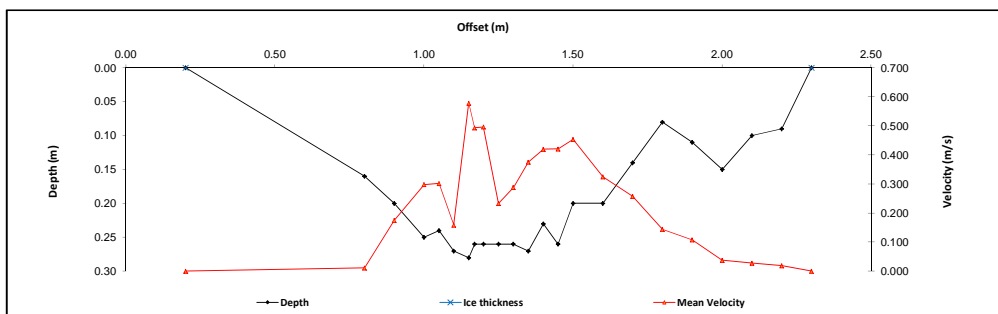
**Logger Details:**

	Before	After
Transducer Reading (m):	0.871	0.832
Water (°C):	10.4	11.3
Datalogger Clock:	09:43	10:44
Laptop Clock:	09:43	10:44
Battery (Main):	14.3	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	298710	348056
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Replaced PLS for calibration

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-04	0.744	274.857		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.754	274.103	274.118	3/4" Pipe 6m NW of data logger
S06-01			1.315	273.542	273.600	Rebar
Water Level:	Cut		2.650	272.207		Time WL Surveyed: 10:09
Temporary BM			2.287	272.570	0.000	-
<b>Turn</b>						
Temporary BM	2.262	274.832		272.570		-
Water Level:	Cut		2.623	272.209		Time WL Surveyed: 10:11
S06-01			1.290	273.542	273.600	Rebar
S06-03			0.728	274.104	274.118	3/4" Pipe 6m NW of data logger
S06-04			0.718	274.114	274.113	3/4" Pipe 7m W of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S06-01	1.290	274.832		273.542		
Water Level:	Cut		2.624	272.208		Time WL Surveyed: 10:41
Water Level:	Cut		2.606	272.208		Time WL Surveyed: 10:42
S06-01	1.272	274.814		273.542		

**WL Survey Summary**

Average WL:	272.208	272.208
Closing Error:	-0.001	-
WL Check:	0.002	0.000
Transducer Elevation	271.337	271.376

**Field Personnel:**

Data Entry Personnel:	SM, TR	Trip Date:	16-Jun-14
Data Check Personnel:	SM	Date:	16-Jun-14
Entered Digitally in the Field:	CJ	Date:	25-Jun-14

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: August 13, 2014  
 Site Visit Time (MST): 15:35

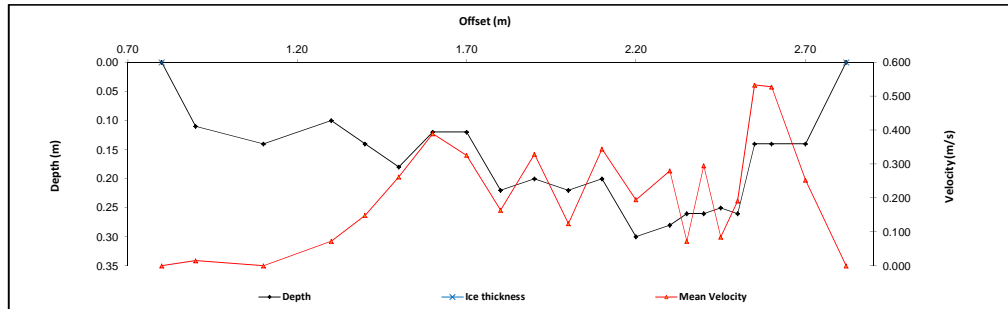


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.82	0.00	0.00		0.000		0.000		0.000	1.00	0.06	0.00	0.000	0.00	0.000	
1	2.70	0.14		0.08	0.253					1.00	0.11	0.14	0.253	0.02	0.004	6%
2	2.60	0.14		0.08	0.527					1.00	0.08	0.14	0.527	0.01	0.006	8%
3	2.55	0.14		0.08	0.533					1.00	0.05	0.14	0.533	0.01	0.004	5%
4	2.50	0.26		0.16	0.192					1.00	0.05	0.26	0.192	0.01	0.002	4%
5	2.45	0.25		0.15	0.085					1.00	0.05	0.25	0.085	0.01	0.001	2%
6	2.40	0.26		0.16	0.296					1.00	0.05	0.26	0.296	0.01	0.004	5%
7	2.35	0.26		0.16	0.073					1.00	0.05	0.26	0.073	0.01	0.001	1%
8	2.30	0.28		0.17	0.280					1.00	0.08	0.28	0.280	0.02	0.006	8%
9	2.20	0.30		0.18	0.195					1.00	0.10	0.30	0.195	0.03	0.006	8%
10	2.10	0.20		0.12	0.344					1.00	0.10	0.20	0.344	0.02	0.007	10%
11	2.00	0.22		0.13	0.125					1.00	0.10	0.22	0.125	0.02	0.003	4%
12	1.90	0.20		0.12	0.329					1.00	0.10	0.20	0.329	0.02	0.007	9%
13	1.80	0.22		0.13	0.165					1.00	0.10	0.22	0.165	0.02	0.004	5%
14	1.70	0.12		0.07	0.326					1.00	0.10	0.12	0.326	0.01	0.004	6%
15	1.60	0.12		0.07	0.390					1.00	0.10	0.12	0.390	0.01	0.005	7%
16	1.50	0.18		0.11	0.262					1.00	0.10	0.18	0.262	0.02	0.005	7%
17	1.40	0.14		0.08	0.149					1.00	0.10	0.14	0.149	0.01	0.002	3%
18	1.30	0.10		0.06	0.073					1.00	0.15	0.10	0.073	0.02	0.001	2%
19	1.10	0.14		0.08	0.000					1.00	0.20	0.14	0.000	0.03	0.000	0%
20	0.90	0.11		0.07	0.015					1.00	0.15	0.11	0.015	0.02	0.000	0%
RB	0.80	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.070</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m DS of weir

Meas. Start Time (MST):	16:04
Meas. End Time (MST):	16:23
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 30 C



**Flow characteristics:**

Total Flow:	0.070	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.33	(m <sup>2</sup> )
Wetted Width:	2.02	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.860	0.861
Water (°C):	15.2	15.2
Datalogger Clock:	15:39	16:30
Laptop Clock:	15:39	16:30
Battery (Main):	14.0	14.0
Battery:		Replaced
Battery Serial #:	-	1205001
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-replaced battery

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-04	0.749	274.862		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.760	274.102	274.118	3/4" Pipe 6m NW of data logger
S06-01			1.322	273.540	273.600	Rebar
<b>Water Level:</b>						
Water Level:	Cut		2.635	272.227		Time WL Surveyed: 15:48
Temporary BM			2.304	272.558	0.000	-
<b>Turn</b>						
Temporary BM	2.289	274.847		272.558		-
Water Level:	Cut		2.622	272.225		Time WL Surveyed: 15:50
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S06-01			1.311	273.536	273.600	Rebar
S06-03			0.748	274.099	274.118	3/4" Pipe 6m NW of data logger
S06-04			0.737	274.110	274.113	3/4" Pipe 7m W of data logger
<b>Secondary Water Level Survey</b>						
S06-01	1.311	274.847		273.536		
Water Level:	Cut		2.623	272.224		Time WL Surveyed: 16:26
Water Level:	Cut		2.612	272.224		Time WL Surveyed: 16:27
S06-01	1.300	274.836		273.536		

**WL Survey Summary**

	Before	After
Average WL:	272.226	272.224
Closing Error:	0.003	-
WL Check:	0.002	0.000
Transducer Elevation	271.366	271.363

**Field Personnel:**

Personnel	SM, MP	Trip Date:	13-Aug-14
Data Entry Personnel:	SM	Date:	13-Aug-14
Data Check Personnel:	GG	Date:	24-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: September 23, 2014  
 Site Visit Time (MST): 12:30

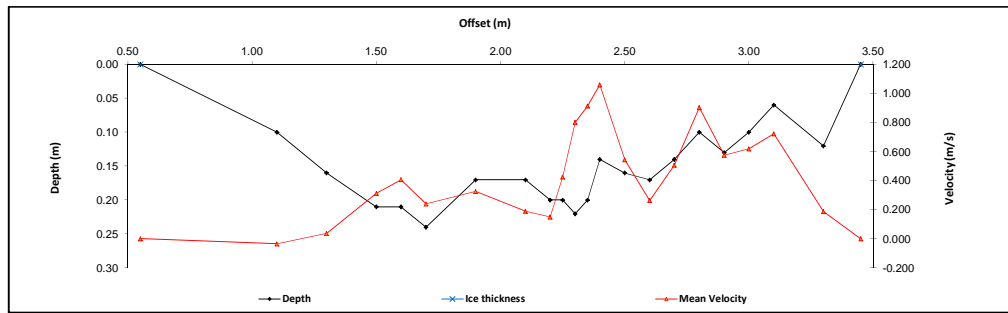


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.45	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	3.30	0.12		0.07	0.188					1.00	0.18	0.12	0.188	0.02	0.004	3%
2	3.10	0.06		0.04	0.722					1.00	0.15	0.06	0.722	0.01	0.006	5%
3	3.00	0.10		0.06	0.619					1.00	0.10	0.10	0.619	0.01	0.006	5%
4	2.90	0.13		0.08	0.576					1.00	0.10	0.13	0.576	0.01	0.007	6%
5	2.80	0.10		0.06	0.903					1.00	0.10	0.10	0.903	0.01	0.009	7%
6	2.70	0.14		0.08	0.507					1.00	0.10	0.14	0.507	0.01	0.007	5%
7	2.60	0.17		0.10	0.264					1.00	0.10	0.17	0.264	0.02	0.004	3%
8	2.50	0.16		0.10	0.545					1.00	0.10	0.16	0.545	0.02	0.009	7%
9	2.40	0.14		0.08	1.059					1.00	0.08	0.14	1.059	0.01	0.011	8%
10	2.35	0.20		0.12	0.915					1.00	0.05	0.20	0.915	0.01	0.009	7%
11	2.30	0.22		0.13	0.801					1.00	0.05	0.22	0.801	0.01	0.009	7%
12	2.25	0.20		0.12	0.425					1.00	0.05	0.20	0.425	0.01	0.004	3%
13	2.20	0.20		0.12	0.151					1.00	0.07	0.20	0.151	0.01	0.002	2%
14	2.10	0.17		0.10	0.190					1.00	0.15	0.17	0.190	0.03	0.005	4%
15	1.90	0.17		0.10	0.326					1.00	0.20	0.17	0.326	0.03	0.011	8%
16	1.70	0.24		0.14	0.241					1.00	0.15	0.24	0.241	0.04	0.009	7%
17	1.60	0.21		0.13	0.407					1.00	0.10	0.21	0.407	0.02	0.009	6%
18	1.50	0.21		0.13	0.313					1.00	0.15	0.21	0.313	0.03	0.010	7%
19	1.30	0.16		0.10	0.038					1.00	0.20	0.16	0.038	0.03	0.001	1%
20	1.10	0.10		0.06	-0.035					1.00	0.38	0.10	-0.035	0.04	-0.001	-1%
LB	0.55	0.00	0.00		0.00		0.00		0.00	1.00	0.28	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.132</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -2m DS of weir

Meas. Start Time (MST):	12:47
Meas. End Time (MST):	13:10
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 23 C



**Flow characteristics:**

Total Flow:	0.132	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.38	(m <sup>2</sup> )
Wetted Width:	2.90	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.30	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.934	0.932
Water (°C):	11.3	11.3
Datalogger Clock:	12:36	13:22
Laptop Clock:	12:35	13:21
Battery (Main):	14.2	14.2
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-04	0.846	274.959		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.854	274.105	274.118	3/4" Pipe 6m NW of data logger
S06-01			1.418	273.541	273.600	Rebar
<b>Water Level:</b>						
Cut	0.268	2.919		272.308		<b>Time WL Surveyed:</b> 12:40
Temporary BM		2.919		272.040	0.000	-
<b>Turn</b>						
Temporary BM	2.888	274.928		272.040		-
Water Level:	Cut	0.268	2.888	272.308		<b>Time WL Surveyed:</b> 12:41
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S06-01	1.387	274.928		273.541		
Water Level:	Cut	0.268	2.888	272.308		<b>Time WL Surveyed:</b> 13:17
Water Level:	Cut	0.268	2.878	272.309		<b>Time WL Surveyed:</b> 13:19
S06-01	1.378	274.919		273.541		

**WL Survey Summary**

	Before	After
Average WL:	272.308	272.309
Closing Error:	-0.002	-
WL Check:	0.000	-0.001
Transducer Elevation	271.374	271.377

**Field Personnel:**

Personnel	Initials	Trip Date
Data Entry Personnel:	TR, MP	23-Sep-14
Data Check Personnel:	TR	23-Sep-14
Entered Digitally in the Field:	GG	9-Oct-14
	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: October 9, 2014  
 Site Visit Time (MST): 11:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.30	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	0.80	0.14		0.08	-0.063					1.00	0.35	0.14	-0.063	0.05	-0.003	-2%
2	1.00	0.19		0.11	0.044					1.00	0.15	0.19	0.044	0.03	0.001	1%
3	1.10	0.20		0.12	0.131					1.00	0.10	0.20	0.131	0.02	0.003	2%
4	1.20	0.22		0.13	0.384					1.00	0.10	0.22	0.384	0.02	0.008	6%
5	1.30	0.22		0.13	0.395					1.00	0.10	0.22	0.395	0.02	0.009	6%
6	1.40	0.18		0.11	0.356					1.00	0.15	0.18	0.356	0.03	0.010	7%
7	1.60	0.28		0.17	0.191					1.00	0.20	0.28	0.191	0.06	0.011	7%
8	1.80	0.20		0.12	0.561					1.00	0.13	0.20	0.561	0.03	0.014	10%
9	1.85	0.23		0.14	0.387					1.00	0.05	0.23	0.387	0.01	0.004	3%
10	1.90	0.21		0.13	0.607					1.00	0.05	0.21	0.607	0.01	0.006	4%
11	1.95	0.19		0.11	0.796					1.00	0.05	0.19	0.796	0.01	0.008	5%
12	2.00	0.20		0.12	0.787					1.00	0.07	0.20	0.787	0.01	0.012	8%
13	2.10	0.20		0.12	0.386					1.00	0.10	0.20	0.386	0.02	0.008	5%
14	2.20	0.18		0.11	0.291					1.00	0.10	0.18	0.291	0.02	0.005	4%
15	2.30	0.19		0.11	0.428					1.00	0.10	0.19	0.428	0.02	0.008	6%
16	2.40	0.20		0.12	0.696					1.00	0.08	0.20	0.696	0.02	0.010	7%
17	2.45	0.20		0.12	0.632					1.00	0.05	0.20	0.632	0.01	0.006	4%
18	2.50	0.17		0.10	0.796					1.00	0.07	0.17	0.796	0.01	0.010	7%
19	2.60	0.14		0.08	0.479					1.00	0.15	0.14	0.479	0.02	0.010	7%
20	2.80	0.08		0.05	0.338					1.00	0.20	0.08	0.338	0.02	0.005	4%
21	3.00	0.10		0.06	0.070					1.00	0.15	0.10	0.070	0.02	0.001	1%
RB	3.10	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.000		
<b>Total Flow</b>														<b>0.147</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 ~2m DS of weir

Meas. Start Time (MST):	12:01
Meas. End Time (MST):	12:27
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, 10 C

**Flow characteristics:**

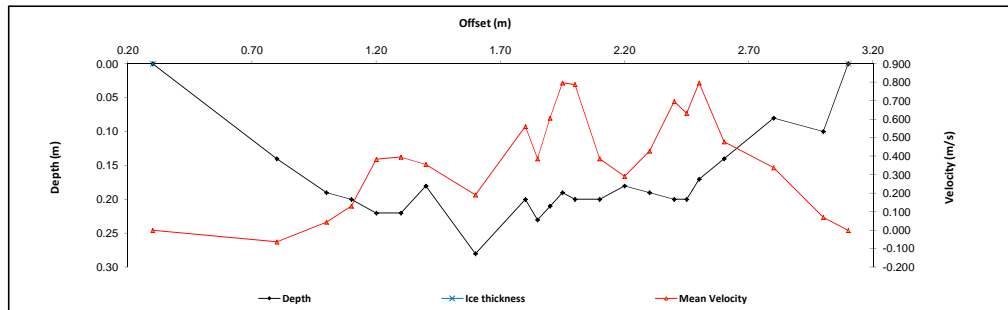
Total Flow:	0.147	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.44	(m <sup>2</sup> )
Wetted Width:	2.80	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.33	(m/s)
Froude Number:	0.27	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.960	0.960
Water (°C):	8.3	8.3
Datalogger Clock:	11:49	12:32
Laptop Clock:	11:49	12:32
Battery (Main):	14.7	14.6
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-04	0.759	274.872		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.768	274.104	274.118	3/4" Pipe 6m NW of data logger
S06-01			1.331	273.541	273.600	Rebar
Water Level:	Cut	0.248	2.787	272.333	Time WL Surveyed:	11:53
Temporary BM			2.787	272.085		-
<b>Turn</b>						
Temporary BM	2.767	274.852		272.085		-
Water Level:	Cut	0.248	2.767	272.333	Time WL Surveyed:	11:54
S06-01				273.540	273.600	Rebar
S06-03			1.312	274.102	274.118	3/4" Pipe 6m NW of data logger
S06-04			0.739	274.113	274.113	3/4" Pipe 7m W of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S06-01	1.313	274.853		273.540		
Water Level:	Cut	0.220	2.729	272.344	Time WL Surveyed:	12:30
Water Level:	Cut	0.220	2.723	272.341	Time WL Surveyed:	12:31
S06-01	1.304	274.844		273.540		

**WL Survey Summary**

Average WL:	272.333	272.343
Closing Error:	0.000	-
WL Check:	0.000	0.003
Transducer Elevation	271.373	271.383

**Field Personnel:**

MP, TR	Trip Date:	9-Oct-14
MP, TR	Date:	9-Oct-14
GG	Date:	20-Nov-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S6 Mills Creek at Hwy 63  
 UTM Location: 463829 E, 6344743 N

Site Visit Date: November 30, 2014  
 Site Visit Time (MST): 13:55

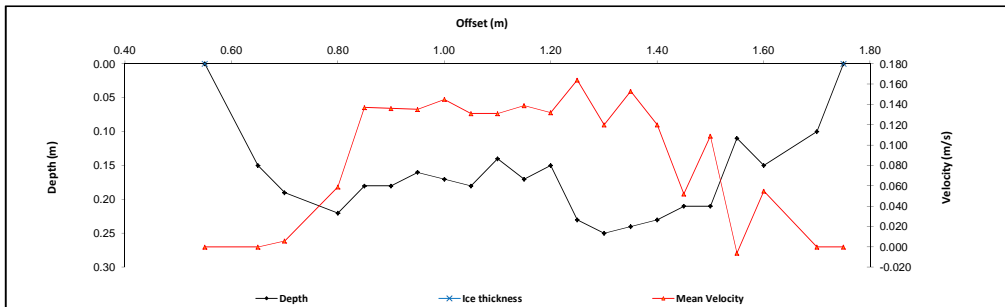


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.75	0.00	0.00		0.000		0.000		0.000	1.00	0.03	0.00	0.000	0.00	0.000	0%
1	1.70	0.10		0.06	0.000					1.00	0.08	0.10	0.000	0.01	0.000	0%
2	1.60	0.15		0.09	0.055					1.00	0.07	0.15	0.055	0.01	0.001	3%
3	1.55	0.11		0.07	-0.006					1.00	0.05	0.11	-0.006	0.01	0.000	0%
4	1.50	0.21		0.13	0.109					1.00	0.05	0.21	0.109	0.01	0.001	6%
5	1.45	0.21		0.13	0.052					1.00	0.05	0.21	0.052	0.01	0.001	3%
6	1.40	0.23		0.14	0.120					1.00	0.05	0.23	0.120	0.01	0.001	7%
7	1.35	0.24		0.14	0.153					1.00	0.05	0.24	0.153	0.01	0.002	10%
8	1.30	0.25		0.15	0.120					1.00	0.05	0.25	0.120	0.01	0.002	8%
9	1.25	0.23		0.14	0.164					1.00	0.05	0.23	0.164	0.01	0.002	10%
10	1.20	0.15		0.09	0.132					1.00	0.05	0.15	0.132	0.01	0.001	5%
11	1.15	0.17		0.10	0.139					1.00	0.05	0.17	0.139	0.01	0.001	6%
12	1.10	0.14		0.08	0.131					1.00	0.05	0.14	0.131	0.01	0.001	5%
13	1.05	0.18		0.11	0.131					1.00	0.05	0.18	0.131	0.01	0.001	6%
14	1.00	0.17		0.10	0.145					1.00	0.05	0.17	0.145	0.01	0.001	6%
15	0.95	0.16		0.10	0.135					1.00	0.05	0.16	0.135	0.01	0.001	6%
16	0.90	0.18		0.11	0.136					1.00	0.05	0.18	0.136	0.01	0.001	6%
17	0.85	0.18		0.11	0.137					1.00	0.05	0.18	0.137	0.01	0.001	6%
18	0.80	0.22		0.13	0.059					1.00	0.07	0.22	0.059	0.02	0.001	5%
19	0.70	0.19		0.11	0.006					1.00	0.08	0.19	0.006	0.01	0.000	0%
20	0.65	0.15		0.09	0.000					1.00	0.08	0.15	0.000	0.01	0.000	0%
LB	0.55	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>0.019</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 7m DS of weir

Meas. Start Time (MST):	14:15
Meas. End Time (MST):	14:45
Equipment:	ADV
Method:	Wading
River Condition:	Partial ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -25 C



**Flow characteristics:**

Total Flow:	0.019	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.20	(m <sup>2</sup> )
Wetted Width:	1.20	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.709	0.709
Water (°C):	2.6	2.6
Datalogger Clock:	13:57	14:48
Laptop Clock:	13:56	14:47
Battery (Main):	15.5	14.6
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Replaced modem

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S06-04	0.995	275.108		274.113	274.113	3/4" Pipe 7m W of data logger
S06-03			0.997	274.111	274.105	3/4" Pipe 6m NW of data logger
S06-01			1.577	273.531	273.541	Rebar
<b>Water Level:</b>						
Water Level:	Cut		3.041	272.067	Time WL Surveyed:	14:04
Temporary BM			2.738	272.370		-
<b>Turn</b>						
Temporary BM	2.725	275.095		272.370		-
Water Level:	Cut		3.027	272.068	Time WL Surveyed:	14:06
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S06-01	1.562	275.094		273.532		
Water Level:	Cut		3.028	272.066	Time WL Surveyed:	14:51
Water Level:	Cut		2.988	272.066	Time WL Surveyed:	14:53
S06-01	1.522	275.054		273.532		

**WL Survey Summary**

	Before	After
Average WL:	272.068	272.066
Closing Error:	-0.003	-
WL Check:	0.001	0.000
Transducer Elevation	271.359	271.357

**Field Personnel:**

Personnel	TR, MP	Trip Date:	30-Nov-14
Data Entry Personnel:	TR	Date:	30-Nov-14
Data Check Personnel:	CJ	Date:	5-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement /

Site: S9 Kearsal Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: January 26, 2014  
 Site Visit Time (MST): 13:45

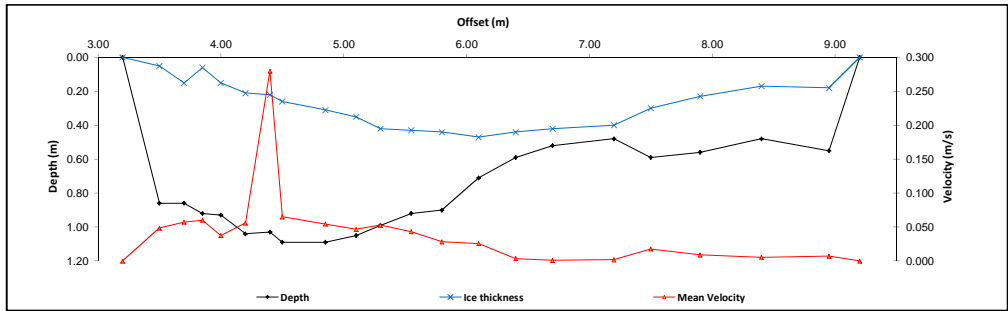


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.20	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	3.50	0.86	0.05							1.00	0.25	0.81	0.049	0.20	0.010	8%
2	3.70	0.86	0.15	0.51	0.065	0.70	0.041	0.21	0.056	0.88	0.18	0.71	0.057	0.12	0.007	6%
3	3.85	0.92	0.06				0.75	0.056	0.23	1.00	0.15	0.86	0.060	0.13	0.008	6%
4	4.00	0.93	0.15				0.77	0.041	0.31	1.00	0.18	0.78	0.038	0.14	0.005	4%
5	4.20	1.04	0.21				0.87	0.049	0.38	1.00	0.20	0.63	0.056	0.17	0.009	7%
6	4.40	1.03	0.22				0.87	0.040	0.38	1.00	0.15	0.81	0.280	0.12	0.034	27%
7	4.50	1.09	0.26				0.92	0.077	0.43	1.00	0.23	0.83	0.065	0.19	0.012	9%
8	4.85	1.09	0.31				0.93	0.068	0.47	1.00	0.30	0.78	0.055	0.23	0.013	10%
9	5.10	1.05	0.35	0.70	0.053					0.88	0.23	0.70	0.047	0.16	0.007	6%
10	5.30	0.99	0.42	0.71	0.060					0.88	0.23	0.57	0.053	0.13	0.007	5%
11	5.55	0.92	0.43	0.68	0.049					0.88	0.25	0.49	0.043	0.12	0.005	4%
12	5.80	0.90	0.44	0.67	0.032					0.88	0.27	0.46	0.028	0.13	0.004	3%
13	6.10	0.71	0.47	0.59	0.029					0.88	0.30	0.24	0.026	0.07	0.002	1%
14	6.40	0.59	0.44	0.52	0.004					0.88	0.30	0.15	0.004	0.05	0.000	0%
15	6.70	0.52	0.42	0.47	0.001					0.88	0.40	0.10	0.001	0.04	0.000	0%
16	7.20	0.48	0.40	0.44	0.002					0.88	0.40	0.08	0.002	0.03	0.000	0%
17	7.50	0.59	0.30	0.45	0.020					0.88	0.35	0.29	0.018	0.10	0.002	1%
18	7.90	0.56	0.23	0.40	0.010					0.88	0.45	0.33	0.009	0.15	0.001	1%
19	8.40	0.48	0.17	0.33	0.006					0.88	0.53	0.31	0.005	0.16	0.001	1%
20	8.95	0.55	0.18	0.37	0.008					0.88	0.40	0.37	0.007	0.15	0.001	1%
RB	9.20	0.00	0.00		0.000		0.000		0.000	0.88	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.128</b>	<b>100%</b>	

**Flow Measurement Details:**

**Metering Section Location (describe):**  
3m upstream of station

Meas. Start Time (MST):	14:24
Meas. End Time (MST):	14:45
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	-



**Flow characteristics:**

Total Flow:	0.128	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	2.59	(m <sup>2</sup> )
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.187	
Water (°C):	0.4	
Datalogger Clock:	13:52	
Laptop Clock:	13:53	
Battery (Main):	14.7	
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Good	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S09-05	0.729	331.364		330.635	330.635	3/4" Pipe 10m NE of logger
S09-04			1.072	330.292	330.293	3/4" Pipe 6m NE of logger
S09-03			1.121	330.243	330.231	3/4" Pipe 10m E of logger
Water Level:	Cut		1.933	329.431	Time WL Surveyed: 13:56	
Temporary BM			1.928	329.436	0.000	-
<b>Turn</b>						
Temporary BM	1.911	331.347		329.436		
Water Level:	Cut		1.920	329.427	Time WL Surveyed: 13:58	
S09-03			1.104	330.243	330.231	3/4" Pipe 10m E of logger
S09-04			1.056	330.291	330.293	3/4" Pipe 6m NE of logger
S09-05			0.712	330.635	330.635	3/4" Pipe 10m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	329.429	-
Closing Error:	0.000	-
WL Check:	0.004	-
Transducer Elevation	328.242	-

**Field Personnel:**

	SM, TR	Trip Date:	26-Jan-14
Data Entry Personnel:	CJ	Date:	14-Apr-14
Data Check Personnel:	MY	Date:	14-Apr-14
Entered Digitally in the Field:	No		



# Hydrometric Measurement / Site Visit Record

Site: S9 Kearsal Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: February 11, 2014  
 Site Visit Time (MST): 14:40

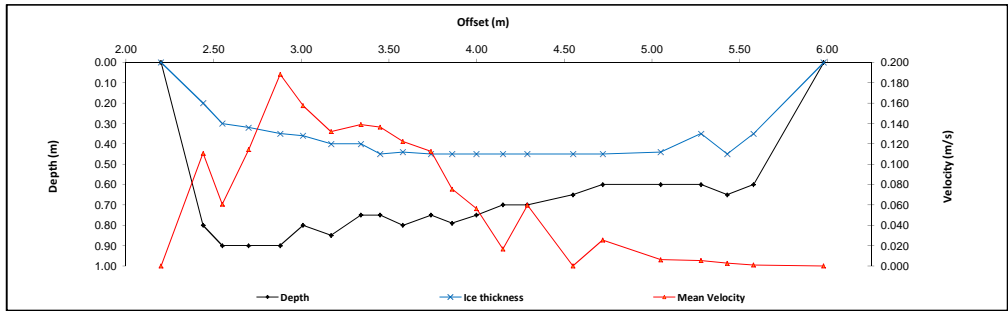


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000				0.000	0.88	0.12	0.00	0.000	0.00	0.000	
1	2.44	0.80	0.20	0.50	0.126					0.88	0.18	0.60	0.111	0.11	0.012	12%
2	2.55	0.90	0.30	0.60	0.069					0.88	0.13	0.60	0.061	0.08	0.005	5%
3	2.70	0.90	0.32	0.61	0.130					0.88	0.17	0.58	0.114	0.10	0.011	11%
4	2.88	0.90	0.35	0.63	0.214					0.88	0.16	0.55	0.188	0.09	0.016	17%
5	3.01	0.80	0.36	0.58	0.179					0.88	0.15	0.44	0.158	0.06	0.010	10%
6	3.17	0.85	0.40	0.63	0.150					0.88	0.17	0.45	0.132	0.07	0.010	10%
7	3.34	0.75	0.40	0.58	0.158					0.88	0.14	0.35	0.139	0.05	0.007	7%
8	3.45	0.75	0.45	0.60	0.155					0.88	0.12	0.30	0.136	0.04	0.005	5%
9	3.58	0.80	0.44	0.62	0.139					0.88	0.15	0.36	0.122	0.05	0.006	7%
10	3.74	0.75	0.45	0.60	0.128					0.88	0.14	0.30	0.113	0.04	0.005	5%
11	3.86	0.79	0.45	0.62	0.086					0.88	0.13	0.34	0.076	0.04	0.003	3%
12	4.00	0.75	0.45	0.60	0.064					0.88	0.15	0.30	0.056	0.04	0.002	3%
13	4.15	0.70	0.45	0.58	0.019					0.88	0.15	0.25	0.017	0.04	0.001	1%
14	4.29	0.70	0.45	0.58	0.068					0.88	0.20	0.25	0.060	0.05	0.003	3%
15	4.55	0.65	0.45	0.55	0.000					0.88	0.22	0.20	0.000	0.04	0.000	0%
16	4.72	0.60	0.45	0.53	0.029					0.88	0.25	0.15	0.026	0.04	0.001	1%
17	5.05	0.60	0.44	0.52	0.007					0.88	0.28	0.16	0.006	0.04	0.000	0%
18	5.28	0.60	0.35	0.48	0.006					0.88	0.19	0.25	0.005	0.05	0.000	0%
19	5.43	0.65	0.45	0.55	0.003					0.88	0.15	0.20	0.003	0.03	0.000	0%
20	5.58	0.60	0.35	0.48	0.001					0.88	0.28	0.25	0.001	0.07	0.000	0%
LB	5.98	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.097</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 4m upstream of station

Meas. Start Time (MST):	15:43
Meas. End Time (MST):	16:14
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, -18 C



**Flow characteristics:**

Total Flow:	0.097	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	1.13	(m <sup>2</sup> )
Wetted Width:	3.78	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.09	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.204	
Water (°C):	0.4	
Datalogger Clock:	14:55	
Laptop Clock:	14:55	
Battery (Main):	14.7	
Battery:	Good	
Battery Serial #:	-	
Enclosure Desiccant:	Good	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S09-05	0.876	331.511		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			1.250	330.261	330.231	3/4" Pipe 10m E of logger
S09-04			1.222	330.289	330.293	3/4" Pipe 6m NE of logger
Water Level:	Cut		2.065	329.446	Time WL Surveyed: 15:30	
Temporary BM			2.043	329.468	0.000	
<b>Turn</b>						
Temporary BM	2.024	331.492		329.468	-	
Water Level:	Cut		2.045	329.447	Time WL Surveyed: 15:36	
S09-04			1.203	330.289	330.293	3/4" Pipe 6m NE of logger
S09-03			1.231	330.261	330.231	3/4" Pipe 10m E of logger
S09-05			0.857	330.635	330.635	3/4" Pipe 10m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	329.447	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	328.243	-

**Field Personnel:**

	SM, MP	Trip Date:	11-Feb-14
Data Entry Personnel:	MP	Date:	11-Feb-14
Data Check Personnel:	CJ	Date:	14-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement /

Site: S9 Kearsal Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

March 6, 2014

Site Visit Time (MST):

15:00



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average 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	0.88	0.13	0.00	0.000	0.00	0.000	
1	3.85	0.34	0.14	0.24	0.152				0.88	0.28	0.20	0.134	0.06	0.007	4%	
2	4.15	0.45	0.12	0.29	0.005				0.88	0.20	0.33	0.004	0.07	0.000	0%	
3	4.25	0.65	0.13	0.39	0.046				0.88	0.13	0.52	0.040	0.07	0.003	1%	
4	4.40	0.79	0.12	0.46	0.254				0.88	0.13	0.67	0.224	0.08	0.019	9%	
5	4.50	0.78	0.10	0.44	0.273				0.88	0.08	0.68	0.240	0.05	0.012	6%	
6	4.55	0.78	0.11	0.45	0.275				0.88	0.07	0.67	0.242	0.05	0.012	6%	
7	4.65	0.74	0.20	0.47	0.293				0.88	0.13	0.54	0.258	0.07	0.017	8%	
8	4.80	0.74	0.29	0.52	0.316				0.88	0.15	0.45	0.278	0.07	0.019	9%	
9	4.95	0.73	0.34	0.54	0.316				0.88	0.13	0.39	0.278	0.05	0.014	7%	
10	5.05	0.72	0.35	0.54	0.309				0.88	0.10	0.37	0.272	0.04	0.010	5%	
11	5.15	0.76	0.30	0.53	0.343				0.88	0.10	0.46	0.302	0.05	0.014	7%	
12	5.25	0.77	0.29	0.53	0.291				0.88	0.13	0.48	0.256	0.06	0.015	7%	
13	5.40	0.77	0.31	0.54	0.254				0.88	0.13	0.46	0.224	0.06	0.013	6%	
14	5.50	0.78	0.30	0.54	0.221				0.88	0.13	0.48	0.194	0.06	0.012	6%	
15	5.65	0.80	0.33	0.57	0.164				0.88	0.13	0.47	0.144	0.06	0.008	4%	
16	5.75	0.78	0.32	0.55	0.143				0.88	0.13	0.46	0.126	0.06	0.007	4%	
17	5.90	0.78	0.35	0.57	0.221				0.88	0.15	0.43	0.194	0.06	0.013	6%	
18	6.05	0.80	0.35	0.58	0.116				0.88	0.13	0.45	0.102	0.06	0.006	3%	
19	6.15	0.79	0.37	0.58	0.065				0.88	0.10	0.42	0.057	0.04	0.002	1%	
20	6.25	0.68	0.45	0.57	0.058				0.88	0.20	0.23	0.051	0.05	0.002	1%	
21	6.55	0.62	0.50	0.56	-0.005				0.88	0.38	0.12	-0.004	0.05	0.000	0%	
LB	7.00	0.00	0.00		0.00				0.88	0.23	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.206</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
-5m upstream of station

Mess. Start Time (MST):	15:35
Mess. End Time (MST):	16:06
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze

## Flow characteristics:

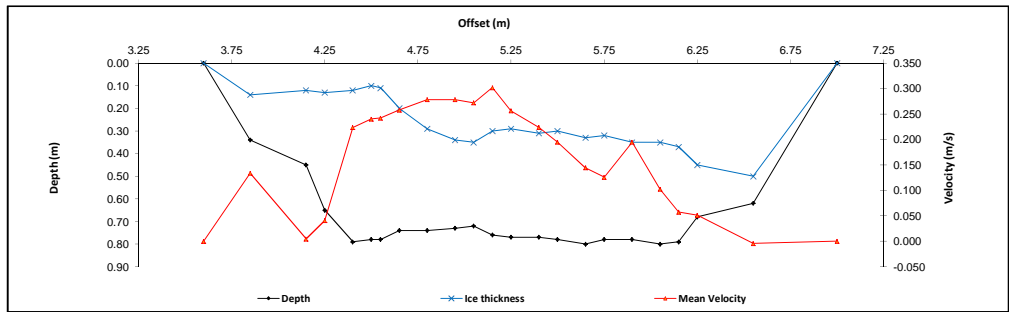
Total Flow:	0.206	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.19	(m <sup>2</sup> )
Wetted Width:	3.40	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.09	

## Logger Details:

	Before	After
Transducer Reading (m):	1.255	
Water (°C):	0.6	
Datalogger Clock:	15:04	
Laptop Clock:	15:04	
Battery (Main):	14.6	
Battery:		Good
Battery Serial #:	-	
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

## Datalogger / Station Notes:

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S09-05	0.857	331.492		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			1.212	330.280	330.231	3/4" Pipe 10m E of logger
S09-04			1.202	330.290	330.293	3/4" Pipe 6m NE of logger
Water Level:	Cut		2.005	329.487	Time WL Surveyed: 15:28	
Temporary BM			1.970	329.522	0.000	
<b>Turn</b>						
Temporary BM	1.952	331.474		329.522		
Water Level:	Cut		1.988	329.486	Time WL Surveyed: 15:30	
S09-04			1.185	330.289	330.293	3/4" Pipe 6m NE of logger
S09-03			1.194	330.280	330.231	3/4" Pipe 10m E of logger
S09-05			0.839	330.635	330.635	3/4" Pipe 10m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	329.487	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	328.232	-

Field Personnel:	SM, MP	Trip Date:	6-Mar-14
Data Entry Personnel:	SM	Date:	6-Mar-14
Data Check Personnel:	CJ	Date:	14-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement /

Site: S9 Kearsal Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: March 31, 2014  
 Site Visit Time (MST): 13:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.30	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.50	1.10	0.15			0.91	0.224	0.34	0.029	1.00	0.18	0.95	0.127	0.17	0.021	11%
2	1.65	1.08	0.16			0.90	0.227	0.34	0.188	1.00	0.15	0.92	0.208	0.14	0.029	15%
3	1.80	1.02	0.20			0.86	0.210	0.36	0.152	1.00	0.13	0.82	0.181	0.10	0.019	10%
4	1.90	1.00	0.20			0.84	0.185	0.36	0.171	1.00	0.13	0.80	0.178	0.10	0.018	9%
5	2.05	1.00	0.22			0.84	0.177	0.38	0.143	1.00	0.10	0.78	0.160	0.08	0.012	6%
6	2.10	1.04	0.20			0.87	0.168	0.37	0.153	1.00	0.10	0.84	0.161	0.08	0.013	7%
7	2.25	1.05	0.24			0.89	0.114	0.40	0.148	1.00	0.15	0.81	0.131	0.12	0.016	8%
8	2.40	1.08	0.23			0.91	0.074	0.40	0.120	1.00	0.13	0.85	0.097	0.11	0.010	5%
9	2.50	1.05	0.24			0.89	0.035	0.40	0.116	1.00	0.13	0.81	0.076	0.10	0.008	4%
10	2.65	1.02	0.26			0.87	0.050	0.41	0.119	1.00	0.13	0.76	0.085	0.10	0.008	4%
11	2.75	1.00	0.25	0.63	0.090					0.88	0.10	0.75	0.079	0.07	0.006	3%
12	2.85	0.98	0.26	0.62	0.093					0.88	0.10	0.72	0.082	0.07	0.006	3%
13	2.95	0.89	0.25	0.57	0.080					0.88	0.10	0.64	0.070	0.06	0.005	2%
14	3.05	0.89	0.26	0.58	0.073					0.88	0.13	0.63	0.064	0.08	0.005	3%
15	3.20	0.90	0.26	0.58	0.067					0.88	0.13	0.64	0.059	0.08	0.005	2%
16	3.30	0.87	0.27	0.57	0.067					0.88	0.18	0.60	0.059	0.11	0.006	3%
17	3.55	0.82	0.30	0.56	0.045					0.88	0.25	0.52	0.040	0.13	0.005	3%
18	3.80	0.80	0.38	0.59	0.025					0.88	0.25	0.42	0.022	0.11	0.002	1%
19	4.05	0.78	0.45	0.62	0.005					0.88	0.35	0.33	0.004	0.12	0.001	0%
20	4.50	0.70	0.45	0.58	0.002					0.88	0.32	0.25	0.002	0.08	0.000	0%
LB	4.70	0.00	0.00		0.00		0.00		0.00	0.88	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.194</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -adjacent to station

Meas. Start Time (MST):	13:05
Meas. End Time (MST):	13:41
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, windy, -10C

**Flow characteristics:**

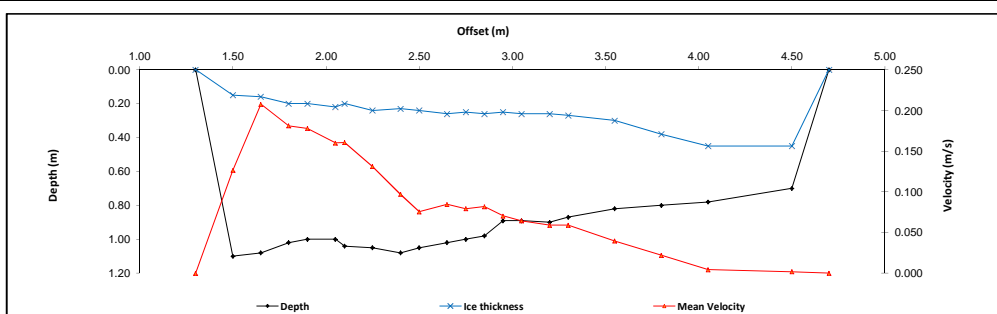
Total Flow:	0.194	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.00	(m <sup>2</sup> )
Wetted Width:	3.40	(m)
Hydraulic Depth:	0.59	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.243	
Water (°C):	0.5	
Datalogger Clock:	12:52	
Laptop Clock:	12:52	
Battery (Main):	14.4	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S09-05	0.844	331.479		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			1.192	330.287	330.231	3/4" Pipe 10m E of logger
S09-04			1.184	330.295	330.293	3/4" Pipe 6m NE of logger
Water Level:	Cut		2.001	329.478	Time WL Surveyed: 13:47	
Temporary BM			2.000	329.479	0.000	
<b>Turn</b>						
Temporary BM	1.982	331.461		329.479		
Water Level:	Cut		1.983	329.478	Time WL Surveyed: 13:50	
S09-04			1.166	330.295	330.293	3/4" Pipe 6m NE of logger
S09-03			1.174	330.287	330.231	3/4" Pipe 10m E of logger
S09-05			0.825	330.636	330.635	3/4" Pipe 10m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	329.478	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	328.235	-

**Field Personnel:**

	SM, MP	Trip Date:	31-Mar-14
Data Entry Personnel:	SM	Date:	31-Mar-14
Data Check Personnel:	CJ	Date:	2-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S9 Kearsal Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: May 1, 2014  
 Site Visit Time (MST): 11:30

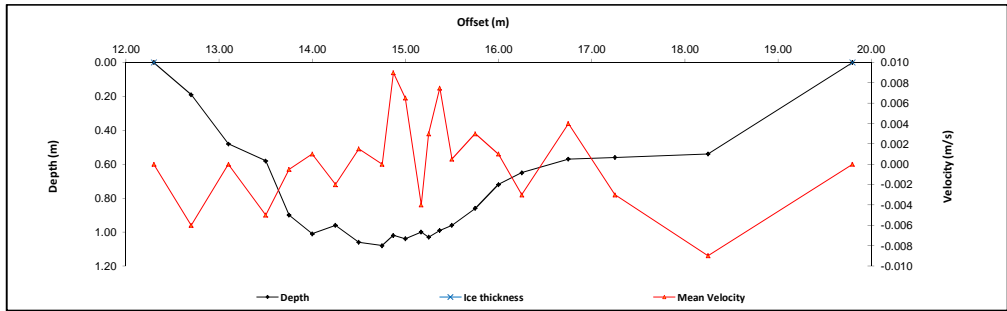


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	12.30	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	12.70	0.19		0.11	-0.006					1.00	0.40	0.19	-0.006	0.08	0.000	11%
2	13.10	0.48		0.29	0.000					1.00	0.40	0.48	0.000	0.19	0.000	0%
3	13.50	0.58		0.35	-0.005					1.00	0.32	0.58	-0.005	0.19	-0.001	23%
4	13.75	0.90				0.72	-0.009	0.18	0.008	1.00	0.25	0.90	-0.001	0.23	0.000	3%
5	14.00	1.01				0.81	-0.008	0.20	0.010	1.00	0.25	1.01	0.001	0.25	0.000	-6%
6	14.25	0.96				0.77	-0.006	0.19	0.002	1.00	0.25	0.96	-0.002	0.24	0.000	12%
7	14.50	1.06				0.85	0.001	0.21	0.002	1.00	0.25	1.06	0.002	0.27	0.000	-10%
8	14.75	1.08				0.86	-0.004	0.22	0.004	1.00	0.18	1.08	0.000	0.20	0.000	0%
9	14.87	1.02				0.82	0.009	0.20	0.009	1.00	0.13	1.02	0.009	0.13	0.001	-28%
10	15.00	1.04				0.83	0.003	0.21	0.010	1.00	0.15	1.04	0.007	0.16	0.001	-25%
11	15.17	1.00				0.80	-0.010	0.20	0.002	1.00	0.13	1.00	-0.004	0.00	0.000	0%
12	15.25	1.03				0.82	-0.003	0.21	0.009	1.00	0.10	1.03	0.003	0.10	0.000	-8%
13	15.37	0.99				0.79	0.005	0.20	0.010	1.00	0.13	0.99	0.008	0.12	0.001	-23%
14	15.50	0.96				0.77	-0.007	0.19	0.008	1.00	0.19	0.96	0.001	0.18	0.000	-2%
15	15.75	0.86				0.69	-0.002	0.17	0.008	1.00	0.25	0.86	0.003	0.22	0.001	-16%
16	16.00	0.72	0.43	0.001						1.00	0.25	0.72	0.001	0.18	0.000	-4%
17	16.25	0.65	0.39	-0.003						1.00	0.38	0.65	-0.003	0.24	-0.001	18%
18	16.75	0.57	0.34	0.004						1.00	0.50	0.57	0.004	0.29	0.001	-28%
19	17.25	0.56	0.34	-0.003						1.00	0.75	0.56	-0.003	0.42	-0.001	31%
20	18.25	0.54	0.32	-0.009						1.00	1.28	0.54	-0.009	0.69	-0.006	152%
RB	19.80	0.00	0.00	0.00	0.000	0.00	0.000	0.00	0.000	1.00	0.78	0.00	0.000	0.000		
<b>Total Flow</b>															<b>-0.004</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): Across from station

Meas. Start Time (MST):	12:00
Meas. End Time (MST):	12:40
Equipment:	ADV
Method:	Wading
River Condition:	Very little flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Partial cloud, breezy, 12 C



**Flow characteristics:**

Total Flow:	-0.004	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	4.36	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.00	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.187	1.187
Water (°C):	5.4	5.6
Datalogger Clock:	11:32	12:49
Laptop Clock:	11:32	12:49
Battery (Main):	13.9	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-very little water flowing through culvert, could not find much measurable flow

**General Notes:**

-very little water flowing through culvert, could not find much measurable flow

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S09-04	1.103	331.396		330.293	330.293	3/4" Pipe 6m NE of logger
S09-05			0.768	330.628	330.635	3/4" Pipe 10m NE of logger
S09-03			1.111	330.285	330.231	3/4" Pipe 10m E of logger
Water Level:	Cut		1.985	329.411		Time WL Surveyed: 11:40
Temporary BM			1.995	329.401	0.000	
<b>Turn</b>						
Temporary BM	1.947	331.348		329.401		
Water Level:	Cut		1.938	329.410		Time WL Surveyed: 11:44
S09-03			1.064	330.284	330.231	3/4" Pipe 10m E of logger
S09-05			0.722	330.626	330.635	3/4" Pipe 10m NE of logger
S09-04			1.057	330.291	330.293	3/4" Pipe 6m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S09-3	1.064	331.349		330.285		
Water Level:	Cut		1.938	329.411		Time WL Surveyed: 12:44
Water Level:	Cut		1.982	329.412		Time WL Surveyed: 12:46
S09-3	1.109	331.394		330.285		

**WL Survey Summary**

	Before	After
Average WL:	329.411	329.412
Closing Error:	0.002	-
WL Check:	0.001	-0.001
Transducer Elevation	328.224	328.225

**Field Personnel:**

	Personnel	Trip Date:	Date
Data Entry Personnel:	TR, GG	1-May-14	1-May-14
Data Check Personnel:	TR	1-May-14	1-May-14
Entered Digitally in the Field:	CJ	2-Jun-14	
	Yes		

# Hydrometric Measurement /

Site: S9 Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

June 16, 2014

Site Visit Time (MST):

13:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	11.80	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	12.20	0.85				0.68	0.001	0.17	0.189	1.00	0.35	0.85	0.095	0.30	0.028	3%
2	12.50	0.88				0.70	0.004	0.18	0.143	1.00	0.30	0.88	0.074	0.26	0.019	2%
3	12.80	0.84				0.67	0.072	0.17	0.257	1.00	0.30	0.84	0.165	0.25	0.041	4%
4	13.10	0.74		0.44	0.147					1.00	0.30	0.74	0.147	0.22	0.033	3%
5	13.40	0.79				0.63	0.001	0.16	0.279	1.00	0.30	0.79	0.140	0.24	0.033	3%
6	13.70	0.62		0.37	0.172					1.00	0.30	0.62	0.172	0.19	0.032	3%
7	14.00	0.74		0.44	0.226					1.00	0.40	0.74	0.226	0.30	0.067	6%
8	14.50	0.78				0.62	0.108	0.16	0.195	1.00	0.50	0.78	0.152	0.39	0.059	6%
9	15.00	0.80				0.64	0.046	0.16	0.188	1.00	0.50	0.80	0.117	0.40	0.047	4%
10	15.50	0.86				0.69	0.115	0.17	0.165	1.00	0.50	0.86	0.140	0.43	0.060	6%
11	16.00	1.11				0.89	0.135	0.22	0.190	1.00	0.50	1.11	0.163	0.56	0.090	9%
12	16.50	1.21				0.97	0.175	0.24	0.173	1.00	0.40	1.21	0.174	0.48	0.084	8%
13	16.80	1.26				1.01	0.207	0.25	0.259	1.00	0.30	1.26	0.233	0.38	0.088	8%
14	17.10	1.25				1.00	0.252	0.25	0.216	1.00	0.30	1.25	0.234	0.37	0.088	8%
15	17.40	1.23				0.98	0.130	0.25	0.250	1.00	0.30	1.23	0.190	0.37	0.070	7%
16	17.70	1.18				0.94	0.152	0.24	0.295	1.00	0.30	1.18	0.224	0.35	0.079	7%
17	18.00	1.03				0.82	0.159	0.21	0.314	1.00	0.30	1.03	0.237	0.31	0.073	7%
18	18.30	0.96				0.77	0.150	0.19	0.195	1.00	0.30	0.96	0.173	0.29	0.050	5%
19	18.60	0.85				0.68	-0.003	0.17	0.151	1.00	0.30	0.85	0.074	0.25	0.019	2%
20	18.90	0.44		0.26	0.012					1.00	0.45	0.44	0.012	0.20	0.002	0%
LB	19.50	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>1.06</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -adjacent to station

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	14:29
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow in both culverts
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 24 C

**Flow characteristics:**

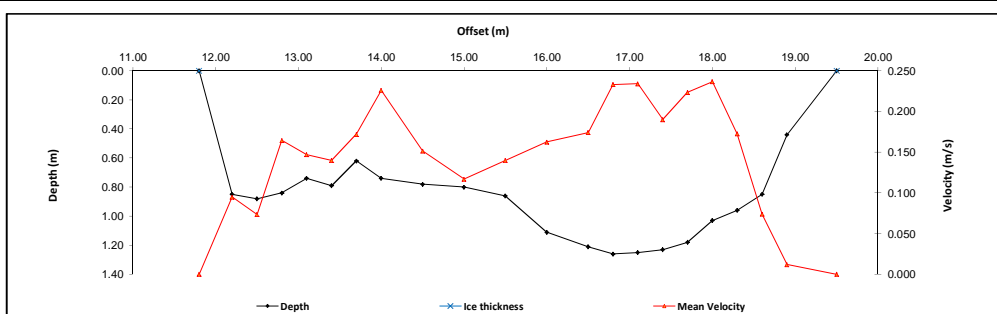
Total Flow:	1.06	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.54	(m <sup>2</sup> )
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.85	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.06	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.256	1.257
Water (°C):	18.6	18.8
Datalogger Clock:	13:21	14:40
Laptop Clock:	13:21	14:40
Battery (Main):	13.5	13.6
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Good	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S09-05	0.649	331.284		330.635	330.635	3/4" Pipe 10m NE of logger
S09-04			0.986	330.298	330.293	3/4" Pipe 6m NE of logger
S09-03			0.992	330.292	330.231	3/4" Pipe 10m E of logger
Water Level:	<b>Cut</b>		1.683	329.601		<b>Time WL Surveyed: 13:36</b>
S09-03			0.992	330.292	330.231	3/4" Pipe 10m E of logger
<b>Turn</b>						
S09-03	0.976	331.268		330.292	330.231	3/4" Pipe 10m E of logger
Water Level:	<b>Cut</b>		1.669	329.599		<b>Time WL Surveyed: 13:38</b>
S09-03			0.976	330.292	330.231	3/4" Pipe 10m E of logger
S09-04			0.971	330.297	330.293	3/4" Pipe 6m NE of logger
S09-05			0.634	330.634	330.635	3/4" Pipe 10m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S09-03	0.976	331.268		330.292		
Water Level:	<b>Cut</b>		1.668	329.600		<b>Time WL Surveyed: 14:37</b>
Water Level:	<b>Cut</b>		1.648	329.602		<b>Time WL Surveyed: 14:38</b>
S09-03	0.958	331.250		330.292		

**WL Survey Summary**

	Before	After
Average WL:	329.600	329.601
Closing Error:	0.001	-
WL Check:	0.002	-0.002
Transducer Elevation	328.344	328.344

**Field Personnel:**

	SM, TR	Trip Date:	16-Jun-14
Data Entry Personnel:	SM	Date:	16-Jun-14
Data Check Personnel:	CJ	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		





# Hydrometric Measurement /

Site: S9 Kearsal Lake Outlet  
 UTM Location: 483962 E, 6346990 N

Site Visit Date: October 21, 2014  
 Site Visit Time (MST): 11:21

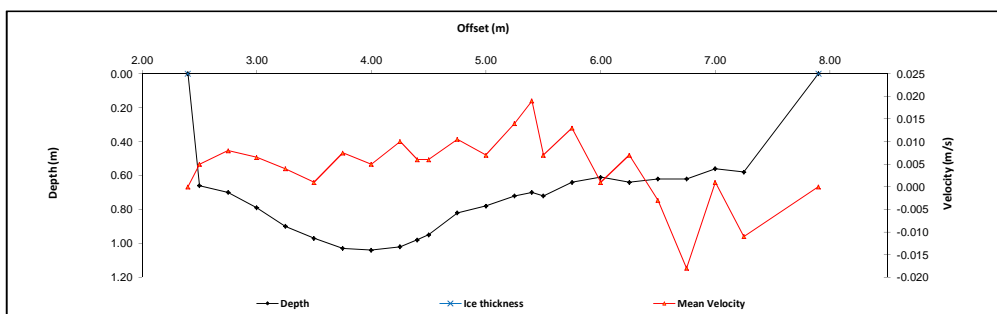


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	7.90	0.00	0.00		0.000		0.000		0.000	1.00	0.33	0.00	0.000	0.00	0.000	
1	7.25	0.58		0.35	-0.011					1.00	0.45	0.58	-0.011	0.26	-0.003	-17%
2	7.00	0.56		0.34	0.001					1.00	0.25	0.56	0.001	0.14	0.000	1%
3	6.75	0.62		0.37	-0.018					1.00	0.25	0.62	-0.018	0.16	-0.003	-17%
4	6.50	0.62		0.37	-0.003					1.00	0.25	0.62	-0.003	0.16	0.000	-3%
5	6.25	0.64		0.38	0.007					1.00	0.25	0.64	0.007	0.16	0.001	7%
6	6.00	0.61		0.37	0.001					1.00	0.25	0.61	0.001	0.15	0.000	1%
7	5.75	0.64		0.38	0.013					1.00	0.25	0.64	0.013	0.16	0.002	12%
8	5.50	0.72		0.43	0.007					1.00	0.18	0.72	0.007	0.13	0.001	5%
9	5.40	0.70		0.42	0.019					1.00	0.13	0.70	0.019	0.09	0.002	10%
10	5.25	0.72		0.43	0.014					1.00	0.20	0.72	0.014	0.14	0.002	12%
11	5.00	0.78				0.62	0.001	0.16	0.013	1.00	0.25	0.78	0.007	0.20	0.001	8%
12	4.75	0.82				0.66	0.003	0.16	0.018	1.00	0.25	0.82	0.011	0.21	0.002	13%
13	4.50	0.95				0.76	-0.003	0.19	0.015	1.00	0.18	0.95	0.006	0.17	0.001	6%
14	4.40	0.98				0.78	-0.003	0.20	0.015	1.00	0.13	0.98	0.006	0.12	0.001	4%
15	4.25	1.02				0.82	0.004	0.20	0.016	1.00	0.20	1.02	0.010	0.20	0.002	12%
16	4.00	1.04				0.83	-0.005	0.21	0.015	1.00	0.25	1.04	0.005	0.26	0.001	8%
17	3.75	1.03				0.82	0.016	0.21	-0.001	1.00	0.25	1.03	0.008	0.26	0.002	11%
18	3.50	0.97				0.78	-0.009	0.19	0.011	1.00	0.25	0.97	0.001	0.24	0.000	1%
19	3.25	0.90				0.72	-0.003	0.18	0.011	1.00	0.25	0.90	0.004	0.23	0.001	5%
20	3.00	0.79				0.63	0.000	0.16	0.013	1.00	0.25	0.79	0.007	0.20	0.001	8%
21	2.75	0.70		0.42	0.008					1.00	0.25	0.70	0.008	0.18	0.001	8%
22	2.50	0.66		0.40	0.005					1.00	0.18	0.66	0.005	0.12	0.001	3%
LB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.017</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): at station -adjacent to station

Meas. Start Time (MST):	11:33
Meas. End Time (MST):	12:21
Equipment:	ADV
Method:	Wading
River Condition:	Beaver affected (backwatered)
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, 12 C



**Flow characteristics:**

Total Flow:	0.017	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.91	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.71	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.00	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.078	1.077
Water (°C):	5.9	6.1
Datalogger Clock:	11:20	12:24
Laptop Clock:	11:20	12:24
Battery (Main):	14.1	14.0
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S09-05	0.682	331.317		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			1.023	330.294	330.231	3/4" Pipe 10m E of logger
S09-04			1.017	330.300	330.293	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.900	329.417	Time WL Surveyed:	11:25
S09-04			1.017	330.300	330.293	3/4" Pipe 6m NE of logger
<b>Turn</b>						
S09-04	1.002	331.302		330.300	330.293	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.882	329.420	Time WL Surveyed:	11:27
S09-04			1.002	330.300	330.293	3/4" Pipe 6m NE of logger
S09-03			1.007	330.295	330.231	3/4" Pipe 10m E of logger
S09-05			0.663	330.639	330.635	3/4" Pipe 10m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S09-04	1.002	331.302		330.300		
Water Level:	Cut		1.883	329.419	Time WL Surveyed:	12:28
Water Level:	Cut		1.854	329.415	Time WL Surveyed:	12:30
S09-04	0.969	331.269		330.300		

**WL Survey Summary**

	Before	After
Average WL:	329.419	329.417
Closing Error:	-0.004	-
WL Check:	0.003	0.004
Transducer Elevation	328.341	328.340

**Field Personnel:**

	GG, TR	Trip Date:	21-Oct-14
Data Entry Personnel:	GG	Date:	21-Oct-14
Data Check Personnel:	CJ	Date:	19-Nov-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement /

Site: S9 Kearl Lake Outlet

UTM Location: 483962 E, 6346990 N

Site Visit Date:

December 2, 2014

Site Visit Time (MST):

09:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.50	0.00	0.00		0.000		0.000		0.000	0.88	0.25	0.00	0.000	0.00	0.000	
1	4.00	0.65	0.15	0.40	0.049					0.88	0.38	0.50	0.043	0.19	0.008	5%
2	4.25	0.65	0.17	0.41	0.063					0.88	0.30	0.48	0.073	0.14	0.011	6%
3	4.60	0.69	0.17	0.43	0.034					0.88	0.35	0.52	0.030	0.18	0.005	3%
4	4.95	0.65	0.20	0.43	0.030					0.88	0.35	0.45	0.026	0.16	0.004	2%
5	5.30	0.67	0.19	0.43	0.046					0.88	0.32	0.48	0.040	0.16	0.006	4%
6	5.60	0.69	0.17	0.43	0.059					0.88	0.28	0.52	0.052	0.14	0.007	4%
7	5.85	0.69	0.17	0.43	0.058					0.88	0.28	0.52	0.051	0.14	0.007	4%
8	6.15	0.78	0.18	0.48	0.041					0.88	0.33	0.60	0.036	0.20	0.007	4%
9	6.50	0.93	0.16			0.78	0.041	0.31	0.057	1.00	0.30	0.77	0.049	0.23	0.011	6%
10	6.75	0.97	0.17			0.81	0.076	0.33	0.088	1.00	0.20	0.80	0.082	0.16	0.013	7%
11	6.90	0.98	0.15			0.81	0.081	0.32	0.081	1.00	0.18	0.83	0.081	0.15	0.012	7%
12	7.10	1.00	0.16			0.83	0.074	0.33	0.097	1.00	0.15	0.84	0.086	0.13	0.011	6%
13	7.20	1.00	0.15			0.83	0.078	0.32	0.080	1.00	0.15	0.85	0.079	0.13	0.010	6%
14	7.40	1.00	0.16			0.83	0.076	0.33	0.101	1.00	0.17	0.84	0.089	0.15	0.013	7%
15	7.55	1.00	0.17			0.83	0.083	0.34	0.087	1.00	0.13	0.83	0.085	0.10	0.009	5%
16	7.65	1.00	0.16			0.83	0.075	0.33	0.076	1.00	0.13	0.84	0.076	0.11	0.008	4%
17	7.80	0.98	0.15			0.81	0.075	0.32	0.076	1.00	0.18	0.83	0.076	0.15	0.011	6%
18	8.00	0.90	0.16	0.53	0.082					0.88	0.25	0.74	0.072	0.19	0.013	7%
19	8.30	0.80	0.17	0.49	0.065					0.88	0.33	0.63	0.057	0.20	0.012	7%
20	8.65	0.67	0.16	0.42	-0.001					0.88	0.38	0.51	-0.001	0.19	0.000	0%
LB	9.05	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.179</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
6m DS of station

Meas. Start Time (MST): 10:20

Meas. End Time (MST): 10:55

Equipment: ADV

Method: Ice

River Condition: Full ice cover

Channel Edges: Trapezoidal Edge (e.g. stream)

Quality/Error (see reverse): Good

Weather: Overcast, calm, -23 C

### Flow characteristics:

Total Flow: 0.179 (m<sup>3</sup>/s)

Perceived Measurement Quality: Good

Cross Section Area: 3.18 (m<sup>2</sup>)

Wetted Width: 5.55 (m)

Hydraulic Depth: 0.57 (m)

Mean Velocity: 0.06 (m/s)

Froude Number: 0.02

### Logger Details:

Transducer Reading (m): Before 1.074 After -

Water (°C): Before 0.4 After -

Datalogger Clock: Before 11:10 After 11:10

Laptop Clock: Before 14.6 After -

Battery (Main): Good

Battery Serial #: -

Enclosure Dessicant: Replaced

Vent Tube Dessicant: Good

PTH (if replaced): -

Logger# (if replaced): -

### Datalogger / Station Notes:

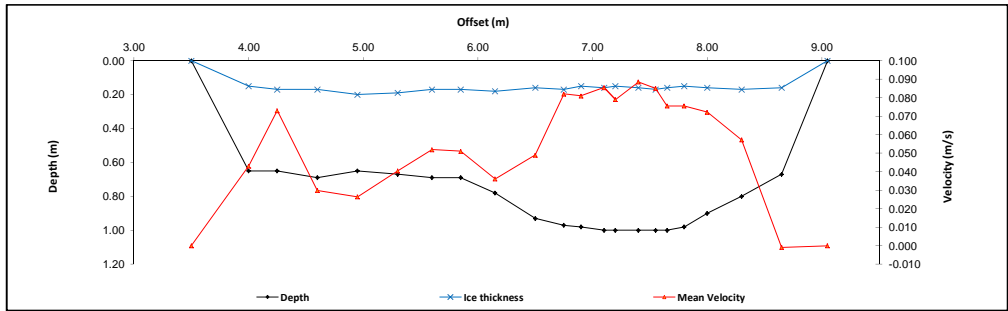
-Enclosure lock frozen, no first download, lock cut

-Ran ADV test, results good

-Modem replaced

-Station has old solar controller, change on subsequent visit

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S09-05	0.664	331.299		330.635	330.635	3/4" Pipe 10m NE of logger
S09-03			0.993	330.306	330.294	3/4" Pipe 10m E of logger
S09-04			1.002	330.297	330.299	3/4" Pipe 6m NE of logger
Water Level:	Cut		1.889	329.410	Time WL Surveyed: 10:14	
Temporary BM			1.862	329.437	0.000	-
<b>Turn</b>						
Temporary BM	1.851	331.288		329.437	-	
Water Level:	Cut		1.876	329.412	Time WL Surveyed: 10:15	
S09-04			0.990	330.298	330.299	3/4" Pipe 6m NE of logger
S09-03			0.981	330.307	330.294	3/4" Pipe 10m E of logger
S09-05			0.651	330.637	330.635	3/4" Pipe 10m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S09-04	0.990	331.288		330.298		
Water Level:	Cut		1.878	329.410	Time WL Surveyed: 11:00	
Water Level:	Cut		1.869	329.407	Time WL Surveyed: 11:01	
S09-04	0.978	331.276		330.298		

WL Survey Summary	Before	After
Average WL:	329.411	329.409
Closing Error:	-0.002	-
WL Check:	0.002	0.003
Transducer Elevation	-	328.335

Field Personnel:	TR, CJ	Trip Date:	2-Dec-14
Data Entry Personnel:	CJ	Date:	2-Dec-14
Data Check Personnel:	CJ	Date:	5-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: January 11, 2014  
 Site Visit Time (MST): 13:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.80	0.00	0.00		0.000		0.000		0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	3.05	0.20	0.15	0.18	-0.001					0.88	0.38	0.05	-0.001	0.02	0.000	0%
2	3.55	0.30	0.16	0.23	0.000					0.88	0.30	0.14	0.000	0.04	0.000	0%
3	3.85	0.27	0.15	0.21	0.062					0.88	0.15	0.12	0.055	0.02	0.001	8%
4	3.85	0.33	0.15	0.24	0.002					0.88	0.23	0.18	0.002	0.04	0.000	1%
5	4.10	0.30	0.17	0.24	0.016					0.88	0.20	0.13	0.014	0.03	0.000	3%
6	4.25	0.40	0.23	0.32	0.014					0.88	0.20	0.27	0.012	0.03	0.000	3%
7	4.50	0.43	0.19	0.31	0.015					0.88	0.30	0.24	0.013	0.07	0.001	7%
8	4.85	0.43	0.21	0.32	0.007					0.88	0.25	0.22	0.006	0.06	0.000	3%
9	5.00	0.50	0.25	0.38	0.024					0.88	0.13	0.25	0.021	0.03	0.001	5%
10	5.10	0.50	0.23	0.37	0.023					0.88	0.20	0.27	0.020	0.05	0.001	9%
11	5.40	0.50	0.24	0.37	0.001					0.88	0.23	0.26	0.001	0.06	0.000	0%
12	5.55	0.54	0.23	0.39	-0.003					0.88	0.25	0.31	-0.003	0.08	0.000	-2%
13	5.90	0.53	0.20	0.37	0.001					0.88	0.25	0.33	0.001	0.08	0.000	1%
14	6.05	0.52	0.17	0.35	0.024					0.88	0.15	0.35	0.021	0.05	0.001	9%
15	6.20	0.50	0.16	0.33	0.035					0.88	0.15	0.34	0.031	0.05	0.002	12%
16	6.35	0.50	0.18	0.34	0.033					0.88	0.17	0.32	0.029	0.06	0.002	13%
17	6.55	0.50	0.15	0.33	0.034					0.88	0.15	0.35	0.030	0.05	0.002	12%
18	6.65	0.48	0.15	0.32	0.039					0.88	0.15	0.33	0.034	0.05	0.002	13%
19	6.85	0.40	0.15	0.28	0.014					0.88	0.28	0.25	0.012	0.07	0.001	7%
20	7.20	0.38	0.15	0.27	-0.008					0.88	0.23	0.23	-0.007	0.05	0.000	-3%
RB	7.30	0.00	0.00		0.00		0.00		0.00	0.88	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.013</b>	<b>100%</b>	

### Flow Measurement Details:

**Metering Section Location (describe):**  
-adjacent to pressure transducer

Mess. Start Time (MST):	14:00
Mess. End Time (MST):	14:35
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, light-breeze, -15 C

### Flow characteristics:

Total Flow:	0.013	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.99	(m <sup>2</sup> )
Wetted Width:	4.50	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	

### Logger Details:

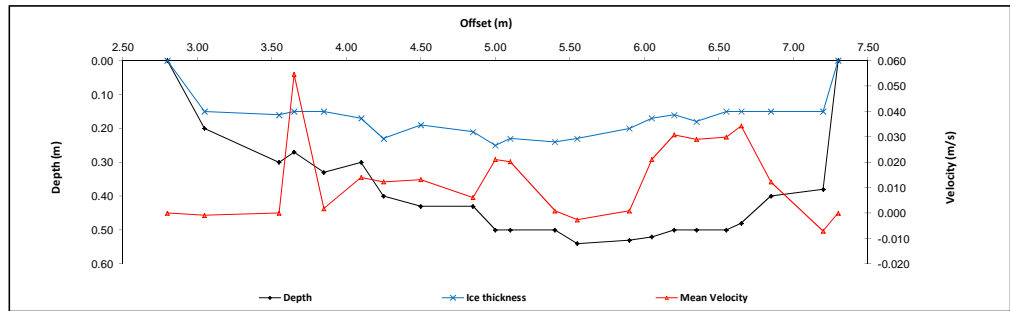
	Before	After
Transducer Reading (m):	0.496	0.496
Water (°C):	0.0	0.0
Datalogger Clock:	13:13	14:41
Laptop Clock:	13:13	14:41
Battery (Main):	11.7	13.0
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

-Repaired wiring to solar controller

### General Notes:

-Augured a set of holes downstream of station, found no flow.  
 -Made a new set of holes adjacent to PLS and conducted flow measurement



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-03	1.344	101.480		100.136	100.136	3/4" Pipe N of logger
S10A-01			1.244	100.236	100.236	3/4" Pipe NW of logger
S10A-02			1.483	99.997	100.000	3/4" Pipe W of logger
Water Level:	Cut		2.683	98.797	Time WL Surveyed:	13:28
Temporary BM			2.654	98.826	0.000	-
<b>Turn</b>						
Temporary BM	2.638	101.464		98.826		-
Water Level:	Cut		2.667	98.797	Time WL Surveyed:	13:30
S10A-02			1.464	100.000	100.000	3/4" Pipe W of logger
S10A-01			1.227	100.237	100.236	3/4" Pipe NW of logger
S10A-03			1.327	100.137	100.136	3/4" Pipe N of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S10A-03	1.327	101.463		100.136		
Water Level:	Cut		2.666	98.797	Time WL Surveyed:	14:37
Water Level:	Cut		2.648	98.796	Time WL Surveyed:	14:39
S10A-03	1.308	101.444		100.136		

WL Survey Summary	Before	After
Average WL:	98.797	98.797
Closing Error:	-0.001	-
WL Check:	0.000	0.001
Transducer Elevation	98.301	98.301

Field Personnel:	SM, DW	Trip Date:	11-Jan-14
Data Entry Personnel:	SM	Date:	11-Jan-14
Data Check Personnel:	CJ	Date:	14-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: February 11, 2014  
 Site Visit Time (MST): 13:00

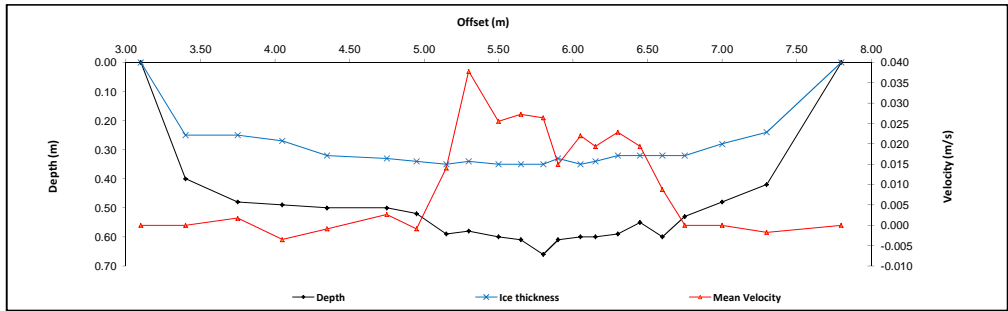


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	3.10	0.00	0.00		0.000				0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	3.40	0.40	0.25	0.33	0.000				0.000	0.88	0.33	0.15	0.000	0.05	0.000	0%
2	3.75	0.48	0.25	0.37	0.002				0.002	0.88	0.33	0.23	0.002	0.07	0.000	1%
3	4.05	0.49	0.27	0.38	-0.004				-0.004	0.88	0.30	0.22	-0.004	0.07	0.000	-3%
4	4.35	0.50	0.32	0.41	-0.001				-0.001	0.88	0.35	0.18	-0.001	0.06	0.000	-1%
5	4.75	0.50	0.33	0.42	0.003				0.003	0.88	0.30	0.17	0.003	0.05	0.000	1%
6	4.95	0.52	0.34	0.43	-0.001				-0.001	0.88	0.20	0.18	-0.001	0.04	0.000	0%
7	5.15	0.59	0.35	0.47	0.016				0.016	0.88	0.17	0.24	0.014	0.04	0.001	7%
8	5.30	0.58	0.34	0.46	0.043				0.043	0.88	0.18	0.24	0.038	0.04	0.002	18%
9	5.50	0.60	0.35	0.48	0.029				0.029	0.88	0.18	0.25	0.026	0.04	0.001	12%
10	5.65	0.61	0.35	0.48	0.031				0.031	0.88	0.15	0.26	0.027	0.04	0.001	12%
11	5.80	0.66	0.35	0.51	0.030				0.030	0.88	0.13	0.31	0.026	0.04	0.001	11%
12	5.90	0.61	0.33	0.47	0.017				0.017	0.88	0.13	0.28	0.015	0.04	0.001	6%
13	6.05	0.60	0.35	0.48	0.025				0.025	0.88	0.13	0.25	0.022	0.03	0.001	8%
14	6.15	0.60	0.34	0.47	0.022				0.022	0.88	0.13	0.26	0.019	0.03	0.001	7%
15	6.30	0.59	0.32	0.46	0.026				0.026	0.88	0.15	0.27	0.023	0.04	0.001	10%
16	6.45	0.55	0.32	0.44	0.022				0.022	0.88	0.15	0.23	0.019	0.03	0.001	7%
17	6.60	0.60	0.32	0.46	0.010				0.010	0.88	0.15	0.28	0.009	0.04	0.000	4%
18	6.75	0.53	0.32	0.43	0.000				0.000	0.88	0.20	0.21	0.000	0.04	0.000	0%
19	7.00	0.48	0.28	0.38	0.000				0.000	0.88	0.28	0.20	0.000	0.06	0.000	0%
20	7.30	0.42	0.24	0.33	-0.002				-0.002	0.88	0.40	0.18	-0.002	0.07	0.000	-1%
RB	7.80	0.00	0.00		0.00				0.00	0.88	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.009</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -3m upstream of station

Meas. Start Time (MST):	13:42
Meas. End Time (MST):	14:22
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, light breeze, -18 C



**Flow characteristics:**

Total Flow:	0.009	(m³/s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	0.93	(m²)
Wetted Width:	4.70	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.478	-
Water (°C):	0.0	-
Datalogger Clock:	13:06	-
Laptop Clock:	13:06	-
Battery (Main):	15.2	15.2
Battery:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Replaced	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-slush in channel affected flow measurement

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-02	1.517	101.517		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.280	100.237	100.236	3/4" Pipe NW of logger
S10A-03			1.381	100.136	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.733	98.784	Time WL Surveyed: 13:31	
Temporary BM			2.595	98.922	0.000	
<b>Turn</b>						
Temporary BM	2.577	101.499		98.922	-	
Water Level:	Cut		2.714	98.785	Time WL Surveyed: 13:37	
S10A-03			1.362	100.137	100.136	3/4" Pipe N of logger
S10A-01			1.260	100.239	100.236	3/4" Pipe NW of logger
S10A-02			1.499	100.000	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.785	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	98.307	-

**Field Personnel:**

	SM, MP	Trip Date:	11-Feb-14
Data Entry Personnel:	SM	Date:	11-Feb-14
Data Check Personnel:	CJ	Date:	14-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: March 10, 2014  
 Site Visit Time (MST): 10:00

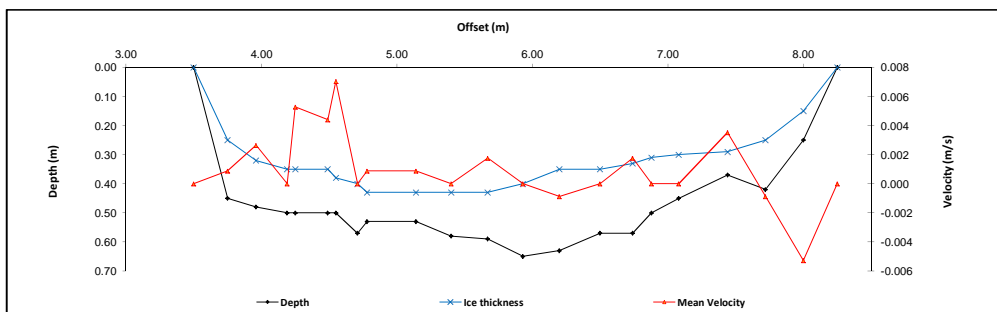


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.50	0.00	0.00		0.000				0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	3.75	0.45	0.25	0.35	0.001				0.88	0.23	0.20	0.001	0.05	0.000	8%	
2	3.96	0.48	0.32	0.40	0.003				0.88	0.22	0.16	0.003	0.04	0.000	19%	
3	4.19	0.50	0.35	0.43	0.000				0.88	0.15	0.15	0.000	0.02	0.000	0%	
4	4.25	0.50	0.35	0.43	0.006				0.88	0.15	0.15	0.005	0.02	0.000	25%	
5	4.49	0.50	0.35	0.43	0.005				0.88	0.15	0.15	0.004	0.02	0.000	20%	
6	4.55	0.50	0.38	0.44	0.008				0.88	0.11	0.12	0.007	0.01	0.000	19%	
7	4.71	0.57	0.40	0.49	0.000				0.88	0.12	0.17	0.000	0.02	0.000	0%	
8	4.78	0.53	0.43	0.48	0.001				0.88	0.22	0.10	0.001	0.02	0.000	4%	
9	5.14	0.53	0.43	0.48	0.001				0.88	0.31	0.10	0.001	0.03	0.000	6%	
10	5.40	0.58	0.43	0.51	0.000				0.88	0.27	0.15	0.000	0.04	0.000	0%	
11	5.67	0.59	0.43	0.51	0.002				0.88	0.27	0.16	0.002	0.04	0.000	15%	
12	5.93	0.65	0.40	0.53	0.000				0.88	0.27	0.25	0.000	0.07	0.000	0%	
13	6.20	0.63	0.35	0.49	-0.001				0.88	0.29	0.28	-0.001	0.08	0.000	-15%	
14	6.50	0.57	0.35	0.46	0.000				0.88	0.27	0.22	0.000	0.06	0.000	0%	
15	6.74	0.57	0.33	0.45	0.002				0.88	0.19	0.24	0.002	0.05	0.000	17%	
16	6.88	0.50	0.31	0.41	0.000				0.88	0.17	0.19	0.000	0.03	0.000	0%	
17	7.08	0.45	0.30	0.38	0.000				0.88	0.28	0.15	0.000	0.04	0.000	0%	
18	7.44	0.37	0.29	0.33	0.004				0.88	0.32	0.08	0.004	0.03	0.000	19%	
19	7.72	0.42	0.25	0.34	-0.001				0.88	0.28	0.17	-0.001	0.05	0.000	-9%	
20	8.00	0.25	0.15	0.20	-0.006				0.88	0.27	0.10	-0.005	0.03	0.000	-29%	
LB	8.25	0.00	0.00		0.00				0.88	0.13	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.000</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -5m upstream of station

Meas. Start Time (MST):	10:45
Meas. End Time (MST):	11:18
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Overcast -10 C



**Flow characteristics:**

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.74	(m <sup>2</sup> )
Wetted Width:	4.75	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.00	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.500	0.502
Water (°C):	0.0	0.0
Datalogger Clock:	10:05	10:14
Laptop Clock:	10:05	10:14
Battery (Main):	14.9	12.7
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-slush under ice throughout, affected flow measurement

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-02	1.490	101.490		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.248	100.242	100.236	3/4" Pipe NW of logger
S10A-03			1.350	100.140	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.683	98.807	Time WL Surveyed: 11:34	
Temporary BM			1.444	100.046	0.000	
<b>Turn</b>						
Temporary BM	1.416	101.462		100.046		
Water Level:	Cut		2.655	98.807	Time WL Surveyed: 11:37	
S10A-03			1.323	100.139	100.136	3/4" Pipe N of logger
S10A-01			1.221	100.241	100.236	3/4" Pipe NW of logger
S10A-02			1.463	99.999	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.807	-
Closing Error:	0.001	-
WL Check:	0.000	-
Transducer Elevation	98.307	-

**Field Personnel:**

	DW, MP	Trip Date:	10-Mar-14
Data Entry Personnel:	MP	Date:	10-Mar-14
Data Check Personnel:	CJ	Date:	14-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: March 31, 2014  
 Site Visit Time (MST): 14:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.80	0.00	0.00		0.000				0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	1.10	0.43	0.40	0.42	0.000				0.88	0.34	0.03	0.000	0.01	0.000	0%	
2	1.47	0.60	0.35	0.48	0.000				0.88	0.37	0.25	0.000	0.09	0.000	0%	
3	1.83	0.63	0.44	0.54	0.002				0.88	0.31	0.19	0.002	0.06	0.000	2%	
4	2.08	0.80	0.40	0.60	-0.005				0.88	0.24	0.40	-0.004	0.09	0.000	-7%	
5	2.30	0.90	0.45	0.68	-0.006				0.88	0.25	0.45	-0.005	0.11	-0.001	-10%	
6	2.58	0.95	0.45	0.70	-0.001				0.88	0.29	0.50	-0.001	0.14	0.000	-2%	
7	2.87	1.00	0.45	0.73	-0.002				0.88	0.32	0.55	-0.002	0.17	0.000	-5%	
8	3.21	1.00	0.45	0.73	0.003				0.88	0.35	0.55	0.003	0.19	0.001	8%	
9	3.57	1.00	0.45	0.73	0.008				0.88	0.11	0.55	0.007	0.06	0.000	7%	
10	3.43	1.00	0.45	0.73	0.009				0.88	0.09	0.55	0.008	0.05	0.000	6%	
11	3.75	1.00	0.50	0.75	0.014				0.88	0.24	0.50	0.012	0.12	0.001	23%	
12	3.90	0.90	0.50	0.70	0.015				0.88	0.17	0.40	0.013	0.07	0.001	14%	
13	4.08	0.90	0.50	0.70	0.034				0.88	0.15	0.40	0.030	0.06	0.002	29%	
14	4.20	0.85	0.45	0.65	0.035				0.88	0.16	0.40	0.031	0.07	0.002	33%	
15	4.41	0.70	0.45	0.58	0.003				0.88	0.17	0.25	0.003	0.04	0.000	2%	
16	4.53	0.70	0.45	0.58	0.000				0.88	0.17	0.25	0.000	0.04	0.000	0%	
17	4.76	0.50	0.40	0.45	0.000				0.88	0.44	0.10	0.000	0.04	0.000	0%	
RB	5.40	0.00	0.00		0.00		0.00		0.88	0.32	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.006</b>	<b>100%</b>	

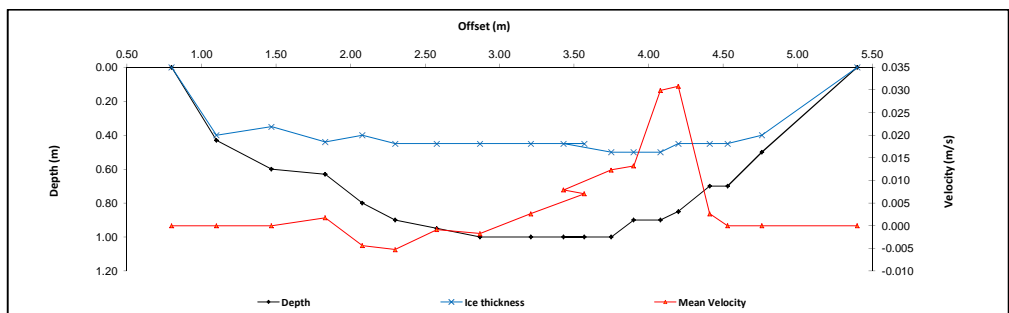
**Flow Measurement Details:**

Metering Section Location (describe):  
-adjacent to station

Meas. Start Time (MST):	14:46
Meas. End Time (MST):	15:10
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, -3 C

**Flow Characteristics:**

Total Flow:	0.006	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.42	(m <sup>2</sup> )
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.00	(m/s)
Froude Number:	0.00	



**Logger Details:**

	Before	After
Transducer Reading (m):	0.496	
Water (°C):	0.0	
Datalogger Clock:	14:21	
Laptop Clock:	14:20	
Battery (Main):	12.4	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-lots of slush under ice, affected flow measurement

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-02	1.610	101.610		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.374	100.236	100.236	3/4" Pipe NW of logger
S10A-03			1.474	100.136	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.812	98.798		<b>Time WL Surveyed:</b> 14:38
Temporary BM			2.523	99.087	0.000	
<b>Turn</b>						
Temporary BM	2.442	101.529		99.087		
Water Level:	Cut		2.731	98.798		<b>Time WL Surveyed:</b> 14:41
S10A-03			1.393	100.136	100.136	3/4" Pipe N of logger
S10A-01			1.289	100.240	100.236	3/4" Pipe NW of logger
S10A-02			1.530	99.999	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					<b>Time WL Surveyed:</b>
Water Level:	Cut					<b>Time WL Surveyed:</b>

**WL Survey Summary**

	Before	After
Average WL:	98.798	-
Closing Error:	0.001	-
WL Check:	0.000	-
Transducer Elevation	98.302	-

**Field Personnel:**

	SM, MP	Trip Date:	31-Mar-14
Data Entry Personnel:	SM	Date:	31-Mar-14
Data Check Personnel:	CJ	Date:	2-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: May 25, 2014  
 Site Visit Time (MST): 13:25



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): -approx. 40m DS of station	
Meas. Start Time (MST):	14:59
Meas. End Time (MST):	15:13
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20 C

<b>Flow characteristics:</b>		
Total Flow:	1.29	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.46	(m <sup>2</sup> )
Wetted Width:	6.13	(m)
Hydraulic Depth:	0.07	(m)
Mean Velocity:	1.29	(m/s)
Froude Number:	1.51	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.857	0.865
Water (°C):	12.7	13.3
Datalogger Clock:	13:29	15:30
Laptop Clock:	13:28	15:30
Battery (Main):	11.2	13.8
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	17935	16116

**Datalogger / Station Notes:**

- Removed modem (not functioning) and antenna cable (an omni cable was previously installed)
- Replaced solar controller and battery
- Need to bring a modem and surge suppressor on next visit
- Replaced data logger

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>					
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08	LB: -
Serial Number:	1802		Salinity (ppt):	-	RB: -
Firmware Version:	3.5		Magnetic Declination (°):	14.33	
Software Version:	3.7		Measured Temperature (°C):	-	
			ADCP Temperature (°C):	15.5	
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>		
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):
Depth Reference:	Vertical Beam		1	6.12	3.46
Coordinate System:	ENU		2	6.23	3.36
Left Method:	Sloped Bank		3	6.19	3.40
Right Method:	Sloped Bank		4	5.98	3.33
Top Fit Type:	Power Fit				
Bottom Fit Type:	Power Fit				
			<b>Mean:</b>	6.13	3.39
			<b>SD:</b>	0.09	0.05
			<b>COV:</b>	0.02	0.01
				0.290	0.027
				1.332	2.90%
				1.301	0.50%
				1.307	0.97%
				1.238	-4.36%

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>	S10A-02	1.292	101.292		100.000	100.000	3/4" Pipe W of logger
	S10A-01			1.051	100.241	100.236	3/4" Pipe NW of logger
	S10A-03			1.156	100.136	100.136	3/4" Pipe N of logger
	Water Level:	Cut		2.122	99.170		<b>Time WL Surveyed:</b> 14:33
	Temporary BM			2.098	99.194	0.000	-
<b>Turn</b>	Temporary BM	2.086	101.280		99.194		-
	Water Level:	Cut		2.109	99.171		<b>Time WL Surveyed:</b> 14:34
	S10A-03			1.141	100.139	100.136	3/4" Pipe N of logger
	S10A-01			1.037	100.243	100.236	3/4" Pipe NW of logger
	S10A-02			1.277	100.003	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
	S10A-03	1.141	101.277		100.136		
	Water Level:	Cut		2.110	99.167		<b>Time WL Surveyed:</b> 15:26
	Water Level:	Cut		2.099	99.169		<b>Time WL Surveyed:</b> 15:27
	S10A-03	1.132	101.268		100.136		

<b>WL Survey Summary</b>	Before	After
Average WL:	99.171	99.168
Closing Error:	-0.003	-
WL Check:	0.001	-0.002
Transducer Elevation	98.314	98.303

<b>Field Personnel:</b>	TR, CJ	Trip Date:	25-May-14
Data Entry Personnel:	CJ	Date:	25-May-14
Data Check Personnel:	CJ	Date:	2-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: June 19, 2014  
 Site Visit Time (MST): 13:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.50	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.80	0.49		0.29	0.150					1.00	0.30	0.49	0.150	0.15	0.022	2%
2	2.10	0.51		0.31	0.156					1.00	0.30	0.51	0.156	0.15	0.024	2%
3	2.40	0.59		0.35	0.246					1.00	0.30	0.59	0.246	0.18	0.044	4%
4	2.70	0.59		0.35	0.308					1.00	0.30	0.59	0.308	0.18	0.055	5%
5	3.00	0.55		0.33	0.368					1.00	0.30	0.55	0.368	0.17	0.061	5%
6	3.30	0.58		0.35	0.429					1.00	0.30	0.58	0.429	0.17	0.075	7%
7	3.60	0.58		0.35	0.428					1.00	0.30	0.58	0.428	0.17	0.074	7%
8	3.90	0.50		0.30	0.611					1.00	0.20	0.50	0.611	0.10	0.061	5%
9	4.00	0.48		0.29	0.578					1.00	0.15	0.48	0.578	0.07	0.042	4%
10	4.20	0.48		0.29	0.694					1.00	0.25	0.48	0.694	0.12	0.083	7%
11	4.50	0.48		0.29	0.517					1.00	0.30	0.48	0.517	0.14	0.074	7%
12	4.80	0.46		0.28	0.789					1.00	0.30	0.46	0.789	0.14	0.109	10%
13	5.10	0.43		0.26	0.807					1.00	0.30	0.43	0.807	0.13	0.104	9%
14	5.40	0.40		0.24	0.737					1.00	0.30	0.40	0.737	0.12	0.088	8%
15	5.70	0.35		0.21	0.686					1.00	0.30	0.35	0.686	0.11	0.072	6%
16	6.00	0.35		0.21	0.501					1.00	0.30	0.35	0.501	0.11	0.053	5%
17	6.30	0.27		0.16	0.377					1.00	0.30	0.27	0.377	0.08	0.031	3%
18	6.60	0.25		0.15	0.371					1.00	0.30	0.25	0.371	0.08	0.028	2%
19	6.90	0.19		0.11	0.297					1.00	0.30	0.19	0.297	0.06	0.017	2%
20	7.20	0.12		0.07	0.000					1.00	0.30	0.12	0.000	0.04	0.000	0%
LB	7.50	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.12</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -adjacent to station

Meas. Start Time (MST):	13:10
Meas. End Time (MST):	13:54
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, 20 C

**Flow characteristics:**

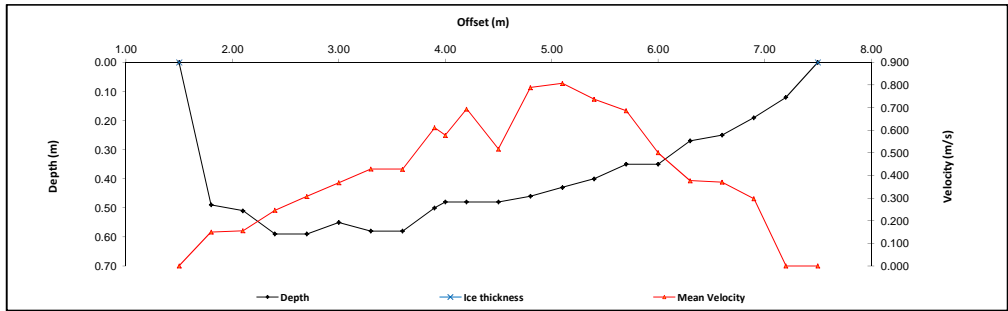
Total Flow:	1.12	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.45	(m <sup>2</sup> )
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.46	(m/s)
Froude Number:	0.23	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.843	0.840
Water (°C):	16.5	16.7
Datalogger Clock:	12:53	13:56
Laptop Clock:	12:53	13:56
Battery (Main):	14.2	14.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-03	1.277	101.413		100.136	100.136	3/4" Pipe N of logger
S10A-01			1.174	100.239	100.236	3/4" Pipe NW of logger
S10A-02			1.414	99.999	100.000	3/4" Pipe W of logger
Water Level:	Cut		2.282	99.131	Time WL Surveyed: 12:58	
Temporary BM			1.486	99.927	0.000	
<b>Turn</b>						
Temporary BM	1.472	101.399		99.927		
Water Level:	Cut		2.264	99.135	Time WL Surveyed: 13:02	
S10A-02			1.401	99.998	100.000	3/4" Pipe W of logger
S10A-01			1.159	100.240	100.236	3/4" Pipe NW of logger
S10A-03			1.263	100.136	100.136	3/4" Pipe N of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S10A-03	1.262	101.398		100.136		
Water Level:	Cut		2.264	99.134	Time WL Surveyed: 14:00	
Water Level:	Cut		2.248	99.131	Time WL Surveyed: 14:01	
S10A-03	1.243	101.379		100.136		

**WL Survey Summary**

	Before	After
Average WL:	99.133	99.133
Closing Error:	0.000	-
WL Check:	0.004	0.003
Transducer Elevation	98.290	98.293

**Field Personnel:**

	DW, MP	Trip Date:	19-Jun-14
Data Entry Personnel:	DW	Date:	19-Jun-14
Data Check Personnel:	CJ	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: August 9, 2014  
 Site Visit Time (MST): 12:21

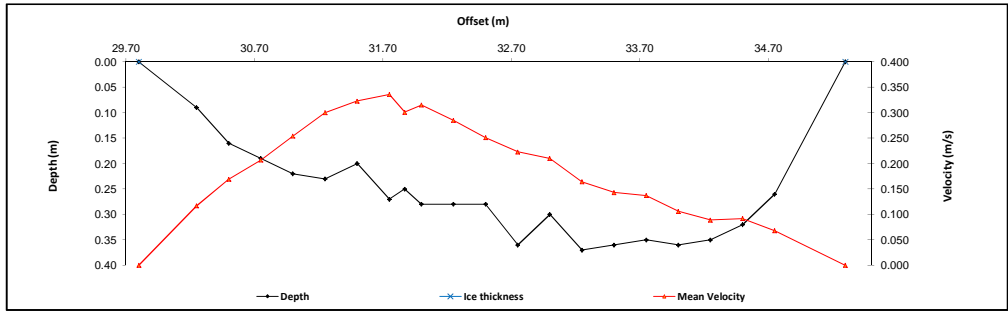


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	29.80	0.00	0.00		0.000				0.000	1.00	0.23	0.00	0.000	0.00	0.000	
1	30.25	0.09		0.05	0.117					1.00	0.35	0.09	0.117	0.03	0.004	1%
2	30.50	0.16		0.10	0.169					1.00	0.25	0.16	0.169	0.04	0.007	3%
3	30.75	0.19		0.11	0.207					1.00	0.25	0.19	0.207	0.05	0.010	4%
4	31.00	0.22		0.13	0.254					1.00	0.25	0.22	0.254	0.06	0.014	5%
5	31.25	0.23		0.14	0.300					1.00	0.25	0.23	0.300	0.06	0.017	7%
6	31.50	0.20		0.12	0.323					1.00	0.25	0.20	0.323	0.05	0.016	6%
7	31.75	0.27		0.16	0.336					1.00	0.19	0.27	0.336	0.05	0.017	7%
8	31.87	0.25		0.15	0.301					1.00	0.13	0.25	0.301	0.03	0.009	4%
9	32.00	0.28		0.17	0.315					1.00	0.19	0.28	0.315	0.05	0.017	7%
10	32.25	0.28		0.17	0.285					1.00	0.25	0.28	0.285	0.07	0.020	8%
11	32.50	0.28		0.17	0.251					1.00	0.25	0.28	0.251	0.07	0.018	7%
12	32.75	0.36		0.22	0.223					1.00	0.25	0.36	0.223	0.09	0.020	8%
13	33.00	0.30		0.18	0.210					1.00	0.25	0.30	0.210	0.08	0.016	6%
14	33.25	0.37		0.22	0.164					1.00	0.25	0.37	0.164	0.09	0.015	6%
15	33.50	0.36		0.22	0.143					1.00	0.25	0.36	0.143	0.09	0.013	5%
16	33.75	0.35		0.21	0.137					1.00	0.25	0.35	0.137	0.09	0.012	5%
17	34.00	0.36		0.22	0.106					1.00	0.25	0.36	0.106	0.09	0.010	4%
18	34.25	0.35		0.21	0.089					1.00	0.25	0.35	0.089	0.09	0.008	3%
19	34.50	0.32		0.19	0.092					1.00	0.25	0.32	0.092	0.08	0.007	3%
20	34.75	0.26		0.16	0.068					1.00	0.40	0.26	0.068	0.10	0.007	3%
RB	35.30	0.00	0.00		0.000		0.000		0.000	1.00	0.27	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.256</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Meas. Start Time (MST):	13:02
Meas. End Time (MST):	13:25
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 21 C



**Flow characteristics:**

Total Flow:	0.256	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.35	(m²)
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.691	0.690
Water (°C):	17.8	18.2
Datalogger Clock:	12:24	13:34
Laptop Clock:	12:24	13:34
Battery (Main):	14.0	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PTH# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Installed new datalogger program, reinstated telemetry

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-03	1.088	101.224		100.136	100.136	3/4" Pipe N of logger
S10A-01			0.985	100.239	100.236	3/4" Pipe NW of logger
S10A-02			1.225	99.999	100.000	3/4" Pipe W of logger
Water Level:	Cut		2.318	98.906		Time WL Surveyed: 12:31
Temporary BM			2.314	98.910	0.000	
<b>Turn</b>						
Temporary BM	2.303	101.213		98.910		
Water Level:	Cut		2.304	98.909		Time WL Surveyed: 12:34
S10A-02			1.213	100.000	100.000	3/4" Pipe W of logger
S10A-01			0.973	100.240	100.236	3/4" Pipe NW of logger
S10A-03			1.077	100.136	100.136	3/4" Pipe N of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S10A-03	1.077	101.213		100.136		
Water Level:	Cut		2.304	98.909		Time WL Surveyed: 13:29
Water Level:	Cut		2.286	98.909		Time WL Surveyed: 13:31
S10A-03	1.059	101.195		100.136		

**WL Survey Summary**

	Before	After
Average WL:	98.908	98.909
Closing Error:	0.000	-
WL Check:	0.003	0.000
Transducer Elevation	98.217	98.219

**Field Personnel:**

	MP, CJ	Trip Date:	9-Aug-14
Data Entry Personnel:	MP	Date:	9-Aug-14
Data Check Personnel:	GG	Date:	24-11-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: September 12, 2014  
 Site Visit Time (MST): 15:35

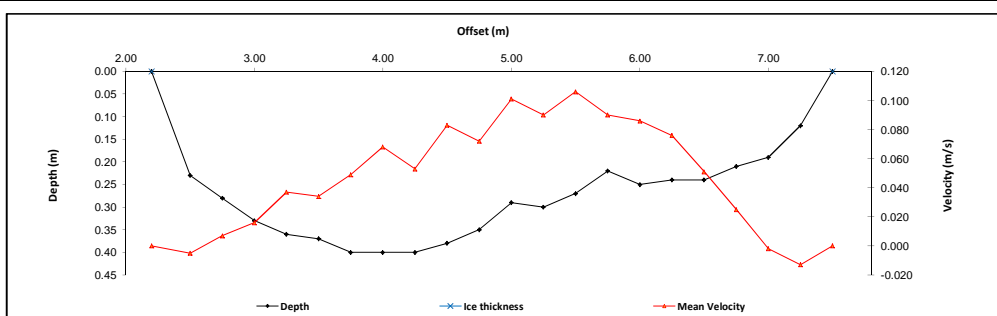


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.50	0.23		0.14	-0.005					1.00	0.28	0.23	-0.005	0.06	0.000	0%
2	2.75	0.28		0.17	0.007					1.00	0.25	0.28	0.007	0.07	0.000	1%
3	3.00	0.33		0.20	0.016					1.00	0.25	0.33	0.016	0.08	0.001	2%
4	3.25	0.36		0.22	0.037					1.00	0.25	0.36	0.037	0.09	0.003	4%
5	3.50	0.37		0.22	0.034					1.00	0.25	0.37	0.034	0.09	0.003	4%
6	3.75	0.40		0.24	0.049					1.00	0.25	0.40	0.049	0.10	0.005	6%
7	4.00	0.40		0.24	0.068					1.00	0.25	0.40	0.068	0.10	0.007	9%
8	4.25	0.40		0.24	0.053					1.00	0.25	0.40	0.053	0.10	0.005	7%
9	4.50	0.38		0.23	0.083					1.00	0.25	0.38	0.083	0.10	0.008	10%
10	4.75	0.35		0.21	0.072					1.00	0.25	0.35	0.072	0.09	0.006	8%
11	5.00	0.29		0.17	0.101					1.00	0.25	0.29	0.101	0.07	0.007	9%
12	5.25	0.30		0.18	0.090					1.00	0.25	0.30	0.090	0.08	0.007	9%
13	5.50	0.27		0.16	0.106					1.00	0.25	0.27	0.106	0.07	0.007	9%
14	5.75	0.22		0.13	0.090					1.00	0.25	0.22	0.090	0.06	0.005	6%
15	6.00	0.25		0.15	0.086					1.00	0.25	0.25	0.086	0.06	0.005	7%
16	6.25	0.24		0.14	0.076					1.00	0.25	0.24	0.076	0.06	0.005	6%
17	6.50	0.24		0.14	0.051					1.00	0.25	0.24	0.051	0.06	0.003	4%
18	6.75	0.21		0.13	0.025					1.00	0.25	0.21	0.025	0.05	0.001	2%
19	7.00	0.19		0.11	-0.002					1.00	0.25	0.19	-0.002	0.05	0.000	0%
20	7.25	0.12		0.07	-0.013					1.00	0.25	0.12	-0.013	0.03	0.000	0%
LB	7.50	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.079</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): At station

Meas. Start Time (MST):	15:54
Meas. End Time (MST):	16:15
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 10 C



**Flow characteristics:**

Total Flow:	0.079	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.46	(m <sup>2</sup> )
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.615	0.614
Water (°C):	9.0	9.1
Datalogger Clock:	15:34	16:18
Laptop Clock:	15:38	16:23
Battery (Main):	12.1	12.7
Battery:	Replaced	
Battery Serial #:	-	1009060
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTB (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Solar panel found disconnected by wildlife, reconnected during visit

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-02	1.438	101.438		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.195	100.243	100.236	3/4" Pipe NW of logger
S10A-03			1.301	100.137	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.583	98.855	Time WL Surveyed: 13:46	
Temporary BM			2.741	98.697	0.000	
<b>Turn</b>						
Temporary BM	2.612	101.309		98.697		
Water Level:	Cut		2.456	98.853	Time WL Surveyed: 15:48	
S10A-03			1.173	100.136	100.136	3/4" Pipe N of logger
S10A-01			1.069	100.240	100.236	3/4" Pipe NW of logger
S10A-02			1.310	99.999	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S10A-01	1.068	101.310		100.242		
Water Level:	Cut	0.241	2.693	98.858	Time WL Surveyed: 16:17	
Water Level:	Cut	0.241	2.718	98.861	Time WL Surveyed: 16:18	
S10A-01	1.096	101.338		100.242		

**WL Survey Summary**

	Before	After
Average WL:	98.854	98.860
Closing Error:	0.001	-
WL Check:	0.002	-0.003
Transducer Elevation	98.239	98.246

**Field Personnel:**

	TR, GG	Trip Date:	12-Sep-14
Data Entry Personnel:	TR	Date:	12-Sep-14
Data Check Personnel:	GG	Date:	9-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: October 16, 2014  
 Site Visit Time (MST): 11:19

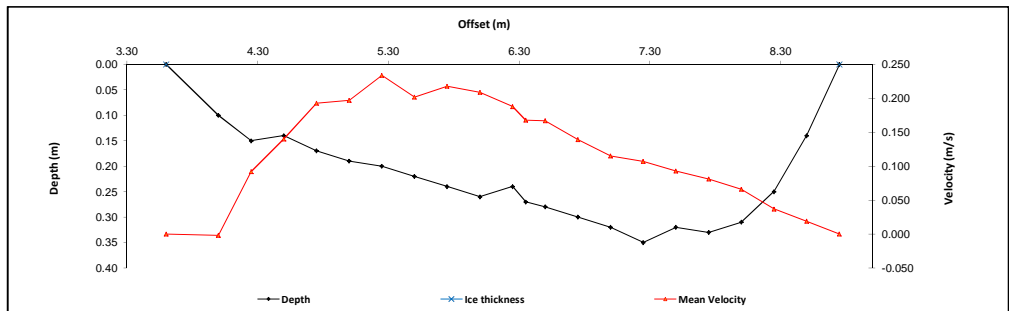


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.60	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	4.00	0.10		0.06	-0.002					1.00	0.33	0.10	-0.002	0.03	0.000	0%
2	4.25	0.15		0.09	0.092					1.00	0.25	0.15	0.092	0.04	0.003	2%
3	4.50	0.14		0.08	0.140					1.00	0.25	0.14	0.140	0.04	0.005	3%
4	4.75	0.17		0.10	0.193					1.00	0.25	0.17	0.193	0.04	0.008	6%
5	5.00	0.19		0.11	0.197					1.00	0.25	0.19	0.197	0.05	0.009	6%
6	5.25	0.20		0.12	0.234					1.00	0.25	0.20	0.234	0.05	0.012	8%
7	5.50	0.22		0.13	0.202					1.00	0.25	0.22	0.202	0.06	0.011	7%
8	5.75	0.24		0.14	0.218					1.00	0.25	0.24	0.218	0.06	0.013	9%
9	6.00	0.26		0.16	0.209					1.00	0.25	0.26	0.209	0.07	0.014	9%
10	6.25	0.24		0.14	0.188					1.00	0.18	0.24	0.188	0.04	0.008	5%
11	6.35	0.27		0.16	0.168					1.00	0.13	0.27	0.168	0.03	0.006	4%
12	6.50	0.28		0.17	0.167					1.00	0.20	0.28	0.167	0.06	0.009	6%
13	6.75	0.30		0.18	0.139					1.00	0.25	0.30	0.139	0.08	0.010	7%
14	7.00	0.32		0.19	0.115					1.00	0.25	0.32	0.115	0.08	0.009	6%
15	7.25	0.35		0.21	0.107					1.00	0.25	0.35	0.107	0.09	0.009	6%
16	7.50	0.32		0.19	0.093					1.00	0.25	0.32	0.093	0.08	0.007	5%
17	7.75	0.33		0.20	0.081					1.00	0.25	0.33	0.081	0.08	0.007	4%
18	8.00	0.31		0.19	0.066					1.00	0.25	0.31	0.066	0.08	0.005	3%
19	8.25	0.25		0.15	0.037					1.00	0.25	0.25	0.037	0.06	0.002	2%
20	8.50	0.14		0.08	0.019					1.00	0.25	0.14	0.019	0.04	0.001	0%
RB	8.75	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.149</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -at station

Meas. Start Time (MST):	11:33
Meas. End Time (MST):	12:00
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 3 C



**Flow characteristics:**

Total Flow:	0.149	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.14	(m <sup>2</sup> )
Wetted Width:	5.15	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.653	0.651
Water (°C):	5.0	5.1
Datalogger Clock:	11:21	12:00
Laptop Clock:	11:20	12:00
Battery (Main):	13.1	12.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-02	1.355	101.355		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.114	100.241	100.236	3/4" Pipe NW of logger
S10A-03			1.218	100.137	100.136	3/4" Pipe N of logger
Water Level:	<b>Cut</b>		2.469	98.886	<b>Time WL Surveyed:</b> 11:26	
Temporary BM			2.448	98.907	0.000	-
<b>Turn</b>						
Temporary BM	2.435	101.342		98.907	-	
Water Level:	<b>Cut</b>		2.459	98.883	<b>Time WL Surveyed:</b> 11:29	
S10A-03			1.207	100.135	100.136	3/4" Pipe N of logger
S10A-01			1.103	100.239	100.236	3/4" Pipe NW of logger
S10A-02			1.344	99.998	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S10A-03	1.206	101.341		100.135		
Water Level:	<b>Cut</b>		2.463	98.878	<b>Time WL Surveyed:</b> 12:03	
Water Level:	<b>Cut</b>		2.451	98.881	<b>Time WL Surveyed:</b> 12:05	
S10A-03	1.197	101.332		100.135		

**WL Survey Summary**

	Before	After
Average WL:	98.885	98.880
Closing Error:	0.002	-
WL Check:	0.003	-0.003
Transducer Elevation	98.232	98.229

**Field Personnel:**

	DW, MP	Trip Date:	16-Oct-14
Data Entry Personnel:	DW, MP	Date:	16-Oct-14
Data Check Personnel:	GG	Date:	22-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S10A Wapasu Creek near the Mouth  
 UTM Location: 488573 E, 6358554 N

Site Visit Date: December 3, 2014  
 Site Visit Time (MST): 09:20



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.50	0.00	0.00		0.000		0.000		0.000	0.88	0.08	0.00	0.000	0.00	0.000	
1	3.65	0.58	0.19	0.39	0.000					0.88	0.25	0.39	0.000	0.10	0.000	0%
2	4.00	0.78	0.23	0.51	0.000					0.88	0.40	0.55	0.000	0.22	0.000	0%
3	4.45	0.99	0.25	0.62	-0.005					0.88	0.45	0.74	-0.004	0.33	-0.001	-3%
4	4.90	1.10	0.33			0.95	-0.006	0.48	-0.005	1.00	0.38	0.77	-0.006	0.29	-0.002	-3%
5	5.20	1.23	0.36			1.06	-0.001	0.53	-0.006	1.00	0.35	0.87	-0.004	0.30	-0.001	-2%
6	5.60	1.30	0.40			1.12	-0.003	0.58	-0.002	1.00	0.35	0.90	-0.003	0.32	-0.001	-2%
7	5.90	1.35	0.22			1.12	0.005	0.45	0.007	1.00	0.18	1.13	0.006	0.20	0.001	2%
8	5.95	1.35	0.27			1.13	-0.001	0.49	0.001	1.00	0.17	1.08	0.000	0.19	0.000	0%
9	6.25	1.39	0.28			1.17	0.001	0.50	0.004	1.00	0.33	1.11	0.003	0.36	0.001	2%
10	6.60	1.36	0.29			1.15	-0.002	0.50	0.004	1.00	0.50	1.07	0.001	0.54	0.001	1%
11	7.25	1.35	0.26			1.13	0.003	0.48	-0.001	1.00	0.48	1.09	0.001	0.52	0.001	1%
12	7.55	1.30	0.25			1.09	0.009	0.46	0.006	1.00	0.30	1.05	0.008	0.31	0.002	5%
13	7.85	1.28	0.25			1.07	0.015	0.46	0.010	1.00	0.28	1.03	0.013	0.28	0.004	7%
14	8.10	1.23	0.17			1.02	0.011	0.38	0.008	1.00	0.30	1.06	0.010	0.32	0.003	6%
15	8.45	1.20	0.20			1.00	0.001	0.40	0.013	1.00	0.35	1.00	0.007	0.35	0.002	5%
16	8.80	0.90	0.17	0.54	0.026					0.88	0.32	0.73	0.023	0.24	0.005	11%
17	9.10	0.88	0.15	0.52	0.031					0.88	0.23	0.73	0.027	0.16	0.004	9%
18	9.25	0.65	0.15	0.40	0.037					0.88	0.25	0.50	0.033	0.13	0.004	8%
20	9.60	0.69	0.13	0.41	0.059					0.88	0.25	0.56	0.052	0.14	0.007	14%
21	9.75	0.64	0.13	0.39	0.075					0.88	0.15	0.51	0.066	0.08	0.005	10%
22	9.90	0.61	0.10	0.36	0.077					0.88	0.25	0.51	0.068	0.13	0.009	17%
23	10.25	0.49	0.05	0.27	0.043					0.88	0.25	0.44	0.038	0.11	0.004	8%
24	10.40	0.47	0.05	0.26	0.014					0.88	0.38	0.42	0.012	0.16	0.002	4%
LB	11.00	0.00	0.00		0.000		0.000		0.000	0.88	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.051</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m DS of heel landing

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:04
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Partial cloud, calm, -22 C

**Flow characteristics:**

Total Flow:	0.051	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	5.76	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.77	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.00	

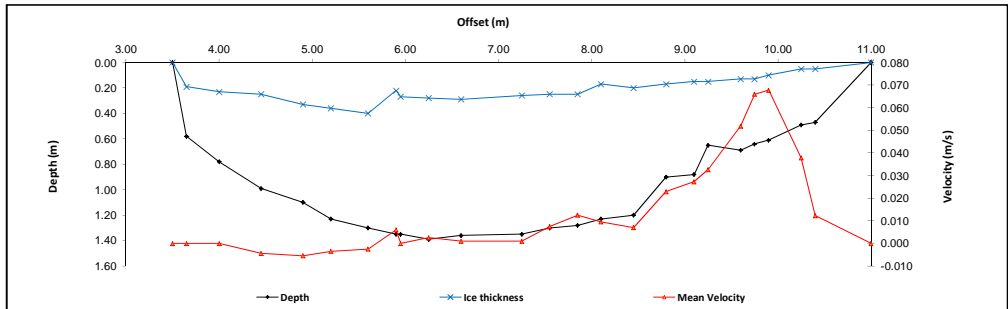
**Logger Details:**

	Before	After
Transducer Reading (m):	0.576	0.575
Water (°C):	0.3	0.3
Datalogger Clock:	09:29	10:47
Laptop Clock:	09:28	10:47
Battery (Main):	12.2	13.1
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Replaced modem
- Slush under the ice along RB

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S10A-02	1.271	101.271		100.000	100.000	3/4" Pipe W of logger
S10A-01			1.030	100.241	100.240	3/4" Pipe NW of logger
S10A-03			1.135	100.136	100.136	3/4" Pipe N of logger
Water Level:	Cut		2.464	98.807	Time WL Surveyed:	9:43
Temporary BM			2.459	98.812	0.000	-
<b>Turn</b>						
Temporary BM	2.449	101.261		98.812	-	-
Water Level:	Cut		2.452	98.809	Time WL Surveyed:	9:44
S10A-03			1.122	100.139	100.136	3/4" Pipe N of logger
S10A-01			1.018	100.243	100.240	3/4" Pipe NW of logger
S10A-02			1.259	100.002	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S10A-02	1.259	101.261		100.002	-	-
Water Level:	Cut		2.456	98.805	Time WL Surveyed:	10:42
Water Level:	Cut		2.444	98.803	Time WL Surveyed:	10:44
S10A-02	1.245	101.247		100.002	-	-

**WL Survey Summary**

	Before	After
Average WL:	98.808	98.804
Closing Error:	-0.002	-
WL Check:	0.002	0.002
Transducer Elevation	98.232	98.229

**Field Personnel:**

	TR, CJ	Trip Date:	3-Dec-14
Data Entry Personnel:	CJ	Date:	3-Dec-14
Data Check Personnel:	CJ	Date:	5-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

January 9, 2014

Site Visit Time (MST):

14:00



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.20	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	4.60	0.68	0.60	0.64	0.014				0.88	0.35	0.08	0.012	0.03	0.000	3%	
2	4.90	0.70	0.60	0.65	0.002				0.88	0.30	0.10	0.002	0.03	0.000	0%	
3	5.20	0.74	0.62	0.68	0.006				0.88	0.25	0.12	0.005	0.03	0.000	1%	
4	5.40	0.73	0.60	0.67	0.032				0.88	0.15	0.13	0.028	0.02	0.001	4%	
5	5.50	0.75	0.60	0.68	0.017				0.88	0.15	0.15	0.015	0.02	0.000	3%	
6	5.70	0.75	0.60	0.68	0.033				0.88	0.15	0.15	0.029	0.02	0.001	5%	
7	5.80	0.78	0.60	0.69	0.037				0.88	0.13	0.18	0.033	0.02	0.001	5%	
8	5.95	0.85	0.60	0.73	0.029				0.88	0.13	0.25	0.026	0.03	0.001	6%	
9	6.05	0.83	0.65	0.74	0.034				0.88	0.13	0.18	0.030	0.02	0.001	5%	
10	6.20	0.78	0.56	0.67	0.039				0.88	0.15	0.22	0.034	0.03	0.001	8%	
11	6.35	0.81	0.55	0.68	0.035				0.88	0.15	0.26	0.031	0.04	0.001	9%	
12	6.50	0.75	0.55	0.65	0.041				0.88	0.13	0.20	0.036	0.03	0.001	7%	
13	6.60	0.70	0.55	0.63	0.000				0.88	0.15	0.15	0.000	0.02	0.000	0%	
14	6.80	0.76	0.52	0.64	0.029				0.88	0.13	0.24	0.026	0.03	0.001	6%	
15	6.85	0.74	0.55	0.65	0.038				0.88	0.15	0.19	0.033	0.03	0.001	7%	
16	7.10	0.70	0.45	0.58	0.039				0.88	0.15	0.25	0.034	0.04	0.001	10%	
17	7.15	0.73	0.45	0.59	0.044				0.88	0.10	0.28	0.039	0.03	0.001	8%	
18	7.30	0.68	0.40	0.54	-0.001				0.88	0.13	0.20	-0.001	0.04	0.000	0%	
19	7.40	0.65	0.40	0.53	0.041				0.88	0.20	0.25	0.036	0.05	0.002	13%	
20	7.70	0.55	0.38	0.47	0.000				0.88	0.30	0.17	0.000	0.05	0.000	0%	
RB	8.00	0.00	0.00		0.00		0.00		1.00	0.15	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.013</b>	<b>100%</b>	

## Flow Measurement Details:

**Metering Section Location (describe):**  
Across from station

Mess. Start Time (MST):	14:56
Mess. End Time (MST):	15:27
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snowing, calm, -10 C

## Flow characteristics:

Total Flow:	0.013	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.61	(m <sup>2</sup> )
Wetted Width:	3.80	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.02	

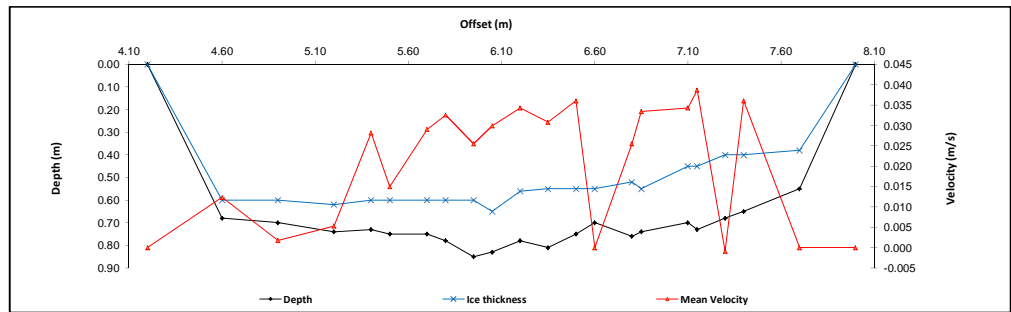
## Logger Details:

	Before	After
Transducer Reading (m):	0.771	0.773
Water (°C):	-0.1	-0.1
Datalogger Clock:	14:12	15:36
Laptop Clock:	14:12	15:36
Battery (Main):	12.3	12.9
Battery:		Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

-Overflow present upstream of station  
-Frozen overflow making up majority of the ice at mmt location as well

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S11-6	0.905	243.484		242.579	242.579	3/4" Pipe 3m E of logger
S11-5			1.273	242.211	242.212	3/4" Pipe 7m W of logger
S11-1			1.355	242.129	242.081	ASCM Pin
Water Level:	Cut		3.530	239.954	Time WL Surveyed: 14:50	
Temporary BM			3.388	240.096	0.000	
<b>Turn</b>						
Temporary BM	3.374	243.470		240.096		
Water Level:	Cut		3.518	239.952	Time WL Surveyed: 14:52	
S11-1			1.340	242.130	242.081	ASCM Pin
S11-5			1.258	242.212	242.212	3/4" Pipe 7m W of logger
S11-6			0.890	242.580	242.579	3/4" Pipe 3m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S11-6	0.891	243.471		242.580		
Water Level:	Cut		3.518	239.953	Time WL Surveyed: 15:31	
Water Level:	Cut		3.502	239.956	Time WL Surveyed: 15:32	
S11-6	0.878	243.458		242.580		

## WL Survey Summary

	Before	After
Average WL:	239.953	239.955
Closing Error:	-0.001	-
WL Check:	0.002	-0.003
Transducer Elevation	239.182	239.182

## Field Personnel:

	SM, TR, AJ	Trip Date:	9-Jan-14
Data Entry Personnel:	SM	Date:	9-Jan-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date: February 6, 2014  
 Site Visit Time (MST): 08:45



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

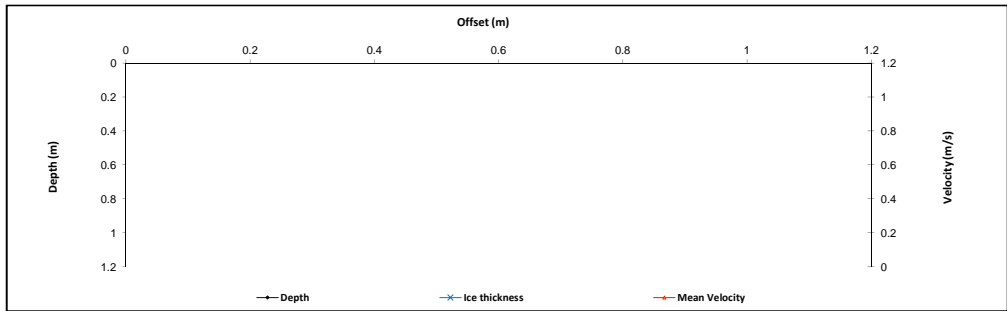
**Logger Details:**

	Before	After
Transducer Reading (m):	1.495	1.518
Water (°C):	-0.1	-0.1
Datalogger Clock:	08:57	10:29
Laptop Clock:	08:57	10:29
Battery (Main):	12.5	13.0
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (# replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Discharge measurement not conducted: significant amount of over flow on top of ice surface and most of the flow is between ice layers - not measurable

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S11-6	0.805	243.384		242.579	242.579	3/4" Pipe 3m E of logger
S11-5			1.173	242.211	242.212	3/4" Pipe 7m W of logger
S11-1			1.249	242.135	242.081	ASCM Pin
Water Level:			2.690	240.694		Time WL Surveyed: 10:13
Temporary BM			2.457	240.927	0.000	
Turn						
Temporary BM	2.436	243.363		240.927		
Water Level:			2.665	240.698		Time WL Surveyed: 10:15
S11-1			1.229	242.134	242.081	ASCM Pin
S11-5			1.152	242.211	242.212	3/4" Pipe 7m W of logger
S11-6			0.785	242.578	242.579	3/4" Pipe 3m E of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	240.696	-
Closing Error:	0.001	-
WL Check:	0.004	-
Transducer Elevation	239.201	-

**Field Personnel:**

Data Entry Personnel:	SM, MP, AJ	Trip Date:	6-Feb-14
Data Check Personnel:	SM	Date:	6-Feb-14
Entered Digitally in the Field:	TR	Date:	14-Mar-14
	Yes		





# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63  
 UTM Location: 472000 E, 6307650 N

Site Visit Date: May 27, 2014  
 Site Visit Time (MST): 07:10



Flow Measurement Details:	
Metering Section Location (describe): 10m DS of PT	
Meas. Start Time (MST):	8:05
Meas. End Time (MST):	8:35
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Rainy, calm, 10

Flow characteristics:		
Total Flow:	3.17	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.23	(m <sup>2</sup> )
Wetted Width:	8.67	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.75	(m/s)
Froude Number:	0.34	

Logger Details:	Before	After
Transducer Reading (m):	1.013	1.020
Water (°C):	11.2	11.3
Datalogger Clock:	07:13	08:44
Laptop Clock:	07:13	08:44
Battery (Main):	13.2	13.1
Battery:	Replaced	
Battery Serial #:	1403005, 1403001, 008011, 1205005	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Bank eroded and fell into creek, likely moved PT around 13-May-14

-WL fluctuating 2 cm during WL survey

**General Notes:**

ADCP Flow Measurement Summary:								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	18.50	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	9.80	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	11.3				
			ADCP Temperature (°C):	11.8				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	8.88	4.37	0.715	3.128	-1.37%
Coordinate System:	ENU		2	8.18	3.74	0.840	3.143	-0.89%
Left Method:	Sloped bank		3	8.96	4.58	0.707	3.243	2.26%
Right Method:	Sloped bank							
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit							
			<b>Mean:</b>	8.67	4.23	0.754	<b>3.17</b>	
			<b>SD:</b>	0.35	0.36	0.061	0.051	
			<b>COV:</b>	0.04	0.08	0.081	0.016	

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>	S11-5	0.981	243.193		242.212	242.212	3/4" Pipe 7m W of logger
	S11-1			1.069	242.124	242.081	ASCM Pin
	S11-6			0.612	242.581	242.579	3/4" Pipe 3m E of logger
	Water Level:	Cut	0.625	3.601	240.217	<b>Time WL Surveyed:</b>	7:36
	Temporary BM			0.612	242.581		0.000
<b>Turn</b>	Temporary BM	0.636	243.217		242.581		
	Water Level:	Cut	0.385	3.389	240.213	<b>Time WL Surveyed:</b>	7:30
	S11-6			0.636	242.581	242.579	3/4" Pipe 3m E of logger
	S11-1			1.092	242.125	242.081	ASCM Pin
	S11-5			1.004	242.213	242.212	3/4" Pipe 7m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>	S11-6	0.613	243.194		242.581		
	Water Level:	Cut	0.471	3.447	240.218	<b>Time WL Surveyed:</b>	8:38
	Water Level:	Cut	0.471	3.419	240.219	<b>Time WL Surveyed:</b>	8:39
	S11-6	0.586	243.167		242.581		

WL Survey Summary	Before	After
Average WL:	240.215	240.219
Closing Error:	-0.001	-
WL Check:	0.004	-0.001
Transducer Elevation	239.202	239.199

<b>Field Personnel:</b>	TR, CJ	Trip Date:	27-May-14
<b>Data Entry Personnel:</b>	TR	Date:	27-May-14
<b>Data Check Personnel:</b>	TR	Date:	1-Aug-14
<b>Entered Digitally in the Field:</b>	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

June 9, 2014

Site Visit Time (MST):

08:45



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	9.00	0.00	0.00													
1	9.50	0.56		0.34	0.000				1.00	0.25	0.00	0.000	0.00	0.000		
2	10.50	0.54		0.32	1.450				1.00	0.75	0.56	1.450	0.42	0.609	6%	
3	11.50	0.53		0.32	1.370				1.00	1.00	0.54	1.370	0.54	0.740	7%	
4	12.50	0.40		0.24	1.480				1.00	1.00	0.53	1.480	0.53	0.784	8%	
5	13.50	0.42		0.25	1.410				1.00	1.00	0.40	1.410	0.40	0.564	6%	
6	14.50	0.48		0.29	1.410				1.00	1.00	0.42	1.410	0.42	0.592	6%	
7	15.50	0.46		0.28	1.380				1.00	1.00	0.48	1.380	0.48	0.662	6%	
8	16.50	0.40		0.24	1.310				1.00	1.00	0.46	1.310	0.46	0.603	6%	
9	17.50	0.40		0.24	1.290				1.00	1.00	0.40	1.290	0.40	0.516	5%	
10	18.50	0.48		0.29	1.550				1.00	1.00	0.40	1.550	0.40	0.620	6%	
11	19.50	0.42		0.25	1.440				1.00	1.00	0.48	1.440	0.48	0.691	7%	
12	20.00	0.37		0.22	1.530				1.00	0.75	0.42	1.530	0.32	0.482	5%	
13	20.50	0.47		0.28	1.480				1.00	0.50	0.37	1.480	0.19	0.274	3%	
14	21.00	0.48		0.29	1.340				1.00	0.50	0.47	1.340	0.24	0.315	3%	
15	21.50	0.50		0.30	1.240				1.00	0.50	0.48	1.240	0.24	0.298	3%	
16	22.00	0.51		0.31	1.240				1.00	0.50	0.50	1.240	0.25	0.310	3%	
17	22.00	0.51		0.31	1.050				1.00	0.75	0.51	1.050	0.38	0.402	4%	
18	23.00	0.52		0.31	1.130				1.00	1.00	0.52	1.130	0.52	0.588	6%	
19	24.00	0.40		0.24	1.200				1.00	1.00	0.40	1.200	0.40	0.480	5%	
20	25.00	0.38		0.23	1.070				1.00	1.00	0.38	1.070	0.38	0.407	4%	
21	26.00	0.33		0.20	1.120				1.00	0.65	0.33	1.120	0.21	0.240	2%	
LB	26.30	0.00	0.00						1.00	0.15	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>10.2</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
Immediately DS of bridge, approx. 50m US of station

Mess. Start Time (MST):	9:30
Mess. End Time (MST):	9:50
Equipment:	Marsh McBimney
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, light rain

## Flow characteristics:

Total Flow:	10.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.65	(m <sup>2</sup> )
Wetted Width:	17.30	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	1.33	(m/s)
Froude Number:	0.64	

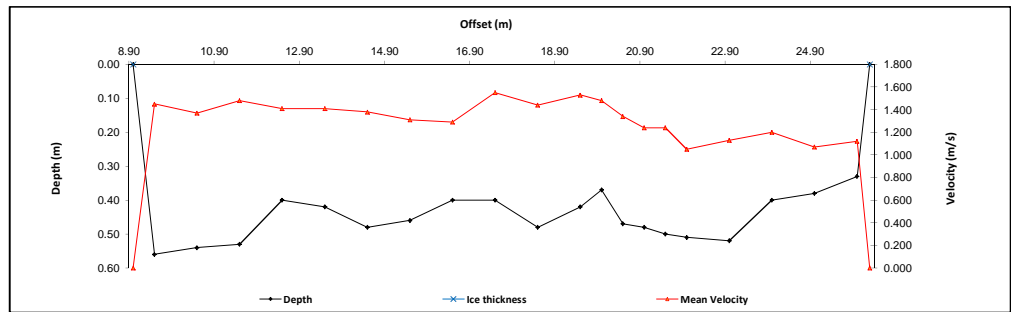
## Logger Details:

	Before	After
Transducer Reading (m):	0.109	0.512
Water (°C):	12.7	13.2
Datalogger Clock:	08:46	10:06
Laptop Clock:	08:46	10:06
Battery (Main):	12.8	13.0
Battery:	Replaced	
Battery Serial #:	1008011, 1205001	1205001, n/a
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	252793	346253
Logger# (if replaced):		

## Datalogger / Station Notes:

- PT and batteries replaced
- One of the two replacement batteries missing a serial no.
- PT was found washed downstream upon arrival

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S11-6	0.843	243.422		242.579	242.579	3/4" Pipe 3m E of logger
S11-5			1.211	242.211	242.212	3/4" Pipe 7m W of logger
S11-1			1.326	242.096	242.081	ASCM Pin
Water Level:	Cut	0.385	3.239	240.568	Time WL Surveyed:	9:20
Temporary BM			3.239	240.183	0.000	
<b>Turn</b>						
Temporary BM	3.219	243.402		240.183		
Water Level:	Cut	0.385	3.219	240.568	Time WL Surveyed:	9:22
S11-1			1.309	242.093	242.081	ASCM Pin
S11-5			1.192	242.210	242.212	3/4" Pipe 7m W of logger
S11-6			0.824	242.578	242.579	3/4" Pipe 3m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S11-6	0.824	243.403		242.579		
Water Level:	Cut	0.328	3.162	240.569	Time WL Surveyed:	9:57
Water Level:	Cut	0.328	3.102	240.569	Time WL Surveyed:	9:58
S11-6	0.764	243.343		242.579		

## WL Survey Summary

Average WL:	240.568	240.569
Closing Error:	0.001	-
WL Check:	0.000	0.000
Transducer Elevation	240.459	240.057

Field Personnel:	TR, NC	Trip Date:	9-Jun-14
Data Entry Personnel:	TR	Date:	9-Jun-14
Data Check Personnel:	TR	Date:	4-Jul-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

August 8, 2014

Site Visit Time (MST):

14:10



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.10	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	3.30	0.13		0.08	0.095					1.00	0.18	0.13	0.095	0.02	0.002	7%
2	3.45	0.18		0.11	0.061					1.00	0.15	0.18	0.061	0.03	0.002	5%
3	3.60	0.18		0.11	0.050					1.00	0.15	0.18	0.050	0.03	0.001	4%
4	3.75	0.22		0.13	0.081					1.00	0.15	0.22	0.081	0.03	0.003	8%
5	3.90	0.21		0.13	0.069					1.00	0.15	0.21	0.069	0.03	0.002	7%
6	4.05	0.24		0.14	0.048					1.00	0.15	0.24	0.048	0.04	0.002	5%
7	4.20	0.20		0.12	0.075					1.00	0.15	0.20	0.075	0.03	0.002	7%
8	4.35	0.16		0.10	0.049					1.00	0.15	0.16	0.049	0.02	0.001	4%
9	4.50	0.11		0.07	0.129					1.00	0.15	0.11	0.129	0.02	0.002	7%
10	4.65	0.14		0.08	0.121					1.00	0.15	0.14	0.121	0.02	0.003	8%
11	4.80	0.15		0.09	0.130					1.00	0.11	0.15	0.130	0.02	0.002	7%
12	4.87	0.16		0.10	0.143					1.00	0.08	0.16	0.143	0.01	0.002	5%
13	4.95	0.17		0.10	0.159					1.00	0.07	0.17	0.159	0.01	0.002	6%
14	5.02	0.18		0.11	0.110					1.00	0.08	0.18	0.110	0.01	0.001	5%
15	5.10	0.17		0.10	0.074					1.00	0.12	0.17	0.074	0.02	0.001	5%
16	5.25	0.15		0.09	0.060					1.00	0.15	0.15	0.060	0.02	0.001	4%
17	5.40	0.14		0.08	0.021					1.00	0.15	0.14	0.021	0.02	0.000	1%
18	5.55	0.15		0.09	0.009					1.00	0.20	0.15	0.009	0.03	0.000	1%
19	5.80	0.18		0.11	0.015					1.00	0.27	0.18	0.015	0.05	0.001	2%
20	6.10	0.15		0.09	0.009					1.00	0.30	0.15	0.009	0.05	0.000	1%
21	6.40	0.04		0.02	0.006					1.00	0.30	0.04	0.006	0.01	0.000	0%
LB	6.70	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.032</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
12m US of PT

Meas. Start Time (MST):	14:40
Meas. End Time (MST):	15:05
Equipment:	ADV
Method:	Wading
River Condition:	Very low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 25 C

## Flow characteristics:

Total Flow:	0.032	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.52	(m <sup>2</sup> )
Wetted Width:	3.60	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.05	

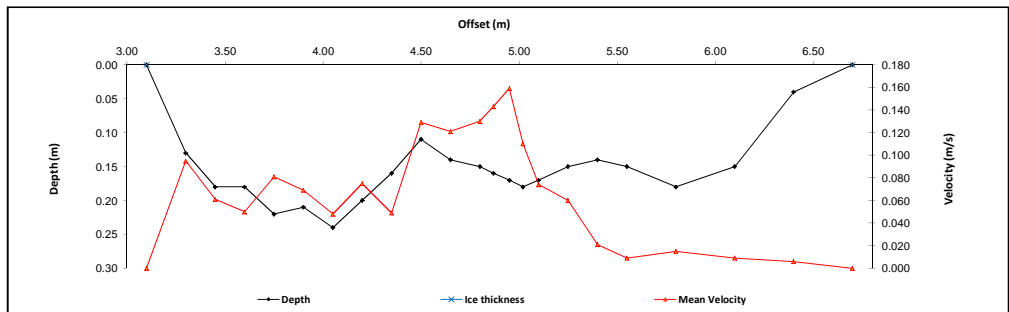
## Logger Details:

	Before	After
Transducer Reading (m):	0.122	0.605
Water (°C):	23.9	23.8
Datalogger Clock:	14:20	15:13
Laptop Clock:	14:20	15:13
Battery (Main):	12.7	12.9
Battery:	Replaced	
Battery Serial #:	1205001	1407002
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

-Moved PT deeper

## General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S11-6	0.864	243.443		242.579	242.579	3/4" Pipe 3m E of logger
S11-5			1.233	242.210	242.212	3/4" Pipe 7m W of logger
S11-1			1.353	242.090	242.081	ASCM Pin
Water Level:	Cut		3.639	239.804	Time WL Surveyed: 14:33	
Temporary BM			3.587	239.856	0.000	-
<b>Turn</b>						
Temporary BM	3.567	243.423		239.856		-
Water Level:	Cut		3.618	239.805	Time WL Surveyed: 14:35	
S11-1			1.334	242.089	242.081	ASCM Pin
S11-5			1.212	242.211	242.212	3/4" Pipe 7m W of logger
S11-6			0.843	242.580	242.579	3/4" Pipe 3m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S11-6	0.843	243.422		242.579		
Water Level:	Cut		3.617	239.805	Time WL Surveyed: 15:06	
Water Level:	Cut		3.596	239.805	Time WL Surveyed: 15:07	
S11-6	0.822	243.401		242.579		

WL Survey Summary	Before	After
Average WL:	239.805	239.805
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	239.683	239.200

Field Personnel:	SM, TR	Trip Date:	8-Aug-14
Data Entry Personnel:	SM	Date:	8-Aug-14
Data Check Personnel:	TR	Date:	29-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

September 13, 2014

Site Visit Time (MST):

14:54



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	11.50	0.00	0.00							1.00	0.20	0.00	0.000	0.00	0.000	
1	11.10	0.22		0.13	0.140					1.00	0.40	0.22	0.140	0.09	0.012	2%
2	10.70	0.28		0.17	0.197					1.00	0.40	0.28	0.197	0.11	0.022	4%
3	10.30	0.37		0.22	0.253					1.00	0.35	0.37	0.253	0.13	0.033	7%
4	10.00	0.36		0.22	0.327					1.00	0.30	0.36	0.327	0.11	0.035	7%
5	9.70	0.30		0.18	0.346					1.00	0.30	0.30	0.346	0.09	0.031	6%
6	9.40	0.36		0.22	0.347					1.00	0.30	0.36	0.347	0.11	0.037	8%
7	9.10	0.32		0.19	0.353					1.00	0.30	0.32	0.353	0.10	0.034	7%
8	8.80	0.31		0.19	0.404					1.00	0.30	0.31	0.404	0.09	0.038	8%
9	8.50	0.38		0.23	0.268					1.00	0.35	0.38	0.268	0.13	0.036	7%
10	8.10	0.35		0.21	0.263					1.00	0.40	0.35	0.263	0.14	0.037	7%
11	7.70	0.38		0.23	0.245					1.00	0.40	0.38	0.245	0.15	0.037	8%
12	7.30	0.30		0.18	0.228					1.00	0.40	0.30	0.228	0.12	0.027	6%
13	6.90	0.27		0.16	0.210					1.00	0.40	0.27	0.210	0.11	0.023	5%
14	6.50	0.21		0.13	0.205					1.00	0.40	0.21	0.205	0.08	0.017	3%
15	6.10	0.15		0.09	0.201					1.00	0.45	0.15	0.201	0.07	0.014	3%
16	5.60	0.22		0.13	0.192					1.00	0.50	0.22	0.192	0.11	0.021	4%
17	5.10	0.28		0.17	0.080					1.00	0.50	0.28	0.080	0.14	0.011	2%
18	4.60	0.26		0.16	0.128					1.00	0.50	0.26	0.128	0.13	0.017	3%
19	4.10	0.22		0.13	0.096					1.00	0.50	0.22	0.096	0.11	0.011	2%
20	3.60	0.14		0.08	0.058					1.00	0.40	0.14	0.058	0.06	0.003	1%
LB	3.30	0.00	0.00							1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.496</b>	<b>100%</b>	

## Flow Measurement Details:

**Metering Section Location (describe):**  
10m DS of PT

Mess. Start Time (MST):	15:30
Mess. End Time (MST):	15:55
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15 C

## Flow characteristics:

Total Flow:	0.496	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.18	(m <sup>2</sup> )
Wetted Width:	8.20	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.14	

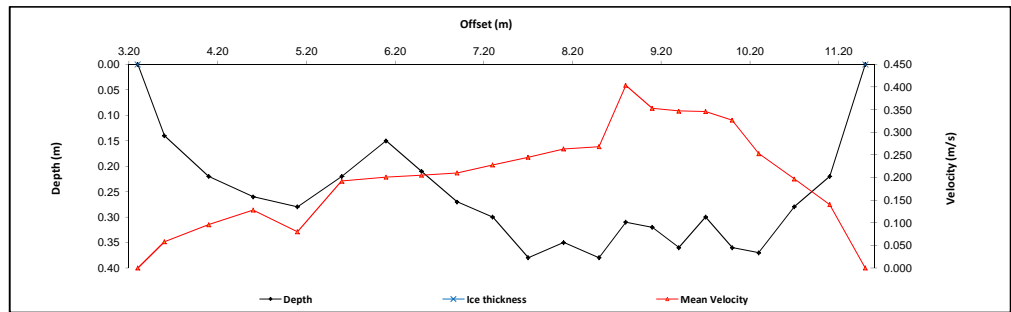
## Logger Details:

	Before	After
Transducer Reading (m):	0.755	0.756
Water (°C):	11.0	11.1
Datalogger Clock:	14:58	16:07
Laptop Clock:	14:58	16:07
Battery (Main):	12.6	13.0
Battery:		Replaced
Battery Serial #:	1407002	1403008
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

-Installed BM 07, one section of pipe pounded into layer of large cobbles

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S11-5	1.182	243.394		242.212	242.212	3/4" Pipe 7m W of logger
S11-7			1.293	242.101		3/4" Pipe 12m W of logger
S11-6			0.813	242.581	242.579	3/4" Pipe 3m E of logger
<b>Water Level:</b>	<b>Cut</b>		3.450	239.944	<b>Time WL Surveyed:</b> 15:21	
S11-5			1.182	242.212	242.212	3/4" Pipe 7m W of logger
<b>Turn</b>						
S11-5	1.164	243.376		242.212	242.212	3/4" Pipe 7m W of logger
<b>Water Level:</b>	<b>Cut</b>		3.429	239.947	<b>Time WL Surveyed:</b> 15:23	
S11-6			0.797	242.579	242.579	3/4" Pipe 3m E of logger
S11-7			1.277	242.099		3/4" Pipe 12m W of logger
S11-5			1.164	242.212	242.212	3/4" Pipe 7m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S11-6	0.795	243.375		242.580		
<b>Water Level:</b>	<b>Cut</b>		3.429	239.946	<b>Time WL Surveyed:</b> 15:57	
<b>Water Level:</b>	<b>Cut</b>		3.412	239.944	<b>Time WL Surveyed:</b> 15:58	
S11-6	0.776	243.356		242.580		

WL Survey Summary	Before	After
Average WL:	239.946	239.945
Closing Error:	0.000	-
WL Check:	0.003	0.002
Transducer Elevation	239.191	239.189

Field Personnel:	GG, TR	Trip Date:	13-Sep-14
Data Entry Personnel:	GG	Date:	13-Sep-14
Data Check Personnel:	TR	Date:	29-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

October 18, 2014

Site Visit Time (MST):

11:10



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	2.50	0.41		0.25	0.065				1.00	0.38	0.41	0.065	0.15	0.010	10%	
2	2.75	0.50		0.30	0.112				1.00	0.19	0.50	0.112	0.09	0.010	10%	
3	2.87	0.52		0.31	0.135				1.00	0.13	0.52	0.135	0.07	0.009	8%	
4	3.00	0.52		0.31	0.164				1.00	0.13	0.52	0.164	0.07	0.011	10%	
5	3.12	0.53		0.32	0.131				1.00	0.13	0.53	0.131	0.07	0.009	8%	
6	3.25	0.54		0.32	0.125				1.00	0.13	0.54	0.125	0.07	0.008	8%	
7	3.37	0.53		0.32	0.133				1.00	0.13	0.53	0.133	0.07	0.009	8%	
8	3.50	0.50		0.30	0.115				1.00	0.13	0.50	0.115	0.06	0.007	7%	
9	3.62	0.49		0.29	0.106				1.00	0.13	0.49	0.106	0.06	0.006	6%	
10	3.75	0.50		0.30	0.096				1.00	0.19	0.50	0.096	0.10	0.009	9%	
11	4.00	0.42		0.25	0.069				1.00	0.25	0.42	0.069	0.11	0.007	7%	
12	4.25	0.40		0.24	0.069				1.00	0.25	0.40	0.069	0.10	0.007	7%	
13	4.50	0.38		0.23	0.041				1.00	0.25	0.38	0.041	0.10	0.004	4%	
14	4.75	0.38		0.23	0.025				1.00	0.25	0.38	0.025	0.10	0.002	2%	
15	5.00	0.40		0.24	0.011				1.00	0.25	0.40	0.011	0.10	0.001	1%	
16	5.25	0.41		0.25	0.012				1.00	0.25	0.41	0.012	0.10	0.001	1%	
17	5.50	0.38		0.23	-0.012				1.00	0.38	0.38	-0.012	0.14	-0.002	-2%	
18	6.00	0.31		0.19	-0.022				1.00	0.50	0.31	-0.022	0.16	-0.003	-3%	
19	6.50	0.22		0.13	-0.022				1.00	0.50	0.22	-0.022	0.11	-0.002	-2%	
20	7.00	0.13		0.08	-0.001				1.00	0.50	0.13	-0.001	0.07	0.000	0%	
LB	7.50	0.00	0.00		0.00		0.00		0.00	0.25	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.104</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
2m DS of PT

Mess. Start Time (MST):	11:31
Mess. End Time (MST):	11:55
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 10C

## Flow characteristics:

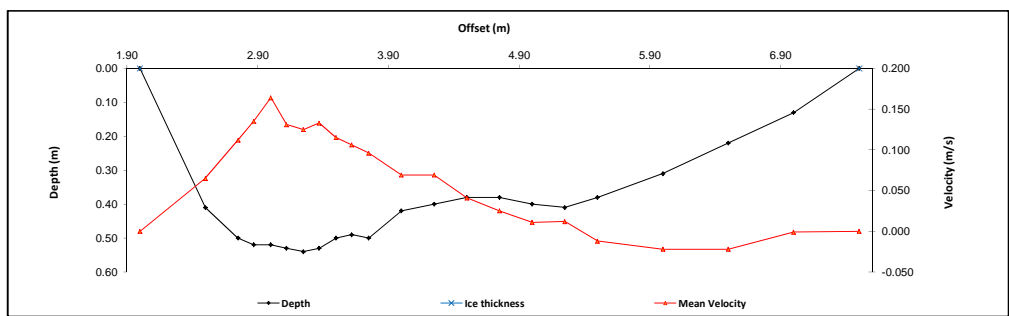
Total Flow:	0.104	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.87	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.03	

## Logger Details:

	Before	After
Transducer Reading (m):	0.651	0.651
Water (°C):	4.7	4.8
Datalogger Clock:	11:17	12:00
Laptop Clock:	11:17	12:00
Battery (Main):	12.7	12.9
Battery:	-	Replaced
Battery Serial #:	1403008	1407001, 1108001
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S11-5	1.240	243.452		242.212	242.212	3/4" Pipe 7m W of logger
S11-7			1.352	242.100		3/4" Pipe 12m W of logger
S11-6			0.870	242.582	242.579	3/4" Pipe 3m E of logger
Water Level:	Cut	0.112	3.719	239.845	Time WL Surveyed:	11:27
Temporary BM			3.719	239.733	0.000	-
<b>Turn</b>						
Temporary BM	3.693	243.426		239.733		-
Water Level:	Cut	0.112	3.693	239.845	Time WL Surveyed:	11:27
S11-6			0.843	242.583	242.579	3/4" Pipe 3m E of logger
S11-7			1.327	242.099		3/4" Pipe 12m W of logger
S11-5			1.214	242.212	242.212	3/4" Pipe 7m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S11-6	0.844	243.426		242.582		
Water Level:	Cut	0.049	3.632	239.843	Time WL Surveyed:	11:56
Water Level:	Cut	0.049	3.613	239.841	Time WL Surveyed:	11:56
S11-6	0.823	243.405		242.582		

WL Survey Summary	Before	After
Average WL:	239.845	239.842
Closing Error:	0.000	-
WL Check:	0.000	0.002
Transducer Elevation	239.194	239.191

Field Personnel:	DW, TR	Trip Date:	18-Oct-14
Data Entry Personnel:	DW	Date:	18-Oct-14
Data Check Personnel:	TR	Date:	30-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S11 Poplar Creek at Hwy 63

UTM Location: 472000 E, 6307650 N

Site Visit Date:

December 2, 2014

Site Visit Time (MST):

14:10



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.90	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	5.30	0.12	0.06	0.09	0.000					0.88	0.28	0.06	0.000	0.02	0.000	0%
2	5.45	0.18	0.06	0.12	0.000					0.88	0.18	0.12	0.000	0.02	0.000	0%
3	5.65	0.21	0.06	0.14	0.000					0.88	0.17	0.15	0.000	0.03	0.000	0%
4	5.80	0.20	0.10	0.15	0.001					0.88	0.15	0.10	0.001	0.02	0.000	0%
5	5.95	0.18	0.10	0.14	0.000					0.88	0.10	0.08	0.000	0.01	0.000	0%
6	6.00	0.19	0.10	0.15	0.000					0.88	0.08	0.09	0.000	0.01	0.000	0%
7	6.10	0.21	0.13	0.17	0.134					0.88	0.18	0.08	0.118	0.01	0.002	32%
8	6.35	0.28	0.13	0.21	0.077					0.88	0.18	0.15	0.068	0.03	0.002	35%
9	6.45	0.29	0.13	0.21	0.089					0.88	0.07	0.16	0.078	0.01	0.001	18%
10	6.50	0.26	0.14	0.20	0.059					0.88	0.10	0.12	0.052	0.01	0.001	12%
11	6.65	0.27	0.14	0.21	0.001					0.88	0.10	0.13	0.001	0.01	0.000	0%
12	6.70	0.27	0.15	0.21	0.001					0.88	0.07	0.12	0.001	0.01	0.000	0%
13	6.80	0.29	0.16	0.23	0.005					0.88	0.15	0.13	0.004	0.02	0.000	2%
14	7.00	0.21	0.15	0.18	0.000					0.88	0.18	0.06	0.000	0.01	0.000	0%
15	7.15	0.22	0.15	0.19	0.000					0.88	0.15	0.07	0.000	0.01	0.000	0%
16	7.30	0.20	0.15	0.18	0.000					0.88	0.13	0.05	0.000	0.01	0.000	0%
17	7.40	0.21	0.15	0.18	0.000					0.88	0.35	0.06	0.000	0.02	0.000	0%
LB	8.00	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.005</b>	<b>100%</b>	

## Flow Measurement Details:

**Metering Section Location (describe):**  
8m Ds of station

Meas. Start Time (MST):	14:52
Meas. End Time (MST):	15:08
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, lots of slush under ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, calm, -15 C

## Flow characteristics:

Total Flow:	0.005	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.25	(m <sup>2</sup> )
Wetted Width:	3.10	(m)
Hydraulic Depth:	0.08	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.02	

## Logger Details:

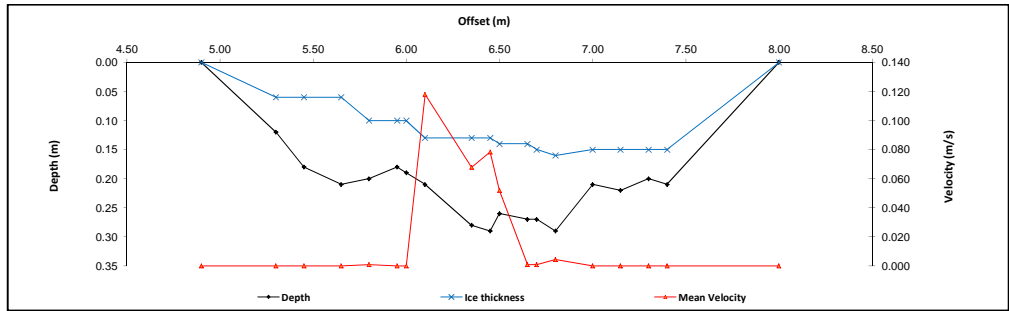
	Before	After
Transducer Reading (m):	0.588	0.593
Water (°C):	0.9	0.9
Datalogger Clock:	14:15	15:14
Laptop Clock:	14:15	15:14
Battery (Main):	12.4	12.9
Battery:		Replaced
Battery Serial #:	1407001, 110800	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

-slush in first three holes from RB

## General Notes:

-slush in first three holes from RB



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S11-6	0.830	243.409		242.579	242.579	3/4" Pipe 3m E of logger
S11-7			1.312	242.097	0.000	3/4" Pipe 12m W of logger
S11-5			1.200	242.209	242.212	3/4" Pipe 7m W of logger
Water Level:	Cut		3.638	239.771		Time WL Surveyed: 14:43
Temporary BM			3.476	239.933	0.000	-
<b>Turn</b>						
Temporary BM	3.452	243.385		239.933		-
Water Level:	Cut		3.618	239.767		Time WL Surveyed: 14:47
S11-5			1.174	242.211	242.212	3/4" Pipe 7m W of logger
S11-7			1.288	242.097		3/4" Pipe 12m W of logger
S11-6			0.807	242.578	242.579	3/4" Pipe 3m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S11-6	0.807	243.386		242.579		
Water Level:	Cut		3.616	239.770		Time WL Surveyed: 15:10
Water Level:	Cut		3.580	239.772		Time WL Surveyed: 15:12
S11-6	0.773	243.352		242.579		

## WL Survey Summary

	Before	After
Average WL:	239.769	239.771
Closing Error:	0.001	-
WL Check:	0.004	-0.002
Transducer Elevation	239.181	239.178

## Field Personnel:

	TR, CJ	Trip Date:	2-Dec-14
Data Entry Personnel:	TR	Date:	2-Dec-14
Data Check Personnel:	CJ	Date:	18-Mar-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: April 28, 2014  
 Site Visit Time (MST): 13:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.00	0.14		0.08	0.497					1.00	0.15	0.14	0.497	0.02	0.010	7%
2	1.10	0.15		0.09	0.667					1.00	0.10	0.15	0.667	0.02	0.010	6%
3	1.20	0.16		0.10	0.963					1.00	0.08	0.16	0.963	0.01	0.012	7%
4	1.25	0.17		0.10	0.775					1.00	0.05	0.17	0.775	0.01	0.007	4%
5	1.30	0.18		0.11	0.797					1.00	0.08	0.18	0.797	0.01	0.011	7%
6	1.40	0.18		0.11	0.223					1.00	0.10	0.18	0.223	0.02	0.004	3%
7	1.50	0.17		0.10	0.880					1.00	0.10	0.17	0.880	0.02	0.015	10%
8	1.60	0.15		0.09	0.359					1.00	0.10	0.15	0.359	0.02	0.005	3%
9	1.70	0.13		0.08	0.905					1.00	0.10	0.13	0.905	0.01	0.012	7%
10	1.80	0.14		0.08	0.618					1.00	0.10	0.14	0.618	0.01	0.009	6%
11	1.90	0.14		0.08	0.877					1.00	0.10	0.14	0.877	0.01	0.012	8%
12	2.00	0.14		0.08	0.571					1.00	0.10	0.14	0.571	0.01	0.008	5%
13	2.10	0.12		0.07	0.481					1.00	0.10	0.12	0.481	0.01	0.006	4%
14	2.20	0.10		0.06	0.536					1.00	0.10	0.10	0.536	0.01	0.005	3%
15	2.30	0.10		0.06	0.591					1.00	0.10	0.10	0.591	0.01	0.006	4%
16	2.40	0.12		0.07	0.463					1.00	0.10	0.12	0.463	0.01	0.006	4%
17	2.50	0.12		0.07	0.626					1.00	0.10	0.12	0.626	0.01	0.008	5%
18	2.60	0.13		0.08	0.355					1.00	0.10	0.13	0.355	0.01	0.005	3%
19	2.70	0.14		0.08	0.232					1.00	0.10	0.14	0.232	0.01	0.003	2%
20	2.80	0.14		0.08	0.253					1.00	0.10	0.14	0.253	0.01	0.004	2%
21	2.90	0.11		0.07	0.032					1.00	0.20	0.11	0.032	0.02	0.001	0%
LB	3.20	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.157</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -5m US of PT

Mess. Start Time (MST):	13:35
Mess. End Time (MST):	14:00
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 8 C

**Flow characteristics:**

Total Flow:	0.157	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.29	(m <sup>2</sup> )
Wetted Width:	2.40	(m)
Hydraulic Depth:	0.12	(m)
Mean Velocity:	0.53	(m/s)
Froude Number:	0.49	

**Logger Details:**

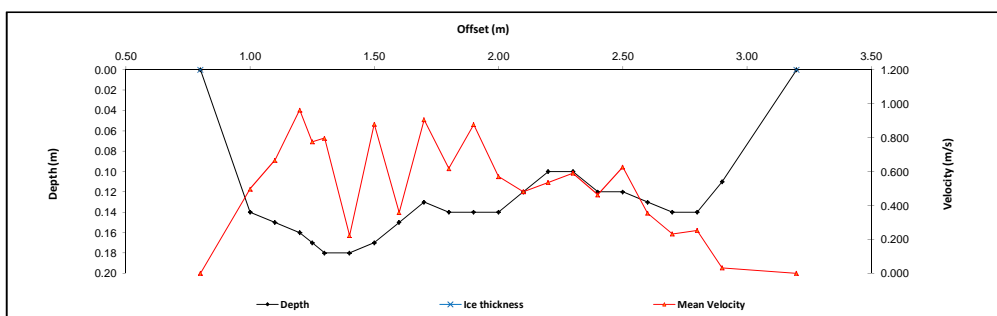
	Before	After
Transducer Reading (m):	0.193	0.191
Water (°C):	-	2.7
Datalogger Clock:	13:24	14:08
Laptop Clock:	13:21	14:05
Battery:	12.7	12.9
Battery Condition:		New
Battery Serial #:	-	-
Enclosure Desiccant:		New
Vent Tube Desiccant:		New
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-installed PT for 2014 open water season

**General Notes:**

-culvert still full of ice



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S12-04	0.364	99.457		99.093	99.093	3/4" Pipe 10m NW of logger
S12-01			0.725	98.732	98.699	T-Post closest to road
S12-05			0.399	99.058	99.058	3/4" Pipe 8m North of logger
Water Level:	Cut		1.992	97.465	Time WL Surveyed:	13:27
Temporary BM			2.152	97.305	0.000	
<b>Turn</b>						
Temporary BM	2.135	99.440		97.305		
Water Level:	Cut		1.974	97.466	Time WL Surveyed:	13:30
S12-05			0.383	99.057	99.058	3/4" Pipe 8m North of logger
S12-01			0.707	98.733	98.699	T-Post closest to road
S12-04			0.348	99.092	99.093	3/4" Pipe 10m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S12-01	0.707	99.439		98.732		
Water Level:	Cut		1.975	97.464	Time WL Surveyed:	14:01
Water Level:	Cut		1.963	97.461	Time WL Surveyed:	14:02
S12-01	0.692	99.424		98.732		

**WL Survey Summary**

Average WL:	97.466	97.463
Closing Error:	0.001	-
WL Check:	0.001	0.003
Transducer Elevation	97.273	97.272

**Field Personnel:**

SM, TR	Trip Date:	28-Apr-14
SM	Date:	28-Apr-14
CJ	Date:	3-Jun-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: June 6, 2014  
 Site Visit Time (MST): 14:10

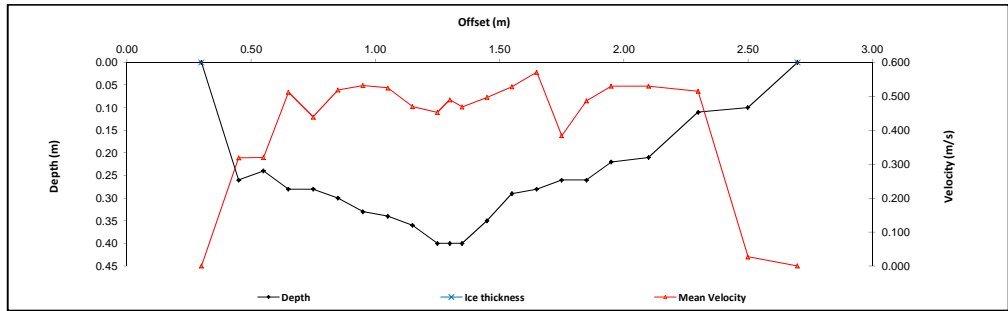


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.30	0.00	0.00		0.000				0.000	1.00	0.08	0.00	0.000	0.00	0.000	
1	0.45	0.26		0.16	0.319					1.00	0.13	0.26	0.319	0.03	0.010	4%
2	0.55	0.24		0.14	0.320					1.00	0.10	0.24	0.320	0.02	0.008	3%
3	0.65	0.28		0.17	0.512					1.00	0.10	0.28	0.512	0.03	0.014	5%
4	0.75	0.28		0.17	0.439					1.00	0.10	0.28	0.439	0.03	0.012	5%
5	0.85	0.30		0.18	0.519					1.00	0.10	0.30	0.519	0.03	0.016	6%
6	0.95	0.33		0.20	0.532					1.00	0.10	0.33	0.532	0.03	0.018	7%
7	1.05	0.34		0.20	0.525					1.00	0.10	0.34	0.525	0.03	0.018	7%
8	1.15	0.36		0.22	0.470					1.00	0.10	0.36	0.470	0.04	0.017	6%
9	1.25	0.40		0.24	0.453					1.00	0.08	0.40	0.453	0.03	0.014	5%
10	1.30	0.40		0.24	0.490					1.00	0.05	0.40	0.490	0.02	0.010	4%
11	1.35	0.40		0.24	0.469					1.00	0.07	0.40	0.469	0.03	0.014	5%
12	1.45	0.35		0.21	0.497					1.00	0.10	0.35	0.497	0.04	0.017	7%
13	1.55	0.29		0.17	0.528					1.00	0.10	0.29	0.528	0.03	0.015	6%
14	1.65	0.28		0.17	0.571					1.00	0.10	0.28	0.571	0.03	0.016	6%
15	1.75	0.26		0.16	0.384					1.00	0.10	0.26	0.384	0.03	0.010	4%
16	1.85	0.26		0.16	0.487					1.00	0.10	0.26	0.487	0.03	0.013	5%
17	1.95	0.22		0.13	0.530					1.00	0.13	0.22	0.530	0.03	0.015	5%
18	2.10	0.21		0.13	0.530					1.00	0.18	0.21	0.530	0.04	0.019	7%
19	2.30	0.11		0.07	0.515					1.00	0.20	0.11	0.515	0.02	0.011	4%
20	2.50	0.10		0.06	0.027					1.00	0.20	0.10	0.027	0.02	0.001	0%
RB	2.70	0.00	0.00		0.000		0.00		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.267</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -5m upstream of PT

Meas. Start Time (MST):	14:40
Meas. End Time (MST):	15:05
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 10 C



**Flow characteristics:**

Total Flow:	0.267	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.58	(m <sup>2</sup> )
Wetted Width:	2.40	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.46	(m/s)
Froude Number:	0.30	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.274	0.273
Water (°C):	12.1	12.0
Datalogger Clock:	14:15	15:28
Laptop Clock:	14:12	15:25
Battery:	12.8	12.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S12-04	0.358	99.451		99.093	99.093	3/4" Pipe 10m NW of logger
S12-01			0.722	98.729	98.699	T-Post closest to road
S12-05			0.393	99.058	99.058	3/4" Pipe 8m North of logger
Water Level:	Cut		1.942	97.509		Time WL Surveyed: 14:19
S12-01			0.722	98.729	98.699	T-Post closest to road
<b>Turn</b>						
S12-01	0.758	99.487		98.729	98.699	T-Post closest to road
Water Level:	Cut		1.982	97.505		Time WL Surveyed: 14:21
S12-05			0.431	99.056	99.058	3/4" Pipe 8m North of logger
S12-01			0.759	98.728	98.699	T-Post closest to road
S12-04			0.397	99.090	99.093	3/4" Pipe 10m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S12-01	0.758	99.486		98.728		
Water Level:	Cut		1.978	97.508		Time WL Surveyed: 15:13
Water Level:	Cut		1.948	97.508		Time WL Surveyed: 15:14
S12-01	0.728	99.456		98.728		

**WL Survey Summary**

	Before	After
Average WL:	97.507	97.508
Closing Error:	0.003	-
WL Check:	0.004	0.000
Transducer Elevation	97.233	97.235

**Field Personnel:**

	SM, GG		6-Jun-14
Data Entry Personnel:	SM	Date:	6-Jun-14
Data Check Personnel:	CJ	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: August 6, 2014  
 Site Visit Time (MST): 10:00

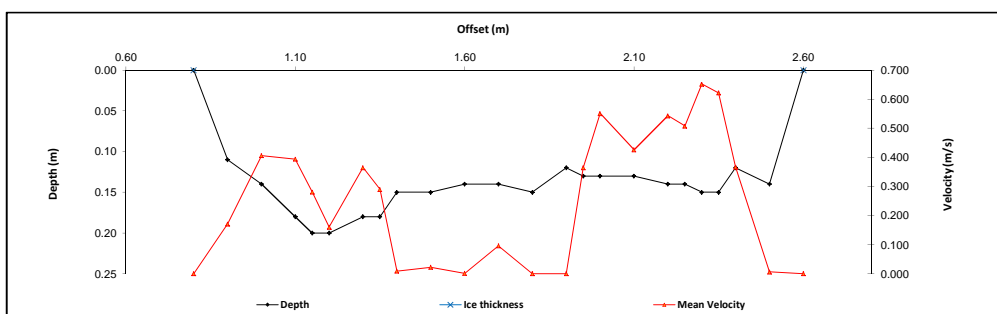


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000				0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.90	0.11		0.07	0.171					1.00	0.10	0.11	0.171	0.01	0.002	3%
2	1.00	0.14		0.08	0.406					1.00	0.10	0.14	0.406	0.01	0.006	9%
3	1.10	0.18		0.11	0.394					1.00	0.08	0.18	0.394	0.01	0.005	8%
4	1.15	0.20		0.12	0.281					1.00	0.05	0.20	0.281	0.01	0.003	4%
5	1.20	0.20		0.12	0.160					1.00	0.08	0.20	0.160	0.02	0.002	4%
6	1.30	0.18		0.11	0.365					1.00	0.08	0.18	0.365	0.01	0.005	8%
7	1.35	0.18		0.11	0.290					1.00	0.05	0.18	0.290	0.01	0.003	4%
8	1.40	0.15		0.09	0.009					1.00	0.08	0.15	0.009	0.01	0.000	0%
9	1.50	0.15		0.09	0.022					1.00	0.10	0.15	0.022	0.02	0.000	1%
10	1.60	0.14		0.08	0.001					1.00	0.10	0.14	0.001	0.01	0.000	0%
11	1.70	0.14		0.08	0.096					1.00	0.10	0.14	0.096	0.01	0.001	2%
12	1.80	0.15		0.09	0.000					1.00	0.10	0.15	0.000	0.02	0.000	0%
13	1.90	0.12		0.07	0.000					1.00	0.07	0.12	0.000	0.01	0.000	0%
14	1.95	0.13		0.08	0.364					1.00	0.05	0.13	0.364	0.01	0.002	4%
15	2.00	0.13		0.08	0.551					1.00	0.07	0.13	0.551	0.01	0.005	9%
16	2.10	0.13		0.08	0.426					1.00	0.10	0.13	0.426	0.01	0.006	9%
17	2.20	0.14		0.08	0.543					1.00	0.07	0.14	0.543	0.01	0.006	9%
18	2.25	0.14		0.08	0.508					1.00	0.05	0.14	0.508	0.01	0.004	6%
19	2.30	0.15		0.09	0.652					1.00	0.05	0.15	0.652	0.01	0.005	8%
20	2.35	0.15		0.09	0.622					1.00	0.05	0.15	0.622	0.01	0.005	7%
21	2.40	0.12		0.07	0.367					1.00	0.08	0.12	0.367	0.01	0.003	5%
22	2.50	0.14		0.08	0.006					1.00	0.10	0.14	0.006	0.01	0.000	0%
LB	2.60	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.063</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 9m DS of culvert

Meas. Start Time (MST):	10:30
Meas. End Time (MST):	11:00
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 20 C



**Flow characteristics:**

Total Flow:	0.063	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.25	(m <sup>2</sup> )
Wetted Width:	1.80	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.22	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.137	0.124
Water (°C):	18.1	18.4
Datalogger Clock:	10:16	11:07
Laptop Clock:	10:14	11:10
Battery:	13.7	14.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	276581	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S12-04	0.292	99.385		99.093	99.093	3/4" Pipe 10m NW of logger
S12-01			0.655	98.730	98.699	T-Post closest to road
S12-05			0.326	99.059	99.058	3/4" Pipe 8m North of logger
Water Level:	Cut		2.003	97.382	Time WL Surveyed:	10:21
Temporary BM			2.078	97.307	0.000	-
<b>Turn</b>						
Temporary BM	2.056	99.363		97.307	-	-
Water Level:	Cut		1.984	97.379	Time WL Surveyed:	10:24
S12-05			0.303	99.060	99.058	3/4" Pipe 8m North of logger
S12-01			0.632	98.731	98.699	T-Post closest to road
S12-04			0.269	99.094	99.093	3/4" Pipe 10m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S12-04	0.269	99.362		99.093		
Water Level:	Cut		1.982	97.380	Time WL Surveyed:	11:03
Water Level:	Cut		1.967	97.380	Time WL Surveyed:	11:04
S12-04	0.254	99.347		99.093		

**WL Survey Summary**

	Before	After
Average WL:	97.381	97.380
Closing Error:	-0.001	-
WL Check:	0.003	0.000
Transducer Elevation	97.244	97.256

**Field Personnel:**

	TR, MP	Trip Date:	6-Aug-14
Data Entry Personnel:	TR	Date:	6-Aug-14
Data Check Personnel:	GG	Date:	14-Aug-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: September 21, 2014  
 Site Visit Time (MST): 12:55

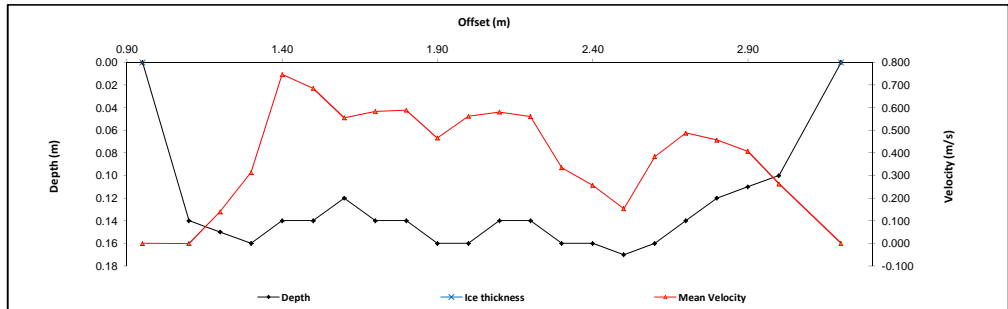


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.20	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	3.00	0.10		0.06	0.263					1.00	0.15	0.10	0.263	0.02	0.004	3%
2	2.90	0.11		0.07	0.407					1.00	0.10	0.11	0.407	0.01	0.004	4%
3	2.80	0.12		0.07	0.457					1.00	0.10	0.12	0.457	0.01	0.005	4%
4	2.70	0.14		0.08	0.488					1.00	0.10	0.14	0.488	0.01	0.007	6%
5	2.60	0.16		0.10	0.384					1.00	0.10	0.16	0.384	0.02	0.006	5%
6	2.50	0.17		0.10	0.153					1.00	0.10	0.17	0.153	0.02	0.003	2%
7	2.40	0.16		0.10	0.257					1.00	0.10	0.16	0.257	0.02	0.004	3%
8	2.30	0.16		0.10	0.334					1.00	0.10	0.16	0.334	0.02	0.005	4%
9	2.20	0.14		0.08	0.561					1.00	0.10	0.14	0.561	0.01	0.008	6%
10	2.10	0.14		0.08	0.581					1.00	0.10	0.14	0.581	0.01	0.008	7%
11	2.00	0.16		0.10	0.562					1.00	0.10	0.16	0.562	0.02	0.009	7%
12	1.90	0.16		0.10	0.466					1.00	0.10	0.16	0.466	0.02	0.007	6%
13	1.80	0.14		0.08	0.589					1.00	0.10	0.14	0.589	0.01	0.008	7%
14	1.70	0.14		0.08	0.583					1.00	0.10	0.14	0.583	0.01	0.008	7%
15	1.60	0.12		0.07	0.555					1.00	0.10	0.12	0.555	0.01	0.007	5%
16	1.50	0.14		0.08	0.685					1.00	0.10	0.14	0.685	0.01	0.010	8%
17	1.40	0.14		0.08	0.747					1.00	0.10	0.14	0.747	0.01	0.010	9%
18	1.30	0.16		0.10	0.314					1.00	0.10	0.16	0.314	0.02	0.005	4%
19	1.20	0.15		0.09	0.140					1.00	0.10	0.15	0.140	0.02	0.002	2%
20	1.10	0.14		0.08	-0.001					1.00	0.13	0.14	-0.001	0.02	0.000	0%
LB	0.95	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.122</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m DS of culvert

Meas. Start Time (MST):	13:10
Meas. End Time (MST):	13:35
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 20C



**Flow characteristics:**

Total Flow:	0.122	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.29	(m <sup>2</sup> )
Wetted Width:	2.25	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.42	(m/s)
Froude Number:	0.37	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.204	0.204
Water (°C):	12.0	12.4
Datalogger Clock:	13:01	13:47
Laptop Clock:	12:58	13:44
Battery:	13.0	13.9
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S12-05	0.332	99.390		99.058	99.058	3/4" Pipe 8m North of logger
S12-04			0.298	99.092	99.093	3/4" Pipe 10m NW of logger
S12-01			0.661	98.729	98.699	T-Post closest to road
Water Level:	Cut		1.976	97.414	Time WL Surveyed: 13:07	
S12-01			0.661	98.729	98.699	T-Post closest to road
<b>Turn</b>						
S12-01	0.639	99.368		98.729	98.699	T-Post closest to road
Water Level:	Cut		1.952	97.416	Time WL Surveyed: 13:09	
S12-01			0.639	98.729	98.699	T-Post closest to road
S12-04			0.276	99.092	99.093	3/4" Pipe 10m NW of logger
S12-05			0.311	99.057	99.058	3/4" Pipe 8m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S12-05	0.311	99.369		99.058		
Water Level:	Cut		1.953	97.416	Time WL Surveyed: 13:40	
Water Level:	Cut		1.933	97.414	Time WL Surveyed: 13:41	
S12-05	0.289	99.347		99.058		

**WL Survey Summary**

	Before	After
Average WL:	97.415	97.415
Closing Error:	0.001	-
WL Check:	0.002	0.002
Transducer Elevation	97.211	97.211

**Field Personnel:**

TR, MP	Trip Date:	21-Sep-14
Data Entry Personnel:	Date:	21-Sep-14
Data Check Personnel:	Date:	24-Nov-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S12 Fort Creek at Hwy 63  
 UTM Location: 462600 E, 6363400 N

Site Visit Date: October 31, 2014  
 Site Visit Time (MST): 09:05



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.30	0.10		0.06	0.000				1.00	0.23	0.10	0.000	0.02	0.000	0%	
2	1.45	0.11		0.07	0.233				1.00	0.15	0.11	0.233	0.02	0.004	3%	
3	1.60	0.13		0.08	0.374				1.00	0.15	0.13	0.374	0.02	0.007	6%	
4	1.75	0.13		0.08	-0.010				1.00	0.15	0.13	-0.010	0.02	0.000	0%	
5	1.90	0.18		0.11	0.008				1.00	0.15	0.18	0.008	0.03	0.000	0%	
6	2.05	0.15		0.09	0.515				1.00	0.12	0.15	0.515	0.02	0.009	7%	
7	2.13	0.18		0.11	0.611				1.00	0.08	0.18	0.611	0.01	0.008	6%	
8	2.20	0.26		0.16	0.571				1.00	0.08	0.26	0.571	0.02	0.011	9%	
9	2.28	0.29		0.17	0.308				1.00	0.07	0.29	0.308	0.02	0.007	5%	
10	2.35	0.26		0.16	0.547				1.00	0.09	0.26	0.547	0.02	0.013	10%	
11	2.46	0.25		0.15	0.132				1.00	0.07	0.25	0.132	0.02	0.002	2%	
12	2.50	0.26		0.16	0.025				1.00	0.06	0.26	0.025	0.02	0.000	0%	
13	2.58	0.26		0.16	0.177				1.00	0.08	0.26	0.177	0.02	0.003	3%	
14	2.65	0.26		0.16	0.687				1.00	0.07	0.26	0.687	0.02	0.013	10%	
15	2.72	0.26		0.16	0.482				1.00	0.07	0.26	0.482	0.02	0.009	7%	
16	2.80	0.26		0.16	0.128				1.00	0.12	0.26	0.128	0.03	0.004	3%	
17	2.95	0.23		0.14	0.425				1.00	0.11	0.23	0.425	0.03	0.011	8%	
18	3.02	0.20		0.12	0.518				1.00	0.07	0.20	0.518	0.01	0.008	6%	
19	3.10	0.26		0.16	0.524				1.00	0.12	0.26	0.524	0.03	0.016	12%	
20	3.25	0.13		0.08	0.198				1.00	0.15	0.13	0.198	0.02	0.004	3%	
21	3.40	0.12		0.07	-0.013				1.00	0.13	0.12	-0.013	0.02	0.000	0%	
RB	3.50	0.00	0.00		0.00		0.00		1.00	0.05	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.129</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
2m DS of culvert

Mess. Start Time (MST):	9:18
Mess. End Time (MST):	9:51
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, 3C

**Flow characteristics:**

Total Flow:	0.129	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.43	(m <sup>2</sup> )
Wetted Width:	2.50	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.23	

**Logger Details:**

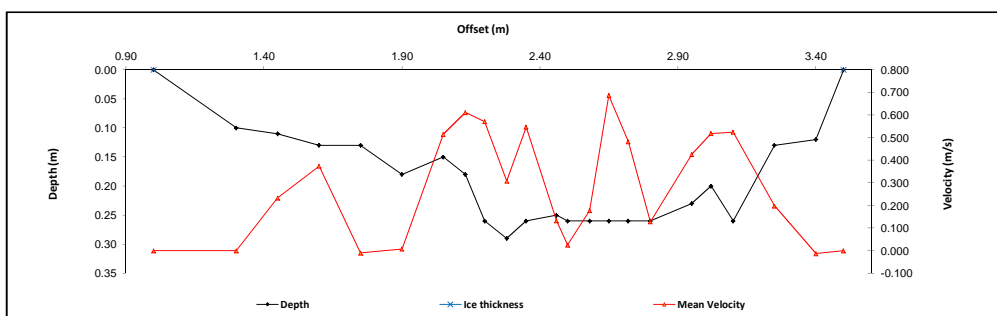
	Before	After
Transducer Reading (m):	0.225	0.227
Water (°C):	2.3	2.4
Datalogger Clock:	09:09	10:04
Laptop Clock:	09:06	10:01
Battery:	12.3	12.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Winterized station

**General Notes:**

-ADV test good  
 -large cobbles in river



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S12-04	0.337	99.430		99.093	99.093	3/4" Pipe 10m NW of logger
S12-01			0.700	98.730	98.699	T-Post closest to road
S12-05			0.373	99.057	99.058	3/4" Pipe 8m North of logger
Water Level:	Cut		1.983	97.447		Time WL Surveyed: 9:11
S12-05			0.373	99.057	99.058	3/4" Pipe 8m North of logger
<b>Turn</b>						
S12-05	0.363	99.420		99.057	99.058	3/4" Pipe 8m North of logger
Water Level:	Cut		1.975	97.445		Time WL Surveyed: 9:13
S12-05			0.363	99.057	99.058	3/4" Pipe 8m North of logger
S12-01			0.692	98.728	98.699	T-Post closest to road
S12-04			0.328	99.092	99.093	3/4" Pipe 10m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S12-05	0.363	99.420		99.057		
Water Level:	Cut		1.974	97.446		Time WL Surveyed: 9:55
Water Level:	Cut		1.965	97.448		Time WL Surveyed: 9:57
S12-05	0.356	99.413		99.057		

**WL Survey Summary**

Average WL:	97.446	97.447
Closing Error:	0.001	-
WL Check:	0.002	-0.002
Transducer Elevation	97.221	97.220

**Field Personnel:**

MP TR	Trip Date:	31-Oct-14
MP TR	Date:	31-Oct-14
GG	Date:	20-Nov-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the Canadian Natural Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: January 7, 2014  
 Site Visit Time (MST): 15:05



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000		0.000		0.000	0.88	0.53	0.00	0.000	0.00	0.000	
1	2.05	0.75	0.60	0.68	0.143					0.88	0.98	0.15	0.126	0.15	0.018	1%
2	2.95	1.00	0.60	0.80	0.172					0.88	0.88	0.40	0.151	0.35	0.053	2%
3	3.80	1.22	0.60	0.91	0.076					0.88	0.82	0.62	0.067	0.51	0.034	1%
4	4.60	1.35	0.60	0.98	0.127					0.88	0.93	0.75	0.112	0.69	0.078	3%
5	5.65	1.40	0.62		0.119	1.24		0.78		0.88	0.95	0.78	0.105	0.74	0.078	3%
6	6.50	1.50	0.63		0.121	1.33		0.80		0.88	0.98	0.87	0.106	0.85	0.090	4%
7	7.60	1.40	0.63		0.158	1.25		0.78		0.88	1.08	0.77	0.139	0.83	0.115	5%
8	8.65	1.40	0.60		0.144	1.24		0.76		0.88	0.98	0.80	0.127	0.78	0.099	4%
9	9.55	1.40	0.60		0.118	1.24		0.76		0.88	0.92	0.80	0.104	0.74	0.077	3%
10	10.50	1.45	0.65		0.178	1.29		0.81		0.88	0.78	0.80	0.157	0.62	0.097	4%
11	11.10	1.40	0.65	1.03	0.182					0.88	0.75	0.75	0.160	0.56	0.090	4%
12	12.00	1.50	0.64		0.185	1.33		0.81		0.88	1.10	0.86	0.163	0.95	0.154	7%
13	13.30	1.60	0.65		0.172	1.41		0.84		0.88	1.08	0.95	0.151	1.02	0.155	7%
14	14.15	1.70	0.65		0.175	1.49		0.86		0.88	0.80	1.05	0.154	0.84	0.129	6%
15	14.90	1.80	0.65		0.146	1.57		0.88		0.88	0.78	1.15	0.128	0.89	0.115	5%
16	15.70	1.80	0.75		0.164	1.59		0.96		0.88	0.87	1.05	0.144	0.92	0.133	6%
17	16.65	1.80	0.70		0.187	1.58		0.92		0.88	1.23	1.10	0.165	1.35	0.222	9%
18	18.15	1.75	0.60		0.155	1.52		0.83		0.88	1.58	1.15	0.136	1.81	0.247	11%
19	19.80	1.80	0.60		0.154	1.56		0.84		0.88	1.78	1.20	0.136	2.13	0.289	12%
20	21.70	1.45	0.65		0.059	1.29		0.81		0.88	1.45	0.80	0.052	1.16	0.060	3%
21	22.70	1.00	0.65	0.83	0.035					0.88	1.30	0.35	0.031	0.46	0.014	1%
RB	24.30	0.00	0.00		0.00		0.00		0.00	0.88	0.80	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.35</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
15m DS of PT

Mess. Start Time (MST):	15:45
Mess. End Time (MST):	16:15
Equipment:	ADV
Method:	Ice
River Condition:	Ice covered
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -35C

**Flow characteristics:**

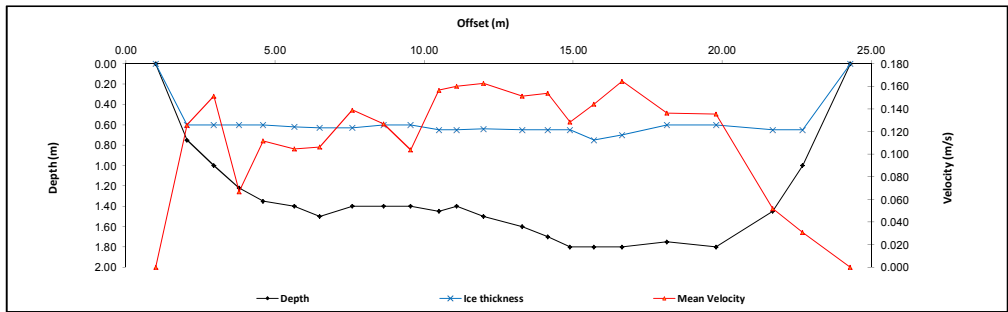
Total Flow:	2.35	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	18.34	(m <sup>2</sup> )
Wetted Width:	23.30	(m)
Hydraulic Depth:	0.79	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.055	1.056
Water (°C):	0.2	0.2
Datalogger Clock:	15:15	16:23
Laptop Clock:	15:17	17:15
Battery (Main):	12.3	12.7
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S14A-05	1.238	101.916		100.678	100.678	Pipe 5m NE of Station
S14A-04			1.512	100.404	100.407	Pipe 5m SE of Station
S14A-03			1.895	100.021	99.989	Pipe 3m SW of Station
Water Level:	Cut		3.760	98.156	Time WL Surveyed: 15:33	
Temporary BM			3.745	98.171	0.000	
<b>Turn</b>						
Temporary BM	3.730	101.901		98.171		
Water Level:	Cut		3.746	98.155	Time WL Surveyed: 15:36	
S14A-03			1.881	100.020	99.989	Pipe 3m SW of Station
S14A-04			1.498	100.403	100.407	Pipe 5m SE of Station
S14A-05			1.223	100.678	100.678	Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S14A-04	1.498	101.902		100.404		
Water Level:	Cut		3.745	98.157	Time WL Surveyed: 16:19	
Water Level:	Cut		3.733	98.156	Time WL Surveyed: 16:21	
S14A-04	1.485	101.889		100.404		

**WL Survey Summary**

Average WL:	98.156	98.157
Closing Error:	0.000	-
WL Check:	0.001	0.001
Transducer Elevation	97.101	97.101

**Field Personnel:**

SM TR	Trip Date:	7-Jan-14
SM	Date:	11-Apr-14
DW	Date:	11-Apr-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the Canadian Natural Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: January 30, 2014  
 Site Visit Time (MST): 14:00

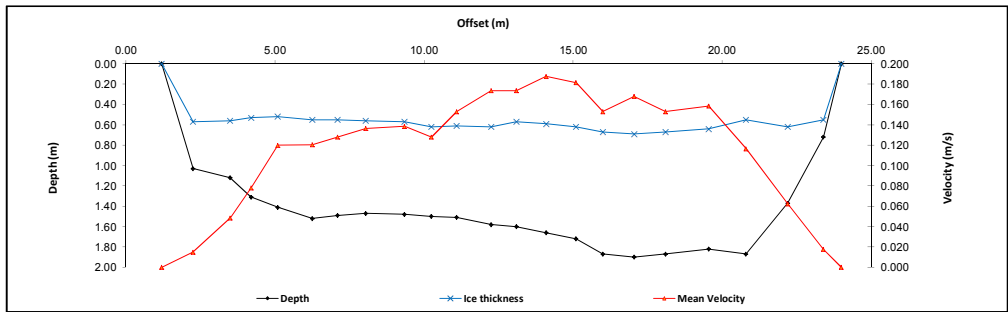


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.20	0.00	0.00		0.000		0.000		0.000	0.88	0.53	0.00	0.000	0.00	0.000	
1	2.25	1.03	0.57	0.80	0.017		0.570		0.88	1.15	0.46	0.015	0.53	0.008	0%	
2	3.50	1.12	0.56	0.84	0.055		0.560		1.00	0.98	0.56	0.048	0.55	0.026	1%	
3	4.20	1.31	0.53			1.15	0.065	0.69	1.00	0.80	0.78	0.078	0.62	0.049	2%	
4	5.10	1.41	0.62			1.23	0.126	0.70	1.00	1.03	0.89	0.120	0.91	0.109	4%	
5	6.25	1.52	0.65			1.33	0.107	0.74	1.00	1.00	0.97	0.121	0.97	0.117	4%	
6	7.10	1.49	0.65			1.30	0.102	0.74	1.00	0.90	0.94	0.128	0.85	0.108	4%	
7	8.05	1.47	0.56			1.29	0.133	0.74	1.00	1.13	0.91	0.137	1.02	0.140	5%	
8	9.35	1.48	0.57			1.30	0.130	0.75	1.00	1.10	0.91	0.139	1.00	0.139	5%	
9	10.25	1.50	0.62			1.32	0.107	0.80	1.00	0.88	0.88	0.128	0.77	0.099	4%	
10	11.10	1.51	0.61			1.33	0.123	0.79	1.00	1.00	0.90	0.153	0.90	0.138	5%	
11	12.25	1.58	0.62			1.39	0.169	0.81	1.00	1.00	0.96	0.174	0.96	0.167	6%	
12	13.10	1.60	0.57			1.39	0.141	0.78	1.00	0.92	1.03	0.174	0.95	0.165	6%	
13	14.10	1.66	0.59			1.45	0.192	0.80	1.00	1.00	1.07	0.188	1.07	0.201	7%	
14	15.10	1.72	0.62			1.50	0.159	0.84	1.00	0.95	1.10	0.182	1.05	0.190	7%	
15	16.00	1.87	0.67			1.63	0.119	0.91	1.00	0.97	1.20	0.153	1.17	0.179	6%	
16	17.05	1.90	0.69			1.66	0.135	0.93	1.00	1.05	1.21	0.168	1.27	0.213	8%	
17	18.10	1.87	0.67			1.63	0.113	0.91	1.00	1.25	1.20	0.153	1.50	0.230	8%	
18	19.55	1.82	0.64			1.58	0.153	0.88	1.00	1.35	1.18	0.159	1.59	0.252	9%	
19	20.80	1.87	0.55			1.61	0.132	0.81	1.00	1.33	1.32	0.117	1.75	0.204	7%	
20	22.20	1.37	0.62	1.00	0.071				0.88	1.30	0.75	0.062	0.97	0.061	2%	
21	23.40	0.72	0.55	0.64	0.020				0.88	0.90	0.17	0.018	0.15	0.003	0%	
RB	24.00	0.00	0.00		0.00		0.00		0.88	0.30	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>2.80</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m Ds of station

Mess. Start Time (MST):	14:50
Mess. End Time (MST):	15:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, calm, -20C



**Flow characteristics:**

Total Flow:	2.80	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	20.56	(m <sup>2</sup> )
Wetted Width:	22.80	(m)
Hydraulic Depth:	0.90	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.083	1.077
Water (°C):	0.2	0.2
Datalogger Clock:	14:09	15:41
Laptop Clock:	14:07	15:41
Battery (Main):	15.1	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S14A-05	1.302	101.980		100.678	100.678	Pipe 5m NE of Station
S14A-04			1.577	100.403	100.407	Pipe 5m SE of Station
S14A-03			1.951	100.029	99.989	Pipe 3m SW of Station
Water Level:	Cut		3.792	98.188	Time WL Surveyed: 14:40	
Temporary BM			3.646	98.334	0.000	
<b>Turn</b>						
Temporary BM	3.619	101.953		98.334		
Water Level:	Cut		3.762	98.191	Time WL Surveyed: 14:45	
S14A-03			1.922	100.031	99.989	Pipe 3m SW of Station
S14A-04			1.549	100.404	100.407	Pipe 5m SE of Station
S14A-05			1.274	100.679	100.678	Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S14A-05	1.274	101.952		100.678		
Water Level:	Cut		3.764	98.188	Time WL Surveyed: 15:38	
Water Level:	Cut		3.742	98.189	Time WL Surveyed: 15:39	
S14A-05	1.253	101.931		100.678		

**WL Survey Summary**

Average WL:	Before	After
	98.190	98.189
Closing Error:	-0.001	-
WL Check:	0.003	-0.001
Transducer Elevation	97.107	97.112

**Field Personnel:**

TR, RM	Trip Date:	30-Jan-14
TR	Date:	30-Jan-14
DW	Date:	11-Apr-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the Canadian Natural Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: March 4, 2014  
 Site Visit Time (MST): 10:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000		0.000		0.000	0.88	0.23	0.00	0.000	0.00	0.000	
1	1.45	1.10	0.65	0.88	-0.016					0.88	0.65	0.45	-0.014	0.29	-0.004	0%
2	2.30	1.05	0.55	0.80	0.017					0.88	0.88	0.50	0.015	0.44	0.007	0%
3	3.20	1.35	0.55			1.19	0.074	0.71	0.029	1.00	0.84	0.80	0.052	0.67	0.035	2%
4	3.98	1.40	0.65			1.23	0.128	0.72	0.116	1.00	0.85	0.85	0.122	0.72	0.088	5%
5	4.90	1.33	0.55			1.17	0.142	0.71	0.124	1.00	0.96	0.78	0.133	0.75	0.100	6%
6	5.90	1.25	0.60	0.93	0.153					0.88	1.08	0.65	0.135	0.70	0.094	6%
7	7.05	1.20	0.65	0.93	0.121					0.88	1.10	0.55	0.106	0.61	0.064	4%
8	8.10	1.25	0.70	0.98	0.063					0.88	1.05	0.55	0.055	0.58	0.032	2%
9	9.15	1.25	0.75	1.00	0.053					0.88	1.00	0.50	0.047	0.50	0.023	1%
10	10.10	1.40	0.75	1.08	0.115					0.88	0.98	0.65	0.101	0.63	0.064	4%
11	11.10	1.45	0.70	1.08	0.141					0.88	0.96	0.75	0.124	0.72	0.089	5%
12	12.02	1.50	0.72			1.34	0.123	0.88	0.153	1.00	0.90	0.78	0.138	0.70	0.097	6%
13	12.90	1.60	0.75			1.43	0.123	0.92	0.144	1.00	0.89	0.85	0.134	0.76	0.101	6%
14	13.80	1.60	0.75			1.43	0.122	0.92	0.155	1.00	0.85	0.85	0.139	0.72	0.100	6%
15	14.60	1.60	0.75			1.43	0.122	0.92	0.120	1.00	0.90	0.85	0.121	0.77	0.093	5%
16	15.60	1.80	0.75			1.59	0.127	0.96	0.152	1.00	1.05	1.05	0.140	1.10	0.154	9%
17	16.70	1.80	0.70			1.58	0.107	0.92	0.140	1.00	1.10	1.10	0.124	1.21	0.149	9%
18	17.80	1.80	0.60			1.56	0.126	0.84	0.137	1.00	1.20	1.20	0.132	1.44	0.189	11%
19	19.10	1.70	0.60			1.48	0.130	0.82	0.090	1.00	1.40	1.10	0.110	1.54	0.169	10%
20	20.60	1.20	0.60	0.90	0.061					0.88	1.35	0.60	0.054	0.81	0.043	3%
21	21.80	0.60	0.50	0.55	0.013					0.88	0.70	0.10	0.011	0.07	0.001	0%
RB	22.00	0.00	0.00		0.00		0.00		0.00	0.88	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.69</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m DS of station

Mess. Start Time (MST):	10:40
Mess. End Time (MST):	11:21
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -23C

**Flow characteristics:**

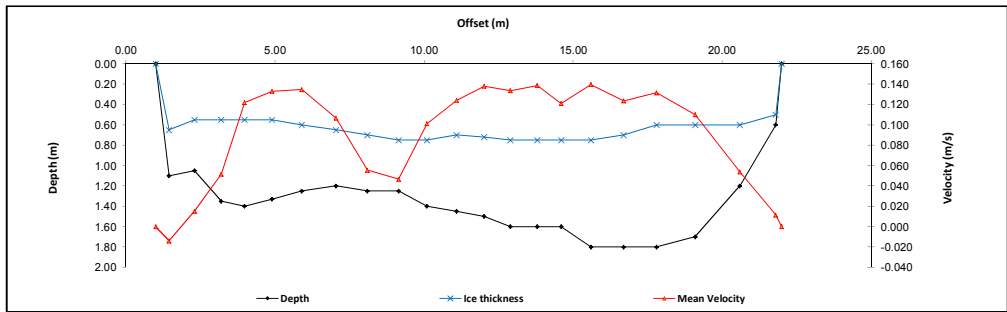
Total Flow:	1.69	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	15.73	(m <sup>2</sup> )
Wetted Width:	21.00	(m)
Hydraulic Depth:	0.75	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.974	-
Water (°C):	0.2	-
Datalogger Clock:	10:09	-
Laptop Clock:	10:09	-
Battery (Main):	15.4	14.6
Battery:	Replaced	
Battery Serial #:	-	905004
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S14A-05	1.239	101.917		100.678	100.678	Pipe 5m NE of Station
S14A-04			1.513	100.404	100.407	Pipe 5m SE of Station
S14A-03			1.872	100.045	99.989	Pipe 3m SW of Station
Water Level:	Cut		3.837	98.080	Time WL Surveyed: 11:29	
Temporary BM			3.767	98.150	0.000	
<b>Turn</b>						
Temporary BM	3.750	101.900		98.150		
Water Level:	Cut		3.822	98.078	Time WL Surveyed: 11:33	
S14A-03			1.855	100.045	99.989	Pipe 3m SW of Station
S14A-04			1.496	100.404	100.407	Pipe 5m SE of Station
S14A-05			1.222	100.678	100.678	Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.079	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	97.105	-

**Field Personnel:**

SM, MP	Trip Date:	4-Mar-14
SM, MP	Date:	4-Mar-14
DW	Date:	11-Apr-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the Canadian Natural Bridge  
 UTM Location: 455748 E, 6344947 N

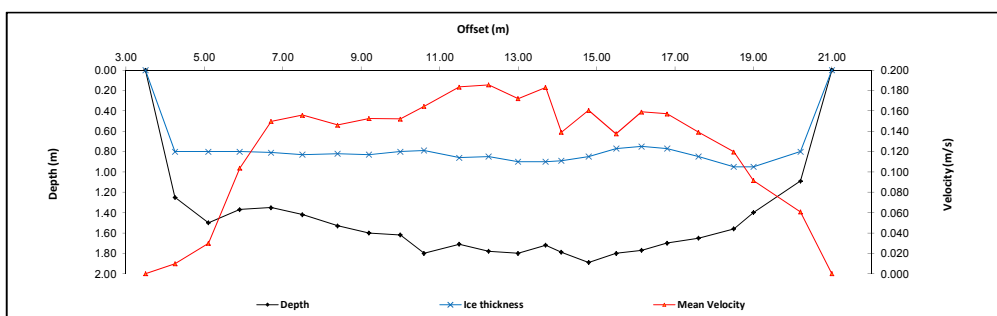
Site Visit Date: April 1, 2014  
 Site Visit Time (MST): 14:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.50	0.00	0.00		0.000				0.000	0.88	0.38	0.00	0.000	0.00	0.000	
1	4.25	1.25	0.80	1.03	0.011				0.88	0.80	0.45	0.010	0.36	0.003	0%	
2	5.10	1.50	0.80	1.15	0.034				0.88	0.83	0.70	0.030	0.58	0.017	1%	
3	5.90	1.37	0.80	1.09	0.118				0.88	0.80	0.57	0.104	0.46	0.047	3%	
4	6.70	1.35	0.81	1.08	0.170				0.88	0.80	0.54	0.150	0.43	0.065	4%	
5	7.50	1.42	0.83	1.13	0.177				0.88	0.85	0.59	0.156	0.50	0.078	4%	
6	8.40	1.53	0.82	1.18	0.166				0.88	0.85	0.71	0.146	0.60	0.088	5%	
7	9.20	1.60	0.83			1.45	0.115	0.98	0.190	1.00	0.80	0.153	0.62	0.094	5%	
8	10.00	1.62	0.80			1.46	0.138	0.96	0.166	1.00	0.70	0.152	0.57	0.087	5%	
9	10.60	1.80	0.79			1.60	0.125	0.99	0.204	1.00	0.75	1.01	0.165	0.125	7%	
10	11.50	1.71	0.86			1.54	0.155	1.03	0.212	1.00	0.82	0.85	0.184	0.129	7%	
11	12.25	1.78	0.85			1.59	0.154	1.04	0.217	1.00	0.75	0.93	0.186	0.129	7%	
12	13.00	1.80	0.90			1.62	0.153	1.08	0.191	1.00	0.73	0.90	0.172	0.112	6%	
13	13.70	1.72	0.90			1.56	0.176	1.06	0.190	1.00	0.55	0.82	0.183	0.083	5%	
14	14.10	1.79	0.89			1.61	0.075	1.07	0.203	1.00	0.55	0.90	0.50	0.069	4%	
15	14.80	1.89	0.85			1.68	0.124	1.06	0.197	1.00	0.70	1.04	0.161	0.117	7%	
16	15.50	1.80	0.77			1.59	0.092	0.98	0.183	1.00	0.67	1.03	0.138	0.070	5%	
17	16.15	1.77	0.75			1.57	0.119	0.95	0.199	1.00	0.65	1.02	0.159	0.105	6%	
18	16.80	1.70	0.77			1.51	0.131	0.96	0.183	1.00	0.73	0.93	0.67	0.106	6%	
19	17.60	1.65	0.85			1.49	0.112	1.01	0.166	1.00	0.85	0.80	0.139	0.095	5%	
20	18.50	1.56	0.95	1.26	0.136				0.88	0.70	0.61	0.120	0.43	0.051	3%	
21	19.00	1.40	0.95	1.18	0.104				0.88	0.85	0.45	0.092	0.38	0.035	2%	
22	20.20	1.09	0.80	0.95	0.069				0.88	1.00	0.29	0.061	0.29	0.018	1%	
RB	21.00	0.00	0.00		0.00				0.00	0.88	0.40	0.00	0.00	0.000		
<b>Total Flow</b>														<b>1.75</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe): 30m US of station

Meas. Start Time (MST):	14:40
Meas. End Time (MST):	15:25
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -3C



**Flow characteristics:**

Total Flow:	1.75	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.42	(m <sup>2</sup> )
Wetted Width:	17.50	(m)
Hydraulic Depth:	0.71	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.098	
Water (°C):	0.2	
Datalogger Clock:	14:24	
Laptop Clock:	14:24	
Battery (Main):	14.7	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

- Flow measurement was conducted 30m upstream of station to avoid overflow ice

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S14A-05	1.323	102.001		100.678	100.678	Pipe 5m NE of Station
S14A-04			1.597	100.404	100.407	Pipe 5m SE of Station
S14A-03			1.951	100.050	99.989	Pipe 3m SW of Station
Water Level:	Cut		3.802	98.199	Time WL Surveyed:	15:33
Temporary BM			3.798	98.203	0.000	-
<b>Turn</b>						
Temporary BM	3.782	101.985		98.203		
Water Level:	Cut		3.784	98.201	Time WL Surveyed:	15:35
S14A-03			1.937	100.048	99.989	Pipe 3m SW of Station
S14A-04			1.583	100.402	100.407	Pipe 5m SE of Station
S14A-05			1.308	100.677	100.678	Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.200	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	97.102	-

**Field Personnel:**

	SM, MP	Trip Date:	1-Apr-14
Data Entry Personnel:	SM	Date:	1-Apr-14
Data Check Personnel:	DW	Date:	11-Apr-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the Canadian Natural Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: June 24, 2014  
 Site Visit Time (MST): 14:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	30.00	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	29.00	0.88		0.41	0.390					1.00	1.25	0.68	0.390	0.85	0.332	1%
2	27.50	0.94				0.75	0.500	0.19	0.490	1.00	1.50	0.94	0.495	1.41	0.698	3%
3	26.00	1.10				0.88	0.610	0.22	0.530	1.00	1.50	1.10	0.570	1.65	0.941	3%
4	24.50	1.20				0.96	0.720	0.24	0.690	1.00	1.50	1.20	0.705	1.80	1.269	5%
5	23.00	1.40				1.12	0.640	0.28	0.740	1.00	1.50	1.40	0.690	2.10	1.449	5%
6	21.50	1.46				1.17	0.580	0.29	0.710	1.00	1.50	1.46	0.645	2.19	1.413	5%
7	20.00	1.40				1.12	0.810	0.28	0.710	1.00	1.50	1.40	0.760	2.10	1.596	6%
8	18.50	1.56				1.25	1.070	0.31	0.710	1.00	1.50	1.56	0.890	2.34	2.083	8%
9	17.00	1.70				1.36	0.800	0.34	0.730	1.00	1.50	1.70	0.765	2.55	1.951	7%
10	15.50	1.78				1.42	0.870	0.36	0.730	1.00	1.13	1.78	0.800	2.00	1.598	6%
11	14.75	1.77				1.42	0.830	0.35	0.900	1.00	0.75	1.77	0.865	1.33	1.148	4%
12	14.00	1.75				1.40	0.920	0.35	0.850	1.00	1.13	1.75	0.885	1.97	1.742	6%
13	12.50	1.80				1.44	0.770	0.36	0.900	1.00	1.50	1.80	0.835	2.70	2.255	8%
14	11.00	1.78				1.42	0.910	0.36	0.880	1.00	1.25	1.78	0.895	2.23	1.991	7%
15	10.00	1.75				1.40	0.800	0.35	0.910	1.00	1.00	1.75	0.855	1.75	1.496	6%
16	9.00	1.75				1.40	0.190	0.35	0.950	1.00	1.00	1.75	0.570	1.75	0.998	4%
17	8.00	1.56				1.25	0.500	0.31	0.730	1.00	1.00	1.56	0.615	1.56	0.959	4%
18	7.00	1.40				1.12	0.920	0.28	0.760	1.00	1.25	1.40	0.840	1.75	1.470	5%
19	5.50	1.26				1.01	0.790	0.25	0.650	1.00	1.25	1.26	0.720	1.58	1.134	4%
20	4.50	1.00				0.80	0.630	0.20	0.530	1.00	0.88	1.00	0.580	0.88	0.508	2%
RB	3.75	0.00	0.00		0.00		0.00		0.00	1.00	0.38	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>27.0</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 20m DS of station

Meas. Start Time (MST):	14:25
Meas. End Time (MST):	15:08
Equipment:	Marsh McBimney
Method:	Fishcat
River Condition:	Moderate flow, turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, calm, 26C

**Flow characteristics:**

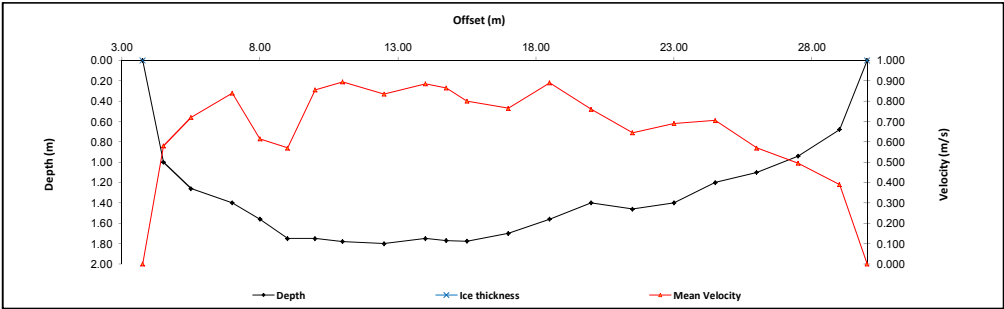
Total Flow:	27.0	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	36.47	(m <sup>2</sup> )
Wetted Width:	26.25	(m)
Hydraulic Depth:	1.39	(m)
Mean Velocity:	0.74	(m/s)
Froude Number:	0.20	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.905	0.902
Water (°C):	19.6	20.0
Datalogger Clock:	13:53	15:39
Laptop Clock:	13:53	15:39
Battery (Main):	13.7	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Good	
Vent Tube Dessiccant:	Good	
PTH# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S14A-05	1.230	101.908		100.678	100.678	Pipe 5m NE of Station
S14A-04			1.504	100.404	100.407	Pipe 5m SE of Station
S14A-03			1.857	100.051	99.989	Pipe 3m SW of Station
<b>Water Level:</b>						
	<b>Cut</b>		3.491	98.417	<b>Time WL Surveyed:</b>	14:03
S14A-03			1.504	100.404	99.989	Pipe 3m SW of Station
<b>Turn</b>						
S14A-03	1.484	101.888		100.404	99.989	Pipe 3m SW of Station
<b>Water Level:</b>						
	<b>Cut</b>		3.469	98.419	<b>Time WL Surveyed:</b>	14:06
S14A-03			1.211	100.677	99.989	Pipe 3m SW of Station
S14A-04			1.836	100.052	100.407	Pipe 5m SE of Station
S14A-05			1.484	100.404	100.678	Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S14A-05	1.485	101.889		100.404		
<b>Water Level:</b>						
	<b>Cut</b>		3.479	98.410	<b>Time WL Surveyed:</b>	15:30
<b>Water Level:</b>						
	<b>Cut</b>		3.458	98.419	<b>Time WL Surveyed:</b>	15:30
S14A-05	1.473	101.877		100.404		

**WL Survey Summary:**

	Before	After
Average WL:	98.418	98.415
Closing Error:	0.274	-
WL Check:	0.002	-0.009
Transducer Elevation	97.513	97.513

**Field Personnel:**

	SM, GG	Trip Date:	24-Jun-14
Data Entry Personnel:	GG	Date:	24-Jun-14
Data Check Personnel:	DW	Date:	10-Oct-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S14A - Elys River at the Canadian Natural Bridge

UTM Location: 455748 E, 6344947 N

Site Visit Date: August 19, 2014

Site Visit Time (MST): 12:20



Flow Measurement Details:	
Metering Section Location (describe): 10m DS of station	
Meas. Start Time (MST):	13:07
Meas. End Time (MST):	13:19
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Thunderstorm, rain, wind, 20C

Flow characteristics:		
Total Flow:	4.16	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	24.43	(m <sup>2</sup> )
Wetted Width:	25.25	(m)
Hydraulic Depth:	0.97	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.06	

Logger Details:	Before	After
Transducer Reading (m):	0.381	0.388
Water (°C):	20.5	20.6
Datalogger Clock:	12:27	13:38
Laptop Clock:	12:27	13:37
Battery (Main):	13.8	12.9
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- BM5 damaged by vehicle
- No secondary survey conducted due to nearby lightning hazard

ADCP Flow Measurement Summary:						
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05	LB:	57.80
Serial Number:	4712		Salinity (ppt):	-	RB:	32.50
Firmware Version:	3.5		Magnetic Declination (°):	14.33		
Software Version:	3.7		Measured Temperature (°C):	-		
			ADCP Temperature (°C):	21.8		
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>			
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam		1	26.97	25.19	0.170
Coordinate System:	ENU		2	25.57	24.20	0.161
Left Method:	Sloped Bank		3	24.32	24.23	0.171
Right Method:	Sloped Bank		4	24.13	24.09	0.180
Top Fit Type:	Power Fit					
Bottom Fit Type:	Power Fit					
			<b>Mean:</b>	25.25	24.43	0.171
			<b>SD:</b>	1.14	0.44	0.007
			<b>COV:</b>	0.05	0.02	0.039
						0.040
						4.285
						3.904
						4.134
						4.330
						2.92%
						-6.23%
						-0.70%
						4.01%

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S14A-04	1.439	101.846		100.407	100.407	Pipe 5m SE of Station
S14A-05			1.194	100.652	100.678	Pipe 5m NE of Station
S14A-03			1.794	100.052	99.989	Pipe 3m SW of Station
Water Level:	Cut		3.953	97.893	Time WL Surveyed:	12:36
Temporary BM			1.439	100.407	0.000	-
<b>Turn</b>						
Temporary BM	1.411	101.818		100.407		-
Water Level:	Cut		3.927	97.891	Time WL Surveyed:	12:38
S14A-03			1.763	100.055	99.989	Pipe 3m SW of Station
S14A-05			1.163	100.655	100.678	Pipe 5m NE of Station
S14A-04			1.411	100.407	100.407	Pipe 5m SE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	97.892	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	97.511	-

Field Personnel:	TR, MP	Trip Date:	19-Aug-14
Data Entry Personnel:	TR	Date:	19-Aug-14
Data Check Personnel:	CJ	Date:	25-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the Canadian Natural Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: September 16, 2014  
 Site Visit Time (MST): 11:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.10	0.00	0.00		0.000				0.000	1.00	0.70	0.00	0.000	0.00	0.000	
1	2.50	0.08		0.05	0.008					1.00	1.45	0.08	0.008	0.12	0.001	0%
2	4.00	0.06		0.04	0.214					1.00	1.50	0.06	0.214	0.09	0.019	1%
3	5.50	0.25		0.15	0.279					1.00	1.50	0.25	0.279	0.38	0.105	4%
4	7.00	0.25		0.15	0.364					1.00	1.50	0.25	0.364	0.38	0.137	6%
5	8.50	0.38		0.23	0.267					1.00	1.50	0.38	0.267	0.57	0.152	6%
6	10.00	0.44		0.26	0.206					1.00	1.50	0.44	0.206	0.66	0.136	6%
7	11.50	0.28		0.17	0.172					1.00	1.70	0.28	0.172	0.48	0.082	3%
8	13.40	0.34		0.20	0.421					1.00	1.50	0.34	0.421	0.51	0.215	9%
9	14.50	0.40		0.24	0.322					1.00	1.30	0.40	0.322	0.52	0.167	7%
10	16.00	0.28		0.17	0.358					1.00	1.50	0.28	0.358	0.42	0.150	6%
11	17.50	0.28		0.17	0.281					1.00	1.50	0.28	0.281	0.42	0.118	5%
12	19.00	0.32		0.19	0.321					1.00	1.50	0.32	0.321	0.48	0.154	6%
13	20.50	0.36		0.22	0.370					1.00	1.13	0.36	0.370	0.41	0.150	6%
14	21.25	0.38		0.23	0.390					1.00	0.75	0.38	0.390	0.29	0.111	5%
15	22.00	0.36		0.22	0.358					1.00	1.13	0.36	0.358	0.41	0.145	6%
16	23.50	0.28		0.17	0.407					1.00	1.50	0.28	0.407	0.42	0.171	7%
17	25.00	0.32		0.19	0.399					1.00	1.50	0.32	0.399	0.48	0.192	8%
18	26.50	0.22		0.13	0.329					1.00	1.50	0.22	0.329	0.33	0.109	4%
19	28.00	0.30		0.18	0.262					1.00	1.50	0.30	0.262	0.45	0.118	5%
20	29.50	0.18		0.11	0.114					1.00	0.95	0.18	0.114	0.17	0.019	1%
LB	29.90	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.45</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
30m DS of bridge

Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:40
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, 15C

### Flow characteristics:

Total Flow:	2.45	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.96	(m <sup>2</sup> )
Wetted Width:	28.80	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.31	(m/s)
Froude Number:	0.19	

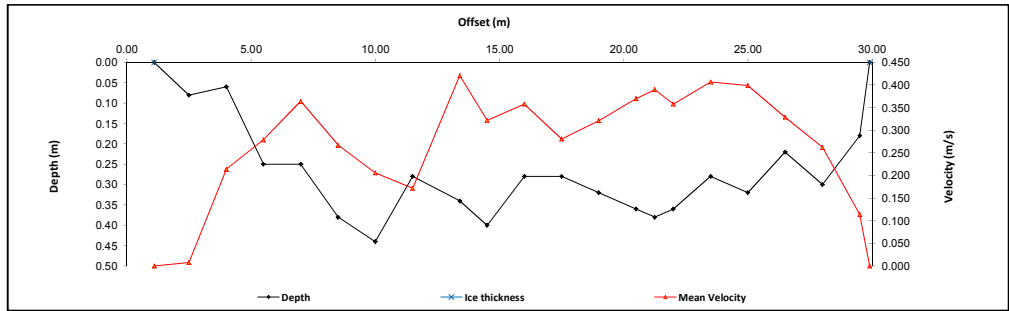
### Logger Details:

	Before	After
Transducer Reading (m):	0.316	0.315
Water (°C):	10.7	10.9
Datalogger Clock:	11:53	12:45
Laptop Clock:	11:52	12:44
Battery (Main):	14.3	14.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

