



# REGIONAL AQUATICS MONITORING PROGRAM

## 2007 Technical Report – Appendices

*FINAL*

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## **LIST OF APPENDICES**

Appendix A	Estimating Area of Land Change for the RAMP Focus Study Area
Appendix B	Quality Assurance and Quality Control Procedures for 2007
Appendix C	Climate and Hydrology Component
Appendix D	Water Quality Component
Appendix E	Benthic Invertebrate Community Component
Appendix F	Principal Components Analysis and Spearman's Rank Correlation of Sediment Quality Data
Appendix G	Fish Population Component
Appendix H	Acid-Sensitive Lakes Component

# TABLE OF CONTENTS

<b>LIST OF TABLES .....</b>	<b>iv</b>
<b>LIST OF FIGURES.....</b>	<b>viii</b>
<b>A.0 ESTIMATING AREA OF LAND CHANGE FOR THE RAMP FOCUS STUDY AREA.....</b>	<b>A-1</b>
<b>A.1 INTRODUCTION.....</b>	<b>A-1</b>
<b>A.2 METHODOLOGY .....</b>	<b>A-1</b>
A.2.1 Satellite Imagery Acquisition.....	A-1
A.2.2 Ortho-Rectification of Image Data .....	A-1
A.2.3 Atmospheric Correction .....	A-4
A.2.4 Classification of Land Change.....	A-4
<b>A.3 RESULTS .....</b>	<b>A-4</b>
<b>B.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES FOR 2007 .....</b>	<b>B-1</b>
<b>B.1 QUALITY ASSURANCE PROCEDURES.....</b>	<b>B-1</b>
B.1.1 Field Staff Training .....	B-1
B.1.2 Field Operations .....	B-1
B.1.3 Laboratory Analyses .....	B-3
B.1.4 Data Management .....	B-3
B.1.5 Sample Management .....	B-3
B.1.6 RAMP Quality Assurance Plan .....	B-4
<b>B.2 QUALITY CONTROL PROCEDURES.....</b>	<b>B-4</b>
B.2.1 Climate and Hydrology Component.....	B-4
B.2.2 Water Quality Component .....	B-6
B.2.3 Benthic Invertebrate Community Component.....	B-29
B.2.4 Sediment Quality Component.....	B-30
B.2.5 Fish Population Component .....	B-35
B.2.6 Acid-Sensitive Lakes Component.....	B-36
<b>C.0 CLIMATE AND HYDROLOGY COMPONENT .....</b>	<b>C-1</b>
<b>C.1 CLIMATE DATA COLLECTED IN 2007 .....</b>	<b>C-1</b>
C.1.1 RAMP Climate Data.....	C-1
C.1.2 Climate Data from Government Agencies .....	C-8
<b>C.2 HYDROMETRIC DATA COLLECTED IN 2007 .....</b>	<b>C-9</b>
C.2.1 RAMP Hydrometric Data .....	C-9
C.2.2 Hydrometric Data from Oil Sands Operators .....	C-12
C.2.3 Hydrometric Data from Government Agencies .....	C-12
C.2.4 2007 Hydrographs in Historical Context .....	C-14
C.2.5 Stage-Discharge Rating Curves .....	C-30
<b>C.3 STATION DESCRIPTION SHEETS .....</b>	<b>C-45</b>
<b>C.4 INVENTORY OF HYDROLOGIC DATA IN THE RAMP DATABASE .....</b>	<b>C-52</b>
<b>C.5 MANUAL WATER LEVEL AND DISCHARGE MEASUREMENTS .....</b>	<b>C-63</b>

<b>D.0</b>	<b>WATER QUALITY COMPONENT .....</b>	<b>D-1</b>
<b>D.1</b>	<b>PCA AND CLUSTER ANALYSIS OF WATER QUALITY DATA.....</b>	<b>D-1</b>
D.1.1	RAMP Stations.....	D-1
<b>E.0</b>	<b>BENTHIC INVERTEBRATE COMMUNITY COMPONENT .....</b>	<b>E-1</b>
<b>E.1</b>	<b>INTRODUCTION.....</b>	<b>E-1</b>
<b>E.2</b>	<b>BENTHIC INVERTEBRATE SAMPLE PROCESSING PROCEDURES.....</b>	<b>E-1</b>
E.2.1	Laboratory Methods.....	E-1
E.2.2	Coarse Fraction.....	E-1
E.2.3	Fine Fraction.....	E-1
E.2.4	Identification .....	E-2
<b>E.3</b>	<b>CALCULATING NORMAL RANGES.....</b>	<b>E-3</b>
<b>F.0</b>	<b>Principal Components Analysis And Spearman's Rank Correlation Of Sediment Quality Data .....</b>	<b>F-1</b>
<b>F.1</b>	<b>INTRODUCTION.....</b>	<b>F-1</b>
<b>F.2</b>	<b>METHODS.....</b>	<b>F-1</b>
F.2.1	Principal Components Analysis .....	F-1
F.2.2	Spearman's Rank Correlation Analysis.....	F-2
<b>F.3</b>	<b>RESULTS .....</b>	<b>F-2</b>
F.3.1	Total Metal Principal Components Analysis .....	F-2
F.3.2	Spearman's Rank Correlation Analysis.....	F-4
<b>F.4</b>	<b>DISCUSSION .....</b>	<b>F-5</b>
<b>F.5</b>	<b>CONCLUSION .....</b>	<b>F-8</b>
<b>G.0</b>	<b>FISH POPULATION COMPONENT .....</b>	<b>G-1</b>
<b>G.1</b>	<b>COMMON AND SCIENTIFIC NAMES FOR FISH SPECIES CAPTURED IN THE 2007 RAMP FISH POPULATION COMPONENT .....</b>	<b>G-1</b>
<b>G.2</b>	<b>EXTERNAL PATHOLOGY CODES FOR FISH EXAMINATION.....</b>	<b>G-2</b>
<b>G.3</b>	<b>HABITAT SITE CARDS.....</b>	<b>G-4</b>
<b>H.0</b>	<b>ACID-SENSITIVE LAKES COMPONENT .....</b>	<b>H-1</b>
<b>H.1</b>	<b>SUMMARY STATISTICS.....</b>	<b>H-1</b>
<b>H.2</b>	<b>COMPARISON OF ASL LAKE CHEMISTRY IN 2006 TO REGIONAL LAKES .....</b>	<b>H-4</b>
<b>H.3</b>	<b>CHARACTERIZATION OF RAMP ASL LAKES BY ION CHEMISTRY.....</b>	<b>H-8</b>
<b>H.4</b>	<b>ANALYSIS OF METALS IN THE RAMP ASL LAKES.....</b>	<b>H-10</b>
<b>H.5</b>	<b>SEASONAL VARIABILITY IN ASL MEASUREMENT ENDPOINTS.....</b>	<b>H-16</b>



## LIST OF TABLES

Table A.3-1	Examples of land change classes.....	A-5
Table A.3-2	Area of watersheds with land change as of 2007, summarized by land change type. ....	A-6
Table A.3-3	Percent of total area of watershed with land change as of 2007, summarized by type of land change. ....	A-7
Table B.2-1	Concentrations of water quality analytes in field blanks, 2007.....	B-9
Table B.2-2	Concentrations of water quality analytes in trip blanks, 2007. ....	B-11
Table B.2-3	Relative percent difference between split water quality samples collected from the Christina River (CHR-2A), winter 2007.....	B-13
Table B.2-4	Relative percent difference between split water quality samples collected from the Tar River (TAR-2), fall 2007. ....	B-15
Table B.2-5	Relative percent difference between split water quality samples collected from the Calumet River (CAR-2), fall 2007.....	B-17
Table B.2-6	Relative percent difference between duplicate water quality samples collected from the Christina River (CHR-2), winter 2007.....	B-19
Table B.2-7	Relative percent difference between duplicate water quality samples collected from the Ells River (ELR-2), spring 2007.....	B-21
Table B.2-8	Relative percent difference between duplicate water quality samples collected from Kearl Lake (KEL-1), summer 2007.....	B-23
Table B.2-9	Relative percent difference between duplicate water quality samples collected from the Hangingstone River (HAR-1), fall 2007.....	B-25
Table B.2-10	Relative percent difference between duplicate water quality samples collected from Kearl Lake (KEL-1), fall 2007.....	B-27
Table B.2-11	Results of quality control checks on sorting efficiency of benthic invertebrate samples, RAMP 2007. ....	B-30
Table B.2-12	Relative percent difference in total metals between duplicate sediment quality samples, Ells River, September 2007.....	B-32
Table B.2-13	Relative percent difference in metals between split sediment quality samples, Ells River, September 2007. ....	B-33
Table B.2-14	Relative percent difference in metals between split sediment quality samples, Jackpine Creek, September 2007.....	B-34

Table B.2-15	Aging results from fin rays and cleithra collected from northern pike captured during the Clearwater inventory and fish tissue program, fall 2007.....	B-36
Table B.2-16	Relative percent difference between duplicate mercury fish tissue samples collected from the Clearwater River, Gregoire Lake and Namur Lake, fall 2007.....	B-36
Table C.1-1	Aurora Climate Station (C1) daily data elements.....	C-1
Table C.1-2	Summary of 2007 monthly climate data collected at C1 Aurora Climate Station. ....	C-2
Table C.1-3	Sensors at other RAMP climate stations.....	C-3
Table C.1-4	Summary of 2007 climate data collected at L1 – McClelland Lake and L2 – Kearl Lake.....	C-4
Table C.1-5	Summary of 2007 climate data collected at other RAMP climate stations. ....	C-5
Table C.1-6	Summary of 2007 snowcourse surveys.....	C-8
Table C.2-1	Summary of 2007 hydrometric monitoring.....	C-10
Table C.2-2	Suspended sediment data collected at RAMP hydrometric stations in 2007.....	C-11
Table C.2-3	Hydrometric information for 2007 received from oil sands operators.....	C-13
Table D.1-1	RAMP water quality stations included in the historical dataset, 1997 to 2007.....	D-1
Table D.1-2	Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for dissolved metals.....	D-5
Table D.1-3	Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for total metals.....	D-6
Table D.1-4	Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for ions.....	D-6
Table D.1-5	Rank correlations among ion, dissolved metal, and total metal principal components.....	D-8
Table D.1-6	Summary of cluster membership by region.....	D-9
Table D.1-7	Summary of cluster membership by station and year for the water quality dataset.....	D-10

Table D.1-8	Rank correlations among conventional variables, general organics, nutrients and total metal principal components.....	D-19
Table D.1-9	Rank correlations of conventional variables, nutrients, and general organics with dissolved and total metals and major ions for the water quality dataset.....	D-21
Table D.1-10	Summary of cluster membership and characteristics. ....	D-23
Table E.2-1	Level of taxonomic identification. ....	E-3
Table 1.3-1	Means and standard deviations of indices of benthic community composition for reference waterbodies in the RAMP FSA.....	E-4
Table F.3-1	Total metals removed from the dataset prior to analysis during initial screening. ....	F-2
Table F.3-2	Pearson correlations of input variables with output summary variables (i.e. principal components) for the total metals data set. ....	F-3
Table F.3-3	Analytes removed from the dataset prior to conducting the Spearman rank correlation. ....	F-4
Table F.3-4	Spearman's Rank correlations between benthic invertebrate community indices and sediment quality endpoints.....	F-5
Table F.4-1	Spearman's Rank Correlation Coefficients for the sediment quality endpoints.....	F-6
Table G.1-1	Common and scientific names for fish species captured for the RAMP Fish Population component, 2007.....	G-1
Table G.2-1	External pathology codes for fish examination.....	G-2
Table H.1-1	Summary statistics for lakes sampled for the RAMP ASL component, 2002 to 2007. ....	H-2
Table H.2-1	Comparison between RAMP ASL lakes and 450 regional lakes in the NSMWG database. ....	H-5
Table H.3-1	Key chemical characteristics of ten RAMP ASL lakes having greater than 40% of anion charge attributable to sulphate and chloride (2007 data).....	H-8
Table H.3-2	Key chemical characteristics of ten RAMP ASL lakes having greater than 40% of cation charge attributable to sodium and potassium (2007 data). ....	H-9
Table H.4-1	Statistical summary of total metals in the RAMP ASL lakes over all lakes and years. ....	H-12

Table H.4-2	Statistical summary of dissolved metals in the RAMP ASL lakes over all lakes and years. ....	H-13
Table H.4-3	Mean concentration of total and dissolved metals in the RAMP ASL lakes in each sub-region (all years). ....	H-14
Table H.4-4	Number of lakes in each region having mean individual trace metal concentrations greater than the 95 <sup>th</sup> percentile. ....	H-15
Table H.4-5	List of exceedances of CCME Surface Water Quality Guidelines for metals in 2007. ....	H-15
Table H.5-1	Seasonal variability in ASL measurement endpoint parameters in ten lakes, 2004 to 2007 (AENV data). ....	H-17

## LIST OF FIGURES

Figure A.2-1	Illustration of the SPOT-5 scenes acquired.....	A-2
Figure A.2-2	Illustration of the Landsat-5 scene acquired. ....	A-3
Figure A.3-1	RAMP land change classes derived from SPOT-5 satellite imagery of July 2007, north of Fort McMurray. ....	A-9
Figure A.3-2	RAMP land change classes overlaid on composite of SPOT-5 satellite imagery from July 2007, north of Fort McMurray.....	A-11
Figure A.3-3	RAMP land change classes derived from SPOT-5 satellite imagery of July 2007 and Landsat-5 satellite image of September 2007, south of Fort McMurray. ....	A-13
Figure A.3-4	RAMP land change classes overlaid on composite of SPOT-5 satellite imagery from July 2007 and Landsat-5 satellite image of September 2007, south of Fort McMurray. ....	A-15
Figure C.1-1	Precipitation at Fort McMurray and RAMP Climate Stations, 2007.....	C-6
Figure C.1-2	2007 daily water temperatures.....	C-6
Figure C.2-1	2007 water level hydrograph and historical context for Station L1, McClelland Lake. ....	C-14
Figure C.2-2	2007 water level hydrograph and historical context for Station L2, Kearl Lake. ....	C-15
Figure C.2-3	2007 water level hydrograph and historical context for Station L3, Isadore's Lake. ....	C-15
Figure C.2-4	2007 discharge hydrograph and historical context for Station S2, Jackpine Creek at Canterra Road. ....	C-16
Figure C.2-5	2007 discharge hydrograph and historical context for Station S3, Iyininim Creek above Kearl Lake. ....	C-16
Figure C.2-6	2007 discharge hydrograph for Station S4A, Blackfly Creek near the Mouth.....	C-17
Figure C.2-7	2007 discharge hydrograph and historical context for Station S5, Muskeg River above Stanley Creek. ....	C-17
Figure C.2-8	2007 discharge hydrograph and historical context for Station S5A, Muskeg River above Muskeg Creek.....	C-18
Figure C.2-9	2007 discharge hydrograph and historical context for Station S6, Mills Creek at Highway 63. ....	C-18

Figure C.2-10	2007 discharge hydrograph and historical context for Station S7, Muskeg River near Fort McKay (07DA008).....	C-19
Figure C.2-11	2007 discharge hydrograph and historical context for Station S9, Kearl Lake Outlet. ....	C-19
Figure C.2-12	2007 discharge hydrograph and historical context for Station S10, Wapasu Creek at Canterra Road.....	C-20
Figure C.2-13	2007 discharge hydrograph and historical context for Station S11, Poplar Creek at Highway 63 (07DA007). ....	C-20
Figure C.2-14	2007 discharge hydrograph and historical context for Station S12, Fort Creek at Highway 63. ....	C-21
Figure C.2-15	2007 discharge hydrograph and historical context for Station S14, Ells River above Joslyn Creek. ....	C-21
Figure C.2-16	2007 discharge hydrograph and historical context for Station S14A, Ells River at the CNRL Bridge. ....	C-22
Figure C.2-17	2007 discharge hydrograph for Station S15A, Tar River near the Mouth.....	C-22
Figure C.2-18	2007 discharge hydrograph and historical context for Station S18A, Calumet River Upland Tributary. ....	C-23
Figure C.2-19	2007 discharge hydrograph and historical context for Station S19, Tar River Lowland Tributary near the Mouth.....	C-23
Figure C.2-20	2007 discharge hydrograph and historical context for Station S20, Muskeg River Upland.....	C-24
Figure C.2-21	2007 discharge hydrograph and historical context for Station S22, Muskeg Creek near the Mouth.....	C-24
Figure C.2-22	2007 discharge hydrograph and historical context for Station S24, Athabasca River below Eymundson Creek. ....	C-25
Figure C.2-23	2007 discharge hydrograph for Station S25, Susan Lake Outlet. ....	C-25
Figure C.2-24	2007 discharge hydrograph and historical context for Station S26, MacKay River near Fort McKay (07DB001).....	C-26
Figure C.2-25	2007 discharge hydrograph and historical context for Station S27, Firebag River near the Mouth (07DC001). ....	C-26
Figure C.2-26	2007 discharge hydrograph and historical context for Station S28, Khahago Creek below Black Fly Creek.....	C-27
Figure C.2-27	2007 discharge hydrograph and historical context for Station S29, Christina River near Chard (07CE002). ....	C-27

Figure C.2-28	2007 discharge hydrograph and historical context for Station S31, Hangingstone Creek near the Mouth. ....	C-28
Figure C.2-29	2007 discharge hydrograph and historical context for Station S32, Surmont Creek at Highway 31. ....	C-28
Figure C.2-30	2007 discharge hydrograph and historical context for Station S33, Muskeg River at the Aurora/Albian Boundary. ....	C-29
Figure C.2-31	2007 discharge hydrograph and historical context for Station S34, Tar River above CNRL Lake. ....	C-29
Figure C.2-32	Stage-discharge rating curve for Station S02, Jackpine Creek at Canterra Road. ....	C-30
Figure C.2-33	Stage-discharge rating curve for Station S03, Iyininim Creek above Kearl Lake. ....	C-31
Figure C.2-34	Stage-discharge rating curve for Station S04A, Blackfly Creek near the mouth. ....	C-31
Figure C.2-35	Stage-discharge rating curve for Station S05, Muskeg River above Stanley Creek. ....	C-32
Figure C.2-36	Stage-discharge rating curve for Station S05A, Muskeg River above Muskeg Creek. ....	C-32
Figure C.2-37	Stage-discharge rating curve for Station S6, Mills Creek at Highway 63. ....	C-33
Figure C.2-38	Stage-discharge rating curve for Station S7, Muskeg River near Fort McKay (07DA008). ....	C-33
Figure C.2-39	Stage-discharge rating curve for Station S9, Kearl Lake Outlet. ....	C-34
Figure C.2-40	Stage-discharge rating curve for Station S10, Wapasu Creek at Canterra Road. ....	C-34
Figure C.2-41	Stage-discharge rating curve for Station S11, Poplar Creek at Highway 61 (07DA007). ....	C-35
Figure C.2-42	Stage-discharge rating curve for Station S12, Fort Creek at Highway 63. ....	C-35
Figure C.2-43	Stage-discharge rating curve for Station S14, Ells River above Joslyn Creek. ....	C-36
Figure C.2-44	Stage-discharge rating curve for Station S14A, Ells River at the CNRL Bridge. ....	C-36
Figure C.2-45	Stage-discharge rating curve for Station S15A, Tar River near the mouth. ....	C-37

Figure C.2-46	Stage-discharge rating curve for Station S18A, Calumet River Upland Tributary. ....	C-37
Figure C.2-47	Stage-discharge rating curve for Station S19, Tar River Lowland Tributary near the Mouth. ....	C-38
Figure C.2-48	Stage-discharge rating curve for Station S20, Muskeg River Upland. ....	C-38
Figure C.2-49	Stage-discharge rating curve for Station S22, Muskeg Creek near the Mouth. ....	C-39
Figure C.2-50	Stage-discharge rating curve for Station S24, Athabasca River below Eymundson Creek. ....	C-39
Figure C.2-51	Stage-discharge rating curve for Station S25, Susan Lake Outlet. ....	C-40
Figure C.2-52	Stage-discharge rating curve for Station S26, MacKay River near Fort McKay (07DB001). ....	C-40
Figure C.2-53	Stage-discharge rating curve for Station S27, Firebag River near the Mouth. ....	C-41
Figure C.2-54	Stage-discharge rating curve for Station S28, Khahago Creek below Black Fly Creek. ....	C-41
Figure C.2-55	Stage-discharge rating curve for Station S29, Christina River near Chard (07CE002). ....	C-42
Figure C.2-56	Stage-discharge rating curve for Station S31, Hangingstone Creek near the Mouth. ....	C-42
Figure C.2-57	Stage-discharge rating curve for Station S32, Surmont Creek at Highway 31. ....	C-43
Figure C.2-58	Stage-discharge rating curve for Station S33, Muskeg River at the Aurora/Albian Boundary. ....	C-43
Figure C.2-59	Stage-discharge rating curve for Station S34, Tar River above CNRL Lake. ....	C-44
Figure D.1-1	Relationship dissolved metals principal component 1 (DISMET PC1) versus dissolved metals principal component 2 (DISMET PC2) for all sites with water quality data (1998-2007); Ellipses represent 95% confidence intervals. ....	D-15
Figure D.1-2	Relationship total metals principal component 1 (TOTMET PC1) versus total metals principal component 2 (TOTMET PC2) for all sites with water quality data (1998-2007); Ellipses represent 95% confidence intervals. ....	D-16



Figure D.1-3	Relationship ions principal component 1 (ION PC1) versus ions principal component 2 (ION PC2) for all sites with water quality data (1998-2007); Ellipses represent 95% confidence intervals.....	D-17
Figure E.2-1	Benthic invertebrate sorting and sub-sampling protocol, which would be applicable for samples with large detrital material and large numbers of small organisms. This is an illustrative example only, which is modified as necessary for station-specific samples. ....	E-2
Figure E.3-1	Ordination (Correspondence Analysis) of benthic invertebrate community samples from reference erosional habitats, 1998 to 2007.....	E-5
Figure E.3-2	Ordination (Correspondence Analysis) of benthic invertebrate community samples from reference depositional habitats, 1998 to 2007.....	E-6
Figure E.3-3	Ordination (Correspondence Analysis) of benthic invertebrate community samples from reference lake habitats, 1998 to 2007. ....	E-7
Figure H.1-1	Mean concentrations of selected parameters in the 50 RAMP ASL lakes over the five year monitoring period, 2002 to 2007. ....	H-3
Figure H.2-1	Box plots of selected chemical parameters for the RAMP ASL lakes in 2007 versus 450 regional lakes reported by the NSMWG (WRS 2004).....	H-6
Figure H.4-1	Piper plots showing the proportion of major cations and anions in the 2007 RAMP ASL lakes. ....	H-11
Figure H.5-1	Seasonal changes in chemical variables in ten RAMP ASL lakes. ....	H-18

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## **Appendix A**

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

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## **A.0 ESTIMATING AREA OF LAND CHANGE FOR THE RAMP FOCUS STUDY AREA**

### **A.1 INTRODUCTION**

This appendix documents the methodology used to quantify the location, extent, and type of land change in the RAMP Focus Study Area (FSA) as of 2007 related to:

- Focal projects (i.e., those projects owned by 2007 RAMP funders, which were under construction or operational in 2007 in the RAMP FSA); and
- Oil sands projects within the RAMP FSA that were under active development in 2007 by companies that were not funders of RAMP in 2007.

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

### **A.2 METHODOLOGY**

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

A total of four SPOT-5 10-meter resolution scenes were obtained by RAMP (Figure A.2-1); one of these images was acquired on 20 July 2007, two images were acquired on 23 July 2007, and one image was acquired on 30 July 2007. No cloud-free SPOT-5 images were available during summer 2007 for the part of the RAMP FSA south of Fort McMurray (except Opti-Nexen Long Lake Lease area as indicated in Figure A.2-1). Therefore, one Landsat-5 TM 30-meter resolution scene, acquired on 9 September 2007 and covering the area south of Fort McMurray, was obtained by RAMP (Figure A.2-2).

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

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

The procedure for ortho-rectifying the image data to a map projection involved the application of previously collected control points, topographic maps, existing ortho-rectified satellite imagery<sup>1</sup> and a digital elevation model (DEM)<sup>2</sup>, to identify common ground control points (GCPs, known reference locations that can be identified on the satellite image). A total of 20 to 30 GCPs for each satellite image were identified to provide enough input values for the image processing software to solve the ortho-rectification algorithm. Once the collection of GCPs was complete, the ortho-rectification model was executed, creating a copy of the image, with the new positions, aligned to the reference maps and the elevation data.

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<sup>1</sup> Geobase Landsat 7 ETM+ ortho-rectified images from 1999, 2000 and 2001.

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

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

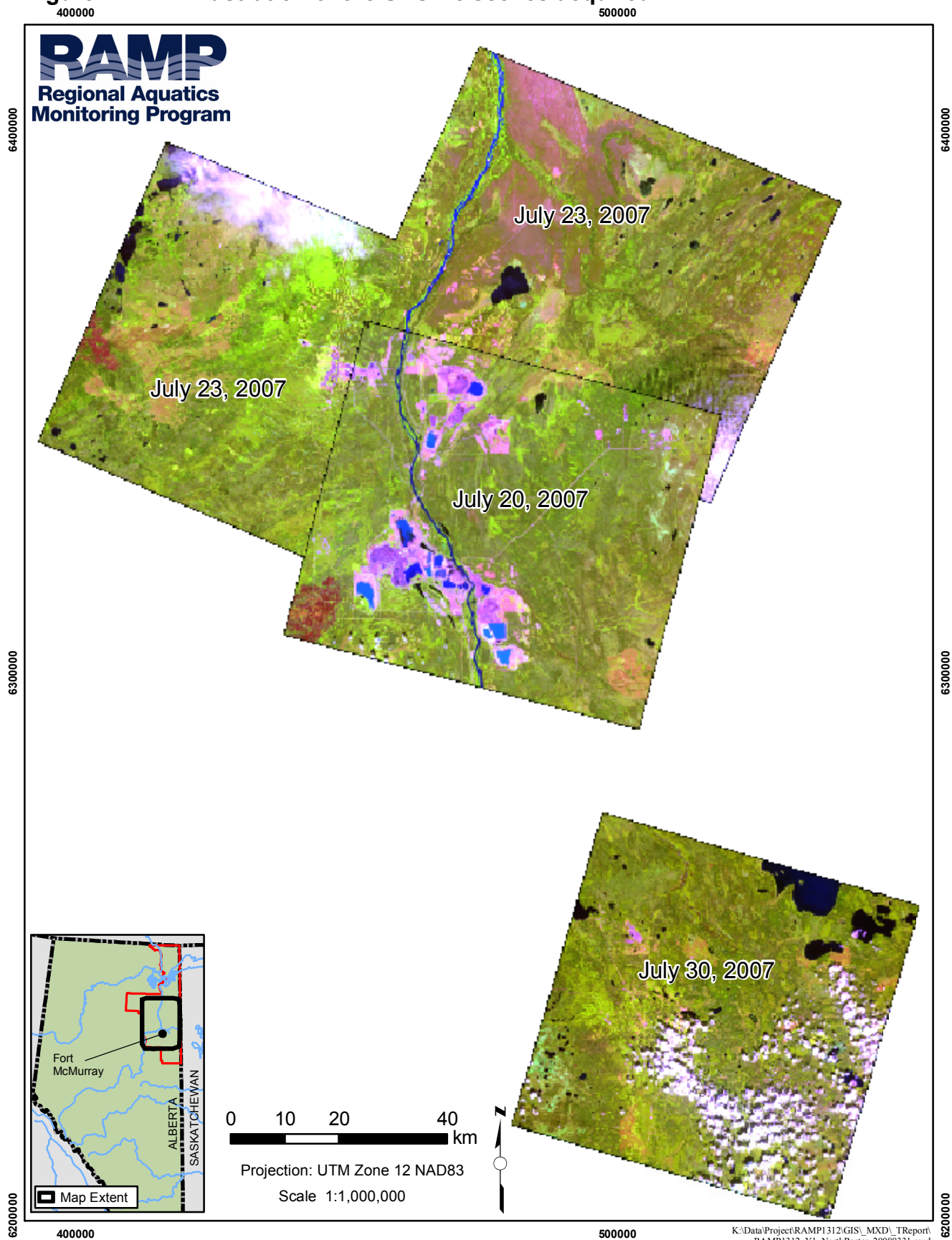
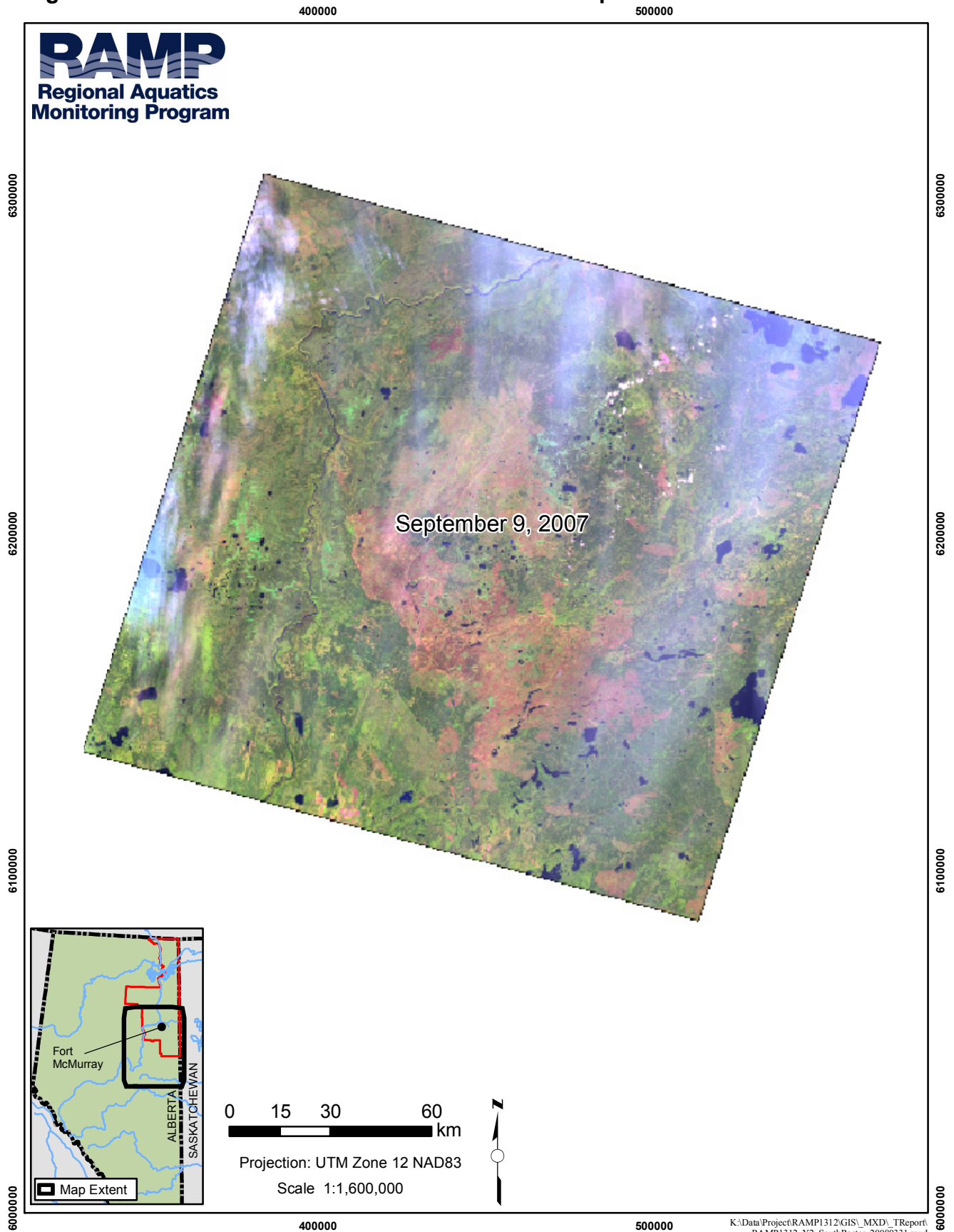


Figure A.2-2 Illustration of the Landsat-5 scene acquired.



The ortho-rectification was performed for both SPOT-5 and Landsat-5 TM imagery.

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

Atmospheric correction<sup>3</sup> was applied to the SPOT-5 images using an automated routine within the PCI Geomatica image processing software using a spatially-adaptive fast atmospheric correction model for flat terrain. No atmospheric correction was applied to the Landsat-5 image.

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

Two classes of land change were distinguished and delineated: closed-circuited; and not closed-circuited.

The 2007 areas of land change were digitized based on the results of the 2006 classification (RAMP 2006a, Appendix A), supplemented with more detailed maps of operations provided by a number of RAMP industry members (Table A.3-1). New areas were added and changed areas were modified based on 2007 SPOT-5, and the activity polygons were coded to a certain land change class, or re-coded to a new class where it was applicable. Draft land change maps were then distributed to the RAMP Technical Program Committee in fall 2007 for review and comment, and a final set of land change maps was then prepared.

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

## **A.3 RESULTS**

Table A.3-2 to Table A.3-3 provide tabular summaries of the land change areas in each of the main watersheds by each land change class. 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.

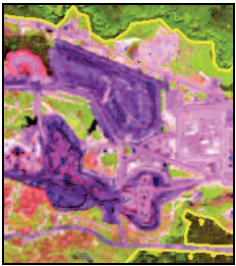

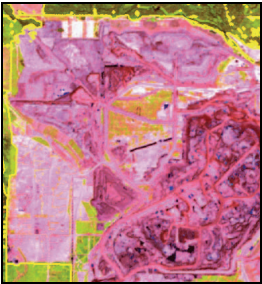

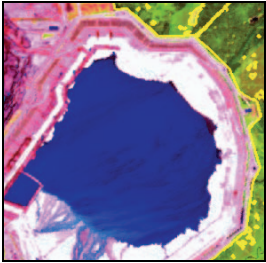

Land change as of 2007 within the RAMP FSA is estimated at approximately 64,000 ha for focal projects and slightly more than 2,200 ha for oil sands projects operated by non-RAMP funding companies, for a total of slightly more than 66,000 ha, or approximately 1.9% of the area of the RAMP FSA. The percentage of the area of watersheds with land change as of 2007 varies from less than 1% for many watersheds (MacKay, Ells, Christina, and Firebag), to 5% to 10% for the Muskeg watershed, to more than 10% for the Fort Creek, Tar, and McLean watersheds, as well as the smaller Athabasca River tributaries from Fort McMurray to the mouth of the Firebag River.

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<sup>3</sup> Optical satellite imagery captures solar radiation reflected from the earth's surface. As visible light is susceptible to interference created by the presence of water vapor in the atmosphere, it is necessary to correct the imagery to remove these effects.



**Table A.3-1 Examples of land change classes.**

Land Change Type	SPOT-5	Examples
Not closed-circuited		
		
Closed-circuited		

**Table A.3-2 Area of watersheds with land change as of 2007, summarized by land change type.**

Watershed	Total Watershed Area (ha)	Watershed Area with Land Change (ha)						
		Focal Projects		Other Oil Sands Projects in RAMP FSA		Total		Watershed Total
		Not Closed-Circuited	Closed-Circuited	Not Closed-Circuited	Closed-Circuited	Not Closed-Circuited	Closed-Circuited	
Minor Athabasca River Tributaries <sup>1</sup>	165,666	8,963	25,516			8,963	25,516	34,479
Calumet	17,354	217				217		217
Christina	1,303,805	1,001	114	824	449	1,825	563	2,388
Ells	245,000	146	87			146	87	233
Firebag	568,174	982	270			982	270	1,252
Fort Creek	3,193	1,626	40			1,626	40	1,666
Hangingstone	106,641				386		386	386
Horse	215,741				545		545	545
MacKay	557,000	839	264			839	264	1,103
McLean	4,712	48	1,076			48	1,076	1,124
Muskeg	146,000	3,659	9,378			3,659	9,378	13,037
Original Poplar <sup>2</sup>	13,856	121	260			121	260	381
Steepbank	135,491	1,538	186			1,538	186	1,724
Tar	33,261	7,036				7,036		7,036
Upper Beaver <sup>2</sup>	28,711	804				804		804
FSA Total	3,544,606	26,980	37,191	824	1,380	27,804	38,571	66,375

Only land changes within the RAMP FSA were delineated.

<sup>1</sup> Refers to Athabasca River tributaries from Fort McMurray to the mouth of the Firebag River excluding the watersheds listed explicitly listed in this table. All land change areas in the minor Athabasca River tributaries in 2007 were above RAMP hydrology station S24.

<sup>2</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).

Note: Rows and columns may not sum totals due to rounding differences.



**Table A.3-3 Percent of total area of watershed with land change as of 2007, summarized by type of land change.**

Watershed	Total Watershed Area (ha)	Watershed Area with Land Change (ha)						
		Focal Projects		Other Oil Sands Projects in RAMP FSA		Total		Watershed Total
		Not Closed-Circuited	Closed-Circuited	Not Closed-Circuited	Closed-Circuited	Not Closed-Circuited	Closed-Circuited	
Minor Athabasca River Tributaries <sup>1</sup>	165,666	5.41	15.40	-	-	5.41	15.40	20.81
Calumet	17,354	1.25	-	-	-	1.25	-	1.25
Christina	1,303,805	0.08	0.01	0.06	0.03	0.14	0.04	0.18
Ells	245,000	0.06	0.04	-	-	0.06	0.04	0.10
Firebag	568,174	0.17	0.05	-	-	0.17	0.05	0.22
Fort Creek	3,193	50.92	1.25	-	-	50.92	1.25	52.18
Hangingstone	106,641	-	-	-	0.36	-	0.36	0.36
Horse	215,741	-	-	-	0.25	-	0.25	0.25
MacKay	557,000	0.15	0.05	-	-	0.15	0.05	0.20
McLean	4,712	1.02	22.84	-	-	1.02	22.84	23.85
Muskeg	146,000	2.51	6.42	-	-	2.51	6.42	8.93
Original Poplar <sup>2</sup>	13,856	0.87	1.88	-	-	0.87	1.88	2.75
Steepbank	135,491	1.14	0.14	-	-	1.14	0.14	1.27
Tar	33,261	21.15	-	-	-	21.15	-	21.15
Upper Beaver <sup>2</sup>	28,711	2.80	-	-	-	2.80	-	2.80
FSA Total	3,544,606	0.76	1.05	0.02	0.04	0.78	1.09	1.87

Only land changes within the RAMP FSA were delineated.

<sup>1</sup> Refers to Athabasca River tributaries from Fort McMurray to the mouth of the Firebag River excluding the watersheds listed explicitly listed in this table. All land change areas in the minor Athabasca River tributaries in 2007 were above RAMP hydrology station S24.

<sup>2</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).

Note: Rows and columns may not sum totals due to rounding differences.

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Figure A.3-1 RAMP land change classes derived from SPOT-5 satellite imagery of July 2007, north of Fort McMurray.

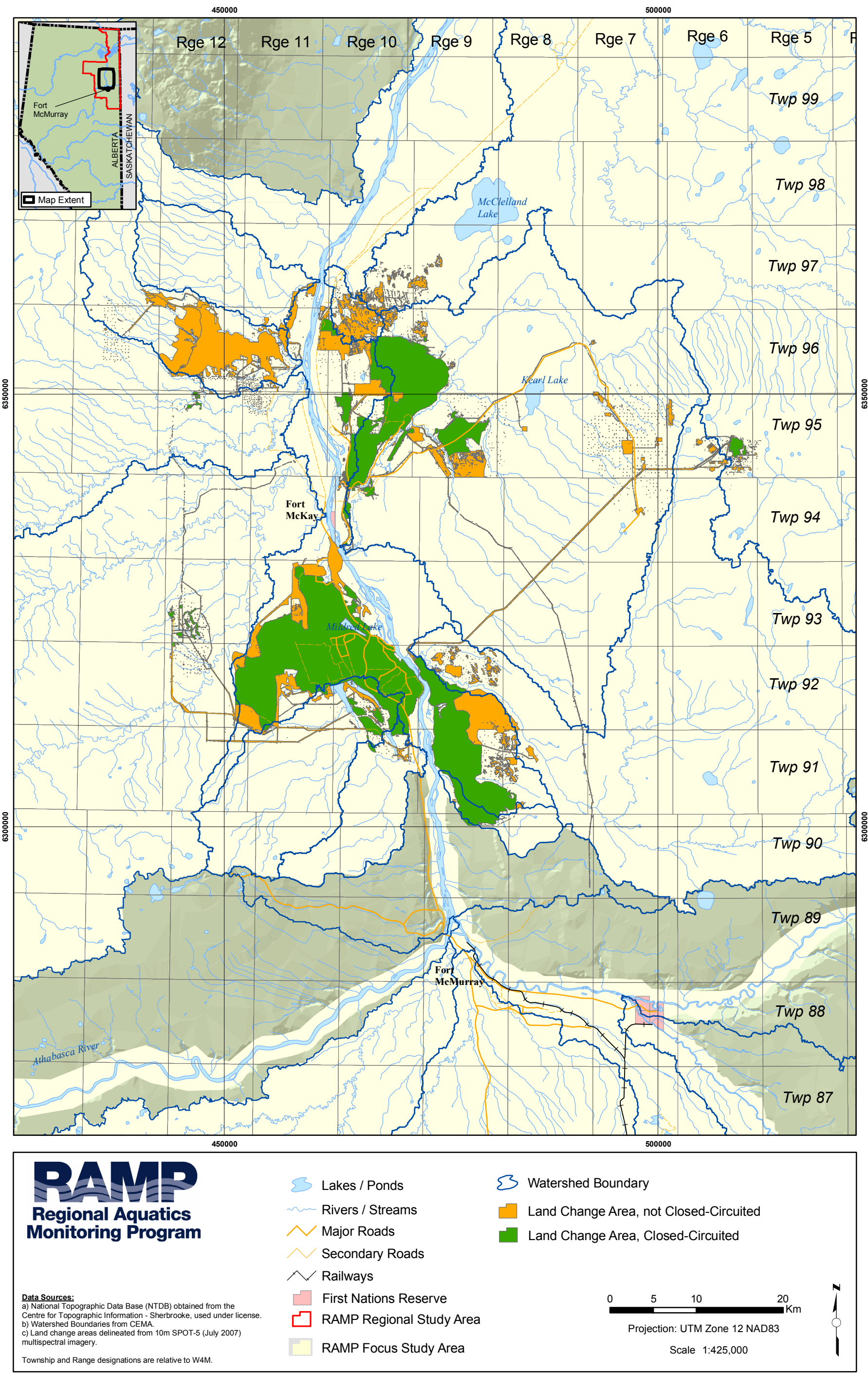






Figure A.3-2 RAMP land change classes overlaid on composite of SPOT-5 satellite imagery from July 2007, north of Fort McMurray.