- Installed lag bolt, bm6, in old logger tree

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S14A-04	1.503	101.910		100.407	100.407	Pipe 5m SE of Station
S14A-06			1.975	99.935	99.935	Bolt in old Logger Tree
S14A-03			1.855	100.055	99.989	Pipe 3m SW of Station
Water Level:	Cut		4.075	97.835		Time WL Surveyed: 12:01
S14A-03			1.855	100.055	99.989	Pipe 3m SW of Station
<b>Turn</b>						
S14A-03	1.847	101.902		100.055	99.989	Pipe 3m SW of Station
Water Level:	Cut		4.066	97.836		Time WL Surveyed: 12:03
S14A-03			1.847	100.055	99.989	Pipe 3m SW of Station
S14A-06			1.967	99.935	99.935	Bolt in old Logger Tree
S14A-04			1.494	100.408	100.407	Pipe 5m SE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S14A-04	1.494	101.902		100.408		
Water Level:	Cut		4.069	97.833		Time WL Surveyed: 12:49
Water Level:	Cut		4.059	97.833		Time WL Surveyed: 12:51
S14A-04	1.494	101.892		100.408		

WL Survey Summary	Before	After
Average WL:	97.835	97.833
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	97.520	97.518

Field Personnel:	TR, MP	Trip Date:	16-Sep-14
Data Entry Personnel:	MP	Date:	16-Sep-14
Data Check Personnel:	DW	Date:	10-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the Canadian Natural Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: October 18, 2014  
 Site Visit Time (MST): 07:20

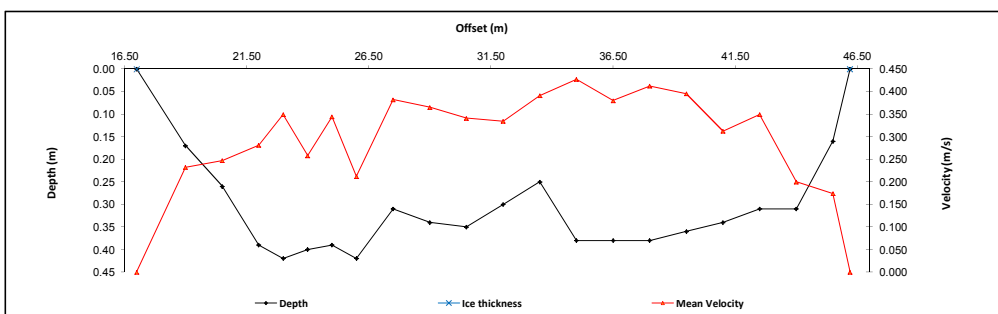


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	46.20	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	45.50	0.16		0.10	0.174					1.00	1.10	0.16	0.174	0.18	0.031	1%
2	44.00	0.31		0.19	0.200					1.00	1.50	0.31	0.200	0.18	0.093	3%
3	42.50	0.31		0.19	0.349					1.00	1.50	0.31	0.349	0.47	0.162	5%
4	41.00	0.34		0.20	0.312					1.00	1.50	0.34	0.312	0.51	0.159	5%
5	39.50	0.36		0.22	0.395					1.00	1.50	0.36	0.395	0.54	0.213	7%
6	38.00	0.38		0.23	0.412					1.00	1.50	0.38	0.412	0.57	0.235	8%
7	36.50	0.38		0.23	0.380					1.00	1.50	0.38	0.380	0.57	0.217	7%
8	35.00	0.38		0.23	0.427					1.00	1.50	0.38	0.427	0.57	0.243	8%
9	33.50	0.25		0.15	0.391					1.00	1.50	0.25	0.391	0.38	0.147	5%
10	32.00	0.30		0.18	0.334					1.00	1.50	0.30	0.334	0.45	0.150	5%
11	30.50	0.35		0.21	0.341					1.00	1.50	0.35	0.341	0.53	0.179	6%
12	29.00	0.34		0.20	0.365					1.00	1.50	0.34	0.365	0.51	0.186	6%
13	27.50	0.31		0.19	0.382					1.00	1.50	0.31	0.382	0.47	0.178	6%
14	26.00	0.42		0.25	0.212					1.00	1.25	0.42	0.212	0.53	0.111	4%
15	25.00	0.39		0.23	0.344					1.00	1.00	0.39	0.344	0.39	0.134	4%
16	24.00	0.40		0.24	0.258					1.00	1.00	0.40	0.258	0.40	0.103	3%
17	23.00	0.42		0.25	0.349					1.00	1.00	0.42	0.349	0.42	0.147	5%
18	22.00	0.39		0.23	0.281					1.00	1.25	0.39	0.281	0.49	0.137	5%
19	20.50	0.26		0.16	0.247					1.00	1.50	0.26	0.247	0.39	0.096	3%
20	19.00	0.17		0.10	0.232					1.00	1.75	0.17	0.232	0.30	0.069	2%
RB	17.00		0.00		0.00		0.00		0.00	1.00	1.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.99</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m DS of station

Meas. Start Time (MST):	7:40
Meas. End Time (MST):	8:04
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 5C



**Flow characteristics:**

Total Flow:	2.99	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.10	(m <sup>2</sup> )
Wetted Width:	29.20	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.33	(m/s)
Froude Number:	0.19	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.341	0.686
Water (°C):	4.9	4.9
Datalogger Clock:	07:22	08:13
Laptop Clock:	07:23	08:13
Battery (Main):		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:	-	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Moved PT deeper

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S14A-04	1.551	101.958		100.407	100.407	Pipe 5m SE of Station
S14A-05			1.304	100.654	100.654	Pipe 5m NE of Station
S14A-03			1.906	100.052	99.989	Pipe 3m SW of Station
S14A-06			2.026	99.932	99.935	Bolt in old Logger Tree
Water Level:	Cut			4.108	97.850	Time WL Surveyed: 7:30
Temporary BM			4.304	97.654	99.935	Bolt in old Logger Tree
<b>Turn</b>						
Temporary BM	4.284	101.938		97.654	99.935	Bolt in old Logger Tree
Water Level:	Cut			4.087	97.851	Time WL Surveyed: 7:32
S14A-06			2.003	99.935	99.935	Bolt in old Logger Tree
S14A-03			1.886	100.052	99.989	Pipe 3m SW of Station
S14A-05			1.284	100.654	100.654	Pipe 5m NE of Station
S14A-04			1.531	100.407	100.407	Pipe 5m SE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S14A-04	1.531	101.938		100.407		
Water Level:	Cut			4.086	97.852	Time WL Surveyed: 8:15
Water Level:	Cut			4.068	97.852	Time WL Surveyed: 8:16
S14A-04	1.513	101.920		100.407		

**WL Survey Summary**

	Before	After
Average WL:	97.851	97.852
Closing Error:	0.000	-
WL Check:	0.001	0.000
Transducer Elevation	97.510	97.166

**Field Personnel:**

	DW, TR	Trip Date:	18-Oct-14
Data Entry Personnel:	DW, TR	Date:	18-Oct-14
Data Check Personnel:	DW	Date:	24-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S14A - Ells River at the Canadian Natural Bridge  
 UTM Location: 455748 E, 6344947 N

Site Visit Date: December 1, 2014  
 Site Visit Time (MST): 09:30



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.40	0.00	0.00		0.000		0.000		0.000	0.88	0.63	0.00	0.000	0.00	0.000	
1	1.65	0.72	0.44	0.58	0.028					0.88	1.35	0.28	0.025	0.38	0.009	0%
2	3.10	0.98	0.47	0.73	0.019					0.88	1.23	0.51	0.017	0.62	0.010	0%
3	4.10	1.13	0.42	0.78	0.042					0.88	1.28	0.71	0.037	0.91	0.033	1%
4	5.65	1.12	0.41	0.77	0.086					0.88	1.40	0.71	0.076	0.99	0.075	3%
5	6.90	1.18	0.41			1.03	0.095	0.56	0.111	1.00	1.18	0.77	0.103	0.90	0.093	4%
6	8.00	1.17	0.36			1.01	0.113	0.52	0.109	1.00	1.10	0.81	0.111	0.89	0.099	4%
7	9.10	1.16	0.36			1.00	0.126	0.52	0.128	1.00	1.15	0.80	0.127	0.92	0.117	5%
8	10.30	1.21	0.37			1.04	0.149	0.54	0.168	1.00	1.10	0.84	0.159	0.92	0.146	6%
9	11.30	1.21	0.37			1.04	0.147	0.54	0.178	1.00	1.25	0.84	0.163	1.05	0.171	7%
10	12.80	1.19	0.38			1.03	0.171	0.54	0.184	1.00	1.35	0.81	0.178	1.09	0.194	9%
11	14.00	1.22	0.37			1.05	0.154	0.54	0.180	1.00	1.20	0.85	0.167	1.02	0.170	7%
12	15.20	1.24	0.36			1.06	0.155	0.54	0.171	1.00	1.20	0.88	0.163	1.06	0.172	8%
13	16.40	1.32	0.37			1.13	0.140	0.56	0.162	1.00	1.25	0.95	0.151	1.19	0.179	8%
14	17.70	1.50	0.41			1.28	0.117	0.63	0.159	1.00	1.25	1.09	0.138	1.36	0.188	8%
15	18.90	1.60	0.42			1.36	0.110	0.66	0.159	1.00	1.25	1.18	0.135	1.48	0.198	9%
16	20.20	1.61	0.43			1.37	0.097	0.67	0.139	1.00	1.30	1.18	0.118	1.53	0.181	8%
17	21.50	1.65	0.43			1.41	0.056	0.67	0.104	1.00	1.35	1.22	0.080	1.65	0.132	6%
18	22.90	1.53	0.43			1.31	0.041	0.65	0.067	1.00	1.35	1.10	0.054	1.49	0.080	4%
19	24.20	1.47	0.44			1.26	0.009	0.65	0.033	1.00	1.30	1.03	0.021	1.34	0.028	1%
20	25.50	0.98	0.44	0.71	-0.004					0.88	1.25	0.54	-0.004	0.68	-0.002	0%
RB	26.70	0.00	0.00		0.00		0.00		0.00	0.88	0.60	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.28</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 20m DS of Station

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:30
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -27C

**Flow characteristics:**

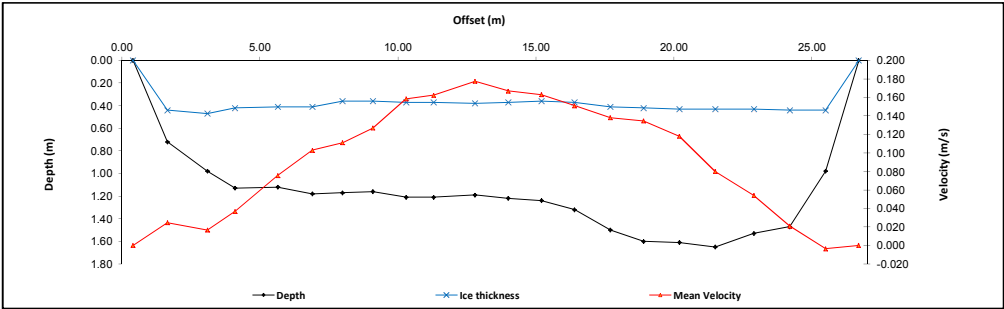
Total Flow:	2.28	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	21.47	(m <sup>2</sup> )
Wetted Width:	26.30	(m)
Hydraulic Depth:	0.82	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.900	0.900
Water (°C):	0.4	0.2
Datalogger Clock:	09:32	10:30
Laptop Clock:	09:33	10:35
Battery (Main):	10.8	12.9
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S14A-05	1.346	102.000		100.654	100.654	Pipe 5m NE of Station
S14A-04			1.593	100.407	100.407	Pipe 5m SE of Station
S14A-06			2.058	99.942	99.935	Bolt in old Logger Tree
S14A-03			1.947	100.053	99.989	Pipe 3m SW of Station
Water Level:	Cut		3.931	98.069	Time WL Surveyed: 9:40	
Temporary BM			3.904	98.096	0.000	
<b>Turn</b>						
Temporary BM	3.893	101.989		98.096		
Water Level:	Cut		3.923	98.066	Time WL Surveyed: 9:44	
S14A-03			1.936	100.053	99.989	Pipe 3m SW of Station
S14A-06			2.047	99.942	99.935	Bolt in old Logger Tree
S14A-04			1.583	100.406	100.407	Pipe 5m SE of Station
S14A-05			1.335	100.654	100.654	Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S14A-05	1.335	101.989		100.654		
Water Level:	Cut		3.922	98.067	Time WL Surveyed: 10:37	
Water Level:	Cut		3.916	98.063	Time WL Surveyed: 10:39	
S14A-05	1.325	101.979		100.654		

**WL Survey Summary:**

	Before	After
Average WL:	98.068	98.065
Closing Error:	0.000	-
WL Check:	0.003	0.004
Transducer Elevation	97.168	97.165

**Field Personnel:**

	MP, TR	Trip Date:	1-Dec-14
Data Entry Personnel:	MP	Date:	1-Dec-14
Data Check Personnel:	DW	Date:	9-Dec-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: June 24, 2014  
 Site Visit Time (MST): 09:55

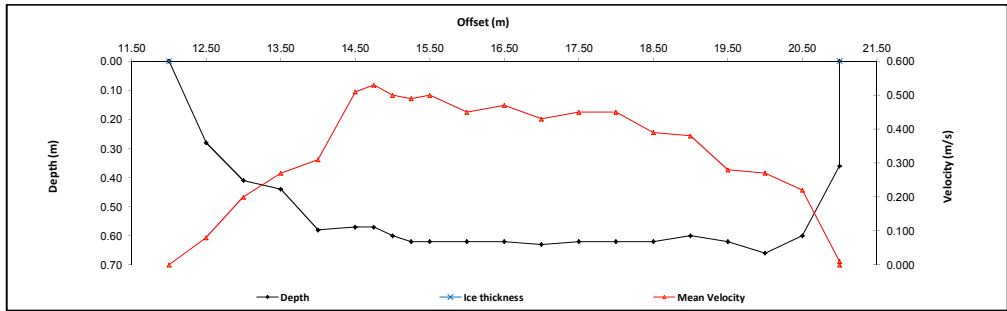


Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	12.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	12.50	0.28		0.17	0.080					1.00	0.50	0.28	0.080	0.14	0.011	1%
2	13.00	0.41		0.25	0.200					1.00	0.50	0.41	0.200	0.21	0.041	2%
3	13.50	0.44		0.26	0.270					1.00	0.50	0.44	0.270	0.22	0.059	3%
4	14.00	0.58		0.35	0.310					1.00	0.50	0.58	0.310	0.29	0.090	5%
5	14.50	0.57		0.34	0.510					1.00	0.38	0.57	0.510	0.21	0.109	6%
6	14.75	0.57		0.34	0.530					1.00	0.25	0.57	0.530	0.14	0.076	4%
7	15.00	0.60		0.36	0.500					1.00	0.25	0.60	0.500	0.15	0.075	4%
8	15.25	0.62		0.37	0.490					1.00	0.25	0.62	0.490	0.16	0.076	4%
9	15.50	0.62		0.37	0.500					1.00	0.38	0.62	0.500	0.23	0.116	6%
10	16.00	0.62		0.37	0.450					1.00	0.50	0.62	0.450	0.31	0.140	8%
11	16.50	0.62		0.37	0.470					1.00	0.50	0.62	0.470	0.31	0.146	8%
12	17.00	0.63		0.38	0.430					1.00	0.50	0.63	0.430	0.32	0.135	7%
13	17.50	0.62		0.37	0.450					1.00	0.50	0.62	0.450	0.31	0.140	8%
14	18.00	0.62		0.37	0.450					1.00	0.50	0.62	0.450	0.31	0.140	8%
15	18.50	0.62		0.37	0.390					1.00	0.50	0.62	0.390	0.31	0.121	7%
16	19.00	0.60		0.36	0.380					1.00	0.50	0.60	0.380	0.30	0.114	6%
17	19.50	0.62		0.37	0.280					1.00	0.50	0.62	0.280	0.31	0.087	5%
18	20.00	0.66		0.40	0.270					1.00	0.50	0.66	0.270	0.33	0.089	5%
19	20.50	0.60		0.36	0.220					1.00	0.50	0.60	0.220	0.30	0.066	4%
20	21.00	0.36		0.22	0.010					1.00	0.25	0.36	0.010	0.09	0.001	0%
RB	21.00	0.00	0.00		0.000		0.000		0.000	1.00	0.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.83</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -adjacent to station

Meas. Start Time (MST):	10:39
Meas. End Time (MST):	10:52
Equipment:	Marsh McBiney
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 21C



**Flow characteristics:**

Total Flow:	1.830	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.94	(m <sup>2</sup> )
Wetted Width:	9.00	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.37	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.604	1.584
Water (°C):	7.3	7.3
Datalogger Clock:	10:00	11:06
Laptop Clock:	09:59	11:05
Battery (Main):	13.9	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Need to trim vegetation
- Anchor cable broke off tree.
- Need new cable and move PT upstream 3m, bring shovel and anchor cable.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S15A-03	1.250	101.250		100.000	100.000	3/4" Pipe 3m S of Station
S15A-04			1.437	99.813	99.815	3/4" Pipe 2m E of Station
S15A-05			1.318	99.932	99.929	3/4" Pipe 3m NE of Station
Water Level:	Cut		4.175	97.075		Time WL Surveyed: 10:33
S15A-03			1.250	100.000	100.000	3/4" Pipe 3m S of Station
<b>Turn</b>						
S15A-03	1.266	101.266		100.000	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.189	97.077		Time WL Surveyed: 10:35
S15A-05			1.335	99.931	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.452	99.814	99.815	3/4" Pipe 2m E of Station
S15A-03			1.266	100.000	100.000	3/4" Pipe 3m S of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S15A-05	1.334	101.266		99.932		
Water Level:	Cut		4.197	97.069		Time WL Surveyed: 11:33
Water Level:	Cut		4.179	97.071		Time WL Surveyed: 11:35
S15A-05	1.318	101.250		99.932		

**WL Survey Summary:**

	Before	After
Average WL:	97.075	97.070
Closing Error:	0.000	-
WL Check:	0.002	-0.002
Transducer Elevation	95.472	95.486

**Field Personnel:**

	GG SM	Trip Date:	24-Jun-14
Data Entry Personnel:	GG	Date:	24-Jun-14
Data Check Personnel:	DW	Date:	25-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: April 28, 2014  
 Site Visit Time (MST): 08:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.90	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	4.20	0.08		0.05	0.030					1.00	0.35	0.08	0.030	0.03	0.001	0%
2	4.60	0.06		0.04	0.284					1.00	0.40	0.06	0.284	0.02	0.007	2%
3	5.00	0.05		0.03	0.200					1.00	0.40	0.05	0.200	0.02	0.004	1%
4	5.40	0.05		0.03	0.258					1.00	0.40	0.05	0.258	0.02	0.005	2%
5	5.80	0.06		0.04	0.224					1.00	0.40	0.06	0.224	0.02	0.005	2%
6	6.20	0.07		0.04	0.300					1.00	0.40	0.07	0.300	0.03	0.008	3%
7	6.60	0.09		0.05	0.326					1.00	0.40	0.09	0.326	0.04	0.012	4%
8	7.00	0.10		0.06	0.344					1.00	0.40	0.10	0.344	0.04	0.014	4%
9	7.40	0.13		0.08	0.384					1.00	0.30	0.13	0.384	0.04	0.015	5%
10	7.60	0.18		0.11	0.427					1.00	0.20	0.18	0.427	0.04	0.015	5%
11	7.80	0.22		0.13	0.539					1.00	0.20	0.22	0.539	0.04	0.024	8%
12	8.00	0.21		0.13	0.570					1.00	0.20	0.21	0.570	0.04	0.024	8%
13	8.20	0.23		0.14	0.615					1.00	0.20	0.23	0.615	0.05	0.028	9%
14	8.40	0.22		0.13	0.538					1.00	0.20	0.22	0.538	0.04	0.024	8%
15	8.60	0.20		0.12	0.541					1.00	0.20	0.20	0.541	0.04	0.022	7%
16	8.80	0.19		0.11	0.467					1.00	0.20	0.19	0.467	0.04	0.018	6%
17	9.00	0.16		0.10	0.480					1.00	0.20	0.16	0.480	0.03	0.015	5%
18	9.20	0.15		0.09	0.401					1.00	0.30	0.15	0.401	0.04	0.018	6%
19	9.60	0.12		0.07	0.427					1.00	0.40	0.12	0.427	0.05	0.020	7%
20	10.00	0.11		0.07	0.359					1.00	0.40	0.11	0.359	0.04	0.016	5%
21	10.40	0.10		0.06	0.256					1.00	0.40	0.10	0.256	0.04	0.010	3%
22	10.80	0.06		0.04	0.227					1.00	0.40	0.06	0.227	0.02	0.005	2%
RB	11.20	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.311</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
 -2m DS of station

Meas. Start Time (MST):	9:04
Meas. End Time (MST):	9:28
Equipment:	ADV
Method:	Wading
River Condition:	Open with bed ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, light breeze

### Flow characteristics:

Total Flow:	0.311	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.78	(m <sup>2</sup> )
Wetted Width:	7.30	(m)
Hydraulic Depth:	0.11	(m)
Mean Velocity:	0.40	(m/s)
Froude Number:	0.39	

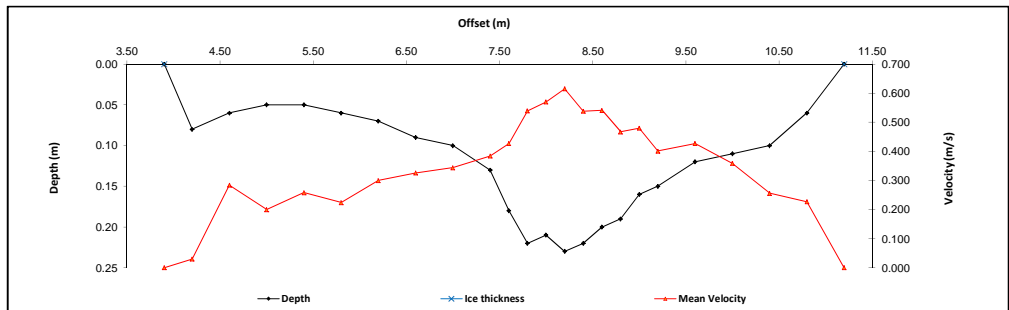
### Logger Details:

	Before	After
Transducer Reading (m):	0.159	0.159
Water (°C):	0.2	0.2
Datalogger Clock:	08:50	09:37
Laptop Clock:	08:50	09:37
Battery (Main):	14.3	14.3
Battery:	Good	
Battery Serial #:	1302001	-
Enclosure Deseccant:	Good	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

- Transducer was installed on bed ice
- Bring replacement anchor cable next visit
- Evidence of flow under bed ice, discharge measurement is likely an underestimate

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S15A-05	1.272	101.201		99.929	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.391	99.810	99.815	3/4" Pipe 2m E of Station
<b>Turn</b>						
S15A-03	1.181	101.176		99.995	100.000	3/4" Pipe 3m S of Station
S15A-04			1.365	99.811	99.815	3/4" Pipe 2m E of Station
S15A-05			1.247	99.929	99.929	3/4" Pipe 3m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S15A-04	1.365	101.175		99.810		
Water Level:	Cut		3.840	97.335		Time WL Surveyed: 9:31
Water Level:	Cut		3.821	97.332		Time WL Surveyed: 9:33
S15A-04	1.343	101.153		99.810		

WL Survey Summary	Before	After
Average WL:	97.337	97.334
Closing Error:	0.000	-
WL Check:	0.002	0.003
Transducer Elevation	97.178	97.175

Field Personnel:	TR, SM	Trip Date:	28-Apr-14
Data Entry Personnel:	SM	Date:	28-Apr-14
Data Check Personnel:	CJ	Date:	4-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: June 24, 2014  
 Site Visit Time (MST): 09:55

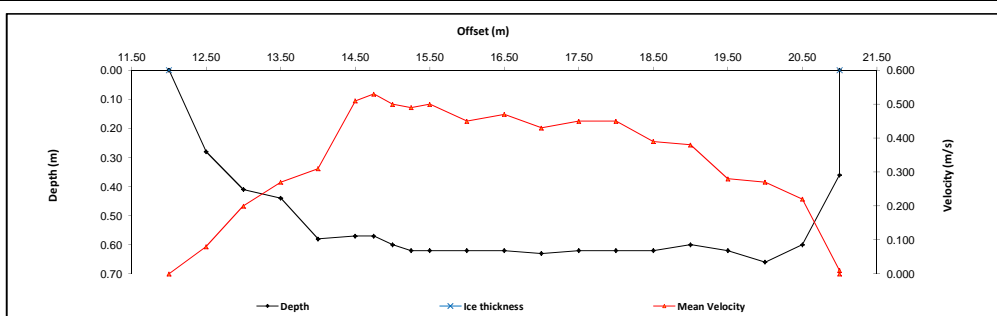


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	12.00	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	12.50	0.28		0.17	0.080					1.00	0.50	0.28	0.080	0.14	0.011	1%
2	13.00	0.41		0.25	0.200					1.00	0.50	0.41	0.200	0.21	0.041	2%
3	13.50	0.44		0.26	0.270					1.00	0.50	0.44	0.270	0.22	0.059	3%
4	14.00	0.58		0.35	0.310					1.00	0.50	0.58	0.310	0.29	0.090	5%
5	14.50	0.57		0.34	0.510					1.00	0.38	0.57	0.510	0.21	0.109	6%
6	14.75	0.57		0.34	0.530					1.00	0.25	0.57	0.530	0.14	0.076	4%
7	15.00	0.60		0.36	0.500					1.00	0.25	0.60	0.500	0.15	0.075	4%
8	15.25	0.62		0.37	0.490					1.00	0.25	0.62	0.490	0.16	0.076	4%
9	15.50	0.62		0.37	0.500					1.00	0.38	0.62	0.500	0.23	0.116	6%
10	16.00	0.62		0.37	0.450					1.00	0.50	0.62	0.450	0.31	0.140	8%
11	16.50	0.62		0.37	0.470					1.00	0.50	0.62	0.470	0.31	0.146	8%
12	17.00	0.63		0.38	0.430					1.00	0.50	0.63	0.430	0.32	0.135	7%
13	17.50	0.62		0.37	0.450					1.00	0.50	0.62	0.450	0.31	0.140	8%
14	18.00	0.62		0.37	0.450					1.00	0.50	0.62	0.450	0.31	0.140	8%
15	18.50	0.62		0.37	0.390					1.00	0.50	0.62	0.390	0.31	0.121	7%
16	19.00	0.60		0.36	0.380					1.00	0.50	0.60	0.380	0.30	0.114	6%
17	19.50	0.62		0.37	0.280					1.00	0.50	0.62	0.280	0.31	0.087	5%
18	20.00	0.66		0.40	0.270					1.00	0.50	0.66	0.270	0.33	0.089	5%
19	20.50	0.60		0.36	0.220					1.00	0.50	0.60	0.220	0.30	0.066	4%
20	21.00	0.36		0.22	0.010					1.00	0.25	0.36	0.010	0.09	0.001	0%
RB	21.00	0.00	0.00		0.000	0.00			0.000	1.00	0.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>1.83</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): -adjacent to station

Meas. Start Time (MST):	10:39
Meas. End Time (MST):	10:52
Equipment:	Marsh McBimney
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 21C



**Flow characteristics:**

Total Flow:	1.830	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.94	(m <sup>2</sup> )
Wetted Width:	9.00	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.37	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.604	1.584
Water (°C):	7.3	7.3
Datalogger Clock:	10:00	11:06
Laptop Clock:	09:59	11:05
Battery (Main):	13.9	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Need to trim vegetation
- Anchor cable broke off tree.
- Need new cable and move PT upstream 3m, bring shovel and anchor cable.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S15A-03	1.250	101.250		100.000	100.000	3/4" Pipe 3m S of Station
S15A-04			1.437	99.813	99.815	3/4" Pipe 2m E of Station
S15A-05			1.318	99.932	99.929	3/4" Pipe 3m NE of Station
Water Level:	Cut		4.175	97.075		Time WL Surveyed: 10:33
S15A-03			1.250	100.000	100.000	3/4" Pipe 3m S of Station
<b>Turn</b>						
S15A-03	1.266	101.266		100.000	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.189	97.077		Time WL Surveyed: 10:35
S15A-05			1.335	99.931	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.452	99.814	99.815	3/4" Pipe 2m E of Station
S15A-03			1.266	100.000	100.000	3/4" Pipe 3m S of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S15A-05	1.334	101.266		99.932		
Water Level:	Cut		4.197	97.069		Time WL Surveyed: 11:33
Water Level:	Cut		4.179	97.071		Time WL Surveyed: 11:35
S15A-05	1.318	101.250		99.932		

**WL Survey Summary**

	Before	After
Average WL:	97.075	97.070
Closing Error:	0.000	-
WL Check:	0.002	-0.002
Transducer Elevation	95.472	95.486

**Field Personnel:**

	GG SM	Trip Date:	24-Jun-14
Data Entry Personnel:	GG	Date:	24-Jun-14
Data Check Personnel:	DW	Date:	25-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: August 19, 2014  
 Site Visit Time (MST): 08:20

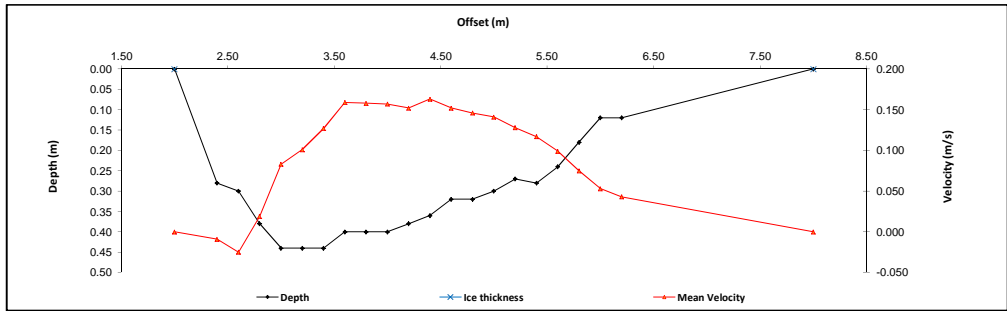


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.00	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	2.40	0.28		0.17	-0.009					1.00	0.30	0.28	-0.009	0.08	-0.001	-1%
2	2.60	0.30		0.18	-0.025					1.00	0.20	0.30	-0.025	0.06	-0.002	-1%
3	2.80	0.38		0.23	0.019					1.00	0.20	0.38	0.019	0.08	0.001	1%
4	3.00	0.44		0.26	0.083					1.00	0.20	0.44	0.083	0.09	0.007	5%
5	3.20	0.44		0.26	0.101					1.00	0.20	0.44	0.101	0.09	0.009	6%
6	3.40	0.44		0.26	0.127					1.00	0.20	0.44	0.127	0.09	0.011	8%
7	3.60	0.40		0.24	0.159					1.00	0.20	0.40	0.159	0.08	0.013	9%
8	3.80	0.40		0.24	0.158					1.00	0.20	0.40	0.158	0.08	0.013	9%
9	4.00	0.40		0.24	0.157					1.00	0.20	0.40	0.157	0.08	0.013	9%
10	4.20	0.38		0.23	0.152					1.00	0.20	0.38	0.152	0.08	0.012	8%
11	4.40	0.36		0.22	0.163					1.00	0.20	0.36	0.163	0.07	0.012	8%
12	4.60	0.32		0.19	0.152					1.00	0.20	0.32	0.152	0.06	0.010	7%
13	4.80	0.32		0.19	0.146					1.00	0.20	0.32	0.146	0.06	0.009	7%
14	5.00	0.30		0.18	0.141					1.00	0.20	0.30	0.141	0.06	0.008	6%
15	5.20	0.27		0.16	0.128					1.00	0.20	0.27	0.128	0.05	0.007	5%
16	5.40	0.28		0.17	0.117					1.00	0.20	0.28	0.117	0.06	0.007	5%
17	5.60	0.24		0.14	0.099					1.00	0.20	0.24	0.099	0.05	0.005	3%
18	5.80	0.18		0.11	0.075					1.00	0.20	0.18	0.075	0.04	0.003	2%
19	6.00	0.12		0.07	0.053					1.00	0.20	0.12	0.053	0.02	0.001	1%
20	6.20	0.12		0.07	0.043					1.00	1.00	0.12	0.043	0.12	0.005	4%
RB	8.00	0.00	0.00		0.00		0.00		0.00	1.00	0.90	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.143</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 3m US of PT

Meas. Start Time (MST):	9:05
Meas. End Time (MST):	9:30
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25 C



**Flow characteristics:**

Total Flow:	0.143	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.40	(m <sup>2</sup> )
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.010	1.005
Water (°C):	9.8	9.8
Datalogger Clock:	08:29	09:42
Laptop Clock:	08:28	09:41
Battery (Main):	13.9	14.0
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT is under ~70cm of sediment and could not be retrieved.
- retrieved PT s/n 262387, by bridge

**General Notes:**

- a lot of large woody debris in channel, log jam US causing a waterfall about 0.2 high

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S15A-03	0.970	100.970		100.000	100.000	3/4" Pipe 3m S of Station
S15A-04			1.153	99.817	99.815	3/4" Pipe 2m E of Station
S15A-05			1.036	99.934	99.929	3/4" Pipe 3m NE of Station
Water Level:	Cut		4.471	96.499		Time WL Surveyed: 8:34
S15A-03			0.970	100.000	100.000	3/4" Pipe 3m S of Station
<b>Turn</b>						
S15A-03	0.948	100.948		100.000	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.451	96.497		Time WL Surveyed: 8:36
S15A-05			1.014	99.934	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.129	99.819	99.815	3/4" Pipe 2m E of Station
S15A-03			0.948	100.000	100.000	3/4" Pipe 3m S of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S15A-03	0.948	100.943		99.995		
Water Level:	Cut		4.452	96.491		Time WL Surveyed: 9:37
Water Level:	Cut		4.440	96.488		Time WL Surveyed: 9:39
S15A-03	0.933	100.928		99.995		

**WL Survey Summary**

	Before	After
Average WL:	96.498	96.490
Closing Error:	0.000	-
WL Check:	0.002	0.003
Transducer Elevation	95.488	95.485

**Field Personnel:**

	TR, MP	Trip Date:	19-Aug-14
Data Entry Personnel:	TR	Date:	19-Aug-14
Data Check Personnel:	MY	Date:	22-Aug-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: September 16, 2014  
 Site Visit Time (MST): 08:43



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	20.90	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	20.30	0.32		0.19	-0.059					1.00	0.45	0.32	-0.059	0.14	-0.008	-4%
2	20.00	0.38		0.23	0.019					1.00	0.30	0.38	0.019	0.11	0.002	1%
3	19.70	0.43		0.26	0.158					1.00	0.23	0.43	0.158	0.10	0.015	8%
4	19.55	0.42		0.25	0.173					1.00	0.15	0.42	0.173	0.06	0.011	6%
5	19.40	0.43		0.26	0.188					1.00	0.15	0.43	0.188	0.06	0.012	6%
6	19.25	0.42		0.25	0.221					1.00	0.15	0.42	0.221	0.06	0.014	7%
7	19.10	0.43		0.26	0.232					1.00	0.15	0.43	0.232	0.06	0.015	8%
8	18.95	0.40		0.24	0.221					1.00	0.15	0.40	0.221	0.06	0.013	7%
9	18.80	0.38		0.23	0.231					1.00	0.15	0.38	0.231	0.06	0.013	7%
10	18.65	0.38		0.23	0.230					1.00	0.15	0.38	0.230	0.06	0.013	7%
11	18.50	0.35		0.21	0.238					1.00	0.15	0.35	0.238	0.05	0.012	7%
12	18.35	0.32		0.19	0.233					1.00	0.15	0.32	0.233	0.05	0.011	6%
13	18.20	0.32		0.19	0.266					1.00	0.23	0.32	0.266	0.07	0.019	10%
14	17.90	0.26		0.16	0.205					1.00	0.30	0.26	0.205	0.08	0.016	8%
15	17.60	0.26		0.16	0.150					1.00	0.30	0.26	0.150	0.08	0.012	6%
16	17.30	0.24		0.14	0.133					1.00	0.30	0.24	0.133	0.07	0.010	5%
17	17.00	0.16		0.10	0.092					1.00	0.30	0.16	0.092	0.05	0.004	2%
18	16.70	0.10		0.06	0.078					1.00	0.30	0.10	0.078	0.03	0.002	1%
19	16.40	0.08		0.05	0.117					1.00	0.45	0.08	0.117	0.04	0.004	2%
20	15.80	0.06		0.04	0.015					1.00	0.75	0.06	0.015	0.05	0.001	0%
RB	14.90	0.00	0.00		0.00				0.00	1.00	0.45	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.192</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 4m US of PT

Meas. Start Time (MST):	9:05
Meas. End Time (MST):	9:35
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g., stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, calm, 10C

**Flow characteristics:**

Total Flow:	0.192	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.34	(m <sup>2</sup> )
Wetted Width:	6.00	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.10	

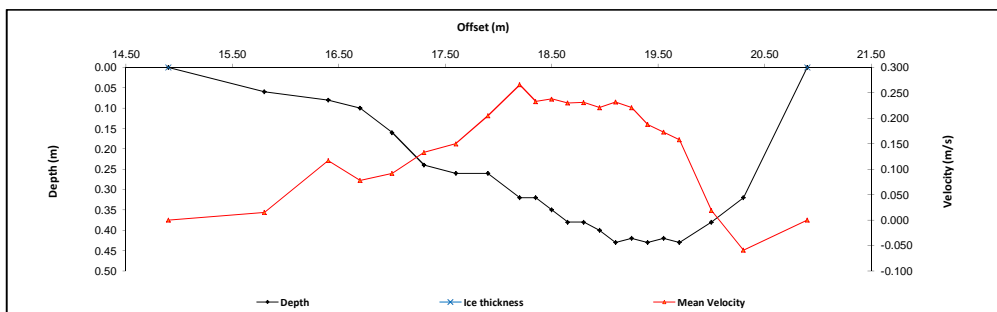
**Logger Details:**

	Before	After
Transducer Reading (m):	1.026	1.027
Water (°C):	7.5	7.5
Datalogger Clock:	08:46	09:38
Laptop Clock:	08:45	09:39
Battery (Main):	13.4	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-ADV test run, results good

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S15A-03	1.197	101.197		100.000	100.000	3/4" Pipe 3m S of Station
S15A-04			1.383	99.814	99.815	3/4" Pipe 2m E of Station
S15A-05			1.265	99.932	99.929	3/4" Pipe 3m NE of Station
Water Level:	Cut		4.679	96.518		Time WL Surveyed: 8:53
S15A-03			1.197	100.000	100.000	3/4" Pipe 3m S of Station
<b>Turn</b>						
S15A-03	1.188	101.188		100.000	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.672	96.516		Time WL Surveyed: 8:55
S15A-05			1.257	99.931	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.375	99.813	99.815	3/4" Pipe 2m E of Station
S15A-03			1.188	100.000	100.000	3/4" Pipe 3m S of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S15A-05	1.258	101.187		99.929		
Water Level:	Cut		4.670	96.517		Time WL Surveyed: 9:40
Water Level:	Cut		4.659	96.517		Time WL Surveyed: 9:41
S15A-05	1.247	101.176		99.929		

**WL Survey Summary**

	Before	After
Average WL:	96.517	96.517
Closing Error:	0.000	-
WL Check:	0.002	0.000
Transducer Elevation	95.491	95.490

**Field Personnel:**

	MP, TR	Trip Date:	16-Sep-14
Data Entry Personnel:	MP, TR	Date:	16-Sep-14
Data Check Personnel:	MY	Date:	23-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S15A - Tar River near the Mouth  
 UTM Location: 458395 E, 6353391 N

Site Visit Date: November 3, 2014  
 Site Visit Time (MST): 10:35



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	9.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	9.00	0.10		0.06	0.038					1.00	0.35	0.10	0.038	0.04	0.001	0%
2	8.70	0.11		0.07	0.117					1.00	0.30	0.11	0.117	0.03	0.004	1%
3	8.40	0.12		0.07	0.195					1.00	0.30	0.12	0.195	0.04	0.007	2%
4	8.10	0.12		0.07	0.208					1.00	0.30	0.12	0.208	0.04	0.007	2%
5	7.80	0.12		0.07	0.286					1.00	0.30	0.12	0.286	0.04	0.010	3%
6	7.50	0.15		0.09	0.222					1.00	0.30	0.15	0.222	0.05	0.010	3%
7	7.20	0.18		0.11	0.210					1.00	0.30	0.18	0.210	0.05	0.011	3%
8	6.90	0.22		0.13	0.142					1.00	0.30	0.22	0.142	0.07	0.009	3%
9	6.60	0.30		0.18	0.228					1.00	0.30	0.30	0.228	0.09	0.021	6%
10	6.30	0.32		0.19	0.264					1.00	0.30	0.32	0.264	0.10	0.025	7%
11	6.00	0.32		0.19	0.281					1.00	0.30	0.32	0.281	0.10	0.027	8%
12	5.70	0.36		0.22	0.264					1.00	0.30	0.36	0.264	0.11	0.029	8%
13	5.40	0.40		0.24	0.245					1.00	0.30	0.40	0.245	0.12	0.029	9%
14	5.10	0.50		0.30	0.252					1.00	0.22	0.50	0.252	0.11	0.028	8%
15	4.95	0.50		0.30	0.254					1.00	0.15	0.50	0.254	0.08	0.019	6%
16	4.80	0.50		0.30	0.265					1.00	0.15	0.50	0.265	0.07	0.020	6%
17	4.65	0.50		0.30	0.279					1.00	0.15	0.50	0.279	0.07	0.021	6%
18	4.50	0.50		0.30	0.272					1.00	0.23	0.50	0.272	0.11	0.031	9%
19	4.20	0.52		0.31	0.176					1.00	0.30	0.52	0.176	0.16	0.027	8%
20	3.90	0.48		0.29	0.108					1.00	0.30	0.48	0.108	0.14	0.016	5%
21	3.60	0.40		0.24	-0.058					1.00	0.45	0.40	-0.058	0.18	-0.010	-3%
LB	3.00	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.343</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
4m upstream of PT

Meas. Start Time (MST):	10:50
Meas. End Time (MST):	11:15
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, OC

**Flow characteristics:**

Total Flow:	0.343	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.78	(m <sup>2</sup> )
Wetted Width:	6.40	(m)
Hydraulic Depth:	0.28	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.12	

**Logger Details:**

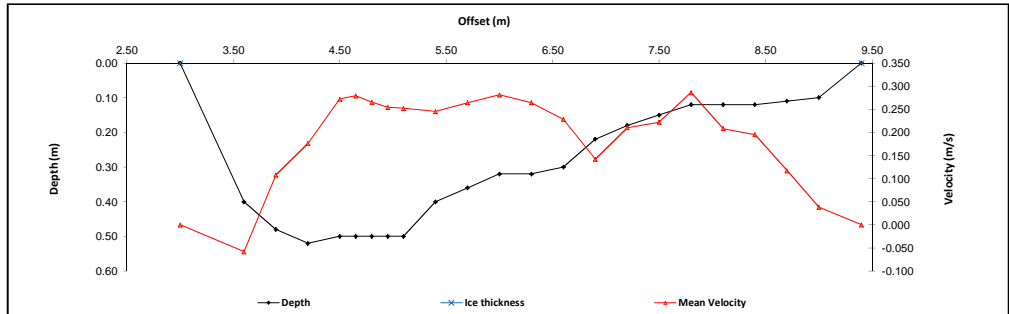
	Before	After
Transducer Reading (m):	1.104	1.104
Water (°C):	4.8	4.8
Datalogger Clock:	10:39	11:19
Laptop Clock:	10:38	11:18
Battery (Main):	12.1	13.3
Battery:	-	-
Battery Serial #:	-	-
Enclosure Dessicant:	-	-
Vent Tube Dessicant:	-	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Removed modern, PT sedimented in and not removable

**General Notes:**

-ADV test completed, results good



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S15A-05	1.326	101.255		99.929	99.929	3/4" Pipe 3m NE of Station
S15A-04			1.444	99.811	99.815	3/4" Pipe 2m E of Station
S15A-03			1.258	99.997	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.667	96.588	Time WL Surveyed:	10:43
S15A-03			1.258	99.997	100.000	3/4" Pipe 3m S of Station
<b>Turn</b>						
S15A-03	1.238	101.235		99.997	100.000	3/4" Pipe 3m S of Station
Water Level:	Cut		4.645	96.590	Time WL Surveyed:	10:44
S15A-03			1.238	99.997	100.000	3/4" Pipe 3m S of Station
S15A-04			1.424	99.811	99.815	3/4" Pipe 2m E of Station
S15A-05			1.306	99.929	99.929	3/4" Pipe 3m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S15A-05	1.306	101.235		99.929		
Water Level:	Cut		4.647	96.588	Time WL Surveyed:	11:21
Water Level:	Cut		4.627	96.589	Time WL Surveyed:	11:23
S15A-05	1.287	101.216		99.929		

**WL Survey Summary**

	Before	After
Average WL:	96.589	96.589
Closing Error:	0.000	-
WL Check:	0.002	-0.001
Transducer Elevation	95.485	95.485

**Field Personnel:**

	TR, MP	Trip Date:	3-Nov-14
Data Entry Personnel:	TR	Date:	3-Nov-14
Data Check Personnel:	MP	Date:	19-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date: April 30, 2014  
 Site Visit Time (MST): 14:00

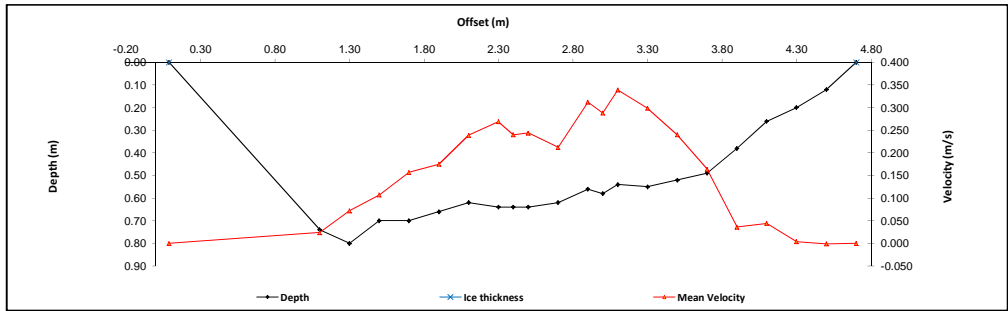


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.09	0.00	0.00		0.000		0.000		0.000	1.00	0.51	0.00	0.000	0.00	0.000	
1	1.10	0.74		0.44	0.024	0.64	0.006	0.16	0.138	1.00	0.61	0.74	0.024	0.45	0.011	3%
2	1.30	0.80		0.42	0.107					1.00	0.20	0.80	0.072	0.16	0.012	3%
3	1.50	0.70		0.42	0.157					1.00	0.20	0.70	0.107	0.14	0.015	4%
4	1.70	0.70		0.42	0.157					1.00	0.20	0.70	0.157	0.14	0.022	6%
5	1.90	0.66		0.40	0.175					1.00	0.20	0.66	0.175	0.13	0.023	7%
6	2.10	0.62		0.37	0.239					1.00	0.20	0.62	0.239	0.12	0.030	8%
7	2.30	0.64		0.38	0.269					1.00	0.15	0.64	0.269	0.10	0.026	7%
8	2.40	0.64		0.38	0.240					1.00	0.10	0.64	0.240	0.06	0.015	4%
9	2.50	0.64		0.38	0.244					1.00	0.15	0.64	0.244	0.10	0.023	7%
10	2.70	0.62		0.37	0.212					1.00	0.20	0.62	0.212	0.12	0.026	7%
11	2.90	0.56		0.34	0.312					1.00	0.15	0.56	0.312	0.08	0.026	7%
12	3.00	0.58		0.35	0.288					1.00	0.10	0.58	0.288	0.06	0.017	5%
13	3.10	0.54		0.32	0.339					1.00	0.15	0.54	0.339	0.08	0.027	8%
14	3.30	0.55		0.33	0.299					1.00	0.20	0.55	0.299	0.11	0.033	9%
15	3.50	0.52		0.31	0.240					1.00	0.20	0.52	0.240	0.10	0.025	7%
16	3.70	0.49		0.29	0.164					1.00	0.20	0.49	0.164	0.10	0.016	5%
17	3.90	0.38		0.23	0.036					1.00	0.20	0.38	0.036	0.08	0.003	1%
18	4.10	0.26		0.16	0.044					1.00	0.20	0.26	0.044	0.05	0.002	1%
19	4.30	0.20		0.12	0.004					1.00	0.20	0.20	0.004	0.04	0.000	0%
20	4.50	0.12		0.07	-0.001					1.00	0.20	0.12	-0.001	0.02	0.000	0%
RB	4.70	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.352</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -Across from hell landing area

Meas. Start Time (MST): 14:15  
 Meas. End Time (MST): 14:48  
 Equipment: ADV  
 Method: Wading  
 River Condition: Moderate flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: Partial cloud, light breeze, 12C



**Flow characteristics:**

Total Flow:	0.352	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.25	(m <sup>2</sup> )
Wetted Width:	4.61	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.670	
Water (°C):	4.3	
Datalogger Clock:	15:14	
Laptop Clock:	15:15	
Battery (Main):	14.2	
Battery:		New
Battery Serial #:	905005	
Enclosure Deseccant:		New
Vent Tube Deseccant:		New
PT# (if replaced):	284720	
Logger# (if replaced):	18200	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S16A-04	0.704	100.680		99.976	99.976	3/4" pipe 2.5m N of logger
S16A-06			0.298	100.382	100.394	3/4" pipe 2m NW of logger
<b>Water Level:</b>						
	<b>Cut</b>		2.348	98.332		<b>Time WL Surveyed:</b> 14:07
S16A-05			1.117	99.563	99.567	3/4" pipe 4m E of logger
<b>Turn</b>						
S16A-05	1.065	100.628		99.563	99.567	3/4" pipe 4m E of logger
Water Level:	<b>Cut</b>		2.292	98.336		<b>Time WL Surveyed:</b> 14:10
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S16A-05	1.059	100.622		99.563		
Water Level:	<b>Cut</b>		2.273	98.349		<b>Time WL Surveyed:</b> 14:55
Water Level:	<b>Cut</b>		2.288	98.353		<b>Time WL Surveyed:</b> 15:09
S16A-05	1.078	100.641		99.563		

**WL Survey Summary**

	Before	After
Average WL:	98.334	98.351
Closing Error:	0.000	-
WL Check:	0.004	-0.004
Transducer Elevation	97.664	-

**Field Personnel:**

	TR, GG	Trip Date:	30-Apr-14
Data Entry Personnel:	GG	Date:	30-Apr-14
Data Check Personnel:	CJ	Date:	4-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date: June 20, 2014  
 Site Visit Time (MST): 14:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.10	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.40	0.52		0.31	-0.036					1.00	0.25	0.52	-0.036	0.13	-0.005	-1%
2	2.60	0.56		0.34	-0.015					1.00	0.20	0.56	-0.015	0.11	-0.002	0%
3	2.80	0.60		0.36	0.076					1.00	0.20	0.60	0.076	0.12	0.009	2%
4	3.00	0.60		0.36	0.252					1.00	0.20	0.60	0.252	0.12	0.030	6%
5	3.20	0.62		0.37	0.362					1.00	0.20	0.62	0.362	0.12	0.045	9%
6	3.40	0.62		0.37	0.507					1.00	0.15	0.62	0.507	0.09	0.047	9%
7	3.50	0.62		0.37	0.534					1.00	0.10	0.62	0.534	0.06	0.033	7%
8	3.60	0.62		0.37	0.464					1.00	0.15	0.62	0.464	0.09	0.043	9%
9	3.80	0.60		0.36	0.231					1.00	0.20	0.60	0.231	0.12	0.028	6%
10	4.00	0.54		0.32	0.254					1.00	0.20	0.54	0.254	0.11	0.027	5%
11	4.20	0.56		0.34	0.185					1.00	0.20	0.56	0.185	0.11	0.021	4%
12	4.40	0.55		0.33	0.050					1.00	0.20	0.55	0.050	0.11	0.005	1%
13	4.60	0.58		0.35	0.126					1.00	0.20	0.58	0.126	0.12	0.015	3%
14	4.80	0.60		0.36	0.345					1.00	0.20	0.60	0.345	0.12	0.041	8%
15	5.00	0.60		0.36	0.342					1.00	0.20	0.60	0.342	0.12	0.041	8%
16	5.20	0.56		0.34	0.211					1.00	0.20	0.56	0.211	0.11	0.024	5%
17	5.40	0.50		0.30	0.316					1.00	0.20	0.50	0.316	0.10	0.032	6%
18	5.60	0.47		0.28	0.180					1.00	0.30	0.47	0.180	0.14	0.025	5%
19	6.00	0.38		0.23	0.204					1.00	0.50	0.38	0.204	0.19	0.039	8%
RB	6.60	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.499</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m DS of station

Meas. Start Time (MST):	15:30
Meas. End Time (MST):	15:59
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, Calm, 23C

**Flow characteristics:**

Total Flow:	0.499	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.20	(m <sup>2</sup> )
Wetted Width:	4.50	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.10	

**Logger Details:**

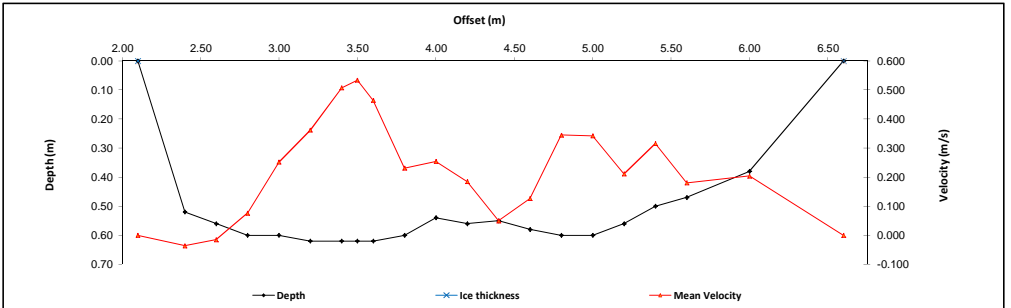
	Before	After
Transducer Reading (m):	0.799	0.789
Water (°C):	17.0	16.9
Datalogger Clock:	15:05	15:58
Laptop Clock:	15:05	15:58
Battery (Main):	12.9	12.9
Battery:		New
Battery Serial #:	-	-
Enclosure Dessiccant:		New
Vent Tube Dessiccant:		New
PT# (if replaced):	284720	259047
Logger# (if replaced):	17835	

**Datalogger / Station Notes:**

- On June 16th the station was found underwater 15m DS.
- The bank collapsed and station went with it.
- 2 BM's remain but should be replaced as they are very close to the collapsing bank and may have moved or likely will move in the near future.
- Returned on June 20th
- Installed datalogger and pt with 2 batteries

**General Notes:**

- Rocks in water producing eddies



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S16A-04	1.388	101.364		99.976	99.976	3/4" pipe 2.5m N of logger
S16A-05			1.796	99.568	99.567	3/4" pipe 4m E of logger
<b>Water Level:</b>						
Cut			3.507	97.857	Time WL Surveyed: 15:19	
Temporary BM			3.197	98.167	0.000	
<b>Turn</b>						
Temporary BM	3.185	101.352		98.167		
<b>Water Level:</b>						
Cut			3.493	97.859	Time WL Surveyed: 15:21	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S16A-05	1.782	101.352		99.570		
<b>Water Level:</b>						
Cut			3.494	97.858	Time WL Surveyed: -	
Cut			3.478	97.856	Time WL Surveyed: -	
S16A-05	1.764	101.334		99.570		

**WL Survey Summary**

	Before	After
Average WL:	97.858	97.857
Closing Error:	-0.001	-
WL Check:	0.002	0.002
Transducer Elevation	97.059	97.068

**Field Personnel:**

	DW, MP	Trip Date:	20-Jun-14
Data Entry Personnel:	DW, MP	Date:	20-Jun-14
Data Check Personnel:	DW	Date:	24-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date: August 12, 2014  
 Site Visit Time (MST): 12:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.70	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.00	0.28		0.17	-0.003					1.00	0.25	0.28	-0.003	0.07	0.000	0%
2	2.20	0.34		0.20	-0.003					1.00	0.20	0.34	-0.003	0.07	0.000	0%
3	2.40	0.42		0.25	0.004					1.00	0.20	0.42	0.004	0.08	0.000	1%
4	2.60	0.48		0.29	0.009					1.00	0.20	0.48	0.009	0.10	0.001	2%
5	2.80	0.50		0.30	0.007					1.00	0.20	0.50	0.007	0.10	0.001	2%
6	3.00	0.54		0.32	0.013					1.00	0.20	0.54	0.013	0.11	0.001	3%
7	3.20	0.54		0.32	0.023					1.00	0.20	0.54	0.023	0.11	0.002	6%
8	3.40	0.60		0.36	0.016					1.00	0.20	0.60	0.016	0.12	0.002	5%
9	3.60	0.62		0.37	0.017					1.00	0.20	0.62	0.017	0.12	0.002	5%
10	3.80	0.68		0.41	0.028					1.00	0.20	0.68	0.028	0.14	0.004	9%
11	4.00	0.72		0.43	0.018					1.00	0.20	0.72	0.018	0.14	0.003	6%
12	4.20	0.75		0.45	0.022					1.00	0.20	0.75	0.022	0.15	0.003	8%
13	4.40	0.80				0.64	0.013	0.16	0.040	1.00	0.15	0.80	0.027	0.12	0.003	7%
14	4.50	0.63		0.38	0.021					1.00	0.10	0.63	0.021	0.06	0.001	3%
15	4.60	0.75		0.45	0.035					1.00	0.15	0.75	0.035	0.11	0.004	9%
16	4.80	0.72		0.43	0.027					1.00	0.20	0.72	0.027	0.14	0.004	9%
17	5.00	0.69		0.41	0.028					1.00	0.20	0.69	0.028	0.14	0.004	9%
18	5.20	0.65		0.39	0.030					1.00	0.15	0.65	0.030	0.10	0.003	7%
19	5.30	0.67		0.40	0.022					1.00	0.10	0.67	0.022	0.07	0.001	3%
20	5.40	0.68		0.41	0.023					1.00	0.15	0.68	0.023	0.10	0.002	6%
21	5.60	0.70		0.42	0.002					1.00	0.30	0.70	0.002	0.21	0.000	1%
LB	6.00	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.043</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from station

Mess. Start Time (MST):	14:30
Mess. End Time (MST):	14:58
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 25C

**Flow characteristics:**

Total Flow:	0.043	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.36	(m <sup>2</sup> )
Wetted Width:	4.30	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

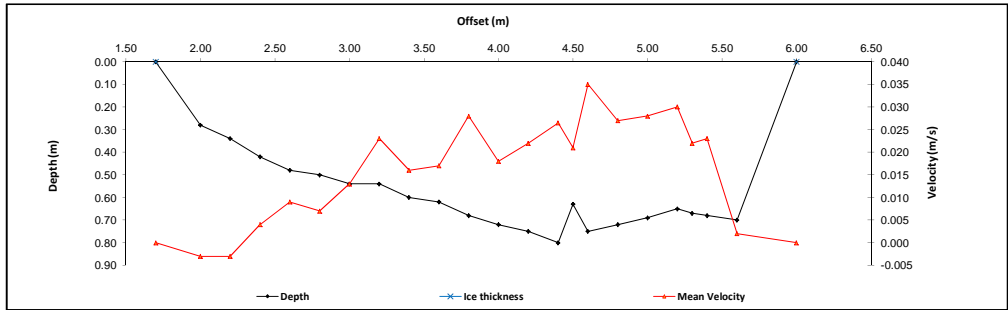
**Logger Details:**

	Before	After
Transducer Reading (m):	0.901	0.900
Water (°C):	16.7	17.0
Datalogger Clock:	14:26	15:10
Laptop Clock:	14:26	15:10
Battery (Main):	12.7	12.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Lots of vegetation in channel



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S16A-05	1.973	101.540		99.567	99.567	3/4" pipe 4m E of logger
S16A-04			1.567	99.973	99.976	3/4" pipe 2.5m N of logger
S16A-07			1.582	99.958	99.958	Lag Bolt in Tree
Water Level:	Cut		3.544	97.996	Time WL Surveyed:	14:16
Temporary BM			3.343	98.197		
<b>Turn</b>						
Temporary BM	3.336	101.533		98.197		
Water Level:	Cut		3.535	97.998	Time WL Surveyed:	14:18
S16A-07			1.574	99.959	99.958	Lag Bolt in Tree
S16A-04			1.558	99.975	99.976	3/4" pipe 2.5m N of logger
S16A-05			1.965	99.568	99.567	3/4" pipe 4m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S16A-07	1.559	101.533		99.974		
Water Level:	Cut		3.542	97.991	Time WL Surveyed:	15:06
Water Level:	Cut		3.535	97.998	Time WL Surveyed:	15:07
S16A-07	1.549	101.523		99.974		

**WL Survey Summary**

	Before	After
Average WL:	97.997	97.990
Closing Error:	-0.001	-
WL Check:	0.002	0.003
Transducer Elevation	97.096	97.090

**Field Personnel:**

	CJ, MP	Trip Date:	12-Aug-14
Data Entry Personnel:	CJ	Date:	12-Aug-14
Data Check Personnel:	MY	Date:	25-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date: September 24, 2014  
 Site Visit Time (MST): 08:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.80	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.00	0.56		0.34	-0.032					1.00	0.20	0.56	-0.032	0.11	-0.004	-25%
2	1.20	0.52		0.31	0.028					1.00	0.15	0.52	0.028	0.08	0.002	15%
3	1.30	0.58		0.35	0.043					1.00	0.10	0.58	0.043	0.06	0.002	17%
4	1.40	0.62		0.37	0.084					1.00	0.07	0.62	0.084	0.05	0.004	27%
5	1.45	0.60		0.36	0.127					1.00	0.05	0.60	0.127	0.03	0.004	26%
6	1.50	0.60		0.36	0.119					1.00	0.05	0.60	0.119	0.03	0.004	24%
7	1.55	0.60		0.36	0.145					1.00	0.05	0.60	0.145	0.03	0.004	30%
8	1.60	0.58		0.35	0.128					1.00	0.05	0.58	0.128	0.03	0.004	25%
9	1.65	0.59		0.35	0.130					1.00	0.05	0.59	0.130	0.03	0.004	26%
10	1.70	0.58		0.35	0.141					1.00	0.08	0.58	0.141	0.04	0.006	42%
11	1.80	0.56		0.34	0.105					1.00	0.10	0.56	0.105	0.06	0.006	40%
12	1.90	0.60		0.36	0.064					1.00	0.10	0.60	0.064	0.06	0.004	26%
13	2.00	0.58		0.35	0.065					1.00	0.10	0.58	0.065	0.06	0.004	26%
14	2.10	0.64		0.38	0.006					1.00	0.10	0.64	0.006	0.06	0.000	3%
15	2.20	0.64		0.38	-0.023					1.00	0.15	0.64	-0.023	0.10	-0.002	-15%
16	2.40	0.66		0.40	-0.027					1.00	0.20	0.66	-0.027	0.13	-0.004	-24%
17	2.60	0.61		0.37	-0.031					1.00	0.20	0.61	-0.031	0.12	-0.004	-26%
18	2.80	0.64		0.38	-0.038					1.00	0.20	0.64	-0.038	0.13	-0.005	-33%
19	3.00	0.70		0.42	-0.032					1.00	0.30	0.70	-0.032	0.21	-0.007	-46%
20	3.40	0.64		0.38	-0.022					1.00	0.40	0.64	-0.022	0.26	-0.006	-39%
21	3.80	0.64		0.38	-0.013					1.00	0.35	0.64	-0.013	0.22	-0.003	-20%
LB	4.10	0.00	0.00		0.00	0.00		0.00		1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.015</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m US of PT

Mess. Start Time (MST):	10:00
Mess. End Time (MST):	10:30
Equipment:	ADV
Method:	Wading
River Condition:	Beaver dammed
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Cloudy, calm, 10C

**Flow characteristics:**

Total Flow:	0.015	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.89	(m <sup>2</sup> )
Wetted Width:	3.30	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.00	

**Logger Details:**

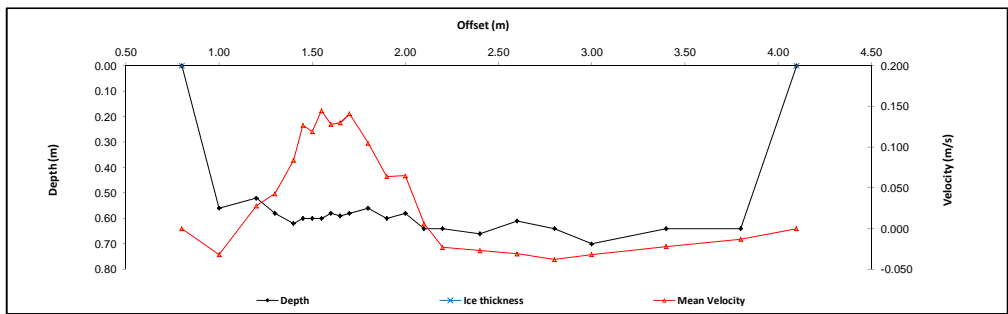
	Before	After
Transducer Reading (m):	1.184	1.187
Water (°C):	9.8	9.8
Datalogger Clock:	09:02	10:37
Laptop Clock:	09:01	10:36
Battery (Main):	12.5	12.9
Battery:		Replaced
Battery Serial #:	1403001 & 1108001	1204020 & unknown
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- ADV test run, results good
- Telemetry strength tested, RSSI = (-99)

**General Notes:**

- BMs Need tags
- Station needs U - bolts and 25-30m PT
- Beaver dam 10m DS of Heli Pad
- Needs solar panel
- BM 8 is 1 section of pipe, driven until it hit rock



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S16A-05	0.671	100.238		99.567	99.567	3/4" pipe 4m E of logger
S16A-04			0.265	99.973	99.976	3/4" pipe 2.5m N of logger
S16A-08			0.173	100.065	100.065	3/4" Pipe
S16A-07			0.280	99.958	99.958	Lag Bolt in Tree
Water Level:	Cut		1.956	98.282	<b>Time WL Surveyed:</b> 9:36	
S16A-09			0.968	99.270	99.270	3/4" Pipe
<b>Turn</b>						
S16A-09	0.958	100.228		99.270	99.270	3/4" Pipe
Water Level:	Cut		1.947	98.281	<b>Time WL Surveyed:</b> 9:40	
S16A-07			0.271	99.957	99.958	Lag Bolt in Tree
S16A-08			0.164	100.064	100.065	3/4" Pipe
S16A-04			0.256	99.972	99.976	3/4" pipe 2.5m N of logger
S16A-05			0.662	99.566	99.567	3/4" pipe 4m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S16A-09	0.959	100.229		99.270	99.270	
Water Level:	Cut		1.946	98.283	<b>Time WL Surveyed:</b> 10:32	
Water Level:	Cut		1.939	98.294	<b>Time WL Surveyed:</b> 10:34	
S16A-09	0.953	100.223		99.270	99.270	

**WL Survey Summary**

	Before	After
Average WL:	98.282	98.284
Closing Error:	0.001	-
WL Check:	0.001	-0.001
Transducer Elevation	97.098	

**Field Personnel:**

Data Entry Personnel:	MP, TR	Trip Date:	24-Sep-14
Data Check Personnel:	MP, TR	Date:	24-Sep-14
Entered Digitally in the Field:	MY	Date:	24-Oct-14

# Hydrometric Measurement / Site Visit Record

Site: S16A - Calumet River Upland Tributary  
 UTM Location: 458130E, 6362062N

Site Visit Date: November 2, 2014  
 Site Visit Time (MST): 13:30



Flow Measurement: Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	3.20	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	3.50	0.22		0.13	0.018					1.00	0.28	0.22	0.018	0.06	0.001	2%
2	3.75	0.20		0.12	0.075					1.00	0.16	0.20	0.075	0.03	0.002	4%
3	3.82	0.16		0.10	0.220					1.00	0.13	0.16	0.220	0.02	0.004	7%
4	4.00	0.32		0.19	0.137					1.00	0.15	0.32	0.137	0.05	0.007	10%
5	4.12	0.32		0.19	0.135					1.00	0.13	0.32	0.135	0.04	0.005	8%
6	4.25	0.37		0.22	0.128					1.00	0.15	0.37	0.128	0.06	0.007	11%
7	4.42	0.46		0.28	0.127					1.00	0.13	0.46	0.127	0.06	0.007	11%
8	4.50	0.37		0.22	0.068					1.00	0.17	0.37	0.068	0.06	0.004	6%
9	4.75	0.50		0.30	0.080					1.00	0.25	0.50	0.080	0.13	0.010	15%
10	5.00	0.38		0.23	0.029					1.00	0.25	0.38	0.029	0.10	0.003	4%
11	5.25	0.70		0.42	-0.004					1.00	0.25	0.70	-0.004	0.18	-0.001	-1%
12	5.50	0.70		0.42	-0.029					1.00	0.25	0.70	-0.029	0.18	-0.005	-8%
13	5.75	0.47		0.28	-0.031					1.00	0.25	0.47	-0.031	0.12	-0.004	-6%
14	6.00	0.26		0.16	0.201					1.00	0.19	0.26	0.201	0.05	0.010	15%
15	6.12	0.24		0.14	0.165					1.00	0.13	0.24	0.165	0.03	0.005	8%
16	6.25	0.30		0.18	0.000					1.00	0.19	0.30	0.000	0.06	0.000	0%
17	6.50	0.31		0.19	0.047					1.00	0.25	0.31	0.047	0.08	0.004	6%
18	6.75	0.24		0.14	0.068					1.00	0.16	0.24	0.068	0.04	0.003	4%
19	6.82	0.16		0.10	0.017					1.00	0.13	0.16	0.017	0.02	0.000	1%
20	7.00	0.18		0.11	-0.002					1.00	0.22	0.18	-0.002	0.04	0.000	0%
21	7.25	0.12		0.07	0.000					1.00	0.25	0.12	0.000	0.03	0.000	0%
22	7.50	0.13		0.08	0.045					1.00	0.38	0.13	0.045	0.05	0.002	3%
LB	8.00	0.00	0.00		0.000		0.000			1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.065</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): 5m DS of station

Meas. Start Time (MST):	13:55
Meas. End Time (MST):	14:23
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow, partial ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 0C

**Flow characteristics:**

Total Flow:	0.065	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.45	(m²)
Wetted Width:	4.80	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.03	

**Logger Details:**

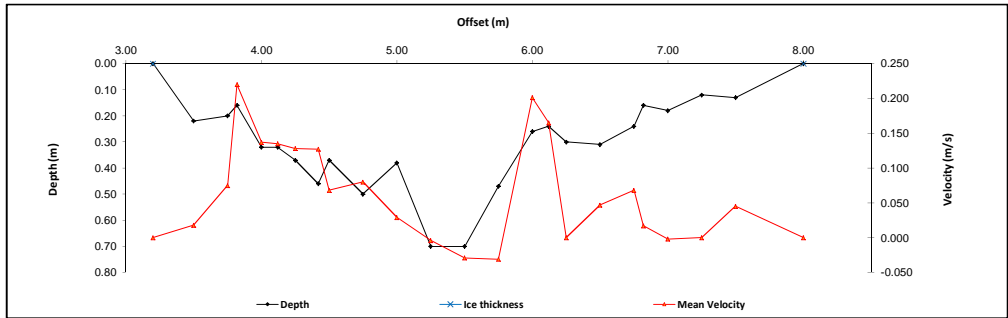
	Before	After
Transducer Reading (m):	1.309	1.310
Water (°C):	1.1	1.2
Datalogger Clock:	13:36	14:31
Laptop Clock:	13:34	13:29
Battery (Main):	11.1	11.2
Battery:	-	-
Battery Serial #:	-	-
Enclosure Dessiccant:	-	-
Vent Tube Dessiccant:	-	-
PT# (if replaced):	259047	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Boulders lining bottom of creek, partially frozen near beaver dam (DS of heli. landing area)

**General Notes:**

- Boulders lining bottom of creek, partially frozen near beaver dam (DS of heli. landing area)



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S16A-05	1.112	100.679		99.567	99.567	3/4" pipe 4m E of logger
S16A-09			1.413	99.266	99.268	3/4" PIPE
S16A-10			0.614	100.065	100.065	TREE BOLT
S16A-04			0.706	99.973	99.976	3/4" pipe 2.5m N of logger
Water Level:	Cut	0.236	2.507	98.408	Time WL Surveyed: 14:10	
Temporary BM			2.507	98.172	0.000	
<b>Turn</b>						
Temporary BM	2.500	100.672		98.172		6
Water Level:	Cut	0.236	2.500	98.408	Time WL Surveyed: 14:12	
S16A-04			0.699	99.973	99.976	3/4" pipe 2.5m N of logger
S16A-10			0.607	100.065	100.065	TREE BOLT
S16A-09			1.404	99.268	99.268	3/4" PIPE
S16A-05			1.105	99.567	99.567	3/4" pipe 4m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S16A-05	1.105	100.672		99.567		
Water Level:	Cut	0.233	2.499	98.406	Time WL Surveyed: 14:30	
Water Level:	Cut	0.233	2.495	98.405	Time WL Surveyed: 14:34	
S16A-05	1.100	100.667		99.567		

**IWL Survey Summary**

	Before	After
Average WL:	98.408	98.406
Closing Error:	0.000	-
IWL Check:	0.000	0.001
Transducer Elevation	97.099	97.096

**Field Personnel:**

Data Entry Personnel:	TR, MP	Trip Date:	2-Nov-14
Data Check Personnel:	TR	Date:	2-Nov-14
Entered Digitally in the Field:	MP	Date:	18-Nov-14

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth

UTM Location: 457315 E, 6352863 N

Site Visit Date:

April 28, 2014

Site Visit Time (MST):

10:45

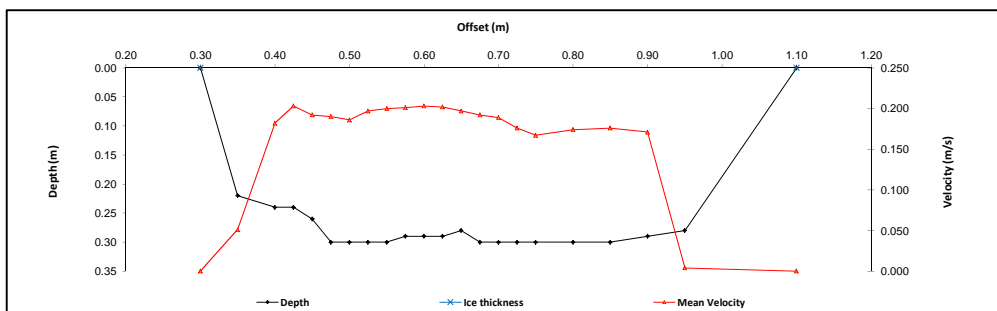


Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.30	0.00	0.00		0.000				0.000	1.00	0.03	0.00	0.000	0.00	0.000	
1	0.35	0.22		0.13	0.051					1.00	0.05	0.22	0.051	0.01	0.001	2%
2	0.40	0.24		0.14	0.182					1.00	0.04	0.24	0.182	0.01	0.002	5%
3	0.43	0.24		0.14	0.203					1.00	0.03	0.24	0.203	0.01	0.001	4%
4	0.45	0.26		0.16	0.192					1.00	0.03	0.26	0.192	0.01	0.001	4%
5	0.48	0.30		0.18	0.190					1.00	0.03	0.30	0.190	0.01	0.001	5%
6	0.50	0.30		0.18	0.186					1.00	0.03	0.30	0.186	0.01	0.001	5%
7	0.53	0.30		0.18	0.197					1.00	0.03	0.30	0.197	0.01	0.001	5%
8	0.55	0.30		0.18	0.200					1.00	0.02	0.30	0.200	0.01	0.001	5%
9	0.58	0.29		0.17	0.201					1.00	0.02	0.29	0.201	0.01	0.001	5%
10	0.60	0.29		0.17	0.203					1.00	0.03	0.29	0.203	0.01	0.001	5%
11	0.63	0.29		0.17	0.202					1.00	0.02	0.29	0.202	0.01	0.001	5%
12	0.65	0.28		0.17	0.197					1.00	0.03	0.28	0.197	0.01	0.001	5%
13	0.68	0.30		0.18	0.192					1.00	0.02	0.30	0.192	0.01	0.001	5%
14	0.70	0.30		0.18	0.189					1.00	0.02	0.30	0.189	0.01	0.001	5%
15	0.73	0.30		0.18	0.176					1.00	0.03	0.30	0.176	0.01	0.001	4%
16	0.75	0.30		0.18	0.167					1.00	0.04	0.30	0.167	0.01	0.002	6%
17	0.80	0.30		0.18	0.174					1.00	0.05	0.30	0.174	0.02	0.003	9%
18	0.85	0.30		0.18	0.176					1.00	0.05	0.30	0.176	0.02	0.003	9%
19	0.90	0.29		0.17	0.171					1.00	0.05	0.29	0.171	0.01	0.002	8%
20	0.95	0.28		0.17	0.004					1.00	0.10	0.28	0.004	0.03	0.000	0%
LB	1.10	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.030</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Meas. Start Time (MST):	11:12
Meas. End Time (MST):	11:32
Equipment:	ADV
Method:	Wading
River Condition:	Open, some ice along banks
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 7C



**Flow characteristics:**

Total Flow:	0.030	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.20	(m <sup>2</sup> )
Wetted Width:	0.80	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.141	0.150
Water (°C):	1.1	1.1
Datalogger Clock:	10:56	11:42
Laptop Clock:	10:54	11:41
Battery (Main):	12.9	12.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	New	
Vent Tube Dessicant:	New	
PT# (if replaced):	48724	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed PT
- Installed 2 batteries, s/n: 1403009 and 1403008
- Needs new solar controller
- Precip. gauge test: 0.2 mm

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S19-04	1.138	104.472		103.334	103.334	3/4" Pipe 5m N of Station
S19-05			0.874	103.598	103.599	3/4" Pipe 3m S of Station
S19-06			0.944	103.528	103.530	3/4" Pipe 3m SE of Station
Water Level:	Cut		3.177	101.295	Time WL Surveyed: 11:02	
Temporary BM			3.236	101.236	0.000	-
<b>Turn</b>						
Temporary BM	3.222	104.458		101.236	-	
Water Level:	Cut		3.162	101.296	Time WL Surveyed: 11:04	
S19-06			0.928	103.530	103.530	3/4" Pipe 3m SE of Station
S19-05			0.858	103.600	103.599	3/4" Pipe 3m S of Station
S19-04			1.123	103.335	103.334	3/4" Pipe 5m N of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S19-06	0.928	104.456		103.528		
Water Level:	Cut		3.160	101.296	Time WL Surveyed: 11:36	
Water Level:	Cut		3.145	101.296	Time WL Surveyed: 11:38	
S19-06	0.913	104.441		103.528		

**WL Survey Summary**

	Before	After
Average WL:	101.296	101.296
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	101.155	101.146

**Field Personnel:**

	SM, TR	Trip Date:	28-Apr-14
Data Entry Personnel:	SM	Date:	28-Apr-14
Data Check Personnel:	CJ	Date:	4-Jun-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: June 24, 2014  
 Site Visit Time (MST): 11:40

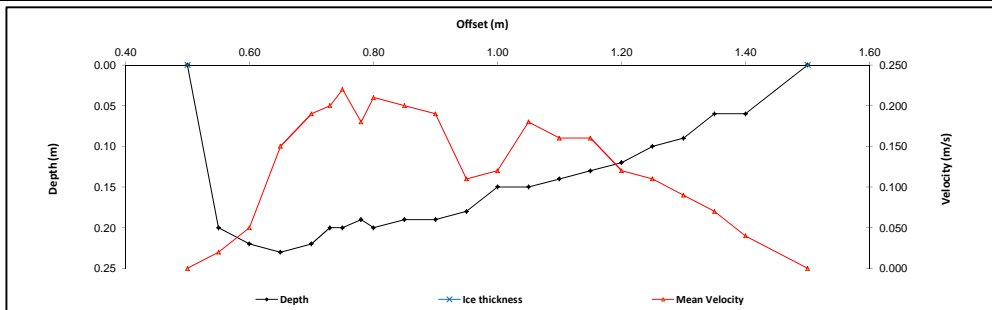


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.50	0.00	0.00		0.000		0.000		0.000	1.00	0.02	0.00	0.000	0.00	0.000	
1	0.55	0.20		0.12	0.020					1.00	0.05	0.20	0.020	0.01	0.000	1%
2	0.60	0.22		0.13	0.050					1.00	0.05	0.22	0.050	0.01	0.001	3%
3	0.65	0.23		0.14	0.150					1.00	0.05	0.23	0.150	0.01	0.002	9%
4	0.70	0.22		0.13	0.190					1.00	0.04	0.22	0.190	0.01	0.002	8%
5	0.73	0.20		0.12	0.200					1.00	0.03	0.20	0.200	0.01	0.001	5%
6	0.75	0.20		0.12	0.220					1.00	0.03	0.20	0.220	0.01	0.001	6%
7	0.78	0.19		0.11	0.180					1.00	0.03	0.19	0.180	0.00	0.001	4%
8	0.80	0.20		0.12	0.210					1.00	0.03	0.20	0.210	0.01	0.001	7%
9	0.85	0.19		0.11	0.200					1.00	0.05	0.19	0.200	0.01	0.002	10%
10	0.90	0.19		0.11	0.190					1.00	0.05	0.19	0.190	0.01	0.002	9%
11	0.95	0.18		0.11	0.110					1.00	0.05	0.18	0.110	0.01	0.001	5%
12	1.00	0.15		0.09	0.120					1.00	0.05	0.15	0.120	0.01	0.001	5%
13	1.05	0.15		0.09	0.180					1.00	0.05	0.15	0.180	0.01	0.001	7%
14	1.10	0.14		0.08	0.160					1.00	0.05	0.14	0.160	0.01	0.001	6%
15	1.15	0.13		0.08	0.160					1.00	0.05	0.13	0.160	0.01	0.001	5%
16	1.20	0.12		0.07	0.120					1.00	0.05	0.12	0.120	0.01	0.001	4%
17	1.25	0.10		0.06	0.110					1.00	0.05	0.10	0.110	0.00	0.001	3%
18	1.30	0.09		0.05	0.090					1.00	0.05	0.09	0.090	0.00	0.000	2%
19	1.35	0.06		0.04	0.070					1.00	0.05	0.06	0.070	0.00	0.000	1%
20	1.40	0.06		0.04	0.040					1.00	0.08	0.06	0.040	0.00	0.000	1%
RB	1.50	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.020</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Meas. Start Time (MST):	12:17
Meas. End Time (MST):	12:27
Equipment:	Marsh McBimney
Method:	Wading
River Condition:	Clear, low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 22C



**Flow characteristics:**

Total Flow:	0.020	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.14	(m <sup>2</sup> )
Wetted Width:	1.00	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.169	0.212
Water (°C):	13.7	13.9
Datalogger Clock:	11:52	12:40
Laptop Clock:	11:50	12:38
Battery (Main):	12.4	12.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT moved to deeper water
- Tested precip gauge 0.2 mm Ok

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S19-04	0.986	104.320		103.334	103.334	3/4" Pipe 5m N of Station
S19-05			0.722	103.598	103.599	3/4" Pipe 3m S of Station
S19-06			0.792	103.528	103.530	3/4" Pipe 3m SE of Station
Water Level:	Cut		3.120	101.200		Time WL Surveyed: 11:57
Temporary BM			3.055	101.265	0.000	-
<b>Turn</b>						
Temporary BM	3.042	104.307		101.265		-
Water Level:	Cut		3.104	101.203		Time WL Surveyed: 11:59
S19-06			0.775	103.532	103.530	3/4" Pipe 3m SE of Station
S19-05			0.707	103.600	103.599	3/4" Pipe 3m S of Station
S19-04			0.973	103.334	103.334	3/4" Pipe 5m N of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S19-05	0.706	104.307		103.601		
Water Level:	Cut		3.106	101.201		Time WL Surveyed: 12:32
Water Level:	Cut		3.089	101.204		Time WL Surveyed: 12:33
S19-05	0.692	104.293		103.601		

**WL Survey Summary**

	Before	After
Average WL:	101.202	101.203
Closing Error:	0.000	-
WL Check:	0.003	-0.003
Transducer Elevation	101.033	100.991

**Field Personnel:**

	SM, GG	Trip Date:	24-Jun-14
Data Entry Personnel:	SM	Date:	24-Jun-14
Data Check Personnel:	DW	Date:	25-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: August 19, 2014  
 Site Visit Time (MST): 10:20

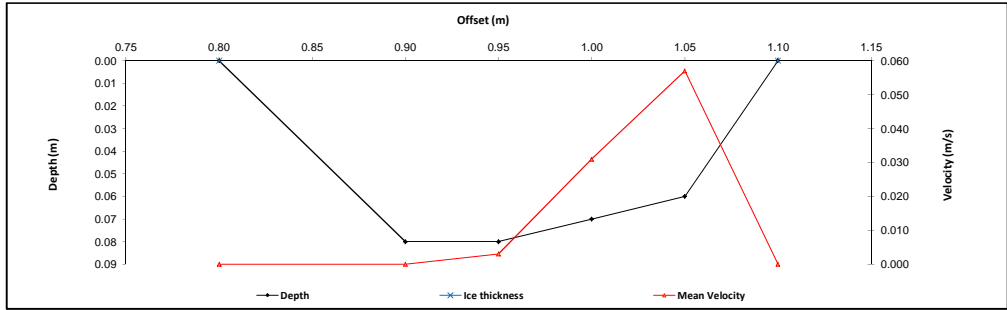


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.10	0.00	0.00		0.000		0.000		0.000	1.00	0.03	0.00	0.000	0.00	0.000	
1	1.05	0.06		0.04	0.057					1.00	0.05	0.06	0.057	0.00	0.000	59%
2	1.00	0.07		0.04	0.031					1.00	0.05	0.07	0.031	0.00	0.000	37%
3	0.95	0.08		0.05	0.003					1.00	0.05	0.08	0.003	0.00	0.000	4%
4	0.90	0.08		0.05	0.000					1.00	0.08	0.08	0.000	0.01	0.000	0%
LB	0.80	0.00	0.00		0.00		0.00		0.00	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.000</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Meas. Start Time (MST):	11:00
Meas. End Time (MST):	11:08
Equipment:	ADV
Method:	Wading
River Condition:	Very low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Cloudy, 28C



**Flow characteristics:**

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.02	(m <sup>2</sup> )
Wetted Width:	0.30	(m)
Hydraulic Depth:	0.06	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.019	0.063
Water (°C):	15.8	16.2
Datalogger Clock:	10:24	11:22
Laptop Clock:	10:22	11:20
Battery (Main):	11.9	13.9
Battery:		Replaced
Battery Serial #:	1403008	1205004
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Beaver dam upstream of station blocking most of the flow
- PT has been moved into deeper area between surveys

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S19-04	1.143	104.477		103.334	103.334	3/4" Pipe 5m N of Station
S19-05			0.877	103.600	103.599	3/4" Pipe 3m S of Station
S19-06			0.947	103.530	103.530	3/4" Pipe 3m SE of Station
Water Level:			3.448	101.029	<b>Time WL Surveyed:</b> 10:53	
Temporary BM			3.403	101.074	0.000	
<b>Turn</b>						
Temporary BM	3.393	104.467		101.074		
Water Level:			3.437	101.030	<b>Time WL Surveyed:</b> 10:55	
S19-06			0.937	103.530	103.530	3/4" Pipe 3m SE of Station
S19-05			0.867	103.600	103.599	3/4" Pipe 3m S of Station
S19-04			1.132	103.335	103.334	3/4" Pipe 5m N of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S19-06	0.937	104.467		103.530		
Water Level:			3.381	101.088	<b>Time WL Surveyed:</b> 11:14	
Water Level:			3.364	101.088	<b>Time WL Surveyed:</b> 11:16	
S19-06	0.922	104.452		103.530		

**WL Survey Summary**

	Before	After
Average WL:	101.030	101.087
Closing Error:	-0.001	-
WL Check:	0.001	-0.002
Transducer Elevation	101.011	101.024

**Field Personnel:**

	TR, MP	Trip Date:	19-Aug-14
Data Entry Personnel:	TR	Date:	19-Aug-14
Data Check Personnel:	MY	Date:	25-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: September 16, 2014  
 Site Visit Time (MST): 10:11



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.50	0.00	0.000		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	0.70	0.11		0.07	-0.001					1.00	0.11	0.11	-0.001	0.01	0.000	-1%
2	0.73	0.12		0.07	0.000					1.00	0.03	0.12	0.000	0.00	0.000	0%
3	0.75	0.12		0.07	0.000					1.00	0.02	0.12	0.000	0.00	0.000	0%
4	0.78	0.12		0.07	0.000					1.00	0.03	0.12	0.000	0.00	0.000	0%
5	0.80	0.11		0.07	0.004					1.00	0.02	0.11	0.004	0.00	0.000	1%
6	0.83	0.10		0.06	0.024					1.00	0.02	0.10	0.024	0.00	0.000	5%
7	0.85	0.10		0.06	0.069					1.00	0.03	0.10	0.069	0.00	0.000	14%
8	0.88	0.11		0.07	0.017					1.00	0.02	0.11	0.017	0.00	0.000	4%
9	0.90	0.10		0.06	0.063					1.00	0.03	0.10	0.063	0.00	0.000	13%
10	0.93	0.11		0.07	0.006					1.00	0.04	0.11	0.006	0.00	0.000	2%
11	0.98	0.10		0.06	0.027					1.00	0.04	0.10	0.027	0.00	0.000	9%
12	1.00	0.10		0.06	0.041					1.00	0.02	0.10	0.041	0.00	0.000	9%
13	1.03	0.09		0.05	0.027					1.00	0.03	0.09	0.027	0.00	0.000	5%
14	1.05	0.10		0.06	0.042					1.00	0.02	0.10	0.042	0.00	0.000	9%
15	1.08	0.09		0.05	0.033					1.00	0.02	0.09	0.033	0.00	0.000	6%
16	1.10	0.09		0.05	0.036					1.00	0.09	0.09	0.036	0.01	0.000	24%
RB	1.25	0.00	0.000		0.00		0.00			1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.001</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Meas. Start Time (MST):	10:27
Meas. End Time (MST):	10:50
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Overcast, 9C

**Flow characteristics:**

Total Flow:	0.001	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.060	(m <sup>2</sup> )
Wetted Width:	0.750	(m)
Hydraulic Depth:	0.080	(m)
Mean Velocity:	0.020	(m/s)
Froude Number:	0.023	

**Logger Details:**

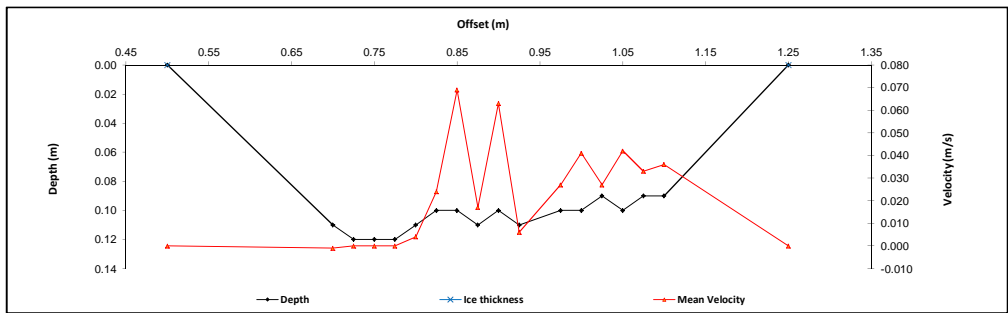
	Before	After
Transducer Reading (m):	0.092	0.105
Water (°C):	8.300	8.3
Datalogger Clock:	10:27	10:57
Laptop Clock:	10:13	10:55
Battery (Main):	14.500	14.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Tipping bucket was tested
- Datalogger clock: before = 10:27
- Laptop clock before = 10:25

**General Notes:**

- Beaver dam still affecting flow upstream
- Channel bathymetry may have been altered during flow measurement due to foot pressure on substrate



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S19-04	1.117	104.451		103.334	103.334	3/4" Pipe 5m N of Station
S19-05			0.851	103.600	103.599	3/4" Pipe 3m S of Station
S19-06			0.919	103.532	103.530	3/4" Pipe 3m SE of Station
<b>Water Level:</b>						
S19-04	Cut		3.333	101.118	101.118	Time WL Surveyed: 10:21
S19-04			1.117	103.334	103.334	3/4" Pipe 5m N of Station
<b>Turn</b>						
S19-04	1.095	104.429		103.334	103.334	3/4" Pipe 5m N of Station
<b>Water Level:</b>						
S19-04	Cut		3.313	101.116	101.116	Time WL Surveyed: 10:23
S19-06			0.900	103.529	103.530	3/4" Pipe 3m SE of Station
S19-05			0.830	103.589	103.599	3/4" Pipe 3m S of Station
S19-04			1.095	103.334	103.334	3/4" Pipe 5m N of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S19-05	0.830	104.428		103.598	103.598	
<b>Water Level:</b>						
S19-05	Cut		3.310	101.118	101.118	Time WL Surveyed: 10:48
<b>Water Level:</b>						
S19-05	Cut		3.303	101.117	101.117	Time WL Surveyed: 10:49
S19-05	0.822	104.420		103.598	103.598	

**WL Survey Summary**

	Before	After
Average WL:	101.117	101.118
Closing Error:	0.000	-
WL Check:	0.002	0.001
Transducer Elevation	101.025	101.013

**Field Personnel:**

TR, MP	Trip Date:	16-Sep-14
MP	Date:	16-Sep-14
MY	Date:	23-Sep-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S19 - Tar River Lowland Tributary near the mouth  
 UTM Location: 457315 E, 6352863 N

Site Visit Date: November 3, 2014  
 Site Visit Time (MST): 12:00



Measured Data								Calculated Data								
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.30	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	1.20	0.10		0.06	0.040					1.00	0.10	0.10	0.040	0.01	0.000	4%
2	1.10	0.12		0.07	0.071					1.00	0.07	0.12	0.071	0.01	0.001	6%
3	1.05	0.11		0.07	0.135					1.00	0.05	0.11	0.135	0.01	0.001	7%
4	1.00	0.12		0.07	0.003					1.00	0.03	0.12	0.003	0.00	0.000	0%
5	0.98	0.12		0.07	0.180					1.00	0.03	0.12	0.180	0.00	0.001	5%
6	0.95	0.12		0.07	0.211					1.00	0.04	0.12	0.211	0.00	0.001	10%
7	0.90	0.12		0.07	0.162					1.00	0.04	0.12	0.162	0.00	0.001	7%
8	0.88	0.14		0.08	0.174					1.00	0.02	0.14	0.174	0.00	0.001	6%
9	0.85	0.14		0.08	0.182					1.00	0.03	0.14	0.182	0.00	0.001	7%
10	0.82	0.14		0.08	0.214					1.00	0.02	0.14	0.214	0.00	0.001	7%
11	0.80	0.14		0.08	0.160					1.00	0.03	0.14	0.160	0.00	0.001	8%
12	0.75	0.14		0.08	0.074					1.00	0.05	0.14	0.074	0.01	0.001	5%
13	0.70	0.14		0.08	0.133					1.00	0.05	0.14	0.133	0.01	0.001	9%
14	0.65	0.16		0.10	0.125					1.00	0.05	0.16	0.125	0.01	0.001	10%
15	0.60	0.16		0.10	0.048					1.00	0.05	0.16	0.048	0.01	0.000	4%
16	0.55	0.14		0.08	0.011					1.00	0.05	0.14	0.011	0.01	0.000	1%
17	0.50	0.13		0.08	0.022					1.00	0.05	0.13	0.022	0.01	0.000	1%
18	0.45	0.13		0.08	0.022					1.00	0.05	0.13	0.022	0.01	0.000	1%
19	0.40	0.12		0.07	0.003					1.00	0.05	0.12	0.003	0.01	0.000	0%
20	0.35	0.13		0.08	0.010					1.00	0.05	0.13	0.010	0.01	0.000	1%
21	0.30	0.12		0.07	0.001					1.00	0.12	0.12	0.001	0.01	0.000	0%
RB	0.12	0.00	0.00		0.00		0.00		0.00	1.00	0.09	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.010</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Meas. Start Time (MST):	12:14
Meas. End Time (MST):	12:37
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -1C

**Flow characteristics:**

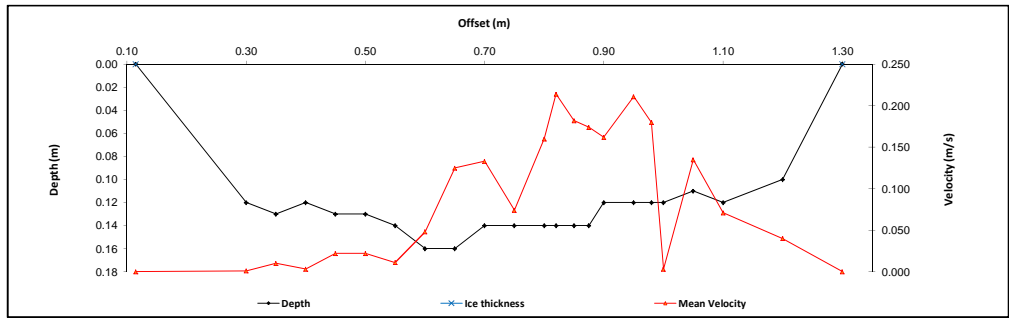
Total Flow:	0.010	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.13	(m <sup>2</sup> )
Wetted Width:	1.19	(m)
Hydraulic Depth:	0.11	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.142	0.158
Water (°C):	2.2	2.2
Datalogger Clock:	12:05	12:45
Laptop Clock:	12:03	12:43
Battery (Main):	13.1	12.8
Battery:	-	-
Battery Serial #:	-	-
Enclosure Dessicant:	-	-
Vent Tube Dessicant:	-	-
PTH (if replaced):	248724	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S19-06	0.899	104.429		103.530	103.530	3/4" Pipe 3m SE of Station
S19-05			0.828	103.601	103.599	3/4" Pipe 3m S of Station
S19-04			1.094	103.335	103.334	3/4" Pipe 5m N of Station
Water Level:	Cut		3.269	101.160		Time WL Surveyed: 12:06
Temporary BM			3.328	101.101	0.000	
<b>Turn</b>						
Temporary BM	3.321	104.422		101.101		
Water Level:	Cut	0.058	3.321	101.159		Time WL Surveyed: 12:08
S19-04			1.087	103.335	103.334	3/4" Pipe 5m N of Station
S19-05			0.822	103.600	103.599	3/4" Pipe 3m S of Station
S19-06			0.891	103.531	103.530	3/4" Pipe 3m SE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S19-05	0.822	104.422		103.600		
Water Level:	Cut	0.072	3.319	101.175		Time WL Surveyed: 12:40
Water Level:	Cut	0.072	3.313	101.175		Time WL Surveyed: 12:42
S19-05	0.816	104.416		103.600		

**WL Survey Summary**

	Before	After
Average WL:	101.160	101.175
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	101.018	101.017

**Field Personnel:**

MP, TR	Trip Date:	3-Nov-14
MP	Date:	3-Nov-14
MP	Date:	18-Nov-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland  
 UTM Location: 492230 E, 6354940 N

Site Visit Date: May 1, 2014  
 Site Visit Time (MST): 09:30

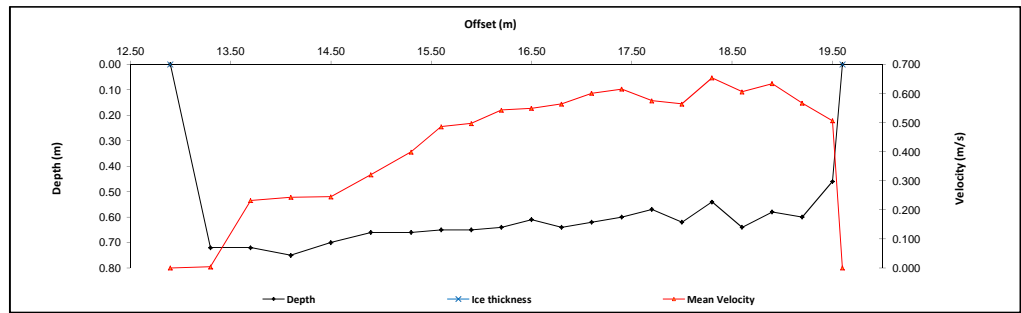


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	12.90	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	13.30	0.72		0.43	0.004					1.00	0.40	0.72	0.004	0.29	0.001	0%
2	13.70	0.72		0.43	0.232					1.00	0.40	0.72	0.232	0.29	0.067	4%
3	14.10	0.75		0.45	0.243					1.00	0.40	0.75	0.243	0.30	0.073	4%
4	14.50	0.70		0.42	0.245					1.00	0.40	0.70	0.245	0.28	0.069	4%
5	14.90	0.66		0.40	0.321					1.00	0.40	0.66	0.321	0.26	0.085	5%
6	15.30	0.66		0.40	0.399					1.00	0.35	0.66	0.399	0.23	0.092	5%
7	15.60	0.65		0.39	0.486					1.00	0.30	0.65	0.486	0.20	0.095	5%
8	15.90	0.65		0.39	0.497					1.00	0.30	0.65	0.497	0.20	0.097	5%
9	16.20	0.64		0.38	0.543					1.00	0.30	0.64	0.543	0.19	0.104	6%
10	16.50	0.61		0.37	0.549					1.00	0.30	0.61	0.549	0.18	0.100	6%
11	16.80	0.64		0.38	0.564					1.00	0.30	0.64	0.564	0.19	0.108	6%
12	17.10	0.62		0.37	0.601					1.00	0.30	0.62	0.601	0.19	0.112	6%
13	17.40	0.60		0.36	0.615					1.00	0.30	0.60	0.615	0.18	0.111	6%
14	17.70	0.57		0.34	0.575					1.00	0.30	0.57	0.575	0.17	0.098	5%
15	18.00	0.62		0.37	0.564					1.00	0.30	0.62	0.564	0.19	0.105	6%
16	18.30	0.54		0.32	0.654					1.00	0.30	0.54	0.654	0.16	0.106	6%
17	18.60	0.64		0.38	0.606					1.00	0.30	0.64	0.606	0.19	0.116	6%
18	18.90	0.58		0.35	0.634					1.00	0.30	0.58	0.634	0.17	0.110	6%
19	19.20	0.60		0.36	0.567					1.00	0.30	0.60	0.567	0.18	0.102	6%
20	19.50	0.46		0.28	0.506					1.00	0.20	0.46	0.506	0.09	0.047	3%
LB	19.60	0.00	0.00		0.00	0.00		0.00		1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.80</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 12m DS of station, near riffle

Mess. Start Time (MST):	9:55
Mess. End Time (MST):	10:20
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 15C



**Flow characteristics:**

Total Flow:	1.80	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.13	(m <sup>2</sup> )
Wetted Width:	6.70	(m)
Hydraulic Depth:	0.62	(m)
Mean Velocity:	0.44	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.091	1.095
Water (°C):	2.8	3.0
Datalogger Clock:	09:38	10:26
Laptop Clock:	09:37	10:25
Battery:	14.2	14.2
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	New	
Vent Tube Desiccant:	Good	
PTA# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-reinstated station for 2014 open water season

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S20A-01	0.881	331.786		330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.884	330.902	330.902	3/4" Pipe 2m NW of logger
<b>Water Level:</b>						
S20A-03	Cut		2.363	329.423	Time WL Surveyed: 9:43	
S20A-03			0.966	330.820	330.820	3/4" Pipe 4m West of logger
<b>Turn</b>						
S20A-03	0.905	331.725		330.820	330.820	3/4" Pipe 4m West of logger
Water Level:	Cut		2.303	329.422	Time WL Surveyed: 9:44	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S20A-01	0.821	331.726		330.905		
Water Level:	Cut		2.301	329.425	Time WL Surveyed: 10:23	
Water Level:	Cut		2.275	329.424	Time WL Surveyed: 10:24	
S20A-01	0.794	331.699		330.905		

**WL Survey Summary**

	Before	After
Average WL:	329.423	329.425
Closing Error:	0.001	-
WL Check:	0.001	0.001
Transducer Elevation	328.332	328.330

**Field Personnel:**

Field Personnel:	TR, GG	Trip Date:	1-May-14
Data Entry Personnel:	TR	Date:	1-May-14
Data Check Personnel:	CJ	Date:	3-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland  
 UTM Location: 492230 E, 6354940 N

Site Visit Date: June 11, 2014  
 Site Visit Time (MST): 10:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	12.10	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	12.20	0.40		0.24	0.555					1.00	0.20	0.40	0.555	0.08	0.044	3%
2	12.50	0.42		0.25	0.620					1.00	0.30	0.42	0.620	0.13	0.078	6%
3	12.80	0.44		0.26	0.587					1.00	0.30	0.44	0.587	0.13	0.077	6%
4	13.10	0.46		0.28	0.586					1.00	0.30	0.46	0.586	0.14	0.081	6%
5	13.40	0.45		0.27	0.607					1.00	0.30	0.45	0.607	0.14	0.082	6%
6	13.70	0.47		0.28	0.598					1.00	0.30	0.47	0.598	0.14	0.084	7%
7	14.00	0.46		0.28	0.553					1.00	0.30	0.46	0.553	0.14	0.076	6%
8	14.30	0.48		0.29	0.576					1.00	0.30	0.48	0.576	0.14	0.083	7%
9	14.60	0.50		0.30	0.578					1.00	0.30	0.50	0.578	0.15	0.087	7%
10	14.90	0.50		0.30	0.508					1.00	0.30	0.50	0.508	0.15	0.076	6%
11	15.20	0.48		0.29	0.472					1.00	0.30	0.48	0.472	0.14	0.068	5%
12	15.50	0.48		0.29	0.496					1.00	0.30	0.48	0.496	0.14	0.071	6%
13	15.80	0.44		0.26	0.469					1.00	0.30	0.44	0.469	0.13	0.062	5%
14	16.10	0.47		0.28	0.469					1.00	0.30	0.47	0.469	0.14	0.066	5%
15	16.40	0.48		0.29	0.406					1.00	0.30	0.48	0.406	0.14	0.058	5%
16	16.70	0.39		0.23	0.358					1.00	0.30	0.39	0.358	0.12	0.042	3%
17	17.00	0.50		0.30	0.253					1.00	0.30	0.50	0.253	0.15	0.038	3%
18	17.30	0.54		0.32	0.167					1.00	0.35	0.54	0.167	0.19	0.032	2%
19	17.70	0.59		0.35	0.155					1.00	0.40	0.59	0.155	0.24	0.037	3%
20	18.10	0.62		0.37	0.097					1.00	0.40	0.62	0.097	0.25	0.024	2%
21	18.50	0.62		0.37	0.024					1.00	0.35	0.62	0.024	0.22	0.005	0%
43	18.80	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	100%

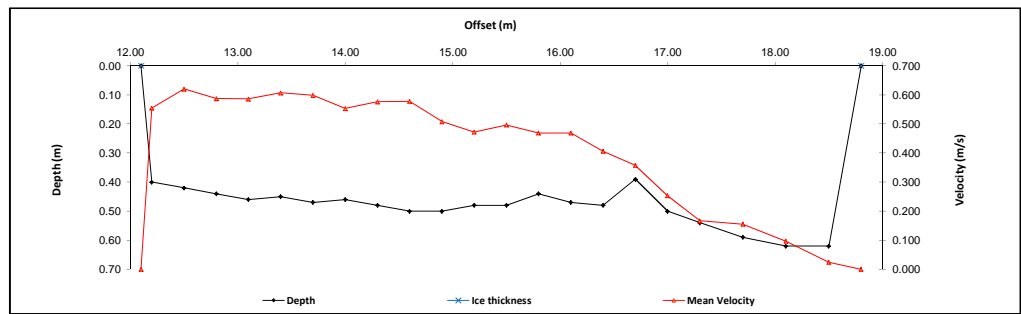
**Flow Measurement Details:**

Metering Section Location (describe):  
 -10m downstream of station

Mess. Start Time (MST):	12:25
Mess. End Time (MST):	12:43
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 22C

**Flow characteristics:**

Total Flow:	1.27	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.20	(m <sup>2</sup> )
Wetted Width:	6.70	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.40	(m/s)
Froude Number:	0.18	



**Logger Details:**

	Before	After
Transducer Reading (m):	0.737	0.738
Water (°C):	16.8	17.1
Datalogger Clock:	12:09	12:50
Laptop Clock:	12:07	12:49
Battery:	14.1	14.1
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Good	
Vent Tube Desiccant:	Good	
PTA (if replaced):	-	-
Loggers (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S20A-01	0.792	331.697		330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.795	330.902	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.876	330.821	330.820	3/4" Pipe 4m West of logger
Water Level:	Cut		2.427	329.270	<b>Time WL Surveyed:</b>	12:16
Temporary BM			1.781	329.916	0.000	-
<b>Turn</b>						
Temporary BM	1.763	331.679		329.916	-	-
Water Level:	Cut		2.406	329.273	<b>Time WL Surveyed:</b>	12:19
S20A-03			0.859	330.820	330.820	3/4" Pipe 4m West of logger
S20A-02			0.778	330.901	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.774	330.905	330.905	3/4" Pipe 2m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S20A-01	0.774	331.679		330.905	-	-
Water Level:	Cut		2.408	329.271	<b>Time WL Surveyed:</b>	12:46
Water Level:	Cut		2.397	329.269	<b>Time WL Surveyed:</b>	12:48
S20A-01	0.761	331.666		330.905	-	-

**WL Survey Summary**

	Before	After
Average WL:	329.272	329.270
Closing Error:	0.000	-
WL Check:	0.003	0.002
Transducer Elevation	328.535	328.532

**Field Personnel:**

Field Personnel:	SM, TR	Trip Date:	16-Jun-14
Data Entry Personnel:	SM	Date:	16-Jun-14
Data Check Personnel:	CJ	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland  
 UTM Location: 492230 E, 6354940 N

Site Visit Date: August 11, 2014  
 Site Visit Time (MST): 11:10



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.70	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	4.00	0.41		0.25	-0.010					1.00	0.30	0.41	-0.010	0.12	-0.001	-5%
2	4.30	0.41		0.25	0.010					1.00	0.30	0.41	0.010	0.12	0.001	5%
3	4.60	0.42		0.25	0.010					1.00	0.30	0.42	0.010	0.13	0.001	5%
4	4.90	0.43		0.26	0.010					1.00	0.30	0.43	0.010	0.13	0.001	5%
5	5.20	0.46		0.28	0.020					1.00	0.30	0.46	0.020	0.14	0.003	11%
6	5.50	0.47		0.28	0.020					1.00	0.30	0.47	0.020	0.14	0.003	11%
7	5.80	0.47		0.28	0.020					1.00	0.23	0.47	0.020	0.11	0.002	8%
8	5.95	0.44		0.26	0.020					1.00	0.15	0.44	0.020	0.07	0.001	5%
9	6.10	0.50		0.30	0.020					1.00	0.23	0.50	0.020	0.11	0.002	9%
10	6.40	0.52		0.31	0.010					1.00	0.30	0.52	0.010	0.16	0.002	6%
11	6.70	0.60		0.36	0.020					1.00	0.23	0.60	0.020	0.14	0.003	10%
12	6.85	0.60		0.36	0.020					1.00	0.15	0.60	0.020	0.09	0.002	7%
13	7.00	0.58		0.35	0.010					1.00	0.15	0.58	0.010	0.09	0.001	3%
14	7.15	0.61		0.37	0.010					1.00	0.15	0.61	0.010	0.09	0.001	4%
15	7.30	0.61		0.37	0.020					1.00	0.23	0.61	0.020	0.14	0.003	11%
16	7.60	0.62		0.37	0.010					1.00	0.30	0.62	0.010	0.19	0.002	7%
17	7.90	0.63		0.38	0.010					1.00	0.30	0.63	0.010	0.19	0.002	7%
18	8.20	0.61		0.37	0.010					1.00	0.30	0.61	0.010	0.18	0.002	7%
19	8.50	0.63		0.38	0.010					1.00	0.30	0.63	0.010	0.19	0.002	7%
20	8.80	0.62		0.37	0.000					1.00	0.30	0.62	0.000	0.19	0.000	0%
21	9.10	0.56		0.34	-0.010					1.00	0.40	0.56	-0.010	0.22	-0.002	-9%
22	9.60	0.68		0.41	-0.010					1.00	0.55	0.68	-0.010	0.37	-0.004	-14%
RB	10.20	0.00	0.00				0.00			1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.026</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): ~3m US of PT

Mess. Start Time (MST):	11:30
Mess. End Time (MST):	11:50
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 30C

**Flow characteristics:**

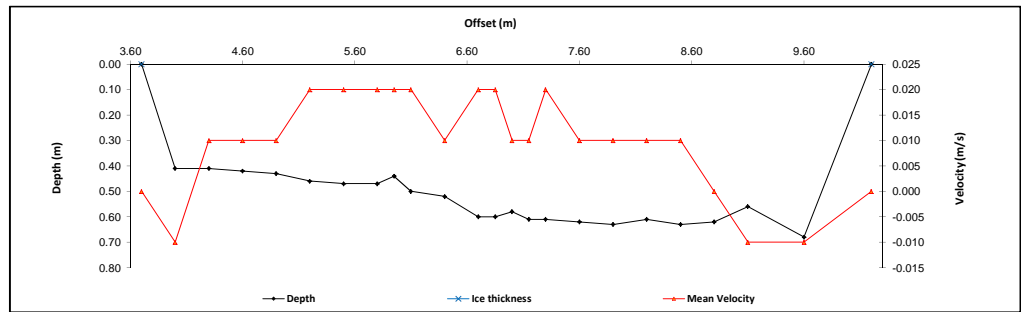
Total Flow:	0.026	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.29	(m <sup>2</sup> )
Wetted Width:	6.50	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.00	

**Logger Details:**

	Before	After
Battery Serial #:	0.408	0.420
Water (°C):	17.2	17.4
Datalogger Clock:	11:16	11:55
Laptop Clock:	11:15	11:53
Battery:	12.5	12.5
Battery Condition:	Good	
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S20A-01	0.833	331.738		330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.838	330.900	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.920	330.818	330.820	3/4" Pipe 4m West of logger
Water Level:	Cut	0.416	3.214	328.940	Time WL Surveyed:	11:22
Temporary BM			3.214	328.524	0.000	-
<b>Turn</b>						
Temporary BM	3.187	331.711		328.524		
Water Level:	Cut	0.416	3.187	328.940	Time WL Surveyed:	11:23
S20A-03			0.889	330.822	330.820	3/4" Pipe 4m West of logger
S20A-02			0.807	330.904	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.804	330.907	330.905	3/4" Pipe 2m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S20A-01	0.803	331.709		330.906		
Water Level:	Cut	0.481	3.234	328.956	Time WL Surveyed:	11:58
Water Level:	Cut	0.481	3.215	328.954	Time WL Surveyed:	11:59
S20A-01	0.782	331.688		330.906		

**WL Survey Summary**

	Before	After
Average WL:	328.940	328.955
Closing Error:	-0.002	-
WL Check:	0.000	0.002
Transducer Elevation	328.532	328.535

**Field Personnel:**

TR, MP	Trip Date:	11-Aug-14
TR	Date:	11-Aug-14
GG	Date:	24-Nov-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland  
 UTM Location: 492230 E, 6354940 N

Site Visit Date: September 20, 2014  
 Site Visit Time (MST): 09:20



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.90	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.20	0.31		0.19	0.010					1.00	0.35	0.31	0.010	0.11	0.001	3%
2	2.60	0.39		0.23	0.007					1.00	0.40	0.39	0.007	0.16	0.001	3%
3	3.00	0.34		0.20	0.007					1.00	0.40	0.34	0.007	0.14	0.001	3%
4	3.40	0.42		0.25	0.011					1.00	0.40	0.42	0.011	0.17	0.002	5%
5	3.80	0.40		0.24	0.018					1.00	0.40	0.40	0.018	0.16	0.003	8%
6	4.20	0.40		0.24	0.021					1.00	0.30	0.40	0.021	0.12	0.003	7%
7	4.40	0.42		0.25	0.013					1.00	0.20	0.42	0.013	0.08	0.001	3%
8	4.60	0.38		0.23	0.021					1.00	0.20	0.38	0.021	0.08	0.002	4%
9	4.80	0.42		0.25	0.019					1.00	0.20	0.42	0.019	0.08	0.002	4%
10	5.00	0.44		0.26	0.019					1.00	0.20	0.44	0.019	0.09	0.002	4%
11	5.20	0.44		0.26	0.020					1.00	0.20	0.44	0.020	0.09	0.002	5%
12	5.40	0.44		0.26	0.015					1.00	0.30	0.44	0.015	0.13	0.002	5%
13	5.80	0.36		0.22	0.021					1.00	0.40	0.36	0.021	0.14	0.003	8%
14	6.20	0.46		0.28	0.018					1.00	0.40	0.46	0.018	0.18	0.003	9%
15	6.60	0.45		0.27	0.017					1.00	0.40	0.45	0.017	0.18	0.003	8%
16	7.00	0.42		0.25	0.012					1.00	0.40	0.42	0.012	0.17	0.002	5%
17	7.40	0.41		0.25	0.008					1.00	0.40	0.41	0.008	0.16	0.001	4%
18	7.80	0.43		0.26	0.013					1.00	0.40	0.43	0.013	0.17	0.002	6%
19	8.20	0.34		0.20	0.009					1.00	0.40	0.34	0.009	0.14	0.001	3%
20	8.60	0.26		0.16	0.008					1.00	0.45	0.26	0.008	0.12	0.001	3%
LB	9.10	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.037</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -10m ds of station

Meas. Start Time (MST):	9:37
Meas. End Time (MST):	9:58
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 16C

**Flow characteristics:**

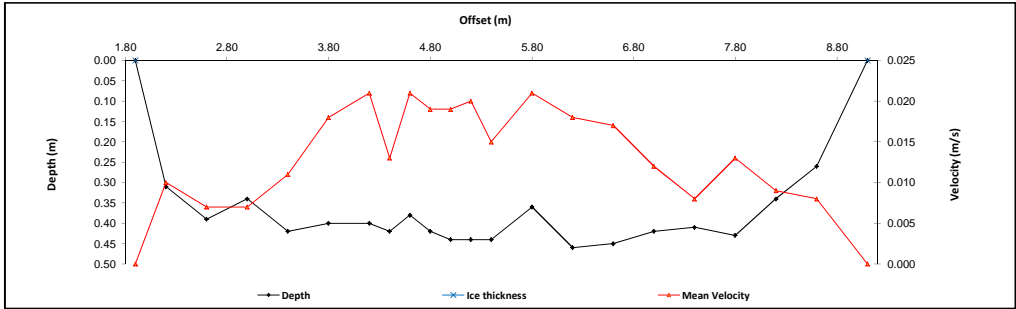
Total Flow:	0.037	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.67	(m <sup>2</sup> )
Wetted Width:	7.20	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.405	0.408
Water (°C):	10.9	11.0
Datalogger Clock:	09:23	10:01
Laptop Clock:	09:21	09:59
Battery:	12.5	12.5
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S20A-01	0.848	331.753		330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.851	330.902	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.933	330.820	330.820	3/4" Pipe 4m West of logger
Water Level:	Cut		2.805	328.948	<b>Time WL Surveyed:</b>	9:28
Temporary BM			0.653	331.100	0.000	-
<b>Turn</b>						
Temporary BM	0.636	331.736		331.100	-	
Water Level:	Cut		2.792	328.944	<b>Time WL Surveyed:</b>	9:29
S20A-03			0.917	330.819	330.820	3/4" Pipe 4m West of logger
S20A-02			0.836	330.900	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.833	330.903	330.905	3/4" Pipe 2m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S20A-01	0.833	331.737		330.904		
Water Level:	Cut		2.789	328.948	<b>Time WL Surveyed:</b>	10:02
Water Level:	Cut		2.782	328.945	<b>Time WL Surveyed:</b>	10:04
S20A-01	0.823	331.727		330.904		

**WL Survey Summary**

	Before	After
Average WL:	328.946	328.947
Closing Error:	0.002	-
WL Check:	0.004	0.003
Transducer Elevation	328.541	328.539

<b>Field Personnel:</b>	MP, SM	<b>Trip Date:</b>	20-Sep-14
<b>Data Entry Personnel:</b>	MP, SM	<b>Date:</b>	20-Sep-14
<b>Data Check Personnel:</b>	GG	<b>Date:</b>	24-Nov-14
<b>Entered Digitally in the Field:</b>	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S20A Muskeg River Upland  
 UTM Location: 492230 E, 6354940 N

Site Visit Date: October 21, 2014  
 Site Visit Time (MST): 09:45

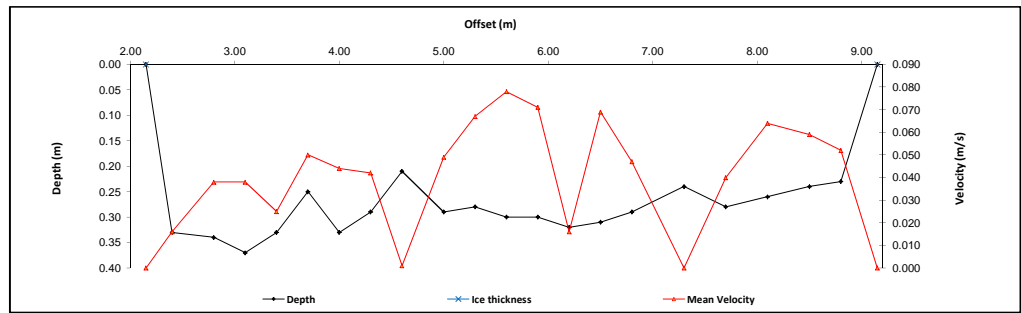


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.15	0.00	0.00		0.000				0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	2.40	0.33		0.20	0.016					1.00	0.33	0.33	0.016	0.11	0.002	2%
2	2.80	0.34		0.20	0.038					1.00	0.35	0.34	0.038	0.12	0.005	6%
3	3.10	0.37		0.22	0.038					1.00	0.30	0.37	0.038	0.11	0.004	5%
4	3.40	0.33		0.20	0.025					1.00	0.30	0.33	0.025	0.10	0.002	3%
5	3.70	0.25		0.15	0.050					1.00	0.30	0.25	0.050	0.08	0.004	5%
6	4.00	0.33		0.20	0.044					1.00	0.30	0.33	0.044	0.10	0.004	5%
7	4.30	0.29		0.17	0.042					1.00	0.30	0.29	0.042	0.09	0.004	4%
8	4.60	0.21		0.13	0.001					1.00	0.35	0.21	0.001	0.07	0.000	0%
9	5.00	0.29		0.17	0.049					1.00	0.35	0.29	0.049	0.10	0.005	6%
10	5.30	0.28		0.17	0.067					1.00	0.30	0.28	0.067	0.08	0.006	7%
11	5.60	0.30		0.18	0.078					1.00	0.30	0.30	0.078	0.09	0.007	9%
12	5.90	0.30		0.18	0.071					1.00	0.30	0.30	0.071	0.09	0.006	8%
13	6.20	0.32		0.19	0.016					1.00	0.30	0.32	0.016	0.10	0.002	2%
14	6.50	0.31		0.19	0.069					1.00	0.30	0.31	0.069	0.09	0.006	8%
15	6.80	0.29		0.17	0.047					1.00	0.40	0.29	0.047	0.12	0.005	7%
16	7.30	0.24		0.14	0.000					1.00	0.45	0.24	0.000	0.11	0.000	0%
17	7.70	0.28		0.17	0.040					1.00	0.40	0.28	0.040	0.11	0.004	5%
18	8.10	0.26		0.16	0.064					1.00	0.40	0.26	0.064	0.10	0.007	8%
19	8.50	0.24		0.14	0.059					1.00	0.35	0.24	0.059	0.08	0.005	6%
20	8.80	0.23		0.14	0.052					1.00	0.33	0.23	0.052	0.07	0.004	5%
RB	9.15	0.00	0.00		0.00		0.00		0.00	1.00	0.18	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.082</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -10m DS of PT

Meas. Start Time (MST):	10:05
Meas. End Time (MST):	10:35
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze, 10C



**Flow characteristics:**

Total Flow:	0.082	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.92	(m <sup>2</sup> )
Wetted Width:	7.00	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.431	0.429
Water (°C):	6.4	6.4
Datalogger Clock:	09:47	10:43
Laptop Clock:	09:45	10:42
Battery:	12.2	13.1
Battery Condition:	Replaced	
Battery Serial #:	FD120614	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Replaced	
PTA (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Installed vent on the enclosure

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S20A-01	0.864	331.769		330.905	330.905	3/4" Pipe 2m NE of logger
S20A-02			0.868	330.901	330.902	3/4" Pipe 2m NW of logger
S20A-03			0.950	330.819	330.820	3/4" Pipe 4m West of logger
Water Level:	Cut		2.799	328.970	Time WL Surveyed: 10:00	
S20A-03			0.950	330.819	330.820	3/4" Pipe 4m West of logger
<b>Turn</b>						
S20A-03	0.933	331.752		330.819	330.820	3/4" Pipe 4m West of logger
Water Level:	Cut		2.781	328.971	Time WL Surveyed: 10:02	
S20A-03			0.933	330.819	330.820	3/4" Pipe 4m West of logger
S20A-02			0.851	330.901	330.902	3/4" Pipe 2m NW of logger
S20A-01			0.847	330.905	330.905	3/4" Pipe 2m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S20A-01	0.847	331.752		330.905		
Water Level:	Cut		2.781	328.971	Time WL Surveyed: 10:39	
Water Level:	Cut		2.761	328.972	Time WL Surveyed: 10:40	
S20A-01	0.828	331.733		330.905		

**WL Survey Summary**

	Before	After
Average WL:	328.971	328.972
Closing Error:	0.000	-
WL Check:	0.001	-0.001
Transducer Elevation	328.540	328.543

**Field Personnel:**

TR, GG	Trip Date:	21-Oct-14
Data Entry Personnel: TR	Date:	21-Oct-14
Data Check Personnel: GG	Date:	20-Nov-14
Entered Digitally in the Field: Yes		

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: January 15, 2014  
 Site Visit Time (MST): 10:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
43	3.40	0.00	0.00		0.000				0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	4.00	0.17	0.11	0.14	0.003				0.88	0.50	0.06	0.003	0.03	0.000	0%	
2	4.40	0.35	0.09	0.22	0.027				0.88	0.35	0.26	0.024	0.09	0.002	1%	
3	4.70	0.34	0.04	0.19	-0.002				0.88	0.35	0.30	-0.002	0.11	0.000	0%	
4	5.10	0.43	0.01	0.22	0.115				0.88	0.32	0.42	0.101	0.14	0.014	10%	
5	5.35	0.47	0.00	0.24	0.183				1.00	0.18	0.47	0.183	0.08	0.015	10%	
6	5.45	0.51	0.00	0.26	0.192				1.00	0.13	0.51	0.192	0.06	0.012	8%	
7	5.60	0.51	0.00	0.26	0.179				1.00	0.13	0.51	0.179	0.06	0.011	8%	
8	5.70	0.52	0.00	0.26	0.132				1.00	0.15	0.52	0.132	0.08	0.010	7%	
9	5.90	0.54	0.00	0.27	0.129				1.00	0.20	0.54	0.129	0.11	0.014	10%	
10	6.10	0.55	0.00	0.28	0.182				1.00	0.15	0.55	0.182	0.08	0.015	10%	
11	6.20	0.41	0.00	0.21	0.137				1.00	0.10	0.41	0.137	0.04	0.006	4%	
12	6.30	0.37	0.00	0.19	0.056				1.00	0.25	0.37	0.056	0.09	0.005	4%	
13	6.70	0.48	0.12	0.30	0.084				0.88	0.33	0.36	0.074	0.12	0.009	6%	
14	6.95	0.24	0.18	0.21	0.104				0.88	0.27	0.06	0.092	0.02	0.002	1%	
15	7.25	0.31	0.09	0.20	0.180				0.88	0.38	0.22	0.158	0.08	0.013	9%	
16	7.70	0.22	0.13	0.18	0.003				0.88	0.40	0.09	0.003	0.04	0.000	0%	
17	8.05	0.20	0.13	0.17	0.001				0.88	0.38	0.07	0.001	0.03	0.000	0%	
18	8.45	0.18	0.01	0.10	0.000				0.88	0.35	0.17	0.000	0.06	0.000	0%	
19	8.75	0.20	0.00	0.10	0.030				0.88	0.38	0.20	0.026	0.08	0.002	1%	
20	9.20	0.21	0.00	0.11	0.188				0.88	0.35	0.21	0.165	0.07	0.012	8%	
21	9.45	0.21	0.09	0.15	0.001				0.88	0.23	0.12	0.001	0.03	0.000	0%	
22	9.65	0.20	0.10	0.15	0.123				0.88	0.27	0.10	0.108	0.03	0.003	2%	
RB	10.00	0.00	0.00		0.00		0.00		0.88	0.18	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.145</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -approx. 50m downstream of station

Mess. Start Time (MST):	13:15
Mess. End Time (MST):	13:45
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -2C

**Flow characteristics:**

Total Flow:	0.145	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.52	(m <sup>2</sup> )
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.06	

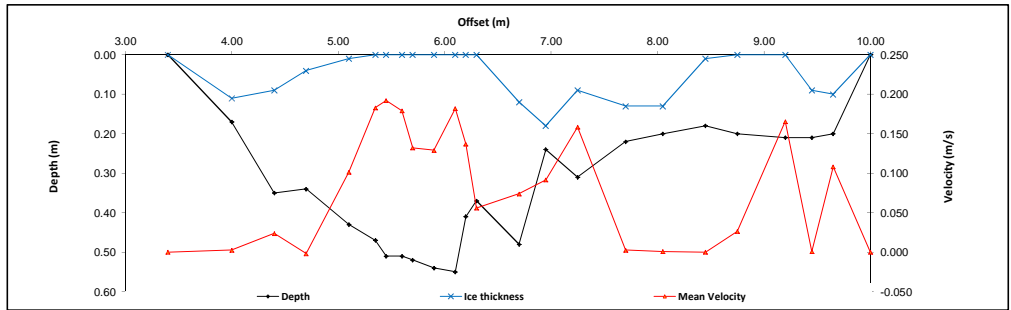
**Logger Details:**

	Before	After
Transducer Reading (m):	0.918	0.915
Water (°C):	0.3	0.3
Datalogger Clock:	10:03	13:53
Laptop Clock:	10:03	13:53
Battery (Main):	12.3	13.0
Battery:	-	Replaced
Battery Serial #:	-	Replaced
Enclosure Deseccant:	-	Good
Vent Tube Deseccant:	-	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-From offsets 5.35 to 6.4, there was an air gap between the ice surface and the water surface (i.e. no top confining layer - velocity correction factor adjusted to 1.0 for these panels)

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	0.734	306.812		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.123	305.689	305.686	Pipe 5m SW of Logger
S22-03			1.229	305.583	305.595	Pipe 3m W of Logger
Water Level:	Cut		3.534	303.278	Time WL Surveyed: 13:06	
Temporary BM			3.543	303.269	0.000	-
<b>Turn</b>						
Temporary BM	3.534	306.803		303.269	-	
Water Level:	Cut		3.527	303.276	Time WL Surveyed: 13:09	
S22-03			1.219	305.584	305.595	Pipe 3m W of Logger
S22-04			1.112	305.691	305.686	Pipe 5m SW of Logger
S22-05			0.725	306.078	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S22-4	1.113	306.803		305.690		
Water Level:	Cut		3.528	303.275	Time WL Surveyed:	
Water Level:	Cut		3.522	303.275	Time WL Surveyed:	
S22-4	1.107	306.797		305.690		

**WL Survey Summary**

	Before	After
Average WL:	303.277	303.275
Closing Error:	0.000	-
WL Check:	0.002	0.000
Transducer Elevation	302.359	302.360

**Field Personnel:**

	DW, TR	Trip Date:	15-Jan-14
Data Entry Personnel:	DW	Date:	15-Jan-14
Data Check Personnel:	MY	Date:	1-Feb-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

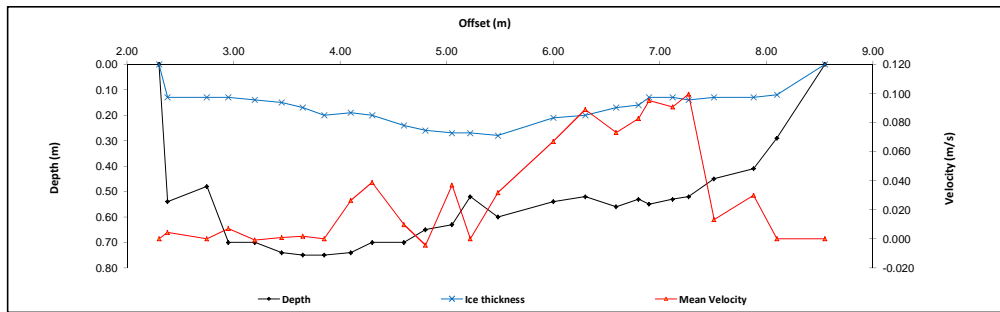
Site Visit Date: February 2, 2014  
 Site Visit Time (MST): 10:45



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.30	0.00	0.00		0.000		0.000		0.000	0.88	0.04	0.00	0.000	0.00	0.000	
1	2.38	0.54	0.13	0.34	0.005					0.88	0.23	0.41	0.004	0.09	0.000	1%
2	2.75	0.48	0.13	0.31	0.000					0.88	0.29	0.35	0.000	0.10	0.000	0%
3	2.95	0.70	0.13	0.42	0.008					0.88	0.23	0.57	0.007	0.13	0.001	1%
4	3.20	0.70	0.14	0.42	-0.001					0.88	0.25	0.56	-0.001	0.14	0.000	0%
5	3.45	0.74	0.15	0.45	0.001					0.88	0.23	0.59	0.001	0.13	0.000	0%
6	3.65	0.75	0.17	0.46	0.002					0.88	0.20	0.58	0.002	0.12	0.000	0%
7	3.85	0.75	0.20	0.48	0.000					0.88	0.23	0.55	0.000	0.12	0.000	0%
8	4.10	0.74	0.19	0.47	0.030					0.88	0.23	0.55	0.026	0.12	0.003	5%
9	4.30	0.70	0.20	0.45	0.044					0.88	0.25	0.50	0.039	0.13	0.005	7%
10	4.60	0.70	0.24	0.47	0.011					0.88	0.25	0.46	0.010	0.12	0.001	2%
11	4.80	0.65	0.26	0.46	-0.005					0.88	0.23	0.39	-0.004	0.09	0.000	-1%
12	5.05	0.63	0.27	0.45	0.042					0.88	0.21	0.36	0.037	0.08	0.003	4%
13	5.22	0.52	0.27	0.40	0.000					0.88	0.22	0.25	0.000	0.05	0.000	0%
14	5.48	0.60	0.28	0.44	0.036					0.88	0.39	0.32	0.032	0.12	0.004	6%
15	6.00	0.54	0.21	0.38	0.076					0.88	0.41	0.33	0.067	0.14	0.009	13%
16	6.30	0.52	0.20	0.36	0.101					0.88	0.30	0.32	0.089	0.09	0.008	12%
17	6.59	0.56	0.17	0.37	0.083					0.88	0.25	0.39	0.073	0.10	0.007	10%
18	6.80	0.53	0.16	0.35	0.094					0.88	0.15	0.37	0.083	0.06	0.005	7%
19	6.90	0.55	0.13	0.34	0.108					0.88	0.16	0.42	0.095	0.07	0.006	9%
20	7.12	0.53	0.13	0.33	0.103					0.88	0.19	0.40	0.091	0.07	0.007	10%
21	7.27	0.52	0.14	0.33	0.113					0.88	0.19	0.38	0.099	0.07	0.007	10%
22	7.51	0.45	0.13	0.29	0.015					0.88	0.31	0.32	0.013	0.10	0.001	2%
23	7.88	0.41	0.13	0.27	0.034					0.88	0.30	0.28	0.030	0.08	0.002	4%
24	8.10	0.29	0.12	0.21	0.000					0.88	0.33	0.17	0.000	0.06	0.000	0%
LB	8.55	0.00	0.00		0.00		0.00		0.00	0.88	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.0706</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 -approx. 50m downstream of station

Meas. Start Time (MST):	12:07
Meas. End Time (MST):	12:55
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, calm



**Flow characteristics:**

Total Flow:	0.071	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.38	(m <sup>2</sup> )
Wetted Width:	6.25	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.884	0.883
Water (°C):	0.3	0.3
Datalogger Clock:	10:55	13:08
Laptop Clock:	10:55	13:08
Battery (Main):	13.6	0.6
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	0.669	306.747		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.057	305.690	305.686	Pipe 5m SW of Logger
S22-03			1.167	305.580	305.595	Pipe 3m W of Logger
Water Level:	<b>Cut</b>		3.511	303.236		<b>Time WL Surveyed: 11:51</b>
Temporary BM			3.489	303.258	0.000	-
<b>Turn</b>						
Temporary BM	3.510	306.768		303.258	-	
Water Level:	<b>Cut</b>		3.526	303.242		<b>Time WL Surveyed: 11:49</b>
S22-03			1.184	305.584	305.595	Pipe 3m W of Logger
S22-04			1.074	305.694	305.686	Pipe 5m SW of Logger
S22-05			0.687	306.081	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S22-4	1.058	306.748		305.690		
Water Level:	<b>Cut</b>		3.509	303.239		<b>Time WL Surveyed: 13:05</b>
Water Level:	<b>Cut</b>		3.491	303.239		<b>Time WL Surveyed: 13:07</b>
S22-4	1.040	306.730		305.690		

**WL Survey Summary**

	Before	After
Average WL:	303.239	303.239
Closing Error:	-0.003	-
WL Check:	0.006	0.000
Transducer Elevation	302.355	302.356

**Field Personnel:**

	SM, RM, MP	Trip Date:	2-Feb-14
Data Entry Personnel:	SM	Date:	2-Feb-14
Data Check Personnel:	CJ	Date:	14-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: March 3, 2014  
 Site Visit Time (MST): 09:40

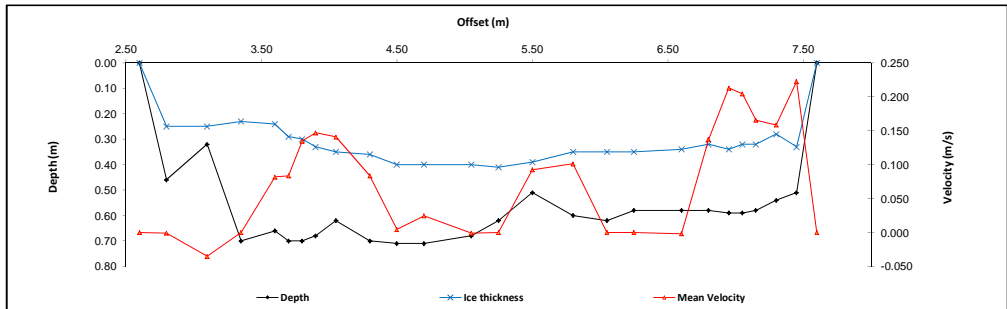


Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	2.60	0.00	0.00		0.000				0.000	0.88	0.10	0.00	0.000	0.00	0.000	
1	2.80	0.46	0.25	0.36	-0.001					0.88	0.25	0.21	-0.001	0.05	-0.000	0%
2	3.10	0.32	0.25	0.29	-0.040					0.88	0.28	0.07	-0.035	0.02	-0.001	-1%
3	3.35	0.70	0.23	0.47	0.000					0.88	0.25	0.47	0.000	0.12	0.000	0%
4	3.60	0.66	0.24	0.45	0.093					0.88	0.18	0.42	0.082	0.07	0.006	7%
5	3.70	0.70	0.29	0.50	0.095					0.88	0.10	0.41	0.084	0.04	0.003	4%
6	3.80	0.70	0.30	0.50	0.153					0.88	0.10	0.40	0.135	0.04	0.005	7%
7	3.90	0.68	0.33	0.51	0.167					0.88	0.13	0.35	0.147	0.04	0.006	8%
8	4.05	0.62	0.35	0.49	0.160					0.88	0.20	0.27	0.141	0.05	0.008	9%
9	4.30	0.70	0.36	0.53	0.095					0.88	0.23	0.34	0.084	0.08	0.006	8%
10	4.50	0.71	0.40	0.56	0.005					0.88	0.20	0.31	0.004	0.06	0.000	0%
11	4.70	0.71	0.40	0.56	0.028					0.88	0.28	0.31	0.025	0.09	0.002	3%
12	5.05	0.68	0.40	0.54	-0.001					0.88	0.28	0.28	-0.001	0.08	0.000	0%
13	5.25	0.62	0.41	0.52	0.000					0.88	0.23	0.21	0.000	0.05	0.000	0%
14	5.50	0.51	0.39	0.45	0.105					0.88	0.28	0.12	0.092	0.03	0.003	4%
15	5.80	0.60	0.35	0.48	0.115					0.88	0.27	0.25	0.101	0.07	0.003	8%
16	6.05	0.62	0.35	0.49	0.000					0.88	0.23	0.27	0.000	0.06	0.000	0%
17	6.25	0.58	0.35	0.47	0.000					0.88	0.27	0.23	0.000	0.06	0.000	0%
18	6.60	0.58	0.34	0.46	-0.002					0.88	0.27	0.24	-0.002	0.07	0.000	0%
19	6.80	0.58	0.32	0.45	0.156					0.88	0.18	0.26	0.137	0.05	0.006	8%
20	6.95	0.59	0.34	0.47	0.242					0.88	0.13	0.25	0.213	0.03	0.007	8%
21	7.05	0.59	0.32	0.46	0.232					0.88	0.10	0.27	0.204	0.03	0.006	7%
22	7.15	0.58	0.32	0.45	0.188					0.88	0.13	0.26	0.165	0.03	0.005	7%
23	7.30	0.54	0.28	0.41	0.180					0.88	0.15	0.26	0.158	0.04	0.006	7%
24	7.45	0.51	0.33	0.42	0.253					0.88	0.15	0.18	0.223	0.03	0.006	7%
LB	7.60	0.00	0.00		0.00		0.00		0.00	0.88	0.07	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.083</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
50m DS of station

Meas. Start Time (MST):	10:10
Meas. End Time (MST):	10:59
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -30 C



**Flow characteristics:**

Total Flow:	0.083	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.28	(m²)
Wetted Width:	5.00	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.905	
Water (°C):	0.3	
Datalogger Clock:	09:47	
Laptop Clock:	09:47	
Battery (Main):	15.7	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-slush present under the ice surface, may have affected flow measurement

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	0.731	306.809		306.078	306.078	Pipe 1m SE of Logger
S22-03			1.226	305.583	305.595	Pipe 3m W of Logger
S22-04			1.112	305.697	305.686	Pipe 5m SW of Logger
Water Level:	Cut		3.583	303.246	Time WL Surveyed:	11:16
Temporary BM			3.607	303.202	0.000	-
<b>Turn</b>						
Temporary BM	3.589	306.791		303.202	-	-
Water Level:	Cut		3.547	303.244	Time WL Surveyed:	11:20
S22-04			1.093	305.698	305.686	Pipe 5m SW of Logger
S22-03			1.207	305.584	305.595	Pipe 3m W of Logger
S22-05			0.712	306.079	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	303.245	-
Closing Error:	-0.001	-
WL Check:	0.002	-
Transducer Elevation	302.340	-

**Field Personnel:**

	SM, MP	Trip Date:	3-Mar-14
Data Entry Personnel:	SM	Date:	3-Mar-14
Data Check Personnel:	CJ	Date:	14-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: April 2, 2014  
 Site Visit Time (MST): 08:40

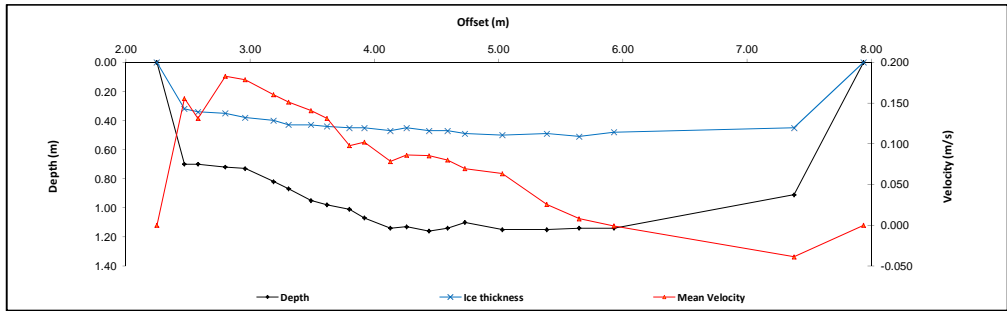


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.25	0.00	0.00		0.000				0.000	0.88	0.11	0.00	0.000	0.00	0.000	
1	2.47	0.70	0.32	0.51	0.177					0.88	0.17	0.38	0.156	0.06	0.010	6%
2	2.58	0.70	0.34	0.52	0.149					0.88	0.17	0.36	0.131	0.06	0.008	5%
3	2.80	0.72	0.35	0.54	0.208					0.88	0.19	0.37	0.183	0.07	0.013	8%
4	2.96	0.73	0.38	0.56	0.203					0.88	0.20	0.35	0.179	0.07	0.012	8%
5	3.19	0.82	0.40	0.61	0.182					0.88	0.18	0.42	0.160	0.07	0.012	8%
6	3.31	0.87	0.43	0.65	0.172					0.88	0.15	0.44	0.151	0.07	0.010	7%
7	3.49	0.95	0.43	0.69	0.160					0.88	0.16	0.52	0.141	0.08	0.011	7%
8	3.62	0.98	0.44	0.71	0.149					0.88	0.16	0.54	0.131	0.08	0.011	7%
9	3.80	1.01	0.45	0.73	0.111					0.88	0.15	0.56	0.098	0.08	0.008	5%
10	3.92	1.07	0.45	0.76	0.116					0.88	0.17	0.62	0.102	0.10	0.010	7%
11	4.13	1.14	0.47	0.81	0.089					0.88	0.17	0.67	0.078	0.11	0.009	6%
12	4.26	1.13	0.45	0.79	0.098					0.88	0.15	0.68	0.086	0.11	0.009	6%
13	4.44	1.16	0.47	0.82	0.097					0.88	0.17	0.69	0.085	0.11	0.010	6%
14	4.59	1.14	0.47	0.81	0.091					0.88	0.15	0.67	0.080	0.10	0.008	5%
15	4.73	1.10	0.49	0.80	0.079					0.88	0.22	0.61	0.070	0.13	0.009	6%
16	5.03	1.15	0.50	0.83	0.072					0.88	0.33	0.65	0.063	0.21	0.014	9%
17	5.39	1.15	0.49	0.82	0.029					0.88	0.31	0.66	0.026	0.20	0.005	3%
18	5.65	1.14	0.51	0.83	0.009					0.88	0.27	0.63	0.008	0.17	0.001	1%
19	5.93	1.14	0.48	0.81	-0.001					0.88	0.86	0.66	-0.001	0.57	-0.001	0%
20	7.38	0.91	0.45	0.68	-0.044					0.88	1.01	0.46	-0.039	0.46	-0.018	-12%
LB	7.94	0.00	0.00		0.00		0.00		0.000	0.88	0.28	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.152</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 50m DS of station

Meas. Start Time (MST):	9:41
Meas. End Time (MST):	10:20
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, overflow ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast



**Flow characteristics:**

Total Flow:	0.152	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.94	(m <sup>2</sup> )
Wetted Width:	5.69	(m)
Hydraulic Depth:	0.52	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.166	
Water (°C):	0.3	
Datalogger Clock:	08:46	
Laptop Clock:	08:46	
Battery (Main):	15.2	
Battery:	Good	
Battery Serial #:	-	
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-frozen to depth at upstream location, moved measurement downstream, 10m from first (December 2013) holes

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	1.841	307.919		306.078	306.078	Pipe 1m SE of Logger
S22-03			2.331	305.588	305.595	Pipe 3m W of Logger
S22-04			2.220	305.699	305.686	Pipe 5m SW of Logger
Water Level:	Cut		4.422	303.497	Time WL Surveyed: 9:39	
Temporary BM			4.417	303.502	0.000	-
<b>Turn</b>						
Temporary BM	4.406	307.908		303.502	-	
Water Level:	Cut		4.410	303.498	Time WL Surveyed: 9:42	
S22-04			2.213	305.695	305.686	Pipe 5m SW of Logger
S22-03			2.323	305.585	305.595	Pipe 3m W of Logger
S22-05			1.831	306.077	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	303.498	-
Closing Error:	0.001	-
WL Check:	0.001	-
Transducer Elevation	302.332	-

**Field Personnel:**

	CJ, MP	Trip Date:	2-Apr-14
Data Entry Personnel:	CJ, MP	Date:	2-Apr-14
Data Check Personnel:	CJ	Date:	24-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: May 1, 2014  
 Site Visit Time (MST): 13:05



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	19.60	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	19.30	0.17		0.10	0.347					1.00	0.30	0.17	0.347	0.05	0.018	1%
2	19.00	0.18		0.11	0.942					1.00	0.30	0.18	0.942	0.05	0.051	3%
3	18.70	0.25		0.15	1.243					1.00	0.30	0.25	1.243	0.08	0.083	5%
4	18.40	0.28		0.17	1.198					1.00	0.30	0.28	1.198	0.08	0.101	5%
5	18.10	0.37		0.22	1.113					1.00	0.30	0.37	1.113	0.11	0.124	6%
6	17.80	0.42		0.25	1.534					1.00	0.30	0.42	1.534	0.13	0.193	10%
7	17.50	0.44		0.26	1.447					1.00	0.30	0.44	1.447	0.13	0.191	10%
8	17.20	0.58		0.35	0.547					1.00	0.30	0.58	0.547	0.17	0.095	5%
9	16.90	0.56		0.34	1.117					1.00	0.30	0.56	1.117	0.17	0.188	9%
10	16.60	0.56		0.34	0.919					1.00	0.30	0.56	0.919	0.17	0.154	8%
11	16.30	0.56		0.34	0.904					1.00	0.30	0.56	0.904	0.17	0.152	8%
12	16.00	0.54		0.32	0.732					1.00	0.30	0.54	0.732	0.16	0.119	6%
13	15.70	0.50		0.30	0.788					1.00	0.30	0.50	0.788	0.15	0.118	6%
14	15.40	0.49		0.29	0.671					1.00	0.30	0.49	0.671	0.15	0.099	5%
15	15.10	0.49		0.29	0.506					1.00	0.30	0.49	0.506	0.15	0.074	4%
16	14.80	0.46		0.28	0.618					1.00	0.30	0.46	0.618	0.14	0.085	4%
17	14.50	0.40		0.24	0.507					1.00	0.30	0.40	0.507	0.12	0.061	3%
18	14.20	0.35		0.21	0.325					1.00	0.30	0.35	0.325	0.11	0.034	2%
19	13.90	0.32		0.19	0.236					1.00	0.30	0.32	0.236	0.10	0.023	1%
20	13.60	0.32		0.19	0.219					1.00	0.30	0.32	0.219	0.10	0.021	1%
LB	13.30	0.00	0.00		0.00				0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.99</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -Across from station

Meas. Start Time (MST):	13:52
Meas. End Time (MST):	13:58
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, windy, 12C

**Flow characteristics:**

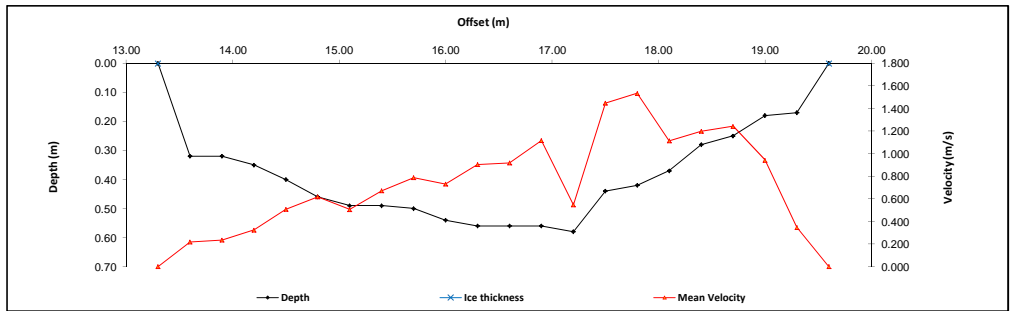
Total Flow:	1.99	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.47	(m <sup>2</sup> )
Wetted Width:	6.30	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.81	(m/s)
Froude Number:	0.41	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.339	1.343
Water (°C):	4.5	5.0
Datalogger Clock:	13:10	14:09
Laptop Clock:	13:10	14:08
Battery (Main):	14.1	14.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	0.509	306.587		306.078	306.078	Pipe 1m SE of Logger
S22-04			0.889	305.698	305.686	Pipe 5m SW of Logger
S22-03			1.003	305.584	305.595	Pipe 3m W of Logger
Water Level:	Cut		2.907	303.680		Time WL Surveyed: 13:17
Temporary BM			1.949	304.638	0.000	
<b>Turn</b>						
Temporary BM	1.918	306.556		304.638		
Water Level:	Cut		2.875	303.681		Time WL Surveyed: 13:20
S22-03			0.972	305.584	305.595	Pipe 3m W of Logger
S22-04			0.859	305.697	305.686	Pipe 5m SW of Logger
S22-05			0.478	306.078	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S22-3	0.972	306.556		305.584		
Water Level:	Cut		2.877	303.679		Time WL Surveyed: 14:02
Water Level:	Cut		2.855	303.682		Time WL Surveyed: 14:04
S22-3	0.953	306.537		305.584		

**WL Survey Summary**

	Before	After
Average WL:	303.681	303.681
Closing Error:	0.000	-
WL Check:	0.001	-0.003
Transducer Elevation	302.342	302.338

**Field Personnel:**

TR, GG	Trip Date:	1-May-14
GG	Date:	1-May-14
SG	Date:	23-May-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: June 25, 2014  
 Site Visit Time (MST): 09:55

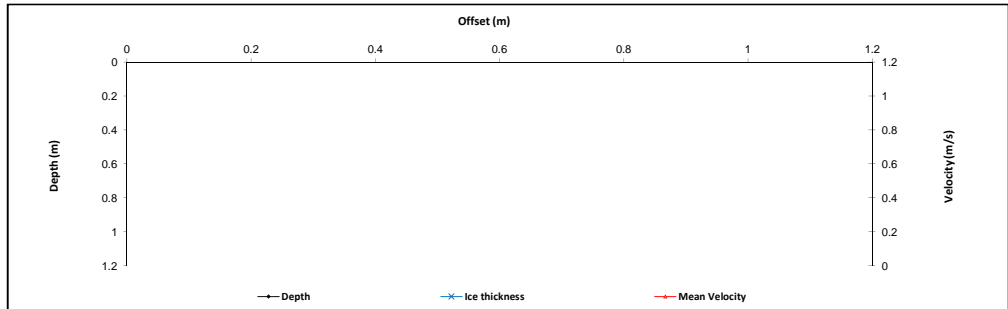


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
Flow Measurement Not Conducted																
															<b>Total Flow</b>	-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.934	
Water (°C):	16.7	
Datalogger Clock:	09:59	
Laptop Clock:	09:59	
Battery (Main):	13.9	
Battery:	Good	
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-Flow measurement was not conducted due to high flow and safety concerns. Velocities were 1.5 to 2.0 m/s with standing waves, see photos.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	0.510	306.588		306.078	306.078	Pipe 1m SE of Logger
S22-04			0.889	305.699	305.686	Pipe 5m SW of Logger
S22-03			1.003	305.585	305.595	Pipe 3m W of Logger
Water Level:	Cut		2.470	304.118	Time WL Surveyed: 10:08	
Temporary BM		1.996		304.592	0.000	
<b>Turn</b>						
Temporary BM	1.976	306.568		304.592		
Water Level:	Cut		2.447	304.121	Time WL Surveyed: 10:11	
S22-03			0.983	305.585	305.595	Pipe 3m W of Logger
S22-04			0.870	305.698	305.686	Pipe 5m SW of Logger
S22-05			0.491	306.077	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	304.120	-
Closing Error:	0.001	-
WL Check:	0.003	-
Transducer Elevation	302.186	-

**Field Personnel:**

Data Entry Personnel:	SM, GG	Trip Date:	25-Jun-14
Data Check Personnel:	SM	Date:	25-Jun-14
Entered Digitally in the Field:	CJ	Date:	16-Jul-14

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: August 7, 2014  
 Site Visit Time (MST): 11:45



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): -40m upstream of station, near bridge	
Meas. Start Time (MST):	12:57
Meas. End Time (MST):	13:34
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	-

<b>Flow characteristics:</b>		
Total Flow:	0.307	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	6.77	(m <sup>2</sup> )
Wetted Width:	7.36	(m)
Hydraulic Depth:	0.92	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	1.174	1.014
Water (°C):	19.1	20.8
Datalogger Clock:	11:48	13:59
Laptop Clock:	11:49	13:58
Battery (Main):	14.0	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	298682	346248
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 -Changed PT between first and second WL survey

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05		LB:	35.90	
Serial Number:	4712		Salinity (ppt):	-		RB:	29.60	
Firmware Version:	3.5		Magnetic Declination (°):	14.33				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	21.0				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	7.40	7.01	0.043	0.301	-1.87%
Coordinate System:	ENU		3	7.02	6.99	0.049	0.341	11.17%
Left Method:	Sloped Bank		4	8.42	7.46	0.040	0.296	-3.50%
Right Method:	Sloped Bank		2	6.60	5.61	0.051	0.289	-5.79%
Top Fit Type:	Power Fit							
Bottom Fit Type:	Power Fit		<b>Mean:</b>	7.36	6.77	0.046	<b>0.307</b>	
			<b>SD:</b>	0.67	0.69	0.004	0.020	
			<b>COV:</b>	0.09	0.10	0.097	0.066	

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>	S22-05	0.854	306.932		306.078	306.078	Pipe 1m SE of Logger
	S22-04			1.231	305.701	305.686	Pipe 5m SW of Logger
	S22-03			1.345	305.587	305.595	Pipe 3m W of Logger
	Water Level:	Cut	0.617	4.185	303.364	<b>Time WL Surveyed:</b>	12:10
	Temporary BM			4.185	302.747	0.000	-
<b>Turn</b>	Temporary BM	4.173	306.920		302.747		-
	Water Level:	Cut	0.617	4.173	303.364	<b>Time WL Surveyed:</b>	12:12
	S22-03			1.334	305.586	305.595	Pipe 3m W of Logger
	S22-04			1.220	305.700	305.686	Pipe 5m SW of Logger
	S22-05			0.843	306.077	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>	S22-03	1.334	306.920		305.586		
	Water Level:	Cut	0.555	4.114	303.361	<b>Time WL Surveyed:</b>	13:50
	Water Level:	Cut	0.555	4.102	303.360	<b>Time WL Surveyed:</b>	13:53
	S22-03	1.321	306.907		305.586		

<b>WL Survey Summary</b>	Before	After
Average WL:	303.364	303.361
Closing Error:	0.001	-
WL Check:	0.000	0.001
Transducer Elevation	302.190	302.347

<b>Field Personnel:</b>	TR, MP	Trip Date:	7-Aug-14
Data Entry Personnel:	TR	Date:	7-Aug-14
Data Check Personnel:	CJ	Date:	22-Aug-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: September 22, 2014  
 Site Visit Time (MST): 12:55



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.40	0.00	0.00		0.000				0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	5.30	0.14		0.08	-0.016					1.00	0.13	0.14	-0.016	0.02	0.000	0%
2	5.15	0.10		0.06	0.078					1.00	0.15	0.10	0.078	0.01	0.001	2%
3	5.00	0.06		0.04	0.356					1.00	0.15	0.06	0.356	0.01	0.003	4%
4	4.85	0.12		0.07	0.140					1.00	0.15	0.12	0.140	0.02	0.003	3%
5	4.70	0.14		0.08	0.430					1.00	0.12	0.14	0.430	0.02	0.007	9%
6	4.62	0.12		0.07	0.240					1.00	0.08	0.12	0.240	0.01	0.002	3%
7	4.55	0.13		0.08	0.359					1.00	0.11	0.13	0.359	0.01	0.005	7%
8	4.40	0.16		0.10	0.211					1.00	0.15	0.16	0.211	0.02	0.005	7%
9	4.25	0.18		0.11	0.165					1.00	0.15	0.18	0.165	0.03	0.004	6%
10	4.10	0.21		0.13	0.109					1.00	0.15	0.21	0.109	0.03	0.003	4%
11	3.95	0.20		0.12	0.137					1.00	0.15	0.20	0.137	0.03	0.004	5%
12	3.80	0.22		0.13	0.290					1.00	0.13	0.22	0.290	0.03	0.008	10%
13	3.70	0.21		0.13	0.509					1.00	0.08	0.21	0.509	0.02	0.008	10%
14	3.65	0.18		0.11	0.570					1.00	0.05	0.18	0.570	0.01	0.005	7%
15	3.60	0.17		0.10	0.638					1.00	0.05	0.17	0.638	0.01	0.005	7%
16	3.55	0.17		0.10	0.511					1.00	0.05	0.17	0.511	0.01	0.004	6%
17	3.50	0.16		0.10	-0.009					1.00	0.10	0.16	-0.009	0.02	0.000	0%
18	3.35	0.16		0.10	0.121					1.00	0.15	0.16	0.121	0.02	0.003	4%
19	3.20	0.12		0.07	0.188					1.00	0.15	0.12	0.188	0.02	0.003	4%
20	3.05	0.10		0.06	0.087					1.00	0.20	0.10	0.087	0.02	0.002	2%
RB	2.80	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.077</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -40m US of station, near bridge

Meas. Start Time (MST):	13:07
Meas. End Time (MST):	13:37
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze

**Flow characteristics:**

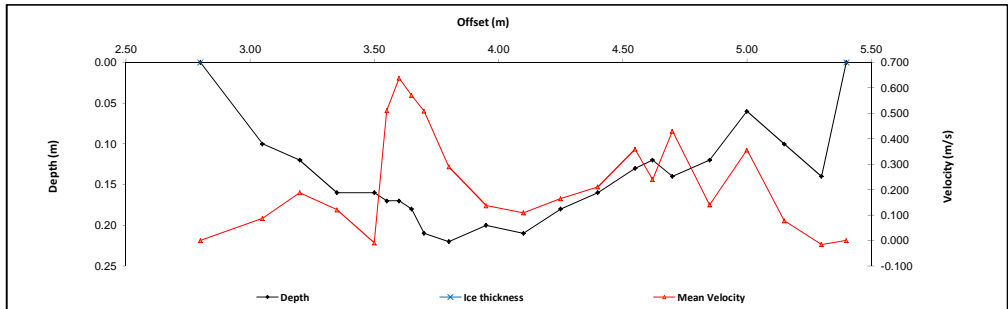
Total Flow:	0.077	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.36	(m <sup>2</sup> )
Wetted Width:	2.60	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.930	0.930
Water (°C):	12.4	12.4
Datalogger Clock:	13:05	13:43
Laptop Clock:	13:05	13:43
Battery (Main):	13.9	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	1.012	307.090		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.393	305.697	305.686	Pipe 5m SW of Logger
S22-03			1.506	305.584	305.595	Pipe 3m W of Logger
Water Level:	Cut	0.426	4.256	303.260	Time WL Surveyed: 13:13	
Temporary BM			4.256	302.834	0.000	
<b>Turn</b>						
Temporary BM	4.237	307.071		302.834		
Water Level:	Cut	0.426	4.237	303.260	Time WL Surveyed: 13:14	
S22-03			1.489	305.582	305.595	Pipe 3m W of Logger
S22-04			1.375	305.696	305.686	Pipe 5m SW of Logger
S22-05			0.995	306.076	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S22-03	1.489	307.072		305.583		
Water Level:	Cut	0.481	4.297	303.256	Time WL Surveyed: 13:40	
Water Level:	Cut	0.481	4.281	303.257	Time WL Surveyed: 13:41	
S22-03	1.474	307.057		305.583		

**WL Survey Summary**

	Before	After
Average WL:	303.260	303.257
Closing Error:	0.002	-
WL Check:	0.000	-0.001
Transducer Elevation	302.330	302.327

**Field Personnel:**

	SM, TR	Trip Date:	22-Sep-14
Data Entry Personnel:	SM	Date:	22-Sep-14
Data Check Personnel:	CJ	Date:	26-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: October 22, 2014  
 Site Visit Time (MST): 11:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.15	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	3.55	0.10		0.06	0.057					1.00	0.23	0.10	0.057	0.02	0.001	1%
2	3.60	0.10		0.06	0.062					1.00	0.15	0.10	0.062	0.02	0.001	0%
3	3.85	0.10		0.06	0.368					1.00	0.15	0.10	0.368	0.02	0.006	3%
4	3.90	0.12		0.07	0.125					1.00	0.10	0.12	0.125	0.01	0.001	1%
5	4.05	0.16		0.10	0.326					1.00	0.15	0.16	0.326	0.02	0.008	4%
6	4.20	0.12		0.07	0.350					1.00	0.15	0.12	0.350	0.02	0.006	3%
7	4.35	0.18		0.11	0.433					1.00	0.15	0.18	0.433	0.03	0.012	6%
8	4.50	0.18		0.11	0.729					1.00	0.15	0.18	0.729	0.03	0.020	10%
9	4.65	0.20		0.12	0.530					1.00	0.10	0.20	0.530	0.02	0.011	5%
10	4.70	0.21		0.13	0.593					1.00	0.07	0.21	0.593	0.02	0.009	5%
11	4.80	0.18		0.11	0.756					1.00	0.13	0.18	0.756	0.02	0.017	9%
12	4.95	0.22		0.13	0.491					1.00	0.15	0.22	0.491	0.03	0.016	8%
13	5.10	0.24		0.14	0.517					1.00	0.15	0.24	0.517	0.04	0.019	9%
14	5.25	0.23		0.14	0.080					1.00	0.15	0.23	0.080	0.03	0.003	1%
15	5.40	0.30		0.18	0.198					1.00	0.15	0.30	0.198	0.04	0.009	4%
16	5.55	0.23		0.14	0.121					1.00	0.15	0.23	0.121	0.03	0.004	2%
17	5.70	0.26		0.16	0.355					1.00	0.15	0.26	0.355	0.04	0.014	7%
18	5.85	0.12		0.07	0.516					1.00	0.15	0.12	0.516	0.02	0.009	5%
19	6.00	0.16		0.10	0.229					1.00	0.15	0.16	0.229	0.02	0.005	3%
20	6.15	0.18		0.11	0.481					1.00	0.15	0.18	0.481	0.03	0.013	7%
21	6.30	0.14		0.08	0.393					1.00	0.28	0.14	0.393	0.04	0.015	8%
RB	6.70	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.199</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): at station -40m US of station, near bridge

Mess. Start Time (MST):	12:00
Mess. End Time (MST):	12:28
Equipment:	ADV
Method:	Wading
River Condition:	Open, low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 12C

**Flow characteristics:**

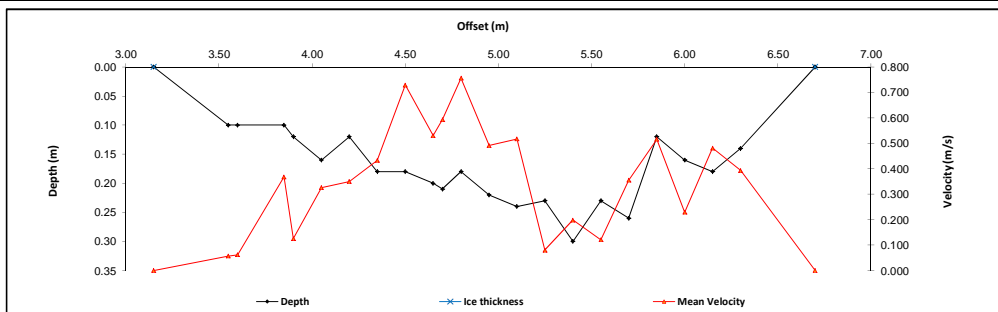
Total Flow:	0.199	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.55	(m <sup>2</sup> )
Wetted Width:	3.55	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.36	(m/s)
Froude Number:	0.30	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.997	0.997
Water (°C):	4.6	4.6
Datalogger Clock:	11:52	12:40
Laptop Clock:	11:52	12:40
Battery (Main):	14.5	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	1.008	307.086		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.390	305.696	305.686	Pipe 5m SW of Logger
S22-03			1.503	305.583	305.595	Pipe 3m W of Logger
Water Level:	Cut	0.661	4.417	303.330	Time WL Surveyed: 11:56	
Temporary BM			4.417	302.669	0.000	
<b>Turn</b>						
Temporary BM	4.391	307.060		302.669		
Water Level:	Cut	0.661	4.391	303.330	Time WL Surveyed: 11:59	
S22-03			1.477	305.583	305.595	Pipe 3m W of Logger
S22-04			1.364	305.696	305.686	Pipe 5m SW of Logger
S22-05			0.982	306.078	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S22-03	1.476	307.059		305.583		
Water Level:	Cut	0.555	4.287	303.327	Time WL Surveyed: 12:30	
Water Level:	Cut	0.555	4.307	303.326	Time WL Surveyed: 12:32	
S22-03	1.497	307.080		305.583		

**WL Survey Summary**

	Before	After
Average WL:	303.330	303.328
Closing Error:	0.000	-
WL Check:	0.000	-0.001
Transducer Elevation	302.333	302.331

**Field Personnel:**

GG, TR	Trip Date:	22-Oct-14
GG	Date:	22-Oct-14
MY	Date:	23-Oct-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S22 Muskeg Creek near the Mouth  
 UTM Location: 481036 E, 6348856 N

Site Visit Date: December 11, 2014  
 Site Visit Time (MST): 12:35

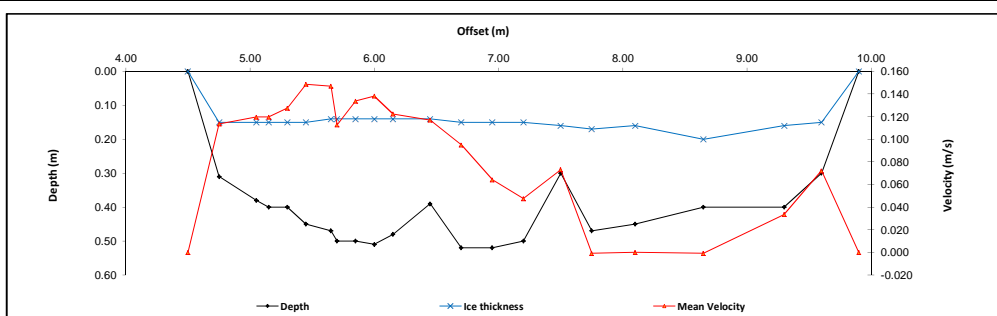


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.50	0.00	0.00		0.000		0.000		0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	4.75	0.31	0.15	0.23	0.129					0.88	0.28	0.16	0.114	0.04	0.005	5%
2	5.05	0.38	0.15	0.27	0.136					0.88	0.20	0.23	0.120	0.05	0.006	6%
3	5.15	0.40	0.15	0.28	0.136					0.88	0.13	0.25	0.120	0.03	0.004	4%
4	5.30	0.40	0.15	0.28	0.145					0.88	0.15	0.25	0.128	0.04	0.005	5%
5	5.45	0.45	0.15	0.30	0.169					0.88	0.18	0.30	0.149	0.05	0.008	8%
6	5.65	0.47	0.14	0.31	0.167					0.88	0.13	0.33	0.147	0.04	0.006	6%
7	5.70	0.50	0.14	0.32	0.128					0.88	0.10	0.36	0.113	0.04	0.004	4%
8	5.85	0.50	0.14	0.32	0.152					0.88	0.15	0.36	0.134	0.05	0.007	7%
9	6.00	0.51	0.14	0.33	0.157					0.88	0.15	0.37	0.138	0.06	0.008	8%
10	6.15	0.48	0.14	0.31	0.139					0.88	0.23	0.34	0.122	0.08	0.009	10%
11	6.45	0.39	0.14	0.27	0.133					0.88	0.27	0.25	0.117	0.07	0.008	8%
12	6.70	0.52	0.15	0.34	0.108					0.88	0.25	0.37	0.095	0.09	0.009	9%
13	6.95	0.52	0.15	0.34	0.073					0.88	0.25	0.37	0.064	0.09	0.006	6%
14	7.20	0.50	0.15	0.33	0.054					0.88	0.27	0.35	0.048	0.10	0.005	5%
15	7.50	0.30	0.16	0.23	0.083					0.88	0.28	0.14	0.073	0.04	0.003	3%
16	7.75	0.47	0.17	0.32	-0.001					0.88	0.30	0.30	-0.001	0.09	0.000	0%
17	8.10	0.45	0.16	0.31	0.000					0.88	0.45	0.29	0.000	0.13	0.000	0%
18	8.65	0.40	0.20	0.30	-0.001					0.88	0.60	0.20	-0.001	0.12	0.000	0%
19	9.30	0.40	0.16	0.28	0.038					0.88	0.47	0.24	0.033	0.11	0.004	4%
20	9.60	0.30	0.15	0.23	0.082					0.88	0.30	0.15	0.072	0.05	0.003	3%
RB	9.90	0.00	0.00		0.000		0.000		0.000	0.88	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.098</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 50m DS of station, marked with pink tape

Meas. Start Time (MST):	13:00
Meas. End Time (MST):	13:20
Equipment:	ADV
Method:	Ice
River Condition:	Thin ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -5C



**Flow characteristics:**

Total Flow:	0.098	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.36	(m <sup>2</sup> )
Wetted Width:	5.40	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.926	-
Water (°C):	0.3	-
Datalogger Clock:	12:44	-
Laptop Clock:	12:43	-
Battery (Main):	12.2	13.0
Battery:		Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S22-05	0.896	306.974		306.078	306.078	Pipe 1m SE of Logger
S22-04			1.273	305.701	305.697	Pipe 5m SW of Logger
S22-03			1.392	305.582	305.584	Pipe 3m W of Logger
Water Level:	Cut		3.718	303.256	Time WL Surveyed: 13:36	
Temporary BM			3.635	303.339	0.000	-
<b>Turn</b>						
Temporary BM	3.617	306.956		303.339	-	
Water Level:	Cut		3.699	303.257	Time WL Surveyed: 13:38	
S22-03			1.373	305.583	305.584	Pipe 3m W of Logger
S22-04			1.254	305.702	305.697	Pipe 5m SW of Logger
S22-05			0.877	306.079	306.078	Pipe 1m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	303.257	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	302.331	-

**Field Personnel:**

	GG, SM	Trip Date:	11-Dec-14
Data Entry Personnel:	GG	Date:	11-Dec-14
Data Check Personnel:	MY	Date:	17-Dec-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date: January 20, 2014  
 Site Visit Time (MST): 11:00



Flow Measurement											Measured Data					Calculated Data				
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)			
RB	438.00	0.00	0.00		0.000		0.000				0.88	8.00	0.00	0.000	0.00	0.000				
1	422.00	1.20	0.70	0.95	0.005						0.88	18.00	0.50	0.004	9.00	0.040	0%			
2	402.00	1.80	0.61			1.56	0.112	0.85	0.127		1.00	21.50	1.19	0.120	25.59	3.057	1%			
3	379.00	2.60	0.60			2.20	0.211	1.00	0.234		1.00	20.50	2.00	0.223	41.00	9.123	4%			
4	361.00	2.50	0.60			2.12	0.202	0.98	0.256		1.00	20.50	1.90	0.229	38.95	8.320	4%			
5	338.00	2.55	0.53			2.15	0.267	0.93	0.297		1.00	21.00	2.02	0.282	42.42	11.962	5%			
6	319.00	2.60	0.55			2.19	0.306	0.96	0.223		1.00	18.50	2.05	0.265	37.93	10.031	4%			
7	301.00	2.45	0.65			2.09	0.317	1.01	0.366		1.00	20.00	1.80	0.342	36.00	12.294	5%			
8	279.00	2.64	0.65			2.24	0.301	1.05	0.292		1.00	19.50	1.99	0.297	38.81	11.506	5%			
9	262.00	2.70	0.65			2.29	0.342	1.06	0.390		1.00	18.00	2.05	0.361	36.90	13.321	6%			
10	243.00	2.95	0.55			2.47	0.280	1.03	0.310		1.00	19.50	2.40	0.295	46.80	13.806	6%			
11	223.00	2.70	0.60			2.28	0.298	1.02	0.405		1.00	18.50	2.10	0.352	38.85	13.656	6%			
12	206.00	2.70	0.65			2.29	0.370	1.06	0.363		1.00	16.50	2.05	0.367	33.83	12.397	5%			
13	190.00	2.50	0.65			2.13	0.392	1.02	0.209		1.00	17.50	1.85	0.301	32.38	9.729	4%			
14	171.00	2.60	0.55			2.19	0.320	0.96	0.321		1.00	18.00	2.05	0.321	36.90	11.826	5%			
15	154.00	2.20	0.55			1.87	0.381	0.88	0.298		1.00	18.50	1.65	0.340	30.53	10.363	5%			
16	134.00	2.30	0.50			1.94	0.304	0.86	0.327		1.00	18.50	1.80	0.316	33.30	10.506	5%			
17	117.00	2.20	0.60			1.88	0.302	0.92	0.330		1.00	18.50	1.60	0.316	29.60	9.354	4%			
18	97.00	1.85	0.65			1.61	0.330	0.89	0.324		1.00	18.00	1.20	0.327	21.60	7.063	3%			
19	81.00	2.05	0.55			1.75	0.337	0.85	0.263		1.00	16.00	1.50	0.300	24.00	7.200	3%			
20	65.00	1.85	0.55			1.59	0.296	0.81	0.315		1.00	15.00	1.30	0.306	19.50	5.957	3%			
21	51.00	2.80	0.55			2.35	0.490	1.00	0.527		1.00	13.50	2.25	0.509	30.38	15.446	7%			
22	38.00	4.00	0.70			3.34	0.287	1.36	0.272		1.00	12.00	3.30	0.280	39.60	11.068	5%			
23	27.00	3.10	0.45			2.57	0.263	0.98	0.255		1.00	12.00	2.65	0.259	31.80	8.236	4%			
24	14.00	2.20	0.45			1.85	0.119	0.80	0.162		1.00	13.50	1.75	0.141	23.63	3.319	1%			
LB	0.00	0.00	0.00		0.00						0.88	7.00	0.00	0.000	0.00	0.000				
<b>Total Flow</b>															<b>230</b>	<b>100%</b>				

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	10:30
Meas. End Time (MST):	12:30
Equipment:	ADV
Method:	Ice
River Condition:	Full Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, breezy, -28C

**Flow characteristics:**

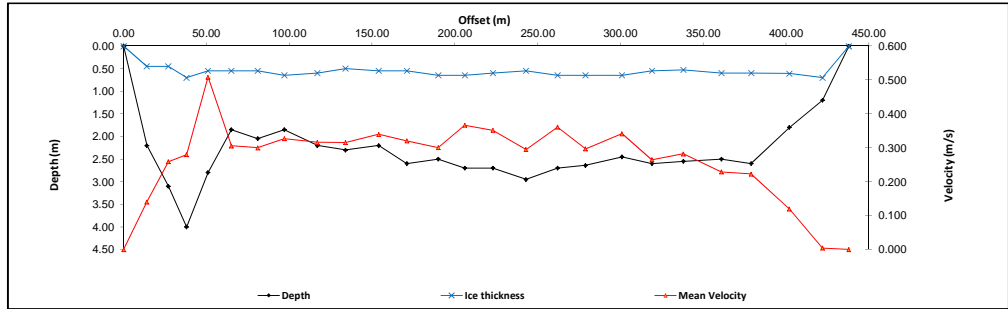
Total Flow:	230	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	779.26	(m <sup>2</sup> )
Wetted Width:	438.00	(m)
Hydraulic Depth:	1.78	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	1.267	1.266
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	0.0	0.0
Water Temperature #2 (°C):	-	-
Datalogger Clock:	09:09	13:05
Laptop Clock:	09:09	13:05
Battery (Main):	12.7	12.8
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 Overflow along RB opposite the monitoring station.

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S24-5	0.519	231.584		231.065	231.065	3/4" Pipe 1.5m South of logger
S24-6			0.860	230.724	230.725	3/4" Pipe 3m North of logger
S24-4			0.747	230.837	230.838	3/4" Pipe 5m N of logger
Water Level:	<b>Cut</b>		5.280	226.304		<b>Time WL Surveyed:</b> 9:23
Temporary BM			5.283	226.301	0.000	-
<b>Turn</b>						
Temporary BM	5.260	231.561		226.301		-
Water Level:	<b>Cut</b>		5.257	226.304		<b>Time WL Surveyed:</b> 9:26
S24-4			0.723	230.838	230.838	3/4" Pipe 5m N of logger
S24-6			0.835	230.726	230.725	3/4" Pipe 3m North of logger
S24-5			0.495	231.066	231.065	3/4" Pipe 1.5m South of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S24-6	0.724	231.561		230.837		
Water Level:	<b>Cut</b>		5.261	226.300		<b>Time WL Surveyed:</b> 12:54
Water Level:	<b>Cut</b>		5.239	226.303		<b>Time WL Surveyed:</b> 12:56
S24-6	0.705	231.542		230.837		

**WL Survey Summary**

	Before	After
Average WL:	226.304	226.302
Closing Error:	-0.001	-
WL Check:	0.000	-0.003
Transducer Elevation	225.037	225.036

**Field Personnel:**

Personnel	SM, TR	Trip Date:	20-Jan-14
Data Entry Personnel:	SM	Date:	20-Jan-14
Data Check Personnel:	SM	Date:	10-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date: February 8, 2014  
 Site Visit Time (MST): 09:15



Flow Measurement: Measured Data																
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	0.88	3.50	0.00	0.000	0.00	0.000	
1	7.00	1.55	0.57		0.079	1.35	0.77		0.88	6.50	0.98	0.070	6.37	0.443	0%	
2	13.00	1.50	0.55		-0.239	1.31	0.74		0.88	5.50	0.95	-0.210	5.23	-1.099	-1%	
3	18.00	1.57	0.49			1.35	0.71	0.690	1.00	6.00	1.08	0.605	6.48	3.920	2%	
4	25.00	1.32	0.53			1.16	0.860	0.69	1.00	9.00	0.79	0.795	7.11	5.652	3%	
5	36.00	1.24	0.54	0.89	0.860				0.88	11.00	0.70	0.757	7.70	5.827	3%	
6	47.00	1.19	0.52	0.86	0.460				0.88	13.50	0.67	0.405	9.05	3.661	2%	
7	63.00	1.27	0.60	0.94	0.333				0.88	13.00	0.67	0.293	8.71	2.552	1%	
8	73.00	1.50	0.58			1.32	0.258	0.76	1.00	11.00	0.92	0.284	10.12	2.874	1%	
9	85.00	1.84	0.53			1.58	0.314	0.79	1.00	14.00	1.31	0.184	18.34	3.365	2%	
10	101.00	2.35	0.65			2.01	0.040	0.99	1.00	16.00	1.70	0.272	27.20	7.385	4%	
11	117.00	2.30	0.69			1.98	0.229	1.01	1.00	19.50	1.61	0.129	31.40	4.050	2%	
12	140.00	2.78	0.72			2.37	0.292	1.13	1.00	22.50	2.06	0.347	46.35	16.083	8%	
13	162.00	2.92	0.58			2.45	0.371	1.05	1.00	19.50	2.34	0.396	45.63	18.069	9%	
14	179.00	3.37	0.75			2.85	0.144	1.27	1.00	18.00	2.62	0.250	47.16	11.790	6%	
15	198.00	3.46	0.67			2.90	0.347	1.23	1.00	18.00	2.79	0.198	50.22	9.944	5%	
16	215.00	3.55	0.66			2.97	0.341	1.24	1.00	14.50	2.89	0.367	41.91	15.379	7%	
17	227.00	3.87	0.88			3.27	0.166	1.48	1.00	18.50	2.99	0.221	55.32	12.197	6%	
18	252.00	3.70	0.75			3.11	0.354	1.34	1.00	23.50	2.95	0.339	69.33	23.467	11%	
19	274.00	3.94	0.71			3.29	0.252	1.36	1.00	20.50	3.23	0.305	66.22	20.196	10%	
20	293.00	3.65	0.68			3.06	0.364	1.27	1.00	17.00	2.97	0.375	50.49	18.934	9%	
21	308.00	3.54	0.64			2.96	0.319	1.22	1.00	16.00	2.90	0.344	46.40	15.938	8%	
22	325.00	2.78	0.59			2.34	0.207	1.03	1.00	20.00	2.19	0.211	43.80	9.220	4%	
23	348.00	1.60	0.61	0.72	-0.334	1.40	0.129	0.81	1.00	16.00	0.99	0.139	15.84	2.194	1%	
24	357.00	1.09	0.35						0.88	8.00	0.74	-0.294	5.92	-1.740	-1%	
LB	364.00	0.00	0.00		0.00		0.00		0.88	3.50	0.00	0.000	0.00	0.000		
<b>Total Flow</b>															<b>210</b>	<b>100%</b>

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	12:02
Meas. End Time (MST):	13:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	-

**Flow characteristics:**

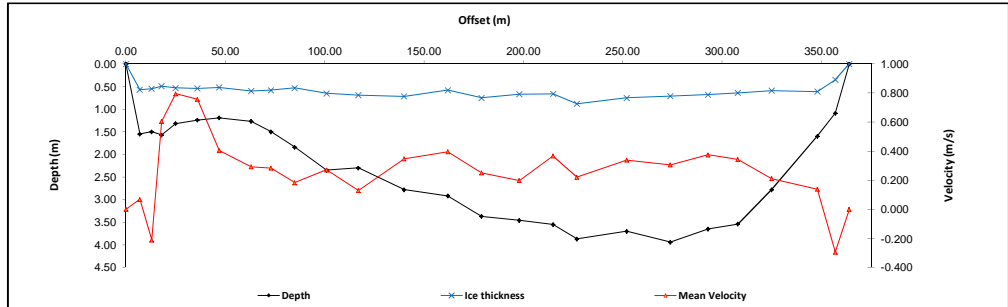
Total Flow:	210	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	722.27	(m <sup>2</sup> )
Wetted Width:	364.00	(m)
Hydraulic Depth:	1.98	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	1.332	-
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	0.0	-
Water Temperature #2 (°C):	-	-
Datalogger Clock:	09:24	-
Laptop Clock:	09:24	-
Battery (Main):	15.05	-
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessoricant:	-	Good
Vent Tube Dessoricant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S24-5	0.649	231.714		231.065	231.065	3/4" Pipe 1.5m South of logger
S24-6			0.987	230.727	230.725	3/4" Pipe 3m North of logger
S24-4			0.876	230.838	230.838	3/4" Pipe 5m N of logger
Water Level:	Cut		5.359	226.355		Time WL Surveyed: 9:39
Temporary BM			5.328	226.386	0.000	-
<b>Turn</b>						
Temporary BM	5.301	231.687		226.386		-
Water Level:	Cut		5.329	226.358		Time WL Surveyed: 9:47
S24-4			0.849	230.838	230.838	3/4" Pipe 5m N of logger
S24-6			0.962	230.725	230.725	3/4" Pipe 3m North of logger
S24-5			0.623	231.064	231.065	3/4" Pipe 1.5m South of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	226.357	-
Closing Error:	0.001	-
WL Check:	0.003	-
Transducer Elevation	225.025	-

**Field Personnel:**

	SG, MP	Trip Date:	8-Feb-14
Data Entry Personnel:	MP	Date:	8-Feb-14
Data Check Personnel:	SG	Date:	12-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date: March 16, 2014  
 Site Visit Time (MST): 10:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	2.50	0.00	0.000	0.00	0.000	
1	5.00	2.30	0.35			1.91	0.155	0.74	0.180	1.00	5.00	1.95	0.168	9.75	1.633	1%
2	10.00	5.00	0.59			4.12	0.318	1.47	0.443	1.00	6.00	4.41	0.381	26.46	10.068	5%
3	17.00	5.25	0.58			4.32	0.516	1.51	0.410	1.00	8.50	4.67	0.463	39.70	18.379	10%
4	27.00	5.50	0.58			4.52	0.358	1.56	0.366	1.00	11.00	4.92	0.362	54.12	19.591	11%
5	39.00	5.20	0.63			4.29	0.260	1.54	0.367	1.00	9.50	4.57	0.314	43.42	13.611	7%
6	46.00	1.30	0.67							0.88	9.50	0.63	0.273	5.99	1.633	1%
7	58.00	1.68	0.60	0.99	0.310	1.46	0.281	0.82	0.344	1.00	14.00	1.08	0.313	15.12	4.725	3%
8	74.00	2.07	0.62			1.78	0.228	0.91	0.337	1.00	22.00	1.45	0.283	31.90	9.012	5%
9	102.00	1.72	0.68			1.51	0.324	0.89	0.445	1.00	25.00	1.04	0.385	26.00	9.997	5%
10	124.00	2.22	0.60			1.90	0.234	0.92	0.340	1.00	24.50	1.62	0.287	39.69	11.391	6%
11	151.00	2.38	0.81			2.07	0.226	1.12	0.462	1.00	24.00	1.57	0.344	37.68	12.962	7%
12	172.00	2.21	0.75			1.92	0.304	1.04	0.376	1.00	23.00	1.46	0.340	33.58	11.417	6%
13	197.00	2.28	0.75			1.97	0.328	1.06	0.414	1.00	22.50	1.53	0.371	34.43	12.772	7%
14	217.00	2.01	0.64			1.74	0.358	0.91	0.363	1.00	22.00	1.37	0.361	30.14	10.865	6%
15	241.00	1.91	0.74			1.68	0.294	0.97	0.329	1.00	22.00	1.17	0.312	25.74	8.018	4%
16	261.00	2.00	0.75			1.75	0.155	1.00	0.354	1.00	20.50	1.25	0.255	25.63	6.522	4%
17	282.00	1.65	0.73			1.47	0.315	0.91	0.332	1.00	20.00	0.92	0.324	18.40	5.952	3%
18	301.00	1.75	0.79			1.56	0.271	0.98	0.305	1.00	18.50	0.96	0.288	17.76	5.115	3%
19	319.00	1.59	0.78			1.43	0.205	0.94	0.251	1.00	21.00	0.81	0.228	17.01	3.878	2%
20	343.00	1.35	0.73	1.04	0.192					0.88	25.00	0.62	0.169	15.50	2.619	1%
21	369.00	1.39	0.73	1.06	0.173					0.88	28.50	0.66	0.152	18.81	2.864	2%
22	400.00	0.88	0.55	0.72	0.098					0.88	36.50	0.33	0.086	12.05	1.039	1%
23	442.00	0.72	0.60	0.66	0.017					0.88	32.50	0.12	0.015	3.90	0.058	0%
LB	465.00	0.00	0.00		0.00		0.00		0.00	0.88	11.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>184</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	8:31
Meas. End Time (MST):	10:12
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze

**Flow characteristics:**

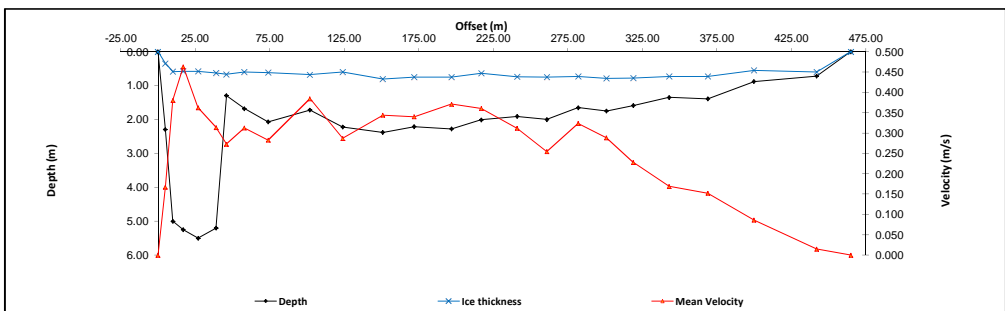
Total Flow:	184.000	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	582.75	(m²)
Wetted Width:	465.00	(m)
Hydraulic Depth:	1.25	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	1.170	
Transducer #2 (0-10m) Reading (m):	-	
Water Temperature #1 (°C):	0.0	
Water Temperature #2 (°C):	-	
Datalogger Clock:	10:45	
Laptop Clock:	10:45	
Battery (Main):	14.1	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S24-5	0.877	231.942		231.065	231.065	3/4" Pipe 1.5m South of logger
S24-6			1.216	230.726	230.725	3/4" Pipe 3m North of logger
S24-4			1.104	230.838	230.838	3/4" Pipe 5m N of logger
Water Level:	Cut		5.740	226.202		<b>Time WL Surveyed:</b> 10:59
Temporary BM			5.732	226.210	0.000	
<b>Turn</b>						
Temporary BM	5.710	231.920		226.210		
Water Level:	Cut		5.718	226.202		<b>Time WL Surveyed:</b> 11:02
S24-4			1.083	230.837	230.838	3/4" Pipe 5m N of logger
S24-6			1.195	230.725	230.725	3/4" Pipe 3m North of logger
S24-5			0.856	231.064	231.065	3/4" Pipe 1.5m South of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					<b>Time WL Surveyed:</b>
Water Level:	Cut					<b>Time WL Surveyed:</b>

**WL Survey Summary**

	Before	After
Average WL:	226.202	-
Closing Error:	0.001	-
WL Check:	0.000	-
Transducer Elevation	225.032	-

**Field Personnel:**

	SM, MP	Trip Date:	16-Mar-14
Data Entry Personnel:	SM	Date:	16-Mar-14
Data Check Personnel:	SG	Date:	12-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date: April 6, 2014  
 Site Visit Time (MST): 07:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.00	0.00	0.00		0.000		0.000		0.000	1.00	5.50	0.00	0.000	0.00	0.000	
1	15.00	3.75	0.60			3.12	0.212	1.23	0.362	1.00	11.00	3.15	0.287	34.65	9.945	4%
2	26.00	4.70	0.75			3.91	0.396	1.54	0.433	1.00	9.50	3.95	0.415	37.53	15.554	6%
3	34.00	5.60	0.65			4.61	0.391	1.64	0.422	1.00	9.00	4.95	0.407	44.55	18.110	7%
4	44.00	5.40	0.75			4.47	0.318	1.68	0.356	1.00	9.50	4.65	0.338	44.18	14.931	6%
5	53.00	3.50	0.75			2.95	0.235	1.30	0.402	1.00	11.50	2.75	0.319	31.63	10.073	4%
6	67.00	2.20	0.75			1.91	0.371	1.04	0.411	1.00	17.50	1.45	0.391	25.38	9.922	4%
7	88.00	2.30	0.75			1.99	0.334	1.06	0.346	1.00	21.00	1.55	0.340	32.55	11.067	4%
8	109.00	2.00	0.75			1.75	0.249	1.00	0.412	1.00	23.00	1.25	0.331	28.75	9.502	4%
9	134.00	2.35	0.75			2.03	0.272	1.07	0.361	1.00	25.50	1.60	0.317	40.80	12.913	5%
10	160.00	2.30	0.65			1.97	0.353	0.98	0.425	1.00	25.50	1.65	0.389	42.08	16.367	6%
11	185.00	2.50	0.75			2.15	0.333	1.10	0.429	1.00	23.50	1.75	0.381	41.13	15.669	6%
12	207.00	2.85	0.75			2.43	0.348	1.18	0.373	1.00	24.00	2.09	0.361	50.16	18.083	7%
13	233.00	2.80	0.75			2.39	0.204	1.16	0.328	1.00	24.00	2.05	0.266	49.20	13.091	5%
14	255.00	2.50	0.80			2.16	0.382	1.14	0.385	1.00	22.50	1.70	0.384	38.25	14.669	6%
15	278.00	2.45	0.80			2.12	0.331	1.13	0.388	1.00	25.00	1.65	0.360	41.25	14.829	6%
16	305.00	2.50	0.85			2.17	0.280	1.18	0.389	1.00	25.50	1.65	0.335	42.08	14.074	5%
17	329.00	2.20	0.75			1.91	0.254	1.04	0.338	1.00	26.00	1.45	0.296	37.70	11.159	4%
18	357.00	2.15	0.80			1.88	0.260	1.07	0.271	1.00	30.00	1.35	0.266	40.50	10.753	4%
19	389.00	1.90	0.80			1.68	0.197	1.02	0.219	1.00	33.00	1.10	0.208	36.30	7.550	3%
20	423.00	1.80	0.75			1.59	0.177	0.96	0.179	1.00	32.00	1.05	0.178	33.60	5.981	2%
21	453.00	1.25	0.65	0.95	0.126					0.88	30.50	0.60	0.111	18.30	2.029	1%
22	484.00	1.00	0.75	0.88	0.029					0.88	24.50	0.25	0.026	6.13	0.156	0%
LB	502.00	0.00	0.00		0.00		0.00		0.00	0.88	9.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>256</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	8:22
Meas. End Time (MST):	9:21
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -3C

**Flow characteristics:**

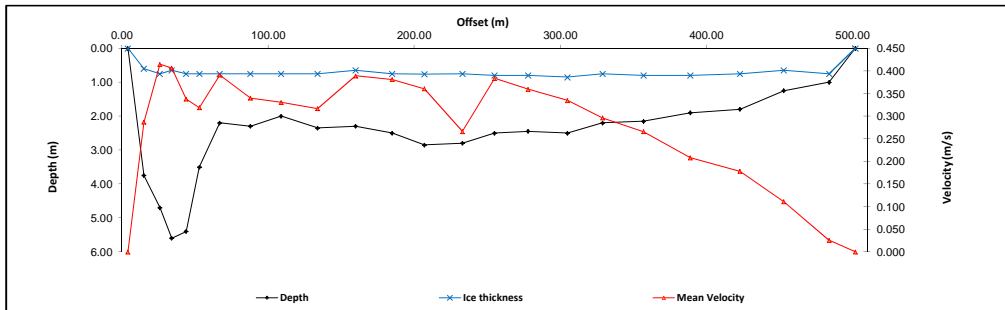
Total Flow:	256	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	796.66	(m <sup>2</sup> )
Wetted Width:	498.00	(m)
Hydraulic Depth:	1.60	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	1.365	-
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	0.0	-
Water Temperature #2 (°C):	-	-
Datalogger Clock:	09:49	-
Laptop Clock:	09:49	-
Battery (Main):	14.4	-
Battery Serial #:	-	Good
Enclosure Dessoricant:	-	Good
Vent Tube Dessoricant:	-	Good
PT# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S24-5	0.613	231.678		231.065	231.065	3/4" Pipe 1.5m South of logger
S24-4			0.839	230.839	230.838	3/4" Pipe 5m N of logger
S24-6			0.953	230.725	230.725	3/4" Pipe 3m North of logger
<b>Water Level:</b>						
Water Level:	Cut		5.308	226.370		Time WL Surveyed: 10:00
Temporary BM			5.248	226.430	0.000	-
<b>Turn</b>						
Temporary BM	5.227	231.657		226.430		-
Water Level:	Cut		5.290	226.367		Time WL Surveyed: 10:05
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	226.369	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	225.004	-

**Field Personnel:**

Field Personnel:	SM, CJ	Trip Date:	6-Apr-14
Data Entry Personnel:	CJ	Date:	6-Apr-14
Data Check Personnel:	SG	Date:	12-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date:

May 20, 2014

Site Visit Time (MST):

11:30



<b>Flow Measurement Details:</b>	
Metering Section Location (describe):	
Meas. Start Time (MST):	12:17
Meas. End Time (MST):	12:40
Equipment:	ADCP
Method:	Boat
River Condition:	High flow, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, windy, 15 C

<b>Flow characteristics:</b>		
Total Flow:	1293	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2243.08	(m <sup>2</sup> )
Wetted Width:	939.58	(m)
Hydraulic Depth:	2.39	(m)
Mean Velocity:	0.58	(m/s)
Froude Number:	0.12	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	NAN	3.498
Water (°C):	0.0	13.6
Datalogger Clock:	09:59	12:19
Laptop Clock:	09:59	15:19
Battery (Main):	13.8	13.6
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	323015	298678
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

Pressure transducer was severed by ice on April 23.