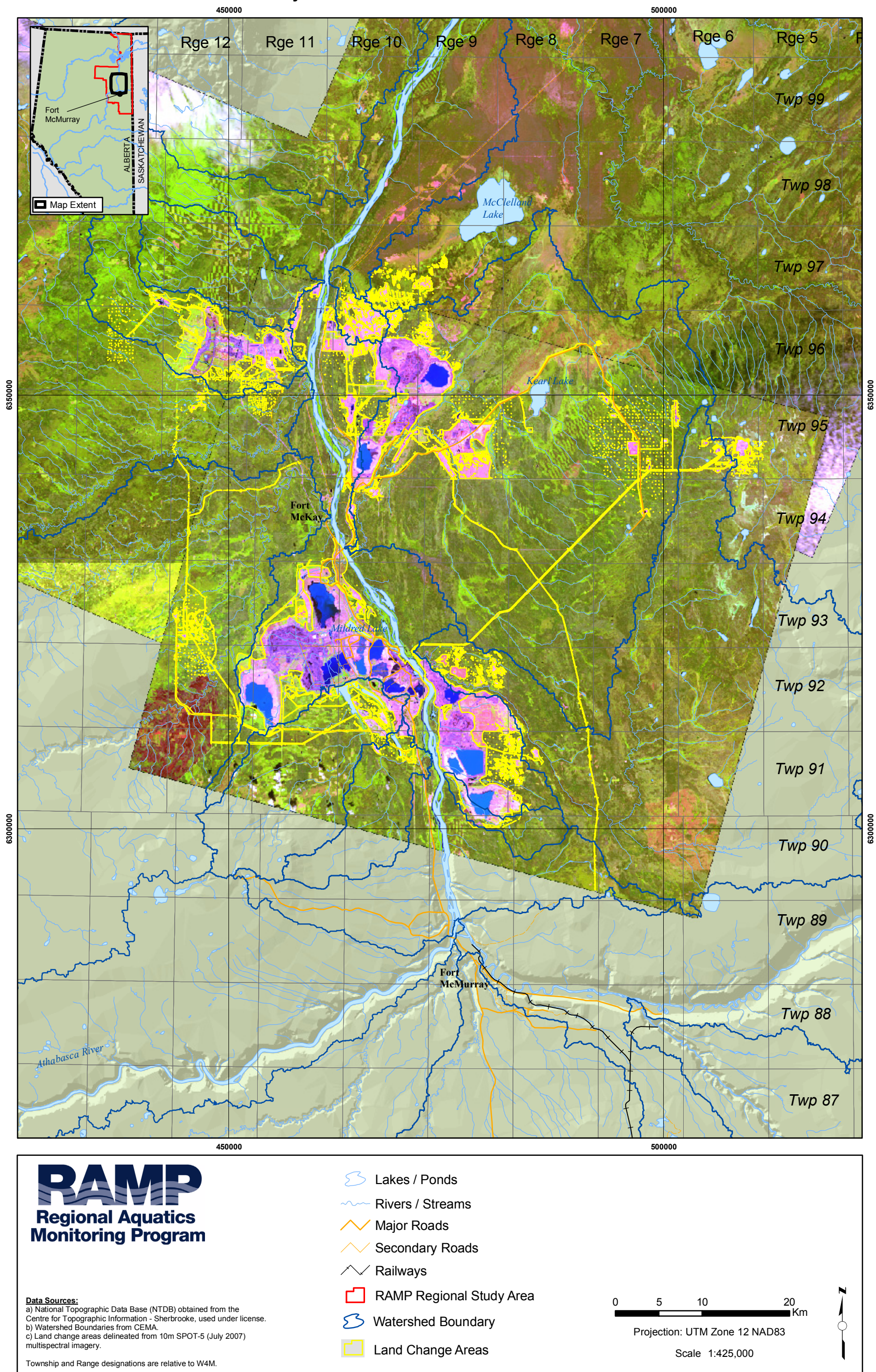






Figure A.3-3 RAMP land change classes derived from SPOT-5 satellite imagery of July 2007 and Landsat-5 of September 2007, south of Fort McMurray.

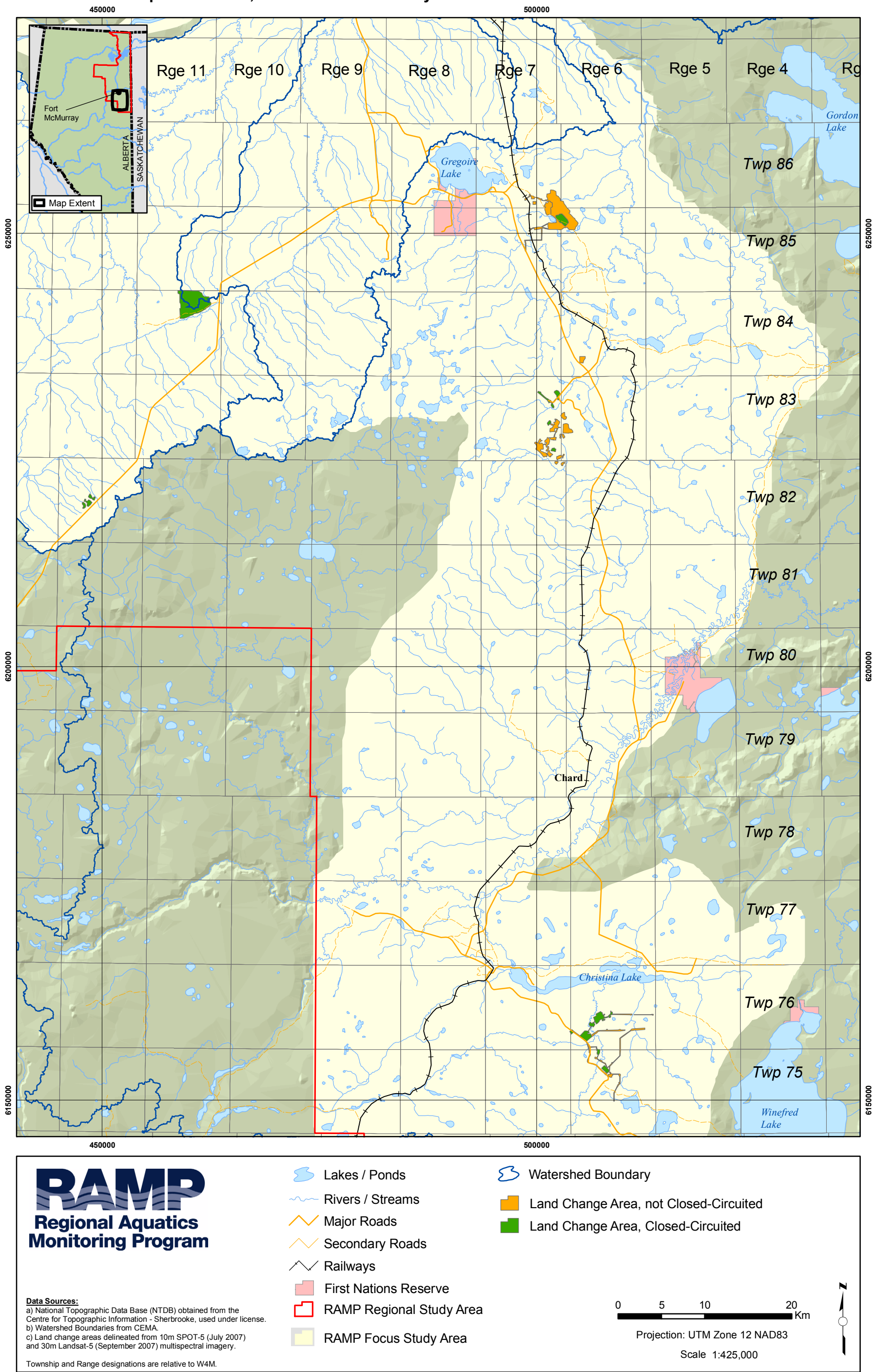
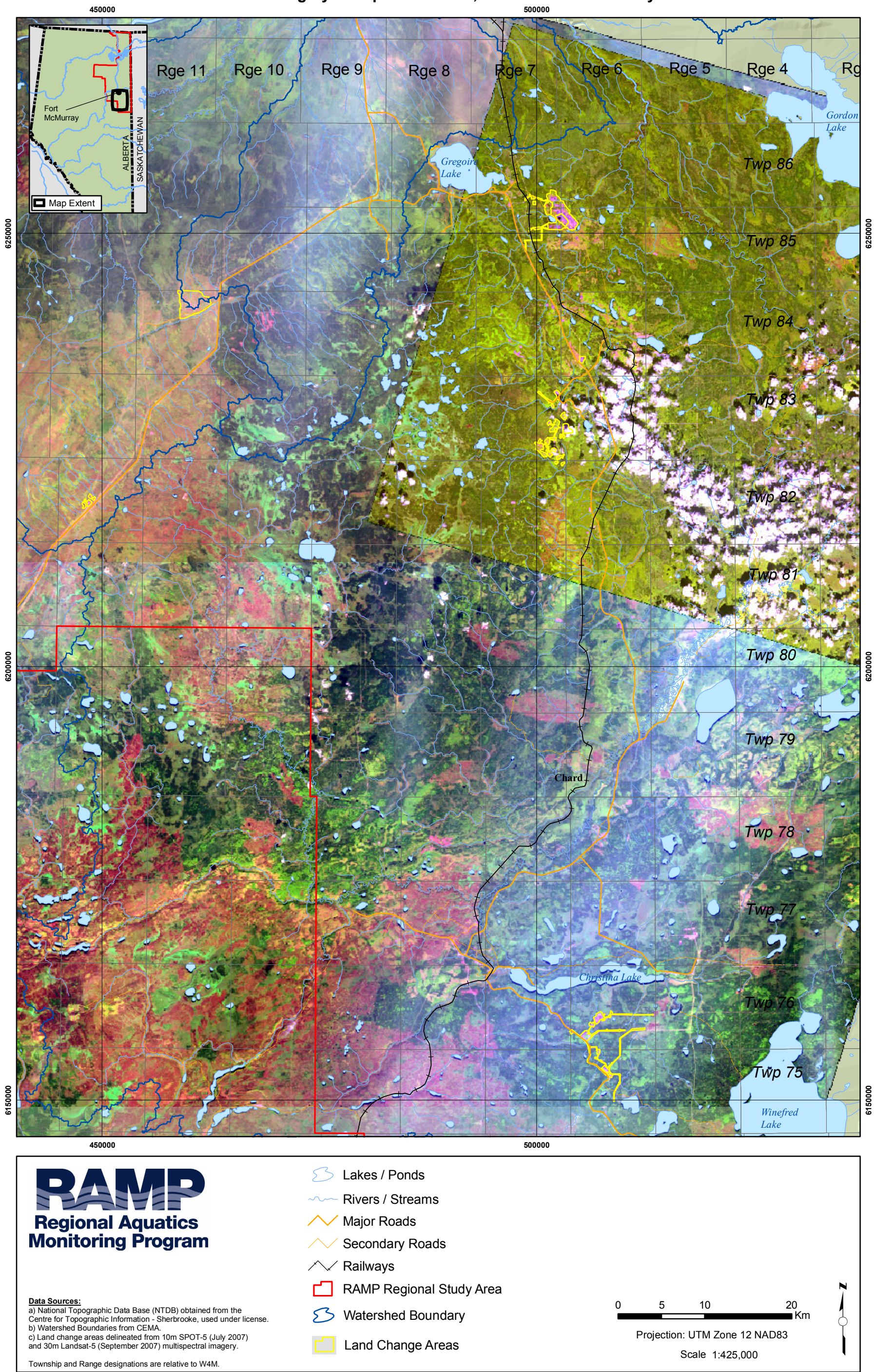






Figure A.3-4 RAMP land change classes overlaid on a composite of SPOT-5 satellite imagery of July 2007 and Landsat-5 satellite imagery of September 2007, south of Fort McMurray.







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## **Appendix B**

### **Quality Assurance and Quality Control Procedures for 2007**

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## **B.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES FOR 2007**

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

Each technical component under RAMP is required to complete a series of procedures to facilitate the collection of a high level of data quality. Environment Canada (1998) 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 Hatfield RAMP team for all RAMP-related data collection, handling and management. More detailed information regarding quality control for each technical component of RAMP follows the presentation of this general information.

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

All personnel participating in 2007 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 Master's- or Ph.D.-level professional and a trained environmental field technician (B.Sc. or Dip. Tech). All 2007 field crewmembers had experience conducting data collection in support of scientifically defensible environmental monitoring programs.

Field crew responsibilities were clearly established prior to beginning fieldwork through the use of Field Work Instructions (FWIs) prepared by the component or task leader. FWIs contained detailed information regarding sampling locations (e.g., coordinate location, access method), appropriate collection methodology, 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).

2007 crewmembers 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 sites. In many cases, field personnel have additional training on the Workplace Hazardous Materials Information System (WHMIS), Transportation of Dangerous Goods (TDG) Regulations, Small Boat Safety (as required by the Coast Guard) and wilderness first aid.

#### **B.1.2 Field Operations**

##### **B.1.2.1 Equipment**

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

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

- Provincial sampling permits (e.g., fish collection permits from Alberta 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 45, 45XL, 12XL or GPSII Global Positioning System (GPS) for obtaining data on sampling station position (latitude and longitude; accurate to approximately  $\pm 15$  m);
- Camera and film (to record sampling areas, specimens captured, unusual features in the environment, etc.);
- Instruments for measuring the following water quality variables *in situ*: temperature, dissolved oxygen, conductivity, pH, current velocity and depth;
- Miscellaneous equipment: tarpaulin, rope, measuring tape, coolers, plastic buckets, and tool box;
- Waterproof clothing, including rain suits, rubber boots, etc.;
- Floater jackets and/or survival suits, first aid kit and other safety equipment (including boat safety equipment);
- IBM-compatible portable (lap-top) computer, Intel Celeron 550 MHz, with 128 MB RAM. Typical programs installed include Microsoft Windows, Microsoft Excel and Microsoft Word; and
- Publications and previous reports for reference.

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

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

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

The following general data were typically recorded for field sampling activities conducted for RAMP (with some minor variability among technical components):

- Date and time of sampling;
- Sample numbers;
- Station location (UTM coordinate, datum, zone);
- Initials of field crew members;
- Sampling methods/gear used;
- Number of samples collected (water/sediment/benthos), number of specimens retained/ released/dissected/archived (biota), number of measurements take (climate and hydrology);

- Volume of sample collected (water/sediment);
- Number of samples in composite;
- Handling techniques, preservation methods, sampling containers used; and
- Photographs of sampling stations.

Field data collection was conducted according to procedures used for all previous RAMP studies (as described in Golder 1999a).

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

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

Other samples, such as benthic invertebrate sorting and taxonomy, and fish aging, are conducted for RAMP by small independent laboratories or boutique consulting companies. These laboratories and companies are required to conduct QA/QC procedures that are considered industry standard for the respective disciplines. For example, QA/QC procedures for benthic invertebrate taxonomy meet or exceed guidelines established by Environment Canada (Glozier *et al.* 2002) for environmental effects monitoring (EEM) studies.

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

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

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

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

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

All samples were handled (including preservation, storage and shipping) in accordance with established procedures (Golder 1999a) and with guidelines from respective laboratories. Sample tracking was conducted by field crew leaders (or Fort McMurray-based team members). Where possible, samples were hand-delivered to laboratories; for instance, preserved benthic invertebrate samples (those collected near the end of the program) were commonly transported by field crews to the taxonomist in Calgary upon completion of the field program.

Detailed lists of samples shipped to analytical laboratories were made, such that samples could be tracked from point of shipment to the laboratory (water/sediment/benthic taxonomy). Chain of Custody (COC) forms (commonly issued by the receiving

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

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

In 2002, a formal RAMP-specific Quality Assurance Plan (QAP) was developed and implemented to cover all routine QA-related activities for the project. These methods were used in 2007 by the Hatfield RAMP team to ensure consistency of methods among years. Activities covered in the RAMP QAP include:

- Pre-field meetings to discuss field methods (i.e., FWIs) and specifics of field tasks;
- Post-field meetings to discuss results of the field activities and identify areas for improvement in future;
- Routine check-ins with component leaders (24 or 48-hour interval) or the RAMP project manager during field work, as required;
- Designation of 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 field crew return (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 Golder 2003b). QC activities for each RAMP technical component used in 2007 are described below.

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

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

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

- Stream discharge measurements and water level surveys were performed in accordance with standard procedures. Each discharge measurement was qualified according to the criteria presented in the standard operating

procedures contained in RAMP (2005b), based on observations of site conditions and analysis of the collected data;

- Sensors from climatic and hydrologic monitoring stations were calibrated on a regular basis. Sensors at climatic stations have been rotated with spare units on a two-year frequency and the units retrieved from the field were recalibrated by the manufacturer. Calibration curves for pressure transducers were verified prior to installation. Pressure transducers at year-round monitoring stations were checked on a less frequent basis, but consistency between water level surveys and pressure transducer readings was checked during every field visit;
- 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;
- Vertical velocity distributions were collected at representative locations for ice-covered discharge measurements to derive and verify ice correction factors; and
- Snow course surveys were performed according to standard protocols as presented in RAMP (2005b).

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

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

- Apparent transducer elevations were calculated after each field visit as the difference between the surveyed water surface elevation and the sensor reading. The history of apparent transducer elevations was plotted for each station to check for physical sensor movement or calibration drift. Continuous water levels measured by the transducer were subsequently converted to elevations, adjusting for movement or drift.
- Rainfall, snowfall, air temperature, humidity, and wind speed data from automated climate sensors were compared to other local and regional records as well as manual observations recorded during site visits.
- All discharge measurements and site visit records were prepared by one person and checked by another.
- Velocity distributions at measurement cross sections were plotted and reviewed to ensure reasonable variation in velocity with flow depth and bed roughness.
- Hydrographs computed from continuous water level measurements and the stage-discharge rating curve were compared with manual measurements on the same plot. The resulting hydrographs were reviewed for consistency.
- Anomalies in the hydrographs, such as rapid changes in water level or discharge, were examined in detail to confirm authenticity. In cases where the data were inconsistent with other local and regional data (for instance, an isolated high water reading, without a subsequent recession curve), they were interpreted or discarded.



- Hydrographs computed for different stations in the same region were compared to identify anomalies and verify similarity in the timing and magnitude of runoff responses. Hydrographs were also analyzed to ensure anticipated effects such as time lag, attenuation by river or lake routing and increments in discharge with drainage area were apparent in the records.

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

### **B.2.2.1 Methods**

#### ***Sample Collection***

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

- The sample bottle and cap were triple-rinsed with site water prior to sample collection;
- Grab samples were collected upstream of the boat and the person collecting the sample to avoid disturbing the substrate;
- Latex powder-free 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 were filtered in the lab instead of in the field.

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 deionized 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, and were used to evaluate potential contamination from the sample container and the efficacy of sample preservation and storage conditions. Field blanks and trip blanks were utilized in all four seasons of sampling, and were analyzed for the same variables as RAMP samples. Field and trip blanks were labeled with dummy RAMP-style codes (e.g., FBS-1, ATR-DD-T) to ensure “blind” laboratory analysis.

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

A set of split samples was collected during winter and fall (2 samples) to assess analytical precision. Split samples were collected from the Christina River (CHR-2A, winter), the Tar River (TAR-2, fall) and the Calumet River (CAL-2, fall). Duplicate samples were collected from the Christina River (CHR-2A, winter), the Ells River (ELR-2, spring), Kearl Lake (KEL-1, summer), the Hangingstone River (HAR-1, fall) and Kearl Lake (KEL-1, fall). Duplicate samples were taken to assess environmental heterogeneity. Analytical results for split and duplicate samples were compared, and relative percent difference (difference between data values/average of data values, multiplied by 100%) was calculated for each analyte. Relative percent differences of 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.

### ***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 (duplicate sample) was used to assess the precision of the analyses. Spiked samples, reference standards, and laboratory controls were used to establish the accuracy of the analyses.

The toxicological laboratory also used a number of QA/QC samples to ensure that the results reported were precise and accurate. For each set of tests, a control group and reference toxicant test were used to assess the accuracy of the toxicity test and health of the test organisms. In addition, five replicates of each treatment group were used in each test to assess the precision of the results.

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. 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***

Concentrations of all conventional variables, major ions, nutrients, and hydrocarbons in field blanks were less than five times the detection limit (Table B.2-1); except for conductivity (winter, spring, and fall), sulphate (winter only), and total phenolics (in one fall sample). The concentration of several dissolved and total metals were greater than five times the detection limit in field blanks from all seasons; the highest number of metals greater than five times the detection limit (5) occurred in fall, while the lowest number of metals with such concentrations (2) occurred in summer. Concentrations of metals in field blanks exceeded the detection limit by up to 13 times (total and dissolved antimony, fall field blank), although all other metal concentrations were less than 11.8 times the detection limit.

Conductivity in trip blanks from winter, spring and fall was greater than five times the detection limit; however concentrations of all other conventional variables, major ions, nutrients, and hydrocarbons were less than five times the detection limits (Table B.2-2). As in the field blanks, concentrations of several metals were greater than five times the detection limit. Total and dissolved silver was greater than 24 times the detection limit in trip blanks from fall. Total and dissolved strontium was greater than 13 times the detection limit in trip blanks from summer.

### ***Split Samples***

Split samples were submitted for laboratory analysis in two sampling seasons in 2007 (Table B.2-3, Table B.2-4, Table B.2-5). The relative percent difference for all conventional

variables, major ions, nutrients, and hydrocarbons was less than 20% for those analytes where concentrations in both samples were greater than five times the detection limit; except for, TOC and total phenolics in the Tar River split sample, and sulphide and total phenolics in the Calumet River split sample. The relative percent difference for TSS and TKN in the Tar River split sample also exceeded 20%; however, concentrations of these analytes the sample were less than five times the detection limit.

The relative percent difference for all metals was less than 20% for those analytes where concentrations in both samples were greater than five times the detection limit; except for, total nickel and total zinc in the Christina River split sample (Table B.2-3), and total titanium and total zinc in the Calumet River split sample (Table B.2-5). The relative percent difference for dissolved lead in all split samples and for total beryllium in the Tar River and Calumet River split sample also exceeded 20%; however, concentrations of these analytes the sample were less than five times the detection limit.

### ***Duplicate Samples***

Duplicate samples were collected at four stations in 2007: CHR-2 in winter, ELR-2 in spring, KEL-1 in summer and fall and HAR-1 in fall (Table B.2-6, Table B.2-7, Table B.2-8, Table B.2-9, Table B.2-10). Conventional variables, major ions, nutrients, and hydrocarbon concentrations were generally quite similar in the duplicate samples. All relative percent differences exceeding 20% had analyte concentrations that were less than five times the detection limit, with the exception of total phenolics in the fall duplicate sample taken at Kearl Lake (Table B.2-10).

The number of metals with concentrations that differed by more than 20% relative percent difference varied by site, indicating that the different rivers exhibited varying degrees of environmental heterogeneity. In the Christina River, metals with concentrations varying by more than 20% relative percent difference included total and dissolved zinc, total aluminum, and total lead (Table B.2-6). In the Ells River, metals with concentrations varying by more than 20% relative percent difference included dissolved manganese, dissolved zinc, total cadmium, total mercury, and total nickel (Table B.2-7). In the Kearl Lake, metals with concentrations varying by more than 20% relative percent difference included total lead in the summer (Table B.2-8) and dissolved antimony, dissolved manganese, total and dissolved zinc, total aluminum, and total antimony in the fall (Table B.2-10). In the Hangingstone River, metals with concentrations varying by more than 20% relative percent difference included dissolved copper, dissolved lead, total and dissolved lithium, total titanium, and total zinc (Table B.2-9). Other metals varied by more than 20% relative percent difference in the duplicate samples, but were below five times the detection limit.

The number of metals with concentrations less than five times the detection limit with high relative percent differences (e.g., >100%) is notable, perhaps indicating laboratory limitations in analyzing low levels of metals for some samples.

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

Results from the QA/QC evaluation of water quality data indicate that overall, data collected for the water quality component is of high quality. Results of duplicate sampling indicate that some stations exhibit a higher degree of environmental heterogeneity than others, and that the analytical laboratory may experience difficulties analyzing low levels of metals in particular samples.

**Table B.2-1 Concentrations of water quality analytes in field blanks, 2007.**

Variable	Unit	Detection Limit	Concentration in Field Blank				
			21-Mar-07	18-May-07	20-Jul-07	5-Sep-07	11-Sep-07
Conventional Variables							
Conductivity	µS/cm	0.2	1.3	1.4	0.8	1.2	2
Dissolved Organic Carbon	mg/L	1	<1	1	<1	<1	<1
Hardness (as CaCO <sub>3</sub> )	mg/L		<1	<1	<1	<1	<1
pH	pH units	0.1	5.7	5.7	5.7	5.7	5.6
Total Alkalinity	mg/L	5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	5		<5	<5	<5	<5
Total Dissolved Solids	mg/L	10	<10				
Total Organic Carbon	mg/L	1	<1	<1	<1	<1	<1
Total Suspended Solids	mg/L	3	<3	<3	<3	<3	<3
True Colour	T.C.U.	2	<2	<2	<2	<2	<2
Major Ions							
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	<5	<5	<5	<5	<5
Calcium (Ca)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	<5	<5	<5
Chloride (Cl)	mg/L	1	<1	<1	<1	<1	<1
Hydroxide (OH)	mg/L	5	<5	<5	<5	<5	<5
Magnesium (Mg)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	mg/L	0.5	1	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	mg/L	1	2	<1	<1	<1	<1
Sulfate (SO <sub>4</sub> )	mg/L	0.5	4.2	<0.5	<0.5	<0.5	<0.5
Sulphide (S <sub>2</sub> )	mg/L	0.003	<0.003	0.005	<0.003	<0.003	<0.003
Nutrients and BOD							
Ammonia-N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	0.05
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2	<2
Chlorophyll a	mg/L	0.001			<0.001	<0.001	<0.001
Nitrate+Nitrite	mg/L	0.1	0.2	<0.1		<0.1	<0.1
Nitrate+Nitrite	mg/L	0.1			<0.1		
Phosphorus, dissolved	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	mg/L	0.001	<0.001	0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Nitrogen	mg/L		0.4	0.3	0.3	0.3	0.3
Hydrocarbons							
Naphthenic Acids	mg/L	1	<1	<1	<1	<1	<1
Total Phenolics	mg/L	0.001	<0.001		<0.001	<0.001	0.013
Total Phenolics	mg/L	0.004		<0.004			
Total Rec. Hydrocarbons	mg/L	1	<1	<1	<1	<1	<1
Dissolved Metals							
Aluminum (Al)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	mg/L	0.000001	0.000003	0.0000111	0.0000116	0.0000027	0.0000135
Arsenic (As)	mg/L	0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	0.37	<0.3	0.44	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	0.0000263	<0.00001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	0.000113	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	0.000014	0.0000303
Lithium (Li)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	0.000197	0.0000865
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum (Mo)	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	<0.00006	<0.00006	0.0000829

# indicates sample concentration greater than five times the detection limit.

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

Variable	Unit	Detection Limit	Concentration in Field Blank				
			21-Mar-07	18-May-07	20-Jul-07	5-Sep-07	11-Sep-07
Dissolved Metals, continued							
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	<0.000005	0.0000661	<0.000005
Strontium (Sr)	mg/L	0.000008	0.000073	0.0000578	0.000013	0.0000165	0.00003
Sulphur (S)	mg/L	0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Titanium (Ti)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Uranium (U)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	mg/L	0.00005	0.000088	<0.00005	0.0000749	<0.00005	<0.00005
Zinc (Zn)	mg/L	0.0002	0.000313	0.000351	<0.0002	0.000218	0.000262
Total Metals							
Aluminum (Al)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Antimony (Sb)	mg/L	0.000001	0.000006	0.0000112	0.0000117	0.0000027	0.0000136
Arsenic (As)	mg/L	0.00004	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	0.368	<0.3	0.445	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	0.0000266	<0.00001
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	0.000207	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.000006	0.0000061	0.0000191	<0.000006	0.0000709	0.0000516
Lithium (Li)	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00003	<0.00003	<0.00003	0.000111	0.000215	0.0000874
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	3.7	<1.2	<1.2	<1.2
Molybdenum (Mo)	mg/L	0.000008	0.0000133	<0.000008	<0.000008	<0.000008	<0.000008
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	<0.00006	0.000102	0.000107
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	<0.000005	0.0000668	<0.000005
Strontium (Sr)	mg/L	0.000008	0.0000735	0.0000637	0.0000145	0.0000167	0.0000301
Sulphur (S)	mg/L	0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.000174	<0.00007	<0.00007
Titanium (Ti)	mg/L	0.00007	0.00024	0.000118	0.000121	<0.00007	<0.00007
Uranium (U)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	mg/L	0.00005	0.0000893	<0.00005	0.0000757	<0.00005	<0.00005
Zinc (Zn)	mg/L	0.0002	0.000387	0.000355	0.000358	0.000346	0.000303

# indicates sample concentration greater than five times the detection limit.

**Table B.2-2 Concentrations of water quality analytes in trip blanks, 2007.**

Variable	Unit	Detection Limit	Concentration in Trip Blank			
			20-Mar-07	18-May-07	20-Jul-07	5-Sep-07
Conventional Variables						
Conductivity	uS/cm	0.2	1.3	1.2	0.8	1.4
Dissolved Organic Carbon	mg/L	1	<1	2	<1	1
Hardness (as CaCO <sub>3</sub> )	mg/L		<1	<1	<1	<1
pH	pH units	0.1	5.6	5.5	5.5	5.4
Total Alkalinity	mg/L	5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	5		<5	<5	<5
Total Dissolved Solids	mg/L	10	<10			
Total Organic Carbon	mg/L	1	<1	2	<1	1
Total Suspended Solids	mg/L	3	<3	<3	<3	<3
True Colour	T.C.U.	2	<2	2	<2	<2
Major Ions						
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	<5	<5	<5	<5
Calcium (Ca)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	<5	<5
Chloride (Cl)	mg/L	1	<1	<1	<1	<1
Hydroxide (OH)	mg/L	5	<5	<5	<5	<5
Magnesium (Mg)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1
Potassium (K)	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Sodium (Na)	mg/L	1	<1	<1	<1	<1
Sulfate (SO <sub>4</sub> )	mg/L	0.5	<0.5	<0.5	<0.5	<0.5
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.005	<0.003	<0.003	<0.003
Nutrients and BOD						
Ammonia-N	mg/L	0.05	<0.05	<0.05	<0.05	<0.05
Biochemical Oxygen Demand	mg/L	2	<2	<2	<2	<2
Chlorophyll <i>a</i>	mg/L	0.001			<0.001	
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1		<0.1
Nitrate+Nitrite	mg/L	0.1			<0.1	
Phosphorus, dissolved	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Phosphorus, total	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen	mg/L	0.2	<0.2	<0.2	<0.2	<0.2
Total Nitrogen	mg/L		0.3	0.3	0.3	0.3
Hydrocarbons						
Naphthenic Acids	mg/L	1	<1	<1	<1	<1
Total Phenolics	mg/L	0.001	<0.001		<0.001	<0.001
Total Phenolics	mg/L	0.004		<0.004		
Total Rec. Hydrocarbons	mg/L	1	<1	<1	<1	<1
Dissolved Metals						
Aluminum (Al)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Antimony (Sb)	mg/L	0.000001	0.000003	0.0000085	0.0000024	0.0000024
Arsenic (As)	mg/L	0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	<0.3	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	0.0000261
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Lithium (Li)	mg/L	0.0002	0.000246	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	0.000184
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum (Mo)	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	<0.00006	<0.00006

# indicates sample concentration greater than five times the detection limit.

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

Variable	Unit	Detection Limit	Concentration in Trip Blank			
			20-Mar-07	18-May-07	20-Jul-07	5-Sep-07
Dissolved Metals, continued						
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	<0.000005	0.000124
Strontium (Sr)	mg/L	0.000008	0.00002	0.0000362	0.000107	<0.000008
Sulphur (S)	mg/L	0.6	<0.6	<0.6	<0.6	<0.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Titanium (Ti)	mg/L	0.00007	<0.00007	<0.00007	<0.00007	<0.00007
Uranium (U)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	mg/L	0.00005	0.0000802	<0.00005	<0.00005	<0.00005
Zinc (Zn)	mg/L	0.0002	0.00027	0.000362	0.000218	0.000266
Total Metals						
Aluminum (Al)	mg/L	0.002	<0.002	<0.002	<0.002	<0.002
Antimony (Sb)	mg/L	0.000001	0.000007	0.0000086	0.0000025	0.0000024
Arsenic (As)	mg/L	0.00004	<0.00004	<0.00004	<0.00004	<0.00004
Barium (Ba)	mg/L	0.0001	<0.0001	<0.0001	0.000141	<0.0001
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Boron (B)	mg/L	0.0008	<0.0008	<0.0008	<0.0008	0.0008
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	<0.000006	<0.000006
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	<0.1	<0.1
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.582	<0.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cobalt (Co)	mg/L	0.00001	<0.00001	<0.00001	<0.00001	0.0000308
Copper (Cu)	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Iron (Fe)	mg/L	0.004	<0.004	<0.004	<0.004	<0.004
Lead (Pb)	mg/L	0.000006	0.0000065	0.0000226	0.0000093	<0.000006
Lithium (Li)	mg/L	0.0002	0.000246	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	0.000207
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	2.2	<1.2	<1.2
Molybdenum (Mo)	mg/L	0.000008	<0.000008	<0.000008	<0.000008	<0.000008
Nickel (Ni)	mg/L	0.00006	<0.00006	<0.00006	<0.00006	0.0000624
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	<0.000005	0.000125
Strontium (Sr)	mg/L	0.000008	0.0000202	0.0000366	0.000108	<0.000008
Sulphur (S)	mg/L	0.6	<0.6	<0.6	<0.6	<0.6
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	<0.00003	<0.00003
Tin (Sn)	mg/L	0.00007	<0.00007	0.000085	0.000434	0.000122
Titanium (Ti)	mg/L	0.00007	0.00074	<0.00007	0.000357	<0.00007
Uranium (U)	mg/L	0.000003	<0.000003	<0.000003	<0.000003	<0.000003
Vanadium (V)	mg/L	0.00005	0.000081	<0.00005	0.0000595	<0.00005
Zinc (Zn)	mg/L	0.0002	0.000276	0.000369	0.000319	0.000362

# indicates sample concentration greater than five times the detection limit.

**Table B.2-3 Relative percent difference between split water quality samples collected from the Christina River (CHR-2A), winter 2007.**

Analyte	Unit	Detection Limit	CHR-2A 21-Mar-07	Split 21-Mar-07	Relative Percent Difference (%) <sup>1</sup>
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	651	652	0.2
Dissolved Organic Carbon	mg/L	1	33	33	0.0
Hardness (as CaCO <sub>3</sub> )	mg/L		327	332	1.5
pH	pH units	0.1	8.4	8.4	0.0
Total Alkalinity	mg/L	5	340	340	0.0
Total Dissolved Solids	mg/L	5	440	440	0.0
Total Organic Carbon	mg/L	1	33	32	3.1
Total Suspended Solids	mg/L	3	<3	<3	0.0
True Colour	T.C.U.	2	54	56	3.6
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	402	403	0.2
Calcium (Ca)	mg/L	0.5	85.1	85.6	0.6
Carbonate (CO <sub>3</sub> )	mg/L	5	7	6	15.4
Chloride (Cl)	mg/L	1	11	11	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	27.9	28.8	3.2
Potassium (K)	mg/L	0.5	4.1	4.3	4.8
Sodium (Na)	mg/L	1	34	34	0.0
Sulfate (SO <sub>4</sub> )	mg/L	0.5	20.7	21.2	2.4
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.006	0.006	0.0
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	0.16	0.15	6.5
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	1.1	1.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.017	0.02	16.2
Phosphorus, total	mg/L	0.001	0.047	0.045	4.3
Total Kjeldahl Nitrogen	mg/L	0.2	1.4	1.4	0.0
Total Nitrogen	mg/L		2.5	2.5	0.0
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	1	1	1	0.0
Total Phenolics	mg/L	0.001	<0.001	<0.001	0.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.0015	0.00141	6.2
Antimony (Sb)	mg/L	0.000001	0.0000492	0.0000448	9.4
Arsenic (As)	mg/L	0.00004	0.000794	0.000813	2.4
Barium (Ba)	mg/L	0.0001	0.0639	0.0639	0.0
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.127	0.129	1.6
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	72.7	72.7	0.0
Chlorine (Cl)	mg/L	0.3	7.33	7.72	5.2
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.00025	0.000241	3.7
Copper (Cu)	mg/L	0.0001	0.000602	0.000594	1.3
Iron (Fe)	mg/L	0.004	0.0338	0.0349	3.2
Lead (Pb)	mg/L	0.000006	0.0000076	0.000006	23.5
Lithium (Li)	mg/L	0.0002	0.0236	0.0234	0.9

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

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

#

indicates analytes differ by > 20% between splits but one or both concentrations are < 5 times the detection limit.

#

indicates analytes differ by > 20% between splits and concentrations are > 5 times the detection limit.



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

Analyte	Unit	Detection Limit	CHR-2A 21-Mar-07	Split 21-Mar-07	Relative Percent Difference (%) <sup>1</sup>
<b>Dissolved Metals, continued</b>					
Manganese (Mn)	mg/L	0.00003	0.146	0.145	0.7
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000988	0.001	1.2
Nickel (Ni)	mg/L	0.00006	0.000405	0.000393	3.0
Selenium (Se)	mg/L	0.0003	<0.0003	0.0003	
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.38	0.381	0.3
Sulphur (S)	mg/L	0.6	4.31	4.29	0.5
Thallium (Tl)	mg/L	0.000003	0.0000046	0.0000047	2.2
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00243	0.00242	0.4
Uranium (U)	mg/L	0.000003	0.000259	0.000258	0.4
Vanadium (V)	mg/L	0.00005	0.000145	0.000157	7.9
Zinc (Zn)	mg/L	0.0002	0.002	0.00165	19.2
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.002	0.0152	0.0133	13.3
Antimony (Sb)	mg/L	0.000001	0.0000497	0.0000453	9.3
Arsenic (As)	mg/L	0.00004	0.000958	0.000963	0.5
Barium (Ba)	mg/L	0.0001	0.0685	0.0687	0.3
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.133	0.137	3.0
Cadmium (Cd)	mg/L	0.000006	0.0000061	0.0000071	15.2
Calcium (Ca)	mg/L	0.1	75.5	75.5	0.0
Chlorine (Cl)	mg/L	0.3	7.94	7.8	1.8
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.000256	0.000276	7.5
Copper (Cu)	mg/L	0.0001	0.000608	0.0006	1.3
Iron (Fe)	mg/L	0.004	0.668	0.695	4.0
Lead (Pb)	mg/L	0.000006	0.0000402	0.0000404	0.5
Lithium (Li)	mg/L	0.0002	0.0242	0.0241	0.4
Manganese (Mn)	mg/L	0.00003	0.155	0.156	0.6
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	<1.2	0.0
Molybdenum (Mo)	mg/L	0.000008	0.00105	0.00103	1.9
Nickel (Ni)	mg/L	0.00006	0.000418	0.000527	23.1
Selenium (Se)	mg/L	0.0003	0.000368	0.000303	19.4
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.384	0.387	0.8
Sulphur (S)	mg/L	0.6	4.46	4.79	7.1
Thallium (Tl)	mg/L	0.000003	0.0000054	0.0000049	9.7
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.003	0.00293	2.4
Uranium (U)	mg/L	0.000003	0.000273	0.00028	2.5
Vanadium (V)	mg/L	0.00005	0.00025	0.000261	4.3
Zinc (Zn)	mg/L	0.0002	0.00211	0.00167	23.3

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

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

# indicates analytes differ by > 20% between splits but one or both concentrations are < 5 times the detection limit.

# indicates analytes differ by > 20% between splits and concentrations are > 5 times the detection limit.

**Table B.2-4 Relative percent difference between split water quality samples collected from the Tar River (TAR-2), fall 2007.**

Analyte	Unit	Detection Limit	TAR-2 16-Sept-07	Split 16-Sept-07	Relative Percent Difference (%) <sup>1</sup>
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	383	382	0.3
Dissolved Organic Carbon	mg/L	1	13	14	7.4
Hardness (as CaCO <sub>3</sub> )	mg/L		181	172	5.1
pH	pH units	0.1	8.3	8.3	0.0
Total Alkalinity	mg/L	5	162	159	1.9
Total Dissolved Solids	mg/L	5	234	233	0.4
Total Organic Carbon	mg/L	1	11	14	24.0
Total Suspended Solids	mg/L	3	5	3	50.0
True Colour	T.C.U.	2	42	41	2.4
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	196	192	2.1
Calcium (Ca)	mg/L	0.5	49	46.8	4.6
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	1	1	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	14.3	13.5	5.8
Potassium (K)	mg/L	0.5	1.6	1.7	6.1
Sodium (Na)	mg/L	1	12	11	8.7
Sulfate (SO <sub>4</sub> )	mg/L	0.5	37.6	36.2	3.8
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.003	0.003	0.0
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.051	0.051	0.0
Phosphorus, total	mg/L	0.001	0.1	0.098	2.0
Total Kjeldahl Nitrogen	mg/L	0.2	0.3	0.2	40.0
Total Nitrogen	mg/L		0.4	0.3	28.6
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.014	0.006	80.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.026	0.026	0.0
Antimony (Sb)	mg/L	0.000001	0.0000447	0.0000456	2.0
Arsenic (As)	mg/L	0.00004	0.000633	0.000614	3.0
Barium (Ba)	mg/L	0.0001	0.0351	0.0345	1.7
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0491	0.05	1.8
Cadmium (Cd)	mg/L	0.000006	0.0000116	0.0000123	5.9
Calcium (Ca)	mg/L	0.1	43.2	43.4	0.5
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.0
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.000349	0.000349	0.0
Copper (Cu)	mg/L	0.0001	0.000583	0.000542	7.3
Iron (Fe)	mg/L	0.004	0.237	0.235	0.8
Lead (Pb)	mg/L	0.000006	0.0000094	0.0000151	46.5
Lithium (Li)	mg/L	0.0002	0.0168	0.0172	2.4