**General Notes:**

WL fluctuating 4.0 cm during survey

<b>ADCP Flow Measurement Summary:</b>						
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	RS-M9		Transducer Depth (m):	0.08	LB:	485.00
Serial Number:	1802		Salinity (ppt):	0.0	RB:	14.00
Firmware Version:	3.5		Magnetic Declination (°):	-		
Software Version:	3.7		Measured Temperature (°C):	-		
			ADCP Temperature (°C):	14.5		
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>			
Track Reference:	Bottom track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam		1	933.41	2381.24	0.572
Coordinate System:	ENU		2	940.81	2223.39	0.592
Left Method:	Sloped Bank		3	939.98	2190.98	0.532
Right Method:	Sloped Bank		4	944.14	2176.71	0.61
Top Fit Type:	Power Fit		-	-	-	-
Bottom Fit Type:	Power Fit		-	-	-	-
			<b>Mean:</b>	939.58	2243.08	0.577
			<b>SD:</b>	3.89	81.54	0.029
			<b>COV:</b>	0.00	0.04	0.050
						0.058
						Discharge (m <sup>3</sup> /s):
						Discharge Difference From Mean
						1362.275
						1316.001
						1166.366
						1328.774
						5.33%
						1.75%
						-9.82%
						2.74%

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S24-06	1.064	231.789		230.725	230.725	3/4" Pipe 3m North of logger
S24-04			0.953	230.836	230.838	3/4" Pipe 5m N of logger
S24-05			0.726	231.063	231.065	3/4" Pipe 1.5m South of logger
Water Level:	Cut	0.134	4.498	227.425	<b>Time WL Surveyed:</b>	10:31
Temporary BM			3.583	228.206	0.000	-
<b>Turn</b>						
Temporary BM	3.609	231.815		228.206		-
Water Level:	Cut	0.128	4.518	227.425	<b>Time WL Surveyed:</b>	10:29
S24-05			0.752	231.063	231.065	3/4" Pipe 1.5m South of logger
S24-04			0.978	230.837	230.838	3/4" Pipe 5m N of logger
S24-06			1.089	230.726	230.725	3/4" Pipe 3m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S24-05	0.726	231.789		231.063		
Water Level:	Cut	0.097	4.453	227.433	<b>Time WL Surveyed:</b>	12:25
Water Level:	Cut	0.098	4.442	227.426	<b>Time WL Surveyed:</b>	12:27
S24-05	0.707	231.770		231.063		

<b>WL Survey Summary</b>			
	Before	After	
Average WL:	227.425	227.430	
Closing Error:	-0.001	-	
WL Check:	0.000	0.007	
Transducer Elevation	-	223.932	

<b>Field Personnel:</b>	TR, MP	Trip Date:	20-May-14
Data Entry Personnel:	TR, MP	Date:	20-May-14
Data Check Personnel:	SM	Date:	15-Jan-15
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date: June 15, 2014  
 Site Visit Time (MST): 10:15



Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)							
RB	545.00	0.00	0.00		0.000		0.000		0.000	1.00	12.50	0.00	0.000	0.00	0.000								
1	520.00	2.35				1.88	0.210	0.47	0.550	1.00	32.00	2.35	0.380	75.20	28.576	2%							
2	481.00	2.77				2.22	0.560	0.55	0.900	1.00	26.00	2.77	0.730	72.02	52.575	3%							
3	468.00	2.55				2.04	0.720	0.51	0.880	1.00	24.00	2.55	0.800	61.20	48.960	3%							
4	433.00	3.63				2.90	0.790	0.73	1.040	1.00	35.00	3.63	0.915	127.05	116.251	6%							
5	398.00	3.58				2.86	1.020	0.72	1.180	1.00	26.50	3.58	1.100	94.87	104.357	6%							
6	380.00	4.12				3.30	0.900	0.82	1.100	1.00	18.50	4.12	1.000	76.22	76.220	4%							
7	361.00	4.11				3.29	0.670	0.82	1.040	1.00	20.50	4.11	0.855	84.26	72.038	4%							
8	339.00	3.94				3.15	0.860	0.79	1.290	1.00	23.00	3.94	1.075	90.62	97.417	5%							
9	315.00	4.19				3.35	1.070	0.84	1.150	1.00	17.50	4.19	1.110	73.33	81.391	4%							
10	304.00	4.21				3.37	0.870	0.84	1.220	1.00	17.50	4.21	1.045	73.68	76.990	4%							
11	280.00	4.43				3.54	0.960	0.89	1.090	1.00	24.00	4.43	1.025	106.32	108.978	6%							
12	256.00	4.46				3.57	0.910	0.89	0.990	1.00	23.50	4.46	0.950	104.81	99.570	6%							
13	233.00	3.97				3.18	1.060	0.79	1.270	1.00	30.00	3.97	1.165	119.10	138.752	8%							
14	196.00	4.18				3.34	0.800	0.84	1.180	1.00	36.50	4.18	0.990	152.57	151.044	8%							
15	160.00	4.29				3.43	0.830	0.86	1.130	1.00	28.00	4.29	0.980	120.12	117.718	7%							
16	140.00	3.69				2.95	0.720	0.74	1.000	1.00	21.00	3.69	0.860	77.49	66.641	4%							
17	118.00	2.56				2.05	0.690	0.51	0.880	1.00	24.00	2.56	0.785	61.44	48.230	3%							
18	92.00	1.91				1.53	0.730	0.38	0.900	1.00	25.00	1.91	0.815	47.75	38.916	2%							
19	68.00	4.12				3.30	0.820	0.82	1.090	1.00	23.00	4.12	0.955	94.76	90.496	5%							
20	46.00	4.88				3.90	0.790	0.98	1.100	1.00	21.00	4.88	0.945	102.48	96.844	5%							
21	26.00	4.54				3.63	0.820	0.91	1.070	1.00	22.00	4.54	0.945	99.88	94.387	5%							
LB	2.00	0.00	0.00		0.00		0.00		0.00	1.00	12.00	0.00	0.000	0.00	0.000								
<b>Total Flow</b>														<b>1810</b>	<b>100%</b>								

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	11:10
Meas. End Time (MST):	13:45
Equipment:	ADC
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 20C

**Flow characteristics:**

Total Flow:	1810	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1915.16	(m <sup>2</sup> )
Wetted Width:	543.00	(m)
Hydraulic Depth:	3.53	(m)
Mean Velocity:	0.95	(m/s)
Froude Number:	0.16	

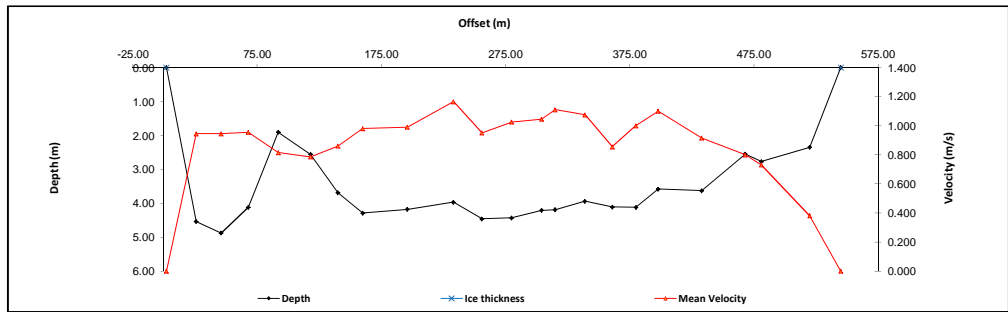
**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	4.395	4.393
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	17.6	18.5
Water Temperature #2 (°C):	-	-
Datalogger Clock:	10:21	14:01
Laptop Clock:	10:21	14:01
Battery (Main):	13.6	13.7
Battery Serial #:	-	Good
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Pressure transducer appears to have moved sltightly

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S24-06	1.078	231.803		230.725	230.725	3/4" Pipe 3m North of logger
S24-04			0.966	230.837	230.838	3/4" Pipe 5m N of logger
S24-05			0.739	231.064	231.065	3/4" Pipe 1.5m South of logger
<b>Water Level:</b>						
Temporary BM	Cut		3.476	228.327	228.327	Time WL Surveyed: 10:30
			2.982	228.821	228.821	Time WL Surveyed: 10:33
<b>Turn</b>						
Temporary BM	2.937	231.758		228.821	228.821	Time WL Surveyed: 10:33
Water Level:	Cut		3.435	228.323	228.323	Time WL Surveyed: 10:33
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S24-04	0.925	231.759		230.834	230.834	
Water Level:	Cut		3.447	228.312	228.312	Time WL Surveyed: 14:04
Water Level:	Cut		3.387	228.315	228.315	Time WL Surveyed: 14:07
S24-04	0.868	231.702		230.834	230.834	

**WL Survey Summary**

	Before	After
Average WL:	228.325	228.314
Closing Error:	0.003	-
WL Check:	0.004	-0.003
Transducer Elevation	223.930	223.921

**Field Personnel:**

Field Personnel:	TR, DW, NC	Trip Date:	15-Jun-14
Data Entry Personnel:	TR	Date:	15-Jun-14
Data Check Personnel:	SG	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date: August 15, 2014

Site Visit Time (MST): 09:08



Flow Measurement Details:	
Metering Section Location (describe):	
Meas. Start Time (MST):	9:52
Meas. End Time (MST):	10:16
Equipment:	ADCP
Method:	Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 30 C

Flow characteristics:		
Total Flow:	651	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1099.58	(m <sup>2</sup> )
Wetted Width:	458.15	(m)
Hydraulic Depth:	2.40	(m)
Mean Velocity:	0.59	(m/s)
Froude Number:	0.12	

Logger Details:	Before	After
Transducer Reading (m):	2.762	2.762
Water (°C):	23.5	23.7
Datalogger Clock:	09:09	10:46
Laptop Clock:	09:09	10:46
Battery (Main):	13.6	13.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

ADCP Flow Measurement Summary:					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	537.00
Serial Number:	4712	Salinity (ppt):	-	RB:	0.00
Firmware Version:	3.5	Magnetic Declination (°):	14.33		
Software Version:	3.7	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	452.75	1104.16	0.598
Coordinate System:	ENU	2	471.62	1070.77	0.601
Left Method:	Sloped Bank	3	454.59	1149.79	0.565
Right Method:	Sloped Bank	4	453.66	1073.59	0.605
Top Fit Type:	Power Fit	-	-	-	-
Bottom Fit Type:	Power Fit	-	-	-	-
		<b>Mean:</b>	458.15	1099.58	0.592
		<b>SD:</b>	7.80	31.81	0.016
		<b>COV:</b>	0.02	0.03	0.027
					651
					6.159
					0.009

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S24-05	0.631	231.696		231.065	231.065	3/4" Pipe 1.5m South of logger
S24-04			0.859	230.837	230.838	3/4" Pipe 5m N of logger
S24-06			0.973	230.723	230.725	3/4" Pipe 3m North of logger
Water Level:	Cut	0.058	5.055	226.699	Time WL Surveyed:	9:20
Temporary BM			5.055	226.641	0.000	-
<b>Turn</b>						
Temporary BM	5.043	231.684		226.641		-
Water Level:	Cut	0.058	5.043	226.699	Time WL Surveyed:	9:22
S24-06			0.957	230.727	230.725	3/4" Pipe 3m North of logger
S24-04			0.845	230.839	230.838	3/4" Pipe 5m N of logger
S24-05			0.616	231.068	231.065	3/4" Pipe 1.5m South of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S24-04	0.845	231.684		230.839		
Water Level:	Cut	0.165	5.152	226.697	Time WL Surveyed:	10:42
Water Level:	Cut	0.165	5.189	226.699	Time WL Surveyed:	10:44
S24-04	0.884	231.723		230.839		

WL Survey Summary	Before	After
Average WL:	226.699	226.698
Closing Error:	-0.003	-
WL Check:	0.000	-0.002
Transducer Elevation	223.937	223.936

Field Personnel:	TR, MP, GG	Trip Date:	15-Aug-14
Data Entry Personnel:	MP	Date:	15-Aug-14
Data Check Personnel:	CJ	Date:	25-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date: September 17, 2014  
 Site Visit Time (MST): \_\_\_\_\_



<b>Flow Measurement Details:</b>	
Metering Section Location (describe):	
Meas. Start Time (MST):	10:41
Meas. End Time (MST):	11:23
Equipment:	ADCP
Method:	Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, windy, 8C

<b>Flow characteristics:</b>		
Total Flow:	400	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	861.25	(m <sup>2</sup> )
Wetted Width:	488.44	(m)
Hydraulic Depth:	1.76	(m)
Mean Velocity:	0.47	(m/s)
Froude Number:	0.11	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	2.236	2.239
Water (°C):	12.3	12.3
Datalogger Clock:	09:52	11:42
Laptop Clock:	09:52	11:42
Battery (Main):	13.4	14.6
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	488.00	
Serial Number:	4712		Salinity (ppt):	-		RB:	0.00	
Firmware Version:	3.5		Magnetic Declination (°):	14.33				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	-				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	453.17	798.76	0.496	396.117	-1.01%
Coordinate System:	ENU		2	498.83	949.20	0.433	411.344	2.80%
Left Method:	Sloped Bank		3	493.04	852.60	0.455	388.239	-2.98%
Right Method:	Sloped Bank		4	508.73	844.45	0.479	404.88	1.18%
Top Fit Type:	Power Fit		-	-	-	-	-	-
Bottom Fit Type:	Power Fit		-	-	-	-	-	-
			<b>Mean:</b>	488.44	861.25	0.466	<b>400</b>	
			<b>SD:</b>	21.12	54.77	0.024	8.744	
			<b>COV:</b>	0.04	0.06	0.051	0.022	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S24-05	0.774	231.839		231.065	231.065	3/4" Pipe 1.5m South of logger
S24-04			1.003	230.836	230.838	3/4" Pipe 5m N of logger
S24-06			1.116	230.723	230.725	3/4" Pipe 3m North of logger
Water Level:	Cut	0.087	5.758	226.168	<b>Time WL Surveyed:</b>	9:56
Temporary BM			5.758	226.081	0.000	-
<b>Turn</b>						
Temporary BM	5.747	231.828		226.081		-
Water Level:	Cut	0.087	5.747	226.168	<b>Time WL Surveyed:</b>	9:57
S24-06			1.102	230.726	230.725	3/4" Pipe 3m North of logger
S24-04			0.989	230.839	230.838	3/4" Pipe 5m N of logger
S24-05			0.759	231.069	231.065	3/4" Pipe 1.5m South of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S24-05	0.760	231.829		231.069		
Water Level:	Cut	0.072	5.726	226.175	<b>Time WL Surveyed:</b>	11:45
Water Level:	Cut	0.072	5.713	226.174	<b>Time WL Surveyed:</b>	11:46
S24-05	0.746	231.815		231.069		

<b>WL Survey Summary</b>	Before	After
Average WL:	226.168	226.175
Closing Error:	-0.004	-
WL Check:	0.000	0.001
Transducer Elevation	223.932	223.936

<b>Field Personnel:</b>	SM, TR, MP	Trip Date:	17-Sep-14
Data Entry Personnel:	SM	Date:	17-Sep-14
Data Check Personnel:	DW	Date:	24-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek

UTM Location: 466313 E, 6372760 N

Site Visit Date: \_\_\_\_\_

October 14, 2014

Site Visit Time (MST): \_\_\_\_\_

09:35



<b>Flow Measurement Details:</b>	
Metering Section Location (describe):	
Meas. Start Time (MST):	10:43
Meas. End Time (MST):	11:12
Equipment:	ADCP
Method:	Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	-

<b>Flow characteristics:</b>		
Total Flow:	355	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	797.93	(m <sup>2</sup> )
Wetted Width:	472.41	(m)
Hydraulic Depth:	1.69	(m)
Mean Velocity:	0.45	(m/s)
Froude Number:	0.11	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	2.200	2.194
Water (°C):	8.4	8.4
Datalogger Clock:	09:41	11:43
Laptop Clock:	09:41	11:43
Battery (Main):	12.9	12.9
Battery:	-	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05		LB:	0.00	
Serial Number:	4712		Salinity (ppt):	-		RB:	472.41	
Firmware Version:	3.5		Magnetic Declination (°):	14.33				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	-				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	475.00	805.02	0.436	350.712	-1.34%
Coordinate System:	ENU		2	469.61	797.52	0.435	347.211	-2.32%
Left Method:	Sloped Bank		3	473.60	773.94	0.465	359.738	1.20%
Right Method:	Sloped Bank		4	471.411	815.23	0.447	364.194	2.46%
Top Fit Type:	Power Fit		-	-	-	-	-	-
Bottom Fit Type:	Power Fit		-	-	-	-	-	-
			<b>Mean:</b>	472.41	797.93	0.446	<b>355</b>	
			<b>SD:</b>	2.06	15.21	0.012	6.804	
			<b>COV:</b>	0.00	0.02	0.027	0.019	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S24-06	1.187	231.912		230.725	230.725	3/4" Pipe 3m North of logger
S24-04			1.073	230.839	230.838	3/4" Pipe 5m N of logger
S24-05			0.846	231.066	231.065	3/4" Pipe 1.5m South of logger
Water Level:	Cut	0.049	5.812	226.149	<b>Time WL Surveyed:</b>	9:45
S24-05			0.846	231.066	#N/A	3/4" Pipe 1.5m South of logger
<b>Turn</b>						
S24-05	0.825	231.891		231.066	#N/A	3/4" Pipe 1.5m South of logger
Water Level:	Cut	0.035	5.786	226.140	<b>Time WL Surveyed:</b>	9:47
S24-05			0.825	231.066	231.065	3/4" Pipe 1.5m South of logger
S24-04			1.054	230.837	230.838	3/4" Pipe 5m N of logger
S24-06			1.168	230.723	230.725	3/4" Pipe 3m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S24-06	1.168	231.892		230.724		
Water Level:	Cut	0.048	5.799	226.141	<b>Time WL Surveyed:</b>	11:38
Water Level:	Cut	0.048	5.818	226.138	<b>Time WL Surveyed:</b>	11:40
S24-06	1.184	231.908				

<b>WL Survey Summary</b>	Before	After
Average WL:	226.145	226.140
Closing Error:	0.002	-
WL Check:	0.009	0.003
Transducer Elevation	223.945	223.946

<b>Field Personnel:</b>	GG, TR, MP	Trip Date:	14-Oct-14
<b>Data Entry Personnel:</b>	GG	Date:	14-Oct-14
<b>Data Check Personnel:</b>	DW	Date:	24-Oct-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S24 - Athabasca River below Eymundson Creek  
 UTM Location: 466313 E, 6372760 N

Site Visit Date: December 10, 2014  
 Site Visit Time (MST): 09:45



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Depth @ 0.2 (m)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000		1.00	7.50	0.00	0.000	0.00	0.000	
1	15.00	2.50	0.65			2.13	0.121	1.02	0.107		1.00	13.00	1.85	0.114	24.05	2.742	2%
2	26.00	3.10	0.75			2.63	0.026	1.22	0.034		1.00	13.00	2.35	0.030	30.55	0.917	1%
3	41.00	1.80	0.70			1.58	0.037	0.92	0.034		1.00	11.50	1.10	0.036	12.65	0.449	0%
4	49.00	1.00	0.65	0.83	0.162						0.88	11.00	0.35	0.143	3.85	0.549	0%
5	63.00	1.05	0.45	0.75	0.143						0.88	9.00	0.60	0.126	5.40	0.680	0%
6	67.00	0.84	0.45	0.65	0.044						0.88	6.00	0.39	0.039	2.34	0.091	0%
7	75.00	0.45	0.45	0.45	0.000						0.88	46.50	0.00	0.000	0.00	0.000	0%
8	160.00	0.60	0.60	0.60	0.000						0.88	45.50	0.00	0.000	0.00	0.000	0%
9	166.00	0.90	0.65	0.78	0.057						0.88	10.50	0.25	0.050	2.63	0.132	0%
10	181.00	1.70	0.36			1.43	0.193	0.63	0.249		1.00	22.00	1.34	0.221	29.48	6.515	4%
11	210.00	3.50	0.45			2.89	0.148	1.06	0.334		1.00	20.50	3.05	0.241	62.53	15.069	9%
12	222.00	3.50	0.75			2.95	0.331	1.30	0.382		1.00	18.50	2.75	0.357	50.88	18.137	10%
13	247.00	3.30	0.75			2.79	0.267	1.26	0.359		1.00	21.00	2.55	0.313	53.55	16.761	9%
14	264.00	3.70	0.45			3.05	0.260	1.10	0.374		1.00	13.00	3.25	0.317	42.25	13.393	8%
15	273.00	3.60	0.75			3.03	0.308	1.32	0.367		1.00	9.50	2.85	0.338	27.08	9.138	5%
16	283.00	3.60	0.75			3.03	0.287	1.32	0.374		1.00	15.50	2.85	0.331	44.18	14.600	8%
17	304.00	3.30	0.70			2.78	0.313	1.22	0.345		1.00	21.00	2.60	0.329	54.60	17.963	10%
18	325.00	3.00	0.40			2.48	0.314	0.92	0.342		1.00	21.00	2.60	0.328	54.60	17.909	10%
19	346.00	3.05	0.75			2.59	0.266	1.21	0.342		1.00	21.50	2.30	0.304	49.45	15.033	8%
20	368.00	3.20	0.40			2.64	0.233	0.96	0.323		1.00	22.50	2.80	0.278	63.00	17.514	10%
21	391.00	2.80	0.40			2.32	0.131	0.88	0.177		1.00	26.00	2.40	0.154	62.40	9.610	5%
22	420.00	1.30	0.40			1.12	-0.003	0.58	-0.008		1.00	28.50	0.90	-0.006	25.65	-0.141	0%
RB	448.00	0.00	0.00		0.00						0.88	14.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>177</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
150m DS of heli. landing

Meas. Start Time (MST):	10:10
Meas. End Time (MST):	11:15
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges (e.g. stream):	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, calm, 0 C

**Flow characteristics:**

Total Flow:	177	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	701.10	(m <sup>2</sup> )
Wetted Width:	448.00	(m)
Hydraulic Depth:	1.56	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.06	

**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	2.216	-
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	0.2	-
Water Temperature #2 (°C):	-	-
Datalogger Clock:	11:52	-
Laptop Clock:	11:52	-
Battery (Main):	14.3	13.9
Battery Serial #:	-	Replaced
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

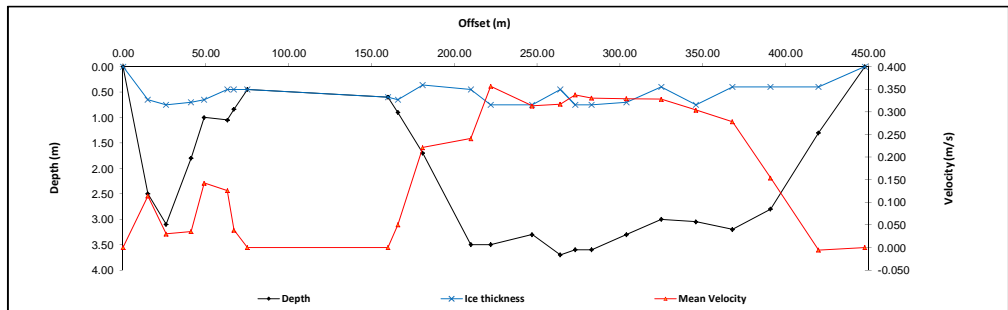
**Datalogger / Station Notes:**

- checked station RSSI: -91
- replaced battery

**General Notes:**

Cross-section dry (sand bar) between 67 and 166m

Conduct future measurements additional 100m downstream to avoid sand bar



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S24-06	1.243	231.968		230.725	230.725	3/4" Pipe 3m North of logger
S24-04			1.130	230.838	230.838	3/4" Pipe 5m N of logger
S24-05			0.902	231.066	231.065	3/4" Pipe 1.5m South of logger
Water Level:	Cut		5.822	226.146		<b>Time WL Surveyed:</b> 12:09
S24-05			0.902	231.066	231.065	3/4" Pipe 1.5m South of logger
<b>Turn</b>						
S24-05	0.873	231.939		231.066	231.065	3/4" Pipe 1.5m South of logger
Water Level:	Cut		5.792	226.147		<b>Time WL Surveyed:</b> 12:14
S24-05			0.873	231.066	231.065	3/4" Pipe 1.5m South of logger
S24-04			1.102	230.837	230.838	3/4" Pipe 5m N of logger
S24-06			1.215	230.724	230.725	3/4" Pipe 3m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					<b>Time WL Surveyed:</b>
Water Level:	Cut					<b>Time WL Surveyed:</b>

**WL Survey Summary**

	Before	After
Average WL:	226.147	-
Closing Error:	0.001	-
WL Check:	0.001	-
Transducer Elevation	223.931	-

**Field Personnel:**

GG, SM	Trip Date:	10-Dec-14
GG	Date:	10-Dec-14
SG	Date:	13-Jan-15
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: April 29, 2014  
 Site Visit Time (MST): 11:05



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.90	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.10	0.40		0.24	0.159				1.00	0.15	0.40	0.159	0.06	0.010	11%	
2	1.30	0.37		0.22	0.090				1.00	0.10	0.37	0.090	0.04	0.003	4%	
3	1.30	0.31		0.19	0.085				1.00	0.10	0.31	0.085	0.03	0.003	3%	
4	1.40	0.33		0.20	0.081				1.00	0.10	0.33	0.081	0.03	0.003	3%	
5	1.50	0.30		0.18	0.210				1.00	0.10	0.30	0.210	0.03	0.006	7%	
6	1.60	0.24		0.14	0.205				1.00	0.10	0.24	0.205	0.02	0.005	6%	
7	1.70	0.24		0.14	0.205				1.00	0.10	0.24	0.205	0.02	0.005	6%	
8	1.80	0.21		0.13	0.159				1.00	0.10	0.21	0.159	0.02	0.003	4%	
9	1.90	0.20		0.12	0.177				1.00	0.10	0.20	0.177	0.02	0.004	4%	
10	2.00	0.20		0.12	0.152				1.00	0.10	0.20	0.152	0.02	0.003	4%	
11	2.10	0.20		0.12	0.115				1.00	0.10	0.20	0.115	0.02	0.002	3%	
12	2.20	0.22		0.13	0.096				1.00	0.10	0.22	0.096	0.02	0.002	2%	
13	2.30	0.24		0.14	0.087				1.00	0.10	0.24	0.087	0.02	0.002	2%	
14	2.40	0.25		0.15	0.097				1.00	0.10	0.25	0.097	0.03	0.002	3%	
15	2.50	0.26		0.16	0.128				1.00	0.10	0.26	0.128	0.03	0.003	4%	
16	2.60	0.24		0.14	0.172				1.00	0.10	0.24	0.172	0.02	0.004	5%	
17	2.70	0.24		0.14	0.166				1.00	0.10	0.24	0.166	0.02	0.004	5%	
18	2.80	0.23		0.14	0.342				1.00	0.10	0.23	0.342	0.02	0.008	9%	
19	2.90	0.23		0.14	0.282				1.00	0.10	0.23	0.282	0.02	0.006	8%	
20	3.00	0.20		0.12	0.120				1.00	0.10	0.20	0.120	0.02	0.002	3%	
21	3.10	0.22		0.13	0.098				1.00	0.15	0.22	0.098	0.03	0.003	4%	
LB	3.30	0.00	0.00		0.00			0.00	1.00	0.10	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.085</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -15m US of station

Mess. Start Time (MST):	11:35
Mess. End Time (MST):	12:10
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g., stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 10C

**Flow characteristics:**

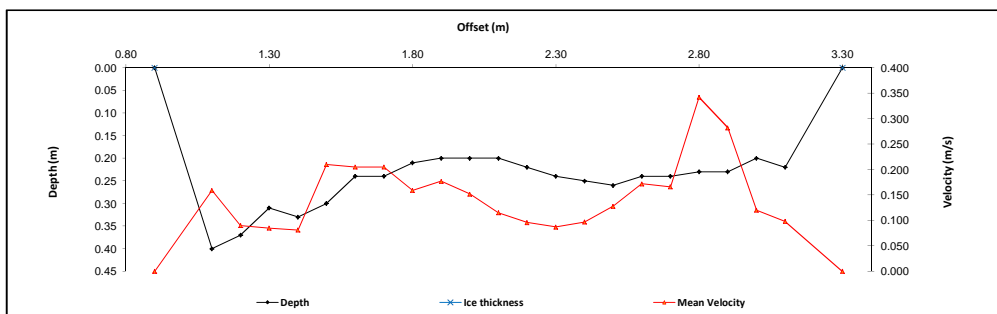
Total Flow:	0.085	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.56	(m <sup>2</sup> )
Wetted Width:	2.40	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.175	
Water (°C):	1.5	
Datalogger Clock:	12:19	
Laptop Clock:	12:19	
Battery:	12.9	
Battery Condition:		New
Battery Serial #:	1305001	
Enclosure Desiccant:		New
Vent Tube Desiccant:		New
PTH# (if replaced):	304017	
Logger# (if replaced):	20960	

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S25-01	1.191	101.191		100.000	100.000	T-Post in PVC 2m North of logger
S25-04			0.941	100.250	100.261	3/4" Pipe 4m East of logger
Water Level:	Cut		2.278	98.913		Time WL Surveyed: 11:27
S25-03			0.991	100.200	100.121	3/4" Pipe 2m East of logger
<b>Turn</b>						
S25-03	0.972	101.172		100.200	100.121	3/4" Pipe 2m East of logger
Water Level:	Cut		2.256	98.916		Time WL Surveyed: 11:28
S25-04			0.921	100.251	100.261	3/4" Pipe 4m East of logger
S25-01			1.173	99.999	100.000	T-Post in PVC 2m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S25-03	0.971	101.171		100.200		
Water Level:	Cut		2.254	98.917		Time WL Surveyed: 12:15
Water Level:	Cut		2.228	98.918		Time WL Surveyed: 12:17
S25-03	0.946	101.146		100.200		

**WL Survey Summary**

	Before	After
Average WL:	98.915	98.918
Closing Error:	0.001	-
WL Check:	0.003	-0.001
Transducer Elevation	98.740	-

**Field Personnel:**

	TR, GG	Trip Date:	29-Apr-14
Data Entry Personnel:	TR	Date:	29-Apr-14
Data Check Personnel:	CJ	Date:	3-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: June 15, 2014  
 Site Visit Time (MST): 14:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	12.80	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	13.00	0.14		0.08	-0.031					1.00	0.15	0.14	-0.031	0.02	-0.001	-1%
2	13.10	0.13		0.08	0.399					1.00	0.10	0.13	0.399	0.01	0.005	5%
3	13.20	0.19		0.11	0.001					1.00	0.10	0.19	0.001	0.02	0.000	0%
4	13.30	0.14		0.08	0.363					1.00	0.10	0.14	0.363	0.01	0.005	5%
5	13.40	0.15		0.09	0.117					1.00	0.10	0.15	0.117	0.01	0.002	2%
6	13.50	0.18		0.11	0.175					1.00	0.10	0.18	0.175	0.02	0.003	3%
7	13.60	0.15		0.09	0.004					1.00	0.10	0.15	0.004	0.01	0.000	0%
8	13.70	0.22		0.13	0.013					1.00	0.10	0.22	0.013	0.02	0.000	0%
9	13.80	0.20		0.12	0.462					1.00	0.10	0.20	0.462	0.02	0.009	10%
10	13.90	0.21		0.13	0.428					1.00	0.10	0.21	0.428	0.02	0.009	9%
11	14.00	0.17		0.10	0.341					1.00	0.08	0.17	0.341	0.01	0.004	5%
12	14.05	0.18		0.11	0.552					1.00	0.05	0.18	0.552	0.01	0.005	5%
13	14.10	0.18		0.11	0.492					1.00	0.05	0.18	0.492	0.01	0.004	5%
14	14.15	0.17		0.10	0.637					1.00	0.05	0.17	0.637	0.01	0.005	6%
15	14.20	0.16		0.10	0.532					1.00	0.07	0.16	0.532	0.01	0.006	7%
16	14.30	0.12		0.07	0.979					1.00	0.07	0.12	0.979	0.01	0.009	9%
17	14.35	0.10		0.06	1.043					1.00	0.05	0.10	1.043	0.01	0.005	6%
18	14.40	0.12		0.07	0.537					1.00	0.07	0.12	0.537	0.01	0.005	5%
19	14.50	0.08		0.05	1.139					1.00	0.08	0.08	1.139	0.01	0.007	7%
20	14.55	0.10		0.06	0.516					1.00	0.05	0.10	0.516	0.00	0.003	3%
21	14.60	0.08		0.05	1.075					1.00	0.05	0.08	1.075	0.00	0.004	5%
22	14.65	0.07		0.04	0.494					1.00	0.10	0.07	0.494	0.01	0.003	4%
RB	14.80	0.00	0.00		0.00		0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.095</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
2m downstream of PT

Meas. Start Time (MST):	14:55
Meas. End Time (MST):	15:28
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 25C

### Flow characteristics:

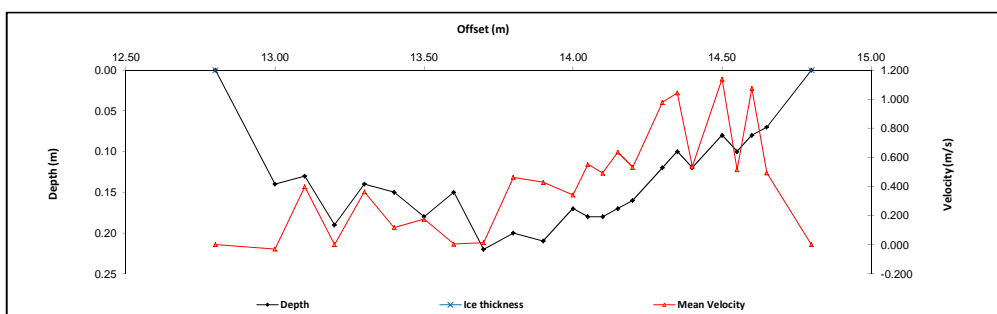
Total Flow:	0.095	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.27	(m²)
Wetted Width:	2.00	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.30	

### Logger Details:

	Before	After
Transducer Reading (m):	0.228	0.226
Water (°C):	15.7	15.9
Datalogger Clock:	14:45	15:34
Laptop Clock:	14:44	15:33
Battery:	13.5	13.5
Battery Condition:	Good	
Battery Serial #:	1305001	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

### General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S25-01	1.093	101.093		100.000	100.000	T-Post in PVC 2m North of logger
S25-03			0.894	100.199	100.121	3/4" Pipe 2m East of logger
S25-04			0.840	100.253	100.261	3/4" Pipe 4m East of logger
Water Level:	Cut	0.278	2.435	98.936	Time WL Surveyed:	14:56
Temporary BM			2.435	98.658	0.000	-0.762
<b>Turn</b>						
Temporary BM	2.357	101.015		98.658		
Water Level:	Cut	0.278	2.357	98.936	Time WL Surveyed:	14:58
S25-04			0.762	100.253	100.261	3/4" Pipe 4m East of logger
S25-03			0.816	100.199	100.121	3/4" Pipe 2m East of logger
S25-01			1.013	100.002	100.000	T-Post in PVC 2m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S25-04	0.761	101.014		100.253		
Water Level:	Cut	0.261	2.343	98.932	Time WL Surveyed:	15:29
Water Level:	Cut	0.261	2.293	98.926	Time WL Surveyed:	15:31
S25-04	0.707	100.960		100.253		

WL Survey Summary	Before	After
Average WL:	98.936	98.930
Closing Error:	-0.002	-
WL Check:	0.000	0.004
Transducer Elevation	98.708	98.704

Field Personnel:	TR, DW, NC	Trip Date:	15-Jun-14
Data Entry Personnel:	NC	Date:	15-Jun-14
Data Check Personnel:	CJ	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: August 15, 2014  
 Site Visit Time (MST): 11:18

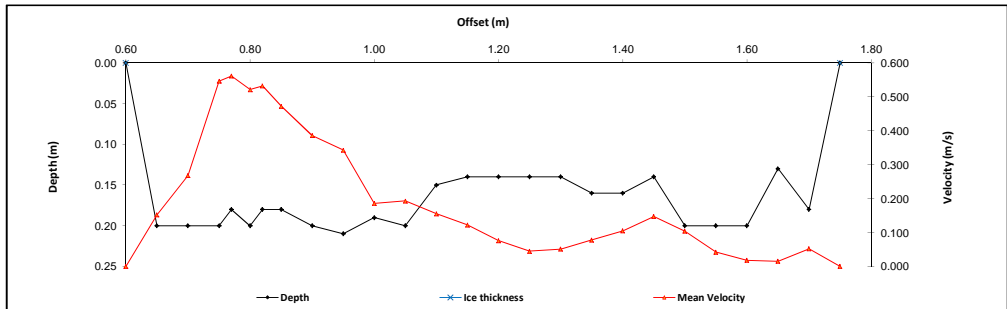


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	0.60	0.00	0.00		0.000				0.000	1.00	0.03	0.00	0.000	0.00	0.000	
1	0.65	0.20		0.12	0.152					1.00	0.05	0.20	0.152	0.01	0.002	4%
2	0.70	0.20		0.12	0.268					1.00	0.05	0.20	0.268	0.01	0.003	7%
3	0.75	0.20		0.12	0.546					1.00	0.04	0.20	0.546	0.01	0.004	10%
4	0.77	0.18		0.11	0.561					1.00	0.02	0.18	0.561	0.00	0.003	7%
5	0.80	0.20		0.12	0.521					1.00	0.03	0.20	0.521	0.01	0.003	7%
6	0.82	0.18		0.11	0.532					1.00	0.03	0.18	0.532	0.00	0.002	6%
7	0.85	0.18		0.11	0.472					1.00	0.04	0.18	0.472	0.01	0.003	9%
8	0.90	0.20		0.12	0.386					1.00	0.05	0.20	0.386	0.01	0.004	10%
9	0.95	0.21		0.13	0.343					1.00	0.05	0.21	0.343	0.01	0.004	9%
10	1.00	0.19		0.11	0.186					1.00	0.05	0.19	0.186	0.01	0.002	5%
11	1.05	0.20		0.12	0.193					1.00	0.05	0.20	0.193	0.01	0.002	5%
12	1.10	0.15		0.09	0.155					1.00	0.05	0.15	0.155	0.01	0.001	3%
13	1.15	0.14		0.08	0.122					1.00	0.05	0.14	0.122	0.01	0.001	2%
14	1.20	0.14		0.08	0.076					1.00	0.05	0.14	0.076	0.01	0.001	1%
15	1.25	0.14		0.08	0.045					1.00	0.05	0.14	0.045	0.01	0.000	1%
16	1.30	0.14		0.08	0.051					1.00	0.05	0.14	0.051	0.01	0.000	1%
17	1.35	0.16		0.10	0.078					1.00	0.05	0.16	0.078	0.01	0.001	2%
18	1.40	0.16		0.10	0.105					1.00	0.05	0.16	0.105	0.01	0.001	2%
19	1.45	0.14		0.08	0.147					1.00	0.05	0.14	0.147	0.01	0.001	3%
20	1.50	0.20		0.12	0.104					1.00	0.05	0.20	0.104	0.01	0.001	3%
21	1.55	0.20		0.12	0.042					1.00	0.05	0.20	0.042	0.01	0.000	1%
22	1.60	0.20		0.12	0.018					1.00	0.05	0.20	0.018	0.01	0.000	0%
23	1.65	0.13		0.08	0.015					1.00	0.05	0.13	0.015	0.01	0.000	0%
24	1.70	0.18		0.11	0.052					1.00	0.05	0.18	0.052	0.01	0.000	1%
RB	1.75	0.00	0.00		0.000		0.00		0.000	1.00	0.03	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.038</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m upstream of PT

Meas. Start Time (MST):	11:45
Meas. End Time (MST):	12:10
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 27C



**Flow characteristics:**

Total Flow:	0.038	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.19	(m²)
Wetted Width:	1.15	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.168	0.168
Water (°C):	18.7	18.8
Datalogger Clock:	11:23	12:18
Laptop Clock:	11:23	12:18
Battery:	12.6	12.6
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-radio installed at relay station

**General Notes**

-Large cobbles and woody debris in channel.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S25-01	0.749	100.749		100.000	100.000	T-Post in PVC 2m North of logger
S25-03			0.597	100.152	100.121	3/4" Pipe 2m East of logger
S25-04			0.497	100.252	100.261	3/4" Pipe 2m East of logger
Water Level:	Cut	0.194	2.063	98.880	Time WL Surveyed: 11:33	
Temporary BM			2.063	98.686	0.000	
<b>Turn</b>						
Temporary BM	2.054	100.740		98.686		
Water Level:	Cut	0.194	2.054	98.880	Time WL Surveyed: 11:35	
S25-04			0.488	100.252	100.261	3/4" Pipe 2m East of logger
S25-03			0.589	100.151	100.121	3/4" Pipe 2m East of logger
S25-01			0.743	99.997	100.000	T-Post in PVC 2m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S25-03	0.593	100.744		100.151		
Water Level:	Cut	0.075	1.939	98.880	Time WL Surveyed: 12:13	
Water Level:	Cut	0.075	1.926	98.882	Time WL Surveyed: 12:15	
S25-03	0.582	100.733		100.151		

**WL Survey Summary**

	Before	After
Average WL:	98.880	98.881
Closing Error:	0.003	-
WL Check:	0.000	-0.002
Transducer Elevation	98.712	98.713

**Field Personnel:**

	TR, GG, MP	Trip Date:	15-Aug-14
Data Entry Personnel:	TR	Date:	15-Aug-14
Data Check Personnel:	CJ	Date:	27-Aug-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: September 17, 2014  
 Site Visit Time (MST): 12:05



Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)							
RB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000								
1	1.90	0.12		0.07	0.133					1.00	0.08	0.12	0.133	0.01	0.001	3%							
2	1.85	0.20		0.12	0.155					1.00	0.05	0.20	0.155	0.01	0.002	4%							
3	1.80	0.22		0.13	0.162					1.00	0.05	0.22	0.162	0.01	0.002	4%							
4	1.75	0.24		0.14	0.132					1.00	0.05	0.24	0.132	0.01	0.002	4%							
5	1.70	0.26		0.16	0.093					1.00	0.05	0.26	0.093	0.01	0.001	3%							
6	1.65	0.26		0.16	0.100					1.00	0.05	0.26	0.100	0.01	0.001	3%							
7	1.60	0.20		0.12	0.096					1.00	0.05	0.20	0.096	0.01	0.001	2%							
8	1.55	0.18		0.11	0.191					1.00	0.05	0.18	0.191	0.01	0.002	4%							
9	1.50	0.18		0.11	0.155					1.00	0.05	0.18	0.155	0.01	0.001	3%							
10	1.45	0.18		0.11	0.031					1.00	0.05	0.18	0.031	0.01	0.000	1%							
11	1.40	0.18		0.11	0.014					1.00	0.05	0.18	0.014	0.01	0.000	0%							
12	1.35	0.19		0.11	0.043					1.00	0.05	0.19	0.043	0.01	0.000	1%							
13	1.30	0.19		0.11	0.072					1.00	0.05	0.19	0.072	0.01	0.001	2%							
14	1.25	0.20		0.12	0.088					1.00	0.05	0.20	0.088	0.01	0.001	2%							
15	1.20	0.20		0.12	0.166					1.00	0.05	0.20	0.166	0.01	0.002	4%							
16	1.15	0.21		0.13	0.155					1.00	0.05	0.21	0.155	0.01	0.002	4%							
17	1.10	0.21		0.13	0.199					1.00	0.05	0.21	0.199	0.01	0.002	5%							
18	1.05	0.22		0.13	0.209					1.00	0.05	0.22	0.209	0.01	0.002	5%							
19	1.00	0.20		0.12	0.286					1.00	0.04	0.20	0.286	0.01	0.002	5%							
20	0.97	0.20		0.12	0.467					1.00	0.02	0.20	0.467	0.00	0.002	5%							
21	0.95	0.20		0.12	0.441					1.00	0.04	0.20	0.441	0.01	0.003	7%							
22	0.90	0.22		0.13	0.498					1.00	0.04	0.22	0.498	0.01	0.004	10%							
23	0.87	0.21		0.13	0.414					1.00	0.02	0.21	0.414	0.01	0.002	5%							
24	0.85	0.22		0.13	0.473					1.00	0.02	0.22	0.473	0.00	0.002	5%							
25	0.83	0.24		0.14	0.365					1.00	0.03	0.24	0.365	0.01	0.002	5%							
26	0.80	0.25		0.15	0.261					1.00	0.02	0.25	0.261	0.00	0.001	3%							
LB	0.79	0.00	0.00		0.00		0.00			1.00	0.01	0.00	0.000	0.00									
<b>Total Flow</b>														<b>0.043</b>	<b>100%</b>								

**Flow Measurement Details:**  
 Metering Section Location (describe): 5m US of PT

Meas. Start Time (MST):	12:26
Meas. End Time (MST):	12:59
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 12C

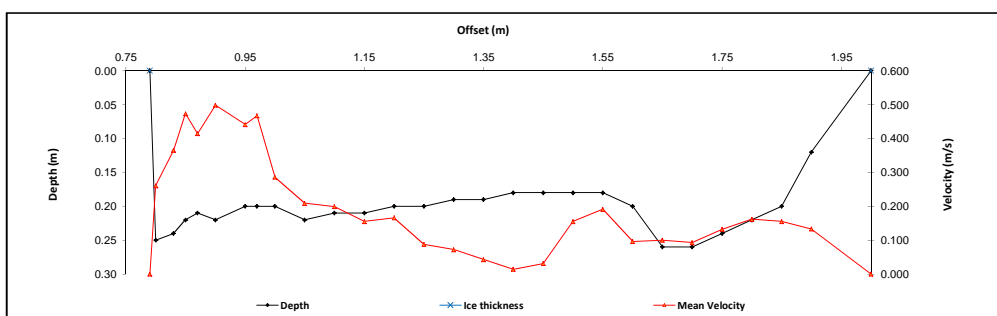
<b>Flow characteristics:</b>		
Total Flow:	0.043	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.23	(m <sup>2</sup> )
Wetted Width:	1.21	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.13	

<b>Logger Details:</b>		
Transducer Reading (m):	Before: 0.184	After: 0.183
Water (°C):	9.1	9.3
Datalogger Clock:	12:09	13:05
Laptop Clock:	12:08	13:05
Battery:	11.7	13.3
Battery Condition:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Replaced battery, repaired solar panel connection

**General Notes:**



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Level Survey:</b>						
<b>Benchmark</b>						
S25-01	1.063	101.063		100.000	100.000	T-Post in PVC 2m North of logger
S25-04			0.811	100.252	100.261	3/4" Pipe 4m East of logger
S25-03			0.917	100.146	100.121	3/4" Pipe 2m East of logger
Water Level:	Cut		2.157	98.906	Time WL Surveyed: 12:18	
Temporary BM			2.211	98.852	0.000	
<b>Turn</b>						
Temporary BM	2.194	101.046		98.852		
Water Level:	Cut		2.141	98.905	Time WL Surveyed: 12:20	
S25-03			0.901	100.145	100.121	3/4" Pipe 2m East of logger
S25-04			0.796	100.250	100.261	3/4" Pipe 4m East of logger
S25-01			1.048	99.998	100.000	T-Post in PVC 2m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S25-03	0.901	101.046		100.145		
Water Level:	Cut		2.140	98.906	Time WL Surveyed: 13:01	
Water Level:	Cut		2.123	98.906	Time WL Surveyed: 13:02	
S25-03	0.884	101.029		100.145		

<b>WL Survey Summary</b>		
Average WL:	Before: 98.906	After: 98.906
Closing Error:	0.002	-
WL Check:	0.001	0.000
Transducer Elevation	98.722	98.723

<b>Field Personnel:</b>			
	SM, TR, MP	Trip Date:	17-Sep-14
Data Entry Personnel:	SM	Date:	17-Sep-14
Data Check Personnel:	GG	Date:	24-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S25 Susan Lake Outlet  
 UTM Location: 464513 E, 6368477 N

Site Visit Date: November 1, 2014  
 Site Visit Time (MST): 14:20

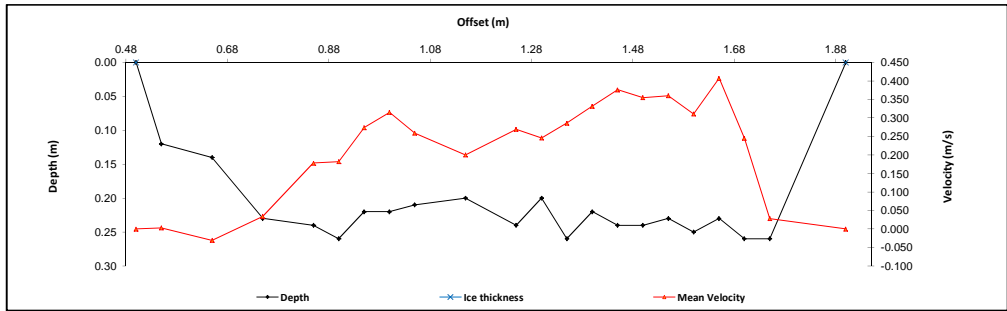


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.50	0.00	0.00		0.000				0.000	1.00	0.03	0.00	0.000	0.00	0.000	
1	0.55	0.12		0.07	0.003					1.00	0.08	0.12	0.003	0.01	0.000	0%
2	0.65	0.14		0.08	-0.031					1.00	0.10	0.14	-0.031	0.01	0.000	-1%
3	0.75	0.23		0.14	0.034					1.00	0.10	0.23	0.034	0.02	0.001	1%
4	0.85	0.24		0.14	0.178					1.00	0.08	0.24	0.178	0.02	0.003	5%
5	0.90	0.26		0.16	0.182					1.00	0.05	0.26	0.182	0.01	0.002	4%
6	0.95	0.22		0.13	0.274					1.00	0.05	0.22	0.274	0.01	0.003	5%
7	1.00	0.22		0.13	0.315					1.00	0.05	0.22	0.315	0.01	0.003	6%
8	1.05	0.21		0.13	0.259					1.00	0.08	0.21	0.259	0.02	0.004	7%
9	1.15	0.20		0.12	0.200					1.00	0.10	0.20	0.200	0.02	0.004	7%
10	1.25	0.24		0.14	0.269					1.00	0.08	0.24	0.269	0.02	0.005	8%
11	1.30	0.20		0.12	0.246					1.00	0.05	0.20	0.246	0.01	0.002	4%
12	1.35	0.26		0.16	0.286					1.00	0.05	0.26	0.286	0.01	0.004	6%
13	1.40	0.22		0.13	0.332					1.00	0.05	0.22	0.332	0.01	0.004	6%
14	1.45	0.24		0.14	0.376					1.00	0.05	0.24	0.376	0.01	0.005	7%
15	1.50	0.24		0.14	0.355					1.00	0.05	0.24	0.355	0.01	0.004	7%
16	1.55	0.23		0.14	0.360					1.00	0.05	0.23	0.360	0.01	0.004	7%
17	1.60	0.25		0.15	0.311					1.00	0.05	0.25	0.311	0.01	0.004	6%
18	1.65	0.23		0.14	0.407					1.00	0.05	0.23	0.407	0.01	0.005	8%
19	1.70	0.26		0.16	0.245					1.00	0.05	0.26	0.245	0.01	0.003	5%
20	1.75	0.26		0.16	0.028					1.00	0.10	0.26	0.028	0.03	0.001	1%
LB	1.90	0.00	0.00				0.00		0.00	1.00	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.061</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m US of PT

Meas. Start Time (MST):	14:34
Meas. End Time (MST):	14:55
Equipment:	ADV
Method:	Wading
River Condition:	Fast flowing
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 5C



**Flow characteristics:**

Total Flow:	0.061	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.29	(m <sup>2</sup> )
Wetted Width:	1.40	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.15	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.211	0.210
Water (°C):	3.0	3.0
Datalogger Clock:	14:25	15:01
Laptop Clock:	14:24	15:00
Battery:	12.3	12.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Small amount of water flowing parallel to stream on left bank, may be entering stream

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S25-01	1.016	101.016		100.000	100.000	T-Post in PVC 2m North of logger
S25-04			0.764	100.252	100.261	3/4" Pipe 4m East of logger
S25-03			0.872	100.144	100.121	3/4" Pipe 2m East of logger
Water Level:	Cut	0.202	2.287	98.931	Time WL Surveyed: 14:29	
Temporary BM			2.287	98.729	0.000	
<b>Turn</b>						
Temporary BM	2.277	101.006		98.729		
Water Level:	Cut	0.202	2.277	98.931	Time WL Surveyed: 14:31	
S25-03			0.862	100.144	100.121	3/4" Pipe 2m East of logger
S25-04			0.754	100.252	100.261	3/4" Pipe 4m East of logger
S25-01			1.007	99.999	100.000	T-Post in PVC 2m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S25-03	0.862	101.006		100.144		
Water Level:	Cut	0.182	2.254	98.934	Time WL Surveyed: 14:57	
Water Level:	Cut	0.182	2.246	98.934	Time WL Surveyed: 14:59	
S25-03	0.854	100.998		100.144		

**WL Survey Summary**

	Before	After
Average WL:	98.931	98.934
Closing Error:	0.001	-
WL Check:	0.000	0.000
Transducer Elevation	98.720	98.724

**Field Personnel:**

	MP, TR	Trip Date:	1-Nov-14
Data Entry Personnel:	MP, TR	Date:	1-Nov-14
Data Check Personnel:	GG	Date:	20-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: January 8, 2014  
 Site Visit Time (MST): 09:00

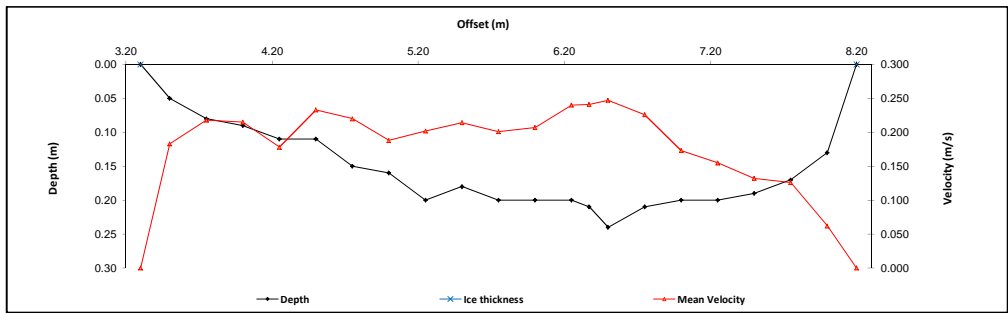


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.30	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	3.50	0.05		0.03	0.183					1.00	0.23	0.05	0.183	0.01	0.002	1%
2	3.75	0.08		0.05	0.218					1.00	0.25	0.08	0.218	0.02	0.004	3%
3	4.00	0.09		0.05	0.215					1.00	0.25	0.09	0.215	0.02	0.005	3%
4	4.25	0.11		0.07	0.178					1.00	0.25	0.11	0.178	0.03	0.005	3%
5	4.50	0.11		0.07	0.233					1.00	0.25	0.11	0.233	0.03	0.006	4%
6	4.75	0.15		0.09	0.220					1.00	0.25	0.15	0.220	0.04	0.008	6%
7	5.00	0.16		0.10	0.188					1.00	0.25	0.16	0.188	0.04	0.008	5%
8	5.25	0.20		0.12	0.202					1.00	0.25	0.20	0.202	0.05	0.010	7%
9	5.50	0.18		0.11	0.214					1.00	0.25	0.18	0.214	0.05	0.010	7%
10	5.75	0.20		0.12	0.201					1.00	0.25	0.20	0.201	0.05	0.010	7%
11	6.00	0.20		0.12	0.207					1.00	0.25	0.20	0.207	0.05	0.010	7%
12	6.25	0.20		0.12	0.240					1.00	0.19	0.20	0.240	0.04	0.009	6%
13	6.37	0.21		0.13	0.241					1.00	0.13	0.21	0.241	0.03	0.006	4%
14	6.50	0.24		0.14	0.247					1.00	0.19	0.24	0.247	0.05	0.011	8%
15	6.75	0.21		0.13	0.226					1.00	0.25	0.21	0.226	0.05	0.012	8%
16	7.00	0.20		0.12	0.173					1.00	0.25	0.20	0.173	0.05	0.009	6%
17	7.25	0.20		0.12	0.155					1.00	0.25	0.20	0.155	0.05	0.008	5%
18	7.50	0.19		0.11	0.132					1.00	0.25	0.19	0.132	0.05	0.006	4%
19	7.75	0.17		0.10	0.126					1.00	0.25	0.17	0.126	0.04	0.005	4%
20	8.00	0.13		0.08	0.062					1.00	0.23	0.13	0.062	0.03	0.002	1%
LB	8.20	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.147</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Rifle 15m US of bridge

Meas. Start Time (MST):	9:30
Meas. End Time (MST):	9:52
Equipment:	ADV
Method:	Wading
River Condition:	Partial Ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	P. cloudy, light snow breezy, -18



**Flow characteristics:**

Total Flow:	0.147	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.76	(m <sup>2</sup> )
Wetted Width:	4.90	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.216	0.215
Water (°C):	0.0	0.0
Rainfall (mm):	0.00	0.00
Datalogger Clock:	9:06	10:04
Laptop Clock:	9:05	10:03
Battery (Main):	12.7	12.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-3	1.449	101.175		99.726	99.726	3/4" Pipe 5m NW of logger
S31-4			1.187	99.988	99.982	3/4" Pipe 3m SW of logger
S31-5			1.189	99.986	99.993	3/4" Pipe 15m S of logger
Water Level:	Cut		2.936	98.239	Time WL Surveyed: 9:15	
Temporary BM			1.187	99.988	0.000	-
<b>Turn</b>						
Temporary BM	1.169	101.157		99.988		
Water Level:	Cut		2.919	98.238	Time WL Surveyed: 9:19	
S31-5			1.171	99.986	99.993	3/4" Pipe 15m S of logger
S31-4			1.169	99.988	99.982	3/4" Pipe 3m SW of logger
S31-3			1.431	99.726	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S31-4	1.169	101.157		99.988		
Water Level:	Cut		2.919	98.238	Time WL Surveyed: 9:59	
Water Level:	Cut		2.899	98.240	Time WL Surveyed: 10:02	
S31-4	1.151	101.139		99.988		

**WL Survey Summary**

	Before	After
Average WL:	98.239	98.239
Closing Error:	0.000	-
WL Check:	0.001	-0.002
Transducer Elevation	98.023	98.024

**Field Personnel:**

	SM, TR	Trip Date:	8-Jan-14
Data Entry Personnel:	SM	Date:	8-Jan-14
Data Check Personnel:	TR	Date:	28-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: February 14, 2014  
 Site Visit Time (MST): 11:15

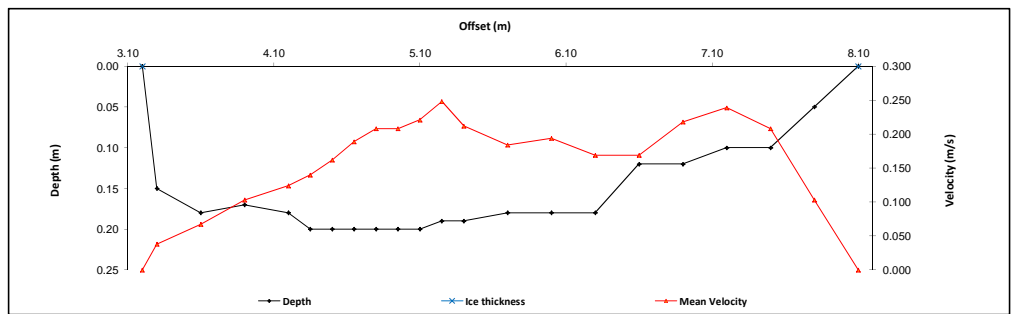


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	8.10	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	7.80	0.05		0.03	0.103					1.00	0.30	0.05	0.103	0.01	0.002	1%
2	7.50	0.10		0.06	0.208					1.00	0.30	0.10	0.208	0.03	0.006	5%
3	7.20	0.10		0.06	0.239					1.00	0.30	0.10	0.239	0.03	0.007	6%
4	6.90	0.12		0.07	0.218					1.00	0.30	0.12	0.218	0.04	0.008	6%
5	6.60	0.12		0.07	0.169					1.00	0.30	0.12	0.169	0.04	0.006	5%
6	6.30	0.18		0.11	0.169					1.00	0.30	0.18	0.169	0.05	0.009	7%
7	6.00	0.18		0.11	0.194					1.00	0.30	0.18	0.194	0.05	0.010	9%
8	5.70	0.18		0.11	0.184					1.00	0.30	0.18	0.184	0.05	0.010	8%
9	5.40	0.19		0.11	0.212					1.00	0.23	0.19	0.212	0.04	0.009	7%
10	5.25	0.19		0.11	0.248					1.00	0.15	0.19	0.248	0.03	0.007	6%
11	5.10	0.20		0.12	0.221					1.00	0.15	0.20	0.221	0.03	0.007	5%
12	4.95	0.20		0.12	0.208					1.00	0.15	0.20	0.208	0.03	0.006	5%
13	4.80	0.20		0.12	0.208					1.00	0.15	0.20	0.208	0.03	0.006	5%
14	4.65	0.20		0.12	0.189					1.00	0.15	0.20	0.189	0.03	0.006	5%
15	4.50	0.20		0.12	0.162					1.00	0.15	0.20	0.162	0.03	0.005	4%
16	4.35	0.20		0.12	0.140					1.00	0.15	0.20	0.140	0.03	0.004	3%
17	4.20	0.18		0.11	0.124					1.00	0.23	0.18	0.124	0.04	0.005	4%
18	3.90	0.17		0.10	0.103					1.00	0.30	0.17	0.103	0.05	0.005	4%
19	3.60	0.18		0.11	0.067					1.00	0.30	0.18	0.067	0.05	0.004	3%
20	3.30	0.15		0.09	0.038					1.00	0.20	0.15	0.038	0.03	0.001	1%
LB	3.20	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.123</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST): 11:55  
 Meas. End Time (MST): 12:22  
 Equipment: ADV  
 Method: Wading  
 River Condition: partial ice (over)  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: clear, light breeze, -16



**Flow characteristics:**

Total Flow:	0.123	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.74	(m <sup>2</sup> )
Wetted Width:	4.90	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.103	
Water (°C):	0.6	
Rainfall (mm):	0.00	
Datalogger Clock:	11:25	
Laptop Clock:	11:24	
Battery (Main):	15.0	
Battery:		Good
Battery Serial #:	-	
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-3	1.415	101.141		99.726	99.726	3/4" Pipe 5m NW of logger
S31-4			1.155	99.986	99.982	3/4" Pipe 3m SW of logger
S31-5			1.166	99.975	99.993	3/4" Pipe 15m S of logger
Water Level:	Cut		2.973	98.168	Time WL Surveyed: 11:37	
Temporary BM			3.087	98.054	0.000	
<b>Turn</b>						
Temporary BM	3.068	101.122		98.054		
Water Level:	Cut		2.951	98.171	Time WL Surveyed: 11:40	
S31-5			1.145	99.977	99.993	3/4" Pipe 15m S of logger
S31-4			1.135	99.987	99.982	3/4" Pipe 3m SW of logger
S31-3			1.395	99.727	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.170	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	98.067	-

**Field Personnel:**

	SM, MP	Trip Date:	14-Feb-14
Data Entry Personnel:	SM	Date:	14-Feb-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: March 5, 2014  
 Site Visit Time (MST): 08:40

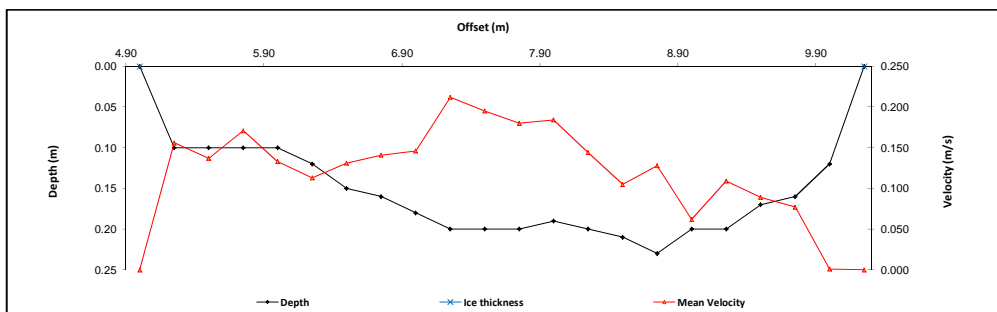


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	5.00	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	5.25	0.10		0.06	0.156					1.00	0.25	0.10	0.156	0.03	0.004	4%
2	5.50	0.10		0.06	0.137					1.00	0.25	0.10	0.137	0.03	0.003	3%
3	5.75	0.10		0.06	0.171					1.00	0.25	0.10	0.171	0.03	0.004	4%
4	6.00	0.10		0.06	0.133					1.00	0.25	0.10	0.133	0.03	0.003	3%
5	6.25	0.12		0.07	0.113					1.00	0.25	0.12	0.113	0.03	0.003	3%
6	6.50	0.15		0.09	0.131					1.00	0.25	0.15	0.131	0.04	0.005	5%
7	6.75	0.16		0.10	0.141					1.00	0.25	0.16	0.141	0.04	0.006	5%
8	7.00	0.18		0.11	0.146					1.00	0.25	0.18	0.146	0.05	0.007	6%
9	7.25	0.20		0.12	0.212					1.00	0.25	0.20	0.212	0.05	0.011	10%
10	7.50	0.20		0.12	0.195					1.00	0.25	0.20	0.195	0.05	0.010	9%
11	7.75	0.20		0.12	0.180					1.00	0.25	0.20	0.180	0.05	0.009	8%
12	8.00	0.19		0.11	0.184					1.00	0.25	0.19	0.184	0.05	0.009	8%
13	8.25	0.20		0.12	0.144					1.00	0.25	0.20	0.144	0.05	0.007	7%
14	8.50	0.21		0.13	0.105					1.00	0.25	0.21	0.105	0.05	0.006	5%
15	8.75	0.23		0.14	0.128					1.00	0.25	0.23	0.128	0.06	0.007	7%
16	9.00	0.20		0.12	0.062					1.00	0.25	0.20	0.062	0.05	0.003	3%
17	9.25	0.20		0.12	0.109					1.00	0.25	0.20	0.109	0.05	0.005	5%
18	9.50	0.17		0.10	0.089					1.00	0.25	0.17	0.089	0.04	0.004	3%
19	9.75	0.16		0.10	0.077					1.00	0.25	0.16	0.077	0.04	0.003	3%
20	10.00	0.12		0.07	0.001					1.00	0.25	0.12	0.001	0.03	0.000	0%
LB	10.25	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.109</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	9:09
Meas. End Time (MST):	9:34
Equipment:	ADV
Method:	Wading
River Condition:	Partial ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	light snow, calm, -18



**Flow characteristics:**

Total Flow:	0.109	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.82	(m <sup>2</sup> )
Wetted Width:	5.25	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.11	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.206	-
Water (°C):	0.5	-
Rainfall (mm):	0.00	-
Datalogger Clock:	8:45	-
Laptop Clock:	8:45	-
Battery (Main):	12.2	13.1
Battery:	-	Replaced
Battery Serial #:	-	1205002
Enclosure Desiccant:	-	Good
Vent Tube Desiccant:	-	Good
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-3	1.481	101.207		99.726	99.726	3/4" Pipe 5m NW of logger
S31-4			1.226	99.981	99.982	3/4" Pipe 3m SW of logger
S31-5			1.247	99.960	99.993	3/4" Pipe 15m S of logger
Water Level:	Cut		3.047	98.160	Time WL Surveyed: 9:44	
Temporary BM			3.008	98.199	0.000	-
<b>Turn</b>						
Temporary BM	2.990	101.189		98.199	-	
Water Level:	Cut		3.026	98.163	Time WL Surveyed: 9:46	
S31-5			1.226	99.983	99.993	3/4" Pipe 15m S of logger
S31-4			1.206	99.983	99.982	3/4" Pipe 3m SW of logger
S31-3			1.461	99.728	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.162	-
Closing Error:	-0.002	-
WL Check:	0.003	-
Transducer Elevation	97.956	-

**Field Personnel:**

SM, AD	Trip Date:	5-Mar-14	
Data Entry Personnel:	SM	Date:	5-Mar-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: March 28, 2014  
 Site Visit Time (MST): 11:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.10	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	2.50	0.19		0.11	0.004					1.00	0.45	0.19	0.004	0.09	0.000	0%
2	3.00	0.20		0.12	0.080					1.00	0.38	0.20	0.080	0.08	0.006	4%
3	3.25	0.20		0.12	0.100					1.00	0.25	0.20	0.100	0.05	0.005	4%
4	3.50	0.20		0.12	0.079					1.00	0.25	0.20	0.079	0.05	0.004	3%
5	3.75	0.20		0.12	0.131					1.00	0.25	0.20	0.131	0.05	0.007	5%
6	4.00	0.20		0.12	0.130					1.00	0.25	0.20	0.130	0.05	0.007	5%
7	4.25	0.16		0.10	0.166					1.00	0.25	0.16	0.166	0.04	0.007	5%
8	4.50	0.17		0.10	0.175					1.00	0.25	0.17	0.175	0.04	0.007	6%
9	4.75	0.15		0.09	0.197					1.00	0.25	0.15	0.197	0.04	0.007	5%
10	5.00	0.13		0.08	0.187					1.00	0.25	0.13	0.187	0.03	0.006	5%
11	5.25	0.15		0.09	0.148					1.00	0.25	0.15	0.148	0.04	0.006	4%
12	5.50	0.18		0.11	0.195					1.00	0.25	0.18	0.195	0.05	0.009	7%
13	5.75	0.19		0.11	0.189					1.00	0.25	0.19	0.189	0.05	0.009	7%
14	6.00	0.20		0.12	0.185					1.00	0.25	0.20	0.185	0.05	0.009	7%
15	6.25	0.20		0.12	0.194					1.00	0.25	0.20	0.194	0.05	0.010	7%
16	6.50	0.15		0.09	0.140					1.00	0.25	0.15	0.140	0.04	0.005	4%
17	6.75	0.17		0.10	0.174					1.00	0.25	0.17	0.174	0.04	0.007	5%
18	7.00	0.15		0.09	0.166					1.00	0.25	0.15	0.166	0.04	0.006	5%
19	7.25	0.18		0.11	0.164					1.00	0.38	0.18	0.164	0.07	0.011	8%
20	7.75	0.21		0.13	0.084					1.00	0.50	0.21	0.084	0.11	0.009	7%
21	8.25	0.20		0.12	-0.020					1.00	0.43	0.20	-0.020	0.09	-0.002	-1%
LB	8.60	0.00	0.00		0.00		0.00		0.00	1.00	0.18	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.135</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m US of PT

Mess. Start Time (MST):	11:40
Mess. End Time (MST):	12:10
Equipment:	ADV
Method:	Wading
River Condition:	Partly frozen along banks
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	clear, light breeze, -10

**Flow characteristics:**

Total Flow:	0.135	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.12	(m <sup>2</sup> )
Wetted Width:	6.50	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:	0.09	

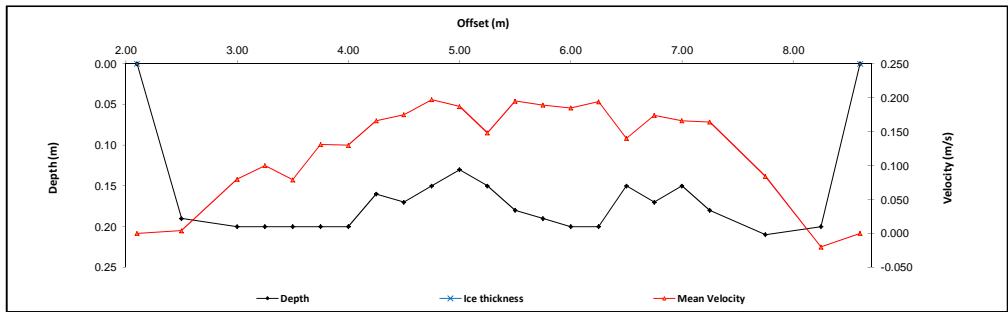
**Logger Details:**

	Before	After
Transducer Reading (m):	0.164	-
Water (°C):	1.0	-
Rainfall (mm):	0.00	0.348
Datalogger Clock:	11:14	-
Laptop Clock:	11:13	-
Battery (Main):	12.2	13.2
Battery:	Replaced	
Battery Serial #:	1205002	1205005
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

Reinstated tipping bucket, levelled and tested.

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-3	1.392	101.118		99.726	99.726	3/4" Pipe 5m NW of logger
S31-4			1.141	99.977	99.982	3/4" Pipe 3m SW of logger
S31-5			1.163	99.955	99.993	3/4" Pipe 15m S of logger
Water Level:	Cut		2.963	98.155	Time WL Surveyed: 11:32	
Temporary BM			2.756	98.362	0.000	
<b>Turn</b>						
Temporary BM	2.738	101.100		98.362		
Water Level:	Cut		2.947	98.153	Time WL Surveyed: 11:34	
S31-5			1.147	99.953	99.993	3/4" Pipe 15m S of logger
S31-4			1.124	99.976	99.982	3/4" Pipe 3m SW of logger
S31-3			1.375	99.725	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.154	-
Closing Error:	0.001	-
WL Check:	0.002	-
Transducer Elevation	97.990	-

**Field Personnel:**

	TR, SM	Trip Date:	28-Mar-14
Data Entry Personnel:	SM	Date:	28-Mar-14
Data Check Personnel:	TR	Date:	15-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road

UTM Location: 476969 E, 6236095 N

Site Visit Date: May 26, 2014

Site Visit Time (MST): 13:35



Flow Measurement Details:	
Metering Section Location (describe): Across from TBRG	
Meas. Start Time (MST):	14:40
Meas. End Time (MST):	14:55
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Calm, rain, 8C

Flow characteristics:		
Total Flow:	1.57	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.72	(m <sup>2</sup> )
Wetted Width:	7.37	(m)
Hydraulic Depth:	0.51	(m)
Mean Velocity:	0.42	(m/s)
Froude Number:	0.19	

Logger Details:	Before	After
Transducer Reading (m):	0.557	0.582
Water (°C):	9.8	9.6
Rainfall (mm):	0.00	0.00
Datalogger Clock:	13:40	15:10
Laptop Clock:	13:39	15:09
Battery (Main):	10.0	12.9
Battery:	Good	
Battery Serial #:	-	905003
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
-Replaced solar panel & solar controller

**General Notes:**

ADCP Flow Measurement Summary:								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	15.60	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	8.10	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	9.8				
			ADCP Temperature (°C):	9.7				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		2	7.58	3.83	0.409	1.567	-0.27%
Coordinate System:	ENU		3	7.14	3.60	0.426	1.532	-2.50%
Left Method:	Sloped bank		5	7.28	3.72	0.429	1.597	1.64%
Right Method:	Sloped bank		6	7.48	3.75	0.423	1.589	1.13%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	7.37	3.72	0.422	<b>1.57</b>	
			<b>SD:</b>	0.17	0.08	0.008	0.025	
			<b>COV:</b>	0.02	0.02	0.018	0.016	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S31-3	0.869	100.595		99.726	99.726	3/4" Pipe 5m NW of logger
S31-5			0.647	99.948	99.993	3/4" Pipe 15m NW of logger
S31-4			0.622	99.973	99.982	3/4" Pipe 3m SW of logger
Water Level:	Cut		2.058	98.537	<b>Time WL Surveyed:</b>	14:10
Temporary BM			1.128	99.467	0.000	-
<b>Turn</b>						
Temporary BM	1.109	100.576		99.467		-
Water Level:	Cut		2.038	98.538	<b>Time WL Surveyed:</b>	14:03
S31-4			0.605	99.971	99.982	3/4" Pipe 3m SW of logger
S31-5			0.628	99.948	99.993	3/4" Pipe 15m NW of logger
S31-3			0.851	99.725	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S31-3	0.851	100.577		99.726		
Water Level:	Cut		2.020	98.557	<b>Time WL Surveyed:</b>	15:06
Water Level:	Cut		1.999	98.557	<b>Time WL Surveyed:</b>	15:08
S31-3	0.830	100.556		99.726		

WL Survey Summary	Before	After
Average WL:	98.538	98.557
Closing Error:	0.001	-
WL Check:	0.001	0.000
Transducer Elevation	97.981	97.975

<b>Field Personnel:</b>	TR, CJ	<b>Trip Date:</b>	26-May-14
<b>Data Entry Personnel:</b>	CJ	<b>Date:</b>	26-May-14
<b>Data Check Personnel:</b>	TR	<b>Date:</b>	1-Aug-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: June 9, 2014  
 Site Visit Time (MST): 14:30

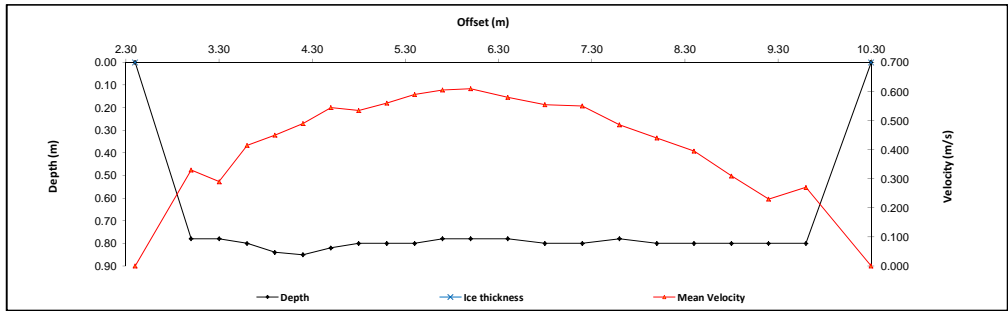


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	10.30	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	9.60	0.80				0.64	0.240	0.16	0.300	1.00	0.55	0.80	0.270	0.44	0.119	5%
2	9.20	0.80				0.64	0.220	0.16	0.240	1.00	0.40	0.80	0.230	0.32	0.074	3%
3	8.80	0.80				0.64	0.250	0.16	0.370	1.00	0.40	0.80	0.310	0.32	0.099	4%
4	8.40	0.80				0.64	0.370	0.16	0.420	1.00	0.40	0.80	0.395	0.32	0.126	5%
5	8.00	0.80				0.64	0.400	0.16	0.480	1.00	0.40	0.80	0.440	0.32	0.141	5%
6	7.60	0.78				0.62	0.490	0.16	0.480	1.00	0.40	0.78	0.485	0.31	0.151	6%
7	7.20	0.80				0.64	0.510	0.16	0.590	1.00	0.40	0.80	0.550	0.32	0.176	7%
8	6.80	0.80				0.64	0.530	0.16	0.580	1.00	0.40	0.80	0.555	0.32	0.178	7%
9	6.40	0.78				0.62	0.580	0.16	0.580	1.00	0.40	0.78	0.580	0.31	0.181	7%
10	6.00	0.78				0.62	0.590	0.16	0.630	1.00	0.35	0.78	0.610	0.27	0.167	6%
11	5.70	0.78				0.62	0.550	0.16	0.660	1.00	0.30	0.78	0.605	0.23	0.142	5%
12	5.40	0.80				0.64	0.580	0.16	0.600	1.00	0.30	0.80	0.590	0.24	0.134	5%
13	5.10	0.80				0.64	0.590	0.16	0.530	1.00	0.30	0.80	0.560	0.24	0.142	5%
14	4.80	0.80				0.64	0.510	0.16	0.560	1.00	0.30	0.80	0.535	0.24	0.128	5%
15	4.50	0.82				0.66	0.570	0.16	0.520	1.00	0.30	0.82	0.545	0.25	0.134	5%
16	4.20	0.85				0.68	0.500	0.17	0.480	1.00	0.30	0.85	0.490	0.26	0.125	5%
17	3.90	0.84				0.67	0.410	0.17	0.490	1.00	0.30	0.84	0.450	0.25	0.113	4%
18	3.60	0.80				0.64	0.440	0.16	0.390	1.00	0.30	0.80	0.415	0.24	0.100	4%
19	3.30	0.78				0.62	0.210	0.16	0.370	1.00	0.30	0.78	0.290	0.23	0.068	3%
20	3.00	0.78			0.330	0.62				1.00	0.45	0.78	0.330	0.35	0.116	4%
LB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.61</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 12m US of PT

Meas. Start Time (MST):	15:27
Meas. End Time (MST):	16:18
Equipment:	Marsh McBimney
Method:	Wading
River Condition:	High water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 10C



**Flow characteristics:**

Total Flow:	2.61	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.79	(m <sup>2</sup> )
Wetted Width:	7.90	(m)
Hydraulic Depth:	0.73	(m)
Mean Velocity:	0.45	(m/s)
Froude Number:	0.17	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.784	0.927
Water (°C):	11.4	11.3
Rainfall (mm):	0.00	0.00
Datalogger Clock:	14:43	16:35
Laptop Clock:	14:43	16:34
Battery (Main):	13.8	13.6
Battery:		Good
Battery Serial #:	905003	-
Enclosure Dessiccant:		Replaced
Tested TBRC:		No
Vent Tube Dessiccant:		Good
PT# (if replaced):	298681	346255
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Grounded logger enclosure and replaced PT for calibration

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-3	1.073	100.799		99.726	99.726	3/4" Pipe 5m NW of logger
S31-4			0.827	99.972	99.982	3/4" Pipe 3m SW of logger
S31-5			0.850	99.949	99.993	3/4" Pipe 15m NW of logger
Water Level:	Cut		2.009	98.790		Time WL Surveyed: 15:22
S31-3			1.073	99.726	99.726	3/4" Pipe 5m NW of logger
<b>Turn</b>						
S31-3	1.034	100.760		99.726	99.726	3/4" Pipe 5m NW of logger
Water Level:	Cut		1.972	98.788		Time WL Surveyed: 15:24
S31-5			0.811	99.949	99.993	3/4" Pipe 15m NW of logger
S31-4			0.788	99.972	99.982	3/4" Pipe 3m SW of logger
S31-3			1.034	99.726	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S31-3	1.034	100.760		99.726		
Water Level:	Cut		1.974	98.786		Time WL Surveyed: 16:25
Water Level:	Cut		1.917	98.789		Time WL Surveyed: 16:27
S31-3	0.880	100.706		99.726		

**WL Survey Summary**

	Before	After
Average WL:	98.789	98.788
Closing Error:	0.000	-
WL Check:	0.002	-0.003
Transducer Elevation	98.005	97.861

**Field Personnel:**

	TR, NC	Trip Date:	9-Jun-14
Data Entry Personnel:	TR, NC	Date:	9-Jun-14
Data Check Personnel:	TR	Date:	4-Jul-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: August 8, 2014  
 Site Visit Time (MST): 07:55

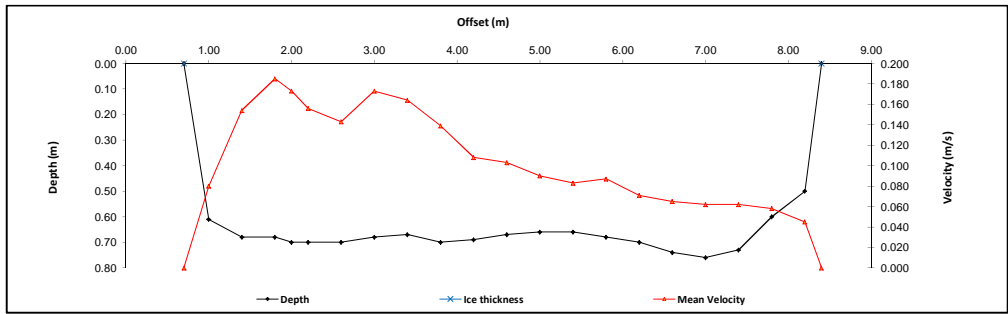


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.70	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.00	0.61		0.37	0.080					1.00	0.35	0.61	0.080	0.21	0.017	3%
2	1.40	0.68		0.41	0.154					1.00	0.40	0.68	0.154	0.27	0.042	8%
3	1.80	0.68		0.41	0.185					1.00	0.30	0.68	0.185	0.20	0.038	7%
4	2.00	0.70		0.42	0.173					1.00	0.20	0.70	0.173	0.14	0.024	4%
5	2.20	0.70		0.42	0.156					1.00	0.30	0.70	0.156	0.21	0.033	6%
6	2.60	0.70		0.42	0.143					1.00	0.40	0.70	0.143	0.28	0.040	7%
7	3.00	0.68		0.41	0.173					1.00	0.40	0.68	0.173	0.27	0.047	9%
8	3.40	0.67		0.40	0.164					1.00	0.40	0.67	0.164	0.27	0.044	8%
9	3.80	0.70		0.42	0.139					1.00	0.40	0.70	0.139	0.28	0.039	7%
10	4.20	0.69		0.41	0.108					1.00	0.40	0.69	0.108	0.28	0.030	5%
11	4.60	0.67		0.40	0.103					1.00	0.40	0.67	0.103	0.27	0.028	5%
12	5.00	0.66		0.40	0.090					1.00	0.40	0.66	0.090	0.26	0.024	4%
13	5.40	0.66		0.40	0.083					1.00	0.40	0.66	0.083	0.26	0.022	4%
14	5.80	0.68		0.41	0.087					1.00	0.40	0.68	0.087	0.27	0.024	4%
15	6.20	0.70		0.42	0.071					1.00	0.40	0.70	0.071	0.28	0.020	4%
16	6.60	0.74		0.44	0.065					1.00	0.40	0.74	0.065	0.30	0.019	4%
17	7.00	0.76				0.61	0.053	0.15	0.071	1.00	0.40	0.76	0.062	0.30	0.019	3%
18	7.40	0.73		0.44	0.062					1.00	0.40	0.73	0.062	0.29	0.018	3%
19	7.80	0.60		0.36	0.058					1.00	0.40	0.60	0.058	0.24	0.014	3%
20	8.20	0.50		0.30	0.045					1.00	0.30	0.50	0.045	0.15	0.007	1%
LB	8.40	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.000		
<b>Total Flow</b>															<b>0.547</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): 10m US of PT

Meas. Start Time (MST):	8:15
Meas. End Time (MST):	8:40
Equipment:	ADV
Method:	Wading
River Condition:	High WL, DS beaver dam
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 20C



**Flow characteristics:**

Total Flow:	0.547	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.05	(m <sup>2</sup> )
Wetted Width:	7.70	(m)
Hydraulic Depth:	0.66	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.832	0.832
Water (°C):	14.9	15.0
Rainfall (mm):	0.00	0.00
Datalogger Clock:	8:02	8:42
Laptop Clock:	8:01	8:41
Battery (Main):	12.8	13.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Tested TBRG:	-	No
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-ADV test run, results good  
 -Large beaver dams upstream and downstream of station

**General Notes:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-3	1.028	100.754		99.726	99.726	3/4" Pipe 5m NW of logger
S31-4			0.781	99.973	99.982	3/4" Pipe 3m SW of logger
S31-5			0.806	99.948	99.993	3/4" Pipe 15m NW of logger
Water Level:	Cut	2.043		98.711	Time WL Surveyed:	8:07
S31-3			1.028	99.726	99.726	3/4" Pipe 5m NW of logger
<b>Turn</b>						
S31-3	0.997	100.723		99.726	99.726	3/4" Pipe 5m NW of logger
Water Level:	Cut	2.010		98.713	Time WL Surveyed:	8:09
S31-5			0.772	99.951	99.993	3/4" Pipe 15m NW of logger
S31-4			0.748	99.975	99.982	3/4" Pipe 3m SW of logger
S31-3	0.997	99.726		99.726	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S31-3	0.996	100.722		99.726		
Water Level:	Cut	2.009		98.713	Time WL Surveyed:	8:38
Water Level:	Cut	1.991		98.713	Time WL Surveyed:	8:39
S31-3	0.978	100.704		99.726		

**WL Survey Summary**

	Before	After
Average WL:	98.712	98.713
Closing Error:	0.000	-
WL Check:	0.002	0.000
Transducer Elevation	97.880	97.881

**Field Personnel:**

TR, SM	Trip Date:	8-Aug-14
TR	Date:	8-Aug-14
MP	Date:	18-Sep-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road

UTM Location: 476969 E, 6236095 N

Site Visit Date: \_\_\_\_\_

September 13, 2014

Site Visit Time (MST): \_\_\_\_\_

10:30



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): Across from TBRG	
Meas. Start Time (MST):	10:55
Meas. End Time (MST):	11:12
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 15C

<b>Flow characteristics:</b>		
Total Flow:	0.276	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.84	(m <sup>2</sup> )
Wetted Width:	7.59	(m)
Hydraulic Depth:	0.64	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.02	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.698	0.699
Water (°C):	5.6	5.8
Datalogger Clock:	10:29	11:20
Laptop Clock:	10:33	11:24
Battery (Main):	14.2	14.6
Battery:	Replaced	
Battery Serial #:	905003	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Checked TBRG

**General Notes:**

-Large beaver dam US, two smaller ones DS

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	8.90	
Serial Number:	4712		Salinity (ppt):	0.0		RB:	1.20	
Firmware Version:	3.5		Magnetic Declination (°):	14				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	7.2				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	7.63	4.94	0.057	0.281	2.00%
Coordinate System:	ENU		2	7.55	4.80	0.057	0.275	-0.18%
Left Method:	Sloped bank		3	7.47	4.78	0.057	0.273	-0.91%
Right Method:	Sloped bank		4	7.71	4.86	0.056	0.273	-0.91%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	7.59	4.84	0.057	<b>0.276</b>	
			<b>SD:</b>	0.09	0.06	0.000	0.003	
			<b>COV:</b>	0.01	0.01	0.008	0.012	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-3	1.072	100.798		99.726	99.726	3/4" Pipe 5m NW of logger
S31-4			0.825	99.973	99.982	3/4" Pipe 3m SW of logger
S31-5			0.851	99.947		3/4" Pipe 15m NW of logger
Water Level:	Cut	0.512	2.623	98.687	<b>Time WL Surveyed:</b>	10:50
Temporary BM			2.623	98.175	0.000	-
<b>Turn</b>						
Temporary BM	2.587	100.762		98.175		-
Water Level:	Cut	0.512	2.587	98.687	<b>Time WL Surveyed:</b>	10:52
S31-5			0.817	99.945		3/4" Pipe 15m NW of logger
S31-4			0.790	99.972	99.982	3/4" Pipe 3m SW of logger
S31-3			1.037	99.725	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S31-3	1.071	100.797		99.726		
Water Level:	Cut	0.848	2.953	98.692	<b>Time WL Surveyed:</b>	11:18
Water Level:	Cut	0.848	2.935	98.691	<b>Time WL Surveyed:</b>	11:20
S31-3	1.052	100.778		99.726		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	98.687	98.692
Closing Error:	0.001	-
WL Check:	0.000	0.001
Transducer Elevation	97.989	97.993

<b>Field Personnel:</b>			
Data Entry Personnel:	GG, TR	Trip Date:	13-Sep-14
Data Check Personnel:	GG	Date:	13-Sep-14
Entered Digitally in the Field:	TR	Date:	16-Oct-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: October 24, 2014  
 Site Visit Time (MST): 08:02

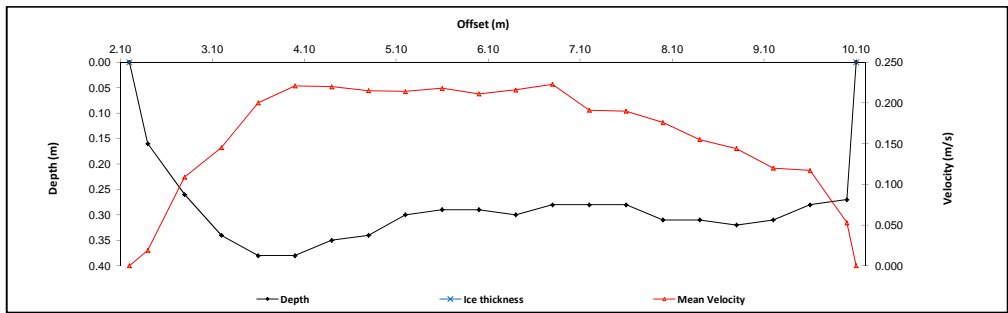


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	10.10	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	10.00	0.27		0.16	0.053					1.00	0.25	0.27	0.053	0.07	0.004	1%
2	9.60	0.28		0.17	0.117					1.00	0.40	0.28	0.117	0.12	0.013	3%
3	9.20	0.31		0.19	0.120					1.00	0.40	0.31	0.120	0.12	0.015	4%
4	8.80	0.32		0.19	0.144					1.00	0.40	0.32	0.144	0.13	0.018	4%
5	8.40	0.31		0.19	0.155					1.00	0.40	0.31	0.155	0.12	0.019	5%
6	8.00	0.31		0.19	0.176					1.00	0.40	0.31	0.176	0.12	0.022	5%
7	7.60	0.28		0.17	0.190					1.00	0.40	0.28	0.190	0.11	0.021	5%
8	7.20	0.28		0.17	0.191					1.00	0.40	0.28	0.191	0.11	0.021	5%
9	6.80	0.28		0.17	0.223					1.00	0.40	0.28	0.223	0.11	0.025	6%
10	6.40	0.30		0.18	0.216					1.00	0.40	0.30	0.216	0.12	0.026	6%
11	6.00	0.29		0.17	0.211					1.00	0.40	0.29	0.211	0.12	0.024	6%
12	5.60	0.29		0.17	0.218					1.00	0.40	0.29	0.218	0.12	0.025	6%
13	5.20	0.30		0.18	0.214					1.00	0.40	0.30	0.214	0.12	0.026	6%
14	4.80	0.34		0.20	0.215					1.00	0.40	0.34	0.215	0.14	0.029	7%
15	4.40	0.35		0.21	0.220					1.00	0.40	0.35	0.220	0.14	0.031	7%
16	4.00	0.38		0.23	0.221					1.00	0.40	0.38	0.221	0.15	0.034	8%
17	3.60	0.38		0.23	0.200					1.00	0.40	0.38	0.200	0.15	0.030	7%
18	3.20	0.34		0.20	0.145					1.00	0.40	0.34	0.145	0.14	0.020	5%
19	2.80	0.26		0.16	0.109					1.00	0.40	0.26	0.109	0.10	0.011	3%
20	2.40	0.16		0.10	0.019					1.00	0.30	0.16	0.019	0.05	0.001	0%
LB	2.20	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.416</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m US from station

Meas. Start Time (MST):	8:16
Meas. End Time (MST):	8:39
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Snow, light breeze, 2C



**Flow characteristics:**

Total Flow:	0.416	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.36	(m <sup>2</sup> )
Wetted Width:	7.90	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.338	0.338
Water (°C):	3.0	3.0
Rainfall (mm):	0.00	0.00
Datalogger Clock:	8:07	8:52
Laptop Clock:	8:06	8:51
Battery (Main):	12.4	12.5
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Tested TBRC:		-
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- ADV test passed
- US beaver dam washed out since last visit

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-3	0.992	100.718		99.726	99.726	3/4" Pipe 5m NW of logger
S31-4			0.743	99.975	99.982	3/4" Pipe 3m SW of logger
S31-5			0.767	99.951	99.993	3/4" Pipe 15m NW of logger
Water Level:	Cut		2.387	98.331		Time WL Surveyed: 8:11
S31-3			0.992	99.726	99.726	3/4" Pipe 5m NW of logger
<b>Turn</b>						
S31-3	0.973	100.699		99.726	99.726	3/4" Pipe 5m NW of logger
Water Level:	Cut		2.365	98.334		Time WL Surveyed: 8:13
S31-5			0.748	99.951	99.993	3/4" Pipe 15m NW of logger
S31-4			0.726	99.973	99.982	3/4" Pipe 3m SW of logger
S31-3			0.973	99.726	99.726	3/4" Pipe 5m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S31-3	0.973	100.699		99.726		
Water Level:	Cut		2.367	98.332		Time WL Surveyed: 8:41
Water Level:	Cut		2.386	98.336		Time WL Surveyed: 8:42
S31-3	0.996	100.722		99.726		

**WL Survey Summary**

	Before	After
Average WL:	98.333	98.334
Closing Error:	0.000	-
WL Check:	0.003	-0.004
Transducer Elevation	97.995	97.996

**Field Personnel:**

	GG, TR	Trip Date:	24-Oct-14
Data Entry Personnel:	GG	Date:	24-Oct-14
Data Check Personnel:	TR	Date:	23-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S31 - Hangingstone Creek at North Star Road  
 UTM Location: 476969 E, 6236095 N

Site Visit Date: November 28, 2014  
 Site Visit Time (MST): 09:45

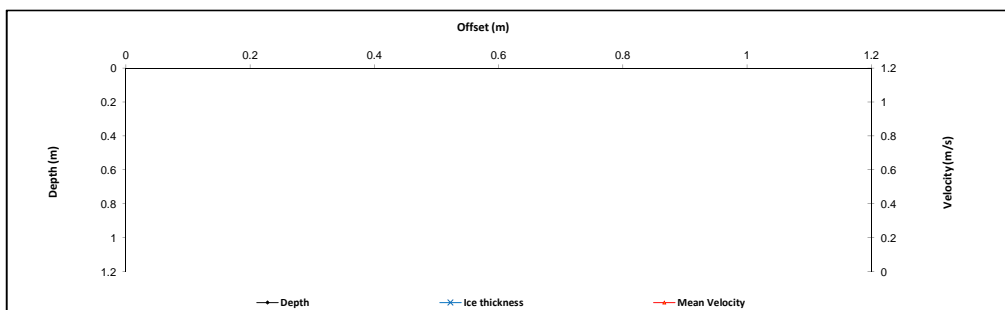


Measured Data										Calculated Data							
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
Flow Measurement Not Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.477	0.477
Water (°C):	0.3	0.3
Rainfall (mm):	-	-
Datalogger Clock:	9:49	10:07
Laptop Clock:	9:48	10:06
Battery (Main):	12.2	12.5
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Tested TBRC:	-	-
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S31-8	1.297	101.297		100.000	100.000	Nail in tree 10m S
S31-7			1.873	99.424	99.423	Rebar 5.5m SE
S31-6			1.700	99.597	99.956	Rebar 5m E
Water Level:	Cut		3.182	98.115	Time WL Surveyed:	9:55
S31-8			1.297	100.000	100.000	Nail in tree 10m S
<b>Turn</b>						
S31-8	1.199	101.199		100.000	100.000	Nail in tree 10m S
Water Level:	Cut		3.088	98.111	Time WL Surveyed:	9:58
S31-6			1.602	99.597	99.956	Rebar 5m E
S31-7			1.777	99.422	99.423	Rebar 5.5m SE
S31-8			1.199	100.000	100.000	Nail in tree 10m S
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.113	-
Closing Error:	0.000	-
WL Check:	0.004	-
Transducer Elevation	97.636	-

**Datalogger / Station Notes:**

**General Notes:**

-Insufficient ice thickness to attempt a flow measurement

**Field Personnel:**

Data Entry Personnel:	TR, GG	Trip Date:	28-Nov-14
Data Check Personnel:	TR	Date:	28-Nov-14
Entered Digitally in the Field:	Yes	Date:	23-Jan-15

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: March 5, 2014  
 Site Visit Time (MST): 16:25

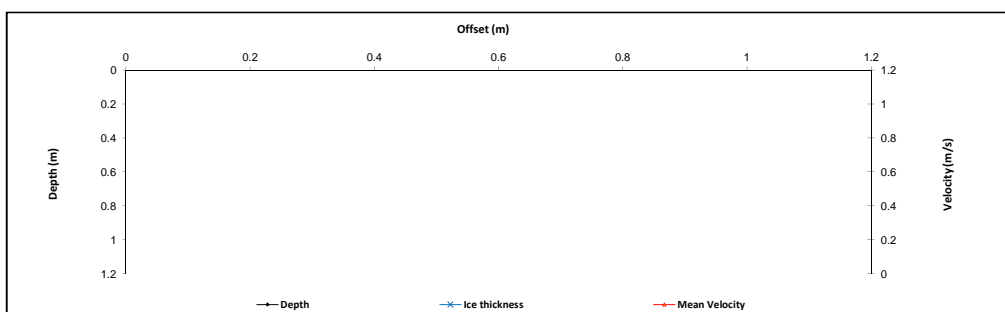


Measured Data								Calculated Data								
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
Flow Measurement Not Conducted																
															<b>Total Flow</b>	-

### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



### Flow characteristics:

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

### Logger Details:

	Before	After
Transducer Reading (m):	1.889	
Water (°C):	0.3	
Datalogger Clock:	16:33	
Laptop Clock:	16:33	
Battery (Main):	12.7	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (# replaced):	-	
Logger# (if replaced):	-	

### Datalogger / Station Notes:

-Significant overflow ice, water pooling on ice surface, flow measurement and WL Survey not possible

### General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	-	-
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

Field Personnel:	SM, MP	Trip Date:	5-Mar-14
Data Entry Personnel:	SM	Date:	5-Mar-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: March 5, 2014  
 Site Visit Time (MST): 14:10



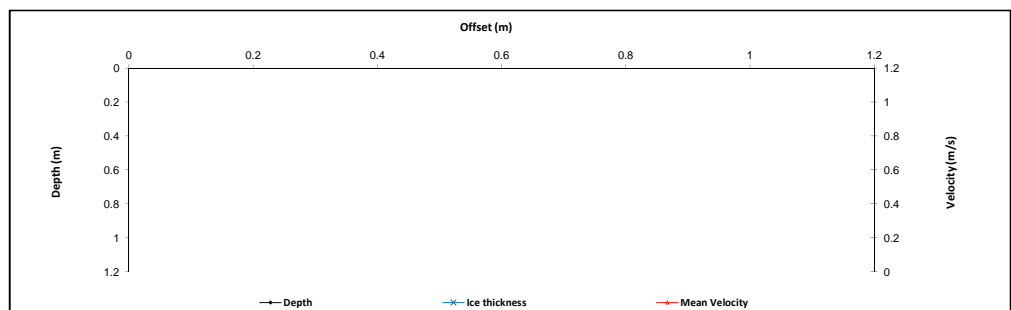
Measured Data					Calculated Data											
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
<b>Flow Measurement Not Conducted</b>																
<b>Total Flow</b>																-

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	<b>0.00</b>	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	



**Logger Details:**

	Before	After
Transducer Reading (m):	2.253	-
Water (°C):	0.3	-
Datalogger Clock:	14:14	-
Laptop Clock:	14:14	-
Battery (Main):	12.4	13.0
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Good
Vent Tube Dessiccant:	-	Good
PT# (# replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 -No flow measurement or water level survey conducted, could not get through thick overflow ice

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	

**Secondary Water Level Survey (pick any BM e.g. closest to water's edge)**

Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	-	-
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

**Field Personnel:**

Data Entry Personnel:	SM, AD	Trip Date:	5-Mar-14
Data Check Personnel:	SM	Date:	5-Mar-14
Entered Digitally in the Field:	TR	Date:	23-Apr-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: April 11, 2014  
 Site Visit Time (MST): 15:15

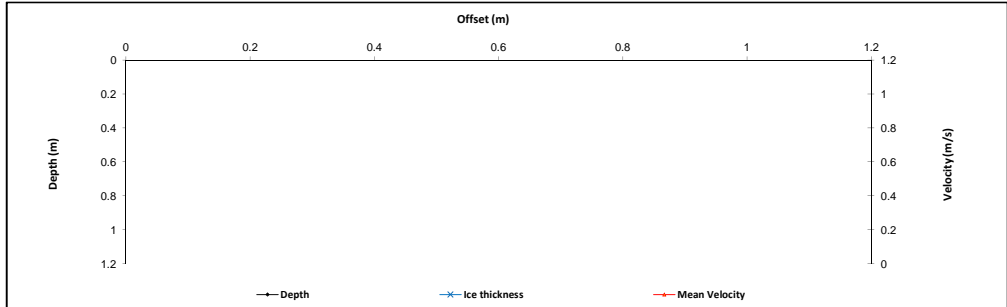


Measured Data										Calculated Data							
Bank/ Mrrt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
Flow Measurement Not Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	2.262	-
Water (°C):	3.0	-
Datalogger Clock:	15:20	15:26
Laptop Clock:	15:21	15:26
Battery (Main):	12.5	12.9
Battery:	Replaced	
Battery Serial #:	10080011, 1403004	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Ice too thick to drill through, more than 30cm of overflow on top of ice
- Water surface on top of ice was surveyed

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S32-3	1.163	100.281		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.618	98.663	98.664	3/4" Pipe 7m S of logger
S32-5			1.477	98.804	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		2.000	98.281	Time WL Surveyed:	15:34
Temporary BM			2.096	98.185	0.000	
<b>Turn</b>						
Temporary BM	2.068	100.253		98.185		
Water Level:	Cut		1.970	98.283	Time WL Surveyed:	15:36
S32-5			1.447	98.806	98.807	3/4" Pipe 4m S of logger
S32-6			1.588	98.665	98.664	3/4" Pipe 7m S of logger
S32-3			1.133	99.120	99.118	3/4" Pipe 10m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.282	-
Closing Error:	-0.002	-
WL Check:	0.002	-
Transducer Elevation	96.020	-

**Field Personnel:**

Data Entry Personnel:	TR, MP	Trip Date:	11-Apr-14
Data Check Personnel:	TR	Date:	11-Apr-14
Entered Digitally in the Field:	Yes	Date:	23-Apr-14

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: May 26, 2014  
 Site Visit Time (MST): 11:30



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 7m US of PT	
Meas. Start Time (MST):	12:05
Meas. End Time (MST):	12:30
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Rain, light breeze, 10C

<b>Flow characteristics:</b>		
Total Flow:	1.94	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.34	(m <sup>2</sup> )
Wetted Width:	7.67	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.45	(m/s)
Froude Number:	0.19	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.955	0.963
Water (°C):	8.3	8.3
Datalogger Clock:	11:36	12:43
Laptop Clock:	11:36	12:43
Battery (Main):	13.1	12.9
Battery:	Replaced	
Battery Serial #:	1403004, 100801	1305003
Enclosure Dessorant:	Replaced	
Vent Tube Dessorant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>						
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08	LB:	16.70
Serial Number:	1802		Salinity (ppt):	0.0	RB:	8.90
Firmware Version:	3.5		Magnetic Declination (°):	-		
Software Version:	3.7		Measured Temperature (°C):	8.3		
			ADCP Temperature (°C):	10.8		
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>			
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam		1	7.78	4.37	0.436
Coordinate System:	ENU		2	7.42	4.26	0.448
Left Method:	Sloped bank		3	7.83	4.47	0.441
Right Method:	Sloped bank		4	7.47	4.37	0.454
Top Fit Type:	Power fit		5	7.86	4.24	0.461
Bottom Fit Type:	Power fit					
			<b>Mean:</b>	7.67	4.34	0.448
			<b>SD:</b>	0.19	0.09	0.009
			<b>COV:</b>	0.02	0.02	0.020
						<b>1.94</b>
						0.033
						0.017

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>	S32-3	0.849	99.967		99.118	99.118	3/4" Pipe 10m S of logger
	S32-6			1.303	98.664	98.664	3/4" Pipe 7m S of logger
	S32-5			1.162	98.805	98.807	3/4" Pipe 4m S of logger
	Water Level:	Cut		2.881	97.086	Time WL Surveyed:	11:44
	Temporary BM			2.549	97.418	0.000	-
<b>Turn</b>	Temporary BM	2.528	99.946		97.418		-
	Water Level:	Cut		2.861	97.085	Time WL Surveyed:	11:47
	S32-5			1.138	98.808	98.807	3/4" Pipe 4m S of logger
	S32-6			1.281	98.665	98.664	3/4" Pipe 7m S of logger
	S32-3			0.827	99.119	99.118	3/4" Pipe 10m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
	S32-6	1.281	99.945		98.664		
	Water Level:	Cut		2.850	97.095	Time WL Surveyed:	12:39
	Water Level:	Cut		2.836	97.092	Time WL Surveyed:	12:40
	S32-6	1.264	99.928		98.664		

<b>WL Survey Summary</b>		
Average WL:	Before	After
	97.086	97.094
Closing Error:	-0.001	-
WL Check:	0.001	0.003
Transducer Elevation	96.131	96.131

<b>Field Personnel:</b>	TR, CJ	Trip Date:	26-May-14
<b>Data Entry Personnel:</b>	TR	Date:	26-May-14
<b>Data Check Personnel:</b>	TR	Date:	1-Aug-14
<b>Entered Digitally in the Field:</b>	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: June 26, 2014  
 Site Visit Time (MST): 15:35



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	11.90	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	12.20	0.38		0.23	0.260					1.00	0.35	0.38	0.260	0.13	0.035	1%
2	12.60	0.48		0.29	0.280					1.00	0.40	0.48	0.280	0.19	0.054	2%
3	13.00	0.51		0.31	0.380					1.00	0.40	0.51	0.380	0.20	0.078	3%
4	13.40	0.68		0.41	0.370					1.00	0.40	0.68	0.370	0.27	0.101	4%
5	13.80	0.75		0.45	0.310					1.00	0.40	0.75	0.310	0.30	0.093	4%
6	14.20	0.84				0.67	0.260	0.17	0.580	1.00	0.40	0.84	0.420	0.34	0.141	6%
7	14.60	0.80				0.64	0.310	0.16	0.720	1.00	0.40	0.80	0.515	0.32	0.165	7%
8	15.00	0.84				0.67	0.240	0.17	0.710	1.00	0.40	0.84	0.475	0.34	0.160	7%
9	15.40	0.88				0.70	0.300	0.18	0.730	1.00	0.40	0.88	0.515	0.35	0.181	8%
10	15.80	0.84				0.67	0.440	0.17	0.720	1.00	0.40	0.84	0.580	0.34	0.195	8%
11	16.20	0.85				0.68	0.450	0.17	0.710	1.00	0.40	0.85	0.580	0.34	0.197	8%
12	16.60	0.79				0.63	0.340	0.16	0.680	1.00	0.40	0.79	0.510	0.32	0.161	7%
13	17.00	0.78				0.62	0.340	0.16	0.660	1.00	0.40	0.78	0.500	0.31	0.156	7%
14	17.40	0.73	0.44		0.460					1.00	0.40	0.73	0.460	0.29	0.134	6%
15	17.80	0.67	0.40		0.390					1.00	0.40	0.67	0.390	0.27	0.105	4%
16	18.20	0.62	0.37		0.440					1.00	0.40	0.62	0.440	0.25	0.109	5%
17	18.60	0.62	0.37		0.480					1.00	0.40	0.62	0.480	0.25	0.119	5%
18	19.00	0.60	0.36		0.380					1.00	0.40	0.60	0.380	0.24	0.091	4%
19	19.40	0.61	0.37		0.220					1.00	0.40	0.61	0.220	0.24	0.054	2%
20	19.80	0.54	0.32		0.280					1.00	0.40	0.54	0.280	0.22	0.060	3%
LB	20.20	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.39</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
7m DS of bridge

Meas. Start Time (MST):	15:50
Meas. End Time (MST):	16:15
Equipment:	Marsh McBiney
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, 17C

**Flow characteristics:**

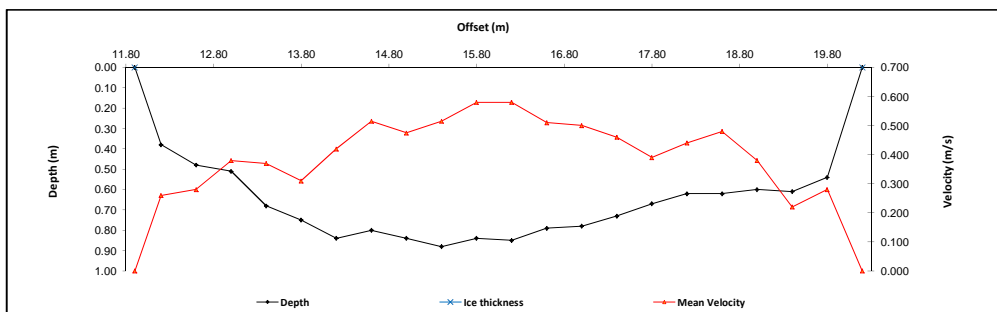
Total Flow:	2.39	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.51	(m <sup>2</sup> )
Wetted Width:	8.30	(m)
Hydraulic Depth:	0.66	(m)
Mean Velocity:	0.43	(m/s)
Froude Number:	0.17	

**Logger Details:**

Transducer Reading (m):	Before	After
	1.167	1.166
Water (°C):	15.3	15.4
Datalogger Clock:	15:37	16:22
Laptop Clock:	15:37	16:22
Battery (Main):	12.7	13.0
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S32-3	0.985	100.103		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.439	98.664	98.664	3/4" Pipe 7m S of logger
S32-5			1.296	98.807	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		2.827	97.276		Time WL Surveyed: 15:45
Temporary BM			3.389	96.714	0.000	
<b>Turn</b>						
Temporary BM	3.374	100.088		96.714		
Water Level:	Cut		2.812	97.276		Time WL Surveyed: 15:48
S32-5			1.282	98.806	98.807	3/4" Pipe 4m S of logger
S32-6			1.425	98.663	98.664	3/4" Pipe 7m S of logger
S32-3			0.970	99.118	99.118	3/4" Pipe 10m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S32-5	1.281	100.087		98.806		
Water Level:	Cut		2.813	97.274		Time WL Surveyed: 16:18
Water Level:	Cut		2.800	97.274		Time WL Surveyed: 16:19
S32-5	1.268	100.074		98.806		

**WL Survey Summary**

Average WL:	Before	After
	97.276	97.274
Closing Error:	0.000	-
WL Check:	0.000	0.000
Transducer Elevation	96.109	96.108

**Field Personnel:**

SM, TR	Trip Date:	26-Jun-14
Data Entry Personnel: SM	Date:	26-Jun-14
Data Check Personnel: TR	Date:	4-Jul-14
Entered Digitally in the Field: Yes		

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: August 8, 2014  
 Site Visit Time (MST): 11:30



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.90	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	2.00	0.10		0.06	0.091					1.00	0.20	0.10	0.091	0.02	0.002	1%
2	2.30	0.20		0.12	0.085					1.00	0.30	0.20	0.085	0.06	0.005	1%
3	2.60	0.32		0.19	0.221					1.00	0.30	0.32	0.221	0.10	0.021	6%
4	2.90	0.34		0.20	0.335					1.00	0.23	0.34	0.335	0.08	0.026	7%
5	3.05	0.33		0.20	0.366					1.00	0.15	0.33	0.366	0.05	0.018	5%
6	3.20	0.32		0.19	0.491					1.00	0.18	0.32	0.491	0.06	0.027	8%
7	3.40	0.30		0.18	0.523					1.00	0.18	0.30	0.523	0.05	0.027	8%
8	3.55	0.30		0.18	0.627					1.00	0.10	0.30	0.627	0.03	0.019	5%
9	3.60	0.30		0.18	0.645					1.00	0.08	0.30	0.645	0.02	0.015	4%
10	3.70	0.32		0.19	0.620					1.00	0.10	0.32	0.620	0.03	0.020	5%
11	3.80	0.31		0.19	0.577					1.00	0.15	0.31	0.577	0.05	0.027	7%
12	4.00	0.32		0.19	0.458					1.00	0.20	0.32	0.458	0.06	0.029	8%
13	4.20	0.37		0.22	0.366					1.00	0.20	0.37	0.366	0.07	0.027	7%
14	4.40	0.37		0.22	0.337					1.00	0.20	0.37	0.337	0.07	0.025	7%
15	4.60	0.34		0.20	0.285					1.00	0.20	0.34	0.285	0.07	0.019	5%
16	4.80	0.28		0.17	0.275					1.00	0.20	0.28	0.275	0.06	0.015	4%
17	5.00	0.26		0.16	0.251					1.00	0.25	0.26	0.251	0.07	0.016	4%
18	5.30	0.22		0.13	0.142					1.00	0.30	0.22	0.142	0.07	0.009	3%
19	5.60	0.19		0.11	0.096					1.00	0.30	0.19	0.096	0.06	0.005	2%
20	5.90	0.19		0.11	0.140					1.00	0.30	0.19	0.140	0.06	0.008	2%
21	6.20	0.18		0.11	0.045					1.00	0.40	0.18	0.045	0.07	0.003	1%
22	6.70	0.11		0.07	-0.030					1.00	0.60	0.11	-0.030	0.07	-0.002	-1%
LB	7.40	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.363</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m DS of bridge

Meas. Start Time (MST):	12:05
Meas. End Time (MST):	12:36
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze, 24 C

**Flow characteristics:**

Total Flow:	0.363	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.26	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.19	

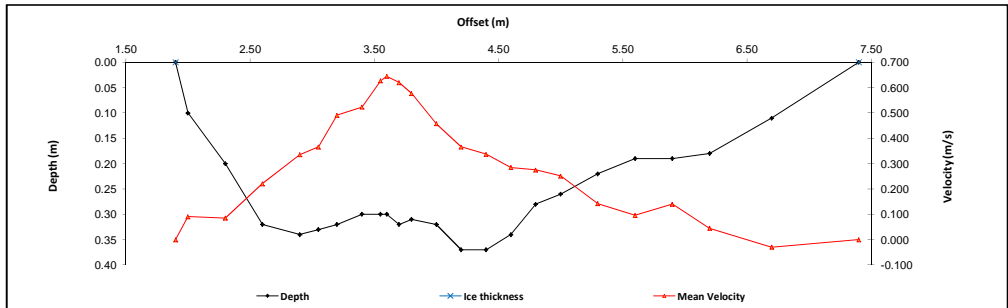
**Logger Details:**

	Before	After
Transducer Reading (m):	0.421	0.466
Water (°C):	16.5	17.4
Datalogger Clock:	11:36	12:43
Laptop Clock:	11:36	12:43
Battery (Main):	12.2	13.0
Battery:	Replaced	
Battery Serial #:	1111001, 1403005	1403003, 1302020
Enclosure Dessicant:	-	
Vent Tube Dessicant:	Good	
PT# (if replaced):	323016	352320
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Replaced PT for calibration

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S32-3	1.224	100.342		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.678	98.664	98.664	3/4" Pipe 7m S of logger
S32-5			1.537	98.805	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.820	96.522		Time WL Surveyed: 12:06
S32-5			1.537	98.805	98.807	3/4" Pipe 4m S of logger
<b>Turn</b>						
S32-5	1.522	100.327		98.805	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.803	96.524		Time WL Surveyed: 12:08
S32-5			1.522	98.805	98.807	3/4" Pipe 4m S of logger
S32-6			1.663	98.664	98.664	3/4" Pipe 7m S of logger
S32-3			1.209	99.118	99.118	3/4" Pipe 10m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S32-6	1.663	100.327		98.664		
Water Level:	Cut		3.810	96.517		Time WL Surveyed: 12:39
Water Level:	Cut		3.795	96.514		Time WL Surveyed: 12:41
S32-6	1.645	100.309		98.664		

**WL Survey Summary**

	Before	After
Average WL:	96.523	96.516
Closing Error:	0.000	-
WL Check:	0.002	0.003
Transducer Elevation	96.102	96.050

**Field Personnel:**

TR, SM	Trip Date:	8-Aug-14
TR	Date:	8-Aug-14
MP	Date:	18-Sep-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: September 13, 2014  
 Site Visit Time (MST): 12:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	1.90	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.10	0.11		0.07	0.100					1.00	0.25	0.11	0.100	0.03	0.003	1%
2	2.40	0.22		0.13	0.138					1.00	0.30	0.22	0.138	0.07	0.009	3%
3	2.70	0.28		0.17	0.221					1.00	0.25	0.28	0.221	0.07	0.015	5%
4	2.90	0.29		0.17	0.279					1.00	0.20	0.29	0.279	0.06	0.016	5%
5	3.10	0.29		0.17	0.311					1.00	0.20	0.29	0.311	0.06	0.018	6%
6	3.30	0.29		0.17	0.415					1.00	0.20	0.29	0.415	0.06	0.024	8%
7	3.50	0.25		0.15	0.490					1.00	0.20	0.25	0.490	0.05	0.025	8%
8	3.70	0.24		0.14	0.559					1.00	0.20	0.24	0.559	0.05	0.027	9%
9	3.90	0.29		0.17	0.566					1.00	0.15	0.29	0.566	0.04	0.025	8%
10	4.00	0.29		0.17	0.616					1.00	0.10	0.29	0.616	0.03	0.018	6%
11	4.10	0.30		0.18	0.495					1.00	0.15	0.30	0.495	0.04	0.022	7%
12	4.30	0.31		0.19	0.467					1.00	0.20	0.31	0.467	0.06	0.029	10%
13	4.50	0.30		0.18	0.305					1.00	0.20	0.30	0.305	0.06	0.018	6%
14	4.70	0.30		0.18	0.253					1.00	0.20	0.30	0.253	0.06	0.015	5%
15	4.90	0.30		0.18	0.178					1.00	0.20	0.30	0.178	0.06	0.011	4%
16	5.10	0.28		0.17	0.157					1.00	0.20	0.28	0.157	0.06	0.009	3%
17	5.30	0.21		0.13	0.163					1.00	0.25	0.21	0.163	0.05	0.009	3%
18	5.60	0.17		0.10	0.070					1.00	0.30	0.17	0.070	0.05	0.004	1%
19	5.90	0.19		0.11	0.048					1.00	0.30	0.19	0.048	0.06	0.003	1%
20	6.20	0.18		0.11	0.060					1.00	0.50	0.18	0.060	0.09	0.005	2%
LB	6.90	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.304</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 10m US of PT

Meas. Start Time (MST):	12:40
Meas. End Time (MST):	13:00
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 15C

**Flow characteristics:**

Total Flow:	0.304	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.10	(m²)
Wetted Width:	5.00	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.19	

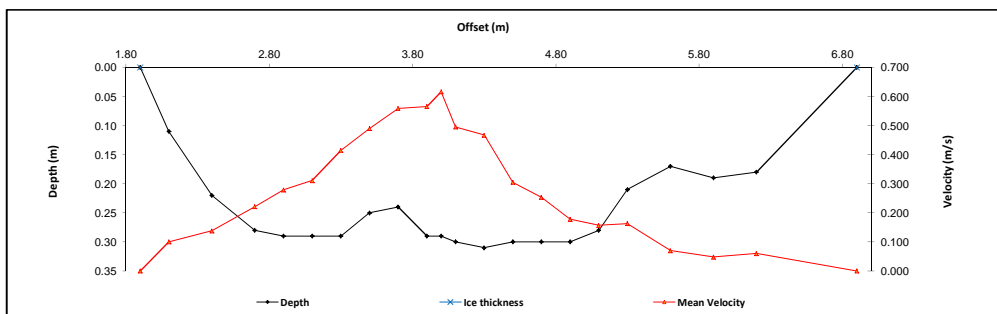
**Logger Details:**

	Before	After
Transducer Reading (m):	0.503	0.507
Water (°C):	7.0	7.1
Datalogger Clock:	12:20	13:11
Laptop Clock:	12:19	13:11
Battery (Main):	12.6	12.9
Battery:	Replaced	
Battery Serial #:	1403003, 130202	1403004, -
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-ADV test run, results good



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	0.953	100.071		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.407	98.664	98.664	3/4" Pipe 7m S of logger
S32-5			1.263	98.808	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.561	96.510	Time WL Surveyed: 12:32	
Temporary BM			3.245	96.826	0.000	-
Turn						
Temporary BM	3.216	100.042		96.826	-	
Water Level:	Cut		3.529	96.513	Time WL Surveyed: 12:34	
S32-5			1.232	98.810	98.807	3/4" Pipe 4m S of logger
S32-6			1.375	98.667	98.664	3/4" Pipe 7m S of logger
S32-3			0.921	99.121	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.232	100.041		98.809		
Water Level:	Cut		3.528	96.513	Time WL Surveyed: 13:07	
Water Level:	Cut		3.509	96.513	Time WL Surveyed: 13:09	
S32-5	1.213	100.022		98.809		

**WL Survey Summary**

	Before	After
Average WL:	96.512	96.513
Closing Error:	-0.003	-
WL Check:	0.003	0.000
Transducer Elevation	96.009	96.006

**Field Personnel:**

TR, GG	Trip Date:	13-Sep-14	
Data Entry Personnel:	TR	Date:	13-Sep-14
Data Check Personnel:	TR	Date:	29-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: October 24, 2014  
 Site Visit Time (MST): 09:55



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000				0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	2.10	0.22		0.13	0.217					1.00	0.20	0.22	0.217	0.04	0.010	1%
2	2.40	0.27		0.16	0.442					1.00	0.30	0.27	0.442	0.08	0.036	5%
3	2.70	0.19		0.11	0.390					1.00	0.30	0.19	0.390	0.06	0.022	3%
4	3.00	0.25		0.15	0.428					1.00	0.30	0.25	0.428	0.08	0.032	5%
5	3.30	0.29		0.17	0.284					1.00	0.30	0.29	0.284	0.09	0.025	4%
6	3.60	0.26		0.16	0.422					1.00	0.30	0.26	0.422	0.08	0.033	5%
7	3.90	0.28		0.17	0.574					1.00	0.30	0.28	0.574	0.08	0.048	7%
8	4.20	0.28		0.17	0.586					1.00	0.30	0.28	0.586	0.08	0.049	7%
9	4.50	0.29		0.17	0.534					1.00	0.30	0.29	0.534	0.09	0.046	7%
10	4.80	0.29		0.17	0.635					1.00	0.30	0.29	0.635	0.09	0.055	8%
11	5.10	0.35		0.21	0.623					1.00	0.30	0.35	0.623	0.11	0.065	9%
12	5.40	0.39		0.23	0.581					1.00	0.30	0.39	0.581	0.12	0.068	10%
13	5.70	0.36		0.22	0.566					1.00	0.30	0.36	0.566	0.11	0.061	9%
14	6.00	0.30		0.18	0.534					1.00	0.30	0.30	0.534	0.09	0.048	7%
15	6.30	0.27		0.16	0.412					1.00	0.30	0.27	0.412	0.08	0.033	5%
16	6.60	0.23		0.14	0.273					1.00	0.35	0.23	0.273	0.08	0.022	3%
17	7.00	0.14		0.08	0.304					1.00	0.40	0.14	0.304	0.06	0.017	2%
18	7.40	0.18		0.11	0.010					1.00	0.40	0.18	0.010	0.07	0.001	0%
19	7.80	0.12		0.07	0.299					1.00	0.40	0.12	0.299	0.05	0.014	2%
20	8.20	0.13		0.08	0.188					1.00	0.40	0.13	0.188	0.05	0.010	1%
21	8.60	0.10		0.06	0.087					1.00	0.35	0.10	0.087	0.04	0.003	0%
LB	8.90	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.000		
<b>Total Flow</b>														<b>0.699</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): DS edge of bridge

Mess. Start Time (MST):	10:15
Mess. End Time (MST):	10:40
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, windy, 0 C

**Flow characteristics:**

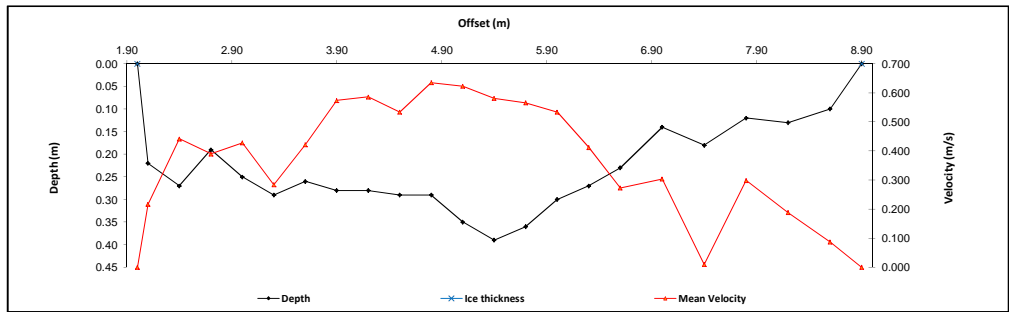
Total Flow:	0.699	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.61	(m <sup>2</sup> )
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.23	(m)
Mean Velocity:	0.43	(m/s)
Froude Number:	0.29	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.671	0.675
Water (°C):	4.4	4.3
Datalogger Clock:	09:58	10:49
Laptop Clock:	09:58	10:48
Battery (Main):	12.7	13.0
Battery:		Replaced
Battery Serial #:	1403004, -	1403010, -
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S32-3	0.929	100.047		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.384	98.663	98.664	3/4" Pipe 7m S of logger
S32-5			1.242	98.805	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut	0.905	4.262	96.690	96.690	Time WL Surveyed: 10:07
Temporary BM			4.262	95.785	0.000	-
<b>Turn</b>						
Temporary BM	4.229	100.014		95.785	-	-
Water Level:	Cut	0.905	4.229	96.690	96.690	Time WL Surveyed: 10:08
S32-5			1.209	98.805	98.807	3/4" Pipe 4m S of logger
S32-6			1.349	98.665	98.664	3/4" Pipe 7m S of logger
S32-3			0.899	99.115	99.118	3/4" Pipe 10m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S32-5	1.209	100.014		98.805	-	-
Water Level:	Cut	0.927	4.245	96.696	96.696	Time WL Surveyed: 10:45
Water Level:	Cut	0.927	4.227	96.694	96.694	Time WL Surveyed: 10:46
S32-5	1.189	99.994		98.605	-	-

**WL Survey Summary**

	Before	After
Average WL:	96.690	96.695
Closing Error:	0.003	-
WL Check:	0.000	0.002
Transducer Elevation	96.019	96.020

**Field Personnel:**

TR, GG	Trip Date:	24-Oct-14
TR	Date:	24-Oct-14
TR	Date:	20-Feb-15
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S32 - Surmont Creek at Highway 881  
 UTM Location: 490252 E, 6254511 N

Site Visit Date: December 28, 2014  
 Site Visit Time (MST): 10:55



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	12.80	0.00	0.00		0.000		0.000		0.000	0.88	0.10	0.00	0.000	0.00	0.000	
1	12.60	0.10	0.04	0.07	0.000				0.88	0.35	0.06	0.000	0.02	0.000	0%	
2	12.10	0.26	0.15	0.21	-0.097				0.88	0.45	0.11	-0.085	0.05	-0.004	-1%	
3	11.70	0.31	0.17	0.24	0.047				0.88	0.40	0.14	0.041	0.06	0.002	1%	
4	11.30	0.37	0.16	0.27	0.124				0.88	0.40	0.21	0.109	0.08	0.009	3%	
5	10.90	0.30	0.17	0.24	0.108				0.88	0.40	0.13	0.095	0.05	0.005	2%	
6	10.50	0.31	0.19	0.25	0.074				0.88	0.42	0.12	0.065	0.05	0.003	1%	
7	10.05	0.37	0.20	0.29	0.251				0.88	0.45	0.17	0.221	0.08	0.017	6%	
8	9.60	0.40	0.19	0.30	0.376				0.88	0.32	0.21	0.331	0.07	0.023	8%	
9	9.40	0.44	0.17	0.31	0.325				0.88	0.20	0.27	0.286	0.05	0.015	5%	
10	9.20	0.46	0.16	0.31	0.436				0.88	0.20	0.30	0.384	0.06	0.023	8%	
11	9.00	0.43	0.17	0.30	0.455				0.88	0.20	0.26	0.400	0.05	0.021	7%	
12	8.80	0.42	0.16	0.29	0.436				0.88	0.20	0.26	0.384	0.05	0.020	7%	
13	8.60	0.40	0.16	0.28	0.472				0.88	0.20	0.24	0.415	0.05	0.020	7%	
14	8.40	0.29	0.16	0.23	0.506				0.88	0.20	0.13	0.445	0.03	0.012	4%	
15	8.20	0.45	0.16	0.31	0.500				0.88	0.18	0.29	0.440	0.05	0.022	8%	
16	8.05	0.47	0.16	0.32	0.483				0.88	0.15	0.31	0.425	0.05	0.020	7%	
17	7.90	0.48	0.16	0.32	0.419				0.88	0.18	0.32	0.369	0.06	0.021	7%	
18	7.70	0.49	0.16	0.33	0.346				0.88	0.25	0.33	0.304	0.08	0.025	9%	
19	7.40	0.31	0.16	0.24	0.299				0.88	0.30	0.15	0.263	0.05	0.012	4%	
20	7.10	0.30	0.16	0.23	0.288				0.88	0.33	0.14	0.253	0.05	0.012	4%	
21	6.75	0.27	0.15	0.21	0.172				0.88	0.33	0.12	0.151	0.04	0.006	2%	
22	6.45	0.20	0.14	0.17	0.001				0.88	0.20	0.06	0.001	0.01	0.000	0%	
RB	6.35	0.00	0.00		0.000		0.000		0.88	0.05	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.283</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
8m DS of bridge

Meas. Start Time (MST):	11:45
Meas. End Time (MST):	12:18
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snowing, calm, -22C

**Flow characteristics:**

Total Flow:	0.283	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.13	(m <sup>2</sup> )
Wetted Width:	6.45	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.19	

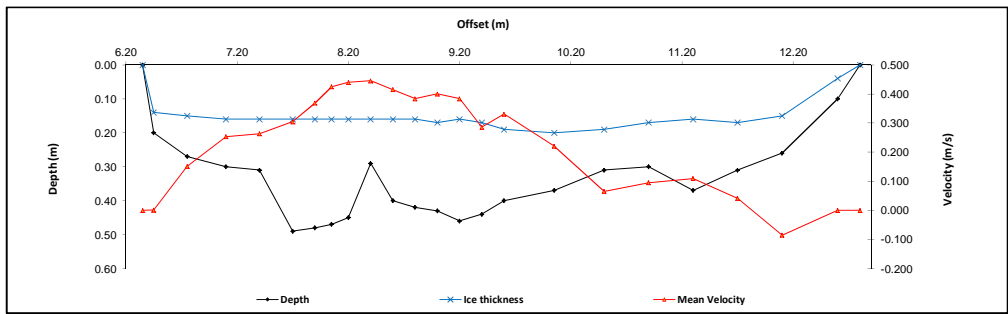
**Logger Details:**

	Before	After
Transducer Reading (m):	0.547	0.563
Water (°C):	0.7	0.7
Datalogger Clock:	11:00	12:31
Laptop Clock:	10:59	12:33
Battery (Main):	12.5	12.5
Battery:	-	Replaced
Battery Serial #:	1403010	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-ADV test good



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S32-3	1.000	100.118		99.118	99.118	3/4" Pipe 10m S of logger
S32-6			1.453	98.665	98.664	3/4" Pipe 7m S of logger
S32-5			1.309	98.809	98.807	3/4" Pipe 4m S of logger
Water Level:	Cut		3.498	96.620	Time WL Surveyed: 11:36	
Temporary BM			3.412	96.706	0.000	
Turn						
Temporary BM	3.391	100.097		96.706		
Water Level:	Cut		3.478	96.619	Time WL Surveyed: 11:39	
S32-5			1.290	98.807	98.807	3/4" Pipe 4m S of logger
S32-6			1.434	98.663	98.664	3/4" Pipe 7m S of logger
S32-3			0.979	99.118	99.118	3/4" Pipe 10m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S32-5	1.288	100.096		98.808		
Water Level:	Cut		3.482	96.614	Time WL Surveyed: 12:18	
Water Level:	Cut		3.512	96.611	Time WL Surveyed: 12:25	
S32-5	1.315	100.123		98.808		

**WL Survey Summary**

	Before	After
Average WL:	96.620	96.613
Closing Error:	0.000	-
WL Check:	0.001	0.003
Transducer Elevation	96.073	96.050

**Field Personnel:**

Data Entry Personnel:	TR	Trip Date:	28-Nov-14
Data Check Personnel:	TR	Date:	28-Nov-14
Entered Digitally in the Field:	Yes		28-Feb-15

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albanian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: January 29, 2014  
 Site Visit Time (MST): 12:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	3.00	0.00	0.00		0.000		0.000		0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	3.60	0.70	0.15	0.43	-0.013					0.88	0.48	0.55	-0.011	0.26	-0.003	-1%
2	3.95	0.90	0.18	0.54	0.003					1.00	0.33	0.80	0.004	0.23	0.001	0%
3	4.25	1.00	0.20			0.84	0.006	0.36	0.001	1.00	0.38	0.95	0.012	0.26	0.001	0%
4	4.60	1.20	0.25			1.01	0.009	0.44	0.014	1.00	0.38	0.95	0.012	0.26	0.001	0%
5	5.00	1.30	0.30			1.10	0.013	0.50	0.041	1.00	0.43	1.00	0.027	0.43	0.011	4%
6	5.45	1.75	0.35			1.47	0.025	0.63	0.055	1.00	0.35	1.40	0.040	0.49	0.020	7%
7	5.70	1.38	0.35			1.17	0.038	0.56	0.060	1.00	0.25	1.03	0.049	0.26	0.013	4%
8	5.95	1.30	0.40			1.12	0.060	0.58	0.061	1.00	0.35	0.90	0.061	0.32	0.019	6%
9	6.40	1.40	0.45			1.21	0.075	0.64	0.075	1.00	0.40	0.95	0.075	0.38	0.029	10%
10	6.75	1.40	0.40			1.20	0.091	0.60	0.080	1.00	0.25	1.00	0.086	0.25	0.021	7%
11	6.90	1.40	0.45			1.21	0.069	0.64	0.095	1.00	0.33	0.95	0.082	0.31	0.025	8%
12	7.40	1.40	0.44			1.21	0.060	0.63	0.080	1.00	0.38	0.96	0.070	0.36	0.025	8%
13	7.65	1.40	0.44			1.21	0.061	0.63	0.092	1.00	0.28	0.96	0.077	0.26	0.020	7%
14	7.95	1.40	0.40			1.20	0.063	0.60	0.078	1.00	0.35	1.00	0.071	0.35	0.025	8%
15	8.35	1.40	0.35			1.19	0.075	0.56	0.076	1.00	0.37	1.05	0.076	0.39	0.030	10%
16	8.70	1.40	0.35			1.19	0.049	0.56	0.074	1.00	0.33	1.05	0.062	0.34	0.021	7%
17	9.00	1.35	0.35			1.15	0.057	0.55	0.081	1.00	0.30	1.00	0.069	0.30	0.021	7%
18	9.30	1.30	0.35			1.11	0.039	0.54	0.032	1.00	0.33	0.95	0.036	0.31	0.011	4%
19	9.65	1.30	0.30			1.10	0.022	0.50	0.008	1.00	0.32	1.00	0.015	0.32	0.005	2%
20	9.95	1.20	0.20			1.00	0.015	0.40	-0.005	1.00	0.27	1.00	0.005	0.27	0.001	0%
21	10.20	0.95	0.25	0.60	-0.002					0.88	0.25	0.70	-0.002	0.18	0.000	0%
RB	10.45	0.00	0.00		0.00		0.00		0.00	0.88	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.299</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Across from station

Mess. Start Time (MST):	13:00
Mess. End Time (MST):	13:50
Equipment:	ADV
Method:	Ice
River Condition:	Ice covered
Channel Edges:	Trapezoidal Edge (e.g., stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, -25C

**Flow characteristics:**

Total Flow:	0.299	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	6.63	(m²)
Wetted Width:	7.45	(m)
Hydraulic Depth:	0.89	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

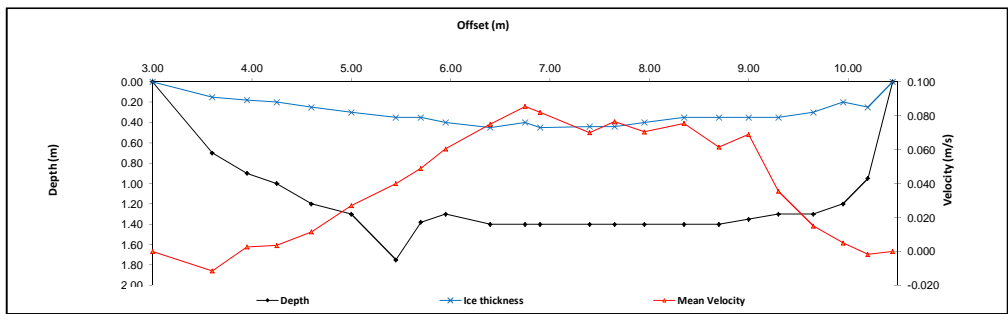
**Logger Details:**

	Before	After
Transducer Reading (m):	0.899	0.899
Water (°C):	0.2	0.2
Datalogger Clock:	12:38	13:59
Laptop Clock:	12:39	13:59
Battery (Main):	12.4	15.1
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- BM 5 was damaged by equipment moving at station and was not included in survey.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S33-04	1.150	282.630		281.480	281.480	3/4" Pipe 8m S of logger
S33-03			1.312	281.318	281.308	3/4" Pipe 3m W of logger
Water Level:	Cut		2.924	279.706		<b>Time WL Surveyed:</b> 12:47
Temporary BM			2.912	279.718	0.000	
<b>Turn</b>						
Temporary BM	2.886	282.604		279.718		
Water Level:	Cut		2.899	279.705		<b>Time WL Surveyed:</b> 12:49
S33-03			1.285	281.319	281.308	3/4" Pipe 3m W of logger
S33-04			1.124	281.480	281.480	3/4" Pipe 8m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S33-4	1.125	282.605		281.480		
Water Level:	Cut		2.895	279.710		<b>Time WL Surveyed:</b> 13:50
Water Level:	Cut		2.878	279.707		<b>Time WL Surveyed:</b> 13:53
S33-4	1.105	282.585		281.480		

**WL Survey Summary**

Average WL:	279.706	279.709
Closing Error:	0.000	-
WL Check:	0.001	0.003
Transducer Elevation	278.807	278.810

**Field Personnel:**

TR, SM	Trip Date:	29-Jan-14
SM	Date:	29-Jan-14
DW	Date:	24-Feb-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albanian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: February 19, 2014  
 Site Visit Time (MST): 12:20



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	2.30	0.00	0.00		0.000		0.000		0.000	0.88	0.44	0.00	0.000	0.00	0.000	
1	3.17	0.80	0.40	0.60	-0.001					0.88	0.58	0.40	-0.001	0.23	0.000	0%
2	3.45	1.00	0.43	0.72	0.002					0.88	0.32	0.57	0.002	0.18	0.000	0%
3	3.80	1.10	0.44	0.77	0.009					1.00	0.33	0.66	0.008	0.21	0.002	0%
4	4.09	1.30	0.45			1.13	0.048	0.62	0.053	1.00	0.33	0.85	0.051	0.28	0.014	4%
5	4.46	1.45	0.45			1.25	0.016	0.65	0.079	1.00	0.35	1.00	0.048	0.35	0.017	4%
6	4.79	1.50	0.52			1.30	0.034	0.72	0.087	1.00	0.33	0.98	0.061	0.32	0.020	5%
7	5.12	1.40	0.55			1.23	0.030	0.72	0.079	1.00	0.33	0.85	0.055	0.28	0.015	4%
8	5.45	1.50	0.54			1.31	0.069	0.73	0.084	1.00	0.28	0.96	0.077	0.26	0.020	5%
9	5.67	1.56	0.55			1.36	0.105	0.75	0.093	1.00	0.27	1.01	0.099	0.27	0.026	7%
10	5.98	1.55	0.55			1.35	0.105	0.75	0.106	1.00	0.34	1.00	0.106	0.34	0.036	9%
11	6.35	1.52	0.56			1.33	0.115	0.75	0.115	1.00	0.35	0.96	0.115	0.33	0.038	10%
12	6.67	1.45	0.55			1.27	0.076	0.73	0.104	1.00	0.31	0.90	0.090	0.27	0.025	6%
13	6.96	1.47	0.55			1.29	0.086	0.73	0.106	1.00	0.31	0.92	0.096	0.29	0.027	7%
14	7.29	1.40	0.54			1.23	0.052	0.71	0.128	1.00	0.33	0.86	0.090	0.28	0.025	6%
15	7.61	1.49	0.54			1.30	0.064	0.73	0.127	1.00	0.32	0.95	0.096	0.30	0.029	7%
16	7.93	1.39	0.50			1.21	0.085	0.68	0.104	1.00	0.29	0.89	0.095	0.25	0.024	6%
17	8.18	1.36	0.48			1.18	0.048	0.66	0.098	1.00	0.29	0.88	0.073	0.26	0.019	5%
18	8.51	1.30	0.46			1.13	0.084	0.63	0.098	1.00	0.32	0.84	0.091	0.26	0.024	6%
19	8.81	1.30	0.44			1.13	0.073	0.61	0.095	1.00	0.29	0.86	0.084	0.25	0.021	5%
20	9.09	1.10	0.40	0.75	0.045					0.88	0.26	0.70	0.040	0.18	0.007	2%
21	9.32	1.00	0.46	0.73	0.015					0.88	0.40	0.54	0.013	0.22	0.003	1%
RB	9.90	0.00	0.00		0.00		0.00		0.00	0.88	0.29	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.392</b>	<b>100%</b>	

**Flow Mt 0.107**  
 Metering Section Location (describe):  
 -2m upstream of station

Mess. Start Time (MST):	12:53
Mess. End Time (MST):	13:32
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -12C

**Flow characteristics:**

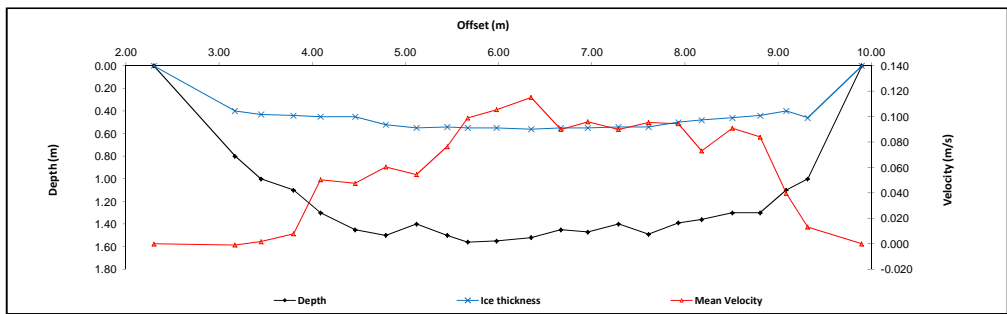
Total Flow:	0.392	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.62	(m²)
Wetted Width:	7.60	(m)
Hydraulic Depth:	0.74	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.952	-
Water (°C):	0.2	-
Datalogger Clock:	12:24	-
Laptop Clock:	12:25	-
Battery (Main):	13.7	13.4
Battery:	Replaced	
Battery Serial #:	-	1306001
Enclosure Desiccant:	Good	
Vent Tube Desiccant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S33-04	1.090	282.570		281.480	281.480	3/4" Pipe 8m S of logger
S33-03			1.258	281.312	281.308	3/4" Pipe 3m W of logger
<b>Turn</b>						
Temporary BM	Cut	2.821	279.749	279.749	0.000	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed: 12:44
Water Level:	Cut					Time WL Surveyed: 12:46
S33-03		1.239		281.314	281.308	3/4" Pipe 3m W of logger
S33-04		1.073		281.480	281.480	3/4" Pipe 8m S of logger
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	279.749	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	278.797	-

**Field Personnel:**

SM, MP	Trip Date:	19-Feb-14
SM	Date:	19-Feb-14
DW	Date:	24-Feb-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: March 17, 2014  
 Site Visit Time (MST): 10:00

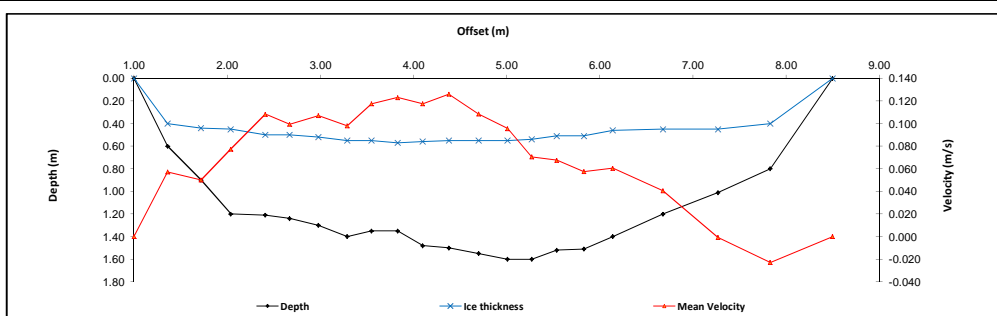


Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)	
RB	1.00	0.00	0.00		0.000		0.000		0.000	0.88	0.18	0.00	0.000	0.00	0.000		
1	1.36	0.60	0.40	0.50	0.065					0.88	0.36	0.20	0.057	0.07	0.004	1%	
2	1.72	0.90	0.44	0.67	0.067					0.88	0.34	0.46	0.050	0.16	0.008	2%	
3	2.04	1.20	0.45	0.83	0.088					0.88	0.35	0.75	0.077	0.26	0.020	5%	
4	2.41	1.21	0.50	0.86	0.123					0.88	0.32	0.71	0.108	0.22	0.024	6%	
5	2.67	1.24	0.50	0.87	0.113					0.88	0.29	0.74	0.099	0.21	0.021	5%	
6	2.98	1.30	0.52			1.14	0.091	0.68	0.123	1.00	0.31	0.78	0.107	0.24	0.026	6%	
7	3.29	1.40	0.55			1.23	0.067	0.72	0.129	1.00	0.29	0.85	0.098	0.24	0.024	6%	
8	3.55	1.35	0.55			1.19	0.113	0.71	0.122	1.00	0.27	0.80	0.118	0.22	0.025	6%	
9	3.83	1.35	0.57			1.19	0.110	0.73	0.136	1.00	0.28	0.78	0.123	0.21	0.026	7%	
10	4.10	1.48	0.56			1.30	0.097	0.74	0.138	1.00	0.28	0.92	0.118	0.25	0.030	7%	
11	4.38	1.50	0.55			1.31	0.131	0.74	0.121	1.00	0.30	0.95	0.126	0.29	0.036	9%	
12	4.70	1.55	0.55			1.35	0.098	0.75	0.119	1.00	0.32	1.00	0.109	0.32	0.034	9%	
13	5.01	1.60	0.55			1.39	0.090	0.76	0.101	1.00	0.28	1.05	0.096	0.30	0.029	7%	
14	5.27	1.60	0.54			1.39	0.045	0.75	0.096	1.00	0.27	1.06	0.071	0.28	0.020	5%	
15	5.54	1.52	0.51			1.32	0.040	0.71	0.095	1.00	0.28	1.01	0.068	0.28	0.019	5%	
16	5.83	1.51	0.51			1.31	0.026	0.71	0.089	1.00	0.30	1.00	0.058	0.30	0.017	4%	
17	6.14	1.40	0.46			1.21	0.039	0.65	0.082	1.00	0.43	0.94	0.061	0.40	0.024	6%	
18	6.68	1.20	0.45	0.83						0.88	0.57	0.75	0.040	0.42	0.017	4%	
19	7.27	1.01	0.45	0.73	-0.001					0.88	0.58	0.56	-0.001	0.32	0.000	0%	
20	7.83	0.80	0.40	0.60	-0.026					0.88	0.61	0.40	-0.023	0.25	-0.006	-1%	
LB	8.50	0.00	0.00		0.00		0.00		0.00	0.88	0.34	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.399</b>	<b>100%</b>		

**Flow Measurement Details:**

Metering Section Location (describe):  
 -3m upstream of station

Meas. Start Time (MST):	10:44
Meas. End Time (MST):	11:20
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 1 C



**Flow characteristics:**

Total Flow:	0.399	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.24	(m²)
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.70	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.942	
Water (°C):	0.3	
Datalogger Clock:	10:15	
Laptop Clock:	10:16	
Battery (Main):	14.6	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessoricant:		Good
Vent Tube Dessoricant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S33-04	1.092	282.572		281.480	281.480	3/4" Pipe 8m S of logger
S33-03			1.263	281.309	281.308	3/4" Pipe 3m W of logger
<b>Water Level:</b>						
Water Level:	Cut		2.847	279.725	Time WL Surveyed:	10:39
Temporary BM			2.818	279.754	0.000	-
<b>Turn</b>						
Temporary BM	2.836	282.590		279.754	-	
Water Level:	Cut		2.865	279.725	Time WL Surveyed:	10:37
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	279.725	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	278.783	-

**Field Personnel:**

	SM, MP	Trip Date:	17-Mar-14
Data Entry Personnel:	SM	Date:	17-Mar-14
Data Check Personnel:	CJ	Date:	14-Apr-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Alban Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: April 14, 2014  
 Site Visit Time (MST): 10:00

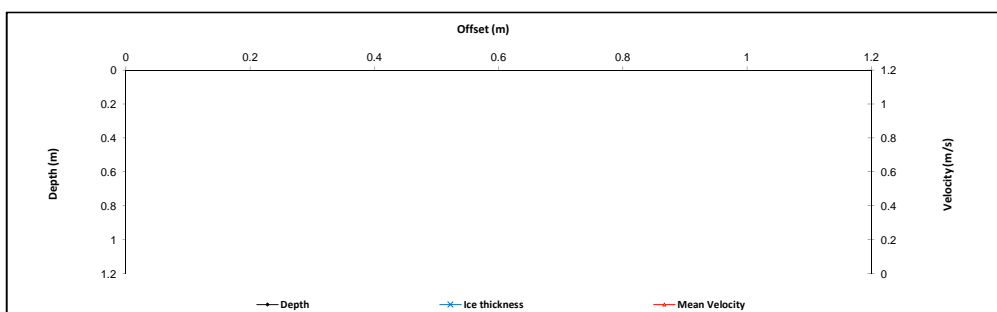


Measured Data										Calculated Data							
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)	
Flow Measurement Not Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



**Flow characteristics:**

Total Flow:	-	(m³/s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m²)
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.001	
Water (°C):	0.5	
Datalogger Clock:	10:01	
Laptop Clock:	10:02	
Battery (Main):	14.6	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (# replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-ice conditions were too unsafe for flow or water level measurements

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	-	-
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

**Field Personnel:**

Data Entry Personnel:	MP SM	Trip Date:	14-Apr-14
Data Check Personnel:	MP SM	Date:	14-Apr-14
Entered Digitally in the Field:	CJ	Date:	24-Apr-14

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary  
 UTM Location: 474876 E, 6350204 N

Site Visit Date: May 13, 2014  
 Site Visit Time (MST): 12:10



Flow Measurement Details:	
Metering Section Location (describe): -3m DS of station	
Meas. Start Time (MST):	12:55
Meas. End Time (MST):	14:26
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, 15C

Flow characteristics:		
Total Flow:	5.45	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.34	(m <sup>2</sup> )
Wetted Width:	10.01	(m)
Hydraulic Depth:	0.03	(m)
Mean Velocity:	5.45	(m/s)
Froude Number:	9.45	

Logger Details:		
Transducer Reading (m):	Before	After
	1.753	1.753
Water (°C):	6.8	7.5
Datalogger Clock:	12:11	14:32
Laptop Clock:	12:12	14:33
Battery (Main):	13.8	1371.0
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PT cable and solar panel poorly secured, mast should be straightened or replaced, secured cables

**General Notes:**

- Temp. BM is old S33-01: rebar 15m W in PVC

ADCP Flow Measurement Summary:						
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9		Transducer Depth (m):	15.43	LB:	-
Serial Number:	1802		Salinity (ppt):	-	RB:	-
Firmware Version:	3.5		Magnetic Declination (°):	14.33		
Software Version:	3.7		Measured Temperature (°C):	-		
			ADCP Temperature (°C):	7.8		
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>			
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam		12	10.05	15.26	0.344
Coordinate System:	ENU		13	10.00	16.33	0.338
Left Method:	Sloped Bank		15	9.57	15.43	0.342
Right Method:	Sloped Bank		16	10.41	17.28	0.332
Top Fit Type:	Power Fit					
Bottom Fit Type:	Power Fit					
			<b>Mean:</b>	10.01	16.08	0.339
			<b>SD:</b>	0.30	0.81	0.005
			<b>COV:</b>	0.03	0.05	0.014
						0.036
						5.246
						5.525
						5.284
						5.729
						-3.67%
						1.45%
						-2.97%
						5.20%

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S33-04	0.991	282.471		281.480	281.480	3/4" Pipe 8m S of logger
Temporary BM			0.618	281.853	0.000	-
S33-03			1.164	281.307	281.308	3/4" Pipe 3m W of logger
Water Level:	<b>Cut</b>	1.941		280.530	<b>Time WL Surveyed:</b>	12:37
Temporary BM		1.427		281.044	0.000	-
<b>Turn</b>						
Temporary BM	1.411	282.455		281.044		-
Water Level:	<b>Cut</b>		1.921	280.534	<b>Time WL Surveyed:</b>	12:39
S33-03			1.149	281.306	281.308	3/4" Pipe 3m W of logger
Temporary BM			0.603	281.852		-
S33-04			0.975	281.480	281.480	3/4" Pipe 8m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S33-04	0.973	282.453		281.480		
Water Level:	<b>Cut</b>		1.923	280.530	<b>Time WL Surveyed:</b>	14:29
Water Level:	<b>Cut</b>		1.906	280.533	<b>Time WL Surveyed:</b>	14:31
S33-04	0.959	282.439		281.480		

WL Survey Summary	Before	After
Average WL:	280.532	280.532
Closing Error:	0.000	-
WL Check:	0.004	-0.003
Transducer Elevation	278.779	278.779

Field Personnel:	TR, MP	Trip Date:	13-May-14
Data Entry Personnel:	TR	Date:	13-May-14
Data Check Personnel:	CJ	Date:	3-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albanian Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

June 9, 2014

Site Visit Time (MST):

12:00



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Flow Measurement Conducted																
															<b>Total Flow</b>	-

### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):

Meas. End Time (MST):

Equipment:

Method:

River Condition:

Channel Edges:

Quality/Error (see reverse):

Weather:

### Flow characteristics:

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

### Logger Details:

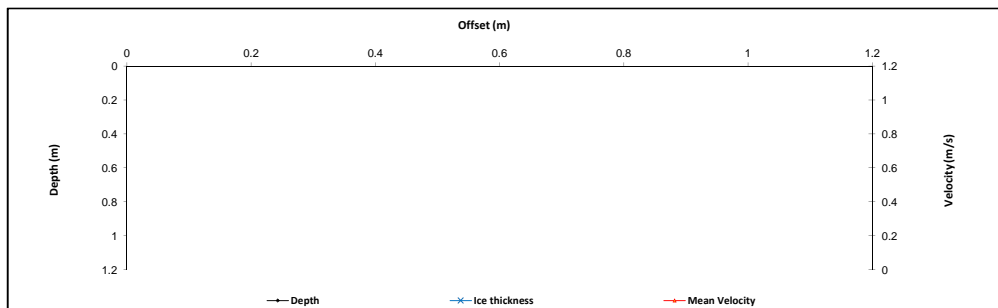
	Before	After
Transducer Reading (m):	2.424	2.464
Water (°C):	12.2	12.2
Datalogger Clock:	12:01	12:40
Laptop Clock:	12:01	12:40
Battery (Main):	13.8	13.8
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (# replaced):	284717	342875
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

- Replaced transducer and stabilized enclosure
- next visit install new BM and new mast for enclosure
- transducer needs new weight

### General Notes:

- Station area flooded.
- No flow measurement conducted due to unconfined flow and water depth greater than capacity of top set rod.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S33-03	1.223	282.531		281.308	281.308	3/4" Pipe 3m W of logger
S33-04			1.044	281.487	281.480	3/4" Pipe 8m S of logger
Water Level:	Cut		1.320	281.211	Time WL Surveyed:	12:11
Temporary BM			1.045	281.486	0.000	-
Turn						
Temporary BM	1.030	282.516		281.486		-
Water Level:	Cut		1.306	281.210	Time WL Surveyed:	12:15
S33-04			1.032	281.484	281.480	3/4" Pipe 8m S of logger
S33-03			1.209	281.307	281.308	3/4" Pipe 3m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S33-04	1.032	282.519		281.487		
Water Level:	Cut		1.306	281.213	Time WL Surveyed:	12:54
Water Level:	Cut		1.293	281.210	Time WL Surveyed:	12:56
S33-04	1.016	282.503		281.487		

WL Survey Summary	Before	After
Average WL:	281.211	281.212
Closing Error:	0.001	-
WL Check:	0.001	0.003
Transducer Elevation	278.787	278.748

Field Personnel:	SM, GG	Trip Date:	9-Jun-14
Data Entry Personnel:	SM	Date:	9-Jun-14
Data Check Personnel:	CJ	Date:	24-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albian Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date: August 13, 2014

Site Visit Time (MST): 12:40



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): -adjacent to station	
Meas. Start Time (MST):	14:10
Meas. End Time (MST):	14:20
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow, turbid water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, 28C

<b>Flow characteristics:</b>		
Total Flow:	1.23	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.55	(m <sup>2</sup> )
Wetted Width:	8.40	(m)
Hydraulic Depth:	1.14	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.04	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	1.064	1.066
Water (°C):	20.2	20.7
Datalogger Clock:	12:43	14:38
Laptop Clock:	12:44	14:39
Battery (Main):	13.4	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Repaired enclosure mast
- installed BM 6
- installed BM tags

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	-
Serial Number:	4712	Salinity (ppt):	-	RB:	-
Firmware Version:	3.5	Magnetic Declination (°):	14.33		
Software Version:	3.7	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	22.4		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	8.37	9.46	0.126
Coordinate System:	ENU	2	8.34	9.58	0.128
Left Method:	Sloped Bank	3	8.43	9.56	0.133
Right Method:	Sloped Bank	4	8.48	9.60	0.126
Top Fit Type:	Power Fit				
Bottom Fit Type:	Power Fit	<b>Mean:</b>	8.40	9.55	0.128
		<b>SD:</b>	0.06	0.05	0.003
		<b>COV:</b>	0.01	0.01	0.022
					0.025

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>	S33-03	1.054	282.362		281.308	281.308	3/4" Pipe 3m W of logger
	S33-06			0.852	281.510	-	3/4" Pipe 7m W of logger
	S33-04			0.890	281.472	281.480	3/4" Pipe 8m S of logger
	Water Level:	Cut		2.523	279.839	Time WL Surveyed:	13:02
	Temporary BM			0.890	281.472	0.000	-
<b>Turn</b>	Temporary BM	0.877	282.349		281.472		-
	Water Level:	Cut		2.513	279.836	Time WL Surveyed:	13:03
	S33-04			0.877	281.472	281.480	3/4" Pipe 8m S of logger
	S33-06			0.838	281.511	-	3/4" Pipe 7m W of logger
	S33-03			1.040	281.309	281.308	3/4" Pipe 3m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
S33-04	0.877	282.349		281.472			
Water Level:	Cut		2.518	279.831	Time WL Surveyed:	14:36	
Water Level:	Cut		2.498	279.832	Time WL Surveyed:	14:37	
S33-04	0.858	282.330		281.472			

<b>WL Survey Summary</b>	Before	After
Average WL:	279.838	279.832
Closing Error:	-0.001	-
WL Check:	0.003	-0.001
Transducer Elevation	278.774	278.766

<b>Field Personnel:</b>	SM, MP	Trip Date:	13-Aug-14
Data Entry Personnel:	SM	Date:	13-Aug-14
Data Check Personnel:	CJ	Date:	27-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albion Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date: \_\_\_\_\_

September 23, 2014

Site Visit Time (MST): \_\_\_\_\_

10:48



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): -adjacent to station	
Meas. Start Time (MST):	11:00
Meas. End Time (MST):	11:25
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	-

<b>Flow characteristics:</b>		
Total Flow:	0.638	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.05	(m <sup>2</sup> )
Wetted Width:	8.85	(m)
Hydraulic Depth:	1.02	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.02	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	1.020	1.030
Water (°C):	12.6	12.8
Datalogger Clock:	10:50	11:32
Laptop Clock:	10:50	11:32
Battery (Main):	14.3	14.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	26.50	
Serial Number:	4712		Salinity (ppt):	-		RB:	17.50	
Firmware Version:	3.50		Magnetic Declination (°):	14.33				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	13.8				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	9.141	8.67	0.077	0.669	4.94%
Coordinate System:	ENU		2	8.837	9.48	0.065	0.616	-3.37%
Left Method:	Sloped Bank		3	8.525	8.63	0.076	0.654	2.59%
Right Method:	Sloped Bank		4	8.914	9.44	0.065	0.611	-4.16%
Top Fit Type:	Power Fit							
Bottom Fit Type:	Power Fit		<b>Mean:</b>	8.85	9.05	0.071	<b>0.638</b>	
			<b>SD:</b>	0.22	0.41	0.006	0.025	
			<b>COV:</b>	0.02	0.04	0.081	0.039	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S33-03	1.027	282.335		281.308	281.308	3/4" Pipe 3m W of logger
S33-06			0.828	281.507	-	3/4" Pipe 7m W of logger
S33-04			0.866	281.469	281.480	3/4" Pipe 8m S of logger
Water Level:	Cut		2.573	279.762	<b>Time WL Surveyed:</b>	10:58
S33-03			0.866	281.469	281.308	3/4" Pipe 3m W of logger
<b>Turn</b>						
S33-03	0.858	282.327		281.469	281.308	3/4" Pipe 3m W of logger
Water Level:	Cut		2.564	279.763	<b>Time WL Surveyed:</b>	11:00
S33-04			0.858	281.469	281.480	3/4" Pipe 8m S of logger
S33-06			0.822	281.505	-	3/4" Pipe 7m W of logger
S33-03			1.021	281.306	281.308	3/4" Pipe 3m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S33-04	0.858	282.327		281.469		
Water Level:	Cut		2.564	279.763	<b>Time WL Surveyed:</b>	11:35
Water Level:	Cut		2.558	279.764	<b>Time WL Surveyed:</b>	11:37
S33-04	0.853	282.322		281.469		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	279.763	279.764
Closing Error:	0.002	-
WL Check:	0.001	-0.001
Transducer Elevation	278.743	278.734

<b>Field Personnel:</b>	MP, TR	Trip Date:	23-Sep-14
<b>Data Entry Personnel:</b>	MP, TR	Date:	23-Sep-14
<b>Data Check Personnel:</b>	MY	Date:	2-Oct-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Albion Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date: \_\_\_\_\_

October 9, 2014

Site Visit Time (MST): \_\_\_\_\_

10:05



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): -adjacent to station	
Meas. Start Time (MST):	10:30
Meas. End Time (MST):	10:40
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10C

<b>Flow characteristics:</b>		
Total Flow:	1.27	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.40	(m <sup>2</sup> )
Wetted Width:	8.85	(m)
Hydraulic Depth:	1.06	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.04	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	1.207	1.206
Water (°C):	5.3	5.4
Datalogger Clock:	10:06	10:52
Laptop Clock:	10:07	10:53
Battery (Main):	14.7	14.6
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-A moose entered the river near the PT location, may have shifted the PT position.

<b>ADCP Flow Measurement Summary:</b>					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	26.70
Serial Number:	4712	Salinity (ppt):	-	RB:	17.10
Firmware Version:	3.5	Magnetic Declination (°):	14.33		
Software Version:	3.7	Measured Temperature (°C):	-		
		ADCP Temperature (°C):			
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	8.397	8.974	0.136
Coordinate System:	ENU	2	9.019	9.739	0.136
Left Method:	Sloped Bank	3	9.374	9.669	0.13
Right Method:	Sloped Bank	4	8.679	9.358	0.13
Top Fit Type:	Power Fit	5	8.780	9.243	0.144
Bottom Fit Type:	Power Fit				
		<b>Mean:</b>	8.85	9.40	0.135
		<b>SD:</b>	0.33	0.28	0.005
		<b>COV:</b>	0.04	0.03	0.038
					1.27
					0.050
					0.039
					-3.78%
					4.41%
					-0.87%
					-4.49%
					4.72%

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S33-03	1.143	282.451		281.308	281.308	3/4" Pipe 3m W of logger
S33-06			0.939	281.512	-	3/4" Pipe 7m W of logger
S33-04			0.977	281.474	281.480	3/4" Pipe 8m S of logger
Water Level:	Cut		2.513	279.938	Time WL Surveyed:	10:10
S33-03			0.977	281.474	281.308	3/4" Pipe 3m W of logger
<b>Turn</b>						
S33-03	0.969	282.443		281.474	281.308	3/4" Pipe 3m W of logger
Water Level:	Cut		2.506	279.937	Time WL Surveyed:	10:12
S33-04			0.969	281.474	281.480	3/4" Pipe 8m S of logger
S33-06			0.934	281.509	-	3/4" Pipe 7m W of logger
S33-03			1.134	281.309	281.308	3/4" Pipe 3m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S33-04	0.971	282.445		281.474		
Water Level:	Cut		2.505	279.940	Time WL Surveyed:	10:49
Water Level:	Cut		2.502	279.937	Time WL Surveyed:	10:51
S33-04	0.965	282.439		281.474		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	279.938	279.939
Closing Error:	-0.001	-
WL Check:	0.001	0.003
Transducer Elevation	278.731	278.733

<b>Field Personnel:</b>			
Data Entry Personnel:	MP, TR	Trip Date:	9-Oct-14
Data Check Personnel:	MP, TR	Date:	9-Oct-14
Entered Digitally in the Field:	MY	Date:	24-Oct-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S33 Muskeg River @ Aurora / Alban Boundary

UTM Location: 474876 E, 6350204 N

Site Visit Date:

November 30, 2014

Site Visit Time (MST):

12:45



## Flow Measurement:

Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
Flow Measurement Not Conducted																	
															<b>Total Flow</b>		-

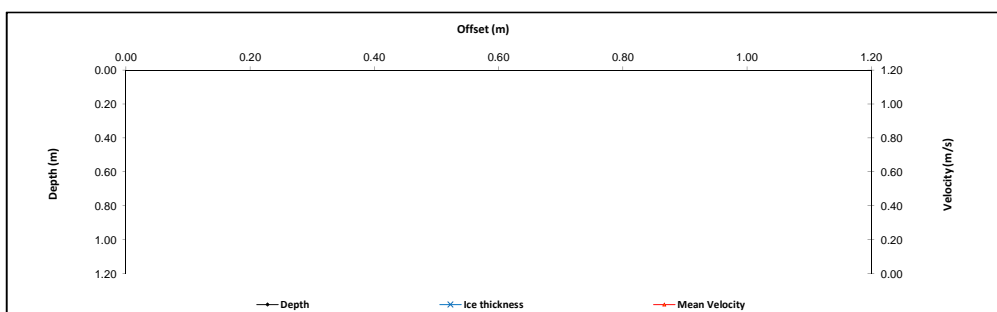
### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

### Flow characteristics:

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	



### Logger Details:

	Before	After
Transducer Reading (m):	0.995	
Water (°C):	0.0	
Datalogger Clock:	12:51	
Laptop Clock:	12:51	
Battery (Main):	15.1	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

### Datalogger / Station Notes:

-Replaced modem

### General Notes:

-Flow measurement not conducted due to thin ice and safety concerns

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S33-03	1.115	282.423		281.308	281.308	3/4" Pipe 3m W of logger
S33-06			0.913	281.510	281.510	3/4" Pipe 7m W of logger
S33-04			0.952	281.471	281.472	3/4" Pipe 8m S of logger
Water Level:	Cut		2.736	279.687	Time WL Surveyed:	13:02
Temporary BM			2.586	279.637	0.000	-
<b>Turn</b>						
Temporary BM	2.558	282.395		279.837		-
Water Level:	Cut		2.704	279.691	Time WL Surveyed:	13:05
S33-04			0.923	281.472	281.472	3/4" Pipe 8m S of logger
S33-06			0.887	281.508	281.510	3/4" Pipe 7m W of logger
S33-03			1.086	281.309	281.308	3/4" Pipe 3m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	279.689	-
Closing Error:	-0.001	-
WL Check:	0.004	-
Transducer Elevation	278.694	-

<b>Field Personnel:</b>	TR, MP	Trip Date:	30-Nov-14
Data Entry Personnel:	TR	Date:	30-Nov-14
Data Check Personnel:	CJ	Date:	12-Dec-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above Horizon Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: January 20, 2014  
 Site Visit Time (MST): 10:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Discharge Measurement Conducted																
															<b>Total Flow</b>	-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

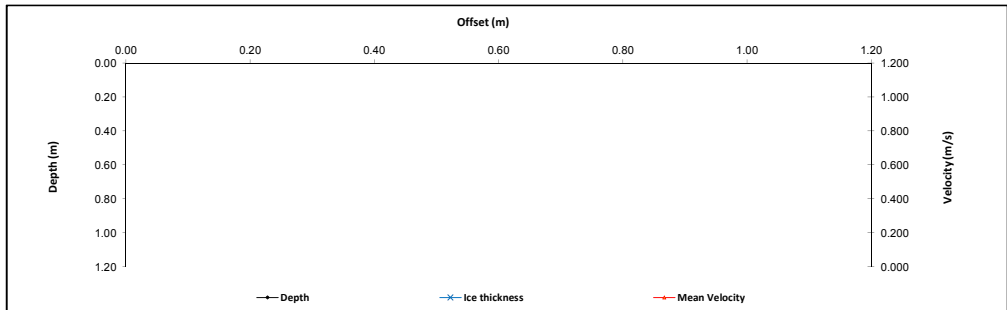
**Logger Details:**

	Before	After
Transducer Reading (m):	0.827	-
Water (°C):	0.1	-
Datalogger Clock:	15:43	-
Laptop Clock:	15:40	-
Battery (Main):	12.9	-
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- No flow meas or WL survey were conducted because the ice thickness was greater than length of auger flight.
- See photos.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	-	-
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

<b>Field Personnel:</b>	SM, TR	Trip Date:	20-Jan-14
Data Entry Personnel:	SM	Date:	20-Jan-14
Data Check Personnel:	DW	Date:	21-Feb-14
Entered Digitally in the Field:	No		



# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above Horizon Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: February 11, 2014  
 Site Visit Time (MST): 10:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Discharge Measurement Conducted																
															<b>Total Flow</b>	-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

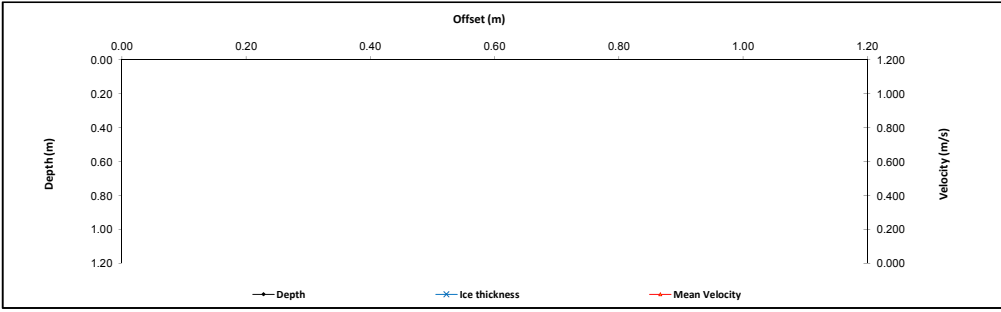
**Logger Details:**

	Before	After
Transducer Reading (m):	0.642	-
Water (°C):	-0.1	-
Datalogger Clock:	10:19	-
Laptop Clock:	10:16	-
Battery (Main):	14.0	-
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dissicant:	Good	
Vent Tube Dissicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- No flow meas or WL survey was conducted because the ice thickness was greater than length of auger with extension.  
 - See photos.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	-	-
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

**Field Personnel:**

	SM, MP	Trip Date:	11-Feb-14
Data Entry Personnel:	SM	Date:	11-Feb-14
Data Check Personnel:	DW	Date:	21-Feb-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above Horizon Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: March 6, 2014  
 Site Visit Time (MST): 10:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Discharge Measurement Conducted																
															<b>Total Flow</b>	-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

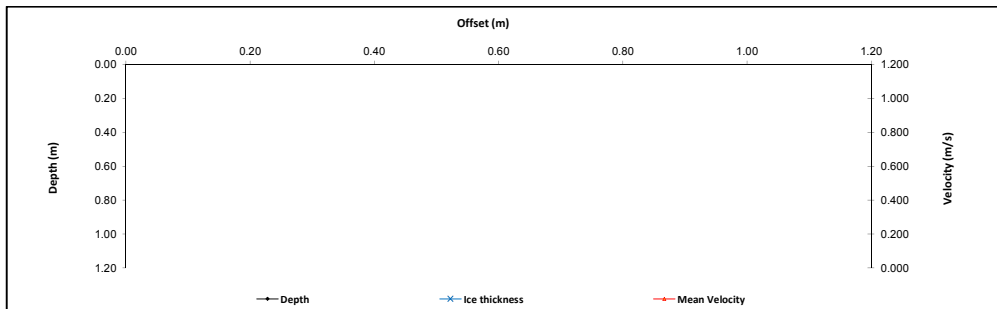
**Logger Details:**

	Before	After
Transducer Reading (m):	0.059	
Water (°C):	0.3	
Datalogger Clock:	10:56	
Laptop Clock:	10:53	
Battery (Main):	14.1	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- Lots of overflow ice.
- Ice too thick for auger with extension.
- No flow measurement or water level survey possible



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	-	-
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

**Field Personnel:**

	SM, MP	Trip Date:	6-Mar-14
Data Entry Personnel:	SM	Date:	6-Mar-14
Data Check Personnel:	DW	Date:	April
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above Horizon Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: March 31, 2014  
 Site Visit Time (MST): 07:55



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Discharge Measurement Conducted																
<b>Total Flow</b>															-	

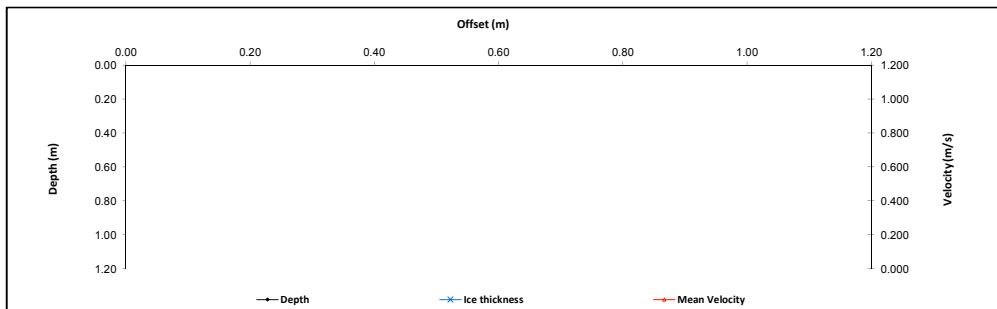
**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	



**Logger Details:**

	Before	After
Transducer Reading (m):	0.054	
Water (°C):	0.6	
Datalogger Clock:	08:01	
Laptop Clock:	07:58	
Battery (Main):	12.7	
Battery:	Good	
Battery Serial #:	-	
Enclosure Desiccant:	Good	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- Lots of overflow ice..
- The ice was too thick for the auger with the extension
- No flow measurement or water level survey conducted.

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
Water Level:	Cut				Time WL Surveyed:	
Turn						
Water Level:	Cut				Time WL Surveyed:	
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:		
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

<b>Field Personnel:</b>	SM, MP	Trip Date:	31-Mar-14
Data Entry Personnel:	SM	Date:	31-Mar-14
Data Check Personnel:	DW	Date:	22-Apr-14
Entered Digitally in the Field:	Yes		





# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above Horizon Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: August 13, 2014  
 Site Visit Time (MST): 13:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
	2.90	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	3.10	0.05		0.03	0.144					1.00	0.45	0.05	0.144	0.02	0.003	2%
2	3.40	0.06		0.04	0.182					1.00	0.25	0.06	0.182	0.02	0.003	2%
3	3.60	0.06		0.04	0.220					1.00	0.30	0.06	0.220	0.02	0.004	3%
4	4.00	0.13		0.08	0.402					1.00	0.25	0.13	0.402	0.03	0.013	8%
5	4.10	0.13		0.08	0.428					1.00	0.10	0.13	0.428	0.01	0.006	4%
6	4.20	0.12		0.07	0.462					1.00	0.10	0.12	0.462	0.01	0.006	4%
7	4.30	0.14		0.08	0.471					1.00	0.10	0.14	0.471	0.01	0.007	4%
8	4.40	0.16		0.10	0.547					1.00	0.10	0.16	0.547	0.02	0.009	6%
9	4.50	0.16		0.10	0.629					1.00	0.10	0.16	0.629	0.02	0.010	6%
10	4.60	0.16		0.10	0.528					1.00	0.10	0.16	0.528	0.02	0.008	5%
11	4.70	0.17		0.10	0.506					1.00	0.10	0.17	0.506	0.02	0.009	5%
12	4.80	0.20		0.12	0.475					1.00	0.10	0.20	0.475	0.02	0.009	6%
13	4.90	0.20		0.12	0.470					1.00	0.10	0.20	0.470	0.02	0.009	6%
14	5.00	0.19		0.11	0.459					1.00	0.10	0.19	0.459	0.02	0.009	6%
15	5.10	0.22		0.13	0.412					1.00	0.10	0.22	0.412	0.02	0.009	6%
16	5.20	0.22		0.13	0.389					1.00	0.10	0.22	0.389	0.02	0.009	5%
17	5.30	0.24		0.14	0.340					1.00	0.10	0.24	0.340	0.02	0.008	5%
18	5.40	0.19		0.11	0.344					1.00	0.10	0.19	0.344	0.02	0.007	4%
19	5.50	0.18		0.11	0.301					1.00	0.15	0.18	0.301	0.03	0.008	5%
20	5.70	0.19		0.11	0.156					1.00	0.25	0.19	0.156	0.05	0.007	5%
21	6.00	0.14		0.08	0.109					1.00	0.35	0.14	0.109	0.05	0.005	3%
6.40	0.00	0.00		0.00		0.00		0.00		1.00	0.20	0.00	0.000	0.00		
<b>Total Flow</b>														<b>0.157</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
3m DS of station

Mess. Start Time (MST):	14:00
Mess. End Time (MST):	14:25
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	-

**Flow characteristics:**

Total Flow:	0.157	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.46	(m <sup>2</sup> )
Wetted Width:	3.90	(m)
Hydraulic Depth:	0.12	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.32	

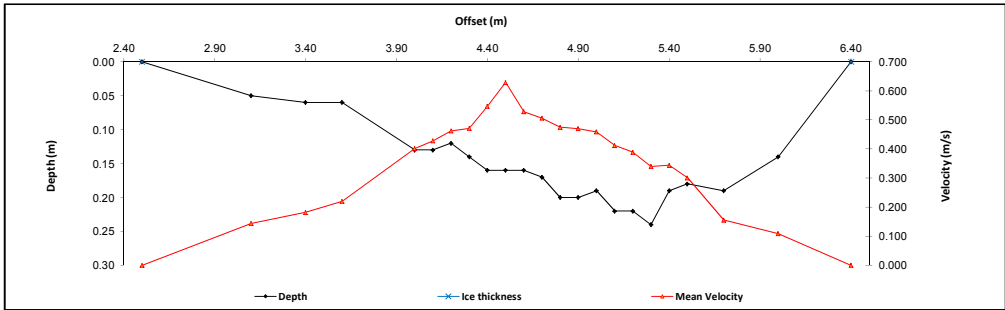
**Logger Details:**

	Before	After
Transducer Reading (m):	0.206	0.206
Water (°C):	18.4	19.0
Datalogger Clock:	13:46	14:40
Laptop Clock:	13:46	14:40
Battery (Main):	14.0	14.0
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

RSSI before: -103  
 RSSI After: -92  
 Reoriented antenna

**General Notes:**



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S34-06	0.488	99.889		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.236	98.653	98.659	3/4" pipe 2 metres east of logger
S34-05			1.619	98.270	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut		2.915	96.974		<b>Time WL Surveyed:</b> 13:54
Temporary BM			2.885	97.004		0.000
<b>Turn</b>						
Temporary BM	2.874	99.878		97.004		-
Water Level:	Cut		2.905	96.973		<b>Time WL Surveyed:</b> 13:55
S34-05			1.608	98.270	98.271	3/4" pipe 8 metres south of logger
S34-04			1.222	98.656	98.659	3/4" pipe 2 metres east of logger
S34-06			0.476	99.402	99.401	Lag bolt in conifer, 30m Nof logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S34-04	1.223	99.878		98.655		
Water Level:	Cut		2.899	96.979		<b>Time WL Surveyed:</b> 14:30
Water Level:	Cut		2.890	96.979		<b>Time WL Surveyed:</b> 14:32
S34-04	1.214	99.869		98.655		

**WL Survey Summary**

Average WL:	96.974	96.979
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	96.768	96.773

**Field Personnel:**

CJ, GG	Trip Date:	13-Aug-14
CJ	Date:	13-Aug-14
MY	Date:	22-Aug-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above Horizon Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: September 15, 2014  
 Site Visit Time (MST): 12:05



Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	3.60	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	3.90	0.10		0.06	0.131					1.00	0.30	0.10	0.131	0.03	0.004	2%
2	4.20	0.14		0.08	0.101					1.00	0.30	0.14	0.101	0.04	0.004	2%
3	4.50	0.20		0.12	0.246					1.00	0.30	0.20	0.246	0.06	0.015	9%
4	4.80	0.24		0.14	0.181					1.00	0.30	0.24	0.181	0.07	0.013	8%
5	5.10	0.25		0.15	0.167					1.00	0.30	0.25	0.167	0.08	0.013	7%
6	5.40	0.25		0.15	0.247					1.00	0.23	0.25	0.247	0.06	0.014	8%
7	5.55	0.21		0.13	0.126					1.00	0.15	0.21	0.126	0.03	0.004	2%
8	5.70	0.19		0.11	0.225					1.00	0.23	0.19	0.225	0.04	0.010	6%
9	6.00	0.20		0.12	0.256					1.00	0.30	0.20	0.256	0.06	0.015	9%
10	6.30	0.18		0.11	0.206					1.00	0.30	0.18	0.206	0.05	0.011	7%
11	6.60	0.16		0.10	0.212					1.00	0.30	0.16	0.212	0.05	0.010	6%
12	6.90	0.16		0.10	0.320					1.00	0.30	0.16	0.320	0.05	0.015	9%
13	7.20	0.22		0.13	0.085					1.00	0.30	0.22	0.085	0.07	0.006	3%
14	7.50	0.16		0.10	0.170					1.00	0.30	0.16	0.170	0.05	0.008	5%
15	7.80	0.16		0.10	0.151					1.00	0.30	0.16	0.151	0.05	0.007	4%
16	8.10	0.16		0.10	0.171					1.00	0.30	0.16	0.171	0.05	0.008	5%
17	8.40	0.10		0.06	0.122					1.00	0.30	0.10	0.122	0.03	0.004	2%
18	8.70	0.08		0.05	0.060					1.00	0.50	0.08	0.060	0.04	0.002	1%
19	9.40	0.10		0.06	0.161					1.00	0.45	0.10	0.161	0.04	0.007	4%
20	9.60	0.08		0.05	0.041					1.00	0.15	0.08	0.041	0.01	0.000	0%
LB	9.70	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.171</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
 Across from hell, landing area

Meas. Start Time (MST):	12:25
Meas. End Time (MST):	12:50
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 15C

### Flow characteristics:

Total Flow:	0.171	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.96	(m²)
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.14	

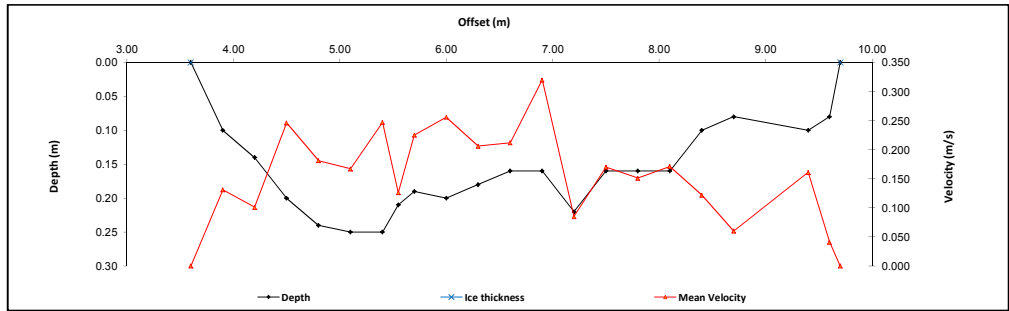
### Logger Details:

	Before	After
Transducer Reading (m):	0.224	0.225
Water (°C):	8.3	8.3
Datalogger Clock:	12:10	12:57
Laptop Clock:	12:10	12:57
Battery (Main):	13.9	13.5
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

-Vent tube appeared pinched upon arrival  
 -RSSI will get no better than -97

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S34-06	0.563	99.964		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.312	98.652	98.659	3/4" pipe 2 metres east of logger
S34-05			1.697	98.267	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut	0.086	3.049	97.001		<b>Time WL Surveyed:</b> 12:17
Temporary BM			3.049	96.915	0.000	-
<b>Turn</b>						
Temporary BM	3.026	99.941		96.915	-	-
Water Level:	Cut	0.086	3.026	97.001		<b>Time WL Surveyed:</b> 12:18
S34-05			1.670	98.271	98.271	3/4" pipe 8 metres south of logger
S34-04			1.286	98.655	98.659	3/4" pipe 2 metres east of logger
S34-06			0.537	99.404	99.401	Lag bolt in conifer, 30m Nof logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S34-05	1.670	99.939		98.269		
Water Level:	Cut	0.048	2.995	96.992		<b>Time WL Surveyed:</b> 12:59
Water Level:	Cut	0.048	2.973	96.993		<b>Time WL Surveyed:</b> 13:00
S34-05	1.649	99.918		98.269		

WL Survey Summary	Before	After
Average WL:	97.001	96.993
Closing Error:	-0.003	-
WL Check:	0.000	-0.001
Transducer Elevation	96.777	96.768

Field Personnel:	TR, MP	Trip Date:	15-Sep-14
Data Entry Personnel:	TR	Date:	15-Sep-14
Data Check Personnel:	MY	Date:	23-Sep-14
Entered Digitally in the Field:	Yes		





# Hydrometric Measurement / Site Visit Record

Site: S34 - Tar River above Horizon Lake  
 UTM Location: 440712 E, 6361615 N

Site Visit Date: December 5, 2014  
 Site Visit Time (MST): 13:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	7.20	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	6.80	0.52	0.46	0.49	0.000					0.88	0.33	0.06	0.000	0.02	0.000	0%
2	6.55	0.62	0.53	0.58	0.068					0.88	0.20	0.09	0.060	0.02	0.001	3%
3	6.40	0.67	0.62	0.60	0.061					0.88	0.15	0.15	0.054	0.02	0.001	3%
4	6.25	0.71	0.65	0.63	0.132					0.88	0.10	0.16	0.116	0.02	0.002	5%
5	6.20	0.72	0.65	0.64	0.144					0.88	0.07	0.17	0.127	0.01	0.002	4%
6	6.10	0.72	0.54	0.63	0.194					0.88	0.15	0.18	0.171	0.03	0.005	14%
7	5.90	0.80	0.55	0.68	0.172					0.88	0.15	0.25	0.151	0.04	0.006	14%
8	5.80	0.81	0.55	0.68	0.166					0.88	0.10	0.26	0.146	0.03	0.004	9%
9	5.70	0.80	0.54	0.67	0.159					0.88	0.13	0.26	0.140	0.03	0.005	11%
10	5.55	0.81	0.54	0.68	0.095					0.88	0.10	0.27	0.084	0.03	0.002	6%
11	5.50	0.81	0.55	0.68	0.061					0.88	0.08	0.26	0.054	0.02	0.001	3%
12	5.40	0.80	0.54	0.67	0.014					0.88	0.15	0.26	0.012	0.04	0.000	1%
13	5.20	0.65	0.53	0.59	0.115					0.88	0.15	0.12	0.101	0.02	0.002	4%
14	5.10	0.79	0.53	0.66	0.086					0.88	0.18	0.26	0.076	0.05	0.003	9%
15	4.85	0.72	0.53	0.63	0.087					0.88	0.20	0.19	0.077	0.04	0.003	7%
16	4.70	0.78	0.53	0.66	0.068					0.88	0.18	0.25	0.060	0.04	0.003	6%
17	4.50	0.58	0.51	0.55	0.077					0.88	0.18	0.07	0.068	0.01	0.001	2%
18	4.35	0.60	0.53	0.57	0.067					0.88	0.15	0.07	0.059	0.01	0.001	2%
19	4.20	0.60	0.53	0.57	0.014					0.88	0.15	0.07	0.012	0.01	0.000	0%
20	4.05	0.61	0.54	0.58	0.004					0.88	0.18	0.07	0.004	0.01	0.000	0%
21	3.85	0.56	0.50	0.53	-0.002					0.88	0.38	0.06	-0.002	0.02	0.000	0%
LB	3.30	0.00	0.00		0.00		0.00		0.00	0.88	0.28	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.041</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
40m US of station

Meas. Start Time (MST):	14:32
Meas. End Time (MST):	14:55
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -10C

**Flow characteristics:**

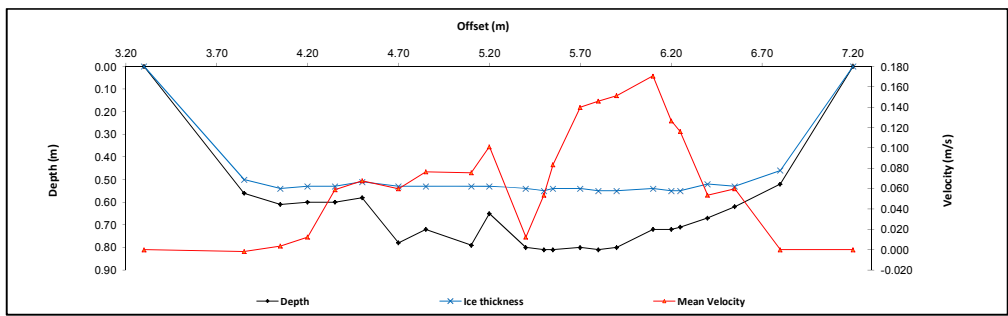
Total Flow:	0.041	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.51	(m <sup>2</sup> )
Wetted Width:	3.90	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.142	0.143
Water (°C):	0.1	0.1
Datalogger Clock:	13:43	15:02
Laptop Clock:	13:43	15:02
Battery (Main):	13.4	13.4
Battery:		Good
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S34-06	0.559	99.960		99.401	99.401	Lag bolt in conifer, 30m Nof logger
S34-04			1.299	98.661	98.659	3/4" pipe 2 metres east of logger
S34-05			1.657	98.303	98.271	3/4" pipe 8 metres south of logger
Water Level:	Cut		3.034	96.926		<b>Time WL Surveyed: 14:26</b>
Temporary BM			2.535	97.425	0.000	
<b>Turn</b>						
Temporary BM	2.526	99.951		97.425		
Water Level:	Cut		3.027	96.924		<b>Time WL Surveyed: 14:28</b>
S34-05			1.645	98.306	98.271	3/4" pipe 8 metres south of logger
S34-04			1.288	98.663	98.659	3/4" pipe 2 metres east of logger
S34-06			0.548	99.403	99.401	Lag bolt in conifer, 30m Nof logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S34-05	1.645	99.950		98.305		
Water Level:	Cut		3.021	96.929		<b>Time WL Surveyed: 14:58</b>
Water Level:	Cut		3.013	96.926		<b>Time WL Surveyed: 14:59</b>
S34-05	1.634	99.939		98.305		

**WL Survey Summary**

Average WL:	96.925	96.928
Closing Error:	-0.002	-
WL Check:	0.002	0.003
Transducer Elevation	96.783	96.785

**Field Personnel:**

TR, CJ	Trip Date:	5-Dec-14
TR	Date:	5-Dec-14
DW	Date:	16-Dec-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: January 26, 2014  
 Site Visit Time (MST): 11:50

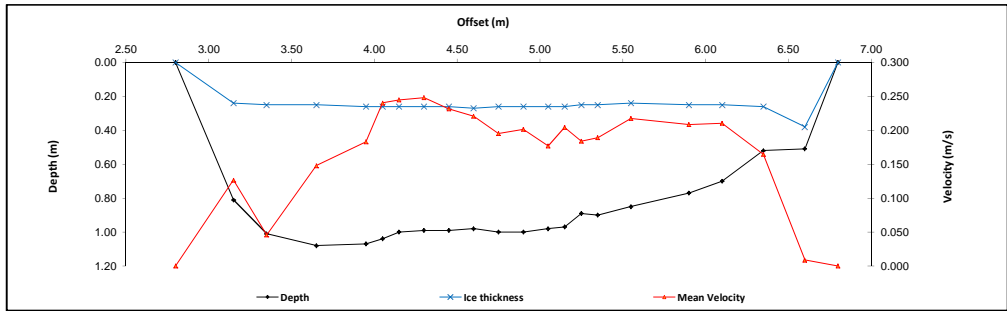


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	6.80	0.00	0.00		0.000				0.000	0.88	0.10	0.00	0.000	0.00	0.000	
1	6.60	0.510	0.38	0.45	0.010					0.88	0.23	0.13	0.009	0.03	0.000	0%
2	6.35	0.520	0.26	0.39	0.187					0.88	0.25	0.26	0.165	0.07	0.011	3%
3	6.10	0.700	0.25	0.48	0.239					0.88	0.23	0.45	0.210	0.10	0.021	5%
4	5.90	0.770	0.25	0.51	0.237					0.88	0.28	0.52	0.209	0.14	0.030	7%
5	5.55	0.850	0.24	0.55	0.247					0.88	0.28	0.61	0.217	0.17	0.036	9%
6	5.35	0.900	0.25	0.58	0.215					0.88	0.15	0.65	0.189	0.10	0.018	4%
7	5.25	0.890	0.25	0.57	0.209					0.88	0.10	0.64	0.184	0.06	0.012	3%
8	5.15	0.970	0.26	0.62	0.232					0.88	0.10	0.71	0.204	0.07	0.014	3%
9	5.05	0.980	0.26	0.62	0.201					0.88	0.13	0.72	0.177	0.09	0.016	4%
10	4.90	1.000	0.26	0.63	0.229					0.88	0.15	0.74	0.202	0.11	0.022	5%
11	4.75	1.000	0.26	0.63	0.222					0.88	0.15	0.74	0.195	0.11	0.022	5%
12	4.60	0.980	0.27	0.63	0.251					0.88	0.15	0.71	0.221	0.11	0.024	6%
13	4.45	0.990	0.26	0.63	0.263					0.88	0.15	0.73	0.231	0.11	0.025	6%
14	4.30	0.990	0.26	0.63	0.282					0.88	0.15	0.73	0.248	0.11	0.027	7%
15	4.15	1.000	0.26	0.63	0.278					0.88	0.13	0.74	0.245	0.09	0.023	5%
16	4.05	1.040	0.26		0.273	0.88		0.42		0.88	0.10	0.78	0.240	0.08	0.019	5%
17	3.95	1.070	0.26		0.208	0.91		0.42		0.88	0.20	0.81	0.183	0.16	0.030	7%
18	3.65	1.080	0.25		0.168	0.91		0.42		0.88	0.30	0.83	0.148	0.25	0.037	9%
19	3.35	1.010	0.25		0.052	0.86		0.40		0.88	0.25	0.76	0.046	0.19	0.009	2%
20	3.15	0.810	0.24	0.53	0.144					0.88	0.28	0.57	0.127	0.16	0.020	5%
LB	2.80	0.00	0.00		0.00				0.00	0.88	0.18	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.416</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 20m DS of station

Meas. Start Time (MST):	12:38
Meas. End Time (MST):	13:06
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, light breeze, 3C



**Flow characteristics:**

Total Flow:	0.416	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.30	(m <sup>2</sup> )
Wetted Width:	4.00	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.992	
Water (°C):	0.4	
Datalogger Clock:	12:00	
Laptop Clock:	12:00	
Battery (Main):	13.0	
Battery:		Replaced
Battery Serial #:	-	
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Argonaut Details:**

	Before	After
Water Level (m):	-	
Index Velocity (m/s):	-	
Discharge (m <sup>3</sup> /s):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-05	1.109	101.504		100.395	100.395	3/4" pipe 6 metres Southwest of logger
S36-04			1.140	100.364	100.206	Pipe 8m W of Data Logger
S36-03			1.107	100.397	100.313	Pipe 6m N of Data Logger
Water Level:	Cut		1.936	99.568	Time WL Surveyed: 12:18	
Temporary BM			1.853	99.651	0.000	
<b>Turn</b>						
Temporary BM	1.834	101.485		99.651		
Water Level:	Cut		1.914	99.571	Time WL Surveyed: 12:30	
S36-03			1.086	100.399	100.313	Pipe 6m N of Data Logger
S36-04			1.121	100.364	100.206	Pipe 8m W of Data Logger
S36-05			1.090	100.395	100.395	3/4" pipe 6 metres Southwest of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.570	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	98.578	-

**Field Personnel:**

SM, TR	Trip Date:	26-Jan-14
DW	Date:	22-Apr-14
CJ	Date:	22-Apr-14
No	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: February 13, 2014  
 Site Visit Time (MST): 10:50

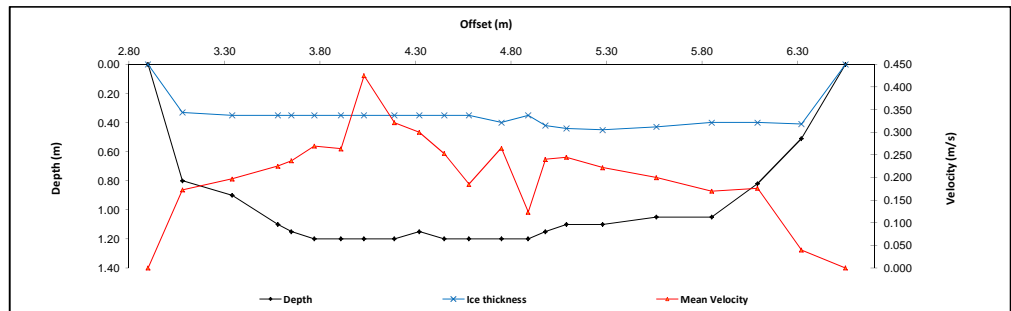


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.90	0.00	0.00		0.000				0.000	0.88	0.09	0.00	0.000	0.00	0.000	
1	3.08	0.80	0.33	0.57	0.196					0.88	0.22	0.47	0.172	0.10	0.018	3%
2	3.34	0.90	0.35	0.63	0.224					0.88	0.25	0.55	0.197	0.14	0.027	5%
3	3.58	1.10	0.35	0.73	0.256					1.00	0.09	0.80	0.225	0.12	0.026	5%
4	3.65	1.15	0.35			0.99	0.220	0.51	0.254	1.00	0.13	0.85	0.237	0.08	0.018	3%
5	3.77	1.20	0.35			1.03	0.249	0.52	0.290	1.00	0.13	0.85	0.270	0.11	0.030	6%
6	3.91	1.20	0.35			1.03	0.237	0.52	0.290	1.00	0.13	0.85	0.264	0.11	0.029	6%
7	4.03	1.20	0.35			1.03	0.541	0.52	0.309	1.00	0.14	0.85	0.425	0.12	0.051	10%
8	4.19	1.20	0.35			1.03	0.321	0.52	0.321	1.00	0.15	0.85	0.321	0.12	0.040	8%
9	4.32	1.15	0.35			0.99	0.324	0.51	0.276	1.00	0.13	0.80	0.300	0.10	0.031	6%
10	4.45	1.20	0.35			1.03	0.315	0.52	0.192	1.00	0.13	0.85	0.254	0.11	0.028	5%
11	4.58	1.20	0.35			1.03	0.188	0.52	0.182	1.00	0.15	0.85	0.185	0.13	0.024	5%
12	4.75	1.20	0.40			1.04	0.286	0.56	0.244	1.00	0.16	0.80	0.265	0.12	0.033	6%
13	4.89	1.20	0.35			1.03	0.247	0.52		1.00	0.12	0.85	0.124	0.10	0.012	2%
14	4.98	1.15	0.42	0.79	0.273					0.88	0.10	0.73	0.240	0.07	0.018	3%
15	5.09	1.10	0.44	0.77	0.278					0.88	0.15	0.66	0.245	0.10	0.024	5%
16	5.28	1.10	0.45	0.78	0.252					0.88	0.23	0.65	0.222	0.15	0.034	6%
17	5.56	1.05	0.43	0.74	0.227					0.88	0.29	0.62	0.200	0.18	0.035	7%
18	5.85	1.05	0.40	0.73	0.193					0.88	0.27	0.65	0.170	0.17	0.029	6%
19	6.09	0.82	0.40	0.61	0.200					0.88	0.24	0.42	0.176	0.10	0.017	3%
20	6.32	0.51	0.41	0.46	0.045					0.88	0.23	0.10	0.040	0.02	0.001	0%
RB	6.55	0.00	0.00		0.00				0.00	0.88	0.12	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.524</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 20m DS of station

Meas. Start Time (MST):	11:59
Meas. End Time (MST):	12:37
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, -18C



**Flow characteristics:**

Total Flow:	0.524	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.26	(m <sup>2</sup> )
Wetted Width:	3.65	(m)
Hydraulic Depth:	0.62	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.578	0.543
Water (°C):	0.3	0.3
Datalogger Clock:	11:07	12:55
Laptop Clock:	11:07	12:55
Battery (Main):	13.3	13.0
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

	Before	After
Water Level (m):	-	99.361
Index Velocity (m/s):	-	-
Discharge (m <sup>3</sup> /s):	-	-0.487

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-05	1.247	101.642		100.395	100.395	3/4" pipe 6 metres Southwest of logger
S36-04			1.254	100.388	100.206	Pipe 8m W of Data Logger
S36-03			1.224	100.418	100.313	Pipe 6m N of Data Logger
Water Level:	Cut		1.993	99.649	Time WL Surveyed: 11:48	
Temporary BM			1.986	99.656	0.000	
<b>Turn</b>						
Temporary BM	1.970	101.626		99.656		
Water Level:	Cut		1.977	99.649	Time WL Surveyed: 11:50	
S36-03			1.209	100.417	100.313	Pipe 6m N of Data Logger
S36-04			1.240	100.386	100.206	Pipe 8m W of Data Logger
S36-05			1.233	100.393	100.395	3/4" pipe 6 metres Southwest of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.649	-
Closing Error:	0.002	-
WL Check:	0.000	-
Transducer Elevation	99.071	-

**Field Personnel:**

SM, MP	Trip Date:	13-Feb-14
SM	Date:	13-Feb-14
DW	Date:	22-Apr-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: March 10, 2014  
 Site Visit Time (MST): 15:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	6.80	0.00	0.00		0.000				0.000	0.88	0.28	0.00	0.000	0.00	0.000	
1	7.36	0.25	0.20	0.23	0.076					0.88	0.40	0.05	0.067	0.02	0.001	0%
2	7.59	0.80	0.55	0.68	0.212					0.88	0.19	0.25	0.187	0.05	0.009	2%
3	7.73	0.80	0.50	0.65	0.211					0.88	0.13	0.30	0.186	0.04	0.007	1%
4	7.85	1.10	0.50	0.80	0.241					0.88	0.15	0.60	0.212	0.09	0.018	3%
5	8.02	1.20	0.50	0.85	0.230					0.88	0.25	0.70	0.202	0.17	0.035	7%
6	8.35	1.20	0.48	0.84	0.304					0.88	0.23	0.72	0.268	0.16	0.043	8%
7	8.47	1.20	0.48	0.84	0.311					0.88	0.14	0.72	0.274	0.10	0.027	5%
8	8.62	1.25	0.45			1.09	0.222	0.61	0.183	1.00	0.19	0.80	0.203	0.15	0.030	6%
9	8.84	1.35	0.45			1.17	0.273	0.63	0.217	1.00	0.16	0.90	0.245	0.14	0.035	7%
10	8.94	1.25	0.45			1.09	0.268	0.61	0.194	1.00	0.23	0.80	0.231	0.18	0.043	8%
11	9.30	1.26	0.44			1.10	0.311	0.60	0.257	1.00	0.27	0.82	0.284	0.23	0.064	12%
12	9.49	1.25	0.45			1.09	0.336	0.61	0.356	1.00	0.23	0.80	0.346	0.18	0.062	12%
13	9.75	1.10	0.45	0.78	0.331					0.88	0.23	0.65	0.291	0.15	0.044	8%
14	9.96	1.10	0.45	0.78	0.333					0.88	0.16	0.65	0.293	0.11	0.031	6%
15	10.08	1.00	0.45	0.73	0.342					0.88	0.12	0.55	0.301	0.07	0.020	4%
16	10.20	1.00	0.45	0.73	0.324					0.88	0.13	0.55	0.285	0.07	0.020	4%
17	10.34	0.83	0.45	0.64	0.280					0.88	0.14	0.38	0.246	0.05	0.013	2%
18	10.47	0.80	0.45	0.63	0.309					0.88	0.13	0.35	0.272	0.05	0.012	2%
19	10.60	0.70	0.43	0.57	0.261					0.88	0.39	0.27	0.230	0.11	0.024	4%
LB	11.25	0.00	0.00		0.00		0.00		0.000	0.88	0.33	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.540</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 20m DS of station

Meas. Start Time (MST):	15:10
Meas. End Time (MST):	15:51
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -10C

**Flow Characteristics:**

Total Flow:	0.540	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.11	(m <sup>2</sup> )
Wetted Width:	4.45	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.592	
Water (°C):	0.3	
Datalogger Clock:	14:20	
Laptop Clock:	14:20	
Battery (Main):	13.7	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PTH (if replaced):	-	
Logger# (if replaced):	-	

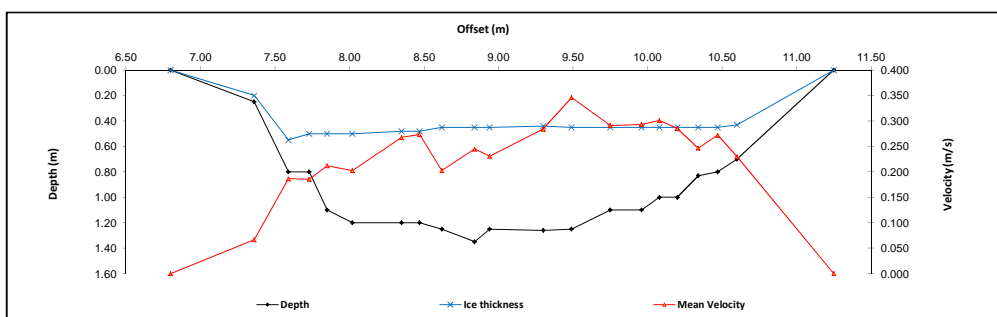
**Argonaut Details:**

	Before	After
Water Level (m):		
Index Velocity (m/s):	-7	
Discharge (m <sup>3</sup> /s):	-	

**Datalogger / Station Notes:**

- Downloaded SL

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-05	1.369	101.764		100.395	100.395	3/4" pipe 6 metres Southwest of logger
S36-03			1.328	100.436	100.313	Pipe 6m N of Data Logger
S36-04			1.354	100.410	100.206	Pipe 8m W of Data Logger
S36-02			1.858	99.906	99.923	Pipe 8m NE of Data Logger
Water Level:	Cut		2.125	99.639	Time WL Surveyed: 16:00	
Temporary BM			2.116	99.648	0.000	
<b>Turn</b>						
Temporary BM	2.105	101.753		99.648		
Water Level:	Cut		2.113	99.640	Time WL Surveyed: 16:00	
S36-02			1.357	100.398	99.923	Pipe 8m NE of Data Logger
S36-04			1.343	100.410	100.206	Pipe 8m W of Data Logger
S36-03			1.317	100.436	100.313	Pipe 6m N of Data Logger
S36-05			1.848	99.905	100.395	3/4" pipe 6 metres Southwest of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed: 16:00	
Water Level:	Cut				Time WL Surveyed: 16:00	

**WL Survey Summary**

	Before	After
Average WL:	99.640	-
Closing Error:	0.490	-
WL Check:	0.001	-
Transducer Elevation	99.048	-

**Field Personnel:**

	DW, MP	Trip Date:	10-Mar-14
Data Entry Personnel:	DW, MP	Date:	10-Mar-14
Data Check Personnel:	DW	Date:	22-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: April 5, 2014  
 Site Visit Time (MST): 09:40

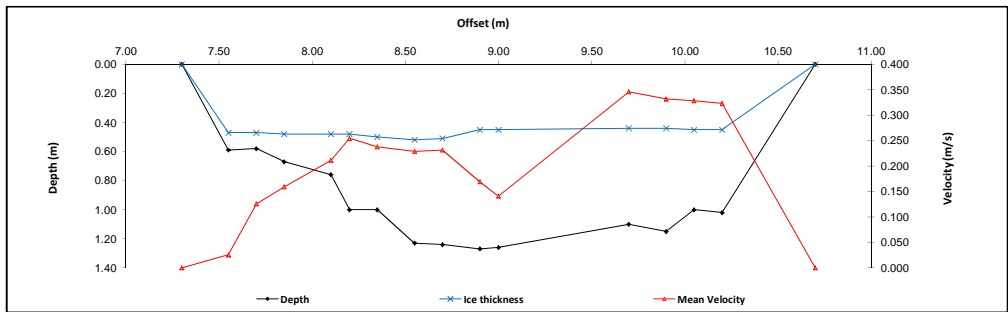


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	7.30	0.00	0.00		0.000				0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	7.55	0.59	0.47	0.53	0.029					0.88	0.20	0.12	0.026	0.02	0.001	0%
2	7.70	0.58	0.47	0.53	0.143					0.88	0.15	0.11	0.126	0.02	0.002	1%
3	7.85	0.67	0.48	0.58	0.181					0.88	0.20	0.19	0.159	0.04	0.006	1%
4	8.10	0.76	0.48	0.62	0.240					0.88	0.17	0.28	0.211	0.05	0.010	3%
5	8.20	1.00	0.48	0.74	0.289					0.88	0.13	0.52	0.254	0.07	0.017	4%
6	8.35	1.00	0.50	0.75	0.270					0.88	0.18	0.50	0.238	0.09	0.021	5%
7	8.55	1.23	0.52	0.88	0.260					0.88	0.18	0.71	0.229	0.12	0.028	7%
8	8.70	1.24	0.51	0.88	0.263					0.88	0.18	0.73	0.231	0.13	0.030	7%
9	8.90	1.27	0.45			1.11	0.338	0.61	0.000	1.00	0.15	0.82	0.169	0.12	0.021	5%
10	9.00	1.26	0.45			1.10	0.296	0.61	-0.014	1.00	0.40	0.81	0.141	0.32	0.046	11%
11	9.70	1.10	0.44	0.77	0.393					0.88	0.45	0.66	0.346	0.30	0.103	25%
12	9.90	1.15	0.44	0.80	0.377					0.88	0.18	0.71	0.332	0.12	0.041	10%
13	10.05	1.00	0.45	0.73	0.373					0.88	0.15	0.55	0.328	0.08	0.027	7%
14	10.20	1.02	0.45	0.74	0.367					0.88	0.32	0.57	0.323	0.19	0.060	15%
LB	10.70	0.00	0.00		0.00				0.00	0.88	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.412</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 20m DS of station

Meas. Start Time (MST):	10:32
Meas. End Time (MST):	11:02
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, calm



**Flow characteristics:**

Total Flow:	0.412	(m³/s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.67	(m²)
Wetted Width:	3.40	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.11	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.503	-
Water (°C):	0.3	-
Datalogger Clock:	09:49	-
Laptop Clock:	09:49	-
Battery (Main):	14.2	13.7
Battery Condition:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Good	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

	Before	After
Water Level (m):	-	-
Index Velocity (m/s):	-	-
Discharge (m³/s):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Tree under ice
- Frozen to bottom in areas

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-05	1.391	101.786		100.395	100.395	3/4" pipe 6 metres Southwest of logger
S36-04			1.365	100.421	100.206	Pipe 8m W of Data Logger
S36-03			1.341	100.445	100.313	Pipe 6m N of Data Logger
Water Level:	Cut	2.232		99.554	Time WL Surveyed:	-
Temporary BM		2.147		99.639	0.000	-
<b>Turn</b>						
Temporary BM	2.164	101.803		99.639		-
Water Level:	Cut		2.250	99.553	Time WL Surveyed:	10:12
S36-03			1.360	100.443	100.313	Pipe 6m N of Data Logger
S36-04			1.383	100.420	100.206	Pipe 8m W of Data Logger
S36-05			1.408	100.395	100.395	3/4" pipe 6 metres Southwest of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.554	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	99.051	-

**Field Personnel:**

	SM, CJ	Trip Date:	5-Apr-14
Data Entry Personnel:	SM, CJ	Date:	5-Apr-14
Data Check Personnel:	DW	Date:	22-Apr-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: June 16, 2014  
 Site Visit Time (MST): 11:20

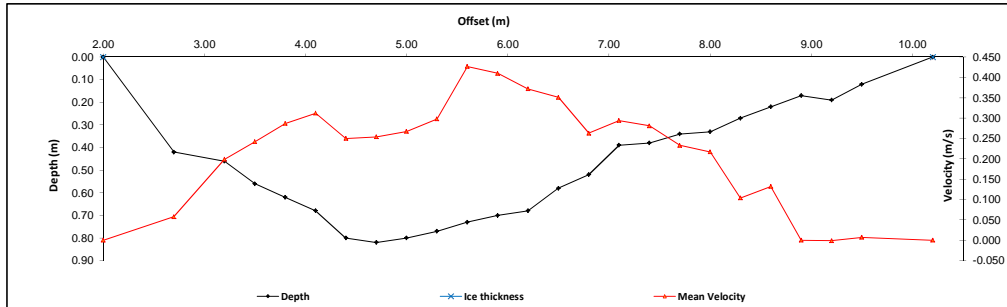


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	10.20	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	9.50	0.12		0.07	0.007		-0.001			1.00	0.50	0.12	-0.007	0.06	0.000	0%
2	9.20	0.19		0.10	0.000		0.000			1.00	0.30	0.19	0.000	0.06	0.000	0%
3	8.90	0.17		0.13	0.132		0.132			1.00	0.30	0.22	0.132	0.07	0.009	1%
4	8.60	0.22		0.16	0.104		0.104			1.00	0.30	0.27	0.104	0.08	0.008	1%
5	8.30	0.27		0.20	0.217		0.217			1.00	0.30	0.33	0.217	0.10	0.021	2%
6	8.00	0.33		0.20	0.233		0.233			1.00	0.30	0.34	0.233	0.10	0.024	2%
7	7.70	0.34		0.23	0.281		0.281			1.00	0.30	0.38	0.281	0.11	0.032	3%
8	7.40	0.38		0.23	0.294		0.294			1.00	0.30	0.39	0.294	0.12	0.034	4%
9	7.10	0.39		0.31	0.263		0.263			1.00	0.30	0.52	0.263	0.16	0.041	4%
10	6.80	0.52		0.35	0.351		0.351			1.00	0.30	0.58	0.351	0.17	0.061	6%
11	6.50	0.58		0.41	0.372		0.372			1.00	0.30	0.68	0.372	0.20	0.076	8%
12	6.20	0.68		0.42	0.410		0.410			1.00	0.30	0.70	0.410	0.21	0.086	9%
13	5.90	0.70		0.44	0.427		0.427			1.00	0.30	0.73	0.427	0.22	0.094	10%
14	5.60	0.73				0.62	0.232	0.15	0.364	1.00	0.30	0.77	0.298	0.23	0.069	7%
15	5.30	0.77				0.64	0.217	0.16	0.318	1.00	0.30	0.80	0.268	0.24	0.064	7%
16	5.00	0.80				0.66	0.206	0.16	0.302	1.00	0.30	0.82	0.254	0.25	0.062	7%
17	4.70	0.82				0.64	0.199	0.16	0.301	1.00	0.30	0.80	0.250	0.24	0.060	6%
18	4.40	0.80		0.41	0.312		0.312			1.00	0.30	0.68	0.312	0.20	0.064	7%
19	4.10	0.68		0.37	0.287		0.287			1.00	0.30	0.62	0.287	0.19	0.053	6%
20	3.80	0.62		0.34	0.242		0.242			1.00	0.30	0.56	0.242	0.17	0.041	4%
21	3.50	0.56		0.28	0.199		0.199			1.00	0.40	0.46	0.199	0.18	0.037	4%
22	3.20	0.46		0.25	0.058		0.058			1.00	0.60	0.42	0.058	0.25	0.015	2%
23	2.70	0.42								1.00	0.35	0.00	0.000	0.00	0.000	
LB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.951</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): at station

Meas. Start Time (MST):	12:20
Meas. End Time (MST):	13:05
Equipment:	ADV
Method:	Wading
River Condition:	Moderate-high
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 24C



**Flow characteristics:**

Total Flow:	0.951	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.66	(m <sup>2</sup> )
Wetted Width:	8.20	(m)
Hydraulic Depth:	0.45	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.546	0.722
Water (°C):	14.400	15.700
Datalogger Clock:	11:26	13:26
Laptop Clock:	11:26	13:26
Battery (Main):	13.9	13.5
Battery:		Good
Battery Serial #:		-
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	326858	346254
Logger# (if replaced):		-

**Argonaut Details:**

	Before	After
Water Level (m):	-	0.722
Index Velocity (m/s):	0.385	0.353
Discharge (m <sup>3</sup> /s):	1.027	0.95

**Datalogger / Station Notes:**

- Replaced PT
- SL downloaded on laptop
- SL formatted
- Battery tote disconnected by wildlife
- Station pushed on angle by wildlife, mast was straightend

**General Notes:**

- Weeds on banks.

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-05	0.858	101.253		100.395	100.395	
S36-06			0.724	100.529	0.000	nail in tree S of logger
S36-04			0.833	100.420	100.206	S36-04
S36-03			0.805	100.448	100.313	S36-03
Water Level:	Cut		1.836	99.417	Time WL Surveyed:	12:11
Temporary BM			1.796	99.457	0.000	Lag bolt in tamarack 10m SSW of logger
<b>Turn</b>						
Temporary BM	1.752	101.209		99.457		Lag bolt in tamarack 10m SSW of logger
Water Level:	Cut		1.791	99.418	Time WL Surveyed:	12:16
S36-03			0.761	100.448	100.313	S36-03
S36-04			0.788	100.421	100.206	S36-04
S36-06			0.680	100.529		nail in tree S of logger
S36-05			0.811	100.398	100.395	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S36-03	0.761	101.209		100.448		S36-03
Water Level:	Cut		1.791	99.418	Time WL Surveyed:	13:39
Water Level:	Cut		1.771	99.416	Time WL Surveyed:	13:41
S36-03	0.739	101.187		100.448		

**WL Survey Summary**

	Before	After
Average WL:	99.418	99.417
Closing Error:	-0.003	-
WL Check:	0.001	0.002
Transducer Elevation	98.872	98.695

**Field Personnel:**

Data Entry Personnel:	DW, NC	Trip Date:	16-Jun-14
Data Check Personnel:	DW, NC	Date:	16-Jun-14
Entered Digitally in the Field:	DW	Date:	26-Jun-14

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: August 11, 2014  
 Site Visit Time (MST): 09:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.20	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.50	0.22		0.13	0.000				1.00	0.40	0.22	0.000	0.09	0.000	0%	
2	2.00	0.29		0.17	0.029				1.00	0.50	0.29	0.029	0.15	0.004	1%	
3	2.50	0.40		0.24	0.073				1.00	0.40	0.40	0.073	0.16	0.012	2%	
4	2.80	0.47		0.28	0.172				1.00	0.30	0.47	0.172	0.14	0.024	4%	
5	3.10	0.54		0.32	0.184				1.00	0.30	0.54	0.184	0.16	0.030	5%	
6	3.40	0.82				0.66	0.294	0.16	0.253	1.00	0.20	0.82	0.274	0.16	0.045	8%
7	3.50	0.88				0.70	0.332	0.18	0.257	1.00	0.10	0.88	0.295	0.09	0.026	4%
8	3.60	0.86				0.69	0.334	0.17	0.260	1.00	0.15	0.86	0.297	0.13	0.038	7%
9	3.80	0.88				0.70	0.332	0.18	0.260	1.00	0.20	0.88	0.176	0.18	0.031	5%
10	4.00	0.88				0.70	0.356	0.18	0.292	1.00	0.15	0.88	0.324	0.13	0.043	7%
11	4.10	0.92				0.74	0.358	0.18	0.304	1.00	0.10	0.92	0.331	0.09	0.030	5%
12	4.20	0.87				0.70	0.364	0.17	0.320	1.00	0.10	0.87	0.342	0.09	0.030	5%
13	4.30	0.88				0.70	0.342	0.18	0.297	1.00	0.10	0.88	0.320	0.09	0.028	5%
14	4.40	0.84				0.67	0.327	0.17	0.302	1.00	0.15	0.84	0.315	0.13	0.040	7%
15	4.60	0.80				0.64	0.323	0.16	0.318	1.00	0.20	0.80	0.321	0.16	0.051	9%
16	4.80	0.77				0.62	0.150	0.15	0.308	1.00	0.20	0.77	0.229	0.15	0.035	6%
17	5.00	0.69		0.41	0.131				1.00	0.25	0.69	0.131	0.17	0.023	4%	
18	5.30	0.55		0.33	0.097				1.00	0.30	0.55	0.097	0.16	0.016	3%	
19	5.60	0.44		0.26	0.062				1.00	0.30	0.44	0.062	0.13	0.008	1%	
20	5.90	0.37		0.22	0.039				1.00	0.30	0.37	0.039	0.11	0.004	1%	
21	6.20	0.36		0.22	0.090				1.00	0.30	0.36	0.090	0.11	0.010	2%	
22	6.50	0.37		0.22	0.186				1.00	0.80	0.37	0.186	0.30	0.055	9%	
LB	7.80	0.00	0.00		0.00		0.00		0.00	1.00	0.65	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.583</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Adjacent to SL

Meas. Start Time (MST):	9:34
Meas. End Time (MST):	10:11
Equipment:	ADV
Method:	Wading
River Condition:	Moderate level
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 20C

**Flow characteristics:**

Total Flow:	0.583	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.08	(m <sup>2</sup> )
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.596	0.598
Water (°C):	12.5	13.5
Datalogger Clock:	08:25	10:58
Laptop Clock:	08:25	10:58
	12.6	13.3
Battery:	Replaced	
Battery Serial #:	1407008/1407007	
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

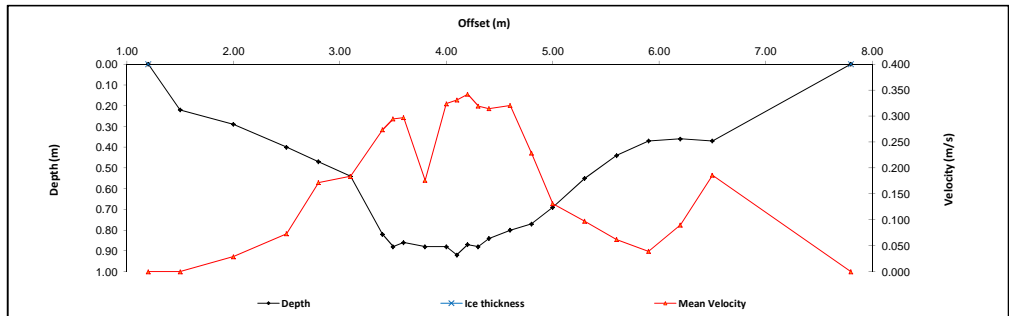
	Before	After
Water Level (m):	-1	99.299
Index Velocity (m/s):	5.7	25.8
Discharge (m <sup>3</sup> /s):	0	0.515

**Datalogger / Station Notes:**

- SL lowered at 10:27
- Updated SL config and redeployed.
- SL was not reporting water level or flow upon arrival due to low water level.
- Reoriented GOES antenna.

**General Notes:**

- Lots of grass in channel
- Need to guy wire station



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-02	1.273	101.196		99.923	99.923	3/4" Pipe 8m North of logger
S36-04			0.779	100.417	100.206	3/4" Pipe 8m West of logger
S36-06			0.731	100.465	100.529	3/4" pipe 6 metres Southwest of logger
S36-05			0.836	100.360	100.395	3/4" pipe 6 metres Southwest of logger
Water Level:	Cut		1.868	99.328	Time WL Surveyed:	9:24
S36-03			0.758	100.438	100.313	3/4" Pipe 6m North of logger
<b>Turn</b>						
S36-03	0.748	101.186		100.438	100.313	3/4" Pipe 6m North of logger
Water Level:	Cut		1.860	99.326	Time WL Surveyed:	9:26
S36-05			0.828	100.358	100.395	3/4" pipe 6 metres Southwest of logger
S36-06			0.721	100.465	100.529	3/4" pipe 6 metres Southwest of logger
S36-04			0.769	100.417	100.206	3/4" Pipe 8m West of logger
S36-02			1.265	99.921	99.923	3/4" Pipe 8m North of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S36-06	0.721	101.186		100.465		
Water Level:	Cut		1.859	99.327	Time WL Surveyed:	10:16
Water Level:	Cut		1.852	99.328	Time WL Surveyed:	10:17
S36-06	0.715	101.180		100.465		

**WL Survey Summary**

	Before	After
Average WL:	99.327	99.328
Closing Error:	0.002	-
WL Check:	0.002	-0.001
Transducer Elevation	98.731	98.730

**Field Personnel:**

	SM, CJ	Trip Date:	11-Aug-14
Data Entry Personnel:	SM, CJ	Date:	11-Aug-14
Data Check Personnel:	DW	Date:	2-Oct-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: September 12, 2014  
 Site Visit Time (MST): 10:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	2.70	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.90	0.29		0.17	0.039					1.00	0.35	0.29	0.039	0.10	0.004	1%
2	3.40	0.34		0.20	0.050					1.00	0.50	0.34	0.050	0.17	0.009	1%
3	3.90	0.45		0.27	0.203					1.00	0.35	0.45	0.203	0.16	0.032	5%
4	4.10	0.62		0.37	0.207					1.00	0.20	0.62	0.207	0.12	0.026	4%
5	4.30	0.72		0.43	0.205					1.00	0.20	0.72	0.205	0.14	0.030	5%
6	4.50	0.84				0.67	0.221	0.17	0.245	1.00	0.20	0.84	0.233	0.17	0.039	6%
7	4.70	0.90				0.72	0.318	0.18	0.251	1.00	0.20	0.90	0.285	0.18	0.051	8%
8	4.90	0.97				0.78	0.288	0.19	0.269	1.00	0.20	0.97	0.279	0.19	0.054	9%
9	5.10	0.91				0.73	0.308	0.18	0.244	1.00	0.20	0.91	0.276	0.18	0.050	8%
10	5.30	0.94				0.75	0.313	0.19	0.265	1.00	0.20	0.94	0.289	0.19	0.054	9%
11	5.50	0.93				0.74	0.303	0.19	0.250	1.00	0.20	0.93	0.277	0.19	0.051	8%
12	5.70	0.92				0.74	0.285	0.18	0.254	1.00	0.20	0.92	0.270	0.18	0.050	8%
13	5.90	0.90				0.72	0.282	0.18	0.260	1.00	0.20	0.90	0.271	0.18	0.049	8%
14	6.10	0.84				0.67	0.112	0.17	0.258	1.00	0.20	0.84	0.185	0.17	0.031	5%
15	6.30	0.67	0.40	0.109						1.00	0.20	0.67	0.109	0.13	0.015	2%
16	6.50	0.58	0.35	0.184						1.00	0.20	0.58	0.184	0.12	0.021	3%
17	6.70	0.63	0.38	0.143						1.00	0.20	0.63	0.143	0.13	0.018	3%
18	6.90	0.44	0.26	0.136						1.00	0.35	0.44	0.136	0.15	0.021	3%
19	7.40	0.37	0.22	0.104						1.00	0.50	0.37	0.104	0.19	0.019	3%
20	7.90	0.37	0.22	0.001						1.00	0.70	0.37	0.001	0.26	0.000	0%
LB	8.80	0.00	0.00		0.00		0.00		0.00	1.00	0.45	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.624</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 2m US of SL

Meas. Start Time (MST):	12:20
Meas. End Time (MST):	12:55
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, breezy, 12C

**Flow characteristics:**

Total Flow:	0.624	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.30	(m²)
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.54	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.611	0.612
Water (°C):	6.600	7.800
Datalogger Clock:	10:16	12:53
Laptop Clock:	10:21	12:58
Battery (Main):	14.3	14.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

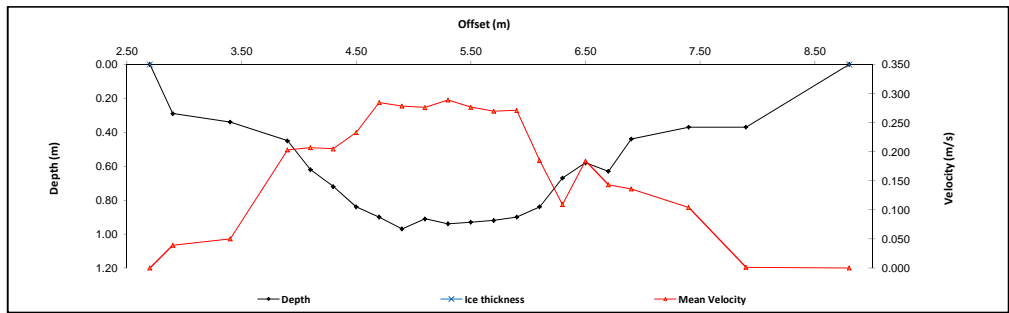
	Before	After
Water Level (m):	99.315	99.314
Index Velocity (m/s):	0.308	0.262
Discharge (m³/s):	0.655	0.553

**Datalogger / Station Notes:**

- Wildlife damage to station
- Large woody debris in centre of channel and vegetation along banks

**General Notes:**

- Installed fence, guy wire mast, replaced telemetry cable, re-wired the solar panel, re-oriented GOES.
- Install lag bolt (BM7).
- GPS is off on GOES, cable appears damaged from GOES antenna installation should be replaced and small pipe to hold GPS installed, transmitter is enabled.