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

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

# indicates analytes differ by > 20% between splits but one or both concentrations are < 5 times the detection limit.

# indicates analytes differ by > 20% between splits and concentrations are > 5 times the detection limit.

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

Analyte	Unit	Detection Limit	TAR-2 16-Sept-07	Split 16-Sept-07	Relative Percent Difference (%) <sup>1</sup>
<b>Dissolved Metals, continued</b>					
Manganese (Mn)	mg/L	0.00003	0.0479	0.0476	0.6
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.0013	0.00135	3.8
Nickel (Ni)	mg/L	0.00006	0.00298	0.00298	0.0
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.164	0.16	2.5
Sulphur (S)	mg/L	0.6	13.8	13.6	1.5
Thallium (Tl)	mg/L	0.000003	0.0000056	0.0000058	3.5
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00092	0.000952	3.4
Uranium (U)	mg/L	0.000003	0.000483	0.000482	0.2
Vanadium (V)	mg/L	0.00005	0.000133	0.000124	7.0
Zinc (Zn)	mg/L	0.0002	0.00276	0.00243	12.7
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.002	0.244	0.223	9.0
Antimony (Sb)	mg/L	0.000001	0.0000452	0.0000461	2.0
Arsenic (As)	mg/L	0.00004	0.00102	0.00102	0.0
Barium (Ba)	mg/L	0.0001	0.0412	0.0411	0.2
Beryllium (Be)	mg/L	0.00001	0.0000169	0.0000246	37.1
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0496	0.0503	1.4
Cadmium (Cd)	mg/L	0.000006	0.0000258	0.0000225	13.7
Calcium (Ca)	mg/L	0.1	43.8	44.2	0.9
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.0
Chromium (Cr)	mg/L	0.0003	0.000324	0.000303	6.7
Cobalt (Co)	mg/L	0.00001	0.000423	0.000435	2.8
Copper (Cu)	mg/L	0.0001	0.000686	0.000656	4.5
Iron (Fe)	mg/L	0.004	0.856	0.866	1.2
Lead (Pb)	mg/L	0.000006	0.000143	0.000156	8.7
Lithium (Li)	mg/L	0.0002	0.017	0.0174	2.3
Manganese (Mn)	mg/L	0.00003	0.0586	0.0601	2.5
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	1.3	1.2	8.0
Molybdenum (Mo)	mg/L	0.000008	0.0013	0.00135	3.8
Nickel (Ni)	mg/L	0.00006	0.00319	0.00312	2.2
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.167	0.167	0.0
Sulphur (S)	mg/L	0.6	14.1	14.1	0.0
Thallium (Tl)	mg/L	0.000003	0.0000082	0.0000089	8.2
Thorium (Th)	mg/L	0.00003	0.0000322	0.0000381	16.8
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00492	0.00447	9.6
Uranium (U)	mg/L	0.000003	0.000512	0.00052	1.6
Vanadium (V)	mg/L	0.00005	0.000808	0.00075	7.4
Zinc (Zn)	mg/L	0.0002	0.00438	0.00476	8.3

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

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

# indicates analytes differ by > 20% between splits but one or both concentrations are < 5 times the detection limit.

# indicates analytes differ by > 20% between splits and concentrations are > 5 times the detection limit.

**Table B.2-5 Relative percent difference between split water quality samples collected from the Calumet River (CAR-2), fall 2007.**

Analyte	Unit	Detection Limit	CAR-2 16-Sept-07	Split 16-Sept-07	Relative Percent Difference (%) <sup>1</sup>
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	772	773	0.1
Dissolved Organic Carbon	mg/L	1	48	47	2.1
Hardness (as CaCO <sub>3</sub> )	mg/L		280	280	0.0
pH	pH units	0.1	8.1	8.1	0.0
Total Alkalinity	mg/L	5	315	316	0.3
Total Dissolved Solids	mg/L	5	538	539	0.2
Total Organic Carbon	mg/L	1	46	46	0.0
Total Suspended Solids	mg/L	3	3	3	0.0
True Colour	T.C.U.	2	110	110	0.0
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	384	386	0.5
Calcium (Ca)	mg/L	0.5	68.2	68.2	0.0
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	16	16	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	26.6	26.6	0.0
Potassium (K)	mg/L	0.5	5	4.6	8.3
Sodium (Na)	mg/L	1	76	74	2.7
Sulfate (SO <sub>4</sub> )	mg/L	0.5	78.4	78.4	0.0
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.025	0.039	43.8
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.119	0.121	1.7
Phosphorus, total	mg/L	0.001	0.311	0.307	1.3
Total Kjeldahl Nitrogen	mg/L	0.2	1.7	1.7	0.0
Total Nitrogen	mg/L		1.8	1.8	0.0
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.012	0.018	40.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.00363	0.0034	6.5
Antimony (Sb)	mg/L	0.000001	0.000149	0.000152	2.0
Arsenic (As)	mg/L	0.00004	0.00179	0.00183	2.2
Barium (Ba)	mg/L	0.0001	0.0245	0.025	2.0
Beryllium (Be)	mg/L	0.00001	0.0000104	0.00001	3.9
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.094	0.0922	1.9
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	61.4	60.5	1.5
Chlorine (Cl)	mg/L	0.3	13.6	13.4	1.5
Chromium (Cr)	mg/L	0.0003	0.000597	0.000664	10.6
Cobalt (Co)	mg/L	0.00001	0.000312	0.000305	2.3
Copper (Cu)	mg/L	0.0001	0.000527	0.000581	9.7
Iron (Fe)	mg/L	0.004	0.404	0.401	0.7
Lead (Pb)	mg/L	0.000006	0.0000165	0.0000292	55.6
Lithium (Li)	mg/L	0.0002	0.0404	0.0387	4.3

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

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

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

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

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

Analyte	Unit	Detection Limit	CAR-2 16-Sept-07	Split 16-Sept-07	Relative Percent Difference (%) <sup>1</sup>
<b>Dissolved Metals, continued</b>					
Manganese (Mn)	mg/L	0.00003	0.065	0.0661	1.7
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000744	0.000755	1.5
Nickel (Ni)	mg/L	0.00006	0.00354	0.00342	3.4
Selenium (Se)	mg/L	0.0003	0.000572	0.000538	6.1
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.338	0.341	0.9
Sulphur (S)	mg/L	0.6	30	30.2	0.7
Thallium (Tl)	mg/L	0.000003	0.0000034	0.0000034	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.000684	0.000603	12.6
Uranium (U)	mg/L	0.000003	0.000957	0.000945	1.3
Vanadium (V)	mg/L	0.00005	0.000446	0.000454	1.8
Zinc (Zn)	mg/L	0.0002	0.00182	0.00159	13.5
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.002	0.0495	0.0516	4.2
Antimony (Sb)	mg/L	0.000001	0.000151	0.000154	2.0
Arsenic (As)	mg/L	0.00004	0.00276	0.00265	4.1
Barium (Ba)	mg/L	0.0001	0.0302	0.0291	3.7
Beryllium (Be)	mg/L	0.00001	0.000017	0.00001	51.9
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0965	0.0934	3.3
Cadmium (Cd)	mg/L	0.000006	0.0000105	0.0000111	5.6
Calcium (Ca)	mg/L	0.1	65.1	62.8	3.6
Chlorine (Cl)	mg/L	0.3	14.2	13.9	2.1
Chromium (Cr)	mg/L	0.0003	0.000681	0.00074	8.3
Cobalt (Co)	mg/L	0.00001	0.000361	0.000362	0.3
Copper (Cu)	mg/L	0.0001	0.00064	0.000587	8.6
Iron (Fe)	mg/L	0.004	1.45	1.43	1.4
Lead (Pb)	mg/L	0.000006	0.0000521	0.0000542	4.0
Lithium (Li)	mg/L	0.0002	0.0405	0.0392	3.3
Manganese (Mn)	mg/L	0.00003	0.117	0.115	1.7
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	1.2	1.2	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000795	0.000765	3.8
Nickel (Ni)	mg/L	0.00006	0.00373	0.00369	1.1
Selenium (Se)	mg/L	0.0003	0.000578	0.000616	6.4
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.356	0.345	3.1
Sulphur (S)	mg/L	0.6	31.8	30.8	3.2
Thallium (Tl)	mg/L	0.000003	0.0000035	0.0000039	10.8
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00163	0.00217	28.4
Uranium (U)	mg/L	0.000003	0.00099	0.000975	1.5
Vanadium (V)	mg/L	0.00005	0.000899	0.000905	0.7
Zinc (Zn)	mg/L	0.0002	0.0033	0.00261	23.4

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

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

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

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

**Table B.2-6 Relative percent difference between duplicate water quality samples collected from the Christina River (CHR-2), winter 2007.**

Analyte	Unit	Detection Limit	CHR-2 21-Mar-07	Duplicate 21-Mar-07	Relative Percent Difference (%) <sup>1</sup>
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	377	378	0.3
Dissolved Organic Carbon	mg/L	1	14	14	0.0
Hardness (as CaCO <sub>3</sub> )	mg/L		189	191	1.1
pH	pH units	0.1	8.1	8.1	0.0
Total Alkalinity	mg/L	5	192	192	0.0
Total Dissolved Solids	mg/L	5	250	210	17.4
Total Organic Carbon	mg/L	1	14	14	0.0
Total Suspended Solids	mg/L	3	5	3	50.0
True Colour	T.C.U.	2	24	25	4.1
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	234	234	0.0
Calcium (Ca)	mg/L	0.5	51.8	52	0.4
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	1	2	66.7
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	14.6	14.8	1.4
Potassium (K)	mg/L	0.5	2.7	2.6	3.8
Sodium (Na)	mg/L	1	15	15	0.0
Sulfate (SO <sub>4</sub> )	mg/L	0.5	16.5	16.2	1.8
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.004	0.004	0.0
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	0.7	0.7	0.0
Phosphorus, dissolved	mg/L	0.001	0.014	0.017	19.4
Phosphorus, total	mg/L	0.001	0.039	0.041	5.0
Total Kjeldahl Nitrogen	mg/L	0.2	0.5	0.5	0.0
Total Nitrogen	mg/L		1.2	1.2	0.0
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	<0.001	<0.001	0.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.0014	0.00143	2.1
Antimony (Sb)	mg/L	0.000001	0.0000163	0.0000143	13.1
Arsenic (As)	mg/L	0.00004	0.000386	0.00039	1.0
Barium (Ba)	mg/L	0.0001	0.0472	0.0484	2.5
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	0.0000142	0.00001	34.7
Boron (B)	mg/L	0.0008	0.0638	0.0644	0.9
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	49.2	48.2	2.1
Chlorine (Cl)	mg/L	0.3	0.3	0.3	0.0
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000835	0.0000825	1.2
Copper (Cu)	mg/L	0.0001	0.000327	0.000313	4.4
Iron (Fe)	mg/L	0.004	0.0889	0.0858	3.5
Lead (Pb)	mg/L	0.000006	0.0000063	0.000006	4.9
Lithium (Li)	mg/L	0.0002	0.0146	0.0152	4.0

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

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

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

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

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

Analyte	Unit	Detection Limit	CHR-2 21-Mar-07	Duplicate 21-Mar-07	Relative Percent Difference (%) <sup>1</sup>
<b>Dissolved Metals, continued</b>					
Manganese (Mn)	mg/L	0.00003	0.0496	0.0501	1.0
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000745	0.000722	3.1
Nickel (Ni)	mg/L	0.00006	0.00009	0.000125	32.6
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.256	0.253	1.2
Sulphur (S)	mg/L	0.6	3.53	3.47	1.7
Thallium (Tl)	mg/L	0.000003	0.0000034	0.0000026	26.7
Thorium (Th)	mg/L	0.00003	0.0000342	0.00003	13.1
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.0015	0.00146	2.7
Uranium (U)	mg/L	0.000003	0.000139	0.000145	4.2
Vanadium (V)	mg/L	0.00005	<0.00005	<0.00005	0.0
Zinc (Zn)	mg/L	0.0002	0.0022	0.00109	67.5
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.002	0.0352	0.0467	28.1
Antimony (Sb)	mg/L	0.000001	0.0000165	0.0000144	13.6
Arsenic (As)	mg/L	0.00004	0.000556	0.000542	2.6
Barium (Ba)	mg/L	0.0001	0.0504	0.0502	0.4
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	0.0000143	0.00001	35.4
Boron (B)	mg/L	0.0008	0.0656	0.0651	0.8
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	49.3	48.7	1.2
Chlorine (Cl)	mg/L	0.3	0.303	0.3	1.0
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000984	0.0000991	0.7
Copper (Cu)	mg/L	0.0001	0.00033	0.000316	4.3
Iron (Fe)	mg/L	0.004	0.704	0.71	0.8
Lead (Pb)	mg/L	0.000006	0.000197	0.0000322	143.8
Lithium (Li)	mg/L	0.0002	0.0151	0.0154	2.0
Manganese (Mn)	mg/L	0.00003	0.0591	0.0592	0.2
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	<1.2	<1.2	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000753	0.000729	3.2
Nickel (Ni)	mg/L	0.00006	0.000091	0.000126	32.3
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.259	0.256	1.2
Sulphur (S)	mg/L	0.6	3.57	3.5	2.0
Thallium (Tl)	mg/L	0.000003	0.0000035	0.000003	15.4
Thorium (Th)	mg/L	0.00003	0.0000345	0.00003	14.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00246	0.00263	6.7
Uranium (U)	mg/L	0.000003	0.000144	0.000146	1.4
Vanadium (V)	mg/L	0.00005	0.00017	0.000162	4.8
Zinc (Zn)	mg/L	0.0002	0.00222	0.0011	67.5

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

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

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

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

**Table B.2-7 Relative percent difference between duplicate water quality samples collected from the EIs River (ELR-2), spring 2007.**

Analyte	Unit	Detection Limit	ELR-2 17-May-07	Duplicate 17-May-07	Relative Percent Difference (%) <sup>1</sup>
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	146	148	1.4
Dissolved Organic Carbon	mg/L	1	20	19	5.1
Hardness (as CaCO <sub>3</sub> )	mg/L	(blank)	65	66	1.5
pH	pH units	0.1	7.9	7.9	0.0
Total Alkalinity	mg/L	5	64	64	0.0
Total Dissolved Solids	mg/L	5	123	132	7.1
Total Organic Carbon	mg/L	1	18	20	10.5
Total Suspended Solids	mg/L	3	338	348	2.9
True Colour	T.C.U.	2	65	66	1.5
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	78	77	1.3
Calcium (Ca)	mg/L	0.5	18.4	18.6	1.1
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	2	2	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	4.6	4.7	2.2
Potassium (K)	mg/L	0.5	1.8	1.5	18.2
Sodium (Na)	mg/L	1	7	7	0.0
Sulfate (SO <sub>4</sub> )	mg/L	0.5	14.3	14.3	0.0
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.017	0.017	0.0
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.018	0.02	10.5
Phosphorus, total	mg/L	0.001	0.293	0.318	8.2
Total Kjeldahl Nitrogen	mg/L	0.2	0.8	0.9	11.8
Total Nitrogen	mg/L	(blank)	0.9	1	10.5
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.005	0.01	66.7
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.0893	0.0908	1.7
Antimony (Sb)	mg/L	0.000001	0.000114	0.000109	4.5
Arsenic (As)	mg/L	0.00004	0.000673	0.00071	5.4
Barium (Ba)	mg/L	0.0001	0.0271	0.0274	1.1
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	0.0000121	0.0
Boron (B)	mg/L	0.0008	0.0408	0.0431	5.5
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	0.0
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.0
Chromium (Cr)	mg/L	0.0003	0.000452	0.000673	39.3
Cobalt (Co)	mg/L	0.00001	0.000141	0.000128	9.7
Copper (Cu)	mg/L	0.0001	0.000942	0.00104	9.9
Iron (Fe)	mg/L	0.004	0.26	0.265	1.9
Lead (Pb)	mg/L	0.000006	0.000156	0.000162	3.8
Lithium (Li)	mg/L	0.0002	0.00961	0.0107	10.7

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

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

#

indicates analytes differ by > 20% between duplicates but one or both concentrations are < 5 times the detection limit.

#

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



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

Analyte	Unit	Detection Limit	ELR-2 17-May-07	Duplicate 17-May-07	Relative Percent Difference (%) <sup>1</sup>
<b>Dissolved Metals, continued</b>					
Manganese (Mn)	mg/L	0.00003	0.00463	0.00363	24.2
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000263	0.000298	12.5
Nickel (Ni)	mg/L	0.00006	0.00168	0.00166	1.2
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.0917	0.0948	3.3
Sulphur (S)	mg/L	0.6	<0.6	<0.6	0.0
Thallium (Tl)	mg/L	0.000003	0.0000053	0.0000058	9.0
Thorium (Th)	mg/L	0.00003	0.0000681	0.0000612	10.7
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00801	0.00791	1.3
Uranium (U)	mg/L	0.000003	0.000156	0.00015	3.9
Vanadium (V)	mg/L	0.00005	0.000517	0.000599	14.7
Zinc (Zn)	mg/L	0.0002	0.00153	0.00686	127.1
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.002	8.3	8.65	4.1
Antimony (Sb)	mg/L	0.000001	0.000115	0.00011	4.4
Arsenic (As)	mg/L	0.00004	0.00324	0.00306	5.7
Barium (Ba)	mg/L	0.0001	0.127	0.114	10.8
Beryllium (Be)	mg/L	0.00001	0.000362	0.000375	3.5
Bismuth (Bi)	mg/L	0.00001	0.000051	0.0000506	0.8
Boron (B)	mg/L	0.0008	0.055	0.0546	0.7
Cadmium (Cd)	mg/L	0.000006	0.0000938	0.0000764	20.4
Calcium (Ca)	mg/L	0.1	<0.1	<0.1	0.0
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.0
Chromium (Cr)	mg/L	0.0003	0.00996	0.00983	1.3
Cobalt (Co)	mg/L	0.00001	0.00415	0.00344	18.7
Copper (Cu)	mg/L	0.0001	0.00729	0.00643	12.5
Iron (Fe)	mg/L	0.004	9.68	8.53	12.6
Lead (Pb)	mg/L	0.000006	0.006	0.00513	15.6
Lithium (Li)	mg/L	0.0002	0.0201	0.0201	0.0
Manganese (Mn)	mg/L	0.00003	0.208	0.173	18.4
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	12	9.4	24.3
Molybdenum (Mo)	mg/L	0.000008	0.000266	0.000301	12.3
Nickel (Ni)	mg/L	0.00006	0.01	0.0132	27.6
Selenium (Se)	mg/L	0.0003	0.0003	0.000346	14.2
Silver (Ag)	mg/L	0.000005	0.0000624	0.0000598	4.3
Strontium (Sr)	mg/L	0.000008	0.0959	0.096	0.1
Sulphur (S)	mg/L	0.6	<0.6	<0.6	0.0
Thallium (Tl)	mg/L	0.000003	0.000121	0.000118	2.5
Thorium (Th)	mg/L	0.00003	0.00167	0.00145	14.1
Tin (Sn)	mg/L	0.00007	0.000076	0.0000979	25.2
Titanium (Ti)	mg/L	0.00007	0.0897	0.105	15.7
Uranium (U)	mg/L	0.000003	0.000732	0.000647	12.3
Vanadium (V)	mg/L	0.00005	0.0185	0.0186	0.5
Zinc (Zn)	mg/L	0.0002	0.0279	0.0249	11.4

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

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

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

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

**Table B.2-8 Relative percent difference between duplicate water quality samples collected from Kears Lake (KEL-1), summer 2007.**

Analyte	Unit	Detection Limit	KEL-1 20-July-07	Duplicate 20-July-07	Relative Percent Difference (%) <sup>1</sup>
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	182	182	0.0
Dissolved Organic Carbon	mg/L	1	25	26	3.9
Hardness (as CaCO <sub>3</sub> )	mg/L		85	84	1.2
pH	pH units	0.1	8.2	8.3	1.2
Total Alkalinity	mg/L	5	93	94	1.1
Total Dissolved Solids	mg/L	5	163	163	0.0
Total Organic Carbon	mg/L	1	28	28	0.0
Total Suspended Solids	mg/L	3	6	7	15.4
True Colour	T.C.U.	2	40	41	2.5
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	113	114	0.9
Calcium (Ca)	mg/L	0.5	21.4	21.3	0.5
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	1	1	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	7.6	7.5	1.3
Potassium (K)	mg/L	0.5	0.7	0.7	0.0
Sodium (Na)	mg/L	1	10	10	0.0
Sulfate (SO <sub>4</sub> )	mg/L	0.5	5.6	5.5	1.8
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.007	0.009	25.0
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Chlorophyll a	mg/L	0.001	0.003	0.003	0.0
Nitrate+Nitrite	mg/L	0.1	0.1	0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.009	0.009	0.0
Phosphorus, total	mg/L	0.001	0.036	0.032	11.8
Total Kjeldahl Nitrogen	mg/L	0.2	1.2	1.3	8.0
Total Nitrogen	mg/L		1.3	1.4	7.4
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.013	0.013	0.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.00166	0.0018	8.1
Antimony (Sb)	mg/L	0.00001	0.0000278	0.0000287	3.2
Arsenic (As)	mg/L	0.00004	0.000416	0.000343	19.2
Barium (Ba)	mg/L	0.0001	0.0163	0.016	1.9
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0459	0.0476	3.6
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	18.5	18.2	1.6
Chlorine (Cl)	mg/L	0.3	0.73	0.471	43.1
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000319	0.0000337	5.5
Copper (Cu)	mg/L	0.0001	0.000182	0.0002	9.4
Iron (Fe)	mg/L	0.004	0.0106	0.0117	9.9
Lead (Pb)	mg/L	0.000006	0.0000086	0.000006	35.6
Lithium (Li)	mg/L	0.0002	0.00538	0.0061	12.5

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

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

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

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

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

Analyte	Unit	Detection Limit	KEL-1 20-July-07	Duplicate 20-July-07	Relative Percent Difference (%) <sup>1</sup>
<b>Dissolved Metals, continued</b>					
Manganese (Mn)	mg/L	0.00003	0.000485	0.000512	5.4
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000122	0.000116	5.0
Nickel (Ni)	mg/L	0.00006	0.000087	0.000086	1.2
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.0687	0.0677	1.5
Sulphur (S)	mg/L	0.6	2.29	2.37	3.4
Thallium (Tl)	mg/L	0.000003	0.000002	0.0000012	50.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.000773	0.000773	0.0
Uranium (U)	mg/L	0.000003	0.0000128	0.0000131	2.3
Vanadium (V)	mg/L	0.00005	0.000437	0.000424	3.0
Zinc (Zn)	mg/L	0.0002	0.00124	0.00136	9.2
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.002	0.0287	0.0307	6.7
Antimony (Sb)	mg/L	0.000001	0.0000281	0.000029	3.2
Arsenic (As)	mg/L	0.00004	0.00042	0.000386	8.4
Barium (Ba)	mg/L	0.0001	0.0179	0.0179	0.0
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0481	0.0527	9.1
Cadmium (Cd)	mg/L	0.000006	0.0000079	0.000006	27.3
Calcium (Ca)	mg/L	0.1	19.3	19	1.6
Chlorine (Cl)	mg/L	0.3	0.733	0.709	3.3
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000583	0.0000569	2.4
Copper (Cu)	mg/L	0.0001	0.000187	0.000202	7.7
Iron (Fe)	mg/L	0.004	0.11	0.104	5.6
Lead (Pb)	mg/L	0.000006	0.0000445	0.0000657	38.5
Lithium (Li)	mg/L	0.0002	0.00579	0.00636	9.4
Manganese (Mn)	mg/L	0.00003	0.0409	0.0398	2.7
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	2.1	2.1	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000136	0.000124	9.2
Nickel (Ni)	mg/L	0.00006	0.000139	0.000132	5.2
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.0708	0.0704	0.6
Sulphur (S)	mg/L	0.6	2.31	2.47	6.7
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00128	0.00135	5.3
Uranium (U)	mg/L	0.000003	0.0000156	0.0000149	4.6
Vanadium (V)	mg/L	0.00005	0.000579	0.000559	3.5
Zinc (Zn)	mg/L	0.0002	0.0013	0.00137	5.2

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

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

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

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

**Table B.2-9 Relative percent difference between duplicate water quality samples collected from the Hangingstone River (HAR-1), fall 2007.**

Analyte	Unit	Detection Limit	HAR-1 5-Sept-07	Duplicate 5-Sept-07	Relative Percent Difference (%) <sup>1</sup>
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	232	233	0.4
Dissolved Organic Carbon	mg/L	1	29	29	0.0
Hardness (as CaCO <sub>3</sub> )	mg/L		95	95	0.0
pH	pH units	0.1	8.2	8.1	1.2
Total Alkalinity	mg/L	5	94	96	2.1
Total Dissolved Solids	mg/L	5	167	190	12.9
Total Organic Carbon	mg/L	1	29	29	0.0
Total Suspended Solids	mg/L	3	9	13	36.4
True Colour	T.C.U.	2	150	150	0.0
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	114	117	2.6
Calcium (Ca)	mg/L	0.5	25.8	25.6	0.8
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	10	10	0.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	7.5	7.5	0.0
Potassium (K)	mg/L	0.5	1.1	1.1	0.0
Sodium (Na)	mg/L	1	18	17	5.7
Sulfate (SO <sub>4</sub> )	mg/L	0.5	9.6	9.5	1.0
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.018	0.017	5.7
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	<0.05	<0.05	0.0
Biochemical Oxygen Demand	mg/L	2	<2	<2	0.0
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.047	0.046	2.2
Phosphorus, total	mg/L	0.001	0.075	0.076	1.3
Total Kjeldahl Nitrogen	mg/L	0.2	0.7	0.8	13.3
Total Nitrogen	mg/L		0.8	0.9	11.8
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.008	0.009	11.8
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	0.0172	0.0193	11.5
Antimony (Sb)	mg/L	0.000001	0.0000471	0.0000505	7.0
Arsenic (As)	mg/L	0.00004	0.00103	0.00115	11.0
Barium (Ba)	mg/L	0.0001	0.0208	0.0218	4.7
Beryllium (Be)	mg/L	0.00001	0.0000135	0.0000185	31.3
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0546	0.0616	12.0
Cadmium (Cd)	mg/L	0.000006	0.0000094	0.0000125	28.3
Calcium (Ca)	mg/L	0.1	21.3	23.3	9.0
Chlorine (Cl)	mg/L	0.3	8.83	8.64	2.2
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.00014	0.000158	12.1
Copper (Cu)	mg/L	0.0001	0.000589	0.000793	29.5
Iron (Fe)	mg/L	0.004	0.646	0.655	1.4
Lead (Pb)	mg/L	0.000006	0.0000639	0.000284	126.5
Lithium (Li)	mg/L	0.0002	0.00833	0.0113	30.3

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

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

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

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

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

Analyte	Unit	Detection Limit	HAR-1 5-Sept-07	Duplicate 5-Sept-07	Relative Percent Difference (%) <sup>1</sup>
<b>Dissolved Metals, continued</b>					
Manganese (Mn)	mg/L	0.00003	0.00837	0.00997	17.4
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000872	0.000919	5.2
Nickel (Ni)	mg/L	0.00006	0.00157	0.00131	18.1
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	0.000005	0.0000351	150.1
Strontium (Sr)	mg/L	0.000008	0.114	0.123	7.6
Sulphur (S)	mg/L	0.6	2.47	1.8	31.4
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.002	0.0019	5.1
Uranium (U)	mg/L	0.000003	0.00017	0.000181	6.3
Vanadium (V)	mg/L	0.00005	0.000424	0.000438	3.2
Zinc (Zn)	mg/L	0.0002	0.0014	0.00148	5.6
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.002	0.499	0.489	2.0
Antimony (Sb)	mg/L	0.000001	0.0000476	0.000051	6.9
Arsenic (As)	mg/L	0.00004	0.0014	0.00146	4.2
Barium (Ba)	mg/L	0.0001	0.0292	0.029	0.7
Beryllium (Be)	mg/L	0.00001	0.0000294	0.000025	16.2
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0561	0.0642	13.5
Cadmium (Cd)	mg/L	0.000006	0.0000194	0.0000228	16.1
Calcium (Ca)	mg/L	0.1	22.4	23.9	6.5
Chlorine (Cl)	mg/L	0.3	8.85	8.73	1.4
Chromium (Cr)	mg/L	0.0003	0.000626	0.000599	4.4
Cobalt (Co)	mg/L	0.00001	0.00038	0.000387	1.8
Copper (Cu)	mg/L	0.0001	0.000877	0.000914	4.1
Iron (Fe)	mg/L	0.004	1.38	1.37	0.7
Lead (Pb)	mg/L	0.000006	0.0003	0.000287	4.4
Lithium (Li)	mg/L	0.0002	0.00874	0.0118	29.8
Manganese (Mn)	mg/L	0.00003	0.0675	0.0678	0.4
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	1.2	2.7	76.9
Molybdenum (Mo)	mg/L	0.000008	0.000915	0.000942	2.9
Nickel (Ni)	mg/L	0.00006	0.00198	0.00171	14.6
Selenium (Se)	mg/L	0.0003	0.000373	0.0003	21.7
Silver (Ag)	mg/L	0.000005	0.000005	0.0000355	150.6
Strontium (Sr)	mg/L	0.000008	0.122	0.126	3.2
Sulphur (S)	mg/L	0.6	2.48	1.82	30.7
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	0.0
Thorium (Th)	mg/L	0.00003	0.0000988	0.0000931	5.9
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.0164	0.0132	21.6
Uranium (U)	mg/L	0.000003	0.000201	0.000205	2.0
Vanadium (V)	mg/L	0.00005	0.00178	0.00177	0.6
Zinc (Zn)	mg/L	0.0002	0.00266	0.00344	25.6

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

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

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

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

**Table B.2-10 Relative percent difference between duplicate water quality samples collected from Kearl Lake (KEL-1), fall 2007.**

Analyte	Unit	Detection Limit	KEL-1 11-Sept-07	Duplicate 11-Sept-07	Relative Percent Difference (%) <sup>1</sup>
<b>Conventional Variables</b>					
Conductivity	µS/cm	0.2	174	172	1.2
Dissolved Organic Carbon	mg/L	1	24	28	15.4
Hardness (as CaCO <sub>3</sub> )	mg/L		69	67	2.9
pH	pH units	0.1	8.1	8.1	0.0
Total Alkalinity	mg/L	5	87	86	1.2
Total Dissolved Solids	mg/L	5	157	157	0.0
Total Organic Carbon	mg/L	1	25	23	8.3
Total Suspended Solids	mg/L	3	13	15	14.3
True Colour	T.C.U.	2	33	32	3.1
<b>Major Ions</b>					
Bicarbonate (HCO <sub>3</sub> )	mg/L	5	106	105	0.9
Calcium (Ca)	mg/L	0.5	18.3	17.6	3.9
Carbonate (CO <sub>3</sub> )	mg/L	5	<5	<5	0.0
Chloride (Cl)	mg/L	1	3	2	40.0
Hydroxide (OH)	mg/L	5	<5	<5	0.0
Magnesium (Mg)	mg/L	0.1	5.7	5.6	1.8
Potassium (K)	mg/L	0.5	<0.5	<0.5	0.0
Sodium (Na)	mg/L	1	9	8	11.8
Sulfate (SO <sub>4</sub> )	mg/L	0.5	3.7	3.7	0.0
Sulphide (S <sub>2</sub> )	mg/L	0.003	0.008	0.008	0.0
<b>Nutrients and BOD</b>					
Ammonia-N	mg/L	0.05	0.24	0.06	120.0
Biochemical Oxygen Demand	mg/L	2	2	3	40.0
Chlorophyll a	mg/L	0.001	0.001	0.001	0.0
Nitrate+Nitrite	mg/L	0.1	<0.1	<0.1	0.0
Phosphorus, dissolved	mg/L	0.001	0.006	0.007	15.4
Phosphorus, total	mg/L	0.001	0.041	0.042	2.4
Total Kjeldahl Nitrogen	mg/L	0.2	1.6	1.4	13.3
Total Nitrogen	mg/L		1.7	1.5	12.5
<b>Hydrocarbons</b>					
Naphthenic Acids	mg/L	1	<1	<1	0.0
Total Phenolics	mg/L	0.001	0.009	0.007	25.0
Total Rec. Hydrocarbons	mg/L	1	<1	<1	0.0
<b>Dissolved Metals</b>					
Aluminum (Al)	mg/L	0.001	<0.001	<0.001	0.0
Antimony (Sb)	mg/L	0.00001	0.0000302	0.0000245	20.8
Arsenic (As)	mg/L	0.00004	0.000345	0.000318	8.1
Barium (Ba)	mg/L	0.0001	0.0141	0.0146	3.5
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0447	0.043	3.9
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	17.4	17.7	1.7
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.0
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000293	0.000013	77.1
Copper (Cu)	mg/L	0.0001	0.00016	0.00014	13.3
Iron (Fe)	mg/L	0.004	<0.004	<0.004	0.0
Lead (Pb)	mg/L	0.000006	0.00002	0.0000064	103.0
Lithium (Li)	mg/L	0.0002	0.00444	0.00411	7.7

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

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

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

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

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

Analyte	Unit	Detection Limit	KEL-1 11-Sept-07	Duplicate 11-Sept-07	Relative Percent Difference (%) <sup>1</sup>
<b>Dissolved Metals, continued</b>					
Manganese (Mn)	mg/L	0.00003	0.000614	0.000218	95.2
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Molybdenum (Mo)	mg/L	0.000008	0.000121	0.000125	3.3
Nickel (Ni)	mg/L	0.00006	0.000073	0.00006	19.5
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.0654	0.065	0.6
Sulphur (S)	mg/L	0.6	0.842	0.774	8.4
Thallium (Tl)	mg/L	0.000003	0.000003	0.0000015	66.7
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00063	0.000587	7.1
Uranium (U)	mg/L	0.000003	0.0000078	0.000008	2.5
Vanadium (V)	mg/L	0.00005	0.000298	0.000265	11.7
Zinc (Zn)	mg/L	0.0002	0.00318	0.00119	91.1
<b>Total Metals</b>					
Aluminum (Al)	mg/L	0.002	0.023	0.0175	27.2
Antimony (Sb)	mg/L	0.000001	0.0000305	0.0000247	21.0
Arsenic (As)	mg/L	0.00004	0.000369	0.00035	5.3
Barium (Ba)	mg/L	0.0001	0.0159	0.0157	1.3
Beryllium (Be)	mg/L	0.00001	<0.00001	<0.00001	0.0
Bismuth (Bi)	mg/L	0.00001	<0.00001	<0.00001	0.0
Boron (B)	mg/L	0.0008	0.0465	0.0466	0.2
Cadmium (Cd)	mg/L	0.000006	<0.000006	<0.000006	0.0
Calcium (Ca)	mg/L	0.1	18.5	18.1	2.2
Chlorine (Cl)	mg/L	0.3	<0.3	<0.3	0.0
Chromium (Cr)	mg/L	0.0003	<0.0003	<0.0003	0.0
Cobalt (Co)	mg/L	0.00001	0.0000413	0.0000338	20.0
Copper (Cu)	mg/L	0.0001	0.000162	0.000141	13.9
Iron (Fe)	mg/L	0.004	0.0988	0.0925	6.6
Lead (Pb)	mg/L	0.000006	0.0000895	0.0000745	18.3
Lithium (Li)	mg/L	0.0002	0.00471	0.00427	9.8
Manganese (Mn)	mg/L	0.00003	0.0248	0.0246	0.8
Mercury (Hg)	mg/L	0.00005	<0.00005	<0.00005	0.0
Mercury (Hg), ultra-trace	ng/L	1.2	1.2	1.6	28.6
Molybdenum (Mo)	mg/L	0.000008	0.000122	0.000125	2.4
Nickel (Ni)	mg/L	0.00006	0.000074	0.00006	20.9
Selenium (Se)	mg/L	0.0003	<0.0003	<0.0003	0.0
Silver (Ag)	mg/L	0.000005	<0.000005	<0.000005	0.0
Strontium (Sr)	mg/L	0.000008	0.0661	0.0657	0.6
Sulphur (S)	mg/L	0.6	0.851	0.785	8.1
Thallium (Tl)	mg/L	0.000003	<0.000003	<0.000003	0.0
Thorium (Th)	mg/L	0.00003	<0.00003	<0.00003	0.0
Tin (Sn)	mg/L	0.00007	<0.00007	<0.00007	0.0
Titanium (Ti)	mg/L	0.00007	0.00115	0.00113	1.8
Uranium (U)	mg/L	0.000003	0.0000107	0.0000114	6.3
Vanadium (V)	mg/L	0.00005	0.000454	0.000427	6.1
Zinc (Zn)	mg/L	0.0002	0.00321	0.0012	91.2

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

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

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

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

## **B.2.3 Benthic Invertebrate Community 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, 2005). Instruments used for measuring supporting variables (e.g., temperature, dissolved oxygen, conductivity, pH, current velocity and depth) were calibrated according to manufacturer instructions (generally daily for water quality meters).

### **B.2.3.2 Quality Control Activities – Laboratory**

Taxonomic samples were sorted and identified by Dr. Jack Zloty of Calgary, AB, who has analyzed benthic invertebrate samples on behalf of RAMP consistently since the program began. Laboratory methods used by Dr. Zloty in 2007 included resorting of 5% of samples as a confirmation of the overall sorting efficiency of all samples. In 2007, a total of 11 samples were resorted. 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 sites, a minimum removal efficiency of 90% was considered acceptable (as previous RAMP studies). This objective is considered acceptable by Environment Canada under current Environmental Effects Monitoring (EEM) strategies (Environment Canada 2002, Glozier et al., 2002).

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

### **B.2.3.3 Quality Control Activities – Results**

Results for quality control samples (5% re-sorts) from the 2007 RAMP benthic invertebrate community component indicate that this objective was consistently achieved (Table B.2-11).

Invertebrate sorting efficiency ranged from 94.18% to 99%. Average sorting efficiency was 97.8% (n=13). Based on the criterion of 90% sorting efficiency, these results were considered acceptable and additional QC activities were not required.



**Table B.2-11 Results of quality control checks on sorting efficiency of benthic invertebrate samples, RAMP 2007.**

Site	% Sorting Efficiency
CHR-D-1 #2	$[1-(52/(1564+52))]*100 = 96.8$
ELR-D-1 #4	$[1-(8/(154+8))]*100 = 95.1$
FBR-D-1 #8	$[1-(10/(990+10))]*100 = 99.0$
FOC-D-1 #2	$[1-(16/(488+16))]*100 = 96.8$
FLC-D-1 #4	$[1-(9/(354+9))]*100 = 97.5$
HSR-E-1 #1	$[1-(5/(188+5))]*100 = 97.4$
JAC-D-2 #8	$[1-(12/(594+12))]*100 = 98.0$
MAR-E-2 #5	$[1-(18/(965+18))]*100 = 98.2$
MUR-D-3 #3	$[1-(8/(129+8))]*100 = 94.2$
STR-E-1 #6	$[1-(24/(830+24))]*100 = 97.2$
FBR-E-2 #2	$[1-(35/(1420+35))]*100 = 97.6$

Average efficiency – 97.1% 11 samples ~ 5%

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

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.

## B.2.4 Sediment Quality Component

The 2007 RAMP sediment quality QA/QC program was conducted to assess potential sample contamination during collection and analysis, the precision and accuracy of the chemical and toxicological analyses, and environmental heterogeneity.

### B.2.4.1 Methods

The following field procedures were used to prevent sample contamination:

- Sampling equipment was rinsed with hexane and acetone, and triple-rinsed with ambient water prior to sample collection at a given station;
- Sampling equipment was rinsed with hexane and acetone, then washed with detergent and rinsed with ambient site water between sample collection at different stations;
- Sample grabs were kept only if they contained no large foreign objects, obtained adequate penetration depth, and were not overfilled or leaking;
- Sediments in direct contact with the grab were not used; and
- Staff wore powder-free latex gloves during sampling.

Split samples were collected from Ells River (ELR-D1) and Jackpine Creek (JAC-1) and a field duplicate sample was collected from Ells River (ELR-D1) to assess environmental variation, analytical precision, and potential contamination.

The relative percent difference (difference between data values/average of data values, multiplied by 100%) for the split sample and field duplicate analytes was calculated. Analytes for which the relative percent difference between duplicate/split sample exceeded 20% (with concentrations greater than five times the detection limit in both samples) were considered to exhibit unacceptable levels of imprecision.

In addition, an equipment rinsate blank is usually collected to assess the effectiveness of cleaning and equipment decontamination, which if not done effectively could lead to sample contamination. Due to incorrect collection of the rinsate sample, results from this QA/QC method are not provided in 2007.

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

### ***Duplicate Sample***

At ELR-D1, concentrations of most analytes in the duplicate sample were similar (Table B.2-12). The relative percent difference was greater than 20% for chromium, copper, potassium, and uranium, although the actual magnitude of difference was small (never exceeds more than 30% difference), and copper and potassium had one or more analyte concentration that was less than 5 times the detection limit.

### ***Split Samples***

In the Ells River split sample, copper and zinc were the only metals that varied by more than 20% (relative percent difference), although both analytes had one or more concentrations that were less than 5 times the detection limit (Table B.2-13).

In the Jackpine Creek split sample, boron, titanium, and zinc were the only metal that varied by more than 20% (relative percent difference), although both boron and zinc had one or more concentrations that were less than 5 times the detection limit (Table B.2-14).

Overall, the similarity in metals between split samples indicates a high degree of homogeneity in sample mixing.

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

The low variability of metals among duplicate and split samples indicates that, with respect to these variables, samples were generally homogeneous within the compositing tray and in the environment, and were representative of site conditions. Proper sampling procedures for rinsate samples should be completed in subsequent monitoring programs to provide an indication of whether sampling equipment is a significant source of contamination.