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-02	1.457	101.380		99.923	99.923	Pipe 8m NE of Data Logger
S36-05			0.958	100.422	100.395	3/4" pipe 6 metres Southwest of logger
S36-07			1.196	100.184	0.000	bolt in tree across hell pad
S36-06			1.027	100.353	100.529	Lag bolt in tamarack 10m SSW of logger
Water Level:	Cut		2.030	99.350		Time WL Surveyed: 12:14
S36-02			1.457	99.923	99.923	Pipe 8m NE of Data Logger
<b>Turn</b>						
S36-02	1.420	101.343		99.923	99.923	Pipe 8m NE of Data Logger
Water Level:	Cut		1.997	99.346		Time WL Surveyed: 12:17
S36-06			0.989	100.354	100.529	Lag bolt in tamarack 10m SSW of logger
S36-07			1.159	100.184		bolt in tree across hell pad
S36-05			0.922	100.421	100.395	3/4" pipe 6 metres Southwest of logger
S36-02			1.420	99.923	99.923	Pipe 8m NE of Data Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S36-02	1.421	101.344		99.923		
Water Level:	Cut		1.998	99.346		Time WL Surveyed: 13:06
Water Level:	Cut		1.960	99.349		Time WL Surveyed: 13:08
S36-02	1.386	101.309		99.923		

**WL Survey Summary**

	Before	After
Average WL:	99.348	99.348
Closing Error:	0.000	-
WL Check:	0.004	-0.003
Transducer Elevation	98.737	98.736

**Field Personnel:**

	Personnel	Trip Date	Date
Data Entry Personnel:	TR, GG	12-Sep-14	12-Sep-14
Data Check Personnel:	TR	12-Sep-14	2-Oct-14
Entered Digitally in the Field:	DW		
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: October 15, 2014  
 Site Visit Time (MST): 10:20



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	9.90	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	9.60	0.12		0.07	-0.001					1.00	0.35	0.12	-0.001	0.04	0.000	0%
2	9.20	0.20		0.12	0.013					1.00	0.40	0.20	0.013	0.08	0.001	0%
3	8.80	0.30		0.18	0.090					1.00	0.40	0.30	0.090	0.12	0.011	2%
4	8.40	0.34		0.20	0.155					1.00	0.40	0.34	0.155	0.14	0.021	4%
5	8.00	0.48		0.29	0.190					1.00	0.40	0.48	0.190	0.19	0.036	7%
6	7.60	0.60		0.36	0.116					1.00	0.30	0.60	0.116	0.18	0.021	4%
7	7.40	0.68		0.41	0.208					1.00	0.20	0.68	0.208	0.14	0.028	5%
8	7.20	0.70		0.42	0.293					1.00	0.20	0.70	0.293	0.14	0.041	8%
9	7.00	0.71		0.43	0.311					1.00	0.20	0.71	0.311	0.14	0.044	8%
10	6.80	0.72		0.43	0.332					1.00	0.20	0.72	0.332	0.14	0.048	9%
11	6.60	0.78				0.62	0.187	0.16	0.331	1.00	0.20	0.78	0.259	0.16	0.040	7%
12	6.40	0.81				0.65	0.222	0.16	0.338	1.00	0.20	0.81	0.280	0.16	0.045	8%
13	6.20	0.85				0.68	0.220	0.17	0.324	1.00	0.20	0.85	0.272	0.17	0.046	8%
14	6.00	0.88				0.70	0.142	0.18	0.290	1.00	0.20	0.88	0.216	0.18	0.038	7%
15	5.80	0.88				0.70	0.137	0.18	0.259	1.00	0.20	0.88	0.198	0.18	0.035	6%
16	5.60	0.84				0.67	0.134	0.17	0.269	1.00	0.20	0.84	0.202	0.17	0.034	6%
17	5.40	0.78				0.62	0.106	0.16	0.281	1.00	0.20	0.78	0.194	0.16	0.030	6%
18	5.20	0.68	0.41	0.105						1.00	0.20	0.68	0.105	0.14	0.014	3%
19	5.00	0.58	0.35	0.036						1.00	0.20	0.58	0.036	0.12	0.004	1%
20	4.80	0.41	0.25	0.011						1.00	1.50	0.41	0.011	0.62	0.007	1%
RB	2.00	0.00	0.00		0.00		0.00		0.00	1.00	1.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.546</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
2m US of SL

Meas. Start Time (MST):	11:00
Meas. End Time (MST):	11:45
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 5C

**Flow characteristics:**

Total Flow:	0.546	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.34	(m²)
Wetted Width:	7.90	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.608	0.608
Water (°C):	4.674	4.800
Datalogger Clock:	10:25	11:47
Laptop Clock:	10:25	11:47
Battery (Main):	13.5	14.1
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Deseiccant:	Replaced	-
Vent Tube Deseiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

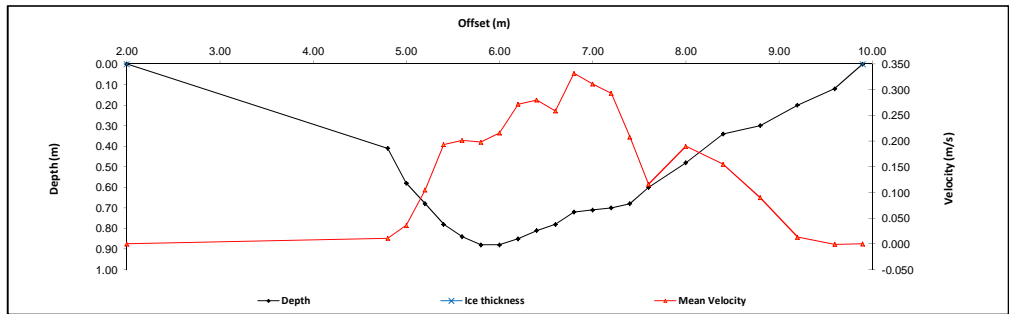
	Before	After
Water Level (m):	99.3	99.315
Index Velocity (m/s):	0.303	0.307
Discharge (m³/s):	0.642	0.602

**Datalogger / Station Notes:**

- Logger needs new program
- SL will freeze, cant be moved deeper
- Cleaned SL sensors

**General Notes:**

- Weeds in LB to 4.3m



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-02	1.429	101.352		99.923	99.923	Pipe 6m NE of Data Logger
S36-05			0.931	100.421	100.395	3/4" pipe 6 metres Southwest of logger
S36-04			0.910	100.442	0.000	0
S36-03			0.885	100.467		
S36-06			0.999	100.353	100.000	0
Water Level:	Cut	2.009		99.343	<b>Time WL Surveyed:</b>	10:49
Temporary BM			2.174	99.178	0.000	-
<b>Turn</b>						
Temporary BM	2.166	101.344		99.178		-
Water Level:	Cut		1.999	99.345	<b>Time WL Surveyed:</b>	10:51
S36-06			0.991	100.353		
S36-03			0.877	100.467	100.000	
S36-04			0.902	100.442		
S36-05			0.923	100.421	100.395	3/4" pipe 6 metres Southwest of logger
S36-02			1.421	99.923	99.923	Pipe 6m NE of Data Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S36-02	1.422	101.345		99.923		
Water Level:	Cut		2.003	99.342	<b>Time WL Surveyed:</b>	11:54
Water Level:	Cut		1.995	99.341	<b>Time WL Surveyed:</b>	11:56
S36-02	1.413	101.336		99.923		

**WL Survey Summary**

	Before	After
Average WL:	99.344	99.342
Closing Error:	0.000	-
WL Check:	0.002	0.001
Transducer Elevation	98.736	98.733

**Field Personnel:**

	DW, MP	Trip Date:	15-Oct-14
Data Entry Personnel:	DW, MP	Date:	15-Oct-14
Data Check Personnel:	MP	Date:	18-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S36 - McClelland Lake Outlet  
 UTM Location: 490626 E, 6384064 N

Site Visit Date: December 9, 2014  
 Site Visit Time (MST): 13:55

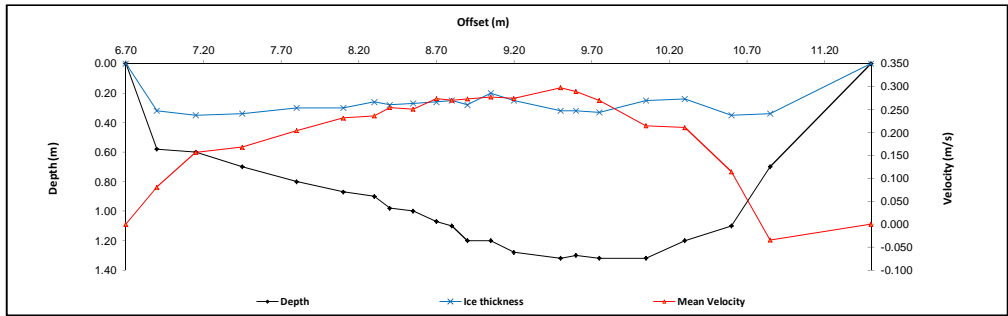


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	6.70	0.00	0.00		0.000				0.000	0.88	0.10	0.00	0.000	0.00	0.000	
1	6.90	0.58	0.32	0.45	0.092					0.88	0.23	0.26	0.081	0.06	0.005	1%
2	7.15	0.60	0.35	0.48	0.178					0.88	0.28	0.25	0.157	0.07	0.011	2%
3	7.45	0.70	0.34	0.52	0.191					0.88	0.32	0.36	0.168	0.12	0.020	3%
4	7.80	0.80	0.30	0.55	0.232					0.88	0.32	0.50	0.204	0.16	0.033	5%
5	8.10	0.87	0.30	0.59	0.263					0.88	0.25	0.57	0.231	0.14	0.033	5%
6	8.30	0.90	0.26	0.58	0.268					0.88	0.15	0.64	0.236	0.10	0.023	3%
7	8.40	0.98	0.28	0.63	0.289					0.88	0.13	0.70	0.254	0.09	0.022	3%
8	8.55	1.00	0.27	0.64	0.285					0.88	0.15	0.73	0.251	0.11	0.027	4%
9	8.70	1.07	0.26			0.91	0.253	0.42	0.294	1.00	0.13	0.81	0.274	0.10	0.028	4%
10	8.80	1.10	0.25			0.93	0.247	0.42	0.293	1.00	0.10	0.85	0.270	0.09	0.023	4%
11	8.90	1.20	0.28			1.02	0.256	0.46	0.290	1.00	0.13	0.92	0.273	0.12	0.031	5%
12	9.05	1.20	0.20			1.00	0.262	0.40	0.292	1.00	0.15	1.00	0.277	0.15	0.042	6%
13	9.20	1.28	0.25			1.07	0.274	0.46	0.274	1.00	0.23	1.03	0.274	0.23	0.063	10%
14	9.50	1.32	0.32			1.12	0.295	0.52	0.300	1.00	0.20	1.00	0.298	0.20	0.060	9%
15	9.60	1.30	0.32			1.10	0.304	0.52	0.274	1.00	0.13	0.98	0.289	0.12	0.035	5%
16	9.75	1.32	0.33			1.12	0.316	0.53	0.233	1.00	0.23	0.99	0.270	0.22	0.060	9%
17	10.05	1.32	0.25			1.11	0.297	0.46	0.132	1.00	0.28	1.07	0.215	0.29	0.063	10%
18	10.30	1.20	0.24			1.01	0.286	0.43	0.135	1.00	0.27	0.96	0.211	0.26	0.056	9%
19	10.60	1.10	0.35	0.73	0.130					0.88	0.28	0.75	0.114	0.21	0.024	4%
20	10.85	0.70	0.34	0.52	-0.039					0.88	0.45	0.36	-0.034	0.16	-0.006	-1%
LB	11.50	0.00	0.00		0.00				0.00	0.88	0.33	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.652</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 40m upstream of station

Meas. Start Time (MST):	14:28
Meas. End Time (MST):	15:03
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 0C



**Flow characteristics:**

Total Flow:	0.652	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.00	(m <sup>2</sup> )
Wetted Width:	4.80	(m)
Hydraulic Depth:	0.62	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.733	-
Water (°C):	0.100	-
Datalogger Clock:	14:02	14:14
Laptop Clock:	14:02	14:14
Battery (Main):	12.9	13.0
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

	Before	After
Water Level (m):		
Index Velocity (m/s):		
Discharge (m <sup>3</sup> /s):		

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S36-06	1.025	101.378		100.353	100.353	3/4" pipe 6 metres Southwest of logger
S36-05			0.989	100.389	100.395	3/4" pipe 6 metres Southwest of logger
S36-04			0.919	100.459	100.206	3/4" Pipe 8m West of logger
Water Level:	Cut		1.947	99.431	Time WL Surveyed:	14:19
Temporary BM			1.938	99.440	100.395	3/4" pipe 6 metres Southwest of logger
<b>Turn</b>						
Temporary BM	1.914	101.354		99.440	100.395	3/4" pipe 6 metres Southwest of logger
Water Level:	Cut		1.923	99.431	Time WL Surveyed:	14:22
S36-04			0.896	100.458	100.206	3/4" Pipe 8m West of logger
S36-05			0.965	100.389	100.395	3/4" pipe 6 metres Southwest of logger
S36-06			1.002	100.352	100.353	3/4" pipe 6 metres Southwest of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.431	-
Closing Error:	0.001	-
WL Check:	0.000	-
Transducer Elevation	98.698	-

**Field Personnel:**

SM, CJ	Trip Date:	9-Dec-14	
Data Entry Personnel:	CJ	Date:	9-Dec-14
Data Check Personnel:	MP	Date:	26-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: April 29, 2014  
 Site Visit Time (MST): 15:20

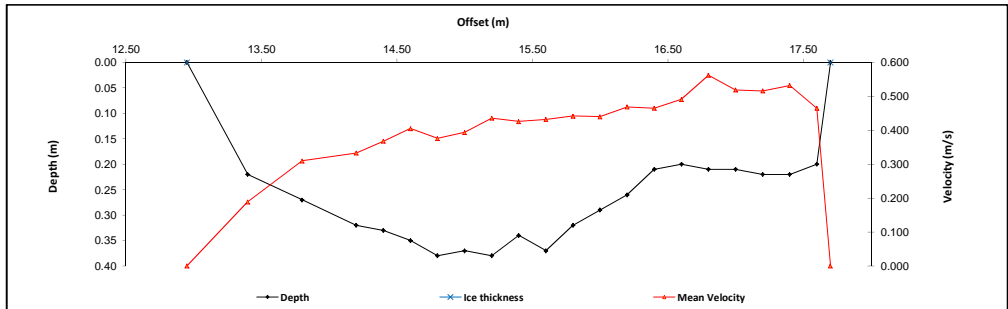


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	12.95	0.00	0.00		0.000				0.000	1.00	0.23	0.00	0.000	0.00	0.000	
1	13.40	0.22		0.13	0.189					1.00	0.43	0.22	0.189	0.09	0.018	3%
2	13.80	0.27		0.16	0.310					1.00	0.40	0.27	0.310	0.11	0.033	7%
3	14.20	0.32		0.19	0.333					1.00	0.30	0.32	0.333	0.10	0.032	6%
4	14.40	0.33		0.20	0.368					1.00	0.20	0.33	0.368	0.07	0.024	5%
5	14.60	0.35		0.21	0.405					1.00	0.20	0.35	0.405	0.07	0.028	6%
6	14.80	0.38		0.23	0.376					1.00	0.20	0.38	0.376	0.08	0.029	6%
7	15.00	0.37		0.22	0.394					1.00	0.20	0.37	0.394	0.07	0.029	6%
8	15.20	0.38		0.23	0.436					1.00	0.20	0.38	0.436	0.08	0.033	6%
9	15.40	0.34		0.20	0.426					1.00	0.20	0.34	0.426	0.07	0.029	6%
10	15.60	0.37		0.22	0.432					1.00	0.20	0.37	0.432	0.07	0.032	6%
11	15.80	0.32		0.19	0.442					1.00	0.20	0.32	0.442	0.06	0.028	6%
12	16.00	0.29		0.17	0.440					1.00	0.20	0.29	0.440	0.06	0.026	5%
13	16.20	0.26		0.16	0.469					1.00	0.20	0.26	0.469	0.05	0.024	5%
14	16.40	0.21		0.13	0.465					1.00	0.20	0.21	0.465	0.04	0.020	4%
15	16.60	0.20		0.12	0.491					1.00	0.20	0.20	0.491	0.04	0.020	4%
16	16.80	0.21		0.13	0.562					1.00	0.20	0.21	0.562	0.04	0.024	5%
17	17.00	0.21		0.13	0.519					1.00	0.20	0.21	0.519	0.04	0.022	4%
18	17.20	0.22		0.13	0.516					1.00	0.20	0.22	0.516	0.04	0.023	4%
19	17.40	0.22		0.13	0.532					1.00	0.20	0.22	0.532	0.04	0.023	5%
20	17.60	0.20		0.12	0.465					1.00	0.15	0.20	0.465	0.03	0.014	3%
RB	17.70	0.00	0.00		0.000		0.000			1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.510</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 15m DS of beaver dam

Meas. Start Time (MST):	15:50
Meas. End Time (MST):	16:15
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, light breeze, 8C



**Flow characteristics:**

Total Flow:	0.510	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.26	(m <sup>2</sup> )
Wetted Width:	4.75	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.40	(m/s)
Froude Number:	0.25	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.101	
Water (°C):	2.3	
Datalogger Clock:	16:28	
Laptop Clock:	16:27	
Battery:	14.3	
Battery Condition:		New
Battery Serial #:	1403006	
Enclosure Dessicant:		New
Vent Tube Dessicant:		New
PTB (if replaced):	284718	
Logger# (if replaced):	18185	

**Datalogger / Station Notes:**

-Need vent tube with tubing on next visit

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S37-04	1.292	102.370		101.078	101.078	3/4" Pipe 4m SW of logger
S37-03			1.519	100.851	100.838	3/4" Pipe 3m South of logger
S37-05					101.178	3/4" Pipe 1.5m from logger
Water Level:	Cut		1.662	100.708		Time WL Surveyed: 15:29
S37-04			1.292	101.078	101.078	3/4" Pipe 4m SW of logger
<b>Turn</b>						
S37-04	1.157	102.235		101.078	101.078	3/4" Pipe 4m SW of logger
Water Level:	Cut		1.526	100.709		Time WL Surveyed: 15:43
S37-05			1.049	101.186	101.178	3/4" Pipe 1.5m from logger
S37-03			1.384	100.851	100.838	3/4" Pipe 3m South of logger
S37-04			1.157	101.078	101.078	3/4" Pipe 4m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S37-05	1.049	102.235		101.186		
Water Level:	Cut		1.528	100.707		Time WL Surveyed: 16:22
Water Level:	Cut		1.513	100.708		Time WL Surveyed: 16:24
S37-05	1.035	102.221		101.186		

**WL Survey Summary**

	Before	After
Average WL:	100.709	100.708
Closing Error:	0.000	-
WL Check:	0.001	-0.001
Transducer Elevation	99.608	-

**Field Personnel:**

TR, GG	Trip Date:	29-Apr-14	
Data Entry Personnel:	TR	Date:	29-Apr-14
Data Check Personnel:	CJ	Date:	3-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: June 16, 2014  
 Site Visit Time (MST): 07:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.80	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	4.40	0.08		0.05	0.309					1.00	0.60	0.08	0.309	0.05	0.015	2%
2	5.00	0.12		0.07	0.505					1.00	0.55	0.12	0.505	0.07	0.033	4%
3	5.50	0.27		0.16	0.463					1.00	0.40	0.27	0.463	0.11	0.050	6%
4	5.80	0.46		0.28	0.416					1.00	0.25	0.46	0.416	0.12	0.048	5%
5	6.00	0.52		0.31	0.455					1.00	0.18	0.52	0.455	0.09	0.041	5%
6	6.15	0.58		0.35	0.471					1.00	0.15	0.58	0.471	0.09	0.041	5%
7	6.30	0.59		0.35	0.518					1.00	0.15	0.59	0.518	0.09	0.046	5%
8	6.45	0.64		0.38	0.578					1.00	0.15	0.64	0.578	0.10	0.055	6%
9	6.60	0.65		0.39	0.619					1.00	0.15	0.65	0.619	0.10	0.060	7%
10	6.75	0.63		0.38	0.744					1.00	0.15	0.63	0.744	0.09	0.070	8%
11	6.90	0.56		0.34	0.738					1.00	0.15	0.56	0.738	0.08	0.062	7%
12	7.05	0.54		0.32	0.787					1.00	0.15	0.54	0.787	0.08	0.064	7%
13	7.20	0.54		0.32	0.858					1.00	0.15	0.54	0.858	0.08	0.069	8%
14	7.35	0.46		0.28	0.560					1.00	0.15	0.46	0.560	0.07	0.039	4%
15	7.50	0.52		0.31	0.828					1.00	0.15	0.52	0.828	0.08	0.069	7%
16	7.65	0.41		0.25	0.753					1.00	0.15	0.41	0.753	0.06	0.046	5%
17	7.80	0.42		0.25	0.692					1.00	0.15	0.42	0.692	0.06	0.044	5%
18	7.95	0.40		0.24	0.452					1.00	0.15	0.40	0.452	0.06	0.027	3%
19	8.10	0.36		0.22	0.337					1.00	0.17	0.36	0.337	0.06	0.021	2%
20	8.30	0.18		0.11	0.109					1.00	0.30	0.18	0.109	0.05	0.006	1%
RB	8.70	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.903</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): approx 150 m DS of station, at pipeline crossing

Meas. Start Time (MST):	8:09
Meas. End Time (MST):	8:31
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm

**Flow characteristics:**

Total Flow:	0.903	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.59	(m <sup>2</sup> )
Wetted Width:	4.90	(m)
Hydraulic Depth:	0.32	(m)
Mean Velocity:	0.57	(m/s)
Froude Number:	0.32	

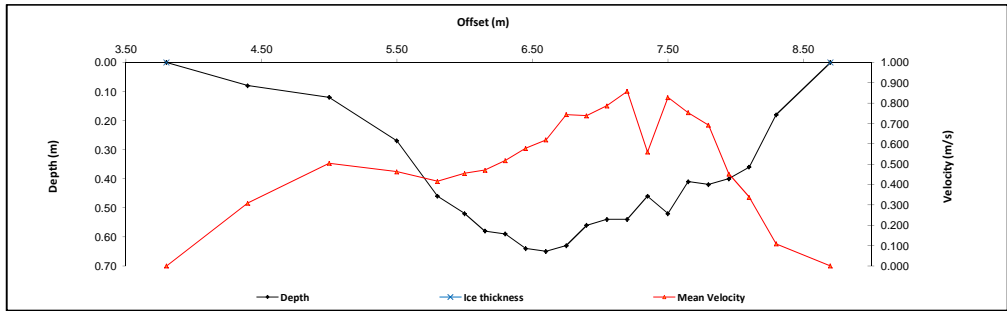
**Logger Details:**

	Before	After
Transducer Reading (m):	0.837	0.835
Water (°C):	12.2	12.2
Datalogger Clock:	07:55	08:42
Laptop Clock:	07:53	08:41
Battery:	14.4	14.1
Battery Condition:	Good	
Battery Serial #:	1403006	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-adv test run, results good



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S37-05	1.137	102.315		101.178	101.178	3/4" Pipe 1.5m from logger
S37-04			1.245	101.070	101.078	3/4" Pipe 4m SW of logger
S37-03			1.473	100.842	100.838	3/4" Pipe 3m South of logger
Water Level:	Cut		1.877	100.438	Time WL Surveyed: 8:00	
Temporary BM			1.673	100.642	0.000	
<b>Turn</b>						
Temporary BM	1.574	102.216		100.642		
Water Level:	Cut		1.775	100.441	Time WL Surveyed: 8:04	
S37-03			1.372	100.844	100.838	3/4" Pipe 3m South of logger
S37-04			1.145	101.071	101.078	3/4" Pipe 4m SW of logger
S37-05			1.038	101.178	101.178	3/4" Pipe 1.5m from logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S37-04	1.145	102.215		101.070		
Water Level:	Cut		1.777	100.438	Time WL Surveyed: 8:37	
Water Level:	Cut		1.746	100.437	Time WL Surveyed: 8:39	
S37-04	1.113	102.183		101.070		

**WL Survey Summary**

	Before	After
Average WL:	100.440	100.438
Closing Error:	0.000	-
WL Check:	0.003	0.001
Transducer Elevation	99.603	99.603

**Field Personnel:**

	DW, NC	Trip Date:	16-Jun-14
Data Entry Personnel:	NC	Date:	16-Jun-14
Data Check Personnel:	CJ	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: August 9, 2014  
 Site Visit Time (MST): 16:25



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	30.50	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	30.90	0.20		0.12	0.058					1.00	0.25	0.20	0.058	0.05	0.003	6%
2	31.00	0.28		0.17	0.067					1.00	0.15	0.28	0.067	0.04	0.003	6%
3	31.20	0.28		0.17	0.069					1.00	0.20	0.28	0.069	0.06	0.004	8%
4	31.40	0.26		0.16	0.054					1.00	0.20	0.26	0.054	0.05	0.003	6%
5	31.60	0.30		0.18	0.039					1.00	0.20	0.30	0.039	0.06	0.002	5%
6	31.80	0.30		0.18	0.048					1.00	0.20	0.30	0.048	0.06	0.003	6%
7	32.00	0.34		0.20	0.048					1.00	0.20	0.34	0.048	0.07	0.003	7%
8	32.20	0.36		0.22	0.036					1.00	0.20	0.36	0.036	0.07	0.003	5%
9	32.40	0.41		0.25	0.039					1.00	0.20	0.41	0.039	0.08	0.003	7%
10	32.60	0.40		0.24	0.036					1.00	0.20	0.40	0.036	0.08	0.003	6%
11	32.80	0.40		0.24	0.033					1.00	0.20	0.40	0.033	0.08	0.003	6%
12	33.00	0.42		0.25	0.034					1.00	0.20	0.42	0.034	0.08	0.003	6%
13	33.20	0.41		0.25	0.032					1.00	0.20	0.41	0.032	0.08	0.003	6%
14	33.40	0.40		0.24	0.029					1.00	0.20	0.40	0.029	0.08	0.002	5%
15	33.60	0.41		0.25	0.029					1.00	0.20	0.41	0.029	0.08	0.002	5%
16	33.80	0.33		0.20	0.022					1.00	0.20	0.33	0.022	0.07	0.001	3%
17	34.00	0.32		0.19	0.017					1.00	0.20	0.32	0.017	0.06	0.001	2%
18	34.20	0.26		0.16	0.021					1.00	0.20	0.26	0.021	0.05	0.001	2%
19	34.40	0.24		0.14	0.017					1.00	0.20	0.24	0.017	0.05	0.001	2%
20	34.60	0.18		0.11	0.015					1.00	0.20	0.18	0.015	0.04	0.001	1%
21	34.80	0.15		0.09	0.000					1.00	0.20	0.15	0.000	0.03	0.000	0%
LB	35.00	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.047</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
40m downstream of station

Mess. Start Time (MST):	16:50
Mess. End Time (MST):	17:12
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 20C

**Flow characteristics:**

Total Flow:	0.047	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.33	(m²)
Wetted Width:	4.50	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

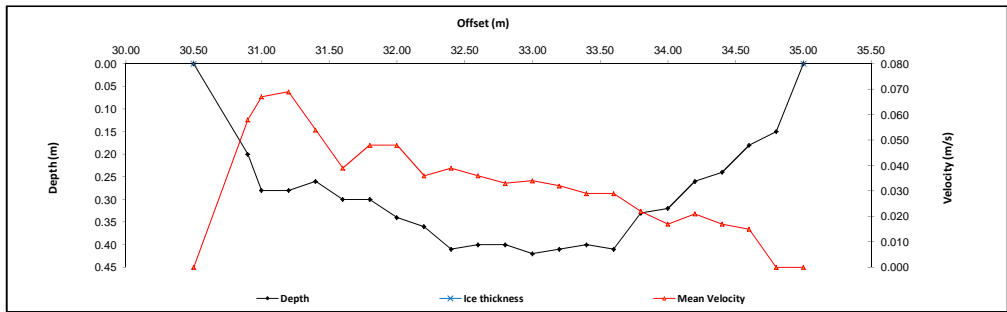
**Logger Details:**

	Before	After
Transducer Reading (m):	0.195	0.194
Water (°C):	15.3	15.4
Datalogger Clock:	16:41	17:22
Laptop Clock:	16:41	17:22
Battery:	14.2	14.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-PLS vent tube broken. Will need to replace PLS on next visit.

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S37-05	1.140	102.318		101.178	101.178	3/4" Pipe 1.5m from logger
S37-04			1.247	101.071	101.078	3/4" Pipe 4m SW of logger
S37-03			0.713	101.605	100.838	3/4" Pipe 3m South of logger
<b>Turn</b>						
S37-03	0.695	102.300		101.605	100.838	3/4" Pipe 3m South of logger
Water Level:	Cut		2.509	99.788	100.838	Time WL Surveyed: 16:45
S37-03			0.713	101.605	100.838	3/4" Pipe 3m South of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S37-04	1.229	102.300		101.071		
Water Level:	Cut		2.509	99.791	99.795	Time WL Surveyed: 17:19
Water Level:	Cut		2.493	99.795	99.795	Time WL Surveyed: 17:20
S37-04	1.217	102.288		101.071		

**WL Survey Summary**

	Before	After
Average WL:	99.790	99.793
Closing Error:	0.000	-
WL Check:	0.003	-0.004
Transducer Elevation	99.595	99.599

**Field Personnel:**

	CJ, MP	Trip Date:	9-Aug-14
Data Entry Personnel:	CJ	Date:	9-Aug-14
Data Check Personnel:	CJ	Date:	5-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: September 4, 2014  
 Site Visit Time (MST): 15:15



Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)							
RB	0.30	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000								
1	0.50	0.20		0.12	0.002					1.00	0.18	0.20	0.002	0.04	0.000	1%							
2	0.65	0.24		0.14	0.000					1.00	0.15	0.24	0.000	0.04	0.000	0%							
3	0.80	0.31		0.19	0.009					1.00	0.15	0.31	0.009	0.05	0.000	4%							
4	0.95	0.32		0.19	0.005					1.00	0.15	0.32	0.005	0.05	0.000	2%							
5	1.10	0.38		0.23	-0.008					1.00	0.15	0.38	-0.008	0.06	0.000	-4%							
6	1.25	0.46		0.28	-0.009					1.00	0.15	0.46	-0.009	0.07	-0.001	-5%							
7	1.40	0.46		0.28	-0.004					1.00	0.15	0.46	-0.004	0.07	0.000	-2%							
8	1.55	0.52		0.31	-0.002					1.00	0.15	0.52	-0.002	0.08	0.000	-1%							
9	1.70	0.52		0.31	-0.003					1.00	0.15	0.52	-0.003	0.08	0.000	-2%							
10	1.85	0.52		0.31	-0.013					1.00	0.15	0.52	-0.013	0.08	-0.001	-9%							
11	2.00	0.46		0.28	-0.003					1.00	0.15	0.46	-0.003	0.07	0.000	-2%							
12	2.15	0.47		0.28	-0.010					1.00	0.15	0.47	-0.010	0.07	-0.001	-6%							
13	2.30	0.37		0.22	0.003					1.00	0.13	0.37	0.003	0.05	0.000	1%							
14	2.40	0.43		0.26	0.013					1.00	0.10	0.43	0.013	0.04	0.001	5%							
15	2.50	0.42		0.25	0.026					1.00	0.10	0.42	0.026	0.04	0.001	9%							
16	2.60	0.35		0.21	0.045					1.00	0.10	0.35	0.045	0.04	0.002	14%							
17	2.70	0.40		0.24	0.052					1.00	0.10	0.40	0.052	0.04	0.002	18%							
18	2.80	0.36		0.22	0.036					1.00	0.10	0.36	0.036	0.04	0.001	11%							
19	2.90	0.32		0.19	0.049					1.00	0.08	0.32	0.049	0.02	0.001	10%							
20	2.95	0.32		0.19	0.068					1.00	0.05	0.32	0.068	0.02	0.001	9%							
21	3.00	0.26		0.16	0.074					1.00	0.05	0.26	0.074	0.01	0.001	8%							
22	3.05	0.26		0.16	0.098					1.00	0.05	0.26	0.098	0.01	0.001	11%							
23	3.10	0.26		0.16	0.087					1.00	0.05	0.26	0.087	0.01	0.001	10%							
24	3.15	0.25		0.15	0.080					1.00	0.05	0.25	0.080	0.01	0.001	9%							
25	3.20	0.24		0.14	0.051					1.00	0.05	0.24	0.051	0.01	0.001	5%							
26	3.25	0.18		0.11	0.044					1.00	0.05	0.18	0.044	0.01	0.000	3%							
27	3.30	0.16		0.10	0.009					1.00	0.07	0.16	0.009	0.01	0.000	1%							
LB	3.40	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000								
<b>Total Flow</b>														<b>0.012</b>	<b>100%</b>								

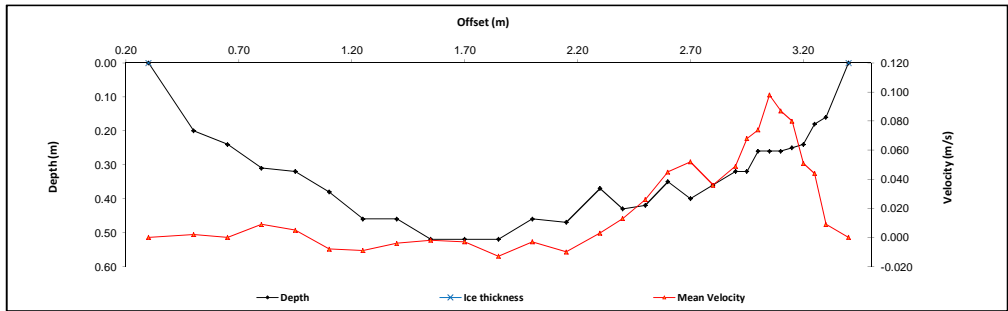
**Flow Measurement Details:**

Metering Section Location (describe):  
 -At PLS location

Meas. Start Time (MST): 15:44  
 Meas. End Time (MST): 16:11  
 Equipment: ADV  
 Method: Wading  
 River Condition: Low flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Fair  
 Weather: Raining

**Flow characteristics:**

Total Flow:	0.012	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	1.10	(m <sup>2</sup> )
Wetted Width:	3.10	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	



**Logger Details:**

	Before	After
Transducer Reading (m):	0.123	0.451
Water (°C):	10.2	10.4
Datalogger Clock:	15:20	16:30
Laptop Clock:	15:18	16:18
Battery:	14.4	13.6
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S37-05	0.973	102.151		101.178	101.178	3/4" Pipe 1.5m from logger
S37-04			1.078	101.073	101.078	3/4" Pipe 4m SW of logger
S37-03			1.307	100.844	100.838	3/4" Pipe 3m South of logger
Water Level:	Cut		2.425	99.726	Time WL Surveyed: 15:30	
Temporary BM			0.544	101.607	0.000	
<b>Turn</b>						
Temporary BM	0.523	102.130		101.607		
Water Level:	Cut		2.404	99.726	Time WL Surveyed: 15:32	
S37-03			1.286	100.844	100.838	3/4" Pipe 3m South of logger
S37-04			1.058	101.072	101.078	3/4" Pipe 4m SW of logger
S37-05			0.952	101.178	101.178	3/4" Pipe 1.5m from logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S37-04	1.058	102.131		101.073		
Water Level:	Cut		2.397	99.734	Time WL Surveyed: 16:15	
Water Level:	Cut		2.373	99.735	Time WL Surveyed: 16:16	
S37-04	1.035	102.108		101.073		

**WL Survey Summary**

	Before	After
Average WL:	99.726	99.735
Closing Error:	0.000	-
WL Check:	0.000	-0.001
Transducer Elevation	99.603	99.284

**Field Personnel:**

	SM, GG	Trip Date:	4-Sep-14
Data Entry Personnel:	SM	Date:	4-Sep-14
Data Check Personnel:	GG	Date:	24-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S37 East Jackpine Creek  
 UTM Location: 487840 E, 6325424 N

Site Visit Date: November 2, 2014  
 Site Visit Time (MST): 09:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	5.65	0.00	0.00		0.000				0.000	1.00	0.13	0.00	0.000	0.00	0.000	
1	5.40	0.20		0.12	0.542					1.00	0.18	0.20	0.542	0.04	0.019	9%
2	5.30	0.20		0.12	0.603					1.00	0.10	0.20	0.603	0.02	0.012	6%
3	5.20	0.19		0.11	0.559					1.00	0.15	0.19	0.559	0.03	0.016	7%
4	5.00	0.17		0.10	-0.001					1.00	0.20	0.17	-0.001	0.03	0.000	0%
5	4.80	0.14		0.08	0.358					1.00	0.20	0.14	0.358	0.03	0.010	5%
6	4.60	0.12		0.07	0.392					1.00	0.20	0.12	0.392	0.02	0.009	4%
7	4.40	0.12		0.07	0.264					1.00	0.20	0.12	0.264	0.02	0.006	3%
8	4.20	0.14		0.08	0.456					1.00	0.20	0.14	0.456	0.03	0.013	6%
9	4.00	0.12		0.07	0.456					1.00	0.20	0.12	0.456	0.02	0.011	5%
10	3.80	0.12		0.07	0.461					1.00	0.20	0.12	0.461	0.02	0.011	5%
11	3.60	0.13		0.08	0.481					1.00	0.20	0.13	0.481	0.03	0.013	6%
12	3.40	0.15		0.09	0.409					1.00	0.20	0.15	0.409	0.03	0.012	6%
13	3.20	0.16		0.10	0.331					1.00	0.20	0.16	0.331	0.03	0.011	5%
14	3.00	0.18		0.11	0.379					1.00	0.20	0.18	0.379	0.04	0.014	6%
15	2.80	0.19		0.11	0.364					1.00	0.20	0.19	0.364	0.04	0.014	6%
16	2.60	0.19		0.11	0.383					1.00	0.20	0.19	0.383	0.04	0.015	7%
17	2.40	0.16		0.10	0.390					1.00	0.20	0.16	0.390	0.03	0.012	6%
18	2.20	0.14		0.08	0.378					1.00	0.20	0.14	0.378	0.03	0.011	5%
19	2.00	0.14		0.08	0.335					1.00	0.23	0.14	0.335	0.03	0.011	5%
20	1.75	0.10		0.06	0.001					1.00	0.30	0.10	0.001	0.03	0.000	0%
LB	1.40	0.00	0.00		0.00		0.00		0.00	1.00	0.18	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.219</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
 -10m US of pipeline

Meas. Start Time (MST):	9:15
Meas. End Time (MST):	9:40
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 2C

### Flow characteristics:

Total Flow:	0.219	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.59	(m <sup>2</sup> )
Wetted Width:	4.25	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.37	(m/s)
Froude Number:	0.32	

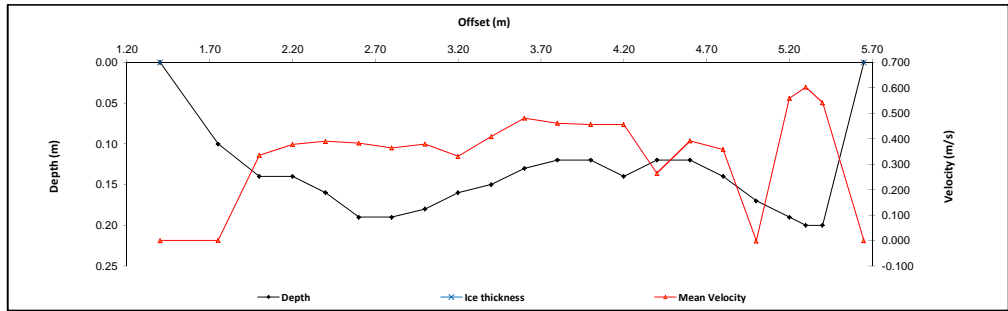
### Logger Details:

	Before	After
Transducer Reading (m):	0.825	0.825
Water (°C):	0.2	0.2
Datalogger Clock:	09:04	09:41
Laptop Clock:	09:03	09:40
Battery:	13.2	13.7
Battery Condition:	-	-
Battery Serial #:	-	-
Enclosure Dessiccant:	-	-
Vent Tube Dessiccant:	-	-
PT# (if replaced):	248718	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

- Removed PT for winter
- Removed relay radio and modem also

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S37-05	0.917	102.095		101.178	101.178	3/4" Pipe 1.5m from logger
S37-03			1.251	100.844	100.838	3/4" Pipe 3m South of logger
S37-04			1.023	101.072	101.078	3/4" Pipe 4m SW of logger
Water Level:	Cut		1.988	100.107		Time WL Surveyed: 9:09
Temporary BM			0.489	101.606	0.000	
<b>Turn</b>						
Temporary BM	0.471	102.077		101.606		
Water Level:	Cut		1.971	100.106		Time WL Surveyed: 9:11
S37-04			1.005	101.072	101.078	3/4" Pipe 4m SW of logger
S37-03			1.232	100.845	100.838	3/4" Pipe 3m South of logger
S37-05			0.899	101.178	101.178	3/4" Pipe 1.5m from logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S37-04	1.005	102.077		101.072		
Water Level:	Cut		1.968	100.109		Time WL Surveyed: 9:43
Water Level:	Cut		1.953	100.107		Time WL Surveyed: 9:44
S37-04	0.988	102.060		101.072		

### WL Survey Summary

	Before	After
Average WL:	100.107	100.108
Closing Error:	0.000	-
WL Check:	0.001	0.002
Transducer Elevation	99.282	99.283

### Field Personnel:

	TR, MP	Trip Date:	2-Nov-14
Data Entry Personnel:	TR	Date:	2-Nov-14
Data Check Personnel:	GG	Date:	20-Nov-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: January 9, 2014  
 Site Visit Time (MST): 11:50

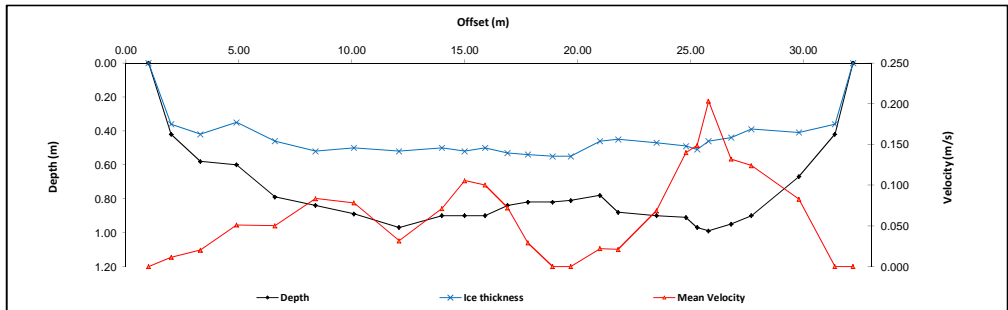


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.00				0.00							
1	2.00	0.42	0.36	0.39	0.013					0.88	0.50	0.00	0.000	0.00	0.000	
2	3.30	0.58	0.42	0.50	0.023					0.88	1.15	0.06	0.011	0.07	0.001	0%
3	4.90	0.60	0.35	0.48	0.058					0.88	1.45	0.16	0.020	0.23	0.005	1%
4	6.60	0.79	0.46	0.63	0.057					0.88	1.65	0.25	0.051	0.41	0.021	3%
5	8.40	0.84	0.52	0.68	0.095					0.88	1.75	0.33	0.050	0.58	0.029	4%
6	10.10	0.89	0.50	0.70	0.089					0.88	1.85	0.39	0.078	0.72	0.047	6%
7	12.10	0.97	0.52	0.75	0.036					0.88	1.95	0.45	0.032	0.88	0.028	4%
8	14.00	0.90	0.50	0.70	0.081					0.88	1.45	0.40	0.071	0.58	0.041	5%
9	15.00	0.90	0.52	0.71	0.120					0.88	0.95	0.38	0.106	0.36	0.038	5%
10	15.90	0.90	0.50	0.70	0.114					0.88	0.95	0.40	0.100	0.38	0.038	5%
11	16.90	0.84	0.53	0.69	0.082					0.88	0.95	0.31	0.072	0.29	0.021	3%
12	17.80	0.82	0.54	0.68	0.033					0.88	1.00	0.28	0.029	0.28	0.008	1%
13	18.90	0.82	0.55	0.69	0.000					0.88	0.95	0.27	0.000	0.26	0.000	0%
14	19.70	0.81	0.55	0.68	0.000					0.88	1.05	0.26	0.000	0.27	0.000	0%
15	21.00	0.78	0.46	0.62	0.025					0.88	1.05	0.32	0.022	0.34	0.007	1%
16	21.80	0.88	0.45	0.67	0.024					0.88	1.25	0.43	0.021	0.54	0.011	1%
17	23.50	0.90	0.47	0.69	0.078					0.88	1.50	0.43	0.069	0.65	0.044	6%
18	24.80	0.91	0.49	0.70	0.159					0.88	0.90	0.42	0.140	0.38	0.053	7%
19	25.30	0.97	0.51	0.74	0.169					0.88	0.50	0.46	0.149	0.23	0.034	4%
20	25.80	0.99	0.46	0.73	0.231					0.88	0.75	0.53	0.203	0.40	0.081	11%
21	26.80	0.95	0.44	0.70	0.150					0.88	0.95	0.51	0.132	0.48	0.064	8%
22	27.70	0.90	0.39	0.65	0.141					0.88	1.50	0.51	0.124	0.77	0.095	12%
23	29.80	0.67	0.41	0.54	0.094					0.88	1.85	0.26	0.063	0.48	0.040	5%
24	31.40	0.42	0.36	0.39	0.000					0.88	1.20	0.06	0.000	0.07	0.000	0%
LB	32.20	0.00	0.00		0.00		0.00		0.00	0.88	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.763</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): across from station

Meas. Start Time (MST):	12:30
Meas. End Time (MST):	13:09
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snowing, -10C



**Flow characteristics:**

Total Flow:	0.763	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	10.20	(m <sup>2</sup> )
Wetted Width:	31.20	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.580	0.581
Water (°C):	0.1	0.1
Rainfall (mm):	0.00	0.00
Datalogger Clock:	12:00	13:18
Laptop Clock:	12:00	13:18
Battery (Main):	13.1	12.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Good
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S40-06	1.294	101.361		100.067	100.067	Pipe 4m S of Logger
S40-07			1.135	100.226	100.227	Pipe 4m SE of logger
S40-05			1.230	100.131	100.135	Pipe 4m NE of Logger
Water Level:			4.875	96.486		Time WL Surveyed: 12:19
Temporary BM			4.885	96.476	0.000	-
<b>Turn</b>						
Temporary BM	4.870	101.346		96.476		-
Water Level:			4.857	96.489		Time WL Surveyed: 12:21
S40-05			1.215	100.131	100.135	Pipe 4m NE of Logger
S40-07			1.121	100.225	100.227	Pipe 4m SE of logger
S40-06			1.280	100.066	100.067	Pipe 4m S of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S40-05	1.216	101.347		100.131		
Water Level:			4.857	96.490		Time WL Surveyed: 13:14
Water Level:			4.838	96.494		Time WL Surveyed: 13:16
S40-05	1.201	101.332		100.131		

**WL Survey Summary**

	Before	After
Average WL:	96.488	96.492
Closing Error:	0.001	-
WL Check:	0.003	-0.004
Transducer Elevation	95.908	95.911

**Field Personnel:**

Data Entry Personnel:	SM, TR	Trip Date:	9-Jan-14
Data Check Personnel:	SM	Date:	9-Jan-14
Entered Digitally in the Field:	DW	Date:	23-Apr-14

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge

UTM Location: 445023 E, 6314256 N

Site Visit Date:

February 6, 2014

Site Visit Time (MST):

13:15



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	0.88	0.60	0.00	0.000	0.00	0.000	
1	2.20	0.58	0.39	0.49	0.031					0.88	2.70	0.19	0.027	0.51	0.014	2%
2	6.40	0.74	0.44	0.59	0.049					0.88	2.65	0.30	0.043	0.80	0.034	5%
3	7.50	0.91	0.45	0.68	0.064					0.88	1.15	0.46	0.074	0.53	0.039	6%
4	8.70	0.88	0.43	0.66	0.117					0.88	1.10	0.45	0.103	0.50	0.051	8%
5	9.70	0.86	0.43	0.65	0.060					0.88	0.95	0.43	0.053	0.41	0.022	3%
6	10.60	0.90	0.44	0.67	-0.004					0.88	1.00	0.46	-0.004	0.46	-0.002	0%
7	11.70	0.92	0.44	0.68	0.140					0.88	1.05	0.48	0.123	0.50	0.062	10%
8	12.70	0.90	0.44	0.67	0.111					0.88	1.55	0.46	0.098	0.71	0.070	11%
9	14.80	0.79	0.44	0.62	0.061					0.88	1.90	0.35	0.054	0.67	0.036	6%
10	16.50	0.79	0.48	0.64	0.019					0.88	1.35	0.31	0.017	0.42	0.007	1%
11	17.50	0.65	0.55	0.60	0.006					0.88	1.35	0.10	0.005	0.14	0.001	0%
12	19.20	0.67	0.46	0.57	0.002					0.88	1.40	0.21	0.002	0.29	0.001	0%
13	20.30	0.79	0.45	0.62	0.009					0.88	1.00	0.34	0.008	0.34	0.003	0%
14	21.20	0.80	0.44	0.62	0.015					0.88	0.90	0.36	0.013	0.32	0.004	1%
15	22.10	0.87	0.43	0.65	0.061					0.88	0.95	0.44	0.054	0.42	0.022	4%
16	23.10	0.86	0.38	0.62	0.136					0.88	1.00	0.48	0.120	0.48	0.057	9%
17	24.10	0.85	0.38	0.62	0.141					0.88	1.20	0.47	0.124	0.56	0.070	11%
18	25.50	0.80	0.34	0.57	0.096					0.88	1.40	0.46	0.084	0.64	0.054	9%
19	26.90	0.83	0.27	0.55	0.134					0.88	1.25	0.56	0.118	0.70	0.083	13%
20	28.00	0.70	0.39	0.55	0.024					0.88	1.00	0.31	0.021	0.31	0.007	1%
21	28.90	0.58	0.38	0.48	0.012					0.88	1.00	0.20	0.011	0.20	0.002	0%
22	30.00	0.47	0.40	0.44	-0.003					0.88	1.05	0.07	-0.003	0.07	0.000	0%
LB	31.00	0.00	0.00		0.00		0.00		0.00	0.88	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.636</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
across from station

Meas. Start Time (MST):	14:45
Meas. End Time (MST):	15:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -13C

## Flow characteristics:

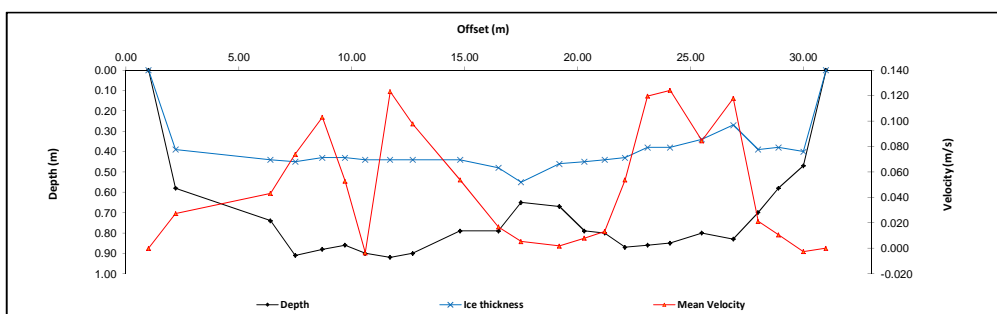
Total Flow:	0.636	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.98	(m <sup>2</sup> )
Wetted Width:	30.00	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.04	

## Logger Details:

	Before	After
Transducer Reading (m):	0.510	0.510
Water (°C):	0.1	0.1
Rainfall (mm):	0.00	0.00
Datalogger Clock:	13:21	16:04
Laptop Clock:	13:21	16:04
Battery (Main):	14.9	14.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S40-06	1.332	101.399		100.067	100.067	Pipe 4m S of Logger
S40-07			1.171	100.228	100.227	Pipe 4m SE of logger
S40-05			1.272	100.127	100.135	Pipe 4m NE of Logger
Water Level:	Cut		5.009	96.390	Time WL Surveyed: 14:29	
Temporary BM			4.879	96.520	0.000	-
<b>Turn</b>						
Temporary BM	4.862	101.382		96.520	-	
Water Level:	Cut		4.990	96.392	Time WL Surveyed: 14:36	
S40-05			1.256	100.126	100.135	Pipe 4m NE of Logger
S40-07			1.154	100.228	100.227	Pipe 4m SE of logger
S40-06			1.315	100.067	100.067	Pipe 4m S of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S40-06	1.280	101.347		100.067		
Water Level:	Cut		4.937	96.410	Time WL Surveyed: 15:59	
Water Level:	Cut		4.913	96.413	Time WL Surveyed: 15:45	
S40-06	1.259	101.326		100.067		

WL Survey Summary	Before	After
Average WL:	96.391	96.412
Closing Error:	0.000	-
WL Check:	0.002	-0.003
Transducer Elevation	95.881	95.902

Field Personnel:	SM, MP, AJ	Trip Date:	6-Feb-14
Data Entry Personnel:	SM	Date:	6-Feb-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: March 8, 2014  
 Site Visit Time (MST): 12:50

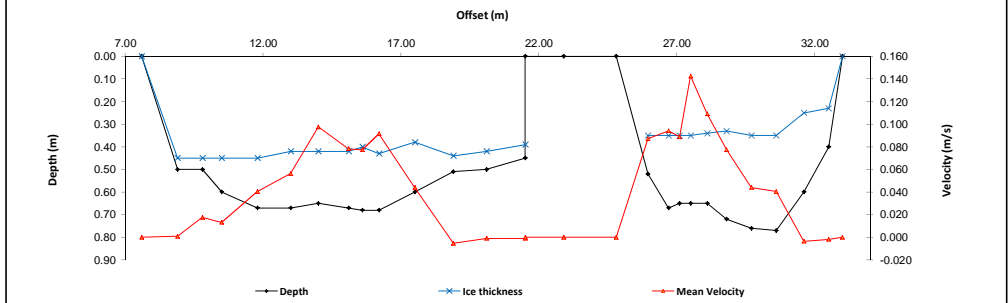


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	7.60	0.00	0.00	0.00	0.000				0.000	0.88	0.65	0.00	0.000	0.00	0.000	
1	8.90	0.50	0.45	0.48	0.001					0.88	1.10	0.05	0.001	0.06	0.000	0%
2	9.90	0.50	0.45	0.48	0.020					0.88	0.80	0.05	0.018	0.04	0.001	0%
3	10.50	0.60	0.45	0.53	0.015					0.88	1.00	0.15	0.013	0.15	0.002	1%
4	11.80	0.67	0.45	0.56	0.046					0.88	1.25	0.22	0.040	0.28	0.011	4%
5	13.00	0.67	0.42	0.55	0.064					0.88	1.10	0.25	0.056	0.28	0.015	6%
6	14.00	0.65	0.42	0.54	0.111					0.88	1.05	0.23	0.098	0.24	0.024	9%
7	15.10	0.67	0.42	0.55	0.089					0.88	0.80	0.25	0.078	0.20	0.016	6%
8	15.60	0.68	0.40	0.54	0.088					0.88	0.55	0.28	0.077	0.15	0.012	5%
9	16.20	0.68	0.43	0.56	0.104					0.88	0.95	0.25	0.092	0.24	0.022	9%
10	17.50	0.60	0.38	0.49	0.050					0.88	1.35	0.22	0.044	0.30	0.013	5%
11	18.90	0.51	0.44	0.48	-0.006					0.88	1.30	0.07	-0.005	0.09	0.000	0%
12	20.10	0.50	0.42	0.46	-0.001					0.88	1.30	0.08	-0.001	0.10	0.000	0%
13	21.50	0.45	0.39	0.42	-0.001					0.88	0.70	0.06	-0.001	0.04	0.000	0%
14	21.50	0.00		0.00	0.000					0.88	0.70	0.00	0.000	0.00	0.000	0%
15	22.90	0.00		0.00	0.000					0.88	1.65	0.00	0.000	0.00	0.000	0%
16	24.80	0.00		0.00	0.000					0.88	1.53	0.00	0.000	0.00	0.000	0%
17	25.95	0.52	0.35	0.44	0.099					0.88	0.95	0.17	0.087	0.16	0.014	6%
18	26.70	0.67	0.35	0.51	0.107					0.88	0.57	0.32	0.094	0.18	0.017	7%
19	27.10	0.65	0.35	0.50	0.101					0.88	0.40	0.30	0.089	0.12	0.011	4%
20	27.50	0.65	0.35	0.50	0.162					0.88	0.50	0.30	0.143	0.15	0.021	8%
21	28.10	0.65	0.34	0.50	0.124					0.88	0.65	0.31	0.109	0.20	0.022	9%
22	28.80	0.72	0.33	0.53	0.088					0.88	0.80	0.39	0.077	0.31	0.024	9%
23	29.70	0.76	0.35	0.56	0.050					0.88	0.90	0.41	0.044	0.37	0.016	6%
24	30.60	0.77	0.35	0.56	0.046					0.88	0.95	0.42	-0.040	0.40	0.016	6%
25	31.60	0.60	0.25	0.43	-0.004					0.88	0.95	0.35	-0.004	0.33	-0.001	0%
26	32.50	0.40	0.23	0.32	-0.002					0.88	0.70	0.17	-0.002	0.12	0.000	0%
LB	33.00	0.00			0.00		0.00			0.88	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.255</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
across from station

Meas. Start Time (MST):	13:48
Meas. End Time (MST):	14:30
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Cloudy, -5C



**Flow characteristics:**

Total Flow:	0.255	(m³/s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	4.51	(m²)
Wetted Width:	25.40	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.389	
Water (°C):	0.1	
Rainfall (mm):	-	
Datalogger Clock:	12:58	
Laptop Clock:	12:58	
Battery (Main):	13.6	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- 21 m to 25m is a sand bar

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S40-07	1.129	101.356		100.227	100.227	Pipe 4m SE of logger
S40-06			1.295	100.061	100.067	Pipe 4m S of Logger
S40-05			1.235	100.121	100.135	Pipe 4m NE of Logger
Water Level:	Cut		5.083	96.273	Time WL Surveyed: 13:30	
Temporary BM			4.885	96.471	0.000	
<b>Turn</b>						
Temporary BM	4.871	101.342		96.471		
Water Level:	Cut		5.072	96.270	Time WL Surveyed: 13:33	
S40-05			1.223	100.119	100.135	Pipe 4m NE of Logger
S40-06			1.281	100.061	100.067	Pipe 4m S of Logger
S40-07			1.115	100.227	100.227	Pipe 4m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	96.272	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	95.883	-

**Field Personnel:**

	DW, MP	Trip Date:	8-Mar-14
Data Entry Personnel:	DW, MP	Date:	8-Mar-13
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: April 10, 2014  
 Site Visit Time (MST): 9:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	32.50	0.00	0.00		0.000				0.000	0.88	1.25	0.00	0.000	0.00	0.000	
1	30.00	1.12	0.58	0.85	0.091					0.88	2.03	0.54	0.080	1.09	0.088	10%
2	28.45	1.20	0.63	0.92	0.087					0.88	1.55	0.57	0.077	0.88	0.068	8%
3	26.90	1.19	0.63	0.91	0.082					0.88	1.58	0.56	0.072	0.88	0.064	7%
4	25.30	1.09	0.63	0.86	0.078					0.88	1.30	0.46	0.069	0.60	0.041	5%
5	24.30	1.05	0.59	0.82	0.070					0.88	1.08	0.46	0.062	0.49	0.030	3%
6	23.15	0.98	0.56	0.77	0.108					0.88	1.05	0.42	0.095	0.44	0.042	5%
7	22.20	1.01	0.55	0.78	0.113					0.88	0.85	0.46	0.099	0.39	0.039	4%
8	21.45	0.94	0.55	0.75	0.115					0.88	0.85	0.39	0.101	0.33	0.034	4%
9	20.50	1.00	0.55	0.78	0.112					0.88	0.83	0.45	0.099	0.37	0.037	4%
10	19.80	1.00	0.54	0.77	0.084					0.88	0.77	0.46	0.074	0.36	0.026	3%
11	18.95	1.00	0.51	0.76	0.078					0.88	0.95	0.49	0.069	0.47	0.032	4%
12	17.90	0.95	0.50	0.73	0.114					0.88	1.03	0.45	0.100	0.46	0.046	5%
13	16.90	0.90	0.55	0.73	0.112					0.88	0.98	0.35	0.099	0.34	0.034	4%
14	15.95	0.90	0.53	0.72	0.111					0.88	0.97	0.37	0.098	0.36	0.035	4%
15	14.95	0.86	0.50	0.68	0.121					0.88	0.98	0.36	0.106	0.35	0.037	4%
16	14.00	0.83	0.55	0.69	0.119					0.88	0.98	0.28	0.105	0.27	0.029	3%
17	13.00	0.82	0.51	0.67	0.104					0.88	0.98	0.31	0.092	0.30	0.028	3%
18	12.05	0.83	0.48	0.66	0.113					0.88	0.98	0.35	0.099	0.34	0.034	4%
19	11.05	0.85	0.50	0.68	0.073					0.88	0.93	0.35	0.064	0.32	0.021	2%
20	10.20	0.81	0.47	0.64	0.060					0.88	1.03	0.34	0.053	0.35	0.018	2%
21	9.00	0.76	0.45	0.61	0.088					0.88	4.60	0.31	0.077	1.43	0.110	12%
LB	1.00	0.00	0.00		0.00		0.00		0.00	0.88	4.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.892</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m US of bridge

Mess. Start Time (MST):	10:40
Mess. End Time (MST):	11:10
Equipment:	ADV
Method:	Ice
River Condition:	Overflow ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 4C

**Flow characteristics:**

Total Flow:	0.892	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	10.84	(m <sup>2</sup> )
Wetted Width:	31.50	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.04	

**Logger Details:**

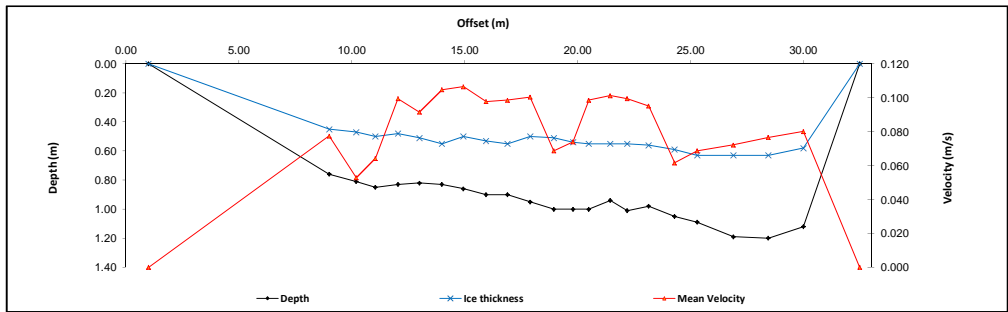
	Before	After
Transducer Reading (m):	0.747	
Water (°C):	0.2	
Rainfall (mm):	0.00	
Datalogger Clock:	10:02	
Laptop Clock:	10:02	
Battery (Main):	14.5	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

- Water level has several spikes over last month, maybe due to large amounts of overflow and surface melt.
- Reinstated rain gauge tipping bucket, tested and working.

**General Notes:**

- Measurement done 5m us of bridge, where last bit of remaining dry ice was found
- Gaps near banks are due to deep overflow



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S40-06	1.287	101.354		100.067	100.067	Pipe 4m S of Logger
S40-07			1.124	100.230	100.227	Pipe 4m SE of logger
S40-05			1.222	100.132	100.135	Pipe 4m NE of Logger
Water Level:	Cut		4.711	96.643	Time WL Surveyed: 10:23	
Temporary BM			4.501	96.853	0.000	
<b>Turn</b>						
Temporary BM	4.479	101.332		96.853		
Water Level:	Cut		4.689	96.643	Time WL Surveyed: 10:26	
S40-05			1.197	100.135	100.135	Pipe 4m NE of Logger
S40-07			1.098	100.234	100.227	Pipe 4m SE of logger
S40-06			1.261	100.071	100.067	Pipe 4m S of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	96.643	-
Closing Error:	-0.004	-
WL Check:	0.000	-
Transducer Elevation	95.896	-

**Field Personnel:**

Data Entry Personnel:	TR, AJ, MP	Trip Date:	10-Apr-14
Data Check Personnel:	TR	Date:	10-Apr-14
Entered Digitally in the Field:	DW	Date:	23-Apr-14
	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: June 9, 2014  
 Site Visit Time (MST): 11:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Discharge Measurement Conducted																
															<b>Total Flow</b>	-

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	-

**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

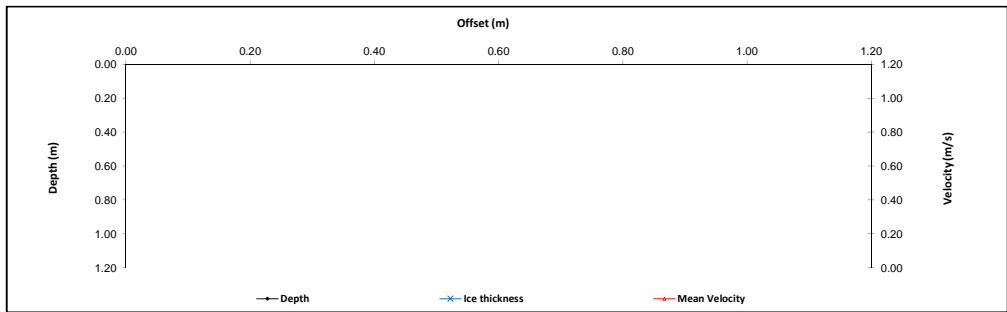
	Before	After
Transducer Reading (m):	1.421	
Water (°C):	12.1	
Rainfall (mm):	0.00	
Datalogger Clock:	11:11	
Laptop Clock:	11:11	
Battery (Main):	14.3	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	33043	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

- Installed TBRG on its own stand.
- Station needs new enclosure to be grounded, bring hose clamps that fit a 3/4" pipe to firmly attach TBRG

**General Notes:**

- Attempted flow measurement but conditions were deemed unsafe due to high velocity.



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S40-06	1.241	101.308		100.067	100.067	Pipe 4m S of Logger
S40-07			1.077	100.231	100.227	Pipe 4m SE of logger
S40-05			1.175	100.133	100.135	Pipe 4m NE of Logger
Water Level:	Cut		4.007	97.301	Time WL Surveyed:	11:21
			3.094	98.214		
<b>Turn</b>						
Water Level:	3.039	101.253		98.214	Time WL Surveyed:	11:26
	Cut		3.955	97.298		
S40-05			1.123	100.130	100.135	Pipe 4m NE of Logger
S40-07			1.024	100.229	100.227	Pipe 4m SE of logger
S40-06			1.189	100.064	100.067	Pipe 4m S of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.300	-
Closing Error:	0.003	-
WL Check:	0.003	-
Transducer Elevation	95.879	-

**Field Personnel:**

TR, NC	Trip Date:	9-Jun-14
TR	Date:	9-Jun-14
DW	Date:	26-Jun-14
Yes	Entered Digitally in the Field:	







# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: October 18, 2014  
 Site Visit Time (MST): 09:30

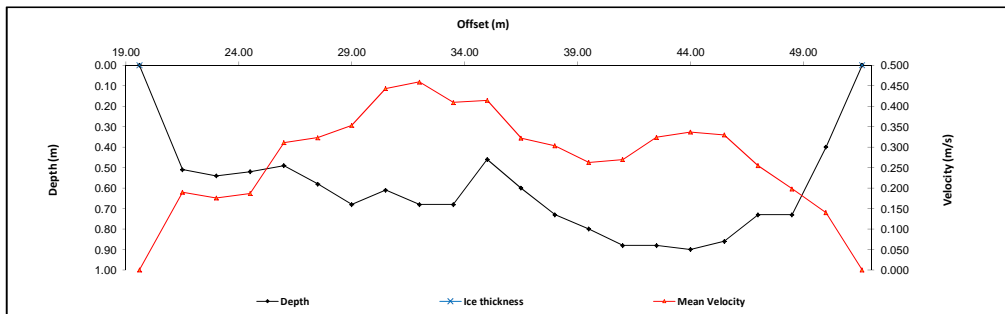


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	19.60	0.00	0.00		0.000				0.000	1.00	0.95	0.00	0.000	0.00	0.000	
1	21.50	0.51		0.31	0.190					1.00	1.70	0.51	0.190	0.87	0.165	3%
2	23.00	0.54		0.32	0.176					1.00	1.50	0.54	0.176	0.81	0.143	2%
3	24.50	0.52		0.31	0.187					1.00	1.50	0.52	0.187	0.78	0.146	2%
4	26.00	0.49		0.29	0.311					1.00	1.50	0.49	0.311	0.74	0.229	4%
5	27.50	0.58		0.35	0.323					1.00	1.50	0.58	0.323	0.87	0.281	5%
6	29.00	0.68		0.41	0.353					1.00	1.50	0.68	0.353	1.02	0.360	6%
7	30.50	0.61		0.37	0.443					1.00	1.50	0.61	0.443	0.92	0.405	7%
8	32.00	0.68		0.41	0.459					1.00	1.50	0.68	0.459	1.02	0.468	8%
9	33.50	0.68		0.41	0.409					1.00	1.50	0.68	0.409	1.02	0.417	7%
10	35.00	0.46		0.28	0.414					1.00	1.50	0.46	0.414	0.69	0.286	5%
11	36.50	0.60		0.36	0.322					1.00	1.50	0.60	0.322	0.90	0.290	5%
12	38.00	0.73		0.44	0.303					1.00	1.50	0.73	0.303	1.10	0.332	5%
13	39.50	0.80				0.64	0.238	0.16	0.287	1.00	1.50	0.80	0.263	1.20	0.315	5%
14	41.00	0.88				0.70	0.193	0.18	0.346	1.00	1.50	0.88	0.270	1.32	0.356	6%
15	42.50	0.88				0.70	0.269	0.18	0.379	1.00	1.50	0.88	0.324	1.32	0.428	7%
16	44.00	0.90				0.72	0.290	0.18	0.384	1.00	1.50	0.90	0.337	1.35	0.455	7%
17	45.50	0.86				0.69	0.271	0.17	0.389	1.00	1.50	0.86	0.330	1.29	0.426	7%
18	47.00	0.73		0.44	0.255					1.00	1.50	0.73	0.255	1.10	0.279	5%
19	48.50	0.73		0.44	0.198					1.00	1.50	0.73	0.198	1.10	0.217	4%
20	50.00	0.40		0.24	0.140					1.00	1.55	0.40	0.140	0.62	0.087	1%
RB	51.60	0.00	0.00		0.000				0.000	1.00	0.80	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>6.08</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m downstream of PT

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:20
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 10C



**Flow characteristics:**

Total Flow:	6.08	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	20.01	(m <sup>2</sup> )
Wetted Width:	32.00	(m)
Hydraulic Depth:	0.63	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.676	0.675
Water (°C):	4.3	4.4
Rainfall (mm):	0.00	0.51
Datalogger Clock:	09:30	10:27
Laptop Clock:	09:30	10:27
Battery (Main):	13.5	14.0
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	-
Vent Tube Dessiccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Tested tipping bucket rain gauge

**General Notes:**

-Beaver built large lodge 8m upstream of PT

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S40-06	1.259	101.326		100.067	100.067	Pipe 4m S of Logger
S40-07			1.098	100.228	100.227	Pipe 4m SE of logger
S40-05			1.193	100.133	100.135	Pipe 4m NE of Logger
Water Level:	Cut	0.170	5.012	96.484	Time WL Surveyed: 9:43	
Temporary BM			5.012	96.314	0.000	
<b>Turn</b>						
Temporary BM	4.990	101.304		96.314	-	
Water Level:	Cut	0.172	4.990	96.486	Time WL Surveyed: 9:45	
S40-05			1.171	100.133	100.135	Pipe 4m NE of Logger
S40-07			1.074	100.230	100.227	Pipe 4m SE of logger
S40-06			1.238	100.066	100.067	Pipe 4m S of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S40-05	1.171	101.304		100.133		
Water Level:	Cut	0.178	4.999	96.483	Time WL Surveyed: 10:23	
Water Level:	Cut	0.178	4.978	96.482	Time WL Surveyed: 10:25	
S40-05	1.149	101.282		100.133		

**WL Survey Summary**

	Before	After
Average WL:	96.485	96.483
Closing Error:	0.001	-
WL Check:	0.002	0.001
Transducer Elevation	95.809	95.808

**Field Personnel:**

	TR, DW	Trip Date:	18-Oct-14
Data Entry Personnel:	TR	Date:	18-Oct-14
Data Check Personnel:	MP	Date:	20-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S40 - MacKay River at Petro-Canada Bridge  
 UTM Location: 445023 E, 6314256 N

Site Visit Date: December 1, 2014  
 Site Visit Time (MST): 12:05



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.20	0.00	0.00		0.000				0.000	0.88	0.85	0.00	0.000	0.00	0.000	
1	5.90	0.50	0.20	0.35	0.031					0.88	1.53	0.30	0.027	0.46	0.012	1%
2	7.25	0.60	0.28	0.44	0.062					0.88	1.55	0.32	0.055	0.50	0.027	2%
3	9.00	0.50	0.30	0.40	0.004					0.88	1.43	0.20	0.004	0.29	0.001	0%
4	10.10	0.44	0.34	0.39	0.003					0.88	1.15	0.10	0.003	0.12	0.000	0%
5	11.30	0.62	0.33	0.48	-0.023					0.88	1.18	0.29	-0.020	0.34	-0.007	-1%
6	12.45	0.80	0.35	0.58	0.065					0.88	1.20	0.45	0.057	0.54	0.031	3%
7	13.70	0.78	0.35	0.57	0.126					0.88	1.33	0.43	0.111	0.57	0.063	5%
8	15.10	0.87	0.30	0.59	0.158					0.88	1.25	0.57	0.139	0.71	0.099	8%
9	16.20	0.76	0.29	0.53	0.154					0.88	1.15	0.47	0.136	0.54	0.073	6%
10	17.40	0.75	0.30	0.53	0.162					0.88	1.28	0.45	0.143	0.57	0.082	7%
11	18.75	0.67	0.30	0.49	0.139					0.88	1.25	0.37	0.122	0.46	0.057	5%
12	19.90	0.60	0.29	0.45	0.104					0.88	1.23	0.31	0.092	0.38	0.035	3%
13	21.20	0.57	0.29	0.43	0.068					0.88	1.30	0.28	0.060	0.36	0.022	2%
14	22.50	0.50	0.30	0.40	0.057					0.88	1.35	0.20	0.050	0.27	0.014	1%
15	23.90	0.50	0.28	0.39	0.075					0.88	1.33	0.22	0.066	0.29	0.019	2%
16	25.15	0.45	0.28	0.37	0.075					0.88	1.48	0.17	0.066	0.25	0.017	1%
17	26.85	0.49	0.28	0.39	0.172					0.88	1.53	0.21	0.151	0.32	0.048	4%
18	28.20	0.76	0.27	0.52	0.216					0.88	1.13	0.49	0.190	0.55	0.105	9%
19	29.10	0.84	0.28	0.56	0.191					0.88	0.88	0.56	0.168	0.49	0.082	7%
20	29.95	0.90	0.25	0.58	0.241					0.88	0.90	0.65	0.212	0.58	0.124	10%
21	30.90	0.90	0.25	0.58	0.217					0.88	0.93	0.65	0.191	0.60	0.115	9%
22	31.80	0.90	0.27	0.59	0.103					0.88	1.30	0.63	0.091	0.82	0.074	6%
23	33.50	0.84	0.29	0.57	0.059					0.88	1.68	0.55	0.052	0.92	0.048	4%
24	35.15	0.80	0.25	0.53	0.045					0.88	1.65	0.55	0.040	0.91	0.036	3%
25	36.80	0.62	0.23	0.43	0.077					0.88	1.48	0.39	0.068	0.58	0.039	3%
26	38.10	0.31	0.22	0.27	0.000					0.88	0.95	0.09	0.000	0.09	0.000	0%
LB	38.70	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	0%
<b>Total Flow</b>														<b>1.22</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Across from station

Meas. Start Time (MST):	12:40
Meas. End Time (MST):	13:20
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -25C

**Flow characteristics:**

Total Flow:	1.22	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.51	(m <sup>2</sup> )
Wetted Width:	34.50	(m)
Hydraulic Depth:	0.36	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.05	

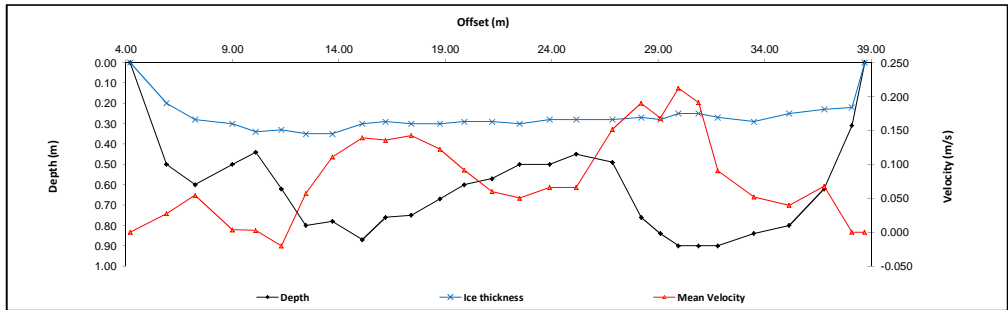
**Logger Details:**

	Before	After
Transducer Reading (m):	0.590	0.590
Water (°C):	0.5	0.5
Rainfall (mm):	0.00	-
Datalogger Clock:	12:10	13:30
Laptop Clock:	12:10	13:30
Battery (Main):	15.1	14.3
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	-
Vent Tube Deseccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Replaced modem
- Winterized TBRG

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description	
<b>Benchmark</b>							
S40-05	1.200	101.335		100.135	100.135	Pipe 4m NE of Logger	
S40-07			1.102	100.233	100.227	Pipe 4m SE of logger	
S40-06			1.267	100.068	100.067	Pipe 4m S of Logger	
Water Level:	Cut		4.938	96.397	Time WL Surveyed:	12:27	
Temporary BM			4.801	96.534	0.000	-	
<b>Turn</b>							
Temporary BM	4.772	101.306		96.534	-	-	
Water Level:	Cut		4.911	96.395	Time WL Surveyed:	12:30	
S40-06			1.240	100.066	100.067	Pipe 4m S of Logger	
S40-07			1.075	100.231	100.227	Pipe 4m SE of logger	
S40-05			1.173	100.133	100.135	Pipe 4m NE of Logger	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
S40-05	1.173	101.307		100.134	96.386	Time WL Surveyed:	13:25
Water Level:	Cut		4.921	96.386	96.388	Time WL Surveyed:	13:28
S40-05	1.142	101.276		100.134			

**WL Survey Summary**

	Before	After
Average WL:	96.396	96.387
Closing Error:	0.002	-
WL Check:	0.002	-0.002
Transducer Elevation	95.806	95.797

**Field Personnel:**

TR, MP	Trip Date:	1-Dec-14	
Data Entry Personnel:	TR	Date:	1-Dec-14
Data Check Personnel:	DW	Date:	5-Jan-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: January 26, 2014  
 Site Visit Time (MST): 09:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.50	0.00	0.00		0.000				0.000	0.88	0.85	0.00	0.000	0.00	0.000	
1	3.20	1.10	0.55	0.83	0.317					0.88	1.58	0.55	0.279	0.87	0.242	4%
2	4.65	1.15	0.45	0.80	0.413					0.88	1.45	0.70	0.363	1.02	0.369	6%
3	6.10	1.20	0.60	0.90	0.422					0.88	1.40	0.60	0.371	0.84	0.312	5%
4	7.45	1.20	0.55	0.88	0.434					0.88	1.35	0.65	0.362	0.88	0.335	6%
5	8.80	1.20	0.55	0.88	0.328					0.88	1.23	0.65	0.289	0.80	0.230	4%
6	9.90	1.15	0.50	0.83	0.300					0.88	1.18	0.65	0.264	0.76	0.202	3%
7	11.15	1.20	0.55	0.88	0.273					0.88	1.48	0.65	0.240	0.96	0.230	4%
8	12.85	1.10	0.55	0.83	0.292					0.88	1.63	0.55	0.257	0.89	0.230	4%
9	14.40	1.30	0.55	0.93	0.380					0.88	1.53	0.75	0.334	1.14	0.382	6%
10	15.90	1.30	0.50							1.00	1.48	0.80	0.380	1.18	0.448	7%
11	17.35	1.30	0.55	0.93	0.438	1.14	0.382	0.66	0.377	0.88	1.53	0.75	0.385	1.14	0.441	7%
12	18.95	1.30	0.60	0.95	0.344					0.88	1.53	0.70	0.303	1.07	0.323	5%
13	20.40	1.20	0.60	0.90	0.287					0.88	1.40	0.60	0.253	0.84	0.212	3%
14	21.75	1.15	0.55	0.85	0.418					0.88	1.35	0.60	0.368	0.81	0.298	5%
15	23.10	1.10	0.60	0.85	0.369					0.88	1.38	0.50	0.325	0.69	0.228	4%
16	24.50	1.25	0.60	0.93	0.440					0.88	1.45	0.65	0.387	0.94	0.365	6%
17	26.00	1.30	0.55	0.93	0.364					0.88	1.40	0.75	0.320	1.05	0.336	6%
18	27.30	1.30	0.60	0.95	0.355					0.88	1.45	0.70	0.312	1.02	0.317	5%
19	28.90	1.00	0.60	0.80	0.291					0.88	2.23	0.40	0.256	0.89	0.228	4%
20	31.75	1.10	0.50	0.80	0.220					0.88	2.10	0.60	0.194	1.26	0.244	4%
21	33.10	1.00	0.50	0.75	0.209					0.88	1.23	0.50	0.184	0.61	0.113	2%
LB	34.20	0.00	0.00		0.00		0.00		0.00	0.88	0.55	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>6.08</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m US of PT

Mess. Start Time (MST):	10:15
Mess. End Time (MST):	10:45
Equipment:	ADV
Method:	Ice
River Condition:	Some overflow ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, calm, -28C

**Flow characteristics:**

Total Flow:	6.08	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	19.65	(m <sup>2</sup> )
Wetted Width:	32.70	(m)
Hydraulic Depth:	0.60	(m)
Mean Velocity:	0.31	(m/s)
Froude Number:	0.13	

**Logger Details:**

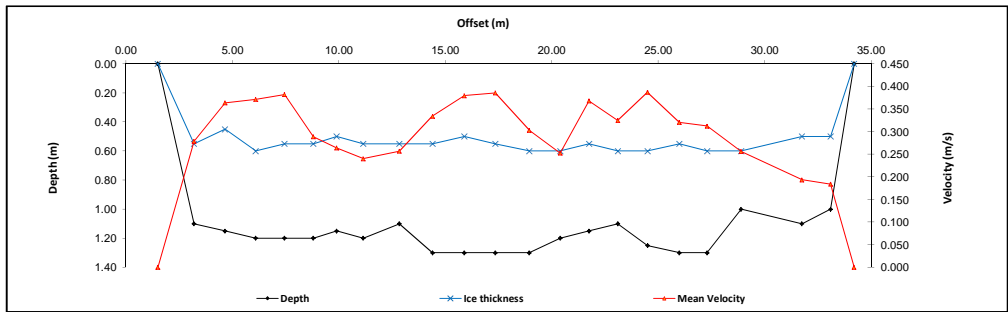
	Before	After
Transducer Reading (m):	1.156	1.155
Water (°C):	0.1	0.1
Precip Gauge Test:	No	
Datalogger Clock:	09:39	11:00
Laptop Clock:	09:36	10:57
Battery (Main):	12.7	15.1
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Ran ADV test, results good  
 - BM3 frozen under layer of ice, could not survey

**General Notes:**

- Ran ADV test, results good  
 - BM3 frozen under layer of ice, could not survey



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-1	1.600	101.870		100.270	100.270	3/4" pipe 1m E of data logger
S43-4			1.537	100.333	100.338	3/4" pipe 1m E of data logger
S43-3					100.113	3/4" pipe 1m E of data logger
Water Level:	Cut		2.435	99.435	Time WL Surveyed: 9:56	
Temporary BM			2.436	99.434	0.000	
<b>Turn</b>						
Temporary BM	2.416	101.850		99.434		
Water Level:	Cut		2.416	99.434	Time WL Surveyed: 9:58	
S43-3					100.113	3/4" pipe 1m E of data logger
S43-4			1.517	100.333	100.338	3/4" pipe 1m E of data logger
S43-1			1.581	100.269	100.270	3/4" pipe 1m E of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-4	1.518	101.851		100.333		
Water Level:	Cut		2.414	99.437	Time WL Surveyed: 10:51	
Water Level:	Cut		2.399	99.435	Time WL Surveyed: 10:52	
S43-4	1.501	101.834		100.333		

**WL Survey Summary**

Average WL:	99.435	99.436
Closing Error:	0.001	-
WL Check:	0.001	0.002
Transducer Elevation	98.279	98.281

**Field Personnel:**

SM, TR	Trip Date:	26-Jan-14
SM	Date:	26-Jan-14
DW	Date:	23-Apr-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: February 13, 2014  
 Site Visit Time (MST): 09:10

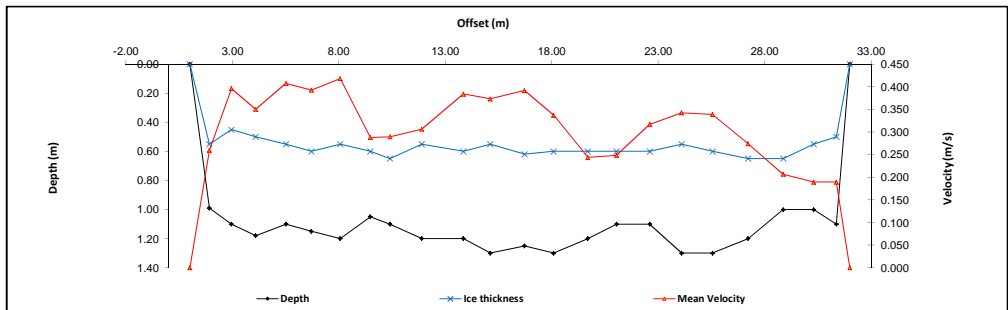


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	0.88	0.46	0.00	0.000	0.00	0.000	
1	1.92	0.99	0.55	0.77	0.295					0.88	0.98	0.44	0.260	0.43	0.112	2%
2	2.96	1.10	0.45	0.78	0.450					0.88	1.09	0.65	0.396	0.71	0.281	5%
3	4.10	1.18	0.50	0.84	0.398					0.88	1.28	0.68	0.350	0.87	0.305	5%
4	5.52	1.10	0.55	0.83	0.463					0.88	1.31	0.55	0.407	0.72	0.292	5%
5	6.71	1.15	0.60	0.88	0.446					0.88	1.28	0.55	0.392	0.70	0.275	5%
6	8.07	1.20	0.55	0.88	0.475					0.88	1.39	0.65	0.418	0.90	0.376	7%
7	9.48	1.05	0.60	0.83	0.327					0.88	1.17	0.45	0.288	0.52	0.151	3%
8	10.40	1.10	0.65	0.88	0.329					0.88	1.21	0.45	0.290	0.54	0.158	3%
9	11.90	1.20	0.55	0.88	0.348					0.88	1.73	0.65	0.306	1.12	0.343	6%
10	13.85	1.20	0.60	0.90	0.436					0.88	1.61	0.60	0.384	0.96	0.369	6%
11	15.11	1.30	0.55	0.93	0.424					0.88	1.44	0.75	0.373	1.08	0.402	7%
12	16.72	1.25	0.62	0.94	0.445					0.88	1.49	0.63	0.392	0.94	0.368	6%
13	18.09	1.30	0.60	0.95	0.383					0.88	1.49	0.70	0.337	1.04	0.352	6%
14	19.70	1.20	0.60	0.90	0.277					0.88	1.48	0.60	0.244	0.88	0.216	4%
15	21.04	1.10	0.60	0.85	0.282					0.88	1.46	0.50	0.248	0.73	0.181	3%
16	22.61	1.10	0.60	0.85	0.360					0.88	1.53	0.50	0.317	0.77	0.242	4%
17	24.10	1.30	0.55	0.93	0.389					0.88	1.47	0.75	0.342	1.10	0.377	7%
18	25.55	1.30	0.60	0.95	0.385					0.88	1.57	0.70	0.339	1.10	0.371	6%
19	27.23	1.20	0.65	0.93	0.311					0.88	1.66	0.55	0.274	0.91	0.250	4%
20	28.87	1.00	0.65	0.83	0.235					0.88	1.54	0.35	0.207	0.54	0.111	2%
21	30.30	1.00	0.55	0.78	0.215					0.88	1.25	0.45	0.189	0.56	0.106	2%
22	31.37	1.10	0.50	0.80	0.215					0.88	0.85	0.60	0.189	0.51	0.096	2%
LB	32.00	0.00	0.00		0.00		0.00		0.00	0.88	0.32	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.73</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 8m US of PT

Meas. Start Time (MST):	9:44
Meas. End Time (MST):	10:13
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -20C



**Flow characteristics:**

Total Flow:	5.73	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	17.64	(m <sup>2</sup> )
Wetted Width:	31.00	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.130	9:44
Water (°C):	0.1	10:13
Precip Gauge Test:	No	
Datalogger Clock:	09:14	
Laptop Clock:	09:11	
Battery (Main):	13.2	
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- #1 element broken off GOES antenna
- BM3 and BM4 frozen under ice, could not survey

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-1	1.697	101.967		100.270	100.270	3/4" pipe 1m E of data logger
S43-3					100.113	3/4" pipe 1m E of data logger
S43-4					100.338	3/4" pipe 1m E of data logger
Water Level:	Cut		2.559	99.408	Time WL Surveyed:	9:38
Temporary BM			2.530	99.437		
<b>Turn</b>						
Temporary BM	2.515	101.952		99.437		
Water Level:	Cut		2.545	99.407	Time WL Surveyed:	9:41
S43-4					100.338	3/4" pipe 1m E of data logger
S43-3					100.113	3/4" pipe 1m E of data logger
S43-1			1.679	100.273	100.270	3/4" pipe 1m E of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.408	-
Closing Error:	-0.003	-
WL Check:	0.001	-
Transducer Elevation	98.278	-

**Field Personnel:**

	SM, MP	Trip Date:	13-Feb-14
Data Entry Personnel:	SM	Date:	13-Feb-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: March 16, 2014  
 Site Visit Time (MST): 13:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000				0.000	0.88	0.61	0.00	0.000	0.00	0.000	
1	1.22	0.95	0.55	0.75	0.399				0.88	1.31	0.40	0.351	0.52	0.183	4%	
2	2.61	1.00	0.50	0.74	0.538				0.88	1.34	0.50	0.473	0.67	0.317	6%	
3	3.90	1.00	0.47	0.74	0.554				0.88	1.30	0.53	0.488	0.69	0.335	7%	
4	5.20	1.10	0.64	0.87	0.519				0.88	1.26	0.46	0.457	0.58	0.265	5%	
5	6.42	1.05	0.70	0.98	0.511				0.88	1.22	0.35	0.450	0.43	0.191	4%	
6	7.63	1.00	0.65	0.83	0.385				0.88	1.13	0.35	0.321	0.40	0.127	2%	
7	8.68	0.95	0.67	0.81	0.376				0.88	1.09	0.28	0.331	0.30	0.101	2%	
8	9.80	1.03	0.70	0.87	0.375				0.88	1.03	0.33	0.330	0.34	0.112	2%	
9	10.74	1.10	0.72	0.91	0.340				0.88	1.00	0.38	0.299	0.38	0.113	2%	
10	11.79	1.25	0.65	0.95	0.331				0.88	1.09	0.60	0.291	0.65	0.190	4%	
11	12.92	1.30	0.66	0.98	0.386				0.88	1.04	0.64	0.340	0.67	0.226	4%	
12	13.87	1.20	0.65	0.93	0.369				0.88	1.04	0.55	0.325	0.57	0.186	4%	
13	15.00	1.30	0.65	0.98	0.432				0.88	1.06	0.65	0.380	0.69	0.261	5%	
14	15.98	1.25	0.70	0.98	0.410				0.88	0.96	0.55	0.361	0.53	0.191	4%	
15	16.92	1.18	0.70	0.94	0.461				0.88	0.90	0.48	0.406	0.43	0.175	3%	
16	17.78	1.05	0.70	0.88	0.406				0.88	0.95	0.35	0.357	0.33	0.119	2%	
17	18.83	1.00	0.71	0.86	0.327				0.88	1.07	0.29	0.288	0.31	0.089	2%	
18	19.91	1.00	0.66	0.83	0.348				0.88	1.24	0.34	0.306	0.42	0.129	3%	
19	21.30	1.08	0.60	0.84	0.393				0.88	1.47	0.48	0.346	0.70	0.243	5%	
20	22.84	1.15	0.65	0.90	0.511				0.88	1.55	0.50	0.450	0.77	0.349	7%	
21	24.40	1.30	0.65	0.98	0.559				0.88	1.57	0.65	0.492	1.02	0.500	10%	
22	25.97	1.10	0.65	0.88	0.481				0.88	2.39	0.45	0.423	1.07	0.454	9%	
23	29.17	1.10	0.72	0.91	0.096				0.88	2.98	0.39	0.084	1.13	0.096	2%	
24	31.92	0.98	0.55	0.77	0.200				0.88	1.97	0.43	0.176	0.84	0.149	3%	
LB	33.10	0.00	0.00		0.00	0.00		0.00	0.88	0.59	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>5.10</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 6m US of FT

Meas. Start Time (MST):	13:47
Meas. End Time (MST):	14:18
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, some open spots
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 7C

**Flow characteristics:**

Total Flow:	5.10	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	14.45	(m <sup>2</sup> )
Wetted Width:	33.10	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.17	

**Logger Details:**

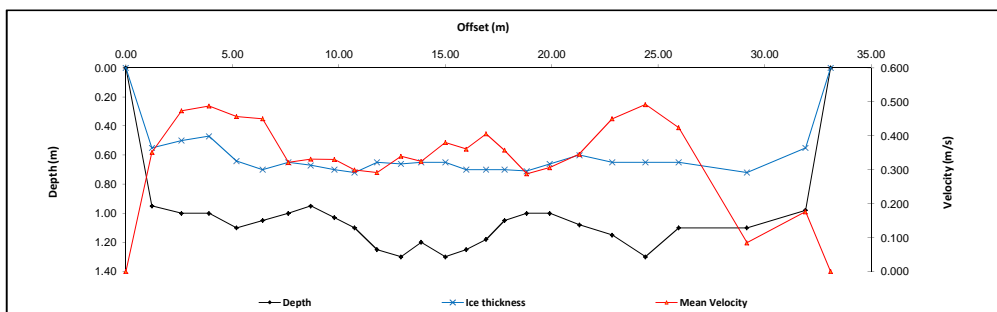
	Before	After
Transducer Reading (m):	1.140	
Water (°C):	0.1	
Precip Gauge Test:		Yes
Datalogger Clock:	13:10	
Laptop Clock:	13:07	
Battery (Main):	14.7	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

- Reinstated precip gauge
- Tested: 0.508 mm

**General Notes:**

- BM3 and BM4 frozen under ice, could not survey



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-1	1.773	102.043		100.270	100.270	3/4" pipe 1m E of data logger
Water Level:	Cut		2.630	99.413	Time WL Surveyed: 13:41	
Temporary BM			2.646	99.397	0.000	
<b>Turn</b>						
Temporary BM	2.632	102.029		99.397	-	
Water Level:	Cut		2.617	99.412	Time WL Surveyed: 13:43	
S43-1			1.758	100.271	100.270	3/4" pipe 1m E of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.413	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	98.273	-

**Field Personnel:**

	SM, MP	Trip Date:	16-Mar-14
Data Entry Personnel:	SM	Date:	16-Mar-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: April 5, 2014  
 Site Visit Time (MST): 11:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000				0.000	0.88	0.50	0.00	0.000	0.00	0.000	
1	2.00	1.00	0.55	0.78	0.370					0.88	1.10	0.45	0.326	0.50	0.161	3%
2	3.20	1.10	0.76	0.93	0.090					0.88	1.25	0.34	0.079	0.43	0.034	1%
3	4.50	1.11	0.75	0.93	0.299					0.88	1.40	0.36	0.263	0.50	0.133	3%
4	6.00	1.20	0.75	0.98	0.570					0.88	1.25	0.45	0.502	0.56	0.282	6%
5	7.00	1.20	0.73	0.97	0.735					0.88	1.00	0.47	0.647	0.47	0.304	6%
6	8.00	1.30	0.70	1.00	0.711					0.88	1.30	0.60	0.626	0.78	0.488	10%
7	9.60	1.10	0.70	0.90	0.652					0.88	1.50	0.40	0.574	0.60	0.344	7%
8	11.00	1.02	0.65	0.84	0.433					0.88	1.35	0.37	0.381	0.50	0.190	4%
9	12.30	1.00	0.75	0.88	0.339					0.88	1.20	0.25	0.298	0.30	0.089	2%
10	13.40	0.90	0.75	0.83	0.290					0.88	1.10	0.15	0.255	0.17	0.042	1%
11	14.50	1.08	0.72	0.90	0.331					0.88	0.90	0.36	0.291	0.32	0.094	2%
12	15.20	1.12	0.70	0.91	0.376					0.88	0.85	0.42	0.331	0.36	0.118	2%
13	16.20	1.19	0.70	0.95	0.405					0.88	0.95	0.49	0.356	0.47	0.166	3%
14	17.10	1.20	0.67	0.94	0.318					0.88	0.90	0.53	0.280	0.48	0.133	3%
15	18.00	1.18	0.68	0.93	0.367					0.88	0.90	0.50	0.323	0.45	0.145	3%
16	18.90	1.18	0.70	0.94	0.351					0.88	1.10	0.48	0.309	0.53	0.163	3%
17	20.20	1.11	0.68	0.90	0.337					0.88	1.35	0.43	0.297	0.58	0.172	4%
18	21.60	1.01	0.66	0.84	0.185					0.88	1.65	0.35	0.163	0.58	0.094	2%
19	23.50	1.02	0.75	0.89	0.222					0.88	1.65	0.27	0.195	0.45	0.087	2%
20	24.90	0.89	0.71	0.80	0.362					0.88	1.40	0.18	0.319	0.25	0.080	2%
21	26.30	0.99	0.67	0.83	0.516					0.88	1.40	0.32	0.454	0.45	0.203	4%
22	27.70	1.12	0.55	0.84	0.696					0.88	1.10	0.57	0.612	0.63	0.384	8%
23	28.50	1.01	0.50	0.76	0.692					0.88	1.05	0.51	0.609	0.54	0.326	7%
24	29.80	0.98	0.35	0.67	0.710					0.88	1.25	0.63	0.625	0.79	0.492	10%
25	31.00	0.90	0.52	0.71	0.407					0.88	1.10	0.38	0.358	0.42	0.150	3%
RB	32.00	0.00	0.00		0.00		0.00		0.00	0.88	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>4.88</b>	<b>0.000</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):

Meas. Start Time (MST):	12:25
Meas. End Time (MST):	13:11
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -2C

**Flow characteristics:**

Total Flow:	4.88	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.07	(m²)
Wetted Width:	31.00	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.40	(m/s)
Froude Number:	0.21	

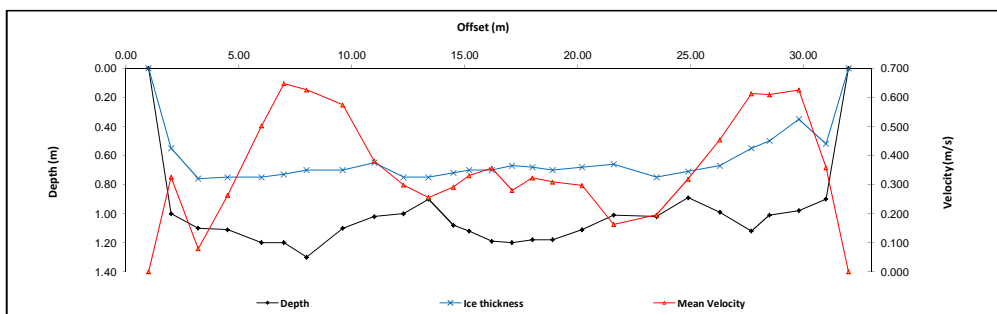
**Logger Details:**

	Before	After
Transducer Reading (m):	1.131	
Water (°C):	0.1	
Precip Gauge Test:	-	
Datalogger Clock:	11:46	
Laptop Clock:	11:43	
Battery (Main):	14.9	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- BM3 and BM4 frozen under ice, could not survey



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-01	1.871	102.141		100.270	100.270	3/4" pipe 1 m S of data logger
				99.448		
Water Level:	Cut		2.744	99.397	Time WL Surveyed:	12:17
Temporary BM			2.693	99.448		
<b>Turn</b>						
Temporary BM	2.677	102.125		99.448		
Water Level:	Cut		2.731	99.394	Time WL Surveyed:	12:23
S43-01			1.854	100.271	100.270	3/4" pipe 1 m S of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.396	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	98.265	-

**Field Personnel:**

SM, CJ	Trip Date:	5-Apr-14
SM	Date:	5-Apr-14
DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

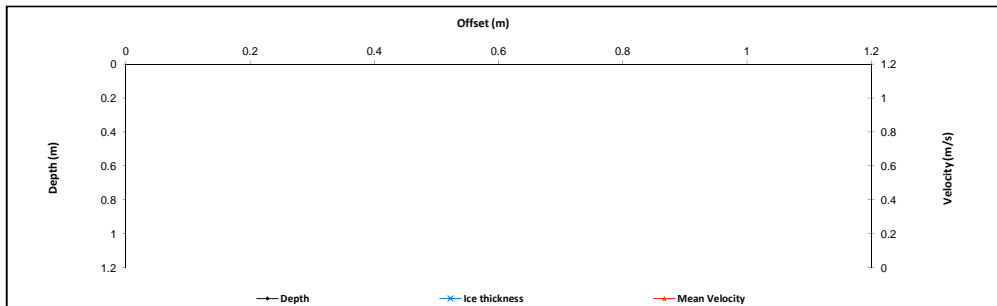
Site Visit Date: May 25, 2014  
 Site Visit Time (MST): 07:50



Measured Data										Calculated Data							
Bank/ Mrrt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	-
Meas. End Time (MST):	-
Equipment:	-
Method:	-
River Condition:	-
Channel Edges:	-
Quality/Error (see reverse):	-
Weather:	Clear, calm, 15C



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.205	-
Water (°C):	11.6	-
Precip Gauge Test:	-	Yes
Datalogger Clock:	07:55	-
Laptop Clock:	07:58	-
Battery (Main):	14.6	-
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 -Front bottom prong missing on GOES antenna

**General Notes:**  
 no flow measurement possible due to high flow conditions

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-1	1.449	101.719		100.270	100.270	3/4" pipe 1 m S of data logger
S43-4			1.387	100.332	100.338	3/4" pipe 1m E of data logger
S43-3			1.607	100.112	100.113	3/4" pipe 5m N of data logger
Water Level:	Cut		2.248	99.471	Time WL Surveyed: 8:12	
Temporary BM			1.973	99.746	0.000	
<b>Turn</b>						
Temporary BM	1.928	101.674		99.746		
Water Level:	Cut		2.202	99.472	Time WL Surveyed: 8:14	
S43-3			1.561	100.113	100.113	3/4" pipe 5m N of data logger
S43-4			1.339	100.335	100.338	3/4" pipe 1m E of data logger
S43-1			1.404	100.270	100.270	3/4" pipe 1 m S of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.472	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	98.267	-

**Field Personnel:**

	TR, CJ	Trip Date:	25-May-14
Data Entry Personnel:	TR	Date:	25-May-14
Data Check Personnel:	CJ	Date:	5-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: June 17, 2014  
 Site Visit Time (MST): 08:20

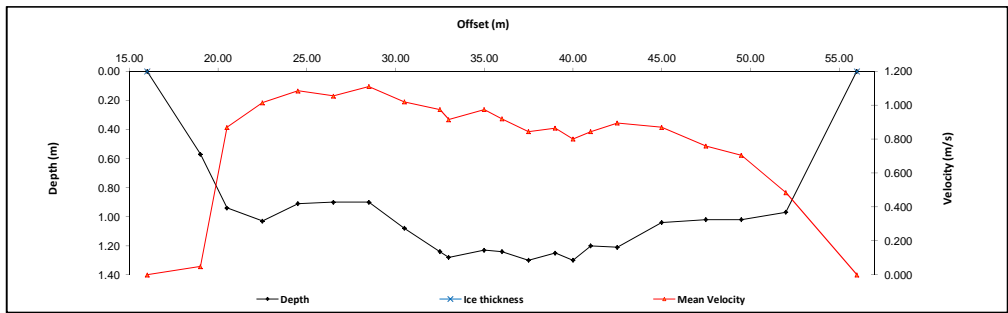


Measured Data										Calculated Data					
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	56.00	0.00	0.00		0.000				0.000	1.00	2.00	0.000	0.00	0.000	
1	52.00	0.97				0.78	0.370	0.19	0.600	1.00	3.25	0.97	3.15	1.529	5%
2	49.50	1.02				0.82	0.630	0.20	0.780	1.00	2.25	1.02	2.30	1.618	5%
3	47.50	1.02				0.82	0.650	0.20	0.870	1.00	2.25	1.02	2.30	1.744	5%
4	45.00	1.04				0.83	0.720	0.21	1.020	1.00	2.50	1.04	2.60	2.262	7%
5	42.50	1.21				0.97	0.810	0.24	0.980	1.00	2.00	1.21	2.42	2.166	7%
6	41.00	1.20				0.96	0.708	0.24	0.980	1.00	1.25	1.20	1.50	1.266	4%
7	40.00	1.30				1.04	0.670	0.26	0.932	1.00	1.00	1.30	1.30	1.041	3%
8	39.00	1.25				1.00	0.740	0.25	0.990	1.00	1.25	1.25	1.56	1.352	4%
9	37.50	1.30				1.04	0.680	0.26	1.010	1.00	1.50	1.30	1.95	1.648	5%
10	36.00	1.24				0.99	0.780	0.25	1.060	1.00	1.25	1.24	1.55	1.426	4%
11	35.00	1.23				0.98	0.840	0.25	1.110	1.00	1.50	1.23	1.85	1.799	6%
12	33.00	1.28				1.02	0.770	0.26	1.060	1.00	1.25	1.28	1.60	1.464	5%
13	32.50	1.24				0.99	0.840	0.25	1.110	1.00	1.25	1.24	1.55	1.511	5%
14	30.50	1.08				0.86	0.850	0.22	1.190	1.00	2.00	1.08	2.16	2.203	7%
15	28.50	0.90				0.72	0.970	0.18	1.250	1.00	2.00	0.90	1.80	1.998	6%
16	26.50	0.90				0.72	0.860	0.18	1.250	1.00	2.00	0.90	1.80	1.899	6%
17	24.50	0.91				0.73	0.880	0.18	1.290	1.00	2.00	0.91	1.82	1.975	6%
18	22.50	1.03				0.82	0.910	0.21	1.120	1.00	2.00	1.03	2.06	2.091	6%
19	20.50	0.94				0.82	0.740	0.19	1.000	1.00	1.75	0.94	1.65	1.431	4%
20	19.00	0.57		0.34	0.049					1.00	2.25	0.57	1.28	0.063	0%
LB	16.00	0.00	0.00		0.00				0.00	1.00	1.50	0.00	0.00	0.000	
<b>Total Flow</b>													<b>32.5</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m US of PT

Meas. Start Time (MST):	9:46
Meas. End Time (MST):	11:17
Equipment:	ADC
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 18C



**Flow characteristics:**

Total Flow:	32.5	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	38.19	(m²)
Wetted Width:	40.00	(m)
Hydraulic Depth:	0.95	(m)
Mean Velocity:	0.85	(m/s)
Froude Number:	0.28	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.135	1.130
Water (°C):	16.0	16.6
Precip Guage Test:		Yes
Datalogger Clock:	08:34	11:48
Laptop Clock:	08:31	11:45
Battery (Main):	13.9	14.4
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- TBRG found on angle, was re-levelled

**General Notes:**

- PT s/n: 252795

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-01	1.332	101.602		100.270	100.270	3/4" pipe 1 m S of data logger
S43-04			1.267	100.335	100.338	3/4" pipe 1m E of data logger
S43-03			1.488	100.114	100.113	3/4" pipe 5m N of data logger
Water Level:	Cut		2.199	99.403	Time WL Surveyed: 8:45	
Temporary BM			1.854	99.748	0.000	
<b>Turn</b>						
Temporary BM	1.815	101.563		99.748		
Water Level:	Cut		2.159	99.404	Time WL Surveyed: 8:46	
S43-03			1.449	100.114	100.113	3/4" pipe 5m N of data logger
S43-04			1.228	100.335	100.338	3/4" pipe 1m E of data logger
S43-01			1.293	100.270	100.270	3/4" pipe 1 m S of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-04	1.433	101.547		100.114		
Water Level:	Cut		2.144	99.403	Time WL Surveyed: 11:57	
Water Level:	Cut		2.123	99.404	Time WL Surveyed: 11:57	
S43-04	1.413	101.527		100.114		

**WL Survey Summary**

	Before	After
Average WL:	99.404	99.404
Closing Error:	0.000	-
WL Check:	0.001	-0.001
Transducer Elevation	98.269	98.274

**Field Personnel:**

	MP, DW	Trip Date:	17-Jun-14
Data Entry Personnel:	MP, DW	Date:	17-Jun-14
Data Check Personnel:	DW	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: August 12, 2014  
 Site Visit Time (MST): 07:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	68.10	0.00	0.00		0.000		0.000		0.000	1.00	1.05	0.00	0.000	0.00	0.000	
1	66.00	0.50		0.30	0.058					1.00	1.80	0.50	0.058	0.90	0.052	1%
2	64.50	0.55		0.33	0.120					1.00	1.50	0.55	0.120	0.83	0.099	2%
3	63.00	0.65		0.39	0.241					1.00	1.50	0.65	0.241	0.98	0.235	4%
4	61.50	0.75		0.45	0.279					1.00	1.50	0.75	0.279	1.13	0.314	5%
5	60.00	0.80				0.64	0.096	0.16	0.345	1.00	1.50	0.80	0.221	1.20	0.265	5%
6	58.50	0.84				0.67	0.149	0.17	0.277	1.00	1.50	0.84	0.213	1.26	0.268	5%
7	57.00	0.82				0.66	0.093	0.16	0.259	1.00	1.50	0.82	0.176	1.23	0.216	4%
8	55.50	0.84				0.67	0.134	0.17	0.296	1.00	1.50	0.84	0.215	1.26	0.271	5%
9	54.00	0.98				0.78	0.091	0.20	0.314	1.00	1.50	0.98	0.203	1.47	0.298	5%
10	52.50	0.94				0.75	0.178	0.19	0.295	1.00	1.50	0.94	0.237	1.41	0.333	6%
11	51.00	0.92				0.74	0.226	0.18	0.338	1.00	1.50	0.92	0.282	1.38	0.389	7%
12	49.50	0.96				0.77	0.199	0.19	0.364	1.00	1.50	0.96	0.282	1.44	0.405	7%
13	48.00	0.90				0.72	0.123	0.18	0.289	1.00	1.50	0.90	0.206	1.35	0.278	5%
14	46.50	0.84				0.67	0.130	0.17	0.289	1.00	1.50	0.84	0.210	1.26	0.264	5%
15	45.00	0.79				0.63	0.190	0.16	0.330	1.00	1.50	0.79	0.260	1.19	0.308	5%
16	43.50	0.77				0.62	0.276	0.15	0.442	1.00	1.50	0.77	0.359	1.16	0.415	7%
17	42.00	0.84				0.67	0.283	0.17	0.459	1.00	1.50	0.84	0.371	1.26	0.467	8%
18	40.50	0.74		0.44	0.302					1.00	1.50	0.74	0.302	1.11	0.335	6%
19	39.00	0.54		0.32	0.303					1.00	1.50	0.54	0.303	0.81	0.245	4%
20	37.50	0.50		0.30	0.246					1.00	1.50	0.50	0.246	0.75	0.185	3%
21	36.00	0.45		0.27	0.158					1.00	1.50	0.45	0.158	0.68	0.107	2%
22	34.50	0.46		0.28	0.013					1.00	2.00	0.46	0.013	0.92	0.012	0%
LB	32.00	0.00	0.00		0.00		0.00		0.00	1.00	1.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.76</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m US of FT

Meas. Start Time (MST):	9:23
Meas. End Time (MST):	10:10
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 26C

**Flow characteristics:**

Total Flow:	5.76	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	24.95	(m <sup>2</sup> )
Wetted Width:	36.10	(m)
Hydraulic Depth:	0.69	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.09	

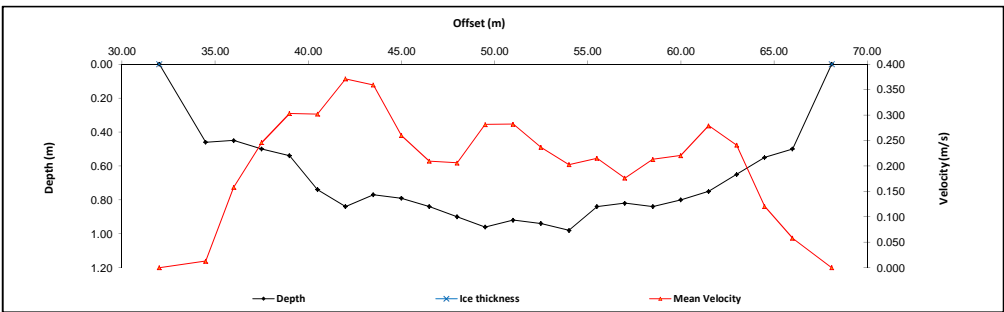
**Logger Details:**

	Before	After
Transducer Reading (m):	0.701	0.701
Water (°C):	17.6	18.6
Precip Guage Test:		No
Datalogger Clock:	08:02	10:20
Laptop Clock:	08:02	10:20
Battery (Main):	14.5	14.2
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- BM 5 installed: lag bolt in conifer 20 m W of logger

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-01	1.403	101.673		100.270	100.270	3/4" pipe 1 m S of data logger
S43-03			1.560	100.113	100.113	3/4" pipe 5m N of data logger
S43-04			1.338	100.335	100.338	3/4" pipe 1m E of data logger
S43-05			0.150	101.523		Lag bolt 20m W new
Water Level:	Cut			98.971	Time WL Surveyed:	9:04
Temporary BM			1.926	99.747	0.000	-
<b>Turn</b>						
Temporary BM	1.919	101.666		99.747		
Water Level:	Cut		2.692	98.974	Time WL Surveyed:	9:05
S43-05			0.144	101.522		Lag bolt 20m W new
S43-04			1.332	100.334	100.338	3/4" pipe 1m E of data logger
S43-03			1.554	100.112	100.113	3/4" pipe 5m N of data logger
S43-01			1.396	100.270	100.270	3/4" pipe 1 m S of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-03	1.553	101.666		100.113		
Water Level:	Cut		2.693	98.973	Time WL Surveyed:	10:14
Water Level:	Cut		2.678	98.973	Time WL Surveyed:	10:15
S43-03	1.538	101.651		100.113		

**WL Survey Summary**

	Before	After
Average WL:	98.973	98.973
Closing Error:	0.000	-
WL Check:	0.003	0.000
Transducer Elevation	98.272	98.272

**Field Personnel:**

	CJ, MP	Trip Date:	12-Aug-14
Data Entry Personnel:	CJ	Date:	12-Aug-14
Data Check Personnel:	GG	Date:	14-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: September 12, 2014  
 Site Visit Time (MST): 07:45



Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.90	0.00	0.00		0.000				0.000	1.00	0.80	0.00	0.000	0.00	0.000	
1	4.50	0.13		0.08	0.074					1.00	1.55	0.21	0.074	0.20	0.015	0%
2	6.00	0.21		0.13	0.163					1.00	1.50	0.21	0.163	0.32	0.058	1%
3	7.50	0.20		0.12	0.063					1.00	1.50	0.20	0.063	0.30	0.019	0%
4	9.00	0.29		0.17	0.158					1.00	1.50	0.29	0.158	0.44	0.069	1%
5	10.50	0.36		0.22	0.269					1.00	1.50	0.36	0.269	0.54	0.145	3%
6	12.00	0.37		0.22	0.433					1.00	1.50	0.37	0.433	0.56	0.240	4%
7	13.50	0.40		0.24	0.484					1.00	1.50	0.40	0.484	0.60	0.290	5%
8	15.00	0.31		0.19	0.413					1.00	1.50	0.31	0.413	0.47	0.192	3%
9	16.50	0.54		0.32	0.509					1.00	1.50	0.54	0.509	0.81	0.412	7%
10	18.00	0.55		0.33	0.569					1.00	1.50	0.55	0.569	0.83	0.469	8%
11	19.50	0.55		0.33	0.703					1.00	1.50	0.55	0.703	0.83	0.580	10%
12	21.00	0.55		0.33	0.728					1.00	1.50	0.55	0.728	0.83	0.601	10%
13	22.50	0.60		0.36	0.507					1.00	1.50	0.60	0.507	0.90	0.456	8%
14	24.00	0.53		0.32	0.634					1.00	1.50	0.53	0.634	0.80	0.504	9%
15	25.50	0.48		0.29	0.632					1.00	1.50	0.48	0.632	0.72	0.455	8%
16	27.00	0.53		0.32	0.521					1.00	1.50	0.53	0.521	0.80	0.414	7%
17	28.50	0.24		0.14	0.644					1.00	1.50	0.24	0.644	0.36	0.232	4%
18	30.00	0.44		0.26	0.410					1.00	1.50	0.44	0.410	0.66	0.271	5%
19	31.50	0.35		0.21	0.433					1.00	1.50	0.35	0.433	0.53	0.227	4%
20	33.00	0.28		0.17	0.279					1.00	1.50	0.28	0.279	0.42	0.117	2%
RB	34.50	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.77</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 - 40m DS of station

Meas. Start Time (MST):	8:35
Meas. End Time (MST):	8:55
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 6C

**Flow characteristics:**

Total Flow:	5.77	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.87	(m <sup>2</sup> )
Wetted Width:	31.60	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.49	(m/s)
Froude Number:	0.25	

**Logger Details:**

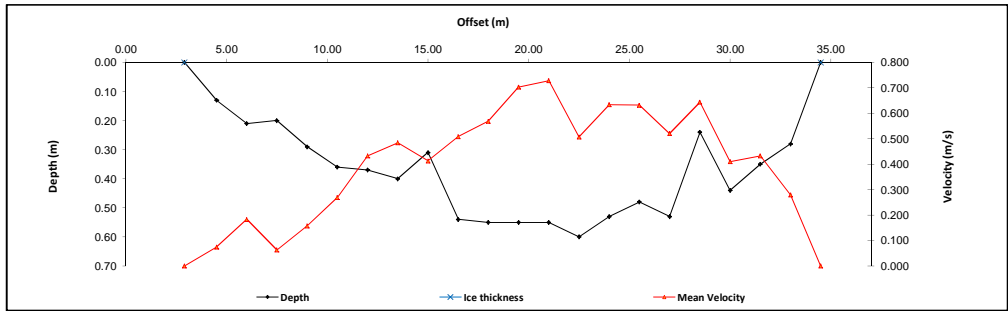
	Before	After
Transducer Reading (m):	0.696	0.695
Water (°C):	7.3	7.4
Precip Guage Test:		Yes
Datalogger Clock:	07:53	09:12
Laptop Clock:	07:54	09:13
Battery (Main):	13.4	14.7
Battery:		Good
Battery Serial #:	-	-
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
**added new program**

- Missing prong on GOES antenna
- Sent new program to logger
- Installed enclosure vent
- Fixed tipping bucket
- Installed BM4 tag

**General Notes:**

- Cobbles and vegetation in stream



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-01	1.457	101.727		100.270	100.270	3/4" pipe 1 m S of data logger
S43-03			1.614	100.113	100.113	3/4" pipe 5m N of data logger
S43-04			1.394	100.333	100.338	3/4" pipe 1m E of data logger
S43-05			0.203	101.524	0.000	Lag bolt in confiner 20m W of logger
Water Level:	<b>Cut</b>		2.752	98.975	<b>Time WL Surveyed:</b> 8:15	
S43-04			1.614	100.113	100.338	3/4" pipe 1m E of data logger
<b>Turn</b>						
S43-04	1.637	101.750		100.113	100.338	3/4" pipe 1m E of data logger
Water Level:	<b>Cut</b>		2.774	98.976	<b>Time WL Surveyed:</b> 8:17	
S43-05			0.227	101.523		Lag bolt in confiner 20m W of logger
S43-04			1.417	100.333	100.338	3/4" pipe 1m E of data logger
S43-03			1.637	100.113	100.113	3/4" pipe 5m N of data logger
S43-01			1.479	100.271	100.270	3/4" pipe 1 m S of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-03	1.636	101.749		100.113		
Water Level:	<b>Cut</b>		2.775	98.974	<b>Time WL Surveyed:</b> 9:03	
Water Level:	<b>Cut</b>		2.801	98.973	<b>Time WL Surveyed:</b> 9:07	
S43-03	1.661	101.774		100.113		

**WL Survey Summary**

	Before	After
Average WL:	98.976	98.974
Closing Error:	-0.001	-
WL Check:	0.001	0.001
Transducer Elevation	98.280	98.279

**Field Personnel:**

TR, GG	Trip Date:	12-Sep-14	
Data Entry Personnel:	TR	Date:	12-Sep-14
Data Check Personnel:	DW	Date:	1-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: October 15, 2014  
 Site Visit Time (MST): 08:00

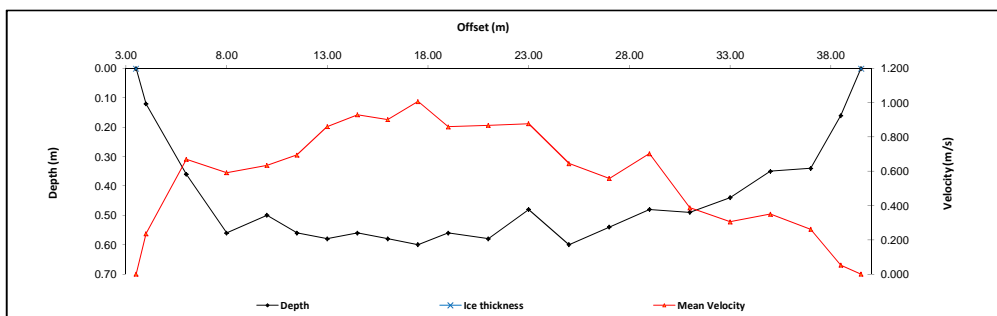


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.50	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	4.00	0.12		0.07	0.236					1.00	1.25	0.12	0.236	0.15	0.035	0%
2	6.00	0.36		0.22	0.670					1.00	2.00	0.36	0.670	0.72	0.482	4%
3	8.00	0.56		0.34	0.592					1.00	2.00	0.56	0.592	1.12	0.663	6%
4	10.00	0.50		0.30	0.635					1.00	1.75	0.50	0.635	0.88	0.556	5%
5	11.50	0.56		0.34	0.696					1.00	1.50	0.56	0.696	0.84	0.585	5%
6	13.00	0.58		0.35	0.861					1.00	1.50	0.58	0.861	0.87	0.749	7%
7	14.50	0.56		0.34	0.930					1.00	1.50	0.56	0.930	0.84	0.781	7%
8	16.00	0.58		0.35	0.902					1.00	1.50	0.58	0.902	0.87	0.785	7%
9	17.50	0.60		0.36	1.008					1.00	1.50	0.60	1.008	0.90	0.907	8%
10	19.00	0.56		0.34	0.860					1.00	1.75	0.56	0.860	0.98	0.843	7%
11	21.00	0.58		0.35	0.868					1.00	2.00	0.58	0.868	1.16	1.007	9%
12	23.00	0.48		0.29	0.878					1.00	2.00	0.48	0.878	0.96	0.843	7%
13	25.00	0.60		0.36	0.645					1.00	2.00	0.60	0.645	1.20	0.774	7%
14	27.00	0.54		0.32	0.558					1.00	2.00	0.54	0.558	1.08	0.603	5%
15	29.00	0.48		0.29	0.703					1.00	2.00	0.48	0.703	0.96	0.675	6%
16	31.00	0.49		0.29	0.387					1.00	2.00	0.49	0.387	0.98	0.379	3%
17	33.00	0.44		0.26	0.305					1.00	2.00	0.44	0.305	0.88	0.268	2%
18	35.00	0.35		0.21	0.350					1.00	2.00	0.35	0.350	0.70	0.245	2%
19	37.00	0.34		0.20	0.261					1.00	1.75	0.34	0.261	0.60	0.155	1%
20	38.50	0.16		0.10	0.052					1.00	1.25	0.16	0.052	0.20	0.010	0%
LB	39.50	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>11.3</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
50m DS of station

Meas. Start Time (MST):	8:45
Meas. End Time (MST):	9:15
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, 4C



**Flow characteristics:**

Total Flow:	11.3	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	16.88	(m <sup>2</sup> )
Wetted Width:	36.00	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.67	(m/s)
Froude Number:	0.31	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.805	0.805
Water (°C):	6.1	6.1
Precip Gauge Test:		Yes
Datalogger Clock:	08:14	09:24
Laptop Clock:	08:10	09:20
Battery (Main):	12.9	13.9
Battery:		Replaced
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Changed BM3 and 4 label tags
- Tipping bucket was at angle, repositioned and secured

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-01	1.422	101.692		100.270	100.270	3/4" pipe 1 m S of data logger
S43-03			1.586	100.106	100.113	3/4" pipe 5m N of data logger
S43-04			1.356	100.336	100.338	3/4" pipe 1m E of data logger
S43-05			0.168	101.524	0.000	Lag bolt 20m N of station
Water Level:	Cut		2.613	99.079	Time WL Surveyed:	8:15
Temporary BM			1.944	99.748	0.000	
<b>Turn</b>						
Temporary BM	1.925	101.673		99.748		
Water Level:	Cut		2.595	99.079	Time WL Surveyed:	8:18
S43-05			0.149	101.524		Lag bolt 20m N of station
S43-04			1.338	100.336	100.338	3/4" pipe 1m E of data logger
S43-03			1.567	100.106	100.113	3/4" pipe 5m N of data logger
S43-01			1.402	100.271	100.270	3/4" pipe 1 m S of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-03	1.566	101.672		100.106		
Water Level:	Cut		2.597	99.075	Time WL Surveyed:	9:40
S43-03	Cut		2.580	99.079	Time WL Surveyed:	9:41
S43-03	1.553	101.659		100.106		

**WL Survey Summary**

	Before	After
Average WL:	99.079	99.077
Closing Error:	-0.001	-
WL Check:	0.001	-0.004
Transducer Elevation	98.274	98.272

**Field Personnel:**

MP, DW	Trip Date:	15-Oct-14
MP, DW	Date:	15-Oct-14
MP	Date:	18-Nov-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S43 - Firebag River Upstream of Suncor Firebag  
 UTM Location: 531528 E, 6354782 N

Site Visit Date: December 9, 2014  
 Site Visit Time (MST): 11:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	1.60	0.92	0.34	0.63	0.124					0.88	0.85	0.58	0.109	0.49	0.054	1%
2	2.70	0.98	0.34	0.66	0.214					0.88	1.20	0.64	0.188	0.77	0.145	3%
3	4.00	0.82	0.35	0.59	0.224					0.88	1.30	0.47	0.197	0.61	0.120	2%
4	5.30	0.79	0.35	0.57	0.009					0.88	1.40	0.44	0.008	0.62	0.005	0%
5	6.80	0.98	0.30	0.64	0.144					0.88	1.15	0.68	0.127	0.78	0.099	2%
6	7.60	1.16	0.30			0.99	0.322	0.47	0.343	1.00	0.95	0.86	0.333	0.82	0.272	5%
7	8.70	1.25	0.33			1.07	0.51			0.88	1.40	0.92	0.334	1.29	0.430	8%
8	10.40	1.40	0.30			1.18	0.297	0.52	0.236	1.00	1.55	1.10	0.267	1.71	0.454	9%
9	11.80	1.46	0.25			1.22	0.263	0.49	0.202	1.00	1.40	1.21	0.133	1.69	0.224	4%
10	13.20	1.35	0.25			1.13	0.352	0.47	0.001	1.00	1.55	1.10	0.177	1.71	0.301	6%
11	14.90	1.35	0.25			1.13	0.238	0.47	0.354	1.00	1.50	1.10	0.296	1.65	0.488	10%
12	16.20	1.25	0.25			1.05	0.153	0.45	0.255	1.00	1.15	1.00	0.204	1.15	0.235	5%
13	17.20	1.22	0.26			1.03	0.213	0.45	0.256	1.00	1.00	0.96	0.235	0.96	0.225	4%
14	18.20	1.18	0.25			0.99	0.167	0.44	0.204	1.00	1.05	0.93	0.186	0.98	0.181	4%
15	19.30	1.10	0.25			0.93	0.128	0.42	0.139	1.00	1.05	0.85	0.134	0.89	0.119	2%
16	20.30	1.10	0.25			0.93	0.125	0.42	0.146	1.00	1.00	0.85	0.136	0.85	0.115	2%
17	21.30	1.10	0.26			0.93	0.204	0.43	0.177	1.00	1.10	0.84	0.191	0.92	0.176	3%
18	22.50	1.09	0.25			0.92	0.252	0.42	0.302	1.00	1.25	0.84	0.277	1.05	0.291	6%
19	23.80	1.01	0.26	0.64	0.392					0.88	1.20	0.75	0.345	0.90	0.310	6%
20	24.90	0.97	0.27	0.62	0.336					0.88	1.15	0.70	0.296	0.80	0.238	5%
21	26.10	0.92	0.30	0.61	0.315					0.88	1.50	0.62	0.277	0.93	0.258	5%
22	27.90	0.83	0.32	0.58	0.213					0.88	1.90	0.51	0.187	0.97	0.182	4%
23	29.90	0.76	0.35	0.56	0.203					0.88	2.05	0.41	0.179	0.84	0.150	3%
LB	32.00	0.00	0.00		0.00		0.00		0.00	0.88	1.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.07</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
8m US of logger

Meas. Start Time (MST):	12:13
Meas. End Time (MST):	12:57
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, -2C

**Flow characteristics:**

Total Flow:	5.07	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	23.38	(m <sup>2</sup> )
Wetted Width:	31.00	(m)
Hydraulic Depth:	0.75	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.08	

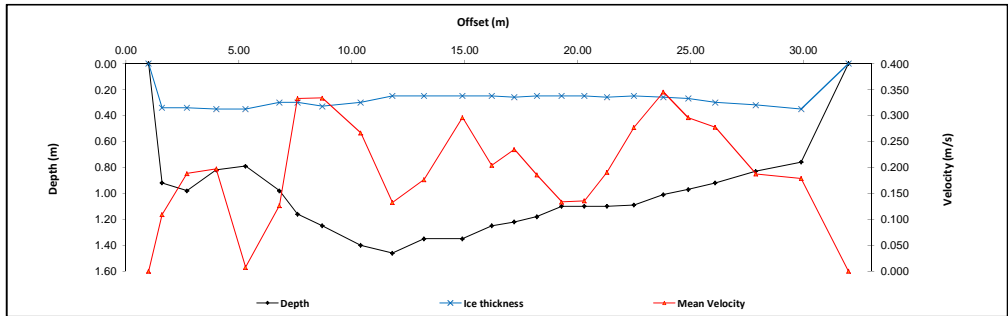
**Logger Details:**

	Before	After
Transducer Reading (m):	0.926	-
Water (°C):	0.2	-
Precip Guage Test:	No	-
Datalogger Clock:	11:36	-
Laptop Clock:	11:36	-
Battery (Main):	13.4	-
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Removed tipping bucket for maintenance

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-01	1.516	101.786		100.270	100.270	3/4" pipe 1 m S of data logger
S43-05			0.271	101.515		Bolt in tree
S43-04			1.457	100.329	100.338	3/4" pipe 1m E of data logger
S43-03			1.680	100.106	100.113	3/4" pipe 5m N of data logger
Water Level:	Cut		2.592	99.194	Time WL Surveyed:	12:01
Temporary BM			2.521	99.265	0.000	-
<b>Turn</b>						
Temporary BM	2.508	101.773		99.265		-
Water Level:	Cut		2.581	99.192	Time WL Surveyed:	12:04
S43-03			1.668	100.105	100.113	3/4" pipe 5m N of data logger
S43-04			1.445	100.328	100.338	3/4" pipe 1m E of data logger
S43-05			0.263	101.510		Bolt in tree
S43-01			1.505	100.268	100.270	3/4" pipe 1 m S of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	99.193	-
Closing Error:	0.002	-
WL Check:	0.002	-
Transducer Elevation	98.267	-

**Field Personnel:**

SM, CJ	Trip Date:	9-Dec-14
CJ	Date:	9-Dec-14
MP	Date:	26-Jan-15
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: April 29, 2014  
 Site Visit Time (MST): 10:30

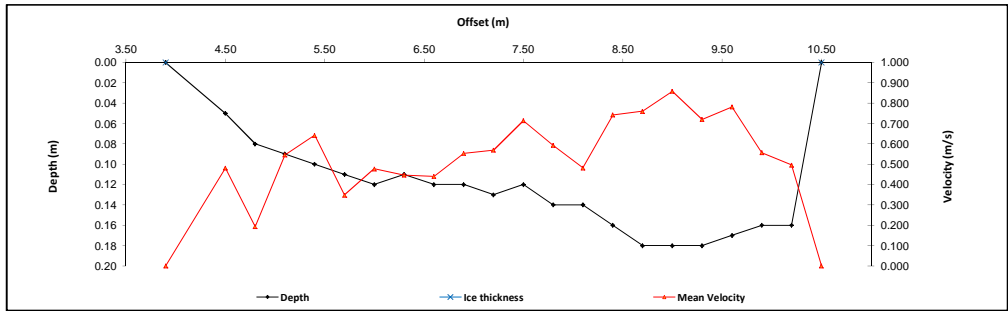


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.90	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	4.50	0.05		0.03	0.481					1.00	0.45	0.05	0.481	0.02	0.011	2%
2	4.90	0.08		0.05	0.193					1.00	0.30	0.08	0.193	0.02	0.005	1%
3	5.10	0.09		0.05	0.546					1.00	0.30	0.09	0.546	0.03	0.015	3%
4	5.40	0.10		0.06	0.642					1.00	0.30	0.10	0.642	0.03	0.019	4%
5	5.70	0.11		0.07	0.348					1.00	0.30	0.11	0.348	0.03	0.011	2%
6	6.00	0.12		0.07	0.477					1.00	0.30	0.12	0.477	0.04	0.017	4%
7	6.30	0.11		0.07	0.447					1.00	0.30	0.11	0.447	0.03	0.015	3%
8	6.60	0.12		0.07	0.440					1.00	0.30	0.12	0.440	0.04	0.016	3%
9	6.90	0.12		0.07	0.553					1.00	0.30	0.12	0.553	0.04	0.020	4%
10	7.20	0.13		0.08	0.569					1.00	0.30	0.13	0.569	0.04	0.022	5%
11	7.50	0.12		0.07	0.714					1.00	0.30	0.12	0.714	0.04	0.026	5%
12	7.80	0.14		0.08	0.593					1.00	0.30	0.14	0.593	0.04	0.025	5%
13	8.10	0.14		0.08	0.482					1.00	0.30	0.14	0.482	0.04	0.020	4%
14	8.40	0.16		0.10	0.742					1.00	0.30	0.16	0.742	0.05	0.036	8%
15	8.70	0.18		0.11	0.760					1.00	0.30	0.18	0.760	0.05	0.041	9%
16	9.00	0.18		0.11	0.858					1.00	0.30	0.18	0.858	0.05	0.046	10%
17	9.30	0.18		0.11	0.720					1.00	0.30	0.18	0.720	0.05	0.039	8%
18	9.60	0.17		0.10	0.781					1.00	0.30	0.17	0.781	0.05	0.040	8%
19	9.90	0.16		0.10	0.557					1.00	0.30	0.16	0.557	0.05	0.027	6%
20	10.20	0.16		0.10	0.496					1.00	0.30	0.16	0.496	0.05	0.024	5%
LB	10.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.474</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -5m DS of PT

Meas. Start Time (MST):	9:50
Meas. End Time (MST):	10:15
Equipment:	ADV
Method:	Wading
River Condition:	Flow over ice
Channel Edges:	Trapezoidal Edge (e.g., stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 8C



**Flow characteristics:**

Total Flow:	0.474	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.79	(m <sup>2</sup> )
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.12	(m)
Mean Velocity:	0.60	(m/s)
Froude Number:	0.55	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.195	
Water (°C):	0.2	
Datalogger Clock:	10:34	
Laptop Clock:	10:34	
Battery (Main):	13.3	
Battery:		New
Battery Serial #:	1305002	
Enclosure Dessiccant:		New
Vent Tube Dessiccant:		New
PT# (if replaced):	278515	
Logger# (if replaced):	16117	

**Datalogger / Station Notes:**

- Cleared fallen tree from station area
- Replaced solar controller

**General Notes:**

- Ice remains, unsure if stream is frozen to depth, measured overflow, grade MMT as "ice"
- Ice bridge upstream of station
- PT installed on top of ice

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-02	1.038	100.916		99.878	99.878	3/4" Pipe 8m E of logger
S43-03			1.107	99.809	99.784	3/4" Pipe 2m W of logger
<b>Water Level:</b>						
	<b>Cut</b>		2.443	98.473	<b>Time WL Surveyed:</b>	10:26
S43-04			0.844	100.072	100.086	3/4" Pipe 6m E of logger
<b>Turn</b>						
S43-04	0.809	100.881		100.072	100.086	3/4" Pipe 6m E of logger
Water Level:	<b>Cut</b>		2.418	98.463	<b>Time WL Surveyed:</b>	10:43
S43-03			1.084	99.797	99.784	3/4" Pipe 2m W of logger
S43-02			1.014	99.867	99.878	3/4" Pipe 8m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	
Water Level:	<b>Cut</b>				<b>Time WL Surveyed:</b>	

**WL Survey Summary**

	Before	After
Average WL:	98.468	-
Closing Error:	0.011	-
WL Check:	0.010	-
Transducer Elevation	98.273	-

**Field Personnel:**

TR, GG	Trip Date:	29-Apr-14
GG	Date:	29-Apr-14
CJ	Date:	5-Jun-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: June 15, 2014  
 Site Visit Time (MST): 14:20



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.10	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.30	0.33		0.20	0.187					1.00	0.30	0.33	0.187	0.10	0.019	2%
2	2.70	0.41		0.25	0.270					1.00	0.35	0.41	0.270	0.14	0.039	3%
3	3.00	0.40		0.24	0.278					1.00	0.30	0.40	0.278	0.12	0.033	3%
4	3.30	0.52		0.31	0.325					1.00	0.30	0.52	0.325	0.16	0.051	4%
5	3.60	0.50		0.30	0.467					1.00	0.30	0.50	0.467	0.15	0.070	6%
6	3.90	0.52		0.31	0.578					1.00	0.33	0.52	0.578	0.17	0.098	8%
7	4.25	0.54		0.32	0.715					1.00	0.24	0.54	0.715	0.13	0.091	8%
8	4.37	0.58		0.35	0.643					1.00	0.13	0.58	0.643	0.07	0.047	4%
9	4.50	0.56		0.34	0.614					1.00	0.19	0.56	0.614	0.11	0.065	6%
10	4.75	0.54		0.32	0.659					1.00	0.25	0.54	0.659	0.14	0.089	8%
11	5.00	0.49		0.29	0.705					1.00	0.25	0.49	0.705	0.12	0.086	7%
12	5.25	0.48		0.29	0.677					1.00	0.25	0.48	0.677	0.12	0.081	7%
13	5.50	0.46		0.28	0.612					1.00	0.25	0.46	0.612	0.12	0.070	6%
14	5.75	0.45		0.27	0.657					1.00	0.25	0.45	0.657	0.11	0.074	6%
15	6.00	0.44		0.26	0.563					1.00	0.25	0.44	0.563	0.11	0.062	5%
16	6.25	0.44		0.26	0.537					1.00	0.25	0.44	0.537	0.11	0.059	5%
17	6.50	0.42		0.25	0.550					1.00	0.25	0.42	0.550	0.11	0.058	5%
18	6.75	0.34		0.20	0.524					1.00	0.25	0.34	0.524	0.09	0.045	4%
19	7.00	0.27		0.16	0.403					1.00	0.25	0.27	0.403	0.07	0.027	2%
20	7.25	0.24		0.14	0.106					1.00	0.40	0.24	0.106	0.10	0.010	1%
LB	7.80	0.00	0.00		0.00		0.00		0.00	1.00	0.28	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.17</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
 at road crossing approx 50 m US of station

Meas. Start Time (MST):	14:47
Meas. End Time (MST):	15:09
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm

### Flow characteristics:

Total Flow:	1.17	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.32	(m <sup>2</sup> )
Wetted Width:	5.70	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.50	(m/s)
Froude Number:	0.25	

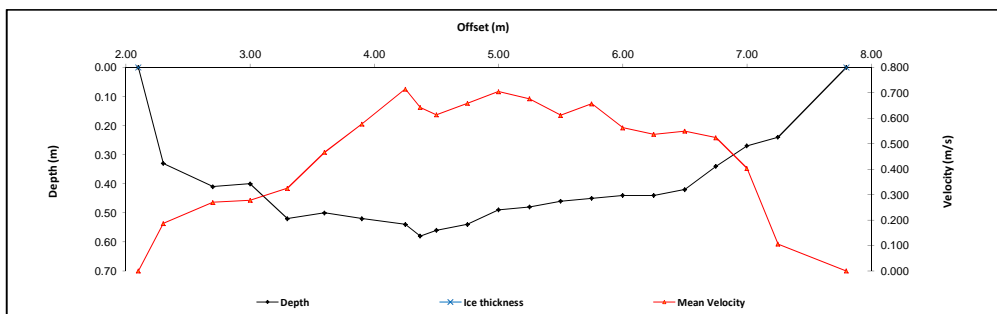
### Logger Details:

	Before	After
Transducer Reading (m):	0.514	0.519
Water (°C):	16.1	16.4
Precip Gauge Test:	No	
Datalogger Clock:	14:28	15:12
Laptop Clock:	14:29	15:12
Battery (Main):	14.1	14.1
Battery:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

- PT repositioned at 14:30 MST

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-02	0.957	100.835		99.878	99.878	3/4" Pipe 8m E of logger
S43-04			0.762	100.073	100.086	3/4" Pipe 6m E of logger
S43-03			1.026	99.809	99.784	3/4" Pipe 2m W of logger
Water Level:	Cut		2.958	97.877	Time WL Surveyed: 14:41	
Temporary BM			2.487	98.348	0.000	-
<b>Turn</b>						
Temporary BM	2.465	100.813		98.348		-
Water Level:	Cut		2.940	97.873	Time WL Surveyed: 14:42	
S43-03			1.003	99.810	99.784	3/4" Pipe 2m W of logger
S43-04			0.741	100.072	100.086	3/4" Pipe 6m E of logger
S43-02			0.935	99.878	99.878	3/4" Pipe 8m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-03	1.003	100.813		99.810		
Water Level:	Cut		2.941	97.872	Time WL Surveyed: 15:16	
Water Level:	Cut		2.922	97.872	Time WL Surveyed: 15:17	
S43-03	0.884	100.794		99.810		

WL Survey Summary	Before	After
Average WL:	97.875	97.872
Closing Error:	0.000	-
WL Check:	0.004	0.000
Transducer Elevation	97.361	97.353

Field Personnel:	DW, NC	Trip Date:	16-Jun-14
Data Entry Personnel:	DW, NC	Date:	16-Jun-14
Data Check Personnel:	DW	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: August 11, 2014  
 Site Visit Time (MST): 12:45



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.20	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	0.80	0.24		0.14	-0.005					1.00	0.45	0.24	-0.005	0.11	-0.001	0%
2	1.10	0.28		0.17	0.002					1.00	0.30	0.28	0.002	0.08	0.000	0%
3	1.40	0.23		0.14	0.095					1.00	0.25	0.23	0.095	0.06	0.005	4%
4	1.60	0.26		0.16	0.204					1.00	0.15	0.26	0.204	0.04	0.008	5%
5	1.70	0.21		0.13	0.342					1.00	0.10	0.21	0.342	0.02	0.007	5%
6	1.80	0.26		0.16	0.369					1.00	0.10	0.26	0.369	0.03	0.010	6%
7	1.90	0.20		0.12	0.341					1.00	0.10	0.20	0.341	0.02	0.007	5%
8	2.00	0.24		0.14	0.272					1.00	0.15	0.24	0.272	0.04	0.010	6%
9	2.20	0.19		0.11	0.299					1.00	0.20	0.19	0.299	0.04	0.011	8%
10	2.40	0.18		0.11	0.158					1.00	0.20	0.18	0.158	0.04	0.006	4%
11	2.60	0.20		0.12	0.287					1.00	0.20	0.20	0.287	0.04	0.011	8%
12	2.80	0.18		0.11	0.310					1.00	0.20	0.18	0.310	0.04	0.011	7%
13	3.00	0.18		0.11	0.324					1.00	0.20	0.18	0.324	0.04	0.012	8%
14	3.20	0.18		0.11	0.200					1.00	0.20	0.18	0.200	0.04	0.007	5%
15	3.40	0.20		0.12	0.249					1.00	0.20	0.20	0.249	0.04	0.010	7%
16	3.60	0.22		0.13	0.262					1.00	0.20	0.22	0.262	0.04	0.012	8%
17	3.80	0.18		0.11	0.112					1.00	0.20	0.18	0.112	0.04	0.004	3%
18	4.00	0.18		0.11	0.267					1.00	0.20	0.18	0.267	0.04	0.010	6%
19	4.20	0.18		0.11	0.264					1.00	0.20	0.18	0.264	0.04	0.010	6%
20	4.40	0.08		0.05	0.055					1.00	0.30	0.08	0.055	0.02	0.001	1%
RB	4.80	0.00	0.00		0.00		0.00			1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.151</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): at road crossing approx. 50m US of station

Meas. Start Time (MST):	13:17
Meas. End Time (MST):	13:40
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25C

**Flow characteristics:**

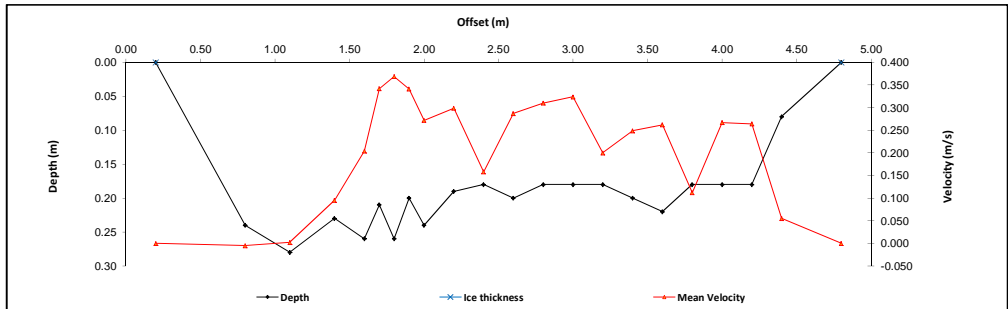
Total Flow:	0.151	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.83	(m <sup>2</sup> )
Wetted Width:	4.60	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.307	0.322
Water (°C):	16.3	16.6
Precip Gauge Test:		Yes
Datalogger Clock:	12:57	13:51
Laptop Clock:	12:57	13:51
Battery (Main):	12.9	13.9
Battery:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-02	0.960	100.838		99.878	99.878	3/4" Pipe 8m E of logger
S43-04			0.765	100.073	100.086	3/4" Pipe 6m E of logger
S43-03			1.027	99.811	99.784	3/4" Pipe 2m W of logger
Water Level:	Cut		3.179	97.659	Time WL Surveyed: 13:05	
Temporary BM			3.327	97.511	0.000	-
<b>Turn</b>						
Temporary BM	3.313	100.824		97.511	-	
Water Level:	Cut		3.163	97.661	Time WL Surveyed: 13:07	
S43-03			1.013	99.811	99.784	3/4" Pipe 2m W of logger
S43-04			0.751	100.073	100.086	3/4" Pipe 6m E of logger
S43-02			0.945	99.879	99.878	3/4" Pipe 8m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-03	1.013	99.824		98.811		
Water Level:	Cut		3.168	96.656	Time WL Surveyed: 13:46	
Water Level:	Cut		3.153	96.660	Time WL Surveyed: 13:50	
S43-03	1.002	99.813		98.811		

**WL Survey Summary**

	Before	After
Average WL:	97.660	96.658
Closing Error:	-0.001	-
WL Check:	0.002	-0.004
Transducer Elevation	97.353	96.336

**Field Personnel:**

	SM, CJ	Trip Date:	11-Aug-14
Data Entry Personnel:	CJ	Date:	11-Aug-14
Data Check Personnel:	GG	Date:	8-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: September 14, 2014  
 Site Visit Time (MST): 14:30



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	7.90	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	7.50	0.09		0.05	0.076					1.00	0.33	0.09	0.076	0.03	0.002	2%
2	7.25	0.17		0.10	0.072					1.00	0.25	0.17	0.072	0.04	0.003	2%
3	7.00	0.23		0.14	0.086					1.00	0.25	0.23	0.086	0.06	0.005	4%
4	6.75	0.26		0.16	0.025					1.00	0.25	0.26	0.025	0.07	0.002	1%
5	6.50	0.31		0.19	0.052					1.00	0.25	0.31	0.052	0.08	0.004	3%
6	6.25	0.35		0.21	0.097					1.00	0.25	0.35	0.097	0.09	0.008	6%
7	6.00	0.37		0.22	0.121					1.00	0.25	0.37	0.121	0.09	0.011	8%
8	5.75	0.28		0.17	0.135					1.00	0.25	0.28	0.135	0.07	0.009	7%
9	5.50	0.34		0.20	0.134					1.00	0.25	0.34	0.134	0.09	0.011	8%
10	5.25	0.29		0.17	0.172					1.00	0.25	0.29	0.172	0.07	0.012	9%
11	5.00	0.34		0.20	0.140					1.00	0.25	0.34	0.140	0.09	0.012	9%
12	4.75	0.29		0.17	0.158					1.00	0.19	0.29	0.158	0.06	0.009	6%
13	4.62	0.29		0.17	0.166					1.00	0.13	0.29	0.166	0.04	0.006	4%
14	4.50	0.31		0.19	0.178					1.00	0.19	0.31	0.178	0.06	0.010	8%
15	4.25	0.29		0.17	0.164					1.00	0.25	0.29	0.164	0.07	0.012	9%
16	4.00	0.28		0.17	0.118					1.00	0.25	0.28	0.118	0.07	0.008	6%
17	3.75	0.26		0.16	0.099					1.00	0.25	0.26	0.099	0.07	0.006	5%
18	3.50	0.19		0.11	0.055					1.00	0.25	0.19	0.055	0.05	0.003	2%
19	3.25	0.13		0.08	0.045					1.00	0.25	0.13	0.045	0.03	0.001	1%
20	3.00	0.14		0.08	0.001					1.00	0.28	0.14	0.001	0.04	0.000	0%
LB	2.70	0.00	0.00		0.00	0.00		0.00		1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.136</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 3m upstream of road crossing

Meas. Start Time (MST):	14:40
Meas. End Time (MST):	15:10
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, calm, 15C

**Flow characteristics:**

Total Flow:	0.136	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.24	(m <sup>2</sup> )
Wetted Width:	5.20	(m)
Hydraulic Depth:	0.24	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.07	

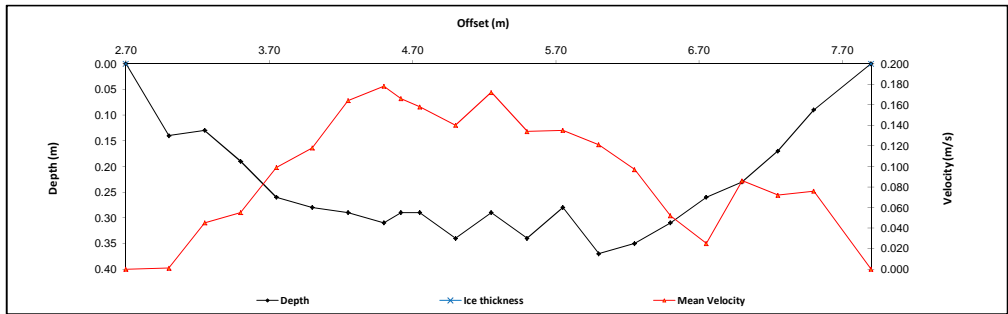
**Logger Details:**

	Before	After
Transducer Reading (m):	0.322	0.333
Water (°C):	7.7	7.8
Datalogger Clock:	14:31	15:18
Laptop Clock:	14:31	15:19
Battery (Main):	13.1	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Installed vent in enclosure

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-02	0.998	100.876		99.878	99.878	3/4" Pipe 8m E of logger
S43-03			1.066	99.810	99.784	3/4" Pipe 2m W of logger
S43-04			0.804	100.072	100.086	3/4" Pipe 6m E of logger
<b>Water Level:</b>						
Water Level:	Cut	0.398	3.608	97.666	97.666	Time WL Surveyed: 14:38
Temporary BM			3.608	97.268	0.000	-
<b>Turn</b>						
Temporary BM	3.584	100.852		97.268		-
Water Level:	Cut	0.398	3.584	97.666	97.666	Time WL Surveyed: 14:39
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-03	1.006	100.815		99.809	99.809	
Water Level:	Cut	0.402	3.552	97.665	97.665	Time WL Surveyed: 15:17
Water Level:	Cut	0.401	3.569	97.668	97.668	Time WL Surveyed: 15:14
S43-03	1.027	100.836		99.809	99.809	

**WL Survey Summary**

	Before	After
Average WL:	97.666	97.667
Closing Error:	0.002	-
WL Check:	0.000	-0.003
Transducer Elevation	97.344	97.334

**Field Personnel:**

Data Entry Personnel:	TR, GG	Trip Date:	14-Sep-14
Data Check Personnel:	TR	Date:	14-Sep-14
Entered Digitally in the Field:	MP	Date:	25-Nov-14
	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S44 - Pierre River near Ft. MacKay  
 UTM Location: 460775 E, 6369400 N

Site Visit Date: November 2, 2014  
 Site Visit Time (MST): 11:50



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.90	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	3.10	0.24		0.14	-0.063					1.00	0.15	0.24	-0.063	0.04	-0.002	-1%
2	3.20	0.36		0.22	0.037					1.00	0.10	0.36	0.037	0.04	0.001	1%
3	3.30	0.24		0.14	0.593					1.00	0.10	0.24	0.593	0.02	0.014	8%
4	3.40	0.34		0.20	0.521					1.00	0.10	0.34	0.521	0.03	0.018	9%
5	3.50	0.32		0.19	0.339					1.00	0.10	0.32	0.339	0.03	0.011	6%
6	3.60	0.38		0.23	0.223					1.00	0.10	0.38	0.223	0.04	0.008	4%
7	3.70	0.38		0.23	0.588					1.00	0.07	0.38	0.588	0.03	0.017	9%
8	3.75	0.36		0.22	0.580					1.00	0.05	0.36	0.580	0.02	0.010	6%
9	3.80	0.32		0.19	0.511					1.00	0.07	0.32	0.511	0.02	0.012	6%
10	3.90	0.30		0.18	0.597					1.00	0.10	0.30	0.597	0.03	0.018	9%
11	4.00	0.30		0.18	0.340					1.00	0.10	0.30	0.340	0.03	0.010	5%
12	4.10	0.28		0.17	0.206					1.00	0.15	0.28	0.206	0.04	0.009	5%
13	4.30	0.24		0.14	0.266					1.00	0.20	0.24	0.266	0.05	0.013	7%
14	4.50	0.18		0.11	0.281					1.00	0.20	0.18	0.281	0.04	0.010	5%
15	4.70	0.20		0.12	0.221					1.00	0.20	0.20	0.221	0.04	0.009	5%
16	4.90	0.20		0.12	0.074					1.00	0.20	0.20	0.074	0.04	0.003	2%
17	5.10	0.18		0.11	0.103					1.00	0.20	0.18	0.103	0.04	0.004	2%
18	5.30	0.12		0.07	0.559					1.00	0.20	0.12	0.559	0.02	0.013	7%
19	5.50	0.12		0.07	0.363					1.00	0.20	0.12	0.363	0.02	0.009	5%
20	5.70	0.10		0.06	0.000					1.00	0.25	0.10	0.000	0.03	0.000	0%
21	6.00	0.08		0.05	0.120					1.00	0.25	0.08	0.120	0.02	0.002	1%
LB	6.20	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.189</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
Ice road crossing by hell, landing

Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:45
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, calm, 5C

**Flow characteristics:**

Total Flow:	0.189	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.67	(m <sup>2</sup> )
Wetted Width:	3.30	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.20	

**Logger Details:**

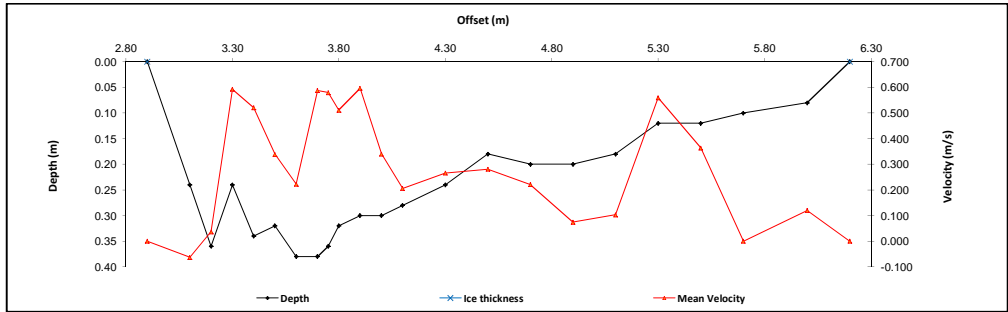
	Before	After
Transducer Reading (m):	0.959	0.958
Water (°C):	0.7	0.8
Datalogger Clock:	11:53	12:45
Laptop Clock:	11:53	12:45
Battery (Main):	12.5	12.1
Battery:	-	-
Battery Serial #:	-	-
Enclosure Dessiccant:	-	-
Vent Tube Dessiccant:	-	-
PT# (if replaced):	278515	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Area by station heavily affected by beaver activity
- Upstream of station has good flow

**General Notes:**

- Removed PT and Modem



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S43-02	1.024	100.902		99.878	99.878	3/4" Pipe 8m E of logger
S43-04			0.829	100.073	100.086	3/4" Pipe 6m E of logger
S43-03			1.092	99.810	99.784	3/4" Pipe 2m W of logger
Water Level:	<b>Cut</b>		2.604	98.298	<b>Time WL Surveyed:</b>	11:58
S43-03			1.092	99.810	99.784	3/4" Pipe 2m W of logger
<b>Turn</b>						
S43-03	1.005	100.815		99.810	99.784	3/4" Pipe 2m W of logger
Water Level:	<b>Cut</b>		2.518	98.297	<b>Time WL Surveyed:</b>	12:01
S43-03			1.005	99.810	99.784	3/4" Pipe 2m W of logger
S43-04			0.742	100.073	100.086	3/4" Pipe 6m E of logger
S43-02			0.938	99.877	99.878	3/4" Pipe 8m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S43-03	1.005	100.815		99.810		
Water Level:	<b>Cut</b>		2.521	98.294	<b>Time WL Surveyed:</b>	12:52
Water Level:	<b>Cut</b>		2.502	98.295	<b>Time WL Surveyed:</b>	12:53
S43-03	0.987	100.797		99.810		

**WL Survey Summary**

	Before	After
Average WL:	98.298	98.295
Closing Error:	0.001	-
WL Check:	0.001	-0.001
Transducer Elevation	97.339	97.337

**Field Personnel:**

TR, MP	Trip Date:	2-Nov-14
TR	Date:	2-Nov-14
MP	Date:	17-Nov-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: January 20, 2014  
 Site Visit Time (MST): 13:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.00	0.00	0.00		0.000		0.000		0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	3.80	0.60	0.32	0.46	0.044					0.88	0.95	0.28	0.039	0.27	0.010	0%
2	4.90	0.79	0.46	0.63	0.122					0.88	1.03	0.33	0.107	0.34	0.036	1%
3	5.85	0.82	0.43	0.63	0.168					0.88	1.00	0.39	0.148	0.39	0.058	2%
4	6.90	0.85	0.43	0.64	0.213					0.88	1.03	0.42	0.187	0.43	0.081	3%
5	7.90	0.97	0.46	0.72	0.265					0.88	0.95	0.51	0.233	0.48	0.113	4%
6	8.80	1.09	0.45	0.77	0.297					0.88	1.00	0.64	0.261	0.64	0.167	6%
7	9.90	1.20	0.42			1.04	0.229	0.58	0.312	1.00	1.00	0.78	0.271	0.78	0.211	8%
8	10.80	1.19	0.44	0.82	0.337					0.88	1.00	0.75	0.297	0.75	0.222	8%
9	11.90	1.32	0.42			1.14	0.264	0.60	0.357	1.00	1.05	0.90	0.311	0.94	0.293	10%
10	12.90	1.31	0.46			1.14	0.286	0.63	0.313	1.00	1.05	0.85	0.300	0.89	0.267	10%
11	14.00	1.19	0.55	0.87	0.306					0.88	1.08	0.64	0.269	0.69	0.185	7%
12	15.05	1.19	0.60	0.90	0.314					0.88	0.90	0.59	0.276	0.53	0.147	5%
13	15.80	1.01	0.61	0.81	0.289					0.88	0.80	0.40	0.254	0.32	0.081	3%
14	16.65	0.94	0.56	0.75	0.305					0.88	0.80	0.38	0.268	0.30	0.082	3%
15	17.40	0.98	0.57	0.78	0.328					0.88	0.75	0.41	0.289	0.31	0.089	3%
16	18.15	1.01	0.61	0.81	0.316					0.88	0.85	0.40	0.278	0.34	0.095	3%
17	19.10	1.05	0.63	0.84	0.318					0.88	0.90	0.42	0.280	0.38	0.106	4%
18	19.95	1.10	0.57	0.84	0.265					0.88	0.80	0.53	0.233	0.42	0.099	4%
19	20.70	1.01	0.56	0.79	0.287					0.88	0.80	0.45	0.253	0.36	0.091	3%
20	21.55	0.89	0.67	0.78	0.227					0.88	0.90	0.22	0.200	0.20	0.040	1%
21	22.50	0.89	0.46	0.68	0.155					0.88	0.93	0.43	0.136	0.40	0.054	2%
22	23.40	1.09	0.45	0.77	0.242					0.88	0.75	0.64	0.213	0.48	0.102	4%
23	24.00	1.15	0.42	0.79	0.231					0.88	0.55	0.73	0.203	0.40	0.082	3%
24	24.50	1.16	0.36							1.00	0.75	0.80	0.147	0.60	0.088	3%
LB	25.50	0.00	0.00		0.00	1.00	0.128	0.52	0.166	0.88	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.80</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe): 30m DS of station

Meas. Start Time (MST):	13:50
Meas. End Time (MST):	14:20
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	-

**Flow characteristics:**

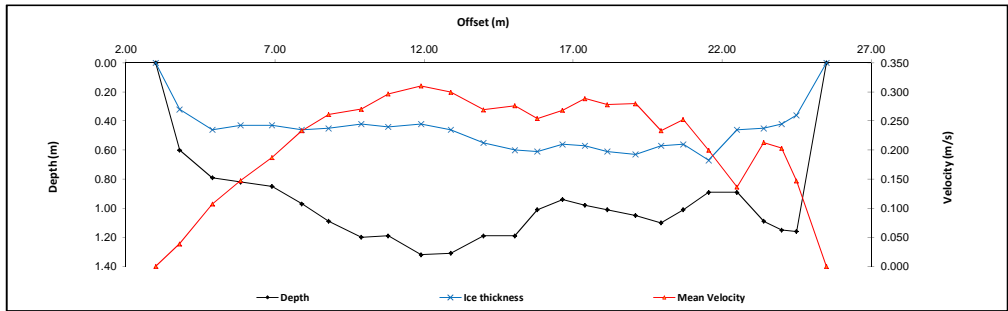
Total Flow:	2.80	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	11.65	(m <sup>2</sup> )
Wetted Width:	22.50	(m)
Hydraulic Depth:	0.52	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	0.11	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.031	
Water (°C):	0.1	
Datalogger Clock:	13:45	
Laptop Clock:	13:46	
Battery (Main):	13.2	
Battery Serial #:	-	
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PTs (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-03	1.307	101.307		100.000	100.000	3/4" Pipe 12m N of data logger
S45-05			1.524	99.783	99.784	3/4" Pipe 3m N of data logger
S45-06			1.429	99.878	99.880	3/4" Pipe 3m E of data logger
<b>Water Level:</b>						
Water Level:	Cut		3.336	97.971		Time WL Surveyed: 14:30
Temporary BM			3.169	98.138	0.000	
<b>Turn</b>						
Temporary BM	3.150	101.288		98.138		
Water Level:	Cut		3.314	97.974		Time WL Surveyed: 14:32
S45-06			1.409	99.879	99.880	3/4" Pipe 3m E of data logger
S45-05			1.504	99.784	99.784	3/4" Pipe 3m N of data logger
S45-03	1.487	101.488	1.287	100.001	100.000	3/4" Pipe 12m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	97.973	-
Closing Error:	-0.001	-
WL Check:	0.003	-
Transducer Elevation	96.942	-

**Field Personnel:**

	SM, TR	Trip Date:	20-Jan-14
Data Entry Personnel:	DW	Date:	23-Feb-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	No		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: February 4, 2014  
 Site Visit Time (MST): 09:50

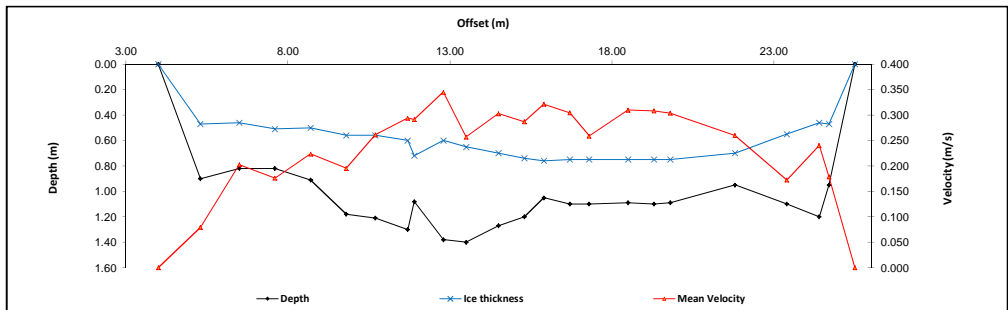


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	4.00	0.00	0.00		0.000				0.000	0.88	0.65	0.00	0.000	0.00	0.000	
1	5.30	0.90	0.47	0.69	0.090					0.88	1.25	0.43	0.079	0.54	0.043	2%
2	6.50	0.82	0.46	0.64	0.230					0.88	1.15	0.36	0.202	0.41	0.084	4%
3	7.80	0.82	0.51	0.67	0.200					0.88	1.10	0.31	0.176	0.34	0.060	3%
4	8.70	0.91	0.50	0.71	0.254					0.88	1.10	0.41	0.224	0.45	0.101	4%
5	9.80	1.18	0.56	0.87	0.222					0.88	1.00	0.62	0.195	0.62	0.121	5%
6	10.70	1.21	0.56	0.89	0.297					0.88	0.95	0.65	0.261	0.62	0.161	7%
7	11.70	1.30	0.60	0.95	0.334					0.88	0.60	0.70	0.294	0.42	0.123	5%
8	11.90	1.08	0.72	0.90	0.331					0.88	0.55	0.36	0.291	0.20	0.058	2%
9	12.80	1.38	0.60			1.22	0.343	0.76	0.347	1.00	0.80	0.78	0.345	0.62	0.215	9%
10	13.50	1.40	0.65	1.03	0.292					0.88	0.85	0.75	0.257	0.64	0.164	7%
11	14.50	1.27	0.70	0.99	0.344					0.88	0.90	0.57	0.303	0.51	0.155	7%
12	15.30	1.20	0.74	0.97	0.326					0.88	0.70	0.46	0.287	0.32	0.092	4%
13	15.90	1.05	0.76	0.91	0.365					0.88	0.70	0.29	0.321	0.20	0.065	3%
14	16.70	1.10	0.75	0.93	0.346					0.88	0.70	0.35	0.304	0.25	0.075	3%
15	17.30	1.10	0.75	0.93	0.294					0.88	0.90	0.35	0.259	0.32	0.081	4%
16	18.50	1.09	0.75	0.92	0.352					0.88	1.00	0.34	0.310	0.34	0.105	5%
17	19.30	1.10	0.75	0.93	0.350					0.88	0.65	0.35	0.308	0.23	0.070	3%
18	19.80	1.09	0.75	0.92	0.345					0.88	1.25	0.34	0.304	0.43	0.129	6%
19	21.80	0.95	0.70	0.83	0.295					0.88	1.80	0.25	0.260	0.45	0.117	5%
20	23.40	1.10	0.55	0.83	0.196					0.88	1.30	0.55	0.172	0.71	0.123	5%
21	24.40	1.20	0.46	0.83	0.273					0.88	0.65	0.74	0.240	0.48	0.116	5%
22	24.70	0.95	0.47	0.71	0.203					0.88	0.55	0.48	0.179	0.26	0.047	2%
LB	25.50	0.00	0.00		0.00				0.00	0.88	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.31</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
30m DS of station

Meas. Start Time (MST):	11:47
Meas. End Time (MST):	12:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, -22C



**Flow characteristics:**

Total Flow:	2.31	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.36	(m²)
Wetted Width:	21.50	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.048	1.047
Water (°C):	0.1	0.1
Datalogger Clock:	09:56	12:45
Laptop Clock:	09:56	12:45
Battery (Main):	13.9	15.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-03	1.334	101.334		100.000	100.000	3/4" Pipe 12m N of data logger
S45-06			1.455	99.879	99.880	3/4" Pipe 3m E of data logger
S45-05			1.548	99.786	99.784	3/4" Pipe 3m N of data logger
Water Level:	Cut		3.341	97.993	Time WL Surveyed: 11:33	
Temporary BM			3.210	98.124	0.000	-
<b>Turn</b>						
Temporary BM	3.185	101.309		98.124	-	
Water Level:	Cut		3.313	97.996	Time WL Surveyed: 11:37	
S45-05			1.523	99.786	99.784	3/4" Pipe 3m N of data logger
S45-06			1.439	99.870	99.880	3/4" Pipe 3m E of data logger
S45-03			1.307	100.002	100.000	3/4" Pipe 12m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-05	1.522	101.308		99.786		
Water Level:	Cut		3.312	97.996	Time WL Surveyed: 12:40	
Water Level:	Cut		3.292	97.997	Time WL Surveyed: 12:43	
S45-05	1.503	101.289		99.786		

**WL Survey Summary**

	Before	After
Average WL:	97.995	97.997
Closing Error:	-0.002	-
WL Check:	0.003	-0.001
Transducer Elevation	96.947	96.950

**Field Personnel:**

	SM, MP	Trip Date:	4-Feb-14
Data Entry Personnel:	MP	Date:	4-Feb-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: March 12, 2014  
 Site Visit Time (MST): 10:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	0.90	0.00	0.00		0.000				0.000	0.88	0.45	0.00	0.000	0.00	0.000	
1	1.80	1.20	0.80	1.00	-0.015					0.88	0.93	0.40	-0.013	0.37	-0.005	-1%
2	2.75	1.20	0.83	1.02	-0.038					0.88	0.78	0.37	-0.033	0.29	-0.010	-1%
3	3.35	1.18	0.84	1.01	0.000					0.88	0.68	0.34	0.000	0.23	0.000	0%
4	4.10	1.20	0.85	1.01	0.199					0.88	0.65	0.35	0.175	0.23	0.040	4%
5	4.65	1.30	0.84	1.07	0.235					0.88	0.53	0.46	0.207	0.24	0.050	6%
6	5.15	1.29	0.84	1.07	0.269					0.88	0.63	0.45	0.237	0.28	0.067	8%
7	5.90	1.30	0.82	1.06	0.297					0.88	0.57	0.48	0.261	0.28	0.072	8%
8	6.30	1.32	0.75	1.04	0.352					0.88	0.45	0.57	0.310	0.26	0.079	9%
9	6.80	1.35	0.75	1.05	0.226					0.88	0.52	0.60	0.199	0.32	0.063	7%
10	7.35	1.40	0.75	1.08	0.332					0.88	0.48	0.65	0.292	0.31	0.090	10%
11	7.75	1.40	0.72	1.06	0.347					0.88	0.25	0.68	0.305	0.17	0.052	6%
12	7.85	1.40	0.73	1.07	0.381					0.88	0.22	0.67	0.335	0.15	0.051	6%
13	8.20	1.34	0.72	1.03	0.336					0.88	0.48	0.62	0.296	0.29	0.087	10%
14	8.80	1.30	0.75	1.03	0.346					0.88	0.50	0.55	0.304	0.28	0.084	9%
15	9.20	1.25	0.75	1.00	0.104					0.88	0.48	0.50	0.092	0.24	0.022	2%
16	9.75	1.20	0.74	0.97	0.270					0.88	0.70	0.46	0.238	0.32	0.077	9%
17	10.60	0.86	0.70	0.78	0.184					0.88	0.90	0.16	0.162	0.14	0.023	3%
18	11.54	0.83	0.65	0.74	-0.014					0.88	0.81	0.18	-0.012	0.15	-0.002	0%
19	12.22	0.90	0.65	0.78	-0.041					0.88	0.68	0.25	-0.036	0.17	-0.006	-1%
20	12.90	0.90	0.60	0.75	0.220					0.88	0.68	0.30	0.194	0.20	0.039	4%
21	13.58	0.83	0.65	0.74	0.022					0.88	0.63	0.18	0.019	0.11	0.002	0%
22	14.15	0.80	0.45	0.63	0.047					0.88	0.74	0.35	0.041	0.26	0.011	1%
23	15.06	0.70	0.50	0.60	0.010					0.88	0.80	0.20	0.009	0.16	0.001	0%
24	15.75	0.55	0.45	0.50	0.002					0.88	0.77	0.10	0.002	0.08	0.000	0%
LB	16.60	0.00	0.00		0.00		0.00			0.88	0.43	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.887</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 30m DS of station

Meas. Start Time (MST):	11:40
Meas. End Time (MST):	12:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, 4C

**Flow characteristics:**

Total Flow:	0.887	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.51	(m²)
Wetted Width:	15.70	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.09	

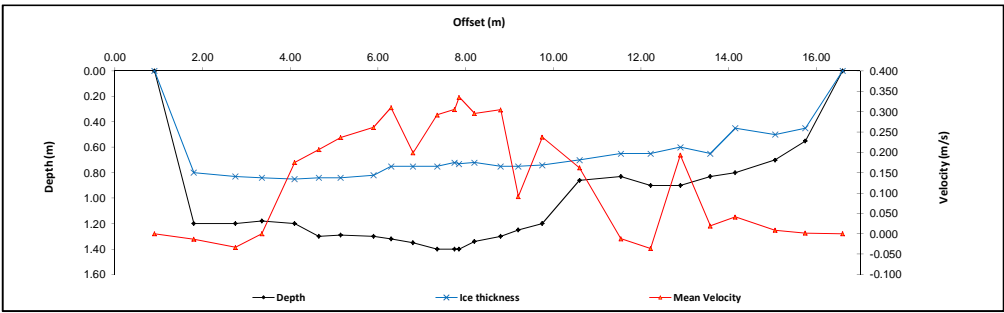
**Logger Details:**

	Before	After
Transducer Reading (m):	1.046	
Water (°C):	0.1	
Datalogger Clock:	10:22	
Laptop Clock:	10:22	
Battery (Main):	14.7	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- Augered 3m downstream of previous holes.
- There was poor flow so new holes drilled upstream of old holes
- Rocky and/or log on bottom creating variable flows conditions.



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-03	1.332	101.332		100.000	100.000	3/4" Pipe 12m N of data logger
S45-05			1.533	99.799	99.784	3/4" Pipe 3m N of data logger
S45-06			1.455	99.877	99.880	3/4" Pipe 3m E of data logger
Water Level:	Cut		3.340	97.992		Time WL Surveyed: 10:42
Temporary BM			3.033	98.299	0.000	
<b>Turn</b>						
Temporary BM	3.021	101.320		98.299		
Water Level:	Cut		3.331	97.989		Time WL Surveyed: 10:44
S45-06			1.444	99.876	99.880	3/4" Pipe 3m E of data logger
S45-05			1.522	99.798	99.784	3/4" Pipe 3m N of data logger
S45-03			1.321	99.999	100.000	3/4" Pipe 12m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-05						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:
S45-05						

**WL Survey Summary**

	Before	After
Average WL:	97.991	-
Closing Error:	0.001	-
WL Check:	0.003	-
Transducer Elevation	96.945	-

**Field Personnel:**

	DW, MP	Trip Date:	12-Mar-14
Data Entry Personnel:	MP	Date:	12-Mar-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: April 3, 2014  
 Site Visit Time (MST): 10:20



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
LB	4.00	0.00	0.00		0.000				0.000	0.88	0.90	0.00	0.000	0.00	0.000		
1	5.80	1.25	0.85	1.05	0.196					0.88	1.40	0.40	0.172	0.56	0.097	7%	
2	6.80	1.29	0.85	1.07	0.237					0.88	1.30	0.44	0.209	0.57	0.119	8%	
3	8.40	1.32	0.90	1.11	0.300					0.88	1.35	0.42	0.264	0.57	0.150	10%	
4	9.50	1.36	0.90	1.01	0.333					0.88	1.10	0.48	0.293	0.53	0.155	11%	
5	10.60	1.39	0.94	1.17	0.382					0.88	0.95	0.45	0.336	0.43	0.144	10%	
6	11.40	1.38	0.95	1.17	0.350					0.88	0.68	0.43	0.308	0.29	0.089	6%	
7	11.95	1.41	0.93	1.17	0.341					0.88	0.57	0.48	0.300	0.28	0.083	6%	
8	12.55	1.33	0.99	1.16	0.383					0.88	0.53	0.34	0.337	0.18	0.060	4%	
9	13.00	1.37	0.85	1.11	0.441					0.88	0.48	0.52	0.388	0.25	0.096	7%	
10	13.50	1.40	0.85	1.13	0.396					0.88	0.53	0.55	0.348	0.29	0.101	7%	
11	14.05	1.41	0.85	1.13	0.387					0.88	0.53	0.56	0.341	0.29	0.100	7%	
12	14.55	1.40	0.85	1.13	0.283					0.88	0.48	0.55	0.249	0.26	0.065	4%	
13	15.00	1.31	0.85	1.08	0.209					0.88	0.45	0.46	0.184	0.21	0.038	3%	
14	15.45	1.20	0.85	1.03	0.281					0.88	0.48	0.35	0.247	0.17	0.041	3%	
15	15.95	1.19	0.82	1.01	-0.039					0.88	0.47	0.37	-0.034	0.18	-0.006	0%	
16	16.40	1.01	0.83	0.92	-0.011					0.88	0.48	0.18	-0.010	0.09	-0.001	0%	
17	16.90	0.95	0.79	0.87	0.117					0.88	0.50	0.16	0.103	0.08	0.008	1%	
18	17.40	0.98	0.78	0.88	0.110					0.88	0.60	0.20	0.097	0.12	0.012	1%	
19	18.10	1.09	0.78	0.94	0.130					0.88	0.58	0.31	0.114	0.18	0.020	1%	
20	18.55	1.03	0.75	0.89	0.088					0.88	0.55	0.28	0.077	0.15	0.012	1%	
21	19.20	1.04	0.70	0.87	0.138					0.88	0.77	0.34	0.121	0.26	0.032	2%	
22	20.10	0.83	0.55	0.69	0.193					0.88	0.85	0.28	0.170	0.24	0.040	3%	
23	20.90	0.79	0.54	0.67	0.076					0.88	0.77	0.25	0.067	0.19	0.013	1%	
24	21.65	0.52	0.45	0.49	0.001					0.88	1.30	0.07	0.001	0.09	0.000	0%	
RB	23.50	0.00	0.00		0.00		0.00		0.00	0.88	0.93	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>1.47</b>	<b>100%</b>		

**Flow Measurement Details:**  
 Metering Section Location (describe): 30 DS of station, around bend

Meas. Start Time (MST):	11:04
Meas. End Time (MST):	11:41
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -10C

**Flow characteristics:**

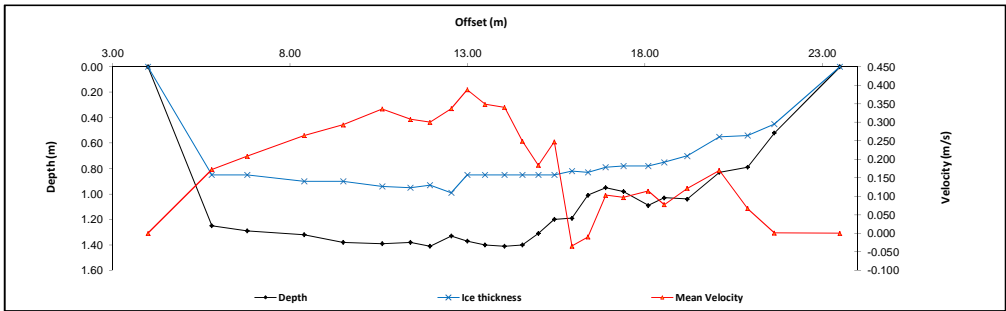
Total Flow:	1.47	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	6.44	(m <sup>2</sup> )
Wetted Width:	19.50	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.133	1.145
Water (°C):	0.1	0.1
Datalogger Clock:	10:37	12:03
Laptop Clock:	10:38	12:04
Battery (Main):	15.0	14.9
Battery:	Good	
Enclosure Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**  
 - Rocks/ slush impeding flow for measurements 15 to 17



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-03	1.215	101.215		100.000	100.000	3/4" Pipe 12m N of data logger
S45-06			1.339	99.876	99.880	3/4" Pipe 3m E of data logger
S45-05			1.415	99.800	99.784	3/4" Pipe 3m N of data logger
Water Level:	Cut		3.139	98.076	Time WL Surveyed:	11:52
Temporary BM			3.094	98.121	0.000	
<b>Turn</b>						
Temporary BM	3.085	101.206		98.121		
Water Level:	Cut		3.126	98.080	Time WL Surveyed:	11:59
S45-05			1.406	99.800	99.784	3/4" Pipe 3m N of data logger
S45-06			1.329	99.877	99.880	3/4" Pipe 3m E of data logger
S45-03			1.207	99.999	100.000	3/4" Pipe 12m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-05						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	
S45-05						

**WL Survey Summary**

	Before	After
Average WL:	98.078	-
Closing Error:	0.001	-
WL Check:	0.004	-
Transducer Elevation	96.945	-

**Field Personnel:**

Field Personnel:	CJ, MP	Trip Date:	3-Apr-14
Data Entry Personnel:	CJ, MP	Date:	3-Apr-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Eells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date:  
 Site Visit Time (MST):

May 24, 2014  
 10:35



Flow Measurement Details:	
Metering Section Location (describe): -8m US of station	
Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, calm, 15C

Flow characteristics:		
Total Flow:	25.3	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	0.87	(m <sup>2</sup> )
Wetted Width:	33.48	(m)
Hydraulic Depth:	0.03	(m)
Mean Velocity:	25.33	(m/s)
Froude Number:	50.21	

Logger Details:		
Transducer Reading (m):	Before	After
Water (°C):	13.7	14.1
Datalogger Clock:	10:39	13:18
Laptop Clock:	10:39	13:17
Battery (Main):	14.4	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

Datalogger / Station Notes:	

General Notes:	

ADCP Flow Measurement Summary:						
<b>System Information:</b>						
System Type:	Sontek RS-M9					
Serial Number:	1802					
Firmware Version:	3.5					
Software Version:	3.7					
<b>System Setup:</b>						
Transducer Depth (m):	0.08					
Salinity (ppt):	-					
Magnetic Declination (°):	14.33					
Measured Temperature (°C):	-					
ADCP Temperature (°C):	14.5					
<b>Bank Offsets:</b>						
LB:	0.00					
RB:	36.00					
<b>Discharge Calculation Settings:</b>						
Track Reference:	Bottom-Track					
Depth Reference:	Vertical Beam					
Coordinate System:	ENU					
Left Method:	Sloped Bank					
Right Method:	Sloped Bank					
Top Fit Type:	Power Fit					
Bottom Fit Type:	Power Fit					
<b>Measurement Results:</b>						
Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean	
2	31.73	28.72	0.93	26.708	5.45%	
3	31.07	27.92	0.803	22.413	-11.51%	
4	34.50	29.82	0.863	25.731	1.60%	
5	36.61	30.03	0.881	26.456	4.48%	
<b>Mean:</b>			33.48	29.12	0.869	25.3
<b>SD:</b>			2.22	0.86	0.045	1.720
<b>COV:</b>			0.07	0.03	0.052	0.068

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S45-03	1.162	101.162		100.000	100.000	3/4" Pipe 12m N of data logger
S45-05			1.358	99.804	99.784	3/4" Pipe 3m N of data logger
<b>Water Level:</b>						
S45-06	Cut	2.848	98.314	99.880	99.880	3/4" Pipe 3m E of data logger
<b>Turn</b>						
S45-06	1.348	101.225		99.877	99.880	3/4" Pipe 3m E of data logger
<b>Water Level:</b>						
S45-05	Cut	2.913	98.312	99.880	99.880	3/4" Pipe 3m E of data logger
S45-05			1.422	99.803	99.784	3/4" Pipe 3m N of data logger
S45-03			1.227	99.998	100.000	3/4" Pipe 12m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-05	1.358	101.162		99.804	99.804	
<b>Water Level:</b>						
S45-05	Cut	2.862	98.300	98.302	98.302	13:12
<b>Water Level:</b>						
S45-05	Cut	2.842	98.302	98.302	98.302	13:14
S45-05	1.340	101.144		99.804	99.804	

WL Survey Summary	Before	After
Average WL:	98.313	98.301
Closing Error:	0.002	-
WL Check:	0.002	-0.002
Transducer Elevation	97.058	97.032

Field Personnel:	CJ, GG	Trip Date:	24-May-14
Data Entry Personnel:	GG	Date:	24-May-14
Data Check Personnel:	CJ	Date:	5-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ellis River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: June 18, 2014  
 Site Visit Time (MST): 10:38



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	59.50	0.00	0.00		0.000		0.000		0.000	1.00	1.25	0.00	0.000	0.00	0.000	
1	57.00	0.48		0.29	0.675		0.67	0.17	0.892	1.00	2.25	0.48	0.675	1.08	0.729	2%
2	55.00	0.57		0.34	0.537		0.67	0.17	0.892	1.00	2.00	0.57	0.537	1.14	0.612	2%
3	53.00	0.84				0.77	0.702	0.19	0.897	1.00	2.00	0.84	0.833	1.68	1.399	5%
4	51.00	0.96				0.72	0.841	0.18	1.080	1.00	2.00	0.96	0.800	1.92	1.535	5%
5	49.00	0.90				0.96	0.717	0.24	0.968	1.00	2.00	1.20	0.843	2.40	2.022	7%
6	47.00	1.30				1.04	0.897	0.26	0.889	1.00	2.00	1.30	0.893	2.60	2.322	8%
7	45.00	1.34				1.07	0.845	0.27	0.938	1.00	1.75	1.34	0.892	2.35	2.091	7%
8	43.00	1.43				1.14	0.479	0.29	0.966	1.00	1.50	1.43	0.723	2.15	1.550	5%
9	41.50	1.43				1.04	0.996	0.26	0.886	1.00	1.50	1.30	0.941	1.95	1.835	6%
10	40.00	1.30				1.02	0.899	0.26	0.927	1.00	1.50	1.28	0.913	1.92	1.753	6%
11	38.50	1.28				0.92	0.845	0.23	0.831	1.00	1.75	1.15	0.838	2.01	1.686	6%
12	37.00	1.15				0.86	1.048	0.22	0.997	1.00	2.00	1.08	1.023	2.16	2.209	7%
13	35.00	1.08				0.85	0.834	0.21	0.950	1.00	2.00	1.06	0.892	2.12	1.891	6%
14	33.00	1.06				0.80	0.786	0.20	0.869	1.00	2.00	1.00	0.828	2.00	1.655	5%
15	31.00	1.00				0.83	0.817	0.21	0.815	1.00	2.00	1.04	0.816	2.08	1.697	6%
16	29.00	1.04				0.84	0.512	0.21	0.815	1.00	1.75	1.05	0.664	1.84	1.219	4%
17	27.00	1.05				0.90	0.735	0.22	0.675	1.00	1.50	1.12	0.705	1.68	1.184	4%
18	25.00	1.12				0.88	0.621	0.22	0.358	1.00	1.25	1.10	0.490	1.38	0.673	2%
19	24.00	1.10				0.86	0.441	0.22	0.385	1.00	1.20	1.08	0.413	1.30	0.535	2%
20	23.00	1.08								1.00	0.70	0.00	0.000	0.00	0.000	
LB	21.60	0.00	0.00		0.00					1.00	0.70	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>30.3</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): 8m US of station

Meas. Start Time (MST):	11:35
Meas. End Time (MST):	12:29
Equipment:	ADV
Method:	Fishcat
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 24C

**Flow characteristics:**

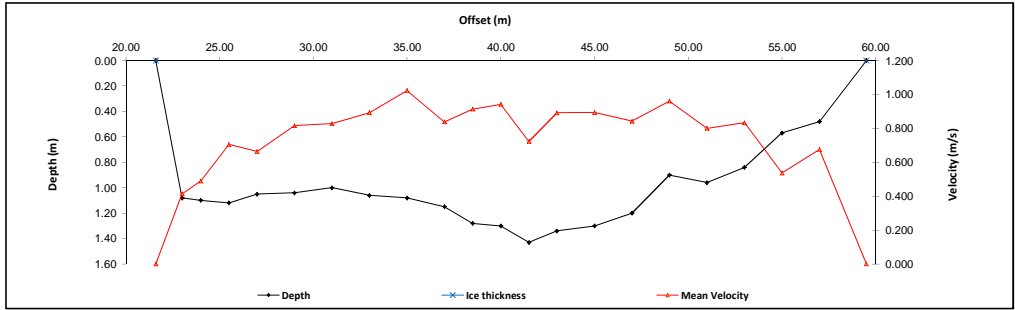
Total Flow:	30.3	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	37.54	(m <sup>2</sup> )
Wetted Width:	37.90	(m)
Hydraulic Depth:	0.99	(m)
Mean Velocity:	0.81	(m/s)
Froude Number:	0.26	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.517	1.526
Water (°C):	15.4	15.9
Datalogger Clock:	10:40	12:44
Laptop Clock:	10:41	12:44
Battery (Main):	14.0	14.1
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	298706	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-03	1.131	101.131		100.000	100.000	3/4" Pipe 12m N of data logger
S45-05			1.325	99.806	99.784	3/4" Pipe 3m N of data logger
S45-06			1.253	99.878	99.880	3/4" Pipe 3m E of data logger
Water Level:			2.566	98.565		Time WL Surveyed: 11:07
Temporary BM			2.503	98.628	0.000	
<b>Turn</b>						
Temporary BM	2.547	101.175		98.628		
Water Level:			2.614	98.561		Time WL Surveyed: 11:09
S45-05			1.298	99.877	99.880	3/4" Pipe 3m E of data logger
S45-05			1.372	99.803	99.784	3/4" Pipe 3m N of data logger
S45-03			1.175	100.000	100.000	3/4" Pipe 12m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-05	1.372	101.177		98.805		
Water Level:			2.619	98.558		Time WL Surveyed: 12:39
Water Level:			2.563	98.572		Time WL Surveyed: 12:42
S45-05	1.330	101.135		98.805		

**WL Survey Summary**

	Before	After
Average WL:	98.563	98.565
Closing Error:	0.000	-
WL Check:	0.004	-0.014
Transducer Elevation	97.046	97.039

**Field Personnel:**

	DW MP	Trip Date:	18-Jun-14
Data Entry Personnel:	DW	Date:	18-Jun-14
Data Check Personnel:	MP	Date:	17-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: August 10, 2014  
 Site Visit Time (MST): 15:53



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	18.80	0.00	0.00		0.000				0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	20.00	0.12		0.07	0.050					1.00	1.60	0.12	0.050	0.19	0.010	0%
2	22.00	0.20		0.12	-0.010					1.00	2.00	0.20	-0.010	0.40	-0.004	0%
3	24.00	0.37		0.22	0.470					1.00	2.00	0.37	0.470	0.74	0.348	8%
4	26.00	0.28		0.17	0.080					1.00	2.00	0.28	0.080	0.56	0.045	1%
5	28.00	0.38		0.23	0.660					1.00	2.00	0.38	0.660	0.76	0.502	9%
6	30.00	0.30		0.18	0.600					1.00	2.00	0.30	0.600	0.60	0.360	6%
7	32.00	0.37		0.22	0.770					1.00	1.50	0.37	0.770	0.56	0.427	7%
8	33.00	0.33		0.20	0.720					1.00	1.00	0.33	0.720	0.33	0.238	4%
9	34.00	0.35		0.21	0.740					1.00	1.00	0.35	0.740	0.35	0.259	5%
10	35.00	0.42		0.25	0.630					1.00	1.00	0.42	0.630	0.42	0.265	5%
11	36.00	0.46		0.28	0.630					1.00	1.00	0.46	0.630	0.46	0.290	5%
12	37.00	0.46		0.28	0.480					1.00	1.00	0.46	0.480	0.46	0.221	4%
13	38.00	0.48		0.29	0.650					1.00	1.00	0.48	0.650	0.48	0.312	5%
14	39.00	0.55		0.33	0.620					1.00	1.00	0.55	0.620	0.55	0.341	6%
15	40.00	0.61		0.37	0.680					1.00	1.00	0.61	0.680	0.61	0.415	7%
16	41.00	0.63		0.38	0.710					1.00	1.00	0.63	0.710	0.63	0.447	8%
17	42.00	0.57		0.34	0.740					1.00	1.00	0.57	0.740	0.57	0.422	7%
18	43.00	0.60		0.36	0.630					1.00	1.00	0.60	0.630	0.60	0.378	7%
19	44.00	0.58		0.35	0.450					1.00	1.50	0.58	0.450	0.87	0.392	7%
20	46.00	0.44		0.26	0.080					1.00	1.40	0.44	0.080	0.62	0.049	1%
RB	46.80	0.00	0.00		0.000		0.000			1.00	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.71</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): across from hell. pad

Meas. Start Time (MST):	16:10
Meas. End Time (MST):	16:25
Equipment:	Marsh McBiney
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 24C

**Flow characteristics:**

Total Flow:	5.71	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.75	(m <sup>2</sup> )
Wetted Width:	28.00	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.53	(m/s)
Froude Number:	0.27	

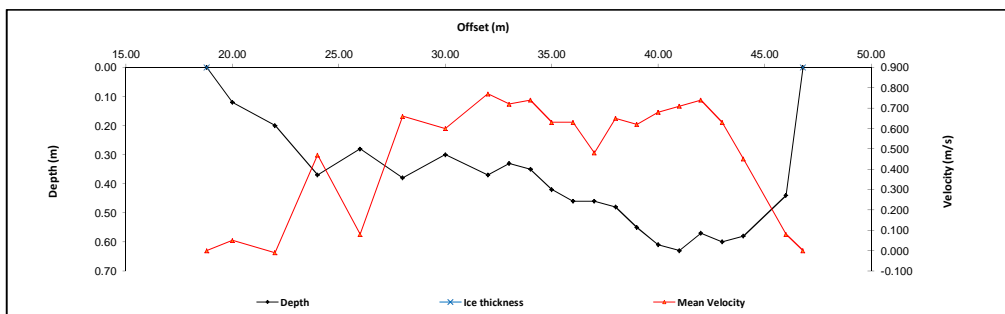
**Logger Details:**

	Before	After
Transducer Reading (m):	0.724	0.720
Water (°C):	21.0	21.0
Datalogger Clock:	15:53	16:43
Laptop Clock:	15:53	16:44
Battery (Main):	13.5	13.5
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Added rope ladder to far bank



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-03	0.804	100.804		100.000	100.000	3/4" Pipe 12m N of data logger
S45-05			0.999	99.805	99.784	3/4" Pipe 3m N of data logger
S45-06			0.927	99.877	99.880	3/4" Pipe 3m E of data logger
Water Level:	Cut		3.072	97.732		Time WL Surveyed: 16:00
Temporary BM			2.747	98.057	0.000	
<b>Turn</b>						
Temporary BM	2.714	100.771		98.057		
Water Level:	Cut		3.042	97.729		Time WL Surveyed: 16:02
S45-06			0.896	99.875	99.880	3/4" Pipe 3m E of data logger
S45-05			0.967	99.804	99.784	3/4" Pipe 3m N of data logger
S45-03			0.772	99.999	100.000	3/4" Pipe 12m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-03	0.712	100.712		100.000		
Water Level:	Cut		0.045	97.724		Time WL Surveyed: 16:42
Water Level:	Cut		3.062	97.726		Time WL Surveyed: 16:36
S45-03	0.743	100.743		100.000		

**WL Survey Summary**

	Before	After
Average WL:	97.731	97.725
Closing Error:	0.001	-
WL Check:	0.003	-0.002
Transducer Elevation	97.007	97.005

**Field Personnel:**

	TR, GG	Trip Date:	10-Aug-14
Data Entry Personnel:	GG	Date:	10-Aug-14
Data Check Personnel:	CJ	Date:	25-Aug-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: September 15, 2014  
 Site Visit Time (MST): 13:35



Measured Data							Calculated Data									
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	2.00	0.48		0.29	0.217					1.00	1.00	0.48	0.217	0.48	0.104	4%
2	3.00	0.53		0.32	0.494					1.00	1.00	0.53	0.494	0.53	0.262	9%
3	4.00	0.50		0.30	0.463					1.00	1.00	0.50	0.463	0.50	0.232	8%
4	5.00	0.44		0.26	0.460					1.00	1.00	0.44	0.460	0.44	0.202	7%
5	6.00	0.34		0.20	0.407					1.00	1.00	0.34	0.407	0.34	0.138	5%
6	7.00	0.30		0.18	0.542					1.00	1.00	0.30	0.542	0.30	0.163	6%
7	8.00	0.24		0.14	0.138					1.00	1.00	0.24	0.138	0.24	0.033	1%
8	9.00	0.24		0.14	0.455					1.00	1.00	0.24	0.455	0.24	0.109	4%
9	10.00	0.20		0.12	0.489					1.00	1.00	0.20	0.489	0.20	0.098	3%
10	11.00	0.19		0.11	0.471					1.00	1.00	0.19	0.471	0.19	0.089	3%
11	12.00	0.14		0.08	0.337					1.00	1.00	0.14	0.337	0.14	0.047	2%
12	13.00	0.18		0.11	0.618					1.00	1.00	0.18	0.618	0.18	0.111	4%
13	14.00	0.18		0.11	0.589					1.00	1.00	0.18	0.589	0.18	0.106	4%
14	15.00	0.18		0.11	0.398					1.00	1.50	0.18	0.398	0.27	0.107	4%
15	17.00	0.23		0.14	0.372					1.00	1.50	0.23	0.372	0.35	0.128	5%
16	18.00	0.28		0.17	0.378					1.00	1.00	0.28	0.378	0.28	0.106	4%
17	19.00	0.40		0.24	0.636					1.00	0.65	0.40	0.636	0.26	0.165	6%
18	19.30	0.40		0.24	0.502					1.00	1.00	0.40	0.502	0.40	0.201	7%
19	21.00	0.50		0.30	0.360					1.00	1.35	0.50	0.360	0.68	0.243	9%
20	22.00	0.38		0.23	0.267					1.00	1.70	0.38	0.267	0.65	0.172	6%
LB	24.40	0.00	0.00		0.00		0.00		0.00	1.00	1.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.82</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from hell, pad

Meas. Start Time (MST): 13:45  
 Meas. End Time (MST): 14:10  
 Equipment: ADV  
 Method: Wading  
 River Condition: Moderate flow  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Excellent  
 Weather: Cloudy, calm, 15C

**Flow characteristics:**

Total Flow:	<b>2.82</b>	(m <sup>3</sup> /s)
Perceived Measurement Quality:	<b>Excellent</b>	
Cross Section Area:	<b>6.84</b>	(m <sup>2</sup> )
Wetted Width:	<b>23.40</b>	(m)
Hydraulic Depth:	<b>0.29</b>	(m)
Mean Velocity:	<b>0.41</b>	(m/s)
Froude Number:	<b>0.24</b>	

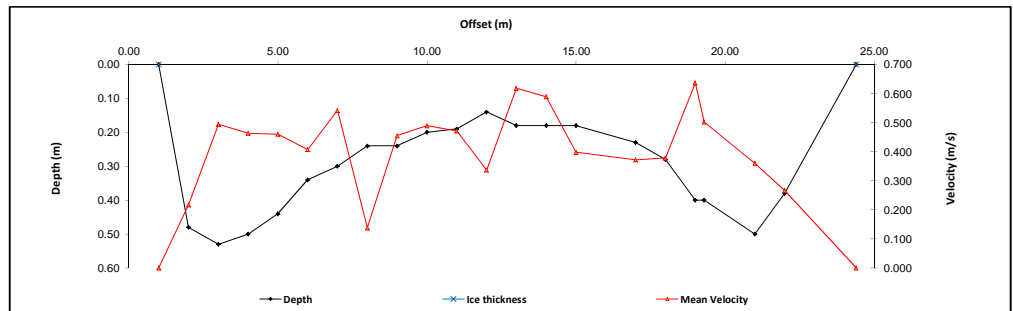
**Logger Details:**

	After	After
Transducer Reading (m):	0.556	0.526
Water (°C):	11.5	11.7
Datalogger Clock:	13:34	14:20
Laptop Clock:	13:34	14:20
Battery (Main):	13.2	14.2
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved antenna directly east, no change in RSSI, but EC/IO went lower, so it was left at lowest setting

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-03	0.661	100.661		100.000	100.000	3/4" Pipe 12m N of data logger
S45-06			0.784	99.877	99.880	3/4" Pipe 3m E of data logger
S45-05			0.857	99.804	99.784	3/4" Pipe 3m N of data logger
Water Level:	<b>Cut</b>	0.120	3.215	97.566	<b>Time WL Surveyed:</b> 13:38	
Temporary BM			0.857	99.804	0.000	
<b>Turn</b>						
Temporary BM	0.838	100.642		99.804		
Water Level:	<b>Cut</b>	0.120	3.197	97.565	<b>Time WL Surveyed:</b> 13:41	
S45-05			0.838	99.804	99.784	3/4" Pipe 3m N of data logger
S45-06			0.766	99.876	99.880	3/4" Pipe 3m E of data logger
S45-03			0.643	99.999	100.000	3/4" Pipe 12m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-05	0.838	100.642		99.804		
Water Level:	<b>Cut</b>	0.120	3.189	97.573	<b>Time WL Surveyed:</b> 14:16	
Water Level:	<b>Cut</b>	0.120	3.178	97.577	<b>Time WL Surveyed:</b> 14:18	
S45-05	0.831	100.635		99.804		

**WL Survey Summary**

	Before	After
Average WL:	97.566	97.575
Closing Error:	0.001	-
WL Check:	0.001	-0.004
Transducer Elevation	97.010	97.049

**Field Personnel:**

TR, MP	Trip Date:	15-Sep-14
Data Entry Personnel:	MP	Date: 15-Sep-14
Data Check Personnel:	DW	Date: 7-Oct-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ellis River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: October 17, 2014  
 Site Visit Time (MST): 11:50



Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	34.20	0.00	0.00		0.000				0.000	1.00	1.10	0.00	0.000	0.00	0.000	
1	32.00	0.36		0.22	0.280					1.00	1.85	0.36	0.280	0.67	0.186	7%
2	30.50	0.32		0.19	0.263					1.00	1.50	0.32	0.263	0.48	0.126	5%
3	29.00	0.32		0.19	0.268					1.00	1.50	0.32	0.268	0.48	0.129	5%
4	27.50	0.30		0.18	0.286					1.00	1.50	0.30	0.286	0.45	0.129	5%
5	26.00	0.32		0.19	0.303					1.00	1.50	0.32	0.303	0.48	0.145	5%
6	24.50	0.32		0.19	0.251					1.00	1.50	0.32	0.251	0.48	0.120	4%
7	23.00	0.30		0.18	0.270					1.00	1.50	0.30	0.270	0.45	0.122	4%
8	21.50	0.24		0.14	0.331					1.00	1.50	0.24	0.331	0.36	0.119	4%
9	20.00	0.30		0.18	0.261					1.00	1.50	0.30	0.261	0.45	0.117	4%
10	18.50	0.38		0.23	0.256					1.00	1.50	0.38	0.256	0.57	0.146	5%
11	17.00	0.42		0.25	0.296					1.00	1.50	0.42	0.296	0.63	0.186	7%
12	15.50	0.46		0.28	0.276					1.00	1.50	0.46	0.276	0.69	0.190	7%
13	14.00	0.39		0.23	0.247					1.00	1.50	0.39	0.247	0.59	0.144	5%
14	12.50	0.42		0.25	0.221					1.00	1.80	0.42	0.221	0.76	0.167	6%
15	10.40	0.48		0.29	0.240					1.00	1.50	0.48	0.240	0.72	0.173	6%
16	9.50	0.48		0.29	0.270					1.00	1.20	0.48	0.270	0.58	0.156	6%
17	8.00	0.38		0.23	0.269					1.00	1.50	0.38	0.269	0.57	0.153	6%
18	6.50	0.31		0.19	0.260					1.00	1.50	0.31	0.260	0.47	0.121	4%
19	5.00	0.34		0.20	0.182					1.00	1.25	0.34	0.182	0.43	0.077	3%
20	4.00	0.24		0.14	0.120					1.00	1.40	0.24	0.120	0.34	0.040	1%
LB	2.20	0.00	0.00		0.000		0.000		0.000	1.00	0.90	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>2.75</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
40m upstream of station above large in-stream boulders

Meas. Start Time (MST):	12:25
Meas. End Time (MST):	12:52
Equipment:	ADV
Method:	Wading
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 8C

**Flow characteristics:**

Total Flow:	2.75	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	10.62	(m <sup>2</sup> )
Wetted Width:	32.00	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.14	

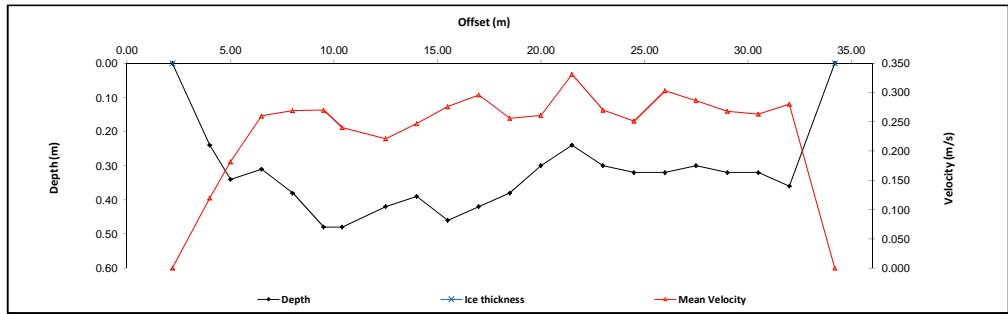
**Logger Details:**

	Before	After
Transducer Reading (m):	0.568	0.557
Water (°C):	3.2	3.9
Datalogger Clock:	12:01	13:04
Laptop Clock:	12:01	13:04
Battery (Main):	14.6	14.5
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- BM3 destroyed by falling tree between visits
- First WL Survey not done by PT, use secondary survey WL



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-06	0.818	100.698		99.880	99.880	3/4" Pipe 3m E of data logger
S45-05			0.891	99.807	99.784	3/4" Pipe 3m N of data logger
Water Level:	Cut	0.191	3.250	97.639	Time WL Surveyed: 12:12	
Temporary BM			2.905	97.793	0.000	
<b>Turn</b>						
Temporary BM	2.890	100.683		97.793		
Water Level:	Cut	0.189	3.229	97.643	Time WL Surveyed: 12:14	
S45-05			0.877	99.806	99.784	3/4" Pipe 3m N of data logger
S45-06			0.893	99.880	99.880	3/4" Pipe 3m E of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-05	0.847	100.654		99.807		
Water Level:	Cut		3.058	97.596	Time WL Surveyed: 13:08	
Water Level:	Cut		3.043	97.600	Time WL Surveyed: 13:09	
S45-05	0.836	100.643		99.807		

**WL Survey Summary**

	Before	After
Average WL:	97.641	97.598
Closing Error:	0.000	-
WL Check:	0.004	-0.004
Transducer Elevation	97.073	97.041

**Field Personnel:**

Data Entry Personnel:	DW, MP	Trip Date:	17-Oct-14
Data Check Personnel:	DW, MP	Date:	17-Oct-14
Entered Digitally in the Field:	MP	Date:	17-Nov-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S45 - Ells River above Joslyn Creek Diversion  
 UTM Location: 440605 E, 6342459 N

Site Visit Date: December 3, 2014  
 Site Visit Time (MST): 13:15



Measured Data											Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)	
LB	3.50	0.00	0.00		0.000		0.000		0.000	0.88	0.45	0.00	0.000	0.00	0.000		
1	4.40	0.58	0.34	0.46	0.102					0.88	0.55	0.24	0.090	0.13	0.012	1%	
2	4.60	0.56	0.40	0.48	0.000					0.88	0.57	0.16	0.000	0.09	0.000	0%	
3	5.55	0.54	0.30	0.42	0.135					0.88	1.50	0.24	0.119	0.36	0.043	2%	
4	7.60	0.58	0.25	0.42	0.157					0.88	1.58	0.33	0.138	0.52	0.072	3%	
5	8.70	0.56	0.25	0.41	0.209					0.88	1.08	0.31	0.184	0.33	0.061	3%	
6	9.75	0.60	0.25	0.43	0.225					0.88	1.08	0.35	0.198	0.38	0.074	3%	
7	10.85	0.73	0.25	0.49	0.237					0.88	0.97	0.48	0.209	0.47	0.098	4%	
8	11.70	0.75	0.25	0.50	0.248					0.88	0.83	0.50	0.218	0.41	0.090	4%	
9	12.50	0.78	0.23	0.51	0.232					0.88	0.83	0.55	0.204	0.45	0.093	4%	
10	13.35	0.82	0.24	0.53	0.259					0.88	0.80	0.58	0.228	0.46	0.106	5%	
11	14.10	0.95	0.25	0.60	0.252					0.88	0.78	0.70	0.222	0.54	0.120	5%	
12	14.90	0.97	0.25	0.61	0.253					0.88	0.82	0.72	0.223	0.59	0.132	6%	
13	15.75	1.02	0.25			0.87	0.224	0.40	0.258	1.00	0.95	0.77	0.241	0.73	0.176	8%	
14	16.80	1.20	0.25			1.01	0.207	0.44	0.280	1.00	0.60	0.95	0.244	0.57	0.139	6%	
15	16.95	1.21	0.25			1.02	0.247	0.44	0.277	1.00	0.50	0.96	0.262	0.48	0.126	6%	
16	17.80	1.38	0.25			1.15	0.260	0.48	0.266	1.00	0.50	1.13	0.263	0.57	0.149	7%	
17	17.95	1.39	0.25			1.16	0.258	0.48	0.242	1.00	0.55	1.14	0.250	0.63	0.157	7%	
18	18.90	1.80	0.30			1.50	0.106	0.60	0.204	1.00	0.55	1.50	0.155	0.83	0.128	6%	
19	19.05	1.83	0.27			1.52	0.147	0.58	0.171	1.00	0.48	1.56	0.159	0.74	0.118	5%	
20	19.85	1.92	0.30			1.60	0.072	0.62	0.142	1.00	0.88	1.62	0.107	1.42	0.152	7%	
21	20.80	1.69	0.33			1.42	0.086	0.60	0.081	1.00	1.03	1.36	0.084	1.39	0.116	5%	
22	21.90	1.35	0.35			1.15	0.031	0.55	0.018	1.00	1.05	1.00	0.025	1.05	0.026	1%	
23	22.90	1.18	0.35	0.68	0.009	1.01	0.020	0.52	0.009	1.00	0.88	0.83	0.015	0.73	0.011	0%	
24	23.65	1.00	0.35							0.88	0.90	0.65	0.008	0.58	0.005	0%	
25	24.70	0.75	0.35	0.55	-0.003					0.88	1.33	0.40	-0.003	0.53	-0.001	0%	
RB	26.30	0.00	0.00		0.00		0.00		0.00	0.88	0.80	0.00	0.000	0.00	0.000		
														<b>Total Flow</b>	<b>2.20</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
25m DS of PT

Meas. Start Time (MST):	13:45
Meas. End Time (MST):	14:30
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, -20C

**Flow characteristics:**

Total Flow:	<b>2.20</b>	(m³/s)
Perceived Measurement Quality:	<b>Excellent</b>	
Cross Section Area:	<b>14.99</b>	(m²)
Wetted Width:	<b>22.80</b>	(m)
Hydraulic Depth:	<b>0.66</b>	(m)
Mean Velocity:	<b>0.15</b>	(m/s)
Froude Number:	<b>0.06</b>	

**Logger Details:**

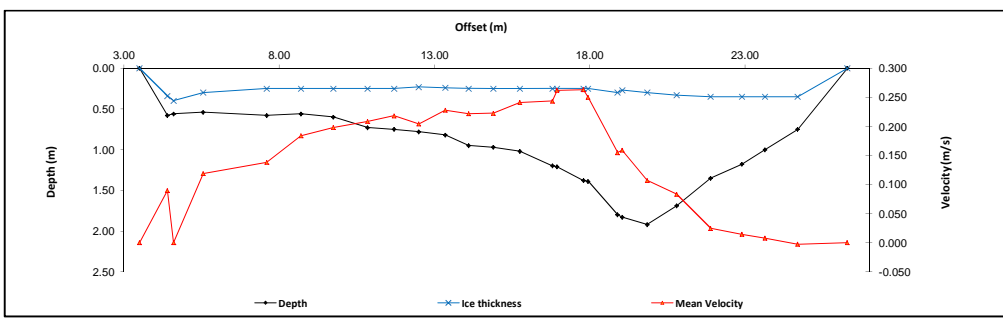
	Before	After
Transducer Reading (m):	0.709	0.713
Water (°C):	0.1	0.1
Datalogger Clock:	01:23	02:39
Laptop Clock:	01:23	02:39
Battery (Main):	12.7	12.9
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Modem replaced

**General Notes:**

- BM 03 damaged, used old nail BM (BM 04) instead



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S45-06	0.884	100.764		99.880	99.880	3/4" Pipe 3m E of data logger
S45-05			0.955	99.809	99.784	3/4" Pipe 3m N of data logger
S45-04			0.721	100.043	101.050	Nail in stump on ledge
Water Level:			3.026	97.738	Time WL Surveyed:	13:34
Temporary BM			2.988	97.776	0.000	-
<b>Turn</b>						
Temporary BM	2.980	100.756		97.776	-	-
Water Level:			3.014	97.742	Time WL Surveyed:	13:36
S45-04			0.711	100.045	101.050	Nail in stump on ledge
S45-05			0.876	99.880	99.784	3/4" Pipe 3m N of data logger
S45-06			0.948	99.808	99.880	3/4" Pipe 3m E of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S45-05	0.914	100.723		99.809	-	-
Water Level:			2.978	97.745	Time WL Surveyed:	14:34
Water Level:			2.967	97.742	Time WL Surveyed:	14:36
S45-05	0.900	100.709		99.809	-	-

**WL Survey Summary**

	Before	After
Average WL:	97.740	97.744
Closing Error:	0.072	-
WL Check:	0.004	0.003
Transducer Elevation	97.031	97.031

**Field Personnel:**

TR, CJ	Trip Date:	3-Dec-14
Data Entry Personnel: CJ	Date:	3-Dec-04
Data Check Personnel: DW	Date:	16-Dec-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: January 13, 2014  
 Site Visit Time (MST): 11:00



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)	
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	3.50	0.00	0.000	0.00	0.000		
1	7.00	1.32	0.47			1.15	0.196	0.64	0.209	1.00	12.25	0.85	0.203	10.41	2.109	1%	
2	24.50	1.91	0.46			1.62	0.357	0.75	0.354	1.00	17.00	1.45	0.356	24.65	8.763	4%	
3	41.00	3.85	0.54			3.19	0.363	1.20	0.644	1.00	17.95	3.31	0.504	59.41	29.915	13%	
4	60.40	3.81	0.72			3.19	0.479	1.34	0.323	1.00	18.25	3.09	0.401	56.39	22.613	10%	
5	77.50	3.37	0.52			2.80	0.462	1.09	0.506	1.00	20.00	2.85	0.484	57.00	27.588	12%	
6	100.40	2.70	0.47			2.25	0.422	0.92	0.458	1.00	22.25	2.23	0.440	49.62	21.832	9%	
7	122.00	2.31	0.74			2.00	0.388	1.05	0.359	1.00	20.30	1.57	0.374	31.87	11.904	5%	
8	141.00	2.10	0.78			1.84	0.279	1.04	0.220	1.00	19.50	1.32	0.250	25.74	6.422	3%	
9	161.00	1.94	0.69			1.69	0.241	0.94	0.135	1.00	20.50	1.25	0.188	25.63	4.818	2%	
10	182.00	2.02	0.54			1.72	0.249	0.84	0.210	1.00	21.00	1.48	0.230	31.08	7.133	3%	
11	203.00	1.51	0.70		0.162	1.35	0.152	0.86	0.035	0.88	21.50	0.81	0.143	17.42	2.483	1%	
12	225.00	1.34	0.69	1.02	0.227					0.88	22.50	0.65	0.200	14.63	2.921	1%	
13	248.00	1.27	0.57	0.92	0.062					0.88	19.50	0.70	0.055	13.65	0.745	0%	
14	264.00	1.23	0.56	0.90	0.178					0.88	18.50	0.67	0.157	12.40	1.942	1%	
15	285.00	1.21	0.56	0.89	0.132					0.88	24.00	0.65	0.116	15.60	1.812	1%	
16	312.00	1.38	0.55			1.21	0.132	0.72	0.137	1.00	20.00	0.83	0.135	16.60	2.233	1%	
17	325.00	1.50	0.69			1.34	0.103	0.85	0.056	1.00	16.50	0.81	0.080	13.37	1.063	0%	
18	345.00	1.67	0.50			1.44	0.208	0.73	0.108	1.00	18.50	1.17	0.158	21.65	3.420	1%	
19	362.00	1.78	0.67			1.56	0.090	0.89	0.159	1.00	16.00	1.11	0.125	17.76	2.211	1%	
20	377.00	4.85	0.57			3.99	0.426	1.43	0.382	1.00	15.50	4.28	0.404	66.34	26.801	11%	
21	393.00	5.00	0.56			4.11	0.456	1.45	0.474	1.00	15.00	4.44	0.465	66.60	30.969	13%	
22	407.00	3.32	0.56			2.77	0.511	1.11	0.500	1.00	11.00	2.76	0.506	30.36	15.347	7%	
23	415.00	1.38	0.58			1.22	0.048	0.74	0.046	1.00	7.00	0.80	0.047	5.60	0.263	0%	
RB	421.00	0.00	0.00		0.00		0.00		0.00	0.88	3.00	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>235</b>	<b>100%</b>		

**Flow Measurement Details:**

Metering Section Location (describe): 70m downstream of station

Meas. Start Time (MST):	12:00
Meas. End Time (MST):	13:45
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Windy

**Flow characteristics:**

Total Flow:	235	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	683.76	(m²)
Wetted Width:	421.00	(m)
Hydraulic Depth:	1.62	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.09	

**Logger Details:**

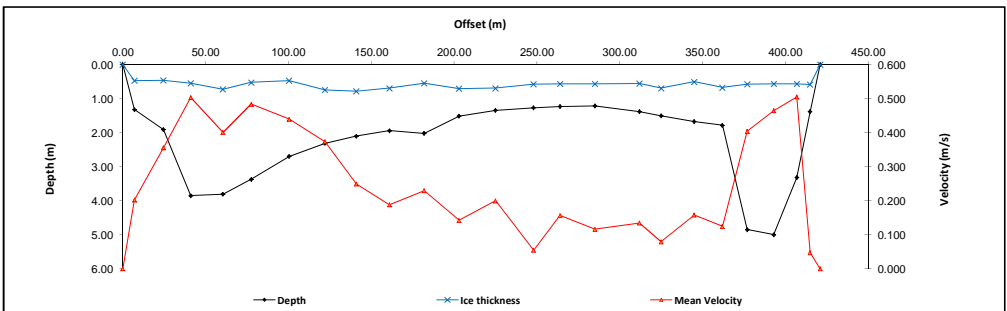
	Before	After
Transducer #1 (0-4m) Reading (m):	1.170	-
Transducer #2 (0-10m) Reading (m):	NAN	-
Water Temperature #1 (°C):	0.4	-
Water Temperature #2 (°C):	0.0	-
Datalogger Clock:	11:16	-
Laptop Clock:	11:15	-
Battery (Main):	12.9	-
Battery:		Replaced
Battery Serial #:	-	Replaced
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

Uploaded new program to data logger to remove data sonde instructions which were no longer needed.