**Table B.2-12 Relative percent difference in total metals between duplicate sediment quality samples, Eils River, September 2007.**

Variable	Units	DL	ELR-D1 7-Sep-07	Duplicate (JAR-D1) 7-Sep-07	Relative Percent Difference (%) <sup>1</sup>
<b>Total metals</b>					
Aluminum (Al)	mg/kg	50	1190	1070	10.6
Arsenic (As)	mg/kg	0.1	2.3	2.2	4.4
Barium (Ba)	mg/kg	0.5	44.9	43.7	2.7
Beryllium (Be)	mg/kg	0.2	<0.2	<0.2	0.0
Bismuth (Bi)	mg/kg	0.5	<0.5	<0.5	0.0
Boron (B)	mg/kg	2	4	4	0.0
Cadmium (Cd)	mg/kg	0.1	<0.1	<0.1	0.0
Calcium (Ca)	mg/kg	100	1700	1600	6.1
Chromium (Cr)	mg/kg	0.2	2.7	2.2	<b>20.4</b>
Cobalt (Co)	mg/kg	0.1	1.9	1.7	11.1
Copper (Cu)	mg/kg	0.5	2	2.7	<b>29.8</b>
Iron (Fe)	mg/kg	200	5800	5400	7.1
Lead (Pb)	mg/kg	0.5	2.4	2.1	13.3
Magnesium (Mg)	mg/kg	20	990	940	5.2
Manganese (Mn)	mg/kg	1	77	66	15.4
Mercury (Hg)	mg/kg	0.05	<0.05	<0.05	0.0
Molybdenum (Mo)	mg/kg	0.1	0.2	0.2	0.0
Nickel (Ni)	mg/kg	0.5	3.5	3.1	12.1
Potassium (K)	mg/kg	100	400	300	<b>28.6</b>
Selenium (Se)	mg/kg	0.2	<0.2	<0.2	0.0
Silver (Ag)	mg/kg	0.2	<0.2	<0.2	0.0
Sodium (Na)	mg/kg	100	<100	<100	0.0
Strontium (Sr)	mg/kg	1	12	11	8.7
Thallium (Tl)	mg/kg	0.05	<0.05	<0.05	0.0
Tin (Sn)	mg/kg	2	<2	<2	0.0
Titanium (Ti)	mg/kg	1	26	22	16.7
Uranium (U)	mg/kg	0.05	0.37	0.3	<b>20.9</b>
Vanadium (V)	mg/kg	0.2	6.5	5.6	14.9
Zinc (Zn)	mg/kg	5	15	15	0.0

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

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

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

**Table B.2-13 Relative percent difference in metals between split sediment quality samples, Ells River, September 2007.**

Variable	Units	DL	ELR-D1 7-Sep-07	Split (JAR-D2) 7-Sep-07	Relative Percent Difference (%) <sup>1</sup>
<b>Total metals</b>					
Aluminum (Al)	mg/kg	50	1190	1190	0.0
Arsenic (As)	mg/kg	0.1	2.3	2.2	4.4
Barium (Ba)	mg/kg	0.5	44.9	45.4	1.1
Beryllium (Be)	mg/kg	0.2	<0.2	<0.2	0.0
Bismuth (Bi)	mg/kg	0.5	<0.5	<0.5	0.0
Boron (B)	mg/kg	2	4	4	0.0
Cadmium (Cd)	mg/kg	0.1	<0.1	<0.1	0.0
Calcium (Ca)	mg/kg	100	1700	1500	12.5
Chromium (Cr)	mg/kg	0.2	2.7	2.3	16.0
Cobalt (Co)	mg/kg	0.1	1.9	1.9	0.0
Copper (Cu)	mg/kg	0.5	2	7.4	114.9
Iron (Fe)	mg/kg	200	5800	5600	3.5
Lead (Pb)	mg/kg	0.5	2.4	2.4	0.0
Magnesium (Mg)	mg/kg	20	990	940	5.2
Manganese (Mn)	mg/kg	1	77	73	5.3
Mercury (Hg)	mg/kg	0.05	<0.05	<0.05	0.0
Molybdenum (Mo)	mg/kg	0.1	0.2	0.2	0.0
Nickel (Ni)	mg/kg	0.5	3.5	3.4	2.9
Potassium (K)	mg/kg	100	400	400	0.0
Selenium (Se)	mg/kg	0.2	<0.2	0.2	0.0
Silver (Ag)	mg/kg	0.2	<0.2	<0.2	0.0
Sodium (Na)	mg/kg	100	<100	<100	0.0
Strontium (Sr)	mg/kg	1	12	12	0.0
Thallium (Tl)	mg/kg	0.05	<0.05	<0.05	0.0
Tin (Sn)	mg/kg	2	<2	<2	0.0
Titanium (Ti)	mg/kg	1	26	22	16.7
Uranium (U)	mg/kg	0.05	0.37	0.32	14.5
Vanadium (V)	mg/kg	0.2	6.5	5.8	11.4
Zinc (Zn)	mg/kg	5	15	20	28.6

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

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

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

**Table B.2-14 Relative percent difference in metals between split sediment quality samples, Jackpine Creek, September 2007.**

Variable	Units	DL	JAC-D1 11-Sep-07	SPLIT (TIC-1) 11-Sep-07	Relative Percent Difference (%) <sup>1</sup>
<b>Total metals</b>					
Aluminum (Al)	mg/kg	50	1190	1120	6.1
Arsenic (As)	mg/kg	0.1	0.4	0.4	0.0
Barium (Ba)	mg/kg	0.5	19.1	16.5	14.6
Beryllium (Be)	mg/kg	0.2	<0.2	<0.2	0.0
Bismuth (Bi)	mg/kg	0.5	<0.5	<0.5	0.0
Boron (B)	mg/kg	2	3	5	50.0
Cadmium (Cd)	mg/kg	0.1	<0.1	<0.1	0.0
Calcium (Ca)	mg/kg	100	1000	900	10.5
Chromium (Cr)	mg/kg	0.2	2.7	2.8	3.6
Cobalt (Co)	mg/kg	0.1	1	0.9	10.5
Copper (Cu)	mg/kg	0.5	1.2	1	18.2
Iron (Fe)	mg/kg	200	2700	2600	3.8
Lead (Pb)	mg/kg	0.5	1.8	1.7	5.7
Magnesium (Mg)	mg/kg	20	460	430	6.7
Manganese (Mn)	mg/kg	1	48	40	18.2
Mercury (Hg)	mg/kg	0.05	<0.05	<0.05	0.0
Molybdenum (Mo)	mg/kg	0.1	0.1	0.1	0.0
Nickel (Ni)	mg/kg	0.5	2.6	2.3	12.2
Potassium (K)	mg/kg	100	200	200	0.0
Selenium (Se)	mg/kg	0.2	<0.2	<0.2	0.0
Silver (Ag)	mg/kg	0.2	<0.2	<0.2	0.0
Sodium (Na)	mg/kg	100	<100	<100	0.0
Strontium (Sr)	mg/kg	1	7	6	15.4
Thallium (Tl)	mg/kg	0.05	<0.05	<0.05	0.0
Tin (Sn)	mg/kg	2	<2	<2	0.0
Titanium (Ti)	mg/kg	1	33	26	23.7
Uranium (U)	mg/kg	0.05	0.31	0.3	3.3
Vanadium (V)	mg/kg	0.2	6	5.6	6.9
Zinc (Zn)	mg/kg	5	10	8	22.2

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

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

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

## **B.2.5 Fish Population Component**

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

Fish and fish habitat sampling field activities were conducted in accordance with field methods considered to be standard scientific practice (e.g., Environment Canada 2005) and methods used in previous RAMP studies (Golder 1999a). Prior to every field program, fieldwork instructions (FWIs) were prepared by the Crew Leader and Component Manager. These FWIs provided technical detail on all field data collection activities planned for the program and were reviewed by all members of the field crew prior to starting the field program.

All field personnel were trained in the proper use of all field equipment to ensure accurate and safe data collection. Instruments used for measuring supporting field water quality variables (e.g., temperature, dissolved oxygen, conductivity, pH, current velocity and depth) were calibrated according to recommendations from the respective manufacturer (as frequently as daily for pH and dissolved oxygen meters). Site locations were recorded using a GPS unit. All sampling details (e.g., date, time, methods used, personnel, measurements) were recorded on project-specific field data sheets and/or in waterproof field books. Upon completion of the fieldwork, all datasheets and field books were stored in a fireproof cabinet in the Hatfield office.

Sample shipping (e.g., for fish tissues sent to ALS Laboratory Group [ALS]) was conducted using lab-provided COC forms.

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

In 2007, fish aging was conducted by North/South Consultants Inc. of Winnipeg, Manitoba. North/South personnel have extensive experience analyzing ageing structures from a wide range of fish species found in the oil sands region. Fish aging structures (e.g., fin rays and cleithra) were read three times by independent technicians and each structure was assigned a numerical estimate of the confidence associated with the age determination. The level of confidence was considered to be moderate to high for all fish submitted for ageing from the 2007 fish program (Clearwater River). Generally, there is greater accuracy in aging cleithra structures relative to fin rays for northern pike (Table B.2-15) (North/South Consultants, *pers. comm.*).

Fish tissue analysis results from ALS and Flett Research Ltd. (Flett) include a description of QC techniques used. If relevant, comments on the results of the analyses are indicated on the printed results received from the lab. QC results meet acceptable guidelines for the lab's own internal quality procedures (a condition of membership in the Canadian Association for Environmental Analytical Laboratories [CAEAL]). In the event alternate procedures were required to achieve a result, this information is also detailed on the laboratory output. QC procedures used by ALS and Flett include method blanks, laboratory duplicates, spike samples, calibration control, use of certified reference standards and internal standards. Duplicate samples for mercury analyses were completed for seven individual tissue samples (Table B.2-16).

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

**Table B.2-15 Aging results from fin rays and cleithra collected from northern pike captured during the Clearwater inventory and fish tissue program, fall 2007.**

Sample ID	Species	Structure	Age
CR1A-17	NRPK	Fin Ray / Cleithra	5 / 5
CR1A-18	NRPK	Fin Ray / Cleithra	5 / 4
CR1A-21	NRPK	Fin Ray / Cleithra	3 / 4
CR1A-22	NRPK	Fin Ray / Cleithra	5 / 4
CR1A-23	NRPK	Fin Ray / Cleithra	4 / 3
CR4-04	NRPK	Fin Ray / Cleithra	4 / 4
CR4-05	NRPK	Fin Ray / Cleithra	4 / 5
CR4-06	NRPK	Fin Ray / Cleithra	6 / 6
CR4-07	NRPK	Fin Ray / Cleithra	4 / 4

**Table B.2-16 Relative percent difference between duplicate mercury fish tissue samples collected from the Clearwater River, Gregoire Lake and Namur Lake, fall 2007.**

Analyte	Waterbody	Sample ID	Unit	Sample Date	Sample	Duplicate	Relative Percent Difference (%)
Mercury	Clearwater River	CR1A-07	ng/g wet weight	25-Sep-07	150	188	5.62
		CR1A-14	ng/g wet weight	25-Sep-07	217	207	1.18
		CR1A-21	ng/g wet weight	25-Sep-07	156	166	1.55
	Gregoire Lake	GL-WALL-13	ng/g wet weight	25-Oct-07	263	225	3.89
		GL-NRPK-10	ng/g wet weight	25-Oct-07	116	113	0.66
		GL-LKWH-09	ng/g wet weight	25-Oct-07	55.6	51.8	1.77
	Namur Lake	NL-8	ng/g wet weight	27-Sep-07	488	488	0.00

## B.2.6 Acid-Sensitive Lakes Component

Field sampling under the Acid-Sensitive Lakes Component of RAMP is conducted entirely by personnel from Alberta Environment. Water samples collected at each lake are analyzed by the University of Alberta Limnology Laboratory. The lab 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., Golder 2003a).

### B.2.6.1 Quality Control Activities – Field

Water sample collection in the field utilizes standard practices for quality control of samples to avoid contamination. Field instruments (e.g., water quality meters) are cared

for so as to maximize data quality (i.e., proper calibration according to manufacturer specifications). Procedures used include the following:

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

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

The University of Alberta Limnology Laboratory maintains an internal QA/QC program to maximize quality of analytical results. Programs used include use of standard reference samples and periodic comparison samples (i.e., blanks) sent to other laboratories. In the event that QC objectives are not achieved, corrective actions are initiated to determine the cause. The laboratory prepares standard QC sample for each group of analyses from analytical grade chemicals or standard reference samples. Annually, 10 samples of known chemistry are submitted by Environment Canada's National Water Research Institute (NWRI) for blind analysis and comparison. Two times per year, quality control samples are sent to the University of Alberta Limnology Laboratory by the Norwegian Institute for Water Research for analysis and comparison.

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



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## **Appendix C**

### **Climate and Hydrology Component**

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## C.0 CLIMATE AND HYDROLOGY COMPONENT

### C.1 CLIMATE DATA COLLECTED IN 2007

#### C.1.1 RAMP Climate Data

##### C.1.1.1 Aurora Climate Station (C1)

The Aurora Climate Station (C1) sensors monitored air temperature, wind speed and direction, precipitation, solar radiation, and relative humidity during 2007. Table C.1-1 lists the data elements monitored at the station. Monthly observations for 2007 are summarized in Table C.1-2, and daily observations are contained in the RAMP database.

**Table C.1-1 Aurora Climate Station (C1) daily data elements.**

Climate Element and Sensor	Parameter	Units	Derivation
Air Temperature 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 Tipping bucket rain gauge	Total	(mm)	Sum of 0.1 mm tips.
Depth of Snow on Ground Sonic level sensor	Total	(cm)	Average of 5 second readings made in the last minute of each hour.
Mean Relative Humidity Humidity sensor	Mean	(%)	Mean of readings every 5 sec.
Total Global Solar Radiation Pyranometer	Total	(kWh/m <sup>2</sup> )	Sum of time integrated readings every 5 sec.
Wind Speed and Direction Wind Vane and Propeller	Direction	(degrees)	Direction of daily mean wind vector from readings averaged every 5 sec.
	5 sec. Gust Speed	(km/h)	Maximum scalar wind speed from 5 sec readings.
	2 min. Gust Speed	(km/h)	Maximum of 1 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.

**Table C.1-2 Summary of 2007 monthly climate data collected at C1 Aurora Climate Station.**

Month	Temperature			Total Precip. (mm)	Month End Depth of Snow on Ground (cm)	Mean Relative Humidity (%)	Total Global Solar Radiation (kWh/m <sup>2</sup> )	Maximum Sustained Wind Speeds		
	Min. (°C)	Mean (°C)	Max. (°C)					5 sec. (km/h)	2 min. (km/h)	10 min. (km/h)
2007										
January	-35.2	-13.8	4.4	17.6	39	84.1	11.8	56.0	40.6	36.0
February	-36.0	-19.3	-2.7	30.0	60	76.7	24.4	35.8	24.8	20.7
March	-34.6	-8.7	11.9	42.1	29	71.4	72.2	34.6	25.1	21.7
April	-16.5	3.0	19.6	16.3	0	60.7	119.6	48.9	32.3	29.7
May	-4.6	10.8	31.6	20.8	0	58.8	162.3	54.3	36.5	30.4
June	-1.5	14.9	30.7	49.0	0	57.3	171.0	49.0	36.1	25.5
July	4.3	20.6	35.7	67.3	0	60.7	181.7	51.5	39.8	31.9
August	0.6	13.4	30.1	75.0	0	72.2	127.0	45.3	36.2	30.5
September	-3.2	7.8	22.8	41.3	0	74.4	75.6	39.2	27.8	22.5
October	-7.1	4.4	21.3	6.9	M	70.9	46.5	56.3	34.7	30.1
November	-33.0	-8.3	6.7	20.3	M	85.4	12.2 P	42.1	29.1	24.6
December	-33.9	-15.9	-4.7	18.5 P	M	86.8	M	30.5	22.0	19.4
2007 Annual	-36.0	0.9	35.7	405.1		71.6	1004.4 P	56.3	40.6	36.0

See notes in section C.1.1.3.

### C.1.1.2 Other RAMP Climate Stations

Table C.1-4 summarizes the climate and water temperature parameters monitored at RAMP stations other than the Aurora Climate Station.

Sensors at Stations S5A, S14A and S19 were operated throughout the year, while other sensors were operated during the open water season (May – October). Despite ongoing maintenance during regular site visits the station records are incomplete due to the following data gaps:

- L1 Precipitation Gauge: Missing data from January 1 – April 24 due to frozen or partly frozen fluids in bucket, as well as data logger problems.
- L1 Air Temperature and Relative Humidity: Missing data from January 1 - February 9 due to sensor malfunction.
- L1 Relative Humidity: Missing data from November 10 – December 31 due to dead battery in data logger.
- S3 Precipitation Gauge: Missing data from April 24 – August 6 because of sensor malfunction.
- S5A Water Temperature – Missing data year round due to sensor malfunction.
- S14A Water Temperature – Missing data from April 25 – August 6 because thermistor was destroyed during ice break-up. Missing data from September 22 – October 25 because of data logger malfunction.
- S19 Precipitation Sensor: Missing data from September 24 – November 19 due to sensor malfunction.

Table C.1-4 provides a monthly summary of the data collected at the other RAMP climate stations. Daily monitoring data are included in the RAMP database and are provided on the RAMP 2007 Technical Report CD. Daily and cumulative precipitation depths at the various stations are compared to precipitation recorded at other regional stations in Figure C.1-1.

**Table C.1-3 Sensors at other RAMP climate stations.**

Station	Parameter	Sensor
L1 McClelland Lake	Precipitation Air Temperature Relative Humidity	Weighing Gauge Thermistor Humidity Sensor
L2 Kearl Lake	Precipitation <sup>1</sup> Water Temperature <sup>1</sup> Air Temperature <sup>1</sup> Relative Humidity <sup>1</sup>	Tipping Bucket Rain/Snow Gauge Thermistor Thermistor Humidity Sensor
S3 Ilyininim Creek above Kearl Lake	Rainfall	Tipping Bucket Rain Gauge
S5A Muskeg River above Muskeg Creek	Barometric Pressure Water Temperature	Pressure Transducer Thermistor
S14A Ells River at CNRL Bridge	Water Temperature	Thermistor
S15A Tar River near the mouth	Water Temperature <sup>1</sup>	Thermistor
S19 Tar River Lowland Tributary near the mouth	Rainfall Snowfall	Tipping Bucket Rain/Snow Gauge
S34 Tar River above CNRL Bridge	Water Temperature <sup>1</sup>	Thermistor

<sup>1</sup> Installed in September 2007.

**Table C.1-4 Summary of 2007 climate data collected at L1 – McClelland Lake and L2 – Kearl Lake.**

Station	L1 McClelland Lake			L2 Kearl Lake			
Period of Operation	Jan 1-Dec 31	Jan 1-Dec 31	Jan 1-Dec 31	Sept 25-Dec 31	Sept 25-Dec 31	Sept 25-Dec 31	Sept 25-Dec 31
Month	Precipitation Depth (mm)	Air Temperature (°C)	Relative Humidity (%)	Water Temperature (°C)	Air Temperature (°C)	Relative Humidity (%)	Precipitation Depth (mm)
Jan							
Feb		-19.1P	75.5P				
Mar		-9.6	67.2				
Apr	3.9P	1.8	60.6				
May	29.2	10.1	60.4				
Jun	34.6	14.6	57.7				
Jul	71.0	19.3	65.5				
Aug	77.7	12.8	74.0				
Sep	56.2	7.6	80.8	6.8P	7.4P	76.4P	0.5P
Oct	7.6	4.3	70.2	3.8	5.2	72.3	1.3
Nov	31.8	-8.9	81.4P	0.9	-8.0	87.7	0.3
Dec	12.9	-16.3		0.4	-15.3	88.8	0
Annual <sup>1</sup>	324.9P	1.5P	69.3P	2.0P	-5.2	82.5P	2.1P

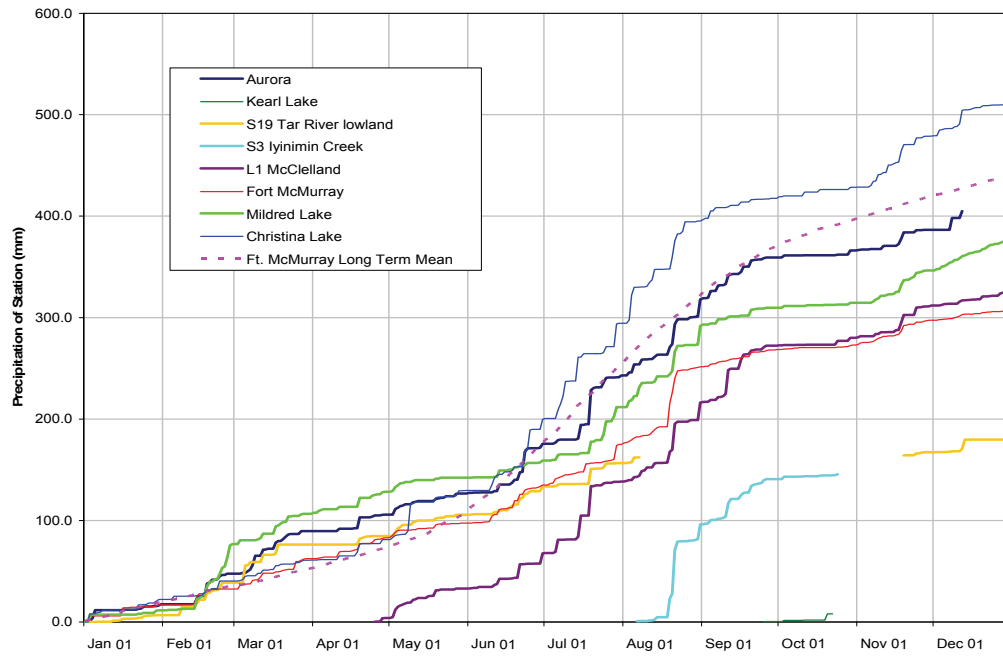
<sup>1</sup> See notes in Section C.1.1.3

**Table C.1-5 Summary of 2007 climate data collected at other RAMP climate stations.**

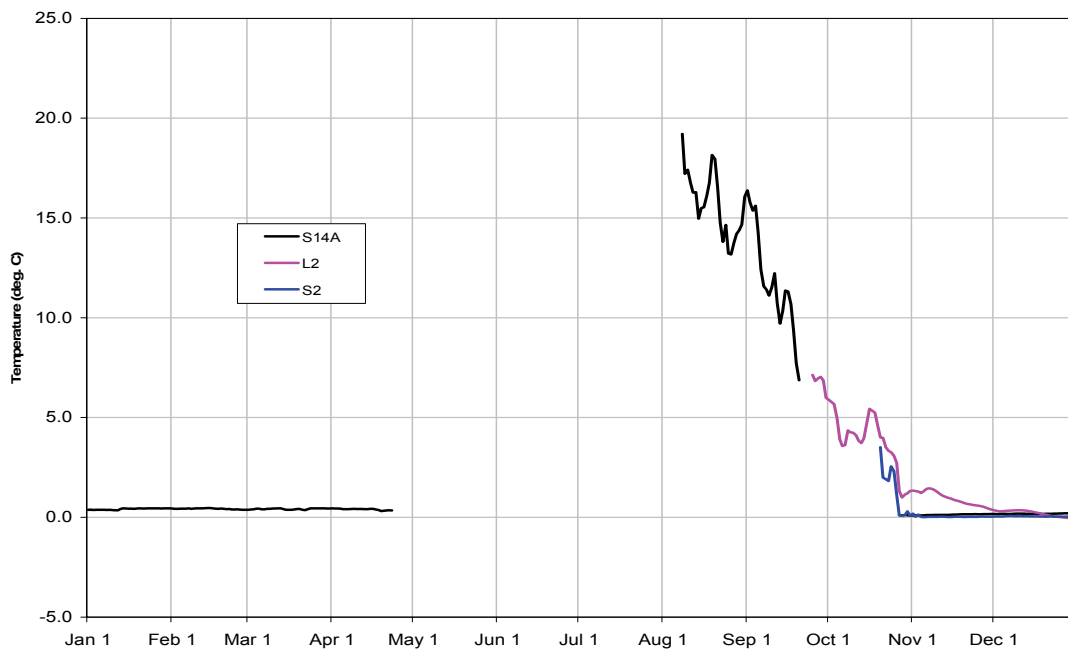
Station	S3	S19	S14A	S5A
	Iyininin Creek above Kearn Lake	Tar River Lowland Tributary near the mouth	Ells River at CNRL Bridge	Muskeg River above Muskeg Creek
Period of Operation	Apr 25-Oct 24	Jan 1-Dec 31	Jan 1-Dec 31	Jan 1-Dec 31
Month	Precipitation Depth (mm)	Precipitation Depth (mm)	Water Temperature (°C)	Barometric Pressure (kPa)
Jan		6.8	0.4	97.92
Feb		32.1	0.4	98.63
Mar		37.5	0.4	98.09
Apr		8.4	0.4P	98.14
May		21.0		98.01
Jun		27.8		97.88
Jul		22.9		97.76
Aug	96.2P	5.8P	15.7P	97.93
Sep	44.6		11.8P	97.75
Oct	4.7P		0.1P	97.50
Nov		5.0P	0.1	97.98
Dec		12.5P	0.2	97.92
Annual <sup>1</sup>	145.5P	179.8P	3.0P	97.96

See notes in Section C.1.1.3

**Figure C.1-1 Precipitation at Fort McMurray and RAMP Climate Stations, 2007.**



**Figure C.1-2 2007 daily water temperatures.**





### C.1.1.3 Notes to Climate Data Tables

The following notes apply to the monthly climate data (Table C.1-2, C.1-4, and C.1-5) and to the daily data provided in the RAMP database ([www.ramp-alberta.org](http://www.ramp-alberta.org)):

- Time distribution of snowfall is sometimes not measured correctly. Snow can accumulate in the gauge for some time and is then recorded when it melts. Therefore daily total snowfall depths may not be accurate and the snowfall may have occurred on a date other than the date it was recorded.
- The precipitation gauges fitted with snowfall adaptors (at C1 and S16) measure total precipitation but do not differentiate between rainfall and snowfall.
- Monthly values consist of the following: extremes in the case of minimum and maximum temperature data; means in the case of mean temperature and relative humidity; totals in the case of precipitation and solar radiation.
- Annual values in the monthly table consist of the following: extremes in the case of minimum and maximum temperature data; means in the case of mean temperature and relative humidity; totals in the case of precipitation and solar radiation.
- Wind direction is the direction from which the wind is blowing, measured in degrees clockwise from North.
- M = Missing
- P = Partial data for the period

### C.1.1.4 2007 Snowcourse Survey Results

Snowcourse surveys were made at sites representing four general terrain types across the RAMP study area:

- Flat Low Lying areas (FL);
- Open Land or Lake areas (OP);
- Mixed Deciduous (MD); and
- Jack Pine (JP).