**General Notes:**

Depths greater than 5.0 m could not be determined using the winter flow rod



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S46-05	1.332	100.997		99.665	99.665	3/4" Pipe 6m S of logger
S46-04			1.247	99.750	99.748	3/4" Pipe 2m S of logger
S46-06			2.382	98.615	98.606	3/4" Pipe on Lower Bench
Water Level:	Cut		5.752	95.245	Time WL Surveyed: 11:38	
Temporary BM			5.727	95.270	0.000	-
<b>Turn</b>						
Temporary BM	5.688	100.958		95.270		
Water Level:	Cut		5.709	95.249	Time WL Surveyed: 11:49	
S46-06			2.342	98.616	98.606	3/4" Pipe on Lower Bench
S46-04			1.206	99.752	99.748	3/4" Pipe 2m S of logger
S46-05			1.292	99.666	99.665	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	95.247	-
Closing Error:	-0.001	-
WL Check:	0.004	-
Transducer Elevation	94.077	-

**Field Personnel:**

	TR, DW	Trip Date:	13-Jan-14
Data Entry Personnel:	TR	Date:	13-Jan-14
Data Check Personnel:	CJ	Date:	24-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: February 7, 2014  
 Site Visit Time (MST): 09:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000	0.88	6.55	0.00	0.000	0.00	0.000	
1	13.10	1.89	0.75		0.213	1.66		0.98		0.88	15.90	1.14	0.187	18.13	3.398	1%
2	31.80	1.74	0.75		0.375	1.54		0.95		0.88	16.90	0.99	0.330	16.70	5.510	2%
3	46.90	2.79	0.63		0.442	2.35		1.06		0.88	15.90	2.16	0.389	34.28	13.334	5%
4	63.60	4.59	0.66		0.547	3.80		1.45		0.88	14.40	3.93	0.481	56.61	27.248	11%
5	75.70	4.96	0.55		0.533	4.07		1.43		0.88	15.25	4.41	0.469	67.18	31.508	13%
6	94.10	3.02	0.56		0.517	2.53		1.05		0.88	19.55	2.46	0.455	48.13	21.898	9%
7	114.80	2.57	0.66		0.480	2.18		1.04		0.88	32.10	1.91	0.422	61.15	25.830	10%
8	158.30	2.14	0.59		0.407	1.83		0.90		0.88	32.90	1.55	0.358	51.03	18.276	7%
9	180.60	1.94	0.73		0.341	1.70		0.97		0.88	20.85	1.21	0.300	25.31	7.596	3%
10	200.00	1.97	0.72		0.324	1.72		0.97		0.88	19.20	1.25	0.285	24.08	6.865	3%
11	219.00	1.25	0.72	0.99	0.319					0.88	20.50	0.53	0.281	10.95	3.073	1%
12	241.00	1.28	0.83	1.05	0.300					0.88	20.00	0.45	0.264	8.96	2.365	1%
13	259.00	1.28	0.85	1.06	0.170					0.88	21.00	0.43	0.150	8.93	1.335	1%
14	283.00	1.09	0.67	0.88	0.175					0.88	21.00	0.42	0.154	8.90	1.371	1%
15	301.00	1.34	0.79	1.06	0.152					0.88	20.00	0.55	0.134	10.96	1.466	1%
16	323.00	1.47	0.70		0.129	1.31		0.85		0.88	19.00	0.77	0.114	14.54	1.650	1%
17	339.00	2.61	0.58		0.202	2.21		0.99		0.88	19.00	2.03	0.178	38.61	6.863	3%
18	361.00	1.83	0.70		0.303	1.60		0.93		0.88	19.00	1.13	0.267	21.38	5.699	2%
19	377.00	2.88	0.69		0.238	2.44		1.13		0.88	14.00	2.19	0.209	30.70	6.430	3%
20	389.00	4.70	0.63		0.430	3.89		1.44		0.88	12.00	4.07	0.378	48.84	18.481	7%
21	401.00	4.97	0.49		0.472	4.07		1.39		0.88	11.00	4.48	0.415	49.27	20.464	8%
22	411.00	4.74	0.58		0.502	3.91		1.41		0.88	10.00	4.16	0.442	41.57	18.364	7%
23	421.00	1.79	0.69		0.155	1.57		0.91		0.88	9.50	1.10	0.136	10.45	1.425	1%
RB	430.00	0.00	0.00		0.00			0.00		0.88	4.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>250</b>	<b>100%</b>	

**Flow Measurement Details:**

**Metering Section Location (describe):**  
 -approx. 30m downstream of station

Meas. Start Time (MST):	12:45
Meas. End Time (MST):	14:00
Equipment:	ADCP
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, -25C

**Flow characteristics:**

Total Flow:	250	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	706.63	(m <sup>2</sup> )
Wetted Width:	430.00	(m)
Hydraulic Depth:	1.64	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.09	

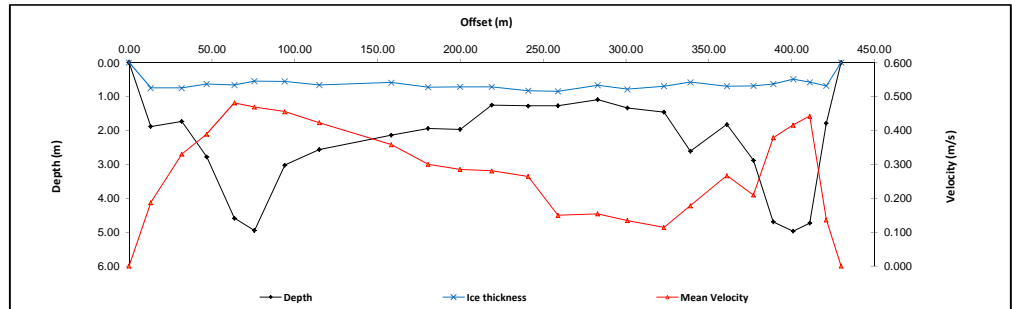
**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	1.172	1.170
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	0.4	0.4
Water Temperature #2 (°C):	-	-
Datalogger Clock:	09:56	14:52
Laptop Clock:	09:55	14:50
Battery (Main):	13.9	14.9
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- ADCP test results were good
- ADCP compass test: 0.5° error



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S46-04	0.263	100.011		99.748	99.748	3/4" Pipe 2m S of logger
S46-05			0.346	99.665	99.665	3/4" Pipe 6m S of logger
S46-06			1.397	98.614	98.606	3/4" Pipe on Lower Bench
<b>Turn</b>						
Water Level:	Cut		4.759	95.252	<b>Time WL Surveyed:</b> 11:05	
Temporary BM			4.805	95.206	0.000	-
<b>Turn</b>						
Temporary BM	4.795	100.001		95.206		-
Water Level:	Cut		4.748	95.253	<b>Time WL Surveyed:</b> 11:07	
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S46-04	0.227	99.975		99.748		
Water Level:	Cut		4.725	95.250	<b>Time WL Surveyed:</b> 14:41	
Water Level:	Cut		4.733	95.251	<b>Time WL Surveyed:</b> 14:43	
S46-04	0.236	99.984		99.748		

**WL Survey Summary**

	Before	After
Average WL:	95.253	95.251
Closing Error:	-0.003	-
WL Check:	0.001	-0.001
Transducer Elevation	94.081	94.081

Field Personnel:	CJ, TR	Trip Date:	7-Feb-14
Data Entry Personnel:	CJ	Date:	24-Apr-14
Data Check Personnel:	SM	Date:	21-Jan-15
Entered Digitally in the Field:	No		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: March 7 and 11, 2014  
 Site Visit Time (MST): 14:30 (March 7) and 10:45 (March 11)



Measured Data										Calculated Data						
Bank/ Mnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000				0.000	0.88	10.70	0.00	0.000	0.00	0.000	
1	21.40	3.27	0.72		0.357	2.76		1.23		0.88	18.05	2.55	0.314	45.94	14.432	8%
2	36.10	4.30	0.50		0.512	3.54		1.26		0.88	12.55	3.80	0.451	47.74	21.510	12%
3	46.50	3.92	0.55		0.503	3.24		1.22		0.88	15.70	3.37	0.443	52.86	23.399	13%
4	67.50	3.46	0.56		0.489	2.88		1.14		0.88	19.85	2.90	0.413	57.64	23.791	14%
5	86.20	2.86	0.75		0.213	2.44		1.17		0.88	23.00	2.11	0.187	48.60	9.109	5%
6	113.50	2.66	0.69		0.139	2.26		1.08		0.88	31.90	1.97	0.122	62.75	7.675	4%
7	150.00	0.00	0.00	0.00						1.00	31.70	0.00		0.00		
8	176.90	2.04	0.77		0.071	1.78		1.02		0.88	30.00	1.27	0.062	37.95	2.371	1%
9	210.00	1.96	0.60		0.215	1.69		0.87		0.88	35.05	1.36	0.189	47.63	9.012	5%
10	247.00	2.07	0.70		0.024	1.80		0.97		0.88	33.50	1.37	0.021	45.93	0.970	1%
11	277.00	1.94	0.63		0.246	1.67		0.89		0.88	25.50	1.31	0.216	33.30	7.209	4%
12	298.00	1.96	0.70		0.040	1.71		0.95		0.88	21.00	1.26	0.035	26.50	0.933	1%
13	319.00	2.70	0.65		0.171	2.29		1.06		0.88	17.50	2.05	0.150	35.84	5.393	3%
14	333.00	3.06	0.66		0.138	2.58		1.14		0.88	14.00	2.40	0.121	33.59	4.079	2%
15	347.00	2.23	0.61		0.145	1.91		0.93		0.88	11.00	1.62	0.128	17.84	2.277	1%
16	355.00	3.26	0.64		0.208	2.73		1.16		0.88	8.00	2.62	0.183	20.93	3.831	2%
17	363.00	4.33	0.69		0.204	3.60		1.42		0.88	8.00	3.64	0.180	29.09	5.222	3%
18	371.00	4.40	0.66		0.375	3.65		1.41		0.88	8.00	3.74	0.330	29.94	9.879	6%
19	379.00	4.53	0.60		0.420	3.74		1.39		0.88	7.00	3.93	0.370	27.48	10.155	6%
20	385.00	4.10	0.56		0.414	3.39		1.27		0.88	5.50	3.54	0.364	19.48	7.097	4%
21	390.00	3.32	0.47		0.318	2.75		1.04		0.88	6.00	2.85	0.280	17.09	4.782	3%
22	397.00	1.80	0.45		0.169	1.53		0.72		0.88	5.35	1.35	0.149	7.24	1.077	1%
RB	400.70	0.00	0.00							0.88	1.85	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>174</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 -approx. 20m downstream of station

Meas. Start Time (MST):	14:30
Meas. End Time (MST):	16:20
Equipment:	ADCP
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -15C

**Flow characteristics:**

Total Flow:	174	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	745.35	(m <sup>2</sup> )
Wetted Width:	400.70	(m)
Hydraulic Depth:	1.86	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.05	

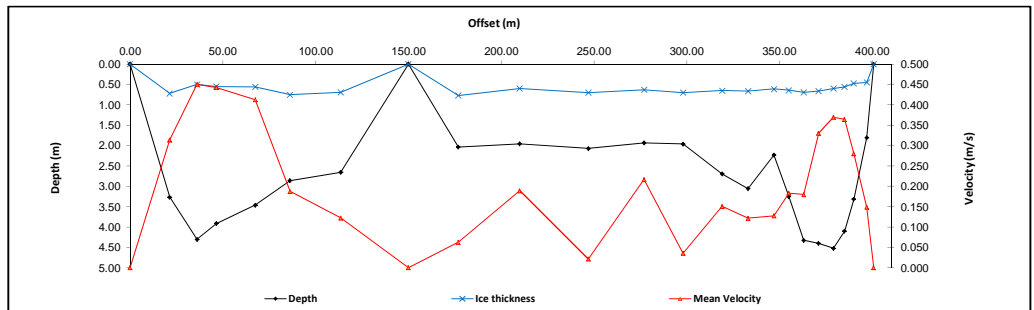
**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	0.899	0.899
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	0.4	0.4
Water Temperature #2 (°C):	-	-
Datalogger Clock:	10:03	13:07
Laptop Clock:	10:03	13:07
Battery (Main):	14.5	14.3
Battery:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Good
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Flow measurement conducted with ADCP on March 7, 2014. All ADCP test results good.
- Returned to station on March 11, 2014 to conduct water level survey and data download.
- A sand bar was present at offset 150m during the flow measurement



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S46-05	0.279	99.944		99.665	99.665	3/4" Pipe 6m S of logger
S46-04			0.197	99.747	99.748	3/4" Pipe 2m S of logger
S46-06			1.329	98.615	98.606	3/4" Pipe on Lower Bench
Water Level	Cut		4.799	95.145		Time WL Surveyed: 12:59
Temporary BM			4.597	95.347	0.000	
<b>Turn</b>						
Temporary BM	4.594	99.941		95.347		
Water Level	Cut		4.794	95.147		Time WL Surveyed: 13:02
S46-06			1.324	98.617	98.606	3/4" Pipe on Lower Bench
S46-04			0.190	99.751	99.748	3/4" Pipe 2m S of logger
S46-05			0.273	99.668	99.665	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level	Cut					Time WL Surveyed:
Water Level	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	95.146	-
Closing Error:	-0.003	-
WL Check:	0.002	-
Transducer Elevation	94.247	-

**Field Personnel:**

	CJ, TR	Trip Date:	11-Mar-14
Data Entry Personnel:	CJ	Date:	24-Apr-14
Data Check Personnel:	SG	Date:	25-Apr-14
Entered Digitally in the Field:	No		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: April 8, 2014  
 Site Visit Time (MST): 08:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	0.88	2.00	0.00	0.000	0.00	0.000	
1	4.00	1.36	0.75	1.06	0.020					0.88	8.00	0.61	0.018	4.88	0.086	0%
2	16.00	5.30	0.55			4.35	0.480	1.50	0.470	1.00	10.50	4.75	0.475	49.88	23.691	11%
3	25.00	5.60	0.68			4.62	0.364	1.66	0.411	1.00	10.50	4.92	0.398	51.66	20.018	9%
4	37.00	5.13	0.65			4.23	0.388	1.55	0.170	1.00	11.00	4.48	0.279	49.28	13.749	6%
5	47.00	2.10	0.85			1.85	0.472	1.10	0.204	1.00	15.00	1.25	0.338	18.75	6.338	3%
6	67.00	1.75	0.67			1.53	0.091	0.89	0.046	1.00	21.50	1.08	0.069	23.22	1.591	1%
7	90.00	1.70	0.75			1.51	-0.056	0.94	0.206	1.00	25.00	0.95	0.075	23.75	1.781	1%
8	117.00	1.55	0.75			1.39	0.095	0.91	0.228	1.00	24.50	0.80	0.162	19.60	3.165	1%
9	139.00	1.61	0.82			1.45	0.015	0.98	0.179	1.00	22.00	0.79	0.097	17.38	1.686	1%
10	161.00	1.42	0.45			1.23	0.123	0.64	-0.017	1.00	48.00	0.97	0.053	46.56	2.468	1%
11	235.00	1.75	0.92			1.58	0.110	1.09	0.292	1.00	51.00	0.83	0.201	42.33	8.508	4%
12	263.00	1.91	0.93			1.71	0.285	1.13	0.412	1.00	24.00	0.98	0.349	23.52	8.197	4%
13	283.00	1.85	0.95			1.67	0.346	1.13	0.505	1.00	20.00	0.90	0.426	18.45	7.850	4%
14	304.00	2.60	0.76			2.23	0.156	1.13	0.409	1.00	24.50	1.84	0.283	45.08	12.735	6%
15	332.00	2.77	0.75			2.37	0.285	1.15	0.380	1.00	25.00	2.02	0.333	50.50	16.798	8%
16	354.00	3.05	0.72			2.58	0.358	1.19	0.504	1.00	17.00	2.33	0.431	39.61	17.072	8%
17	366.00	3.35	0.73			2.83	0.359	1.25	0.463	1.00	12.00	2.62	0.411	31.44	12.922	6%
18	378.00	4.30	0.69			3.58	0.323	1.41	0.515	1.00	12.00	3.61	0.419	43.32	18.151	8%
19	390.00	4.25	0.75			3.55	0.235	1.45	0.435	1.00	13.00	3.50	0.335	45.50	15.243	7%
20	404.00	4.40	0.70			3.66	0.285	1.44	0.256	1.00	13.50	3.70	0.271	49.95	13.511	6%
21	417.00	3.25	0.71			2.74	0.396	1.22	0.438	1.00	10.00	2.54	0.417	25.40	10.592	5%
22	424.00	2.30	0.85				0.249	1.14	0.337	1.00	7.50	1.45	0.293	10.88	3.186	1%
LB	432.00	0.00	0.00		0.00					0.88	4.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>219</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 10m DS of station

Mess. Start Time (MST):	10:18
Mess. End Time (MST):	11:40
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 4 C

**Flow characteristics:**

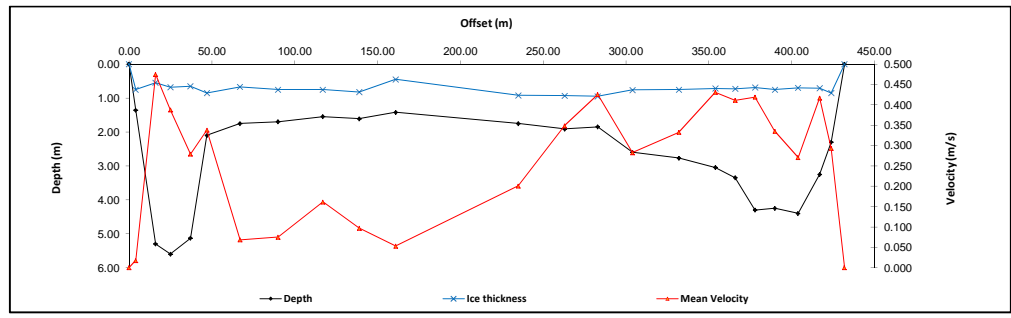
Total Flow:	219	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good	
Cross Section Area:	730.93	(m <sup>2</sup> )
Wetted Width:	432.00	(m)
Hydraulic Depth:	1.69	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	1.121	-
Transducer #2 (0-10m) Reading (m):	-	-
Water Temperature #1 (°C):	0.4	-
Water Temperature #2 (°C):	-	-
Datalogger Clock:	08:48	-
Laptop Clock:	08:47	-
Battery (Main):	14.4	-
Battery Serial #:	-	Good
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S46-05	1.365	101.030		99.665	99.665	3/4" Pipe 6m S of logger
S46-04			1.278	99.752	99.748	3/4" Pipe 2m S of logger
S46-06			2.409	98.621	98.606	3/4" Pipe on Lower Bench
Water Level:	Cut		5.814	95.216	95.216	Time WL Surveyed: 9:51
S46-04			1.278	99.752	99.748	3/4" Pipe 2m S of logger
<b>Turn</b>						
S46-04	1.261	101.013		99.752	99.748	3/4" Pipe 2m S of logger
Water Level:	Cut		5.798	95.215	95.215	Time WL Surveyed: 9:54
S46-06			2.390	98.623	98.606	3/4" Pipe on Lower Bench
S46-04			1.261	99.752	99.748	3/4" Pipe 2m S of logger
S46-05			1.344	99.669	99.665	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	95.216	-
Closing Error:	-0.004	-
WL Check:	0.001	-
Transducer Elevation	94.095	-

**Field Personnel:**

	SM, MP	Trip Date:	8-Apr-14
Data Entry Personnel:	SM	Date:	8-Apr-14
Data Check Personnel:	CJ	Date:	24-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: May 16, 2014  
 Site Visit Time (MST): 09:20



Flow Measurement Details:	
Metering Section Location (describe): -adjacent to station	
Meas. Start Time (MST):	11:15
Meas. End Time (MST):	12:15
Equipment:	ADCP
Method:	Boat
River Condition:	Open, no ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15 C

Flow characteristics:		
Total Flow:	1191	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1448.63	(m <sup>2</sup> )
Wetted Width:	415.55	(m)
Hydraulic Depth:	3.49	(m)
Mean Velocity:	0.82	(m/s)
Froude Number:	0.14	

Logger Details:	Before	After
Transducer #1 (0-4m) Reading (m):	-	3.270
Transducer #2 (0-10m) Reading (m):	-	5.081
Water Temperature #1 (°C):	-	10.4
Water Temperature #2 (°C):	-	10.0
Datalogger Clock:	09:24	12:29
Laptop Clock:	09:23	12:28
Battery (Main):	13.1	-
Battery:	Replaced	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Transducers were found severed by ice
- Transducer #1 s/n: 278516
- Transducer #2 s/n: 333233

**General Notes:**

- Discharge measurement was conducted with ADCP
- Benchmarks 5 and 6 were damaged by ice. BM 4 was not damaged.

ADCP Flow Measurement Summary:								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	-	
Serial Number:	1802		Salinity (ppt):	-		RB:	-	
Firmware Version:	3.5		Magnetic Declination (°):	14.33				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	10.5				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	415.57	1428.49	0.844	1204.959	1.19%
Coordinate System:	ENU		2	416.23	1471.42	0.809	1189.708	-0.09%
Left Method:	Sloped Bank		3	418.71	1427.06	0.824	1175.503	-1.29%
Right Method:	Sloped Bank		4	411.68	1467.57	0.813	1193.063	0.19%
Top Fit Type:	Power Fit		-	-	-	-	-	-
Bottom Fit Type:	Power Fit		-	-	-	-	-	-
			<b>Mean:</b>	415.55	1448.63	0.823	<b>1191</b>	
			<b>SD:</b>	2.52	20.91	0.014	10.497	
			<b>COV:</b>	0.01	0.01	0.017	0.009	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S46-04	1.215	100.963		99.748	99.748	3/4" Pipe 2m S of logger
Temporary BM			1.454	99.509	0.000	-
Water Level:	Cut		4.277	96.686	<b>Time WL Surveyed:</b>	11:05
S46-04			1.215	99.748	99.748	3/4" Pipe 2m S of logger
<b>Turn</b>						
S46-04	1.227	100.975		99.748	99.748	3/4" Pipe 2m S of logger
Water Level:	Cut		4.285	96.690	<b>Time WL Surveyed:</b>	11:00
Temporary BM			1.466	99.509		-
S46-04			1.226	99.749	99.748	3/4" Pipe 2m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S46-04	1.215	100.963		99.748		
Water Level:	Cut		4.278	96.685	<b>Time WL Surveyed:</b>	12:24
Water Level:	Cut		4.262	96.686	<b>Time WL Surveyed:</b>	12:25
S46-04	1.200	100.948		99.748		

WL Survey Summary	Before	After
Average WL:	96.688	96.686
Closing Error:	-0.001	-
WL Check:	0.004	-0.001
Transducer Elevation	-	93.416

Field Personnel:	SM, MP	Trip Date:	16-May-14
Data Entry Personnel:	SM	Date:	16-May-14
Data Check Personnel:	CJ	Date:	18-Jul-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: June 14, 2014  
 Site Visit Time (MST): 08:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	9.00	0.00	0.000	0.00	0.000	
1	19.00	6.62				5.30	0.980	1.32	0.970	1.00	22.00	6.62	0.975	145.64	141.999	7%
2	45.00	5.34				4.27	1.080	1.07	1.460	1.00	19.00	5.34	1.270	101.46	128.854	6%
3	57.00	5.29				4.23	1.000	1.06	1.380	1.00	19.00	5.29	1.190	100.51	119.607	6%
4	83.00	5.28				4.22	0.820	1.06	1.460	1.00	23.50	5.28	1.140	124.08	141.451	7%
5	104.00	5.21				4.17	0.610	1.04	1.230	1.00	20.50	5.21	0.920	106.81	98.261	5%
6	124.00	5.31				4.25	0.610	1.06	1.490	1.00	17.50	5.31	1.050	92.93	97.571	5%
7	139.00	5.43				4.34	0.960	1.09	1.480	1.00	20.00	5.43	1.220	108.60	132.492	6%
8	164.00	5.04				4.03	1.040	1.01	1.540	1.00	20.50	5.04	1.290	103.32	133.283	6%
9	180.00	5.16				4.13	1.060	1.03	1.390	1.00	17.00	5.16	1.225	87.72	107.457	5%
10	198.00	5.03				4.02	0.840	1.01	1.450	1.00	22.50	5.03	1.145	113.18	129.585	6%
11	225.00	5.22				4.18	0.910	1.04	1.320	1.00	20.50	5.22	1.115	107.01	119.316	6%
12	239.00	4.62				3.70	1.020	0.92	1.340	1.00	19.50	4.62	1.180	90.09	106.306	5%
13	264.00	4.26				3.41	0.740	0.85	1.230	1.00	20.50	4.26	0.985	87.33	86.020	4%
14	280.00	4.00				3.20	0.720	0.80	1.110	1.00	21.00	4.00	0.915	84.00	76.860	4%
15	306.00	3.79				3.03	0.740	0.76	1.020	1.00	21.50	3.79	0.880	81.49	71.707	3%
16	323.00	3.66				2.93	0.650	0.73	0.890	1.00	16.50	3.66	0.770	60.39	46.500	2%
17	339.00	3.76				3.01	0.550	0.75	0.790	1.00	19.00	3.76	0.670	71.44	47.865	2%
18	361.00	4.25				3.40	0.570	0.85	0.680	1.00	22.00	4.25	0.625	93.50	58.438	3%
19	383.00	6.98				5.58	0.600	1.40	0.850	1.00	22.00	6.98	0.725	153.56	111.331	5%
20	405.00	6.12				4.90	0.710	1.22	0.850	1.00	18.00	6.12	0.780	110.16	85.925	4%
21	419.00	5.93				4.74	0.530	1.19	0.850	1.00	15.00	5.93	0.690	88.95	61.376	3%
22	435.00	3.73				2.98	0.480	0.75	0.640	1.00	14.50	3.73	0.560	54.09	30.288	1%
RB	448.00	0.00	0.00		0.00					1.00	6.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>2130</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
at station

Mess. Start Time (MST):	9:36
Mess. End Time (MST):	12:07
Equipment:	ADC
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze

**Flow characteristics:**

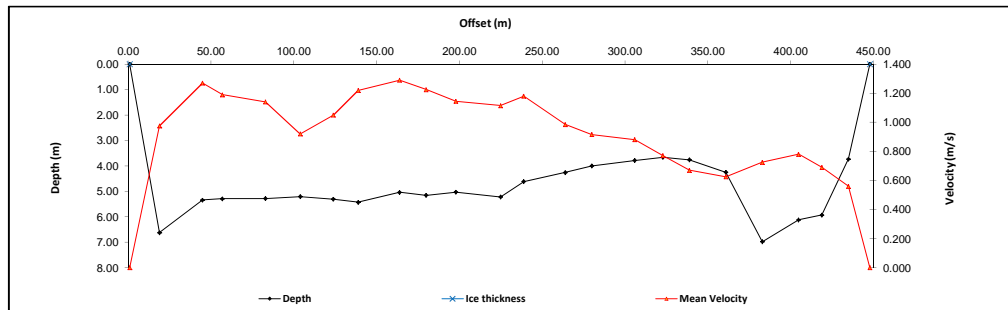
Total Flow:	2130	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2166.24	(m <sup>2</sup> )
Wetted Width:	447.00	(m)
Hydraulic Depth:	4.85	(m)
Mean Velocity:	0.98	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	NAN	NAN
Transducer #2 (0-10m) Reading (m):	6.493	6.474
Water Temperature #1 (°C):	12.7	12.7
Water Temperature #2 (°C):	14.4	14.2
Datalogger Clock:	08:33	12:35
Laptop Clock:	08:32	12:33
Battery (Main):	13.1	13.7
Battery:	Good	-
Battery Serial #:	906001	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S46-04	0.389	100.137		99.748	99.748	3/4" Pipe 2m S of logger
S46-05			0.587	99.550	99.665	3/4" Pipe 6m S of logger
<b>Turn</b>						
Water Level:	Cut	0.361	2.626	97.872		Time WL Surveyed: 8:49
Temporary BM			0.629	99.508	0.000	boat anchor pipe
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S46-04	0.326	100.074		99.748		
Water Level:	Cut	0.412	2.627	97.859		Time WL Surveyed: 12:29
Water Level:	Cut	0.412	2.568	97.961		Time WL Surveyed: 12:30
S46-04	0.269	100.017		99.748		

**WL Survey Summary**

	Before	After
Average WL:	97.872	97.860
Closing Error:	0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	-	-

**Field Personnel:**

	TR, NC	Trip Date:	14-Jun-14
Data Entry Personnel:	NC	Date:	14-Jun-14
Data Check Personnel:	SG	Date:	29-Jul-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: August 10, 2014  
 Site Visit Time (MST): 08:20



Flow Measurement Details:	
Metering Section Location (describe): adjacent to station	
Meas. Start Time (MST):	9:54
Meas. End Time (MST):	10:31
Equipment:	ADCP
Method:	Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25 C

Flow characteristics:		
Total Flow:	721	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1102.28	(m <sup>2</sup> )
Wetted Width:	404.94	(m)
Hydraulic Depth:	2.72	(m)
Mean Velocity:	0.65	(m/s)
Froude Number:	0.13	

Logger Details:	Before	After
Transducer #1 (0-4m) Reading (m):	2.691	2.690
Transducer #2 (0-10m) Reading (m):	4.638	4.637
Water Temperature #1 (°C):	20.9	21.3
Water Temperature #2 (°C):	21.1	21.6
Datalogger Clock:	08:46	10:59
Laptop Clock:	08:45	10:58
Battery (Main):	13.2	13.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**  
 -Installed two new benchmarks: a tree bolt (S46-07) and 3/4" pipe 3 sections long (S46-08).

ADCP Flow Measurement Summary:								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05		LB:	441.00	
Serial Number:	4712		Salinity (ppt):	-		RB:	0.00	
Firmware Version:	3.5		Magnetic Declination (°):	14.33				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	21.7				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	403.58	1083.55	0.662	717.809	-0.41%
Coordinate System:	ENU		2	406.85	1111.98	0.653	725.917	0.71%
Left Method:	Sloped Bank		3	403.71	1090.45	0.658	717.854	-0.41%
Right Method:	Sloped Bank		4	405.63	1123.16	0.642	721.54	0.11%
Top Fit Type:	Power Fit		-	-	-	-	-	-
Bottom Fit Type:	Power Fit		-	-	-	-	-	-
			<b>Mean:</b>	404.94	1102.28	0.654	721	
			<b>SD:</b>	1.37	15.98	0.007	3.330	
			<b>COV:</b>	0.00	0.01	0.011	0.005	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S46-04	0.371	100.119		99.748	99.748	3/4" Pipe 2m S of logger
S46-05			0.566	99.553	99.665	3/4" Pipe 6m S of logger
S46-07			0.259	99.860	99.860	Lag bolt in tree 7m DS of station
S46-08			2.218	97.901	97.901	3/4" Pipe on back side of bench
Water Level:	Cut		4.241	95.878	<b>Time WL Surveyed:</b>	9:16
Temporary BM			0.259	99.860	99.860	Lag bolt in tree 7m DS of station
<b>Turn</b>						
Temporary BM	0.231	100.091		99.860	99.860	Lag bolt in tree 7m DS of station
Water Level:	Cut		4.209	95.882	<b>Time WL Surveyed:</b>	9:19
S46-08			2.189	97.902	97.901	3/4" Pipe on back side of bench
S46-07			0.231	99.860	99.860	Lag bolt in tree 7m DS of station
S46-05			0.539	99.552	99.665	3/4" Pipe 6m S of logger
S46-04			0.344	99.747	99.748	3/4" Pipe 2m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S46-04	0.343	100.091		99.748		
Water Level:	Cut		4.208	95.893	<b>Time WL Surveyed:</b>	10:50
Water Level:	Cut		4.182	95.885	<b>Time WL Surveyed:</b>	10:54
S46-04	0.319	100.067		99.748		

WL Survey Summary	Before	After
Average WL:	95.880	95.884
Closing Error:	0.001	-
WL Check:	0.004	-0.002
Transducer Elevation	93.189	93.194

Field Personnel:	TR, GG	Trip Date:	10-Aug-14
Data Entry Personnel:	TR	Date:	10-Aug-14
Data Check Personnel:	CJ	Date:	25-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

**Site:** S46 - Athabasca River above the Delta  
**UTM Location:** 470235 E, 6463205 N

**Site Visit Date:** September 4, 2014  
**Site Visit Time (MST):** 10:15



<b>Flow Measurement Details:</b>	
<b>Metering Section Location (describe):</b> adjacent to station	
Meas. Start Time (MST):	10:25
Meas. End Time (MST):	11:10
Equipment:	ADCP
Method:	Boat
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, 15 C

<b>Flow characteristics:</b>		
Total Flow:	436	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	861.41	(m <sup>2</sup> )
Wetted Width:	409.70	(m)
Hydraulic Depth:	2.10	(m)
Mean Velocity:	0.51	(m/s)
Froude Number:	0.11	

<b>Logger Details:</b>		
	Before	After
Transducer #1 (0-4m) Reading (m):	2.092	2.088
Transducer #2 (0-10m) Reading (m):	4.036	4.032
Water Temperature #1 (°C):	16.0	16.2
Water Temperature #2 (°C):	16.0	16.2
Datalogger Clock:	09:14	11:37
Laptop Clock:	09:12	11:35
Battery (Main):	12.4	13.6
Battery:	- Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### **Datalogger / Station Notes:**

- Replaced 3 batteries
- Reoriented GOES antenna
- Uploaded new logger program

### **General Notes:**

### **ADCP Flow Measurement Summary:**

<b>System Information:</b>	
System Type:	Sontek RS-M9
Serial Number:	4712
Firmware Version:	3.5
Software Version:	3.7

<b>System Setup:</b>	
Transducer Depth (m):	0.05
Salinity (ppt):	-
Magnetic Declination (°):	14.33
Measured Temperature (°C):	-
ADCP Temperature (°C):	16.2

<b>Bank Offsets:</b>	
LB:	424.00
RB:	0.00

### **Discharge Calculation Settings:**

Track Reference:	Bottom-Track
Depth Reference:	Vertical Beam
Coordinate System:	ENU
Left Method:	Sloped Bank
Right Method:	Sloped Bank
Top Fit Type:	Power Fit
Bottom Fit Type:	Power Fit

### **Measurement Results:**

Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
1	408.00	869.36	0.524	455.153	4.30%
2	407.22	836.52	0.502	420.284	-3.69%
3	415.35	868.66	0.501	435.415	-0.22%
4	408.22	871.08	0.499	434.655	-0.39%
-	-	-	-	-	-
<b>Mean:</b>	409.70	861.41	0.507	<b>436</b>	
<b>SD:</b>	3.28	14.40	0.010	12.404	
<b>COV:</b>	0.01	0.02	0.020	0.028	

### **Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S46-08	2.366	100.267		97.901	97.901	3/4" Pipe behind beam near boat
S46-04			0.522	99.745	99.748	3/4" Pipe 2m S of logger
S46-07			0.406	99.861	99.860	bolt in birch tree
Water Level:	Cut	0.021	5.004	95.284	Time WL Surveyed:	9:58
S46-07			0.406	99.861	99.860	bolt in birch tree
<b>Turn</b>						
S46-07	0.377	100.238		99.861	99.860	bolt in birch tree
Water Level:	Cut	0.021	4.975	95.284	Time WL Surveyed:	10:00
S46-07			0.377	99.861	99.860	bolt in birch tree
S46-04			0.492	99.746	99.748	3/4" Pipe 2m S of logger
S46-08			2.336	97.902	97.901	3/4" Pipe behind beam near boat

### **Secondary Water Level Survey (pick any BM e.g. closest to water's edge)**

S46-04	0.492	100.238		99.746		
Water Level:	Cut	0.064	5.017	95.285	Time WL Surveyed:	11:31
Water Level:	Cut	0.064	5.001	95.283	Time WL Surveyed:	11:32
S46-04	0.474	100.220		99.746		

### **WL Survey Summary**

	Before	After
Average WL:	95.284	95.284
Closing Error:	-0.001	-
WL Check:	0.000	0.002
Transducer Elevation	93.192	93.196

<b>Field Personnel:</b>	SM, GG	Trip Date:	4-Sep-14
<b>Data Entry Personnel:</b>	SM	Date:	4-Sep-14
<b>Data Check Personnel:</b>	SM	Date:	21-Jan-15
<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: October 7, 2014  
 Site Visit Time (MST): 08:35



Flow Measurement Details:	
Metering Section Location (describe): adjacent to station	
Meas. Start Time (MST):	10:13
Meas. End Time (MST):	10:54
Equipment:	ADCP
Method:	Boat
River Condition:	Low
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	-

Flow characteristics:		
Total Flow:	541	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	966.39	(m <sup>2</sup> )
Wetted Width:	395.38	(m)
Hydraulic Depth:	2.44	(m)
Mean Velocity:	0.56	(m/s)
Froude Number:	0.11	

Logger Details:	Before	After
Transducer #1 (0-4m) Reading (m):	2.295	2.287
Transducer #2 (0-10m) Reading (m):	4.239	4.229
Water Temperature #1 (°C):	7.3	7.3
Water Temperature #2 (°C):	7.2	7.3
Datalogger Clock:	08:39	11:11
Laptop Clock:	08:37	11:09
Battery (Main):	13.0	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

ADCP Flow Measurement Summary:					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	0.00
Serial Number:	4712	Salinity (ppt):	-	RB:	395.38
Firmware Version:	3.5	Magnetic Declination (°):	14.33		
Software Version:	3.7	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical Beam	1	391.15	915.23	0.592
Coordinate System:	ENU	2	394.93	989.90	0.556
Left Method:	Sloped Bank	3	396.44	965.08	0.568
Right Method:	Sloped Bank	4	398.98	995.36	0.526
Top Fit Type:	Power Fit	-	-	-	-
Bottom Fit Type:	Power Fit	-	-	-	-
		<b>Mean:</b>	395.38	966.39	0.561
		<b>SD:</b>	2.84	31.66	0.024
		<b>COV:</b>	0.01	0.03	0.042
					0.019
					541
					10.366
					0.13%
					1.68%
					1.35%
					-3.16%

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S46-04	1.313	101.061		99.748	99.748	3/4" Pipe 2m S of logger
S46-07			1.201	99.860	99.860	bolt in birch tree
S46-08			3.160	97.901	97.901	3/4" Pipe behind beam near boat
Water Level:	Cut	0.067	5.642	95.486	Time WL Surveyed:	9:52
Temporary BM			5.642	95.419	0.000	-
<b>Turn</b>						
Temporary BM	5.624	101.043		95.419		-
Water Level:	Cut	0.067	5.624	95.486	Time WL Surveyed:	9:54
S46-08			3.139	97.904	97.901	3/4" Pipe behind beam near boat
S46-07			1.181	99.862	99.860	bolt in birch tree
S46-04			1.295	99.748	99.748	3/4" Pipe 2m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S46-04	0.534	100.282		99.748		
Water Level:	Cut	0.052	4.847	95.487	Time WL Surveyed:	11:04
Water Level:	Cut	0.052	4.825	95.486	Time WL Surveyed:	11:06
S46-04	0.511	100.259		99.748		

WL Survey Summary	Before	After
Average WL:	95.486	95.487
Closing Error:	0.000	-
WL Check:	0.000	0.001
Transducer Elevation	93.191	93.200

<b>Field Personnel:</b>	TR, MP	Trip Date:	7-Oct-14
Data Entry Personnel:	TR	Date:	7-Oct-14
Data Check Personnel:	DW	Date:	24-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S46 - Athabasca River above the Delta  
 UTM Location: 470235 E, 6463205 N

Site Visit Date: December 8, 2014  
 Site Visit Time (MST): 11:00



Measured Data													Calculated Data						
Bank/Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)			
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	5.00	0.00	0.000	0.00	0.000				
1	10.00	2.35	0.32			1.94	0.364	0.73	0.360	1.00	13.50	2.03	0.362	27.41	9.921	4%			
2	27.00	3.29	0.35			2.70	0.290	0.94	0.328	1.00	15.50	2.94	0.309	45.57	14.081	6%			
3	41.00	3.55	0.35			2.91	0.138	0.99	0.094	1.00	14.50	3.20	0.116	46.40	5.382	2%			
4	56.00	4.20	0.33			3.43	0.054	1.10	0.082	1.00	13.00	3.87	0.088	50.31	3.421	2%			
5	67.00	0.77	0.35	0.56	0.045					0.88	13.00	0.42	0.040	5.46	0.216	0%			
6	82.00	0.66	0.33	0.50	0.033					0.88	15.00	0.33	0.029	4.95	0.144	0%			
7	97.00	0.72	0.43	0.58	0.038					0.88	14.00	0.29	0.033	4.06	0.136	0%			
8	110.00	0.82	0.40	0.61	0.118					0.88	14.00	0.42	0.104	5.88	0.611	0%			
9	125.00	1.30	0.40			1.12	0.136	0.58	0.112	1.00	13.50	0.90	0.124	12.15	1.507	1%			
10	137.00	1.28	0.43			1.11	0.085	0.60	0.135	1.00	13.50	0.85	0.110	11.48	1.262	1%			
11	152.00	1.32	0.42			1.14	0.153	0.60	0.245	1.00	13.50	0.90	0.199	12.15	2.418	1%			
12	164.00	1.51	0.45			1.30	0.150	0.66	0.265	1.00	14.50	1.06	0.208	15.37	3.189	1%			
13	181.00	2.02	0.50			1.72	0.275	0.80	0.286	1.00	16.50	1.52	0.281	25.08	7.035	3%			
14	197.00	2.56	0.50			2.15	0.247	0.91	0.328	1.00	15.50	2.06	0.288	31.93	9.180	4%			
15	212.00	2.57	0.48			2.15	0.269	0.90	0.394	1.00	16.00	2.09	0.332	33.44	11.085	5%			
16	229.00	2.88	0.48			2.40	0.252	0.96	0.274	1.00	16.50	2.40	0.263	39.60	10.415	5%			
17	245.00	3.32	0.43			2.74	0.351	1.01	0.073	1.00	15.50	2.89	0.212	44.80	9.497	4%			
18	260.00	3.49	0.53			2.90	0.364	1.12	0.195	1.00	14.50	2.96	0.280	42.92	11.996	5%			
19	274.00	3.50	0.53			2.91	0.207	1.12	0.092	1.00	16.00	2.97	0.150	47.52	7.104	3%			
20	292.00	3.17	0.45			2.63	0.404	0.99	0.364	1.00	16.00	2.72	0.384	43.52	16.712	7%			
21	306.00	3.43	0.35			2.81	0.338	0.97	0.367	1.00	18.00	3.08	0.353	55.44	19.543	9%			
22	328.00	3.34	0.33			2.74	0.233	0.93	0.243	1.00	18.00	3.01	0.238	54.18	12.895	6%			
23	342.00	3.11	0.43			2.57	0.457	0.97	0.446	1.00	17.00	2.68	0.452	45.56	20.570	9%			
24	362.00	2.86	0.43			2.37	0.431	0.92	0.387	1.00	22.00	2.43	0.409	53.46	21.865	10%			
25	386.00	2.94	0.30			2.41	0.356	0.83	0.394	1.00	16.50	2.64	0.375	43.56	16.335	7%			
26	395.00	3.20	0.30			2.62	0.223	0.88	0.218	1.00	12.00	2.90	0.221	34.80	7.673	3%			
LB	410.00	0.00			0.00					0.88	7.50	0.00	0.000	0.00	0.000				
<b>Total Flow</b>														<b>224</b>	<b>100%</b>				

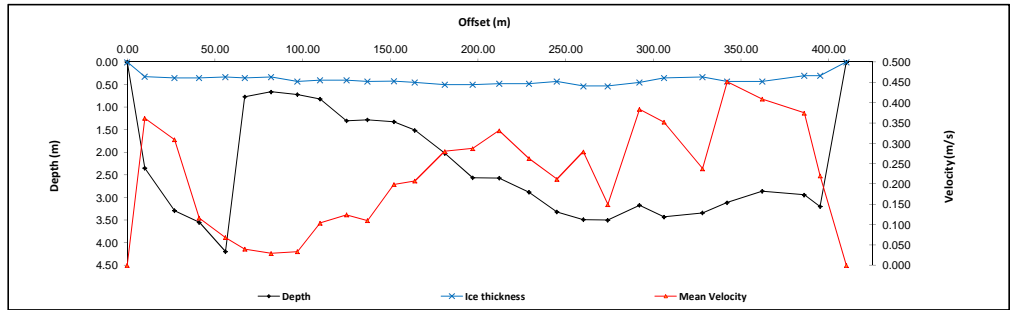
**Flow Measurement Details:**

Metering Section Location (describe): at station

Meas. Start Time (MST):	10:54
Meas. End Time (MST):	12:52
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, -15 C

**Flow characteristics:**

Total Flow:	224	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	836.99	(m²)
Wetted Width:	410.00	(m)
Hydraulic Depth:	2.04	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.06	



**Logger Details:**

	Before	After
Transducer #1 (0-4m) Reading (m):	2.274	2.272
Transducer #2 (0-10m) Reading (m):	4.047	4.043
Water Temperature #1 (°C):	0.2	0.1
Water Temperature #2 (°C):	0.2	0.2
Datalogger Clock:	10:31	13:05
Laptop Clock:	10:29	13:03
Battery (Main):	13.2	14.6
Battery:	Good	-
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S46-04	0.453	100.201		99.748	99.748	3/4" Pipe 2m S of logger
S46-07			0.341	99.860	99.860	Tree
S46-08			2.297	97.904	97.901	Behind Berm
Water Level:			4.896	95.305	Time WL Surveyed:	10:38
Temporary BM:			4.889	95.312	0.000	-
<b>Turn</b>						
Temporary BM:	4.882	100.194		95.312		-
Water Level:			4.887	95.307	Time WL Surveyed:	10:41
S46-08			2.287	97.907	97.901	Behind Berm
S46-07			0.332	99.862	99.860	Tree
S46-04			0.443	99.751	99.748	3/4" Pipe 2m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S46-04	0.442	100.193		99.751		
Water Level:			4.886	95.307	Time WL Surveyed:	12:56
Water Level:			4.869	95.309	Time WL Surveyed:	12:58
S46-04	0.427	100.178		99.751		

**WL Survey Summary**

	Before	After
Average WL:	95.306	95.308
Closing Error:	-0.003	-
WL Check:	0.002	-0.002
Transducer Elevation	93.032	93.036

**Field Personnel:**

Data Entry Personnel:	GG, CJ	Trip Date:	8-Dec-14
Data Check Personnel:	GG	Date:	8-Dec-14
Entered Digitally in the Field:	Yes	Date:	13-Jan-15

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

January 10, 2013

Site Visit Time (MST):

09:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	9.00	0.00	0.00		0.000		0.000		0.000	0.88	1.50	0.00	0.000	0.00	0.000	
1	12.00	1.01	0.44	0.73	0.001					0.88	3.85	0.57	0.001	2.19	0.002	0%
2	16.70	1.09	0.45	0.77	-0.003					0.88	3.45	0.64	-0.003	2.21	-0.006	0%
3	18.90	1.07	0.43	0.75	0.001					0.88	2.05	0.64	0.001	1.31	0.001	0%
4	20.80	1.12	0.44	0.78	0.002					0.88	1.85	0.68	0.002	1.26	0.002	0%
5	22.60	1.17	0.45	0.81	0.343					0.88	1.75	0.72	0.302	1.26	0.380	3%
6	24.30	1.11	0.35							1.00	1.85	0.76	0.498	1.41	0.699	6%
7	26.30	1.09	0.39	0.74	0.679	0.96	0.377	0.50	0.618	0.88	2.05	0.70	0.598	1.44	0.857	8%
8	28.40	1.21	0.32							1.00	2.20	0.89	0.559	1.96	1.094	10%
9	30.70	1.29	0.35			1.03	0.454	0.50	0.663	1.00	1.95	0.94	0.487	1.83	0.893	8%
10	32.30	1.19	0.44	0.82	0.600	1.10	0.420	0.54	0.554	0.88	2.25	0.75	0.528	1.69	0.891	8%
11	35.20	1.23	0.35			1.05	0.520	0.53	0.751	1.00	2.05	0.88	0.636	1.80	1.146	10%
12	36.40	1.25	0.26			1.05	0.602	0.46	0.810	1.00	1.35	0.99	0.706	1.34	0.944	9%
13	37.90	1.28	0.37			1.10	0.507	0.55	0.735	1.00	1.45	0.91	0.621	1.32	0.819	7%
14	39.30	1.32	0.43			1.14	0.522	0.61	0.735	1.00	1.60	0.89	0.629	1.42	0.895	8%
15	41.10	1.25	0.36			1.07	0.489	0.54	0.755	1.00	1.65	0.89	0.622	1.47	0.913	8%
16	42.60	1.09	0.43	0.76	0.629					0.88	1.70	0.66	0.554	1.12	0.621	6%
17	44.50	1.11	0.51	0.81	0.529					0.88	2.60	0.60	0.466	1.56	0.726	7%
18	47.80	1.12	0.51	0.82	-0.001					0.88	3.00	0.61	-0.001	1.83	-0.002	0%
19	50.50	1.13	0.47	0.80	0.070					0.88	2.50	0.66	0.062	1.65	0.102	1%
20	52.80	1.08	0.47	0.78	0.023					0.88	2.25	0.61	0.020	1.37	0.028	0%
21	55.00	1.17	0.51	0.84	0.007					0.88	3.60	0.66	0.006	2.38	0.015	0%
RB	60.00	0.00	0.00		0.00		0.00		0.00	0.88	2.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>11.0</b>	<b>100%</b>		

### Flow Measurement Details:

Metering Section Location (describe):  
at normal location

Meas. Start Time (MST):	10:54
Meas. End Time (MST):	11:33
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -13 C

### Flow characteristics:

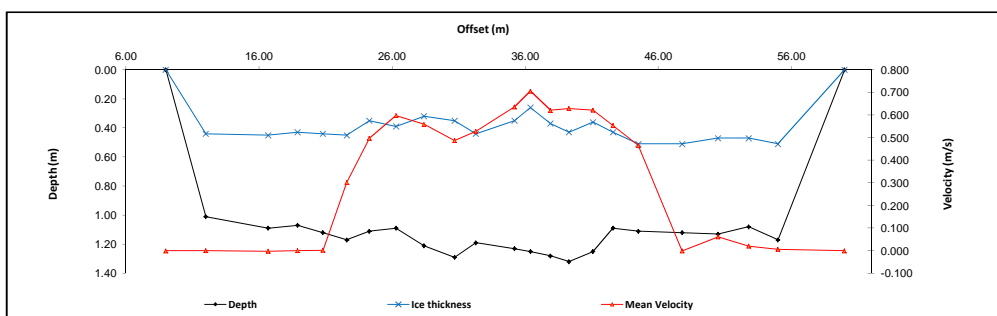
Total Flow:	11.0	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	33.82	(m <sup>2</sup> )
Wetted Width:	51.00	(m)
Hydraulic Depth:	0.66	(m)
Mean Velocity:	0.33	(m/s)
Froude Number:	0.13	

### Logger Details:

	Before	After
Transducer Reading (m):	0.889	0.887
Water (°C):	0.0	0.0
Datalogger Clock:	09:48	12:28
Laptop Clock:	09:48	12:28
Battery (Main):	12.2	12.8
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Desiccant:	Good	
Vent Tube Desiccant:	Good	
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

### General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S47A-1	0.919	101.015		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-2			1.128	99.887	99.884	3/4" Pipe 5m S of logger
S47A-3			1.437	99.578	99.579	3/4" Pipe 7m S of logger
Water Level:	Cut		4.229	96.786	Time WL Surveyed: 9:55	
Temporary BM			4.022	96.993	0.000	
<b>Turn</b>						
Temporary BM	3.993	100.986		96.993	-	
Water Level:	Cut		4.201	96.785	Time WL Surveyed: 9:57	
S47A-3			1.407	99.579	99.579	3/4" Pipe 7m S of logger
S47A-2			1.100	99.886	99.884	3/4" Pipe 5m S of logger
S47A-1			0.890	100.096	100.096	3/4" Pipe 6m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S47A-2	1.100	100.987		99.887		
Water Level:	Cut		4.211	96.776	Time WL Surveyed: 12:23	
Water Level:	Cut		4.189	96.780	Time WL Surveyed: 12:25	
S47A-2	1.082	100.969		99.887		

WL Survey Summary	Before	After
Average WL:	96.786	96.778
Closing Error:	0.000	-
WL Check:	0.001	-0.004
Transducer Elevation	95.897	95.891

Field Personnel:	TR, SM, AJ	Trip Date:	10-Jan-13
Data Entry Personnel:	SM	Date:	10-Jan-13
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

February 7, 2014

Site Visit Time (MST):

08:40



Measured Data											Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB	1.00	0.00	0.00		0.000				0.000	0.88	0.85	0.00	0.000	0.00	0.000		
1	2.70	1.14	0.54	0.84	0.099					0.88	3.65	0.60	0.087	2.19	0.191	2%	
2	8.30	1.18	0.58	0.88	0.300					0.88	4.00	0.60	0.264	2.40	0.634	6%	
3	10.70	1.08	0.60	0.84	0.341					0.88	2.40	0.48	0.300	1.15	0.346	3%	
4	13.10	1.10	0.57	0.84	-0.001					0.88	2.45	0.53	-0.001	1.30	-0.001	0%	
5	15.60	1.13	0.58	0.86	-0.006					0.88	2.45	0.55	-0.005	1.35	-0.007	0%	
6	18.00	1.21	0.57	0.89	0.414					0.88	2.40	0.64	0.364	1.54	0.560	6%	
7	20.40	1.21	0.52	0.87	0.413					0.88	2.10	0.69	0.363	1.45	0.527	5%	
8	22.20	1.21	0.45			1.06	0.518	0.60	0.635	1.00	1.85	0.76	0.577	1.41	0.811	8%	
9	24.10	1.38	0.45			1.19	0.430	0.64	0.673	1.00	1.85	0.93	0.552	1.72	0.949	9%	
10	25.90	1.30	0.35			1.11	0.388	0.54	0.610	1.00	1.85	0.95	0.499	1.76	0.877	9%	
11	27.80	1.21	0.55	0.88	0.624					0.88	2.10	0.66	0.549	1.39	0.761	8%	
12	30.10	1.25	0.54	0.90	0.463					0.88	1.85	0.71	0.407	1.31	0.535	5%	
13	31.50	1.30	0.59	0.95	0.450					0.88	1.45	0.71	0.396	1.03	0.408	4%	
14	33.00	1.28	0.52			1.13	0.326	0.67	0.549	1.00	2.00	0.76	0.438	1.52	0.665	7%	
15	35.50	1.21	0.50	0.86	0.397					0.88	2.15	0.71	0.349	1.53	0.533	5%	
16	37.30	1.19	0.55	0.87	0.524					0.88	1.55	0.64	0.461	0.99	0.457	5%	
17	38.60	1.08	0.45	0.77	0.482					0.88	1.90	0.63	0.424	1.20	0.508	5%	
18	41.10	1.08	0.59	0.84	0.476					0.88	2.60	0.49	0.419	1.27	0.534	5%	
19	43.80	1.12	0.55	0.84	0.003					0.88	2.45	0.57	0.003	1.40	0.004	0%	
20	46.00	1.01	0.47	0.74	0.005					0.88	2.40	0.54	0.004	1.30	0.006	0%	
21	48.60	1.02	0.47	0.75	0.085					0.88	2.55	0.55	0.075	1.40	0.105	1%	
22	51.10	1.00	0.58	0.79	0.354					0.88	2.50	0.42	0.312	1.05	0.327	3%	
23	53.60	0.90	0.40	0.65	0.223					0.88	2.20	0.50	0.196	1.10	0.216	2%	
24	55.50	0.59	0.34	0.47	0.201					0.88	3.20	0.25	0.177	0.80	0.142	1%	
LB	60.00	0.00	0.00		0.00		0.00		0.00	0.88	2.25	0.00	0.000	0.00	0.000		
<b>Total Flow</b>															<b>10.1</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
at normal location

Meas. Start Time (MST):	10:34
Meas. End Time (MST):	11:18
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, -13 C

## Flow characteristics:

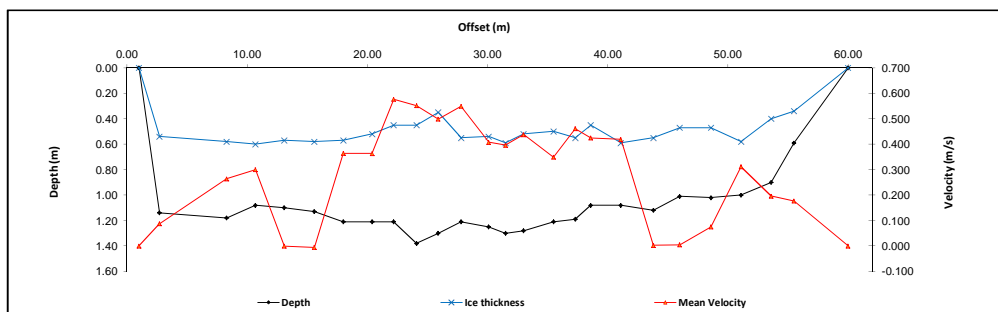
Total Flow:	10.1	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	33.54	(m <sup>2</sup> )
Wetted Width:	59.00	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.30	(m/s)
Froude Number:	0.13	

## Logger Details:

	Before	After
Transducer Reading (m):	0.794	0.793
Water (°C):	0.0	0.0
Datalogger Clock:	08:52	12:08
Laptop Clock:	08:52	12:08
Battery (Main):	12.6	14.7
Battery:	-	Replaced
Enclosure Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Replaced
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S47A-1	0.837	100.933		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-2			1.047	99.886	99.884	3/4" Pipe 5m S of logger
S47A-3			1.352	99.581	99.579	3/4" Pipe 7m S of logger
Water Level:	Cut		4.259	96.674	Time WL Surveyed:	9:04
Temporary BM			3.989	96.944	0.000	
<b>Turn</b>						
Temporary BM	3.969	100.913		96.944	-	
Water Level:	Cut		4.237	96.676	Time WL Surveyed:	9:08
S47A-3			1.333	99.580	99.579	3/4" Pipe 7m S of logger
S47A-2			1.025	99.888	99.884	3/4" Pipe 5m S of logger
S47A-1			0.816	100.097	100.096	3/4" Pipe 6m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S47A-3	1.331	100.912		99.581		
Water Level:	Cut		4.228	96.684	Time WL Surveyed:	11:54
Water Level:	Cut		4.214	96.684	Time WL Surveyed:	12:06
S47A-3	1.317	100.898		99.581		

WL Survey Summary	Before	After
Average WL:	96.675	96.684
Closing Error:	-0.001	-
WL Check:	0.002	0.000
Transducer Elevation	95.881	95.891

Field Personnel:	SM, MP	Trip Date:	7-Feb-14
Data Entry Personnel:	MP	Date:	7-Feb-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

March 11, 2014

Site Visit Time (MST):

07:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000				0.000	0.88	1.65	0.00	0.000	0.00	0.000	
1	4.30	0.95	0.65	0.80	0.270					0.88	2.40	0.30	0.238	0.72	0.171	2%
2	5.90	1.10	0.68	0.89	0.154					0.88	5.10	0.42	0.136	2.14	0.290	4%
3	14.50	1.10	0.69	0.90	0.290					0.88	6.55	0.33	0.246	2.69	0.662	10%
4	18.90	1.10	0.77	0.94	0.183					0.88	3.45	0.33	0.161	1.14	0.183	3%
5	21.40	1.17	0.82	1.00	0.172					0.88	3.20	0.35	0.151	1.12	0.170	2%
6	25.30	1.18	0.75	0.97	0.150					0.88	3.20	0.43	0.132	1.38	0.182	3%
7	27.80	1.18	0.80	0.99	0.281					0.88	2.40	0.38	0.247	0.91	0.226	3%
8	30.10	1.05	0.75	0.90	0.317					0.88	2.85	0.30	0.279	0.86	0.239	3%
9	33.50	1.18	0.75	0.97	0.160					0.88	3.20	0.43	0.141	1.38	0.194	3%
10	36.50	1.18	0.60	0.89	0.326					0.88	3.25	0.58	0.287	1.89	0.541	8%
11	40.00	1.19	0.60	0.90	0.355					0.88	2.55	0.59	0.312	1.50	0.470	7%
12	41.60	1.25	0.65	0.95	0.323					0.88	1.75	0.60	0.284	1.05	0.298	4%
13	43.50	1.18	0.75	0.97	0.401					0.88	2.55	0.43	0.353	1.10	0.387	6%
14	46.70	1.30	0.78	1.04	0.353					0.88	2.50	0.52	0.311	1.30	0.404	6%
15	48.50	1.11	0.83	0.97	0.376					0.88	1.75	0.28	0.331	0.49	0.162	2%
16	50.20	1.18	0.78	0.98	0.335					0.88	1.90	0.40	0.295	0.76	0.224	3%
17	52.30	1.20	0.75	0.98	0.215					0.88	3.05	0.45	0.189	1.37	0.260	4%
18	56.30	1.25	0.67	0.96	0.295					0.88	4.35	0.58	0.260	2.52	0.655	10%
19	61.00	1.03	0.70	0.87	0.341					0.88	4.35	0.33	0.300	1.44	0.431	6%
20	65.00	1.05	0.68	0.87	0.261					0.88	4.45	0.37	0.230	1.65	0.378	5%
21	69.90	0.95	0.55	0.75	0.206					0.88	5.00	0.40	0.181	2.00	0.363	5%
22	75.00	0.50	0.45	0.48	0.001					0.88	2.65	0.05	0.001	0.13	0.000	0%
LB	75.20	0.00	0.00		0.00		0.00		0.00	0.88	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>6.89</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
at normal location

Meas. Start Time (MST):	8:55
Meas. End Time (MST):	9:32
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light cloud, -13 C

### Flow characteristics:

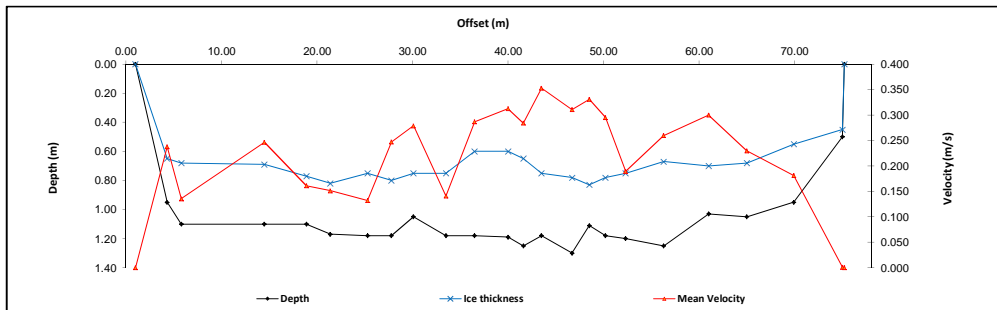
Total Flow:	6.89	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	29.52	(m²)
Wetted Width:	74.20	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.12	

### Logger Details:

	Before	After
Transducer Reading (m):	0.705	
Water (°C):	0.0	
Datalogger Clock:	07:48	
Laptop Clock:	07:48	
Battery (Main):	13.4	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

### Datalogger / Station Notes:

### General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S47A-3	0.967	100.546		99.579	99.579	3/4" Pipe 7m S of logger
S47A-2			0.665	99.881	99.884	3/4" Pipe 5m S of logger
S47A-1			0.452	100.094	100.096	3/4" Pipe 6m SE of logger
Water Level:	Cut		3.955	96.591	Time WL Surveyed: 7:55	
Temporary BM			3.678	96.868	0.000	-
<b>Turn</b>						
Temporary BM	3.663	100.531		96.868		
Water Level:	Cut		3.942	96.589	Time WL Surveyed: 7:58	
S47A-1			0.439	100.092	100.096	3/4" Pipe 6m SE of logger
S47A-2			0.651	99.880	99.884	3/4" Pipe 5m S of logger
S47A-3			0.954	99.577	99.579	3/4" Pipe 7m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	96.590	-
Closing Error:	0.002	-
WL Check:	0.002	-
Transducer Elevation	95.885	-

Field Personnel:	DW, MP	Trip Date:	11-Mar-14
Data Entry Personnel:	DW	Date:	11-Mar-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

April 7, 2014

Site Visit Time (MST):

07:35



**Flow Measurement:**

Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	85.00	0.00	0.00		0.000				0.000	0.88	2.50	0.00	0.000	0.00	0.000	
1	80.00	1.20	0.75	0.98	0.218					0.88	5.00	0.45	0.192	2.25	0.432	5%
2	75.00	1.25	0.75	1.00	0.208					0.88	4.50	0.50	0.183	2.25	0.412	5%
3	71.00	1.35	0.80	1.06	0.196					0.88	4.00	0.55	0.172	2.20	0.379	4%
4	67.00	1.34	0.60	0.97	0.210					0.88	4.00	0.74	0.185	2.96	0.547	6%
5	63.00	1.33	0.60	0.97	0.273					0.88	3.00	0.73	0.240	2.19	0.526	6%
6	61.00	1.34	0.65	1.00	0.258					0.88	2.50	0.69	0.227	1.73	0.392	5%
7	58.00	1.34	0.65	1.00	0.317					0.88	2.00	0.69	0.279	1.38	0.385	4%
8	57.00	1.30	0.63	0.97	0.297					0.88	2.00	0.67	0.261	1.34	0.350	4%
9	54.00	1.32	0.55			1.17	0.215	0.70	0.287	1.00	2.50	0.77	0.251	1.93	0.483	6%
10	52.00	1.33	0.62	0.98	0.257					0.88	2.50	0.71	0.226	1.78	0.401	5%
11	49.00	1.20	0.82	1.01	0.220					0.88	3.00	0.38	0.194	1.14	0.221	3%
12	46.00	1.20	0.85	1.03	0.216					0.88	3.50	0.35	0.190	1.23	0.233	3%
13	42.00	1.20	0.75	0.98	0.319					0.88	4.50	0.45	0.281	2.03	0.568	7%
14	37.00	1.20	0.55	0.88	0.290					0.88	4.00	0.65	0.255	2.60	0.664	8%
15	34.00	1.20	0.75	0.98	0.203					0.88	4.00	0.45	0.179	1.80	0.322	4%
16	29.00	1.20	0.60	0.90	0.187					0.88	4.00	0.60	0.165	2.40	0.395	5%
17	26.00	1.25	0.85	1.05	0.128					0.88	3.00	0.40	0.113	1.20	0.135	2%
18	23.00	1.20	0.90	1.05	0.223					0.88	4.50	0.30	0.196	1.35	0.265	3%
19	17.00	1.35	0.85	1.10	0.228					0.88	6.00	0.50	0.201	3.00	0.602	7%
20	11.00	1.20	0.75	0.98	0.209					0.88	5.00	0.45	0.184	2.25	0.414	5%
21	7.00	1.10	0.70	0.90	0.240					0.88	4.00	0.40	0.211	1.60	0.338	4%
22	3.00	1.00	0.65	0.83	0.159					0.88	3.50	0.35	0.140	1.23	0.171	2%
LB	0.00	0.00	0.00		0.00		0.00		0.00	0.88	1.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>8.63</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
Normal location

Meas. Start Time (MST):	8:55
Meas. End Time (MST):	9:25
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 3 C

**Flow characteristics:**

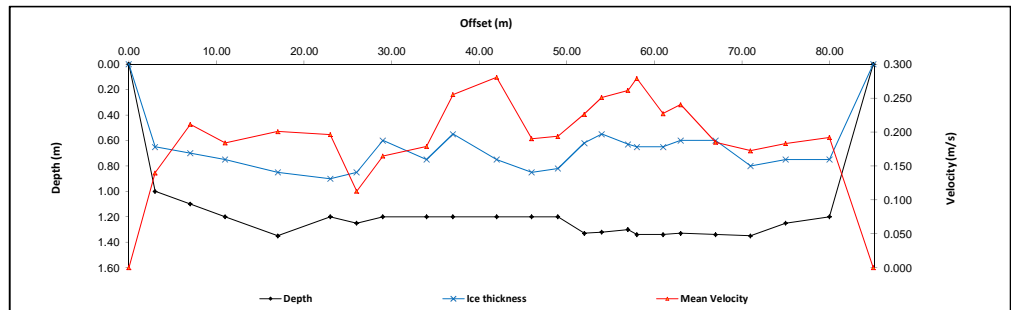
Total Flow:	8.63	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	41.81	(m <sup>2</sup> )
Wetted Width:	85.00	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.793	
Water (°C):	0.0	
Datalogger Clock:	07:43	
Laptop Clock:	07:43	
Battery (Main):	13.5	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S47A-1	0.917	101.013		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-2			1.126	99.887	99.884	3/4" Pipe 5m S of logger
S47A-3			1.434	99.579	99.579	3/4" Pipe 7m S of logger
Water Level:	Cut		4.325	96.688	<b>Time WL Surveyed: 7:52</b>	
Temporary BM			4.209	96.804	0.000	-
<b>Turn</b>						
Temporary BM	4.199	101.003		96.804		
Water Level:	Cut		4.315	96.688	<b>Time WL Surveyed: 7:54</b>	
S47A-3			1.425	99.578	99.579	3/4" Pipe 7m S of logger
S47A-2			1.116	99.887	99.884	3/4" Pipe 5m S of logger
S47A-1			0.907	100.096	100.096	3/4" Pipe 6m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

WL Survey Summary	Before	After
Average WL:	96.688	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	95.895	-

Field Personnel:	SM, CP, MP	Trip Date:	7-Apr-14
Data Entry Personnel:	SM	Date:	7-Apr-14
Data Check Personnel:	TR	Date:	15-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth  
 UTM Location: 499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date: May 21, 2014  
 Site Visit Time (MST): 08:50



<b>Flow Measurement Details:</b>	
<b>Metering Section Location (describe):</b> Regular discharge location	
Meas. Start Time (MST):	10:28
Meas. End Time (MST):	11:00
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Slightly overcast, 14 C

<b>Flow characteristics:</b>		
Total Flow:	114	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	93.28	(m <sup>2</sup> )
Wetted Width:	75.47	(m)
Hydraulic Depth:	1.24	(m)
Mean Velocity:	1.23	(m/s)
Froude Number:	0.35	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.960	0.947
Water (°C):	12.0	12.5
Datalogger Clock:	09:21	11:04
Laptop Clock:	09:21	11:04
Battery (Main):	14.0	13.6
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	276703	268456
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.008		LB:	-	
Serial Number:	1802		Salinity (ppt):	-		RB:	-	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	12.5				
			ADCP Temperature (°C):	13.6				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		12	72.44	91.04	1.216	110.674	-3.20%
Coordinate System:	ENU		14	77.08	96.53	1.210	116.822	2.17%
Left Method:	Sloped bank		15	73.25	91.06	1.268	115.444	0.97%
Right Method:	Sloped bank		16	79.13	94.50	1.211	114.402	0.06%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	75.47	93.28	1.226	<b>114</b>	
			<b>SD:</b>	2.74	2.35	0.024	2.282	
			<b>COV:</b>	0.04	0.03	0.020	0.020	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S47A-1	0.604	100.700		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-3			1.118	99.582	99.579	3/4" Pipe 7m S of logger
S47A-2			0.815	99.885	99.884	3/4" Pipe 5m S of logger
Water Level:	Cut		3.448	97.252	<b>Time WL Surveyed:</b>	9:15
Temporary BM			3.448	97.252	0.000	-
<b>Turn</b>						
Temporary BM	3.432	100.684		97.252		-
Water Level:	Cut		3.432	97.252	<b>Time WL Surveyed:</b>	9:18
S47A-2			0.799	99.885	99.884	3/4" Pipe 5m S of logger
S47A-3			1.104	99.580	99.579	3/4" Pipe 7m S of logger
S47A-1			0.587	100.097	100.096	3/4" Pipe 6m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S47A-3	1.103	100.685		99.582		
Water Level:	Cut		3.435	97.250	<b>Time WL Surveyed:</b>	10:57
Water Level:	Cut		3.426	97.251	<b>Time WL Surveyed:</b>	11:00
S47A-3	1.095	100.677		99.582		

<b>WL Survey Summary</b>	Before	After
Average WL:	97.252	97.251
Closing Error:	-0.001	-
WL Check:	0.000	-0.001
Transducer Elevation	96.292	96.304

<b>Field Personnel:</b>	TR, MP, CJ	Trip Date:	21-May-14
Data Entry Personnel:	MP	Date:	21-May-14
Data Check Personnel:	CJ	Date:	30-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

June 19, 2014

Site Visit Time (MST):

07:20



## Flow Measurement:

Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	5.00	0.00	0.000	0.00	0.000	
1	10.00	1.48				1.18	1.070	0.30	1.690	1.00	7.50	1.48	1.380	11.10	15.318	6%
2	15.00	1.57				1.26	1.460	0.31	2.010	1.00	6.00	1.57	1.735	9.42	16.344	6%
3	22.00	1.86				1.49	1.550	0.37	2.170	1.00	5.00	1.86	1.860	9.30	17.298	7%
4	25.00	1.78				1.42	1.760	0.36	2.200	1.00	5.00	1.78	1.890	8.90	17.622	7%
5	32.00	1.99				1.59	1.660	0.40	2.110	1.00	6.00	1.99	1.885	11.94	22.507	9%
6	37.00	1.89				1.51	1.730	0.38	2.310	1.00	4.50	1.89	2.020	8.51	17.180	7%
7	41.00	1.89				1.51	1.490	0.38	2.210	1.00	3.50	1.89	1.850	6.62	12.238	5%
8	44.00	1.64				1.31	1.840	0.33	2.210	1.00	3.00	1.64	2.025	4.92	9.963	4%
9	47.00	1.96				1.57	1.480	0.39	2.100	1.00	3.50	1.96	1.790	6.86	12.279	5%
10	51.00	1.90				1.52	1.730	0.38	2.000	1.00	4.00	1.90	1.865	7.60	14.174	6%
11	55.00	2.01				1.61	1.600	0.40	2.300	1.00	3.00	2.01	1.950	6.03	11.759	5%
12	57.00	1.97				1.58	1.640	0.39	2.130	1.00	2.50	1.97	1.885	4.93	9.284	4%
13	60.00	1.98				1.58	1.530	0.40	2.080	1.00	3.50	1.98	1.805	6.93	12.509	5%
14	64.00	1.93				1.54	1.430	0.39	2.090	1.00	3.50	1.93	1.760	6.76	11.889	5%
15	67.00	1.95				1.56	1.430	0.39	2.100	1.00	3.50	1.95	1.765	6.83	12.046	5%
16	71.00	1.83				1.46	1.410	0.37	1.850	1.00	4.00	1.83	1.630	7.32	11.932	5%
17	75.00	1.81				1.45	1.290	0.36	2.010	1.00	4.50	1.81	1.650	8.15	13.439	5%
18	80.00	1.68				1.34	1.570	0.34	1.840	1.00	5.00	1.68	1.705	8.40	14.322	6%
19	85.00	1.41				1.13	0.440	0.28	0.730	1.00	4.00	1.41	0.585	5.64	3.299	1%
20	88.00	0.56		0.34	0.039					1.00	4.50	0.56	0.039	2.52	0.098	0%
RB	94.00	0.00	0.00		0.000		0.000		0.000	1.00	3.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>255</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
Regular discharge location

Meas. Start Time (MST):	8:45
Meas. End Time (MST):	10:05
Equipment:	ADC
Method:	Boat
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Light rain, 12 C

## Flow characteristics:

Total Flow:	255.0	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	148.65	(m <sup>2</sup> )
Wetted Width:	94.00	(m)
Hydraulic Depth:	1.58	(m)
Mean Velocity:	1.72	(m/s)
Froude Number:	0.44	

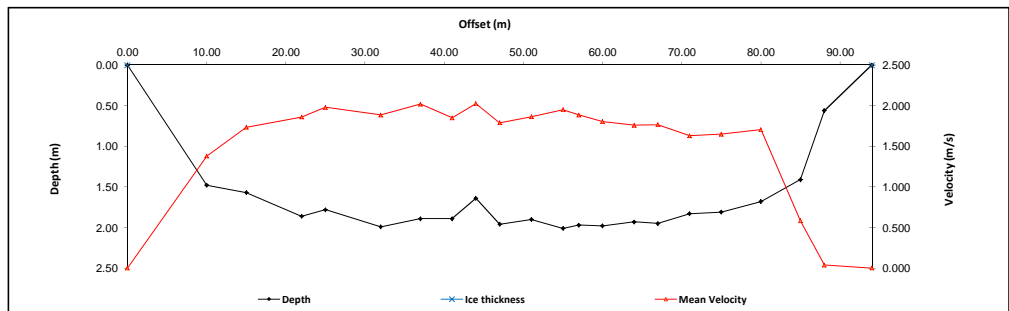
## Logger Details:

	Before	After
Transducer Reading (m):	1.425	1.425
Water (°C):	16.7	16.9
Datalogger Clock:	07:30	10:36
Laptop Clock:	07:30	10:36
Battery (Main):	13.6	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:

-Graded as fair due to minor boat drifting during discharge measurement due to elevated velocities  
-WL fluctuating by 4cm during WL survey



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S47A-1	0.162	100.258		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-3			0.680	99.578	99.579	3/4" Pipe 7m S of logger
S47A-2			0.373	99.885	99.884	3/4" Pipe 5m S of logger
Water Level:	<b>Cut</b>		2.455	97.803	<b>Time WL Surveyed:</b> 7:38	
Temporary BM			2.394	97.864	0.000	
<b>Turn</b>						
Temporary BM	2.382	100.246		97.864		
Water Level:	<b>Cut</b>		2.445	97.801	<b>Time WL Surveyed:</b> 7:40	
S47A-2			0.358	99.888	99.884	3/4" Pipe 5m S of logger
S47A-3			0.665	99.581	99.579	3/4" Pipe 7m S of logger
S47A-1			0.147	100.099	100.096	3/4" Pipe 6m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S47A-2	0.344	100.231		99.887		
Water Level:	<b>Cut</b>		2.446	97.785	<b>Time WL Surveyed:</b> 10:41	
Water Level:	<b>Cut</b>		2.428	97.785	<b>Time WL Surveyed:</b> 10:42	
S47A-2	0.326	100.213		99.887		

## WL Survey Summary

	Before	After
Average WL:	97.802	97.785
Closing Error:	-0.003	-
WL Check:	0.002	0.000
Transducer Elevation	96.377	96.360

## Field Personnel:

Data Entry Personnel:	DW, MP	Trip Date:	19-Jun-14
Data Check Personnel:	DW, MP	Date:	19-Jun-14
Entered Digitally in the Field:	TR	Date:	4-Jul-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

August 9, 2014

Site Visit Time (MST):

07:50



<b>Flow Measurement Details:</b>	
<b>Metering Section Location (describe):</b> Usual location	
Meas. Start Time (MST):	9:05
Meas. End Time (MST):	10:15
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Medium flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 15 C

<b>Flow characteristics:</b>		
Total Flow:	43.8	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	63.83	(m <sup>2</sup> )
Wetted Width:	73.42	(m)
Hydraulic Depth:	0.87	(m)
Mean Velocity:	0.69	(m/s)
Froude Number:	0.24	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	0.287	0.283
Water (°C):	19.3	19.1
Datalogger Clock:	07:56	10:48
Laptop Clock:	07:56	10:48
Battery (Main):	13.0	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>				
<b>System Information:</b>				
System Type:	Sontek RS-M9			
Serial Number:	4712			
Firmware Version:	3.50			
Software Version:	3.70			
<b>System Setup:</b>				
Transducer Depth (m):	0.05			
Salinity (ppt):	0.0			
Magnetic Declination (°):	14			
Measured Temperature (°C):	-			
ADCP Temperature (°C):	19.2			
<b>Units:</b>				
Distance:	m			
Velocity:	m/s			
Area:	m <sup>2</sup>			
Discharge:	m <sup>3</sup> /s			
Temperature:	°C			
<b>Discharge Calculation Settings:</b>				
Track Reference:	Bottom-Track			
Depth Reference:	Vertical beam			
Coordinate System:	ENU			
Left Method:	Sloped bank			
Right Method:	Sloped bank			
Top Fit Type:	Power fit			
Bottom Fit Type:	Power fit			
<b>Measurement Results:</b>				
Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):
1	70.49	62.28	0.704	43.873
2	73.47	63.86	0.695	44.371
3	74.90	64.96	0.670	43.554
5	74.82	64.21	0.679	43.566
<b>Mean:</b>				
	73.42	63.83	0.687	43.8
<b>SD:</b>				
	1.78	0.98	0.013	0.332
<b>SE (%):</b>				
	44.61	24.44	0.332	8.291

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S47A-2	0.391	100.275		99.884	99.884	3/4" Pipe 5m S of logger
S47A-3			0.698	99.577	99.579	3/4" Pipe 7m S of logger
S47A-1			0.181	100.094	100.096	3/4" Pipe 6m SE of logger
Water Level:	Cut	0.085	3.733	96.627	<b>Time WL Surveyed:</b>	8:02
Temporary BM			3.732	96.543	0.000	-
<b>Turn</b>						
Temporary BM	3.705	100.248		96.543		-
Water Level:	Cut	0.085	3.705	96.628	<b>Time WL Surveyed:</b>	8:04
S47A-1			0.150	100.098	100.096	3/4" Pipe 6m SE of logger
S47A-3			0.666	99.582	99.579	3/4" Pipe 7m S of logger
S47A-2			0.360	99.888	99.884	3/4" Pipe 5m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S47A-2	0.359	100.245		99.886		
Water Level:	Cut	0.058	3.678	96.625	<b>Time WL Surveyed:</b>	10:52
Water Level:	Cut	0.058	3.698	96.624	<b>Time WL Surveyed:</b>	10:56
S47A-2	0.378	100.264		99.886		

<b>WL Survey Summary</b>	Before	After
Average WL:	96.628	96.625
Closing Error:	-0.004	-
WL Check:	0.001	0.001
Transducer Elevation	96.341	96.342

<b>Field Personnel:</b>		TR, GG	Trip Date:	9-Aug-14
Data Entry Personnel:	TR		Date:	9-Aug-14
Data Check Personnel:	TR		Date:	29-Sep-14
Entered Digitally in the Field:	Yes			

# Hydrometric Measurement / Site Visit Record

Site: S47A Christina River near the mouth

UTM Location:

499621 E, 6277162 N (Flow), 505048 E, 6272065 N (Station)

Site Visit Date:

September 5, 2014

Site Visit Time (MST):

10:43



## Flow Measurement:

Measured Data									Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000		0.000		0.000	1.00	1.00	0.00	0.000	0.00	0.000	
1	2.00	0.52		0.31	0.322					1.00	3.00	0.52	0.322	1.56	0.502	2%
2	6.00	0.50		0.30	0.390					1.00	4.00	0.50	0.390	2.00	0.780	4%
3	10.00	0.53		0.32	0.504					1.00	3.00	0.53	0.504	1.59	0.801	4%
4	12.00	0.63		0.38	0.469					1.00	3.00	0.63	0.469	1.89	0.886	4%
5	16.00	0.66		0.40	0.530					1.00	4.00	0.66	0.530	2.64	1.399	7%
6	20.00	0.80				0.64	0.396	0.16	0.550	1.00	4.00	0.80	0.473	3.20	1.514	7%
7	24.00	0.78				0.62	0.239	0.16	0.467	1.00	4.00	0.78	0.353	3.12	1.101	5%
8	28.00	0.82				0.66	0.354	0.16	0.631	1.00	4.00	0.82	0.493	3.28	1.615	8%
9	32.00	0.85				0.68	0.502	0.17	0.674	1.00	3.50	0.85	0.588	2.98	1.749	8%
10	35.00	0.92				0.74	0.411	0.18	0.639	1.00	3.00	0.92	0.525	2.76	1.449	7%
11	38.00	1.00				0.80	0.200	0.20	0.653	1.00	3.00	1.00	0.427	3.00	1.280	6%
12	41.00	0.98				0.78	0.336	0.20	0.545	1.00	3.00	0.98	0.441	2.94	1.295	6%
13	44.00	0.94				0.75	0.364	0.19	0.596	1.00	3.00	0.94	0.480	2.82	1.354	7%
14	47.00	0.84				0.67	0.374	0.17	0.514	1.00	3.00	0.84	0.444	2.52	1.119	5%
15	50.00	0.80				0.64	0.387	0.16	0.540	1.00	3.50	0.80	0.464	2.80	1.298	6%
16	54.00	0.66		0.40	0.344					1.00	4.00	0.66	0.344	2.64	0.908	4%
17	58.00	0.56		0.34	0.275					1.00	4.00	0.56	0.275	2.24	0.616	3%
18	62.00	0.56		0.34	0.280					1.00	4.00	0.56	0.280	2.24	0.627	3%
19	66.00	0.50		0.30	0.204					1.00	3.50	0.50	0.204	1.75	0.357	2%
20	69.00	0.46		0.28	0.133					1.00	2.50	0.46	0.133	1.15	0.153	1%
LB	71.00	0.00	0.00		0.00		0.00		0.00	1.00	1.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>20.8</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
normal flow location

Meas. Start Time (MST):	11:00
Meas. End Time (MST):	12:00
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 12 C

## Flow characteristics:

Total Flow:	20.8	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	49.12	(m²)
Wetted Width:	71.00	(m)
Hydraulic Depth:	0.69	(m)
Mean Velocity:	0.42	(m/s)
Froude Number:	0.16	

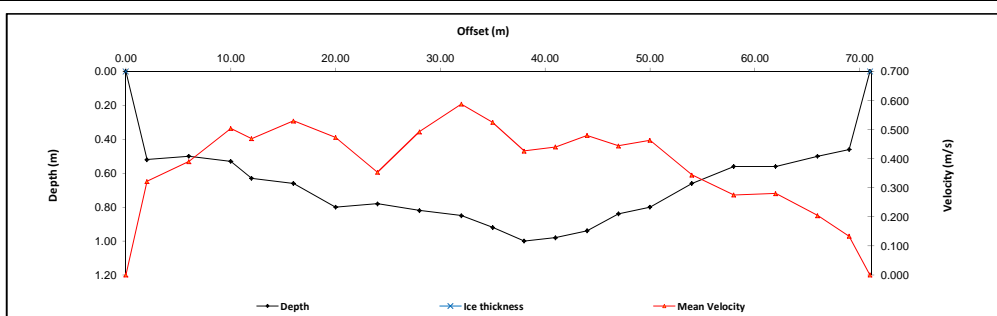
## Logger Details:

	Before	After
Transducer Reading (m):	0.041	0.324
Water (°C):	13.6	13.9
Datalogger Clock:	09:49	12:17
Laptop Clock:	09:49	12:17
Battery (Main):	14.3	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

- Moved PLS to deeper water
- Uploaded new logger program

## General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S47A-1	0.180	100.276		100.096	100.096	3/4" Pipe 6m SE of logger
S47A-2			0.390	99.886	99.884	3/4" Pipe 5m S of logger
S47A-3			0.697	99.579	99.579	3/4" Pipe 7m S of logger
Water Level:	<b>Cut</b>		3.895	96.381	<b>Time WL Surveyed:</b>	10:11
Temporary BM			3.895	96.381	0.000	-
<b>Turn</b>						
Temporary BM	3.878	100.259		96.381		-
Water Level:	<b>Cut</b>		3.878	96.381	<b>Time WL Surveyed:</b>	10:12
S47A-3			0.680	99.579	99.579	3/4" Pipe 7m S of logger
S47A-2			0.373	99.886	99.884	3/4" Pipe 5m S of logger
S47A-1			0.162	100.097	100.096	3/4" Pipe 6m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S47A-2	0.373	100.259		99.886		
Water Level:	<b>Cut</b>		3.875	96.384	<b>Time WL Surveyed:</b>	12:14
Water Level:	<b>Cut</b>		3.865	96.383	<b>Time WL Surveyed:</b>	12:15
S47A-2	0.362	100.248		99.886		

## WL Survey Summary

	Before	After
Average WL:	96.381	96.384
Closing Error:	-0.001	-
WL Check:	0.000	0.001
Transducer Elevation	96.340	96.060

## Field Personnel:

	SM, GG	Trip Date:	5-Sep-14
Data Entry Personnel:	SM	Date:	5-Sep-14
Data Check Personnel:	TR	Date:	29-Sep-14
Entered Digitally in the Field:	Yes		





# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek

UTM Location: 470895 E, 6389207 N

Site Visit Date:

June 20, 2014

Site Visit Time (MST):

09:45



## Flow Measurement:

Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
RB	9.70	0.00	0.00							1.00	0.15	0.00	0.000	0.00	0.000		
1	9.40	0.20		0.12	0.144					1.00	0.30	0.20	0.144	0.06	0.009	1%	
2	9.10	0.28		0.17	0.144					1.00	0.30	0.28	0.144	0.08	0.012	2%	
3	8.80	0.38		0.23	0.166					1.00	0.30	0.38	0.166	0.11	0.019	2%	
4	8.50	0.44		0.26	0.186					1.00	0.30	0.44	0.186	0.13	0.025	3%	
5	8.20	0.50		0.30	0.177					1.00	0.30	0.50	0.177	0.15	0.027	3%	
6	7.90	0.58		0.35	0.171					1.00	0.30	0.58	0.171	0.17	0.030	4%	
7	7.60	0.60		0.36	0.165					1.00	0.30	0.60	0.165	0.18	0.030	4%	
8	7.30	0.67		0.40	0.164					1.00	0.30	0.67	0.164	0.20	0.033	4%	
9	7.00	0.65		0.39	0.171					1.00	0.30	0.65	0.171	0.20	0.033	4%	
10	6.70	0.70		0.42	0.221					1.00	0.30	0.70	0.221	0.21	0.046	6%	
11	6.40	0.72		0.43	0.202					1.00	0.30	0.72	0.202	0.22	0.044	6%	
12	6.10	0.75		0.45	0.240					1.00	0.30	0.75	0.240	0.22	0.054	7%	
13	5.80	0.75		0.45	0.243					1.00	0.30	0.75	0.243	0.23	0.055	7%	
14	5.50	0.80				0.64	0.192	0.16	0.284	1.00	0.35	0.80	0.238	0.28	0.067	8%	
15	5.10	0.80				0.64	0.220	0.16	0.300	1.00	0.30	0.80	0.260	0.24	0.062	8%	
16	4.90	0.80				0.64	0.194	0.16	0.294	1.00	0.20	0.80	0.244	0.16	0.039	5%	
17	4.70	0.70		0.42	0.240					1.00	0.35	0.70	0.240	0.25	0.059	7%	
18	4.20	0.61		0.37	0.201					1.00	0.50	0.61	0.201	0.31	0.061	8%	
19	3.70	0.56		0.34	0.148					1.00	0.50	0.56	0.148	0.28	0.041	5%	
20	3.20	0.46		0.28	0.114					1.00	0.60	0.46	0.114	0.28	0.031	4%	
21	2.50	0.28		0.17	0.094					1.00	0.65	0.28	0.094	0.18	0.017	2%	
LB	1.90	0.00	0.00							1.00	0.30	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.793</b>	<b>100%</b>		

### Flow Measurement Details:

Metering Section Location (describe):  
20m US of station

Meas. Start Time (MST):	10:45
Meas. End Time (MST):	11:07
Equipment:	ADV
Method:	Wading
River Condition:	Lots of debris
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 25C

### Flow characteristics:

Total Flow:	0.793	(m <sup>3</sup> /s)
Perceived Measuremt. Quality:	Excellent	
Cross Section Area:	4.13	(m <sup>2</sup> )
Wetted Width:	7.80	(m)
Hydraulic Depth:	0.53	(m)
Mean Velocity:	0.19	(m/s)
Froude Number:	0.08	

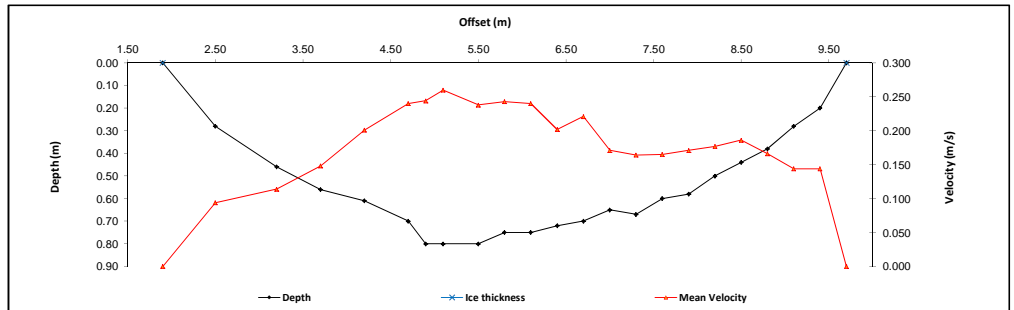
### Logger Details:

	Before	After
Transducer Reading (m):	1.221	0.211
Water (°C):	14.8	14.8
Datalogger Clock:	10:14	11:11
Laptop Clock:	10:14	11:10
Battery (Main):	12.7	12.7
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

- Solar panel was disconnected from solar controller by wildlife
- Wires were secured and reconnected
- Station grounded

### General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S48-03	1.292	101.090		99.798	99.798	3/4" Pipe 6m NE of datalogger
S48-04			1.418	99.672	99.662	3/4" Pipe 6m E of datalogger
S48-01			0.964	100.126	100.000	3/4" Pipe 2m SE of datalogger
Water Level:	Cut		2.480	98.610	Time WL Surveyed: 10:20	
Temporary BM Turn			1.478	99.612	0.000	
Temporary BM	1.495	101.107		99.612		
Water Level:	Cut		2.498	98.609	Time WL Surveyed: 10:22	
			2.498	98.609		
S48-01			0.984	100.123	100.000	3/4" Pipe 2m SE of datalogger
S48-04			1.437	99.670	99.662	3/4" Pipe 6m E of datalogger
S48-03			1.308	99.799	99.798	3/4" Pipe 6m NE of datalogger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S48-01	0.964	101.088		100.124		
Water Level:	Cut		2.481	98.607	Time WL Surveyed: 11:14	
Water Level:	Cut		2.467	98.608	Time WL Surveyed: 11:15	
S48-01	0.951	101.075		100.124		

WL Survey Summary	Before	After
Average WL:	98.610	98.608
Closing Error:	-0.001	-
WL Check:	0.001	-0.001
Transducer Elevation	97.389	98.397

Field Personnel:	DW, MP	Trip Date:	20-Jun-14
Data Entry Personnel:	DW, MP	Date:	20-Jun-14
Data Check Personnel:	DW	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek  
 UTM Location: 470895 E, 6389207 N

Site Visit Date: August 10, 2014  
 Site Visit Time (MST): 08:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.30	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.50	0.22		0.13	0.006		-0.011			1.00	0.25	0.22	0.006	0.06	0.000	0%
2	1.80	0.32		0.19	0.007		0.007			1.00	0.30	0.32	-0.011	0.10	-0.001	0%
3	2.10	0.36		0.22	0.106		0.106			1.00	0.30	0.36	0.007	0.11	0.001	0%
4	2.40	0.36		0.22	0.106		0.106			1.00	0.30	0.36	0.106	0.11	0.011	4%
5	2.70	0.44		0.26	0.198		0.198			1.00	0.30	0.44	0.198	0.13	0.026	8%
6	3.00	0.52		0.31	0.205		0.205			1.00	0.23	0.52	0.205	0.12	0.024	7%
7	3.15	0.55		0.33	0.207		0.207			1.00	0.15	0.55	0.207	0.08	0.017	5%
8	3.30	0.56		0.34	0.204		0.204			1.00	0.23	0.56	0.204	0.13	0.026	8%
9	3.60	0.60		0.36	0.152		0.152			1.00	0.30	0.60	0.152	0.18	0.027	8%
10	3.90	0.55		0.33	0.136		0.136			1.00	0.30	0.55	0.136	0.17	0.022	7%
11	4.20	0.53		0.32	0.108		0.108			1.00	0.30	0.53	0.108	0.16	0.017	5%
12	4.50	0.47		0.28	0.242		0.242			1.00	0.30	0.47	0.242	0.14	0.034	10%
13	4.80	0.40		0.24	0.188		0.188			1.00	0.30	0.40	0.188	0.12	0.023	7%
14	5.10	0.38		0.23	0.176		0.176			1.00	0.30	0.38	0.176	0.11	0.020	6%
15	5.40	0.33		0.20	0.208		0.208			1.00	0.30	0.33	0.208	0.10	0.021	6%
16	5.70	0.26		0.16	0.169		0.169			1.00	0.30	0.26	0.169	0.08	0.013	4%
17	6.00	0.24		0.14	0.186		0.186			1.00	0.30	0.24	0.186	0.07	0.013	4%
18	6.30	0.18		0.11	0.193		0.193			1.00	0.30	0.18	0.193	0.05	0.010	3%
19	6.60	0.15		0.09	0.162		0.162			1.00	0.30	0.15	0.162	0.05	0.007	2%
20	6.90	0.15		0.09	0.139		0.139			1.00	0.30	0.15	0.139	0.05	0.006	2%
21	7.20	0.18		0.11	0.136		0.136			1.00	0.25	0.18	0.136	0.05	0.006	2%
RB	7.40	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.325</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
30m upstream of station

Meas. Start Time (MST):	8:58
Meas. End Time (MST):	9:28
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow, lots of LWD
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 19C

**Flow characteristics:**

Total Flow:	0.325	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.14	(m <sup>2</sup> )
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.08	

**Logger Details:**

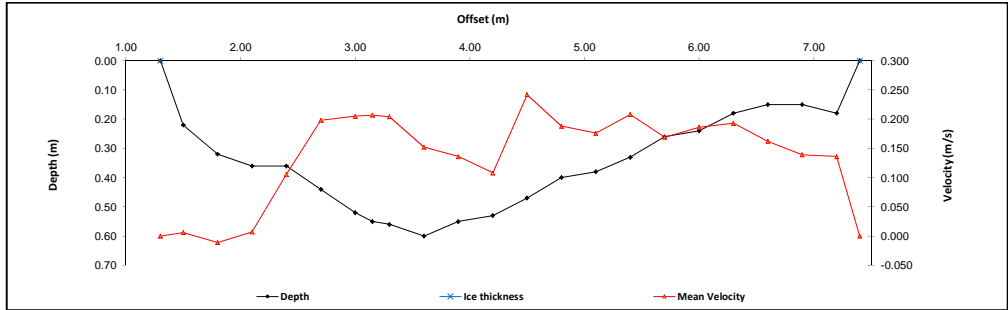
	Before	After
Transducer Reading (m):	0.997	0.973
Water (°C):	13.2	13.2
Datalogger Clock:	08:24	08:44
Laptop Clock:	08:22	09:43
Battery (Main):	14.6	13.9
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Sent new program to logger
- replaced the damaged radio and antenna cables.

**General Notes:**

- Beaver dam and lots of woody debris throughout stream



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S48-03	1.154	100.952		99.798	99.798	3/4" Pipe 6m NE of datalogger
S48-04			1.282	99.670	99.662	3/4" Pipe 6m E of datalogger
S48-01			0.828	100.124	100.000	3/4" Pipe 2m SE of datalogger
Water Level:	Cut		2.595	98.357	Time WL Surveyed:	8:51
Temporary BM			0.828	100.124	0.000	
<b>Turn</b>						
Temporary BM	0.845	100.969		100.124		
Water Level:	Cut		2.615	98.354	Time WL Surveyed:	8:49
S48-01			0.845	100.124	100.000	3/4" Pipe 2m SE of datalogger
S48-04			1.296	99.673	99.662	3/4" Pipe 6m E of datalogger
S48-03			1.168	99.801	99.798	3/4" Pipe 6m NE of datalogger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S48-01	0.829	100.953		100.124		
Water Level:	Cut		2.603	98.350	Time WL Surveyed:	9:38
Water Level:	Cut		2.593	98.346	Time WL Surveyed:	9:40
S48-01	0.815	100.939		100.124		

**WL Survey Summary**

	Before	After
Average WL:	98.356	98.348
Closing Error:	-0.003	-
WL Check:	0.003	0.004
Transducer Elevation	97.359	97.375

**Field Personnel:**

MP, CJ	Trip Date:	10-Aug-14
MP	Date:	10-Aug-14
MP	Date:	5-Sep-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek  
 UTM Location: 470895 E, 6389207 N

Site Visit Date: September 14, 2014  
 Site Visit Time (MST): 10:06



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.50	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	3.00	0.10		0.06	0.083				1.00	0.50	0.10	0.083	0.05	0.004	1%	
2	3.50	0.12		0.07	0.119				1.00	0.50	0.12	0.119	0.06	0.007	3%	
3	4.00	0.10		0.06	0.168				1.00	0.50	0.10	0.168	0.05	0.008	3%	
4	4.50	0.08		0.05	0.162				1.00	0.50	0.08	0.162	0.04	0.006	2%	
5	5.00	0.18		0.11	0.116				1.00	0.45	0.18	0.116	0.08	0.009	3%	
6	5.40	0.36		0.22	0.144				1.00	0.40	0.36	0.144	0.14	0.021	7%	
7	5.80	0.48		0.29	0.163				1.00	0.30	0.48	0.163	0.14	0.023	8%	
8	6.00	0.48		0.29	0.148				1.00	0.20	0.48	0.148	0.10	0.014	5%	
9	6.20	0.48		0.29	0.168				1.00	0.25	0.48	0.168	0.12	0.020	7%	
10	6.50	0.44		0.26	0.147				1.00	0.30	0.44	0.147	0.13	0.019	7%	
11	6.80	0.45		0.27	0.155				1.00	0.30	0.45	0.155	0.14	0.021	7%	
12	7.10	0.51		0.31	0.146				1.00	0.30	0.51	0.146	0.15	0.022	8%	
13	7.40	0.50		0.30	0.170				1.00	0.30	0.50	0.170	0.15	0.026	9%	
14	7.70	0.53		0.32	0.128				1.00	0.30	0.53	0.128	0.16	0.020	7%	
15	8.00	0.52		0.31	0.125				1.00	0.30	0.52	0.125	0.16	0.020	7%	
16	8.30	0.52		0.31	0.110				1.00	0.30	0.52	0.110	0.16	0.017	6%	
17	8.60	0.42		0.25	0.087				1.00	0.30	0.42	0.087	0.13	0.011	4%	
18	8.90	0.36		0.22	0.052				1.00	0.30	0.36	0.052	0.11	0.006	2%	
19	9.20	0.28		0.17	0.057				1.00	0.30	0.28	0.057	0.08	0.005	2%	
20	9.50	0.18		0.11	0.003				1.00	0.30	0.18	0.003	0.05	0.000	0%	
LB	9.80	0.00	0.00		0.000			0.000	1.00	0.15	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.281</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m downstream from station

Meas. Start Time (MST):	10:49
Meas. End Time (MST):	11:09
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Sunny, 10C

**Flow characteristics:**

Total Flow:	0.281	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.20	(m <sup>2</sup> )
Wetted Width:	7.30	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.07	

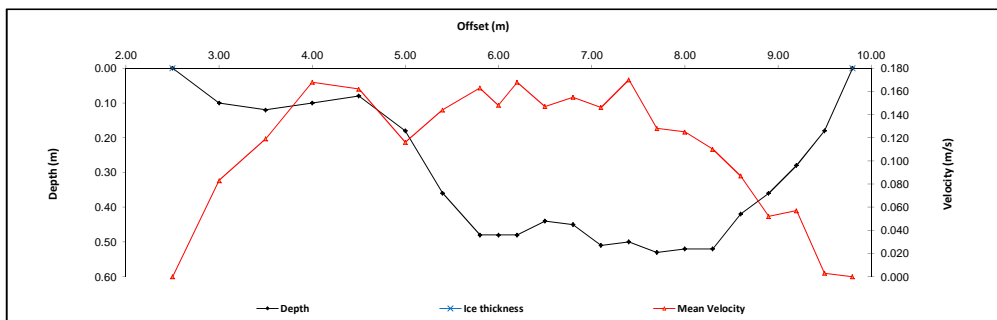
**Logger Details:**

	Before	After
Transducer Reading (m):	1.035	1.034
Water (°C):	7.6	7.5
Datalogger Clock:	10:12	11:19
Laptop Clock:	10:11	11:18
Battery (Main):	12.6	14.6
Battery Serial #:	-	1407010
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- station damaged by wildlife
- replaced telemetry cable and battery
- installed vent on enclosure
- new program sent to logger

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S48-03	1.305	101.103		99.798	99.798	3/4" Pipe 6m NE of datalogger
S48-04			1.431	99.672	99.662	3/4" Pipe 6m E of datalogger
S48-01			0.976	100.127	100.000	3/4" Pipe 2m SE of datalogger
Water Level:	Cut		2.676	98.427	Time WL Surveyed:	10:38
Temporary BM			1.739	99.364	0.000	
<b>Turn</b>						
Temporary BM	1.718	101.082		99.364		
Water Level:	Cut		2.659	98.423	Time WL Surveyed:	10:41
S48-01			0.955	100.127	100.000	3/4" Pipe 2m SE of datalogger
S48-04			1.409	99.673	99.662	3/4" Pipe 6m E of datalogger
S48-03			1.284	99.798	99.798	3/4" Pipe 6m NE of datalogger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S48-01	0.954	101.081		100.127		
Water Level:	Cut		2.656	98.425	Time WL Surveyed:	11:13
Water Level:	Cut		2.638	98.424	Time WL Surveyed:	11:14
S48-01	0.935	101.062		100.127		

**WL Survey Summary**

	Before	After
Average WL:	98.425	98.425
Closing Error:	0.000	-
WL Check:	0.004	0.001
Transducer Elevation	97.390	97.391

**Field Personnel:**

Data Entry Personnel:	GG, TR	Trip Date:	14-Sep-14
Data Check Personnel:	GG	Date:	14-Sep-14
Entered Digitally in the Field:	MP	Date:	17-Nov-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S48 Big Creek  
 UTM Location: 470895 E, 6389207 N

Site Visit Date: November 1, 2014  
 Site Visit Time (MST): 10:20

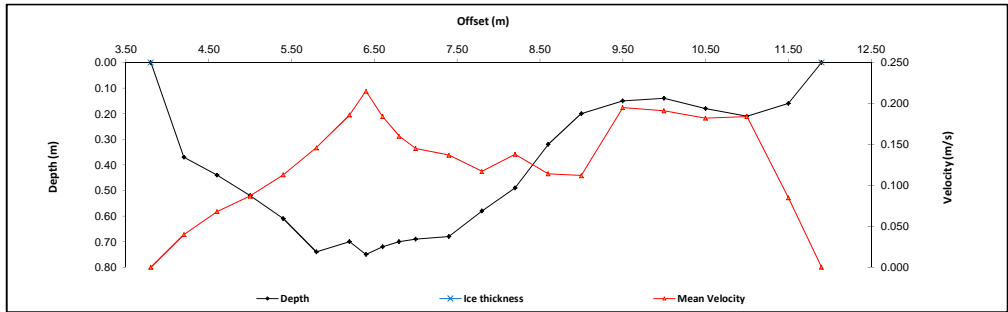


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.80	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	4.20	0.37		0.22	0.040					1.00	0.40	0.37	0.040	0.15	0.006	1%
2	4.60	0.44		0.26	0.068					1.00	0.40	0.44	0.068	0.18	0.012	3%
3	5.00	0.52		0.31	0.087					1.00	0.40	0.52	0.087	0.21	0.018	4%
4	5.40	0.61		0.37	0.113					1.00	0.40	0.61	0.113	0.24	0.028	6%
5	5.80	0.74		0.44	0.146					1.00	0.40	0.74	0.146	0.30	0.043	10%
6	6.20	0.70		0.42	0.186					1.00	0.30	0.70	0.186	0.21	0.039	9%
7	6.40	0.75		0.45	0.215					1.00	0.20	0.75	0.215	0.15	0.032	7%
8	6.60	0.72		0.43	0.184					1.00	0.20	0.72	0.184	0.14	0.026	6%
9	6.80	0.70		0.42	0.160					1.00	0.20	0.70	0.160	0.14	0.022	5%
10	7.00	0.69		0.41	0.145					1.00	0.30	0.69	0.145	0.21	0.030	7%
11	7.40	0.68		0.41	0.137					1.00	0.40	0.68	0.137	0.27	0.037	8%
12	7.80	0.58		0.35	0.117					1.00	0.40	0.58	0.117	0.23	0.027	6%
13	8.20	0.49		0.29	0.138					1.00	0.40	0.49	0.138	0.20	0.027	6%
14	8.60	0.32		0.19	0.114					1.00	0.40	0.32	0.114	0.13	0.015	3%
15	9.00	0.20		0.12	0.112					1.00	0.45	0.20	0.112	0.09	0.010	2%
16	9.50	0.15		0.09	0.195					1.00	0.50	0.15	0.195	0.08	0.015	3%
17	10.00	0.14		0.08	0.191					1.00	0.50	0.14	0.191	0.07	0.013	3%
18	10.50	0.18		0.11	0.182					1.00	0.50	0.18	0.182	0.09	0.016	4%
19	11.00	0.21		0.13	0.184					1.00	0.50	0.21	0.184	0.11	0.019	4%
20	11.50	0.16		0.10	0.085					1.00	0.45	0.16	0.085	0.07	0.006	1%
LB	11.90		0.00				0.00			1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.443</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): 10m DS of station

Meas. Start Time (MST):	10:41
Meas. End Time (MST):	11:02
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 2C



**Flow characteristics:**

Total Flow:	0.443	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.25	(m <sup>2</sup> )
Wetted Width:	8.10	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.127	1.126
Water (°C):	4.3	4.3
Datalogger Clock:	10:29	11:15
Laptop Clock:	10:27	11:13
Battery (Main):	14.7	14.5
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Left PT installed for winter; this PT remains from last winter as it is sedimented in.

**General Notes:**

-ADV test results good

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S48-03	1.297	101.095		99.798	99.798	3/4" Pipe 6m NE of datalogger
S48-04			1.425	99.670	99.662	3/4" Pipe 6m E of datalogger
S48-01			0.872	100.223	100.000	3/4" Pipe 2m SE of datalogger
Water Level:	Cut	0.192	2.768	98.519	Time WL Surveyed: 10:32	
Temporary BM			2.768	98.327	0.000	
<b>Turn</b>						
Temporary BM	2.758	101.085		98.327		
Water Level:	Cut	0.192	2.758	98.519	Time WL Surveyed: 10:34	
S48-01			0.961	100.124	100.000	3/4" Pipe 2m SE of datalogger
S48-04			1.415	99.670	99.662	3/4" Pipe 6m E of datalogger
S48-03			1.287	99.798	99.798	3/4" Pipe 6m NE of datalogger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S48-01	0.962	101.086		100.124		
Water Level:	Cut	0.177	2.743	98.520	Time WL Surveyed: 11:12	
Water Level:	Cut	0.177	2.732	98.517	Time WL Surveyed: 11:14	
S48-01	0.948	101.072		100.124		

**IWL Survey Summary**

	Before	After
Average WL:	98.519	98.519
Closing Error:	0.000	-
WL Check:	0.000	0.003
Transducer Elevation	97.392	97.393

**Field Personnel:**

	MP, TR	Trip Date:	1-Nov-14
Data Entry Personnel:	MP	Date:	1-Nov-14
Data Check Personnel:	MP	Date:	17-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: April 30, 2014  
 Site Visit Time (MST): 11:08



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	11.50	0.00	0.00		0.000		0.000		0.000	1.00	0.85	0.00	0.000	0.00	0.000	
1	13.20	0.76		0.45	0.193	0.61	0.281	0.15	0.124	1.00	1.00	0.76	0.203	0.76	0.154	10%
2	13.50	0.75								1.00	0.30	0.75	0.193	0.23	0.043	3%
3	13.80	0.78								1.00	0.30	0.78	0.280	0.23	0.066	4%
4	14.10	0.80								1.00	0.30	0.80	0.225	0.24	0.054	4%
5	14.40	0.82								1.00	0.30	0.82	0.315	0.25	0.077	5%
6	14.70	0.84								1.00	0.30	0.84	0.354	0.25	0.089	6%
7	15.00	0.99								1.00	0.30	0.99	0.365	0.30	0.108	7%
8	15.30	1.06								1.00	0.30	1.06	0.420	0.32	0.134	9%
9	15.60	1.14								1.00	0.23	1.14	0.503	0.26	0.129	9%
10	15.75	1.16								1.00	0.15	1.16	0.483	0.17	0.084	6%
11	15.90	1.16								1.00	0.23	1.16	0.455	0.26	0.119	8%
12	16.20	1.20								1.00	0.30	1.20	0.308	0.36	0.111	7%
13	16.50	1.22								1.00	0.30	1.22	0.380	0.37	0.139	9%
14	16.80	1.18								1.00	0.30	1.18	0.295	0.35	0.104	7%
15	17.10	0.98								1.00	0.40	0.98	0.240	0.39	0.094	6%
16	17.60	0.50	0.30	0.19	0.049	0.94	0.228	0.24	0.362	1.00	0.50	0.50	0.049	0.25	0.012	1%
17	18.10	0.32			-0.046	0.78	0.150	0.20	0.329	1.00	0.70	0.32	-0.046	0.22	-0.010	-1%
LB	19.00	0.00	0.00		0.00		0.00		0.00	1.00	0.45	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.51</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -Across from heli. landing

Meas. Start Time (MST):	12:10
Meas. End Time (MST):	13:00
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	

**Flow Characteristics:**

Total Flow:	1.51	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.21	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.69	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.11	

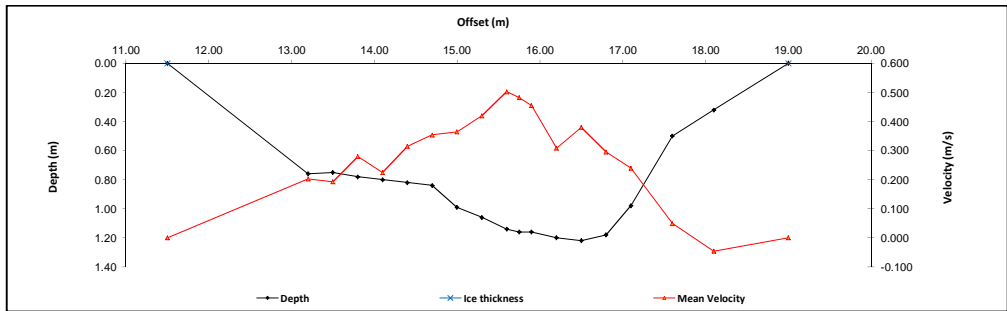
**Logger Details:**

	Before	After
Transducer Reading (m):	0.679	
Water (°C):	0.4	
Datalogger Clock:	13:17	
Laptop Clock:	13:18	
Battery (Main):	13.0	
Battery Serial #:	1001111	
Enclosure Dessiccant:		New
Vent Tube Dessiccant:		New
PT# (if replaced):	287963	
Logger# (if replaced):	17937	

**Datalogger / Station Notes:**

**General Notes:**

-some ice remains along banks in channel



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S49-01	1.127	101.127		100.000	100.000	3/4" Pipe 6m N of data logger
S49-04			0.841	100.286	100.290	3/4" Pipe 7m E of data logger
<b>Water Level:</b>						
	Cut		2.694	98.433	Time WL Surveyed:	11:48
S49-03			1.196	99.931	99.935	3/4" Pipe 5m NE of data logger
<b>Turn</b>						
S49-03	1.179	101.110		99.931	99.935	3/4" Pipe 5m NE of data logger
Water Level:	Cut		2.677	98.433	Time WL Surveyed:	11:49
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S49-01	1.113	101.112		99.999		
Water Level:	Cut		2.621	98.491	Time WL Surveyed:	13:08
Water Level:	Cut		2.578	98.495	Time WL Surveyed:	13:11
S49-01	1.074	101.073		99.999		

**WL Survey Summary**

	Before	After
Average WL:	98.433	98.493
Closing Error:	0.002	-
WL Check:	0.000	-0.004
Transducer Elevation	97.754	-

Field Personnel:	TR, GG	Trip Date:	30-Apr-14
Data Entry Personnel:	GG	Date:	30-Apr-14
Data Check Personnel:	CJ	Date:	9-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: June 20, 2014  
 Site Visit Time (MST): 11:50



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	8.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	8.20	0.32		0.19	-0.046					1.00	0.30	0.32	-0.046	0.10	-0.004	0%
2	7.90	0.42		0.25	-0.007					1.00	0.30	0.42	-0.007	0.13	-0.001	0%
3	7.60	0.46		0.28	0.081					1.00	0.30	0.46	0.081	0.14	0.011	1%
4	7.30	0.52		0.31	0.125					1.00	0.30	0.52	0.125	0.16	0.019	2%
5	7.00	0.58		0.35	0.206					1.00	0.30	0.58	0.206	0.17	0.036	4%
6	6.70	0.65		0.39	0.206					1.00	0.30	0.65	0.206	0.19	0.040	4%
7	6.40	0.75		0.45	0.197					1.00	0.30	0.75	0.197	0.22	0.044	4%
8	6.10	0.81				0.65	0.020	0.16	0.227	1.00	0.30	0.81	0.124	0.24	0.030	3%
9	5.80	0.92				0.74	0.076	0.18	0.224	1.00	0.30	0.92	0.150	0.28	0.041	4%
10	5.50	1.02				0.82	0.039	0.20	0.321	1.00	0.30	1.02	0.180	0.31	0.055	6%
11	5.20	1.08				0.86	0.156	0.22	0.346	1.00	0.30	1.08	0.251	0.32	0.081	8%
12	4.90	1.10				0.88	0.094	0.22	0.419	1.00	0.30	1.10	0.257	0.33	0.085	9%
13	4.60	1.12				0.90	0.127	0.22	0.303	1.00	0.30	1.12	0.215	0.34	0.072	7%
14	4.30	1.08				0.86	0.111	0.22	0.405	1.00	0.30	1.08	0.258	0.32	0.084	8%
15	4.00	1.04				0.83	0.105	0.21	0.388	1.00	0.30	1.04	0.247	0.31	0.077	8%
16	3.70	1.00				0.80	0.132	0.20	0.412	1.00	0.30	1.00	0.272	0.30	0.082	8%
17	3.40	0.98				0.78	0.092	0.20	0.418	1.00	0.30	0.98	0.255	0.29	0.075	8%
18	3.10	0.95				0.76	0.115	0.19	0.325	1.00	0.30	0.95	0.220	0.29	0.063	6%
19	2.80	0.98				0.78	0.194	0.20	0.429	1.00	0.30	0.98	0.312	0.29	0.092	9%
20	2.50	0.70		0.42	0.029					1.00	0.30	0.70	0.029	0.21	0.006	1%
21	2.20	0.12		0.07	0.045					1.00	0.25	0.12	0.045	0.03	0.001	0%
RB	2.00	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.989</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from hill, landing area

Mess. Start Time (MST):	12:55
Mess. End Time (MST):	13:44
Equipment:	ADV
Method:	Wading
River Condition:	Moderate-high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 18C

**Flow characteristics:**

Total Flow:	0.989	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.97	(m <sup>2</sup> )
Wetted Width:	6.50	(m)
Hydraulic Depth:	0.77	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.07	

**Logger Details:**

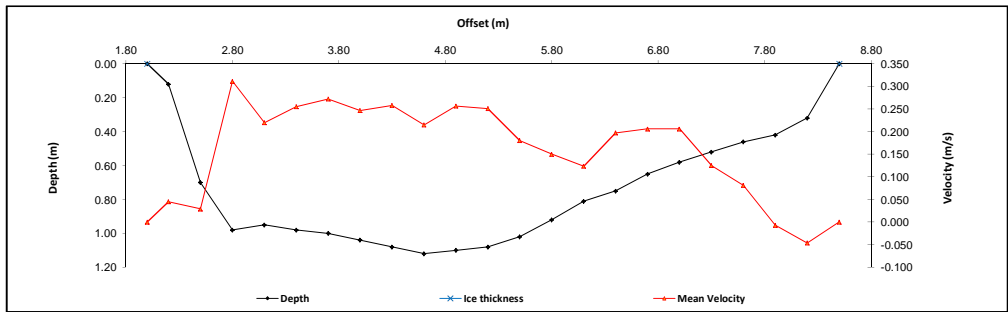
	Before	After
Transducer Reading (m):	0.933	0.933
Water (°C):	11.4	11.4
Datalogger Clock:	12:26	13:44
Laptop Clock:	12:26	13:44
Battery (Main):	9.2	13.0
Battery Serial #:	1001111	1303002
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PTH# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Faulty solar controller replaced
- Station bank is soft and station is leaning towards the river. Consider moving station away from bank

**General Notes:**

- LB has very soft mud
- Lots of woody debris and rocks on bottom of river
- Lots of woody debris near RB



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S49-01	1.164	101.164		100.000	100.000	3/4" Pipe 6m N of data logger
S49-03			1.228	99.936	99.935	3/4" Pipe 5m NE of data logger
S49-04			0.875	100.289	100.290	3/4" Pipe 7m E of data logger
Water Level:	Cut		2.804	98.360	Time WL Surveyed: 12:35	
Temporary BM			1.751	99.413	0.000	
<b>Turn</b>						
Temporary BM	1.736	101.149		98.413		
Water Level:	Cut		2.786	98.363	Time WL Surveyed: 12:40	
S49-04			0.857	100.292	100.290	3/4" Pipe 7m E of data logger
S49-03			1.212	99.937	99.935	3/4" Pipe 5m NE of data logger
S49-01			1.146	100.003	100.000	3/4" Pipe 6m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S49-01	1.147	101.149		100.002		
Water Level:	Cut		2.788	98.361	Time WL Surveyed: 13:48	
Water Level:	Cut		2.769	98.360	Time WL Surveyed: 13:51	
S49-01	1.127	101.129		100.002		

**WL Survey Summary**

Average WL:	98.362	98.361
Closing Error:	-0.003	-
WL Check:	0.003	0.001
Transducer Elevation	97.429	97.428

**Field Personnel:**

Data Entry Personnel:	DW, MP	Trip Date:	20-Jun-14
Data Check Personnel:	DW, MP	Date:	20-Jun-14
Entered Digitally in the Field:	DW	Date:	26-Jun-14

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: August 10, 2014  
 Site Visit Time (MST): 14:15

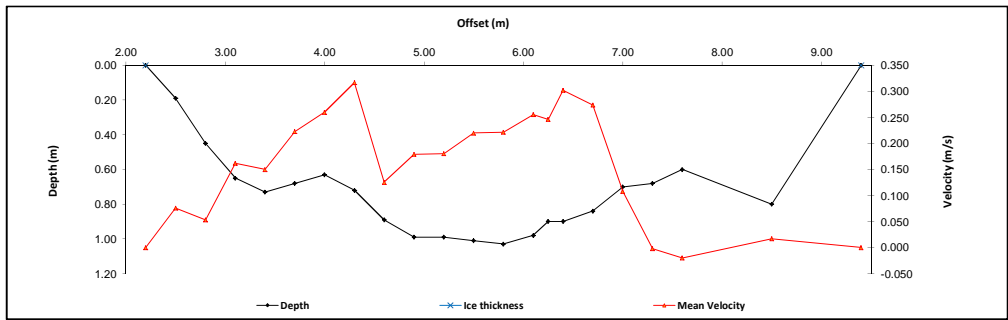


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.20	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.50	0.19		0.11	0.076					1.00	0.30	0.19	0.076	0.06	0.004	1%
2	2.90	0.45		0.27	0.053					1.00	0.30	0.45	0.053	0.14	0.007	1%
3	3.10	0.65		0.39	0.162					1.00	0.30	0.65	0.162	0.20	0.032	4%
4	3.40	0.73		0.44	0.150					1.00	0.30	0.73	0.150	0.22	0.033	4%
5	3.70	0.68		0.41	0.223					1.00	0.30	0.68	0.223	0.20	0.045	6%
6	4.00	0.63		0.38	0.260					1.00	0.30	0.63	0.260	0.19	0.049	6%
7	4.30	0.72		0.43	0.317					1.00	0.30	0.72	0.317	0.22	0.068	9%
8	4.60	0.89				0.71	0.041	0.18	0.210	1.00	0.30	0.89	0.126	0.27	0.034	4%
9	4.90	0.99				0.79	0.160	0.20	0.198	1.00	0.30	0.99	0.179	0.30	0.053	7%
10	5.20	0.99				0.79	0.134	0.20	0.227	1.00	0.30	0.99	0.181	0.30	0.054	7%
11	5.50	1.01				0.81	0.151	0.20	0.289	1.00	0.30	1.01	0.220	0.30	0.067	9%
12	5.80	1.03				0.82	0.161	0.21	0.282	1.00	0.30	1.03	0.222	0.31	0.068	9%
13	6.10	0.98				0.78	0.215	0.20	0.296	1.00	0.23	0.98	0.256	0.22	0.056	7%
14	6.25	0.90				0.72	0.167	0.18	0.325	1.00	0.15	0.90	0.246	0.14	0.033	4%
15	6.40	0.90				0.72	0.235	0.18	0.369	1.00	0.23	0.90	0.302	0.20	0.061	8%
16	6.70	0.84				0.67	0.236	0.17	0.312	1.00	0.30	0.84	0.274	0.25	0.069	9%
17	7.00	0.70	Good	0.42	0.108					1.00	0.30	0.70	0.108	0.21	0.023	3%
18	7.30	0.68		0.41	-0.002					1.00	0.30	0.68	-0.002	0.20	0.000	0%
19	7.60	0.60		0.36	-0.020					1.00	0.60	0.60	-0.020	0.36	-0.007	-1%
20	8.50	0.80			0.017	0.64		0.16		1.00	0.90	0.80	0.017	0.72	0.012	2%
RB	9.40	0.00	0.00		0.00		0.00		0.00	1.00	0.45	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.761</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m downstream of station

Meas. Start Time (MST):	14:43
Meas. End Time (MST):	15:27
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, breezy, 25C



**Flow characteristics:**

Total Flow:	0.761	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.99	(m <sup>2</sup> )
Wetted Width:	9.25	(m)
Hydraulic Depth:	0.54	(m)
Mean Velocity:	0.15	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.857	0.854
Water (°C):	14.4	14.4
Datalogger Clock:	14:22	15:38
Laptop Clock:	14:22	15:38
Battery (Main):	13.5	13.5
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Lots of large woody debris in channel

**General Notes:**

- Lots of large woody debris in channel

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S49-01	1.075	101.075		100.000	100.000	3/4" Pipe 6m N of data logger
S49-03			1.142	99.933	99.935	3/4" Pipe 5m NE of data logger
S49-04			0.786	100.289	100.290	3/4" Pipe 7m E of data logger
<b>Water Level:</b>						
Water Level:	Cut		2.804	98.271		Time WL Surveyed: 14:27
Temporary BM			1.541	99.534	0.000	
<b>Turn</b>						
Temporary BM	1.534	101.068		99.534		
Water Level:	Cut		2.795	98.273		Time WL Surveyed: 14:29
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S49-01	1.067	101.067		100.000		
Water Level:	Cut		2.787	98.290		Time WL Surveyed: 15:35
Water Level:	Cut		2.782	98.277		Time WL Surveyed: 15:36
S49-01	1.059	101.059		100.000		

**WL Survey Summary**

	Before	After
Average WL:	98.272	98.279
Closing Error:	0.000	-
WL Check:	0.002	0.003
Transducer Elevation	97.415	97.425

**Field Personnel:**

Data Entry Personnel:	CJ, MP	Trip Date:	10-Aug-14
Data Check Personnel:	CJ	Date:	10-Aug-14
Entered Digitally in the Field:	MP	Date:	5-Sep-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: September 14, 2014  
 Site Visit Time (MST): 12:28

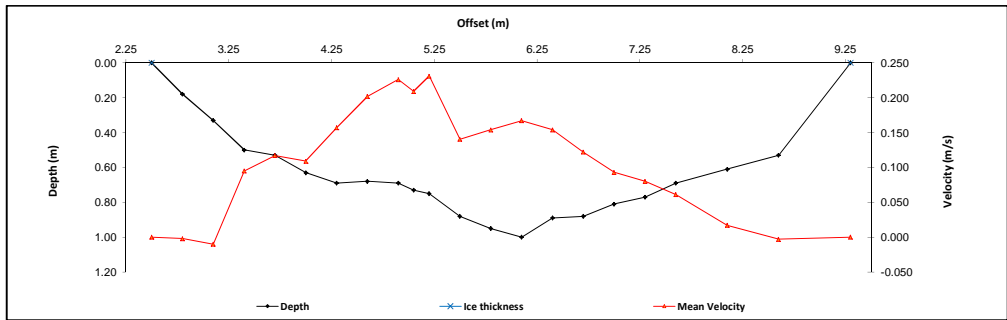


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	2.50	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.80	0.18		0.11	-0.002					1.00	0.30	0.18	-0.002	0.05	-0.000	0%
2	3.10	0.33		0.20	-0.010					1.00	0.30	0.33	-0.010	0.10	-0.001	0%
3	3.40	0.50		0.30	0.095					1.00	0.30	0.50	0.095	0.15	0.014	3%
4	3.70	0.53		0.32	0.117					1.00	0.30	0.53	0.117	0.16	0.019	4%
5	4.00	0.63		0.38	0.109					1.00	0.30	0.63	0.109	0.19	0.021	4%
6	4.30	0.69		0.41	0.157					1.00	0.30	0.69	0.157	0.21	0.032	7%
7	4.60	0.68		0.41	0.202					1.00	0.30	0.68	0.202	0.20	0.041	8%
8	4.90	0.69		0.41	0.226					1.00	0.23	0.69	0.226	0.16	0.035	7%
9	5.05	0.73		0.44	0.209					1.00	0.15	0.73	0.209	0.11	0.023	5%
10	5.20	0.75		0.45	0.231					1.00	0.23	0.75	0.231	0.17	0.039	8%
11	5.50	0.88				0.70	0.056	0.18	0.225	1.00	0.30	0.88	0.141	0.26	0.037	8%
12	5.80	0.95				0.76	0.087	0.19	0.221	1.00	0.30	0.95	0.154	0.28	0.044	9%
13	6.10	1.00				0.80	0.133	0.20	0.201	1.00	0.30	1.00	0.167	0.30	0.050	10%
14	6.40	0.89				0.71	0.167	0.18	0.141	1.00	0.30	0.89	0.154	0.27	0.041	8%
15	6.70	0.88				0.70	0.167	0.18	0.077	1.00	0.30	0.88	0.122	0.26	0.032	7%
16	7.00	0.81				0.65	0.149	0.16	0.037	1.00	0.30	0.81	0.093	0.24	0.023	5%
17	7.30	0.77				0.62	0.114	0.15	0.046	1.00	0.30	0.77	0.080	0.23	0.018	4%
18	7.60	0.69		0.41	0.061					1.00	0.40	0.69	0.061	0.28	0.017	3%
19	8.10	0.61		0.37	0.017					1.00	0.50	0.61	0.017	0.31	0.005	1%
20	8.60	0.53		0.32	-0.003					1.00	0.60	0.53	-0.003	0.32	-0.001	0%
RB	9.30	0.00	0.00		0.00		0.00		0.00	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.490</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Across from heli. landing area

Meas. Start Time (MST):	13:15
Meas. End Time (MST):	13:50
Equipment:	ADV
Method:	Wading
River Condition:	Good flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 15 C



**Flow characteristics:**

Total Flow:	0.490	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.25	(m <sup>2</sup> )
Wetted Width:	6.80	(m)
Hydraulic Depth:	0.62	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.635	0.636
Water (°C):	7.1	7.1
Datalogger Clock:	12:25	14:05
Laptop Clock:	12:26	14:06
Battery (Main):	14.4	14.5
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Checked RSSI after supporting mast: -94
- Guy-wired antenna mast

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S49-01	1.103	101.103		100.000	100.000	3/4" Pipe 6m N of data logger
S49-03			1.168	99.935	99.935	3/4" Pipe 5m NE of data logger
S49-04			0.813	100.290	100.290	3/4" Pipe 7m E of data logger
<b>Water Level:</b>	<b>Cut</b>		3.023	98.080	<b>Time WL Surveyed:</b>	13:13
S49-01			1.103	100.000	100.000	3/4" Pipe 6m N of data logger
<b>Turn</b>						
S49-01	1.132	101.132		100.000	100.000	3/4" Pipe 6m N of data logger
Water Level:	Cut		3.055	98.077	<b>Time WL Surveyed:</b>	13:15
S49-04			0.842	100.290	100.290	3/4" Pipe 7m E of data logger
S49-03			1.197	99.935	99.935	3/4" Pipe 5m NE of data logger
S49-01			1.132	100.000	100.000	3/4" Pipe 6m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S49-01	1.133	101.133		100.000		
Water Level:	Cut		3.062	98.071	<b>Time WL Surveyed:</b>	13:58
Water Level:	Cut		3.035	98.071	<b>Time WL Surveyed:</b>	14:00
S49-01	1.106	101.106		100.000		

**WL Survey Summary**

	Before	After
Average WL:	98.079	98.071
Closing Error:	0.000	-
WL Check:	0.003	0.000
Transducer Elevation	97.444	97.435

<b>Field Personnel:</b>	GG, TR	Trip Date:	14-Sep-14
Data Entry Personnel:	GG	Date:	14-Sep-14
Data Check Personnel:	MP	Date:	24-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S49 Eymundson Creek  
 UTM Location: 465524 E, 6372768 N

Site Visit Date: November 1, 2014  
 Site Visit Time (MST): 12:50

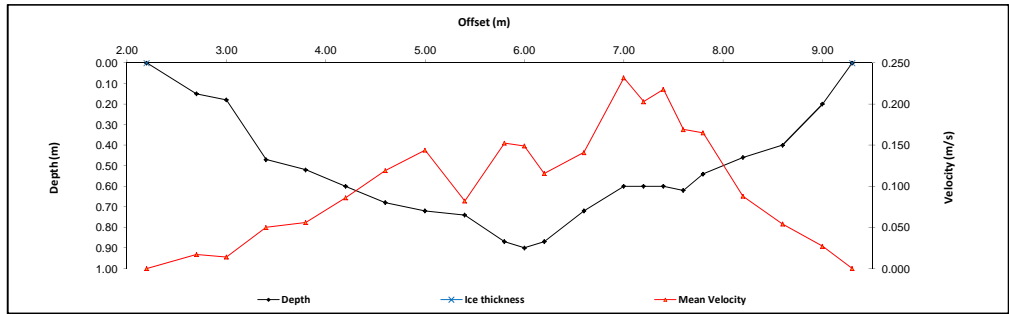


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	2.70	0.15		0.09	0.017					1.00	0.40	0.15	0.017	0.06	0.001	0%
2	3.00	0.18		0.11	0.014					1.00	0.35	0.18	0.014	0.06	0.001	0%
3	3.40	0.47		0.28	0.050					1.00	0.40	0.47	0.050	0.19	0.009	2%
4	3.80	0.52		0.31	0.056					1.00	0.40	0.52	0.056	0.21	0.012	3%
5	4.20	0.60		0.36	0.086					1.00	0.40	0.60	0.086	0.24	0.021	5%
6	4.60	0.68		0.41	0.119					1.00	0.40	0.68	0.119	0.27	0.032	7%
7	5.00	0.72		0.43	0.144					1.00	0.40	0.72	0.144	0.29	0.041	9%
8	5.40	0.74		0.44	0.082					1.00	0.40	0.74	0.082	0.30	0.024	5%
9	5.80	0.87				0.70	0.167	0.17	0.138	1.00	0.30	0.87	0.153	0.26	0.040	9%
10	6.00	0.90				0.72	0.146	0.18	0.152	1.00	0.20	0.90	0.149	0.18	0.027	6%
11	6.20	0.87				0.70	0.085	0.17	0.146	1.00	0.30	0.87	0.116	0.26	0.030	7%
12	6.60	0.72	0.43	0.141						1.00	0.40	0.72	0.141	0.29	0.041	9%
13	7.00	0.60	0.36	0.232						1.00	0.30	0.60	0.232	0.18	0.042	9%
14	7.20	0.60	0.36	0.203						1.00	0.20	0.60	0.203	0.12	0.024	5%
15	7.40	0.60	0.36	0.218						1.00	0.20	0.60	0.218	0.12	0.026	6%
16	7.60	0.62	0.37	0.169						1.00	0.20	0.62	0.169	0.12	0.021	5%
17	7.80	0.54	0.32	0.165						1.00	0.30	0.54	0.165	0.16	0.027	6%
18	8.20	0.46	0.28	0.088						1.00	0.40	0.46	0.088	0.18	0.016	4%
19	8.60	0.40	0.24	0.054						1.00	0.40	0.40	0.054	0.16	0.009	2%
20	9.00	0.20	0.12	0.027						1.00	0.35	0.20	0.027	0.07	0.002	0%
LB	9.30	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.446</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Across from heli. landing area

Meas. Start Time (MST):	13:10
Meas. End Time (MST):	13:40
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 7C



**Flow characteristics:**

Total Flow:	0.446	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.73	(m <sup>2</sup> )
Wetted Width:	7.10	(m)
Hydraulic Depth:	0.52	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.613	0.614
Water (°C):	2.4	2.4
Datalogger Clock:	12:50	13:42
Laptop Clock:	12:51	13:42
Battery (Main):	12.5	12.7
Battery Serial #:	-	-
Enclosure Dessiccant:	-	-
Vent Tube Dessiccant:	-	-
PTH (if replaced):	287963	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Removed Modem and PT for winter

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S49-01	1.099	101.099		100.000	100.000	3/4" Pipe 6m N of data logger
S49-03			1.164	99.935	99.935	3/4" Pipe 5m NE of data logger
S49-04			0.808	100.291	100.290	3/4" Pipe 7m E of data logger
Water Level:	Cut		3.053	98.046	Time WL Surveyed: 12:56	
Temporary BM			1.569	99.530	0.000	
<b>Turn</b>						
Temporary BM	1.548	101.078		99.530		
Water Level:	Cut		3.035	98.043	Time WL Surveyed: 12:59	
S49-04			0.788	100.290	100.290	3/4" Pipe 7m E of data logger
S49-03			1.143	99.935	99.935	3/4" Pipe 5m NE of data logger
S49-01			1.077	100.001	100.000	3/4" Pipe 6m N of data logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S49-04	0.787	101.077		100.290		
Water Level:	Cut		3.033	98.044	Time WL Surveyed: 13:46	
Water Level:	Cut		3.009	98.044	Time WL Surveyed: 13:47	
S49-04	0.763	101.053		100.290		

**WL Survey Summary**

	Before	After
Average WL:	98.045	98.044
Closing Error:	-0.001	-
WL Check:	0.003	0.000
Transducer Elevation	97.432	97.430

**Field Personnel:**

Data Entry Personnel:	TR, MP	Trip Date:	1-Nov-14
Data Check Personnel:	TR	Date:	1-Nov-14
Entered Digitally in the Field:	MP	Date:	17-Nov-14
	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S50A Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: April 30, 2014  
 Site Visit Time (MST): 08:37



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	11.50	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	12.00	0.53		0.32	0.090					1.00	0.40	0.53	0.090	0.21	0.019	2%
2	12.30	0.59		0.35	0.161					1.00	0.30	0.59	0.161	0.18	0.028	3%
3	12.60	0.58		0.35	0.228					1.00	0.30	0.58	0.228	0.17	0.040	4%
4	12.90	0.54		0.32	0.268					1.00	0.30	0.54	0.268	0.16	0.043	5%
5	13.20	0.54		0.32	0.234					1.00	0.30	0.54	0.234	0.16	0.038	4%
6	13.50	0.57		0.34	0.250					1.00	0.30	0.57	0.250	0.17	0.043	5%
7	13.80	0.58		0.35	0.260					1.00	0.30	0.58	0.260	0.17	0.045	5%
8	14.10	0.58		0.35	0.306					1.00	0.30	0.58	0.306	0.17	0.053	6%
9	14.40	0.59		0.35	0.326					1.00	0.30	0.59	0.326	0.18	0.058	6%
10	14.70	0.62		0.37	0.317					1.00	0.30	0.62	0.317	0.19	0.059	7%
11	15.00	0.63		0.38	0.354					1.00	0.30	0.63	0.354	0.19	0.067	7%
12	15.30	0.66		0.40	0.344					1.00	0.30	0.66	0.344	0.20	0.068	8%
13	15.60	0.68		0.41	0.300					1.00	0.30	0.68	0.300	0.20	0.061	7%
14	15.90	0.64		0.38	0.178					1.00	0.40	0.64	0.178	0.26	0.046	5%
15	16.40	0.62		0.37	0.102					1.00	0.50	0.62	0.102	0.31	0.032	4%
16	16.90	0.62		0.37	0.183					1.00	0.50	0.62	0.183	0.31	0.057	6%
17	17.40	0.63		0.38	0.155					1.00	0.40	0.63	0.155	0.25	0.039	4%
18	17.70	0.62		0.37	0.134					1.00	0.30	0.62	0.134	0.19	0.025	3%
19	18.00	0.63		0.38	0.123					1.00	0.40	0.63	0.123	0.25	0.031	3%
20	18.50	0.63		0.38	0.131					1.00	0.50	0.63	0.131	0.32	0.041	5%
LB	19.00	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.893</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -Across from PT

Meas. Start Time (MST):	9:25
Meas. End Time (MST):	10:00
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 10C

**Flow characteristics:**

Total Flow:	0.893	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.24	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	0.57	(m)
Mean Velocity:	0.21	(m/s)
Froude Number:	0.09	

**Logger Details:**

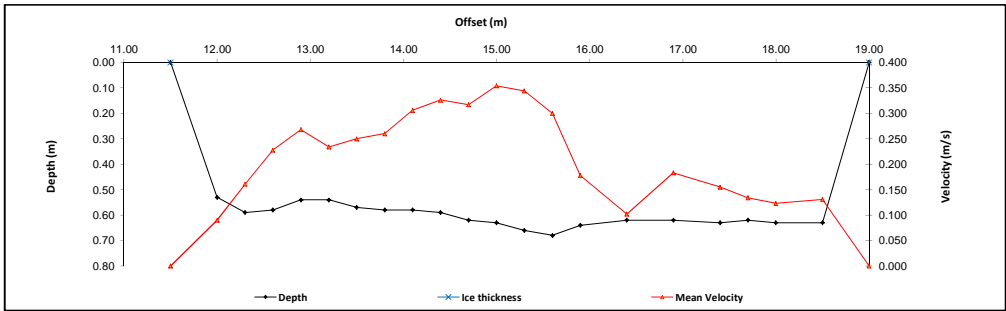
	Before	After
Transducer Reading (m):	0.550	0.549
Water (°C):	4.6	2.2
Datalogger Clock:	08:45	10:04
Laptop Clock:	08:44	10:03
Battery (Main):	14.7	14.5
Battery Serial #:	-	-
Enclosure Dessiccant:		New
Vent Tube Dessiccant:		New
PT# (if replaced):	-	333044
Logger# (if replaced):	-	16203

**Datalogger / Station Notes:**

- PT needs weight, old PT still stuck
- Lots of trees have fallen

**General Notes:**

- Ran ADV test, all good
- Wildlife took tote of batteries at relay



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S50A-02	1.468	101.628		100.160	100.160	Pipe 15m SE of logger
S50A-03			1.649	99.979	99.969	Pipe 10m SSE of logger
<b>Turn</b>						
S50A-04	0.735	101.664		100.929	99.979	Pipe 7m South of logger
Water Level:	Cut		3.138	98.526		Time WL Surveyed: 9:15
S50A-03		1.686		99.978	99.969	Pipe 10m SSE of logger
S50A-02		1.503		100.161	100.160	Pipe 15m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S50A-03	1.650	101.629		99.979		
Water Level:	Cut		3.107	98.522		Time WL Surveyed: 10:00
Water Level:	Cut		3.064	98.526		Time WL Surveyed: 10:02
S50A-03	1.631	101.610		99.979		

**WL Survey Summary**

	Before	After
Average WL:	98.526	98.524
Closing Error:	-0.001	-
WL Check:	0.001	-0.004
Transducer Elevation	97.976	97.975

**Field Personnel:**

	TR, GG	Trip Date:	30-Apr-14
Data Entry Personnel:	GG	Date:	30-Apr-14
Data Check Personnel:	CJ	Date:	9-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: June 20, 2014  
 Site Visit Time (MST): 08:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.20	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	2.50	0.38		0.23	0.214					1.00	0.30	0.38	0.214	0.11	0.024	3%
2	2.90	0.40		0.24	0.231					1.00	0.30	0.40	0.231	0.12	0.028	3%
3	3.10	0.40		0.24	0.246					1.00	0.30	0.40	0.246	0.12	0.030	4%
4	3.40	0.43		0.26	0.247					1.00	0.30	0.43	0.247	0.13	0.032	4%
5	3.70	0.46		0.28	0.260					1.00	0.30	0.46	0.260	0.14	0.036	4%
6	4.00	0.48		0.29	0.250					1.00	0.30	0.48	0.250	0.14	0.036	4%
7	4.30	0.55		0.33	0.281					1.00	0.30	0.55	0.281	0.16	0.046	6%
8	4.60	0.58		0.35	0.234					1.00	0.30	0.58	0.234	0.17	0.041	5%
9	4.90	0.60		0.36	0.267					1.00	0.30	0.60	0.267	0.18	0.048	6%
10	5.20	0.60		0.36	0.248					1.00	0.30	0.60	0.248	0.18	0.045	5%
11	5.50	0.60		0.36	0.186					1.00	0.30	0.60	0.186	0.18	0.033	4%
12	5.80	0.61		0.37	0.214					1.00	0.30	0.61	0.214	0.18	0.039	5%
13	6.10	0.63		0.38	0.246					1.00	0.30	0.63	0.246	0.19	0.046	6%
14	6.40	0.61		0.37	0.241					1.00	0.30	0.61	0.241	0.18	0.044	5%
15	6.70	0.61		0.37	0.232					1.00	0.30	0.61	0.232	0.18	0.042	5%
16	7.00	0.61		0.37	0.237					1.00	0.30	0.61	0.237	0.18	0.043	5%
17	7.30	0.63		0.38	0.230					1.00	0.30	0.63	0.230	0.19	0.043	5%
18	7.60	0.68		0.41	0.205					1.00	0.30	0.68	0.205	0.20	0.042	5%
19	7.90	0.71		0.43	0.120					1.00	0.35	0.71	0.120	0.25	0.030	4%
20	8.30	0.74		0.44	0.156					1.00	0.65	0.74	0.156	0.48	0.075	9%
21	9.20	0.61		0.37	0.045					1.00	0.75	0.61	0.045	0.46	0.021	2%
LB	9.80	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.825</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):

Mess. Start Time (MST):	8:39
Mess. End Time (MST):	9:10
Equipment:	ADV
Method:	Wading
River Condition:	Moderate Flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 20C

**Flow characteristics:**

Total Flow:	0.825	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.15	(m <sup>2</sup> )
Wetted Width:	7.60	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.09	

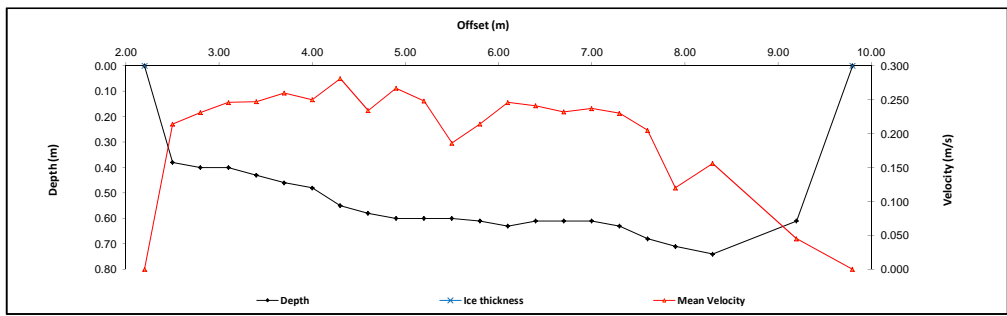
**Logger Details:**

	Before	After
Transducer Reading (m):	0.539	0.539
Water (°C):	13.8	13.9
Datalogger Clock:	08:26	09:13
Laptop Clock:	08:25	09:13
Battery (Main):	14.1	14.1
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PTH# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Needs grounding wire and a new trail to site

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S50A-02	1.456	101.616		100.160	100.160	Pipe 8m S of logger
S50A-03			1.642	99.974	99.969	Pipe 7m SW of logger
S50A-04			0.687	100.929	99.979	Pipe 10m SE of logger
Water Level:	Cut		3.113	98.503	Time WL Surveyed: 8:33	
Temporary BM			2.983	98.633	0.000	
<b>Turn</b>						
Temporary BM	2.947	101.580		98.633		
Water Level:	Cut		3.075	98.505	Time WL Surveyed: 8:36	
S50A-04			0.654	100.926	99.979	Pipe 10m SE of logger
S50A-03			1.605	99.975	99.969	Pipe 7m SW of logger
S50A-02			1.411	100.169	100.160	Pipe 8m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S50A-02	1.423	101.583		100.160		
Water Level:	Cut		3.074	98.509	Time WL Surveyed: 9:20	
Water Level:	Cut		3.060	98.507	Time WL Surveyed: 9:23	
S50A-02	1.407	101.567		100.160		

**WL Survey Summary**

	Before	After
Average WL:	98.504	98.508
Closing Error:	-0.009	-
WL Check:	0.002	0.002
Transducer Elevation	97.965	97.969

**Field Personnel:**

	DW, MP	Trip Date:	20-Jun-14
Data Entry Personnel:	DW, MP	Date:	20-Jun-14
Data Check Personnel:	DW	Date:	26-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S50 Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: August 10, 2014  
 Site Visit Time (MST): 10:45

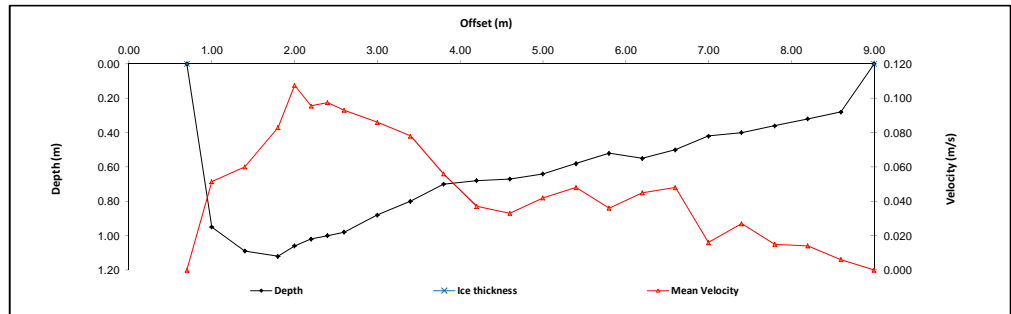


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	0.70	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.00	0.95				0.76	0.016	0.19	0.087	1.00	0.35	0.95	0.052	0.33	0.017	6%
2	1.40	1.09				0.87	0.056	0.22	0.084	1.00	0.40	1.09	0.060	0.44	0.026	8%
3	1.80	1.12				0.90	0.089	0.22	0.077	1.00	0.30	1.12	0.083	0.34	0.028	9%
4	2.00	1.06				0.85	0.099	0.21	0.116	1.00	0.20	1.06	0.108	0.21	0.023	7%
5	2.20	1.02				0.82	0.093	0.20	0.098	1.00	0.20	1.02	0.096	0.20	0.019	6%
6	2.40	1.00				0.80	0.091	0.20	0.104	1.00	0.20	1.00	0.098	0.20	0.020	6%
7	2.60	0.98				0.78	0.073	0.20	0.113	1.00	0.30	0.98	0.093	0.29	0.027	9%
8	3.00	0.88				0.70	0.084	0.18	0.088	1.00	0.40	0.88	0.086	0.35	0.030	10%
9	3.40	0.80				0.64	0.086	0.16	0.070	1.00	0.40	0.80	0.078	0.32	0.025	8%
10	3.80	0.70		0.42	0.056					1.00	0.40	0.70	0.056	0.28	0.016	5%
11	4.20	0.68		0.41	0.037					1.00	0.40	0.68	0.037	0.27	0.010	3%
12	4.60	0.67		0.40	0.033					1.00	0.40	0.67	0.033	0.27	0.009	3%
13	5.00	0.64		0.38	0.042					1.00	0.40	0.64	0.042	0.26	0.011	3%
14	5.40	0.58		0.35	0.048					1.00	0.40	0.58	0.048	0.23	0.011	4%
15	5.80	0.52		0.31	0.036					1.00	0.40	0.52	0.036	0.21	0.007	2%
16	6.20	0.55		0.33	0.045					1.00	0.40	0.55	0.045	0.22	0.010	3%
17	6.60	0.50		0.30	0.048					1.00	0.40	0.50	0.048	0.20	0.010	3%
18	7.00	0.42		0.25	0.016					1.00	0.40	0.42	0.016	0.17	0.003	1%
19	7.40	0.40		0.24	0.027					1.00	0.40	0.40	0.027	0.16	0.004	1%
20	7.80	0.36		0.22	0.015					1.00	0.40	0.36	0.015	0.14	0.002	1%
21	8.20	0.32		0.19	0.014					1.00	0.40	0.32	0.014	0.13	0.002	1%
22	8.60	0.28		0.17	0.006					1.00	0.40	0.28	0.006	0.11	0.001	0%
RB	9.00	0.00	0.00							1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.311</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -15m downstream of station

Meas. Start Time (MST):	11:24
Meas. End Time (MST):	12:00
Equipment:	ADV
Method:	Wading
River Condition:	Lots of woody debris
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 26C



**Flow characteristics:**

Total Flow:	0.311	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.33	(m²)
Wetted Width:	8.30	(m)
Hydraulic Depth:	0.64	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.671	0.671
Water (°C):	11.9	12.3
Datalogger Clock:	11:01	12:09
Laptop Clock:	11:00	01:55
Battery (Main):	14.0	13.6
Battery Serial #:	-	-
Enclosure Dessiccant:	-	Replaced
Vent Tube Dessiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Fallen trees throughout stream

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S50A-02	1.298	101.458		100.160	100.160	Pipe 8m S of logger
S50A-03			1.484	99.974	99.969	Pipe 7m SW of logger
S50A-04			0.532	100.928	99.979	Pipe 10m SE of logger
Water Level:	Cut	2.827		98.631		Time WL Surveyed: 11:17
Temporary BM			2.597	98.861	0.000	
Turn						
Temporary BM	2.617	101.478		98.861		
Water Level:	Cut		2.843	98.635		Time WL Surveyed: 11:19
S50A-04			0.550	100.928	99.979	Pipe 10m SE of logger
S50A-03			1.503	99.975	99.969	Pipe 7m SW of logger
S50A-02			1.317	100.161	100.160	Pipe 8m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S50A-03	1.503	101.478		99.975		
Water Level:	Cut		2.843	98.635		Time WL Surveyed: 12:04
Water Level:	Cut		2.832	98.632		Time WL Surveyed: 12:05
S50A-03	1.489	101.464		99.975		

**WL Survey Summary**

	Before	After
Average WL:	98.633	98.634
Closing Error:	-0.001	-
WL Check:	0.004	0.003
Transducer Elevation	97.962	97.963

**Field Personnel:**

	MP, CJ	Trip Date:	10-Aug-14
Data Entry Personnel:	MP	Date:	10-Aug-14
Data Check Personnel:	MP	Date:	5-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S50A Red Clay Creek

UTM Location: 474872 E, 6400203 N

Site Visit Date: \_\_\_\_\_

September 14, 2014

Site Visit Time (MST): \_\_\_\_\_

07:57



<b>Flow Measurement Details:</b>	
<b>Metering Section Location (describe):</b> Where road crosses creek	
Meas. Start Time (MST):	8:50
Meas. End Time (MST):	9:15
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	clear, calm, 10

<b>Flow characteristics:</b>		
Total Flow:	0.263	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	6.01	(m <sup>2</sup> )
Wetted Width:	9.52	(m)
Hydraulic Depth:	0.63	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.771	0.770
Water (°C):	5.4	5.3
Datalogger Clock:	08:04	09:29
Laptop Clock:	08:04	09:29
Battery (Main):	12.8	13.4
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

Sent program, installed valve on enclosure

**General Notes:**

Site is flooded due to beaver activity  
Installed valve, repaired relay

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	17.50	
Serial Number:	1802		Salinity (ppt):	-		RB:	25.80	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	-				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		3	9.63	5.99	0.046	0.276	4.94%
Coordinate System:	ENU		4	9.39	5.98	0.043	0.256	-2.66%
Left Method:	Sloped bank		5	9.52	6.05	0.043	0.262	-0.38%
Right Method:	Sloped bank		6	9.54	6.03	0.043	0.258	-1.90%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	9.52	6.01	0.044	<b>0.263</b>	
			<b>SD:</b>	0.09	0.03	0.001	0.008	
			<b>COV:</b>	0.01	0.01	0.030	0.030	

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S50A-02	1.469	101.629		100.160	100.160	Pipe 15m SE of logger
S50A-03			1.653	99.976	99.969	Pipe 10m SSE of logger
S50A-04			0.700	100.929	99.979	Pipe 7m S of logger
Water Level:	Cut		2.884	98.745	<b>Time WL Surveyed:</b>	8:25
Temporary BM			2.948	98.681	0.000	-
<b>Turn</b>						
Temporary BM	2.981	101.662		98.681		-
Water Level:	Cut		2.915	98.747	<b>Time WL Surveyed:</b>	8:27
S50A-04			0.730	100.932	99.979	Pipe 7m S of logger
S50A-03			1.683	99.979	99.969	Pipe 10m SSE of logger
S50A-02			1.500	100.162	100.160	Pipe 15m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S50A-03	1.683	101.662		99.979		
Water Level:	Cut		2.917	98.745	<b>Time WL Surveyed:</b>	9:24
Water Level:	Cut		2.900	98.744	<b>Time WL Surveyed:</b>	9:25
S50A-03	1.665	101.644		99.979		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	98.746	98.745
Closing Error:	-0.002	-
WL Check:	0.002	0.001
Transducer Elevation	97.975	97.975

<b>Field Personnel:</b>			
Data Entry Personnel:	GG TR	Trip Date:	14-Sep-14
Data Check Personnel:	GG	Date:	14-Sep-14
Entered Digitally in the Field:	DW	Date:	20-Sep-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S50A Red Clay Creek  
 UTM Location: 474872 E, 6400203 N

Site Visit Date: November 1, 2014  
 Site Visit Time (MST): 08:25



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	11.30	0.00	0.00		0.000		0.000		0.000	1.00	0.65	0.00	0.000	0.00	0.000	
1	10.00	0.44		0.26	0.041					1.00	0.85	0.44	0.041	0.37	0.015	5%
2	9.60	0.53		0.32	0.043					1.00	0.40	0.53	0.043	0.21	0.009	3%
3	9.20	0.32		0.19	0.059					1.00	0.40	0.32	0.059	0.13	0.008	2%
4	8.80	0.60		0.36	0.039					1.00	0.40	0.60	0.039	0.24	0.009	3%
5	8.40	0.78				0.62	0.027	0.16	0.049	1.00	0.40	0.78	0.038	0.31	0.012	4%
6	8.00	0.80				0.64	0.036	0.16	0.050	1.00	0.40	0.80	0.043	0.32	0.014	4%
7	7.60	0.84				0.67	0.037	0.17	0.024	1.00	0.40	0.84	0.031	0.34	0.010	3%
8	7.20	0.84				0.67	0.022	0.17	0.024	1.00	0.40	0.84	0.023	0.34	0.008	2%
9	6.80	0.82				0.66	0.027	0.16	0.049	1.00	0.40	0.82	0.038	0.33	0.012	4%
10	6.40	0.84				0.67	0.035	0.17	0.005	1.00	0.40	0.84	0.020	0.34	0.007	2%
11	6.00	0.84				0.67	0.059	0.17	0.024	1.00	0.40	0.84	0.042	0.34	0.014	4%
12	5.60	0.84				0.67	0.120	0.17	0.087	1.00	0.30	0.84	0.104	0.25	0.026	8%
13	5.40	0.84				0.67	0.104	0.17	0.117	1.00	0.20	0.84	0.111	0.17	0.019	6%
14	5.20	0.82				0.66	0.109	0.16	0.115	1.00	0.30	0.82	0.112	0.25	0.028	9%
15	4.80	0.84				0.67	0.104	0.17	0.085	1.00	0.40	0.84	0.095	0.34	0.032	10%
16	4.40	0.82				0.66	0.074	0.16	0.086	1.00	0.40	0.82	0.080	0.33	0.026	8%
17	4.00	0.86				0.69	0.021	0.17	0.097	1.00	0.40	0.86	0.059	0.34	0.020	7%
18	3.60	0.88				0.70	-0.006	0.18	0.090	1.00	0.40	0.88	0.042	0.35	0.015	5%
19	3.20	0.86				0.69	0.042	0.17	0.091	1.00	0.40	0.86	0.067	0.34	0.023	7%
20	2.80	0.80				0.64	-0.010	0.16	0.040	1.00	0.40	0.80	0.015	0.32	0.005	2%
LB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.311</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
3m downstream of PT

Meas. Start Time (MST):	8:50
Meas. End Time (MST):	9:45
Equipment:	ADV
Method:	Wading
River Condition:	Beaver affected
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, 4C

**Flow characteristics:**

Total Flow:	0.311	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.95	(m <sup>2</sup> )
Wetted Width:	8.90	(m)
Hydraulic Depth:	0.67	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

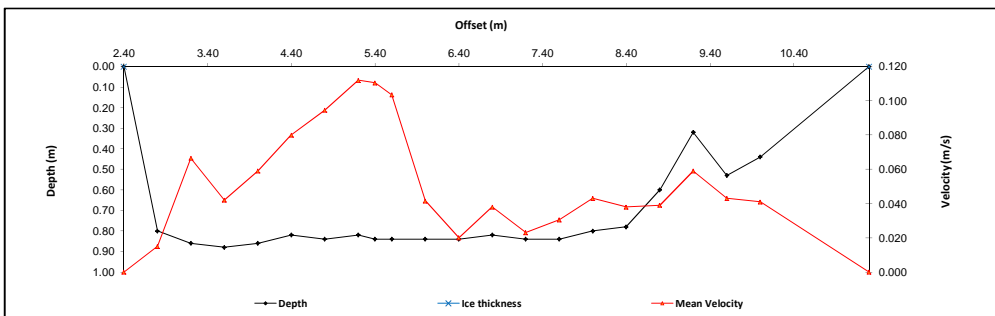
**Logger Details:**

	Before	After
Transducer Reading (m):	0.751	1.789
Water (°C):	3.1	4.6
Datalogger Clock:	08:26	09:47
Laptop Clock:	08:27	09:46
Battery (Main):	12.7	12.8
Battery Serial #:	-	-
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	333044	stuck
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

Removed modem, PT, and relays  
 Wired up PT that is stuck, OTT changed between surveys

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S50A-02	1.487	101.647		100.160	100.160	Pipe 15m SE of logger
S50A-03			1.669	99.978	99.969	Pipe 10m SSE of logger
S50A-04			0.719	100.928	99.979	Pipe 7m South of logger
<b>Water Level:</b>						
Cut			2.922	98.725	Time WL Surveyed: 8:38	
S50A-03			1.669	99.978	99.969	Pipe 10m SSE of logger
<b>Turn</b>						
S50A-03	1.648	101.626		99.978	99.969	Pipe 10m SSE of logger
Water Level:	Cut		2.901	98.725	Time WL Surveyed: 8:40	
S50A-04			0.698	100.928	99.979	Pipe 7m South of logger
S50A-03			1.648	99.978	99.969	Pipe 10m SSE of logger
S50A-02			1.465	100.161	100.160	Pipe 15m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S50A-02	1.465	101.626		100.161		
Water Level:	Cut		2.902	98.724	Time WL Surveyed: 9:49	
Water Level:	Cut		2.888	98.726	Time WL Surveyed: 9:51	
S50A-02	1.453	101.614		100.161		

**WL Survey Summary**

	Before	After
Average WL:	98.725	98.725
Closing Error:	-0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	97.974	96.956

**Field Personnel:**

	TR, MP	Trip Date:	1-Nov-14
Data Entry Personnel:	TR	Date:	1-Nov-14
Data Check Personnel:	MP	Date:	19-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: January 10, 2014  
 Site Visit Time (MST): 14:25



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.10	0.00	0.00		0.000				0.000	0.88	0.25	0.00	0.000	0.00	0.000	
1	3.60	0.60	0.25	0.43	0.782					0.88	0.55	0.35	0.688	0.19	0.132	7%
2	4.20	0.60	0.30	0.45	0.632					0.88	0.60	0.30	0.556	0.18	0.100	5%
3	4.80	0.60	0.30	0.45	0.427					0.88	0.60	0.30	0.376	0.18	0.068	4%
4	5.40	0.45	0.40	0.43	0.000					0.88	0.53	0.05	0.000	0.03	0.000	0%
5	5.85	0.50	0.42	0.46	0.399					0.88	0.60	0.08	0.351	0.05	0.017	1%
6	6.60	0.55	0.50	0.53	0.448					0.88	0.80	0.05	0.394	0.04	0.016	1%
7	7.45	0.65	0.50	0.58	0.285					0.88	0.85	0.15	0.233	0.13	0.030	2%
8	8.30	0.55	0.50	0.53	0.271					0.88	0.88	0.05	0.238	0.04	0.010	1%
9	9.20	0.65	0.35	0.50	0.972					0.88	0.85	0.30	0.855	0.26	0.218	11%
10	10.00	0.70	0.32	0.51	1.067					0.88	0.50	0.38	0.939	0.19	0.178	9%
11	10.20	0.70	0.30	0.50	0.733					0.88	0.40	0.40	0.645	0.16	0.103	5%
12	10.80	0.65	0.35	0.50	1.008					0.88	0.65	0.30	0.887	0.20	0.173	9%
13	11.50	0.55	0.35	0.45	1.010					0.88	0.85	0.20	0.889	0.17	0.151	8%
14	12.50	0.75	0.40	0.58	0.700					0.88	0.85	0.35	0.616	0.30	0.183	10%
15	13.20	0.80	0.42	0.61	0.551					0.88	0.80	0.38	0.485	0.30	0.147	8%
16	14.10	0.70	0.40	0.55	0.615					0.88	0.90	0.30	0.541	0.27	0.146	8%
17	15.00	0.70	0.45	0.58	0.001					0.88	0.85	0.25	0.001	0.21	0.000	0%
18	15.80	0.62	0.45	0.54	0.516					0.88	0.80	0.17	0.454	0.14	0.062	3%
19	16.60	0.65	0.45	0.55	0.142					0.88	0.80	0.20	0.125	0.16	0.020	1%
20	17.40	0.65	0.50	0.58	0.524					0.88	0.85	0.15	0.461	0.13	0.059	3%
21	18.30	0.68	0.40	0.54	0.355					0.88	0.95	0.28	0.312	0.27	0.083	4%
LB	19.30	0.00	0.00		0.00		0.00		0.00	0.88	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.90</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m US of station

Mess. Start Time (MST):	14:50
Mess. End Time (MST):	15:23
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, light snow, calm

**Flow characteristics:**

Total Flow:	1.90	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.58	(m <sup>2</sup> )
Wetted Width:	16.20	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.53	(m/s)
Froude Number:	0.36	

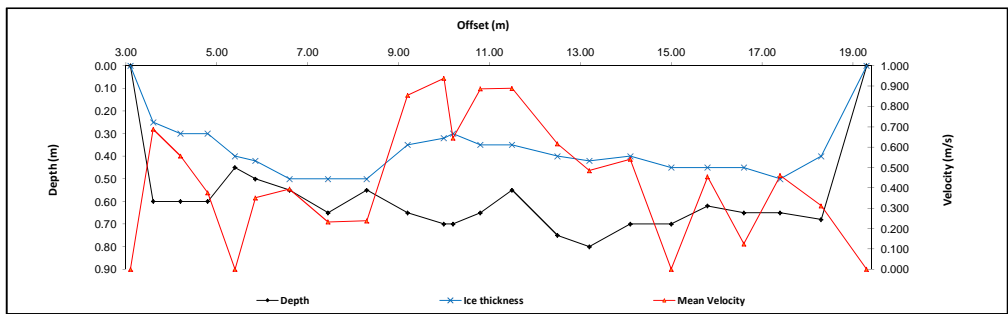
**Logger Details:**

	Before	After
Transducer Reading (m):	0.603	0.602
Water (°C):	0.2	0.2
Datalogger Clock:	14:33	15:31
Laptop Clock:	14:33	15:31
Battery (Main):	13.1	13.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Good	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-6cm of overflow on ice

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S51-1	1.182	101.182		100.000	100.000	Pipe 3m SE of logger
S51-2			1.103	100.079	100.058	Pipe 3m S of logger
S51-3			0.697	100.485	100.474	Pipe 2m W of logger
Water Level:	Cut		3.032	98.150	Time WL Surveyed: 14:40	
Temporary BM			3.033	98.149	0.000	
<b>Turn</b>						
Temporary BM	3.023	101.172		98.149		
Water Level:	Cut		3.025	98.147	Time WL Surveyed: 14:42	
S51-3			0.686	100.486	100.474	Pipe 2m W of logger
S51-2			1.093	100.079	100.058	Pipe 3m S of logger
S51-1			1.171	100.001	100.000	Pipe 3m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S51-2	1.093	101.172		100.079		
Water Level:	Cut		3.026	98.146	Time WL Surveyed: 15:27	
Water Level:	Cut		3.016	98.145	Time WL Surveyed: 15:29	
S51-2	1.082	101.161		100.079		

**WL Survey Summary**

Average WL:	Before	After
	98.149	98.146
Closing Error:	-0.001	-
WL Check:	0.003	0.001
Transducer Elevation	97.546	97.544

**Field Personnel:**

SM, TR, AJ	Trip Date:	10-Jan-14
SM	Date:	10-Jan-14
TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: March 11, 2014  
 Site Visit Time (MST): 10:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average 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	0.88	0.40	0.00	0.000	0.00	0.000	
1	1.30	0.30	0.05	0.18	0.713					0.88	0.73	0.25	0.627	0.18	0.114	6%
2	1.95	0.37	0.01	0.19	0.964					0.88	0.59	0.36	0.848	0.21	0.180	9%
3	2.48	0.48	0.02	0.25	0.425					0.88	0.73	0.46	0.374	0.33	0.125	6%
4	3.40	0.40	0.04	0.22	0.461					0.88	1.01	0.36	0.406	0.36	0.148	7%
5	4.50	0.40	0.30	0.35	0.750					0.88	0.95	0.10	0.660	0.10	0.063	3%
6	5.30	0.00	0.00	0.00	0.000					0.88	1.04	0.00	0.000	0.00	0.000	0%
7	6.58	0.00	0.00	0.00	0.000					0.88	0.86	0.00	0.000	0.00	0.000	0%
8	7.02	0.52	0.43	0.48	0.070					0.88	0.42	0.09	0.062	0.04	0.002	0%
9	7.42	0.60	0.30	0.45	0.709					0.88	0.43	0.30	0.624	0.13	0.080	4%
10	7.87	0.60	0.15	0.38	0.765					0.88	0.39	0.45	0.673	0.18	0.118	6%
11	8.20	0.50	0.15	0.33	0.680					0.88	0.57	0.35	0.598	0.20	0.118	6%
12	9.00	0.55	0.15	0.35	0.630					0.88	0.65	0.40	0.554	0.26	0.145	7%
13	9.51	0.60	0.25	0.43	0.536					0.88	0.49	0.35	0.472	0.17	0.081	4%
14	9.98	0.50	0.30	0.40	0.485					0.88	0.61	0.20	0.427	0.12	0.052	3%
15	10.72	0.55	0.25	0.40	0.673					0.88	0.80	0.30	0.592	0.24	0.142	7%
16	11.58	0.45	0.25	0.35	0.522					0.88	0.64	0.20	0.459	0.13	0.059	3%
17	12.00	0.50	0.25	0.38	0.662					0.88	0.60	0.25	0.583	0.15	0.087	4%
18	12.78	0.52	0.32	0.42	0.513					0.88	0.91	0.20	0.451	0.18	0.083	4%
19	13.83	0.57	0.35	0.46	0.758					0.88	0.85	0.22	0.667	0.19	0.125	6%
20	14.48	0.60	0.30	0.45	0.672					0.88	0.64	0.30	0.591	0.19	0.114	6%
21	15.11	0.53	0.35	0.44	0.631					0.88	0.62	0.18	0.555	0.11	0.062	3%
22	15.72	0.50	0.27	0.39	0.642					0.88	0.68	0.23	0.565	0.16	0.088	4%
23	16.47	0.45	0.25	0.35	0.006					0.88	0.76	0.20	0.005	0.15	0.001	0%
24	17.23	0.08	0.05	0.07	0.767					0.88	1.72	0.03	0.675	0.05	0.035	2%
LB	19.90	0.00	0.00		0.00		0.00			0.88	1.34	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.02</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 20m US of station

Meas. Start Time (MST):	11:39
Meas. End Time (MST):	12:03
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, some open spots
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -2 C

**Flow characteristics:**

Total Flow:	2.02	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.83	(m <sup>2</sup> )
Wetted Width:	19.40	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.53	(m/s)
Froude Number:	0.38	

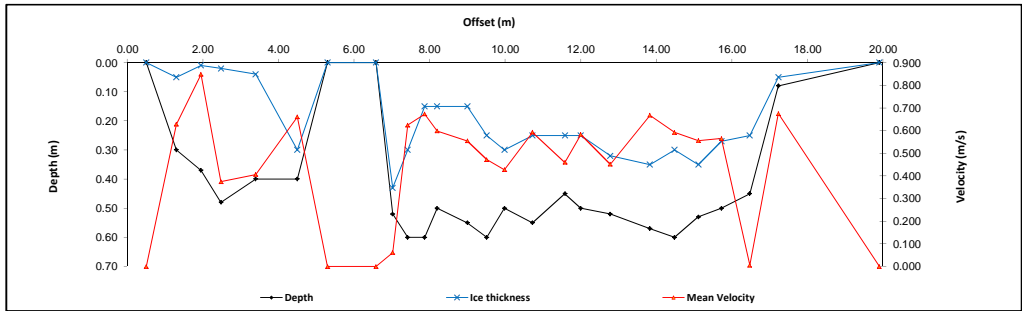
**Logger Details:**

	Before	After
Transducer Reading (m):	0.403	
Water (°C):	0.2	
Datalogger Clock:	10:48	
Laptop Clock:	10:48	
Battery (Main):	14.6	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessoricant:	-	Replaced
Vent Tube Dessoricant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- WL fluctuating by 10cm in holes with high flow
- No effective water depth at offsets 5.3 and 6.58m during flow measurement



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S51-1	1.210	101.210		100.000	100.000	Pipe 3m SE of logger
S51-2			1.133	100.077	100.058	Pipe 3m S of logger
S51-3			0.726	100.484	100.474	Pipe 2m W of logger
Water Level:	Cut	0.356	3.632	97.934	Time WL Surveyed: 11:18	
Temporary BM			3.552	97.658	0.000	
<b>Turn</b>						
Temporary BM	3.542	101.200		97.658		
Water Level:	Cut	0.358	3.624	97.934	Time WL Surveyed: 11:21	
S51-3			0.716	100.484	100.474	Pipe 2m W of logger
S51-2			1.123	100.077	100.058	Pipe 3m S of logger
S51-1			1.199	100.001	100.000	Pipe 3m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.934	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	97.531	-

**Field Personnel:**

	DW, MP	Trip Date:	11-Mar-14
Data Entry Personnel:	DW	Date:	11-Mar-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date: March 24, 2014

Site Visit Time (MST): 10:35



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000		0.000		0.000	0.88	0.28	0.00	0.000	0.00	0.000	
1	2.55	0.31	0.01	0.16	0.808					0.88	0.61	0.30	0.711	0.18	0.129	5%
2	3.21	0.36	0.01	0.19	0.836					0.88	0.64	0.35	0.736	0.22	0.164	6%
3	3.82	0.40	0.01	0.21	0.414					0.88	0.73	0.39	0.364	0.28	0.104	4%
4	4.67	0.31	0.00	0.16	0.749					0.88	0.89	0.31	0.659	0.27	0.181	6%
5	5.59	0.39	0.16	0.28	0.133					0.88	1.77	0.23	0.117	0.41	0.048	2%
6	8.20	0.46	0.26	0.36	0.209					0.88	1.73	0.20	0.184	0.35	0.063	2%
7	9.04	0.59	0.15	0.37	0.783					0.88	0.60	0.44	0.689	0.26	0.182	7%
8	9.40	0.59	0.14	0.37	0.800					0.88	0.37	0.45	0.704	0.16	0.116	4%
9	9.77	0.53	0.14	0.34	0.857					0.88	0.46	0.39	0.754	0.18	0.135	5%
10	10.32	0.58	0.15	0.37	0.554					0.88	0.43	0.43	0.488	0.18	0.090	3%
11	10.63	0.57	0.16	0.37	0.764					0.88	0.41	0.41	0.672	0.17	0.114	4%
12	11.15	0.57	0.22	0.40	0.657					0.88	0.55	0.35	0.578	0.19	0.110	4%
13	11.72	0.53	0.14	0.34	0.714					0.88	0.56	0.39	0.628	0.22	0.137	5%
14	12.27	0.49	0.16	0.33	0.705					0.88	0.49	0.33	0.620	0.16	0.100	4%
15	12.70	0.49	0.15	0.32	0.705					0.88	0.42	0.34	0.620	0.14	0.089	3%
16	13.11	0.43	0.14	0.29	0.840					0.88	0.53	0.29	0.739	0.15	0.114	4%
17	13.76	0.57	0.18	0.38	0.717					0.88	0.65	0.39	0.631	0.25	0.159	6%
18	14.40	0.48	0.16	0.32	0.850					0.88	0.59	0.32	0.748	0.19	0.141	5%
19	14.94	0.39	0.17	0.28	0.001					0.88	0.62	0.22	0.001	0.14	0.000	0%
20	15.64	0.60	0.22	0.41	0.924					0.88	0.66	0.38	0.813	0.25	0.202	7%
21	16.25	0.59	0.25	0.42	0.845					0.88	0.65	0.34	0.744	0.22	0.163	6%
22	16.93	0.50	0.19	0.35	0.822					0.88	0.68	0.31	0.723	0.21	0.151	5%
23	17.60	0.39	0.20	0.30	0.300					0.88	0.71	0.19	0.264	0.13	0.036	1%
24	18.35	0.19	0.05	0.12	0.750					0.88	0.65	0.14	0.660	0.09	0.060	2%
25	18.90	0.30	0.68	0.49						1.00	0.77	-0.38		-0.29		
LB	19.90	0.00	0.00		0.00		0.00		0.00	0.88	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.79</b>	<b>100%</b>	

### Flow Measurement Details:

**Metering Section Location (describe):**  
20m US of station

Meas. Start Time (MST):	11:15
Meas. End Time (MST):	11:49
Equipment:	ADV
Method:	Ice
River Condition:	Frozen, open pockets
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, -8 C

### Flow characteristics:

Total Flow:	2.79	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.73	(m <sup>2</sup> )
Wetted Width:	17.90	(m)
Hydraulic Depth:	0.26	(m)
Mean Velocity:	0.59	(m/s)
Froude Number:	0.37	

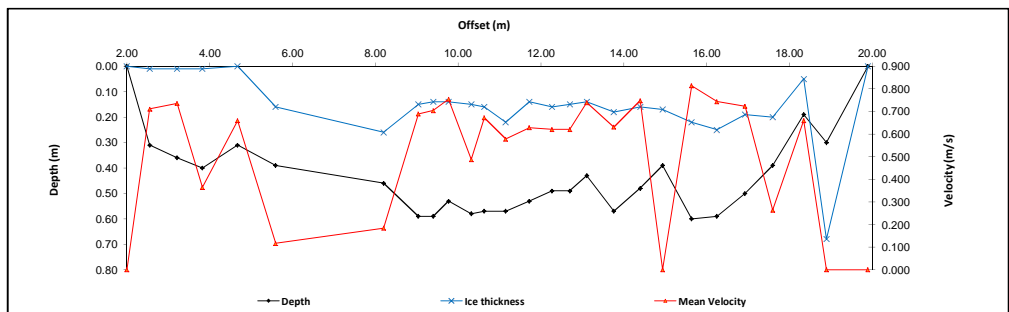
### Logger Details:

	Before	After
Transducer Reading (m):	0.400	
Water (°C):	0.2	
Datalogger Clock:	10:42	
Laptop Clock:	10:42	
Battery (Main):	15.2	
Battery:		Good
Battery Serial #:	-	
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

### Datalogger / Station Notes:

-Bottom lowest prong on GOES antenna is missing

### General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
SS1-1	1.152	101.152		100.000	100.000	Pipe 3m SE of logger
SS1-2			1.076	100.076	100.058	Pipe 3m S of logger
SS1-3			0.667	100.485	100.474	Pipe 2m W of logger
SS1-4			1.120	100.032	100.025	Lag Bolt 7m SE of logger
Water Level:	Cut		3.226	97.926	<b>Time WL Surveyed:</b> 11:08	
Temporary BM			3.163	97.989	0.000	
<b>Turn</b>						
Temporary BM	3.146	101.135		97.989		
Water Level:	Cut		3.210	97.925	<b>Time WL Surveyed:</b> 11:10	
SS1-4			1.103	100.032	100.025	Lag Bolt 7m SE of logger
SS1-3			0.649	100.486	100.474	Pipe 2m W of logger
SS1-2			0.657	100.478	100.058	Pipe 3m S of logger
SS1-1			1.134	100.001	100.000	Pipe 3m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

WL Survey Summary	Before	After
Average WL:	97.926	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	97.526	-

Field Personnel:	TR, MP	Trip Date:	24-Mar-14
Data Entry Personnel:	MP	Date:	24-Mar-14
Data Check Personnel:	TR	Date:	15-May-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: April 5, 2014  
 Site Visit Time (MST): 14:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
R B	3.00	0.00	0.00		0.000		0.000		0.000	0.88	0.45	0.00	0.000	0.00	0.000	
1	3.90	0.30	0.10	0.20	0.912				0.88	0.77	0.20	0.803	0.16	0.124	7%	
2	4.55	0.30	0.10	0.20	0.795				0.88	0.58	0.20	0.700	0.12	0.080	4%	
3	5.05	0.45	0.15	0.30	0.544				0.88	0.50	0.30	0.479	0.15	0.072	4%	
4	5.55	0.48	0.25	0.37	0.173				0.88	0.98	0.23	0.152	0.22	0.034	2%	
5	7.00	0.00	0.00	0.00	0.000				0.88	1.48	0.00	0.000	0.00	0.000	0%	
6	8.50	0.60	0.45	0.53	0.455				0.88	1.10	0.15	0.400	0.17	0.066	4%	
7	9.20	0.55	0.25	0.40	0.703				0.88	0.65	0.30	0.619	0.20	0.121	7%	
8	9.80	0.60	0.20	0.40	0.872				0.88	0.60	0.40	0.767	0.24	0.184	10%	
9	10.40	0.50	0.30	0.40	0.699				0.88	0.52	0.20	0.615	0.11	0.065	4%	
10	10.85	0.55	0.30	0.43	0.869				0.88	0.50	0.25	0.765	0.13	0.096	5%	
11	11.40	0.62	0.30	0.46	0.771				0.88	0.50	0.32	0.678	0.16	0.109	6%	
12	11.85	0.58	0.37	0.48	0.703				0.88	0.43	0.21	0.619	0.09	0.055	3%	
13	12.25	0.55	0.35	0.45	0.657				0.88	0.48	0.20	0.578	0.10	0.055	3%	
14	12.80	0.60	0.35	0.48	0.634				0.88	0.53	0.25	0.558	0.13	0.073	4%	
15	13.30	0.52	0.32	0.42	0.375				0.88	0.40	0.20	0.330	0.08	0.026	1%	
16	13.60	0.52	0.35	0.44	0.754				0.88	0.32	0.17	0.664	0.06	0.037	2%	
17	13.95	0.58	0.35	0.47	0.751				0.88	0.38	0.23	0.661	0.09	0.057	3%	
18	14.35	0.58	0.36	0.47	0.513				0.88	0.43	0.22	0.451	0.09	0.042	2%	
19	14.80	0.62	0.45	0.54	0.648				0.88	0.48	0.17	0.570	0.08	0.046	3%	
20	15.30	0.60	0.35	0.48	0.889				0.88	0.50	0.25	0.782	0.13	0.098	5%	
21	15.80	0.55	0.35	0.45	1.003				0.88	0.53	0.20	0.883	0.11	0.093	5%	
22	16.35	0.55	0.34	0.45	0.738				0.88	0.60	0.21	0.649	0.13	0.082	5%	
23	17.00	0.50	0.30	0.40	0.701				0.88	1.58	0.20	0.617	0.32	0.194	11%	
LB	19.50	0.00	0.00		0.000		0.000		0.88	1.25	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>1.81</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m US of station

Meas. Start Time (MST):	14:51
Meas. End Time (MST):	15:16
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 5C

**Flow characteristics:**

Total Flow:	1.81	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.02	(m <sup>2</sup> )
Wetted Width:	16.50	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.60	(m/s)
Froude Number:	0.45	

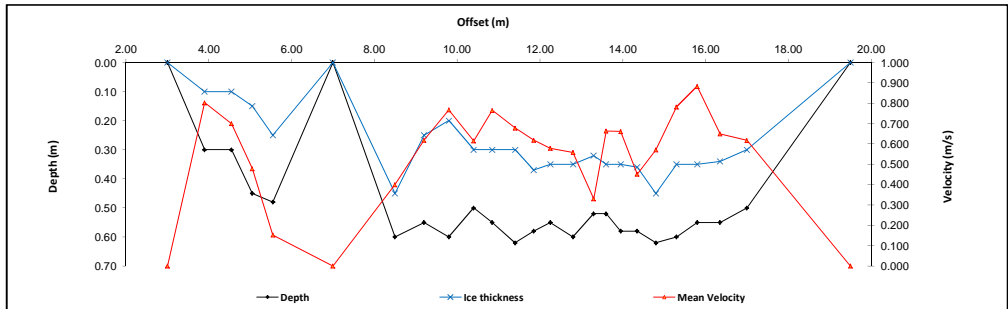
**Logger Details:**

	Before	After
Transducer Reading (m):	0.419	
Water (°C):	0.2	
Datalogger Clock:	14:02	
Laptop Clock:	14:02	
Battery (Main):	14.6	
Battery Condition:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Good
Vent Tube Deseccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-Stream is dry between offsets 5.55m and 8.5m



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S51-1	1.210	101.210		100.000	100.000	Pipe 3m SE of logger
S51-2			1.133	100.077	100.058	Pipe 3m S of logger
S51-3			0.726	100.484	100.474	Pipe 2m W of logger
Water Level:	Cut	0.356	3.632	97.934	Time WL Surveyed: 11:18	
Temporary BM			3.552	97.658	0.000	
<b>Turn</b>						
Temporary BM	3.542	101.200		97.658		
Water Level:	Cut	0.358	3.624	97.934	Time WL Surveyed: 11:21	
S51-3			0.716	100.484	100.474	Pipe 2m W of logger
S51-2			1.123	100.077	100.058	Pipe 3m S of logger
S51-1			1.199	100.001	100.000	Pipe 3m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.934	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	97.515	-

**Field Personnel:**

SM, CJ	Trip Date:	5-Apr-14
CJ	Date:	5-Apr-14
TR	Date:	15-May-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River

UTM Location: 533925 E, 6291921 N

Site Visit Date: \_\_\_\_\_

May 21, 2014

Site Visit Time (MST): \_\_\_\_\_

11:37



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 20m US of station	
Meas. Start Time (MST):	12:55
Meas. End Time (MST):	13:20
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Rain, windy, 13 C

<b>Flow characteristics:</b>		
Total Flow:	14.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.43	(m <sup>2</sup> )
Wetted Width:	22.49	(m)
Hydraulic Depth:	0.55	(m)
Mean Velocity:	1.15	(m/s)
Froude Number:	0.49	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	0.675	0.685
Water (°C):	10.3	10.3
Datalogger Clock:	11:39	13:51
Laptop Clock:	11:38	13:51
Battery (Main):	14.0	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Second WL survey was aborted due to incoming thunder storms

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	7.20	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	28.10	
Firmware Version:	3.5		Magnetic Declination (°):	14				
Software Version:	3.7		Measured Temperature (°C):	10.3				
			ADCP Temperature (°C):	11.3				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		2	20.30	11.40	1.232	14.035	-1.02%
Coordinate System:	ENU		4	22.37	12.13	1.155	14.003	-1.25%
Left Method:	Sloped bank		6	24.80	13.76	1.054	14.502	2.27%
Right Method:	Sloped bank							
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	22.49	12.43	1.147	<b>14.2</b>	
			<b>SD:</b>	1.84	0.99	0.073	0.228	
			<b>COV:</b>	0.08	0.08	0.064	0.016	

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S51-1	1.084	101.084		100.000	100.000	Pipe 3m SE of logger
S51-2			1.009	100.075	100.058	Pipe 3m S of logger
S51-3			0.604	100.480	100.474	Pipe 2m W of logger
S51-4			1.055	100.029	100.025	Lag Bolt 7m SE of logger
Water Level:	Cut		2.948	98.136	<b>Time WL Surveyed:</b>	13:48
Temporary BM			2.948	98.136	100.025	Lag Bolt 7m SE of logger
<b>Turn</b>						
Temporary BM	2.901	101.037		98.136	100.025	Lag Bolt 7m SE of logger
Water Level:	Cut		2.901	98.136	<b>Time WL Surveyed:</b>	13:50
S51-4			1.007	100.030	100.025	Lag Bolt 7m SE of logger
S51-3			0.556	100.481	100.474	Pipe 2m W of logger
S51-2			0.963	100.074	100.058	Pipe 3m S of logger
S51-1			1.036	100.001	100.000	Pipe 3m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

<b>WL Survey Summary</b>	Before	After
Average WL:	98.136	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	97.461	-

<b>Field Personnel:</b>	TR, CJ, MP	Trip Date:	21-May-14
Data Entry Personnel:	CJ	Date:	21-May-14
Data Check Personnel:	TR	Date:	1-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: June 22, 2014  
 Site Visit Time (MST): 13:00

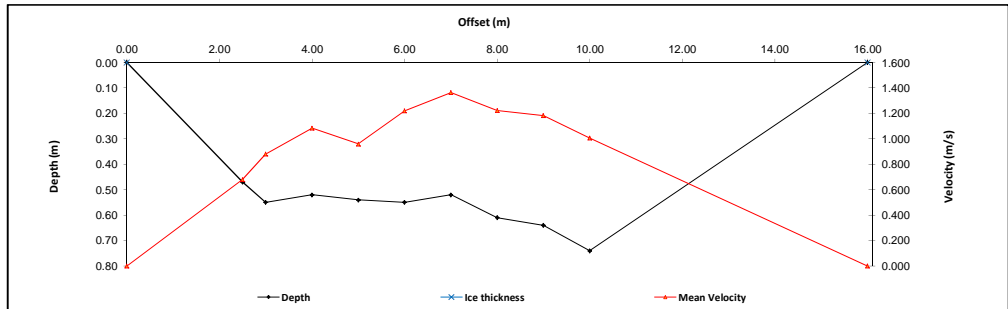


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	0.00	0.00	0.00		0.000				0.000	1.00	1.25	0.00	0.000	0.00	0.000	
1	2.50	0.47		0.28	0.681					1.00	1.50	0.47	0.681	0.71	0.480	6%
2	3.00	0.55		0.33	0.881					1.00	0.75	0.55	0.881	0.41	0.363	5%
3	4.00	0.52		0.31	1.084					1.00	1.00	0.52	1.084	0.52	0.564	8%
4	5.00	0.54		0.32	0.960					1.00	1.00	0.54	0.960	0.54	0.518	7%
5	6.00	0.55		0.33	1.220					1.00	1.00	0.55	1.220	0.55	0.671	9%
6	7.00	0.52		0.31	1.364					1.00	1.00	0.52	1.364	0.52	0.709	10%
7	8.00	0.61		0.37	1.222					1.00	1.00	0.61	1.222	0.61	0.745	10%
8	9.00	0.64		0.38	1.183					1.00	1.00	0.64	1.183	0.64	0.757	10%
9	10.00	0.74		0.44	1.006					1.00	3.50	0.74	1.006	2.59	2.606	35%
LB	16.00	0.00	0.00		0.00		0.00		0.000	1.00	3.00	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>7.41</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m US of heli. pad

Meas. Start Time (MST):	13:40
Meas. End Time (MST):	13:55
Equipment:	ADV
Method:	Wading
River Condition:	High flow, turbid
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Overcast, light showers



**Flow characteristics:**

Total Flow:	7.41	(m³/s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	7.99	(m²)
Wetted Width:	16.00	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	1.05	(m/s)
Froude Number:	0.50	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.434	0.436
Water (°C):	15.6	16.3
Datalogger Clock:	13:05	14:10
Laptop Clock:	13:04	14:10
Battery (Main):	14.0	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Good	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Discharge measurement was abandoned midway because flow was too fast and deep for wading or fishcat measurement

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S51-1	0.974	100.974		100.000	100.000	Pipe 3m SE of logger
S51-2			0.902	100.072	100.058	Pipe 3m S of logger
S51-3			0.493	100.481	100.474	Pipe 2m W of logger
Water Level:	Cut		2.852	98.122		Time WL Surveyed: 13:25
Temporary BM			2.002	98.972	0.000	
<b>Turn</b>						
Temporary BM	1.988	100.960		98.972		
Water Level:	Cut		2.837	98.123		Time WL Surveyed: 13:38
S51-3			0.476	100.484	100.474	Pipe 2m W of logger
S51-2			0.884	100.076	100.058	Pipe 3m S of logger
S51-1			0.958	100.002	100.000	Pipe 3m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S51-3	0.476	100.960		100.484		
Water Level:	Cut		2.836	98.124		Time WL Surveyed: 14:04
Water Level:	Cut		2.828	98.122		Time WL Surveyed: 14:06
S51-3	0.466	100.950		100.484		

**WL Survey Summary**

	Before	After
Average WL:	98.123	98.123
Closing Error:	-0.002	-
WL Check:	0.001	0.002
Transducer Elevation	97.689	97.687

**Field Personnel:**

Field Personnel:	GG, SM	Trip Date:	22-Jun-14
Data Entry Personnel:	GG	Date:	22-Jun-14
Data Check Personnel:	TR	Date:	15-Jul-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: August 9, 2014  
 Site Visit Time (MST): 14:09



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	36.30	0.00	0.00		0.000				0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	35.50	0.23		0.14	0.450					1.00	0.90	0.23	0.450	0.21	0.093	3%
2	34.50	0.26		0.16	0.410					1.00	1.00	0.26	0.410	0.26	0.107	3%
3	33.50	0.28		0.17	0.540					1.00	1.00	0.28	0.540	0.28	0.151	4%
4	32.50	0.10		0.06	0.540					1.00	1.00	0.10	0.540	0.10	0.054	2%
5	31.50	0.32		0.19	0.560					1.00	1.00	0.32	0.560	0.32	0.179	5%
6	30.50	0.33		0.20	0.630					1.00	1.00	0.33	0.630	0.33	0.208	6%
7	29.50	0.44		0.26	0.610					1.00	1.00	0.44	0.610	0.44	0.268	8%
8	28.50	0.45		0.27	0.700					1.00	0.75	0.45	0.700	0.34	0.236	7%
9	28.00	0.56		0.34	0.510					1.00	0.50	0.56	0.510	0.28	0.143	4%
10	27.50	0.54		0.32	0.700					1.00	0.75	0.54	0.700	0.41	0.284	8%
11	26.50	0.51		0.31	0.670					1.00	0.75	0.51	0.670	0.38	0.256	7%
12	26.00	0.51		0.31	0.660					1.00	0.50	0.51	0.660	0.26	0.168	5%
13	25.50	0.32		0.19	0.820					1.00	0.75	0.32	0.820	0.24	0.197	6%
14	24.50	0.36		0.22	0.780					1.00	1.00	0.36	0.780	0.36	0.281	8%
15	23.50	0.38		0.23	0.760					1.00	1.00	0.38	0.760	0.38	0.289	8%
16	22.50	0.37		0.22	0.670					1.00	1.00	0.37	0.670	0.37	0.248	7%
17	21.50	0.36		0.22	0.530					1.00	1.00	0.36	0.530	0.36	0.191	5%
18	20.50	0.19		0.11	0.520					1.00	1.00	0.19	0.520	0.19	0.099	3%
19	19.50	0.16		0.10	0.120					1.00	1.00	0.16	0.120	0.16	0.019	1%
20	18.50	0.11		0.07	0.000					1.00	0.75	0.11	0.000	0.08	0.000	0%
21	18.00	0.07		0.04	0.070					1.00	0.40	0.07	0.070	0.03	0.002	0%
LB	17.70	0.00	0.00		0.00		0.00		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.47</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m US of heel, landing

Mess. Start Time (MST):	14:30
Mess. End Time (MST):	14:48
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 20 C

**Flow characteristics:**

Total Flow:	3.47	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.77	(m <sup>2</sup> )
Wetted Width:	18.60	(m)
Hydraulic Depth:	0.31	(m)
Mean Velocity:	0.60	(m/s)
Froude Number:	0.35	

**Logger Details:**

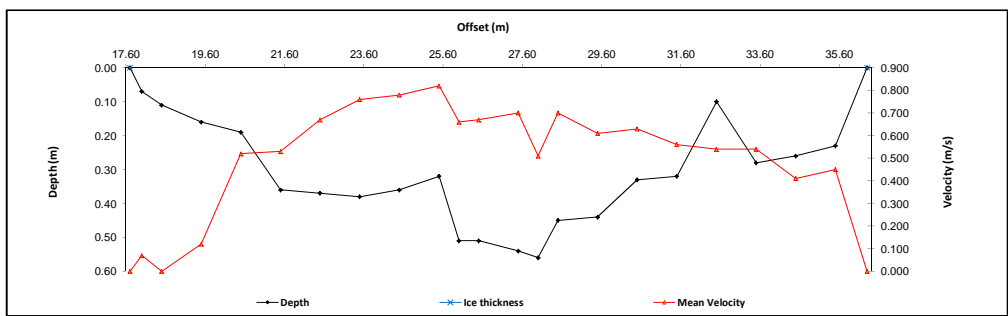
	Before	After
Transducer Reading (m):	0.151	0.147
Water (°C):	17.5	17.8
Datalogger Clock:	14:07	14:51
Laptop Clock:	14:07	14:51
Battery (Main):	14.2	14.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Needs a longer PT
- Large spike in water level today
- Installed cableway

**General Notes:**

- Returned to station on 17-Aug, moved station onto mast, installed GOES, installed fence around station



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S51-1	1.033	101.033		100.000	100.000	Pipe 3m SE of logger
S51-3			0.552	100.481	100.474	Pipe 2m W of logger
S51-2			0.961	100.072	100.058	Pipe 3m S of logger
S51-4			1.013	100.020	100.025	Lag Bolt 7m SE of logger
Water Level:	Cut		3.208	97.825	Time WL Surveyed: 14:15	
Temporary BM			2.728	98.305		
<b>Turn</b>						
Temporary BM	2.686	100.991		98.305		
Water Level:	Cut		3.165	97.826	Time WL Surveyed: 14:17	
S51-4			0.969	100.022	100.025	Lag Bolt 7m SE of logger
S51-2			0.916	100.075	100.058	Pipe 3m S of logger
S51-3			0.507	100.484	100.474	Pipe 2m W of logger
S51-1			0.991	100.000	100.000	Pipe 3m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S51-3	0.507	100.989		100.482		
Water Level:	Cut		3.162	97.827	Time WL Surveyed: 14:55	
Water Level:	Cut		3.136	97.830	Time WL Surveyed: 14:57	
S51-3	0.484	100.966		100.482		

**WL Survey Summary**

	Before	After
Average WL:	97.826	97.829
Closing Error:	0.000	-
WL Check:	0.001	-0.003
Transducer Elevation	97.675	97.682

**Field Personnel:**

	TR, GG	Trip Date:	9-Aug-14
Data Entry Personnel:	TR	Date:	9-Aug-14
Data Check Personnel:	TR	Date:	29-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: September 25, 2014  
 Site Visit Time (MST): 11:30

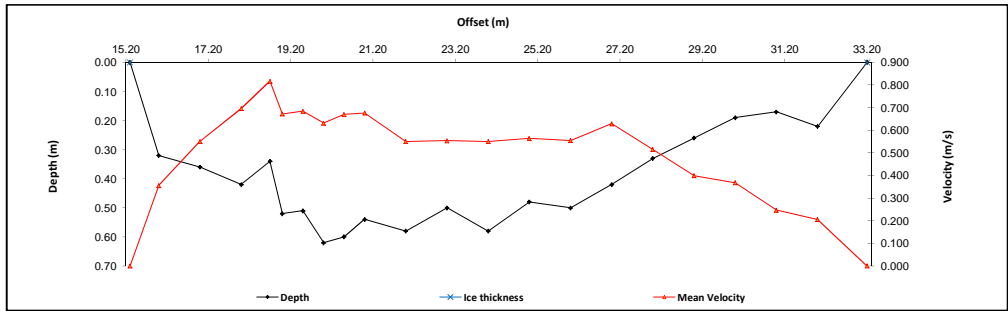


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	33.20	0.00	0.00		0.000		0.000		0.000	1.00	0.60	0.00	0.000	0.00	0.000	
1	32.00	0.22		0.13	0.205					1.00	1.10	0.22	0.205	0.24	0.050	1%
2	31.00	0.17		0.10	0.247					1.00	1.00	0.17	0.247	0.17	0.042	1%
3	30.00	0.19		0.11	0.368					1.00	1.00	0.19	0.368	0.19	0.070	2%
4	29.00	0.26		0.16	0.399					1.00	1.00	0.26	0.399	0.26	0.104	3%
5	28.00	0.33		0.20	0.515					1.00	1.00	0.33	0.515	0.33	0.170	4%
6	27.00	0.42		0.25	0.629					1.00	1.00	0.42	0.629	0.42	0.264	7%
7	26.00	0.50		0.30	0.555					1.00	1.00	0.50	0.555	0.50	0.278	7%
8	25.00	0.48		0.29	0.564					1.00	1.00	0.48	0.564	0.48	0.271	7%
9	24.00	0.58		0.35	0.550					1.00	1.00	0.58	0.550	0.58	0.319	8%
10	23.00	0.50		0.30	0.554					1.00	1.00	0.50	0.554	0.50	0.277	7%
11	22.00	0.58		0.35	0.550					1.00	1.00	0.58	0.550	0.58	0.319	8%
12	21.00	0.54		0.32	0.676					1.00	0.75	0.54	0.676	0.41	0.274	7%
13	20.50	0.60		0.36	0.670					1.00	0.50	0.60	0.670	0.30	0.201	5%
14	20.00	0.62		0.37	0.632					1.00	0.50	0.62	0.632	0.31	0.196	5%
15	19.50	0.51		0.31	0.684					1.00	0.50	0.51	0.684	0.26	0.174	5%
16	19.00	0.52		0.31	0.672					1.00	0.40	0.52	0.672	0.21	0.140	4%
17	18.70	0.34		0.20	0.817					1.00	0.50	0.34	0.817	0.17	0.139	4%
18	18.00	0.42		0.25	0.696					1.00	0.85	0.42	0.696	0.36	0.248	6%
19	17.00	0.36		0.22	0.551					1.00	1.00	0.36	0.551	0.36	0.198	5%
20	16.00	0.32		0.19	0.356					1.00	0.85	0.32	0.356	0.27	0.097	3%
LB	15.30	0.00	0.00		0.00		0.00		0.00	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>3.83</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
At cableway

Meas. Start Time (MST):	12:20
Meas. End Time (MST):	12:50
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 15 C



**Flow characteristics:**

Total Flow:	3.83	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.89	(m <sup>2</sup> )
Wetted Width:	17.90	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.56	(m/s)
Froude Number:	0.29	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.143	0.322
Water (°C):	10.7	10.8
Datalogger Clock:	11:47	13:16
Laptop Clock:	11:47	13:15
Battery (Main):	13.7	13.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved PT between surveys
- Sent new program to logger
- Mounted enclosure to mast
- Raised cableway higher

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S51-4	0.999	101.024		100.025	100.025	Lag Bolt 7m SE of logger
S51-1			1.022	100.002	100.000	Pipe 3m SE of logger
S51-2			0.944	100.080	100.058	Pipe 3m S of logger
S51-3			0.536	100.488	100.474	Pipe 2m W of logger
Water Level:	Cut	0.112	3.312	97.824	Time WL Surveyed: 12:05	
Temporary BM			3.313	97.711		
<b>Turn</b>						
Temporary BM	3.304	101.015		97.711		
Water Level:	Cut	0.112	3.304	97.823	Time WL Surveyed: 12:07	
S51-3			0.531	100.484	100.474	Pipe 2m W of logger
S51-2			0.937	100.078	100.058	Pipe 3m S of logger
S51-1			1.013	100.002	100.000	Pipe 3m SE of logger
S51-4			0.992	100.023	100.025	Lag Bolt 7m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S51-3	0.531	101.017		100.486		
Water Level:	Cut	0.379	3.561	97.835	Time WL Surveyed: 13:10	
Water Level:	Cut	0.379	3.557	97.833	Time WL Surveyed: 13:12	
S51-3	0.525	101.011		100.486		

**WL Survey Summary**

	Before	After
Average WL:	97.824	97.834
Closing Error:	0.002	-
WL Check:	0.001	0.002
Transducer Elevation	97.681	97.512

**Field Personnel:**

TR, MP	Trip Date:	25-Sep-14
Data Entry Personnel:	Date:	25-Sep-14
Data Check Personnel:	Date:	29-Sep-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: October 8, 2014  
 Site Visit Time (MST): 14:50



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.90	0.00	0.00		0.000				0.000	1.00	0.55	0.00	0.000	0.00	0.000	
1	3.00	0.20		0.12	0.257					1.00	1.05	0.20	0.257	0.21	0.054	1%
2	4.00	0.20		0.16	0.408					1.00	1.00	0.20	0.408	0.20	0.082	2%
3	5.00	0.27		0.16	0.415					1.00	1.00	0.27	0.415	0.27	0.112	2%
4	6.00	0.28		0.17	0.567					1.00	1.00	0.28	0.567	0.28	0.159	3%
5	7.00	0.40		0.24	0.591					1.00	1.00	0.40	0.591	0.40	0.236	5%
6	8.00	0.50		0.30	0.575					1.00	1.00	0.50	0.575	0.50	0.288	6%
7	9.00	0.50		0.30	0.750					1.00	1.00	0.50	0.750	0.50	0.375	7%
8	10.00	0.42		0.25	0.890					1.00	1.00	0.42	0.890	0.42	0.374	7%
9	11.00	0.44		0.26	0.829					1.00	1.00	0.44	0.829	0.44	0.365	7%
10	12.00	0.44		0.26	0.761					1.00	1.00	0.44	0.761	0.44	0.335	6%
11	13.00	0.46		0.28	0.883					1.00	1.00	0.46	0.883	0.46	0.406	8%
12	14.00	0.39		0.23	0.912					1.00	1.00	0.39	0.912	0.39	0.356	7%
13	15.00	0.46		0.28	0.883					1.00	1.00	0.46	0.883	0.46	0.406	8%
14	16.00	0.40		0.24	0.790					1.00	1.00	0.40	0.790	0.40	0.316	6%
15	17.00	0.33		0.20	0.870					1.00	1.00	0.33	0.870	0.33	0.287	6%
16	18.00	0.32		0.19	0.740					1.00	1.00	0.32	0.740	0.32	0.237	5%
17	19.00	0.39		0.23	0.258					1.00	1.00	0.39	0.258	0.39	0.101	2%
18	20.00	0.37		0.22	0.735					1.00	1.00	0.37	0.735	0.37	0.272	5%
19	21.00	0.32		0.19	0.639					1.00	1.00	0.32	0.639	0.32	0.204	4%
20	22.00	0.31		0.19	0.762					1.00	1.05	0.31	0.762	0.33	0.248	5%
RB	23.10	0.00	0.00		0.00		0.00		0.00	1.00	0.55	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.21</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from hell, landing

Meas. Start Time (MST):	15:10
Meas. End Time (MST):	15:35
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 10 C

**Flow characteristics:**

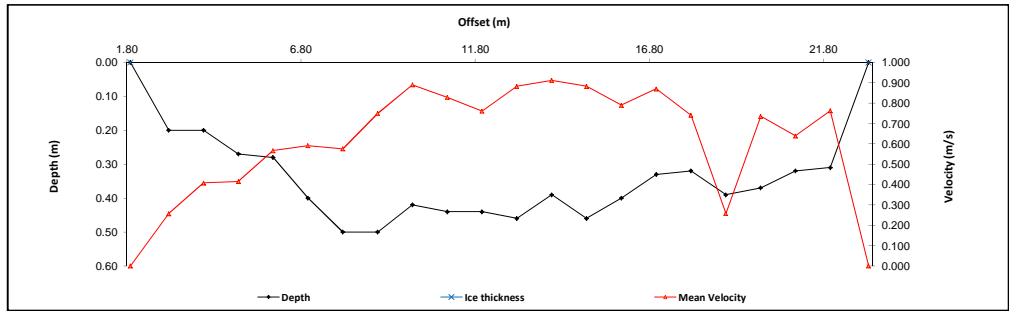
Total Flow:	5.21	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.43	(m <sup>2</sup> )
Wetted Width:	21.20	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.70	(m/s)
Froude Number:	0.38	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.391	0.389
Water (°C):	3.9	3.9
Datalogger Clock:	14:53	15:40
Laptop Clock:	14:53	15:40
Battery (Main):	14.4	14.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S51-4	0.999	101.024		100.025	100.025	Lag Bolt 7m SE of logger
S51-1			1.018	100.006	100.000	Pipe 3m SE of logger
S51-2			0.943	100.081	100.058	Pipe 3m S of logger
S51-3			0.533	100.491	100.474	Pipe 2m W of logger
Water Level:	Cut	0.121	3.241	97.904	Time WL Surveyed: 15:00	
Temporary BM			3.241	97.783	0.000	
<b>Turn</b>						
Temporary BM	3.222	101.005		97.783		
Water Level:	Cut	0.121	3.222	97.904	Time WL Surveyed: 15:02	
S51-3			0.516	100.489	100.474	Pipe 2m W of logger
S51-2			0.924	100.081	100.058	Pipe 3m S of logger
S51-1			1.002	100.003	100.000	Pipe 3m SE of logger
S51-4			0.979	100.026	100.025	Lag Bolt 7m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S51-3	0.517	101.007		100.490		
Water Level:	Cut	0.149	3.259	97.897	Time WL Surveyed: 15:42	
Water Level:	Cut	0.149	3.245	97.895	Time WL Surveyed: 15:43	
S51-3	0.501	100.991		100.490		

**WL Survey Summary**

	Before	After
Average WL:	97.904	97.896
Closing Error:	-0.001	-
WL Check:	0.000	0.002
Transducer Elevation	97.513	97.507

**Field Personnel:**

	MP, TR	Trip Date:	8-Oct-14
Data Entry Personnel:	MP	Date:	8-Oct-14
Data Check Personnel:	TR	Date:	22-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S51 High Hills River  
 UTM Location: 533925 E, 6291921 N

Site Visit Date: December 9, 2014  
 Site Visit Time (MST): 08:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	6.50	0.00	0.00		0.000		0.000		0.000	0.88	0.43	0.00	0.000	0.00	0.000	
1	7.35	0.50	0.20	0.35	0.000				0.88	1.28	0.30	0.000	0.38	0.000	0%	
2	9.05	0.78	0.65	0.72	0.469				0.88	1.23	0.13	0.413	0.16	0.066	4%	
3	9.80	0.80	0.60	0.70	0.113				0.88	0.80	0.20	0.099	0.16	0.016	1%	
4	10.65	0.85	0.70	0.78	0.474				0.88	0.65	0.15	0.417	0.10	0.041	2%	
5	11.10	0.90	0.65	0.78	0.594				0.88	0.45	0.25	0.523	0.11	0.059	4%	
6	11.55	0.30	0.15	0.23	0.160				0.88	0.40	0.15	0.141	0.06	0.008	1%	
7	11.90	0.85	0.75	0.80	0.004				0.88	0.35	0.10	0.004	0.03	0.000	0%	
8	12.25	0.80	0.65	0.73	-0.002				0.88	0.33	0.15	-0.002	0.05	0.000	0%	
9	12.55	0.90	0.65	0.78	0.139				0.88	0.35	0.25	0.122	0.09	0.011	1%	
10	12.95	0.90	0.65	0.78	0.282				0.88	0.32	0.25	0.248	0.08	0.020	1%	
11	13.20	0.90	0.65	0.78	0.358				0.88	0.35	0.25	0.315	0.09	0.028	2%	
12	13.65	0.90	0.65	0.78	0.422				0.88	0.40	0.25	0.371	0.10	0.037	2%	
13	14.00	0.90	0.60	0.75	0.366				0.88	0.33	0.30	0.322	0.10	0.031	2%	
14	14.30	0.90	0.55	0.73	0.763				0.88	0.42	0.35	0.671	0.15	0.100	6%	
15	14.85	1.00	0.40	0.70	0.906				0.88	0.45	0.60	0.797	0.27	0.215	13%	
16	15.20	0.95	0.25	0.60	0.917				0.88	0.38	0.70	0.807	0.26	0.212	13%	
17	15.60	1.00	0.35	0.68	0.000				0.88	0.35	0.65	0.000	0.23	0.000	0%	
18	15.90	1.00	0.45	0.73	0.687				0.88	0.35	0.55	0.605	0.19	0.116	7%	
19	16.30	1.00	0.45	0.73	0.893				0.88	0.35	0.55	0.786	0.19	0.151	9%	
20	16.60	0.95	0.45	0.70	0.417				0.88	0.30	0.50	0.367	0.15	0.055	3%	
21	16.90	0.90	0.50	0.70	0.000				0.88	0.45	0.40	0.000	0.18	0.000	0%	
22	17.50	0.87	0.55	0.71	1.114				0.88	0.55	0.32	0.979	0.18	0.172	11%	
23	18.00	0.90	0.55	0.73	1.243				0.88	0.75	0.35	1.095	0.26	0.287	18%	
LB	19.00	0.00	0.00		0.000		0.000		0.88	0.50	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>1.63</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
40 m US of station

Meas. Start Time (MST):	9:30
Meas. End Time (MST):	10:46
Equipment:	ADV
Method:	Ice
River Condition:	Full ice, overflow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Clear, calm, -2C

**Flow characteristics:**

Total Flow:	1.63	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	3.57	(m <sup>2</sup> )
Wetted Width:	12.50	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.46	(m/s)
Froude Number:	0.27	

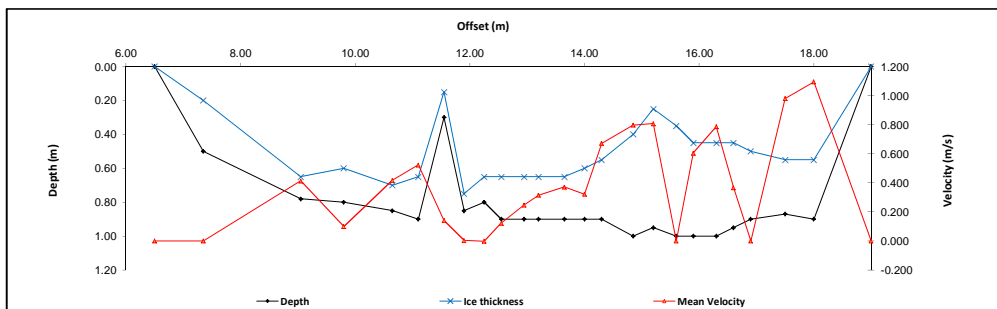
**Logger Details:**

	Before	After
Transducer Reading (m):	0.336	-
Water (°C):	0.4	-
Datalogger Clock:	08:48	-
Laptop Clock:	08:48	-
Battery (Main):	12.2	12.9
Battery:	-	Replaced
Battery Serial #:	-	1303002_0905001
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PTH (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Large cobbles/boulders affecting flow at several offsets



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S51-1	0.991	100.991		100.000	100.000	Pipe 3m SE of logger
S51-2			0.915	100.076	100.058	Pipe 3m S of logger
S51-3			0.508	100.483	100.474	Pipe 2m W of logger
S51-4			0.968	100.023	100.025	Lag Bolt 7m SE of logger
Water Level:	Cut		3.103	97.888	<b>Time WL Surveyed:</b> 9:14	
Temporary BM			2.540	98.451	0.000	
<b>Turn</b>						
Temporary BM	2.519	100.970		98.451		
Water Level:	Cut		3.082	97.888	<b>Time WL Surveyed:</b> 9:17	
S51-4			0.948	100.022	100.025	Lag Bolt 7m SE of logger
S51-3			0.487	100.483	100.474	Pipe 2m W of logger
S51-2			0.893	100.077	100.058	Pipe 3m S of logger
S51-1			0.969	100.001	100.000	Pipe 3m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

**WL Survey Summary**

	Before	After
Average WL:	97.888	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	97.552	-

**Field Personnel:**

	SM, CJ	Trip Date:	9-Dec-14
Data Entry Personnel:	SM	Date:	9-Dec-14
Data Check Personnel:	TR	Date:	22-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: January 11, 2014  
 Site Visit Time (MST): 10:25



Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.90	0.00	0.00		0.000		0.000		0.000	0.88	0.10	0.00	0.000	0.00	0.000	
1	6.10	0.30	0.25	0.28	0.069					0.88	0.30	0.05	0.061	0.02	0.001	0%
2	6.50	0.25	0.20	0.23	0.001					0.88	0.35	0.05	0.001	0.02	0.000	0%
3	6.80	0.30	0.20	0.25	0.292					0.88	0.30	0.10	0.248	0.03	0.007	4%
4	7.10	0.42	0.16	0.29	0.126					0.88	0.35	0.26	0.111	0.09	0.010	5%
5	7.50	0.35	0.16	0.26	0.477					0.88	0.25	0.19	0.420	0.05	0.020	10%
6	7.60	0.30	0.16	0.23	0.061					0.88	0.15	0.14	0.054	0.02	0.001	1%
7	7.80	0.50	0.16	0.33	0.000					0.88	0.15	0.34	0.000	0.05	0.000	0%
8	7.90	0.45	0.16	0.31	0.405					0.88	0.25	0.29	0.356	0.07	0.026	13%
9	8.30	0.30	0.16	0.23	-0.050					0.88	0.25	0.14	-0.044	0.04	-0.002	-1%
10	8.40	0.35	0.17	0.26	0.276					0.88	0.20	0.18	0.243	0.04	0.009	4%
11	8.70	0.50	0.16	0.33	0.375					0.88	0.20	0.34	0.330	0.07	0.022	11%
12	8.80	0.58	0.17	0.38	0.281					0.88	0.20	0.41	0.247	0.08	0.020	10%
13	9.10	0.58	0.20	0.39	0.330					0.88	0.20	0.38	0.290	0.08	0.022	11%
14	9.20	0.58	0.20	0.39	0.226					0.88	0.28	0.38	0.199	0.10	0.021	11%
15	9.65	0.54	0.25	0.40	0.032					0.88	0.43	0.29	0.028	0.12	0.003	2%
16	10.05	0.56	0.28	0.42	-0.006					0.88	0.40	0.28	-0.005	0.11	-0.001	0%
17	10.45	0.55	0.26	0.41	0.171					0.88	0.32	0.29	0.150	0.09	0.014	7%
18	10.70	0.56	0.32	0.44	0.300					0.88	0.25	0.24	0.264	0.06	0.016	8%
19	10.95	0.43	0.38	0.41	0.673					0.88	0.30	0.05	0.592	0.02	0.009	5%
20	11.30	0.53	0.42	0.48	-0.223					0.88	0.35	0.11	-0.196	0.04	-0.008	-4%
21	11.65	0.55	0.35	0.45	0.075					0.88	0.40	0.20	0.066	0.08	0.005	3%
22	12.10	0.55	0.35	0.45	-0.039					0.88	0.48	0.20	-0.034	0.10	-0.003	-2%
23	12.60	0.44	0.35	0.40	0.005					0.88	0.60	0.09	0.004	0.05	0.000	0%
24	13.30	0.43	0.34	0.39	0.032					0.88	0.55	0.09	0.028	0.05	0.001	1%
RB	13.70	0.00	0.00		0.00		0.00		0.00	0.88	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.196</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 Near the hall, landing area

Meas. Start Time (MST):	11:10
Meas. End Time (MST):	11:50
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Overcast, light snow

**Flow characteristics:**

Total Flow:	0.196	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.47	(m <sup>2</sup> )
Wetted Width:	7.80	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.10	

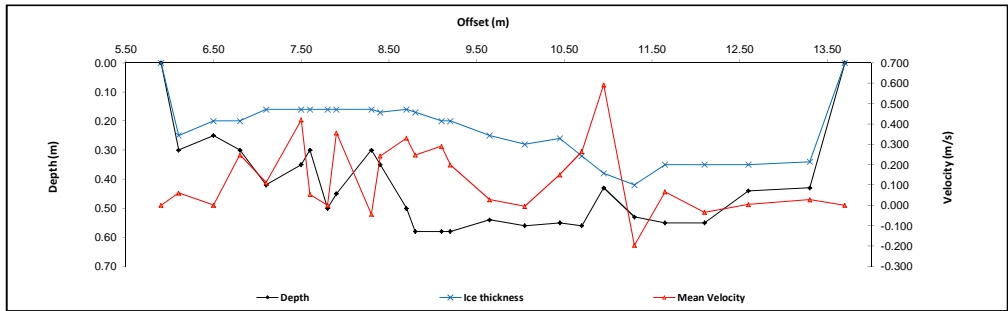
**Logger Details:**

	Before	After
Transducer Reading (m):	0.528	0.529
Water (°C):	0.1	0.1
Datalogger Clock:	10:33	12:08
Laptop Clock:	10:33	12:09
Battery (Main):	12.3	13.3
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Very little effective depth in the channel adjacent to the station
- Flow effected by rocks under the ice



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S53-3	1.085	101.446		100.361	100.361	Pipe 5m N of logger
S53-4			1.281	100.165	100.165	Pipe 2m SE of logger
S53-5			1.058	100.388	100.388	Pipe 5m E of logger
<b>Water Level:</b>						
Cut			3.803	97.643		<b>Time WL Surveyed:</b> 11:02
Temporary BM			3.787	97.659	0.000	
<b>Turn</b>						
Temporary BM	3.775	101.434		97.659		
Water Level:	Cut		3.790	97.644		<b>Time WL Surveyed:</b> 11:06
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S53-3	1.073	101.434		100.361		
Water Level:	Cut		3.793	97.641		<b>Time WL Surveyed:</b> 12:00
Water Level:	Cut		3.785	97.638		<b>Time WL Surveyed:</b> 12:04
S53-3	1.062	101.423		100.361		

**WL Survey Summary**

	Before	After
Average WL:	97.644	97.640
Closing Error:	0.000	-
WL Check:	0.001	0.003
Transducer Elevation	97.116	97.111

**Field Personnel:**

	SM DW	Trip Date:	11-Jan-14
Data Entry Personnel:	SM	Date:	11-Jan-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: February 9, 2014  
 Site Visit Time (MST): 14:30

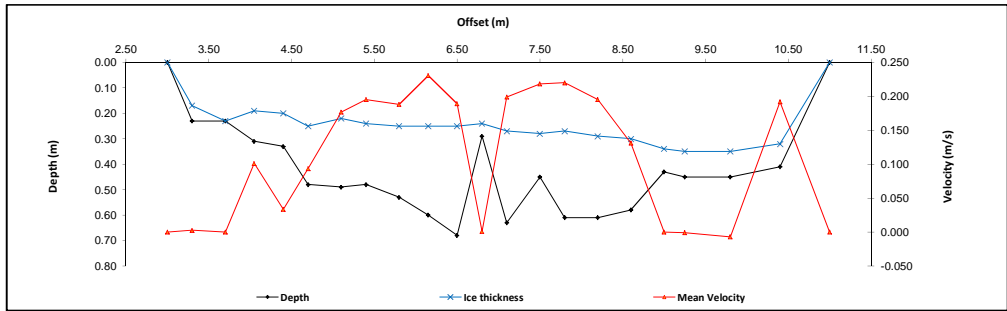


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	11.00	0.00	0.00		0.000				0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	10.40	0.41	0.32	0.37	0.218					0.88	0.60	0.09	0.192	0.05	0.010	4%
2	9.80	0.45	0.35	0.40	-0.008					0.88	0.58	0.10	-0.007	0.06	0.000	0%
3	9.25	0.45	0.35	0.40	-0.001					0.88	0.40	0.10	-0.001	0.04	0.000	0%
4	9.00	0.43	0.34	0.39	0.000					0.88	0.32	0.09	0.000	0.03	0.000	0%
5	8.60	0.58	0.30	0.44	0.149					0.88	0.40	0.28	0.131	0.11	0.015	6%
6	8.20	0.61	0.29	0.45	0.222					0.88	0.40	0.32	0.195	0.13	0.025	11%
7	7.80	0.61	0.27	0.44	0.250					0.88	0.35	0.34	0.220	0.12	0.026	11%
8	7.50	0.45	0.28	0.37	0.248					0.88	0.35	0.17	0.218	0.06	0.013	6%
9	7.10	0.63	0.27	0.45	0.226					0.88	0.35	0.36	0.199	0.13	0.025	11%
10	6.80	0.29	0.24	0.27	0.001					0.88	0.30	0.05	0.001	0.01	0.000	0%
11	6.50	0.68	0.25	0.47	0.215					0.88	0.33	0.43	0.189	0.14	0.026	11%
12	6.15	0.60	0.25	0.43	0.262					0.88	0.35	0.35	0.231	0.12	0.028	12%
13	5.80	0.53	0.25	0.39	0.214					0.88	0.38	0.28	0.188	0.11	0.020	8%
14	5.40	0.48	0.24	0.36	0.222					0.88	0.35	0.24	0.195	0.08	0.016	7%
15	5.10	0.49	0.22	0.36	0.201					0.88	0.35	0.27	0.177	0.09	0.017	7%
16	4.70	0.48	0.25	0.37	0.106					0.88	0.35	0.23	0.093	0.08	0.008	3%
17	4.40	0.33	0.20	0.27	0.038					0.88	0.33	0.13	0.033	0.04	0.001	1%
18	4.05	0.31	0.19	0.25	0.115					0.88	0.35	0.12	0.101	0.04	0.004	2%
19	3.70	0.23	0.23	0.23	0.000					0.88	0.38	0.00	0.000	0.00	0.000	0%
20	3.30	0.23	0.17	0.20	0.003					0.88	0.35	0.06	0.003	0.02	0.000	0%
RB	3.00	0.00	0.00		0.00		0.00		0.00	0.88	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.235</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10m US of heel, landing area

Meas. Start Time (MST):	15:13
Meas. End Time (MST):	15:53
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm



**Flow characteristics:**

Total Flow:	0.235	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.47	(m <sup>2</sup> )
Wetted Width:	8.00	(m)
Hydraulic Depth:	0.18	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.455	
Water (°C):	0.1	
Datalogger Clock:	02:44	
Laptop Clock:	02:44	
Battery (Main):	14.9	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Good
Vent Tube Deseccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
Water Level:	Cut					Time WL Surveyed:
Turn						
Water Level:	Cut					Time WL Surveyed:
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:		
Closing Error:	-	-
WL Check:	-	-
Transducer Elevation	-	-

**Field Personnel:**

MP, SG	Trip Date:	9-Feb-14
Data Entry Personnel:	Date:	9-Feb-14
Data Check Personnel:	Date:	23-Apr-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: March 10, 2014  
 Site Visit Time (MST): 09:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	16.30	0.00	0.00		0.000		0.000		0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	16.00	0.40	0.29	0.35	0.001					0.88	0.40	0.11	0.001	0.04	0.000	0%
2	15.50	0.40	0.30	0.35	0.012					0.88	0.53	0.10	0.011	0.05	0.001	0%
3	14.95	0.39	0.34	0.37	0.019					0.88	0.53	0.05	0.017	0.03	0.000	0%
4	14.45	0.49	0.35	0.42	0.009					0.88	0.52	0.14	0.008	0.07	0.001	0%
5	13.90	0.59	0.36	0.48	0.101					0.88	0.55	0.23	0.089	0.13	0.011	8%
6	13.35	0.63	0.40	0.52	0.130					0.88	0.50	0.23	0.114	0.12	0.013	9%
7	12.90	0.70	0.43	0.57	0.116					0.88	0.30	0.27	0.102	0.08	0.008	6%
8	12.75	0.73	0.44	0.59	0.139					0.88	0.20	0.29	0.122	0.06	0.007	5%
9	12.50	0.75	0.43	0.59	0.170					0.88	0.23	0.32	0.150	0.07	0.011	8%
10	12.30	0.75	0.43	0.59	0.157					0.88	0.25	0.32	0.138	0.08	0.011	8%
11	12.00	0.71	0.44	0.58	0.165					0.88	0.23	0.27	0.145	0.06	0.009	6%
12	11.85	0.72	0.45	0.59	0.161					0.88	0.30	0.27	0.142	0.08	0.011	8%
13	11.40	0.70	0.44	0.57	0.146					0.88	0.40	0.26	0.128	0.10	0.013	9%
14	11.05	0.61	0.44	0.53	0.124					0.88	0.50	0.17	0.109	0.09	0.009	7%
15	10.40	0.60	0.44	0.52	0.112					0.88	0.63	0.16	0.099	0.10	0.010	7%
16	9.80	0.61	0.45	0.53	0.100					0.88	0.60	0.16	0.088	0.10	0.008	6%
17	9.20	0.63	0.45	0.54	0.067					0.88	0.43	0.18	0.059	0.08	0.005	3%
18	8.95	0.60	0.45	0.53	0.053					0.88	0.32	0.15	0.047	0.05	0.002	2%
19	8.55	0.60	0.46	0.53	0.059					0.88	0.45	0.14	0.052	0.06	0.003	2%
20	8.05	0.65	0.47	0.56	0.054					0.88	0.48	0.18	0.048	0.09	0.004	3%
21	7.60	0.65	0.51	0.58	0.050					0.88	0.40	0.14	0.044	0.06	0.002	2%
22	7.25	0.59	0.50	0.55	0.006					0.88	0.50	0.09	0.005	0.05	0.000	0%
23	6.60	0.53	0.45	0.49	-0.001					0.88	0.63	0.08	-0.001	0.05	0.000	0%
RB	6.00	0.00	0.00		0.000		0.000		0.000	0.88	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.141</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 10m DS of heel, landing area

Meas. Start Time (MST):	8:30
Meas. End Time (MST):	9:00
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partly cloudy, -10C

**Flow characteristics:**

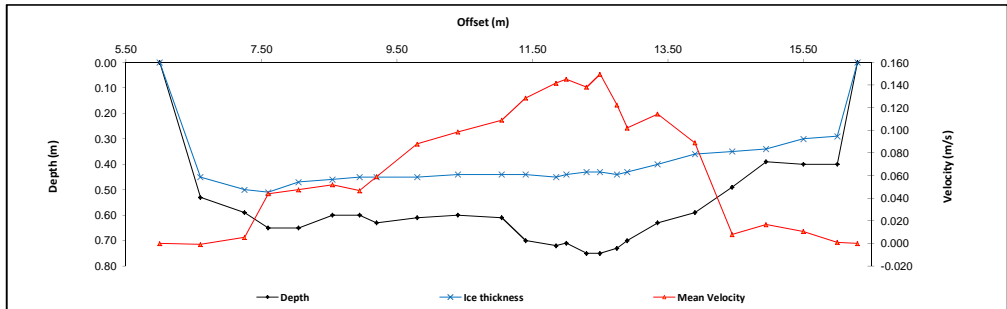
Total Flow:	0.141	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.68	(m²)
Wetted Width:	10.30	(m)
Hydraulic Depth:	0.16	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.478	-
Water (°C):	0.1	-
Datalogger Clock:	08:06	-
Laptop Clock:	08:05	-
Battery (Main):	13.1	12.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S53-4	1.265	101.430		100.165	100.165	Pipe 2m SE of logger
S53-5			1.043	100.387	100.388	Pipe 5m E of logger
S53-3			1.068	100.362	100.361	Pipe 5m N of logger
Water Level:	Cut		3.844	97.586	Time WL Surveyed:	-
Temporary BM			3.787	97.643	0.000	-
<b>Turn</b>						
Temporary BM	3.767	101.410		97.643		-
Water Level:	Cut		3.821	97.589	Time WL Surveyed:	-
S53-3			1.049	100.361	100.361	Pipe 5m N of logger
S53-5			1.022	100.388	100.388	Pipe 5m E of logger
S53-4			1.243	100.167	100.165	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	-
Water Level:	Cut				Time WL Surveyed:	-

**WL Survey Summary**

	Before	After
Average WL:	97.588	-
Closing Error:	-0.002	-
WL Check:	0.003	-
Transducer Elevation	97.110	-

**Field Personnel:**

Data Entry Personnel:	DW, MP	Trip Date:	10-Mar-14
Data Check Personnel:	DW	Date:	10-Mar-14
Entered Digitally in the Field:	Yes	Date:	23-Apr-14

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: April 8, 2014  
 Site Visit Time (MST): 13:26



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.40	0.00	0.00		0.000		0.000		0.000	0.88	0.28	0.00	0.000	0.00	0.000	
1	3.95	0.65	0.50	0.58	0.003					0.88	0.53	0.15	0.003	0.08	0.000	0%
2	4.46	0.87	0.50	0.69	-0.018					0.88	0.52	0.37	-0.016	0.19	-0.003	-1%
3	4.98	1.08	0.51	0.80	0.015					1.00	0.61	0.57	0.013	0.31	0.004	1%
4	5.56	1.38	0.54			1.21	0.011	0.71	0.031	1.00	0.61	0.84	0.021	0.51	0.011	4%
5	6.20	1.37	0.55			1.21	0.017	0.71	0.037	1.00	0.58	0.82	0.027	0.48	0.013	4%
6	6.72	1.80	0.55			1.55	0.030	0.80	0.043	1.00	0.57	1.25	0.037	0.71	0.026	9%
7	7.33	1.90	0.58			1.64	0.022	0.84	0.042	1.00	0.52	1.32	0.032	0.69	0.022	7%
8	7.76	2.00	0.58			1.72	0.035	0.86	0.045	1.00	0.44	1.42	0.040	0.62	0.025	8%
9	8.20	1.95	0.60			1.68	0.027	0.87	0.043	1.00	0.43	1.35	0.035	0.57	0.020	7%
10	8.61	2.00	0.60			1.72	0.035	0.88	0.049	1.00	0.40	1.40	0.042	0.57	0.024	8%
11	9.01	1.90	0.60			1.64	0.033	0.86	0.049	1.00	0.44	1.30	0.041	0.57	0.023	8%
12	9.49	1.78	0.61			1.55	0.034	0.84	0.052	1.00	0.40	1.17	0.043	0.46	0.020	7%
13	9.80	1.67	0.67			1.47	0.036	0.87	0.054	1.00	0.39	1.00	0.045	0.39	0.018	6%
14	10.27	1.50	0.71			1.34	0.045	0.87	0.066	1.00	0.43	0.79	0.056	0.34	0.019	6%
15	10.67	1.38	0.70	1.04	0.069					0.88	0.43	0.68	0.061	0.29	0.018	6%
16	11.13	1.20	0.65	0.93	0.064					0.88	0.44	0.55	0.056	0.24	0.013	4%
17	11.54	1.05	0.60	0.83	0.077					0.88	0.39	0.45	0.068	0.18	0.012	4%
18	11.91	0.90	0.60	0.75	0.082					0.88	0.62	0.30	0.072	0.19	0.013	4%
19	12.78	0.79	0.56	0.68	0.105					0.88	0.81	0.23	0.092	0.19	0.017	6%
20	13.52	0.65	0.55	0.60	0.105					0.88	0.76	0.10	0.092	0.08	0.007	2%
LB	14.30	0.00	0.00		0.00		0.00		0.00	0.88	0.39	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.302</b>	<b>100%</b>	

### Flow Measurement Details:

**Metering Section Location (describe):**  
 - Measurement was conducted at a deeper channel section 15m downstream of the helicopter landing area.

Meas. Start Time (MST):	14:20
Meas. End Time (MST):	14:48
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, windy, 18C

### Flow characteristics:

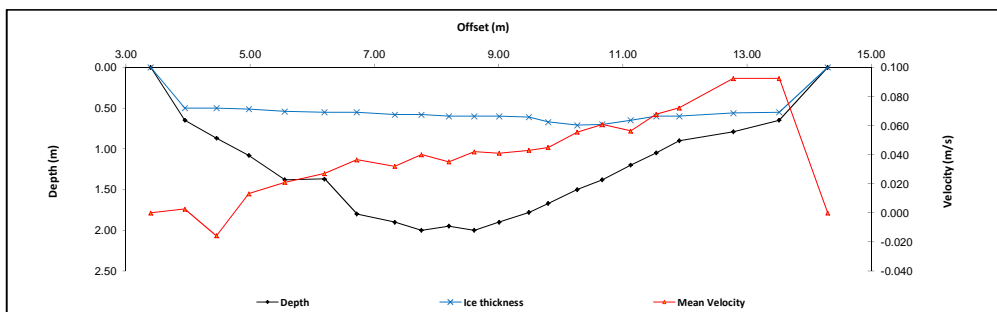
Total Flow:	0.302	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.64	(m <sup>2</sup> )
Wetted Width:	10.90	(m)
Hydraulic Depth:	0.70	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

### Logger Details:

	Before	After
Transducer Reading (m):	0.696	
Water (°C):	0.1	
Datalogger Clock:	13:26	
Laptop Clock:	13:26	
Battery (Main):	13.6	
Battery:	Good	
Battery Serial #:	-	
Enclosure Desiccant:	Good	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

### Datalogger / Station Notes:

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S53-4	1.203	101.368		100.165	100.165	Pipe 2m SE of logger
S53-5			0.983	100.385	100.388	Pipe 5m E of logger
S53-3			1.006	100.362	100.361	Pipe 5m N of logger
Water Level:	Cut		3.586	97.782	Time WL Surveyed: 13:58	
Temporary BM			3.600	97.768	0.000	-
<b>Turn</b>						
Temporary BM	3.586	101.354		97.768		-
Water Level:	Cut		3.575	97.779	Time WL Surveyed: 14:01	
S53-3			0.993	100.361	100.361	Pipe 5m N of logger
S53-5			0.968	100.386	100.388	Pipe 5m E of logger
S53-4			1.189	100.165	100.165	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	97.781	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	97.085	-

Field Personnel:	SM, MP	Trip Date:	8-Apr-14
Data Entry Personnel:	SM	Date:	8-Apr-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: May 16, 2014  
 Site Visit Time (MST): 14:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	7.90	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	8.30	0.30		0.18	0.148					1.00	0.55	0.30	0.148	0.17	0.024	1%
2	9.00	0.38		0.23	0.202					1.00	0.70	0.38	0.202	0.27	0.054	2%
3	9.70	0.44		0.26	0.309					1.00	0.70	0.44	0.309	0.31	0.095	3%
4	10.40	0.45		0.27	0.366					1.00	0.70	0.45	0.366	0.32	0.115	4%
5	11.10	0.52		0.31	0.421					1.00	0.70	0.52	0.421	0.36	0.153	5%
6	11.80	0.58		0.35	0.404					1.00	0.70	0.58	0.404	0.41	0.164	5%
7	12.50	0.64		0.38	0.383					1.00	0.70	0.64	0.383	0.45	0.172	5%
8	13.20	0.64		0.38	0.554					1.00	0.70	0.64	0.554	0.45	0.248	8%
9	13.90	0.77				0.62	0.384	0.15	0.578	1.00	0.70	0.77	0.481	0.54	0.259	8%
10	14.60	0.82				0.66	0.426	0.16	0.592	1.00	0.70	0.82	0.509	0.57	0.292	9%
11	15.30	0.84				0.67	0.383	0.17	0.636	1.00	0.70	0.84	0.510	0.59	0.300	9%
12	16.00	0.82				0.66	0.349	0.16	0.586	1.00	0.70	0.82	0.468	0.57	0.268	8%
13	16.70	0.82				0.66	0.301	0.16	0.557	1.00	0.70	0.82	0.429	0.57	0.246	8%
14	17.40	0.64	0.38		0.337					1.00	0.70	0.64	0.337	0.45	0.151	5%
15	18.10	0.52	0.31		0.461					1.00	0.70	0.52	0.461	0.36	0.168	5%
16	18.80	0.52	0.31		0.443					1.00	0.70	0.52	0.443	0.36	0.161	5%
17	19.50	0.50	0.30		0.299					1.00	0.70	0.50	0.299	0.35	0.105	3%
18	20.20	0.48	0.29		0.282					1.00	0.70	0.48	0.282	0.34	0.095	3%
19	20.90	0.36	0.22		0.374					1.00	0.60	0.36	0.374	0.22	0.081	3%
20	21.40	0.36	0.22		0.262					1.00	0.40	0.36	0.262	0.14	0.038	1%
LB	21.70	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.19</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe): -adjacent to station

Meas. Start Time (MST):	15:28
Meas. End Time (MST):	15:52
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 13 C

### Flow characteristics:

Total Flow:	3.19	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.79	(m <sup>2</sup> )
Wetted Width:	0.55	(m)
Hydraulic Depth:	14.17	(m)
Mean Velocity:	0.41	(m/s)
Froude Number:	0.03	

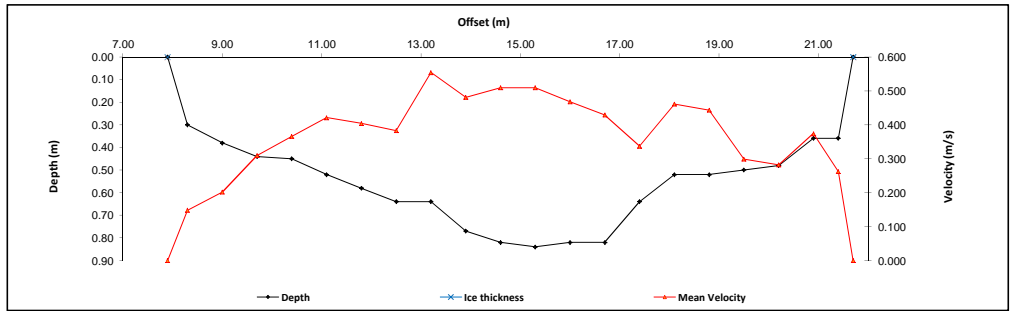
### Logger Details:

	Before	After
Transducer Reading (m):	0.706	0.779
Water (°C):	12.1	12.4
Datalogger Clock:	14:46	16:04
Laptop Clock:	14:46	16:04
Battery (Main):	13.9	13.8
Battery:	Good	
Battery Serial #:	903001	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

-Need to move enclosure to a 2" pipe mast

### General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S53-05	0.952	101.340		100.388	100.388	Pipe 5m E of logger
S53-04			1.174	100.166	100.165	Pipe 2m SE of logger
<b>Water Level:</b>	<b>Cut</b>		3.507	97.833	<b>Time WL Surveyed:</b> 15:06	
S53-03			0.979	100.361	100.361	Pipe 5m N of logger
<b>Turn</b>						
S53-03	0.965	101.326		100.361	100.361	Pipe 5m N of logger
<b>Water Level:</b>	<b>Cut</b>		3.492	97.834	<b>Time WL Surveyed:</b> 15:13	
S53-04			1.158	100.168	100.165	Pipe 2m SE of logger
S53-05			0.937	100.389	100.388	Pipe 5m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S53-03	0.965	101.326		100.361		
<b>Water Level:</b>	<b>Cut</b>		3.487	97.839	<b>Time WL Surveyed:</b> 15:58	
<b>Water Level:</b>	<b>Cut</b>		3.472	97.838	<b>Time WL Surveyed:</b> 16:00	
S53-03	0.949	101.310		100.361		

### WL Survey Summary

	Before	After
Average WL:	97.834	97.839
Closing Error:	-0.001	-
WL Check:	0.001	0.001
Transducer Elevation	97.128	97.060

### Field Personnel:

	MP, SM	Trip Date:	16-May-14
Data Entry Personnel:	MP, SM	Date:	16-May-14
Data Check Personnel:	CJ	Date:	13-Jun-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: June 14, 2014  
 Site Visit Time (MST): 14:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	29.40	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	29.00	0.28		0.17	0.234					1.00	0.45	0.28	0.234	0.13	0.029	0%
2	28.50	0.44		0.26	0.323					1.00	0.50	0.44	0.323	0.22	0.071	1%
3	28.00	0.45		0.27	0.380					1.00	0.50	0.45	0.380	0.23	0.086	1%
4	27.50	0.41		0.25	0.567					1.00	0.50	0.41	0.567	0.21	0.116	2%
5	27.00	0.46		0.28	0.637					1.00	0.50	0.46	0.637	0.23	0.147	2%
6	26.50	0.53		0.32	0.545					1.00	0.50	0.53	0.545	0.27	0.144	2%
7	26.00	0.46		0.28	0.441					1.00	0.50	0.46	0.441	0.23	0.101	2%
8	25.50	0.43		0.26	0.761					1.00	0.50	0.43	0.761	0.22	0.164	2%
9	25.00	0.47		0.28	0.581					1.00	0.50	0.47	0.581	0.24	0.137	2%
10	24.50	0.40		0.24	0.615					1.00	0.50	0.40	0.615	0.20	0.123	2%
11	24.00	0.50		0.30	0.692					1.00	0.50	0.50	0.692	0.25	0.173	3%
12	23.50	0.50		0.30	0.867					1.00	0.50	0.50	0.867	0.25	0.217	3%
13	23.00	0.54		0.32	0.778					1.00	0.50	0.54	0.778	0.27	0.210	3%
14	22.50	0.61		0.37	0.726					1.00	0.50	0.61	0.726	0.31	0.221	3%
15	22.00	0.58		0.35	0.576					1.00	0.75	0.58	0.576	0.44	0.251	4%
16	21.00	0.58		0.35	0.890					1.00	0.75	0.58	0.890	0.44	0.387	6%
17	20.50	0.58		0.35	0.426					1.00	0.50	0.58	0.426	0.29	0.124	2%
18	20.00	0.59		0.35	1.011					1.00	0.50	0.59	1.011	0.30	0.298	5%
19	19.50	0.54		0.32	0.795					1.00	0.50	0.54	0.795	0.27	0.215	3%
20	19.00	0.57		0.34	0.960					1.00	0.75	0.57	0.960	0.43	0.410	6%
21	18.00	0.54		0.32	0.913					1.00	1.00	0.54	0.913	0.54	0.493	8%
22	17.00	0.56		0.34	0.948					1.00	1.00	0.56	0.948	0.56	0.531	8%
23	16.00	0.54		0.32	0.886					1.00	1.00	0.54	0.886	0.54	0.478	7%
24	15.00	0.51		0.31	0.822					1.00	1.00	0.51	0.822	0.51	0.419	6%
25	14.00	0.66		0.40	0.748					1.00	1.00	0.66	0.748	0.66	0.494	8%
26	13.00	0.51		0.31	0.861					1.00	1.20	0.51	0.861	0.61	0.527	8%
LB	11.60	0.00	0.00		0.000		0.000			1.00	0.70	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>6.57</b>	<b>100%</b>	

### Flow Measurement Details:

**Metering Section Location (describe):**  
 30 m ds of heli. landing, top of riffle

Meas. Start Time (MST):	15:30
Meas. End Time (MST):	15:55
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, light breeze

### Flow characteristics:

Total Flow:	6.57	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.80	(m <sup>2</sup> )
Wetted Width:	17.80	(m)
Hydraulic Depth:	0.49	(m)
Mean Velocity:	0.75	(m/s)
Froude Number:	0.34	

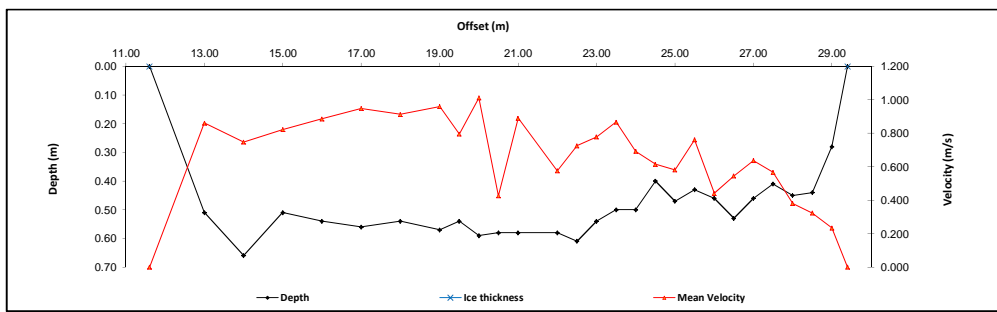
### Logger Details:

	Before	After
Transducer Reading (m):	0.775	0.856
Water (°C):	18.4	18.6
Datalogger Clock:	14:46	16:11
Laptop Clock:	14:45	16:12
Battery (Main):	13.6	13.5
Battery:	Good	
Battery Serial #:	903001	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	298683	348055
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

-PT was found swept downstream, was replaced for calibration and repositioned.

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S53-04	1.209	101.374		100.165	100.165	Pipe 2m SE of logger
S53-05			0.987	100.387	100.388	Pipe 5m E of logger
S53-03			1.013	100.361	100.361	Pipe 5m N of logger
Water Level:	Cut		3.399	97.975	Time WL Surveyed:	15:09
S53-03			1.013	100.361	100.361	Pipe 5m N of logger
<b>Turn</b>						
S53-03	0.981	101.342		100.361	100.361	Pipe 5m N of logger
Water Level:	Cut		3.367	97.975	Time WL Surveyed:	15:11
S53-03			0.981	100.361	100.361	Pipe 5m N of logger
S53-05			0.953	100.389	100.388	Pipe 5m E of logger
S53-04			1.176	100.166	100.165	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut		3.373	97.969	Time WL Surveyed:	16:04
Water Level:	Cut		3.336	97.973	Time WL Surveyed:	16:05
S53-03	0.948	101.309		100.361		

WL Survey Summary	Before	After
Average WL:	97.975	97.971
Closing Error:	-0.001	-
WL Check:	0.000	-0.004
Transducer Elevation	97.200	97.115

Field Personnel:	TR, NC	Trip Date:	14-Jun-14
Data Entry Personnel:	TR	Date:	14-Jun-14
Data Check Personnel:	MP	Date:	4-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: August 10, 2014  
 Site Visit Time (MST): 12:15

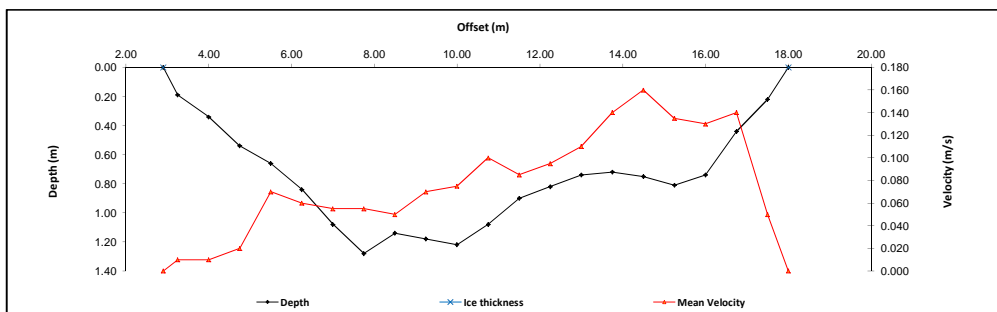


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.90	0.00	0.00		0.000		0.000		0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	3.25	0.19		0.11	0.010					1.00	0.55	0.19	0.010	0.10	0.001	0%
2	4.00	0.34		0.20	0.010					1.00	0.75	0.34	0.010	0.26	0.003	0%
3	4.75	0.54		0.32	0.020					1.00	0.75	0.54	0.020	0.41	0.008	1%
4	5.50	0.66		0.40	0.070					1.00	0.75	0.66	0.070	0.50	0.035	4%
5	6.25	0.84				0.67	0.050	0.17	0.070	1.00	0.75	0.84	0.060	0.63	0.038	4%
6	7.00	1.08				0.86	0.040	0.22	0.070	1.00	0.75	1.08	0.055	0.81	0.045	5%
7	7.75	1.28				1.02	0.040	0.26	0.070	1.00	0.75	1.28	0.055	0.96	0.053	5%
8	8.50	1.14				0.91	0.040	0.23	0.060	1.00	0.75	1.14	0.050	0.86	0.043	4%
9	9.25	1.18				0.94	0.080	0.24	0.060	1.00	0.75	1.18	0.070	0.89	0.062	6%
10	10.00	1.22				0.98	0.060	0.24	0.090	1.00	0.75	1.22	0.075	0.92	0.069	7%
11	10.75	1.08				0.86	0.090	0.22	0.110	1.00	0.75	1.08	0.100	0.81	0.081	8%
12	11.50	0.90				0.72	0.060	0.18	0.110	1.00	0.75	0.90	0.085	0.68	0.057	6%
13	12.25	0.82				0.66	0.080	0.16	0.110	1.00	0.75	0.82	0.095	0.62	0.058	6%
14	13.00	0.74	0.44		0.110					1.00	0.75	0.74	0.110	0.56	0.061	6%
15	13.75	0.72	0.43		0.140					1.00	0.75	0.72	0.140	0.54	0.076	8%
16	14.50	0.75	0.45		0.160					1.00	0.75	0.75	0.160	0.56	0.090	9%
17	15.25	0.81				0.65	0.130	0.16	0.140	1.00	0.75	0.81	0.135	0.61	0.082	8%
18	16.00	0.74	0.44		0.130					1.00	0.75	0.74	0.130	0.56	0.072	7%
19	16.75	0.44	0.26		0.140					1.00	0.75	0.44	0.140	0.33	0.046	5%
20	17.50	0.22	0.13		0.050					1.00	0.63	0.22	0.050	0.14	0.007	1%
LB	18.00	0.00	0.00		0.00		0.00		0.00	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.986</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 15m DS of hell, landing

Meas. Start Time (MST):	12:40
Meas. End Time (MST):	13:05
Equipment:	Marsh McBirmey
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 30 C



**Flow characteristics:**

Total Flow:	0.986	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.70	(m <sup>2</sup> )
Wetted Width:	15.10	(m)
Hydraulic Depth:	0.77	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.542	0.542
Water (°C):	19.7	19.7
Datalogger Clock:	12:19	13:20
Laptop Clock:	12:18	13:19
Battery (Main):	13.7	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- changed cell telemetry cable
- changed battery
- output on old solar controller: 3V
- replaced solar controller

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S53-05	0.868	101.256		100.388	100.388	Pipe 5m E of logger
S53-04			1.092	100.164	100.165	Pipe 2m SE of logger
S53-03			0.897	100.359	100.361	Pipe 5m N of logger
Water Level:	Cut	0.394	3.978	97.672	Time WL Surveyed: 12:30	
Temporary BM			3.978	97.278	0.000	
<b>Turn</b>						
Temporary BM	4.000	101.278		97.278	-	
Water Level:	Cut	0.394	4.000	97.672	Time WL Surveyed: 12:34	
S53-03			0.917	100.361	100.361	Pipe 5m N of logger
S53-04			1.113	100.165	100.165	Pipe 2m SE of logger
S53-05			0.892	100.386	100.388	Pipe 5m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S53-04	1.113	101.278		100.165		
Water Level:	Cut	0.389	3.995	97.672	Time WL Surveyed: 13:16	
Water Level:	Cut	0.389	4.028	97.673	Time WL Surveyed: 13:18	
S53-04	1.147	101.312		100.165		

**WL Survey Summary**

	Before	After
Average WL:	97.672	97.673
Closing Error:	0.002	-
WL Check:	0.000	-0.001
Transducer Elevation	97.130	97.131

**Field Personnel:**

	GG, TR	Trip Date:	10-Aug-14
Data Entry Personnel:	GG	Date:	10-Aug-14
Data Check Personnel:	GG	Date:	14-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: September 4, 2014  
 Site Visit Time (MST): 13:17

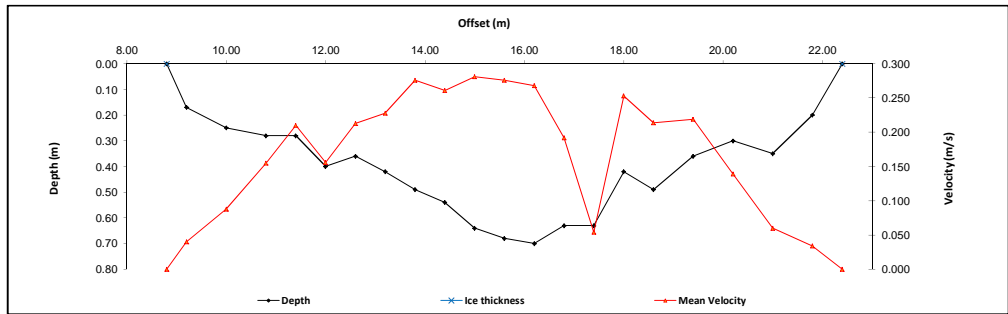


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	22.40	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	21.80	0.20		0.12	0.034					1.00	0.70	0.20	0.034	0.14	0.005	0%
2	21.00	0.35		0.21	0.060					1.00	0.80	0.35	0.060	0.28	0.017	2%
3	20.20	0.30		0.18	0.139					1.00	0.80	0.30	0.139	0.24	0.033	3%
4	19.40	0.36		0.22	0.219					1.00	0.80	0.36	0.219	0.29	0.063	6%
5	18.60	0.49		0.29	0.214					1.00	0.70	0.49	0.214	0.34	0.073	7%
6	18.00	0.42		0.25	0.253					1.00	0.60	0.42	0.253	0.25	0.064	6%
7	17.40	0.63		0.38	0.054					1.00	0.60	0.63	0.054	0.38	0.020	2%
8	16.80	0.63		0.38	0.192					1.00	0.60	0.63	0.192	0.38	0.073	7%
9	16.20	0.70		0.42	0.268					1.00	0.60	0.70	0.268	0.42	0.113	10%
10	15.60	0.68		0.41	0.276					1.00	0.60	0.68	0.276	0.41	0.113	10%
11	15.00	0.64		0.38	0.281					1.00	0.60	0.64	0.281	0.38	0.108	10%
12	14.40	0.54		0.32	0.261					1.00	0.60	0.54	0.261	0.32	0.085	8%
13	13.80	0.49		0.29	0.276					1.00	0.60	0.49	0.276	0.29	0.081	8%
14	13.20	0.42		0.25	0.228					1.00	0.60	0.42	0.228	0.25	0.057	5%
15	12.60	0.36		0.22	0.213					1.00	0.60	0.36	0.213	0.22	0.046	4%
16	12.00	0.40		0.24	0.156					1.00	0.60	0.40	0.156	0.24	0.037	3%
17	11.40	0.28		0.17	0.210					1.00	0.60	0.28	0.210	0.17	0.035	3%
18	10.80	0.28		0.17	0.155					1.00	0.70	0.28	0.155	0.20	0.030	3%
19	10.00	0.25		0.15	0.088					1.00	0.80	0.25	0.088	0.20	0.018	2%
20	9.20	0.17		0.10	0.040					1.00	0.60	0.17	0.040	0.10	0.004	0%
RB	8.80	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>1.08</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): at station

Meas. Start Time (MST):	13:45
Meas. End Time (MST):	14:16
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast



**Flow characteristics:**

Total Flow:	1.08	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.50	(m <sup>2</sup> )
Wetted Width:	13.60	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.533	0.531
Water (°C):	14.7	14.9
Datalogger Clock:	13:26	14:29
Laptop Clock:	13:25	14:28
Battery (Main):	13.7	13.8
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Uploaded new logger program

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S53-04	1.192	101.357		100.165	100.165	Pipe 2m SE of logger
S53-05			0.968	100.389	100.388	Pipe 5m E of logger
S53-03			0.997	100.360	100.361	Pipe 5m N of logger
Water Level:	Cut	3.688		97.669	Time WL Surveyed:	13:33
Temporary BM			3.725	97.632	0.000	
Turn						
Temporary BM	3.689	101.321		97.632		
Water Level:	Cut		3.656	97.665	Time WL Surveyed:	13:36
S53-03			0.962	100.359	100.361	Pipe 5m N of logger
S53-05			0.933	100.388	100.388	Pipe 5m E of logger
S53-04			1.156	100.165	100.165	Pipe 2m SE of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S53-03	0.962	101.321		100.359		
Water Level:	Cut		3.657	97.664	Time WL Surveyed:	14:21
Water Level:	Cut		3.691	97.665	Time WL Surveyed:	14:23
S53-03	0.997	101.356		100.359		

**WL Survey Summary**

	Before	After
Average WL:	97.667	97.665
Closing Error:	0.000	-
WL Check:	0.004	-0.001
Transducer Elevation	97.134	97.134

**Field Personnel:**

	SM, GG	Trip Date:	4-Sep-14
Data Entry Personnel:	SM	Date:	4-Sep-14
Data Check Personnel:	MP	Date:	19-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River

UTM Location: 451994 E, 6336589 N

Site Visit Date: \_\_\_\_\_

October 7, 2014

Site Visit Time (MST): \_\_\_\_\_

12:48



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 15m DS of hell, landing area	
Meas. Start Time (MST):	13:25
Meas. End Time (MST):	13:40
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partly cloudy, 6C

<b>Flow characteristics:</b>		
Total Flow:	2.11	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	15.49	(m <sup>2</sup> )
Wetted Width:	14.74	(m)
Hydraulic Depth:	1.05	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.04	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.609	0.608
Water (°C):	5.8	6.2
Datalogger Clock:	12:50	14:07
Laptop Clock:	12:49	14:06
Battery (Main):	14.4	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	16.40
Serial Number:	4712	Salinity (ppt):	0.0	RB:	0.20
Firmware Version:	3.50	Magnetic Declination (°):	14		
Software Version:	3.70	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	19.2		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	14.54	15.06	0.136
Coordinate System:	ENU	2	14.70	15.41	0.137
Left Method:	Sloped bank	3	14.95	16.11	0.133
Right Method:	Sloped bank	4	14.76	15.37	0.139
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		<b>Mean:</b>	14.74	15.49	0.136
		<b>SD:</b>	0.15	0.38	0.002
		<b>COV:</b>	0.01	0.02	0.016
					0.017
					2.056
					2.109
					2.141
					2.142
					-2.65%
					-0.14%
					1.37%
					1.42%

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>	S53-05	0.866	101.254		100.388	100.388	Pipe 5m E of logger
	S53-04			1.089	100.165	100.165	Pipe 2m SE of logger
	S53-03			0.895	100.359	100.361	Pipe 5m N of logger
	Water Level:	Cut	0.251	3.765	97.740	<b>Time WL Surveyed:</b>	12:54
	Temporary BM			3.765	97.489		-
<b>Turn</b>	Temporary BM	3.756	101.245		97.489		-
	Water Level:	Cut	0.251	3.756	97.740	<b>Time WL Surveyed:</b>	12:56
				0.885	100.360	100.361	Pipe 5m N of logger
	S53-04			1.080	100.165	100.165	Pipe 2m SE of logger
	S53-05			0.857	100.388	100.388	Pipe 5m E of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>	S53-03	0.885	101.245		100.360		
	Water Level:	Cut	0.218	3.724	97.739	<b>Time WL Surveyed:</b>	14:00
	Water Level:	Cut	0.218	3.713	97.741	<b>Time WL Surveyed:</b>	14:02
	S53-03	0.876	101.236		100.360		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	97.740	97.740
Closing Error:	0.000	-
WL Check:	0.000	-0.002
Transducer Elevation	97.131	97.132

<b>Field Personnel:</b>	MP, TR	Trip Date:	7-Oct-14
Data Entry Personnel:	MP, TR	Date:	7-Oct-14
Data Check Personnel:	MP	Date:	19-Nov-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S53 - Dover River  
 UTM Location: 451994 E, 6336589 N

Site Visit Date: December 10, 2014  
 Site Visit Time (MST): 13:40

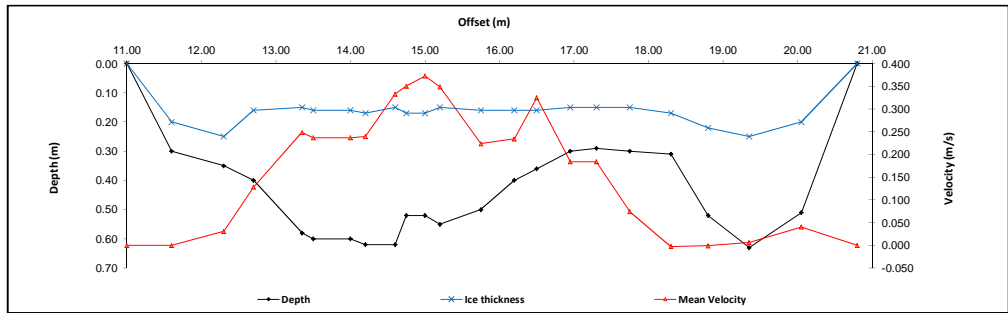


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	11.00	0.00	0.00		0.000		0.000		0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	11.60	0.30	0.20	0.25	0.000					0.88	0.65	0.10	0.000	0.06	0.000	0%
2	12.30	0.35	0.25	0.30	0.035					0.88	0.55	0.10	0.031	0.06	0.002	0%
3	12.70	0.40	0.16	0.28	0.146					0.88	0.52	0.24	0.128	0.13	0.016	4%
4	13.35	0.58	0.15	0.37	0.282					0.88	0.40	0.43	0.248	0.17	0.043	10%
5	13.50	0.60	0.16	0.38	0.269					0.88	0.32	0.44	0.237	0.14	0.034	8%
6	14.00	0.60	0.16	0.38	0.269					0.88	0.35	0.44	0.237	0.15	0.036	8%
7	14.20	0.62	0.17	0.40	0.272					0.88	0.30	0.45	0.239	0.14	0.032	7%
8	14.60	0.62	0.15	0.39	0.378					0.88	0.28	0.47	0.333	0.13	0.043	10%
9	14.75	0.52	0.17	0.35	0.398					0.88	0.20	0.35	0.350	0.07	0.025	6%
10	15.00	0.52	0.17	0.35	0.423					0.88	0.23	0.35	0.372	0.08	0.029	7%
11	15.20	0.55	0.15	0.35	0.396					0.88	0.38	0.40	0.348	0.15	0.052	12%
12	15.75	0.50	0.16	0.33	0.254					0.88	0.50	0.34	0.224	0.17	0.038	9%
13	16.20	0.40	0.16	0.28	0.266					0.88	0.38	0.24	0.234	0.09	0.021	5%
14	16.50	0.36	0.16	0.26	0.369					0.88	0.38	0.20	0.325	0.08	0.024	6%
15	16.95	0.30	0.15	0.23	0.209					0.88	0.40	0.15	0.184	0.06	0.011	3%
16	17.30	0.29	0.15	0.22	0.209					0.88	0.40	0.14	0.184	0.06	0.010	2%
17	17.75	0.30	0.15	0.23	0.084					0.88	0.50	0.15	0.074	0.08	0.006	1%
18	18.30	0.31	0.17	0.24	-0.003					0.88	0.53	0.14	-0.003	0.07	0.000	0%
19	18.80	0.52	0.22	0.37	-0.001					0.88	0.53	0.30	-0.001	0.16	0.000	0%
20	19.35	0.63	0.25	0.44	0.007					0.88	0.63	0.38	0.006	0.24	0.001	0%
21	20.05	0.51	0.20	0.36	0.046					0.88	0.72	0.31	0.040	0.22	0.009	2%
LB	20.80	0.00	0.00		0.00		0.00		0.00	0.88	0.38	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.433</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
15m DS of heli. landing area

Meas. Start Time (MST):	14:15
Meas. End Time (MST):	14:46
Equipment:	ADV
Method:	Ice
River Condition:	Ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -1C



**Flow characteristics:**

Total Flow:	0.433	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.50	(m <sup>2</sup> )
Wetted Width:	9.80	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.17	(m/s)
Froude Number:	0.11	

**Logger Details:**

Transducer Reading (m):	Before: 0.448	After: 0.447
Water (°C):	0.1	0.0
Datalogger Clock:	13:53	15:05
Laptop Clock:	13:52	15:05
Battery (Main):	13.2	12.7
Battery:	Replaced	
Battery Serial #:	903001	1403002
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
SS3-04	1.212	101.377		100.165	100.165	Pipe 2m SE of logger
SS3-05			0.987	100.390	100.388	Pipe 5m E of logger
SS3-03			1.016	100.361	100.361	Pipe 5m N of logger
Water Level:	Cut		3.800	97.577	Time WL Surveyed: 14:57	
Temporary BM			3.570	97.807	0.000	
<b>Turn</b>						
Temporary BM	3.550	101.357		97.807		
Water Level:	Cut		3.779	97.578	Time WL Surveyed: 14:59	
SS3-03			0.997	100.360	100.361	Pipe 5m N of logger
SS3-05			0.968	100.389	100.388	Pipe 5m E of logger
SS3-04			1.192	100.165	100.165	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.578	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	97.130	-

**Field Personnel:**

SM, GG	Trip Date:	10-Dec-14	
Data Entry Personnel:	SM	Date:	10-Dec-14
Data Check Personnel:	MP	Date:	26-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: January 14, 2014  
 Site Visit Time (MST): 11:55



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.50	0.00	0.00		0.000		0.000		0.000	0.88	0.75	0.00	0.000	0.00	0.000	
1	3.00	0.60	0.45	0.53	0.027					0.88	1.38	0.15	0.024	0.21	0.005	1%
2	4.25	0.70	0.45	0.58	0.008					0.88	1.43	0.25	0.007	0.36	0.003	0%
3	5.85	0.60	0.45	0.53	0.061					0.88	1.40	0.15	0.054	0.21	0.011	2%
4	7.05	0.55	0.45	0.50	0.247					0.88	0.90	0.10	0.217	0.09	0.020	4%
5	7.65	0.63	0.45	0.54	0.136					0.88	0.68	0.18	0.120	0.12	0.015	3%
6	8.40	0.46	0.41	0.44	0.000					0.88	0.73	0.05	0.000	0.04	0.000	0%
7	9.10	0.78	0.45	0.62	0.214					0.88	0.70	0.33	0.188	0.23	0.044	8%
8	9.80	0.75	0.42	0.59	0.250					0.88	0.58	0.33	0.220	0.19	0.042	8%
9	10.25	0.70	0.44	0.57	0.221					0.88	0.75	0.26	0.194	0.20	0.038	7%
10	11.30	0.68	0.45	0.57	0.153					0.88	1.15	0.23	0.135	0.26	0.036	6%
11	12.55	0.70	0.55	0.63	0.114					0.88	1.30	0.15	0.100	0.20	0.020	4%
12	13.90	0.72	0.55	0.64	0.187					0.88	0.95	0.17	0.165	0.16	0.027	5%
13	14.45	0.78	0.53	0.66	0.159					0.88	0.63	0.25	0.140	0.16	0.022	4%
14	15.15	0.80	0.48	0.64	0.191					0.88	0.85	0.32	0.168	0.27	0.046	8%
15	16.15	0.83	0.45	0.64	0.166					0.88	0.58	0.38	0.146	0.22	0.032	6%
16	16.30	0.85	0.45	0.65	0.172					0.88	0.48	0.40	0.151	0.19	0.029	5%
17	17.10	0.85	0.45	0.65	0.163					0.88	0.85	0.40	0.143	0.34	0.049	9%
18	18.00	0.70	0.46	0.58	0.115					0.88	0.77	0.24	0.101	0.19	0.019	3%
19	18.65	0.67	0.45	0.56	0.187					0.88	0.70	0.22	0.165	0.15	0.025	5%
20	19.40	0.70	0.45	0.58	0.043					0.88	0.70	0.25	0.038	0.18	0.007	1%
21	20.05	0.68	0.45	0.57	0.164					0.88	0.95	0.23	0.144	0.22	0.032	6%
22	21.30	0.68	0.50	0.59	0.139					0.88	1.33	0.18	0.122	0.24	0.029	5%
23	22.70	0.57	0.48	0.53	0.058					0.88	1.30	0.09	0.051	0.12	0.006	1%
24	23.90	0.52	0.45	0.49	0.018					0.88	1.25	0.07	0.016	0.09	0.001	0%
25	25.20	0.38	0.33	0.36	0.000					0.88	1.05	0.05	0.000	0.05	0.000	0%
RR	26.00	0.00	0.00		0.00		0.00		0.00	0.88	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.554</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 7m US of PT

Meas. Start Time (MST):	12:20
Meas. End Time (MST):	13:00
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, -12C

**Flow characteristics:**

Total Flow:	0.554	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.66	(m <sup>2</sup> )
Wetted Width:	24.50	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:	0.09	

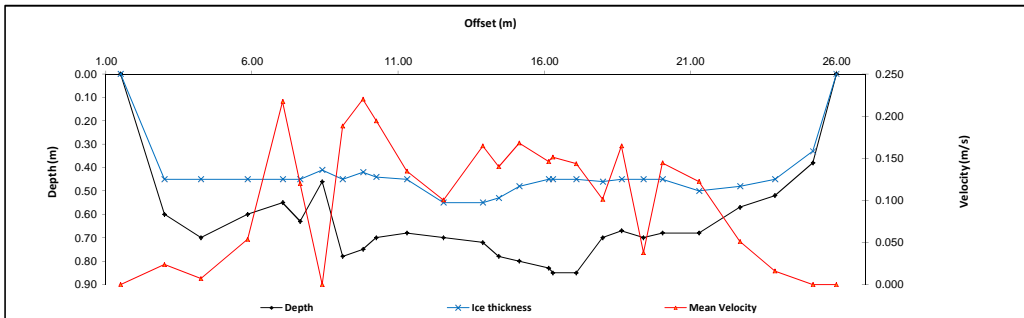
**Logger Details:**

	Before	After
Transducer Reading (m):	0.885	0.885
Water (°C):	0.3	0.3
Datalogger Clock:	12:00	13:09
Laptop Clock:	11:59	13:09
Battery (Main):	11.7	12.8
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Deseccant:	-	Good
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Ran ADV test, results good
- 4cm overflow on ice



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S54-3	0.867	100.775		99.908	99.908	Pipe 6m SE of Logger
S54-2			1.074	99.701	99.699	Pipe 2m SE of logger
S54-1			1.083	99.692	99.674	Pipe 3m SW of logger
Water Level:	Cut		3.162	97.613		Time WL Surveyed: 12:15
Temporary BM			3.210	97.565	0.000	
<b>Turn</b>						
Temporary BM	3.203	100.768		97.565		
Water Level:	Cut		3.156	97.612		Time WL Surveyed: 12:17
S54-1			1.077	99.691	99.674	Pipe 3m SW of logger
S54-2			1.068	99.700	99.699	Pipe 2m SE of logger
S54-3			0.860	99.908	99.908	Pipe 6m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S54-1	1.076	100.768		99.692		
Water Level:	Cut		3.156	97.612		Time WL Surveyed: 13:05
Water Level:	Cut		3.148	97.612		Time WL Surveyed: 13:06
S54-1	1.068	100.760		99.692		

**WL Survey Summary**

	Before	After
Average WL:	97.613	97.612
Closing Error:	0.000	-
WL Check:	0.001	0.000
Transducer Elevation	96.728	96.727

**Field Personnel:**

	TR, DW	Trip Date:	14-Jan-14
Data Entry Personnel:	TR	Date:	14-Jan-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: February 9, 2014  
 Site Visit Time (MST): 08:55



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.00	0.00	0.00		0.000				0.000	0.88	0.50	0.00	0.000	0.00	0.000	
1	4.00	0.50	0.38	0.44	0.060					0.88	0.90	0.12	0.053	0.11	0.006	2%
2	4.80	0.53	0.38	0.46	0.061					0.88	0.92	0.15	0.054	0.14	0.007	3%
3	5.85	0.57	0.39	0.48	0.064					0.88	0.95	0.18	0.052	0.17	0.016	6%
4	6.70	0.55	0.40	0.48	0.109					0.88	0.78	0.15	0.096	0.12	0.011	4%
5	7.40	0.58	0.43	0.51	0.112					0.88	0.68	0.15	0.099	0.10	0.010	4%
6	8.05	0.54	0.49	0.52	0.002					0.88	0.65	0.05	0.002	0.03	0.000	0%
7	8.70	0.60	0.45	0.53	0.092					0.88	0.70	0.15	0.081	0.11	0.009	3%
8	9.45	0.63	0.44	0.54	0.165					0.88	0.78	0.19	0.145	0.15	0.021	8%
9	10.25	0.66	0.44	0.55	0.172					0.88	0.83	0.22	0.151	0.18	0.027	11%
10	11.10	0.63	0.46	0.55	0.076					0.88	0.77	0.17	0.067	0.13	0.009	3%
11	11.80	0.62	0.48	0.55	0.121					0.88	1.00	0.14	0.106	0.14	0.015	6%
12	13.10	0.48	0.48	0.48	0.000					0.88	0.93	0.00	0.000	0.00	0.000	0%
13	13.65	0.57	0.47	0.52	0.001					0.88	0.85	0.10	0.001	0.09	0.000	0%
14	14.80	0.60	0.43	0.52	0.157					0.88	0.92	0.17	0.138	0.16	0.022	9%
15	15.50	0.62	0.39	0.51	0.194					0.88	0.65	0.23	0.171	0.15	0.026	10%
16	16.10	0.53	0.35	0.44	0.211					0.88	0.70	0.18	0.186	0.13	0.023	9%
17	16.90	0.63	0.38	0.51	0.186					0.88	0.70	0.25	0.164	0.18	0.029	11%
18	17.50	0.59	0.40	0.50	0.155					0.88	0.65	0.19	0.136	0.12	0.017	7%
19	18.20	0.50	0.43	0.47	0.040					0.88	0.60	0.07	0.035	0.04	0.001	1%
20	18.70	0.52	0.43	0.48	0.085					0.88	0.65	0.09	0.075	0.06	0.004	2%
LB	19.50	0.00	0.00		0.000		0.000		0.000	0.88	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.253</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m US of PT

Meas. Start Time (MST):	9:44
Meas. End Time (MST):	10:15
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, cold

**Flow characteristics:**

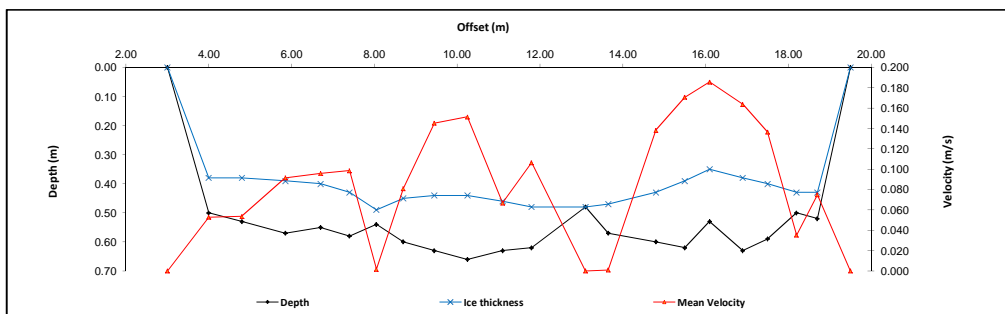
Total Flow:	0.253	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.29	(m <sup>2</sup> )
Wetted Width:	16.50	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.789	
Water (°C):	0.3	
Datalogger Clock:	08:58	
Laptop Clock:	08:58	
Battery (Main):	12.5	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S54-2	1.127	100.826		99.699	99.699	Pipe 2m SE of logger
S54-3			0.917	99.909	99.908	Pipe 6m SE of Logger
S54-1			1.127	99.699	99.674	Pipe 3m SW of logger
Water Level:	Cut		3.302	97.524	Time WL Surveyed: 9:30	
Temporary BM			3.136	97.690	0.000	
<b>Turn</b>						
Temporary BM	3.126	100.816		97.690		
Water Level:	Cut		3.296	97.520	Time WL Surveyed: 9:32	
S54-1			1.111	99.705	99.674	Pipe 3m SW of logger
S54-3			0.902	99.914	99.908	Pipe 6m SE of Logger
S54-2			1.115	99.701	99.699	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S54-1	1.111	100.810		99.699		
Water Level:	Cut		3.293	97.517	Time WL Surveyed: 10:19	
Water Level:	Cut		3.291	97.517	Time WL Surveyed: 10:21	
S54-1	1.109	100.808		99.699		

**WL Survey Summary**

	Before	After
Average WL:	97.522	97.517
Closing Error:	-0.002	-
WL Check:	0.004	0.000
Transducer Elevation	96.733	-

**Field Personnel:**

	MP, SG	Trip Date:	9-Feb-14
Data Entry Personnel:	SG	Date:	9-Feb-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: March 12, 2014  
 Site Visit Time (MST): 08:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	5.90	0.00	0.00		0.000		0.000		0.000	0.88	0.60	0.00	0.000	0.00	0.000	
1	7.10	0.50	0.30	0.40	0.070					0.88	0.85	0.20	0.062	0.17	0.010	8%
2	7.60	0.53	0.26	0.40	0.111					0.88	0.33	0.27	0.098	0.09	0.009	8%
3	7.75	0.55	0.25	0.40	0.106					0.88	0.38	0.30	0.093	0.11	0.010	10%
4	8.35	0.53	0.35	0.44	0.107					0.88	0.32	0.18	0.094	0.06	0.006	5%
5	8.40	0.56	0.28	0.42	0.154					0.88	0.28	0.28	0.136	0.08	0.010	10%
6	8.90	0.52	0.30	0.41	0.141					0.88	0.33	0.22	0.124	0.07	0.009	9%
7	9.05	0.52	0.33	0.43	0.116					0.88	0.30	0.19	0.102	0.06	0.006	6%
8	9.50	0.51	0.36	0.44	0.075					0.88	0.57	0.15	0.066	0.09	0.006	6%
9	10.20	0.00	0.00	0.00	0.000					0.88	0.70	0.00	0.000	0.00	0.000	0%
10	10.90	0.00	0.00	0.00	0.000					0.88	1.10	0.00	0.000	0.00	0.000	0%
11	12.40	0.59	0.42	0.51	0.053					0.88	1.15	0.17	0.047	0.20	0.009	9%
12	13.20	0.57	0.39	0.48	0.023					0.88	0.85	0.18	0.020	0.15	0.003	3%
13	14.10	0.52	0.35	0.44	0.059					0.88	0.68	0.17	0.052	0.11	0.006	6%
14	14.55	0.50	0.30	0.40	0.081					0.88	0.65	0.20	0.071	0.13	0.009	9%
15	15.40	0.45	0.35	0.40	0.014					0.88	0.77	0.10	0.012	0.08	0.001	1%
16	16.10	0.42	0.34	0.38	0.000					0.88	0.58	0.08	0.000	0.05	0.000	0%
17	16.55	0.42	0.35	0.39	0.000					0.88	0.47	0.07	0.000	0.03	0.000	0%
18	17.05	0.43	0.35	0.39	0.006					1.00	0.47	0.08	0.000	0.04	0.000	0%
19	17.50	0.43	0.35	0.39	-0.002					0.88	0.68	0.08	-0.002	0.05	0.000	0%
20	18.40	0.44	0.32	0.38	0.050					0.88	0.70	0.12	0.044	0.08	0.004	4%
21	18.90	0.40	0.28	0.34	0.044					0.88	0.52	0.12	0.039	0.06	0.002	2%
22	19.45	0.47	0.28	0.38	0.001					0.88	1.38	0.19	0.001	0.26	0.000	0%
23	21.65	0.40	0.29	0.35	0.016					0.88	1.53	0.11	0.014	0.17	0.002	2%
RB	22.50	0.00	0.00		0.000		0.000		0.000	0.88	0.43	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.103</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
4m US of FT

Meas. Start Time (MST):	8:38
Meas. End Time (MST):	9:24
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 0C

**Flow characteristics:**

Total Flow:	0.103	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.14	(m <sup>2</sup> )
Wetted Width:	16.60	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.04	

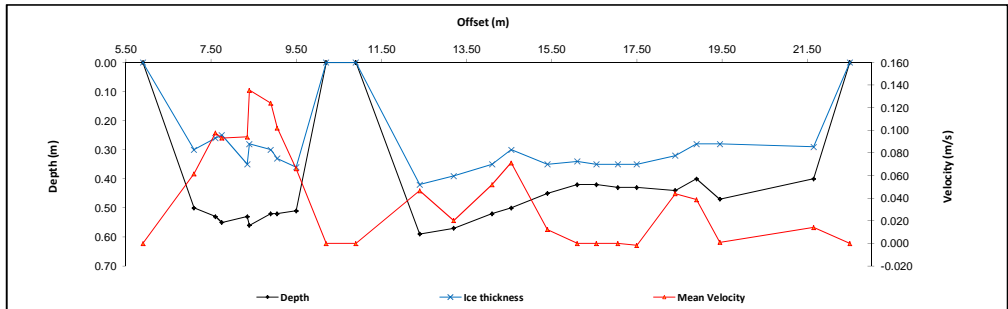
**Logger Details:**

	Before	After
Transducer Reading (m):	0.664	
Water (°C):	0.3	
Datalogger Clock:	08:02	
Laptop Clock:	08:01	
Battery (Main):	12.9	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Replaced
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- Trees have fallen near the station
- QAQC ADV test successful
- No effective flow at offsets 10.2 and 10.9m



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S54-3	0.902	100.810		99.908	99.908	Pipe 6m SE of Logger
S54-2			1.110	99.700	99.699	Pipe 2m SE of logger
S54-1			1.108	99.702	99.674	Pipe 3m SW of logger
Water Level:	Cut		3.430	97.380		<b>Time WL Surveyed:</b> 9:35
Temporary BM			3.196	97.614	0.000	
<b>Turn</b>						
Temporary BM	3.184	100.798		97.614		
Water Level:	Cut		3.420	97.378		<b>Time WL Surveyed:</b> 9:40
S54-1			1.098	99.700	99.674	Pipe 3m SW of logger
S54-2			1.100	99.698	99.699	Pipe 2m SE of logger
S54-3			0.890	99.908	99.908	Pipe 6m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					<b>Time WL Surveyed:</b>
Water Level:	Cut					<b>Time WL Surveyed:</b>

**WL Survey Summary**

	Before	After
Average WL:	97.379	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	96.715	-

**Field Personnel:**

	DW, MP	Trip Date:	12-Mar-14
Data Entry Personnel:	DW, MP	Date:	12-Mar-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: April 3, 2014  
 Site Visit Time (MST): 12:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	9.50	0.00	0.00		0.000				0.000	0.88	1.16	0.00	0.000	0.00	0.000	
1	11.82	0.32	0.28	0.30	0.010				0.88	1.60	0.04	0.009	0.06	0.001	0.000	6%
2	12.70	0.49	0.33	0.41	0.000				0.88	0.82	0.16	0.000	0.13	0.000	0.000	0%
3	13.46	0.34	0.29	0.32	0.005				0.88	0.76	0.05	0.004	0.04	0.000	0.000	2%
4	14.22	0.38	0.32	0.35	0.012				0.88	0.76	0.06	0.011	0.05	0.000	0.000	5%
5	14.97	0.44	0.25	0.35	0.060				0.88	0.69	0.19	0.053	0.13	0.007	0.007	75%
6	15.60	0.35	0.31	0.33	0.000				0.88	0.36	0.04	0.000	0.01	0.000	0.000	0%
7	15.68	0.36	0.28	0.32	0.001				0.88	0.40	0.08	0.001	0.03	0.000	0.000	0%
8	16.40	0.40	0.34	0.37	0.000				0.88	0.40	0.06	0.000	0.02	0.000	0.000	0%
9	16.48	0.40	0.33	0.37	0.004				0.88	0.35	0.07	0.004	0.02	0.000	0.000	1%
10	17.09	0.37	0.31	0.34	0.020				0.88	0.33	0.06	0.018	0.02	0.000	0.000	4%
11	17.15	0.39	0.32	0.36	0.010				0.88	0.31	0.07	0.009	0.02	0.000	0.000	2%
12	17.70	0.40	0.34	0.37	-0.001				0.88	0.31	0.06	-0.001	0.02	0.000	0.000	0%
13	17.76	0.39	0.33	0.36	0.000				0.88	0.26	0.06	0.000	0.02	0.000	0.000	0%
14	18.22	0.40	0.30	0.35	-0.001				0.88	0.27	0.10	-0.001	0.03	0.000	0.000	0%
15	18.30	0.40	0.28	0.34	0.022				0.88	0.30	0.12	0.019	0.04	0.001	0.001	7%
16	18.81	0.42	0.25	0.34	-0.001				0.88	0.26	0.17	-0.001	0.04	0.000	0.000	0%
17	18.82	0.39	0.25	0.32	-0.002				0.88	0.26	0.17	-0.001	0.04	0.000	0.000	0%
18	18.82	0.39	0.25	0.32	-0.002				0.88	0.26	0.17	-0.001	0.04	0.000	0.000	0%
18	18.96	0.40	0.24	0.32	0.001				0.88	0.44	0.16	0.001	0.07	0.000	0.000	1%
19	19.70	0.37	0.25	0.31	-0.003				0.88	0.77	0.12	-0.003	0.09	0.000	0.000	-3%
20	20.50	0.20	0.20	0.20	0.000				0.88	0.65	0.00	0.000	0.00	0.000	0.000	0%
RB	21.00	0.00	0.00						0.88	0.25	0.00	0.000	0.00	0.000	0.000	
<b>Total Flow</b>														<b>0.009</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 2m US of PT

Mess. Start Time (MST):	13:30
Mess. End Time (MST):	14:03
Equipment:	ADC
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, -3C

**Flow characteristics:**

Total Flow:	0.009	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	0.86	(m <sup>2</sup> )
Wetted Width:	11.50	(m)
Hydraulic Depth:	0.07	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.01	

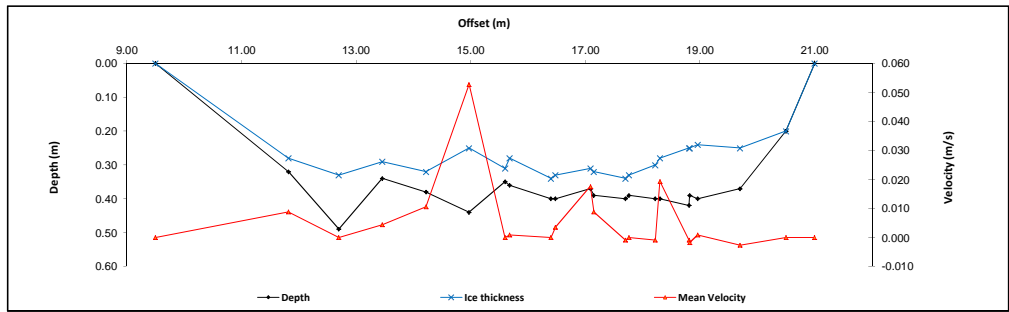
**Logger Details:**

	Before	After
Transducer Reading (m):	0.634	
Water (°C):	0.5	
Datalogger Clock:	12:46	
Laptop Clock:	12:46	
Battery (Main):	15.1	
Battery:	Good	
Battery Serial #:	-	
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- a large negative and large positive flow velocity were excluded and estimated as zero during the flow mmt, due to extreme ice effects on the very small effective water column.
- low mmt should be considered estimated and poor



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S54-2	1.181	100.880		99.699	99.699	Pipe 2m SE of logger
S54-1			1.183	99.697	99.674	Pipe 3m SW of logger
S54-3			0.974	99.906	99.908	Pipe 6m SE of Logger
Water Level:	Cut		3.541	97.339	Time WL Surveyed: 14:06	
Temporary BM			3.277	97.603	0.000	
<b>Turn</b>						
Temporary BM	3.245	100.848		97.603		
Water Level:	Cut		3.506	97.342	Time WL Surveyed: 14:10	
S54-3			0.941	99.907	99.908	Pipe 6m SE of Logger
S54-1			1.149	99.699	99.674	Pipe 3m SW of logger
S54-2			1.147	99.701	99.699	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.341	-
Closing Error:	-0.002	-
WL Check:	0.003	-
Transducer Elevation	96.707	-

**Field Personnel:**

	MP, CJ	Trip Date:	3-Apr-14
Data Entry Personnel:	MP, CJ	Date:	3-Apr-14
Data Check Personnel:	DW	Date:	23-Apr-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River

UTM Location: 395657 E, 6302612 N

Site Visit Date: May 22, 2014

Site Visit Time (MST): 14:30



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 15m upstream of PT	
Meas. Start Time (MST):	15:38
Meas. End Time (MST):	15:50
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 15

<b>Flow characteristics:</b>		
Total Flow:	14.0	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	20.20	(m <sup>2</sup> )
Wetted Width:	26.04	(m)
Hydraulic Depth:	0.78	(m)
Mean Velocity:	0.69	(m/s)
Froude Number:	0.25	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	1.407	1.406
Water (°C):	9.5	9.7
Datalogger Clock:	14:33	16:13
Laptop Clock:	14:33	16:13
Battery (Main):	12.6	12.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-solar panel cable found pulled from solar controller by wildlife, reconnected

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	27.60	
Serial Number:	1802		Salinity (ppt):	-		RB:	0.40	
Firmware Version:	3.5		Magnetic Declination (°):	14.33				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	13.0				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical Beam		1	26.05	20.21	0.696	14.072	0.59%
Coordinate System:	ENU		2	25.85	20.00	0.685	13.692	-2.12%
Left Method:	Sloped Bank		3	25.98	20.23	0.698	14.114	0.89%
Right Method:	Sloped Bank		4	26.29	20.36	0.691	14.078	0.64%
Top Fit Type:	Power Fit							
Bottom Fit Type:	Power Fit		<b>Mean:</b>	26.04	20.20	0.693	<b>14.0</b>	
			<b>SD:</b>	0.16	0.13	0.005	0.172	
			<b>COV:</b>	0.01	0.01	0.007	0.012	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S54-02	0.961	100.660		99.699	99.699	Pipe 2m SE of logger
S54-01			0.957	99.703	99.674	Pipe 3m SW of logger
S54-03			0.752	99.908	99.908	Pipe 6m SE of Logger
Water Level:	Cut		2.529	98.131	<b>Time WL Surveyed:</b>	14:48
Temporary BM			2.206	98.454	0.000	-
<b>Turn</b>						
Temporary BM	2.187	100.641		98.454		-
Water Level:	Cut		2.510	98.131	<b>Time WL Surveyed:</b>	14:50
S54-03			0.731	99.910	99.908	Pipe 6m SE of Logger
S54-01			0.937	99.704	99.674	Pipe 3m SW of logger
S54-02			0.939	99.702	99.699	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S54-01	0.937	100.639		99.702		
Water Level:	Cut		2.504	98.135	<b>Time WL Surveyed:</b>	16:09
Water Level:	Cut		2.482	98.134	<b>Time WL Surveyed:</b>	16:11
S54-01	0.914	100.616		99.702		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	98.131	98.135
Closing Error:	-0.003	-
WL Check:	0.000	0.001
Transducer Elevation	96.724	96.729

<b>Field Personnel:</b>	TR, CJ	Trip Date:	22-May-14
Data Entry Personnel:	CJ	Date:	22-May-14
Data Check Personnel:	CJ	Date:	16-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: June 18, 2014  
 Site Visit Time (MST): 07:30



Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	46.60	0.00	0.00		0.000		0.000		0.000	1.00	0.80	0.00	0.000	0.00	0.000	
1	45.00	0.68		0.41	0.456					1.00	1.55	0.68	0.456	1.05	0.481	4%
2	43.50	0.69		0.41	0.402					1.00	1.50	0.69	0.402	1.04	0.416	4%
3	42.00	0.75		0.45	0.465					1.00	1.50	0.75	0.465	1.13	0.523	5%
4	40.50	0.97				0.78	0.266	0.19	0.607	1.00	1.50	0.97	0.437	1.46	0.635	6%
5	39.00	1.00				0.80	0.487	0.20	0.662	1.00	1.50	1.00	0.575	1.50	0.862	8%
6	37.50	0.98				0.78	0.505	0.20	0.678	1.00	1.50	0.98	0.592	1.47	0.870	8%
7	36.00	1.00				0.80	0.346	0.20	0.545	1.00	1.50	1.00	0.446	1.50	0.668	6%
8	34.50	1.04				0.83	0.580	0.21	0.685	1.00	1.50	1.04	0.633	1.56	0.987	9%
9	33.00	1.02				0.82	0.430	0.20	0.659	1.00	1.25	1.02	0.545	1.28	0.694	6%
10	32.00	1.05				0.84	0.462	0.21	0.650	1.00	1.00	1.05	0.556	1.05	0.584	5%
11	31.00	1.00				0.80	0.459	0.20	0.535	1.00	1.00	1.00	0.497	1.00	0.497	5%
12	30.00	1.02				0.82	0.337	0.20	0.586	1.00	1.00	1.02	0.462	1.02	0.471	4%
13	29.00	0.95				0.76	0.409	0.19	0.590	1.00	1.00	0.95	0.500	0.95	0.475	4%
14	28.00	0.96				0.77	0.528	0.19	0.563	1.00	1.00	0.96	0.546	0.96	0.524	5%
15	27.00	0.90				0.72	0.501	0.18	0.493	1.00	1.00	0.90	0.497	0.90	0.447	4%
16	26.00	0.88				0.70	0.503	0.18	0.656	1.00	1.25	0.88	0.580	1.10	0.637	6%
17	24.50	0.67	0.40	0.390						1.00	1.50	0.67	0.390	1.01	0.392	4%
18	23.00	0.58	0.35	0.415						1.00	1.50	0.58	0.415	0.87	0.361	3%
19	21.50	0.63	0.38	0.240						1.00	1.50	0.63	0.240	0.95	0.227	2%
20	20.00	0.52	0.31	0.323						1.00	1.10	0.52	0.323	0.57	0.185	2%
RB	19.30	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>10.9</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 12m US of PT

Meas. Start Time (MST):	8:40
Meas. End Time (MST):	9:39
Equipment:	ADV
Method:	Fishcat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 21 C

**Flow characteristics:**

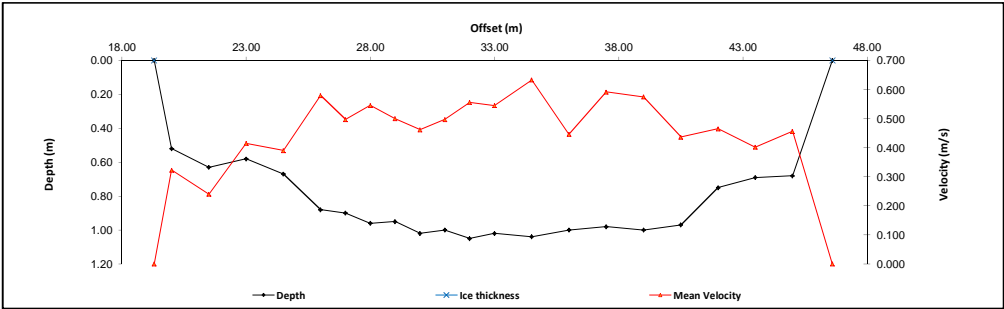
Total Flow:	10.9	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	22.35	(m <sup>2</sup> )
Wetted Width:	1.20	(m)
Hydraulic Depth:	18.62	(m)
Mean Velocity:	0.49	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.351	1.394
Water (°C):	15.0	15.5
Datalogger Clock:	07:41	09:58
Laptop Clock:	07:41	09:58
Battery (Main):	13.1	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	250997	278500
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S54-2	0.826	100.525		99.699	99.699	Pipe 2m SE of logger
S54-1			0.823	99.702	99.674	Pipe 3m SW of logger
S54-3			0.617	99.908	99.908	Pipe 6m SE of Logger
Water Level:	Cut		2.423	98.102	Time WL Surveyed: 8:23	
Temporary BM			0.885	99.640	0.000	
<b>Turn</b>						
Temporary BM	0.870	100.510		99.640	-	
Water Level:	Cut		2.411	98.099	Time WL Surveyed: 8:25	
S54-3			0.603	99.907	99.908	Pipe 6m SE of Logger
S54-1			0.807	99.703	99.674	Pipe 3m SW of logger
S54-2			0.812	99.698	99.699	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S54-2	0.812	100.511		99.699		
Water Level:	Cut		2.415	98.096	Time WL Surveyed: 9:50	
Water Level:	Cut		2.401	98.095	Time WL Surveyed: 9:51	
S54-2	0.797	100.496		99.699		

**WL Survey Summary**

	Before	After
Average WL:	98.101	98.096
Closing Error:	0.001	-
WL Check:	0.003	0.001
Transducer Elevation	96.750	96.702

**Field Personnel:**

Field Personnel:	DW, MP	Trip Date:	18-Jun-14
Data Entry Personnel:	DW, MP	Date:	18-Jun-14
Data Check Personnel:	DW	Date:	17-Dec-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: August 13, 2014  
 Site Visit Time (MST): 10:59

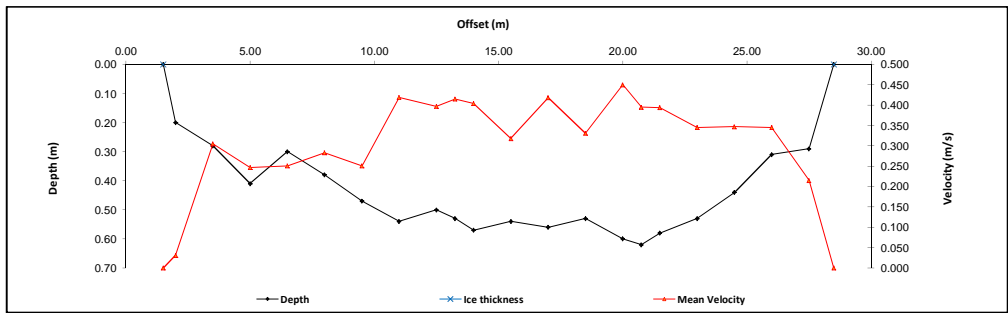


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.50	0.00	0.00		0.000				0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	2.00	0.20		0.12	0.031					1.00	1.00	0.20	0.031	0.20	0.006	0%
2	3.50	0.28		0.17	0.305					1.00	1.50	0.28	0.305	0.42	0.128	3%
3	5.00	0.41		0.25	0.247					1.00	1.50	0.41	0.247	0.62	0.152	4%
4	6.50	0.30		0.18	0.251					1.00	1.50	0.30	0.251	0.45	0.113	3%
5	8.00	0.38		0.23	0.283					1.00	1.50	0.38	0.283	0.57	0.161	4%
6	9.50	0.47		0.28	0.251					1.00	1.50	0.47	0.251	0.71	0.177	4%
7	11.00	0.54		0.32	0.419					1.00	1.50	0.54	0.419	0.81	0.339	8%
8	12.50	0.50		0.30	0.397					1.00	1.13	0.50	0.397	0.56	0.223	5%
9	13.25	0.53		0.32	0.415					1.00	0.75	0.53	0.415	0.40	0.165	4%
10	14.00	0.57		0.34	0.404					1.00	1.13	0.57	0.404	0.64	0.259	6%
11	15.50	0.54		0.32	0.318					1.00	1.50	0.54	0.318	0.81	0.258	6%
12	17.00	0.56		0.34	0.418					1.00	1.50	0.56	0.418	0.84	0.351	9%
13	18.50	0.53		0.32	0.331					1.00	1.50	0.53	0.331	0.80	0.263	6%
14	20.00	0.60		0.36	0.450					1.00	1.13	0.60	0.450	0.68	0.304	7%
15	20.75	0.62		0.37	0.395					1.00	0.75	0.62	0.395	0.47	0.184	5%
16	21.50	0.58		0.35	0.394					1.00	1.13	0.58	0.394	0.65	0.257	6%
17	23.00	0.53		0.32	0.345					1.00	1.50	0.53	0.345	0.80	0.274	7%
18	24.50	0.44		0.26	0.347					1.00	1.50	0.44	0.347	0.66	0.229	6%
19	26.00	0.31		0.19	0.345					1.00	1.50	0.31	0.345	0.47	0.160	4%
20	27.50	0.29		0.17	0.215					1.00	1.25	0.29	0.215	0.36	0.078	2%
LB	28.50	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>4.08</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 12 m upstream of station

Meas. Start Time (MST):	11:49
Meas. End Time (MST):	12:14
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 25 C



**Flow characteristics:**

Total Flow:	4.08	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.89	(m <sup>2</sup> )
Wetted Width:	1.25	(m)
Hydraulic Depth:	9.51	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.037	1.036
Water (°C):	19.6	20.1
Datalogger Clock:	11:02	12:34
Laptop Clock:	11:02	12:34
Battery (Main):	13.8	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- downloaded program from logger
- destroyed bm1
- installed bm4, lag bolt in conifer 5m NW of logger

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S54-2	1.069	100.768		99.699	99.699	Pipe 2m SE of logger
S54-3			0.862	99.906	99.908	Pipe 6m SE of Logger
S54-4			0.708	100.060		tree bolt 5m NW of logger
Water Level:	Cut		3.019	97.749	Time WL Surveyed:	11:35
Temporary BM			2.755	98.013	0.000	-
<b>Turn</b>						
Temporary BM	2.732	100.745		98.013		-
Water Level:	Cut		2.997	97.748	Time WL Surveyed:	11:36
S54-4			0.681	100.064		tree bolt 5m NW of logger
S54-3			0.833	99.912	99.908	Pipe 6m SE of Logger
S54-2			1.042	99.703	99.699	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S54-2	1.035	100.736		99.701		
Water Level:	Cut		2.986	97.750	Time WL Surveyed:	12:26
Water Level:	Cut		3.009	97.752	Time WL Surveyed:	12:30
S54-2	1.060	100.761		99.701		

**WL Survey Summary**

	Before	After
Average WL:	97.749	97.751
Closing Error:	-0.004	-
WL Check:	0.001	-0.002
Transducer Elevation	96.712	96.715

**Field Personnel:**

		Trip Date:	
Data Entry Personnel:	CJ, GG	Date:	13-Aug-14
Data Check Personnel:	GG	Date:	13-Aug-14
Entered Digitally in the Field:	CJ	Date:	25-Aug-14
	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: September 15, 2014  
 Site Visit Time (MST): 07:48

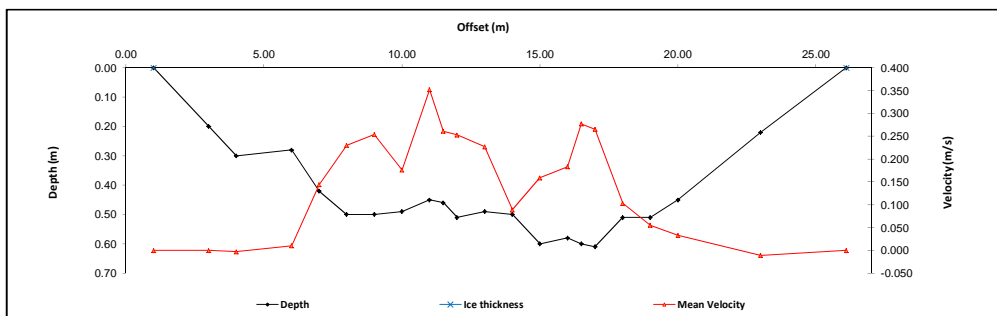


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	1.00	0.00	0.000	0.00	0.000	
1	3.00	0.20		0.12	0.000					1.00	1.50	0.20	0.000	0.30	0.000	0%
2	4.00	0.30		0.18	-0.003					1.00	1.50	0.30	-0.003	0.45	-0.001	0%
3	6.00	0.28		0.17	0.010					1.00	1.50	0.28	0.010	0.42	0.004	0%
4	7.00	0.42		0.25	0.144					1.00	1.00	0.42	0.144	0.42	0.060	5%
5	8.00	0.50		0.30	0.230					1.00	1.00	0.50	0.230	0.50	0.115	9%
6	9.00	0.50		0.30	0.254					1.00	1.00	0.50	0.254	0.50	0.127	10%
7	10.00	0.49		0.29	0.176					1.00	1.00	0.49	0.176	0.49	0.086	7%
8	11.00	0.45		0.27	0.352					1.00	0.75	0.45	0.352	0.34	0.119	9%
9	11.50	0.46		0.28	0.261					1.00	0.50	0.46	0.261	0.23	0.060	5%
10	12.00	0.51		0.31	0.253					1.00	0.75	0.51	0.253	0.38	0.097	7%
11	13.00	0.49		0.29	0.227					1.00	1.00	0.49	0.227	0.49	0.111	8%
12	14.00	0.50		0.30	0.089					1.00	1.00	0.50	0.089	0.50	0.045	3%
13	15.00	0.60		0.36	0.159					1.00	1.00	0.60	0.159	0.60	0.095	7%
14	16.00	0.58		0.35	0.183					1.00	0.75	0.58	0.183	0.44	0.080	6%
15	16.50	0.60		0.36	0.277					1.00	0.50	0.60	0.277	0.30	0.083	6%
16	17.00	0.61		0.37	0.265					1.00	0.75	0.61	0.265	0.46	0.121	9%
17	18.00	0.51		0.31	0.103					1.00	1.00	0.51	0.103	0.51	0.053	4%
18	19.00	0.51		0.31	0.055					1.00	1.00	0.51	0.055	0.51	0.028	2%
19	20.00	0.45		0.27	0.033					1.00	2.00	0.45	0.033	0.90	0.030	2%
20	23.00	0.22		0.13	-0.011					1.00	3.05	0.22	-0.011	0.67	-0.007	-1%
LB	26.10	0.00	0.00		0.00		0.00		0.00	1.00	1.55	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.31</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
15m upstream of PT

Meas. Start Time (MST):	8:20
Meas. End Time (MST):	8:50
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10C



**Flow characteristics:**

Total Flow:	1.31	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.40	(m <sup>2</sup> )
Wetted Width:	25.10	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.801	0.801
Water (°C):	8.2	8.2
Datalogger Clock:	07:50	08:58
Laptop Clock:	07:50	08:57
Battery (Main):	12.8	13.2
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-ADV test complete, results good

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S54-02	0.842	100.541		99.699	99.699	Pipe 2m SE of logger
S54-04			0.479	100.062	100.063	Pipe 6m SE of Logger
S54-03			0.633	99.908	99.908	Pipe 6m SE of Logger
Water Level:	Cut		3.028	97.513		Time WL Surveyed: 8:12
Temporary BM			0.633	99.908	0.000	
Turn						
Temporary BM	0.646	100.554		99.908		
Water Level:	Cut		3.045	97.509		Time WL Surveyed: 8:06
S54-03			0.646	99.908	99.908	Pipe 6m SE of Logger
S54-04			0.493	100.061	100.063	Pipe 6m SE of Logger
S54-02			0.855	99.699	99.699	Pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S54-02	0.842	100.541		99.699		
Water Level:	Cut		3.025	97.516		Time WL Surveyed: 8:53
Water Level:	Cut		3.007	97.516		Time WL Surveyed: 8:55
S54-02	0.824	100.523		99.699		

**WL Survey Summary**

	Before	After
Average WL:	97.511	97.516
Closing Error:	0.000	-
WL Check:	0.004	0.000
Transducer Elevation	96.710	96.715

**Field Personnel:**

	MP, TR	Trip Date:	15-Sep-14
Data Entry Personnel:	MP	Date:	15-Sep-14
Data Check Personnel:	MP	Date:	17-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: October 17, 2014  
 Site Visit Time (MST): 13:55

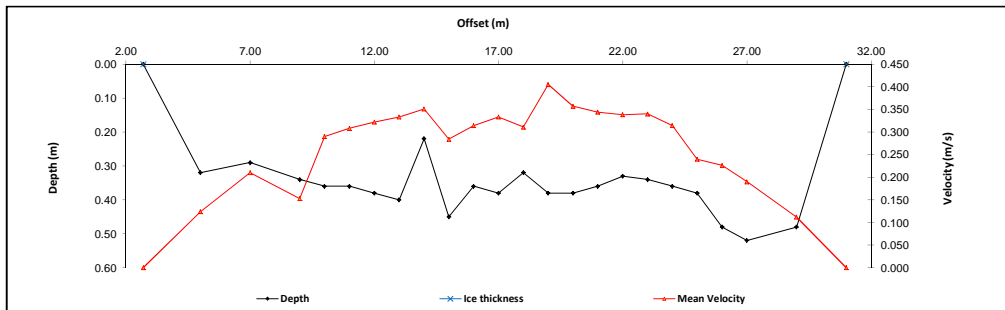


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	31.00	0.00	0.00		0.000				0.000	1.00	1.00	0.00	0.000	0.00	0.000	
1	29.00	0.48		0.29	0.112					1.00	2.00	0.48	0.112	0.96	0.108	4%
2	27.00	0.52		0.31	0.190					1.00	1.50	0.52	0.190	0.78	0.148	6%
3	26.00	0.48		0.29	0.226					1.00	1.00	0.48	0.226	0.48	0.108	4%
4	25.00	0.38		0.23	0.240					1.00	1.00	0.38	0.240	0.38	0.091	4%
5	24.00	0.36		0.22	0.314					1.00	1.00	0.36	0.314	0.36	0.113	5%
6	23.00	0.34		0.20	0.340					1.00	1.00	0.34	0.340	0.34	0.116	5%
7	22.00	0.33		0.20	0.338					1.00	1.00	0.33	0.338	0.33	0.112	4%
8	21.00	0.36		0.22	0.344					1.00	1.00	0.36	0.344	0.36	0.124	5%
9	20.00	0.38		0.23	0.357					1.00	1.00	0.38	0.357	0.38	0.136	5%
10	19.00	0.38		0.23	0.405					1.00	1.00	0.38	0.405	0.38	0.154	6%
11	18.00	0.32		0.19	0.311					1.00	1.00	0.32	0.311	0.32	0.100	4%
12	17.00	0.38		0.23	0.333					1.00	1.00	0.38	0.333	0.38	0.127	5%
13	16.00	0.36		0.22	0.314					1.00	1.00	0.36	0.314	0.36	0.113	5%
14	15.00	0.45		0.27	0.284					1.00	1.00	0.45	0.284	0.45	0.128	5%
15	14.00	0.22		0.13	0.351					1.00	1.00	0.22	0.351	0.22	0.077	3%
16	13.00	0.40		0.24	0.333					1.00	1.00	0.40	0.333	0.40	0.133	5%
17	12.00	0.38		0.23	0.322					1.00	1.00	0.38	0.322	0.38	0.122	5%
18	11.00	0.36		0.22	0.308					1.00	1.00	0.36	0.308	0.36	0.111	4%
19	10.00	0.36		0.22	0.290					1.00	1.00	0.36	0.290	0.36	0.104	4%
20	9.00	0.34		0.20	0.153					1.00	1.50	0.34	0.153	0.51	0.078	3%
21	7.00	0.29		0.17	0.210					1.00	2.00	0.29	0.210	0.58	0.122	5%
22	5.00	0.32		0.19	0.124					1.00	2.15	0.32	0.124	0.69	0.085	3%
LB	2.70	0.00	0.00		0.00		0.00		0.00	1.00	1.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.51</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
40m upstream of station

Meas. Start Time (MST):	14:22
Meas. End Time (MST):	14:43
Equipment:	ADV
Method:	Wading
River Condition:	Slow flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 12C



**Flow characteristics:**

Total Flow:	2.51	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.76	(m <sup>2</sup> )
Wetted Width:	28.30	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.631	0.631
Water (°C):	3.3	3.4
Datalogger Clock:	14:00	14:48
Laptop Clock:	13:59	14:47
Battery (Main):	14.1	14.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	-
Vent Tube Deseccant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S54-03	0.743	100.651		99.908	99.908	Pipe 6m SE of Logger
S54-02			0.949	99.702	99.699	Pipe 2m SE of logger
S54-04			0.588	100.063	100.063	Lag bolt in tree
Water Level:	Cut		3.029	97.622	Time WL Surveyed: 14:09	
Temporary BM			2.573	98.078	0.000	-
<b>Turn</b>						
Temporary BM	2.561	100.639		98.078	-	
Water Level:	Cut		3.019	97.620	Time WL Surveyed: 14:11	
S54-04			0.577	100.062	100.063	Lag bolt in tree
S54-02			0.939	99.700	99.699	Pipe 2m SE of logger
S54-03			0.733	99.906	99.908	Pipe 6m SE of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S54-02	0.939	100.639		99.700		
Water Level:	Cut		3.005	97.618	Time WL Surveyed: 14:50	
Water Level:	Cut		3.005	97.618	Time WL Surveyed: 14:52	
S54-02	0.923	100.623		99.700		

**WL Survey Summary**

	Before	After
Average WL:	97.621	97.618
Closing Error:	0.002	-
WL Check:	0.002	0.000
Transducer Elevation	96.990	96.987

**Field Personnel:**

	DW, MP	Trip Date:	17-Oct-14
Data Entry Personnel:	DW, MP	Date:	17-Oct-14
Data Check Personnel:	MP	Date:	5-Nov-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S54 Dunkirk River  
 UTM Location: 395657 E, 6302612 N

Site Visit Date: December 5, 2014  
 Site Visit Time (MST): 09:45

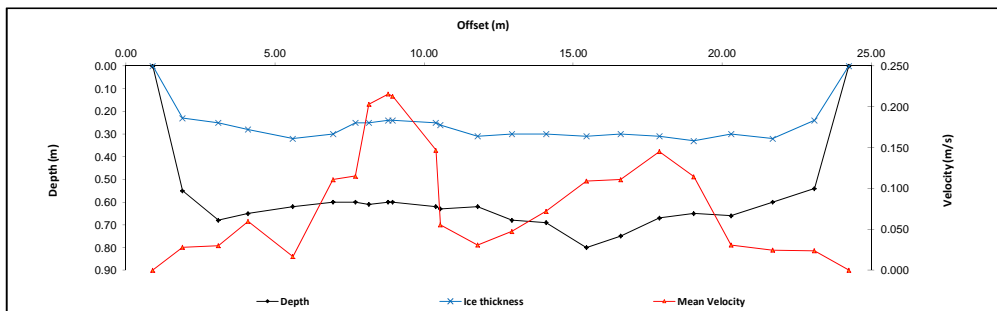


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.90	0.00	0.00		0.000		0.000		0.000	0.88	0.50	0.00	0.000	0.00	0.000	
1	1.90	0.55	0.23	0.39	0.032					0.88	1.10	0.32	0.028	0.35	0.010	2%
2	3.10	0.68	0.25	0.47	0.034					0.88	1.10	0.43	0.030	0.47	0.014	2%
3	4.10	0.65	0.28	0.47	0.068					0.88	1.25	0.37	0.060	0.46	0.028	4%
4	5.60	0.62	0.32	0.47	0.019					0.88	1.43	0.30	0.017	0.43	0.007	1%
5	6.95	0.60	0.30	0.45	0.126					0.88	1.05	0.30	0.111	0.32	0.035	5%
6	7.70	0.60	0.25	0.43	0.131					0.88	0.60	0.35	0.115	0.21	0.024	4%
7	8.15	0.61	0.25	0.43	0.231					0.88	0.55	0.36	0.203	0.20	0.040	6%
8	8.80	0.60	0.24	0.42	0.245					0.88	0.40	0.36	0.216	0.14	0.031	5%
9	8.95	0.60	0.24	0.42	0.242					0.88	0.80	0.36	0.213	0.29	0.061	10%
10	10.40	0.62	0.25	0.44	0.167					0.88	0.80	0.37	0.147	0.30	0.044	7%
11	10.55	0.63	0.26	0.45	0.063					0.88	0.70	0.37	0.055	0.26	0.014	2%
12	11.80	0.62	0.31	0.47	0.035					0.88	1.20	0.31	0.031	0.37	0.011	2%
13	12.95	0.68	0.30	0.49	0.054					0.88	1.15	0.38	0.048	0.44	0.021	3%
14	14.10	0.69	0.30	0.50	0.082					0.88	1.25	0.39	0.072	0.49	0.035	5%
15	15.45	0.80	0.31	0.56	0.124					0.88	1.25	0.49	0.109	0.61	0.067	10%
16	16.60	0.75	0.30	0.53	0.126					0.88	1.23	0.45	0.111	0.55	0.061	9%
17	17.90	0.67	0.31	0.49	0.165					0.88	1.23	0.36	0.145	0.44	0.064	10%
18	19.05	0.65	0.33	0.49	0.130					0.88	1.20	0.32	0.114	0.38	0.044	7%
19	20.30	0.66	0.30	0.48	0.035					0.88	1.33	0.36	0.031	0.48	0.015	2%
20	21.70	0.60	0.32	0.46	0.028					0.88	1.40	0.28	0.025	0.39	0.010	1%
21	23.10	0.54	0.24	0.39	0.027					0.88	1.28	0.30	0.024	0.38	0.009	1%
RB	24.25	0.00	0.00		0.000		0.000		0.000	0.88	0.57	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.645</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
4m US of station

Meas. Start Time (MST):	10:30
Meas. End Time (MST):	10:50
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, light snow, -10C



**Flow characteristics:**

Total Flow:	0.645	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.96	(m <sup>2</sup> )
Wetted Width:	23.35	(m)
Hydraulic Depth:	0.34	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.563	0.562
Water (°C):	0.1	0.1
Datalogger Clock:	09:48	10:58
Laptop Clock:	09:48	10:58
Battery (Main):	12.5	12.9
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
SS4-04	0.414	100.477		100.063	100.063	Pipe 6m SE of Logger
SS4-02			0.775	99.702	99.699	Pipe 2m SE of logger
SS4-03			0.567	99.910	99.908	Pipe 6m SE of Logger
<b>Water Level:</b>						
			2.928	97.549		<b>Time WL Surveyed:</b> 10:04
Temporary BM			0.567	99.910	0.000	
<b>Turn</b>						
Temporary BM	0.551	100.461		99.910		
Water Level:			2.915	97.546		<b>Time WL Surveyed:</b> 10:05
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
SS4-02	0.760	100.462		99.702		
Water Level:			2.915	97.547		<b>Time WL Surveyed:</b> 10:54
Water Level:			2.900	97.548		<b>Time WL Surveyed:</b> 10:56
SS4-02	0.746	100.448		99.702		

**WL Survey Summary**

	Before	After
Average WL:	97.548	97.548
Closing Error:	0.002	-
WL Check:	0.003	-0.001
Transducer Elevation	96.985	96.986

**Field Personnel:**

TR, CJ	Trip Date:	5-Dec-14	
Data Entry Personnel:	CJ	Date:	5-Dec-14
Data Check Personnel:	MP	Date:	12-Dec-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: January 10, 2014  
 Site Visit Time (MST): 13:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	9.70	0.00	0.00		0.000				0.000	0.88	0.33	0.00	0.000	0.00	0.000	
1	10.35	0.50	0.43	0.47	0.230					0.88	0.60	0.07	0.202	0.04	0.009	2%
2	10.90	0.51	0.43	0.47	0.211					0.88	0.48	0.08	0.186	0.04	0.007	1%
3	11.30	0.49	0.43	0.46	0.135					0.88	0.50	0.06	0.119	0.03	0.004	1%
4	11.90	0.58	0.45	0.52	0.128					0.88	0.55	0.13	0.113	0.07	0.008	2%
5	12.40	0.51	0.45	0.48	0.000					0.88	0.55	0.06	0.000	0.03	0.000	0%
6	13.00	0.61	0.42	0.52	0.136					0.88	0.65	0.19	0.120	0.12	0.015	3%
7	13.70	0.70	0.36	0.53	0.120					0.88	0.65	0.34	0.106	0.22	0.023	5%
8	14.30	0.80	0.36	0.58	0.181					0.88	0.40	0.44	0.159	0.18	0.028	6%
9	14.50	0.80	0.36	0.58	0.187					0.88	0.38	0.44	0.165	0.17	0.027	6%
10	15.05	0.79	0.41	0.60	0.202					0.88	0.70	0.38	0.178	0.27	0.047	10%
11	15.90	0.72	0.42	0.57	0.160					0.88	0.75	0.30	0.141	0.23	0.032	6%
12	16.55	0.74	0.45	0.60	0.121					0.88	0.65	0.29	0.106	0.19	0.020	4%
13	17.20	0.83	0.44	0.64	0.130					0.88	0.57	0.39	0.114	0.22	0.026	5%
14	17.70	0.91	0.44	0.68	0.205					0.88	0.47	0.47	0.180	0.22	0.040	8%
15	18.15	0.95	0.43	0.69	0.185					0.88	0.48	0.52	0.163	0.25	0.040	8%
16	18.65	1.09	0.44	0.77	0.155					0.88	0.48	0.65	0.136	0.31	0.042	9%
17	19.10	1.08	0.43	0.76	0.096					0.88	0.48	0.65	0.084	0.31	0.026	5%
18	19.60	0.99	0.42	0.71	0.111					0.88	0.55	0.57	0.098	0.31	0.031	6%
19	20.20	0.98	0.40	0.69	0.154					0.88	0.65	0.58	0.136	0.38	0.051	10%
20	20.90	0.98	0.43	0.71	0.042					0.88	0.60	0.55	0.037	0.33	0.012	2%
21	21.40	0.65	0.37	0.51	0.028					0.88	0.55	0.28	0.025	0.15	0.004	1%
LB	22.00	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.492</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 across from station

Mess. Start Time (MST):	13:23
Mess. End Time (MST):	13:49
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Light snow, calm, -12C

**Flow characteristics:**

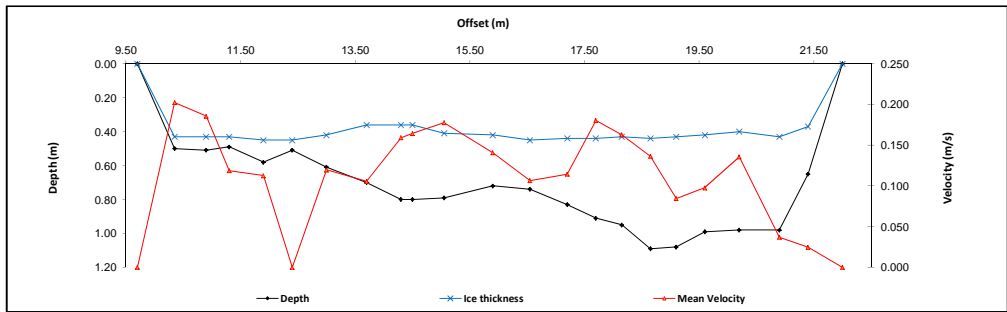
Total Flow:	0.492	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.07	(m²)
Wetted Width:	12.30	(m)
Hydraulic Depth:	0.33	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:	0.07	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.692	0.692
Water (°C):	0.3	0.3
Datalogger Clock:	12:56	14:02
Laptop Clock:	12:54	14:00
Battery (Main):	12.8	14.5
Battery:	-	Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	-	Good
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S55-1	1.139	101.139		100.000	100.000	Bolt in Spruce tree
S55-5			1.327	99.812	99.810	3/4" Pipe 4m N of logger
S55-6			0.861	100.278	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut		4.184	96.955	Time WL Surveyed: 13:00	
Temporary BM			4.047	97.092	0.000	
<b>Turn</b>						
Temporary BM	4.029	101.121		97.092	-	
Water Level:	Cut		4.163	96.958	Time WL Surveyed: 13:02	
S55-6			0.846	100.275	100.275	3/4" pipe 2m SE of logger
S55-5			1.313	99.808	99.810	3/4" Pipe 4m N of logger
S55-1			1.125	99.996	100.000	Bolt in Spruce tree
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S55-6	0.847	101.125		100.278		
Water Level:	Cut		4.172	96.953	Time WL Surveyed: 13:55	
Water Level:	Cut		4.161	96.952	Time WL Surveyed: 13:57	
S55-6	0.835	101.113		100.278		

**WL Survey Summary**

Average WL:	Before	After
	96.957	96.953
Closing Error:	0.004	-
WL Check:	0.003	0.001
Transducer Elevation	96.265	96.261

**Field Personnel:**

SM, TR, AJ	Trip Date:	10-Jan-14
SM	Date:	10-Jan-14
TR	Date:	28-Mar-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: February 7, 2014  
 Site Visit Time (MST): 13:30

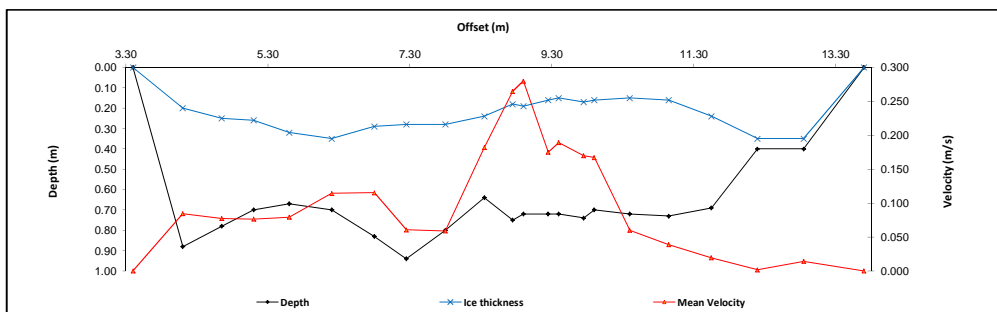


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.40	0.00	0.00		0.000				0.000	0.88	0.35	0.00	0.000	0.00	0.000	
1	4.10	0.88	0.20	0.54	0.096					0.88	0.63	0.68	0.084	0.43	0.036	8%
2	4.65	0.78	0.25	0.52	0.088					0.88	0.50	0.53	0.077	0.27	0.021	5%
3	5.10	0.70	0.26	0.46	0.087					0.88	0.48	0.44	0.077	0.21	0.016	4%
4	5.60	0.67	0.32	0.50	0.090					0.88	0.55	0.35	0.079	0.19	0.015	3%
5	6.20	0.70	0.35	0.53	0.130					0.88	0.60	0.35	0.114	0.21	0.024	6%
6	6.80	0.83	0.29	0.56	0.131					0.88	0.53	0.54	0.115	0.28	0.033	7%
7	7.25	0.94	0.28	0.61	0.069					0.88	0.50	0.66	0.061	0.33	0.020	5%
8	7.80	0.80	0.28	0.54	0.067					0.88	0.55	0.52	0.059	0.29	0.017	4%
9	8.35	0.64	0.24	0.44	0.207					0.88	0.48	0.40	0.182	0.19	0.035	8%
10	8.75	0.75	0.18	0.47	0.301					0.88	0.27	0.57	0.265	0.16	0.042	10%
11	8.90	0.72	0.19	0.46	0.318					0.88	0.25	0.53	0.280	0.13	0.037	9%
12	9.25	0.72	0.16	0.44	0.199					0.88	0.25	0.56	0.175	0.14	0.025	6%
13	9.40	0.72	0.15	0.44	0.215					0.88	0.25	0.57	0.189	0.14	0.027	6%
14	9.75	0.74	0.17	0.46	0.193					0.88	0.25	0.57	0.170	0.14	0.024	6%
15	9.90	0.70	0.16	0.43	0.190					0.88	0.33	0.54	0.167	0.18	0.029	7%
16	10.40	0.72	0.15	0.44	0.068					0.88	0.53	0.57	0.060	0.30	0.018	4%
17	10.95	0.73	0.16	0.45	0.044					0.88	0.57	0.57	0.039	0.33	0.013	3%
18	11.55	0.69	0.24	0.47	0.022					0.88	0.63	0.45	0.019	0.28	0.005	1%
19	12.20	0.40	0.35	0.38	0.002					0.88	0.65	0.05	0.002	0.03	0.000	0%
20	12.85	0.40	0.35	0.38	0.016					0.88	0.75	0.05	0.014	0.04	0.001	0%
RB	13.70	0.00	0.00		0.00		0.00		0.00	0.88	0.43	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.436</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): across from station

Meas. Start Time (MST):	14:45
Meas. End Time (MST):	15:22
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -13 C



**Flow characteristics:**

Total Flow:	0.436	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.26	(m <sup>2</sup> )
Wetted Width:	10.30	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.05	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.575	0.576
Water (°C):	0.3	0.3
Datalogger Clock:	13:44	15:43
Laptop Clock:	13:42	15:41
Battery (Main):	14.9	14.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PTB (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S55-1	1.197	101.197		100.000	100.000	Bolt in Spruce tree
S55-5			1.385	99.812	99.810	3/4" Pipe 4m N of logger
S55-6			0.918	100.279	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut		4.357	96.840	Time WL Surveyed: 14:30	
Temporary BM			4.141	97.056	0.000	
<b>Turn</b>						
Temporary BM	4.127	101.183		97.056		
Water Level:	Cut		4.339	96.844	Time WL Surveyed: 14:37	
S55-6			0.905	100.278	100.275	3/4" pipe 2m SE of logger
S55-5			1.372	99.811	99.810	3/4" Pipe 4m N of logger
S55-1			1.182	100.001	100.000	Bolt in Spruce tree
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S55-6	0.904	101.182		100.278		
Water Level:	Cut		4.338	96.844	Time WL Surveyed: 15:31	
Water Level:	Cut		4.321	96.844	Time WL Surveyed: 15:31	
S55-6	0.887	101.165		100.278		

**WL Survey Summary**

	Before	After
Average WL:	96.842	96.844
Closing Error:	-0.001	-
WL Check:	0.004	0.000
Transducer Elevation	96.267	96.268

**Field Personnel:**

	SM, MP	Trip Date:	7-Feb-14
Data Entry Personnel:	SM	Date:	7-Feb-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: March 11, 2014  
 Site Visit Time (MST): 15:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.30	0.00	0.00		0.000				0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	2.70	0.50	0.15	0.33	-0.002					0.88	0.74	0.35	-0.002	0.26	0.000	0%
2	3.78	0.70	0.16	0.43	0.039					0.88	0.64	0.54	0.034	0.35	0.012	5%
3	3.98	0.62	0.30	0.46	0.024					0.88	0.37	0.32	0.021	0.12	0.002	1%
4	4.51	0.60	0.33	0.47	0.038					0.88	0.55	0.27	0.033	0.15	0.005	2%
5	5.08	0.62	0.38	0.50	0.113					0.88	0.61	0.24	0.099	0.15	0.014	6%
6	5.72	0.63	0.38	0.51	0.149					0.88	0.65	0.25	0.131	0.16	0.021	9%
7	6.38	0.70	0.35	0.53	0.107					0.88	0.57	0.35	0.094	0.20	0.019	8%
8	6.85	0.72	0.35	0.54	0.070					0.88	0.40	0.37	0.062	0.15	0.009	4%
9	7.17	0.63	0.35	0.49	0.055					0.88	0.43	0.28	0.048	0.12	0.006	2%
10	7.70	0.55	0.35	0.45	0.105					0.88	0.42	0.20	0.092	0.08	0.008	3%
11	8.02	0.65	0.30	0.48	0.287					0.88	0.21	0.35	0.253	0.07	0.019	8%
12	8.12	0.67	0.28	0.48	0.230					0.88	0.24	0.39	0.202	0.10	0.019	8%
13	8.51	0.72	0.27	0.50	0.205					0.88	0.24	0.45	0.180	0.11	0.019	8%
14	8.60	0.70	0.25	0.48	0.277					0.88	0.08	0.45	0.244	0.04	0.009	4%
15	8.67	0.75	0.25	0.50	0.262					0.88	0.19	0.50	0.231	0.09	0.009	4%
16	8.98	0.64	0.17	0.41	0.227					0.88	0.21	0.47	0.200	0.10	0.019	8%
17	9.08	0.69	0.17	0.43	0.181					0.88	0.25	0.52	0.159	0.13	0.021	9%
18	9.48	0.60	0.15	0.38	0.068					0.88	0.56	0.45	0.060	0.25	0.015	6%
19	10.20	0.59	0.15	0.37	0.023					0.88	0.64	0.44	0.020	0.28	0.006	2%
20	10.75	0.48	0.25	0.37	0.002					0.88	0.65	0.23	0.002	0.15	0.000	0%
21	11.50	0.50	0.25	0.38	-0.005					0.88	1.18	0.25	-0.004	0.29	-0.001	-1%
22	13.10	0.21	0.15	0.18	-0.041					0.88	1.25	0.06	-0.036	0.08	-0.003	-1%
LB	14.00	0.00	0.00		0.00		0.00		0.00	0.88	0.45	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.241</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 across from station

Meas. Start Time (MST):	15:28
Meas. End Time (MST):	15:55
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 4 C

**Flow characteristics:**

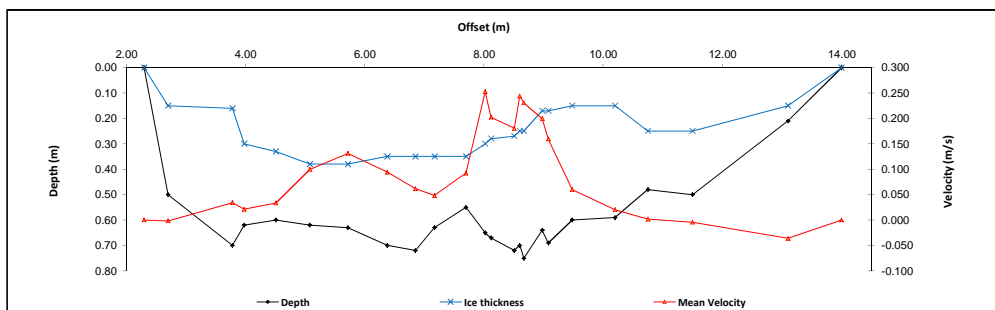
Total Flow:	0.241	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.41	(m <sup>2</sup> )
Wetted Width:	11.70	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.531	
Water (°C):	0.3	
Datalogger Clock:	15:07	
Laptop Clock:	15:05	
Battery (Main):	14.2	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S55-1	1.262	101.262		100.000	100.000	Bolt in Spruce tree
S55-5			1.452	99.810	99.810	3/4" Pipe 4m N of logger
S55-6			0.985	100.277	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut		4.461	96.801	Time WL Surveyed:	16:04
			4.167	97.095		
<b>Turn</b>						
	4.146	101.241		97.095		
Water Level:	Cut		4.437	96.804	Time WL Surveyed:	16:05
S55-6			0.962	100.279	100.275	3/4" pipe 2m SE of logger
S55-5			1.429	99.812	99.810	3/4" Pipe 4m N of logger
S55-1			1.239	100.002	100.000	Bolt in Spruce tree
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	96.803	-
Closing Error:	-0.002	-
WL Check:	0.003	-
Transducer Elevation	96.272	-

**Field Personnel:**

	DW, MP	Trip Date:	11-Mar-14
Data Entry Personnel:	DW	Date:	11-Mar-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: April 9, 2014  
 Site Visit Time (MST): 14:20



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.90	0.00	0.00		0.000				0.000	0.88	0.50	0.00	0.000	0.00	0.000	
1	3.90	0.22	0.12	0.17	0.315					0.88	0.70	0.10	0.277	0.07	0.019	4%
2	4.30	0.30	0.15	0.23	0.244					0.88	0.63	0.15	0.215	0.09	0.020	5%
3	5.15	0.50	0.35	0.43	0.044					0.88	0.65	0.15	0.039	0.10	0.004	1%
4	5.60	0.50	0.35	0.43	0.049					0.88	0.45	0.15	0.043	0.07	0.003	1%
5	6.05	0.49	0.35	0.42	-0.013					0.88	0.53	0.14	-0.011	0.07	-0.001	0%
6	6.65	0.50	0.25	0.38	0.090					0.88	0.40	0.25	0.079	0.10	0.008	2%
7	6.85	0.54	0.21	0.38	0.273					0.88	0.40	0.33	0.240	0.13	0.032	7%
8	7.45	0.44	0.20	0.32	0.408					0.88	0.57	0.24	0.359	0.14	0.050	14%
9	8.00	0.70	0.27	0.49	0.470					0.88	0.35	0.43	0.414	0.15	0.062	11%
10	8.15	0.70	0.30	0.50	0.455					0.88	0.25	0.40	0.400	0.10	0.040	9%
11	8.50	0.72	0.35	0.54	0.343					0.88	0.18	0.37	0.302	0.06	0.020	5%
12	8.50	0.51	0.25	0.38	0.064					0.88	0.30	0.26	0.056	0.08	0.004	1%
13	9.10	0.72	0.45	0.59	0.225					0.88	0.55	0.27	0.198	0.15	0.029	7%
14	9.60	0.68	0.43	0.56	0.134					0.88	0.48	0.25	0.118	0.12	0.014	3%
15	10.05	0.70	0.40	0.55	0.251					0.88	0.48	0.30	0.221	0.14	0.031	7%
16	10.55	0.70	0.40	0.55	0.187					0.88	0.52	0.30	0.165	0.16	0.026	6%
17	11.10	0.68	0.43	0.56	0.083					0.88	0.50	0.25	0.073	0.13	0.009	2%
18	11.55	0.70	0.40	0.55	0.012					0.88	0.40	0.30	0.011	0.12	0.001	0%
19	11.90	0.70	0.40	0.55	0.067					0.88	0.38	0.30	0.059	0.11	0.007	2%
20	12.30	0.78	0.38	0.58	0.030					0.88	0.40	0.40	0.026	0.16	0.004	1%
21	12.70	0.87	0.35	0.61	0.096					0.88	0.45	0.52	0.084	0.23	0.020	5%
22	13.20	0.80	0.35	0.58	0.184					0.88	0.40	0.45	0.162	0.18	0.029	7%
LB	13.50	0.00	0.00				0.00			0.88	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.432</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 across from station

Meas. Start Time (MST):	15:14
Meas. End Time (MST):	15:46
Equipment:	ADV
Method:	Ice
River Condition:	Degrading ice conditions
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 12 C

**Flow characteristics:**

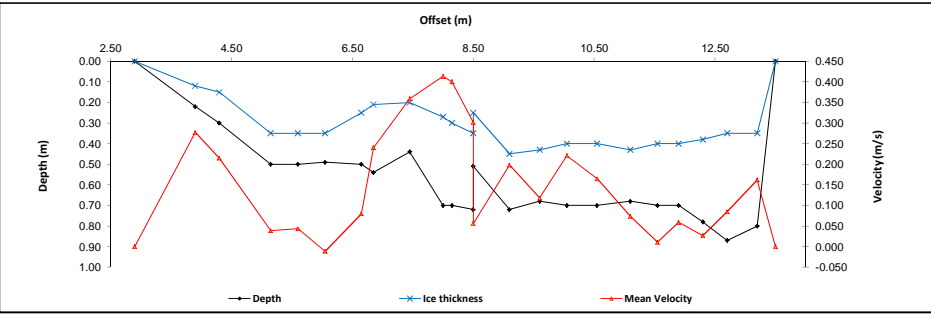
Total Flow:	0.432	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.66	(m <sup>2</sup> )
Wetted Width:	10.60	(m)
Hydraulic Depth:	0.25	(m)
Mean Velocity:	0.16	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.619	
Water (°C):	0.3	
Datalogger Clock:	14:30	
Laptop Clock:	14:28	
Battery (Main):	-	Good
Battery:	-	Good
Battery Serial #:	-	
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S55-1	1.165	101.165		100.000	100.000	Bolt in Spruce tree
S55-5			1.356	99.809	99.810	3/4" Pipe 4m N of logger
S55-6			0.888	100.277	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut		4.283	96.882	Time WL Surveyed:	15:03
Temporary BM			4.107	97.058	0.000	-
<b>Turn</b>						
Temporary BM	4.145	101.203		97.058	-	-
Water Level:	Cut		4.321	96.882	Time WL Surveyed:	14:59
S55-6			0.925	100.278	100.275	3/4" pipe 2m SE of logger
S55-5			1.392	99.811	99.810	3/4" Pipe 4m N of logger
S55-1			1.200	100.003	100.000	Bolt in Spruce tree
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	96.882	-
Closing Error:	-0.003	-
WL Check:	0.000	-
Transducer Elevation	96.263	-

**Field Personnel:**

	SM, MP	Trip Date:	9-Apr-14
Data Entry Personnel:	SM	Date:	9-Apr-14
Data Check Personnel:	TR	Date:	15-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date: May 21, 2014

Site Visit Time (MST): 14:25



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 8m US of PT	
Meas. Start Time (MST):	14:50
Meas. End Time (MST):	15:40
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, 15 C

<b>Flow characteristics:</b>		
Total Flow:	9.21	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	12.62	(m <sup>2</sup> )
Wetted Width:	14.84	(m)
Hydraulic Depth:	0.85	(m)
Mean Velocity:	0.73	(m/s)
Froude Number:	0.25	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	0.964	0.966
Water (°C):	10.9	11.1
Datalogger Clock:	14:30	15:52
Laptop Clock:	14:28	15:50
Battery (Main):	13.8	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	27.60	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	12.80	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	11.0				
			ADCP Temperature (°C):	12.8				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	14.09	12.70	0.709	9.003	-2.21%
Coordinate System:	ENU		3	14.20	11.90	0.767	9.130	-0.83%
Left Method:	Sloped bank		5	15.71	12.76	0.754	9.621	4.50%
Right Method:	Sloped bank		6	15.24	13.19	0.692	9.127	-0.86%
Top Fit Type:	Power fit		7	14.99	12.57	0.728	9.151	-0.60%
Bottom Fit Type:	Power fit		<b>Mean:</b>	14.84	12.62	0.730	<b>9.21</b>	
			<b>SD:</b>	0.62	0.42	0.028	0.214	
			<b>COV:</b>	0.04	0.03	0.038	0.023	

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S55-6	0.675	100.950		100.275	100.275	3/4" pipe 2m SE of logger
S55-5			1.142	99.808	99.810	3/4" Pipe 4m N of logger
S55-1			0.951	99.999	100.000	Bolt in Spruce tree
Water Level:	Cut		3.675	97.275	<b>Time WL Surveyed:</b>	14:35
Temporary BM			3.675	97.275	0.000	-
<b>Turn</b>						
Temporary BM	3.669	100.944		97.275		-
Water Level:	Cut		3.669	97.275	<b>Time WL Surveyed:</b>	14:36
S55-1			0.945	99.999	100.000	Bolt in Spruce tree
S55-5			1.135	99.809	99.810	3/4" Pipe 4m N of logger
S55-6			0.668	100.276	100.275	3/4" pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S55-5	1.135	100.943		98.808		
Water Level:	Cut		3.670	97.273	<b>Time WL Surveyed:</b>	15:54
Water Level:	Cut		3.664	97.271	<b>Time WL Surveyed:</b>	15:55
S55-5	1.127	100.935		98.808		

<b>WL Survey Summary</b>	Before	After
Average WL:	97.275	97.272
Closing Error:	-0.001	-
WL Check:	0.000	0.002
Transducer Elevation	96.311	96.306

<b>Field Personnel:</b>	TR, MP, CJ	Trip Date:	21-May-14
Data Entry Personnel:	TR	Date:	21-May-14
Data Check Personnel:	TR	Date:	1-Aug-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: June 13, 2014  
 Site Visit Time (MST): 13:00

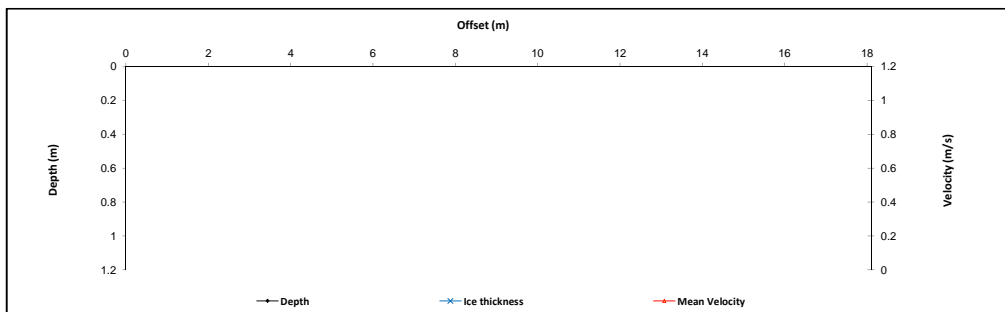


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
No Measurement Conducted																
															<b>Total Flow</b>	<b>0%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
2m US of PT

Meas. Start Time (MST):	14:05
Meas. End Time (MST):	14:10
Equipment:	ADV
Method:	Wading
River Condition:	Very high
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, calm, 20 C



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.333	0.595
Water (°C):	15.1	15.6
Datalogger Clock:	13:02	13:55
Laptop Clock:	13:00	13:53
Battery (Main):	13.7	13.7
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	298579	342745
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Enclosure grounded

**General Notes:**

-Discharge measurement aborted due due to high flows and unsafe conditions

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S55-1	0.997	100.997		100.000	100.000	Bolt in Spruce tree
S55-5			1.185	99.812	99.810	3/4" Pipe 4m N of logger
S55-6			0.720	100.277	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut	0.191	3.600	97.206	Time WL Surveyed:	13:44
S55-6			0.720	100.277	100.275	3/4" pipe 2m SE of logger
<b>Turn</b>						
S55-6	0.642	100.919		100.277	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut	0.202	3.532	97.185	Time WL Surveyed:	13:47
S55-6			0.642	100.277	100.275	3/4" pipe 2m SE of logger
S55-5			1.107	99.812	99.810	3/4" Pipe 4m N of logger
S55-1			0.918	100.001	100.000	Bolt in Spruce tree
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.196	-
Closing Error:	-0.001	-
WL Check:	0.021	-
Transducer Elevation	95.863	-

**Field Personnel:**

	TR, NC	Trip Date:	13-Jun-14
Data Entry Personnel:	TR	Date:	13-Jun-14
Data Check Personnel:	TR	Date:	15-Jul-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 510862 E, 6260508 N

Site Visit Date:  
Site Visit Time (MST):

August 9, 2014

11:20



Flow Measurement Details:	
Metering Section Location (describe): Across from station	
Meas. Start Time (MST):	12:35
Meas. End Time (MST):	13:05
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Turbulent flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 22C

Flow characteristics:		
Total Flow:	3.18	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.35	(m <sup>2</sup> )
Wetted Width:	12.93	(m)
Hydraulic Depth:	0.72	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.13	

Logger Details:	Before	After
Transducer Reading (m):	0.219	0.219
Water (°C):	18.5	18.8
Datalogger Clock:	11:31	13:11
Laptop Clock:	11:28	13:08
Battery (Main):	14.0	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

ADCP Flow Measurement Summary:				
<b>System Information:</b>				
System Type:	Sontek RS-M9			
Serial Number:	4712			
Firmware Version:	3.50			
Software Version:	3.70			
<b>System Setup:</b>				
Transducer Depth (m):	0.05			
Salinity (ppt):	0.0			
Magnetic Declination (°):	14			
Measured Temperature (°C):	-			
ADCP Temperature (°C):	18.5			
<b>Bank Offsets:</b>				
LB:	4.10			
RB:	16.30			
<b>Discharge Calculation Settings:</b>				
Track Reference:	Bottom-Track			
Depth Reference:	Vertical beam			
Coordinate System:	ENU			
Left Method:	Sloped bank			
Right Method:	Sloped bank			
Top Fit Type:	Power fit			
Bottom Fit Type:	Power fit			
<b>Measurement Results:</b>				
Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):
4	12.86	9.34	0.326	3.046
7	12.21	9.18	0.351	3.220
9	14.16	9.69	0.340	3.290
10	12.49	9.21	0.342	3.151
<b>Mean:</b>				
	12.93	9.35	0.340	3.18
<b>SD:</b>				
	0.75	0.20	0.009	0.090
<b>SE (%):</b>				
	18.67	5.08	0.224	2.252

Level Survey:						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S55-1	1.100	101.100		100.000	100.000	Bolt in Spruce tree
S55-5			1.288	99.812	99.810	3/4" Pipe 4m N of logger
S55-6			0.823	100.277	100.275	3/4" pipe 2m SE of logger
<b>Water Level:</b>						
	Cut	0.121	4.175	97.046	<b>Time WL Surveyed:</b>	11:39
Temporary BM			4.175	96.925	0.000	-
<b>Turn</b>						
Temporary BM	4.154	101.079		96.925		-
Water Level:	Cut	0.121	4.154	97.046	<b>Time WL Surveyed:</b>	11:43
S55-6			0.802	100.277	100.275	3/4" pipe 2m SE of logger
S55-5			1.267	99.812	99.810	3/4" Pipe 4m N of logger
S55-1			1.078	100.001	100.000	Bolt in Spruce tree
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S55-5	1.267	101.079		99.812		
Water Level:	Cut	0.106	4.144	97.041	<b>Time WL Surveyed:</b>	13:18
Water Level:	Cut	0.106	4.121	97.041	<b>Time WL Surveyed:</b>	13:21
S55-5	1.244	101.056		99.812		

WL Survey Summary	Before	After
Average WL:	97.046	97.041
Closing Error:	-0.001	-
WL Check:	0.000	0.000
Transducer Elevation	96.827	96.822

Field Personnel:	TR, GG	Trip Date:	9-Aug-14
Data Entry Personnel:	TR	Date:	9-Aug-14
Data Check Personnel:	MP	Date:	3-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 15QJG62508 E, 6260508 N

Site Visit Date: \_\_\_\_\_

September 5, 2014

Site Visit Time (MST): \_\_\_\_\_

07:25



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): Across from station	
Meas. Start Time (MST):	8:20
Meas. End Time (MST):	8:40
Equipment:	ADCP
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15C

<b>Flow characteristics:</b>		
Total Flow:	0.773	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.14	(m <sup>2</sup> )
Wetted Width:	9.67	(m)
Hydraulic Depth:	0.63	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.05	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.220	0.594
Water (°C):	18.8	11.9
Datalogger Clock:	07:35	09:07
Laptop Clock:	07:33	09:05
Battery (Main):	13.5	14.6
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Moved PT deeper

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05		LB:	20.25	
Serial Number:	4712		Salinity (ppt):	0.0		RB:	10.75	
Firmware Version:	3.5		Magnetic Declination (°):	14				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	12.2				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	9.91	5.55	0.139	0.770	-0.36%
Coordinate System:	ENU		3	9.62	6.19	0.127	0.786	1.71%
Left Method:	Sloped bank		4	9.35	6.18	0.122	0.754	-2.43%
Right Method:	Sloped bank		6	9.83	6.65	0.118	0.781	1.07%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	9.67	6.14	0.127	<b>0.773</b>	
			<b>SD:</b>	0.21	0.39	0.008	0.012	
			<b>COV:</b>	0.02	0.06	0.062	0.016	

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S55-1	0.941	100.941		100.000	100.000	Bolt in Spruce tree
S55-5			1.129	99.812	99.810	3/4" Pipe 4m N of logger
S55-6			0.663	100.278	100.275	3/4" pipe 2m SE of logger
Water Level:	Cut	0.391	4.458	96.874	<b>Time WL Surveyed:</b>	8:00
Temporary BM			4.458	96.483	0.000	-
<b>Turn</b>						
Temporary BM	4.485	100.968		96.483		-
Water Level:	Cut	0.391	4.485	96.874	<b>Time WL Surveyed:</b>	8:02
S55-6			0.690	100.278	100.275	3/4" pipe 2m SE of logger
S55-5			1.157	99.811	99.810	3/4" Pipe 4m N of logger
S55-1			0.968	100.000	100.000	Bolt in Spruce tree
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S55-6	0.690	100.968		100.278		
Water Level:	Cut	0.463	4.560	96.871	<b>Time WL Surveyed:</b>	9:00
Water Level:	Cut	0.464	4.526	96.872	<b>Time WL Surveyed:</b>	9:02
S55-6	0.656	100.934		100.278		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	96.874	96.872
Closing Error:	0.000	-
WL Check:	0.000	-0.001
Transducer Elevation	96.654	96.278

<b>Field Personnel:</b>			
Data Entry Personnel:	GG, SM	Trip Date:	5-Sep-14
Data Check Personnel:	GG	Date:	5-Sep-14
Entered Digitally in the Field:	TR	Date:	16-Oct-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S55 Gregoire River

UTM Location: 150862 E, 6260508 N

Site Visit Date: October 8, 2014

Site Visit Time (MST): 13:16



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 8m US of PT	
Meas. Start Time (MST):	13:35
Meas. End Time (MST):	14:05
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 10 C

<b>Flow characteristics:</b>		
Total Flow:	3.55	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.68	(m <sup>2</sup> )
Wetted Width:	16.64	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.37	(m/s)
Froude Number:	0.15	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	0.740	0.748
Water (°C):	5.0	5.2
Datalogger Clock:	13:22	14:14
Laptop Clock:	13:20	14:11
Battery (Main):	14.1	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Secured PT cable for winter

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05		LB:	33.80	
Serial Number:	4712		Salinity (ppt):	0.0		RB:	19.40	
Firmware Version:	3.5		Magnetic Declination (°):	14				
Software Version:	3.7		Measured Temperature (°C):	5.0				
			ADCP Temperature (°C):					
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	16.89	10.15	0.360	3.654	2.91%
Coordinate System:	ENU		2	16.49	9.48	0.365	3.460	-2.56%
Left Method:	Sloped bank		3	16.70	9.59	0.375	3.596	1.27%
Right Method:	Sloped bank		4	16.48	9.48	0.369	3.493	-1.63%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	16.64	9.68	0.367	<b>3.55</b>	
			<b>SD:</b>	0.17	0.28	0.005	0.078	
			<b>COV:</b>	0.01	0.03	0.015	0.022	

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S55-6	0.733	101.008		100.275	100.275	3/4" pipe 2m SE of logger
S55-5			1.199	99.809	99.810	3/4" Pipe 4m N of logger
S55-1			1.008	100.000	100.000	Bolt in Spruce tree
Water Level:	Cut	0.094	4.077	97.025	<b>Time WL Surveyed:</b>	13:25
Temporary BM			4.077	96.931	0.000	-
<b>Turn</b>						
Temporary BM	4.068	100.999		96.931		-
Water Level:	Cut	0.094	4.068	97.025	<b>Time WL Surveyed:</b>	13:27
S55-1			1.000	99.999	100.000	Bolt in Spruce tree
S55-5			1.188	99.811	99.810	3/4" Pipe 4m N of logger
S55-6			0.724	100.275	100.275	3/4" pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S55-6	0.723	100.998		100.275		
Water Level:	Cut	0.122	4.095	97.025	<b>Time WL Surveyed:</b>	14:17
Water Level:	Cut	0.122	4.082	97.027	<b>Time WL Surveyed:</b>	14:19
S55-6	0.712	100.987		100.275		

<b>WL Survey Summary</b>	Before	After
Average WL:	97.025	97.026
Closing Error:	0.000	-
WL Check:	0.000	-0.002
Transducer Elevation	96.285	96.278

<b>Field Personnel:</b>	MP, TR	Trip Date:	8-Oct-14
Data Entry Personnel:	MP	Date:	8-Oct-14
Data Check Personnel:	TR	Date:	21-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S55 Greigore River  
 UTM Location: 510862 E, 6260508 N

Site Visit Date: December 4, 2014  
 Site Visit Time (MST): 14:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	19.60	0.00	0.00		0.000		0.000		0.000	0.88	0.38	0.00	0.000	0.00	0.000	
1	18.85	0.38	0.14	0.26	0.296					0.88	0.83	0.24	0.260	0.20	0.052	5%
2	17.95	0.51	0.16	0.34	0.438					0.88	0.85	0.35	0.385	0.30	0.115	11%
3	17.15	0.52	0.22	0.37	0.521					0.88	0.70	0.30	0.458	0.21	0.096	9%
4	16.55	0.50	0.22	0.36	0.508					0.88	0.73	0.28	0.447	0.20	0.091	9%
5	15.70	0.58	0.22	0.40	0.501					0.88	0.78	0.36	0.441	0.28	0.123	12%
6	15.00	0.54	0.17	0.36	0.418					0.88	0.70	0.37	0.368	0.26	0.095	9%
7	14.30	0.39	0.25	0.32	0.298					0.88	0.70	0.14	0.262	0.10	0.026	3%
8	13.60	0.39	0.26	0.33	0.075					0.88	0.65	0.13	0.066	0.08	0.006	1%
9	13.00	0.33	0.26	0.30	0.187					0.88	0.65	0.07	0.165	0.05	0.007	1%
10	12.30	0.38	0.25	0.32	0.212					0.88	0.75	0.13	0.187	0.10	0.018	2%
11	11.50	0.31	0.16	0.24	0.644					0.88	0.75	0.15	0.567	0.11	0.064	6%
12	10.80	0.38	0.24	0.31	0.147					0.88	0.60	0.14	0.129	0.08	0.011	1%
13	10.30	0.31	0.24	0.28	0.263					0.88	0.63	0.07	0.231	0.04	0.010	1%
14	9.55	0.35	0.25	0.30	0.195					0.88	0.70	0.10	0.172	0.07	0.012	1%
15	8.90	0.36	0.24	0.30	0.592					0.88	0.65	0.12	0.521	0.08	0.041	4%
16	8.25	0.47	0.23	0.35	0.303					0.88	0.65	0.24	0.267	0.16	0.042	4%
17	7.60	0.49	0.24	0.37	0.427					0.88	0.63	0.25	0.376	0.16	0.059	6%
18	7.00	0.53	0.22	0.38	0.390					0.88	0.55	0.31	0.343	0.17	0.059	6%
19	6.50	0.51	0.24	0.38	0.395					0.88	0.58	0.27	0.348	0.16	0.054	5%
20	5.85	0.37	0.21	0.29	0.409					0.88	0.65	0.16	0.360	0.10	0.037	4%
21	5.20	0.38	0.03	0.21	0.003					0.88	0.93	0.35	0.003	0.32	0.001	0%
LB	4.00	0.00	0.00		0.00		0.00		0.00	0.88	0.60	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.02</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from station

Mess. Start Time (MST):	15:01
Mess. End Time (MST):	15:23
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, -15 C

**Flow characteristics:**

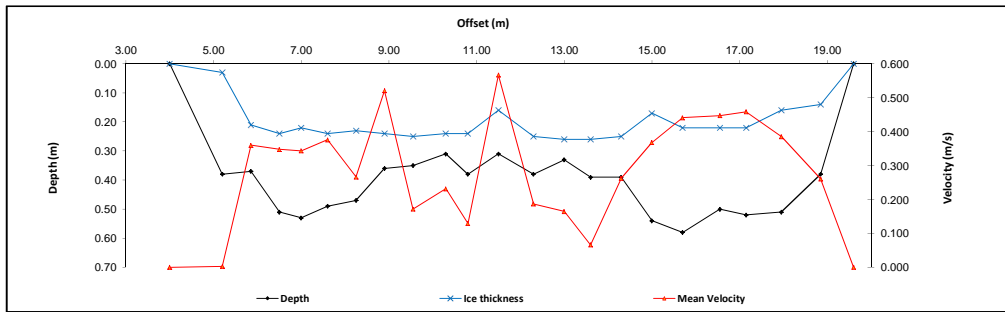
Total Flow:	1.02	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	3.23	(m <sup>2</sup> )
Wetted Width:	15.60	(m)
Hydraulic Depth:	0.21	(m)
Mean Velocity:	0.32	(m/s)
Froude Number:	0.22	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.748	0.749
Water (°C):	0.3	0.3
Datalogger Clock:	14:51	15:30
Laptop Clock:	14:51	15:30
Battery (Main):	13.2	13.0
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S55-6	0.715	100.990		100.275	100.275	3/4" pipe 2m SE of logger
S55-5			1.180	99.810	99.810	3/4" Pipe 4m N of logger
S55-1			0.994	99.996	100.000	Bolt in Spruce tree
Water Level:	Cut		3.978	97.012	Time WL Surveyed:	14:54
Temporary BM			3.752	97.238	0.000	-
<b>Turn</b>						
Temporary BM	3.743	100.981		97.238	-	-
Water Level:	Cut		3.969	97.012	Time WL Surveyed:	14:57
S55-1			0.983	99.998	100.000	Bolt in Spruce tree
S55-5			1.168	99.813	99.810	3/4" Pipe 4m N of logger
S55-6			0.704	100.277	100.275	3/4" pipe 2m SE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S55-6	0.703	100.979		100.276	-	-
Water Level:	Cut		3.974	97.005	Time WL Surveyed:	15:26
Water Level:	Cut		3.968	97.000	Time WL Surveyed:	15:28
S55-6	0.692	100.968		100.276	-	-

**WL Survey Summary**

Average WL:	97.012	97.003
Closing Error:	-0.002	-
WL Check:	0.000	0.005
Transducer Elevation	96.264	96.254

**Field Personnel:**

TR, CJ, AJ	Trip Date:	4-Dec-14
Data Entry Personnel: CJ	Date:	4-Dec-14
Data Check Personnel: TR	Date:	21-Jan-15
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

January 8, 2014

Site Visit Time (MST):

12:20



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000		0.000		0.000	0.88	0.20	0.00	0.000	0.00	0.000	
1	2.40	0.59	0.34	0.47	0.018					0.88	0.60	0.25	0.016	0.15	0.002	0%
2	3.20	0.74	0.35	0.55	0.060					0.88	1.10	0.39	0.053	0.43	0.023	2%
3	4.60	0.92	0.37	0.65	0.129					0.88	1.25	0.55	0.114	0.69	0.078	6%
4	5.70	0.91	0.36	0.64	0.177					0.88	1.15	0.55	0.156	0.63	0.099	8%
5	6.90	0.83	0.34	0.59	0.213					0.88	1.15	0.49	0.187	0.56	0.106	8%
6	8.00	0.79	0.35	0.57	0.263					0.88	0.95	0.44	0.231	0.42	0.097	8%
7	8.90	0.90	0.36	0.63	0.140					0.88	0.75	0.54	0.123	0.41	0.050	4%
8	9.50	0.91	0.36	0.64	0.131					0.88	0.70	0.55	0.115	0.39	0.044	4%
9	10.20	0.79	0.35	0.57	0.208					0.88	0.70	0.44	0.183	0.31	0.056	4%
10	10.90	0.88	0.34	0.61	0.256					0.88	0.70	0.54	0.225	0.38	0.085	7%
11	11.60	0.81	0.33	0.57	0.277					0.88	0.70	0.48	0.244	0.34	0.082	7%
12	12.30	0.88	0.34	0.61	0.273					0.88	0.70	0.54	0.240	0.38	0.091	7%
13	13.00	0.84	0.34	0.59	0.110					0.88	0.65	0.50	0.097	0.33	0.031	2%
14	13.60	1.03	0.34	0.69	0.212					0.88	0.70	0.69	0.187	0.48	0.090	7%
15	14.40	1.08	0.35	0.72	0.258					0.88	0.60	0.73	0.227	0.44	0.099	8%
16	14.80	1.05	0.34	0.70	0.202					0.88	0.80	0.71	0.178	0.57	0.101	8%
17	16.00	0.99	0.34	0.67	0.139					0.88	1.35	0.65	0.122	0.88	0.107	9%
18	17.50	0.60	0.45	0.53	0.007					0.88	1.40	0.15	0.006	0.21	0.001	0%
19	18.80	0.55	0.43	0.49	-0.008					0.88	1.33	0.12	-0.007	0.16	-0.001	0%
20	20.15	0.55	0.36	0.46	0.032					0.88	1.45	0.19	0.028	0.28	0.008	1%
21	21.70	0.50	0.32	0.41	0.036					0.88	1.28	0.18	0.032	0.23	0.007	1%
22	22.70	0.47	0.16	0.32	0.000					0.88	1.00	0.31	0.000	0.31	0.000	0%
LB	23.70	0.00	0.00		0.00		0.00		0.00	0.88	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.26</b>	<b>100%</b>	

## Flow Measurement Details:

Metering Section Location (describe):  
6m US of station

Meas. Start Time (MST):	12:55
Meas. End Time (MST):	13:27
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover, snow depth 40cm
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, -13 C

## Flow characteristics:

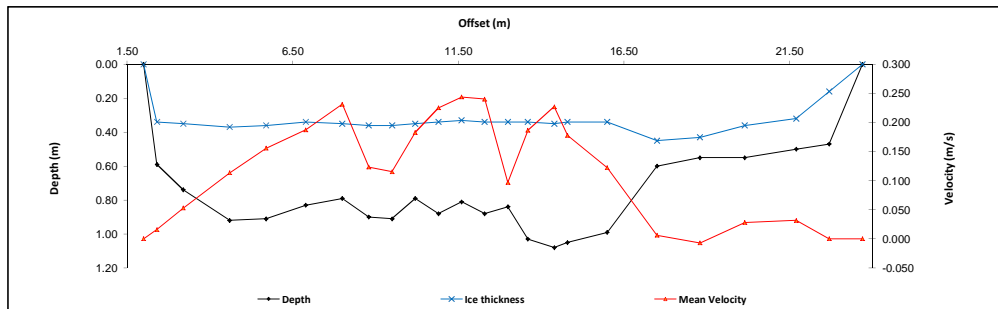
Total Flow:	1.26	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.95	(m <sup>2</sup> )
Wetted Width:	21.70	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.07	

## Logger Details:

	Before	After
Transducer Reading (m):	0.696	0.698
Water (°C):	0.2	0.2
Datalogger Clock:	12:32	13:33
Laptop Clock:	12:31	13:32
Battery (Main):	12.4	14.3
Battery:		Replaced
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

## Datalogger / Station Notes:

## General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S56-3	1.311	101.362		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.397	99.965	99.967	3/4" Pipe 2m E of logger
S56-4			1.305	100.057	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.890	98.472		Time WL Surveyed: 12:48
Temporary BM			2.935	98.427	0.000	-
<b>Turn</b>						
Temporary BM	2.919	101.346		98.427		-
Water Level:	Cut		2.875	98.471		Time WL Surveyed: 12:50
S56-4			1.288	100.058	100.056	3/4" Pipe 3m NW of logger
S56-2			1.379	99.967	99.967	3/4" Pipe 2m E of logger
S56-3			1.294	100.052	100.051	3/4" Pipe 4m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S56-3	1.294	101.346		98.472		
Water Level:	Cut		2.870	98.476		Time WL Surveyed: 13:35
Water Level:	Cut		2.855	98.473		Time WL Surveyed: 13:37
S56-3	1.276	101.328		100.052		

WL Survey Summary	Before	After
Average WL:	98.472	98.475
Closing Error:	-0.001	-
WL Check:	0.001	0.003
Transducer Elevation	97.776	97.777

Field Personnel:	SM, TR	Trip Date:	8-Jan-14
Data Entry Personnel:	SM	Date:	8-Jan-14
Data Check Personnel:	TR	Date:	28-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

February 10, 2014

Site Visit Time (MST):

11:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	22.50	0.00	0.00		0.000		0.000		0.000	0.88	0.35	0.00	0.000	0.00	0.000	
1	21.80	1.10	0.80	0.95	0.000					0.88	0.95	0.30	0.000	0.28	0.000	0%
2	20.60	1.55	0.80	1.18	0.048					0.88	1.20	0.75	0.042	0.50	0.038	3%
3	19.40	1.57	0.80			1.42	0.136	0.95	0.085	1.00	1.35	0.77	0.111	1.04	0.115	10%
4	17.90	1.25	0.75	1.00	0.173					0.88	1.50	0.50	0.152	0.75	0.114	10%
5	16.40	1.25	0.75	1.00	0.104					0.88	1.40	0.50	0.092	0.70	0.064	5%
6	15.10	1.25	0.75	1.00	0.195					0.88	0.97	0.50	0.172	0.48	0.083	7%
7	14.47	1.25	0.70	0.98	0.210					0.88	0.60	0.55	0.185	0.33	0.061	5%
8	13.90	1.20	0.70	0.95	0.257					0.88	0.69	0.50	0.226	0.34	0.077	7%
9	13.10	1.20	0.68	0.94	0.268					0.88	0.65	0.52	0.236	0.34	0.080	7%
10	12.60	1.20	0.65	0.93	0.272					0.88	0.58	0.55	0.239	0.32	0.076	6%
11	11.95	0.95	0.66	0.81	0.288					0.88	0.85	0.29	0.253	0.25	0.062	5%
12	10.90	1.20	0.67	0.94	0.266					0.88	0.88	0.53	0.234	0.46	0.109	9%
13	10.20	1.20	0.68	0.94	0.238					0.88	0.75	0.52	0.209	0.39	0.082	7%
14	9.40	1.35	0.66	1.01	0.183					0.88	0.80	0.69	0.161	0.55	0.089	7%
15	8.60	1.38	0.65	1.02	0.173					0.88	0.80	0.73	0.152	0.58	0.089	7%
16	7.80	1.00	0.65	0.83	0.140					0.88	0.85	0.35	0.123	0.30	0.037	3%
17	6.90	1.05	0.75	0.90	0.020					0.88	1.45	0.30	0.018	0.44	0.008	1%
18	4.90	0.90	0.80	0.85	0.017					0.88	1.85	0.10	0.015	0.19	0.003	0%
19	3.20	0.90	0.75	0.83	0.006					0.88	1.30	0.15	0.005	0.20	0.001	0%
20	2.30	0.85	0.75	0.80	0.014					0.88	0.60	0.10	0.012	0.06	0.001	0%
LB	2.00	0.00	0.00		0.00		0.00		0.00	0.88	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.19</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
8m US of station

Meas. Start Time (MST):	12:30
Meas. End Time (MST):	12:58
Equipment:	ADV
Method:	Ice
River Condition:	Frozen
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -18 C

### Flow characteristics:

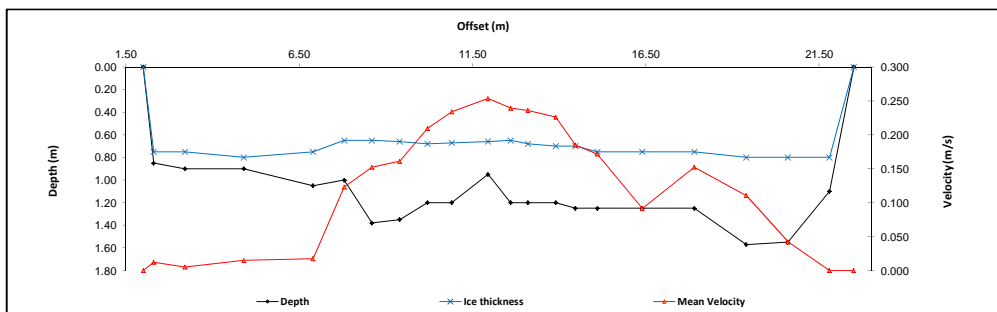
Total Flow:	1.19	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.89	(m <sup>2</sup> )
Wetted Width:	20.50	(m)
Hydraulic Depth:	0.43	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.06	

### Logger Details:

	Before	After
Transducer Reading (m):	1.101	
Water (°C):	0.2	
Datalogger Clock:	11:48	
Laptop Clock:	11:47	
Battery (Main):	15.5	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

### Datalogger / Station Notes:

### General Notes:



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S56-4	1.393	101.449		100.056	100.056	3/4" Pipe 3m NW of logger
S56-2			1.484	99.965	99.967	3/4" Pipe 2m E of logger
S56-3			1.400	100.049	100.051	3/4" Pipe 4m S of logger
Water Level:	Cut		2.573	98.876		Time WL Surveyed: 12:20
Temporary BM			2.532	98.917	0.000	
Turn						
Temporary BM	2.509	101.426		98.917		
Water Level:	Cut		2.550	98.876		Time WL Surveyed: 12:22
S56-3			1.377	100.049	100.051	3/4" Pipe 4m S of logger
S56-2			1.461	99.965	99.967	3/4" Pipe 2m E of logger
S56-4			1.370	100.056	100.056	3/4" Pipe 3m NW of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

WL Survey Summary	Before	After
Average WL:	98.876	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	97.775	-

Field Personnel:	SM MP	Trip Date:	10-Feb-14
Data Entry Personnel:	SM	Date:	10-Feb-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493:489491 E, 6345029 N

Site Visit Date: March 9, 2014  
 Site Visit Time (MST): 10:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.00	0.00	0.00		0.000				0.000	0.88	0.75	0.00	0.000	0.00	0.000	
1	4.50	1.03	0.91		0.083				0.000	0.88	1.20	0.12	0.073	0.14	0.011	1%
2	5.40	1.04	0.99		0.000				0.000	0.88	0.70	0.05	0.000	0.04	0.000	0%
3	5.90	1.70	0.98		0.022				0.000	0.88	0.65	0.72	0.019	0.47	0.009	1%
4	6.70	1.80	0.95			1.63	0.040	1.12	0.039	1.00	0.80	0.85	0.040	0.68	0.027	3%
5	7.50	1.72	0.95			1.57	0.094	1.10	0.241	1.00	0.50	0.77	0.168	0.39	0.064	8%
6	7.70	1.70	0.96	1.33	0.187					0.88	0.40	0.74	0.165	0.30	0.049	6%
7	8.30	1.66	0.86			1.50	0.023	1.02	0.108	1.00	0.40	0.80	0.066	0.32	0.021	2%
8	8.50	1.62	0.87	1.25	0.116					0.88	0.55	0.75	0.102	0.41	0.042	5%
9	9.40	1.25	0.83	1.04	0.115					0.88	0.90	0.42	0.101	0.38	0.038	4%
10	10.30	1.33	0.83	1.08	0.100					0.88	0.80	0.50	0.088	0.40	0.035	4%
11	11.00	1.30	0.83	1.07	0.169					0.88	0.60	0.47	0.149	0.28	0.042	5%
12	11.50	1.30	0.80	1.05	0.174					0.88	0.45	0.50	0.153	0.23	0.034	4%
13	11.90	1.10	0.77	0.94	0.218					0.88	0.45	0.33	0.192	0.15	0.028	3%
14	12.40	1.07	0.75	0.91	0.230					0.88	0.55	0.32	0.202	0.18	0.036	4%
15	13.00	1.30	0.83	1.07	0.194					0.88	0.55	0.47	0.171	0.26	0.044	5%
16	13.50	1.40	0.78	1.09	0.166					0.88	0.60	0.62	0.146	0.37	0.054	6%
17	14.20	1.47	0.78	1.13	0.161					0.88	0.85	0.69	0.142	0.59	0.083	10%
18	15.20	1.20	0.80	1.00	0.189					0.88	1.05	0.40	0.166	0.42	0.070	8%
19	16.30	1.23	0.78	1.01	0.182					0.88	1.10	0.45	0.160	0.50	0.079	9%
20	17.40	1.25	0.78	1.02	0.012					0.88	0.90	0.47	0.011	0.42	0.004	1%
21	18.10	1.40	0.75	1.08	0.163					0.88	0.75	0.65	0.143	0.49	0.070	8%
22	18.90	1.25	0.75	1.00	0.022					0.88	1.60	0.50	0.019	0.80	0.015	2%
23	21.30	0.88	0.84	0.86	0.001					0.88	2.05	0.04	0.001	0.08	0.000	0%
LB	23.00	0.00	0.00		0.000		0.000		0.000	0.88	0.85	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.857</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
9m US of station

Meas. Start Time (MST):	10:29
Meas. End Time (MST):	11:04
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, -1 C

**Flow characteristics:**

Total Flow:	0.857	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.27	(m <sup>2</sup> )
Wetted Width:	20.00	(m)
Hydraulic Depth:	0.41	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.05	

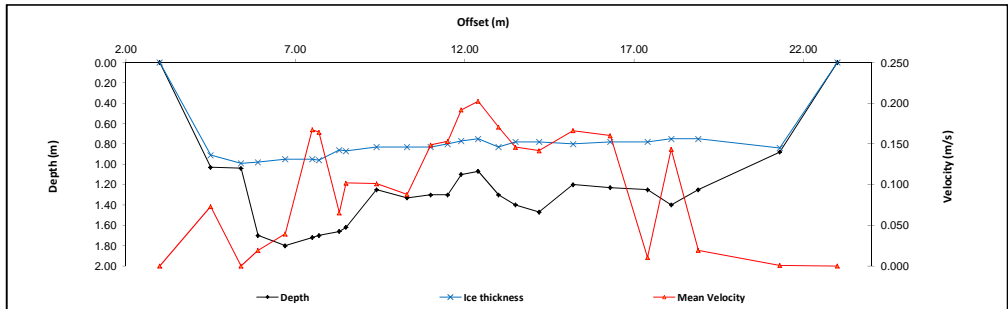
**Logger Details:**

	Before	After
Transducer Reading (m):	1.192	
Water (°C):	0.2	
Datalogger Clock:	09:07	
Laptop Clock:	09:07	
Battery (Main):	13.8	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-Ran ADV test, results good



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S56-3	1.412	101.463		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.496	99.967	99.967	3/4" Pipe 2m E of logger
S56-4			1.406	100.057	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.493	98.970	Time WL Surveyed: 10:18	
Temporary BM			2.483	98.980	0.000	
<b>Turn</b>						
Temporary BM	2.467	101.447		98.980		
Water Level:	Cut		2.477	98.970	Time WL Surveyed: 10:20	
S56-4			1.389	100.058	100.056	3/4" Pipe 3m NW of logger
S56-2			1.480	99.967	99.967	3/4" Pipe 2m E of logger
S56-3			1.395	100.052	100.051	3/4" Pipe 4m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.970	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	97.778	-

**Field Personnel:**

	DW, MP	Trip Date:	9-Mar-14
Data Entry Personnel:	DW	Date:	9-Mar-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

April 11, 2014

Site Visit Time (MST):

11:20

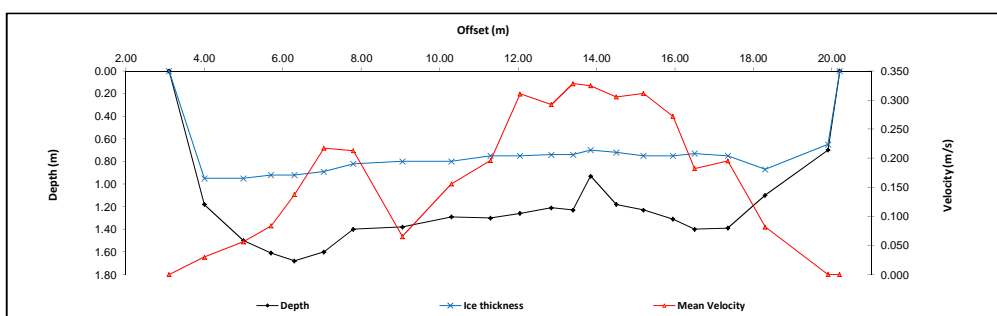


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 1.0 Depth (m)	Velocity @ 1.0 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.10	0.00	0.00		0.000		0.000		0.000	0.88	0.45	0.00	0.000	0.00	0.000	
1	4.00	1.18	0.95	1.07	0.034					0.88	0.95	0.23	0.030	0.22	0.007	0%
2	5.00	1.50	0.95	1.23	0.064					0.88	0.85	0.55	0.056	0.47	0.026	2%
3	5.70	1.61	0.92	1.27	0.095					0.88	0.65	0.69	0.084	0.45	0.037	3%
4	6.30	1.68	0.92			1.53	0.158	1.07	0.117	1.00	0.68	0.76	0.138	0.51	0.071	5%
5	7.05	1.60	0.89	1.25	0.247					0.88	0.75	0.71	0.217	0.53	0.116	8%
6	7.80	1.40	0.82	1.11	0.242					0.88	1.00	0.58	0.213	0.58	0.124	8%
7	9.05	1.38	0.80	1.09	0.074					0.88	1.25	0.58	0.065	0.73	0.047	3%
8	10.30	1.29	0.80	1.05	0.177					0.88	1.13	0.49	0.156	0.55	0.086	6%
9	11.30	1.30	0.75	1.03	0.223					0.88	0.88	0.55	0.196	0.48	0.094	6%
10	12.05	1.26	0.75	1.01	0.353					0.88	0.77	0.51	0.311	0.40	0.123	8%
11	12.85	1.21	0.74	0.98	0.332					0.88	0.68	0.47	0.292	0.32	0.093	6%
12	13.40	1.23	0.74	0.99	0.373					0.88	0.50	0.49	0.328	0.25	0.080	5%
13	13.85	0.93	0.70	0.82	0.369					0.88	0.55	0.23	0.325	0.13	0.041	3%
14	14.50	1.18	0.72	0.95	0.347					0.88	0.67	0.46	0.305	0.31	0.095	6%
15	15.20	1.23	0.75	0.99	0.354					0.88	0.73	0.48	0.312	0.35	0.108	7%
16	15.95	1.31	0.75	1.03	0.309					0.88	0.65	0.56	0.272	0.36	0.099	7%
17	16.50	1.40	0.73	1.07	0.207					0.88	0.70	0.67	0.182	0.47	0.085	6%
18	17.35	1.39	0.75	1.07	0.222					0.88	0.90	0.64	0.195	0.58	0.113	8%
19	18.30	1.10	0.87	0.99	0.093					0.88	1.28	0.23	0.082	0.29	0.024	2%
20	19.90	0.70	0.65	0.68	0.000					0.88	0.95	0.05	0.090	0.05	0.000	0%
LB	20.20	0.00	0.00		0.00		0.00		0.00	0.88	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.47</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m US of PT

Meas. Start Time (MST):	11:55
Meas. End Time (MST):	12:30
Equipment:	ADV
Method:	Ice
River Condition:	Deteriorating ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Snowing, calm, -2 C



**Flow characteristics:**

Total Flow:	1.47	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.01	(m <sup>2</sup> )
Wetted Width:	17.10	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.147	
Water (°C):	0.2	
Datalogger Clock:	11:34	
Laptop Clock:	11:33	
Battery (Main):	14.6	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-Ran ADV test, results good

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.281	101.332		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.367	99.965	99.967	3/4" Pipe 2m E of logger
S56-4			1.277	100.055	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.408	98.924		Time WL Surveyed: 12:35
Temporary BM			2.368	98.964	0.000	
Turn						
Temporary BM	2.344	101.308		98.964		
Water Level:	Cut		2.382	98.926		Time WL Surveyed: 12:37
S56-4			1.251	100.057	100.056	3/4" Pipe 3m NW of logger
S56-2			1.341	99.967	99.967	3/4" Pipe 2m E of logger
S56-3			1.255	100.053	100.051	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut					Time WL Surveyed:
Water Level:	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	98.925	-
Closing Error:	-0.002	-
WL Check:	0.002	-
Transducer Elevation	97.778	-

**Field Personnel:**

	TR, MP	Trip Date:	11-Apr-14
Data Entry Personnel:	TR	Date:	11-Apr-14
Data Check Personnel:	TR	Date:	15-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date: May 15, 2014

Site Visit Time (MST): 15:35



<b>Flow Measurement Details:</b>	
<b>Metering Section Location (describe):</b> Regular discharge location	
Meas. Start Time (MST):	16:20
Meas. End Time (MST):	16:40
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, breezy, 10 C

<b>Flow characteristics:</b>		
Total Flow:	13.5	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Good	
Cross Section Area:	24.79	(m <sup>2</sup> )
Wetted Width:	24.01	(m)
Hydraulic Depth:	1.03	(m)
Mean Velocity:	0.55	(m/s)
Froude Number:	0.17	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	1.080	1.079
Water (°C):	4.7	4.8
Datalogger Clock:	15:46	16:58
Laptop Clock:	15:45	16:56
Battery (Main):	13.8	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	33.20	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	9.50	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	4.8				
			ADCP Temperature (°C):	6.2				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		6	24.02	24.85	0.537	13.344	-1.34%
Coordinate System:	ENU		8	24.33	25.17	0.545	13.708	1.35%
Left Method:	Sloped bank		9	23.69	24.34	0.556	13.524	-0.01%
Right Method:	Sloped bank							
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	24.01	24.79	0.546	<b>13.5</b>	
			<b>SD:</b>	0.26	0.34	0.008	0.149	
			<b>COV:</b>	0.01	0.01	0.014	0.011	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S56-3	1.236	101.287		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.321	99.966	99.967	3/4" Pipe 2m E of logger
S56-4			1.233	100.054	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.455	98.832	<b>Time WL Surveyed:</b>	15:58
Temporary BM			2.816	98.471	0.000	-
<b>Turn</b>						
Temporary BM	2.804	101.275		98.471		-
Water Level:	Cut		2.440	98.835	<b>Time WL Surveyed:</b>	16:01
S56-4			1.220	100.055	100.056	3/4" Pipe 3m NW of logger
S56-2			1.308	99.967	99.967	3/4" Pipe 2m E of logger
S56-3			1.225	100.050	100.051	3/4" Pipe 4m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S56-3	1.224	101.274		100.050		
Water Level:	Cut		2.432	98.842	<b>Time WL Surveyed:</b>	16:51
Water Level:	Cut		2.413	98.844	<b>Time WL Surveyed:</b>	16:53
S56-3	1.207	101.257		100.050		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	98.834	98.843
Closing Error:	0.001	-
WL Check:	0.003	-0.002
Transducer Elevation	97.754	97.764

<b>Field Personnel:</b>		SM, MP	Trip Date:	15-May-14
Data Entry Personnel:		SM	Date:	15-May-14
Data Check Personnel:		TR	Date:	1-Aug-14
Entered Digitally in the Field:		Yes		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: June 26, 2014  
 Site Visit Time (MST): 12:15

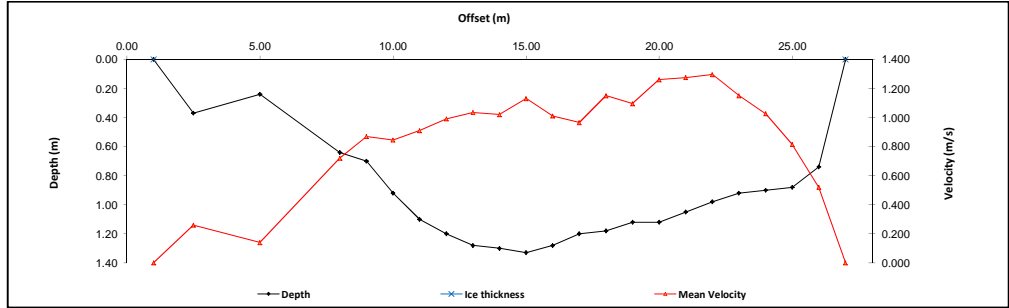


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.00	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	2.50	0.37		0.22	0.260					1.00	2.00	0.37	0.260	0.74	0.192	1%
2	5.00	0.24		0.14	0.140					1.00	2.75	0.24	0.140	0.66	0.092	0%
3	8.00	0.64		0.38	0.720					1.00	2.00	0.64	0.720	1.28	0.922	4%
4	9.00	0.70		0.42	0.870					1.00	1.00	0.70	0.870	0.70	0.609	3%
5	10.00	0.92				0.74	0.750	0.18	0.940	1.00	1.00	0.92	0.845	0.92	0.777	4%
6	11.00	1.10				0.88	0.650	0.22	1.170	1.00	1.00	1.10	0.910	1.10	1.001	5%
7	12.00	1.20				0.96	0.620	0.24	1.360	1.00	1.00	1.20	0.990	1.20	1.188	6%
8	13.00	1.28				1.02	0.620	0.26	1.450	1.00	1.00	1.28	1.035	1.28	1.325	6%
9	14.00	1.30				1.04	0.810	0.26	1.230	1.00	1.00	1.30	1.020	1.30	1.326	6%
10	15.00	1.33				1.06	0.980	0.27	1.280	1.00	1.00	1.33	1.130	1.33	1.503	7%
11	16.00	1.28				1.02	0.780	0.26	1.240	1.00	1.00	1.28	1.010	1.28	1.293	6%
12	17.00	1.20				0.96	0.750	0.24	1.180	1.00	1.00	1.20	0.965	1.20	1.158	5%
13	18.00	1.18				0.94	1.010	0.24	1.290	1.00	1.00	1.18	1.150	1.18	1.357	6%
14	19.00	1.12				0.90	0.980	0.22	1.210	1.00	1.00	1.12	1.095	1.12	1.226	6%
15	20.00	1.12				0.90	1.190	0.22	1.330	1.00	1.00	1.12	1.260	1.12	1.411	7%
16	21.00	1.05				0.84	1.110	0.21	1.440	1.00	1.00	1.05	1.275	1.05	1.339	6%
17	22.00	0.98				0.78	1.070	0.20	1.520	1.00	1.00	0.98	1.295	0.98	1.269	6%
18	23.00	0.92				0.74	1.020	0.18	1.280	1.00	1.00	0.92	1.150	0.92	1.058	5%
19	24.00	0.90				0.72	0.930	0.18	1.120	1.00	1.00	0.90	1.025	0.90	0.923	4%
20	25.00	0.88				0.70	0.650	0.18	0.980	1.00	1.00	0.88	0.815	0.88	0.717	3%
21	26.00	0.74		0.44	0.520					1.00	1.00	0.74	0.520	0.74	0.385	2%
LB	27.00	0.00	0.00		0.00		0.00		0.00	1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>21.1</b>	<b>100%</b>		

**Flow Measurement Details:**

Metering Section Location (describe):  
20m DS of bridge

Meas. Start Time (MST):	13:00
Meas. End Time (MST):	13:45
Equipment:	Marsh McBirney
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, rain, 20 C



**Flow characteristics:**

Total Flow:	21.1	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	21.88	(m <sup>2</sup> )
Wetted Width:	26.00	(m)
Hydraulic Depth:	0.84	(m)
Mean Velocity:	0.96	(m/s)
Froude Number:	0.34	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.334	1.331
Water (°C):	17.9	18.2
Datalogger Clock:	12:26	14:04
Laptop Clock:	12:24	14:03
Battery (Main):	13.8	14.2
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S56-3	1.208	101.259		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.294	99.965	99.967	3/4" Pipe 2m E of logger
S56-4			1.205	100.054	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut		2.201	99.058	Time WL Surveyed:	12:32
Temporary BM			1.671	99.588	0.000	
<b>Turn</b>						
Temporary BM	1.653	101.241		99.588		
Water Level:	Cut		2.185	99.056	Time WL Surveyed:	12:34
S56-4			1.188	100.053	100.056	3/4" Pipe 3m NW of logger
S56-2			1.276	99.965	99.967	3/4" Pipe 2m E of logger
S56-3			1.192	100.049	100.051	3/4" Pipe 4m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S56-3	1.192	101.242		100.050		
Water Level:	Cut		2.187	99.055	Time WL Surveyed:	14:00
Water Level:	Cut		2.166	99.053	Time WL Surveyed:	14:01
S56-3	1.169	101.219		100.050		

**WL Survey Summary**

	Before	After
Average WL:	99.057	99.054
Closing Error:	0.002	-
WL Check:	0.002	0.002
Transducer Elevation	97.723	97.723

**Field Personnel:**

Data Entry Personnel:	SM, TR	Trip Date:	26-Jun-14
Data Check Personnel:	SM	Date:	26-Jun-14
Entered Digitally in the Field:	TR	Date:	15-Jul-14

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: \_\_\_\_\_  
 Site Visit Time (MST): \_\_\_\_\_

August 8, 2014  
 15:40



Flow Measurement Details:	
Metering Section Location (describe): 20m DS of bridge	
Meas. Start Time (MST):	16:16
Meas. End Time (MST):	16:30
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, 17C

Flow characteristics:		
Total Flow:	3.35	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	14.79	(m <sup>2</sup> )
Wetted Width:	24.90	(m)
Hydraulic Depth:	0.59	(m)
Mean Velocity:	0.23	(m/s)
Froude Number:	0.09	

Logger Details:	Before	After
Transducer Reading (m):	0.827	0.827
Water (°C):	20.0	19.9
Datalogger Clock:	15:43	16:46
Laptop Clock:	15:41	16:44
Battery (Main):	13.9	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

ADCP Flow Measurement Summary:					
<b>System Information:</b>					
System Type:	Sontek RS-M9				
Serial Number:	4712				
Firmware Version:	3.50				
Software Version:	3.70				
<b>System Setup:</b>					
Transducer Depth (m):	0.05				
Salinity (ppt):	-				
Magnetic Declination (°):	14.3				
Measured Temperature (°C):	-				
ADCP Temperature (°C):	-				
<b>Bank Offsets:</b>					
LB:	55.20				
RB:	31.10				
<b>Discharge Calculation Settings:</b>					
Track Reference:	Bottom-Track				
Depth Reference:	Vertical beam				
Coordinate System:	ENU				
Left Method:	Sloped bank				
Right Method:	Sloped bank				
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
<b>Measurement Results:</b>					
Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	
2	25.84	14.63	0.220	3.214	
3	23.73	14.35	0.233	3.343	
5	24.73	15.12	0.229	3.467	
6	25.31	15.07	0.225	3.392	
<b>Mean:</b>		24.90	14.79	0.227	3.35
<b>SD:</b>		0.78	0.32	0.005	0.092
<b>SE (%):</b>		19.62	7.98	0.120	2.303

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S56-4	1.062	101.118		100.056	100.056	3/4" Pipe 3m NW of logger
S56-2			1.150	99.968	99.967	3/4" Pipe 2m E of logger
S56-3			1.066	100.052	100.051	3/4" Pipe 4m S of logger
Water Level:	Cut		2.576	98.542	<b>Time WL Surveyed:</b>	15:50
Temporary BM			2.778	98.340		-
<b>Turn</b>						
Temporary BM	2.762	101.102		98.340		-
Water Level:	Cut		2.560	98.542	<b>Time WL Surveyed:</b>	15:53
S56-3			1.049	100.053	100.051	3/4" Pipe 4m S of logger
S56-2			1.134	99.968	99.967	3/4" Pipe 2m E of logger
S56-4			1.045	100.057	100.056	3/4" Pipe 3m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S56-4	1.045	101.102		100.057		
Water Level:	Cut		2.560	98.542	<b>Time WL Surveyed:</b>	16:40
Water Level:	Cut		2.551	98.541	<b>Time WL Surveyed:</b>	16:42
S56-4	1.035	101.092		100.057		

WL Survey Summary	Before	After
Average WL:	98.542	98.542
Closing Error:	-0.001	-
WL Check:	0.000	0.001
Transducer Elevation	97.715	97.715

Field Personnel:	MP, CJ	Trip Date:	8-Aug-14
Data Entry Personnel:	MP	Date:	8-Aug-14
Data Check Personnel:	MP	Date:	2-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: September 21, 2014  
 Site Visit Time (MST): 08:30

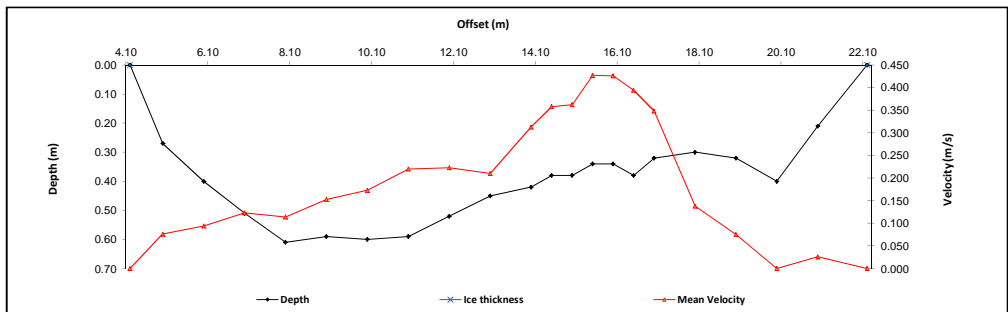


Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	4.20	0.00	0.00		0.000				0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	5.00	0.27		0.16	0.076					1.00	0.90	0.27	0.076	0.24	0.018	1%
2	6.00	0.40		0.24	0.094					1.00	1.00	0.40	0.094	0.40	0.038	3%
3	7.00	0.51		0.31	0.123					1.00	1.00	0.51	0.123	0.51	0.063	5%
4	8.00	0.61		0.37	0.114					1.00	1.00	0.61	0.114	0.61	0.070	5%
5	9.00	0.59		0.35	0.153					1.00	1.00	0.59	0.153	0.59	0.090	7%
6	10.00	0.60		0.36	0.173					1.00	1.00	0.60	0.173	0.60	0.104	8%
7	11.00	0.59		0.35	0.220					1.00	1.00	0.59	0.220	0.59	0.130	10%
8	12.00	0.52		0.31	0.223					1.00	1.00	0.52	0.223	0.52	0.116	9%
9	13.00	0.45		0.27	0.210					1.00	1.00	0.45	0.210	0.45	0.095	7%
10	14.00	0.42		0.25	0.313					1.00	0.75	0.42	0.313	0.32	0.099	7%
11	14.50	0.38		0.23	0.358					1.00	0.50	0.38	0.358	0.19	0.068	5%
12	15.00	0.38		0.23	0.362					1.00	0.50	0.38	0.362	0.19	0.069	5%
13	15.50	0.34		0.20	0.427					1.00	0.50	0.34	0.427	0.17	0.073	5%
14	16.00	0.34		0.20	0.426					1.07	0.50	0.34	0.426	0.17	0.072	5%
15	16.50	0.38		0.23	0.394					1.00	0.50	0.38	0.394	0.19	0.075	6%
16	17.00	0.32		0.19	0.348					1.00	0.75	0.32	0.348	0.24	0.084	6%
17	18.00	0.30		0.18	0.138					1.00	1.00	0.30	0.138	0.30	0.041	3%
18	19.00	0.32		0.19	0.075					1.00	1.00	0.32	0.075	0.32	0.024	2%
19	20.00	0.40		0.24	0.000					1.00	1.00	0.40	0.000	0.40	0.000	0%
20	21.00	0.21		0.13	0.026					1.00	1.10	0.21	0.026	0.23	0.006	0%
RB	22.20	0.00	0.00		0.00		0.00		0.00	1.00	0.60	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.33</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
20m US of bridge

Meas. Start Time (MST):	8:53
Meas. End Time (MST):	9:16
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 18 C



**Flow characteristics:**

Total Flow:	1.33	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.23	(m <sup>2</sup> )
Wetted Width:	18.00	(m)
Hydraulic Depth:	0.40	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.644	0.664
Water (°C):	12.4	12.4
Datalogger Clock:	08:36	09:37
Laptop Clock:	08:34	09:35
Battery (Main):	12.9	13.2
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Right bank heavily weeded from 17m to shore

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S56-4	1.166	101.222		100.056	100.056	3/4" Pipe 3m NW of logger
S56-2			1.255	99.967	99.967	3/4" Pipe 2m E of logger
S56-3			1.171	100.051	100.051	3/4" Pipe 4m S of logger
Water Level:	Cut	0.183	3.013	98.392	Time WL Surveyed: 8:39	
Temporary BM			3.013	98.209	0.000	
<b>Turn</b>						
Temporary BM	3.002	101.211		98.209	-	
Water Level:	Cut	0.183	3.002	98.392	Time WL Surveyed: 8:41	
S56-3			1.158	100.053	100.051	3/4" Pipe 4m S of logger
S56-2			1.244	99.967	99.967	3/4" Pipe 2m E of logger
S56-4			1.154	100.057	100.056	3/4" Pipe 3m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S56-4	1.155	101.212		100.057		
Water Level:	Cut	0.187	3.003	98.396	Time WL Surveyed: 9:30	
Water Level:	Cut	0.188	2.993	98.397	Time WL Surveyed: 9:32	
S56-4	1.145	101.202		100.057		

**WL Survey Summary**

	Before	After
Average WL:	98.392	98.397
Closing Error:	-0.001	-
WL Check:	0.000	-0.001
Transducer Elevation	97.748	97.733

**Field Personnel:**

	MP TR	Trip Date:	21-Sep-14
Data Entry Personnel:	MP	Date:	21-Sep-14
Data Check Personnel:	TR	Date:	30-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake

UTM Location: 493711 E, 6169759 N

Site Visit Date:

October 10, 2014

Site Visit Time (MST):

07:00

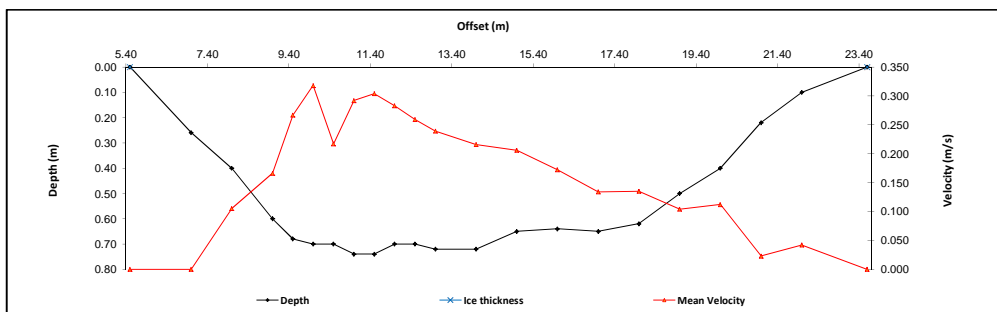


Flow Measurement:										Measured Data							Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)							
LB	5.50	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000								
1	7.00	0.26		0.16	0.000					1.00	1.25	0.26	0.000	0.33	0.000	0%							
2	8.00	0.40		0.24	0.105					1.00	1.00	0.40	0.105	0.40	0.042	3%							
3	9.00	0.60		0.36	0.166					1.00	0.75	0.60	0.166	0.45	0.075	5%							
4	9.50	0.68		0.41	0.267					1.00	0.50	0.68	0.267	0.34	0.091	6%							
5	10.00	0.70		0.42	0.318					1.00	0.50	0.70	0.318	0.35	0.111	7%							
6	10.50	0.70		0.42	0.217					1.00	0.50	0.70	0.217	0.35	0.076	5%							
7	11.00	0.74		0.44	0.292					1.00	0.50	0.74	0.292	0.37	0.108	7%							
8	11.50	0.74		0.44	0.304					1.00	0.50	0.74	0.304	0.37	0.112	7%							
9	12.00	0.70		0.42	0.283					1.00	0.50	0.70	0.283	0.35	0.099	6%							
10	12.50	0.70		0.42	0.259					1.00	0.50	0.70	0.259	0.35	0.091	6%							
11	13.00	0.72		0.43	0.239					1.00	0.75	0.72	0.239	0.54	0.129	8%							
12	14.00	0.72		0.43	0.216					1.00	1.00	0.72	0.216	0.72	0.156	10%							
13	15.00	0.65		0.39	0.206					1.00	1.00	0.65	0.206	0.65	0.134	8%							
14	16.00	0.64		0.38	0.172					1.00	1.00	0.64	0.172	0.64	0.110	7%							
15	17.00	0.65		0.39	0.134					1.00	1.00	0.65	0.134	0.65	0.087	5%							
16	18.00	0.62		0.37	0.135					1.00	1.00	0.62	0.135	0.62	0.084	5%							
17	19.00	0.50		0.30	0.104					1.00	1.00	0.50	0.104	0.50	0.052	3%							
18	20.00	0.40		0.24	0.112					1.00	1.00	0.40	0.112	0.40	0.045	3%							
19	21.00	0.22		0.13	0.023					1.00	1.00	0.22	0.023	0.22	0.005	0%							
20	22.00	0.10		0.06	0.042					1.00	1.30	0.10	0.042	0.13	0.005	0%							
RB	23.60	0.00	0.00		0.00		0.00		0.00	1.00	0.80	0.00	0.000	0.00	0.000								
<b>Total Flow</b>														<b>1.61</b>	<b>100%</b>								

**Flow Measurement Details:**

Metering Section Location (describe):  
10m DS of bridge

Meas. Start Time (MST):	7:35
Meas. End Time (MST):	8:05
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 5 C



**Flow characteristics:**

Total Flow:	1.61	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	8.73	(m <sup>2</sup> )
Wetted Width:	18.10	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.696	0.697
Water (°C):	6.8	6.8
Datalogger Clock:	07:20	08:14
Laptop Clock:	07:18	08:12
Battery (Main):	12.7	12.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	0	Elevation as given (m)	Description
<b>Benchmark</b>						
S56-3	1.166	101.217		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.249	99.968	99.967	3/4" Pipe 2m E of logger
S56-4			1.161	100.056	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut	0.228	3.020	98.425	Time WL Surveyed: 7:23	
Temporary BM			3.020	98.197	0.000	
<b>Turn</b>						
Temporary BM	3.013	101.210		98.197		
Water Level:	Cut	0.228	3.013	98.425	Time WL Surveyed: 7:25	
S56-4			1.153	100.057	100.056	3/4" Pipe 3m NW of logger
S56-2			1.243	99.967	99.967	3/4" Pipe 2m E of logger
S56-3			1.156	100.054	100.051	3/4" Pipe 4m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S56-3	1.156	101.210		100.054		
Water Level:	Cut	2.784	98.426	98.426	Time WL Surveyed: 8:09	
Water Level:	Cut	2.776	98.427	98.427	Time WL Surveyed: 8:11	
S56-3	1.149	101.203		100.054		

**WL Survey Summary**

	Before	After
Average WL:	98.425	98.427
Closing Error:	-0.003	-
WL Check:	0.000	-0.001
Transducer Elevation	97.729	97.730

**Field Personnel:**

MP, TR	Trip Date:	10-Oct-14
MP, TR	Date:	10-Oct-14
TR	Date:	14-Jan-15
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S56 Jackfish River Below Christina Lake  
 UTM Location: 493711 E, 6169759 N

Site Visit Date: November 28, 2014  
 Site Visit Time (MST): 14:38

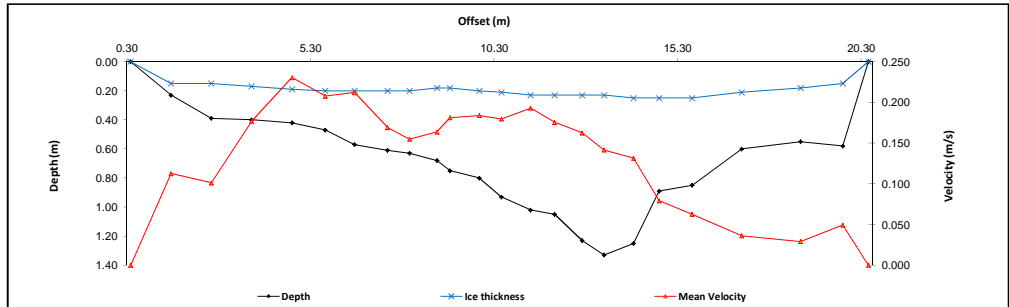


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.40	0.00	0.00		0.000				0.000	0.88	0.55	0.00	0.000	0.00	0.000	
1	1.50	0.23	0.15	0.19	0.128					0.88	1.10	0.08	0.113	0.09	0.010	1%
2	2.60	0.39	0.15	0.27	0.115					0.88	1.10	0.24	0.101	0.26	0.027	2%
3	3.70	0.40	0.17	0.29	0.201					0.88	1.10	0.23	0.177	0.25	0.045	3%
4	4.80	0.42	0.19	0.31	0.262					0.88	1.00	0.23	0.231	0.23	0.053	4%
5	5.70	0.47	0.20	0.34	0.236					0.88	0.85	0.27	0.208	0.23	0.048	4%
6	6.50	0.57	0.20	0.39	0.241					0.88	0.85	0.37	0.212	0.31	0.067	5%
7	7.40	0.61	0.20	0.41	0.192					0.88	0.75	0.41	0.169	0.31	0.052	4%
8	8.00	0.63	0.20	0.42	0.176					0.88	0.68	0.43	0.155	0.29	0.045	4%
9	8.75	0.68	0.18	0.43	0.186					0.88	0.55	0.50	0.164	0.28	0.045	4%
10	9.10	0.75	0.18	0.47	0.206					0.88	0.57	0.57	0.181	0.33	0.059	5%
11	9.90	0.80	0.20	0.50	0.209					0.88	0.70	0.60	0.184	0.42	0.077	6%
12	10.50	0.93	0.21	0.57	0.204					0.88	0.70	0.72	0.180	0.50	0.090	7%
13	11.30	1.02	0.23			0.86	0.159	0.39	0.227	1.00	0.73	0.79	0.193	0.57	0.111	9%
14	11.95	1.05	0.23			0.89	0.133	0.39	0.218	1.00	0.70	0.82	0.176	0.57	0.101	8%
15	12.70	1.23	0.23			1.03	0.116	0.43	0.209	1.00	0.68	1.00	0.163	0.68	0.110	9%
16	13.30	1.33	0.23			1.11	0.096	0.45	0.187	1.00	0.70	1.10	0.142	0.77	0.109	9%
17	14.10	1.25	0.25			1.05	0.091	0.45	0.172	1.00	0.75	1.00	0.132	0.75	0.099	8%
18	14.80	0.89	0.25	0.57	0.090					0.88	0.80	0.64	0.079	0.51	0.041	3%
19	15.70	0.85	0.25	0.55	0.071					0.88	1.13	0.60	0.062	0.68	0.042	3%
20	17.05	0.60	0.21	0.41	0.041					0.88	1.48	0.39	0.036	0.58	0.021	2%
21	18.65	0.55	0.18	0.37	0.033					0.88	1.38	0.29	0.029	0.51	0.015	1%
22	19.80	0.58	0.15	0.37	0.056					0.88	0.92	0.43	0.049	0.40	0.020	2%
LB	20.50	0.00	0.00		0.00				0.00	0.88	0.35	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.28</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
3m US of station

Meas. Start Time (MST):	14:55
Meas. End Time (MST):	15:50
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Snowing, calm, -23 C



**Flow characteristics:**

Total Flow:	1.28	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	9.51	(m <sup>2</sup> )
Wetted Width:	20.10	(m)
Hydraulic Depth:	0.47	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.06	

**Logger Details:**

	Before	After
Transducer Reading (m):		
Water (°C):		
Datalogger Clock:		
Laptop Clock:		
Battery (Main):		
Battery:		
Battery Serial #:		
Enclosure Dessicant:		
Vent Tube Dessicant:		
PT# (if replaced):		
Logger# (if replaced):		

**Datalogger / Station Notes:**

-No datalogger download conducted, lock is frozen and could not be removed

**General Notes:**

-No datalogger download conducted, lock is frozen and could not be removed

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Benchmark						
S56-3	1.382	101.433		100.051	100.051	3/4" Pipe 4m S of logger
S56-2			1.467	99.966	99.967	3/4" Pipe 2m E of logger
S56-4			1.378	100.055	100.056	3/4" Pipe 3m NW of logger
Water Level:	Cut	2.990		98.443		Time WL Surveyed: 14:42
Temporary BM			2.921	98.512	0.000	
Turn						
Temporary BM	2.897	101.409		98.512		
Water Level:	Cut	2.967		98.442		Time WL Surveyed: 14:44
S56-4			1.352	100.057	100.056	3/4" Pipe 3m NW of logger
S56-2			1.443	99.966	99.967	3/4" Pipe 2m E of logger
S56-3			1.356	100.053	100.051	3/4" Pipe 4m S of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
S56-4	1.357	101.413		100.056		
Water Level:	Cut	2.973		98.440		Time WL Surveyed: 16:00
Water Level:	Cut	2.947		98.438		Time WL Surveyed: 16:03
S56-4	1.329	101.385		100.056		

**WL Survey Summary**

	Before	After
Average WL:	98.443	98.439
Closing Error:	-0.002	-
WL Check:	0.001	0.002
Transducer Elevation	-	-

**Field Personnel:**

Field Personnel:	GG, TR	Trip Date:	28-Nov-14
Data Entry Personnel:	GG	Date:	28-Nov-14
Data Check Personnel:	TR	Date:	14-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: January 16, 2014  
 Site Visit Time (MST): 12:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.40	0.00	0.00		0.000		0.000		0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	5.00	0.21	0.06	0.14	0.063					0.88	0.55	0.15	0.055	0.08	0.005	2%
2	5.50	0.31	0.14	0.23	0.072					0.88	0.65	0.17	0.063	0.11	0.007	3%
3	6.30	0.31	0.19	0.25	0.115					0.88	0.75	0.12	0.101	0.09	0.009	4%
4	7.00	0.40	0.27	0.34	0.141					0.88	0.65	0.13	0.124	0.08	0.010	4%
5	7.60	0.50	0.29	0.40	0.153					0.88	0.55	0.21	0.135	0.12	0.016	6%
6	8.10	0.50	0.30	0.40	0.212					0.88	0.45	0.20	0.187	0.09	0.017	7%
7	8.50	0.50	0.24	0.37	0.144					0.88	0.38	0.26	0.127	0.10	0.012	5%
8	8.85	0.49	0.24	0.37	0.130					0.88	0.38	0.25	0.114	0.09	0.011	4%
9	9.25	0.58	0.35	0.47	0.215					0.88	0.42	0.23	0.189	0.10	0.018	7%
10	9.70	0.57	0.26	0.42	0.173					0.88	0.33	0.31	0.152	0.10	0.015	6%
11	9.90	0.57	0.37	0.47	0.180					0.88	0.30	0.20	0.158	0.06	0.010	4%
12	10.30	0.56	0.46	0.51	0.199					0.88	0.45	0.10	0.175	0.04	0.008	3%
13	10.80	0.52	0.37	0.45	0.220					0.88	0.45	0.15	0.194	0.07	0.013	5%
14	11.20	0.50	0.38	0.44	0.213					0.88	0.40	0.12	0.187	0.05	0.009	4%
15	11.60	0.48	0.38	0.43	0.081					0.88	0.33	0.10	0.071	0.03	0.002	1%
16	11.85	0.46	0.46	0.46	0.067					0.88	0.30	0.00	0.059	0.00	0.000	0%
17	12.20	0.49	0.37	0.43	0.163					0.88	0.33	0.12	0.143	0.04	0.006	2%
18	12.50	0.49	0.38	0.44	0.140					0.88	0.83	0.11	0.123	0.09	0.011	4%
19	13.85	0.46	0.37	0.42	0.172					0.88	1.10	0.09	0.151	0.10	0.015	6%
20	14.70	0.47	0.33	0.40	0.080					0.88	0.60	0.14	0.070	0.08	0.006	2%
21	15.05	0.52	0.23	0.38	0.118					0.88	0.25	0.29	0.104	0.07	0.008	3%
22	15.20	0.51	0.25	0.38	0.078					0.88	0.32	0.26	0.069	0.08	0.006	2%
23	15.70	0.50	0.16	0.33	0.158					0.88	0.55	0.34	0.139	0.19	0.026	10%
24	16.30	0.40	0.06	0.23	0.106					0.88	0.40	0.34	0.093	0.14	0.013	5%
LB	16.50	0.00	0.00		0.00		0.00			0.88	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.252</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 5m US of FT

Meas. Start Time (MST):	12:30
Meas. End Time (MST):	13:05
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, calm, -1 C

**Flow characteristics:**

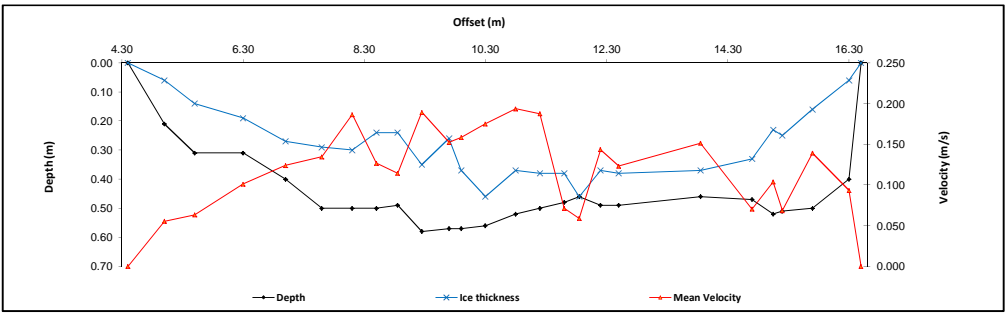
Total Flow:	0.252	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.01	(m <sup>2</sup> )
Wetted Width:	12.10	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.416	0.417
Water (°C):	0.1	0.1
Datalogger Clock:	12:05	13:19
Laptop Clock:	12:04	13:18
Battery (Main):	13.1	14.3
Battery:	-	Replaced
Enclosure Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S57-3	1.447	101.507		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.546	99.961	99.960	3/4" Pipe 5m W of logger
S57-1			1.508	99.999	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.698	97.809		Time WL Surveyed: 12:33
Temporary BM			3.688	97.819	0.000	-
<b>Turn</b>						
Temporary BM	3.672	101.491		97.819	-	
Water Level:	Cut		3.680	97.811		Time WL Surveyed: 12:35
S57-1			1.491	100.000	100.000	3/4" Pipe closest to logger
S57-2			1.528	99.963	99.960	3/4" Pipe 5m W of logger
S57-3			1.429	100.062	100.060	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S57-1	1.491	101.491		100.000		
Water Level:	Cut		3.687	97.804		Time WL Surveyed: 13:13
Water Level:	Cut		3.663	97.808		Time WL Surveyed: 13:14
S57-1	1.471	101.471		100.000		

**WL Survey Summary**

	Before	After
Average WL:	97.810	97.806
Closing Error:	-0.002	-
WL Check:	0.002	-0.004
Transducer Elevation	97.394	97.389

**Field Personnel:**

	TR, DW	Trip Date:	16-Jan-14
Data Entry Personnel:	TR	Date:	16-Jan-14
Data Check Personnel:	TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: February 26, 2014  
 Site Visit Time (MST): 13:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.60	0.00	0.00		0.000		0.000		0.000	0.88	0.08	0.00	0.000	0.00	0.000	
1	3.75	0.35	0.23	0.29	0.000				0.88	0.25	0.12	0.000	0.03	0.000	0%	
2	4.10	0.32	0.24	0.28	0.073				0.88	0.33	0.08	0.064	0.03	0.002	1%	
3	4.40	0.40	0.29	0.35	0.065				0.88	0.33	0.11	0.057	0.04	0.002	1%	
4	4.75	0.48	0.30	0.39	0.181				0.88	0.33	0.18	0.159	0.06	0.009	7%	
5	5.05	0.49	0.35	0.42	0.170				0.88	0.32	0.14	0.150	0.05	0.007	5%	
6	5.40	0.50	0.33	0.42	0.210				0.88	0.35	0.17	0.185	0.06	0.011	8%	
7	5.75	0.49	0.34	0.42	0.215				0.88	0.38	0.15	0.189	0.06	0.011	8%	
8	6.15	0.58	0.36	0.47	0.090				0.88	0.35	0.22	0.079	0.08	0.006	4%	
9	6.45	0.59	0.37	0.48	0.173				0.88	0.32	0.22	0.152	0.07	0.011	8%	
10	6.80	0.59	0.38	0.49	0.162				0.88	0.43	0.21	0.143	0.09	0.013	9%	
11	7.30	0.60	0.40	0.50	0.062				0.88	0.50	0.20	0.055	0.10	0.005	4%	
12	7.80	0.60	0.42	0.51	0.157				0.88	0.48	0.18	0.138	0.09	0.012	8%	
13	8.25	0.58	0.42	0.50	0.143				0.88	0.42	0.16	0.126	0.07	0.009	6%	
14	8.65	0.54	0.42	0.48	0.100				0.88	0.45	0.12	0.088	0.05	0.005	3%	
15	9.15	0.50	0.36	0.43	0.048				0.88	0.53	0.14	0.042	0.07	0.003	2%	
16	9.70	0.50	0.39	0.45	0.070				0.88	0.57	0.11	0.062	0.06	0.004	3%	
17	10.30	0.48	0.37	0.43	0.006				0.88	0.57	0.11	0.005	0.06	0.000	0%	
18	10.85	0.49	0.43	0.46	0.000				0.88	1.03	0.06	0.000	0.06	0.000	0%	
19	12.35	0.35	0.23	0.29	0.088				0.88	0.90	0.12	0.077	0.11	0.008	6%	
20	12.65	0.43	0.16	0.30	0.155				0.88	0.25	0.27	0.136	0.07	0.009	7%	
21	12.85	0.44	0.16	0.30	0.209				0.88	0.27	0.28	0.184	0.08	0.014	10%	
LB	13.20	0.00	0.00		0.00		0.00		0.88	0.18	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.141</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
3m US of station

Mess. Start Time (MST):	13:46
Mess. End Time (MST):	14:27
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Light snow, breezy, -20 C

**Flow characteristics:**

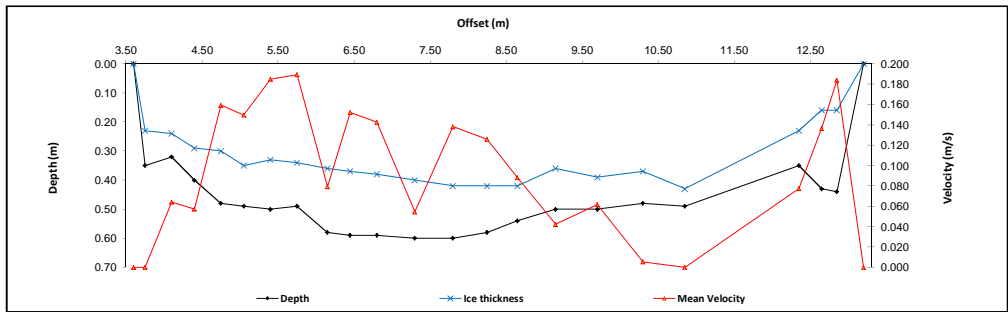
Total Flow:	0.141	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.37	(m <sup>2</sup> )
Wetted Width:	9.60	(m)
Hydraulic Depth:	0.14	(m)
Mean Velocity:	0.10	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.446	
Water (°C):	0.1	
Datalogger Clock:	13:18	
Laptop Clock:	13:17	
Battery (Main):	15.0	
Battery:		Good
Battery Serial #:	-	
Enclosure Desiccant:		Good
Vent Tube Desiccant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S57-1	1.599	101.599		100.000	100.000	3/4" Pipe closest to logger
S57-2			1.637	99.962	99.960	3/4" Pipe 5m W of logger
S57-3			1.538	100.061	100.060	3/4" Pipe 10m W of logger
Water Level:	Cut		3.805	97.794	Time WL Surveyed: 13:39	
Temporary BM			3.781	97.818	0.000	
<b>Turn</b>						
Temporary BM	3.766	101.584		97.818		
Water Level:	Cut		3.790	97.794	Time WL Surveyed: 13:42	
S57-3			1.522	100.062	100.060	3/4" Pipe 10m W of logger
S57-2			1.620	99.964	99.960	3/4" Pipe 5m W of logger
S57-1			1.583	100.001	100.000	3/4" Pipe closest to logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.794	-
Closing Error:	-0.001	-
WL Check:	0.000	-
Transducer Elevation	97.348	-

**Field Personnel:**

	SM, MP	Trip Date:	26-Feb-14
Data Entry Personnel:	SM	Date:	26-Feb-14
Data Check Personnel:	TR	Date:	17-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: March 14, 2014  
 Site Visit Time (MST): 09:10

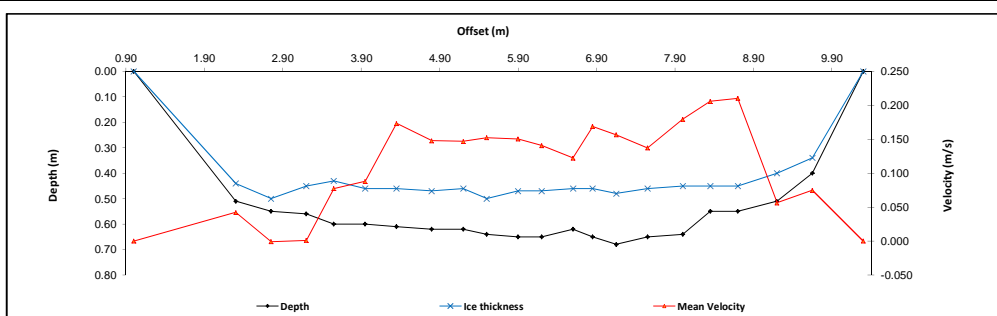


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.00	0.00	0.00		0.000		0.000		0.000	0.88	0.65	0.00	0.000	0.00	0.000	
1	2.30	0.51	0.44	0.48	0.048					0.88	0.88	0.07	0.042	0.06	0.003	2%
2	2.75	0.55	0.50	0.53	-0.001					0.88	0.45	0.05	-0.001	0.02	0.000	0%
3	3.20	0.56	0.45	0.51	0.001					0.88	0.40	0.11	0.001	0.04	0.000	0%
4	3.55	0.60	0.43	0.52	0.088					0.88	0.38	0.17	0.077	0.06	0.005	4%
5	3.95	0.60	0.46	0.53	0.100					0.88	0.40	0.14	0.088	0.06	0.005	4%
6	4.35	0.61	0.46	0.54	0.197					0.88	0.42	0.15	0.173	0.06	0.011	8%
7	4.80	0.62	0.47	0.55	0.168					0.88	0.43	0.15	0.148	0.06	0.009	7%
8	5.20	0.62	0.46	0.54	0.167					0.88	0.35	0.16	0.147	0.06	0.008	6%
9	5.50	0.64	0.50	0.57	0.173					0.88	0.35	0.14	0.152	0.05	0.007	5%
10	5.90	0.65	0.47	0.56	0.171					0.88	0.35	0.18	0.150	0.06	0.009	7%
11	6.20	0.65	0.47	0.56	0.160					0.88	0.35	0.18	0.141	0.06	0.009	6%
12	6.60	0.62	0.46	0.54	0.139					0.88	0.32	0.16	0.122	0.05	0.006	5%
13	6.85	0.65	0.46	0.56	0.192					0.88	0.28	0.19	0.169	0.05	0.009	6%
14	7.15	0.68	0.48	0.58	0.178					0.88	0.35	0.20	0.157	0.07	0.011	8%
15	7.55	0.65	0.46	0.56	0.156					0.88	0.43	0.19	0.137	0.08	0.011	8%
16	8.00	0.64	0.45	0.55	0.204					0.88	0.40	0.19	0.180	0.08	0.014	10%
17	8.35	0.55	0.45	0.50	0.234					0.88	0.35	0.10	0.206	0.03	0.007	5%
18	8.70	0.55	0.45	0.50	0.239					0.88	0.43	0.10	0.210	0.04	0.009	6%
19	9.20	0.51	0.40	0.46	0.064					0.88	0.48	0.11	0.056	0.05	0.003	2%
20	9.65	0.40	0.34	0.37	0.085					0.88	0.55	0.06	0.075	0.03	0.002	2%
RB	10.30	0.00	0.00		0.00		0.00		0.00	0.88	0.33	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.139</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from station

Meas. Start Time (MST): 9:40  
 Meas. End Time (MST): 10:10  
 Equipment: ADV  
 Method: Ice  
 River Condition: Overflow on top of ice  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Good  
 Weather: Partial cloudy, 0 C



**Flow characteristics:**

Total Flow:	0.139	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.10	(m <sup>2</sup> )
Wetted Width:	9.30	(m)
Hydraulic Depth:	0.12	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.12	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.460	
Water (°C):	0.1	
Datalogger Clock:	09:21	
Laptop Clock:	09:20	
Battery (Main):	14.8	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S57-3	1.442	101.502		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.539	99.963	99.960	3/4" Pipe 5m W of logger
S57-1			1.501	100.001	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.650	97.852	Time WL Surveyed: 9:32	
Temporary BM			3.567	97.935	0.000	
<b>Turn</b>						
Temporary BM	3.552	101.487		97.935		
Water Level:	Cut		3.632	97.855	Time WL Surveyed: 9:37	
S57-1			1.488	99.999	100.000	3/4" Pipe closest to logger
S57-2			1.526	99.961	99.960	3/4" Pipe 5m W of logger
S57-3			1.427	100.060	100.060	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	97.854	-
Closing Error:	0.000	-
WL Check:	0.003	-
Transducer Elevation	97.394	-

**Field Personnel:**

	SM, DW	Trip Date:	14-Mar-14
Data Entry Personnel:	DW	Date:	14-Mar-14
Data Check Personnel:	TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake

UTM Location: 506232E 6158404N

Site Visit Date:

April 11, 2014

Site Visit Time (MST):

09:05



## Flow Measurement:

Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

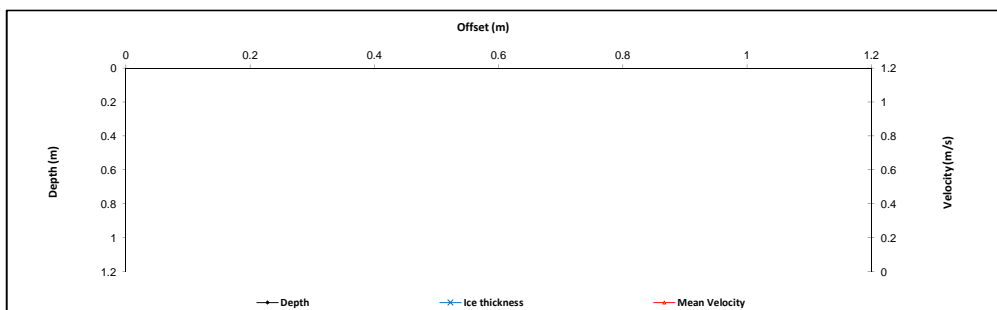
### Flow Measurement Details:

Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	

### Flow characteristics:

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	



### Logger Details:

	Before	After
Transducer Reading (m):	0.910	
Water (°C):	0.1	
Datalogger Clock:	09:08	
Laptop Clock:	09:09	
Battery (Main):	14.5	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

### Datalogger / Station Notes:

-Over 30cm of overflow on top of degrading ice, no discharge measurement completed, could not drill holes without flooding auger

### General Notes:

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
Station						
Benchmark						
S57-3	1.372	101.432		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.471	99.961	99.960	3/4" Pipe 5m W of logger
S57-1			1.433	99.999	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.136	98.296	Time WL Surveyed:	9:16
Temporary BM			3.278	98.154	0.000	-
Turn						
Temporary BM	3.243	101.397		98.154		-
Water Level:	Cut		3.098	98.299	Time WL Surveyed:	9:20
S57-1			1.397	100.000	100.000	3/4" Pipe closest to logger
S57-2			1.436	99.961	99.960	3/4" Pipe 5m W of logger
S57-3			1.335	100.062	100.060	3/4" Pipe 10m W of logger
Secondary Water Level Survey (pick any BM e.g. closest to water's edge)						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

WL Survey Summary	Before	After
Average WL:	98.298	-
Closing Error:	-0.002	-
WL Check:	0.003	-
Transducer Elevation	97.388	-

Field Personnel:	TR, MP	Trip Date:	11-Apr-14
Data Entry Personnel:	TR	Date:	11-Apr-14
Data Check Personnel:	TR	Date:	15-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake

UTM Location: 506232 E 6158404 N

Site Visit Date: May 14, 2014

Site Visit Time (MST): 11:05



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 4m US of PT	
Meas. Start Time (MST):	11:31
Meas. End Time (MST):	12:33
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Flowing well
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 16 C

<b>Flow characteristics:</b>		
Total Flow:	4.03	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	10.01	(m <sup>2</sup> )
Wetted Width:	13.12	(m)
Hydraulic Depth:	0.76	(m)
Mean Velocity:	0.40	(m/s)
Froude Number:	0.15	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	0.812	0.809
Water (°C):	7.3	8.0
Datalogger Clock:	11:12	12:43
Laptop Clock:	11:11	12:42
Battery (Main):	13.8	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	21.10	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	8.00	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	8.0				
			ADCP Temperature (°C):	10.1				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	13.22	10.28	0.403	4.146	2.91%
Coordinate System:	ENU		2	13.05	9.96	0.406	4.038	0.23%
Left Method:	Sloped bank		3	13.18	9.91	0.402	3.983	-1.14%
Right Method:	Sloped bank		4	13.03	9.90	0.399	3.948	-2.00%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	13.12	10.01	0.403	<b>4.03</b>	
			<b>SD:</b>	0.08	0.15	0.003	0.075	
			<b>COV:</b>	0.01	0.02	0.006	0.019	

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S57-3	1.262	101.322		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.361	99.961	99.960	3/4" Pipe 5m W of logger
S57-1			1.323	99.999	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.145	98.177	<b>Time WL Surveyed:</b>	11:26
Temporary BM			3.241	98.081	0.000	-
<b>Turn</b>						
Temporary BM	3.216	101.297		98.081		-
Water Level:	Cut		3.116	98.181	<b>Time WL Surveyed:</b>	11:30
S57-1			1.297	100.000	100.000	3/4" Pipe closest to logger
S57-2			1.335	99.962	99.960	3/4" Pipe 5m W of logger
S57-3			1.235	100.062	100.060	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S57-1	1.297	101.297		100.000		
Water Level:	Cut		3.119	98.178	<b>Time WL Surveyed:</b>	12:38
Water Level:	Cut		3.102	98.178	<b>Time WL Surveyed:</b>	12:39
S57-1	1.280	101.280		100.000		

<b>WL Survey Summary</b>	Before	After
Average WL:	98.179	98.178
Closing Error:	-0.002	-
WL Check:	0.004	0.000
Transducer Elevation	97.367	97.369

<b>Field Personnel:</b>	MP, TR	Trip Date:	14-May-14
<b>Data Entry Personnel:</b>	MP	Date:	14-May-14
<b>Data Check Personnel:</b>	TR	Date:	1-Aug-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: June 23, 2014  
 Site Visit Time (MST): 10:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	12.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	13.00	0.54		0.32	0.130					1.00	0.63	0.54	0.130	0.34	0.044	1%
2	13.75	0.59		0.35	0.220					1.00	0.75	0.59	0.220	0.44	0.097	2%
3	14.50	0.67		0.40	0.210					1.00	0.75	0.67	0.210	0.50	0.106	2%
4	15.25	0.88				0.70	0.140	0.18	0.290	1.00	0.75	0.88	0.215	0.66	0.142	3%
5	16.00	0.97				0.80	0.400	0.19	0.460	1.00	0.75	0.97	0.430	0.73	0.313	6%
6	16.75	1.00				0.80	0.380	0.20	0.490	1.00	0.75	1.00	0.435	0.75	0.326	6%
7	17.50	1.00				0.80	0.490	0.20	0.530	1.00	0.63	1.00	0.510	0.63	0.319	6%
8	18.00	1.06				0.85	0.440	0.21	0.560	1.00	0.50	1.06	0.500	0.53	0.265	5%
9	18.50	1.09				0.87	0.500	0.22	0.690	1.00	0.50	1.09	0.590	0.55	0.322	6%
10	19.00	1.05				0.84	0.580	0.21	0.720	1.00	0.50	1.05	0.650	0.53	0.341	7%
11	19.50	1.03				0.82	0.610	0.21	0.780	1.00	0.50	1.03	0.695	0.52	0.358	7%
12	20.00	1.00				0.80	0.490	0.20	0.710	1.00	0.50	1.00	0.600	0.50	0.300	6%
13	20.50	1.02				0.82	0.600	0.20	0.790	1.00	0.50	1.02	0.695	0.51	0.354	7%
14	21.00	0.98				0.78	0.590	0.20	0.720	1.00	0.50	0.98	0.655	0.49	0.321	6%
15	21.50	0.93				0.74	0.730	0.19	0.770	1.00	0.50	0.93	0.750	0.47	0.349	7%
16	22.00	0.96				0.77	0.520	0.19	0.710	1.00	0.50	0.96	0.615	0.48	0.295	6%
17	22.50	0.95				0.76	0.480	0.19	0.660	1.00	0.50	0.95	0.570	0.48	0.271	5%
18	23.00	0.88				0.70	0.420	0.18	0.650	1.00	0.50	0.88	0.535	0.44	0.235	5%
19	23.50	0.91				0.73	0.330	0.18	0.460	1.00	0.50	0.91	0.395	0.46	0.180	4%
20	24.00	0.92				0.74	0.150	0.18	0.280	1.00	0.63	0.92	0.215	0.58	0.124	2%
21	24.75	0.68		0.41	0.120					1.00	0.75	0.68	0.120	0.51	0.061	1%
LB	25.50	0.00	0.00		0.00		0.00		0.00	1.00	0.38	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>5.12</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 Across from station

Mess. Start Time (MST):	11:05
Mess. End Time (MST):	11:32
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 20 C

**Flow characteristics:**

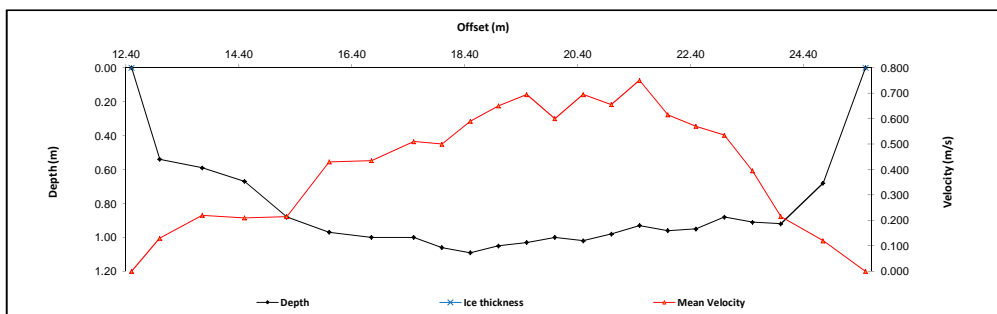
Total Flow:	5.12	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	11.06	(m <sup>2</sup> )
Wetted Width:	13.00	(m)
Hydraulic Depth:	0.85	(m)
Mean Velocity:	0.46	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.913	0.918
Water (°C):	14.0	14.5
Datalogger Clock:	10:18	11:45
Laptop Clock:	10:16	11:44
Battery (Main):	14.2	13.7
Battery:	Good	
Battery Serial #:	120614	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	284722	284726
Logger# (if replaced):	20959	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S57-1	1.325	101.325		100.000	100.000	3/4" Pipe closest to logger
S57-2			1.365	99.960	99.960	3/4" Pipe 5m W of logger
S57-3			1.265	100.060	100.060	3/4" Pipe 10m W of logger
<b>Turn</b>						
S57-1	Cut		3.045	98.280	98.280	Time WL Surveyed: 10:54
S57-1			1.325	100.000	100.000	3/4" Pipe closest to logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S57-1	1.309	101.309		100.000	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.029	98.280	98.280	Time WL Surveyed: 10:57
S57-3			1.248	100.061	100.060	3/4" Pipe 10m W of logger
S57-2			1.347	99.962	99.960	3/4" Pipe 5m W of logger
S57-1			1.309	100.000	100.000	3/4" Pipe closest to logger
<b>WL Survey Summary</b>						
Water Level:	Cut		3.028	98.281	98.281	Time WL Surveyed: 11:39
Water Level:	Cut		3.015	98.278	98.278	Time WL Surveyed: 11:41
S57-1	1.293	101.293		100.000	100.000	

**WL Survey Summary**

Average WL:	Before	After
	98.280	98.280
Closing Error:	0.000	-
WL Check:	0.000	0.003
Transducer Elevation	97.367	97.362

**Field Personnel:**

SM, GG	Trip Date:	23-Jun-14
SM	Date:	23-Jun-14
TR	Date:	15-Jul-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: August 14, 2014  
 Site Visit Time (MST): 11:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	0.60	0.00	0.00		0.000				0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	1.00	0.24		0.14	-0.014					1.00	0.50	0.24	-0.014	0.12	-0.002	0%
2	1.60	0.48		0.29	0.004					1.00	0.60	0.48	0.004	0.29	0.001	0%
3	2.20	0.48		0.29	0.061					1.00	0.60	0.48	0.061	0.29	0.018	3%
4	2.80	0.46		0.28	0.109					1.00	0.60	0.46	0.109	0.28	0.030	5%
5	3.40	0.44		0.26	0.114					1.00	0.60	0.44	0.114	0.26	0.030	5%
6	4.00	0.40		0.24	0.142					1.00	0.60	0.40	0.142	0.24	0.034	6%
7	4.60	0.44		0.26	0.122					1.00	0.60	0.44	0.122	0.26	0.032	5%
8	5.20	0.40		0.24	0.136					1.00	0.60	0.40	0.136	0.24	0.033	6%
9	5.80	0.41		0.25	0.159					1.00	0.60	0.41	0.159	0.25	0.039	7%
10	6.40	0.42		0.25	0.178					1.00	0.60	0.42	0.178	0.25	0.045	8%
11	7.00	0.44		0.26	0.149					1.00	0.60	0.44	0.149	0.26	0.039	7%
12	7.60	0.45		0.27	0.149					1.00	0.60	0.45	0.149	0.27	0.040	7%
13	8.20	0.50		0.30	0.149					1.00	0.60	0.50	0.149	0.30	0.045	8%
14	8.80	0.55		0.33	0.148					1.00	0.60	0.55	0.148	0.33	0.049	8%
15	9.40	0.51		0.31	0.175					1.00	0.60	0.51	0.175	0.31	0.054	9%
16	10.00	0.38		0.23	0.157					1.00	0.60	0.38	0.157	0.23	0.036	6%
17	10.60	0.46		0.28	0.105					1.00	0.60	0.46	0.105	0.28	0.029	5%
18	11.20	0.35		0.21	0.082					1.00	0.60	0.35	0.082	0.21	0.017	3%
19	11.80	0.34		0.20	0.089					1.00	0.60	0.34	0.089	0.20	0.018	3%
20	12.40	0.22		0.13	0.031					1.00	0.80	0.22	0.031	0.18	0.005	1%
RB	13.40	0.00	0.00		0.000				0.000	1.00	0.50	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.592</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m US of PT

Meas. Start Time (MST):	11:30
Meas. End Time (MST):	11:55
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 30 C

**Flow characteristics:**

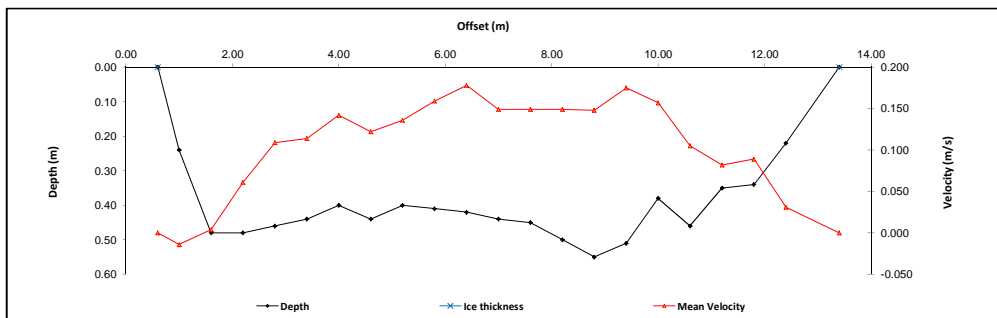
Total Flow:	0.592	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.04	(m <sup>2</sup> )
Wetted Width:	12.80	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.12	(m/s)
Froude Number:	0.06	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.443	0.444
Water (°C):	19.4	19.7
Datalogger Clock:	11:19	12:04
Laptop Clock:	11:19	12:04
Battery (Main):	13.5	13.5
Battery:		Good
Battery Serial #:	-	-
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S57-3	1.353	101.413		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.457	99.956	99.960	3/4" Pipe 5m W of logger
S57-1			1.418	99.995	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.608	97.805		Time WL Surveyed: 11:25
Temporary BM			1.418	99.995		
<b>Turn</b>						
Temporary BM	1.408	101.403		99.995		
Water Level:	Cut		3.595	97.808		Time WL Surveyed: 11:27
S57-1			1.408	99.995	100.000	3/4" Pipe closest to logger
S57-2			1.446	99.957	99.960	3/4" Pipe 5m W of logger
S57-3			1.346	100.057	100.060	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S57-1	1.408	101.403		99.995		
Water Level:	Cut		3.593	97.810		Time WL Surveyed: 12:02
Water Level:	Cut		3.586	97.809		Time WL Surveyed: 12:03
S57-1	1.400	101.395		99.995		

**WL Survey Summary**

	Before	After
Average WL:	97.807	97.810
Closing Error:	0.003	-
WL Check:	0.003	0.001
Transducer Elevation	97.364	97.366

**Field Personnel:**

	TR, CJ	Trip Date:	14-Aug-14
Data Entry Personnel:	CJ	Date:	14-Aug-14
Data Check Personnel:	MP	Date:	4-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: September 18, 2014  
 Site Visit Time (MST): 13:10

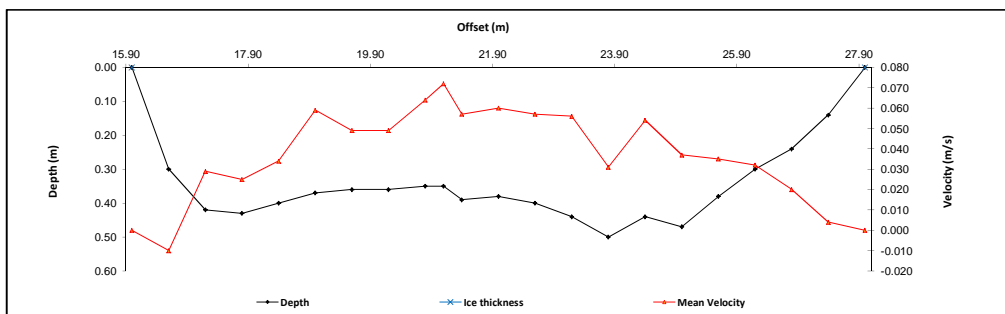


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	16.00	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	16.60	0.30		0.18	-0.010					1.00	0.60	0.30	-0.010	0.18	-0.002	-1%
2	17.20	0.42		0.25	0.029					1.00	0.60	0.42	0.029	0.25	0.007	4%
3	17.80	0.43		0.26	0.025					1.00	0.60	0.43	0.025	0.26	0.006	4%
4	18.40	0.40		0.24	0.034					1.00	0.60	0.40	0.034	0.24	0.008	5%
5	19.00	0.37		0.22	0.059					1.00	0.60	0.37	0.059	0.22	0.013	7%
6	19.60	0.36		0.22	0.049					1.00	0.60	0.36	0.049	0.22	0.011	6%
7	20.20	0.36		0.22	0.049					1.00	0.60	0.36	0.049	0.22	0.011	6%
8	20.80	0.35		0.21	0.064					1.00	0.45	0.35	0.064	0.16	0.010	6%
9	21.10	0.35		0.21	0.072					1.00	0.30	0.35	0.072	0.10	0.008	4%
10	21.40	0.39		0.23	0.057					1.00	0.45	0.39	0.057	0.18	0.010	6%
11	22.00	0.38		0.23	0.060					1.00	0.60	0.38	0.060	0.23	0.014	8%
12	22.60	0.40		0.24	0.057					1.00	0.60	0.40	0.057	0.24	0.014	8%
13	23.20	0.44		0.26	0.056					1.00	0.60	0.44	0.056	0.26	0.015	8%
14	23.80	0.50		0.30	0.031					1.00	0.60	0.50	0.031	0.30	0.009	5%
15	24.40	0.44		0.26	0.054					1.00	0.60	0.44	0.054	0.26	0.014	8%
16	25.00	0.47		0.28	0.037					1.00	0.60	0.47	0.037	0.28	0.010	6%
17	25.60	0.38		0.23	0.035					1.00	0.60	0.38	0.035	0.23	0.008	5%
18	26.20	0.30		0.18	0.032					1.00	0.60	0.30	0.032	0.18	0.006	3%
19	26.80	0.24		0.14	0.020					1.00	0.60	0.24	0.020	0.14	0.003	2%
20	27.40	0.14		0.08	0.004					1.00	0.60	0.14	0.004	0.08	0.000	0%
RB	28.00	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>0.175</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
4m US of PT

Meas. Start Time (MST):	13:25
Meas. End Time (MST):	13:55
Equipment:	ADV
Method:	Wading
River Condition:	Low water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15 C



**Flow characteristics:**

Total Flow:	0.175	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.24	(m <sup>2</sup> )
Wetted Width:	12.00	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.391	0.392
Water (°C):	10.6	10.7
Datalogger Clock:	13:22	14:00
Laptop Clock:	13:20	13:59
Battery (Main):	14.3	14.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Beaver dam located 20m upstream of bridge

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S57-3	1.406	101.466		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.505	99.961	99.960	3/4" Pipe 5m W of logger
S57-1			1.467	99.999	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.705	97.761		Time WL Surveyed: 13:24
S57-1			1.467	99.999	100.000	3/4" Pipe closest to logger
<b>Turn</b>						
S57-1	1.455	101.454		99.999	100.000	3/4" Pipe closest to logger
Water Level:	Cut		3.692	97.762		Time WL Surveyed: 13:26
S57-1			1.455	99.999	100.000	3/4" Pipe closest to logger
S57-2			1.492	99.962	99.960	3/4" Pipe 5m W of logger
S57-3			1.394	100.060	100.060	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S57-1	1.455	101.454		99.999		
Water Level:	Cut		3.693	97.761		Time WL Surveyed: 13:57
Water Level:	Cut		3.678	97.762		Time WL Surveyed: 13:58
S57-1	1.441	101.440		99.999		

**WL Survey Summary**

	Before	After
Average WL:	97.762	97.762
Closing Error:	0.000	-
WL Check:	0.001	-0.001
Transducer Elevation	97.371	97.370

**Field Personnel:**

	SM, TR	Trip Date:	18-Sep-14
Data Entry Personnel:	SM	Date:	18-Sep-14
Data Check Personnel:	TR	Date:	29-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Above Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: October 10, 2014  
 Site Visit Time (MST): 12:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	2.90	0.00	0.00		0.000		0.000		0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	3.50	0.18		0.11	0.006					1.00	0.80	0.18	0.006	0.14	0.001	0%
2	4.50	0.34		0.20	0.039					1.00	0.75	0.34	0.039	0.26	0.010	2%
3	5.00	0.38		0.04	0.053					1.00	0.50	0.38	0.053	0.19	0.010	2%
4	5.50	0.46		0.28	0.060					1.00	0.50	0.46	0.060	0.23	0.014	3%
5	6.00	0.46		0.28	0.113					1.00	0.50	0.46	0.113	0.23	0.026	5%
6	6.50	0.51		0.31	0.084					1.00	0.50	0.51	0.084	0.26	0.021	4%
7	7.00	0.54		0.32	0.143					1.00	0.50	0.54	0.143	0.27	0.039	7%
8	7.50	0.54		0.32	0.153					1.00	0.50	0.54	0.153	0.27	0.041	8%
9	8.00	0.51		0.31	0.140					1.00	0.50	0.51	0.140	0.26	0.036	6%
10	8.50	0.42		0.25	0.167					1.00	0.50	0.42	0.167	0.21	0.035	6%
11	9.00	0.44		0.26	0.180					1.00	0.50	0.44	0.180	0.22	0.040	7%
12	9.50	0.44		0.26	0.182					1.00	0.50	0.44	0.182	0.22	0.040	7%
13	10.00	0.43		0.26	0.166					1.00	0.50	0.43	0.166	0.22	0.036	6%
14	10.50	0.41		0.25	0.161					1.00	0.50	0.41	0.161	0.21	0.033	6%
15	11.00	0.41		0.25	0.145					1.00	0.50	0.41	0.145	0.21	0.030	5%
16	11.50	0.41		0.25	0.125					1.00	0.50	0.41	0.125	0.21	0.026	5%
17	12.00	0.40		0.24	0.147					1.00	0.50	0.40	0.147	0.20	0.029	5%
18	12.50	0.41		0.25	0.112					1.00	0.50	0.41	0.112	0.21	0.023	4%
19	13.00	0.42		0.25	0.107					1.00	0.50	0.42	0.107	0.21	0.022	4%
20	13.50	0.46		0.28	0.082					1.00	0.75	0.46	0.082	0.35	0.028	5%
21	14.50	0.33		0.20	0.032					1.00	0.95	0.33	0.032	0.31	0.010	2%
LB	15.40	0.00	0.00		0.00		0.00		0.00	1.00	0.45	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.55</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
3m US of PT

Mess. Start Time (MST):	12:20
Mess. End Time (MST):	12:45
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10 C

**Flow characteristics:**

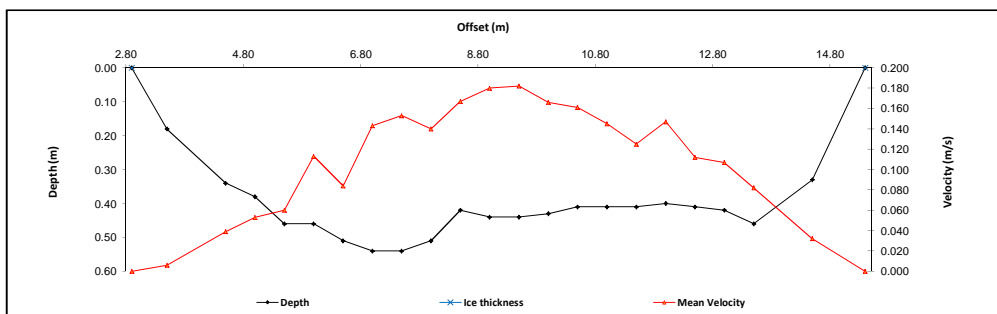
Total Flow:	0.550	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.85	(m²)
Wetted Width:	12.50	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.06	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.453	0.453
Water (°C):	4.8	5.0
Datalogger Clock:	12:03	12:51
Laptop Clock:	12:02	12:49
Battery (Main):	13.8	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S57-3	1.307	101.367		100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.405	99.962	99.960	3/4" Pipe 5m W of logger
S57-1			1.367	100.000	100.000	3/4" Pipe closest to logger
Water Level:	Cut	0.191	3.737	97.821	Time WL Surveyed:	12:11
Temporary BM			3.737	97.630	0.000	-
<b>Turn</b>						
Temporary BM	3.717	101.347		97.630	-	-
Water Level:	Cut	0.191	3.717	97.821	Time WL Surveyed:	12:12
S57-1			1.347	100.000	100.000	3/4" Pipe closest to logger
S57-2			1.386	99.961	99.960	3/4" Pipe 5m W of logger
S57-3			1.289	100.058	100.060	3/4" Pipe 10m W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S57-1	1.347	101.347		100.000	-	-
Water Level:	Cut	0.201	3.731	97.817	Time WL Surveyed:	12:46
Water Level:	Cut	0.201	3.710	97.818	Time WL Surveyed:	12:47
S57-1	1.327	101.327		100.000	-	-

**WL Survey Summary**

	Before	After
Average WL:	97.821	97.818
Closing Error:	0.002	-
WL Check:	0.000	-0.001
Transducer Elevation	97.368	97.365

**Field Personnel:**

TR, MP	Trip Date:	10-Oct-14
Data Entry Personnel: TR	Date:	10-Oct-14
Data Check Personnel: TR	Date:	20-Jan-15
Entered Digitally in the Field:	Yes	



# Hydrometric Measurement / Site Visit Record

Site: S57 Sunday Creek Abover Christina Lake  
 UTM Location: 506232E 6158404N

Site Visit Date: December 6, 2014  
 Site Visit Time (MST): 10:30



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.00	0.00	0.00		0.000		0.000		0.000	0.88	0.43	0.00	0.000	0.00	0.000	
1	3.85	0.33	0.14	0.24	0.002					0.88	0.65	0.19	0.002	0.12	0.000	0%
2	4.30	0.43	0.15	0.29	0.128					0.88	0.48	0.28	0.113	0.13	0.015	5%
3	4.80	0.40	0.16	0.28	0.150					0.88	0.45	0.24	0.132	0.11	0.014	5%
4	5.20	0.40	0.17	0.29	0.131					0.88	0.40	0.23	0.115	0.09	0.011	4%
5	5.60	0.40	0.16	0.28	0.124					0.88	0.42	0.24	0.109	0.10	0.011	4%
6	6.05	0.41	0.16	0.29	0.117					0.88	0.38	0.25	0.103	0.09	0.010	3%
7	6.35	0.39	0.16	0.28	0.000					0.88	0.33	0.23	0.000	0.07	0.000	0%
8	6.70	0.39	0.17	0.28	0.127					0.88	0.38	0.22	0.112	0.08	0.009	3%
9	7.10	0.39	0.20	0.30	0.105					0.88	0.40	0.19	0.092	0.08	0.007	2%
10	7.50	0.39	0.20	0.30	0.118					0.88	0.40	0.19	0.104	0.08	0.008	3%
11	7.90	0.38	0.17	0.28	0.122					0.88	0.40	0.21	0.107	0.08	0.009	3%
12	8.30	0.40	0.19	0.30	0.137					0.88	0.38	0.21	0.121	0.08	0.009	3%
13	8.65	0.40	0.19	0.30	0.132					0.88	0.35	0.21	0.116	0.07	0.009	3%
14	9.00	0.48	0.20	0.34	0.133					0.88	0.35	0.28	0.117	0.10	0.011	4%
15	9.35	0.43	0.19	0.31	0.161					0.88	0.35	0.24	0.142	0.08	0.012	4%
16	9.70	0.45	0.19	0.32	0.170					0.88	0.40	0.26	0.150	0.10	0.016	5%
17	10.15	0.49	0.18	0.34	0.154					0.88	0.48	0.31	0.136	0.15	0.020	7%
18	10.65	0.58	0.17	0.38	0.123					0.88	0.48	0.41	0.108	0.19	0.021	7%
19	11.10	0.60	0.18	0.39	0.145					0.88	0.40	0.42	0.128	0.17	0.021	7%
20	11.45	0.61	0.18	0.40	0.131					0.88	0.40	0.43	0.115	0.17	0.020	7%
21	11.90	0.60	0.17	0.39	0.119					0.88	0.48	0.43	0.105	0.20	0.021	7%
22	12.40	0.59	0.16	0.38	0.102					0.88	0.45	0.43	0.090	0.19	0.017	6%
23	12.80	0.55	0.16	0.36	0.029					0.88	0.42	0.39	0.026	0.17	0.004	1%
24	13.25	0.49	0.16	0.33	0.110					0.88	0.45	0.33	0.097	0.15	0.014	5%
25	13.70	0.39	0.16	0.28	0.016					0.88	0.45	0.23	0.014	0.10	0.001	0%
26	14.15	0.36	0.18	0.27	0.007					0.88	0.55	0.18	0.006	0.10	0.001	0%
LB	14.80	0.00	0.00		0.00		0.00		0.00	0.88	0.33	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.293</b>	<b>100%</b>	

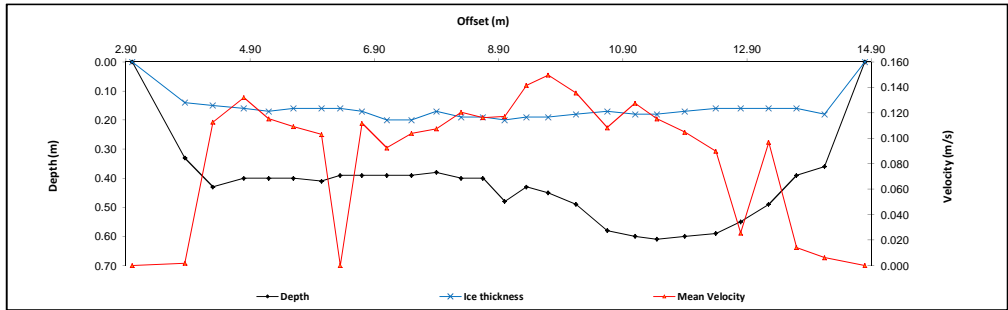
**Flow Measurement Details:**

Metering Section Location (describe):  
5m DS of station

Meas. Start Time (MST): 11:23  
 Meas. End Time (MST): 12:01  
 Equipment: ADV  
 Method: Ice  
 River Condition: Full ice cover  
 Channel Edges: Trapezoidal Edge (e.g. stream)  
 Quality/Error (see reverse): Good  
 Weather: Clear, calm, -8C

**Flow characteristics:**

Total Flow: 0.293 (m<sup>3</sup>/s)  
 Perceived Measurement Quality: Good  
 Cross Section Area: 3.08 (m<sup>2</sup>)  
 Wetted Width: 11.80 (m)  
 Hydraulic Depth: 0.26 (m)  
 Mean Velocity: 0.10 (m/s)  
 Froude Number: 0.06



**Logger Details:**

	Before	After
Transducer Reading (m):	0.405	0.403
Water (°C):	0.3	0.3
Datalogger Clock:	10:52	12:14
Laptop Clock:	10:52	12:14
Battery (Main):	14.8	15.0
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Modem replaced

**General Notes:**

-Slush or upstream flow obstruction at offset 6.35m

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S57-1	1.357	101.357		100.000	100.000	3/4" Pipe closest to logger
S57-2			1.395	99.962	99.960	3/4" Pipe 5m W of logger
S57-3			1.297	100.060	100.060	3/4" Pipe 10m W of logger
Water Level:	Cut		3.585	97.772		Time WL Surveyed: 11:13
Temporary BM			1.297	100.060	0.000	
<b>Turn</b>						
Temporary BM	1.300	101.360		100.060		
Water Level:	Cut		3.590	97.770		Time WL Surveyed: 11:14
S57-3			1.300	100.060	100.060	3/4" Pipe 10m W of logger
S57-2			1.399	99.961	99.960	3/4" Pipe 5m W of logger
S57-1			1.362	99.998	100.000	3/4" Pipe closest to logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S57-1	1.358	101.357		99.999		
Water Level:	Cut		3.607	97.750		Time WL Surveyed: 12:07
Water Level:	Cut		3.591	97.754		Time WL Surveyed: 12:09
S57-1	1.346	101.345		99.999		

**WL Survey Summary**

	Before	After
Average WL:	97.771	97.752
Closing Error:	0.002	-
WL Check:	0.002	-0.004
Transducer Elevation	97.366	97.349

**Field Personnel:**

Data Entry Personnel:	CJ, NC	Trip Date:	6-Dec-14
Data Check Personnel:	CJ	Date:	6-Dec-14
Entered Digitally in the Field:	TR	Date:	28-Jan-15

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake

UTM Location: 511444E 6167182N

Site Visit Date: \_\_\_\_\_

May 15, 2014

Site Visit Time (MST): \_\_\_\_\_

12:10



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): under bridge	
Meas. Start Time (MST):	13:00
Meas. End Time (MST):	13:25
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Rain, calm, 12 C

<b>Flow characteristics:</b>		
Total Flow:	1.20	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.92	(m <sup>2</sup> )
Wetted Width:	6.49	(m)
Hydraulic Depth:	0.76	(m)
Mean Velocity:	0.24	(m/s)
Froude Number:	0.09	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	1.223	1.233
Water (°C):	6.8	6.8
Datalogger Clock:	12:16	13:41
Laptop Clock:	12:16	13:41
Battery (Main):	13.2	13.0
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

<b>Argonaut Details:</b>		
	Before	After
Water Level (m):		
Index Velocity (m/s):		
Discharge (m <sup>3</sup> /s):		

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.08	LB:	19.10
Serial Number:	1802	Salinity (ppt):	0.0	RB:	12.90
Firmware Version:	3.5	Magnetic Declination (°):	-		
Software Version:	3.7	Measured Temperature (°C):	6.8		
		ADCP Temperature (°C):	8.9		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	6.72	5.09	0.240
Coordinate System:	ENU	2	6.23	4.87	0.247
Left Method:	Sloped bank	3	6.53	4.81	0.243
Right Method:	Sloped bank				
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit	<b>Mean:</b>	6.49	4.92	0.243
		<b>SD:</b>	0.20	0.12	0.003
		<b>COV:</b>	0.03	0.02	0.012
					1.20
					0.021
					0.018

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S58-1	0.920	100.920		100.000	100.000	3/4" Pipe W of logger
S58-2			1.030	99.890	99.872	3/4" Pipe SW of logger
S58-3			1.055	99.865	99.865	3/4" Pipe S of logger
Water Level:	Cut		1.835	99.085	<b>Time WL Surveyed:</b>	12:34
S58-3			1.055	99.865	99.865	
<b>Turn</b>						
S58-3	1.044	100.909		99.865	99.865	
Water Level:	Cut		1.824	99.085	<b>Time WL Surveyed:</b>	12:37
S58-3			1.044	99.865	99.865	3/4" Pipe S of logger
S58-2			1.019	99.890	99.872	3/4" Pipe SW of logger
S58-1			0.909	100.000	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S58-1	1.044	100.909		99.865		
Water Level:	Cut		1.814	99.095	<b>Time WL Surveyed:</b>	13:37
Water Level:	Cut		1.800	99.093	<b>Time WL Surveyed:</b>	13:39
S58-1	1.028	100.893		99.865		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	99.085	99.094
Closing Error:	0.000	-
WL Check:	0.000	0.002
Transducer Elevation	97.862	97.861

<b>Field Personnel:</b>			
Data Entry Personnel:	SM, MP	Trip Date:	15-May-14
Data Check Personnel:	SM	Date:	15-May-14
Entered Digitally In the Field:	TR	Date:	1-Aug-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: June 12, 2015  
 Site Visit Time (MST): 13:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	1.60	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	2.40	0.44		0.26	-0.013					1.00	0.60	0.44	-0.013	0.26	-0.003	0%
2	2.90	0.81				0.65	0.002	0.16	0.014	1.00	0.40	0.81	0.008	0.32	0.003	0%
3	3.20	0.94				0.75	0.009	0.19	0.360	1.00	0.40	0.94	0.185	0.38	0.069	2%
4	3.60	1.09				0.87	-0.048	0.22	0.561	1.00	0.40	1.09	0.257	0.44	0.112	3%
5	4.00	1.40				1.12	0.056	0.28	0.552	1.00	0.40	1.40	0.304	0.56	0.170	4%
6	4.40	1.62				1.30	0.249	0.32	0.573	1.00	0.40	1.62	0.411	0.65	0.266	7%
7	4.80	1.68				1.34	0.584	0.34	0.639	1.00	0.30	1.68	0.612	0.50	0.308	8%
8	5.00	1.69				1.35	0.668	0.34	0.632	1.00	0.20	1.69	0.650	0.34	0.220	6%
9	5.20	1.71				1.37	0.586	0.34	0.619	1.00	0.20	1.71	0.603	0.34	0.206	5%
10	5.40	1.66				1.33	0.510	0.33	0.672	1.00	0.20	1.66	0.591	0.33	0.196	5%
11	5.60	1.66				1.33	0.595	0.33	0.632	1.00	0.30	1.66	0.614	0.50	0.306	8%
12	6.00	1.64				1.31	0.449	0.33	0.667	1.00	0.40	1.64	0.558	0.66	0.366	9%
13	6.40	1.51				1.21	0.229	0.30	0.702	1.00	0.40	1.51	0.466	0.60	0.281	7%
14	6.80	1.40				1.12	0.197	0.28	0.757	1.00	0.40	1.40	0.477	0.56	0.267	7%
15	7.20	1.34				1.07	0.216	0.27	0.739	1.00	0.40	1.34	0.478	0.54	0.256	6%
16	7.60	1.24				0.99	0.177	0.25	0.685	1.00	0.40	1.24	0.431	0.50	0.214	5%
17	8.00	1.28				1.02	0.412	0.26	0.616	1.00	0.40	1.28	0.514	0.51	0.263	7%
18	8.40	1.18				0.94	0.583	0.24	0.569	1.00	0.40	1.18	0.576	0.47	0.272	7%
19	8.80	0.72		0.43	0.498					1.00	0.40	0.72	0.498	0.29	0.143	4%
20	9.20	0.40		0.24	0.219					1.00	0.40	0.40	0.219	0.16	0.035	1%
21	9.60	0.26		0.16	0.007					1.00	0.50	0.26	0.007	0.13	0.001	0%
RB	10.20	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>3.95</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): Under bridge

Mess. Start Time (MST):	14:17
Mess. End Time (MST):	15:20
Equipment:	ADV
Method:	Wading
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm

**Flow characteristics:**

Total Flow:	3.95	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.04	(m²)
Wetted Width:	8.60	(m)
Hydraulic Depth:	1.05	(m)
Mean Velocity:	0.44	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.777	1.869
Water (°C):	14.3	15.7
Datalogger Clock:	13:08	15:36
Laptop Clock:	13:10	15:37
Battery (Main):	13.7	13.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PTH# (if replaced):	298578	284729
Logger# (if replaced):	-	-

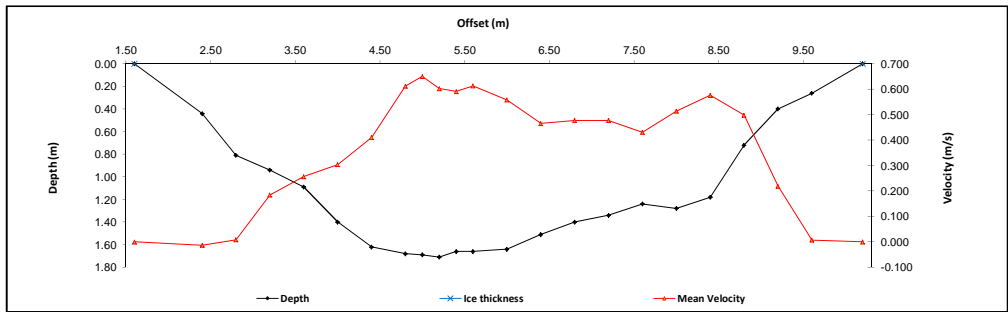
**Argonaut Details:**

	Before	After
Water Level (m):	-	1.869
Index Velocity (m/s):	-	0.302
Discharge (m³/s):	-	5.081

**Datalogger / Station Notes**

-Grounded enclosure

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S58-1	1.216	101.216		100.000	100.000	3/4" Pipe W of logger
S58-2			1.323	99.893	99.872	3/4" Pipe SW of logger
S58-3			1.348	99.868	99.865	3/4" Pipe S of logger
<b>Water Level:</b>						
S58-3	Cut		1.593	99.623	99.865	Time WL Surveyed: 13:59
<b>Turn</b>						
S58-3	1.315	101.183		99.868	99.865	3/4" Pipe S of logger
Water Level:	Cut		1.563	99.620	99.865	Time WL Surveyed: 14:01
S58-3			1.315	99.868	99.865	3/4" Pipe S of logger
S58-2			1.292	99.891	99.872	3/4" Pipe SW of logger
S58-1			1.184	99.999	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S58-3	1.315	101.183		99.868	99.868	
Water Level:	Cut		1.585	99.598	99.868	Time WL Surveyed: 15:34
S58-3	1.248	101.116		99.599	99.868	Time WL Surveyed: 15:35

**WL Survey Summary**

	Before	After
Average WL:	99.622	99.599
Closing Error:	0.001	
WL Check:	0.003	-0.001
Transducer Elevation	97.845	97.730

**Field Personnel:**

TR, NC	Trip Date:	12-Jun-14
NC	Date:	12-Jun-14
TR	Date:	15-Jul-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: \_\_\_\_\_  
 Site Visit Time (MST): \_\_\_\_\_

August 8, 2014  
 12:45



Flow Measurement Details:	
Metering Section Location (describe): 5m US of bridge	
Meas. Start Time (MST):	13:46
Meas. End Time (MST):	14:07
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Slow flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, 17 C

Flow characteristics:		
Total Flow:	0.064	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	3.40	(m <sup>2</sup> )
Wetted Width:	5.34	(m)
Hydraulic Depth:	0.64	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

Logger Details:	Before	After
Transducer Reading (m):	1.171	1.171
Water (°C):	18.2	18.2
Datalogger Clock:	12:58	14:26
Laptop Clock:	12:58	14:25
Battery (Main):	13.6	14.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

ADCP Flow Measurement Summary:				
<b>System Information:</b>				
System Type:	Sontek RS-M9			
Serial Number:	4712			
Firmware Version:	3.50			
Software Version:	3.70			
<b>System Setup:</b>				
Transducer Depth (m):	0.05			
Salinity (ppt):	-			
Magnetic Declination (°):	14.3			
Measured Temperature (°C):	-			
ADCP Temperature (°C):	-			
<b>Bank Offsets:</b>				
LB:	17.00			
RB:	22.40			
<b>Discharge Calculation Settings:</b>				
Track Reference:	Bottom-Track			
Depth Reference:	Vertical beam			
Coordinate System:	ENU			
Left Method:	Sloped bank			
Right Method:	Sloped bank			
Top Fit Type:	Power fit			
Bottom Fit Type:	Power fit			
<b>Measurement Results:</b>				
Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):
4	5.06	3.51	0.018	0.064
5	5.11	2.65	0.024	0.064
10	5.86	4.05	0.016	0.064
<b>Mean:</b>				
	5.34	3.40	0.019	<b>0.064</b>
<b>SD:</b>				
	0.37	0.58	0.003	0.000
<b>SE (%):</b>				
	12.17	19.26	0.113	0.000

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S58-01	0.955	100.955		100.000	100.000	3/4" Pipe W of logger
S58-02			1.064	99.891	99.872	3/4" Pipe SW of logger
S58-03			1.085	99.870	99.865	3/4" Pipe S of logger
Water Level:	Cut		2.035	98.920	<b>Time WL Surveyed:</b>	13:15
S58-03			1.085	99.870	99.865	3/4" Pipe S of logger
<b>Turn</b>						
S58-03	1.079	100.949		99.870	99.865	3/4" Pipe S of logger
Water Level:	Cut		2.026	98.923	<b>Time WL Surveyed:</b>	13:17
S58-03			1.079	99.870	99.865	3/4" Pipe S of logger
S58-02			1.059	99.890	99.872	3/4" Pipe SW of logger
S58-01			0.949	100.000	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S58-03	1.079	100.949		99.870		
Water Level:	Cut		2.024	98.925	<b>Time WL Surveyed:</b>	14:20
Water Level:	Cut		2.019	98.926	<b>Time WL Surveyed:</b>	14:22
S58-03	1.075	100.945		99.870		

WL Survey Summary	Before	After
Average WL:	98.922	98.926
Closing Error:	0.000	-
WL Check:	0.003	-0.001
Transducer Elevation	97.751	97.755

Field Personnel:	CJ, MP	Trip Date:	8-Aug-14
Data Entry Personnel:	CJ	Date:	8-Aug-14
Data Check Personnel:	MP	Date:	2-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake

UTM Location: 511444E 6167182N

Site Visit Date: \_\_\_\_\_

September 19, 2014

Site Visit Time (MST): \_\_\_\_\_

11:00



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): Under bridge	
Meas. Start Time (MST):	12:10
Meas. End Time (MST):	12:31
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow, some vegetation
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, breezy, 18 C

<b>Flow characteristics:</b>		
Total Flow:	0.090	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.27	(m <sup>2</sup> )
Wetted Width:	8.23	(m)
Hydraulic Depth:	0.88	(m)
Mean Velocity:	0.01	(m/s)
Froude Number:	0.00	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	1.364	2.228
Water (°C):	10.5	9.4
Datalogger Clock:	11:11	16:20
Laptop Clock:	11:11	16:20
Battery (Main):	14.1	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

<b>Argonaut Details:</b>		
	Before	After
Water Level (m):	-1.923	-1.664
Index Velocity (m/s):	0.200	0.024
Discharge (m <sup>3</sup> /s):	0.018	0.163

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05	LB:	10.80		
Serial Number:	4712		Salinity (ppt):	-	RB:	3.30		
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	-				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		2	8.88	7.92	0.008	0.063	-29.81%
Coordinate System:	ENU		4	6.36	7.16	0.013	0.095	5.85%
Left Method:	Sloped bank		5	9.03	6.11	0.017	0.105	16.99%
Right Method:	Sloped bank		6	8.67	7.89	0.012	0.096	6.96%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	8.23	7.27	0.013	<b>0.090</b>	
			<b>SD:</b>	1.09	0.74	0.003	0.016	
			<b>COV:</b>	0.13	0.10	0.256	0.177	

Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>							
	S58-1	0.981	100.981		100.000	100.000	3/4" Pipe W of logger
	S58-2			1.090	99.891	99.872	3/4" Pipe SW of logger
	S58-3			1.113	99.868	99.865	3/4" Pipe S of logger
	Water Level:	Cut		1.867	99.114	<b>Time WL Surveyed:</b>	11:53
	S58-3			1.113	99.868	99.865	3/4" Pipe S of logger
<b>Turn</b>							
	S58-3	1.088	100.956		99.868	99.865	3/4" Pipe S of logger
	Water Level:	Cut		1.840	99.116	<b>Time WL Surveyed:</b>	11:54
	S58-3			1.088	99.868	99.865	3/4" Pipe S of logger
	S58-2			1.065	99.891	99.872	3/4" Pipe SW of logger
	S58-1			0.955	100.001	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>							
	S58-3	1.087	100.955		99.868		
	Water Level:	Cut		1.836	99.119	<b>Time WL Surveyed:</b>	15:01
	Water Level:	Cut		1.658	99.122	<b>Time WL Surveyed:</b>	15:12
	S58-3	0.912	100.780		99.868		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	99.115	99.121
Closing Error:	-0.001	-
WL Check:	0.002	-0.003
Transducer Elevation	97.751	96.893

<b>Field Personnel:</b>			
Data Entry Personnel:	SM, MP	Trip Date:	19-Sep-14
Data Check Personnel:	SM	Date:	19-Sep-14
Entered Digitally in the Field:	TR	Date:	16-Oct-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S58 Sawbones Creek Above Christina Lake  
 UTM Location: 511444E 6167182N

Site Visit Date: October 23, 2014  
 Site Visit Time (MST): 11:29



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	7.80	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	7.40	0.44		0.26	0.008					1.00	0.35	0.44	0.008	0.15	0.001	1%
2	7.10	0.65		0.39	0.015					1.00	0.30	0.65	0.015	0.20	0.003	3%
3	6.80	0.81				0.65	-0.001	0.16	0.017	1.00	0.30	0.81	0.008	0.24	0.002	2%
4	6.50	1.08				0.96	0.000	0.22	0.009	1.00	0.30	1.08	0.005	0.32	0.001	1%
5	6.20	1.12				0.90	0.014	0.22	0.021	1.00	0.30	1.12	0.018	0.34	0.006	6%
6	5.90	1.13				0.90	0.023	0.23	0.027	1.00	0.30	1.13	0.025	0.34	0.008	8%
7	5.60	1.17				0.94	0.031	0.23	0.029	1.00	0.25	1.17	0.030	0.29	0.009	9%
8	5.40	1.14				0.91	0.032	0.23	0.037	1.00	0.20	1.14	0.035	0.23	0.008	8%
9	5.20	1.06				0.85	0.031	0.21	0.043	1.00	0.20	1.06	0.037	0.21	0.008	8%
10	5.00	1.02				0.82	0.025	0.20	0.041	1.00	0.20	1.02	0.033	0.20	0.007	7%
11	4.80	1.00				0.80	0.027	0.20	0.044	1.00	0.20	1.00	0.036	0.20	0.007	7%
12	4.60	0.97				0.78	0.032	0.19	0.038	1.00	0.25	0.97	0.035	0.24	0.008	8%
13	4.30	0.92				0.74	0.033	0.18	0.034	1.00	0.30	0.92	0.034	0.28	0.009	9%
14	4.00	0.88				0.70	0.024	0.18	0.040	1.00	0.30	0.88	0.032	0.26	0.008	8%
15	3.70	0.81				0.65	0.015	0.16	0.019	1.00	0.30	0.81	0.017	0.24	0.004	4%
16	3.40	0.81				0.65	0.002	0.16	0.014	1.00	0.25	0.81	0.008	0.20	0.002	2%
17	3.20	0.81				0.65	0.011	0.16	0.014	1.00	0.20	0.81	0.013	0.16	0.002	2%
18	3.00	0.81				0.65	0.016	0.16	0.015	1.00	0.25	0.81	0.016	0.20	0.003	3%
19	2.70	0.59		0.35	0.023					1.00	0.28	0.59	0.023	0.16	0.004	4%
20	2.45	0.52		0.31	0.013					1.00	0.20	0.52	0.013	0.10	0.001	1%
RB	2.30	0.00	0.00		0.000		0.000		0.000	1.00	0.08	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>0.102</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): Under bridge

Meas. Start Time (MST):	12:05
Meas. End Time (MST):	12:55
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, breezy, 10 C

**Flow characteristics:**

Total Flow:	0.102	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.59	(m <sup>2</sup> )
Wetted Width:	5.50	(m)
Hydraulic Depth:	0.83	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

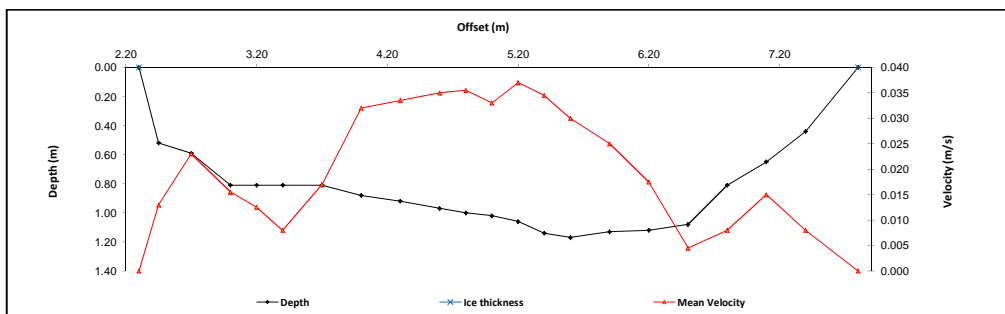
	Before	After
Transducer Reading (m):	2.231	2.231
Water (°C):	4.4	4.6
Datalogger Clock:	11:35	12:57
Laptop Clock:	11:35	12:56
Battery (Main):	14.4	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessoricant:	Replaced	
Vent Tube Dessoricant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Argonaut Details:**

	Before	After
Water Level (m):	-1.646	-1.645
Index Velocity (m/s):	-	0.033
Discharge (m <sup>3</sup> /s):	-	0.028

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S58-1	1.027	101.027		100.000	100.000	3/4" Pipe W of logger
S58-2			1.136	99.891	99.872	3/4" Pipe SW of logger
S58-3			1.158	99.869	99.865	3/4" Pipe S of logger
Water Level:	Cut		1.903	99.124		Time WL Surveyed: 11:57
S58-3			1.158	99.869	99.865	3/4" Pipe S of logger
<b>Turn</b>						
S58-3	1.133	101.002		99.869	99.865	3/4" Pipe S of logger
Water Level:	Cut		1.878	99.124		Time WL Surveyed: 11:59
S58-3			1.133	99.869	99.865	3/4" Pipe S of logger
S58-2			1.112	99.890	99.872	3/4" Pipe SW of logger
S58-1			1.002	100.000	100.000	3/4" Pipe W of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S58-3	1.133	101.002		99.869		
Water Level:	Cut		1.877	99.125		Time WL Surveyed: 13:01
Water Level:	Cut		1.863	99.125		Time WL Surveyed: 13:05
S58-3	1.119	100.988		99.869		

**WL Survey Summary**

	Before	After
Average WL:	99.124	99.125
Closing Error:	0.000	-
WL Check:	0.000	0.000
Transducer Elevation	96.893	96.894

**Field Personnel:**

Field Personnel:	GG, TR	Trip Date:	23-Oct-14
Data Entry Personnel:	GG	Date:	23-Oct-14
Data Check Personnel:	TR	Date:	9-Jan-15
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake

UTM Location: 511145E 6159877N

Site Visit Date: May 14, 2014

Site Visit Time (MST): 09:10



Flow Measurement Details:	
Metering Section Location (describe): 15m US of PT	
Meas. Start Time (MST):	10:00
Meas. End Time (MST):	10:30
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 12 C

Flow characteristics:		
Total Flow:	1.19	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.46	(m <sup>2</sup> )
Wetted Width:	5.79	(m)
Hydraulic Depth:	0.77	(m)
Mean Velocity:	0.27	(m/s)
Froude Number:	0.10	

Logger Details:	Before	After
Transducer Reading (m):	1.047	1.045
Water (°C):	5.8	6.2
Datalogger Clock:	09:28	10:35
Laptop Clock:	09:27	10:35
Battery (Main):	14.2	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

ADCP Flow Measurement Summary:								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	14.00	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	8.40	
Firmware Version:	3.5		Magnetic Declination (°):	14				
Software Version:	3.7		Measured Temperature (°C):	9.4				
			ADCP Temperature (°C):	6.2				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	5.74	4.37	0.268	1.170	-1.91%
Coordinate System:	ENU		2	6.05	4.74	0.259	1.224	2.62%
Left Method:	Sloped bank		3	5.59	4.26	0.272	1.160	-2.75%
Right Method:	Sloped bank		4	5.79	4.49	0.271	1.217	2.03%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit							
			<b>Mean:</b>	5.79	4.46	0.268	<b>1.19</b>	
			<b>SD:</b>	0.17	0.18	0.005	0.028	
			<b>COV:</b>	0.03	0.04	0.019	0.024	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S60-1	0.372	100.372		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.425	99.947	99.947	3/4" Pipe 4m E of logger
S60-3			0.576	99.796	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		2.630	97.742	<b>Time WL Surveyed:</b>	9:37
Temporary BM			2.089	98.283	0.000	-
<b>Turn</b>						
Temporary BM	2.071	100.354		98.283		-
Water Level:	Cut		2.609	97.745	<b>Time WL Surveyed:</b>	9:39
S60-3			0.558	99.796	99.798	3/4" Pipe 6m E of logger
S60-2			0.405	99.949	99.947	3/4" Pipe 4m E of logger
S60-1			0.352	100.002	100.000	3/4" Pipe 8m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S60-2	0.404	100.352		99.948		
Water Level:	Cut		2.608	97.744	<b>Time WL Surveyed:</b>	10:37
Water Level:	Cut		2.582	97.747	<b>Time WL Surveyed:</b>	10:39
S60-2	0.381	100.329		99.948		

WL Survey Summary	Before	After
Average WL:	97.744	97.746
Closing Error:	-0.002	-
WL Check:	0.003	-0.003
Transducer Elevation	96.697	96.701

<b>Field Personnel:</b>	TR, MP	Trip Date:	14-May-14
Data Entry Personnel:	TR	Date:	14-May-14
Data Check Personnel:	TR	Date:	1-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake  
 UTM Location: 511145E 6159877N

Site Visit Date: June 23, 2014  
 Site Visit Time (MST): 12:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	12.50	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	12.80	0.51		0.31	0.070	0.82	0.040	0.20	0.460	1.00	0.35	0.51	0.070	0.18	0.012	1%
2	13.20	1.02				0.09	0.130	0.25	0.400	1.00	0.40	1.02	0.250	0.41	0.102	4%
3	13.60	1.24				1.03	0.250	0.26	0.400	1.00	0.40	1.24	0.265	0.50	0.131	6%
4	14.00	1.29				0.90	0.370	0.22	0.180	1.00	0.40	1.29	0.325	0.52	0.168	7%
5	14.40	1.12				0.80	0.250	0.20	0.470	1.00	0.40	1.12	0.275	0.45	0.123	5%
6	14.80	1.00				0.87	0.330	0.22	0.460	1.00	0.30	1.09	0.395	0.33	0.129	6%
7	15.20	1.09				0.93	0.300	0.23	0.370	1.00	0.20	1.16	0.335	0.23	0.078	3%
8	15.40	1.16				0.94	0.350	0.23	0.470	1.00	0.20	1.17	0.410	0.23	0.086	4%
9	15.60	1.17				0.95	0.410	0.24	0.460	1.00	0.20	1.19	0.435	0.24	0.104	5%
10	15.80	1.19				0.94	0.180	0.24	0.470	1.00	0.30	1.18	0.325	0.35	0.115	5%
11	16.00	1.18				0.94	0.160	0.24	0.450	1.00	0.40	1.18	0.305	0.47	0.144	6%
12	16.40	1.18				0.97	0.010	0.24	0.580	1.00	0.40	1.21	0.295	0.48	0.143	6%
13	16.80	1.21				1.00	0.000	0.25	0.590	1.00	0.40	1.25	0.295	0.50	0.147	6%
14	17.20	1.25				1.01	0.110	0.25	0.640	1.00	0.40	1.26	0.375	0.50	0.189	8%
15	17.60	1.26				1.00	0.010	0.25	0.470	1.00	0.40	1.25	0.240	0.50	0.120	5%
16	18.00	1.25				1.04	-0.050	0.26	0.520	1.00	0.40	1.30	0.235	0.52	0.122	5%
17	18.40	1.30				1.01	-0.010	0.25	0.470	1.00	0.40	1.26	0.230	0.50	0.116	5%
18	18.80	1.26				0.94	-0.060	0.24	0.480	1.00	0.40	1.18	0.210	0.47	0.099	4%
19	19.20	1.18				0.92	-0.110	0.23	0.150	1.00	0.40	1.15	0.020	0.46	0.009	0%
20	19.60	1.15								1.00	0.20	0.00	0.000	0.00	0.000	
RB	20.00	0.00	0.00		0.00					1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.29</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 30m DS of station

Meas. Start Time (MST):	12:50
Meas. End Time (MST):	13:21
Equipment:	Marsh McBimney
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm

**Flow characteristics:**

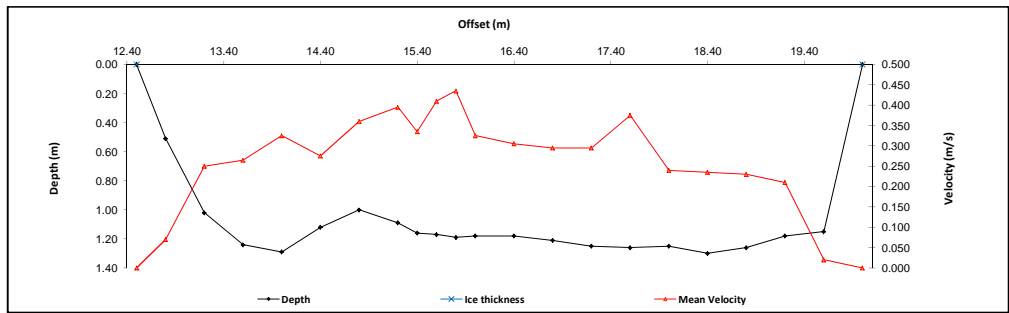
Total Flow:	2.29	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	8.25	(m <sup>2</sup> )
Wetted Width:	7.50	(m)
Hydraulic Depth:	1.10	(m)
Mean Velocity:	0.28	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.886	1.887
Water (°C):	15.5	15.8
Datalogger Clock:	12:22	13:32
Laptop Clock:	12:22	13:32
Battery (Main):	13.7	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S60-1	1.720	101.720		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			1.773	99.947	99.947	3/4" Pipe 4m E of logger
S60-3			1.925	99.795	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.625	98.095	Time WL Surveyed: 12:30	
Temporary BM			2.935	98.785	0.000	
<b>Turn</b>						
Temporary BM	2.920	101.705		98.785		
Water Level:	Cut		3.610	98.095	Time WL Surveyed: 12:36	
S60-3			1.909	99.796	99.798	3/4" Pipe 6m E of logger
S60-2			1.757	99.948	99.947	3/4" Pipe 4m E of logger
S60-1			1.705	100.000	100.000	3/4" Pipe 8m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S60-2	1.757	101.705		99.948		
Water Level:	Cut		3.606	98.099	Time WL Surveyed: 13:27	
Water Level:	Cut		3.593	98.097	Time WL Surveyed: 13:29	
S60-2	1.742	101.690		99.948		

**WL Survey Summary**

	Before	After
Average WL:	98.095	98.098
Closing Error:	0.000	-
WL Check:	0.000	0.002
Transducer Elevation	96.209	96.211

**Field Personnel:**

SM, GG	Trip Date:	23-Jun-14
Data Entry Personnel: SM	Date:	23-Jun-14
Data Check Personnel: TR	Date:	15-Jul-14
Entered Digitally in the Field: Yes		



# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake  
 UTM Location: 511145E 6159877N

Site Visit Date: August 14, 2014  
 Site Visit Time (MST): 09:30

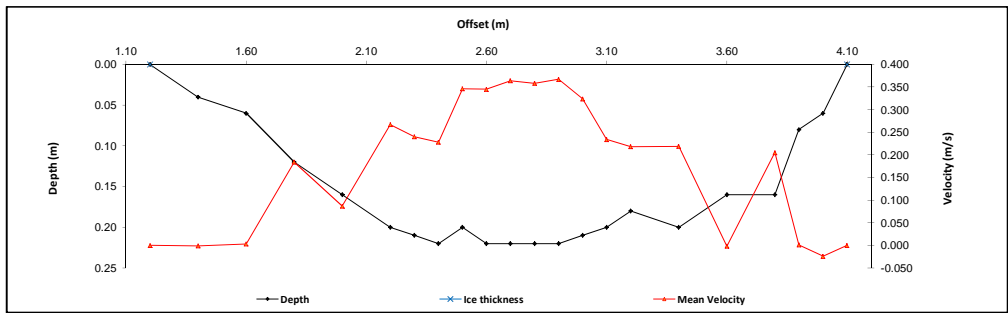


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	1.20	0.00	0.00		0.000				0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	1.40	0.04		0.02	-0.001					1.00	0.20	0.04	-0.001	0.01	0.000	0%
2	1.60	0.06		0.04	0.003					1.00	0.20	0.06	0.003	0.01	0.000	0%
3	1.80	0.12		0.07	0.194					1.00	0.20	0.12	0.184	0.02	0.004	5%
4	2.00	0.16		0.10	0.087					1.00	0.20	0.16	0.087	0.03	0.003	3%
5	2.20	0.20		0.12	0.267					1.00	0.15	0.20	0.267	0.03	0.008	8%
6	2.30	0.21		0.13	0.240					1.00	0.10	0.21	0.240	0.02	0.005	5%
7	2.40	0.22		0.13	0.228					1.00	0.10	0.22	0.228	0.02	0.005	5%
8	2.50	0.20		0.12	0.346					1.00	0.10	0.20	0.346	0.02	0.007	7%
9	2.60	0.22		0.13	0.345					1.00	0.10	0.22	0.345	0.02	0.008	8%
10	2.70	0.22		0.13	0.364					1.00	0.10	0.22	0.364	0.02	0.008	8%
11	2.80	0.22		0.13	0.358					1.00	0.10	0.22	0.358	0.02	0.008	8%
12	2.90	0.22		0.13	0.367					1.00	0.10	0.22	0.367	0.02	0.008	9%
13	3.00	0.21		0.13	0.324					1.00	0.10	0.21	0.324	0.02	0.007	7%
14	3.10	0.20		0.12	0.234					1.00	0.10	0.20	0.234	0.02	0.005	5%
15	3.20	0.18		0.11	0.218					1.00	0.15	0.18	0.218	0.03	0.006	6%
16	3.40	0.20		0.12	0.219					1.00	0.20	0.20	0.219	0.04	0.009	9%
17	3.60	0.16		0.10	-0.002					1.00	0.20	0.16	-0.002	0.03	0.000	0%
18	3.80	0.16		0.10	0.205					1.00	0.15	0.16	0.205	0.02	0.005	5%
19	3.90	0.08		0.05	0.001					1.00	0.10	0.08	0.001	0.01	0.000	0%
20	4.00	0.06		0.04	-0.024					1.00	0.10	0.06	-0.024	0.01	0.000	0%
LB	4.10	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.095</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 30m DS of station

Meas. Start Time (MST):	10:15
Meas. End Time (MST):	10:36
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 25 C



**Flow characteristics:**

Total Flow:	0.095	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.44	(m²)
Wetted Width:	2.90	(m)
Hydraulic Depth:	0.15	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.977	0.973
Water (°C):	19.7	20.2
Datalogger Clock:	09:40	10:50
Laptop Clock:	09:40	10:50
Battery (Main):	13.8	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PTB (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S60-1	0.717	100.717		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.771	99.946	99.947	3/4" Pipe 4m E of logger
S60-3			0.922	99.795	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.546	97.171		Time WL Surveyed: 9:58
S60-1			0.717	100.000	100.000	3/4" Pipe 8m NE of logger
<b>Turn</b>						
S60-1	0.748	100.748		100.000	100.000	3/4" Pipe 8m NE of logger
Water Level:	Cut		3.578	97.170		Time WL Surveyed: 9:49
S60-3			0.953	99.795	99.798	3/4" Pipe 6m E of logger
S60-2			0.802	99.946	99.947	3/4" Pipe 4m E of logger
S60-1			0.748	100.000	100.000	3/4" Pipe 8m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S60-2	0.771	100.717		99.946		
Water Level:	Cut		0.486	4.032	97.171	Time WL Surveyed: 10:42
Water Level:	Cut		3.524	97.173		Time WL Surveyed: 10:44
S60-2	0.751	100.697		99.946		

**WL Survey Summary**

	Before	After
Average WL:	97.171	97.172
Closing Error:	0.000	-
WL Check:	0.001	-0.002
Transducer Elevation	96.194	96.199

**Field Personnel:**

TR, CJ	Trip Date:	14-Aug-14
Data Entry Personnel:	Date:	14-Aug-14
Data Check Personnel:	Date:	30-Sep-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake  
 UTM Location: 511145E 6159877N

Site Visit Date: September 18, 2014  
 Site Visit Time (MST): 12:00

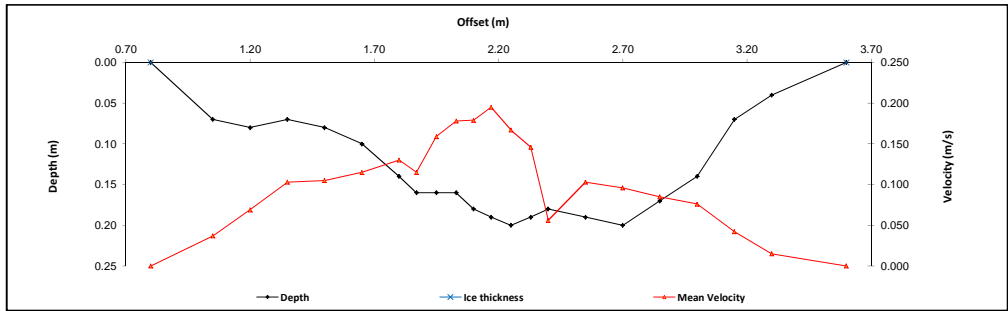


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	3.60	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	3.30	0.04		0.02	0.015					1.00	0.23	0.04	0.015	0.01	0.000	0%
2	3.15	0.07		0.04	0.042					1.00	0.15	0.07	0.042	0.01	0.000	1%
3	3.00	0.14		0.08	0.076					1.00	0.15	0.14	0.076	0.02	0.002	5%
4	2.85	0.17		0.10	0.085					1.00	0.15	0.17	0.085	0.03	0.002	6%
5	2.70	0.20		0.12	0.096					1.00	0.15	0.20	0.096	0.03	0.003	8%
6	2.55	0.19		0.11	0.103					1.00	0.15	0.19	0.103	0.03	0.003	9%
7	2.40	0.18		0.11	0.056					1.00	0.11	0.18	0.056	0.02	0.001	3%
8	2.33	0.19		0.11	0.146					1.00	0.08	0.19	0.146	0.01	0.002	6%
9	2.25	0.20		0.12	0.167					1.00	0.08	0.20	0.167	0.02	0.003	8%
10	2.17	0.19		0.11	0.195					1.00	0.08	0.19	0.195	0.01	0.003	8%
11	2.10	0.18		0.11	0.179					1.00	0.07	0.18	0.179	0.01	0.002	7%
12	2.03	0.16		0.10	0.178					1.00	0.08	0.16	0.178	0.01	0.002	6%
13	1.95	0.16		0.10	0.159					1.00	0.08	0.16	0.159	0.01	0.002	6%
14	1.87	0.16		0.10	0.115					1.00	0.08	0.16	0.115	0.01	0.001	4%
15	1.80	0.14		0.08	0.130					1.00	0.11	0.14	0.130	0.02	0.002	6%
16	1.65	0.10		0.06	0.115					1.00	0.15	0.10	0.115	0.02	0.002	5%
17	1.50	0.08		0.05	0.105					1.00	0.15	0.08	0.105	0.01	0.001	4%
18	1.35	0.07		0.04	0.103					1.00	0.15	0.07	0.103	0.01	0.001	3%
19	1.20	0.08		0.05	0.069					1.00	0.15	0.08	0.069	0.01	0.001	2%
20	1.05	0.07		0.04	0.037					1.00	0.20	0.07	0.037	0.01	0.001	2%
RB	0.80	0.00	0.00		0.000		0.000		0.000	1.00	0.13	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>0.034</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
30m DS of station

Meas. Start Time (MST):	12:20
Meas. End Time (MST):	12:42
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 16 C



**Flow characteristics:**

Total Flow:	0.034	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.32	(m²)
Wetted Width:	2.80	(m)
Hydraulic Depth:	0.11	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.886	0.885
Water (°C):	10.6	10.8
Datalogger Clock:	12:11	12:51
Laptop Clock:	12:11	12:51
Battery (Main):	13.7	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S60-1	0.591	100.591		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.646	99.945	99.947	3/4" Pipe 4m E of logger
S60-3			0.798	99.793	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.499	97.082		Time WL Surveyed: 12:17
S60-3			0.798	99.793	99.798	3/4" Pipe 6m E of logger
<b>Turn</b>						
S60-3	0.782	100.575		99.793	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.480	97.085		Time WL Surveyed: 12:19
S60-3			0.782	99.793	99.798	3/4" Pipe 6m E of logger
S60-2			0.631	99.944	99.947	3/4" Pipe 4m E of logger
S60-1			0.575	100.000	100.000	3/4" Pipe 8m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S60-2	0.630	100.574		99.944		
Water Level:	Cut		3.486	97.088		Time WL Surveyed: 12:48
Water Level:	Cut		3.470	97.091		Time WL Surveyed: 12:49
S60-2	0.617	100.561		99.944		

**WL Survey Summary**

	Before	After
Average WL:	97.094	97.090
Closing Error:	0.000	-
WL Check:	0.003	-0.003
Transducer Elevation	96.208	96.205

**Field Personnel:**

	SM, TR	Trip Date:	18-Sep-14
Data Entry Personnel:	SM	Date:	18-Sep-14
Data Check Personnel:	TR	Date:	30-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S60 Unnamed Creek South of Christina Lake

UTM Location: 511145E 6159877N

Site Visit Date:

October 10, 2014

Site Visit Time (MST):

10:55



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.05	0.00	0.00		0.000				0.000	1.00	0.18	0.00	0.000	0.00	0.000	
1	1.40	0.09		0.05	0.098					1.00	0.28	0.09	0.098	0.02	0.002	2%
2	1.60	0.11		0.07	0.169					1.00	0.20	0.11	0.169	0.02	0.004	4%
3	1.80	0.13		0.08	0.210					1.00	0.20	0.13	0.210	0.03	0.005	5%
4	2.00	0.15		0.09	0.237					1.00	0.20	0.15	0.237	0.03	0.007	7%
5	2.20	0.18		0.11	0.275					1.00	0.15	0.18	0.275	0.03	0.007	7%
6	2.30	0.18		0.11	0.286					1.00	0.10	0.18	0.286	0.02	0.005	5%
7	2.40	0.22		0.13	0.279					1.00	0.10	0.22	0.279	0.02	0.006	6%
8	2.50	0.22		0.13	0.195					1.00	0.10	0.22	0.195	0.02	0.004	4%
9	2.60	0.22		0.13	0.232					1.00	0.15	0.22	0.232	0.03	0.008	7%
10	2.80	0.26		0.16	0.198					1.00	0.20	0.26	0.198	0.05	0.010	10%
11	3.00	0.24		0.14	0.198					1.00	0.20	0.24	0.198	0.05	0.010	9%
12	3.20	0.26		0.16	0.211					1.00	0.15	0.26	0.211	0.04	0.008	8%
13	3.30	0.26		0.16	0.234					1.00	0.10	0.26	0.234	0.03	0.006	6%
14	3.40	0.32		0.19	0.167					1.00	0.10	0.32	0.167	0.03	0.005	5%
15	3.50	0.28		0.17	0.177					1.00	0.10	0.28	0.177	0.03	0.005	5%
16	3.60	0.30		0.18	0.139					1.00	0.15	0.30	0.139	0.05	0.006	6%
17	3.80	0.27		0.16	0.100					1.00	0.20	0.27	0.100	0.05	0.005	5%
18	4.00	0.28		0.17	0.013					1.00	0.20	0.28	0.013	0.06	0.001	1%
19	4.20	0.26		0.16	-0.003					1.00	0.20	0.26	-0.003	0.05	0.000	0%
20	4.40	0.23		0.14	-0.004					1.00	0.40	0.23	-0.004	0.09	0.000	0%
RB	5.00	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.106</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
6m US of Bridge

Meas. Start Time (MST):	11:10
Meas. End Time (MST):	11:30
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 13 C

### Flow characteristics:

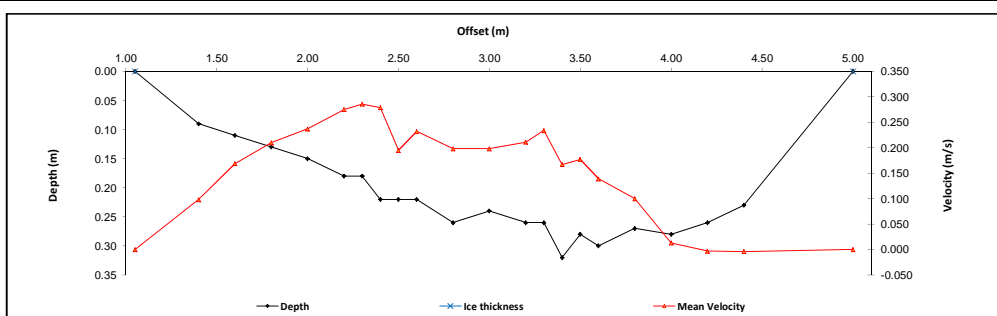
Total Flow:	0.106	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.75	(m <sup>2</sup> )
Wetted Width:	3.95	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.14	(m/s)
Froude Number:	0.10	

### Logger Details:

	Before	After
Transducer Reading (m):	0.960	0.961
Water (°C):	4.5	4.8
Datalogger Clock:	10:56	11:38
Laptop Clock:	10:55	11:37
Battery (Main):	13.4	13.9
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

### General Notes:



Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S60-1	0.607	100.607		100.000	100.000	3/4" Pipe 8m NE of logger
S60-2			0.661	99.946	99.947	3/4" Pipe 4m E of logger
S60-3			0.812	99.795	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.447	97.160		Time WL Surveyed: 11:00
S60-3			0.812	99.795	99.798	3/4" Pipe 6m E of logger
<b>Turn</b>						
S60-3	0.795	100.590		99.795	99.798	3/4" Pipe 6m E of logger
Water Level:	Cut		3.428	97.162		Time WL Surveyed: 11:02
S60-3			0.795	99.795	99.798	3/4" Pipe 6m E of logger
S60-2			0.642	99.948	99.947	3/4" Pipe 4m E of logger
S60-1			0.589	100.001	100.000	3/4" Pipe 8m NE of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S60-2	0.643	100.591		99.948		
Water Level:	Cut		3.424	97.167		Time WL Surveyed: 11:33
Water Level:	Cut		3.414	97.167		Time WL Surveyed: 11:35
S60-2	0.633	100.581		99.948		

WL Survey Summary	Before	After
Average WL:	97.161	97.167
Closing Error:	-0.001	-
WL Check:	0.002	0.000
Transducer Elevation	96.201	96.206

Field Personnel:	TR, MP	Trip Date:	10-Oct-14
Data Entry Personnel:	TR	Date:	10-Oct-14
Data Check Personnel:	TR	Date:	31-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: February 13, 2014  
 Site Visit Time (MST): 14:40



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	4.00	0.00	0.00		0.000		0.000		0.000	0.88	0.50	0.00	0.000	0.00	0.000	
1	5.00	0.63	0.54	0.59	0.208					0.88	1.20	0.09	0.183	0.11	0.020	3%
2	6.40	0.65	0.54	0.60	0.140					0.88	1.40	0.11	0.123	0.15	0.019	2%
3	7.80	0.60	0.54	0.57	0.110					0.88	1.10	0.06	0.097	0.07	0.006	1%
4	8.60	0.78	0.56	0.67	0.095					0.88	0.73	0.22	0.084	0.16	0.013	2%
5	9.25	0.95	0.57	0.76	0.099					0.88	0.67	0.38	0.087	0.26	0.022	3%
6	9.95	1.12	0.59	0.86	0.154					0.88	0.67	0.53	0.136	0.36	0.048	6%
7	10.60	1.06	0.60	0.83	0.167					0.88	0.58	0.46	0.147	0.26	0.039	5%
8	11.10	1.00	0.55	0.78	0.171					0.88	0.55	0.45	0.150	0.25	0.037	5%
9	11.70	0.98	0.54	0.76	0.169					0.88	0.55	0.44	0.149	0.24	0.036	5%
10	12.20	1.04	0.54	0.79	0.211					0.88	0.48	0.50	0.186	0.24	0.044	6%
11	12.65	1.08	0.54	0.81	0.206					0.88	0.45	0.54	0.181	0.24	0.044	6%
12	13.10	1.02	0.53	0.78	0.227					0.88	0.48	0.49	0.200	0.23	0.046	6%
13	13.60	0.97	0.53	0.75	0.234					0.88	0.45	0.44	0.206	0.20	0.041	5%
14	14.00	0.89	0.50	0.70	0.282					0.88	0.45	0.39	0.248	0.18	0.044	6%
15	14.50	0.92	0.47	0.70	0.250					0.88	0.50	0.45	0.220	0.23	0.050	6%
16	15.00	0.95	0.45	0.70	0.271					0.88	0.50	0.50	0.238	0.25	0.060	8%
17	15.50	1.02	0.44	0.73	0.288					0.88	0.45	0.58	0.253	0.26	0.066	9%
18	15.90	0.62	0.44	0.53	0.334					0.88	0.43	0.18	0.294	0.08	0.022	3%
19	16.35	0.63	0.54	0.59	0.328					0.88	0.50	0.09	0.289	0.05	0.013	2%
20	16.90	0.78	0.42	0.60	0.196					0.88	0.50	0.36	0.172	0.18	0.031	4%
21	17.35	0.71	0.44	0.58	0.181					0.88	0.45	0.27	0.159	0.12	0.019	3%
22	17.80	0.70	0.43	0.57	0.208					0.88	0.42	0.27	0.183	0.11	0.021	3%
23	18.20	0.73	0.45	0.59	0.187					0.88	0.50	0.28	0.165	0.14	0.023	3%
RB	18.80	0.00	0.00		0.000		0.000		0.000	0.88	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.766</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
10m DS of station

Meas. Start Time (MST):	15:19
Meas. End Time (MST):	15:54
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, -10 C

**Flow characteristics:**

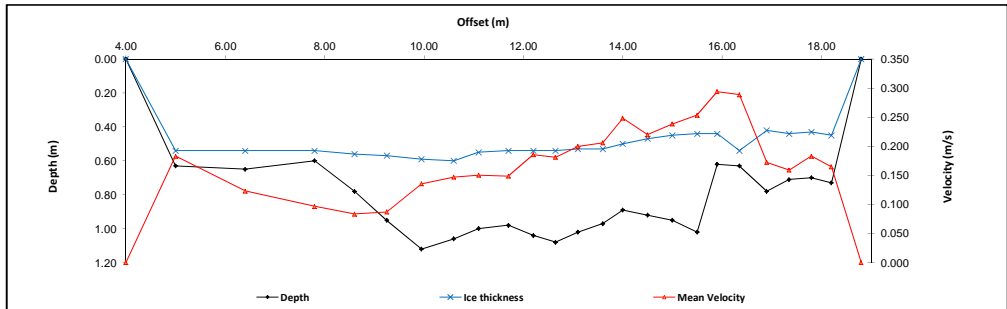
Total Flow:	0.766	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.36	(m²)
Wetted Width:	14.80	(m)
Hydraulic Depth:	0.29	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.429	
Water (°C):	0.2	
Datalogger Clock:	14:46	
Laptop Clock:	14:46	
Battery (Main):	14.8	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessicant:		Good
Vent Tube Dessicant:		
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S61-1	1.385	101.385		100.000	100.000	3/4" Pipe 6m S of logger
S61-2			0.857	100.528	100.525	3/4" Pipe 8m SW of logger
S61-3			1.363	100.022	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		4.904	96.481		<b>Time WL Surveyed: 15:05</b>
Temporary BM			4.882	96.503	0.000	
<b>Turn</b>						
Temporary BM	4.866	101.369		96.503		
Water Level:	Cut		4.890	96.479		<b>Time WL Surveyed: 15:12</b>
S61-3			1.346	100.023	100.020	3/4" Pipe 4m NW of logger
S61-2			0.841	100.528	100.525	3/4" Pipe 8m SW of logger
S61-1			1.369	100.000	100.000	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut					<b>Time WL Surveyed:</b>
Water Level:	Cut					<b>Time WL Surveyed:</b>

**WL Survey Summary**

	Before	After
Average WL:	96.480	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	96.051	-

**Field Personnel:**

SM, MP	Trip Date:	13-Feb-14
SM	Date:	13-Feb-14
TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: March 11, 2014  
 Site Visit Time (MST): 13:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.80	0.00	0.00		0.000				0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	2.60	0.47	0.40	0.44	0.193					0.88	1.00	0.07	0.170	0.07	0.012	1%
2	3.00	0.76	0.45	0.61	0.163					0.88	1.15	0.31	0.143	0.36	0.051	5%
3	4.90	0.80	0.50	0.65	0.144					0.88	0.85	0.30	0.127	0.26	0.032	3%
4	5.50	0.80	0.50	0.65	0.137					0.88	0.65	0.30	0.121	0.20	0.024	2%
5	6.20	0.80	0.55	0.68	0.118					0.88	0.65	0.25	0.104	0.16	0.017	2%
6	6.80	0.89	0.55	0.72	0.153					0.88	0.70	0.34	0.135	0.24	0.032	3%
7	7.60	0.98	0.57	0.78	0.146					0.88	0.70	0.41	0.128	0.29	0.037	3%
8	8.20	1.01	0.57	0.79	0.114					0.88	0.55	0.44	0.100	0.24	0.024	2%
9	8.70	0.99	0.56	0.78	0.031					0.88	0.50	0.43	0.027	0.22	0.006	1%
10	9.20	0.89	0.55	0.72	0.124					0.88	0.55	0.34	0.109	0.19	0.020	2%
11	9.80	1.00	0.60	0.80	0.171					0.88	0.55	0.40	0.150	0.22	0.033	3%
12	10.30	0.98	0.58	0.78	0.151					0.88	0.60	0.40	0.133	0.24	0.032	3%
13	11.00	1.00	0.60	0.80	0.187					0.88	0.65	0.40	0.165	0.26	0.043	4%
14	11.60	0.98	0.58	0.78	0.231					0.88	0.70	0.40	0.203	0.28	0.057	5%
15	12.40	0.98	0.55	0.77	0.258					0.88	0.75	0.43	0.227	0.32	0.073	7%
16	13.10	1.02	0.55	0.79	0.276					0.88	0.70	0.47	0.243	0.33	0.080	7%
17	13.80	1.00	0.55	0.78	0.306					0.88	0.70	0.45	0.269	0.32	0.085	8%
18	14.50	1.05	0.55	0.80	0.290					0.88	0.70	0.50	0.255	0.35	0.089	8%
19	15.20	1.08	0.52	0.80	0.305					0.88	0.70	0.56	0.268	0.39	0.105	10%
20	15.90	0.97	0.53	0.75	0.293					0.88	0.85	0.44	0.258	0.37	0.096	9%
21	16.90	0.85	0.50	0.68	0.258					0.88	1.00	0.35	0.227	0.35	0.079	7%
22	17.90	0.90	0.55	0.73	0.167					0.88	0.80	0.35	0.147	0.28	0.041	4%
RB	18.50	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.07</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe):  
 8m DS of station

Meas. Start Time (MST):	13:18
Meas. End Time (MST):	13:54
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Sunny, 5 C

**Flow characteristics:**

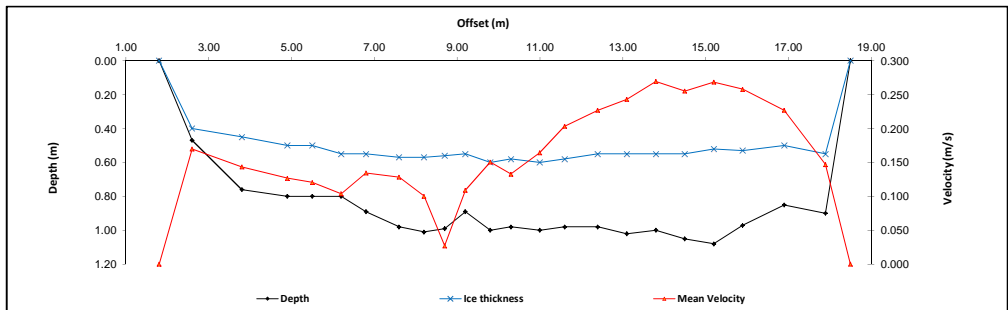
Total Flow:	1.070	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.92	(m <sup>2</sup> )
Wetted Width:	16.70	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.515	
Water (°C):	0.2	
Datalogger Clock:	13:09	
Laptop Clock:	13:09	
Battery (Main):	14.2	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		-
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S61-2	0.817	101.342		100.525	100.525	3/4" Pipe 8m SW of logger
S61-1			1.343	99.999	100.000	3/4" Pipe 6m S of logger
S61-3			1.322	100.020	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		4.777	96.565	Time WL Surveyed:	14:05
Temporary BM			4.733	96.609	0.000	-
<b>Turn</b>						
Temporary BM	4.719	101.328		96.609	-	-
Water Level:	Cut		4.764	96.564	Time WL Surveyed:	14:10
S61-3			1.308	100.020	100.020	3/4" Pipe 4m NW of logger
S61-1			1.327	100.001	100.000	3/4" Pipe 6m S of logger
S61-2			0.803	100.525	100.525	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	96.565	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	96.050	-

**Field Personnel:**

	SM, MP	Trip Date:	11-Mar-14
Data Entry Personnel:	SM	Date:	11-Mar-14
Data Check Personnel:	TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: April 7, 2014  
 Site Visit Time (MST): 12:15

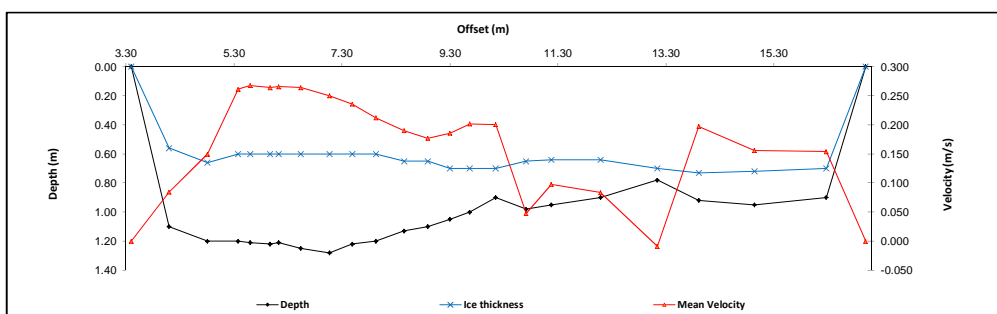


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.40	0.00	0.00		0.000				0.000	0.88	0.35	0.00	0.000	0.00	0.000	
1	4.10	1.10	0.56	0.83	0.096					0.88	0.71	0.54	0.084	0.38	0.032	4%
2	4.81	1.20	0.66	0.93	0.170					0.88	0.64	0.54	0.150	0.35	0.052	6%
3	5.38	1.20	0.60	0.90	0.297					0.88	0.40	0.60	0.261	0.24	0.062	7%
4	5.60	1.21	0.60	0.91	0.304					0.88	0.30	0.61	0.268	0.18	0.048	5%
5	5.97	1.22	0.60	0.91	0.300					0.88	0.27	0.62	0.264	0.16	0.043	5%
6	6.13	1.21	0.60	0.91	0.302					0.88	0.29	0.61	0.266	0.17	0.046	5%
7	6.54	1.25	0.60	0.93	0.300					0.88	0.47	0.65	0.264	0.31	0.081	9%
8	7.07	1.28	0.60	0.94	0.284					0.88	0.48	0.68	0.250	0.32	0.081	9%
9	7.49	1.22	0.60	0.91	0.268					0.88	0.43	0.62	0.236	0.27	0.063	7%
10	7.93	1.20	0.60	0.90	0.241					0.88	0.48	0.60	0.212	0.29	0.061	7%
11	8.45	1.13	0.65	0.89	0.216					0.88	0.48	0.48	0.190	0.23	0.044	5%
12	8.89	1.10	0.65	0.88	0.201					0.88	0.43	0.45	0.177	0.19	0.034	4%
13	9.30	1.05	0.70	0.88	0.211					0.88	0.39	0.35	0.186	0.14	0.025	3%
14	9.67	1.00	0.70	0.85	0.229					0.88	0.43	0.30	0.202	0.13	0.026	3%
15	10.15	0.90	0.70	0.80	0.228					0.88	0.52	0.20	0.201	0.10	0.021	2%
16	10.71	0.98	0.65	0.82	0.054					0.88	0.52	0.33	0.048	0.17	0.008	1%
17	11.18	0.95	0.64	0.80	0.111					0.88	0.69	0.31	0.098	0.21	0.021	2%
18	12.09	0.90	0.64	0.77	0.095					0.88	0.98	0.26	0.084	0.25	0.021	2%
19	13.14	0.78	0.70	0.74	-0.010					0.88	0.91	0.08	-0.009	0.07	-0.001	0%
20	13.91	0.92	0.73	0.83	0.224					0.88	0.90	0.19	0.197	0.17	0.034	4%
21	14.94	0.95	0.72	0.84	0.177					0.88	1.18	0.23	0.156	0.27	0.042	5%
22	16.27	0.90	0.70	0.80	0.175					0.88	1.03	0.20	0.154	0.21	0.032	4%
LB	17.00	0.00	0.00		0.00		0.00		0.00	0.88	0.37	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.876</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 6m DS of station

Meas. Start Time (MST):	13:08
Meas. End Time (MST):	13:32
Equipment:	ADV
Method:	Ice
River Condition:	Some melt on ice surface
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, 10 C



**Flow characteristics:**

Total Flow:	0.876	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.81	(m <sup>2</sup> )
Wetted Width:	13.60	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.10	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.591	
Water (°C):	0.2	
Datalogger Clock:	12:21	
Laptop Clock:	12:21	
Battery (Main):	14.2	
Battery:		Good
Battery Serial #:	-	
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Replaced	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S61-1	1.384	101.384		100.000	100.000	3/4" Pipe 6m S of logger
S61-2			0.854	100.530	100.525	3/4" Pipe 8m SW of logger
S61-3			1.361	100.023	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		4.732	96.652	Time WL Surveyed: 12:51	
Temporary BM			4.676	96.708	0.000	-
<b>Turn</b>						
Temporary BM	4.697	101.405		96.708		
Water Level:	Cut		4.757	96.648	Time WL Surveyed: 13:00	
S61-3			1.383	100.022	100.020	3/4" Pipe 4m NW of logger
S61-2			0.876	100.529	100.525	3/4" Pipe 8m SW of logger
S61-1			1.403	100.002	100.000	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	96.650	-
Closing Error:	-0.002	-
WL Check:	0.004	-
Transducer Elevation	96.059	-

**Field Personnel:**

	SM, MP	Trip Date:	7-Apr-14
Data Entry Personnel:	SM	Date:	7-Apr-14
Data Check Personnel:	TR	Date:	15-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer

UTM Location: 466037E 6193791N

Site Visit Date: \_\_\_\_\_

May 22, 2014

Site Visit Time (MST): \_\_\_\_\_

11:00



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 5m DS of station	
Meas. Start Time (MST):	11:40
Meas. End Time (MST):	13:10
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, 15 C

<b>Flow characteristics:</b>		
Total Flow:	16.2	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	23.33	(m <sup>2</sup> )
Wetted Width:	17.68	(m)
Hydraulic Depth:	1.32	(m)
Mean Velocity:	0.69	(m/s)
Froude Number:	0.19	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	1.180	1.180
Water (°C):	9.6	9.8
Datalogger Clock:	11:09	13:28
Laptop Clock:	11:09	13:28
Battery (Main):	13.9	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
-Evidence of wildlife investigating station, no damage

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>						
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08	LB:	18.50
Serial Number:	1802		Salinity (ppt):	0.0	RB:	0.20
Firmware Version:	3.5		Magnetic Declination (°):	-		
Software Version:	3.7		Measured Temperature (°C):	9.7		
			ADCP Temperature (°C):	11.3		
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>			
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam		4	18.01	23.86	0.693
Coordinate System:	ENU		6	16.87	22.26	0.710
Left Method:	Sloped bank		8	17.37	22.89	0.690
Right Method:	Sloped bank		9	18.03	23.71	0.705
Top Fit Type:	Power fit		11	18.10	23.91	0.676
Bottom Fit Type:	Power fit		<b>Mean:</b>	17.68	23.33	0.695
			<b>SD:</b>	0.48	0.65	0.012
			<b>COV:</b>	0.03	0.03	0.017
						0.370
						0.023

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S61-1	1.263	101.263		100.000	100.000	3/4" Pipe 6m S of logger
S61-2			0.739	100.524	100.525	3/4" Pipe 8m SW of logger
S61-3			1.243	100.020	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		4.088	97.175	<b>Time WL Surveyed:</b>	11:19
Temporary BM			1.243	100.020	0.000	-
<b>Turn</b>						
Temporary BM	1.343	101.363		100.020		-
Water Level:	Cut		4.186	97.177	<b>Time WL Surveyed:</b>	11:24
S61-3			1.343	100.020	100.020	3/4" Pipe 4m NW of logger
S61-2			0.841	100.522	100.525	3/4" Pipe 8m SW of logger
S61-1			1.367	99.996	100.000	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S61-3	1.343	101.363		100.020		
Water Level:	Cut		4.183	97.180	<b>Time WL Surveyed:</b>	13:24
Water Level:	Cut		4.164	97.178	<b>Time WL Surveyed:</b>	13:26
S61-3	1.322	101.342		100.020		

<b>WL Survey Summary</b>	Before	After
Average WL:	97.176	97.179
Closing Error:	0.004	-
WL Check:	0.002	0.002
Transducer Elevation	95.996	95.999

<b>Field Personnel:</b>	TR, CJ	Trip Date:	22-May-14
<b>Data Entry Personnel:</b>	TR	Date:	22-May-14
<b>Data Check Personnel:</b>	TR	Date:	1-Aug-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: June 13, 2014  
 Site Visit Time (MST): 08:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	15.00	0.00	0.00		0.000		0.000		0.000	1.00	1.50	0.00	0.000	0.00	0.000	
1	18.00	1.18				0.94	0.447	0.24	0.579	1.00	2.00	1.18	0.513	2.36	1.211	6%
2	19.00	1.65				1.32	0.215	0.33	0.767	1.00	1.00	1.65	0.491	1.65	0.810	4%
3	20.00	1.76				1.41	0.691	0.35	0.837	1.00	1.00	1.76	0.764	1.76	1.345	7%
4	21.00	1.83				1.46	0.778	0.37	0.867	1.00	0.75	1.83	0.833	1.37	1.143	6%
5	21.50	1.84				1.47	0.770	0.37	0.950	1.00	0.50	1.84	0.860	0.92	0.791	4%
6	22.00	1.82				1.46	0.766	0.36	0.985	1.00	0.50	1.82	0.876	0.91	0.797	4%
7	22.50	1.79				1.43	0.784	0.36	1.010	1.00	0.50	1.79	0.897	0.90	0.803	4%
8	23.00	1.78				1.42	0.737	0.36	1.027	1.00	0.75	1.78	0.882	1.34	1.177	6%
9	24.00	1.67				1.34	0.827	0.33	1.011	1.00	1.00	1.67	0.919	1.67	1.535	7%
10	25.00	1.56				1.25	0.666	0.31	0.999	1.00	1.00	1.56	0.833	1.56	1.299	6%
11	26.00	1.57				1.26	0.758	0.31	0.950	1.00	1.00	1.57	0.854	1.57	1.341	7%
12	27.00	1.60				1.28	0.653	0.32	0.953	1.00	1.00	1.60	0.803	1.60	1.285	6%
13	28.00	1.68				1.34	0.622	0.34	0.890	1.00	1.00	1.68	0.756	1.68	1.270	6%
14	29.00	1.63				1.30	0.636	0.33	0.880	1.00	1.00	1.63	0.758	1.63	1.236	6%
15	30.00	1.59		0.45	0.093	1.27	0.666	0.32	0.818	1.00	1.00	1.59	0.742	1.59	1.180	6%
16	31.00	1.56				1.25	0.648	0.31	0.784	1.00	1.00	1.56	0.716	1.56	1.117	5%
17	32.00	1.50				1.20	0.589	0.30	0.737	1.00	1.00	1.50	0.663	1.50	0.995	5%
18	33.00	1.40				1.12	0.146	0.28	0.654	1.00	1.00	1.40	0.398	1.40	0.557	3%
19	34.00	1.28				1.02	0.346	0.26	0.550	1.00	1.10	1.28	0.450	1.41	0.634	3%
20	35.20	0.75								1.00	0.80	0.75	0.093	0.60	0.056	0%
LB	35.60	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>20.6</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10m DS of station

Meas. Start Time (MST):	10:45
Meas. End Time (MST):	11:39
Equipment:	ADV
Method:	Boat
River Condition:	High flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 23 C

**Flow characteristics:**

Total Flow:	20.6	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	28.97	(m <sup>2</sup> )
Wetted Width:	20.60	(m)
Hydraulic Depth:	1.41	(m)
Mean Velocity:	0.71	(m/s)
Froude Number:	0.19	

**Logger Details:**

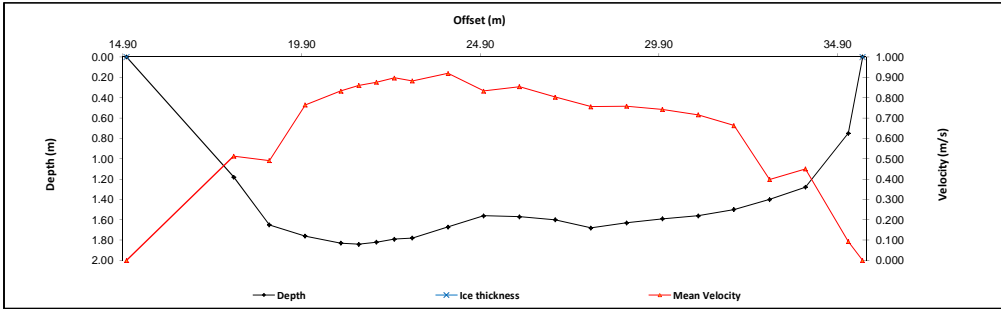
	Before	After
Transducer Reading (m):	1.404	1.399
Water (°C):	13.0	13.2
Datalogger Clock:	08:49	11:53
Laptop Clock:	08:49	11:53
Battery (Main):	12.5	13.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Wildlife damaged telemetry and solar panel cables between visits, repaired
- Enclosure grounded

**General Notes:**

- Ran ADV test, all results good



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S61-1	1.260	101.260		100.000	100.000	3/4" Pipe 6m S of logger
S61-2			0.735	100.525	100.525	3/4" Pipe 8m SW of logger
S61-3			1.239	100.021	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		3.862	97.398		Time WL Surveyed: 9:56
Temporary BM			1.239	100.021		
<b>Turn</b>						
Temporary BM	1.206	101.227		100.021		
Water Level:	Cut		3.830	97.397		Time WL Surveyed: 9:58
S61-3			1.206	100.021	100.020	3/4" Pipe 4m NW of logger
S61-2			0.702	100.525	100.525	3/4" Pipe 8m SW of logger
S61-1			1.226	100.001	100.000	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S61-3	1.207	101.228		100.021		
Water Level:	Cut		3.833	97.395		Time WL Surveyed: 11:56
Water Level:	Cut		3.775	97.395		Time WL Surveyed: 11:58
S61-3	1.149	101.170		100.021		

**WL Survey Summary**

	Before	After
Average WL:	97.398	97.395
Closing Error:	-0.001	-
WL Check:	0.001	0.000
Transducer Elevation	95.994	95.996

**Field Personnel:**

TR, NC	Trip Date:	13-Jun-14
NC	Date:	13-Jun-13
TR	Date:	15-Jul-14
Yes	Entered Digitally in the Field:	



# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoio Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: June 22, 2014  
 Site Visit Time (MST): 09:05



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.70	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
1	3.50	1.28				1.02	0.513	0.26	0.450	1.00	0.90	1.28	0.482	1.15	0.555	4%
2	4.50	1.38				1.10	0.582	0.28	0.447	1.00	0.75	1.38	0.515	1.04	0.533	4%
3	5.00	1.44				1.15	0.550	0.29	0.358	1.00	0.50	1.44	0.454	0.72	0.327	2%
4	5.50	1.50				1.20	0.677	0.30	0.559	1.00	0.50	1.50	0.618	0.75	0.464	3%
5	6.00	1.49				1.19	0.747	0.30	0.592	1.00	0.50	1.49	0.670	0.75	0.498	4%
6	6.50	1.54				1.23	0.726	0.31	0.617	1.00	0.50	1.54	0.672	0.77	0.517	4%
7	7.00	1.47				1.18	0.732	0.29	0.629	1.00	0.50	1.47	0.681	0.74	0.500	4%
8	7.50	1.46				1.17	0.655	0.29	0.496	1.00	0.75	1.46	0.576	1.10	0.630	5%
9	8.50	1.37				1.10	0.647	0.27	0.661	1.00	1.00	1.37	0.654	1.37	0.896	7%
10	9.50	1.30				1.04	0.719	0.26	0.811	1.00	1.00	1.30	0.765	1.30	0.995	7%
11	10.50	1.23				0.98	0.729	0.25	0.876	1.00	1.00	1.23	0.803	1.23	0.987	7%
12	11.50	1.23				0.98	0.675	0.25	0.747	1.00	1.00	1.23	0.711	1.23	0.875	7%
13	12.50	1.34				1.07	0.678	0.27	0.613	1.00	1.00	1.34	0.646	1.34	0.865	7%
14	13.50	1.40				1.12	0.639	0.28	0.497	1.00	1.00	1.40	0.568	1.40	0.795	6%
15	14.50	1.25				1.00	0.643	0.25	0.673	1.00	1.00	1.25	0.658	1.25	0.823	6%
16	15.50	1.25				1.00	0.605	0.25	0.685	1.00	1.00	1.25	0.645	1.25	0.806	6%
17	16.50	1.22				0.98	0.643	0.24	0.402	1.00	1.00	1.22	0.523	1.22	0.637	5%
18	17.50	1.18				0.94	0.667	0.24	0.546	1.00	1.00	1.18	0.607	1.18	0.716	5%
19	18.50	1.10				0.88	0.603	0.22	0.477	1.00	1.00	1.10	0.540	1.10	0.594	4%
20	19.50	0.82				0.66	0.440	0.16	0.368	1.00	0.90	0.82	0.404	0.74	0.298	2%
LB	20.30	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.000	0.000	
<b>Total Flow</b>														<b>13.3</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10m DS of station

Meas. Start Time (MST):	9:55
Meas. End Time (MST):	11:02
Equipment:	ADV
Method:	Fishcat
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, breezy, 20 C

**Flow characteristics:**

Total Flow:	13.3	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	21.61	(m <sup>2</sup> )
Wetted Width:	17.60	(m)
Hydraulic Depth:	1.23	(m)
Mean Velocity:	0.62	(m/s)
Froude Number:	0.18	

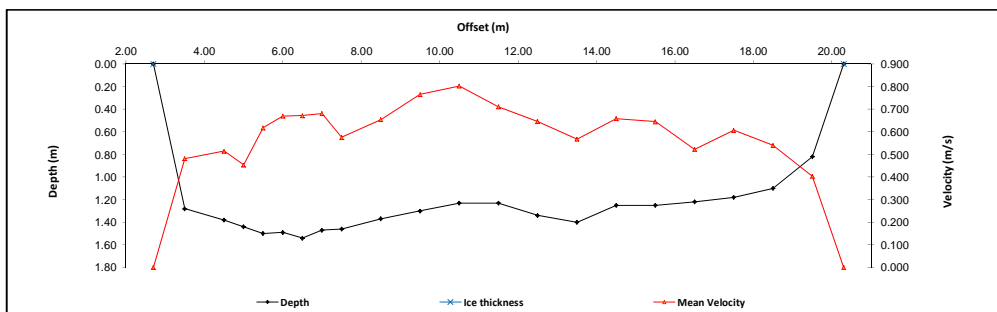
**Logger Details:**

	Before	After
Transducer Reading (m):	1.113	1.110
Water (°C):	14.1	14.1
Datalogger Clock:	09:02	11:22
Laptop Clock:	09:02	11:23
Battery (Main):	14.2	14.3
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- ADV test failed, peak location out of bounds
- Could not retrieve PLS to install 25 lb weight



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S61-1	1.255	101.255		100.000	100.000	3/4" Pipe 6m S of logger
S61-2			0.729	100.526	100.525	3/4" Pipe 8m SW of logger
S61-3			1.234	100.021	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		4.153	97.102		Time WL Surveyed: 9:32
S61-3			1.234	100.021	100.020	3/4" Pipe 4m NW of logger
<b>Turn</b>						
S61-3	1.283	101.304		100.021	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		4.200	97.104		Time WL Surveyed: 9:34
S61-3			1.283	100.021	100.020	3/4" Pipe 4m NW of logger
S61-2			0.779	100.525	100.525	3/4" Pipe 8m SW of logger
S61-1			1.304	100.000	100.000	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S61-3	1.283	101.304		100.021		
Water Level:	Cut		4.200	97.104		Time WL Surveyed: 11:13
Water Level:	Cut		4.228	97.106		Time WL Surveyed: 11:18
S61-3	1.313	101.334		100.021		

**WL Survey Summary**

	Before	After
Average WL:	97.103	97.105
Closing Error:	0.000	-
WL Check:	0.002	-0.002
Transducer Elevation	95.990	95.995

**Field Personnel:**

	SM, GG	Trip Date:	22-Jun-14
Data Entry Personnel:	SM	Date:	22-Jun-14
Data Check Personnel:	TR	Date:	15-Jul-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: August 17, 2014  
 Site Visit Time (MST): 08:40

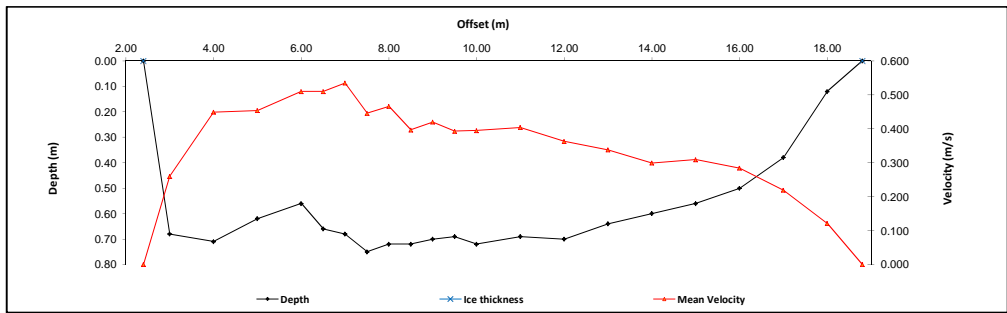


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.40	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	3.00	0.68		0.41	0.260					1.00	0.80	0.68	0.260	0.54	0.141	4%
2	4.00	0.71		0.43	0.449					1.00	1.00	0.71	0.449	0.71	0.319	9%
3	5.00	0.62		0.37	0.454					1.00	1.00	0.62	0.454	0.62	0.281	8%
4	6.00	0.56		0.34	0.510					1.00	0.75	0.56	0.510	0.42	0.214	6%
5	6.50	0.66		0.40	0.510					1.00	0.50	0.66	0.510	0.33	0.168	5%
6	7.00	0.68		0.41	0.535					1.00	0.50	0.68	0.535	0.34	0.182	5%
7	7.50	0.75		0.45	0.446					1.00	0.50	0.75	0.446	0.38	0.167	5%
8	8.00	0.72		0.43	0.466					1.00	0.50	0.72	0.466	0.36	0.168	5%
9	8.50	0.72		0.43	0.397					1.00	0.50	0.72	0.397	0.36	0.143	4%
10	9.00	0.70		0.42	0.420					1.00	0.50	0.70	0.420	0.35	0.147	4%
11	9.50	0.69		0.41	0.393					1.00	0.50	0.69	0.393	0.35	0.136	4%
12	10.00	0.72		0.43	0.395					1.00	0.75	0.72	0.395	0.54	0.213	6%
13	11.00	0.69		0.41	0.404					1.00	1.00	0.69	0.404	0.69	0.279	8%
14	12.00	0.70		0.42	0.363					1.00	1.00	0.70	0.363	0.70	0.254	7%
15	13.00	0.64		0.38	0.338					1.00	1.00	0.64	0.338	0.64	0.216	6%
16	14.00	0.60		0.36	0.299					1.00	1.00	0.60	0.299	0.60	0.179	5%
17	15.00	0.56		0.34	0.309					1.00	1.00	0.56	0.309	0.56	0.173	5%
18	16.00	0.50		0.30	0.284					1.00	1.00	0.50	0.284	0.50	0.142	4%
19	17.00	0.38		0.23	0.219					1.00	1.00	0.38	0.219	0.38	0.083	2%
20	18.00	0.12		0.07	0.121					1.00	0.90	0.12	0.121	0.11	0.013	0%
LB	18.80	0.00	0.00		0.00		0.00		0.00	1.00	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.62</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10m US of PT

Meas. Start Time (MST):	9:12
Meas. End Time (MST):	9:37
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 18 C



**Flow characteristics:**

Total Flow:	3.62	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.47	(m <sup>2</sup> )
Wetted Width:	16.40	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.38	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.416	0.414
Water (°C):	18.0	17.9
Datalogger Clock:	08:43	09:48
Laptop Clock:	08:43	09:48
Battery (Main):	13.9	14.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S61-2	0.795	101.320		100.525	100.525	3/4" Pipe 8m SW of logger
S61-1			1.319	100.001	100.000	3/4" Pipe 6m S of logger
S61-3			1.300	100.020	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		4.905	96.415		Time WL Surveyed: 8:52
S61-3			1.300	100.020	100.020	3/4" Pipe 4m NW of logger
<b>Turn</b>						
S61-3	1.277	101.297		100.020	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		4.882	96.415		Time WL Surveyed: 8:59
S61-3			1.277	100.020	100.020	3/4" Pipe 4m NW of logger
S61-1			1.298	99.999	100.000	3/4" Pipe 6m S of logger
S61-2			0.773	100.524	100.525	3/4" Pipe 8m SW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S61-3	1.277	101.297		100.020		
Water Level:	Cut		0.085	4.969	96.413	Time WL Surveyed: 9:45
Water Level:	Cut		0.086	4.949	96.415	Time WL Surveyed: 9:46
S61-3	1.258	101.278		100.020		

**WL Survey Summary**

	Before	After
Average WL:	96.415	96.414
Closing Error:	0.001	-
WL Check:	0.000	-0.002
Transducer Elevation	95.999	96.000

**Field Personnel:**

TR, MP	Trip Date:	17-Aug-14
Data Entry Personnel:	Date:	17-Aug-14
Data Check Personnel:	Date:	30-Sep-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismer

UTM Location: 466037E 6193791N

Site Visit Date: \_\_\_\_\_

September 5, 2014

Site Visit Time (MST): \_\_\_\_\_

13:10



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): At cableway	
Meas. Start Time (MST):	13:51
Meas. End Time (MST):	14:25
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 13 C

<b>Flow characteristics:</b>		
Total Flow:	1.58	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.01	(m <sup>2</sup> )
Wetted Width:	16.02	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.14	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.205	0.229
Water (°C):	10.9	11.9
Datalogger Clock:	13:11	14:37
Laptop Clock:	13:11	14:37
Battery (Main):	14.5	14.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- PLS was moved to deeper water
- Raised cableway

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05		LB:	0.00	
Serial Number:	4712		Salinity (ppt):	-		RB:	16.00	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	-				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		3	16.39	6.13	0.264	1.617	2.04%
Coordinate System:	ENU		4	16.98	6.28	0.256	1.606	1.34%
Left Method:	Sloped bank		5	15.58	5.83	0.267	1.556	-1.81%
Right Method:	Sloped bank		6	15.13	5.80	0.269	1.560	-1.56%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	16.02	6.01	0.264	<b>1.58</b>	
			<b>SD:</b>	0.71	0.20	0.005	0.027	
			<b>COV:</b>	0.04	0.03	0.019	0.017	

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S61-3	1.732	101.752		100.020	100.020	3/4" Pipe 4m NW of logger
S61-2			1.224	100.528	100.525	3/4" Pipe 8m SW of logger
S61-1			1.750	100.002	100.000	3/4" Pipe 6m S of logger
Water Level:	Cut		5.548	96.204	<b>Time WL Surveyed:</b>	13:41
Temporary BM			5.386	96.366	0.000	-
<b>Turn</b>						
Temporary BM	5.359	101.725		96.366		-
Water Level:	Cut		5.517	96.208	<b>Time WL Surveyed:</b>	13:43
S61-1			1.724	100.001	100.000	3/4" Pipe 6m S of logger
S61-2			1.198	100.527	100.525	3/4" Pipe 8m SW of logger
S61-3			1.707	100.018	100.020	3/4" Pipe 4m NW of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S61-3	1.707	101.726		100.019		
Water Level:	Cut	0.225	5.748	96.203	<b>Time WL Surveyed:</b>	14:31
Water Level:	Cut	0.225	5.784	96.202	<b>Time WL Surveyed:</b>	14:33
S61-3	1.742	101.761		100.019		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	96.206	96.203
Closing Error:	0.002	-
WL Check:	0.004	0.001
Transducer Elevation	96.001	95.974

<b>Field Personnel:</b>			
	SM, GG	Trip Date:	5-Sep-14
Data Entry Personnel:	SM	Date:	5-Sep-14
Data Check Personnel:	MP	Date:	3-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoi Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: October 8, 2014  
 Site Visit Time (MST): 11:40



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): At cableway	
Meas. Start Time (MST):	12:00
Meas. End Time (MST):	12:25
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Cloudy, calm, 7 C

<b>Flow characteristics:</b>		
Total Flow:	3.55	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.67	(m <sup>2</sup> )
Wetted Width:	16.64	(m)
Hydraulic Depth:	0.58	(m)
Mean Velocity:	0.37	(m/s)
Froude Number:	0.15	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.395	0.394
Water (°C):	3.8	3.8
Datalogger Clock:	11:42	12:27
Laptop Clock:	11:43	12:27
Battery (Main):	13.7	13.0
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Removed cableway for winter
- Stake and float installed 6m US of logger

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05		LB:	0.90	
Serial Number:	4712		Salinity (ppt):	0.0		RB:	18.20	
Firmware Version:	3.5		Magnetic Declination (°):	14				
Software Version:	3.7		Measured Temperature (°C):	3.8				
			ADCP Temperature (°C):	5.4				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	16.89	10.15	0.36	3.654	2.91%
Coordinate System:	ENU		2	16.49	9.48	0.365	3.46	-2.56%
Left Method:	Sloped bank		3	16.70	9.59	0.375	3.596	1.27%
Right Method:	Sloped bank		4	16.48	9.48	0.369	3.493	-1.63%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	16.64	9.67	0.367	<b>3.55</b>	
			<b>SD:</b>	0.17	0.28	0.005	0.078	
			<b>COV:</b>	0.01	0.03	0.015	0.022	

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S61-1	1.374	101.374		100.000	100.000	3/4" Pipe 6m S of logger
S61-2			0.848	100.526	100.525	3/4" Pipe 8m SW of logger
S61-3			1.352	100.022	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut	0.025	5.018	96.381	<b>Time WL Surveyed:</b>	11:48
Temporary BM			5.018	96.356	0.000	-
<b>Turn</b>						
Temporary BM	5.001	101.357		96.356		-
Water Level:	Cut	0.025	5.001	96.381	<b>Time WL Surveyed:</b>	11:49
S61-3			1.334	100.023	100.020	3/4" Pipe 4m NW of logger
S61-2			0.829	100.528	100.525	3/4" Pipe 8m SW of logger
S61-1			1.355	100.002	100.000	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S61-1	1.354	101.355		100.001		
Water Level:	Cut	0.026	4.999	96.382	<b>Time WL Surveyed:</b>	12:31
Water Level:	Cut	0.026	4.984	96.352	<b>Time WL Surveyed:</b>	12:32
S61-1	1.339	101.340		100.001		

<b>WL Survey Summary</b>	Before	After
Average WL:	96.381	96.382
Closing Error:	-0.002	-
WL Check:	0.000	0.000
Transducer Elevation	95.986	95.988

<b>Field Personnel:</b>	TR, MP	Trip Date:	8-Oct-14
Data Entry Personnel:	TR	Date:	8-Oct-14
Data Check Personnel:	TR	Date:	31-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S61 Christina River above Statoil Leismer  
 UTM Location: 466037E 6193791N

Site Visit Date: November 29, 2014  
 Site Visit Time (MST): 12:05

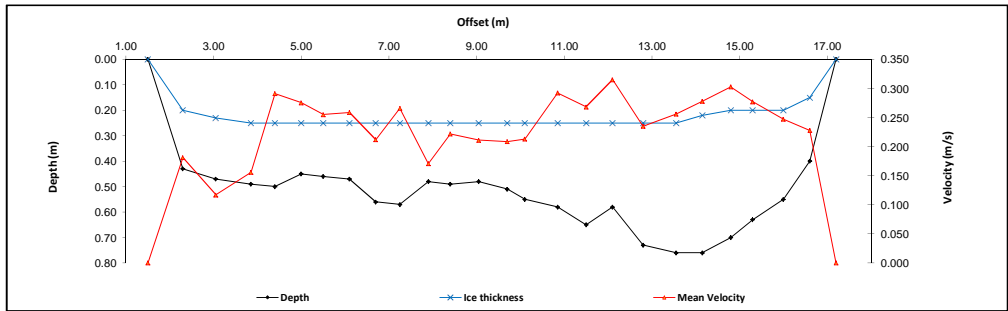


Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.50	0.00	0.00		0.000		0.000		0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	2.30	0.43	0.20	0.32	0.206					0.88	0.78	0.23	0.181	0.18	0.032	3%
2	3.05	0.47	0.23	0.35	0.133					0.88	0.78	0.24	0.117	0.19	0.022	2%
3	3.85	0.49	0.25	0.37	0.177					0.88	0.68	0.24	0.156	0.16	0.025	2%
4	4.40	0.50	0.25	0.38	0.331					0.88	0.58	0.25	0.291	0.14	0.042	4%
5	5.00	0.45	0.25	0.35	0.313					0.88	0.55	0.20	0.275	0.11	0.030	3%
6	5.50	0.46	0.25	0.36	0.290					0.88	0.55	0.21	0.255	0.12	0.029	3%
7	6.10	0.47	0.25	0.36	0.294					0.88	0.60	0.22	0.259	0.13	0.034	3%
8	6.70	0.56	0.25	0.41	0.241					0.88	0.57	0.31	0.212	0.18	0.038	3%
9	7.25	0.57	0.25	0.41	0.302					0.88	0.60	0.32	0.266	0.19	0.051	4%
10	7.90	0.48	0.25	0.37	0.194					0.88	0.58	0.23	0.171	0.13	0.023	2%
11	8.40	0.49	0.25	0.37	0.252					0.88	0.58	0.24	0.222	0.14	0.031	3%
12	9.05	0.48	0.25	0.37	0.240					0.88	0.65	0.23	0.211	0.15	0.032	3%
13	9.70	0.51	0.25	0.38	0.237					0.88	0.52	0.26	0.209	0.14	0.028	2%
14	10.10	0.55	0.25	0.40	0.242					0.88	0.58	0.30	0.213	0.17	0.037	3%
15	10.85	0.58	0.25	0.42	0.332					0.88	0.70	0.33	0.292	0.23	0.067	6%
16	11.50	0.65	0.25	0.45	0.305					0.88	0.63	0.40	0.268	0.25	0.067	6%
17	12.10	0.58	0.25	0.42	0.358					0.88	0.65	0.33	0.315	0.21	0.068	6%
18	12.80	0.73	0.25	0.49	0.267					0.88	0.73	0.48	0.235	0.35	0.082	7%
19	13.55	0.76	0.25	0.51	0.291					0.88	0.68	0.51	0.256	0.34	0.088	8%
20	14.15	0.76	0.22	0.49	0.316					0.88	0.63	0.54	0.278	0.34	0.094	8%
21	14.80	0.70	0.20	0.45	0.344					0.88	0.57	0.50	0.303	0.29	0.087	7%
22	15.30	0.63	0.20	0.42	0.315					0.88	0.60	0.43	0.277	0.26	0.072	6%
23	16.00	0.55	0.20	0.38	0.281					0.88	0.65	0.35	0.247	0.23	0.056	5%
24	16.60	0.40	0.15	0.28	0.259					0.88	0.60	0.25	0.228	0.15	0.034	3%
RB	17.20	0.00	0.00		0.00		0.00		0.00	0.88	0.30	0.00	0.000	0.00	0.000	
														<b>Total Flow</b>	<b>1.17</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe):  
15m DS of PT

Meas. Start Time (MST):	12:45
Meas. End Time (MST):	13:25
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, breezy, -25 C



**Flow characteristics:**

Total Flow:	1.17	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	4.77	(m <sup>2</sup> )
Wetted Width:	15.70	(m)
Hydraulic Depth:	0.30	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.14	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.367	0.367
Water (°C):	0.2	0.2
Datalogger Clock:	12:07	13:27
Laptop Clock:	12:08	13:28
Battery (Main):	13.4	14.4
Battery:	-	-
Enclosure Dessoricant:	-	Replaced
Vent Tube Dessoricant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-replaced modem

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S61-1	1.402	101.402		100.000	100.000	3/4" Pipe 6m S of logger
S61-2			0.875	100.527	100.525	3/4" Pipe 8m SW of logger
S61-3			1.387	100.015	100.020	3/4" Pipe 4m NW of logger
Water Level:	Cut		5.052	96.350	Time WL Surveyed:	12:35
Temporary BM			4.988	96.414	0.000	
<b>Turn</b>						
Temporary BM	4.946	101.360		96.414	-	
Water Level:	Cut		5.013	96.347	Time WL Surveyed:	12:40
S61-3			1.345	100.015	100.020	3/4" Pipe 4m NW of logger
S61-2			0.837	100.523	100.525	3/4" Pipe 8m SW of logger
S61-1			1.363	99.997	100.000	3/4" Pipe 6m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S61-3	1.344	101.359		100.015		
Water Level:	Cut		5.014	96.345	Time WL Surveyed:	13:18
Water Level:	Cut		4.984	96.345	Time WL Surveyed:	13:20
S61-3	1.314	101.329		100.015		

**WL Survey Summary**

	Before	After
Average WL:	96.349	96.345
Closing Error:	0.003	-
WL Check:	0.003	0.000
Transducer Elevation	95.982	95.978

**Field Personnel:**

TR, GG	Trip Date:	29-Nov-14
TR	Date:	29-Nov-14
CJ	Date:	28-Mar-15
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: January 8, 2014  
 Site Visit Time (MST): 14:10

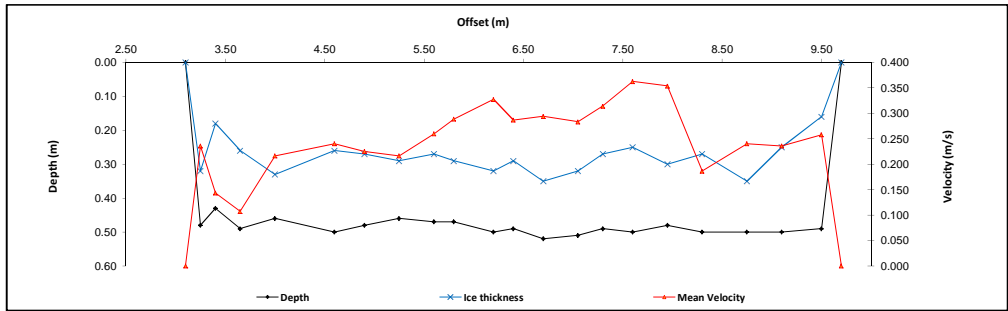


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.10	0.00	0.00		0.000				0.000	0.88	0.08	0.00	0.000	0.00	0.000	
1	3.25	0.48	0.32	0.40	0.268					0.88	0.15	0.16	0.236	0.02	0.006	2%
2	3.40	0.43	0.18	0.31	0.163					0.88	0.20	0.25	0.143	0.05	0.007	2%
3	3.65	0.49	0.26	0.38	0.122					0.88	0.30	0.23	0.107	0.07	0.007	2%
4	4.00	0.46	0.33	0.40	0.246					0.88	0.48	0.13	0.216	0.06	0.013	4%
5	4.60	0.50	0.26	0.38	0.273					0.88	0.45	0.24	0.240	0.11	0.026	8%
6	4.90	0.48	0.27	0.38	0.256					0.88	0.33	0.21	0.225	0.07	0.015	5%
7	5.25	0.46	0.29	0.38	0.246					0.88	0.35	0.17	0.216	0.06	0.013	4%
8	5.60	0.47	0.27	0.37	0.295					0.88	0.27	0.20	0.260	0.05	0.014	4%
9	5.80	0.47	0.29	0.38	0.328					0.88	0.30	0.18	0.289	0.05	0.016	5%
10	6.20	0.50	0.32	0.41	0.372					0.88	0.30	0.18	0.327	0.05	0.018	5%
11	6.40	0.49	0.29	0.39	0.326					0.88	0.25	0.20	0.287	0.05	0.014	4%
12	6.70	0.52	0.35	0.44	0.334					0.88	0.32	0.17	0.294	0.06	0.016	5%
13	7.05	0.51	0.32	0.42	0.322					0.88	0.30	0.19	0.283	0.06	0.016	5%
14	7.30	0.49	0.27	0.38	0.357					0.88	0.27	0.22	0.314	0.06	0.019	6%
15	7.60	0.50	0.25	0.38	0.412					0.88	0.33	0.25	0.363	0.08	0.029	9%
16	7.95	0.48	0.30	0.39	0.402					0.88	0.35	0.18	0.354	0.06	0.022	7%
17	8.30	0.50	0.27	0.39	0.212					0.88	0.40	0.23	0.187	0.09	0.017	5%
18	8.75	0.50	0.35	0.43	0.273					0.88	0.40	0.15	0.240	0.06	0.014	4%
19	9.10	0.50	0.25	0.38	0.268					0.88	0.38	0.25	0.236	0.09	0.022	7%
20	9.50	0.49	0.16	0.33	0.293					0.88	0.30	0.33	0.258	0.10	0.026	8%
LB	9.70	0.00	0.00		0.00		0.00		0.000	0.88	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.332</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 15m DS of culvert

Meas. Start Time (MST):	14:45
Meas. End Time (MST):	15:12
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, light breeze



**Flow characteristics:**

Total Flow:	0.332	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.32	(m <sup>2</sup> )
Wetted Width:	6.60	(m)
Hydraulic Depth:	0.20	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.324	1.324
Water (°C):	0.3	0.3
Datalogger Clock:	14:20	15:30
Laptop Clock:	14:18	15:29
Battery (Main):	12.7	12.6
Battery:	Replaced	
Battery Serial #:	-	-
Enclosure Dessicant:	Good	-
Vent Tube Dessicant:	Good	-
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S62-1	1.218	101.218		100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.270	99.948	99.948	3/4" Pipe 5m W of Station
S62-3			1.185	100.033	100.034	3/4" Pipe 8m W of Station
Water Level:	Cut		3.162	98.056	Time WL Surveyed: 14:31	
Temporary BM			3.124	98.094	0.000	
<b>Turn</b>						
Temporary BM	3.108	101.202		98.094		
Water Level:	Cut		3.145	98.057	Time WL Surveyed: 14:33	
S62-3			1.168	100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.253	99.949	99.948	3/4" Pipe 5m W of Station
S62-1			1.201	100.001	100.000	3/4" Pipe 2m N of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S62-1	1.203	101.203		100.000		
Water Level:	Cut		3.148	98.055	Time WL Surveyed: 15:25	
Water Level:	Cut		3.132	98.054	Time WL Surveyed: 15:27	
S62-1	1.186	101.186		100.000		

**WL Survey Summary**

	Before	After
Average WL:	98.057	98.055
Closing Error:	-0.001	-
WL Check:	0.001	0.001
Transducer Elevation	96.733	96.731

**Field Personnel:**

SM, TR	Trip Date:	8-Jan-14
Data Entry Personnel: SM	Date:	8-Jan-14
Data Check Personnel: TR	Date:	19-Mar-14
Entered Digitally in the Field: Yes		

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: February 4, 2013  
 Site Visit Time (MST): 13:45

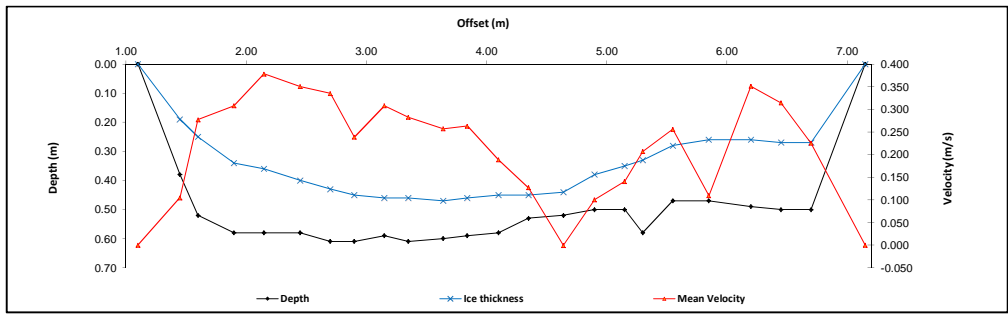


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.10	0.00	0.00		0.000		0.000		0.000	0.88	0.18	0.00	0.000	0.00	0.000	
1	1.45	0.38	0.19	0.29	0.119					0.88	0.25	0.19	0.105	0.05	0.005	2%
2	1.60	0.52	0.25	0.39	0.315					0.88	0.23	0.27	0.277	0.06	0.017	7%
3	1.90	0.58	0.34	0.46	0.350					0.88	0.28	0.24	0.308	0.07	0.020	8%
4	2.15	0.58	0.36	0.47	0.430					0.88	0.28	0.22	0.378	0.06	0.023	9%
5	2.45	0.58	0.40	0.49	0.398					0.88	0.28	0.18	0.350	0.05	0.017	7%
6	2.70	0.61	0.43	0.52	0.381					0.88	0.23	0.18	0.335	0.04	0.014	5%
7	2.90	0.61	0.45	0.53	0.271					0.88	0.23	0.16	0.238	0.04	0.009	3%
8	3.15	0.59	0.46	0.53	0.350					0.88	0.23	0.13	0.308	0.03	0.009	4%
9	3.35	0.61	0.46	0.54	0.321					0.88	0.25	0.15	0.282	0.04	0.010	4%
10	3.64	0.60	0.47	0.54	0.292					0.88	0.25	0.13	0.257	0.03	0.008	3%
11	3.84	0.59	0.46	0.53	0.299					0.88	0.23	0.13	0.263	0.03	0.008	3%
12	4.10	0.58	0.45	0.52	0.214					0.88	0.26	0.13	0.188	0.03	0.006	3%
13	4.35	0.53	0.45	0.49	0.144					0.88	0.27	0.08	0.127	0.02	0.003	1%
14	4.64	0.52	0.44	0.48	-0.001					0.88	0.28	0.08	-0.001	0.02	0.000	0%
15	4.90	0.50	0.38	0.44	0.114					0.88	0.26	0.12	0.100	0.03	0.003	1%
16	5.15	0.50	0.35	0.43	0.160					0.88	0.20	0.15	0.141	0.03	0.004	2%
17	5.30	0.58	0.33	0.46	0.235					0.88	0.20	0.25	0.207	0.05	0.010	4%
18	5.55	0.47	0.28	0.38	0.291					0.88	0.27	0.19	0.256	0.05	0.013	5%
19	5.85	0.47	0.26	0.37	0.124					0.88	0.33	0.21	0.109	0.07	0.007	3%
20	6.20	0.49	0.26	0.38	0.399					0.88	0.30	0.23	0.351	0.07	0.024	10%
21	6.45	0.50	0.27	0.39	0.357					0.88	0.25	0.23	0.314	0.06	0.018	7%
22	6.70	0.50	0.27	0.39	0.256					0.88	0.35	0.23	0.225	0.08	0.018	7%
LB	7.15	0.00	0.00		0.00		0.00		0.00	0.88	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.248</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
15m DS of bridge

Meas. Start Time (MST):	14:50
Meas. End Time (MST):	15:25
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, -19 C



**Flow characteristics:**

Total Flow:	0.248	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.00	(m <sup>2</sup> )
Wetted Width:	6.05	(m)
Hydraulic Depth:	0.17	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.19	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.273	
Water (°C):	0.2	
Datalogger Clock:	14:02	
Laptop Clock:	14:02	
Battery (Main):	12.9	
Battery:		Replaced
Battery Serial #:	-	Replaced
Enclosure Dessicant:	-	
Vent Tube Dessicant:	-	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

-Station battery dead upon arrival, dead since 30-Jan

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S62-1	1.279	101.279		100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.331	99.948	99.948	3/4" Pipe 5m W of Station
S62-3			1.245	100.034	100.034	3/4" Pipe 8m W of Station
Water Level:	Cut		3.278	98.001	Time WL Surveyed:	14:40
Temporary BM			3.198	98.081		
<b>Turn</b>						
Temporary BM	3.171	101.252		98.081		
Water Level:	Cut		3.249	98.003	Time WL Surveyed:	14:46
S62-3			1.216	100.036	100.034	3/4" Pipe 8m W of Station
S62-2			1.302	99.950	99.948	3/4" Pipe 5m W of Station
S62-1			1.251	100.001	100.000	3/4" Pipe 8m W of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S62-1	1.251	101.251		100.000		
Water Level:	Cut		3.250	98.001	Time WL Surveyed:	15:42
Water Level:	Cut		3.235	98.004	Time WL Surveyed:	15:45
S62-1	1.239	101.239		100.000		

**WL Survey Summary**

	Before	After
Average WL:	98.002	98.003
Closing Error:	-0.001	-
WL Check:	0.002	-0.003
Transducer Elevation	96.729	-

**Field Personnel:**

	TR, JB	Trip Date:	4-Feb-14
Data Entry Personnel:	JB	Date:	4-Feb-14
Data Check Personnel:	TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

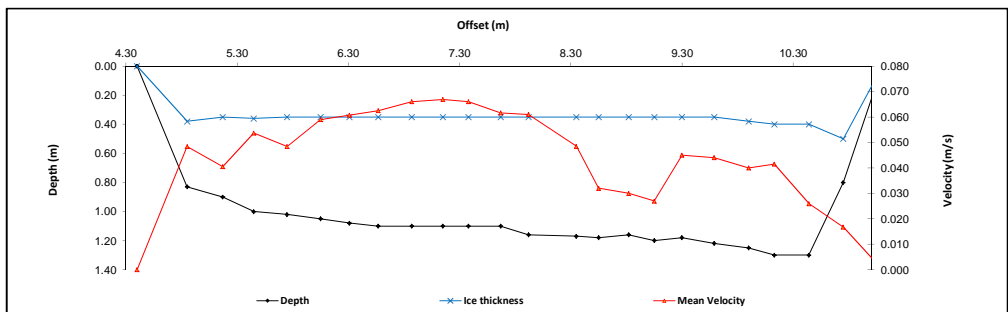
Site Visit Date: March 9, 2014  
 Site Visit Time (MST): 13:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	11.10	0.00	0.00		0.000		0.000		0.000	0.88	0.18	0.00	0.000	0.00	0.000	
1	10.75	0.80	0.50	0.65	0.019					0.88	0.33	0.30	0.017	0.10	0.002	1%
2	10.44	1.30	0.40			1.12	0.016	0.58	0.036	1.00	0.27	0.90	0.026	0.28	0.007	3%
3	10.13	1.30	0.40			1.12	0.037	0.58	0.046	1.00	0.27	0.90	0.042	0.24	0.010	5%
4	9.90	1.25	0.38			1.08	0.044	0.55	0.036	1.00	0.27	0.87	0.040	0.23	0.009	4%
5	9.59	1.22	0.35			1.05	0.052	0.52	0.036	1.00	0.30	0.87	0.044	0.26	0.011	5%
6	9.30	1.18	0.35			1.01	0.053	0.52	0.037	1.00	0.27	0.83	0.045	0.22	0.010	5%
7	9.05	1.20	0.35			1.03	0.054	0.52	0.000	1.00	0.24	0.85	0.027	0.20	0.006	2%
8	8.82	1.16	0.35			1.00	0.059	0.51	0.001	1.00	0.25	0.81	0.030	0.20	0.006	3%
9	8.55	1.18	0.35			1.01	0.063	0.52	0.001	1.00	0.24	0.83	0.032	0.20	0.006	3%
10	8.35	1.17	0.35			1.01	0.068	0.51	0.029	1.00	0.32	0.82	0.049	0.26	0.013	6%
11	7.92	1.16	0.35			1.00	0.074	0.51	0.048	1.00	0.34	0.81	0.061	0.28	0.017	8%
12	7.67	1.10	0.35	0.73	0.070					0.88	0.27	0.75	0.062	0.20	0.012	6%
13	7.38	1.10	0.35	0.73	0.075					0.88	0.26	0.75	0.066	0.20	0.013	6%
14	7.15	1.10	0.35	0.73	0.076					0.88	0.26	0.75	0.067	0.19	0.013	6%
15	6.87	1.10	0.35	0.73	0.075					0.88	0.29	0.75	0.066	0.22	0.014	6%
16	6.57	1.10	0.35	0.73	0.071					0.88	0.28	0.75	0.062	0.21	0.013	6%
17	6.31	1.08	0.35	0.72	0.069					0.88	0.26	0.73	0.061	0.19	0.012	5%
18	6.05	1.05	0.35	0.70	0.067					0.88	0.28	0.70	0.059	0.20	0.012	5%
19	5.75	1.02	0.35	0.69	0.055					0.88	0.30	0.67	0.048	0.20	0.010	4%
20	5.45	1.00	0.36	0.68	0.061					0.88	0.29	0.64	0.054	0.19	0.010	5%
21	5.17	0.90	0.35	0.63	0.046					0.88	0.30	0.55	0.040	0.17	0.007	3%
22	4.85	0.83	0.38	0.61	0.055					0.88	0.39	0.45	0.048	0.17	0.008	4%
LB	4.40	0.00	0.00		0.00		0.00		0.00	0.88	0.23	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.221</b>	<b>100%</b>	

**Flow Measurement Details:**  
 Metering Section Location (describe): upstream of culvert

Mess. Start Time (MST):	14:10
Mess. End Time (MST):	14:54
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, 3 C



**Flow characteristics:**

Total Flow:	0.221	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	4.60	(m <sup>2</sup> )
Wetted Width:	6.70	(m)
Hydraulic Depth:	0.69	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.329	1.328
Water (°C):	0.2	0.2
Datalogger Clock:	13:23	13:37
Laptop Clock:	13:23	13:37
Battery (Main):	11.8	13.0
Battery:		Replaced
Battery Serial #:	-	1205004
Enclosure Dessicant:		Good
Vent Tube Dessicant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Tried flow DS of bridge, gushing overflow forced crew to move measurement US of bridge

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S62-1	1.310	101.310		100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.364	99.946	99.948	3/4" Pipe 5m W of Station
S62-3			1.277	100.033	100.034	3/4" Pipe 8m W of Station
Water Level:	Cut		3.249	98.061	Time WL Surveyed: 15:05	
Temporary BM			3.068	98.242	0.000	-
<b>Turn</b>						
Temporary BM	3.039	101.281		98.242		
Water Level:	Cut		3.221	98.060	Time WL Surveyed: 15:08	
S62-3			1.247	100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.332	99.949	99.948	3/4" Pipe 5m W of Station
S62-1			1.281	100.000	100.000	3/4" Pipe 2m N of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.061	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	96.732	-

**Field Personnel:**

	DW, MP	Trip Date:	9-Mar-14
Data Entry Personnel:	DW	Date:	9-Mar-14
Data Check Personnel:	TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

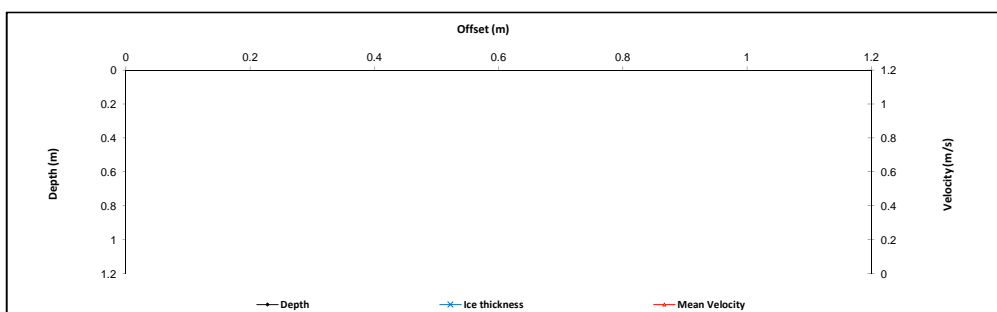
Site Visit Date: April 11, 2014  
 Site Visit Time (MST): 10:40



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.362	-
Water (°C):	0.2	-
Datalogger Clock:	10:44	10:50
Laptop Clock:	10:45	10:51
Battery (Main):	11.6	13.0
Battery:	-	Replaced
Battery Serial #:	1205004	1403010
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Ice very thin US of dam, 3 cm
- Overflow 0.5m deep DS of dam, could not drill through without flooding auger

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S62-3	1.147	101.181		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.233	99.948	99.948	3/4" Pipe 5m W of Station
S62-1			1.181	100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		3.084	98.097	<b>Time WL Surveyed:</b>	10:58
Temporary BM			2.888	98.293	0.000	-
<b>Turn</b>						
Temporary BM	2.834	101.127		98.293		-
Water Level:	Cut		3.029	98.098	<b>Time WL Surveyed:</b>	11:00
S62-1			1.125	100.002	100.000	3/4" Pipe 2m N of Station
S62-2			1.179	99.948	99.948	3/4" Pipe 5m W of Station
S62-3			1.093	100.034	100.034	3/4" Pipe 8m W of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

**WL Survey Summary**

	Before	After
Average WL:	98.098	-
Closing Error:	0.000	-
WL Check:	0.001	-
Transducer Elevation	96.736	-

**Field Personnel:**

Data Entry Personnel:	TR, MP	Trip Date:	11-Apr-14
Data Check Personnel:	TR	Date:	11-Apr-14
Entered Digitally in the Field:	Yes	Date:	15-May-14

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: May 14, 2014  
 Site Visit Time (MST): 15:20



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 4m DS of station	
Meas. Start Time (MST):	17:15
Meas. End Time (MST):	17:50
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, calm, 15 C

<b>Flow characteristics:</b>		
Total Flow:	2.07	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.98	(m <sup>2</sup> )
Wetted Width:	7.64	(m)
Hydraulic Depth:	0.78	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.13	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	1.375	1.376
Water (°C):	3.8	3.9
Datalogger Clock:	15:24	16:56
Laptop Clock:	15:25	16:57
Battery (Main):	11.6	13.5
Battery:	Replaced	
Battery Serial #:	1403010	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**  
 -Replaced solar panel

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	15.40	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	7.90	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	3.9				
			ADCP Temperature (°C):	9.7				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		6	7.13	5.69	0.348	1.981	-4.25%
Coordinate System:	ENU		7	7.59	5.99	0.357	2.137	3.29%
Left Method:	Sloped bank		8	7.72	6.03	0.336	2.023	-2.22%
Right Method:	Sloped bank		10	8.12	6.19	0.345	2.135	3.19%
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit		<b>Mean:</b>	7.64	5.98	0.347	<b>2.07</b>	
			<b>SD:</b>	0.35	0.18	0.007	0.069	
			<b>COV:</b>	0.05	0.03	0.022	0.033	

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S62-3	1.070	101.104		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.155	99.949	99.948	3/4" Pipe 5m W of Station
S62-1			1.104	100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		2.998	98.106	<b>Time WL Surveyed:</b>	15:45
Temporary BM			2.805	98.299	0.000	-
<b>Turn</b>						
Temporary BM	2.793	101.092		98.299		-
Water Level:	Cut		2.983	98.109	<b>Time WL Surveyed:</b>	15:48
S62-1			1.092	100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.143	99.949	99.948	3/4" Pipe 5m W of Station
S62-3			1.057	100.035	100.034	3/4" Pipe 8m W of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S62-1	1.092	101.092		100.000		
Water Level:	Cut		2.981	98.111	<b>Time WL Surveyed:</b>	17:03
Water Level:	Cut		2.968	98.108	<b>Time WL Surveyed:</b>	17:04
S62-1	1.076	101.076		100.000		

<b>WL Survey Summary</b>	Before	After
Average WL:	98.108	98.110
Closing Error:	-0.001	-
WL Check:	0.003	0.003
Transducer Elevation	96.733	96.734

<b>Field Personnel:</b>	TR, MP	Trip Date:	14-May-14
<b>Data Entry Personnel:</b>	MP	Date:	14-May-14
<b>Data Check Personnel:</b>	TR	Date:	1-Aug-14
<b>Entered Digitally in the Field:</b>	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: June 23, 2014  
 Site Visit Time (MST): 16:20

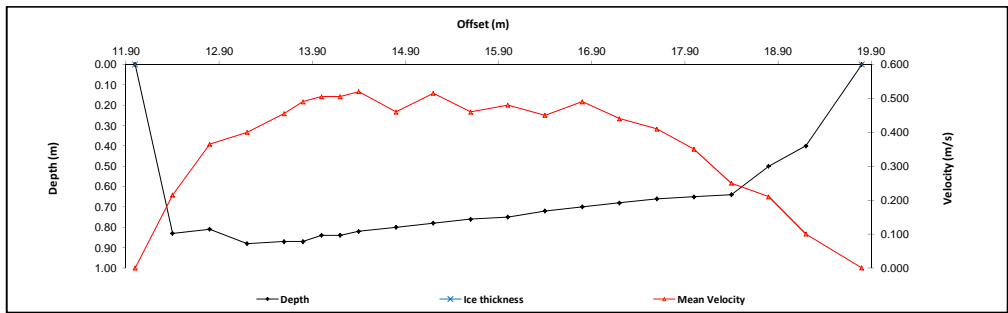


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	12.00	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	12.40	0.83				0.66	0.210	0.17	0.220	1.00	0.40	0.83	0.215	0.33	0.071	3%
2	12.80	0.81				0.21	0.320	0.22	0.410	1.00	0.40	0.81	0.365	0.32	0.118	6%
3	13.20	0.88				0.31	0.440	0.29	0.360	1.00	0.40	0.88	0.400	0.35	0.141	7%
4	13.60	0.87				0.70	0.480	0.17	0.430	1.00	0.30	0.87	0.455	0.26	0.119	6%
5	13.80	0.87				0.420	0.470	0.17	0.560	1.00	0.20	0.87	0.490	0.17	0.085	4%
6	14.00	0.84				0.67	0.580	0.17	0.430	1.00	0.20	0.84	0.505	0.17	0.085	4%
7	14.20	0.84				0.67	0.550	0.17	0.460	1.00	0.20	0.84	0.505	0.17	0.085	4%
8	14.40	0.82				0.66	0.450	0.16	0.590	1.00	0.30	0.82	0.520	0.25	0.128	6%
9	14.80	0.80				0.64	0.400	0.16	0.520	1.00	0.40	0.80	0.460	0.32	0.147	7%
10	15.20	0.78				0.62	0.440	0.16	0.590	1.00	0.40	0.78	0.515	0.31	0.161	8%
11	15.60	0.76				0.61	0.350	0.15	0.570	1.00	0.40	0.76	0.460	0.30	0.140	7%
12	16.00	0.75	0.45	0.480						1.00	0.40	0.75	0.480	0.30	0.144	7%
13	16.40	0.72	0.43	0.450						1.00	0.40	0.72	0.450	0.29	0.130	6%
14	16.80	0.70	0.42	0.490						1.00	0.40	0.70	0.490	0.28	0.137	6%
15	17.20	0.68	0.41	0.440						1.00	0.40	0.68	0.440	0.27	0.120	6%
16	17.60	0.66	0.40	0.410						1.00	0.40	0.66	0.410	0.26	0.108	5%
17	18.00	0.65	0.39	0.350						1.00	0.40	0.65	0.350	0.26	0.091	4%
18	18.40	0.64	0.38	0.250						1.00	0.40	0.64	0.250	0.26	0.064	3%
19	18.80	0.50	0.30	0.210						1.00	0.40	0.50	0.210	0.20	0.042	2%
20	19.20	0.40	0.24	0.100						1.00	0.50	0.40	0.100	0.20	0.020	1%
LB	19.80	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.14</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 8m DS of culvert

Meas. Start Time (MST):	16:48
Meas. End Time (MST):	17:09
Equipment:	Marsh McBimney
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Thundershowers, breezy, 18 C



**Flow characteristics:**

Total Flow:	2.14	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.28	(m <sup>2</sup> )
Wetted Width:	7.80	(m)
Hydraulic Depth:	0.68	(m)
Mean Velocity:	0.41	(m/s)
Froude Number:	0.16	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.234	1.232
Water (°C):	11.6	11.6
Datalogger Clock:	16:27	17:15
Laptop Clock:	16:28	17:16
Battery (Main):	12.4	12.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S62-3	1.202	101.236		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.286	99.950	99.948	3/4" Pipe 5m W of Station
S62-1			1.236	100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	<b>Cut</b>		3.272	97.964		<b>Time WL Surveyed:</b> 16:33
S62-1			1.235	100.001	100.000	3/4" Pipe 2m N of Station
<b>Turn</b>						
S62-1	1.216	101.217		100.001	100.000	3/4" Pipe 2m N of Station
Water Level:	<b>Cut</b>		3.252	97.965		<b>Time WL Surveyed:</b> 16:37
S62-1			1.216	100.001	100.000	3/4" Pipe 2m N of Station
S62-2			1.267	99.950	99.948	3/4" Pipe 5m W of Station
S62-3			1.184	100.033	100.034	3/4" Pipe 8m W of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S62-1	1.217	101.218		100.001		
Water Level:	<b>Cut</b>		3.254	97.964		<b>Time WL Surveyed:</b> 17:13
Water Level:	<b>Cut</b>		3.235	97.965		<b>Time WL Surveyed:</b> 17:14
S62-1	1.199	101.200		100.001		

**WL Survey Summary**

	Before	After
Average WL:	97.965	97.965
Closing Error:	0.001	-
WL Check:	0.001	-0.001
Transducer Elevation	96.731	96.733

**Field Personnel:**

	SM, GG	Trip Date:	23-Jun-14
Data Entry Personnel:	SM	Date:	23-Jun-14
Data Check Personnel:	TR	Date:	15-Jul-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: August 14, 2014  
 Site Visit Time (MST): 14:30

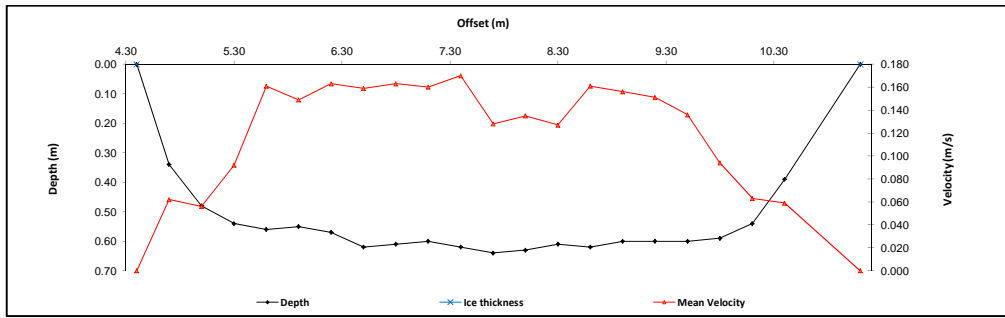


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	4.40	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	4.70	0.34		0.20	0.062				1.00	0.30	0.34	0.062	0.10	0.006	1%	
2	5.00	0.48		0.29	0.056				1.00	0.30	0.48	0.056	0.14	0.008	2%	
3	5.30	0.54		0.32	0.092				1.00	0.30	0.54	0.092	0.16	0.015	3%	
4	5.60	0.56		0.34	0.161				1.00	0.30	0.56	0.161	0.17	0.027	6%	
5	5.90	0.55		0.33	0.149				1.00	0.30	0.55	0.149	0.17	0.025	5%	
6	6.20	0.57		0.34	0.163				1.00	0.30	0.57	0.163	0.17	0.028	6%	
7	6.50	0.62		0.37	0.159				1.00	0.30	0.62	0.159	0.19	0.030	7%	
8	6.80	0.61		0.37	0.163				1.00	0.30	0.61	0.163	0.18	0.030	7%	
9	7.10	0.60		0.36	0.160				1.00	0.30	0.60	0.160	0.18	0.029	6%	
10	7.40	0.62		0.37	0.170				1.00	0.30	0.62	0.170	0.19	0.032	7%	
11	7.70	0.64		0.38	0.128				1.00	0.30	0.64	0.128	0.19	0.025	5%	
12	8.00	0.63		0.38	0.135				1.00	0.30	0.63	0.135	0.19	0.026	6%	
13	8.30	0.61		0.37	0.127				1.00	0.30	0.61	0.127	0.18	0.023	5%	
14	8.60	0.62		0.37	0.161				1.00	0.30	0.62	0.161	0.19	0.030	7%	
15	8.90	0.60		0.36	0.156				1.00	0.30	0.60	0.156	0.18	0.028	6%	
16	9.20	0.60		0.36	0.151				1.00	0.30	0.60	0.151	0.18	0.027	6%	
17	9.50	0.60		0.36	0.136				1.00	0.30	0.60	0.136	0.18	0.024	5%	
18	9.80	0.59		0.35	0.094				1.00	0.30	0.59	0.094	0.18	0.017	4%	
19	10.10	0.54		0.32	0.063				1.00	0.30	0.54	0.063	0.16	0.010	2%	
20	10.40	0.39		0.23	0.059				1.00	0.50	0.39	0.059	0.20	0.012	3%	
LB	11.10	0.00	0.00		0.00		0.00		1.00	0.35	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.450</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
8m DS of bridge

Meas. Start Time (MST):	15:20
Meas. End Time (MST):	14:40
Equipment:	ADV
Method:	Wading
River Condition:	Beaver affected
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 30 C



**Flow characteristics:**

Total Flow:	0.450	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	3.47	(m <sup>2</sup> )
Wetted Width:	6.70	(m)
Hydraulic Depth:	0.52	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.06	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.377	1.375
Water (°C):	15.0	15.0
Datalogger Clock:	14:55	15:51
Laptop Clock:	14:56	15:51
Battery (Main):	12.9	13.4
Battery:		New
Battery Serial #:	-	1407004
Enclosure Dessiccant:		Replaced
Vent Tube Dessiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**General Notes:**

- installed new solar controller and panel

**Datalogger / Station Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S62-3	1.017	101.051		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.100	99.951	99.948	3/4" Pipe 5m W of Station
S62-1			1.049	100.002	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut	1.048	3.988	98.111	Time WL Surveyed: 15:02	
Temporary BM			3.988	97.063		
<b>Turn</b>						
Temporary BM	3.977	101.040		97.063		
Water Level:	Cut	1.048	3.977	98.111	Time WL Surveyed: 15:03	
S62-1			1.039	100.001	100.000	3/4" Pipe 2m N of Station
S62-2			1.090	99.950	99.948	3/4" Pipe 5m W of Station
S62-3			1.007	100.033	100.034	3/4" Pipe 8m W of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S62-1	1.039	101.040		100.001		
Water Level:	Cut	1.049	3.988	98.101	Time WL Surveyed: 15:48	
Water Level:	Cut	1.049	3.975	98.104	Time WL Surveyed: 15:49	
S62-1	1.029	101.030		100.001		

**WL Survey Summary**

	Before	After
Average WL:	98.111	98.103
Closing Error:	0.001	-
WL Check:	0.000	-0.003
Transducer Elevation	96.734	96.728

**Field Personnel:**

Data Entry Personnel:	TR, CJ	Trip Date:	14-Aug-14
Data Check Personnel:	TR	Date:	14-Aug-14
Entered Digitally in the Field:	MP	Date:	4-Sep-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: September 18, 2014  
 Site Visit Time (MST): 08:00



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 10m DS of culvert	
Meas. Start Time (MST):	8:42
Meas. End Time (MST):	8:53
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Beaver affected
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Light rain, calm, 10C

<b>Flow characteristics:</b>		
Total Flow:	0.290	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.38	(m <sup>2</sup> )
Wetted Width:	7.42	(m)
Hydraulic Depth:	0.99	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.01	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	1.523	1.522
Water (°C):	8.5	8.5
Datalogger Clock:	08:13	09:00
Laptop Clock:	08:14	09:00
Battery (Main):	12.9	13.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Replaced	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.08	LB:	1.50
Serial Number:	4712	Salinity (ppt):	-	RB:	9.00
Firmware Version:	3.5	Magnetic Declination (°):	-		
Software Version:	3.7	Measured Temperature (°C):	-		
		ADCP Temperature (°C):	-		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	3	7.34	7.19	0.040
Coordinate System:	ENU	4	7.36	7.38	0.040
Left Method:	Sloped bank	5	7.26	7.36	0.039
Right Method:	Sloped bank	6	7.72	7.60	0.038
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit				
		<b>Mean:</b>	7.42	7.38	0.039
		<b>SD:</b>	0.18	0.15	0.001
		<b>COV:</b>	0.02	0.02	0.021
					0.290
					0.004
					0.014
					0.17%
					2.25%
					-1.55%
					-0.86%

<b>Level Survey:</b>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S62-3	1.149	101.183		100.034	100.034	3/4" Pipe 8m W of Station
S62-2			1.234	99.949	99.948	3/4" Pipe 5m W of Station
S62-1			1.182	100.001	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		2.924	98.259	<b>Time WL Surveyed:</b>	8:21
S62-1			1.182	100.001	100.000	3/4" Pipe 2m N of Station
<b>Turn</b>						
S62-1	1.166	101.167		100.001	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		2.909	98.258	<b>Time WL Surveyed:</b>	8:23
S62-1			1.166	100.001	100.000	3/4" Pipe 2m N of Station
S62-2			1.218	99.949	99.948	3/4" Pipe 5m W of Station
S62-3			1.133	100.034	100.034	3/4" Pipe 8m W of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S62-1	1.167	101.168		100.001		
Water Level:	Cut		2.909	98.259	<b>Time WL Surveyed:</b>	9:04
Water Level:	Cut		2.894	98.259	<b>Time WL Surveyed:</b>	9:06
S62-1	1.152	101.153		100.001		

<b>WL Survey Summary</b>	Before	After
Average WL:	98.259	98.259
Closing Error:	0.000	-
WL Check:	0.001	0.000
Transducer Elevation	96.736	96.737

<b>Field Personnel:</b>	SM, TR	Trip Date:	18-Sep-14
Data Entry Personnel:	SM	Date:	18-Sep-14
Data Check Personnel:	MP	Date:	3-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S62 Birch Creek at Hwy 881  
 UTM Location: 492149E 6163182N

Site Visit Date: October 10, 2014  
 Site Visit Time (MST): 08:40



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 5m US of PT	
Meas. Start Time (MST):	9:10
Meas. End Time (MST):	9:30
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Beaver affected
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 10 C

<b>Flow characteristics:</b>		
Total Flow:	0.427	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.65	(m <sup>2</sup> )
Wetted Width:	7.54	(m)
Hydraulic Depth:	1.01	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.02	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	1.567	1.566
Water (°C):	5.3	5.3
Datalogger Clock:	08:42	09:38
Laptop Clock:	08:43	09:38
Battery (Main):	14.3	14.1
Battery:	Replaced	
Battery Serial #:	1407004	fd120614
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	25576	26153

**Datalogger / Station Notes:**

-Replaced logger, uploaded new program, could not retrieve PT from sediment

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>					
<b>System Information:</b>		<b>System Setup:</b>		<b>Bank Offsets:</b>	
System Type:	Sontek RS-M9	Transducer Depth (m):	0.05	LB:	16.70
Serial Number:	4712	Salinity (ppt):	0.0	RB:	24.30
Firmware Version:	3.5	Magnetic Declination (°):	14		
Software Version:	3.7	Measured Temperature (°C):	5.3		
		ADCP Temperature (°C):	3.8		
<b>Discharge Calculation Settings:</b>		<b>Measurement Results:</b>			
Track Reference:	Bottom-Track	Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam	1	7.63	7.79	0.054
Coordinate System:	ENU	2	7.90	7.76	0.057
Left Method:	Sloped bank	3	6.76	7.25	0.057
Right Method:	Sloped bank	4	7.88	7.80	0.054
Top Fit Type:	Power fit				
Bottom Fit Type:	Power fit	<b>Mean:</b>	7.54	7.65	0.056
		<b>SD:</b>	0.46	0.23	0.002
		<b>COV:</b>	0.06	0.03	0.027
					0.023
					0.427
					0.010
					0.023

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S62-3	1.168	101.202		100.034	100.034	3/4" Pipe 8m W of Station
S62-4			1.098	100.104		Bolt in Tree
S62-2			1.253	99.949	99.948	3/4" Pipe 5m W of Station
S62-1			1.202	100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		2.899	98.303	<b>Time WL Surveyed:</b>	8:47
S62-1			1.202	100.000	100.000	3/4" Pipe 2m N of Station
<b>Turn</b>						
S62-1	1.194	101.194		100.000	100.000	3/4" Pipe 2m N of Station
Water Level:	Cut		2.888	98.306	<b>Time WL Surveyed:</b>	8:50
S62-1			1.194	100.000	100.000	3/4" Pipe 2m N of Station
S62-2			1.245	99.949	99.948	3/4" Pipe 5m W of Station
S62-4			1.089	100.105		Bolt in Tree
S62-3			1.162	100.032	100.034	3/4" Pipe 8m W of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S62-3	1.161	101.194		100.033		
Water Level:	Cut		2.893	98.301	<b>Time WL Surveyed:</b>	9:41
Water Level:	Cut		2.878	98.301	<b>Time WL Surveyed:</b>	9:42
S62-3	1.146	101.179		100.033		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	98.305	98.301
Closing Error:	0.002	-
WL Check:	0.003	0.000
Transducer Elevation	96.738	96.735

<b>Field Personnel:</b>			
Data Entry Personnel:	MP, TR	Trip Date:	10-Oct-14
Data Check Personnel:	TR	Date:	10-Oct-14
Entered Digitally in the Field:	Yes	Date:	30-Oct-14

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: January 16, 2014  
 Site Visit Time (MST): 10:15

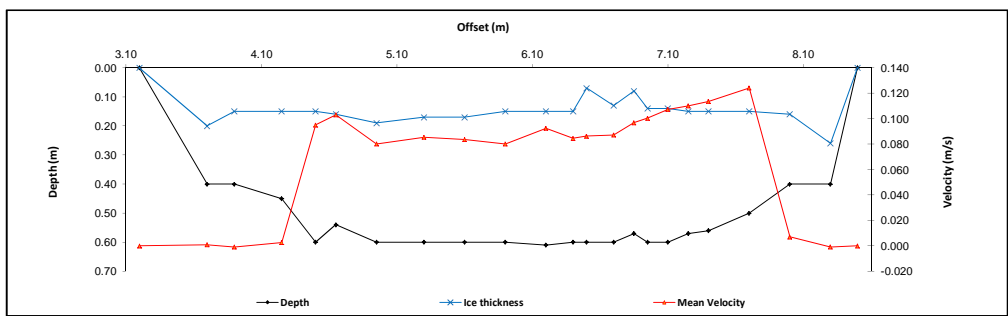


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	3.20	0.00	0.00		0.000		0.000		0.000	0.88	0.25	0.00	0.000	0.00	0.000	
1	3.70	0.40	0.20	0.30	0.001					0.88	0.35	0.20	0.001	0.07	0.000	0%
2	3.90	0.40	0.15	0.28	-0.001					0.88	0.28	0.25	-0.001	0.07	0.000	0%
3	4.25	0.45	0.15	0.30	0.003					0.88	0.30	0.30	0.003	0.09	0.000	0%
4	4.50	0.60	0.15	0.38	0.108					0.88	0.20	0.45	0.095	0.09	0.009	6%
5	4.65	0.54	0.16	0.35	0.117					0.88	0.23	0.38	0.103	0.09	0.009	6%
6	4.95	0.60	0.19	0.40	0.091					0.88	0.32	0.41	0.080	0.13	0.011	8%
7	5.30	0.60	0.17	0.39	0.097					0.88	0.32	0.43	0.085	0.14	0.012	8%
8	5.60	0.60	0.17	0.39	0.095					0.88	0.30	0.43	0.084	0.13	0.011	8%
9	5.90	0.60	0.15	0.38	0.091					0.88	0.30	0.45	0.080	0.14	0.011	8%
10	6.20	0.61	0.15	0.38	0.105					0.88	0.25	0.46	0.092	0.12	0.011	7%
11	6.40	0.60	0.15	0.38	0.096					0.88	0.15	0.45	0.084	0.07	0.006	4%
12	6.50	0.60	0.07	0.34	0.098					0.88	0.15	0.53	0.086	0.08	0.007	5%
13	6.70	0.60	0.13	0.37	0.099					0.88	0.18	0.47	0.087	0.08	0.007	5%
14	6.85	0.57	0.08	0.33	0.110					0.88	0.13	0.49	0.097	0.06	0.006	4%
15	6.95	0.60	0.14	0.37	0.114					0.88	0.13	0.46	0.100	0.06	0.006	4%
16	7.10	0.60	0.14	0.37	0.122					0.88	0.15	0.46	0.107	0.07	0.007	5%
17	7.25	0.57	0.15	0.36	0.125					0.88	0.15	0.42	0.110	0.06	0.007	5%
18	7.40	0.56	0.15	0.36	0.129					0.88	0.23	0.41	0.114	0.09	0.010	7%
19	7.70	0.50	0.15	0.33	0.141					0.88	0.30	0.35	0.124	0.11	0.013	9%
20	8.00	0.40	0.16	0.28	0.008					0.88	0.30	0.24	0.007	0.07	0.001	0%
21	8.30	0.40	0.26	0.33	-0.001					0.88	0.25	0.14	-0.001	0.04	0.000	0%
LB	8.50	0.00	0.00		0.00		0.00		0.00	0.88	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.142</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
6m DS of PT

Mess. Start Time (MST):	10:35
Mess. End Time (MST):	11:05
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Light cloud, -5 C



**Flow characteristics:**

Total Flow:	0.142	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.84	(m²)
Wetted Width:	5.30	(m)
Hydraulic Depth:	0.35	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.741	0.740
Water (°C):	0.2	0.2
Datalogger Clock:	10:20	11:08
Laptop Clock:	10:20	11:08
Battery (Main):	14.8	13.8
Battery:		Good
Battery Serial #:	-	-
Enclosure Desiccant:		Good
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Ran ADV test, results good

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.654	100.654		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.824	99.830	99.830	3/4" Pipe 7m E of Station
S63-3			1.211	99.443	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		4.139	96.515	Time WL Surveyed:	10:29
Temporary BM			4.096	96.558	0.000	-
<b>Turn</b>						
Temporary BM	4.077	100.635		96.558	-	-
Water Level:	Cut		4.122	96.513	Time WL Surveyed:	10:30
S63-3			1.191	99.444	99.444	3/4" Pipe 10m E of Station
S63-2			0.804	99.831	99.830	3/4" Pipe 7m E of Station
S63-1			0.635	100.000	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S63-1	0.635	100.636		100.001	-	-
Water Level:	Cut		4.120	96.516	Time WL Surveyed:	11:05
Water Level:	Cut		4.114	96.514	Time WL Surveyed:	11:06
S63-1	0.627	100.628		100.001	-	-

**WL Survey Summary**

Average WL:	Before	After
	96.514	96.515
Closing Error:	0.000	-
WL Check:	0.002	0.002
Transducer Elevation	95.773	95.775

**Field Personnel:**

DW, TR	Trip Date:	16-Jan-14
DW	Date:	16-Jan-14
TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: February 10, 2014  
 Site Visit Time (MST): 13:30

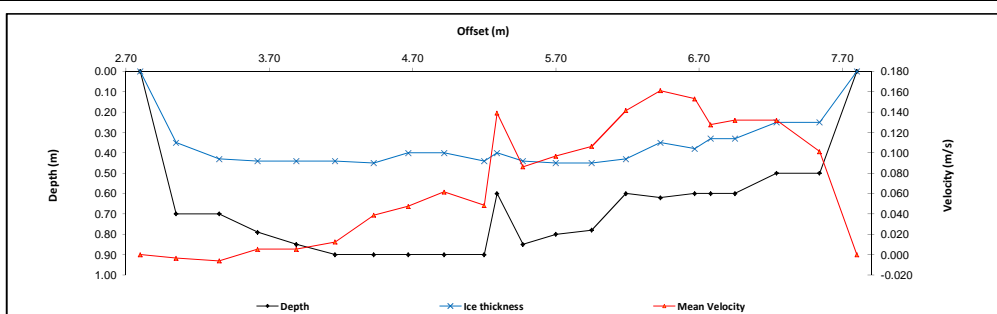


Measured Data								Calculated Data								
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	7.80	0.00	0.00		0.000				0.000	0.88	0.13	0.00	0.000	0.00	0.000	
1	7.54	0.50	0.25	0.38	0.115					0.88	0.28	0.25	0.101	0.07	0.007	7%
2	7.24	0.50	0.25	0.38	0.150					0.88	0.30	0.25	0.132	0.07	0.010	9%
3	6.95	0.60	0.33	0.47	0.150					0.88	0.23	0.27	0.132	0.06	0.008	8%
4	6.78	0.60	0.33	0.47	0.145					0.88	0.14	0.27	0.128	0.04	0.005	5%
5	6.67	0.60	0.38	0.49	0.174					0.88	0.18	0.22	0.153	0.04	0.006	6%
6	6.43	0.62	0.35	0.49	0.183					0.88	0.24	0.27	0.161	0.06	0.010	10%
7	6.19	0.60	0.43	0.52	0.161					0.88	0.24	0.17	0.142	0.04	0.006	6%
8	5.95	0.78	0.45	0.62	0.121					0.88	0.25	0.33	0.106	0.08	0.009	8%
9	5.70	0.80	0.45	0.63	0.110					0.88	0.24	0.35	0.097	0.08	0.008	8%
10	5.47	0.85	0.44	0.65	0.098					0.88	0.21	0.41	0.086	0.08	0.007	7%
11	5.29	0.60	0.40	0.50	0.158					0.88	0.14	0.20	0.139	0.03	0.004	4%
12	5.20	0.90	0.44	0.67	0.055					0.88	0.19	0.46	0.048	0.09	0.004	4%
13	4.92	0.90	0.40	0.65	0.070					0.88	0.27	0.50	0.062	0.13	0.008	8%
14	4.67	0.90	0.40	0.65	0.054					0.88	0.25	0.50	0.048	0.12	0.006	6%
15	4.43	0.90	0.45	0.68	0.044					0.88	0.26	0.45	0.039	0.11	0.004	4%
16	4.16	0.90	0.44	0.67	0.014					0.88	0.27	0.46	0.012	0.12	0.002	1%
17	3.89	0.85	0.44	0.65	0.006					0.88	0.27	0.41	0.005	0.11	0.001	1%
18	3.62	0.79	0.44	0.62	0.006					0.88	0.27	0.35	0.005	0.09	0.000	0%
19	3.35	0.70	0.43	0.57	-0.007					0.88	0.29	0.27	-0.006	0.08	0.000	0%
20	3.05	0.70	0.35	0.53	-0.004					0.88	0.28	0.35	-0.004	0.10	0.000	0%
LB	2.80	0.00	0.00		0.00		0.00		0.00	0.88	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.104</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 5m DS of PT

Meas. Start Time (MST):	14:14
Meas. End Time (MST):	14:42
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, calm, -18C



**Flow characteristics:**

Total Flow:	0.104	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.62	(m <sup>2</sup> )
Wetted Width:	5.00	(m)
Hydraulic Depth:	0.32	(m)
Mean Velocity:	0.06	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.911	
Water (°C):	0.2	
Datalogger Clock:	13:44	
Laptop Clock:	13:44	
Battery (Main):	14.7	
Battery:		Good
Battery Serial #:	-	
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.959	100.959		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			1.127	99.832	99.830	3/4" Pipe 7m E of Station
S63-3			1.512	99.447	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		4.283	96.676	Time WL Surveyed: 14:05	
Temporary BM			4.372	96.587	0.000	
<b>Turn</b>						
Temporary BM	4.354	100.941		96.587		
Water Level:	Cut		4.266	96.675	Time WL Surveyed: 14:10	
S63-3			1.497	99.444	99.444	3/4" Pipe 10m E of Station
S63-2			1.112	99.829	99.830	3/4" Pipe 7m E of Station
S63-1			0.944	99.997	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	96.676	-
Closing Error:	0.003	-
WL Check:	0.001	-
Transducer Elevation	95.765	-

**Field Personnel:**

	SM, MP	Trip Date:	10-Feb-14
Data Entry Personnel:	SM	Date:	10-Feb-14
Data Check Personnel:	TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: March 9, 2014  
 Site Visit Time (MST): 11:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	3.00	0.00	0.00		0.000				0.000	0.88	0.30	0.00	0.000	0.00	0.000	
1	3.60	0.50	0.45	0.48	0.019					0.88	0.50	0.05	0.017	0.03	0.000	1%
2	4.00	0.83	0.58	0.61	0.027					0.88	0.35	0.05	0.024	0.02	0.000	1%
3	4.30	0.98	0.85	0.92	0.004					0.88	0.30	0.13	0.004	0.04	0.000	0%
4	4.60	1.01	0.90	0.96	-0.008					0.88	0.30	0.11	-0.007	0.03	0.000	-1%
5	4.90	1.11	0.80	0.96	-0.014					0.88	0.30	0.31	-0.012	0.09	-0.001	-3%
6	5.20	1.18	0.82	1.00	-0.013					0.88	0.30	0.36	-0.011	0.11	-0.001	-3%
7	5.50	1.20	0.85	1.03	-0.001					0.88	0.33	0.35	-0.001	0.11	0.000	0%
8	5.85	1.20	0.85	1.03	0.007					0.88	0.38	0.35	0.006	0.13	0.001	2%
9	6.25	1.10	0.90	0.95	0.095					0.88	0.25	0.30	0.084	0.08	0.006	15%
10	6.35	1.10	0.85	0.98	0.311					0.88	0.08	0.25	0.274	0.02	0.005	12%
11	6.40	1.10	0.85	0.98	0.306					0.88	0.05	0.25	0.269	0.01	0.003	8%
12	6.45	1.10	0.85	0.98	0.284					0.88	0.10	0.25	0.232	0.02	0.006	14%
13	6.60	1.12	0.87	1.00	0.193					0.88	0.15	0.25	0.170	0.04	0.006	15%
14	6.75	1.17	0.90	1.04	0.118					0.88	0.28	0.27	0.104	0.07	0.008	19%
15	7.15	1.10	0.90	1.00	-0.029					0.88	0.40	0.20	-0.026	0.08	-0.002	-5%
16	7.55	1.09	0.82	0.96	-0.004					0.88	0.40	0.27	-0.004	0.11	0.000	-1%
17	7.95	0.83	0.76	0.80	0.054					0.88	0.30	0.07	0.048	0.02	0.001	2%
18	8.15	0.85	0.65	0.75	0.108					0.88	0.13	0.20	0.095	0.03	0.002	6%
19	8.20	0.85	0.65	0.75	0.117					0.88	0.05	0.20	0.103	0.01	0.001	3%
20	8.25	0.85	0.62	0.74	0.136					0.88	0.20	0.23	0.120	0.05	0.006	13%
21	8.60	0.98	0.85	0.92	-0.002					0.88	0.42	0.13	-0.002	0.06	0.000	0%
LB	9.10	0.00	0.00		0.00	0.00		0.00		0.88	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>0.041</b>	<b>100%</b>		

**Flow Measurement Details:**

Metering Section Location (describe):  
4m DS of PT

Mess. Start Time (MST):	11:35
Mess. End Time (MST):	12:25
Equipment:	ADV
Method:	Ice
River Condition:	Overflow on top of ice
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Sunny, -1C

**Flow characteristics:**

Total Flow:	0.041	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	1.15	(m <sup>2</sup> )
Wetted Width:	6.10	(m)
Hydraulic Depth:	0.19	(m)
Mean Velocity:	0.04	(m/s)
Froude Number:	0.03	

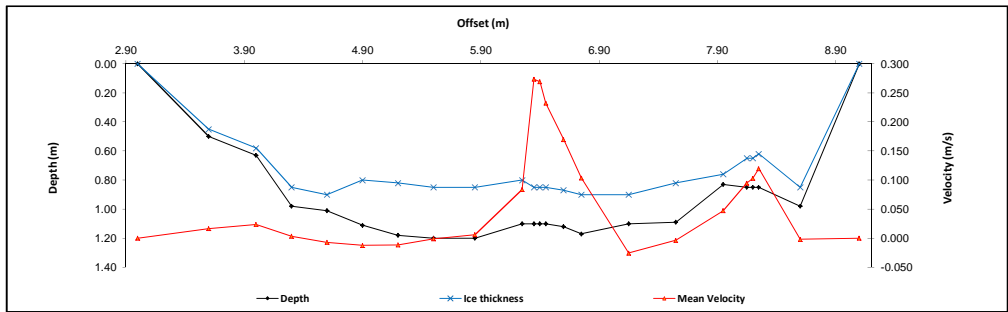
**Logger Details:**

	Before	After
Transducer Reading (m):	1.212	1.210
Water (°C):	0.2	0.2
Datalogger Clock:	11:04	11:17
Laptop Clock:	11:04	11:17
Battery (Main):	14.6	14.4
Battery:		Replaced
Battery Serial #:	-	1305001
Enclosure Deseccant:		Good
Vent Tube Deseccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- Slush present throughout channel
- Frozen overflow causing very thick and layered ice



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.654	100.654		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.824	99.830	99.830	3/4" Pipe 7m E of Station
S63-3			1.198	99.456	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		3.672	96.982	Time WL Surveyed:	11:23
Temporary BM			3.514	97.140	0.000	
<b>Turn</b>						
Temporary BM	3.501	100.641		97.140		
Water Level:	Cut		3.657	96.984	Time WL Surveyed:	11:26
S63-3			1.183	99.458	99.444	3/4" Pipe 10m E of Station
S63-2			0.809	99.832	99.830	3/4" Pipe 7m E of Station
S63-1			0.641	100.000	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	96.983	-
Closing Error:	0.000	-
WL Check:	0.002	-
Transducer Elevation	95.771	-

**Field Personnel:**

DW, MP	Trip Date:	9-Mar-14
Data Entry Personnel:	Date:	9-Mar-14
Data Check Personnel:	Date:	19-Mar-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

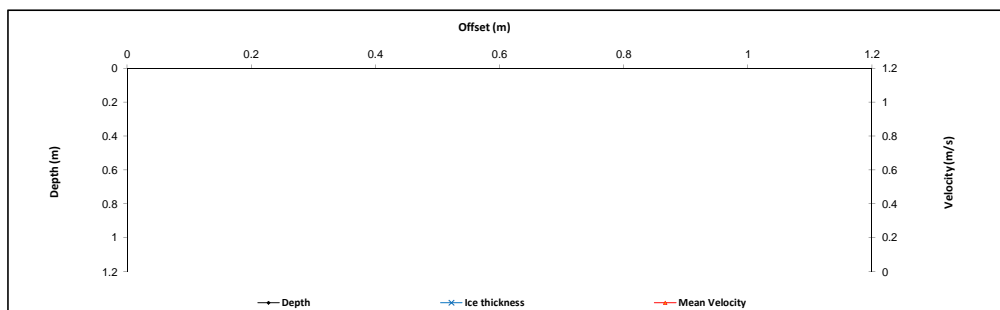
Site Visit Date: April 11, 2014  
 Site Visit Time (MST): 10:10



Measured Data										Calculated Data							
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)	
No Flow Measurement Conducted																	
															<b>Total Flow</b>		-

**Flow Measurement Details:**  
 Metering Section Location (describe):

Meas. Start Time (MST):	
Meas. End Time (MST):	
Equipment:	
Method:	
River Condition:	
Channel Edges:	
Quality/Error (see reverse):	
Weather:	



**Flow characteristics:**

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Cross Section Area:	0.00	(m <sup>2</sup> )
Wetted Width:	-	(m)
Hydraulic Depth:	-	(m)
Mean Velocity:	-	(m/s)
Froude Number:	-	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.664	
Water (°C):	0.2	
Datalogger Clock:	10:13	
Laptop Clock:	10:13	
Battery (Main):	14.3	
Battery:	-	Good
Battery Serial #:	-	
Enclosure Dessicant:	-	Replaced
Vent Tube Dessicant:	-	Good
PT# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

- Very deep overflow, 0.6m, thick ice remains underneath
- Could not auger holes without flooding auger

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.606	100.606		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.774	99.832	99.830	3/4" Pipe 7m E of Station
S63-3			1.147	99.459	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		3.175	97.431	<b>Time WL Surveyed:</b>	10:21
Temporary BM			3.359	97.247	0.000	-
<b>Turn</b>						
Temporary BM	3.342	100.589		97.247		-
Water Level:	Cut		3.159	97.430	<b>Time WL Surveyed:</b>	10:23
S63-3			1.127	99.462	99.444	3/4" Pipe 10m E of Station
S63-2			0.754	99.835	99.830	3/4" Pipe 7m E of Station
S63-1			0.588	100.001	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				<b>Time WL Surveyed:</b>	
Water Level:	Cut				<b>Time WL Surveyed:</b>	

**WL Survey Summary**

	Before	After
Average WL:	97.431	-
Closing Error:	-0.001	-
WL Check:	0.001	-
Transducer Elevation	95.767	-

**Field Personnel:**

	TR, MP	Trip Date:	11-Apr-14
Data Entry Personnel:	TR	Date:	11-Apr-14
Data Check Personnel:	TR	Date:	15-May-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

**Site:** S63 Sunday Creek at HWY 881  
**UTM Location:** 494283E 6157255N

**Site Visit Date:** May 14, 2014  
**Site Visit Time (MST):** 13:35



<u><b>Flow Measurement Details:</b></u>	
Metering Section Location (describe): 7m US of culvert	
Meas. Start Time (MST):	14:00
Meas. End Time (MST):	14:50
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Partial cloud, breezy, 15 C

<u><b>Flow characteristics:</b></u>		
Total Flow:	1.30	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	5.92	(m <sup>2</sup> )
Wetted Width:	6.71	(m)
Hydraulic Depth:	0.88	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.08	

<u><b>Logger Details:</b></u>	Before	After
Transducer Reading (m):	1.114	1.112
Water (°C):	7.2	7.7
Datalogger Clock:	13:36	14:54
Laptop Clock:	13:36	14:54
Battery (Main):	13.7	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<u><b>ADCP Flow Measurement Summary:</b></u>						
<u><b>System Information:</b></u>			<u><b>System Setup:</b></u>		<u><b>Bank Offsets:</b></u>	
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08	LB:	8.00
Serial Number:	1802		Salinity (ppt):	0.0	RB:	14.60
Firmware Version:	3.5		Magnetic Declination (°):	-		
Software Version:	3.7		Measured Temperature (°C):	7.7		
			ADCP Temperature (°C):	9.4		
<u><b>Discharge Calculation Settings:</b></u>		<u><b>Measurement Results:</b></u>				
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):
Depth Reference:	Vertical beam		1	6.58	5.80	0.225
Coordinate System:	ENU		2	6.99	6.19	0.210
Left Method:	Sloped bank		3	6.57	5.78	0.227
Right Method:	Sloped bank					
Top Fit Type:	Power fit					
Bottom Fit Type:	Power fit		<b>Mean:</b>	6.71	5.92	0.221
			<b>SD:</b>	0.20	0.19	0.008
			<b>COV:</b>	0.03	0.03	0.034
						Discharge (m <sup>3</sup> /s):
						Discharge Difference From Mean

<u><b>Level Survey:</b></u>	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<u><b>Station</b></u>						
<u><b>Benchmark</b></u>						
S63-1	0.488	100.488		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.655	99.833	99.830	3/4" Pipe 7m E of Station
S63-3			1.028	99.460	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		3.609	96.879		<b>Time WL Surveyed:</b> 13:45
Temporary BM			4.361	96.127	0.000	-
<u><b>Turn</b></u>						
Temporary BM	4.349	100.476		96.127		-
Water Level:	Cut		3.596	96.880		<b>Time WL Surveyed:</b> 13:49
S63-3			1.018	99.458	99.444	3/4" Pipe 10m E of Station
S63-2			0.646	99.830	99.830	3/4" Pipe 7m E of Station
S63-1			0.477	99.999	100.000	3/4" Pipe 5m NE of Station
<u><b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b></u>						
S63-2	0.646	100.478		99.832		
Water Level:	Cut		3.597	96.881		<b>Time WL Surveyed:</b> 14:58
Water Level:	Cut		3.579	96.881		<b>Time WL Surveyed:</b> 14:59
S63-2	0.628	100.460		99.832		

<u><b>WL Survey Summary</b></u>	Before	After
Average WL:	96.880	96.881
Closing Error:	0.001	-
WL Check:	0.001	0.000
Transducer Elevation	95.766	95.769

<u><b>Field Personnel:</b></u>	TR, MP	Trip Date:	14-May-14
Data Entry Personnel:	TR	Date:	14-May-14
Data Check Personnel:	TR	Date:	1-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: June 23, 2014  
 Site Visit Time (MST): 14:44

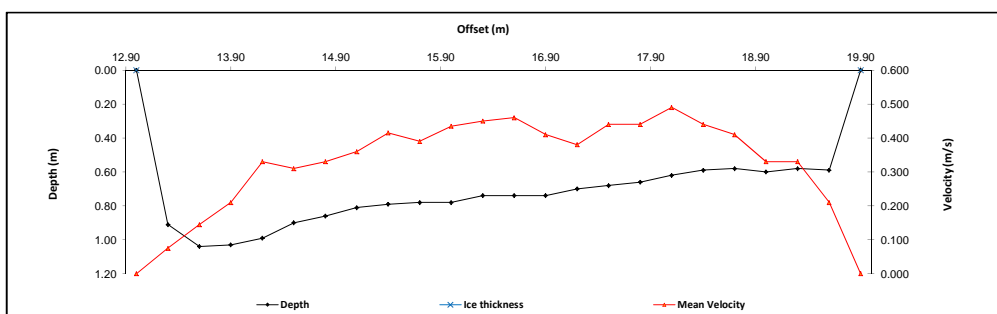


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	13.00	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	13.30	0.91				0.73	0.100	0.18	0.050	1.00	0.30	0.91	0.075	0.27	0.020	1%
2	13.60	1.04				0.83	0.170	0.21	0.120	1.00	0.30	1.04	0.145	0.31	0.045	3%
3	13.90	1.03				0.92	0.210	0.21	0.210	1.00	0.30	1.03	0.210	0.31	0.065	4%
4	14.20	0.99				0.79	0.330	0.20	0.330	1.00	0.30	0.99	0.330	0.30	0.098	6%
5	14.50	0.90				0.72	0.230	0.18	0.390	1.00	0.30	0.90	0.310	0.27	0.084	5%
6	14.80	0.86				0.69	0.270	0.17	0.390	1.00	0.30	0.86	0.330	0.26	0.085	5%
7	15.10	0.81				0.65	0.320	0.16	0.400	1.00	0.30	0.81	0.360	0.24	0.087	5%
8	15.40	0.79				0.63	0.390	0.16	0.440	1.00	0.30	0.79	0.415	0.24	0.098	6%
9	15.70	0.78				0.62	0.350	0.16	0.430	1.00	0.30	0.78	0.390	0.23	0.091	5%
10	16.00	0.78				0.62	0.440	0.16	0.430	1.00	0.30	0.78	0.435	0.23	0.102	6%
11	16.30	0.74	0.44	0.450						1.00	0.30	0.74	0.450	0.22	0.100	6%
12	16.60	0.74	0.44	0.460						1.00	0.30	0.74	0.460	0.22	0.102	6%
13	16.90	0.74	0.44	0.410						1.00	0.30	0.74	0.410	0.22	0.091	5%
14	17.20	0.70	0.42	0.380						1.00	0.30	0.70	0.380	0.21	0.080	5%
15	17.50	0.68	0.41	0.440						1.00	0.30	0.68	0.440	0.20	0.090	5%
16	17.80	0.66	0.40	0.440						1.00	0.30	0.66	0.440	0.20	0.087	5%
17	18.10	0.62	0.37	0.490						1.00	0.30	0.62	0.490	0.19	0.091	5%
18	18.40	0.59	0.35	0.440						1.00	0.30	0.59	0.440	0.18	0.078	5%
19	18.70	0.58	0.35	0.410						1.00	0.30	0.58	0.410	0.17	0.071	4%
20	19.00	0.60	0.36	0.330						1.00	0.30	0.60	0.330	0.18	0.059	3%
21	19.30	0.58	0.35	0.330						1.00	0.30	0.58	0.330	0.17	0.057	3%
22	19.60	0.59	0.35	0.210						1.00	0.30	0.59	0.210	0.18	0.037	2%
LB	19.90	0.00	0.00		0.00		0.00		0.00	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.72</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 10m US of station

Meas. Start Time (MST):	15:28
Meas. End Time (MST):	15:51
Equipment:	Marsh McBirney
Method:	Wading
River Condition:	High flow, clear water
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 22 C, calm



**Flow characteristics:**

Total Flow:	1.72	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	5.01	(m <sup>2</sup> )
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.73	(m)
Mean Velocity:	0.34	(m/s)
Froude Number:	0.13	

**Logger Details:**

	Before	After
Transducer Reading (m):	1.170	1.127
Water (°C):	16.7	16.9
Datalogger Clock:	14:46	16:02
Laptop Clock:	14:46	16:02
Battery (Main):	13.6	13.4
Battery:	Good	
Battery Serial #:	-	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	298684	278402
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.703	100.703		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.872	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.245	99.458	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		3.766	96.937		<b>Time WL Surveyed: 15:18</b>
S63-3			1.245	99.458	99.444	3/4" Pipe 10m E of Station
<b>Turn</b>						
S63-3	1.218	100.676		99.458	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		3.741	96.935		<b>Time WL Surveyed: 15:21</b>
S63-3			1.218	99.458	99.444	3/4" Pipe 10m E of Station
S63-2			0.847	99.829	99.830	3/4" Pipe 7m E of Station
S63-1			0.678	99.998	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S63-2	0.872	100.702		99.830		
Water Level:	Cut		3.763	96.939		<b>Time WL Surveyed: 15:55</b>
Water Level:	Cut		3.742	96.937		<b>Time WL Surveyed: 15:58</b>
S63-2	0.849	100.679		99.830		

**WL Survey Summary**

	Before	After
Average WL:	96.936	96.938
Closing Error:	0.002	-
WL Check:	0.002	0.002
Transducer Elevation	95.766	95.811

**Field Personnel:**

	GG, SM	Trip Date:	23-Jun-14
Data Entry Personnel:	GG	Date:	23-Jun-14
Data Check Personnel:	TR	Date:	15-Jul-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: August 14, 2014  
 Site Visit Time (MST): 13:00

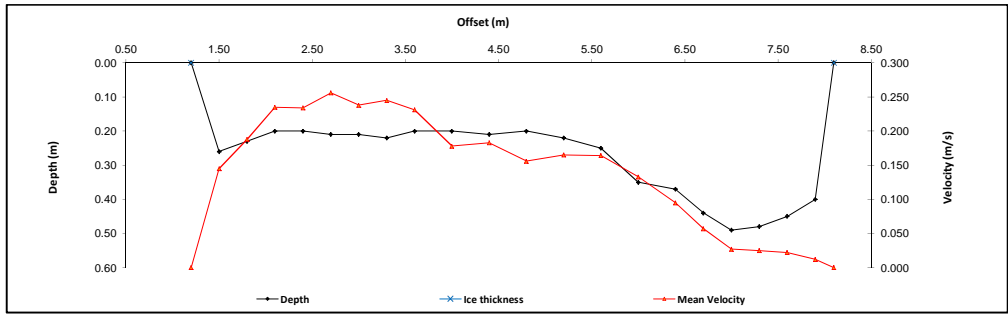


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	1.20	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.50	0.26		0.16	0.145					1.00	0.30	0.26	0.145	0.08	0.011	5%
2	1.80	0.23		0.14	0.188					1.00	0.30	0.23	0.188	0.07	0.013	5%
3	2.10	0.20		0.12	0.235					1.00	0.30	0.20	0.235	0.06	0.014	6%
4	2.40	0.20		0.12	0.234					1.00	0.30	0.20	0.234	0.06	0.014	6%
5	2.70	0.21		0.13	0.256					1.00	0.30	0.21	0.256	0.06	0.016	7%
6	3.00	0.21		0.13	0.238					1.00	0.30	0.21	0.238	0.06	0.015	6%
7	3.30	0.22		0.13	0.245					1.00	0.30	0.22	0.245	0.07	0.016	7%
8	3.60	0.20		0.12	0.231					1.00	0.35	0.20	0.231	0.07	0.016	7%
9	4.00	0.20		0.12	0.178					1.00	0.40	0.20	0.178	0.08	0.014	6%
10	4.40	0.21		0.13	0.183					1.00	0.40	0.21	0.183	0.08	0.015	6%
11	4.80	0.20		0.12	0.156					1.00	0.40	0.20	0.156	0.08	0.012	5%
12	5.20	0.22		0.13	0.165					1.00	0.40	0.22	0.165	0.09	0.015	6%
13	5.60	0.25		0.15	0.164					1.00	0.40	0.25	0.164	0.10	0.016	7%
14	6.00	0.35		0.21	0.133					1.00	0.40	0.35	0.133	0.14	0.019	8%
15	6.40	0.37		0.22	0.095					1.00	0.35	0.37	0.095	0.13	0.012	5%
16	6.70	0.44		0.26	0.057					1.00	0.30	0.44	0.057	0.13	0.008	3%
17	7.00	0.49		0.29	0.027					1.00	0.30	0.49	0.027	0.15	0.004	2%
18	7.30	0.48		0.29	0.025					1.00	0.30	0.48	0.025	0.14	0.004	2%
19	7.60	0.45		0.27	0.022					1.00	0.30	0.45	0.022	0.14	0.003	1%
20	7.90	0.40		0.24	0.012					1.00	0.25	0.40	0.012	0.10	0.001	1%
LB	8.10	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>															<b>0.239</b>	<b>100%</b>

**Flow Measurement Details:**

Metering Section Location (describe): 12m US of PT

Meas. Start Time (MST):	13:20
Meas. End Time (MST):	13:40
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 30 C



**Flow characteristics:**

Total Flow:	0.239	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.89	(m <sup>2</sup> )
Wetted Width:	6.90	(m)
Hydraulic Depth:	0.27	(m)
Mean Velocity:	0.13	(m/s)
Froude Number:	0.08	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.688	0.688
Water (°C):	18.5	18.6
Datalogger Clock:	13:03	13:55
Laptop Clock:	13:03	13:55
Battery (Main):	13.5	13.5
Battery:		Good
Battery Serial #:	-	-
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.528	100.528		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.697	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.069	99.459	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		4.060	96.468		Time WL Surveyed: 13:10
Temporary BM			4.272	96.256		
<b>Turn</b>						
Temporary BM	4.248	100.504		96.256		
Water Level:	Cut		4.039	96.465		Time WL Surveyed: 13:13
S63-3			1.044	99.460	99.444	3/4" Pipe 10m E of Station
S63-2			0.672	99.832	99.830	3/4" Pipe 7m E of Station
S63-1			0.502	100.002	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S63-1	0.451	100.452		100.001		
Water Level:	Cut		3.979	96.473		Time WL Surveyed: 13:44
Water Level:	Cut		4.008	96.471		Time WL Surveyed: 13:45
S63-1	0.478	100.479		100.001		

**WL Survey Summary**

	Before	After
Average WL:	96.467	96.472
Closing Error:	-0.002	-
WL Check:	0.003	0.002
Transducer Elevation	95.779	95.784

**Field Personnel:**

Data Entry Personnel:	TR, CJ	Trip Date:	14-Aug-14
Data Check Personnel:	TR	Date:	14-Aug-14
Entered Digitally in the Field:	MP	Date:	4-Sep-14
	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: September 18, 2014  
 Site Visit Time (MST): 09:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	16.60	0.00	0.00		0.000		0.000		0.000	1.00	0.20	0.00	0.000	0.00	0.000	
1	17.00	0.68		0.41	0.002					1.00	0.35	0.68	0.002	0.24	0.000	1%
2	17.30	0.67		0.40	0.023					1.00	0.30	0.67	0.023	0.20	0.005	6%
3	17.60	0.58		0.35	0.027					1.00	0.30	0.58	0.027	0.17	0.005	6%
4	17.90	0.59		0.35	0.031					1.00	0.30	0.59	0.031	0.18	0.005	7%
5	18.20	0.53		0.32	0.031					1.00	0.30	0.53	0.031	0.16	0.005	6%
6	18.50	0.50		0.30	0.031					1.00	0.30	0.50	0.031	0.15	0.005	6%
7	18.80	0.43		0.26	0.055					1.00	0.30	0.43	0.055	0.13	0.007	9%
8	19.10	0.41		0.25	0.049					1.00	0.30	0.41	0.049	0.12	0.006	7%
9	19.40	0.40		0.24	0.062					1.00	0.30	0.40	0.062	0.12	0.007	9%
10	19.70	0.39		0.23	0.068					1.00	0.23	0.39	0.068	0.09	0.006	7%
11	19.85	0.39		0.23	0.078					1.00	0.15	0.39	0.078	0.06	0.005	6%
12	20.00	0.39		0.23	0.075					1.00	0.15	0.39	0.075	0.06	0.004	5%
13	20.15	0.40		0.24	0.070					1.00	0.15	0.40	0.070	0.06	0.004	5%
14	20.30	0.40		0.24	0.070					1.00	0.23	0.40	0.070	0.09	0.006	8%
15	20.60	0.38		0.23	0.044					1.00	0.30	0.38	0.044	0.11	0.005	6%
16	20.90	0.35		0.21	0.033					1.00	0.30	0.35	0.033	0.10	0.003	4%
17	21.20	0.30		0.18	0.017					1.00	0.30	0.30	0.017	0.09	0.002	2%
18	21.50	0.27		0.16	0.010					1.00	0.30	0.27	0.010	0.08	0.001	1%
19	21.80	0.23		0.14	0.004					1.00	0.30	0.23	0.004	0.07	0.000	0%
20	22.10	0.19		0.11	0.007					1.00	0.40	0.19	0.007	0.08	0.001	1%
21	22.60	0.15		0.09	-0.011					1.00	0.35	0.15	-0.011	0.05	-0.001	-1%
RB	22.80	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>0.082</b>	<b>100%</b>		

**Flow Measurement Details:**

Metering Section Location (describe):  
10m US of culvert

Meas. Start Time (MST):	9:40
Meas. End Time (MST):	10:03
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 14 C

**Flow characteristics:**

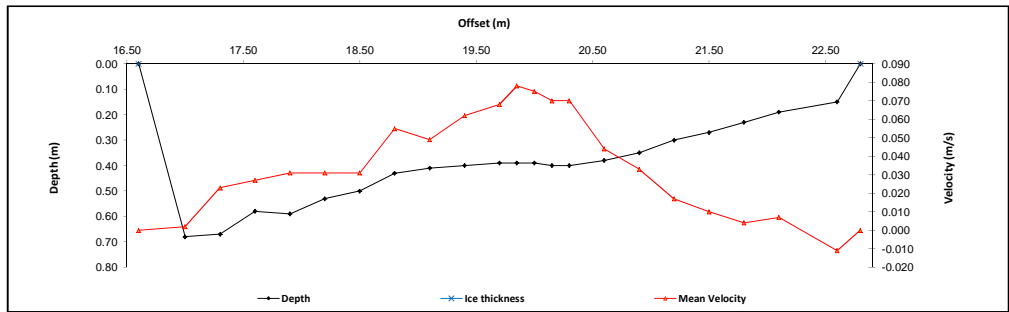
Total Flow:	0.082	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	2.41	(m <sup>2</sup> )
Wetted Width:	6.20	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.03	(m/s)
Froude Number:	0.02	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.728	0.727
Water (°C):	9.4	9.3
Datalogger Clock:	09:26	10:10
Laptop Clock:	09:26	10:10
Battery (Main):	13.3	13.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.587	100.587		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.756	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.128	99.459	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut	0.399	4.472	96.514	Time WL Surveyed:	9:34
Temporary BM			4.472	96.115	0.000	-
<b>Turn</b>						
Temporary BM	4.459	100.574		96.115		-
Water Level:	Cut	0.399	4.459	96.514	Time WL Surveyed:	9:35
S63-3			1.113	99.461	99.444	3/4" Pipe 10m E of Station
S63-2			0.742	99.832	99.830	3/4" Pipe 7m E of Station
S63-1			0.573	100.001	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S63-1	0.573	100.574		100.001		
Water Level:	Cut	0.399	4.459	96.514	Time WL Surveyed:	10:07
Water Level:	Cut	0.399	4.442	96.515	Time WL Surveyed:	10:09
S63-1	0.557	100.558		100.001		

**WL Survey Summary**

	Before	After
Average WL:	96.514	96.515
Closing Error:	-0.001	-
WL Check:	0.000	-0.001
Transducer Elevation	95.786	95.788

**Field Personnel:**

	SM, TR	Trip Date:	18-Sep-14
Data Entry Personnel:	SM	Date:	18-Sep-14
Data Check Personnel:	TR	Date:	30-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: October 10, 2014  
 Site Visit Time (MST): 13:40

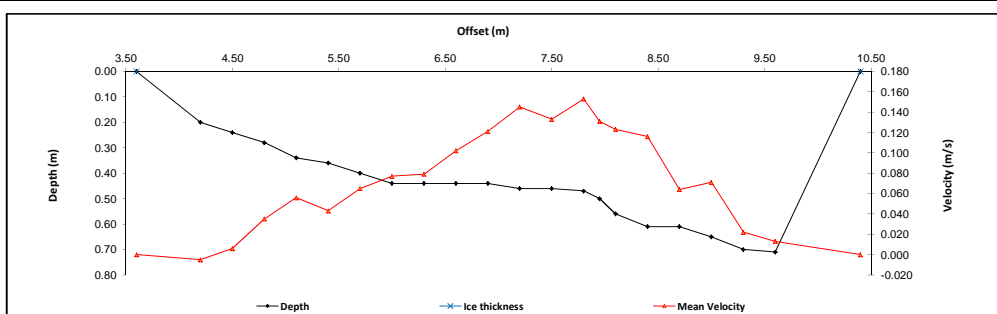


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.60	0.00	0.00		0.000				0.000	1.00	0.30	0.00	0.000	0.00	0.000	
1	4.20	0.20		0.12	-0.005					1.00	0.45	0.20	-0.005	0.09	0.000	0%
2	4.50	0.24		0.14	0.006					1.00	0.30	0.24	0.006	0.07	0.000	0%
3	4.80	0.28		0.17	0.005					1.00	0.30	0.28	0.005	0.08	0.003	1%
4	5.10	0.34		0.20	0.056					1.00	0.30	0.34	0.056	0.10	0.006	3%
5	5.40	0.36		0.22	0.043					1.00	0.30	0.36	0.043	0.11	0.005	2%
6	5.70	0.40		0.24	0.065					1.00	0.30	0.40	0.065	0.12	0.008	4%
7	6.00	0.44		0.26	0.077					1.00	0.30	0.44	0.077	0.13	0.010	5%
8	6.30	0.44		0.26	0.079					1.00	0.30	0.44	0.079	0.13	0.010	5%
9	6.60	0.44		0.26	0.102					1.00	0.30	0.44	0.102	0.13	0.013	7%
10	6.90	0.44		0.26	0.121					1.00	0.30	0.44	0.121	0.13	0.016	8%
11	7.20	0.46		0.28	0.145					1.00	0.30	0.46	0.145	0.14	0.020	10%
12	7.50	0.46		0.28	0.133					1.00	0.30	0.46	0.133	0.14	0.018	9%
13	7.80	0.47		0.28	0.153					1.00	0.23	0.47	0.153	0.11	0.016	8%
14	7.95	0.50		0.30	0.131					1.00	0.15	0.50	0.131	0.08	0.010	5%
15	8.10	0.56		0.34	0.123					1.00	0.23	0.56	0.123	0.13	0.015	7%
16	8.40	0.61		0.37	0.116					1.00	0.30	0.61	0.116	0.18	0.021	10%
17	8.70	0.61		0.37	0.064					1.00	0.30	0.61	0.064	0.18	0.012	6%
18	9.00	0.65		0.39	0.071					1.00	0.30	0.65	0.071	0.20	0.014	7%
19	9.30	0.70		0.42	0.022					1.00	0.30	0.70	0.022	0.21	0.005	2%
20	9.60	0.71		0.43	0.013					1.00	0.55	0.71	0.013	0.39	0.005	2%
LB	10.40	0.00	0.00		0.000		0.000		0.000	1.00	0.40	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.207</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 12m US of PT

Meas. Start Time (MST):	13:55
Meas. End Time (MST):	14:25
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze, 10C



**Flow characteristics:**

Total Flow:	0.207	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.85	(m <sup>2</sup> )
Wetted Width:	6.80	(m)
Hydraulic Depth:	0.42	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.04	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.788	0.789
Water (°C):	5.2	5.3
Datalogger Clock:	13:44	14:31
Laptop Clock:	13:44	14:32
Battery (Main):	13.7	13.7
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.664	100.664		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.832	99.832	99.830	3/4" Pipe 7m E of Station
S63-3			1.205	99.459	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut	0.285	4.372	96.577	Time WL Surveyed: 13:47	
Temporary BM			4.372	96.292	0.000	
<b>Turn</b>						
Temporary BM	4.327	100.619		96.292		
Water Level:	Cut	0.285	4.327	96.577	Time WL Surveyed: 13:49	
S63-3			1.159	99.460	99.444	3/4" Pipe 10m E of Station
S63-2			0.787	99.832	99.830	3/4" Pipe 7m E of Station
S63-1			0.618	100.001	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S63-2	0.787	100.619		99.832		
Water Level:	Cut	0.281	4.320	96.580	Time WL Surveyed: 14:29	
Water Level:	Cut	0.281	4.299	96.581	Time WL Surveyed: 14:30	
S63-2	0.767	100.599		99.832		

**WL Survey Summary**

	Before	After
Average WL:	96.577	96.581
Closing Error:	-0.001	-
WL Check:	0.000	-0.001
Transducer Elevation	95.789	95.792

**Field Personnel:**

TR, MP	Trip Date:	10-Oct-14
Data Entry Personnel:	Date:	10-Oct-14
Data Check Personnel:	Date:	31-Oct-14
Entered Digitally in the Field:	Yes	

# Hydrometric Measurement / Site Visit Record

Site: S63 Sunday Creek at HWY 881  
 UTM Location: 494283E 6157255N

Site Visit Date: December 6, 2014  
 Site Visit Time (MST): 14:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
LB	2.00	0.00	0.00		0.000				0.000	0.88	0.15	0.00	0.000	0.00	0.000	
1	2.30	0.55	0.13	0.34	0.000					0.88	0.35	0.42	0.000	0.15	0.000	0%
2	2.70	0.63	0.13	0.38	0.015					0.88	0.33	0.50	0.013	0.16	0.002	2%
3	2.95	0.66	0.14	0.40	0.027					0.88	0.28	0.52	0.024	0.14	0.003	3%
4	3.25	0.75	0.15	0.45	0.043					0.88	0.28	0.60	0.038	0.17	0.006	5%
5	3.50	0.77	0.13	0.45	0.086					0.88	0.23	0.64	0.076	0.14	0.011	8%
6	3.70	0.77	0.06	0.42	0.123					0.88	0.15	0.71	0.108	0.11	0.012	9%
7	3.80	0.78	0.09	0.44	0.115					0.88	0.15	0.69	0.101	0.10	0.010	8%
8	4.00	0.70	0.05	0.38	0.121					0.88	0.13	0.65	0.106	0.08	0.009	6%
9	4.05	0.75	0.05	0.40	0.127					0.88	0.15	0.70	0.112	0.11	0.012	9%
10	4.30	0.63	0.05	0.34	0.125					0.88	0.18	0.58	0.110	0.10	0.011	8%
11	4.40	0.59	0.05	0.32	0.134					0.88	0.13	0.54	0.118	0.07	0.008	6%
12	4.55	0.51	0.05	0.28	0.117					0.88	0.13	0.46	0.103	0.06	0.006	4%
13	4.65	0.51	0.05	0.28	0.121					0.88	0.20	0.46	0.106	0.09	0.007	7%
14	4.95	0.41	0.10	0.26	0.121					0.88	0.27	0.31	0.106	0.09	0.009	7%
15	5.20	0.38	0.13	0.26	0.120					0.88	0.27	0.25	0.106	0.07	0.007	5%
16	5.50	0.38	0.13	0.26	0.086					0.88	0.30	0.25	0.076	0.08	0.006	4%
17	5.80	0.36	0.15	0.26	0.077					0.88	0.35	0.21	0.068	0.07	0.005	4%
18	6.20	0.38	0.15	0.27	0.059					0.88	0.38	0.23	0.052	0.09	0.004	3%
19	6.55	0.39	0.15	0.27	0.024					0.88	0.38	0.24	0.021	0.09	0.002	1%
20	6.95	0.32	0.15	0.24	0.026					0.88	0.35	0.17	0.023	0.06	0.001	1%
21	7.25	0.30	0.15	0.23	0.013					0.88	0.23	0.15	0.011	0.03	0.000	0%
RB	7.40	0.00	0.00		0.00		0.00		0.00	0.88	0.08	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.135</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m DS of logger enclosure

Mess. Start Time (MST):	14:35
Mess. End Time (MST):	15:00
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, calm, -11C

**Flow characteristics:**

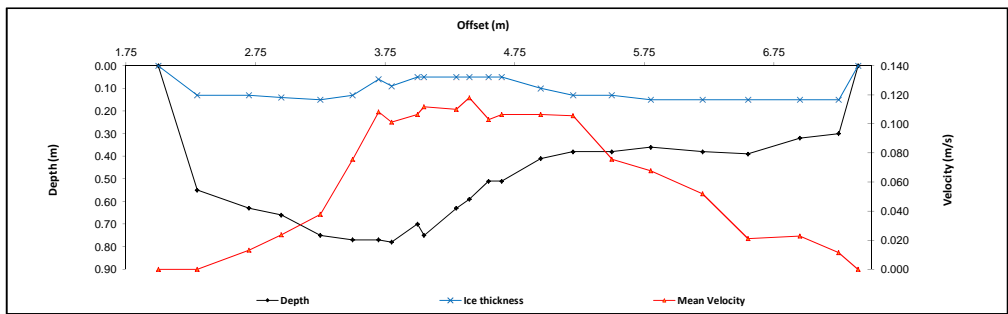
Total Flow:	0.135	(m³/s)
Perceived Measurement Quality:	Good	
Cross Section Area:	2.05	(m²)
Wetted Width:	5.40	(m)
Hydraulic Depth:	0.38	(m)
Mean Velocity:	0.07	(m/s)
Froude Number:	0.03	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.725	0.724
Water (°C):	0.5	0.5
Datalogger Clock:	14:02	15:13
Laptop Clock:	14:02	15:13
Battery (Main):	13.8	13.2
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S63-1	0.775	100.775		100.000	100.000	3/4" Pipe 5m NE of Station
S63-2			0.944	99.831	99.830	3/4" Pipe 7m E of Station
S63-3			1.317	99.458	99.444	3/4" Pipe 10m E of Station
Water Level:	Cut		4.265	96.510		Time WL Surveyed: 14:19
Temporary BM			4.215	96.560	0.000	Ice
<b>Turn</b>						
Temporary BM	4.288	100.848		96.560		Ice
Water Level:	Cut		4.340	96.508		Time WL Surveyed: 14:23
S63-3			1.389	99.459	99.444	3/4" Pipe 10m E of Station
S63-2			1.015	99.833	99.830	3/4" Pipe 7m E of Station
S63-1			0.846	100.002	100.000	3/4" Pipe 5m NE of Station
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S63-2	1.014	100.846		99.832		
Water Level:	Cut		4.337	96.509		Time WL Surveyed: 15:07
Water Level:	Cut		4.263	96.512		Time WL Surveyed: 15:09
S63-2	0.943	100.775		99.832		

**WL Survey Summary**

Average WL:	Before	After
	96.509	96.511
Closing Error:	-0.002	-
WL Check:	0.002	-0.003
Transducer Elevation	95.784	95.787

**Field Personnel:**

	CJ, NC	Trip Date:	6-Dec-14
Data Entry Personnel:	NC	Date:	6-Dec-14
Data Check Personnel:	TR	Date:	20-Jan-15
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517644E 6163643N

Site Visit Date: February 12, 2014  
 Site Visit Time (MST): 16:40

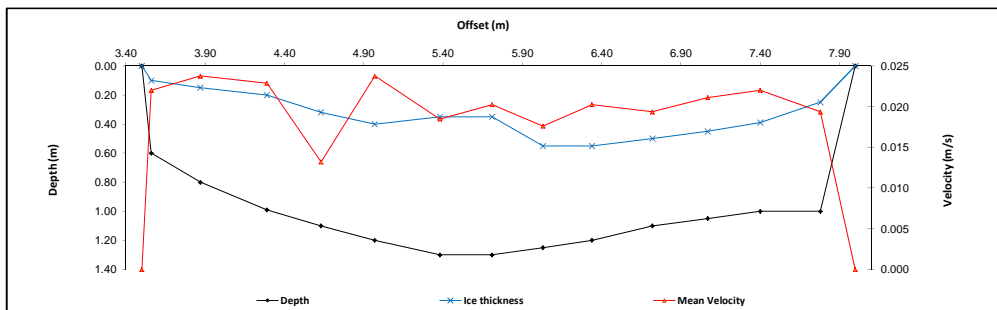


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	3.50	0.00	0.00		0.000		0.000		0.000	0.88	0.03	0.00	0.000	0.00	0.000	
1	3.56	0.60	0.10	0.35	0.025					0.88	0.19	0.50	0.022	0.09	0.002	3%
2	3.67	0.80	0.15	0.48	0.027					0.88	0.37	0.65	0.024	0.24	0.006	9%
3	4.29	0.99	0.20		0.026	0.83				0.88	0.38	0.79	0.023	0.30	0.007	11%
4	4.63	1.10	0.32		0.015	0.94				0.88	0.34	0.78	0.013	0.27	0.004	5%
5	4.97	1.20	0.40		0.027	1.04				0.88	0.38	0.60	0.024	0.30	0.007	11%
6	5.38	1.30	0.35		0.021	1.11				0.88	0.37	0.95	0.018	0.35	0.006	10%
7	5.71	1.30	0.35		0.023	1.11				0.88	0.33	0.95	0.020	0.31	0.006	10%
8	6.03	1.25	0.55	0.90	0.020					0.88	0.32	0.70	0.018	0.22	0.004	6%
9	6.34	1.20	0.55	0.88	0.023					0.88	0.34	0.65	0.020	0.22	0.005	7%
10	6.72	1.10	0.50	0.80	0.022					0.88	0.37	0.60	0.019	0.22	0.004	7%
11	7.07	1.05	0.45	0.75	0.024					0.88	0.34	0.60	0.021	0.20	0.004	7%
12	7.40	1.00	0.39	0.70	0.025					0.88	0.36	0.61	0.022	0.22	0.005	7%
13	7.78	1.00	0.25	0.63	0.022					0.88	0.30	0.75	0.019	0.23	0.004	7%
LB	8.00	0.00	0.00		0.00		0.00		0.00	0.88	0.11	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.064</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): 50m US of station

Meas. Start Time (MST):	16:48
Meas. End Time (MST):	17:09
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Snowing, -19C



**Flow characteristics:**

Total Flow:	0.064	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Cross Section Area:	3.16	(m <sup>2</sup> )
Wetted Width:	4.50	(m)
Hydraulic Depth:	0.70	(m)
Mean Velocity:	0.02	(m/s)
Froude Number:	0.01	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.579	
Water (°C):	0.3	
Datalogger Clock:	17:29	
Laptop Clock:	17:29	
Battery (Main):	14.0	
Battery:		Good
Battery Serial #:	-	
Enclosure Dessiccant:		Good
Vent Tube Dessiccant:		Good
PTH# (if replaced):	-	
Logger# (if replaced):	-	

**Datalogger / Station Notes:**

**General Notes:**

-Visited station to perform a winter test measurement

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S64-1	1.322	101.322		100.000	100.000	3/4" Pipe 6m SE
S64-2			1.525	99.797	99.801	3/4" Pipe 11m E
S64-3			1.478	99.844	99.849	3/4" Pipe 8m E
Water Level:	Cut		2.596	98.726	Time WL Surveyed:	17:23
Temporary BM			2.458	98.864	0.000	-
<b>Turn</b>						
Temporary BM	2.437	101.301		98.864		-
Water Level:	Cut		2.574	98.727	Time WL Surveyed:	17:25
S64-3			1.456	99.845	99.849	3/4" Pipe 8m E
S64-2			1.503	99.798	99.801	3/4" Pipe 11m E
S64-1			1.289	100.002	100.000	3/4" Pipe 6m SE
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
Water Level:	Cut				Time WL Surveyed:	
Water Level:	Cut				Time WL Surveyed:	

**WL Survey Summary**

	Before	After
Average WL:	98.727	-
Closing Error:	-0.002	-
WL Check:	0.001	-
Transducer Elevation	98.148	-

**Field Personnel:**

	SM, MP	Trip Date:	12-Feb-14
Data Entry Personnel:	MP	Date:	12-Feb-14
Data Check Personnel:	TR	Date:	19-Mar-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake

UTM Location: 517644E 6163643N

Site Visit Date: \_\_\_\_\_

May 15, 2014

Site Visit Time (MST): \_\_\_\_\_

09:45



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 50m US of station	
Meas. Start Time (MST):	10:25
Meas. End Time (MST):	11:10
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Rain, calm, 12 C

<b>Flow characteristics:</b>		
Total Flow:	1.31	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	6.06	(m <sup>2</sup> )
Wetted Width:	7.49	(m)
Hydraulic Depth:	0.81	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.08	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.660	0.663
Water (°C):	7.6	7.8
Datalogger Clock:	09:58	11:19
Laptop Clock:	09:58	11:19
Battery (Main):	14.5	0.6
Battery:	Replaced	
Battery Serial #:	1205002	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.08		LB:	10.60	
Serial Number:	1802		Salinity (ppt):	0.0		RB:	17.60	
Firmware Version:	3.5		Magnetic Declination (°):	-				
Software Version:	3.7		Measured Temperature (°C):	7.7				
			ADCP Temperature (°C):	9.4				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		1	7.77	6.44	0.208	1.338	1.98%
Coordinate System:	ENU		2	7.21	5.69	0.226	1.286	-1.98%
Left Method:	Sloped bank							
Right Method:	Sloped bank							
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit							
			<b>Mean:</b>	7.49	6.06	0.217	<b>1.31</b>	
			<b>SD:</b>	0.28	0.38	0.009	0.026	
			<b>COV:</b>	0.04	0.06	0.041	0.020	

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S64-3	1.424	101.273		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.474	99.799	99.801	3/4" Pipe 11m E of Logger
S64-1			1.255	100.018	100.000	3/4" Pipe 6m SE of Logger
Water Level:	Cut		2.474	98.799	<b>Time WL Surveyed:</b>	10:16
Temporary BM			1.255	100.018	0.000	
<b>Turn</b>						
Temporary BM	1.242	101.260		100.018		
Water Level:	Cut		2.462	98.798	<b>Time WL Surveyed:</b>	10:18
S64-1			1.242	100.018	100.000	3/4" Pipe 6m SE of Logger
S64-2			1.461	99.799	99.801	3/4" Pipe 11m E of Logger
S64-3			1.410	99.850	99.849	3/4" Pipe 8m E of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S64-1	1.242	101.260		100.018		
Water Level:	Cut		2.454	98.806	<b>Time WL Surveyed:</b>	11:12
Water Level:	Cut		2.442	98.806	<b>Time WL Surveyed:</b>	11:14
S64-1	1.229	101.247		100.018		

<b>WL Survey Summary</b>		
	Before	After
Average WL:	98.799	98.806
Closing Error:	-0.001	-
WL Check:	0.001	0.001
Transducer Elevation	98.139	98.143

<b>Field Personnel:</b>	SM, MP	Trip Date:	15-May-14
Data Entry Personnel:	SM	Date:	15-May-14
Data Check Personnel:	TR	Date:	1-Aug-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517644E 6163643N

Site Visit Date: June 12, 2014  
 Site Visit Time (MST): 10:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.40	0.00	0.00		0.000		0.000		0.000	1.00	1.80	0.00	0.000	0.00	0.000	
1	6.00	0.43		0.26	0.078					1.00	2.30	0.43	0.078	0.99	0.077	1%
2	7.00	0.62		0.37	0.088					1.00	1.00	0.62	0.088	0.62	0.055	1%
3	8.00	1.27				1.02	1.060	0.25	0.369	1.00	0.63	1.27	0.715	0.79	0.567	9%
4	8.25	1.84				1.47	0.383	0.37	0.407	1.00	0.25	1.84	0.395	0.46	0.182	3%
5	8.50	1.91				1.53	2.090	0.38	0.381	1.00	0.25	1.91	1.236	0.48	0.590	10%
6	8.75	2.08				1.66	0.632	0.42	0.485	1.00	0.25	2.08	0.559	0.52	0.290	5%
7	9.00	2.01				1.61	0.602	0.40	0.652	1.00	0.38	2.01	0.627	0.75	0.473	8%
8	9.50	2.22				1.78	0.200	0.44	0.528	1.00	0.50	2.22	0.364	1.11	0.404	7%
9	10.00	2.35				1.88	0.156	0.47	0.465	1.00	0.50	2.35	0.311	1.18	0.365	6%
10	10.50	2.38				1.90	0.020	0.48	0.522	1.00	0.50	2.38	0.271	1.19	0.322	5%
11	11.00	1.93				1.54	0.057	0.39	0.507	1.00	0.50	1.93	0.282	0.97	0.272	5%
12	11.50	1.64				1.31	0.020	0.33	0.696	1.00	0.50	1.64	0.358	0.82	0.294	5%
13	12.00	1.60				1.28	-0.077	0.32	-0.002	1.00	0.50	1.60	-0.040	0.80	-0.032	-1%
14	12.50	1.54				1.23	-0.076	0.31	0.439	1.00	0.50	1.54	0.182	0.77	0.140	2%
15	13.00	1.54				1.23	-0.055	0.31	0.380	1.00	0.50	1.54	0.163	0.77	0.125	2%
16	13.50	1.41				1.13	0.053	0.28	0.429	1.00	0.50	1.41	0.241	0.71	0.170	3%
17	14.00	1.22				0.98	0.075	0.24	0.387	1.00	0.50	1.22	0.231	0.61	0.141	2%
18	14.50	0.96				0.77	0.131	0.19	0.223	1.00	1.50	0.96	0.177	1.44	0.255	4%
19	17.00	0.81			0.210		0.65		0.16	1.00	2.25	0.81	0.210	1.82	0.383	6%
20	19.00	0.52		0.31	0.568					1.00	2.00	0.52	0.568	1.04	0.591	10%
21	21.00	0.58		0.35	0.266					1.00	2.00	0.58	0.266	1.16	0.309	5%
22	23.00	0.56		0.34	0.002					1.00	3.50	0.56	0.002	1.96	0.004	0%
23	28.00	0.54		0.32	0.023					1.00	5.25	0.54	0.023	2.84	0.065	1%
LB	33.50	0.00	0.00		0.000		0.000		0.000	1.00	2.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>6.04</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
From DS side of foot bridge

Meas. Start Time (MST):	11:20
Meas. End Time (MST):	12:20
Equipment:	ADV
Method:	Wading
River Condition:	Banks flooded
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Clear, light breeze

**Flow characteristics:**

Total Flow:	6.04	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	23.79	(m <sup>2</sup> )
Wetted Width:	31.10	(m)
Hydraulic Depth:	0.76	(m)
Mean Velocity:	0.25	(m/s)
Froude Number:	0.09	

**Logger Details:**

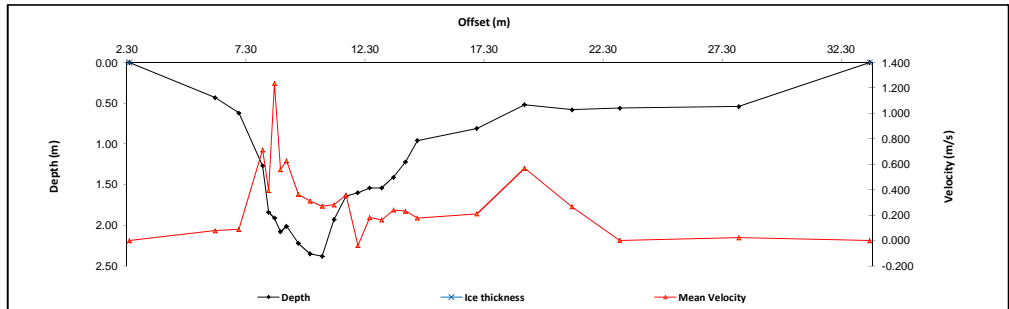
	Before	After
Transducer Reading (m):	1.471	1.468
Water (°C):	12.4	13.6
Datalogger Clock:	10:56	12:29
Laptop Clock:	10:57	12:30
Battery (Main):	13.9	13.8
Battery:	Good	
Battery Serial #:	1205002	-
Enclosure Deseccant:	Replaced	
Vent Tube Deseccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Log jam on US side of bridge from RB to offset approx 17.5m

**General Notes:**

-Log jam on US side of bridge from RB to offset approx 17.5m



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S64-3	1.476	101.325		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.527	99.798	99.801	3/4" Pipe 11m E of Logger
S64-1			1.307	100.018	100.000	3/4" Pipe 6m SE of Logger
<b>Turn</b>						
S64-1	1.254	101.272		100.018	100.000	3/4" Pipe 6m SE of Logger
Water Level:	Cut		1.655	99.617	99.617	Time WL Surveyed: 11:06
S64-1				100.018	100.000	3/4" Pipe 6m SE of Logger
S64-2			1.473	99.799	99.801	3/4" Pipe 11m E of Logger
S64-3			1.422	99.850	99.849	3/4" Pipe 8m E of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S64-1	1.254	101.272		100.018	100.018	
Water Level:	Cut		1.657	99.615	99.615	Time WL Surveyed: 12:26
Water Level:	Cut		1.565	99.618	99.618	Time WL Surveyed: 12:27
S64-1	1.165	101.183		100.018	100.018	

**WL Survey Summary**

	Before	After
Average WL:	99.617	99.617
Closing Error:	-0.001	-
WL Check:	0.001	-0.003
Transducer Elevation	98.146	98.149

**Field Personnel:**

Data Entry Personnel:	TR, NC	Trip Date:	12-Jun-14
Data Check Personnel:	TR, NC	Date:	12-Jun-14
Entered Digitally in the Field:	TR	Date:	15-Jul-14

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517644E 6163643N

Site Visit Date: \_\_\_\_\_  
 Site Visit Time (MST): \_\_\_\_\_

August 8, 2014  
 10:10



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 50m US of station	
Meas. Start Time (MST):	11:08
Meas. End Time (MST):	11:36
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Very slow flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Poor
Weather:	Clear, 16C

<b>Flow characteristics:</b>		
Total Flow:	0.254	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Cross Section Area:	4.59	(m <sup>2</sup> )
Wetted Width:	6.03	(m)
Hydraulic Depth:	0.76	(m)
Mean Velocity:	0.05	(m/s)
Froude Number:	0.02	

<b>Logger Details:</b>	Before	After
Transducer Reading (m):	0.423	0.423
Water (°C):	19.3	20.0
Datalogger Clock:	10:16	12:01
Laptop Clock:	10:16	12:00
Battery (Main):	12.1	12.1
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**  
 Large woody debris on left side of channel

<b>ADCP Flow Measurement Summary:</b>				
<b>System Information:</b>				
System Type:	Sontek RS-M9			
Serial Number:	4712			
Firmware Version:	3.50			
Software Version:	3.70			
<b>System Setup:</b>				
Transducer Depth (m):	0.05			
Salinity (ppt):	0.0			
Magnetic Declination (°):	14			
Measured Temperature (°C):	-			
ADCP Temperature (°C):	20.2			
<b>Bank Offsets:</b>				
LB:	46.00			
RB:	52.60			
<b>Discharge Calculation Settings:</b>				
Track Reference:	Bottom-Track			
Depth Reference:	Vertical beam			
Coordinate System:	ENU			
Left Method:	Sloped bank			
Right Method:	Sloped bank			
Top Fit Type:	Power fit			
Bottom Fit Type:	Power fit			
<b>Measurement Results:</b>				
Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):
5	6.22	4.98	0.050	0.262
8	5.95	4.26	0.058	0.248
9	5.93	4.54	0.056	0.253
<b>Mean:</b>				
	6.03	4.59	0.055	0.254
<b>SD:</b>				
	0.13	0.29	0.003	0.006
<b>SE (%):</b>				
	4.45	9.82	0.113	0.193

<b>Level Survey:</b>						
Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S64-2	1.253	101.054		99.801	99.801	3/4" Pipe 11m E
S64-1			1.036	100.018	100.000	3/4" Pipe 6m SE
<b>Turn</b>						
Temporary BM	1.017	101.035		100.018		
Water Level:	Cut		2.499	98.536		Time WL Surveyed: 10:24
Temporary BM			1.036	100.018	0.000	-
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S64-1	1.017	101.035		100.018		
Water Level:	Cut		2.499	98.536		Time WL Surveyed: 11:55
Water Level:	Cut		2.485	98.534		Time WL Surveyed: 11:57
S64-1	1.001	101.019		100.018		

<b>WL Survey Summary</b>	Before	After
Average WL:	98.536	98.535
Closing Error:	0.001	-
WL Check:	0.000	0.002
Transducer Elevation	98.113	98.112

<b>Field Personnel:</b>	MP, CJ	Trip Date:	8-Aug-14
Data Entry Personnel:	MP	Date:	8-Aug-14
Data Check Personnel:	MP	Date:	2-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake

UTM Location: 517644E 6163643N

Site Visit Date: \_\_\_\_\_

September 19, 2014

Site Visit Time (MST): \_\_\_\_\_

09:10



<b>Flow Measurement Details:</b>	
Metering Section Location (describe): 50m US of station	
Meas. Start Time (MST):	10:02
Meas. End Time (MST):	10:17
Equipment:	ADCP
Method:	Temporary Cableway
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Fair
Weather:	Partial cloud, 14C

<b>Flow characteristics:</b>		
Total Flow:	0.573	(m <sup>3</sup> /s)
Perceived Measuremt Quality:	Fair	
Cross Section Area:	2.51	(m <sup>2</sup> )
Wetted Width:	5.21	(m)
Hydraulic Depth:	0.48	(m)
Mean Velocity:	0.26	(m/s)
Froude Number:	0.12	

<b>Logger Details:</b>		
	Before	After
Transducer Reading (m):	0.182	0.234
Water (°C):	10.0	10.5
Datalogger Clock:	09:21	10:29
Laptop Clock:	09:21	10:29
Battery (Main):	14.5	14.4
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-Moved transducer to deeper water  
 -BM3 and BM2 appear to have been hit by equipment, likely still usable

**General Notes:**

<b>ADCP Flow Measurement Summary:</b>								
<b>System Information:</b>			<b>System Setup:</b>		<b>Bank Offsets:</b>			
System Type:	Sontek RS-M9		Transducer Depth (m):	0.05		LB:	30.00	
Serial Number:	4712		Salinity (ppt):	0.0		RB:	24.50	
Firmware Version:	3.50		Magnetic Declination (°):	14				
Software Version:	3.70		Measured Temperature (°C):	-				
			ADCP Temperature (°C):	11.7				
<b>Discharge Calculation Settings:</b>			<b>Measurement Results:</b>					
Track Reference:	Bottom-Track		Pass (#):	Width (m):	Area (m <sup>2</sup> ):	Mean Pass Velocity (m/s):	Discharge (m <sup>3</sup> /s):	Discharge Difference From Mean
Depth Reference:	Vertical beam		3	5.29	3.60	0.158	0.559	-2.36%
Coordinate System:	ENU		5	5.12	1.42	0.356	0.586	2.36%
Left Method:	Sloped bank							
Right Method:	Sloped bank							
Top Fit Type:	Power fit							
Bottom Fit Type:	Power fit							
			<b>Mean:</b>	5.21	2.51	0.257	<b>0.573</b>	
			<b>SD:</b>	0.08	1.09	0.099	0.014	
			<b>COV:</b>	0.02	0.43	0.385	0.024	

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S64-3	1.360	101.209		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.405	99.804	99.801	3/4" Pipe 11m E of Logger
S64-1			1.185	100.024	100.000	3/4" Pipe 6m SE of Logger
Water Level:	Cut		2.910	98.299	<b>Time WL Surveyed:</b>	9:31
Temporary BM			2.738	98.471	0.000	-
<b>Turn</b>						
Temporary BM	2.724	101.195		98.471		-
Water Level:	Cut		2.898	98.297	<b>Time WL Surveyed:</b>	9:33
S64-1			1.171	100.024	100.000	3/4" Pipe 6m SE of Logger
S64-2			1.391	99.804	99.801	3/4" Pipe 11m E of Logger
S64-3			1.345	99.850	99.849	3/4" Pipe 8m E of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S64-1	1.171	101.195		100.024		
Water Level:	Cut		2.898	98.297	<b>Time WL Surveyed:</b>	10:25
Water Level:	Cut		2.882	98.297	<b>Time WL Surveyed:</b>	10:26
S64-1	1.155	101.179		100.024		

<b>WL Survey Summary</b>	Before	After
Average WL:	98.298	98.297
Closing Error:	-0.001	-
WL Check:	0.002	0.000
Transducer Elevation	98.116	98.063

<b>Field Personnel:</b>	SM, MP	Trip Date:	19-Sep-14
Data Entry Personnel:	SM	Date:	19-Sep-14
Data Check Personnel:	MP	Date:	3-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S64 Unnamed Creek East of Christina Lake  
 UTM Location: 517644E 6163643N

Site Visit Date: October 23, 2014  
 Site Visit Time (MST): 09:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.80	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
1	2.30	0.16		0.10	-0.003					1.00	0.40	0.16	-0.003	0.06	0.000	0%
2	2.60	0.16		0.10	0.063					1.00	0.30	0.16	0.063	0.05	0.003	3%
3	2.90	0.24		0.14	0.014					1.00	0.30	0.24	0.014	0.07	0.001	1%
4	3.20	0.26		0.16	0.036					1.00	0.30	0.26	0.036	0.08	0.003	3%
5	3.50	0.28		0.17	0.101					1.00	0.30	0.28	0.101	0.08	0.008	8%
6	3.80	0.34		0.20	0.072					1.00	0.30	0.34	0.072	0.10	0.007	7%
7	4.10	0.30		0.18	0.059					1.00	0.30	0.30	0.059	0.09	0.005	5%
8	4.40	0.34		0.20	0.145					1.00	0.23	0.34	0.145	0.08	0.011	10%
9	4.55	0.32		0.19	0.107					1.00	0.15	0.32	0.107	0.05	0.005	5%
10	4.70	0.29		0.17	0.127					1.00	0.23	0.29	0.127	0.07	0.008	7%
11	5.00	0.28		0.17	0.091					1.00	0.30	0.28	0.091	0.08	0.008	7%
12	5.30	0.24		0.14	0.027					1.00	0.30	0.24	0.027	0.07	0.002	2%
13	5.60	0.24		0.14	0.115					1.00	0.30	0.24	0.115	0.07	0.008	7%
14	5.90	0.26		0.16	0.096					1.00	0.30	0.26	0.096	0.08	0.007	7%
15	6.20	0.26		0.16	0.086					1.00	0.30	0.26	0.086	0.08	0.007	6%
16	6.50	0.24		0.14	0.108					1.00	0.30	0.24	0.108	0.07	0.008	7%
17	6.80	0.22		0.13	0.064					1.00	0.30	0.22	0.064	0.07	0.004	4%
18	7.10	0.19		0.11	0.156					1.00	0.30	0.19	0.156	0.06	0.009	8%
19	7.40	0.16		0.10	0.088					1.00	0.30	0.16	0.088	0.05	0.004	4%
20	7.70	0.14		0.08	0.022					1.00	0.30	0.14	0.022	0.04	0.001	1%
21	8.00	0.14		0.08	0.025					1.00	0.28	0.14	0.025	0.04	0.001	1%
RB	8.25	0.00	0.00		0.00		0.00		0.00	1.00	0.13	0.00	0.000	0.00	0.000	
<b>Total Flow</b>													<b>0.111</b>	<b>100%</b>		

**Flow Measurement Details:**

Metering Section Location (describe):  
25m DS from station

Mess. Start Time (MST):	9:41
Mess. End Time (MST):	10:09
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Cloudy, breezy, 8

**Flow characteristics:**

Total Flow:	0.111	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	1.44	(m <sup>2</sup> )
Wetted Width:	6.45	(m)
Hydraulic Depth:	0.22	(m)
Mean Velocity:	0.08	(m/s)
Froude Number:	0.05	

**Logger Details:**

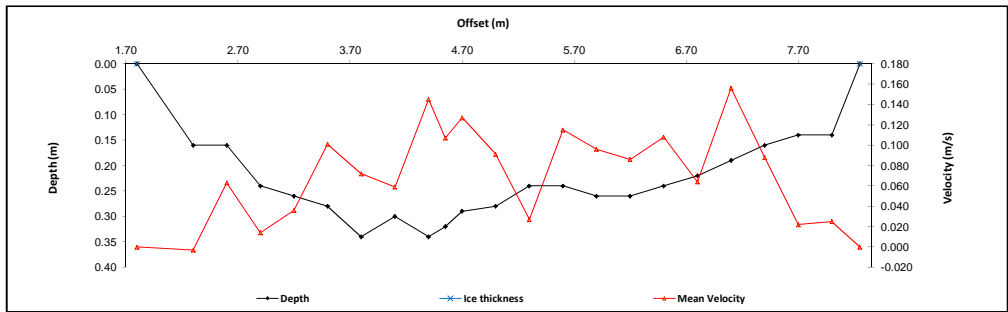
	Before	After
Transducer Reading (m):	0.194	0.444
Water (°C):	4.2	4.5
Datalogger Clock:	09:10	10:18
Laptop Clock:	09:09	10:17
Battery (Main):	13.4	14.0
Battery:	Good	
Battery Serial #:	-	-
Enclosure Desiccant:	Replaced	
Vent Tube Desiccant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-PT moved between surveys

**General Notes:**

-Ran ADV test, all results good  
 -Bed of channel mostly silt and vegetation, wading rod sinking during discharge measurement



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S64-3	1.269	101.118		99.849	99.849	3/4" Pipe 8m E of Logger
S64-2			1.316	99.802	99.801	3/4" Pipe 11m E of Logger
S64-1			1.098	100.020	100.000	3/4" Pipe 6m SE of Logger
<b>Water Level:</b>						
Cut		2.893		98.225		<b>Time WL Surveyed:</b> 9:15
S64-1		1.098		100.020	100.000	3/4" Pipe 6m SE of Logger
<b>Turn</b>						
S64-1	1.076	101.096		100.020	100.000	3/4" Pipe 6m SE of Logger
<b>Water Level:</b>						
Cut		2.867		98.229		<b>Time WL Surveyed:</b> 9:18
S64-1		1.076		100.020	100.000	3/4" Pipe 6m SE of Logger
S64-2		1.296		99.800	99.801	3/4" Pipe 11m E of Logger
S64-3		1.250		99.846	99.849	3/4" Pipe 8m E of Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S64-1	1.076	101.096		100.020		
<b>Water Level:</b>						
Cut		2.871		98.225		<b>Time WL Surveyed:</b> 10:14
<b>Water Level:</b>						
Cut		2.852		98.225		<b>Time WL Surveyed:</b> 10:16
S64-1	1.057	101.077		100.020		

**WL Survey Summary**

Average WL:	98.227	98.225
Closing Error:	0.003	-
WL Check:	0.004	0.000
Transducer Elevation	98.033	97.781

**Field Personnel:**

TR, GG	Trip Date:	23-Oct-14
TR	Date:	23-Oct-14
TR	Date:	29-Oct-14
Yes	Entered Digitally in the Field:	

# Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek  
 UTM Location: 489845 E, 6333039 N

Site Visit Date: May 1, 2014  
 Site Visit Time (MST): 07:30

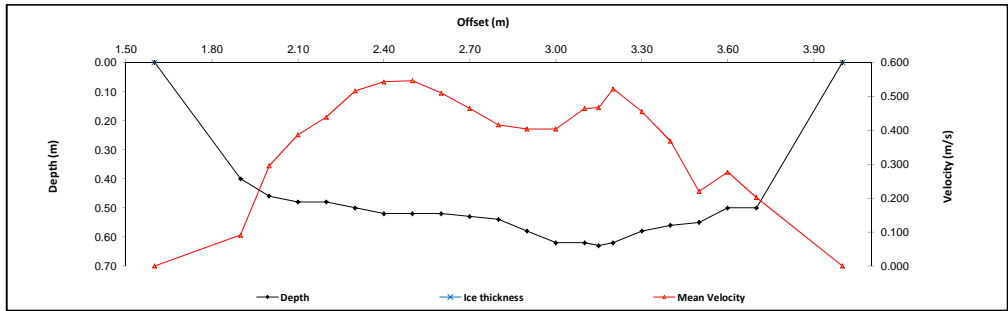


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	1.60	0.00	0.00		0.000				0.000	1.00	0.15	0.00	0.000	0.00	0.000	
1	1.90	0.40		0.24	0.091					1.00	0.20	0.40	0.091	0.08	0.007	2%
2	2.00	0.46		0.28	0.295					1.00	0.10	0.46	0.295	0.05	0.014	3%
3	2.10	0.48		0.29	0.387					1.00	0.10	0.48	0.387	0.05	0.019	4%
4	2.20	0.48		0.29	0.439					1.00	0.10	0.48	0.439	0.05	0.021	5%
5	2.30	0.50		0.30	0.516					1.00	0.10	0.50	0.516	0.05	0.026	6%
6	2.40	0.52		0.31	0.543					1.00	0.10	0.52	0.543	0.05	0.028	7%
7	2.50	0.52		0.31	0.546					1.00	0.10	0.52	0.546	0.05	0.028	7%
8	2.60	0.52		0.31	0.510					1.00	0.10	0.52	0.510	0.05	0.027	6%
9	2.70	0.53		0.32	0.464					1.00	0.10	0.53	0.464	0.05	0.025	6%
10	2.80	0.54		0.32	0.416					1.00	0.10	0.54	0.416	0.05	0.022	5%
11	2.90	0.58		0.35	0.404					1.00	0.10	0.58	0.404	0.06	0.023	6%
12	3.00	0.62		0.37	0.404					1.00	0.10	0.62	0.404	0.06	0.025	6%
13	3.10	0.62		0.37	0.464					1.00	0.08	0.62	0.464	0.05	0.022	5%
14	3.15	0.63		0.38	0.467					1.00	0.05	0.63	0.467	0.03	0.015	4%
15	3.20	0.62		0.37	0.522					1.00	0.08	0.62	0.522	0.05	0.024	6%
16	3.30	0.58		0.35	0.455					1.00	0.10	0.58	0.455	0.06	0.026	6%
17	3.40	0.56		0.34	0.368					1.00	0.10	0.56	0.368	0.06	0.021	5%
18	3.50	0.55		0.33	0.220					1.00	0.10	0.55	0.220	0.05	0.012	3%
19	3.60	0.50		0.30	0.277					1.00	0.10	0.50	0.277	0.05	0.014	3%
20	3.70	0.50		0.30	0.202					1.00	0.20	0.50	0.202	0.10	0.020	5%
RB	4.00	0.00	0.00		0.000		0.000		0.000	1.00	0.15	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.419</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): -30m DS of bridge

Meas. Start Time (MST):	8:18
Meas. End Time (MST):	8:43
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 15C



**Flow characteristics:**

Total Flow:	0.419	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.10	(m <sup>2</sup> )
Wetted Width:	2.40	(m)
Hydraulic Depth:	0.46	(m)
Mean Velocity:	0.38	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.935	0.930
Water (°C):	0.5	0.8
Datalogger Clock:	07:57	08:50
Laptop Clock:	07:58	08:51
Battery (Main):	14.5	0.4
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	322938	-
Logger# (if replaced):	25582	-

**Datalogger / Station Notes:**

-station needs modem and double-male serial cable

**General Notes:**

-channel is ice-covered at station

-ran ADV test, all good

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S65-01	0.685	100.685		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.954	99.731	0.000	3/4" Pipe 5m SW of logger
<b>Turn</b>						
S65-03	1.000	100.619		99.619		3/4" Pipe 6m W of logger
Water Level:	Cut		2.822	97.797		Time WL Surveyed: 8:12
S65-02			0.889	99.730		3/4" Pipe 5m SW of logger
S65-01			0.619	100.000	100.000	3/4" Pipe 5m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S65-03	1.000	100.619		99.619		
Water Level:	Cut		2.823	97.796		Time WL Surveyed: 8:48
Water Level:	Cut		2.789	97.797		Time WL Surveyed: 8:50
S65-03	0.967	100.586		99.619		

**WL Survey Summary**

	Before	After
Average WL:	97.798	97.797
Closing Error:	0.000	-
WL Check:	0.002	-0.001
Transducer Elevation	96.863	96.867

**Field Personnel:**

TR, GG	Trip Date:	1-May-13	
Data Entry Personnel:	TR	Date:	1-May-13
Data Check Personnel:	CJ	Date:	3-Jun-13
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek

UTM Location:

Site Visit Date:

June 11, 2014

Site Visit Time (MST):

08:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.00	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
1	2.20	0.10		0.06	0.098					1.00	0.20	0.10	0.098	0.02	0.002	0%
2	2.40	0.19		0.11	0.193					1.00	0.20	0.19	0.193	0.04	0.007	1%
3	2.60	0.38		0.23	0.248					1.00	0.20	0.38	0.248	0.08	0.019	3%
4	2.80	0.42		0.25	0.375					1.00	0.20	0.42	0.375	0.08	0.032	6%
5	3.00	0.47		0.28	0.408					1.00	0.20	0.47	0.408	0.09	0.038	7%
6	3.20	0.45		0.27	0.558					1.00	0.15	0.45	0.558	0.07	0.038	7%
7	3.30	0.54		0.32	0.489					1.00	0.10	0.54	0.489	0.05	0.026	5%
8	3.40	0.54		0.32	0.505					1.00	0.10	0.54	0.505	0.05	0.027	5%
9	3.50	0.55		0.33	0.479					1.00	0.10	0.55	0.479	0.05	0.026	5%
10	3.60	0.54		0.32	0.468					1.00	0.15	0.54	0.468	0.08	0.038	7%
11	3.80	0.52		0.31	0.402					1.00	0.20	0.52	0.402	0.10	0.042	7%
12	4.00	0.50		0.30	0.471					1.00	0.20	0.50	0.471	0.10	0.047	8%
13	4.20	0.42		0.25	0.458					1.00	0.20	0.42	0.458	0.08	0.038	7%
14	4.40	0.42		0.25	0.460					1.00	0.20	0.42	0.460	0.08	0.039	7%
15	4.60	0.40		0.24	0.495					1.00	0.20	0.40	0.495	0.08	0.040	7%
16	4.80	0.37		0.22	0.476					1.00	0.20	0.37	0.476	0.07	0.035	6%
17	5.00	0.34		0.20	0.510					1.00	0.20	0.34	0.510	0.07	0.035	6%
18	5.20	0.33		0.20	0.380					1.00	0.20	0.33	0.380	0.07	0.025	4%
19	5.40	0.33		0.20	0.149					1.00	0.20	0.33	0.149	0.07	0.010	2%
20	5.60	0.27		0.16	0.018					1.00	0.20	0.27	0.018	0.05	0.001	0%
LB	5.80	0.00	0.00		0.000		0.000		0.000	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.565</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
approx 50 m DS of station

Meas. Start Time (MST):	8:45
Meas. End Time (MST):	9:05
Equipment:	ADV
Method:	Wading
River Condition:	Open
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm

### Flow characteristics:

Total Flow:	0.565	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	1.40	(m <sup>2</sup> )
Wetted Width:	3.80	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.40	(m/s)
Froude Number:	0.21	

### Logger Details:

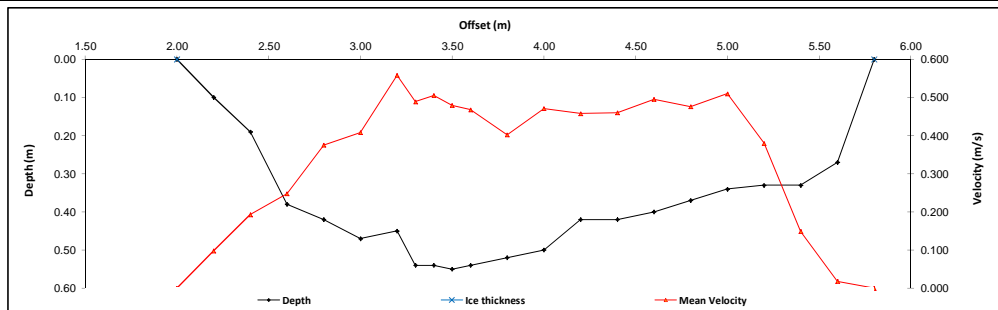
	Before	After
Transducer Reading (m):	1.050	1.050
Water (°C):	7.5	7.8
Datalogger Clock:	08:03	09:21
Laptop Clock:	08:04	09:22
Battery (Main):	14.3	13.8
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

-installed modem (s/n: 1220686231)  
-omni antenna used at station, RSSI checked: -98

### General Notes:

-ran adv test, all results good



Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Station</b>						
<b>Benchmark</b>						
S65-01	0.583	100.583		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.851	99.732	0.000	3/4" Pipe 5m SW of logger
S65-03			0.961	99.622	0.000	3/4" Pipe 6m W of logger
Water Level:	Cut	0.029	2.652	97.960	Time WL Surveyed: 8:35	
Temporary BM			2.652	97.931	0.000	
<b>Turn</b>						
Temporary BM	2.604	100.535		97.931		
Water Level:	Cut	0.029	2.604	97.960	Time WL Surveyed: 8:36	
S65-03			0.911	99.624		3/4" Pipe 6m W of logger
S65-02			0.800	99.735		3/4" Pipe 5m SW of logger
S65-01			0.533	100.002	100.000	3/4" Pipe 5m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S65-03	0.912	100.535		99.623		
Water Level:	Cut	0.039	2.612	97.962	Time WL Surveyed: 9:10	
Water Level:	Cut	0.039	2.553	97.962	Time WL Surveyed: 9:13	
S65-03	0.853	100.476		99.623		

WL Survey Summary	Before	After
Average WL:	97.960	97.962
Closing Error:	-0.002	-
WL Check:	0.000	0.000
Transducer Elevation	96.910	96.912

Field Personnel:	TR, NC	Trip Date:	11-Jun-14
Data Entry Personnel:	TR, NC	Date:	11-Jun-14
Data Check Personnel:	CJ	Date:	17-Jul-14
Entered Digitally in the Field:	Yes		



# Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek  
 UTM Location: 489845 E, 6333039 N

Site Visit Date: August 11, 2014  
 Site Visit Time (MST): 09:00

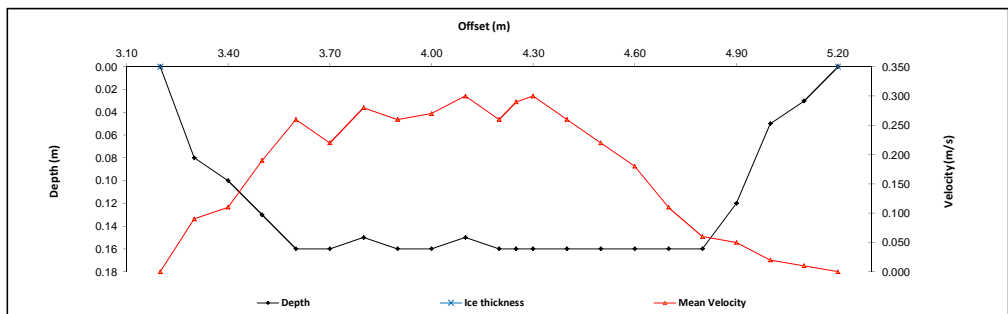


Measured Data								Calculated Data								
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	5.20	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	5.10	0.03		0.02	0.010					1.00	0.10	0.03	0.010	0.00	0.000	0%
2	5.00	0.05		0.03	0.020					1.00	0.10	0.05	0.020	0.00	0.000	0%
3	4.90	0.12		0.07	0.050					1.00	0.10	0.12	0.050	0.01	0.001	1%
4	4.80	0.16		0.10	0.060					1.00	0.10	0.16	0.060	0.02	0.001	2%
5	4.70	0.16		0.10	0.110					1.00	0.10	0.16	0.110	0.02	0.002	3%
6	4.60	0.16		0.10	0.180					1.00	0.10	0.16	0.180	0.02	0.003	6%
7	4.50	0.16		0.10	0.220					1.00	0.10	0.16	0.220	0.02	0.004	7%
8	4.40	0.16		0.10	0.260					1.00	0.10	0.16	0.260	0.02	0.004	8%
9	4.30	0.16		0.10	0.300					1.00	0.07	0.16	0.300	0.01	0.004	7%
10	4.25	0.16		0.10	0.290					1.00	0.05	0.16	0.290	0.01	0.002	4%
11	4.20	0.16		0.10	0.260					1.00	0.07	0.16	0.260	0.01	0.003	6%
12	4.10	0.15		0.09	0.300					1.00	0.10	0.15	0.300	0.02	0.005	9%
13	4.00	0.16		0.10	0.270					1.00	0.10	0.270	0.270	0.02	0.004	8%
14	3.90	0.16		0.10	0.260					1.00	0.10	0.16	0.260	0.02	0.004	8%
15	3.80	0.15		0.09	0.280					1.00	0.10	0.15	0.280	0.01	0.004	8%
16	3.70	0.16		0.10	0.220					1.00	0.10	0.16	0.220	0.02	0.004	7%
17	3.60	0.16		0.10	0.260					1.00	0.10	0.16	0.260	0.02	0.004	8%
18	3.50	0.13		0.08	0.190					1.00	0.10	0.13	0.190	0.01	0.002	5%
19	3.40	0.10		0.06	0.110					1.00	0.10	0.10	0.110	0.01	0.001	2%
20	3.30	0.08		0.05	0.090					1.00	0.10	0.08	0.090	0.01	0.001	1%
LB	3.20	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.052</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -50m downstream of station

Meas. Start Time (MST):	9:46
Meas. End Time (MST):	10:08
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 25C



**Flow characteristics:**

Total Flow:	0.052	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.26	(m <sup>2</sup> )
Wetted Width:	2.00	(m)
Hydraulic Depth:	0.13	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.18	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.611	0.611
Water (°C):	14.4	14.6
Datalogger Clock:	09:24	10:15
Laptop Clock:	09:24	10:16
Battery (Main):	13.8	13.7
Battery:	-	Good
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- replaced modem s/n: 1250759451
- uploaded new logger program

**General Notes:**

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S65-01	0.480	100.480		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.748	99.732	0.000	3/4" Pipe 5m SW of logger
S65-03			0.861	99.619	0.000	3/4" Pipe 6m W of logger
Water Level:	Cut	2.981		97.499	Time WL Surveyed: 9:33	
S65-03			0.861	99.619	0.000	3/4" Pipe 6m W of logger
<b>Turn</b>						
S65-03	0.868	100.487		99.619		3/4" Pipe 6m W of logger
Water Level:	Cut		2.986	97.501	Time WL Surveyed: 9:41	
S65-03			0.868	99.619		3/4" Pipe 6m W of logger
S65-02			0.757	99.730		3/4" Pipe 5m SW of logger
S65-01			0.489	99.998	100.000	3/4" Pipe 5m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S65-03	0.860	100.479		99.619		
Water Level:	Cut	0.539	3.517	97.501	Time WL Surveyed: 10:10	
S65-03	0.847	100.466		99.619	Time WL Surveyed: 10:12	

**WL Survey Summary**

	Before	After
Average WL:	97.500	97.500
Closing Error:	0.002	-
WL Check:	0.002	0.002
Transducer Elevation	96.889	96.889

**Field Personnel:**

	TR, MP	Trip Date:	11-Aug-14
Data Entry Personnel:	TR	Date:	11-Aug-14
Data Check Personnel:	MP	Date:	4-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek  
 UTM Location: 489845 E, 6333039 N

Site Visit Date: September 20, 2014  
 Site Visit Time (MST): 07:45



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m²)	Pannel Discharge (m³/s)	Percent of total flow (%)
RB	0.50	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.60	0.04		0.02	0.185					1.00	0.10	0.04	0.185	0.00	0.001	3%
2	0.70	0.08		0.05	0.179					1.00	0.10	0.08	0.179	0.01	0.001	6%
3	0.80	0.08		0.05	0.183					1.00	0.08	0.08	0.183	0.01	0.001	5%
4	0.85	0.08		0.05	0.170					1.00	0.05	0.08	0.170	0.00	0.001	3%
5	0.90	0.10		0.06	0.200					1.00	0.05	0.10	0.200	0.01	0.001	4%
6	0.95	0.10		0.06	0.260					1.00	0.05	0.10	0.260	0.00	0.001	5%
7	1.00	0.11		0.07	0.252					1.00	0.05	0.11	0.252	0.01	0.001	6%
8	1.05	0.12		0.07	0.236					1.00	0.05	0.12	0.236	0.01	0.001	6%
9	1.10	0.12		0.07	0.235					1.00	0.05	0.12	0.235	0.01	0.001	6%
10	1.15	0.12		0.07	0.247					1.00	0.05	0.12	0.247	0.01	0.001	6%
11	1.20	0.10		0.06	0.280					1.00	0.05	0.10	0.280	0.01	0.001	6%
12	1.25	0.10		0.06	0.296					1.00	0.05	0.10	0.296	0.00	0.001	6%
13	1.30	0.08		0.05	0.289					1.00	0.05	0.08	0.289	0.00	0.001	5%
14	1.35	0.10		0.06	0.247					1.00	0.05	0.10	0.247	0.00	0.001	5%
15	1.40	0.10		0.06	0.274					1.00	0.05	0.10	0.274	0.00	0.001	6%
16	1.45	0.10		0.06	0.268					1.00	0.05	0.10	0.268	0.01	0.001	5%
17	1.50	0.09		0.05	0.236					1.00	0.05	0.09	0.236	0.00	0.001	4%
18	1.55	0.09		0.05	0.170					1.00	0.05	0.09	0.170	0.00	0.001	3%
19	1.60	0.08		0.05	0.240					1.00	0.07	0.08	0.240	0.01	0.001	6%
20	1.70	0.08		0.05	0.175					1.00	0.10	0.08	0.175	0.01	0.001	6%
21	1.80	0.06		0.04	0.023					1.00	0.10	0.06	0.023	0.01	0.000	1%
LB	1.90	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.025</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -20m US of bridge

Meas. Start Time (MST):	8:11
Meas. End Time (MST):	8:30
Equipment:	ADV
Method:	Wading
River Condition:	Moderate flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, 15C

**Flow characteristics:**

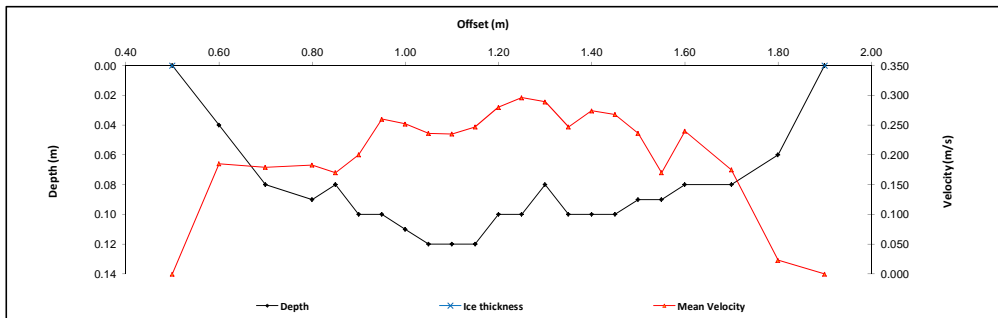
Total Flow:	0.025	(m³/s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.11	(m²)
Wetted Width:	1.40	(m)
Hydraulic Depth:	0.08	(m)
Mean Velocity:	0.22	(m/s)
Froude Number:	0.24	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.566	0.568
Water (°C):	8.7	8.7
Datalogger Clock:	07:53	08:35
Laptop Clock:	07:54	08:36
Battery (Main):	14.6	14.5
Battery:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S65-01	0.416	100.416		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.686	99.730	0.000	3/4" Pipe 5m SW of logger
S65-03			0.797	99.619	0.000	3/4" Pipe 6m W of logger
Water Level:	Cut	0.440	3.404	97.452	Time WL Surveyed: 8:03	
Temporary BM			3.404	97.012	0.000	
<b>Turn</b>						
Temporary BM	3.385	100.397		97.012		
Water Level:	Cut	0.440	3.385	97.452	Time WL Surveyed: 8:05	
S65-03			0.778	99.619		3/4" Pipe 6m W of logger
S65-02			0.667	99.730		3/4" Pipe 5m SW of logger
S65-01			0.398	99.999	100.000	3/4" Pipe 5m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S65-03	0.778	100.397		99.619		
Water Level:	Cut	0.450	3.385	97.462	Time WL Surveyed: 8:33	
Water Level:	Cut	0.450	3.363	97.461	Time WL Surveyed: 8:35	
S65-03	0.755	100.374		99.619		

**WL Survey Summary**

	Before	After
Average WL:	97.452	97.462
Closing Error:	0.001	-
WL Check:	0.000	0.001
Transducer Elevation	96.886	96.894

**Field Personnel:**

Data Entry Personnel:	MP, SM	Trip Date:	20-Sep-14
Data Check Personnel:	MP, SM	Date:	20-Sep-14
Entered Digitally in the Field:	MP	Date:	3-Oct-14

# Hydrometric Measurement / Site Visit Record

Site: S65 North Green Stockings Creek

UTM Location:

Site Visit Date:

October 21, 2014

Site Visit Time (MST):

07:49

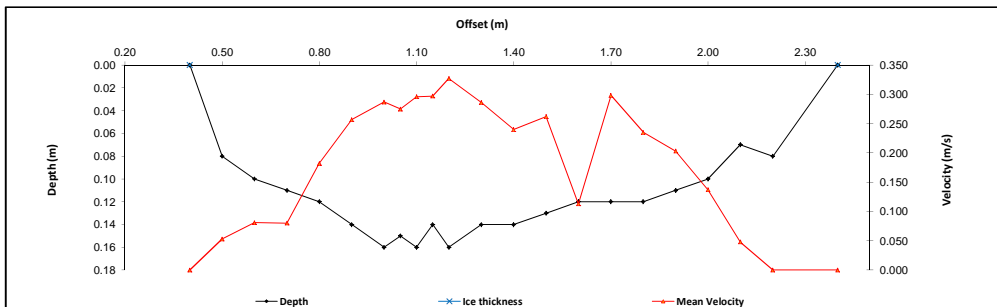


Measured Data										Calculated Data						
Bank/ Mmnt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	0.40	0.00	0.00		0.000		0.000		0.000	1.00	0.05	0.00	0.000	0.00	0.000	
1	0.50	0.08		0.05	0.053					1.00	0.10	0.08	0.053	0.01	0.000	1%
2	0.60	0.10		0.06	0.061					1.00	0.10	0.10	0.061	0.01	0.001	2%
3	0.70	0.11		0.07	0.080					1.00	0.10	0.11	0.080	0.01	0.001	2%
4	0.80	0.12		0.07	0.182					1.00	0.10	0.12	0.182	0.01	0.002	5%
5	0.90	0.14		0.08	0.257					1.00	0.10	0.14	0.257	0.01	0.004	8%
6	1.00	0.16		0.10	0.287					1.00	0.08	0.16	0.287	0.01	0.003	8%
7	1.05	0.15		0.09	0.275					1.00	0.05	0.15	0.275	0.01	0.002	5%
8	1.10	0.16		0.10	0.296					1.00	0.05	0.16	0.296	0.01	0.002	5%
9	1.15	0.14		0.08	0.297					1.00	0.05	0.14	0.297	0.01	0.002	5%
10	1.20	0.16		0.10	0.327					1.00	0.08	0.16	0.327	0.01	0.004	9%
11	1.30	0.14		0.08	0.286					1.00	0.10	0.14	0.286	0.01	0.004	9%
12	1.40	0.14		0.08	0.240					1.00	0.10	0.14	0.240	0.01	0.003	8%
13	1.50	0.13		0.08	0.262					1.00	0.10	0.13	0.262	0.01	0.003	8%
14	1.60	0.12		0.07	0.113					1.00	0.10	0.12	0.113	0.01	0.001	3%
15	1.70	0.12		0.07	0.298					1.00	0.10	0.12	0.298	0.01	0.004	8%
16	1.80	0.12		0.07	0.235					1.00	0.10	0.12	0.235	0.01	0.003	6%
17	1.90	0.11		0.07	0.203					1.00	0.10	0.11	0.203	0.01	0.002	5%
18	2.00	0.10		0.06	0.137					1.00	0.10	0.10	0.137	0.01	0.001	3%
19	2.10	0.07		0.04	0.048					1.00	0.10	0.07	0.048	0.01	0.000	1%
20	2.20	0.08		0.05	0.000					1.00	0.15	0.08	0.000	0.01	0.000	0%
LB	2.40	0.00	0.00		0.00		0.00		0.00	1.00	0.10	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>0.044</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
-15m DS from station

Meas. Start Time (MST):	8:05
Meas. End Time (MST):	8:26
Equipment:	ADV
Method:	Wading
River Condition:	Open and flowing
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, 8C



**Flow characteristics:**

Total Flow:	0.044	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	0.22	(m <sup>2</sup> )
Wetted Width:	2.00	(m)
Hydraulic Depth:	0.11	(m)
Mean Velocity:	0.20	(m/s)
Froude Number:	0.20	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.569	0.599
Water (°C):	8.7	5.5
Datalogger Clock:	07:52	08:33
Laptop Clock:	07:53	08:34
Battery (Main):	12.5	12.8
Battery:		Good
Battery Serial #:	-	-
Enclosure Deseccant:	-	Replaced
Vent Tube Deseccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

- ADV test passed
- Pressure transducer moved slightly deeper

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S65-01	0.442	100.442		100.000	100.000	3/4" Pipe 5m S of logger
S65-02			0.708	99.734	0.000	3/4" Pipe 5m SW of logger
S65-03			0.819	99.623	0.000	3/4" Pipe 6m W of logger
Water Level:	Cut	0.488	3.437	97.493	Time WL Surveyed:	7:59
Temporary BM			3.437	97.005	0.000	
<b>Turn</b>						
Temporary BM	3.418	100.423		97.005		
Water Level:	Cut	0.488	3.418	97.493	Time WL Surveyed:	8:01
S65-03			0.800	99.623		3/4" Pipe 6m W of logger
S65-02			0.688	99.735		3/4" Pipe 5m SW of logger
S65-01			0.422	100.001	100.000	3/4" Pipe 5m S of logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S65-03	0.800	100.423		99.623		
Water Level:	Cut	0.461	3.393	97.491	Time WL Surveyed:	8:29
Water Level:	Cut	0.461	3.408	97.491	Time WL Surveyed:	8:31
S65-03	0.815	100.438		99.623		

**WL Survey Summary**

	Before	After
Average WL:	97.493	97.491
Closing Error:	-0.001	-
WL Check:	0.000	0.000
Transducer Elevation	96.924	96.992

**Field Personnel:**

Data Entry Personnel:	GG, TR	Trip Date:	21-Oct-14
Data Check Personnel:	GG	Date:	21-Oct-14
Entered Digitally in the Field:	MP	Date:	27-Oct-14

# Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence  
 UTM Location: 491458 E, 6302625 N

Site Visit Date: May 23, 2014  
 Site Visit Time (MST): 12:30



Measured Data										Calculated Data						
Bank/ Mmt#	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	8.00	0.00	0.00		0.000		0.000		0.000	1.00	0.75	0.00	0.000	0.00	0.000	
1	9.50	0.60		0.36	0.406					1.00	1.50	0.60	0.406	0.90	0.365	3%
2	11.00	0.57		0.34	0.622					1.00	1.25	0.57	0.622	0.71	0.443	3%
3	12.00	0.80				0.64	0.476	0.16	1.012	1.00	1.00	0.80	0.57	0.80	0.595	5%
4	13.00	0.80				0.64	0.664	0.16	0.745	1.00	1.00	0.80	0.744	0.80	0.564	4%
5	14.00	0.90				0.72	0.540	0.18	1.101	1.00	1.00	0.90	0.821	0.90	0.738	6%
6	15.00	1.00				0.80	0.700	0.20	0.844	1.00	1.00	1.00	0.772	1.00	0.772	6%
7	16.00	1.00				0.80	0.516	0.20	0.629	1.00	1.00	1.00	0.573	1.00	0.573	4%
8	17.00	1.00				0.80	0.725	0.20	0.946	1.00	1.00	1.00	0.836	1.00	0.836	6%
9	18.00	1.10				0.88	0.799	0.22	0.696	1.00	1.00	1.10	0.748	1.10	0.822	6%
10	19.00	1.20				0.96	0.658	0.24	0.692	1.00	1.00	1.20	0.675	1.20	0.810	6%
11	20.00	1.06				0.85	0.747	0.21	0.692	1.00	1.00	1.06	0.720	1.06	0.763	6%
12	21.00	1.16				0.93	0.569	0.23	0.968	1.00	1.00	1.16	0.769	1.16	0.891	7%
13	22.00	1.16				0.93	0.604	0.23	0.798	1.00	1.00	1.16	0.701	1.16	0.813	6%
14	23.00	1.28				1.02	0.550	0.26	0.953	1.00	1.00	1.28	0.752	1.28	0.962	7%
15	24.00	1.24				0.99	0.345	0.25	1.020	1.00	1.00	1.24	0.683	1.24	0.846	6%
16	25.00	1.17				0.94	0.569	0.23	0.857	1.00	1.00	1.17	0.713	1.17	0.834	6%
17	26.00	1.20				0.96	0.423	0.24	0.561	1.00	1.00	1.20	0.492	1.20	0.590	5%
18	27.00	1.05				0.84	0.331	0.21	0.331	1.00	1.00	1.05	0.331	1.05	0.348	3%
19	28.00	0.92				0.84	0.245	0.18	0.294	1.00	1.50	0.92	0.270	1.38	0.372	3%
20	30.00	0.46		0.28	0.200					1.00	1.30	0.46	0.200	0.60	0.120	1%
RB	30.60		0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>13.1</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -5m US of station

Meas. Start Time (MST):	13:55
Meas. End Time (MST):	14:55
Equipment:	ADV
Method:	Fishcat
River Condition:	Medium-high flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Clear, calm, 27C

**Flow characteristics:**

Total Flow:	13.1	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	20.71	(m <sup>2</sup> )
Wetted Width:	22.60	(m)
Hydraulic Depth:	0.92	(m)
Mean Velocity:	0.63	(m/s)
Froude Number:	0.21	

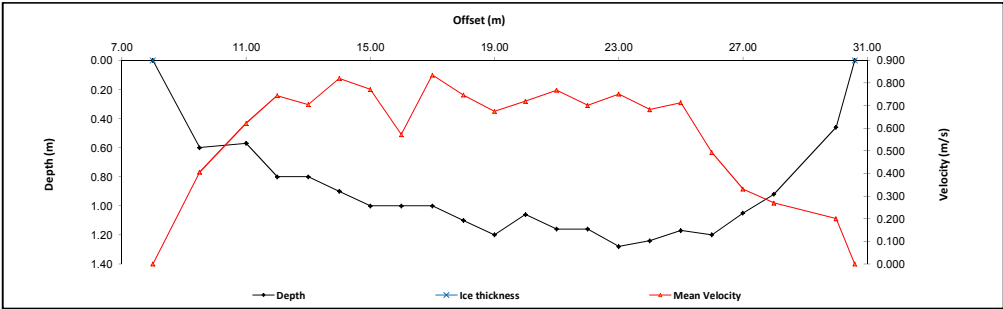
**Logger Details:**

	Before	After
Transducer Reading (m):	1.017	1.024
Water (°C):	11.2	12.0
Datalogger Clock:	12:41	15:16
Laptop Clock:	12:41	15:16
Battery:	12.9	13.0
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	New	
Vent Tube Dessiccant:	New	
PT# (if replaced):	-	-
Logger# (if replaced):	12686	-

**Datalogger / Station Notes:**

-installed station: data logger enclosure on a 2" Pipe mast. Needs GOES telemetry to be installed at later date. Attach additional weights to PT on future visit.

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S66-01	0.899	100.899		100.000	100.000	Bolt in Tree 10 E from Logger
S66-02			0.779	100.120	0.000	Bolt in Tree 12 N from Logger
S66-03			1.315	99.584	0.000	3/4" Pipe 5 m NW from Logger
Water Level:	Cut		2.699	98.200		Time WL Surveyed: 13:52
S66-04			1.381	99.518	0.000	3/4" Pipe 7 m West from Logger
<b>Turn</b>						
S66-04	1.365	100.883		99.518		3/4" Pipe 7 m West from Logger
Water Level:	Cut		2.679	98.204		Time WL Surveyed: 13:54
S66-03			1.365	99.518		
S66-03			1.299	99.584		3/4" Pipe 5 m NW from Logger
S66-02			0.763	100.120		Bolt in Tree 12 N from Logger
S66-01			0.883	100.000	100.000	Bolt in Tree 10 E from Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S66-04	1.365	100.883		99.518		
Water Level:	Cut		2.685	98.198		Time WL Surveyed: 15:08
Water Level:	Cut		2.676	98.194		Time WL Surveyed: 15:09
S66-04	1.352	100.870		99.518		

**WL Survey Summary**

	Before	After
Average WL:	98.202	98.196
Closing Error:	0.000	-
WL Check:	0.004	0.004
Transducer Elevation	97.185	97.172

**Field Personnel:**

SM, C.J. GG	Trip Date:	23-May-14
Data Entry Personnel: SM	Date:	23-May-14
Data Check Personnel: C.J.	Date:	3-Jun-13
Entered Digitally in the Field: Yes		

# Hydrometric Measurement / Site Visit Record

Site: S66 Middle Steepbank River  
 UTM Location: 491458 E, 6302625 N

Site Visit Date: June 17, 2014  
 Site Visit Time (MST): 16:10



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	16.00	0.00	0.00		0.000		0.000		0.000	1.00	0.50	0.00	0.000	0.00	0.000	
1	17.00	0.42		0.25	0.323	0.64	0.391	0.16	0.445	1.00	1.50	0.42	0.323	0.63	0.203	1%
2	19.00	0.80				0.76	0.390	0.19	0.542	1.00	2.00	0.80	0.418	1.60	0.669	4%
3	21.00	0.95				0.75	0.771	0.19	0.791	1.00	1.50	0.95	0.466	1.43	0.664	4%
4	22.00	0.94				1.00	0.722	0.25	0.978	1.00	1.00	0.94	0.781	0.94	0.734	4%
5	23.00	1.25				1.06	0.530	0.27	1.019	1.00	1.00	1.25	0.850	1.25	1.063	6%
6	24.00	1.33				1.08	0.609	0.27	1.008	1.00	1.00	1.33	0.775	1.33	1.030	6%
7	25.00	1.35				1.00	0.411	0.25	1.056	1.00	1.00	1.25	0.734	1.25	0.917	5%
8	26.00	1.25				1.01	0.516	0.25	1.007	1.00	1.00	1.26	0.762	1.26	0.959	6%
9	27.00	1.26				0.94	0.700	0.23	1.100	1.00	1.00	1.17	0.900	1.17	1.053	6%
10	28.00	1.17				0.91	0.570	0.23	1.120	1.00	1.00	1.14	0.845	1.14	0.963	6%
11	29.00	1.14				0.90	0.700	0.22	1.220	1.00	1.00	1.12	0.960	1.12	1.075	6%
12	30.00	1.12				0.87	0.180	0.22	1.230	1.00	1.00	1.09	0.705	1.09	0.768	5%
13	31.00	1.09				0.77	0.460	0.19	1.170	1.00	1.00	0.96	0.815	0.96	0.782	5%
14	32.00	0.96				0.74	0.930	0.18	1.300	1.00	1.00	0.92	1.115	0.92	1.026	6%
15	33.00	0.92				0.62	1.110	0.16	1.300	1.00	1.00	0.78	1.205	0.78	0.940	6%
16	34.00	0.78								1.00	1.00	0.66	1.110	0.66	0.733	4%
17	35.00	0.66		0.40	1.110					1.00	1.00	0.72	1.180	0.72	0.850	5%
18	36.00	0.72		0.43	1.180					1.00	1.00	0.57	1.120	0.57	0.638	4%
19	37.00	0.57		0.34	1.120					1.00	1.00	0.62	0.850	0.62	0.527	3%
20	38.00	0.62		0.37	0.850					1.00	0.70	0.62	0.620	0.43	0.269	2%
21	39.00	0.62		0.37	0.620					1.00	0.20	0.00	0.000	0.00	0.000	
LB	39.40	0.00	0.00		0.00		0.00		0.00	1.00	0.20	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>17.0</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
5m upstream of station

Mess. Start Time (MST):	17:20
Mess. End Time (MST):	18:25
Equipment:	ADV
Method:	Boat
River Condition:	High
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, 18C

**Flow characteristics:**

Total Flow:	17.0	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	21.22	(m <sup>2</sup> )
Wetted Width:	23.40	(m)
Hydraulic Depth:	0.91	(m)
Mean Velocity:	0.80	(m/s)
Froude Number:	0.27	

**Logger Details:**

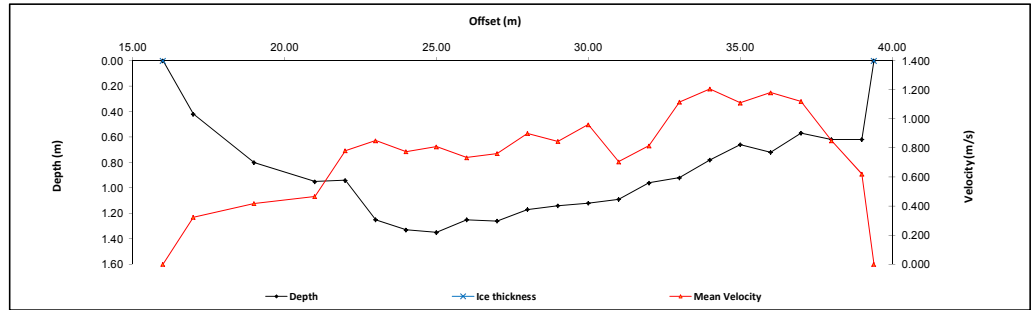
	Before	After
Transducer Reading (m):	1.039	1.033
Water (°C):	14.7	14.7
Datalogger Clock:	16:15	18:30
Laptop Clock:	16:14	18:30
Battery:	12.4	12.7
Battery Condition:		Replaced
Battery Serial #:	-	-
Enclosure Desiccant:		Replaced
Vent Tube Desiccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- Moved BM 1 and 2 as they were installed at an angle in the trees, straightened them
- BM2 setup 1 survey reading (pre-move): 0.958m
- BM3 setup 1 survey reading (pre-move): 1.082m

**General Notes:**

- rocks causing eddy effects in channel
- ADC not working properly, switched to ADV at offsets 27m - 17m
- PT was repositioned



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S66-04	1.557	101.075		99.518	99.518	3/4" Pipe 7 m West from Logger
S66-01			0.897	100.178		Bolt in Tree 10 E from Logger
S66-02			1.011	100.064		Bolt in Tree 12 N from Logger
S66-03			1.494	99.581	99.584	3/4" Pipe 5 m NW from Logger
Water Level:	Cut		2.793	98.282	<b>Time WL Surveyed:</b> 16:20	
Temporary BM			2.691	98.384	99.518	3/4" Pipe 7 m West from Logger
<b>Turn</b>						
Temporary BM	2.656	101.040		98.384	99.518	3/4" Pipe 7 m West from Logger
Water Level:	Cut		2.757	98.283	<b>Time WL Surveyed:</b> 18:25	
S66-03			1.458	99.582	99.584	3/4" Pipe 5 m NW from Logger
S66-02			0.976	100.064		Bolt in Tree 12 N from Logger
S66-01			0.862	100.178		Bolt in Tree 10 E from Logger
S66-04			1.520	99.520	99.518	3/4" Pipe 7 m West from Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S66-03	1.455	101.037		99.582		
Water Level:	Cut		2.753	98.284	<b>Time WL Surveyed:</b> 18:47	
Water Level:	Cut		2.731	98.284	<b>Time WL Surveyed:</b> 18:49	
S66-03	1.433	101.015		99.582		

**WL Survey Summary**

	Before	After
Average WL:	98.283	98.284
Closing Error:	-0.002	-
WL Check:	0.001	0.000
Transducer Elevation	97.244	97.251

**Field Personnel:**

	DW, MP	Trip Date:	17-Jun-14
Data Entry Personnel:	MP	Date:	17-Jun-14
Data Check Personnel:	CJ	Date:	17-Jul-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S66 Middle Steepbank River  
 UTM Location: 491458 E, 6302625 N

Site Visit Date: August 9, 2014  
 Site Visit Time (MST): 08:15



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	27.30	0.00	0.00		0.000		0.000		0.000	1.00	0.35	0.00	0.000	0.00	0.000	
1	28.00	0.10		0.06	0.077					1.00	0.85	0.10	0.077	0.09	0.007	0%
2	29.00	0.27		0.16	0.150					1.00	1.00	0.27	0.150	0.27	0.041	2%
3	30.00	0.30		0.18	0.225					1.00	1.00	0.30	0.225	0.30	0.068	3%
4	31.00	0.45		0.27	0.172					1.00	1.00	0.45	0.172	0.45	0.077	3%
5	32.00	0.50		0.30	0.219					1.00	0.75	0.50	0.219	0.38	0.082	4%
6	32.50	0.67		0.40	0.265					1.00	0.50	0.67	0.265	0.34	0.089	4%
7	33.00	0.70		0.42	0.323					1.00	0.50	0.70	0.323	0.35	0.113	5%
8	33.50	0.73		0.44	0.222					1.00	0.50	0.73	0.222	0.37	0.081	3%
9	34.00	0.63		0.38	0.318					1.00	0.50	0.63	0.318	0.32	0.100	4%
10	34.50	0.70		0.42	0.388					1.00	0.50	0.70	0.388	0.35	0.136	6%
11	35.00	0.52		0.31	0.305					1.00	0.50	0.52	0.305	0.26	0.079	3%
12	35.50	0.63		0.38	0.152					1.00	0.50	0.63	0.152	0.32	0.048	2%
13	36.00	0.48		0.29	0.276					1.00	0.50	0.48	0.276	0.24	0.066	3%
14	36.50	0.50		0.30	0.325					1.00	0.50	0.50	0.325	0.25	0.081	3%
15	37.00	0.46		0.28	0.255					1.00	0.75	0.46	0.255	0.35	0.088	4%
16	38.00	0.60		0.36	0.341					1.00	1.00	0.60	0.341	0.60	0.205	9%
17	39.00	0.59		0.35	0.368					1.00	1.00	0.59	0.368	0.59	0.217	9%
18	40.00	0.53		0.32	0.292					1.00	1.00	0.53	0.292	0.53	0.155	7%
19	41.00	0.46		0.28	0.362					1.00	1.00	0.46	0.362	0.46	0.167	7%
20	42.00	0.38		0.23	0.395					1.00	1.00	0.38	0.395	0.38	0.150	6%
21	43.00	0.28		0.17	0.383					1.00	1.00	0.28	0.383	0.28	0.107	5%
22	44.00	0.30		0.18	0.350					1.00	1.00	0.30	0.350	0.30	0.105	5%
23	45.00	0.26		0.16	0.330					1.00	0.75	0.26	0.330	0.20	0.064	3%
LB	45.50	0.00	0.00		0.000		0.000		0.000	1.00	0.25	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>2.33</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe): adjacent to station

Meas. Start Time (MST):	8:47
Meas. End Time (MST):	9:14
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, calm, 15 C

**Flow characteristics:**

Total Flow:	2.33	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.94	(m <sup>2</sup> )
Wetted Width:	18.20	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.29	(m/s)
Froude Number:	0.14	

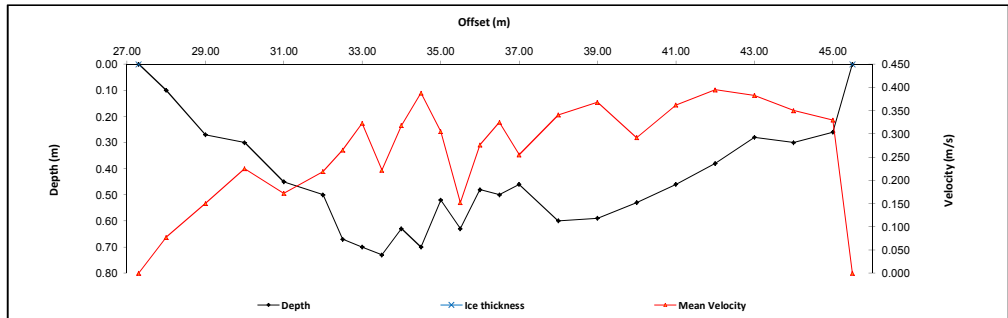
**Logger Details:**

	Before	After
Transducer Reading (m):	0.355	0.354
Water (°C):	16.2	16.8
Datalogger Clock:	08:26	11:42
Laptop Clock:	08:26	11:42
Battery:	13.0	14.3
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessicant:	Replaced	
Vent Tube Dessicant:	Good	
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

-installed cabledway 5m upstream of station

**General Notes:**



**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S66-04	1.394	100.913		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-03			1.329	99.584	99.583	3/4" Pipe 5 m NW from Logger
S66-01			0.735	100.178	100.177	Bolt in Tree 10 E from Logger
<b>Water Level:</b>						
	Cut		3.245	97.668		Time WL Surveyed: 11:35
S66-02			0.850	100.063	100.064	Bolt in Tree 12 N from Logger
<b>Turn</b>						
S66-02	0.834	100.897		100.063	100.064	Bolt in Tree 12 N from Logger
<b>Water Level:</b>						
	Cut		3.229	97.668		Time WL Surveyed: 11:37
S66-01			0.720	100.177	100.177	Bolt in Tree 10 E from Logger
S66-03			1.313	99.584	99.583	3/4" Pipe 5 m NW from Logger
S66-04			1.378	99.519	99.519	3/4" Pipe 7 m West from Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
<b>Water Level:</b>						
	Cut					Time WL Surveyed:
	Cut					Time WL Surveyed:

**WL Survey Summary**

	Before	After
Average WL:	97.668	-
Closing Error:	0.000	-
WL Check:	0.000	-
Transducer Elevation	97.313	-

**Field Personnel:**

	CJ, MP	Trip Date:	9-Aug-14
Data Entry Personnel:	CJ	Date:	9-Aug-14
Data Check Personnel:	CJ	Date:	4-Sep-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence  
 UTM Location: 491458 E, 6302625 N

Site Visit Date: September 15, 2014  
 Site Visit Time (MST): 15:13

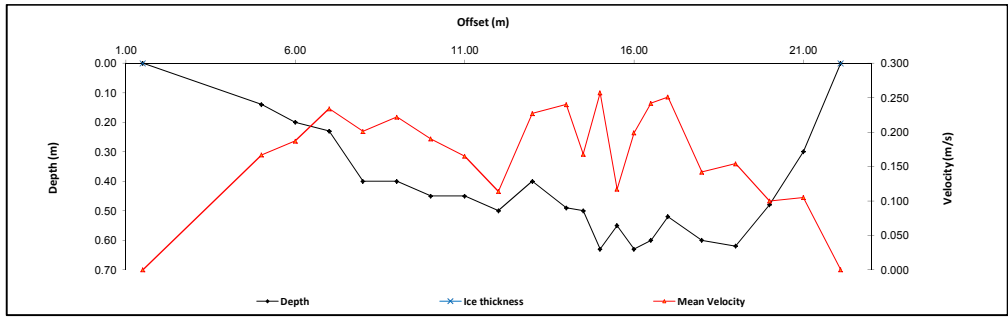


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	22.10	0.00	0.00		0.000		0.000		0.000	1.00	0.55	0.00	0.000	0.00	0.000	
1	21.00	0.30		0.18	0.105					1.00	1.05	0.30	0.105	0.32	0.033	2%
2	20.00	0.48		0.29	0.100					1.00	1.00	0.48	0.100	0.48	0.048	4%
3	19.00	0.62		0.37	0.154					1.00	1.00	0.62	0.154	0.62	0.095	7%
4	18.00	0.60		0.36	0.142					1.00	1.00	0.60	0.142	0.60	0.085	6%
5	17.00	0.52		0.31	0.251					1.00	0.75	0.52	0.251	0.39	0.098	7%
6	16.50	0.60		0.36	0.242					1.00	0.50	0.60	0.242	0.30	0.073	5%
7	16.00	0.63		0.38	0.199					1.00	0.50	0.63	0.199	0.32	0.063	5%
8	15.50	0.55		0.33	0.117					1.00	0.50	0.55	0.117	0.28	0.032	2%
9	15.00	0.63		0.38	0.257					1.00	0.50	0.63	0.257	0.32	0.081	6%
10	14.50	0.50		0.30	0.168					1.00	0.50	0.50	0.168	0.25	0.042	3%
11	14.00	0.49		0.29	0.240					1.00	0.75	0.49	0.240	0.37	0.088	6%
12	13.00	0.40		0.24	0.227					1.00	1.00	0.40	0.227	0.40	0.091	7%
13	12.00	0.50		0.30	0.114					1.00	1.00	0.50	0.114	0.50	0.057	4%
14	11.00	0.45		0.27	0.165					1.00	1.00	0.45	0.165	0.45	0.074	5%
15	10.00	0.45		0.27	0.190					1.00	1.00	0.45	0.190	0.45	0.086	6%
16	9.00	0.40		0.24	0.222					1.00	1.00	0.40	0.222	0.40	0.089	7%
17	8.00	0.40		0.24	0.201					1.00	1.00	0.40	0.201	0.40	0.080	6%
18	7.00	0.23		0.14	0.234					1.00	1.00	0.23	0.234	0.23	0.054	4%
19	6.00	0.20		0.12	0.187					1.00	1.00	0.20	0.187	0.20	0.037	3%
20	5.00	0.14		0.08	0.167					1.00	2.25	0.14	0.167	0.32	0.053	4%
LB	1.50	0.00	0.00		0.00		0.00		0.00	1.00	1.75	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>1.36</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -At cableway

Meas. Start Time (MST):	15:30
Meas. End Time (MST):	16:00
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Partial cloud, calm, 15 C



**Flow characteristics:**

Total Flow:	1.36	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	7.57	(m <sup>2</sup> )
Wetted Width:	20.60	(m)
Hydraulic Depth:	0.37	(m)
Mean Velocity:	0.18	(m/s)
Froude Number:	0.09	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.290	0.289
Water (°C):	9.7	9.7
Datalogger Clock:	15:13	16:10
Laptop Clock:	15:14	16:10
Battery:	13.7	13.8
Battery Condition:	Good	
Battery Serial #:	-	-
Enclosure Dessiccant:	Replaced	
Vent Tube Dessiccant:	Good	
PTH# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

**General Notes:**

-Rocks along left bank effecting flows until offset 4.8m

**Level Survey:**

Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S66-04	1.419	100.938		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-01			0.763	100.175	100.177	Bolt in Tree 10 E from Logger
S66-03			1.355	99.583	99.583	3/4" Pipe 5 m NW from Logger
S66-02			0.874	100.064	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut	0.085	3.412	97.611	Time WL Surveyed: 15:23	
Temporary BM			3.412	97.526	0.000	0
<b>Turn</b>						
Temporary BM	3.389	100.915		97.526		
Water Level:	Cut	0.085	3.389	97.611	Time WL Surveyed: 15:24	
S66-02			0.852	100.063	100.064	Bolt in Tree 12 N from Logger
S66-03			1.333	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-01			0.741	100.174	100.177	Bolt in Tree 10 E from Logger
S66-04			1.399	99.516	99.519	3/4" Pipe 7 m West from Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S66-03	1.334	100.917		99.583		
Water Level:	Cut	0.083	3.389	97.611	Time WL Surveyed: 16:06	
Water Level:	Cut	0.083	3.375	97.610	Time WL Surveyed: 16:08	
S66-03	1.319	100.902		99.583		

**WL Survey Summary**

	Before	After
Average WL:	97.611	97.611
Closing Error:	0.003	-
WL Check:	0.000	0.001
Transducer Elevation	97.321	97.322

**Field Personnel:**

	MP, TR	Trip Date:	15-Sep-14
Data Entry Personnel:	MP	Date:	15-Sep-14
Data Check Personnel:	MP	Date:	1-Oct-14
Entered Digitally in the Field:	Yes		

# Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence  
 UTM Location: 491458 E, 6302625 N

Site Visit Date: October 16, 2014  
 Site Visit Time (MST): 07:57

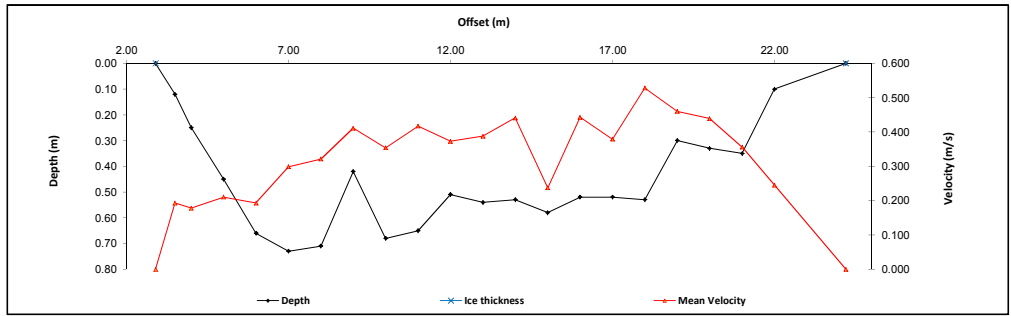


Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.6 Depth (m)	Velocity @ 0.6 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
LB	24.20	0.00	0.00		0.000		0.000		0.000	1.00	1.10	0.00	0.000	0.00	0.000	
1	22.00	0.10		0.06	0.245					1.00	1.60	0.10	0.245	0.16	0.039	1%
2	21.00	0.35		0.21	0.356					1.00	1.00	0.35	0.356	0.35	0.125	4%
3	20.00	0.33		0.20	0.439					1.00	1.00	0.33	0.439	0.33	0.145	4%
4	19.00	0.30		0.18	0.460					1.00	1.00	0.30	0.460	0.30	0.138	4%
5	18.00	0.53		0.32	0.528					1.00	1.00	0.53	0.528	0.53	0.280	8%
6	17.00	0.52		0.31	0.379					1.00	1.00	0.52	0.379	0.52	0.197	6%
7	16.00	0.52		0.31	0.443					1.00	1.00	0.52	0.443	0.52	0.230	7%
8	15.00	0.58		0.35	0.237					1.00	1.00	0.58	0.237	0.58	0.137	4%
9	14.00	0.53		0.32	0.441					1.00	1.00	0.53	0.441	0.53	0.234	7%
10	13.00	0.54		0.32	0.388					1.00	1.00	0.54	0.388	0.54	0.210	6%
11	12.00	0.51		0.31	0.373					1.00	1.00	0.51	0.373	0.51	0.190	6%
12	11.00	0.65		0.39	0.417					1.00	1.00	0.65	0.417	0.65	0.271	8%
13	10.00	0.68		0.41	0.354					1.00	1.00	0.68	0.354	0.68	0.241	7%
14	9.00	0.42		0.25	0.411					1.00	1.00	0.42	0.411	0.42	0.173	5%
15	8.00	0.71		0.43	0.321					1.00	1.00	0.71	0.321	0.71	0.228	7%
16	7.00	0.73		0.44	0.299					1.00	1.00	0.73	0.299	0.73	0.218	7%
17	6.00	0.66		0.40	0.193					1.00	1.00	0.66	0.193	0.66	0.127	4%
18	5.00	0.45		0.27	0.210					1.00	1.00	0.45	0.210	0.45	0.095	3%
19	4.00	0.25		0.15	0.178					1.00	0.75	0.25	0.178	0.19	0.033	1%
20	3.50	0.12		0.07	0.193					1.00	0.55	0.12	0.193	0.07	0.013	0%
RB	2.90	0.00	0.00		0.00		0.00		0.00	1.00	0.30	0.00	0.000	0.00	0.000	
<b>Total Flow</b>														<b>3.32</b>	<b>100%</b>	

**Flow Measurement Details:**

Metering Section Location (describe):  
 -at cableway

Meas. Start Time (MST):	8:32
Meas. End Time (MST):	8:55
Equipment:	ADV
Method:	Wading
River Condition:	Low flow
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Excellent
Weather:	Overcast, 5C



**Flow characteristics:**

Total Flow:	3.32	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Cross Section Area:	9.42	(m <sup>2</sup> )
Wetted Width:	21.30	(m)
Hydraulic Depth:	0.44	(m)
Mean Velocity:	0.35	(m/s)
Froude Number:	0.17	

**Logger Details:**

	Before	After
Transducer Reading (m):	0.430	0.440
Water (°C):	2.9	2.9
Datalogger Clock:	08:01	08:00
Laptop Clock:	08:00	08:59
Battery:	12.6	13.0
Battery Condition:		Good
Battery Serial #:	-	-
Enclosure Deseccant:		Replaced
Vent Tube Deseccant:		Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

**Datalogger / Station Notes:**

- installed GOES telemetry, properly oriented antenna to 227degrees, test run completed, enabled
- covered pressure transducer cable with rocks, to weigh down against high flows/debris

**General Notes:**

Level Survey:	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>						
S66-04	1.445	100.964		99.519	99.519	3/4" Pipe 7 m West from Logger
S66-01			0.787	100.177	100.177	Bolt in Tree 10 E from Logger
S66-03			1.382	99.582	99.583	3/4" Pipe 5 m NW from Logger
S66-02			0.900	100.064	100.064	Bolt in Tree 12 N from Logger
Water Level:	Cut	0.035	3.252	97.747	Time WL Surveyed:	8:21
Temp BM			3.288	97.676	99.519	3/4" Pipe 7 m West from Logger
<b>Turn</b>						
Temp BM	3.271	100.947		97.676	99.519	3/4" Pipe 7 m West from Logger
Water Level:	Cut	0.036	3.237	97.746	Time WL Surveyed:	8:24
S66-02			0.882	100.065	100.064	Bolt in Tree 12 N from Logger
S66-03			1.366	99.581	99.583	3/4" Pipe 5 m NW from Logger
S66-01			0.769	100.178	100.177	Bolt in Tree 10 E from Logger
S66-04			1.428	99.519	99.519	3/4" Pipe 7 m West from Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>						
S66-03	1.367	100.949		99.582		
Water Level:	Cut	0.067	3.271	97.745	Time WL Surveyed:	9:04
Water Level:	Cut	0.067	3.253	97.743	Time WL Surveyed:	9:05
S66-03	1.347	100.929		99.582		

**WL Survey Summary**

	Before	After
Average WL:	97.747	97.744
Closing Error:	0.000	-
WL Check:	0.001	0.002
Transducer Elevation	97.317	97.304

**Field Personnel:**

Data Entry Personnel:	MP, DW	Trip Date:	16-Oct-14
Data Check Personnel:	MP, DW	Date:	16-Oct-14
Entered Digitally in the Field:	MP	Date:	27-Oct-14



# Hydrometric Measurement / Site Visit Record

Site: S66 Steepbank River below North Steepbank Confluence  
 UTM Location: 491458 E, 6302625 N

Site Visit Date: December 4, 2014  
 Site Visit Time (MST): 09:00



Measured Data										Calculated Data						
Bank/ Mmt #	Offset (m)	Depth from bottom to WS (m)	WS to bottom of ice (m)	Depth of Obs. @ 0.5 Depth (m)	Velocity @ 0.5 Depth (m/s)	Depth of Obs. @ 0.8 Depth (m)	Velocity @ 0.8 Depth (m/s)	Depth of Obs. @ 0.2 Depth (m)	Velocity @ 0.2 Depth (m/s)	Velocity Correction Factor (m)	Pannel Width (m)	Effective Pannel Depth (m)	Effective Average Pannel Velocity (m/s)	Pannel Area (m <sup>2</sup> )	Pannel Discharge (m <sup>3</sup> /s)	Percent of total flow (%)
RB	2.90	0.00	0.00		0.000		0.000		0.000	0.88	0.40	0.00	0.000	0.00	0.000	
1	3.70	0.21	0.10	0.16	0.000				0.88	0.88	0.11	0.000	0.10	0.000	0%	
2	4.65	0.57	0.15	0.36	0.158				0.88	1.00	0.42	0.139	0.42	0.058	7%	
3	5.70	0.80	0.23	0.52	0.181				0.88	0.98	0.57	0.159	0.56	0.089	11%	
4	6.60	1.00	0.25	0.63	0.123				0.88	1.00	0.75	0.168	0.75	0.081	10%	
5	7.70	0.85	0.25	0.55	0.201				0.88	0.63	0.60	0.177	0.38	0.066	8%	
6	7.85	0.80	0.26	0.53	0.188				0.88	0.48	0.54	0.165	0.26	0.042	5%	
7	8.65	0.84	0.20	0.52	0.012				0.88	0.82	0.64	0.011	0.53	0.006	1%	
8	9.50	0.80	0.33	0.57	0.037				0.88	0.90	0.47	0.033	0.42	0.014	2%	
9	10.45	0.41	0.34	0.38	0.000				0.88	0.75	0.07	0.000	0.05	0.000	0%	
10	11.00	0.68	0.30	0.49	0.055				0.88	0.68	0.38	0.048	0.26	0.012	1%	
11	11.80	0.79	0.24	0.52	0.122				0.88	0.70	0.55	0.107	0.39	0.041	5%	
12	12.40	0.75	0.20	0.48	0.062				0.88	0.57	0.55	0.055	0.32	0.017	2%	
13	12.95	0.74	0.19	0.47	0.175				0.88	0.67	0.55	0.154	0.37	0.057	7%	
14	13.75	0.65	0.20	0.43	0.184				0.88	0.75	0.45	0.162	0.34	0.055	7%	
15	14.45	0.62	0.21	0.42	0.184				0.88	0.67	0.41	0.162	0.28	0.045	5%	
16	15.10	0.60	0.23	0.42	0.136				0.88	0.75	0.37	0.120	0.28	0.033	4%	
17	15.95	0.42	0.25	0.34	0.080				0.88	0.88	0.17	0.070	0.15	0.010	1%	
18	16.85	0.58	0.26	0.42	0.125				0.88	0.93	0.32	0.110	0.30	0.033	4%	
19	17.80	0.52	0.24	0.38	0.149				0.88	0.88	0.28	0.131	0.25	0.032	4%	
20	18.60	0.45	0.16	0.31	0.243				0.88	1.00	0.29	0.214	0.29	0.062	7%	
21	19.80	0.45	0.09	0.27	0.200				0.88	1.23	0.36	0.176	0.44	0.078	9%	
22	21.05	0.35	0.00	0.18	0.013				0.88	1.05	0.35	0.011	0.37	0.004	1%	
LB	21.90	0.00	0.00		0.00		0.00		0.88	0.42	0.00	0.000	0.00	0.000		
<b>Total Flow</b>														<b>0.836</b>	<b>100%</b>	

### Flow Measurement Details:

Metering Section Location (describe):  
 12m US of station

Meas. Start Time (MST):	10:25
Meas. End Time (MST):	10:55
Equipment:	ADV
Method:	Ice
River Condition:	Full ice cover
Channel Edges:	Trapezoidal Edge (e.g. stream)
Quality/Error (see reverse):	Good
Weather:	Overcast, light snow, -18C

### Flow characteristics:

Total Flow:	0.836	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Cross Section Area:	7.47	(m <sup>2</sup> )
Wetted Width:	19.00	(m)
Hydraulic Depth:	0.39	(m)
Mean Velocity:	0.11	(m/s)
Froude Number:	0.06	

### Logger Details:

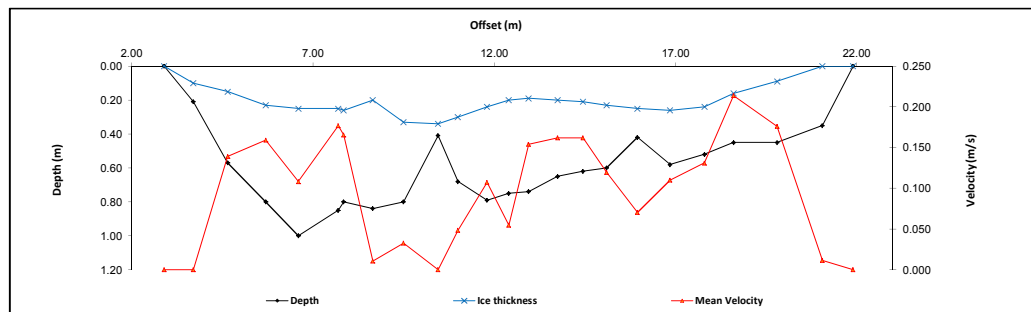
	Before	After
Transducer Reading (m):	0.357	0.356
Water (°C):	0.2	0.2
Datalogger	09:15	10:56
Laptop Clock:	09:15	10:55
Battery:	12.3	13.0
Battery Condition:		Replaced
Battery Serial #:		
Enclosure Desiccant:	-	Replaced
Vent Tube Desiccant:	-	Good
PT# (if replaced):	-	-
Logger# (if replaced):	-	-

### Datalogger / Station Notes:

-ADV test run, results good  
 -Reoriented GOES antenna to GOES West (227 deg.)

### General Notes:

-WL fluctuating about 2 cm in hole  
 -Ice surface uneven  
 -Some slush under ice surface affecting mmt



Level Survey:	Station	BS + (m)	HI (m)	FS - (m)	Elevation (m)	Elevation as given (m)	Description
<b>Benchmark</b>	S66-04	1.550	101.069		99.519	99.519	3/4" Pipe 7 m West from Logger
	S66-03			1.488	99.581	99.583	3/4" Pipe 5 m NW from Logger
	S66-01			0.897	100.172	100.177	Bolt in Tree 10 E from Logger
	S66-02			1.007	100.062	100.064	Bolt in Tree 12 N from Logger
	Water Level:	Cut		3.429	97.640		Time WL Surveyed: 10:18
	Temp BM			3.292	97.777	0.000	
<b>Turn</b>	Temp BM	3.282	101.059		97.777		
	Water Level:	Cut		3.415	97.644		Time WL Surveyed: 10:21
	S66-02			0.997	100.062	100.064	Bolt in Tree 12 N from Logger
	S66-01			0.885	100.174	100.177	Bolt in Tree 10 E from Logger
	S66-03			1.476	99.583	99.583	3/4" Pipe 5 m NW from Logger
<b>Secondary Water Level Survey (pick any BM e.g. closest to water's edge)</b>	S66-04			1.540	99.519	99.519	3/4" Pipe 7 m West from Logger
	Water Level:	Cut		3.429	96.629		Time WL Surveyed: 11:07
	Water Level:	Cut		3.418	96.632		Time WL Surveyed: 11:09
	S66-03			1.488	100.050	98.582	

WL Survey Summary	Before	After
Average WL:	97.642	96.631
Closing Error:	0.000	-
WL Check:	0.004	-0.003
Transducer Elevation	97.285	96.275

Field Personnel:	TR, CJ, AJ	Trip Date:	4-Dec-14
Data Entry Personnel:	CJ	Date:	4-Dec-14
Data Check Personnel:	CJ	Date:	5-Jan-15
Entered Digitally in the Field:	Yes		

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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 INTRODUCTION**

The objective of this appendix is to provide technical details on laboratory methods used for the processing and identification of the benthic samples, the calculations used to estimate the normal ranges of variability for benthic invertebrate community measurement endpoints that were used in Section 5, and the calculations used to estimate predicted PAH toxicity in sediments..

### **D.2 BENTHIC INVERTEBRATE SAMPLE PROCESSING PROCEDURES**

#### **D.2.1 Laboratory Methods**

In preparation for laboratory processing, samples were checked upon arrival to the laboratory to ensure that they were adequately sealed, labeled and that the preservative had effectively penetrated the entire sample. Samples were then rinsed of the residual fine debris and preservative (provided a minimum exposure of 72 hours to formalin occurred). Samples were either sorted immediately, or transferred to 80% ethanol, prior to sorting and taxonomic work. After sorting and identification, freshwater macro-invertebrates were stored in a solution of 70 to 80% ethanol, and 5% glycerin in vials or jars with airtight lids.

To expedite the sorting process, samples with large pieces of organic matter were divided in the laboratory into appropriate size fractions. The most commonly used fractions were coarse (>1.00 mm) and fine (250 µm to 1.00 mm), which corresponded to the divisions used to define coarse and fine particulate organic matter (CPOM and FPOM), respectively. Where there were very large pieces of organic material or large invertebrates, they were separated from the rest of the sample with a 4.00-mm sieve. All fractions were sorted. If warranted by large numbers of organisms, the fractions were sub-sampled (as described below). After the initial washing and fractionation of samples, the invertebrates were sorted from the debris by trained technicians on a gridded tray or petri dish under a dissecting microscope at 10X to 20X magnification. Samples that contained large amounts of debris, or large numbers of animals were further sub-sampled as per Figure D.2-1.

#### **D.2.2 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.

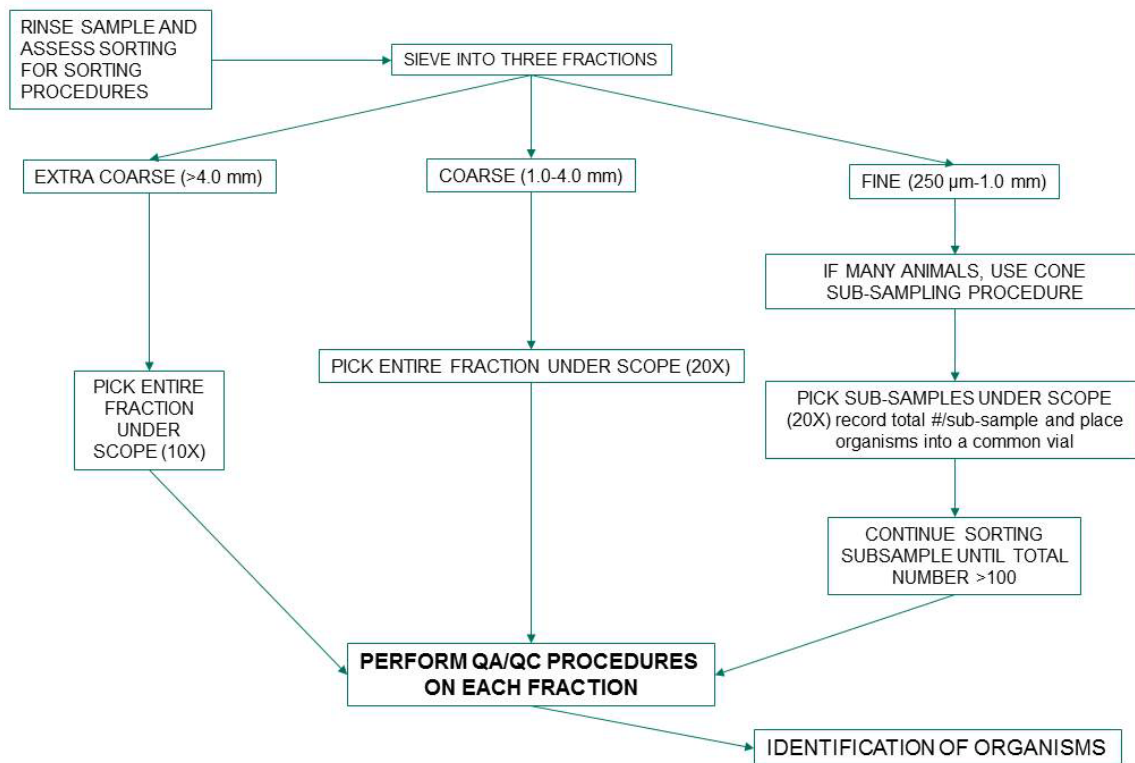
#### **D.2.3 Fine Fraction**

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.

When there was a lot of organic material in the fine fractions and/or large numbers of organisms, a sub-sampling of the fine fractions was done as described below.

The fine fraction was sorted in its entirety when possible. When there were large amounts of the fine fraction, the material was sub-sampled using an Imhoff Cone and bubbler (Wrona et al. 1982). Either ¼ of the sample was sorted, or at least 100 animals were removed from the debris. The fine fraction was stained with haematoxylin or rose Bengal to improve sorting.

**Figure D.2-1 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 is modified as necessary for station-specific samples.

## D.2.4 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.2-1). Small, early-instar or damaged specimens were identified to the lowest level possible, generally to family.

**Table D.2-1 Level of taxonomic identification.**

<b>Group</b>	<b>Level</b>
Nematoda	Phylum
Oligochaeta	Family
Gastropoda	Genus/Species
Turbellaria	Family
Hirudinea	Species
Mollusca	Genus/Species
Acari	Subclass
Cladocera	Genus/Species
Copepoda	Order
Ostracoda	Class
Amphipoda	Genus
Insecta	Genus/Species

Organisms that require detailed microscopic examination for identification (e.g., Chironomidae and Oligochaeta) were mounted onto microscope slides using an appropriate mounting media (e.g., Canada balsam, Permout, 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 were mounted for identification.

### **D.3 CALCULATION OF MEASUREMENT ENDPOINTS**

Total abundance, richness, equitability, and %EPT were calculated from the counts of organisms. Taxa were typically identified to genus, and at times to species. Some small or immature specimens were identified to Family, Order, or other applicable (but lowest possible) higher taxonomic level. Taxa richness was; therefore, the total number of taxa determined using lowest practical taxonomic level.

Equitability was calculated using:

$$\text{Equitability} = \left( \frac{1}{\sum p_i} \right), [1]$$

Where,

$p_i$  was the fraction of the total count in a sample accounted for by taxon  $i$ , and  $S$  was the number of taxa.

Percent EPT (i.e., % EPT) is the percentage of the fauna as Ephemeroptera, Trichoptera, and Plecoptera.

A multivariate ordination (Correspondence Analysis, CA; Gauch 1982) was also calculated in addition to these conventional measures of community composition. The CA was carried out using the logarithms of abundances ( $\log$  of  $x_i+1$ , where  $x$  is the number of individuals of taxon  $i$  per sample) of taxa that comprised a minimum of 0.5% of the total number of organisms in the dataset under examination (Gauch 1982). Four separate ordinations were carried out: (i) erosional reaches; (ii) depositional reaches; (iii) delta Channels; and (iv) lakes. Two CA axes were 'kept' and used as measurement endpoints, from each of the four ordinations, with 'scores' on those two axes being the endpoint values used in subsequent analyses similar to analyses for abundance, richness, %EPT, and equitability.

## D.4 CALCULATION OF NORMAL RANGES

Though rigorous analyses of variance can be used to test for effects of oil sands operations by comparison of potentially influenced watercourses to those that are not, the design of the benthic invertebrate community component has considerable statistical power, and thus the potential to detect statistical differences that are negligible in magnitude. The "normal range of variation" is an alternative complimentary approach to determining if significant differences in measurement endpoints are unusual. Use of the "normal range of variation" of a reference or *baseline* condition as an ecological criterion implies that some fraction of a *baseline* data set is used to define the expected range of values for a measurement endpoint. The use of normal ranges for the assessment of benthic invertebrate communities has precedence (e.g., see numerous chapters in Davis and Simon 1995; numerous chapters in Simon 1998; and Bailey et al. 2004). Measurement endpoints inside the normal range are considered an indication of an acceptable condition; values outside the range indicate potential or likely impairment. Different authors have used different "fractions" of the *baseline* data to define the normal range. Reynoldson et al. (1995; 1999; 2003; 2004) and Bailey et al. (2004) indicated that values inside the 90<sup>th</sup> percentile were "acceptable", values between the 90<sup>th</sup> and 99<sup>th</sup> percentiles were potentially impaired, and values outside the 99<sup>th</sup> percentile indicated impaired benthic communities. Kilgour et al. (1998) suggested that the 95% region provided a general rule of thumb that could be used to denote a reach that is "in" its expected range of reference values, compared to a community that is potentially unusual. Other authors using the 95% region as the normal range of variation for a target ecological reference condition have included Bloom (1980); Kersting (1991); Yan et al. (1996); and Findlay and Kasian (1996).

The limits of the normal range, based on 95% of possible observations, can be approximated using:

$$\bar{x} \pm 2SD$$

Where, SD is the standard deviation of observations (in this case natural differences in reach annual means in the *baseline* period).

With a relatively large number of samples,  $\bar{x} \pm 2SD$  includes about 95% of possible observations. Standard deviations, like any statistic, are estimated with error. When sample sizes are small, that quantity may enclose considerably more or less than 95% of possible observations.

Like a mean, the 5<sup>th</sup> and 95<sup>th</sup> percentiles are estimated imprecisely from a sample of the data (Berthouex and Hau 1991). Tolerance limits are confidence regions for extreme percentiles. Tolerance limits were calculated for the  $p^{\text{th}}$  percentile of the *baseline* data (per Hunt et al. 2001; Smith 2002; and Krishnamoorthy and Mathew 2009).

The tolerance limit for the  $p^{\text{th}}$  percentile is:

$$\bar{x} \pm k \cdot \text{sd}$$

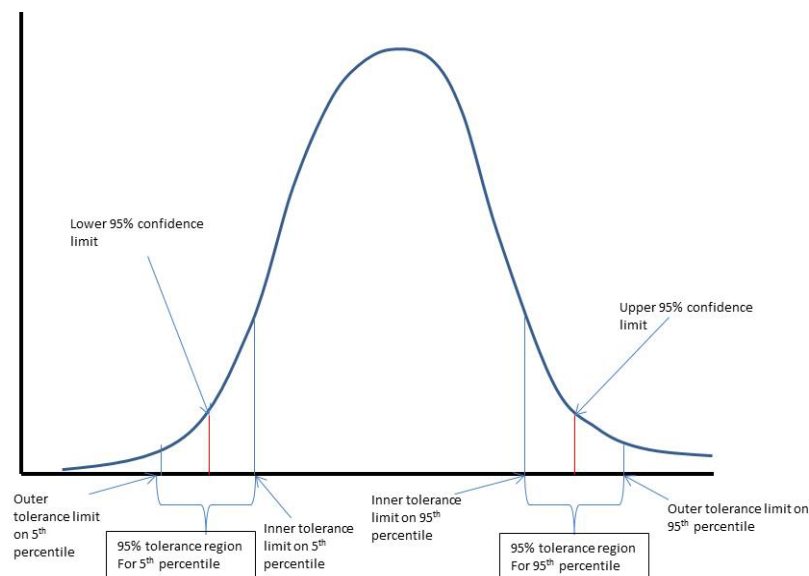
Where,

- $k = \frac{t_{\gamma, N-1, \delta}}{\sqrt{N}}$  ;
- $t_{\gamma, N-1, \delta}$  is a non-central t-statistic (where  $\gamma$  is set and determines the lower 5<sup>th</sup> or upper 95<sup>th</sup> percentile of the non-central t distribution);
- $\delta = z_p \sqrt{N}$  ; and
- $Z_p$  is the Z-statistic at the  $p^{\text{th}}$  percentile.

Here, and for the 95<sup>th</sup> percentile of the data,  $Z = 1.96$ . The value for  $\delta$  depends on sample size, as then does the non-central t statistic and ultimately  $k$ .

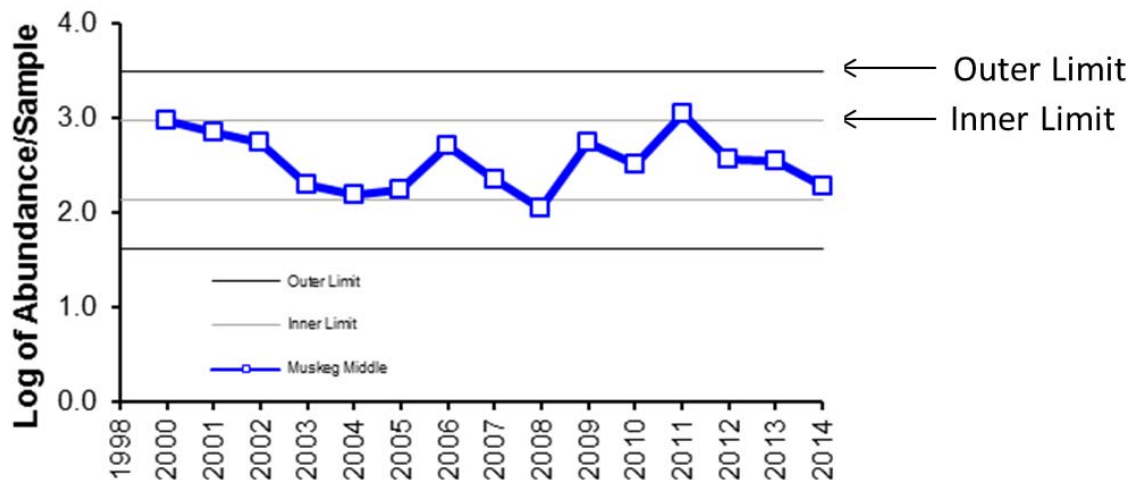
There are two intrinsic benefits of using confidence limits on percentiles. Values inside the inner tolerance limit clearly are not unusual, while values outside the outer tolerance limit clearly are unusual relative to the “normal range” (see also Figure D.4-1). Values that fall between the inner and outer tolerance limits are in a grey zone of uncertainty that may or may not truly be unusual depending on what would be determined from the collection of more data. Values in the “grey” zone might be considered a trigger for further examination (or monitoring). Industry is often criticized for trying to keep sample sizes low, because doing so reduces the likelihood of detecting changes particularly when conventional statistical approaches are being used (e.g., two-sample contrasts). The concern of using small sample sizes diminishes when “one-sample” contrasts are used for inner and outer tolerance limits because small sample sizes will lead to broad limits on extreme percentiles, resulting in more observations being classified as “potentially” unusual, and an incentive for industry to collect more data.

**Figure D.4-1 Schematic of a normal distribution showing the relationship between inner and outer tolerance limits on the lower 5<sup>th</sup> and upper 95<sup>th</sup> percentiles.**



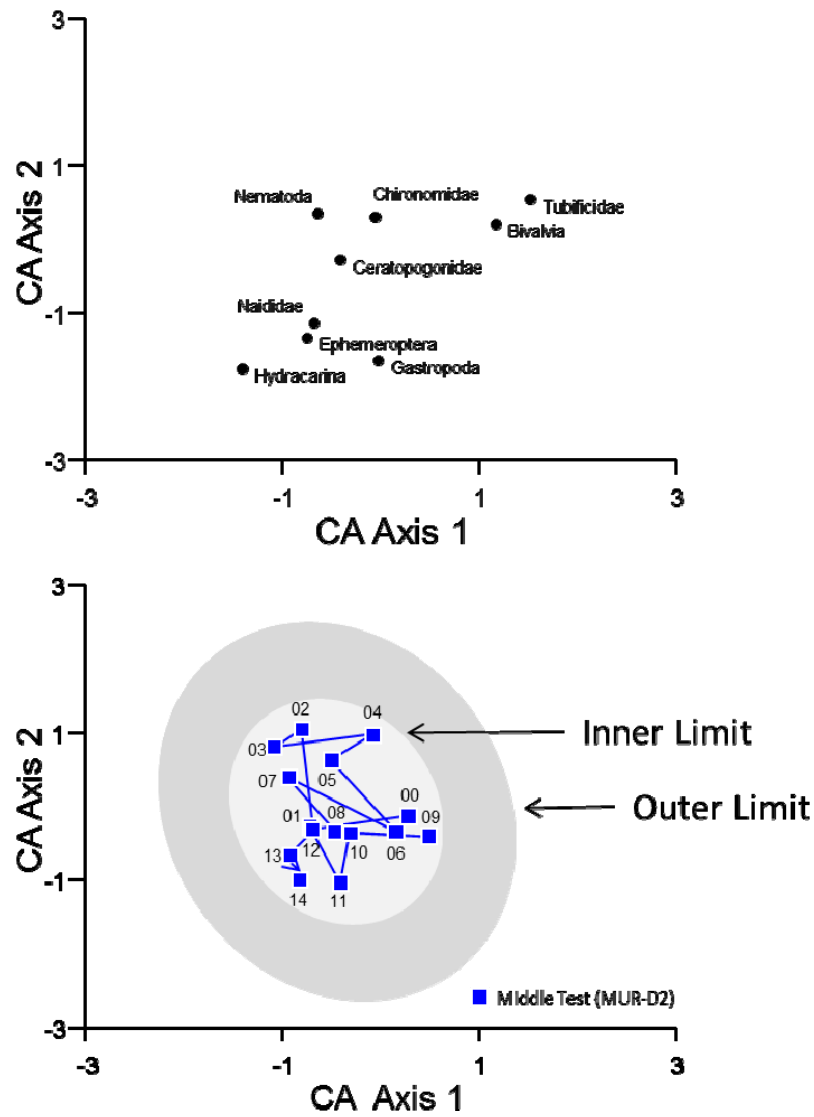
Two sets of normal ranges were calculated for each of the case studies explored. The first set was for the *test* reach being assessed. Normal ranges were calculated for any given year of assessment using the data from all previous years. The within-reach normal range for the middle Muskeg River in 2012, for example, was calculated using annual means of measurement endpoints from samples collected from this reach since 1998 through to 2013. This method was used only if the reach had more than eight years of historical data (Figure D.4-2 and Figure D.4-3 and Table D.4-1 to Table D.4-4). The second set of normal ranges was for the among-*baseline*-reach calculated in any year using all of the available annual means of measurement endpoints from *baseline* reaches up to and including the previous year. The among-*baseline*-reach normal range for 2014, for example, was calculated using data from regional *baseline* reaches sampled from 1998 to 2013. The inner and outer tolerance limits on the lower 5<sup>th</sup> and upper 95<sup>th</sup> percentiles of the normal ranges were calculated, per the methods described above. This method was used for depositional and erosional river reaches and lakes when there were less than eight years of historical data (Table D.4-1 to Table D.4-4).

**Figure D.4-2 Example time trend chart for the abundance of benthic invertebrate communities relative to the normal range of variation, in this case, from all previous years at the middle reach of the Muskeg River.**





**Figure D.4-3** Example bi-plot showing time trend of CA Axis scores for benthic invertebrate communities relative to the normal range of variation, in this case, from all previous years at the middle reach of the Muskeg River.



**Table D.4-1 Tolerance limits calculated for lake, river, and delta reaches for abundance (log-transformed).**

Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>Baseline</i>	3.81	3.49	2.33	2.02
	Lower MacKay (MAR-E1)	3.49	3.04	2.41	1.96
	Middle MacKay (MAR-E2)	3.73	3.23	2.53	2.02
	Lower Muskeg (MUR-E1)	3.79	3.34	2.58	2.13
	Lower Steepbank (STR-E1)	3.54	2.99	2.11	1.57
Depositional Rivers	Regional <i>Baseline</i>	3.15	2.79	1.32	0.96
	Lower Christina (CHR-D1)	3.67	2.61	1.58	0.52
	Middle Christina (CHR-D2)	4.33	2.64	1.23	-0.45
	Lower Ells (ELR-D1)	3.39	2.63	1.80	1.04
	Fort Creek (FOC-D1)	3.29	2.07	0.89	-0.34
	Lower Jackpine (JAC-D1)	3.80	2.88	1.69	0.78
	Middle Muskeg (MUR-D2)	3.48	2.97	2.14	1.62
	Upper Muskeg (MUR-D3)	2.77	2.46	2.01	1.69
Athabasca River Delta	Lower Tar (TAR-D1)	4.04	2.79	1.29	0.04
Lakes	Fletcher, Goose Island, and Big Point channels, Embarras River	3.19	2.77	1.43	1.01
	Isadore's (ISL-1)	3.46	2.22	1.02	-0.22
	Johnson (JOL-1)	2.44	2.06	1.98	1.60
	Kearl (KEL-1)	3.00	2.29	1.21	0.50
	McClelland (MCL-1)	4.10	3.03	1.52	0.45
	Shipyard (SHL-1)	3.43	2.65	1.42	0.65

**Table D.4-2 Tolerance limits calculated for lake, river, and delta reaches for richness (log-transformed).**

Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>Baseline</i>	1.75	1.66	1.34	1.26
	Lower MacKay (MAR-E1)	1.68	1.54	1.33	1.18
	Middle MacKay (MAR-E2)	1.74	1.54	1.33	1.18
	Lower Muskeg (MUR-E1)	1.69	1.60	1.45	1.36
	Lower Steepbank (STR-E1)	1.69	1.51	1.23	1.05
Depositional Rivers	Regional <i>Baseline</i>	1.50	1.35	0.72	0.57
	Lower Christina (CHR-D1)	1.57	1.20	0.79	0.42
	Middle Christina (CHR-D2)	1.54	1.09	0.65	0.19
	Lower Eills (ELR-D1)	1.59	1.21	0.79	0.41
	Fort Creek (FOC-D1)	1.62	1.07	0.53	-0.03
	Lower Jackpine (JAC-D1)	1.73	1.38	0.92	0.56
	Middle Muskeg (MUR-D2)	1.69	1.47	1.10	0.88
	Upper Muskeg (MUR-D3)	1.14	1.21	0.71	0.92
Athabasca River Delta	Lower Tar (TAR-D1)	1.79	1.28	0.65	0.13
Lakes	Fletcher, Goose Island, and Big Point channels, Embarras River	1.29	1.15	0.72	0.58
	Isadore's (ISL-1)	1.42	0.93	0.91	-0.04
	Johnson (JOL-1)	1.13	0.95	0.91	0.73
	Kearl (KEL-1)	1.38	1.10	0.66	0.37
	McClelland (MCL-1)	1.78	1.37	0.79	0.38
	Shipyard (SHL-1)	1.58	1.25	0.72	0.38

**Table D.4-3 Tolerance limits calculated for lake, river, and delta reaches for equitability.**

Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>Baseline</i>	0.45	0.39	0.17	0.11
	Lower MacKay (MAR-E1)	0.50	0.39	0.24	0.13
	Middle MacKay (MAR-E2)	0.56	0.39	0.14	-0.03
	Lower Muskeg (MUR-E1)	0.45	0.34	0.16	0.05
	Lower Steepbank (STR-E1)	0.55	0.42	0.19	0.06
Depositional Rivers	Regional <i>Baseline</i>	0.74	0.65	0.26	0.17
	Lower Christina (CHR-D1)	0.65	0.49	0.32	0.15
	Middle Christina (CHR-D2)	0.96	0.61	0.27	-0.07
	Lower Eills (ELR-D1)	0.76	0.53	0.27	0.03
	Fort Creek (FOC-D1)	1.26	0.81	0.38	-0.07
	Lower Jackpine (JAC-D1)	0.73	0.55	0.32	0.14
	Middle Muskeg (MUR-D2)	0.56	0.42	0.19	0.05
	Upper Muskeg (MUR-D3)	0.67	0.53	0.32	0.17
Athabasca River Delta	Lower Tar (TAR-D1)	0.89	0.60	0.25	-0.05
Lakes	Fletcher, Goose Island, and Big Point channels, Embarras River	0.76	0.62	0.18	0.04
	Isadore's (ISL-1)	1.10	0.76	0.43	0.10
	Johnson (JOL-1)	0.65	0.48	0.44	0.28
	Kearl (KEL-1)	0.91	0.69	0.35	0.13
	McClelland (MCL-1)	0.94	0.64	0.25	-0.06
	Shipyard (SHL-1)	0.87	0.66	0.32	0.11

**Table D.4-4 Tolerance limits calculated for lake, river, and delta reaches for the percentage of EPT taxa (log-transformed).**

Habitat Class	Reach	Upper Outer Limit	Upper Inner Limit	Lower Inner Limit	Lower Outer Limit
Erosional Rivers	Regional <i>Baseline</i>	2.00	1.81	1.12	0.94
	Lower MacKay (MAR-E1)	1.95	1.55	0.99	0.60
	Middle MacKay (MAR-E2)	1.83	1.54	1.14	0.86
	Lower Muskeg (MUR-E1)	2.03	1.71	1.17	0.86
	Lower Steepbank (STR-E1)	2.07	1.70	1.10	0.72
Depositional Rivers	Regional <i>Baseline</i>	0.88	0.69	-0.12	-0.31
	Lower Christina (CHR-D1)	0.52	0.34	0.15	-0.03
	Middle Christina (CHR-D2)	1.07	0.59	0.12	-0.36
	Lower Ells (ELR-D1)	0.34	0.17	-0.01	-0.17
	Fort Creek (FOC-D1)	1.26	0.81	0.38	-0.07
	Lower Jackpine (JAC-D1)	0.91	0.54	0.05	-0.32
	Middle Muskeg (MUR-D2)	1.04	0.68	0.09	-0.27
	Upper Muskeg (MUR-D3)	1.21	0.72	0.02	-0.47
Athabasca River Delta	Lower Tar (TAR-D1)	0.53	0.28	-0.01	-0.25
Lakes	Fletcher, Goose Island, and Big Point channels, Embarras River	0.89	0.64	-0.15	-0.40
	Isadore's (ISL-1)	0.54	0.19	-0.15	-0.50
	Johnson (JOL-1)	0.64	0.06	-0.01	-0.65
	Kearl (KEL-1)	0.71	0.39	-0.08	-0.40
	McClelland (MCL-1)	1.53	0.94	0.11	-0.49
	Shipyard (SHL-1)	1.41	0.78	-0.22	-0.84

## D.5 CALCULATION OF ADJUSTED MEASUREMENT ENDPOINTS

Multiple-regression was used to test whether water velocity, the percentage of sand substrate, and water depth at the point of sampling, explained any variation in measurement endpoints. Models were constructed using backward-stepwise multiple regression. Substrate texture was only used as a template variable for the Athabasca River Delta (ARD) reaches (Fletcher, Goose Island, and Big Point channels, Embarras River) because it can be influenced by changes in hydrodynamics, and hydrodynamic alterations are one of the predicted stressors in watercourses influenced by oil sands operations.

Adjusted models for erosional and depositional rivers were not calculated due to missing data points for template variables; therefore, only unadjusted values were used. Models for lakes were adjusted to a common depth of 2 m and models for reaches of the ARD were adjusted to a common percent sand composition of 50% (Table D.5-1 and Table D.5-2 and Figure D.5-1 and Figure D.5-2).

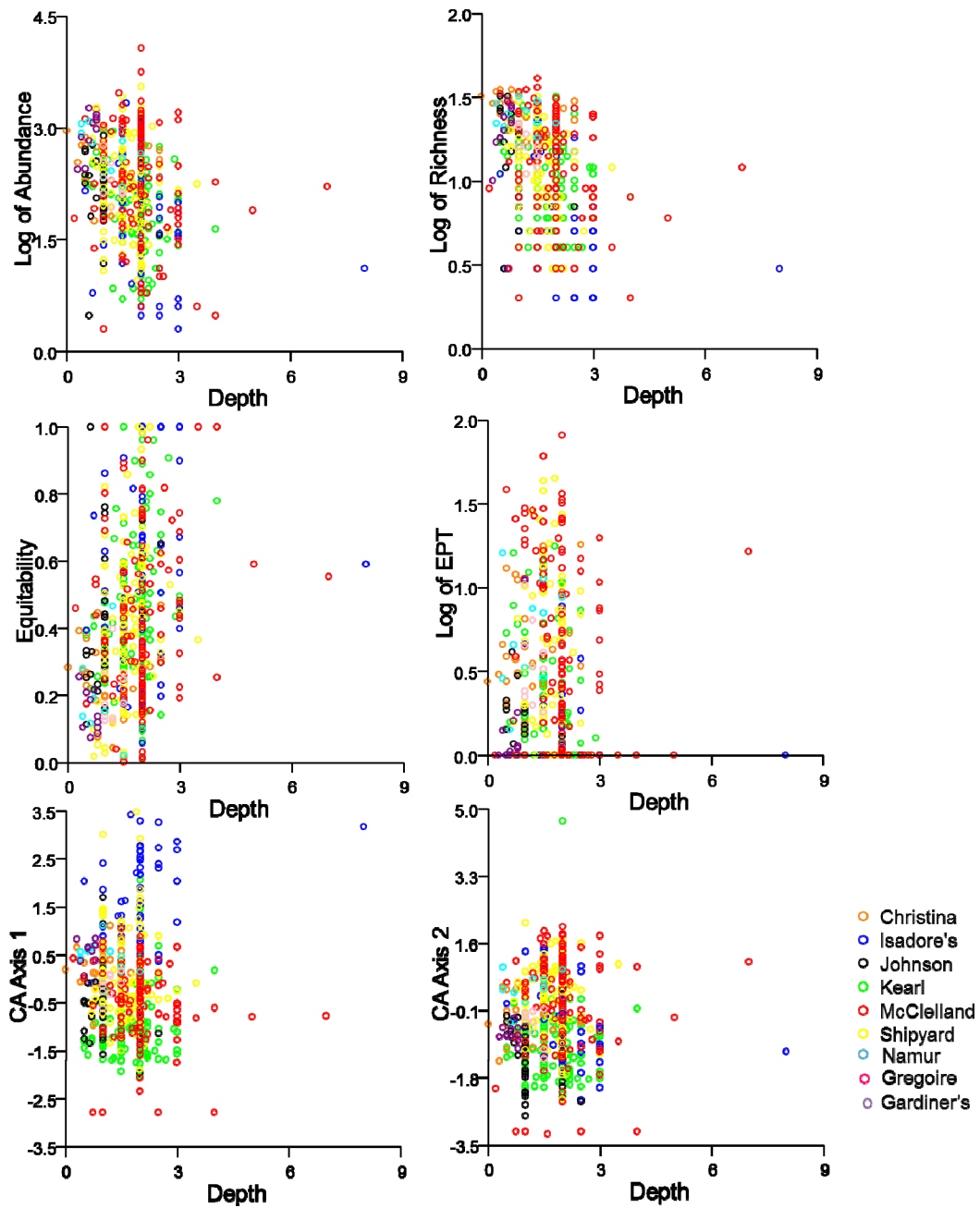
**Table D.5-1 Results of the ANOVA showing the relationship between water depth and measurement endpoints of benthic invertebrate communities in lakes.**

Predictor	Measurement Endpoint					
	Log of Abundance	Log of Richness	Equitability	Log of EPT	CA Axis 1 Scores	CA Axis 2 Scores
Constant	2.581	1.285	0.249	0.484	0.000	-0.185
Depth	-0.185	-0.096	0.060	-0.087	0.096	-0.115
MSE	0.382	0.067	0.046	0.165	0.753	0.871
SD	0.618	0.259	0.214	0.406	0.868	0.933

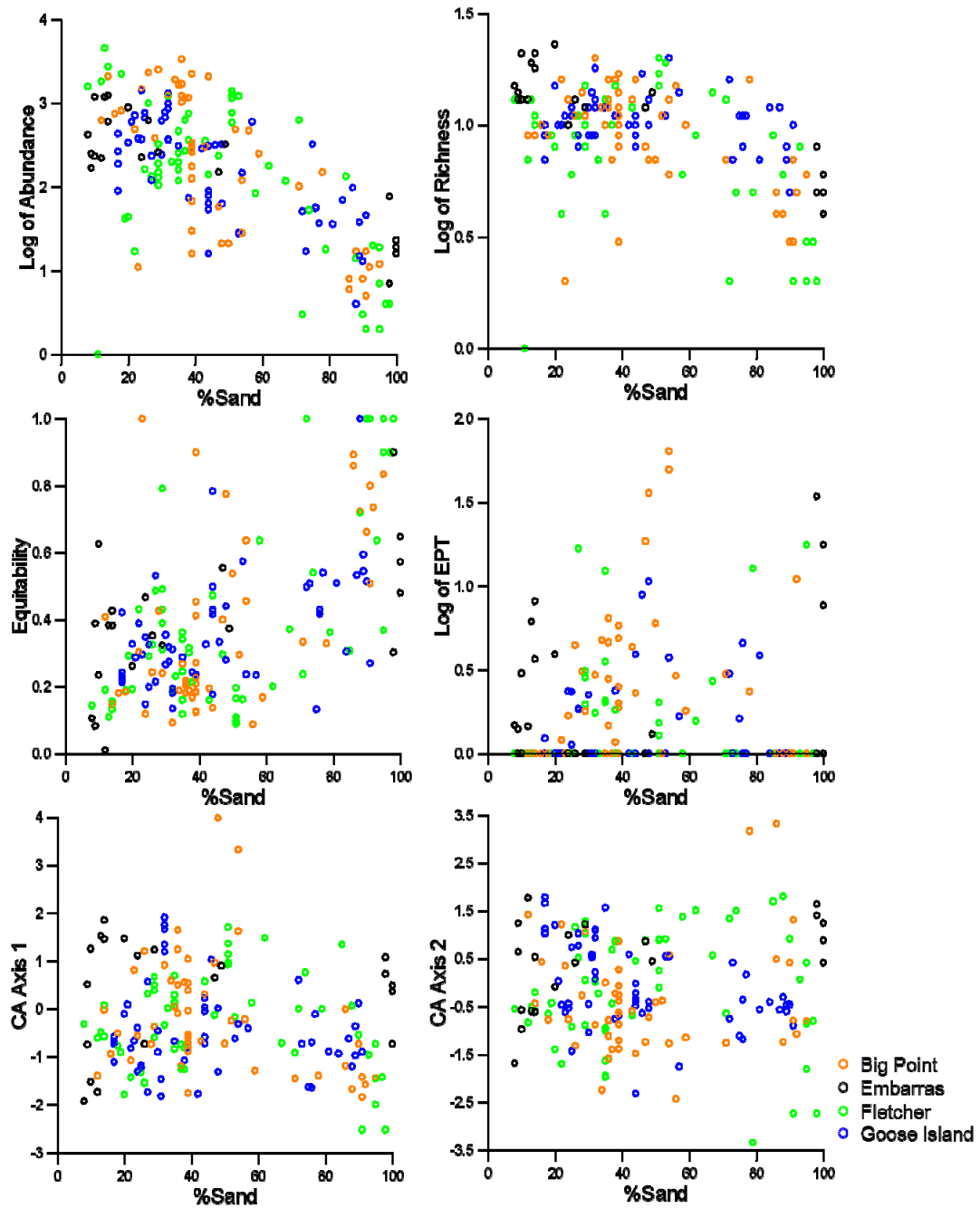
**Table D.5-2 Results of the ANOVA showing the relationship between the percentage of sand substrate and measurement endpoints of benthic invertebrate communities for reaches of the Athabasca River Delta.**

Predictor	Measurement Endpoint					
	Log of Abundance	Log of Richness	Equitability	Log of EPT	CA Axis 1 Scores	CA Axis 2 Scores
Constant	2.864	1.044	0.226	0.242	0.057	-0.115
Sand	-0.019	-0.004	0.005	0.001	-0.005	0.004
MSE	0.345	0.041	0.036	0.141	0.999	1.119
SD	0.587	0.202	0.190	0.375	0.999	1.058

Figure D.5-1 Relationship between measurement endpoints and water depth used in the adjustment model for lakes.



**Figure D.5-2 Relationship between measurement endpoints and the percentage of sand substrate used in the adjustment model for reaches of the Athabasca River Delta.**





## D.6 SEDIMENT QUALITY

### D.6.1 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 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 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:

$$\text{PAH}_{(\text{normalized})} = \frac{\text{PAH concentration}}{\text{total recoverable hydrocarbons}}$$

Where,

- $\text{PAH}_{(\text{normalized})}$  refers to the estimate of PAHs available in pore water and complexed to the particulate fraction of sediment;
- PAH concentration refers to the absolute concentration of specific PAH species; and
- Total recoverable hydrocarbons (TRH) refer to the total amount of hydrocarbons representing NAPL. TRH was measured directly from 1997 to 2004, and replaced in 2005 by the more detailed, higher-resolution measure, CCME total hydrocarbons, with both methods overlapping in 2004. To allow long-term comparisons using data from 2005 onward, TRH in each sample was estimated using the concentration of CCME total hydrocarbons adjusted using the following equation, which was based on direct within-sample comparisons made using 2004 data:

$$\text{TRH} = \text{total CCME hydrocarbons} * 2.183$$

Where,

- Total CCME hydrocarbons are equal to the sum of CCME Fractions 2 to 4.

$\text{PAH}_{(\text{normalized})}$  concentrations then were divided by the octanol/water partition coefficient ( $K_{ow}$ ) to estimate the concentration of each PAH that is bioavailable in the dissolved (pore water) phase of sediment. These estimates are divided by a chronic toxicity value (compiled from Mackay et al. 1992; Neff and Burns 1996; Ran et al. 2002; and references cited in Neff et al. 2005) to produce a hazard quotient (HQ) for each PAH measured in the sediment sample:

$$\text{HQ} = \left( \frac{\text{PAH}_{(\text{normalized})}}{K_{ow}} \right) + \text{Chronic Toxicity}$$

Finally, all HQs calculated using this method are summed to produce a hazard index (HI) for total PAHs in sediment pore water:

$$\text{HI} = \sum \text{HQ}$$

Sediments with a calculated hazard index value greater than 1.0 have the potential to be toxic to aquatic organisms (Neff et al. 2005).



**Appendix E**

**Fish Populations Component**



## 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 JOSMP in 2014.

**Table E.1-1 Common and scientific names of fish species captured during fish monitoring activities undertaken by JOSMP, 2014.**

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
finescale dace	<i>Phoxinus neogaeus</i>	FNDC
goldeye	<i>Hiodon alsoides</i>	GOLD
lake chub	<i>Couesius plumbeus</i>	LKCH
lake trout	<i>Salvelinus namaycush</i>	LKTR
lake whitefish	<i>Coregonus clupeaformis</i>	LKWH
longnose dace	<i>Rhinichthys cataractae</i>	LNDC
longnose sucker	<i>Catostomus catostomus</i>	LNSC
mountain whitefish	<i>Prosopium williamsoni</i>	MNWH
ninespine stickleback	<i>Pungitius pungitius</i>	NNST
northern pike	<i>Esox Lucius</i>	NRPK
northern redbelly dace	<i>Phoxinus eos</i>	NRDC
slimy sculpin	<i>Cottus cognatus</i>	SLSC
spoonhead sculpin	<i>Cottus ricei</i>	SPSC
spottail shiner	<i>Notropis hudsonius</i>	SPSH
trout-perch	<i>Percopsis omiscomaycus</i>	TRPR
walleye	<i>Sander vitreus</i>	WALL
white sucker	<i>Catostomus commersoni</i>	WHSC
yellow perch	<i>Perca flavescens</i>	YLPR

## E.2 HEALTH ASSESSMENT CODES FOR FISH EXAMINATION

Fish body part and abnormality codes were developed to rapidly assess the external health of captured fish in an effort to minimize the fish holding time in the field prior to release (Table E.2-1). These codes were also developed to assess the internal health of fish captured for dissection and tissue analyses. For each abnormality that was observed, the severity of the abnormality was recorded (1-mild; 2-moderate; 3-severe) as well as the location of the abnormality (Table E.2-2).

**Table E.2-1 External and internal health assessment codes for fish examinations.**

Variable	Variable Code	Variable Condition	Variable Condition Code
eyes	EYE	no aberrations; good "clear" eye	N
		exophthalmia (popeye)	EX
		blind; an opaque eye (one or both)	BL
		cloudy cornea	CC
		lens deformed	LD
		lens parasites	LP
		lens cataract	LC
		hemorrhaging or bleeding in the eye (one or both)	HM
		missing one or both eyes	MI
		other; any condition not covered above	OT
gills	GIL	normal; no apparent aberrations	N
		frayed; erosion of tips of gill lamellae resulting in "ragged" gills	FR
		clubbed; swelling of the tips of gill lamellae	CL
		marginate; gills with light, discoloured margin along tips the lamellae	MA
		pale; very light in colour	DI
		parasites	PA
		gas bubbles	GB
		other; any condition not covered above	OT
pseudobranchs	PSD	normal; flat, containing no aberrations	N
		swollen; convex in aspect	SW
		lithic; mineral deposits, white, somewhat amorphous spots	LI
		other; any condition not covered above	OT
thymus	THY	no hemorrhage	0
		hemorrhagic	HM
		other; any condition not covered above	OT

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

Variable	Variable Code	Variable Condition	Variable Condition Code
skin	BOS	normal; no skin aberrations	N
		lesion	LE
		raised or missing scales	RM
		reoriented scales	RS
		swollen	SW
		exceeds mucus	EX
		growths and/or tumours	GR
		parasites	PA
		wounds and/or scars	WO
		other; any condition not covered above	OT
fins	FIN	no active erosion	N
		frayed-eroded	FE
		parasites	PA
		hemorrhagic	HM
		gas bubbles	GB
		other; any condition not covered above	OT
opercle	OPR	no shortening	N
		incomplete	IN
		other; any condition not covered above	OT
hindgut	ANU	normal; no inflammation or reddening	N
		inflamed	IN
		other; any condition not covered above	OT
body deformities	BOF	none	N
		emaciated	EM
		truncate	TR
		scoliosis	SC
		lordosis	LO
		other; any condition not covered above	OT
mesenteric fat	MF	none	0
		<50% coverage of mesentery	1
		50% coverage of mesentery	2
		>50% coverage of mesentery	3
		100% of mesentery covered	4

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

<b>Variable</b>	<b>Variable Code</b>	<b>Variable Condition</b>	<b>Variable Condition Code</b>
liver	LI	normal; solid red or light red colour	A
		"fatty" liver; "coffee with cream" colour	C
		nodules in the liver; cysts or nodules	D
		focal discolouration; distinct localized colour changes	E
		general discolouration; colour change in whole liver	F
		other; any condition not covered above	OT
spleen	SP	normal; black, very dark red, or red	B
		granular; rough appearance of spleen	G
		nodular; containing fistulas or nodules of varying sizes	D
		enlarged; noticeable enlarged	E
		other; any condition not covered above	OT
gall bladder	GA	normal	0
		enlarged	1
		parasites	2
kidney	KI	normal; firm dark red colour, lying relatively flat along vertebral column	N
		swollen; enlarged or swollen wholly or in part	S
		mottled; gray discolouration	M
		granular; granular appearance and texture	G
		urolithiasis/nephrocalcinosis; white/cream mineral material in tubules	U
		other; any condition not covered above	OT
parasites	PA	no observed parasites	0
		few observed parasites	1
		moderate parasite infestation	2
		numerous parasites	3

**Table E.2-2 Codes for the location of external fish abnormalities.**

Variable	Location	Code
Body surface	fins	1
	head	2
	eyes	3
	mouth	4
	peduncle	5
	ventral	6
	dorsal	7
	lateral	8
Fins	dorsal	1
	pectoral	2
	pelvic	3
	anal	4
	adipose	5
	caudal	6
Eyes	right	1
	left	2

### E.3 ANALYSIS OF FISH ASSEMBLAGE DATA

The analysis of the JOSMP fish assemblage data involved four steps to determine if fish measurement endpoints varied in relation to physical or chemical habitat descriptors, and to identify which habitat variables would help to classify *baseline* reaches to calculate the normal ranges of variability in measurement endpoints:

1. A Principal Component Analysis (PCA) was conducted on habitat variables from *baseline* reaches to examine the variability of each characteristic within reaches.
2. Correlation of key physical and chemical habitat data from the PCA with measurement endpoints to identify habitat variables that strongly relate or drive the variability in measurement endpoints.
3. A cluster analysis in order to group each reach-year combination based on similarities in key habitat variables.
4. Calculation of normal ranges of variability for all regional *baseline* reaches of similar habitat characteristics for comparison to data from *test* reaches of similar habitat characteristics.



### E.3.1 Principal Components Analysis of Habitat Data

A PCA was conducted on habitat variables using the 48 *baseline* reach-year combinations to summarize the variability in habitat conditions. Data for all habitat variables were scaled by unit variance prior to conducting the PCA to ensure that all data were comparable. Principal component axes explaining >10% of the total variance (Jackson 1993) were used in subsequent correlation analyses with habitat variables. Pearson correlations (i.e., Pearson r-values) between individual variables and PCA axes that were >|0.6| were considered strongly correlated with an axis.

PCA axes 1, 2, and 3 explained 15%, 14%, and 13%, respectively, of the variance in habitat variables (Table E.3-1). Scores on the first axis were strongly correlated with:

- understory shrub coverage for both left and right banks;
- canopy coverage as small woody debris (SWD) for both left and right banks;
- canopy coverage as large woody debris (LWD) for the right bank; and
- big tree canopy cover (RDB).

The first PCA axis; therefore, indicated that the greatest variation among reach-year combinations was mostly instream vegetation cover.

PCA 2 scores strongly correlated with mean bankful and wetted widths, instream boulder cover, and big tree canopy cover on both left and right banks. Therefore, PCA 2 explained a large amount of variation related to stream size.

Scores on the third PCA axis were strongly correlated with depth at mid-channel and instream cover as macrophytes. The third axis; therefore, explained a large amount of variation related to stream depth. All variables that were strongly correlated with PCA axes were carried forward in subsequent correlation analyses with the fish assemblage measurement endpoints.

**Table E.3-1 Principal Component axes correlated with habitat variables for baseline fish assemblages reaches, 2009 to 2014.**

Habitat Variable	PC1	PC2	PC3
Maximum depth	0.148	-0.204	0.570
Bankful width	-0.157	<b>-0.793</b>	0.372
Wetted width	-0.143	<b>-0.762</b>	0.450
Bank height LDB	0.433	-0.006	-0.379
Bank height RDB	0.431	-0.017	-0.352
Bank angle RDB	0.007	-0.068	-0.160
Bank angle LDB	-0.393	-0.063	-0.062
Flow at mid-channel	-0.020	-0.526	-0.301
Depth at mid-channel	0.029	-0.118	<b>0.611</b>
Instream macrophytes	-0.180	0.015	<b>0.712</b>
Instream LWD	0.371	-0.002	0.382
Instream SWD	-0.017	0.339	0.513
Live trees	0.405	0.396	0.188
Undercut banks	0.131	0.349	-0.045
Boulders	-0.100	<b>-0.670</b>	-0.094
Big tree canopy RDB	0.204	<b>-0.700</b>	-0.227
Big tree canopy LDB	0.430	<b>-0.614</b>	-0.140
Small tree canopy RDB	0.584	-0.419	0.086
Small tree canopy LDB	0.553	-0.134	0.414
Under shrub LDB	<b>0.725</b>	0.181	-0.285
Under shrub RDB	<b>0.654</b>	0.146	-0.339
Canopy SWD RDB	<b>0.791</b>	0.074	0.229
Canopy SWD LDB	<b>0.615</b>	0.067	0.571
Canopy LWD RDB	<b>0.725</b>	-0.077	-0.092
Canopy LWD LDB	0.583	-0.104	0.003
Instream algae	-0.231	-0.415	-0.094
Dissolved oxygen	-0.019	0.076	-0.518
Conductivity	-0.113	0.557	0.303
pH	-0.039	-0.135	-0.376
Temperature (°C)	0.042	-0.241	-0.026
<b>% of Variance Explained</b>	15%	14%	13%

Note: Values are Pearson Correlations ( $r$ ); values in bold  $>|0.6|$  indicate strong associations with the PC axis.

LWD – large woody debris; SWD – small woody debris; LDB – left downstream bank; RDB – right downstream bank

## E.3.2 Correlation Analyses

Spearman rank correlations were calculated between habitat variables that were highly correlated with PCA axes 1, 2, and 3 and measurement endpoints (catch per unit effort [CPUE], abundance, total richness, diversity, and an assemblage tolerance index [ATI]). This step identified which habitat characteristics were driving changes in measurement endpoints.

CPUE was significantly correlated with wetted width, depth at mid-channel, and big tree canopy cover on the left bank (Table E.3-2). Abundance was significantly correlated with mid-channel depth and big tree canopy cover on the left bank. Richness was correlated with instream cover as boulders and big tree canopy cover on the left bank. Diversity was significantly correlated with understory shrub scores for the left and right banks. ATI was significantly correlated with depth at mid-channel and instream cover as macrophytes.

**Table E.3-2 Spearman correlations between measurement endpoints and habitat variables for *baseline* fish assemblages reaches, 2009 to 2014.**

	Abundance	Richness	Diversity	ATI	CPUE
Bankful width	-0.040	0.237	0.252	-0.094	-0.132
Wetted width	-0.217	0.197	0.257	0.061	<b>-0.281</b>
Depth at mid-channel	<b>-0.426</b>	-0.140	-0.080	<b>0.590</b>	<b>-0.490</b>
Instream macrophytes	-0.090	0.029	0.139	<b>0.554</b>	-0.023
Boulders	0.232	<b>0.288</b>	0.225	-0.138	0.144
Big tree canopy RDB	0.079	0.258	0.034	-0.052	0.068
Big tree canopy LDB	<b>0.296</b>	<b>0.298</b>	0.055	-0.031	<b>0.274</b>
Under shrub LDB	0.036	-0.142	<b>-0.276</b>	0.159	0.060
Under shrub RDB	0.040	-0.100	<b>-0.296</b>	0.022	0.090
Canopy SWD RDB	-0.044	0.054	-0.179	-0.035	-0.054
Canopy SWD LDB	0.001	-0.009	-0.226	-0.133	-0.009
Canopy LWD RDB	-0.007	0.062	-0.039	0.023	0.026

LWD – large woody debris; SWD – small woody debris; LDB – left downstream bank; RDB – right downstream bank

## E.3.3 Cluster Analysis of Habitat Data

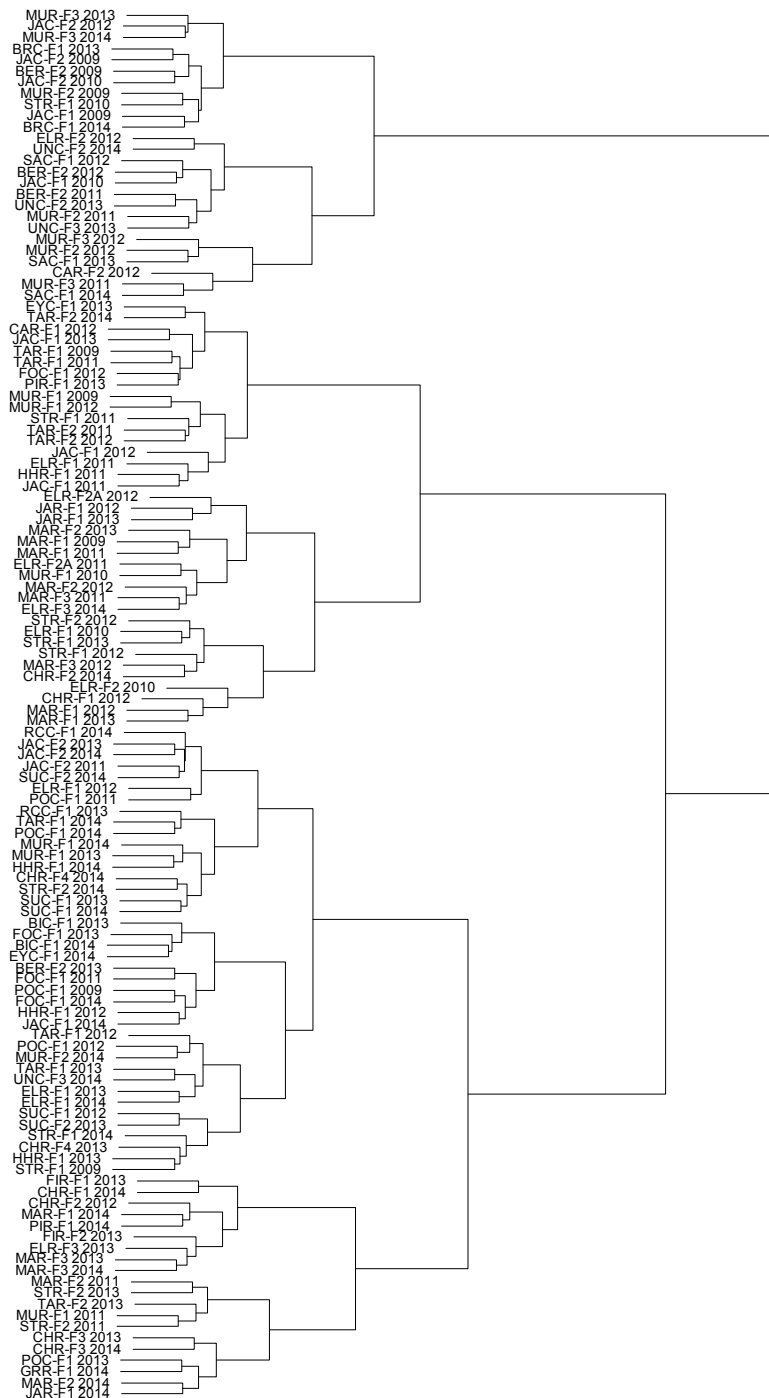
A cluster analysis was conducted using significant habitat variables identified in the PCA to group the 126 reach x year (*baseline and test*) combinations based on similar habitat conditions. Ward's hierarchical clustering using Euclidean distance was used in the cluster analysis. Prior to clustering, data for each variable was scaled by unit variance to ensure that data for every descriptor was comparable. Habitat variables that were highly correlated (Spearman  $r > 0.9$ ) with other habitat variables were excluded from the cluster analysis given that the inclusion of several highly correlated variables would result in clusters being overly influenced by what is essentially the same descriptor (Mooi and Sastedt 2011). Only left bank understory shrub cover was removed from the analysis based on this criterion.

Three main groupings of *baseline* and *test* reaches were observed (Figure E.3-1):

- Cluster group 1 – narrow, deep channel with lots of instream macrophytes, and small amount of instream boulders and big tree canopy cover;

- Cluster group 2 – medium width, shallow channel with little instream macrophytes, small amount of big tree canopy cover and understory shrubs, but lots of instream boulders; and
- Cluster group 3 – wide, shallow channel with little instream macrophytes, some instream boulders, and lots of big tree canopy cover and understory shrubs.

**Figure E.3-1 Dendrogram based on cluster analysis of all reach-year combinations of measurement endpoints based on significant habitat variables.**



### E.3.4 Calculation of Normal *Baseline* Ranges

*Baseline* reaches were grouped into the clusters to develop normal *baseline* ranges of variability for all measurement endpoints (Table E.3-3). As more data are collected over time, analysis of habitat variables and their influence on fish assemblages will be refined.

**Table E.3-3 Summary of normal *baseline* ranges, classified by cluster groups.**

Cluster Group	Measurement Endpoint	Outer Tolerance Limit on the 5 <sup>th</sup> Percentile	5 <sup>th</sup> percentile	Inner Tolerance Limit on the 5 <sup>th</sup> Percentile	Inner Tolerance Limit on the 95 <sup>th</sup> Percentile	95 <sup>th</sup> percentile	Outer Tolerance Limit on the 95 <sup>th</sup> Percentile
1	Mean Abundance (#/m)	0.00	0.01	0.01	0.29	0.29	0.58
	Total Richness	0.00	0.48	0.43	6.22	6.30	12.23
	Mean Diversity	0.00	0.00	0.00	0.64	0.61	1.00
	Mean ATI	0.00	4.08	4.59	9.04	8.82	10.00
	CPUE (No./100 sec)	0.00	0.23	0.00	5.68	6.42	11.80
2	Mean Abundance (#/m)	0.00	0.03	0.00	0.43	0.41	0.57
	Total Richness	0.09	2.00	1.12	8.13	9.00	11.00
	Mean Diversity	0.00	0.07	0.08	0.78	0.70	0.98
	Mean ATI	2.33	3.77	3.69	7.74	7.98	9.11
	Mean CPUE (No./100 sec)	0.00	0.69	0.32	7.27	7.52	9.59
3	Mean Abundance (#/m)	0.00	0.28	0.29	0.88	0.89	1.58
	Total Richness	0.00	1.60	2.18	6.39	6.00	11.43
	Mean Diversity	0.00	0.03	0.01	0.64	0.66	1.00
	Mean ATI	0.00	3.04	2.50	6.85	6.81	10.00
	Mean CPUE (No./100 sec)	0.00	4.78	4.83	10.84	11.25	18.03

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**Appendix F**  
**Acid-Sensitive Lakes Component**

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## F ACID-SENSITIVE LAKES COMPONENT

This appendix provides the descriptive information for the Acid-Sensitive Lakes (ASL) component in 2014 and includes the following:

- Water yields and runoff estimates for the individual lakes;
- Calculation of the  $ANC_{lim}$  in the critical load calculations;
- Calculation of the original base cation concentrations in the lakes for the critical load calculations;
- The chemistry of the 45 lakes in 2014 compared to that in 450 lakes within the oil sands region reported by the  $NO_xSO_x$  Management Working Group (NSMWG);
- The characterization of the ion chemistry of the lakes in 2014;
- A summary of trace metal concentrations in the lakes (2003 to 2014), and the relationship between trace metals, lake location, and guideline exceedances;
- A summary of low-level mercury and methylmercury concentrations in the lakes; and
- A Mann-Kendall trend analysis on selected metals to determine whether increases in these metals have occurred in the lakes over the twelve years of monitoring.

### F.1 RUNOFF CALCULATIONS FOR EACH LAKE

The runoff (Q) to each lake, was calculated by Dr. John Gibson (University of Victoria) from analyses of heavy isotopes of oxygen ( $^{18}O$ ) and ( $^2H$ ) in each lake. With this technique, the natural evaporative enrichment of  $^{18}O$  and  $^2H$  in each lake is used to partition water losses between evaporation and liquid outflow and hence derive an estimate of runoff (Gibson 2002; Gibson et al. 2002; Gibson and Edwards 2002; Gibson et al. 2010). This isotopic mass balance (IMB) technique utilizes a different set of assumptions from traditional hydrometric methods, which extrapolate water yields from one or more gauged catchments to the ungauged lake catchments.

The water yields for each lake catchment and the runoff to each lake are provided in Table F.1-1 and Table F.1-2. The runoff was calculated from the water yield by incorporating the lake catchment areas and represents the discharge that would be measured at the lake outlet. For 2011 to 2014, the runoff values using the IMB method were unavailable. Therefore, the mean yield and runoff values from 2002 to 2010 were applied to calculate the critical loads for these years. The runoff estimates for the lakes ranged from 0.001  $m^3/s$  to 2.43  $m^3/s$ , with a median of 0.072  $m^3/s$ . As evident in Table F.1-2, the runoff for an individual lake can vary considerably between years. The median coefficient of variation of the runoff over all 45 ASL lakes from 2002 to 2010 was 36.6%. Annual variability in the yield and runoff to a lake will have a direct effect on its critical load and acid sensitivity (Gibson et al. 2010).

**Table F.1-1 Water yields to the ASL component lakes, 2002 to 2014<sup>1</sup>.**

Lake ID No.	AESRD Label	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2014 <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	2.0	15.36
354	SM1	132	181	230	277	143	49	387	383	314	233	2.4	9.61
165	WF1	98	235	252	305	218	200	523	427	311	285	3.2	10.43
171	WF2	46	96	81	182	69	-	232	161	119	123	0.8	4.30
172	WF3	19	35	51	91	43	34	101	88	44	56	2.2	51.55
223	WF4	9	8	10	78	17	9	29	28	16	23	0.0	1.79
225	WF5	14	38	30	156	49	34	62	68	81	59	0.2	5.04
226	WF6	27	99	77	196	81	61	78	133	121	97	0.2	4.19
227	WF7	34	138	73	214	105	62	115	174	173	121	0.1	1.59
267	WF8	20	42	38	93	61	25	-	95	39	52	2.0	23.08
452	NE1	197	194	133	265	180	98	383	201	88	193	0.7	16.75
470	NE2	153	111	79	152	161	66	146	130	94	121	0.3	15.13
471	NE3	88	132	112	232	248	58	140	136	104	139	0.6	23.98
400	NE4	606	503	449	869	409	260	587	708	369	529	1.2	3.17
268	NE5	267	488	379	480	303	101	410	560	426	379	1.9	7.32
182	NE6	156	148	91	260	101	192	42	155	282	159	0.4	8.34
185	NE7	166	125	101	162	126	132	172	121	140	138	0.1	5.91
209	NE8	753	586	373	861	461	349	985	669	831	652	0.1	0.82
270	NE9	176	245	255	339	319	106	279	491	354	285	3.2	11.21
271	NE10	132	128	230	373	246	189	245	426	240	246	4.2	17.09
418	NE11	-	167	140	239	112	47	129	144	96	134	5.8	77.17
436	BM2	353	536	472	410	487	263	551	577	518	463	44.0	165.55
442	BM9	179	288	246	295	326	239	278	311	248	268	3.5	33.26
444	BM1	431	660	595	435	607	343	703	697	615	565	17.0	58.72
447	BM6	393	455	285	733	407	284	429	570	520	453	1.3	13.67
448	BM7	430	444	531	514	287	245	351	509	365	408	0.7	4.66
454	BM8	121	168	101	289	151	69	115	213	114	149	1.2	32.49
455	BM4	167	232	119	455	274	112	303	422	270	262	4.3	37.33
457	BM5	141	244	118	455	232	92	262	322	162	225	2.6	30.59
464	BM3	77	141	87	168	112	59	134	182	97	117	1.0	29.75
175	BM10	30	25	27	92	51	33	76	192	50	64	0.4	5.15
199	BM11	75	117	121	133	116	69	79	130	87	103	0.1	0.57
473	S4	23	30	24	57	38	38	42	39	28	35	1.4	114.65
118	S1	425	482	387	389	452	349	502	438	424	428	3.4	13.40
84	S2	43	51	42	65	39	-	54	71	33	50	1.0	112.59
88	S5	113	122	108	116	127	-	118	144	81	116	0.3	4.48
90	S3	112	159	130	140	148	139	150	187	115	142	1.4	37.89
	Min	9.0	8.0	10.0	57.0	17.0	9.0	29.0	28.0	16.0	23.0		
	Max	753	660	595	869	607	349	985	708	831	652		
	Mean	163	204	177	282	198	130	262	282	224	213		
	Median	127	148	121	239	151	95	214	197	154	149		

<sup>1</sup> Data provided by Dr. John Gibson.

<sup>2</sup> Water yields were not available from 2011 to 2014; therefore, the mean value from 2002 to 2010 was used for each lake.



**Table F.1-2 Runoff to the ASL component lakes, 2002 to 2014.**

Lake ID No.	AESRD Label	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011 to 2014 <sup>1</sup>
Runoff (m <sup>3</sup> /s)											
168	SM10	0.055	0.071	0.078	0.078	0.086	0.052	0.112	0.114	0.089	0.082
169	SM9	0.041	0.054	0.054	0.108	0.068	0.059	0.076	0.070	0.067	0.066
170	SM6	0.016	0.021	0.025	0.035	0.029	0.022	0.036	0.035	0.031	0.028
167	SM5	0.028	0.030	0.030	0.040	0.032	0.025	0.068	0.061	0.059	0.042
166	SM7	0.012	0.026	0.031	0.042	0.038	0.025	0.065	0.074	0.058	0.041
287	SM8	0.044	0.065	0.070	0.099	0.078	0.021	0.100	0.096	0.085	0.073
289	SM3	0.043	0.061	0.055	0.101	0.069	0.049	0.084	0.100	0.088	0.072
290	SM4	0.011	0.027	0.021	0.027	0.026	0.022	0.033	0.036	0.032	0.026
342	SM2	0.015	0.016	0.035	0.062	0.032	0.005	0.063	0.069	0.057	0.039
354	SM1	0.040	0.055	0.070	0.084	0.044	0.015	0.118	0.117	0.096	0.071
165	WF1	0.032	0.078	0.083	0.101	0.072	0.066	0.173	0.141	0.103	0.094
171	WF2	0.006	0.013	0.011	0.025	0.009	-	0.032	0.022	0.016	0.017
172	WF3	0.031	0.057	0.083	0.149	0.070	0.056	0.165	0.144	0.072	0.092
223	WF4	0.0005	0.0004	0.0005	0.0044	0.0009	0.0005	0.0016	0.0016	0.0009	0.001
225	WF5	0.002	0.006	0.005	0.025	0.008	0.005	0.010	0.011	0.013	0.009
226	WF6	0.004	0.013	0.010	0.026	0.011	0.008	0.010	0.018	0.016	0.013
227	WF7	0.002	0.007	0.004	0.011	0.005	0.003	0.006	0.009	0.009	0.006
267	WF8	0.015	0.031	0.028	0.068	0.045	0.018	-	0.070	0.029	0.038
452	NE1	0.105	0.103	0.070	0.141	0.096	0.052	0.204	0.107	0.047	0.103
470	NE2	0.073	0.053	0.038	0.073	0.077	0.032	0.070	0.062	0.045	0.058
471	NE3	0.067	0.100	0.085	0.176	0.188	0.044	0.107	0.103	0.079	0.106
400	NE4	0.061	0.051	0.045	0.087	0.041	0.026	0.059	0.071	0.037	0.053
268	NE5	0.062	0.113	0.088	0.112	0.070	0.024	0.095	0.130	0.099	0.088
182	NE6	0.041	0.039	0.024	0.069	0.027	0.051	0.011	0.041	0.075	0.042
185	NE7	0.031	0.023	0.019	0.030	0.024	0.025	0.032	0.023	0.026	0.026
209	NE8	0.020	0.015	0.010	0.022	0.012	0.009	0.026	0.017	0.022	0.017
270	NE9	0.062	0.087	0.090	0.121	0.113	0.038	0.099	0.174	0.126	0.101
271	NE10	0.072	0.069	0.125	0.202	0.133	0.103	0.133	0.231	0.130	0.133
418	NE11	-	0.409	0.342	0.584	0.273	0.115	0.315	0.353	0.235	0.328
436	BM2	1.851	2.815	2.476	2.155	2.557	1.383	2.890	3.029	2.719	2.431
442	BM9	0.189	0.304	0.259	0.311	0.344	0.253	0.294	0.328	0.262	0.282
444	BM1	0.803	1.229	1.107	0.810	1.130	0.638	1.309	1.297	1.145	1.052
447	BM6	0.170	0.197	0.123	0.318	0.177	0.123	0.186	0.247	0.225	0.196
448	BM7	0.064	0.066	0.078	0.076	0.042	0.036	0.052	0.075	0.054	0.060
454	BM8	0.125	0.174	0.104	0.298	0.155	0.071	0.119	0.220	0.117	0.154
455	BM4	0.198	0.274	0.141	0.538	0.324	0.133	0.358	0.500	0.320	0.310
457	BM5	0.137	0.237	0.115	0.441	0.225	0.089	0.254	0.312	0.157	0.219
464	BM3	0.072	0.133	0.082	0.159	0.105	0.055	0.127	0.172	0.092	0.111
175	BM10	0.005	0.004	0.004	0.015	0.008	0.005	0.012	0.031	0.008	0.010
199	BM11	0.001	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002
473	S4	0.082	0.110	0.089	0.206	0.138	0.139	0.152	0.143	0.102	0.129
118	S1	0.180	0.205	0.165	0.165	0.192	0.148	0.213	0.186	0.180	0.182
84	S2	0.153	0.182	0.149	0.232	0.139	-	0.191	0.253	0.118	0.177
88	S5	0.016	0.017	0.015	0.016	0.018	-	0.017	0.020	0.012	0.016
90	S3	0.135	0.191	0.156	0.169	0.178	0.167	0.180	0.225	0.138	0.171
	Min	0.0005	0.0004	0.0005	0.002	0.0009	0.0005	0.001	0.0016	0.0009	0.0010
	Max	1.851	2.815	2.476	2.155	2.557	1.383	2.89	3.029	2.719	2.431
	Mean	0.118	0.174	0.149	0.191	0.167	0.100	0.197	0.212	0.167	0.164
	Median	0.044	0.061	0.070	0.099	0.070	0.041	0.097	0.100	0.075	0.072

<sup>1</sup> Water yields were not available in 2011 or 2012; therefore, the mean runoff value from 2002 to 2010 was used for each lake.

## F.2 CALCULATION OF THE ORIGINAL BASE CATION CONCENTRATIONS TO DETERMINE CRITICAL LOADS

In order to be consistent with international methods, the original base cation concentration in each ASL component lake,  $[BC_o]$ , was calculated using the equation published in the “Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads” (CLRTAP 2004) and Henriksen et al. (2002):

$$[BC_o] = [BC_T] - F(SO_{4,T} - SO_{4,o} + NO_{3,T} - NO_{3,o})$$

Where,

- $[BC_T]$  is the current base cation concentration;
- F is the “F factor” describing the ratio of the change in base cations to the addition of strong acids to each lake from acid deposition;
- $SO_{4,T}$  and  $SO_{4,o}$  are the current and original sulphate concentrations in each lake, respectively; and
- $NO_{3,T}$  and  $NO_{3,o}$  are the current and original nitrate concentrations in each lake, respectively.

The F factor is defined as:

$$F = \sin(\pi/2 \cdot Q/[BC_T]/S)$$

Where,

- Q is the runoff and S is the base cation flux when all of the acid deposition is neutralized in the catchment ( $F=1$ ); and
- S is assumed to be 400 meq/m<sup>2</sup>/y.

The original sulphate concentration ( $SO_{4,o}$ ) for each lake was assumed to be the 5<sup>th</sup> percentile of sulphate concentrations from all ASL component lakes.

The predicted original base cation concentrations  $[BC_o]$  are provided in Table F.2-1. The final column of the table indicates the percent difference between the  $[BC_T]$  (i.e., the current 2014 base cation concentration) and  $[BC_o]$ . The mean difference between the two estimates was 2.8%, with only three *test* lakes having a difference greater than 10%. These three lakes in the Birch Mountains subregion were found to have relatively high sulphate concentrations. The same results were reported in 2013 for these three lakes. As shown in Figure F.2-1, the greater the sulphate concentration in a lake the greater the difference between the  $BC_T$  and  $BC_o$ . This relationship occurs because the estimate of  $SO_{4,o}$  as the 5<sup>th</sup> percentile of sulphate concentration for all the lakes was not universally applicable and far too low for lakes with relatively high sulphate concentrations. The high sulphate concentrations in these lakes were likely natural in origin rather than from acid deposition, given that the Birch Mountains subregion is remote from major sources of acidic emission.

In applying the Henriksen model in previous years, it was assumed that base cations have not increased in the ASL component lakes as a result of acidic deposition; that is, the current base cation concentrations  $[BC_T]$  were equivalent to the original base cations concentrations  $[BC_o]$ . Based on

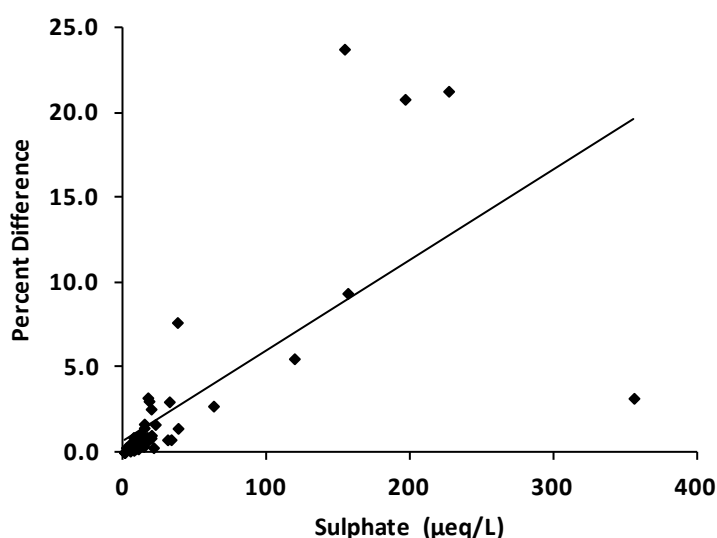
Table F.2-1, this assumption appears to be valid. The assumption is further supported by Whitfield et al. (2010) who applied the Magic Model to soils in the oil sands region and concluded that, to date, sulphate deposition in the oil sands region has resulted in limited removal of base cations from the soil.

**Table F.2-1 Comparison of the calculated BC<sub>0</sub> to the current BC<sub>T</sub> in the ASL component lakes in 2014.**

AESRD Label	Lake ID No.	Sulphate (mg/L)	Sulphate (µeq/L)	Runoff (m/y)	F Factor	BC <sub>T</sub> (µeq/L)	BC <sub>0</sub> (Predicted) (µeq/L)	% Difference between BC <sub>T</sub> and BC <sub>0</sub>
SM10	168	0.78	16.3	0.142	0.058	104.3	103.3	0.9
SM9	169	0.55	11.5	0.253	0.084	84.3	83.4	1.1
SM6	170	0.66	13.8	0.067	0.028	107.5	107.1	0.4
SM5	167	0.32	6.7	0.357	0.171	122.2	121.2	0.9
SM7	166	1.05	21.9	0.188	0.151	204.9	201.5	1.6
SM8	287	1.52	31.7	0.239	0.079	83.9	81.5	3.0
SM3	289	0.68	14.2	0.309	0.226	188.2	185.1	1.7
SM4	290	0.40	8.3	0.070	0.043	157.0	156.7	0.2
SM2	342	0.02	0.4	0.080	0.084	266.9	266.9	0.0
SM1	354	0.02	0.4	0.233	0.414	467.0	466.9	0.0
WF1	165	0.02	0.4	0.285	0.478	444.8	444.7	0.0
WF2	171	0.87	18.1	0.123	0.212	443.0	439.2	0.9
WF3	172	0.48	10.0	0.056	0.062	280.1	279.5	0.2
WF4	223	17.09	356.0	0.023	0.145	1,637.4	1,585.9	3.2
WF5	225	1.58	32.9	0.059	0.232	1,006.6	999.1	0.8
WF6	226	1.81	37.8	0.097	0.235	623.3	614.5	1.4
WF7	227	0.91	19.0	0.121	0.489	1,076.1	1,067.0	0.8
WF8	267	0.21	4.4	0.052	0.187	925.4	924.6	0.1
NE1	452	0.53	11.0	0.193	0.221	293.5	290.8	0.9
NE2	470	0.56	11.7	0.121	0.169	356.4	354.5	0.5
NE3	471	0.92	19.2	0.139	0.319	596.7	590.7	1.0
NE4	400	0.80	16.7	0.529	0.590	303.8	294.2	3.2
NE5	268	0.19	4.0	0.379	0.743	562.5	559.8	0.5
NE6	182	0.22	4.6	0.159	0.668	1,175.4	1,172.5	0.2
NE7	185	0.54	11.3	0.138	0.157	289.3	287.6	0.6
NE8	209	0.08	1.7	0.652	0.825	379.1	378.0	0.3
NE9	270	0.30	6.3	0.285	0.997	1,337.9	1,332.0	0.4
NE10	271	0.02	0.4	0.246	0.973	1,386.7	1,386.7	0.0
NE11	418	3.00	62.5	0.134	0.873	2,015.4	1,961.1	2.7
BM2	436	7.39	154.0	0.463	0.949	686.7	541.0	23.7
BM9	442	0.68	14.2	0.268	0.293	283.1	279.1	1.4
BM1	444	1.79	37.3	0.565	0.711	356.6	330.3	7.7
BM6	447	0.84	17.5	0.453	0.374	215.7	209.3	3.0
BM7	448	0.02	0.4	0.408	0.052	32.2	32.2	0.0
BM8	454	7.50	156.3	0.149	0.403	709.6	646.1	9.4
BM4	455	9.42	196.3	0.262	0.587	610.2	495.3	20.8
BM5	457	10.88	226.7	0.225	0.474	558.4	451.1	21.3
BM3	464	5.71	119.0	0.117	0.319	705.0	667.1	5.5
BM10	175	1.46	30.4	0.064	0.282	1,135.7	1,127.2	0.7
BM11	199	0.75	15.6	0.103	0.118	291.9	290.1	0.6
S4	473	0.99	20.6	0.035	0.083	598.8	597.2	0.3
S1	118	0.91	19.0	0.428	0.895	660.5	643.9	2.6
S2	84	0.33	6.9	0.050	0.127	652.1	651.3	0.1
S5	88	0.19	4.0	0.116	0.178	393.3	392.6	0.2
S3	90	0.43	9.0	0.142	0.282	512.2	509.8	0.5
							Mean	2.8

Note: BC<sub>T</sub>=current (2014) base cation concentration; BC<sub>0</sub>=original base cation concentration predicted from the F factor.

**Figure F.2-1 Relationship between the percent difference between  $BC_T$  and  $BC_o$  and the sulphate concentration in each lake.**

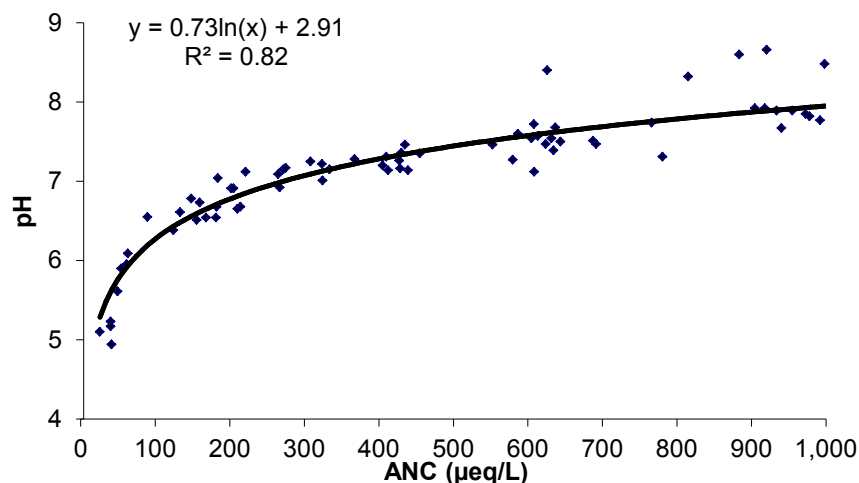


### **F.3 CALCULATION OF $ANC_{LIM}$ IN THE CALCULATION OF CRITICAL LOAD OF ACIDITY**

The limiting critical load ( $ANC_{lim}$ ) of 75 µeq/L, used to calculate the critical load of acidity to each lake was derived in a study by WRS (2001) from data on 180 lakes within the oil sands region of northern Alberta. The critical load concept assumes a dose-response relationship between a water quality variable and an aquatic indicator organism. In this case, the water quality variable is the acid neutralizing capacity (ANC) required to maintain a healthy fish population. In applying the Henriksen model in Europe, a critical threshold ANC ( $ANC_{lim}$ ) was set to protect brown trout, the most common European salmonid, to ensure that no toxic acidic episodes occur to this species during the year. The  $ANC_{lim}$  was derived from a survey of water chemistry data, critical load exceedances, and fish population status in 1,000 lakes in Norway in 1986 (Henriksen et al. 1988; Lien et al. 1991). A value of 20 µeq/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 pH greater than six 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 for all lakes, a pH of 6.0 was associated with an alkalinity of approximately 75 µeq/L. This value was; therefore, chosen for the  $ANC_{lim}$ .

**Figure F.3-1 Lake pH vs. Gran alkalinity for 180 lakes within the oil sands region of northern Alberta.**



## **F.4 COMPARISON OF ASL COMPONENT LAKE CHEMISTRY IN 2014 TO REGIONAL LAKE CHEMISTRY**

In order to determine whether the water chemistry of the ASL component lakes was representative of regional lake chemistry, data collected from the ASL component lakes in 2014 were 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) (WRS 2004). Key results were as follows (Table F.4-1 and Figure F.4-1):

- The ASL component lakes covered a slightly narrower pH range (4.44 to 9.87) with a lower median value (7.05 vs. 7.70) than the regional lakes. The median pH of the ASL component lakes was significantly less than that of the regional lakes ( $p < 0.05$ );
- Total alkalinity in the ASL component lakes ranged from 25 µeq/L to 1,644 µeq/L, with a median of 275 µeq/L, which was much lower than the regional median of 1,020 µeq/L. The median total alkalinity in the ASL component lakes was significantly lower than median of the regional lakes ( $p < 0.05$ );
- Conductivity was relatively low in the ASL component lakes, ranging from 9.57 µS/cm to 161 µS/cm (median: 35.3 µS/cm). The median conductivity of the regional lakes was 125 µS/cm. The median conductivity of the ASL component lakes was significantly lower than that of the regional lakes ( $p < 0.05$ );
- Consistent with lower conductivity in the ASL component lakes, the mean and median concentrations of the principal cations (calcium, magnesium, sodium, and potassium) and the sum of base cations (SBC) were all lower than for the regional lakes. The median SBC in the ASL component lakes in 2014 was 444 µeq/L compared to 1,247 µeq/L in the regional lakes. The median values of all these variables were significantly lower in the ASL component lakes ( $p < 0.05$ );

- The mean and median concentrations of the major anions (chloride, sulphate, and bicarbonate) were significantly lower in the ASL component lakes ( $p < 0.05$ );
- Total phosphorus was quite variable in both the ASL component lakes and the regional lakes, with individual lakes attaining concentrations that would classify them as eutrophic or hypereutrophic (Wetzel 2001). The highest concentration of total phosphorus observed in the ASL component lakes in 2014 was 451  $\mu\text{g/L}$  in BM 8/Lake 454 in the Birch Mountains subregion. The highest concentration of total phosphorus in the regional lakes was 495  $\mu\text{g/L}$ . The median concentration of total phosphorus in the ASL component lakes was 35  $\mu\text{g/L}$  compared to 49  $\mu\text{g/L}$  in the regional lakes. There was no significant difference in the median concentration of total phosphorus between the ASL component lakes and the regional lakes ( $p > 0.05$ );
- Compared with previous years, concentrations of nitrate in the ASL component lakes in 2014 were extremely low (median: non-detectable), although several lakes had values that were two orders of magnitude higher (e.g., 23  $\mu\text{g/L}$  in Lake NE1/452 in the Northeast of Fort McMurray subregion). Concentrations of nitrate in the regional lakes were similarly variable with a median of 2  $\mu\text{g/L}$  and a maximum concentration of 1,860  $\mu\text{g/L}$ . For the first time since the beginning of the ASL monitoring program, the median concentration of nitrate in 2014 was significantly lower than the regional lakes ( $p < 0.05$ ); and
- There was no significant difference in the median concentration of total dissolved nitrogen between the ASL component lakes in 2014 and the regional lakes ( $p < 0.05$ ).

The chemical differences in water between the ASL component lakes and the regional lakes reflected the bias in the selection process for lakes in the ASL component. The ASL component lakes were selected for their acid sensitivity which, in practice, meant selecting lakes with the lowest pH, alkalinity, conductivity, and base cation concentrations. Lakes with these characteristics are often the smallest lakes and are often located in the upland regions where catchments are dominated by fens and organic soils.

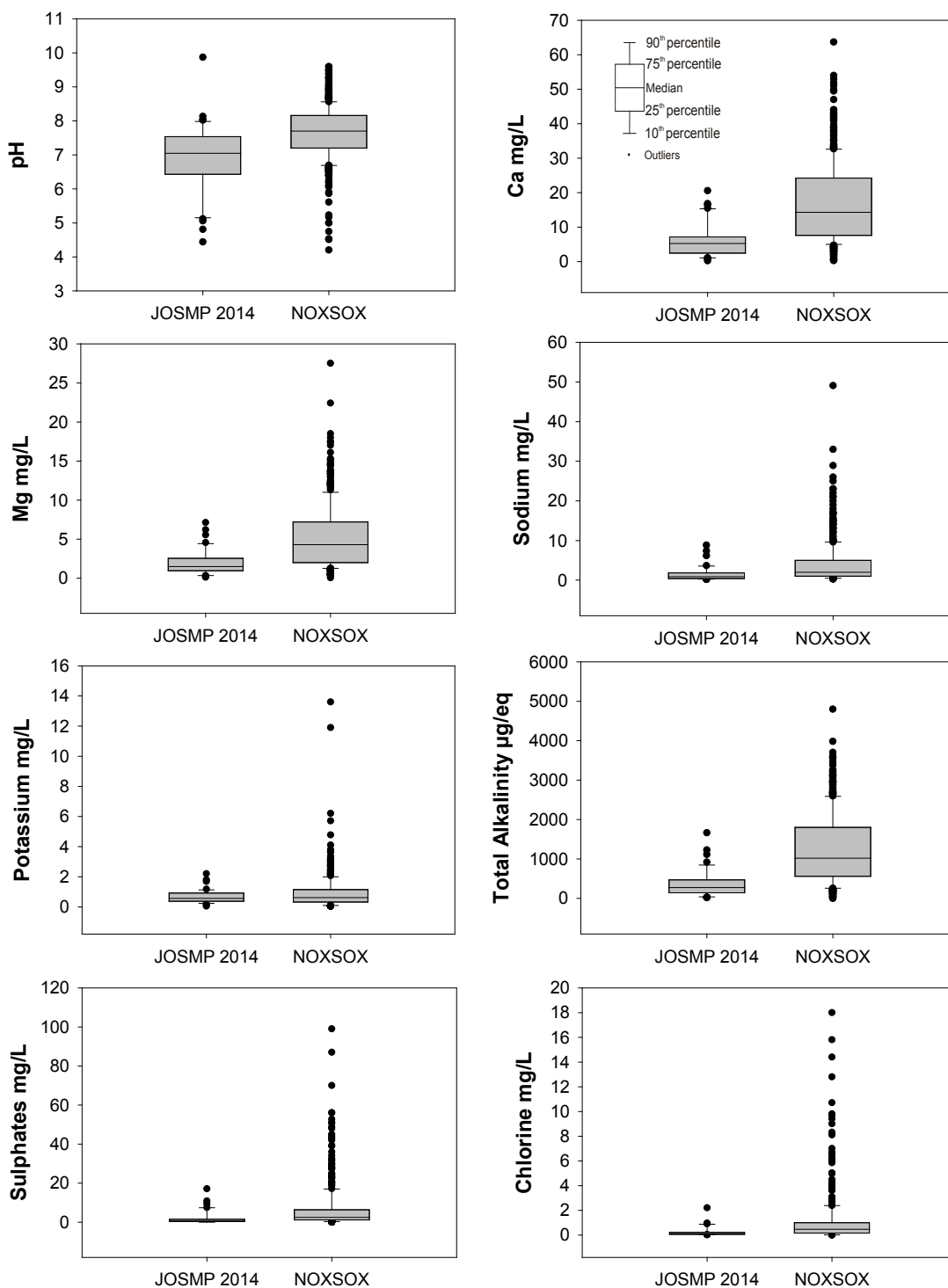
**Table F.4-1 Comparison between ASL component lakes in 2014 and 450 regional lakes in the NSMWG<sup>1</sup> database (WRS 2004).**

Variable	Units	ASL Component Lakes (2014)				Regional Lakes				
		Min	Max	Median	Mean	No.	Min	Max	Median	Mean
Lake Area	km <sup>2</sup>	0.03	43.40	1.30	2.86	431	0.01	214	1.60	6.26
Catchment Area	km <sup>2</sup>	0.7	224	15.3	28.1	432	0.1	1,769	17.4	89.3
Drainage Ratio	ratio	0.2	88.6	10.1	15.7	431	1.4	1,178	13.0	26.2
Runoff	m <sup>3</sup> /s	0.001	2.431	0.077	0.178	432	0.0002	4.67	0.04	0.26
Lab pH	pH units	4.44	9.87	7.05	6.91	432	4.2	10.0	7.7	7.7
Total Alkalinity	µeq/L	25	1,664	275	372	432	0	4,797	1,020	1,241
Specific Conductivity	µS/cm	9.6	161	35.3	45.2	399	11	481	125	144
Dissolved Organic Carbon	mg/L	7.3	45.9	21.5	22.5	383	0.2	60.0	19.4	20.4
Sodium	mg/L	0.15	8.81	0.86	1.61	432	0.28	49.0	2.00	4.07
Potassium	mg/L	0.05	2.20	0.57	0.69	432	0.05	14.0	0.620	0.943
Calcium	mg/L	0.23	20.60	5.26	6.18	432	0.25	64.0	14.3	17.0
Magnesium	mg/L	0.12	7.12	1.50	2.03	432	0.05	28.0	4.30	5.34
Sum of Base Cations	µeq/L	32	2,015	444	563	432	46	5,770	1,247	1,487
Chloride	mg/L	0.02	2.20	0.11	0.25	429	0.01	18.0	0.49	1.09
Sulphate	mg/L	0.02	17.09	0.68	1.90	431	0.03	99.0	2.50	6.73
Nitrate + Nitrite	µg/L	1.0	23.0	1.0	2.2	445	0.02	1,860	2.0	21.0
Ammonia	µg/L	1.5	1,040	9.0	40.7	320	0.2	650	11.4	31.8
Total Dissolved Nitrogen	µg/L	307	3,010	798	846	150	183	1,904	861	869
Total Phosphorus	µg/L	5	451	35	71	426	3.0	495	49.0	66.6

Note: Shading denotes significantly different median concentrations using a non-parametric Mann-Whitney test (p<0.05).

<sup>1</sup> NSMWG: NO<sub>x</sub>SO<sub>x</sub> Management Working Group

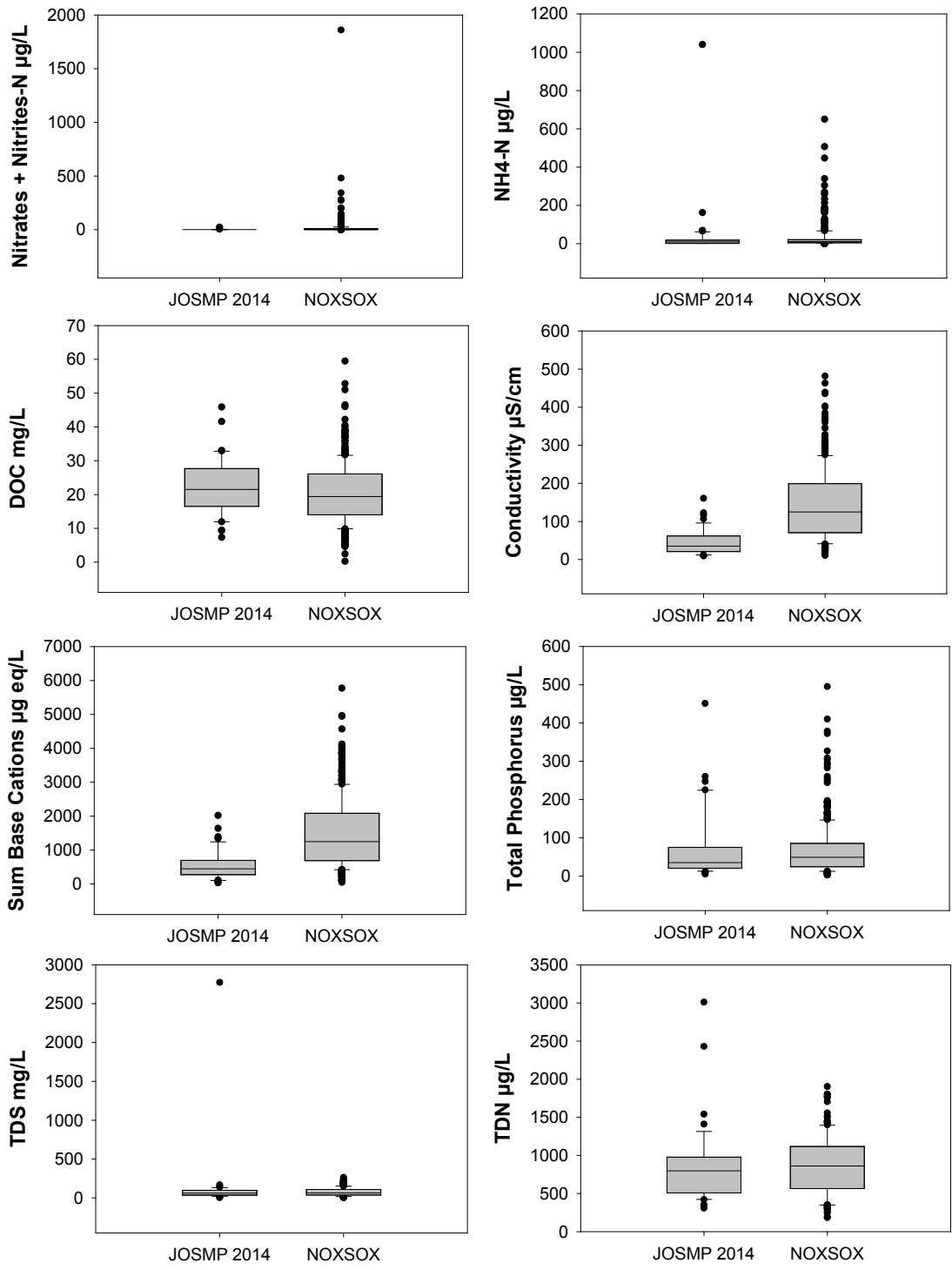
**Figure F.4-1** Box plots of selected chemical variables for the ASL lakes in 2014 versus 432 regional lakes reported by the NSMWG<sup>1</sup> (WRS 2004).



<sup>1</sup> NSMWG: NO<sub>x</sub>SO<sub>x</sub> Management Working Group.



Figure F.4-1 (Cont'd.)



<sup>1</sup> NSMWG: NO<sub>x</sub>SO<sub>x</sub> Management Working Group.

## F.5 CHARACTERIZATION OF ION CHEMISTRY IN THE ASL COMPONENT LAKES

In order to characterize the water of the ASL component lakes, the major anions and cations were displayed in Piper plots (Figure F.5-1). A Piper plot is a multivariate graphical technique that is used to divide the lakes into four water types on the basis of major cation constituents (Güler et al. 2002; Freeze and Cherry 1979; Back and Hanshaw 1965):

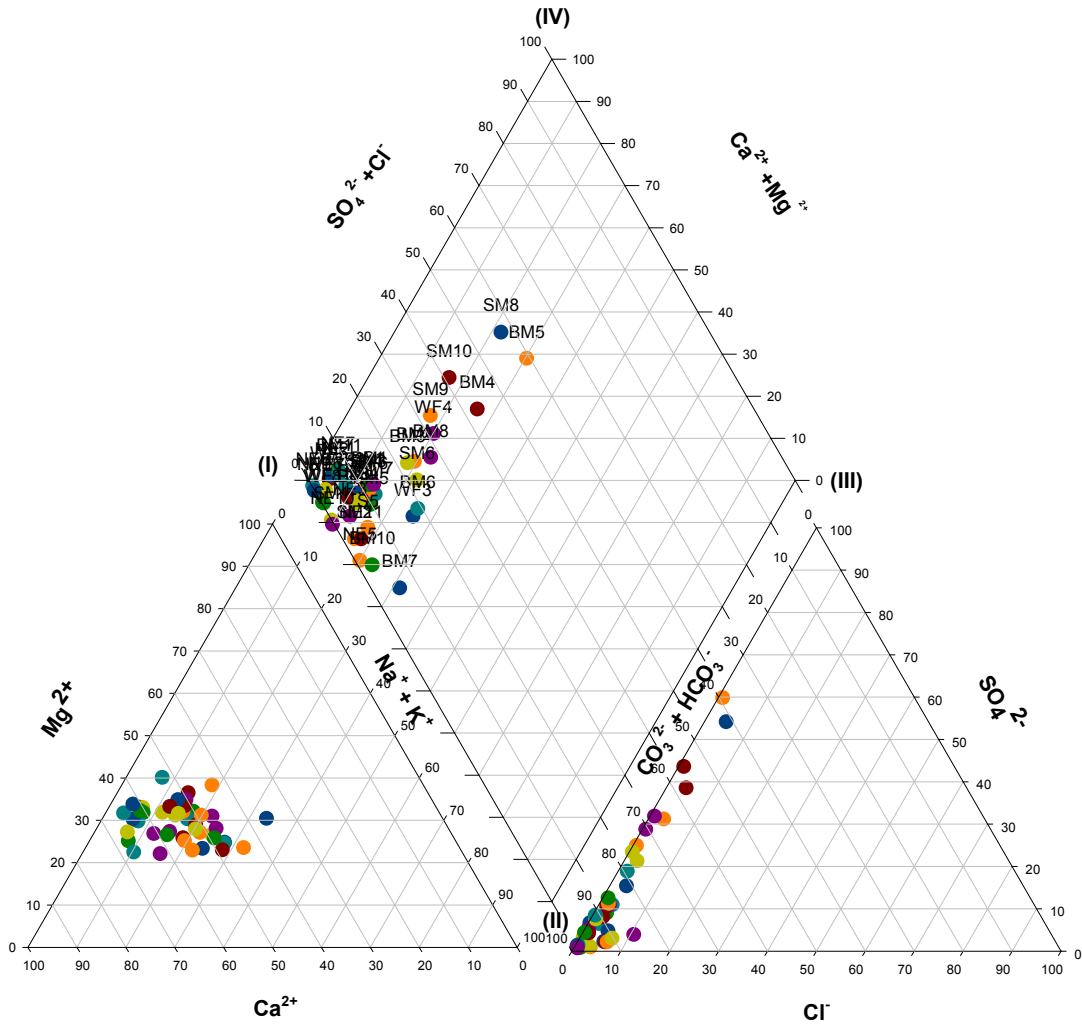
- Type I  $\text{Ca}^{2+}$  -  $\text{Mg}^{2+}$  -  $\text{HCO}_3^-$ ;
- Type II  $\text{Na}^+$  -  $\text{K}^+$  -  $\text{HCO}_3^-$ ;
- Type III  $\text{Na}^+$  -  $\text{K}^+$  -  $\text{Cl}^-$  -  $\text{SO}_4^{2-}$ ; and
- Type IV  $\text{Ca}^{2+}$  -  $\text{Mg}^{2+}$  -  $\text{Cl}^-$  -  $\text{SO}_4^{2-}$ .

As in previous years, the Piper plots showed that the majority of the lakes were designated as Type I, dominated by calcium and magnesium bicarbonates. Ten lakes had greater than 20% of their anionic charge attributed to sulphate and chloride rather than bicarbonates and carbonates and tended towards a Type IV designation (Table F.5-1). A total of seven lakes had at least 25% of their cation charge attributed to sodium and potassium rather than magnesium and calcium and tended towards a Type II designation (Table F.5-2). Many of the lakes tending towards a Type IV designation were found in the Birch and Stony Mountain subregions and were characterized with low conductivity, high DOC, and low Gran alkalinity. The range in types of water shown in Figure F.5-1 indicated significant variability in source waters to the ASL component lakes (e.g., groundwater vs. surface runoff).

**Table F.5-1 Key chemical characteristics of ASL component lakes with greater than 20% of anion charge attributed to sulphate and chloride.**

Lake	AESRD Name	pH	Gran Alkalinity ( $\mu\text{eq/L}$ )	Conductivity ( $\mu\text{S/cm}$ )	DOC ( $\text{mg/L}$ )	Lake Area ( $\text{km}^2$ )
<b>Stony Mountains Subregion</b>						
168	SM 10	5.12	12.0	12.2	18.3	1.4
169	SM9	4.81	3.0	12.8	19.8	1.4
170	SM6	5.41	14.2	10.3	15.2	0.7
287	SM8	5.17	6.6	9.6	13.4	1.9
<b>West of Fort McMurray Subregion</b>						
223	WF4	7.56	777.2	122.3	45.9	0.034
<b>Birch Mountains Subregion</b>						
436	BM2	7.50	447.6	66.2	7.3	44.0
454	BM8	6.91	378.2	65.2	32.5	1.2
455	BM4	6.98	230.4	54.5	21.5	4.3
457	BM5	6.48	123.8	50.0	24.8	2.6
464	BM3	7.26	383.0	58.6	24.1	1.0

Figure F.5-1 Piper plot showing the proportion of major cations and anions in the ASL component lakes in 2014.



**Table F.5-2 Key chemical characteristics of JOSMP lakes with at least 25% of cation charge attributed to sodium and potassium.**

Lake	AESRD Name	pH	Gran Alkalinity (µeq/L)	Conductivity (µS/cm)	DOC (mg/L)	Lake Area (km <sup>2</sup> )
<b>West of Fort McMurray Sub-Region</b>						
172	WF3	5.06	32.4	19.5	32.4	2.2
223	WF4	7.56	777	122.5	45.9	0.034
<b>Birch Mountains Sub-Region</b>						
447	BM6	5.49	43.2	18.3	29.4	1.3
448	BM7	4.44	3.00	15.5	21.5	0.68
455	BM4	6.98	230	54.5	21.5	4.3
457	BM5	6.48	124	50.0	24.8	2.6
175	BM10	8.02	792	78.0	41.6	0.39

## F.6 ANALYSIS OF METALS IN THE ASL COMPONENT LAKES

Elevated concentrations of metals, in particular aluminum, have traditionally served as important indicators of lake acidification. Historical concentrations of metals in the ASL component lakes are provided in Table F.6-1 and Table F.6-2 for total and dissolved fractions, respectively. Table F.6-3 presents the mean concentration of each trace metal for lakes in each subregion.

In general, concentrations of trace metals were quite low and close to detection limits. Table F.6-3 shows that the highest concentrations of trace metals were found in lakes located in the upland regions (i.e., the Birch, Stony Mountains, and Muskeg River Uplands). The mean concentrations of most dissolved metals including silver, aluminum, arsenic, barium, beryllium, bismuth, chromium, copper, cobalt, iron, manganese nickel, lead, selenium, and zinc were highest in lakes of the Birch Mountains subregion. In the Birch Mountains, 46 individual metals in eleven lakes had mean dissolved concentrations of metals that were higher than the 95<sup>th</sup> percentile for all of the ASL component lakes (Table F.6-4).

Maps of dissolved aluminum, lead, iron, and cobalt in the ASL component lakes clearly show the higher concentrations of trace metals in the upland regions, especially the Birch and Stony Mountains subregions (Figure F.6-1 to Figure F.6-4). The lakes with the highest concentrations of metals included those identified in the Piper plot as having a high proportion of the anionic charge attributed to chloride and sulphate rather than bicarbonates.

The reason for the higher concentrations of metals in the upland regions, especially in the Birch Mountains subregion, was unclear but may be related to the relatively low mean pH in these lakes (Table F.6-4). The high concentrations of metals in lakes of the Birch Mountains subregion may also be related to the known presence of poly-metallic black shale in the Birch Mountains (DNI 2012). The high concentrations of chloride and sulphate, as well as high concentrations of barium in lakes of the Birch Mountains subregion suggested a potential groundwater source for these metals. The relatively high concentrations of metals in these lakes; therefore, are natural in origin rather than the result of emissions from regional industry.

To determine whether metal concentrations are increasing in the ASL component lakes, a Mann-Kendall trend analysis was conducted on dissolved aluminum, arsenic, cobalt, iron, and lead from 2003 to 2014. Significant increases in concentrations of these metals included:

- arsenic in lakes BM4/455, BM2/436, and WF2/171;
- aluminum in lake NE1/452; and
- iron in lakes WF5/225, WF7/227, BM11/199, and BM3/464.

These variables were plotted in control plots in Figure F.6-5 to Figure F.6-7. When the rules for interpreting control charts are applied (Section 3.2.5.2), only iron in Lake BM11/199 showed an increasing trend, which was the result of two consecutive years (2013 and 2014) in which the 2 standard deviation (SD) limit was exceeded. High concentrations of iron were observed in all subregions in 2013 and 2014. The median concentrations of iron for all 45 lakes in 2013 (255 µg/L) and 2014 (310 µg/L) were considerably higher than previously observed (median for 2003 to 2011: 160 µg/L). It is unknown why concentrations of iron were so much higher in 2013 and 2014 but the fact that these high concentrations were observed in all subregions including the *baseline* lakes in the Canadian Shield subregion suggested that it was not related to acidification.

### F.6.1 Guideline Exceedances of Metals in the ASL Lakes

The exceedances of the CCME and AESRD Surface Water Quality Guidelines for the protection of aquatic life in 2014 (CCME 2007; AESRD 2014) are provided in Table F.6-5. Exceedances were observed in concentrations of aluminum, iron, and mercury. The guideline exceedances were scattered throughout the various subregions, with a large number occurring in lakes in the Birch Mountains subregion, consistent with higher concentrations of metals found in lakes in this subregion. The AESRD guideline for mercury was exceeded in four Birch Mountain lakes (BM6, BM8, BM4, BM5).

### F.6.2 Analysis of Low-Level Mercury and Methylmercury in the ASL Component Lakes

In 2014, low-level mercury and methylmercury analyses were conducted on water from the 45 ASL component lakes (Table F.6-6). Concentrations of inorganic mercury ranged from 0.390 ng/L to 6.36 ng/L (median: 1.75 ng/L). Concentrations of methylmercury ranged from 0.008 ng/L to 0.263 ng/L (median: 0.079 ng/L). A regression of methylmercury against inorganic mercury indicated a significant relationship between the two variables ( $p < 0.0007$ ).

**Table F.6-1 Statistical summary of total trace metals in the ASL Component lakes, 2003 to 2014.**

Metal (µg/L)	2003 to 2014						2014					
	Minimum	Maximum	Mean	Median	95%tile	N	Minimum	Maximum	Mean	Median	95%tile	% Non-Detects
Ag	0.00025	0.103	0.0070	0.0025	0.0286	555	0.001	0.009	0.00156	0.001	0.0054	84
Al	0.25	8694	189	55.3	739	555	6.9	1590	144	53.7	539	0
As	0.13	4.43	0.515	0.374	1.43	554	0.169	4.43	0.609	0.374	1.74	0
Ba	0.914	83.2	14.4	11.5	35.29	555	0.914	46.4	14.3	11.7	38.6	0
Be	0.0015	0.38	0.0193	0.0095	0.0805	511	0.004	0.101	0.0151	0.004	0.0622	53
Bi	0.0005	0.359	0.0065	0.0025	0.0209	555	0.0005	0.09	0.00781	0.002	0.0254	33
B	0.5	71.2	13.2	9.52	33.1	555	5.4	48.4	17.3	14.9	30.9	0
Cd	0.001	9.94	0.0358	0.01	0.0627	555	0.001	0.065	0.0104	0.005	0.0348	9
Co	0.0005	2.2	0.173	0.0835	0.5725	555	0.001	2.01	0.194	0.096	0.632	2
Cr	0.015	7.3	0.389	0.224	1.373	555	0.015	1.93	0.252	0.13	0.918	4
Cu	0.025	23.6	0.613	0.29	1.803	555	0.025	1.86	0.35	0.22	1.56	16
Fe	2.37	6750	641	360	2353	555	12.9	6750	842	552	2700	0
Li	0.01	16.9	2.70	1.76	8.469	555	0.025	8.91	2.58	1.75	7.83	4
Mn	3.24	469	49.7	38	136.5	555	4.46	469	71.7	54.4	156	0
Mo	0.0005	1.1	0.115	0.0788	0.39	555	0.001	0.618	0.113	0.063	0.452	2
Ni	0.0025	46	0.703	0.249	3.326	555	0.004	4.34	0.524	0.178	2.87	9
Pb	0.0005	95.3	0.376	0.100	0.709	555	0.0015	1.03	0.125	0.052	0.756	4
Sb	0.00025	0.2	0.0277	0.0186	0.09	555	0.006	0.152	0.0244	0.014	0.092	0
Se	0.02	0.9	0.110	0.05	0.25	555	0.03	0.31	0.0631	0.03	0.168	64
Sn	0.0015	3.02	0.0743	0.015	0.0603	555	0.0015	0.04	0.0127	0.01	0.0288	9
Sr	1.9	109	25.3	21.7	61.2	555	1.9	75.1	25.5	26.4	60.4	0
Th	0.00015	0.72	0.0336	0.0091	0.161	555	0.00045	0.493	0.0506	0.01	0.289	22
Ti	0.1	79	2.96	1.05	13.6	555	0.26	16.3	2.29	1.36	10.7	0
Tl	0.00015	0.077	0.0039	0.0021	0.0127	555	0.00045	0.024	0.00431	0.0027	0.0127	16
U	0.0004	0.432	0.0391	0.0112	0.185	555	0.0015	0.398	0.04	0.012	0.168	11
V	0.0025	15.5	0.762	0.344	3.326	555	0.06	5.73	0.676	0.32	2.91	0
Zn	0.05	34.4	3.47	2.57	9.039	555	0.05	11.4	2.42	1.4	6.32	2
Hg (ng/L)	0.326	19	3.54	3.98	5.129	240	0.390	6.36	2.20	1.75	5.84	0
MeHg (ng/L)	0.008	0.528	0.102	0.069	0.235	81	0.008	0.263	0.090	0.079	0.207	0

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 ASL lakes, 2003 to 2014.**

Metal (µg/L)	2003 to 2014						2014					
	Minimum	Maximum	Mean	Median	95%tile	N	Minimum	Maximum	Mean	Median	95%tile	% Non-Detects
Ag	0.00025	0.102	0.00238	0.00025	0.0083	466	0.0005	0.007	0.000967	0.0005	0.0044	87
Al	0.1	850	72.9	21.9	335	466	0.4	441	63.7	27.3	278	0
As	0.08	2.94	0.440	0.323	1.198	466	0.137	2.94	0.468	0.304	1.25	0
Ba	0.36	41	11.0	9.3	25.5	466	0.36	32	10.2	9.03	23	0
Be	0.0015	0.3	0.0145	0.0053	0.0568	466	0.0045	0.088	0.0112	0.0045	0.0444	71
Bi	0.0005	0.089	0.0043	0.00185	0.0148	466	0.0015	0.089	0.00722	0.0015	0.0248	58
B	1.8	62.3	11.5	8.04	27.8	466	2.8	41.9	11	7.06	26.4	0
Cd	0.001	5.82	0.0236	0.005	0.0394	466	0.001	0.044	0.00676	0.004	0.02	31
Co	0.0005	1.59	0.121	0.041	0.4585	466	0.001	1.59	0.129	0.038	0.352	9
Cr	0.02	1.88	0.240	0.1705	0.6908	466	0.05	0.6	0.133	0.1	0.46	49
Cu	0.005	2.13	0.378	0.24	1.358	466	0.04	1.78	0.297	0.21	1.3	16
Fe	0.01	3890	393	113	1815	466	1.8	3890	491	241	1660	0
Li	0.01	16.4	2.52	1.58	7.899	466	0.01	7.96	2.31	1.55	7.17	4
Mn	0.06	388	21.2	3.82	79.9	466	0.06	388	31.4	14.5	80.7	0
Mo	0.0005	1.43	0.0962	0.0619	0.330	427	0.001	0.541	0.0892	0.053	0.363	13
Ni	0.0025	4.18	0.468	0.161	2.603	466	0.003	3.18	0.392	0.147	2.2	16
Pb	0.0005	16.3	0.129	0.0383	0.415	466	0.002	0.536	0.0796	0.038	0.38	7
Sb	0.00025	0.179	0.0265	0.0174	0.085	466	0.004	0.142	0.0239	0.014	0.0912	7
Se	0.005	0.9	0.0833	0.05	0.250	466	0.02	0.2	0.0411	0.02	0.164	67
Sn	0.0015	0.0889	0.0192	0.015	0.050	466	0.0015	0.017	0.00507	0.005	0.0118	36
Sr	1.62	101	23.7	19.6	58.1	466	1.62	66.6	22.3	22.3	54.9	0
Th	0.00015	0.438	0.0274	0.0081	0.135	466	0.0004	0.376	0.0432	0.0098	0.2	22
Ti	0.02	15.9	1.27	0.45	6.600	466	0.04	8.11	1.19	0.61	5.62	4
Tl	0.00015	0.043	0.0028	0.0017	0.008	466	0.0002	0.0098	0.00262	0.002	0.00688	22
U	0.0002	0.365	0.0280	0.008	0.127	466	0.001	0.327	0.0307	0.009	0.122	18
V	0.01	3.94	0.392	0.19	1.725	466	0.01	1.96	0.346	0.2	1.56	2
Zn	0.045	29.5	2.69	1.955	6.73	466	0.045	5.71	1.88	1.02	5.53	2

Note: For the purpose 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 ASL component lakes in each subregion, 2003 to 2014.**

Metal	Mean Concentrations µg/L – Dissolved Metals					Mean Concentrations µg/L – Total Metals				
	SM	WFM	NEFM	BM	CS	SM	WFM	NEFM	BM	CS
Ag	0.00123	0.00198	0.00111	0.00449	0.00343	0.00606	0.00625	0.00603	0.00959	0.0062
Al	78.8	18.3	36.1	162	17	229	46.1	62.4	437	39
As	0.327	0.337	0.402	0.755	0.183	0.385	0.399	0.441	0.915	0.201
Ba	7.5	9.75	10.5	17.5	6.15	9.58	14.1	13.2	23	7.37
Be	0.0151	0.00476	0.00796	0.0269	0.0134	0.022	0.0073	0.0138	0.0344	0.0096
Bi	0.00456	0.00397	0.00459	0.00507	0.00199	0.0064	0.0055	0.0072	0.0083	0.0024
B	6.41	12.4	11.3	18.1	6.14	8.42	15.0	12.79	19.2	7.56
Cd	0.0149	0.00893	0.0595	0.0166	0.0032	0.0222	0.0164	0.0865	0.0256	0.0060
Co	0.168	0.0507	0.0724	0.215	0.0172	0.22	0.0862	0.102	0.317	0.0375
Cr	0.215	0.155	0.197	0.374	0.214	0.323	0.203	0.269	0.748	0.248
Cu	0.342	0.214	0.228	0.681	0.338	0.7	0.474	0.442	0.891	0.388
Fe	288	126	240	898	184	451	301	464	1,320	369
Li	0.786	2.71	1.99	5.09	1.18	0.846	2.91	2.02	5.45	1.34
Mn	28.5	23.1	15.4	26.2	2.47	43.8	70.8	49.5	51.07	26.5
Mo	0.0861	0.0372	0.0426	0.175	0.147	0.096	0.0561	0.060	0.197	0.175
Ni	0.316	0.119	0.149	1.29	0.11	0.818	0.227	0.210	1.63	0.139
Pb	0.0971	0.0582	0.193	0.188	0.0268	0.198	0.136	0.842	0.356	0.139
Sb	0.0211	0.0179	0.0157	0.0543	0.0101	0.022	0.0192	0.016	0.057	0.0104
Se	0.0766	0.0674	0.069	0.113	0.0841	0.101	0.0848	0.092	0.152	0.109
Sn	0.0186	0.0186	0.0196	0.0198	0.0192	0.071	0.0234	0.049	0.111	0.129
Sr	8.53	33	25.1	27.4	31.1	9.22	35.3	25.70	29.1	32.8
Th	0.0202	0.00592	0.0114	0.0682	0.0161	0.023	0.0090	0.012	0.0872	0.0161
Ti	1.03	0.389	0.577	3.07	0.451	2.51	1.06	1.19	7.221	0.880
Tl	0.00414	0.00144	0.00161	0.00359	0.00236	0.0047	0.0022	0.0018	0.0070	0.0020
U	0.0122	0.00471	0.00595	0.0474	0.105	0.020	0.0081	0.0084	0.0642	0.134
V	0.326	0.196	0.302	0.793	0.0893	0.603	0.348	0.476	1.71	0.173
Zn	3.13	2.34	2.27	3.70	0.793	3.85	2.82	3.20	4.89	1.06
Hg (ng/L)	-	-	-	-	-	3.34	3.21	3.98	3.77	2.94

Note: SM = Stony Mountains, WFM = west of Fort McMurray, NEFM = north east of Fort McMurray, BM = Birch Mountains, CS = Canadian Shield, CM = Caribou Mountains.

Note: For purpose of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory.



**Table F.6-4 Number of lakes in each subregion with mean concentrations of trace metals greater than the 95<sup>th</sup> percentile.**

Subregion	No. of Lakes in Region	No. of Trace Metals with 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 (2014)
Stony Mountains	10	1	0.10	6.05
West of Fort McMurray	8	2	0.25	7.17
North-East of Fort McMurray	11	7	0.64	7.42
Birch Mountains	11	46	4.18	6.74
Canadian Shield	5	4	0.80	7.43
<b>Total</b>	<b>45</b>	<b>60</b>		

<sup>1</sup> Mean metal concentration for each lake calculated across all years.

<sup>2</sup> 95<sup>th</sup> percentile calculated for each metal across all lakes and years.

**Table F.6-5 ASL component lakes with exceedances of CCME and AESRD surface water quality guidelines for total metals in 2014.**

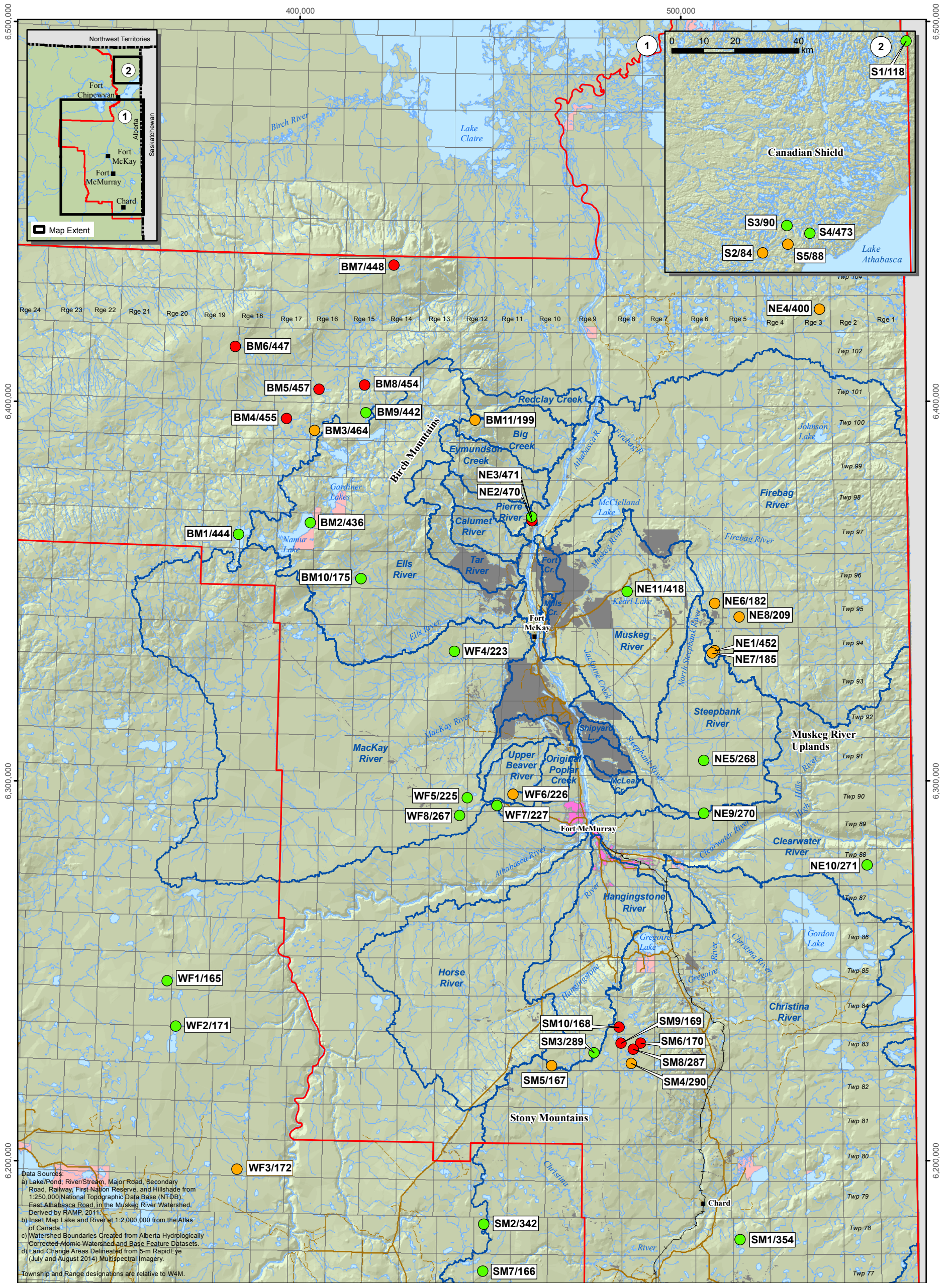
Metal	Number of Exceedances	Lakes with Exceedances
Al	14	SM10, SM9, SM6, WF3, BM11, SM8, SM4, NE4, BM6, BM7, BM8, BM4, BM5, NE2
Fe	20	S2, S3, SM10, SM9, SM6, WF3, BM10, NE7, NE8, WF6, SM8, BM9, BM6, BM7, NE1, BM8, BM4, BM5, BM3, NE2
Hg	4	BM6, BM8, BM4, BM5

**Table F.6-6 Concentrations of low-level inorganic mercury and methylmercury in the ASL component lakes in 2014.**

	Inorganic Mercury (ng/L)	Methylmercury (ng/L)
Min	0.390	0.008
Max	6.360	0.263
Mean	2.205	0.090
Median	1.750	0.079
No. of Exceedances	4	0
CCME PAL Guideline	26.0	4.0
AESRD Guideline	5.0	1.0

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Figure F.6-1 Concentrations of dissolved aluminum in the ASL component lakes, 2014.



Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Areas Delineated from 5-m RapidEye (July and August 2014) Multispectral Imagery.  
 Township and Range designations are relative to W4M.

**Legend**

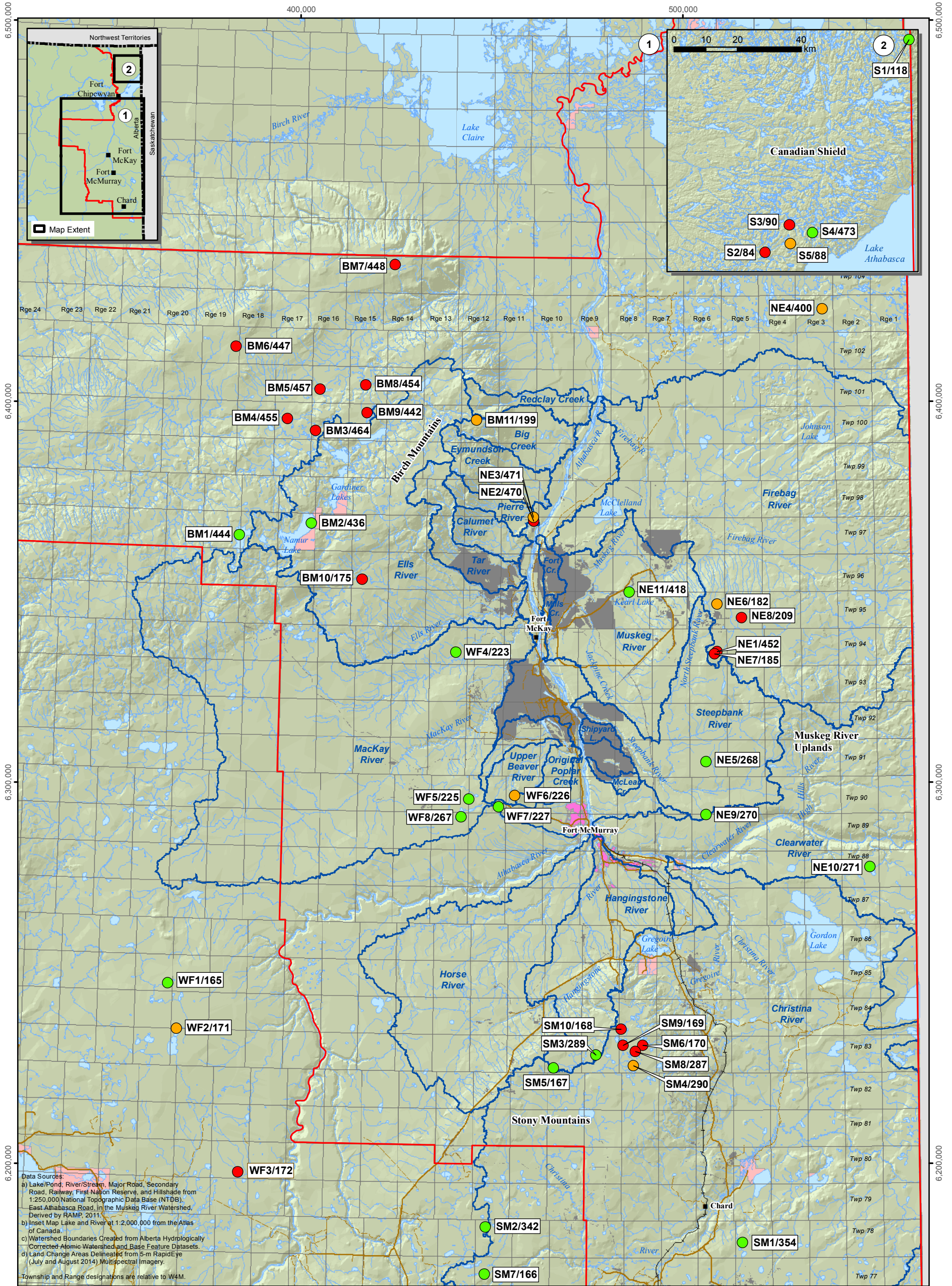
- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2014<sup>d</sup>

- 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 ASL component lakes, 2014.



Legend

- Lake/Pond
- River/Stream
- Watershed Boundary
- Major Road
- Secondary Road
- Railway
- First Nations Reserve
- Regional Municipality of Wood Buffalo Boundary
- Town of Fort McMurray
- Land Change Area as of 2014<sup>d</sup>

Dissolved Iron Concentration

- Low (< 199 µg/L)
- Medium (200 to 399 µg/L)
- High (≥ 400 µg/L)

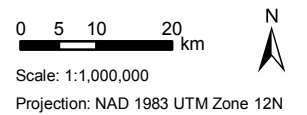
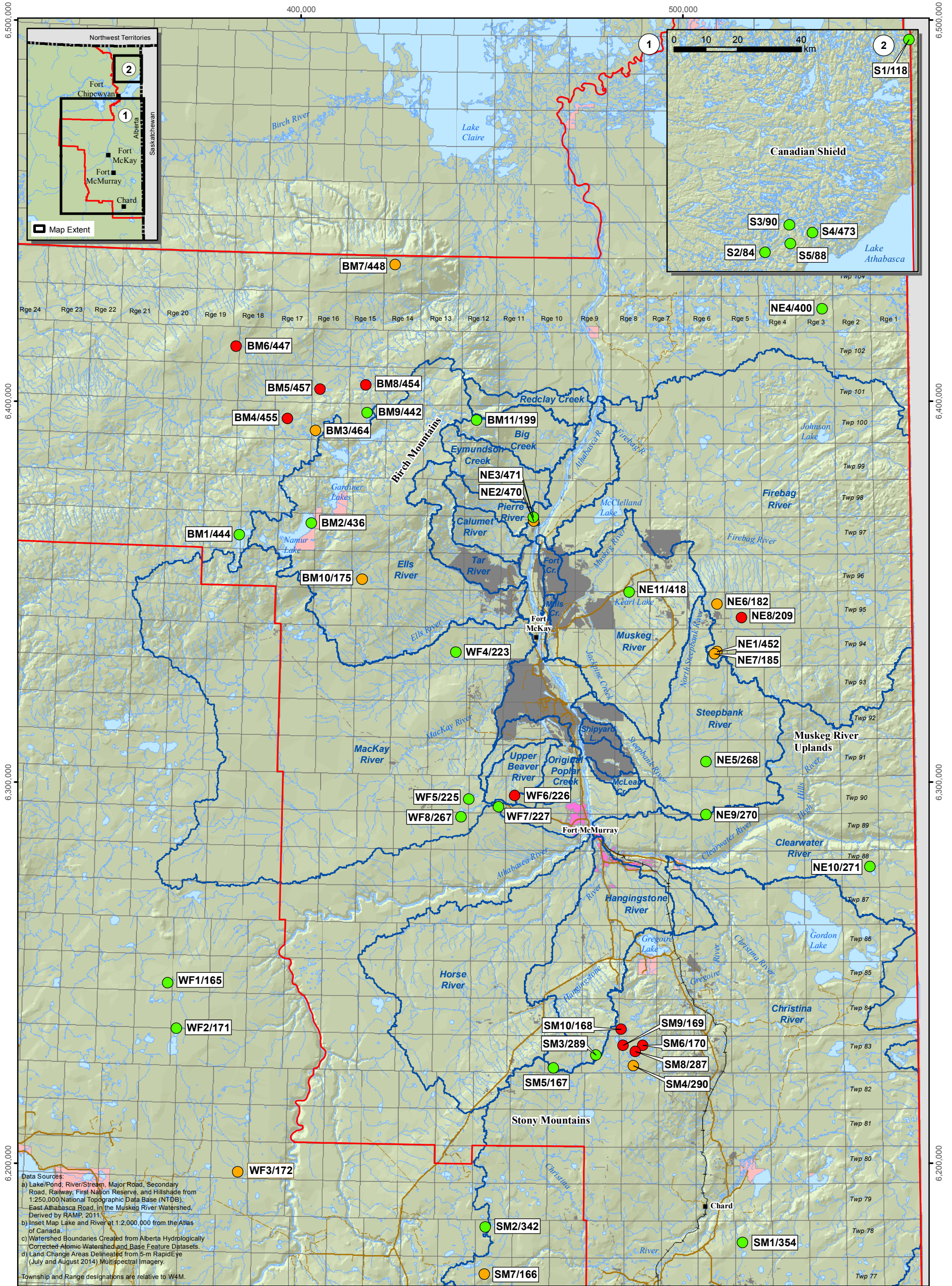


Figure F.6-3 Concentrations of dissolved cobalt in the ASL component lakes, 2014.



Data Sources:  
 a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
 b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
 c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
 d) Land Change Areas Delineated from 5-m RapidEye (July and August 2014) Multispectral Imagery.  
 Township and Range designations are relative to W4M.

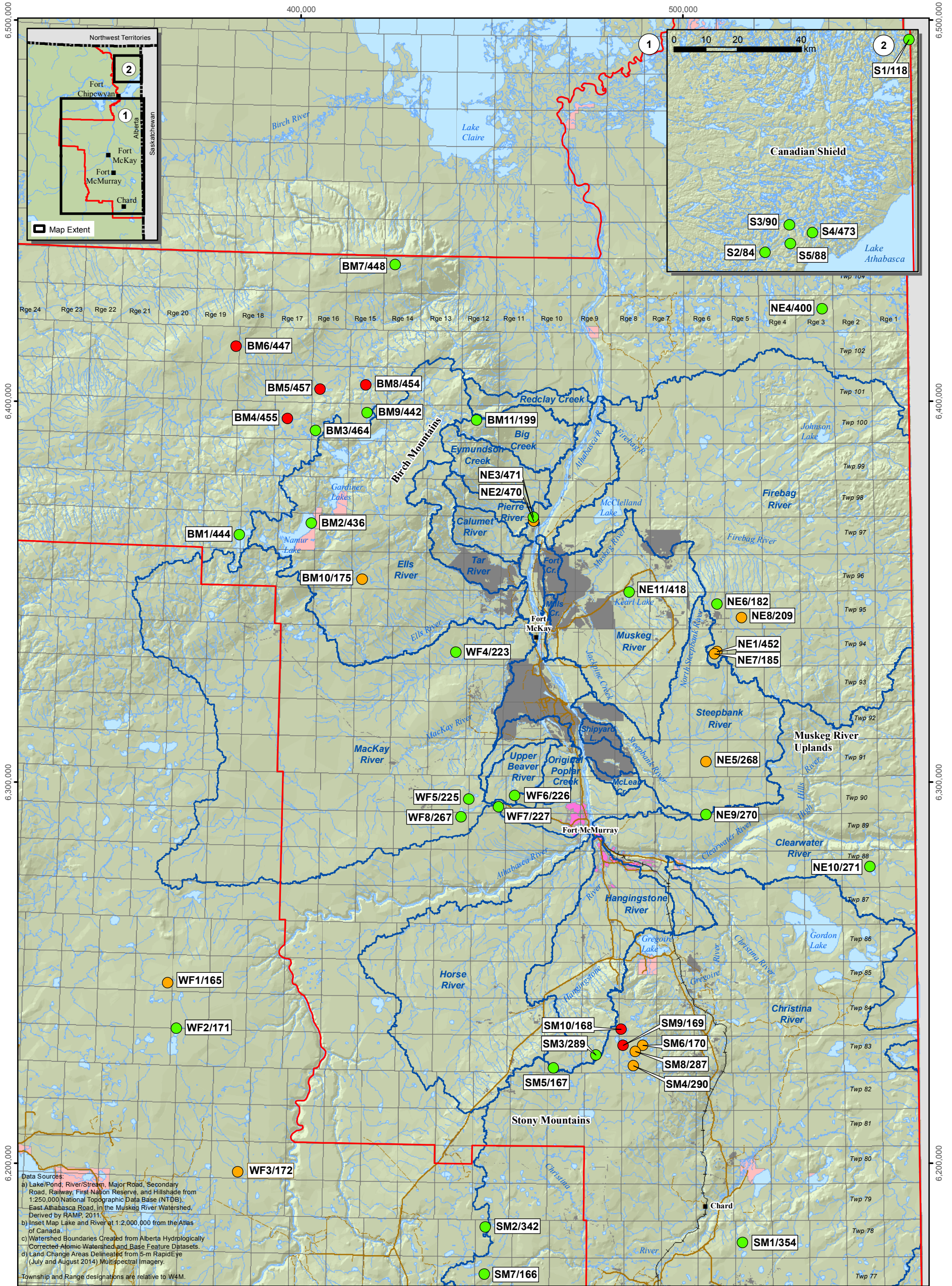
- Legend**
- Lake/Pond
  - River/Stream
  - Watershed Boundary
  - Major Road
  - Secondary Road
  - Railway
  - First Nations Reserve
  - Regional Municipality of Wood Buffalo Boundary
  - Town of Fort McMurray
  - Land Change Area as of 2014<sup>d</sup>

- Dissolved Cobalt Concentration**
- Low (< 0.049 µg/L)
  - Medium (0.05 to 0.149 µg/L)
  - High (≥ 0.150 µg/L)

0 5 10 20 km  
 Scale: 1:1,000,000  
 Projection: NAD 1983 UTM Zone 12N



Figure F.6-4 Concentrations of dissolved lead in the ASL component lakes, 2014.



Data Sources:  
a) Lake/Pond, River/Stream, Major Road, Secondary Road, Railway, First Nation Reserve, and Hillshade from 1:250,000 National Topographic Data Base (NTDB), East Athabasca Road, in the Muskeg River Watershed, Derived by RAMP, 2011.  
b) Inset Map Lake and River at 1:2,000,000 from the Atlas of Canada.  
c) Watershed Boundaries Created from Alberta Hydrologically Corrected Atomic Watershed and Base Feature Datasets.  
d) Land Change Areas Delineated from 5-m RapidEye (July and August 2014) Multispectral Imagery.  
Township and Range designations are relative to W4M.

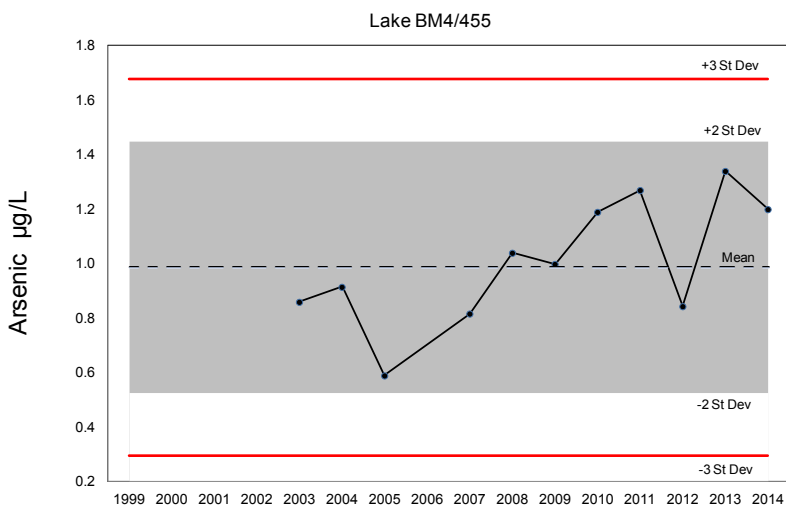
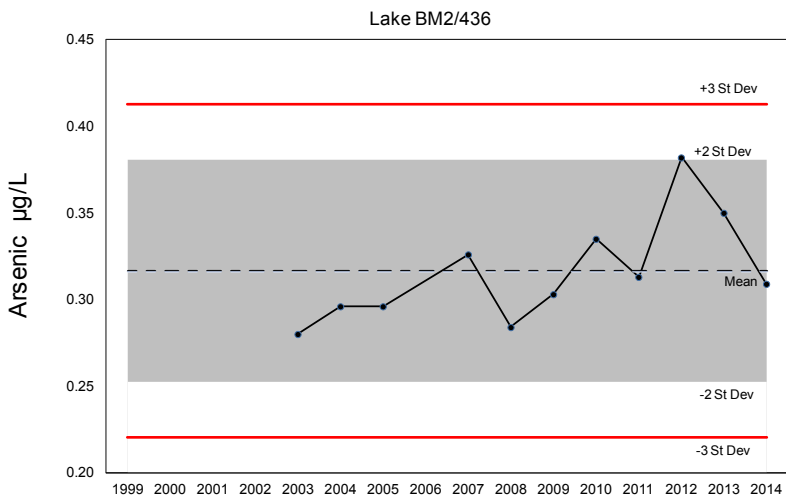
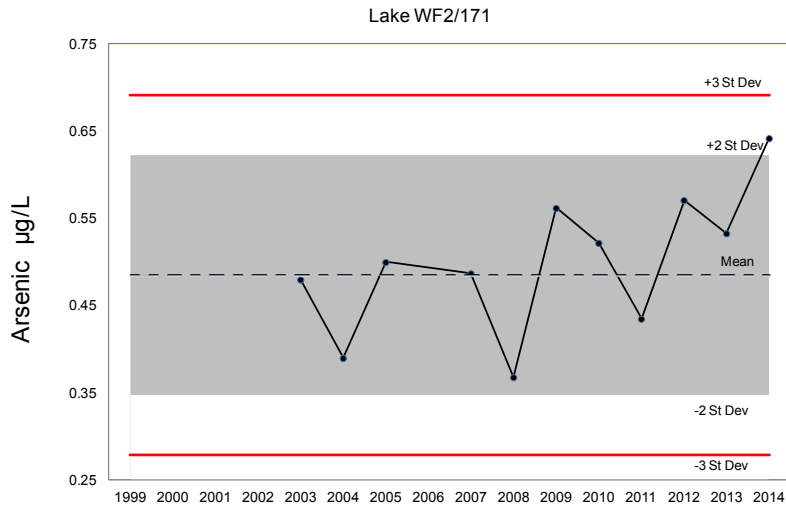
- Legend**
- Lake/Pond
  - River/Stream
  - Watershed Boundary
  - Major Road
  - Secondary Road
  - Railway
  - First Nations Reserve
  - Regional Municipality of Wood Buffalo Boundary
  - Town of Fort McMurray
  - Land Change Area as of 2014<sup>d</sup>

- Dissolved Lead Concentration**
- Low (< 0.049 µg/L)
  - Medium (0.05 to 0.149 µg/L)
  - High (≥ 0.150 µg/L)

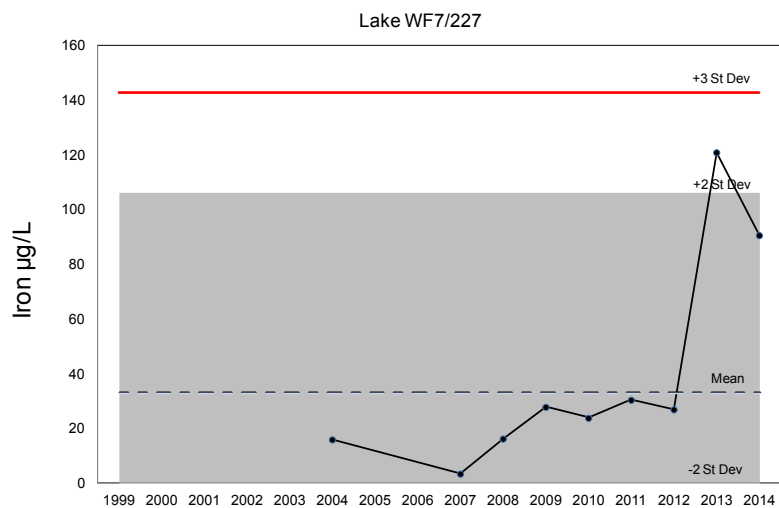
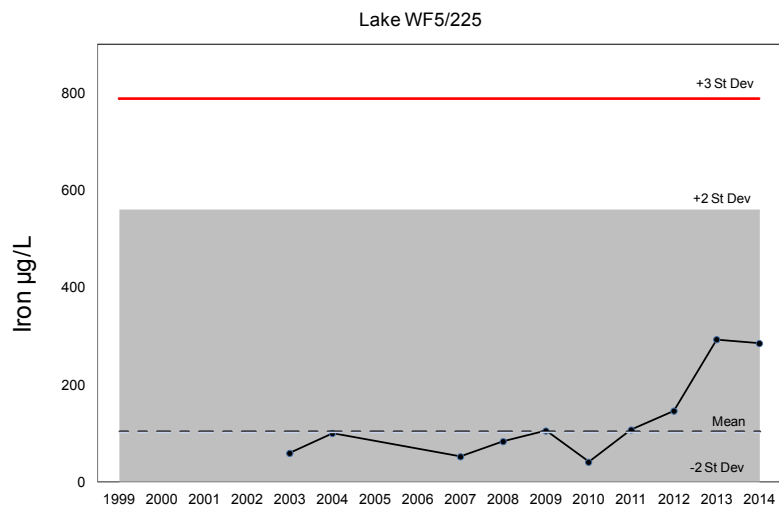
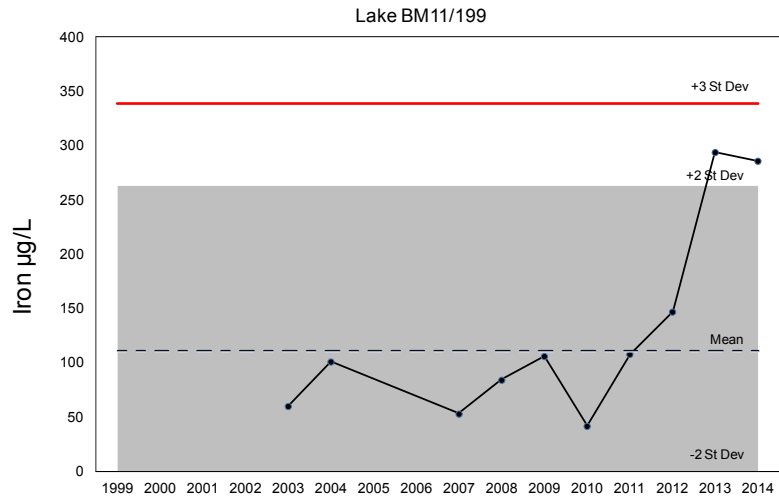
0 5 10 20 km  
Scale: 1:1,000,000  
Projection: NAD 1983 UTM Zone 12N



**Figure F.6-5 Control charts for ASL component lakes showing significant increases in concentrations of dissolved arsenic, 2003 to 2014.**



**Figure F.6-6 Control charts for ASL component lakes showing significant increases in concentrations of dissolved iron, 2003 to 2014.**





**Figure F.6-7 Control charts for ASL component lakes showing significant increases in concentrations of dissolved iron and aluminum, 2003 to 2014.**