Locations of the snow courses are shown on Figure 3.1-1 in the main report.

Snowcourse surveys were completed between February 7 to 17, March 5 to 10, and March 27 to 29, 2007, with the results shown in Table C.1-6.

**Table C.1-6 Summary of 2007 snowcourse surveys.**

Terrain Type	Survey Plot No	February 7-17		March 5-10		March 27-29	
		Snow Depth (cm)	Snow Water Equivalent (mm)	Snow Depth (cm)	Snow Water Equivalent (mm)	Snow Depth (cm)	Snow Water Equivalent (mm)
Flat Low Lying	FL-04-1	50.0	63.2	69.9	105	46.6	102
	FL-00-1	44.8	67.8	72.2	94.7	44.5	102
	FL-04-4	46.5	63.2	78.7	74.8	41.9	96.7
	FL-06-1	40.6	68.7	70.5	108	39.9	90.8
	<b>Mean</b>	<b>45.5</b>	<b>65.7</b>	<b>72.8</b>	<b>95.7</b>	<b>43.2</b>	<b>97.9</b>
Open Land or Lake Area	OP-04-1 (Lake)	19.5	34.7	53.4	117	43.6	108
	OP-97-1 (Land)			37.6	75.6	22.1	92.3
	OP-99-2 (Land)	31.8	59.4	67.4	121	36.3	87.7
	OP-06-1 (Lake)	19.0	36.0	56.6	83.7	29.3	128
	<b>Mean</b>	<b>23.4</b>	<b>43.3</b>	<b>53.7</b>	<b>99.1</b>	<b>32.8</b>	<b>104</b>
Mixed Deciduous	MD-04-1	34.3	53.3	53.3	87.5	36.4	92.0
	MD-04-2	45.3	84.1	59.2	92.7		
	MD-00-2	29.2	48.8	59.1	96.8	47.4	106
	MD-06-1	26.2	40.3	46.7	88.9	43.8	97.2
	<b>Mean</b>	<b>33.7</b>	<b>56.6</b>	<b>54.6</b>	<b>91.5</b>	<b>42.5</b>	<b>98.4</b>
Jack Pine	JP-00-1	45.9	60.2	53.7	82.3	49.3	114
	JP-01-1	20.7	41.9	70.6	112	39.6	85.7
	JP-97-2	38.9	66.6	65.4	88.0	31.9	84.7
	JP-06-1	27.6	55.0	62.6	87.7	29.6	69.7
	<b>Mean</b>	<b>33.3</b>	<b>55.9</b>	<b>63.1</b>	<b>92.4</b>	<b>37.6</b>	<b>88.5</b>

### C.1.2 Climate Data from Government Agencies

Daily climate data published by Environment Canada for climate stations in the study area have been incorporated into the RAMP database. The station locations are shown on Figure 3.1-1 in Section 3 of the main report, and an inventory of the data obtained for the stations is provided in Section C.4, below.

## **C.2 HYDROMETRIC DATA COLLECTED IN 2007**

### **C.2.1 RAMP Hydrometric Data**

#### **C.2.1.1 Water Level and Discharge**

Table C.2-1 summarizes the hydrometric monitoring carried out at various stations in 2007. Daily discharges and water levels are contained in the RAMP database and are provided on the RAMP report CD. The quality assessment shown for each station record is based on an assessment matrix which considers the number and quality of discharge measurements made during the year, the quality and extent of the stage-discharge rating curve, and the record completeness.

**Table C.2-1 Summary of 2007 hydrometric monitoring.**

Station	Catchment Area	Monitored Period	Maximum Daily Discharge		Minimum Daily Discharge <sup>1</sup>		Runoff Volume <sup>1</sup>		Data Quality Assessment <sup>2</sup>	
			2007	Mean	2007	Mean	2007	Mean	Winter	Open-Water
			(km <sup>2</sup> )	2007	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)	(m <sup>3</sup> /s)		
Athabasca River										
S24 - Athabasca River below Eymundson Creek	146,000	Jan 1 - Dec 31	3400	2177	326	361	16,100,000	14,097,175	Excellent	Good
Athabasca River at McMurray (07DA001)	133,000	Jan 1 - Dec 31	3170	2517	312	434	15,000,000	15,731,846		
Muskeg River Watershed										
S2 - Jackpine Creek at Canterra Road	358	Jan 12 - Dec 31	7.45	8.28	0.021	0.319	16,600	30,680	Excellent	Good
S3 - Iyininim Creek above Kearl Lake	32.2	Apr 25 - Oct 24	0.74	1.28	0.000	0.052	3,390	4,945		Fair
S4A - Blackfly Creek near the Mouth <sup>3</sup>	27	Apr 25 - Oct 25	0.64		0.001		1,370			Fair
S5 - Muskeg River above Stanley Creek	395	Jan 1 - Dec 31	6.35	8.09	0.075	0.245	21,800	26,387	Excellent	Excellent
S5A - Muskeg River above Muskeg Creek	552	Jan 1 - Dec 31	9.01	7.88	0.304	0.437	31,800	34,082	Good	Fair
S7 - Muskeg River near Fort MacKay (07DA008)	1460	Jan 1 - Dec 31	18.70	25.32	0.265	1.092	62,900	104,212	Excellent	
S9 - Kearl Lake Outlet	73.6	Jan 12 - Dec 8	0.81	0.70	0.002	0.066	2,790	3,982		Fair
S10 - Wapasu Creek at Canterra Road	90.7	Jan 12 - Dec 31	2.47	3.00	0.007	0.042	8,290	7,684	Excellent	Excellent
S20 - Muskeg River Upland <sup>3</sup>	157	Apr 25 - Oct 20	2.24	4.70	0.064	0.086	8,040	9,321		Good
S22 - Muskeg Creek near the Mouth	157	Apr 24 - Oct 20	4.72	5.80	0.010	0.187	14,300	24,235		Fair
S28 - Khahago Creek below Blackfly Creek <sup>3</sup>	212	Apr 25 - Oct 25	2.20	3.27	0.083	0.169	4,510	14,485		Fair
S33 - Muskeg River at the Aurora/Albian Boundary	728	Jan 1 - Dec 31	13.70	14.33	0.224	0.530	45,600	52,444	Excellent	Good
Athabasca River Tributaries Upstream of Fort McMurray										
S29 - Christina River near Chard (07CE002)	4,860	Jan 1 - Dec 31	104.0	78.1	6.5	6.4	420,000	361,566	Excellent	
S31 - Hangingstone Creek at North Star Road <sup>3</sup>	160	Apr 28 - Oct 19	4.90	6.54	0.148	0.160	8,930	13,889		Good
S32 - Surmont Creek at Highway 881 <sup>3</sup>	158	Apr 28 - Oct 19	6.12	6.05	0.029	0.187	9,970	18,759		Fair
Athabasca River Tributaries Downstream of Fort McMurray										
S6 - Mills Creek at Highway 63	23.8	Jan 1 - Dec 31	0.033	0.170	0.013	0.018	278	732	Good	Poor
S11 - Poplar Creek at Highway 63 (07DA007) <sup>3</sup>	422	Jan 13 - Dec 13	8.96	8.74	0.021	0.141	2,010	24,121	Excellent	Excellent
S12 - Fort Creek at Highway 63	45.6	Apr 24 - Oct 20	0.245	0.435	0.024	0.024	1,120	1,252		Fair
S14 - Ells River above Joslyn Creek	2,450	Jan 14 - Oct 24	52.5	33.7	2.55	3.39	146,000	155,609		Excellent
S14A - Ells River at CNRL bridge <sup>3</sup>	2,430	Jan 1 - Dec 31	36.6	41.1	2.66	2.72	73,700	155,548	Excellent	Excellent
S15A - Tar River near the Mouth	301	May 1 - Oct 22	18.20		0.094		20,600			Fair
S18A - Calumet River Upland Tributary <sup>3</sup>	53.4	Apr 27 - Oct 24	1.110	1.196	0.000	0.001	146	642		Fair
S19 - Tar River Lowland Tributary near the Mouth	11.5	Apr 24 - Oct 22	0.092	0.069	0.000	0.002	153	229		Poor
S25 - Susan Lake Outlet	13.6	May 1 - Oct 23	0.672	0.604	0.007	0.003	830			Good
S26 - MacKay River near Fort MacKay (07DB001)	5570	Jan 1 - Dec 31	114	123	4.19	3.65	354,000	366,937	Excellent	
S27 - Firebag River near the Mouth (07DC001)	5990	Jan 1 - Dec 31	115	111	11.4	15.3	536,000	591,525	Excellent	
S34 - Tar River above CNRL Lake <sup>3</sup>	136	Jan 1 - Dec 11	6.34	6.79	0.095	0.342	3,590		Good	Good
Water Level Stations										
			Maximum Level		Minimum Level					
			2007	Mean	2007	Mean				
L1 - McClelland Lake	28	Jan 14 - Dec 10	294.621	294.605	294.461	294.381				
L2 - Kearl Lake	72.6	Jan 1 - Dec 31	332.001	332.151	331.591	331.780				
L3 - Isadore's Lake	191	Jan 1 - Dec 31	233.897	233.900	233.627	233.665				

<sup>1</sup>Runoff volume and minimum daily discharge are for the period May 1 - Oct 31.

<sup>2</sup>Quality assesment refers to RAMP discharge data only.

<sup>3</sup>The runoff volume and minimum daily discharge is based on a shorter period than at the other stations.

### C.2.1.2 Suspended Sediment

Suspended sediment samples were collected at 27 RAMP streamflow stations for a total of 114 measurements during 2007. The total suspended sediment (TSS) data are provided in Table C.2-2.

**Table C.2-2 Suspended sediment data collected at RAMP hydrometric stations in 2007.**

Station / Variable		April 25-30	June 12-18	Aug 3-11	Sept 16-26	Oct 19-26
L1	TSS (mg/L)		34			7
	Q (m <sup>3</sup> /s)	0.106	0.011			
S02	TSS (mg/L)	31	<3	<3	6	
	Q (m <sup>3</sup> /s)	4.48	0.559	0.034	0.795	0.829
S03	TSS (mg/L)	22	4	3	9	8
	Q (m <sup>3</sup> /s)	0.624	0.056	0.008	0.456	0.119
S04A	TSS (mg/L)	82	<3	10	<3	<3
	Q (m <sup>3</sup> /s)	0.561	0.052	0.003		0.090
S5	TSS (mg/L)	5	<3	3	<3	<3
	Q (m <sup>3</sup> /s)	3.94	0.383	0.213	2.35	0.675
S5A	TSS (mg/L)	8	7	5	<3	<3
	Q (m <sup>3</sup> /s)		0.735	0.290	2.38	1.32
S6	TSS (mg/L)	<3	<3	<3	<3	
	Q (m <sup>3</sup> /s)	0.026				
S7	TSS (mg/L)	16	3	<3	<3	
	Q (m <sup>3</sup> /s)			0.348	4.56	3.02
S9	TSS (mg/L)	<3	5	<3	<3	
	Q (m <sup>3</sup> /s)	0.257	0.147	0.004	0.093	0.141
S10	TSS (mg/L)	3	<3	<3	<3	
	Q (m <sup>3</sup> /s)	1.16	0.175	0.005	0.923	0.431
S11	TSS (mg/L)	33	<3	17	5	7
	Q (m <sup>3</sup> /s)	8.96	0.571	0.038	0.044	0.366
S12	TSS (mg/L)	6	<3	5	3	
	Q (m <sup>3</sup> /s)	0.243	0.236	0.028	0.142	0.029
S14	TSS (mg/L)	5770	12	<3	<3	4
	Q (m <sup>3</sup> /s)		9.84	2.93		3.60
S14A	TSS (mg/L)	1040		3	<3	3
	Q (m <sup>3</sup> /s)			2.44	3.17	2.35
S15A	TSS (mg/L)		7	75	3	6
	Q (m <sup>3</sup> /s)	5.02	0.435	0.166	0.443	0.286
S18A	TSS (mg/L)	12	7		13	17
	Q (m <sup>3</sup> /s)	0.565	0.040		0.007	0.006
S19	TSS (mg/L)	3	<3	23	7	5
	Q (m <sup>3</sup> /s)					0.004
S20	TSS (mg/L)	4	<3	6	<3	
	Q (m <sup>3</sup> /s)		0.224	0.053	1.14	0.396

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

	Station	April 25-30	June 12-18	Aug 3-11	Sept 16-26	Oct 19-26
S22	TSS (mg/L)	8	<3	<3	<3	
	Q (m <sup>3</sup> /s)	1.72	0.662	0.011	0.923	0.626
S24	TSS (mg/L)	776	175	92	20	6
	Q (m <sup>3</sup> /s)	1761	1264	556	286	
S25	TSS (mg/L)	184	<3	4	6	<3
	Q (m <sup>3</sup> /s)		0.032	0.010	0.063	0.027
S27	TSS (mg/L)	88				
	Q (m <sup>3</sup> /s)					
S28	TSS (mg/L)	<3	56	<3	<3	6
	Q (m <sup>3</sup> /s)	2.19	0.114	0.083	0.964	0.185
S31	TSS (mg/L)	61	3	13	3	
	Q (m <sup>3</sup> /s)				0.698	0.253
S32	TSS (mg/L)	142	5	24	24	
	Q (m <sup>3</sup> /s)				0.843	0.250
S33	TSS (mg/L)	18	6	4	<3	3
	Q (m <sup>3</sup> /s)			0.237	3.59	1.94
S34	TSS (mg/L)	133	3	6	3	<3
	Q (m <sup>3</sup> /s)			0.221	0.338	0.206

### C.2.2 Hydrometric Data from Oil Sands Operators

Several oil sands operators provided streamflow and operational water withdrawal and release information to RAMP, as summarized in Table C.2-3. Data provided at a daily time interval are contained in the RAMP database and are provided on the RAMP web database.

### C.2.3 Hydrometric Data from Government Agencies

Daily data published by Environment Canada for hydrometric stations in the study area have been incorporated into the RAMP database. An inventory of the data obtained for the stations is provided in Section C.4.

**Table C.2-3 Hydrometric information for 2007 received from oil sands operators.**

Operator	Component	Location	Annual Volume (dam <sup>3</sup> )	Daily Discharge Provided
Albian – Muskeg River Mine	Withdrawals from the Athabasca River	SE-24-95-11-W4	5,715	√
	Releases		0	
CNRL Horizon	Withdrawals from the Athabasca River	SW-14-97-11-W4	7,029	√
	Releases to the Athabasca River			
	Release from Temporary Wastewater Treatment Plant	7-21-96-11-W4	377	√
Petro-Canada (Fort Hills)	Withdrawals from the Athabasca River		78	
	Dewatering Releases			
	Release to Fort Creek (Pond 2)	463915 E; 6358770 N (NAD 83)	427*	√
	Release to Unnamed Creek (Pond 1)	461061 E; 6356525 N (NAD 83)	1,073*	√
Shell Canada Energy – Albian Sands Expansion	Dewatering Releases			
	Release to Shelley Creek (Pond 2)	476508 E; 6347999 N (NAD 83)	3,421	√
	Release to Jackpine Creek (Pond 3)	480472 E; 6344400 N (NAD 83)	54	√
	Release to Khahago Creek (Pond 4)	480472 E; 6347044 N (NAD 83)	238	√
	Release to Jackpine Creek (Pond 6)	474067 E; 6345217 N (NAD 83)	346	√
Suncor	Withdrawals from the Athabasca River	471871 E; 6317855 N (NAD 83)	43,600	
	Releases to Ruth Lake		73	
Syncrude	Withdrawals from the Athabasca River	NW35-92-10-W4	35,951	
	Release (treated wastewater) to the Athabasca River	2-93-10-W4	261	
	Diversions			
	Clean water diversion to Stanley Creek	SW-21-96-9-W4	1,988	
	Poplar Creek Spillway releases		5,405*	√

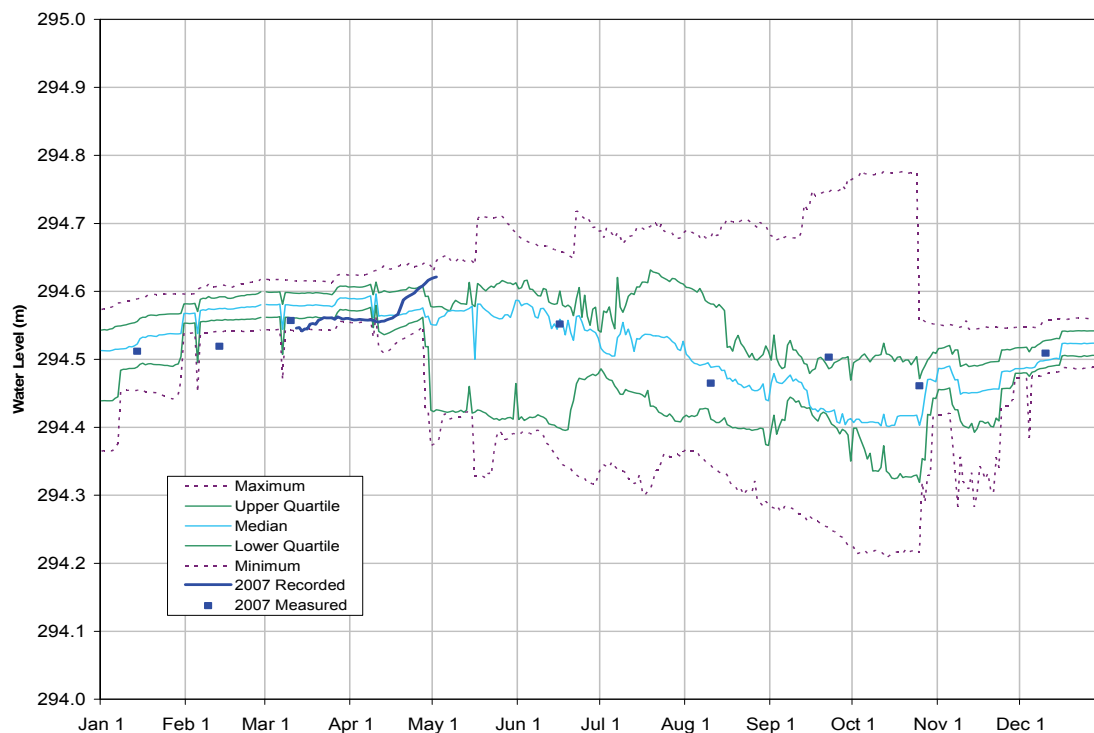
\* Incomplete record



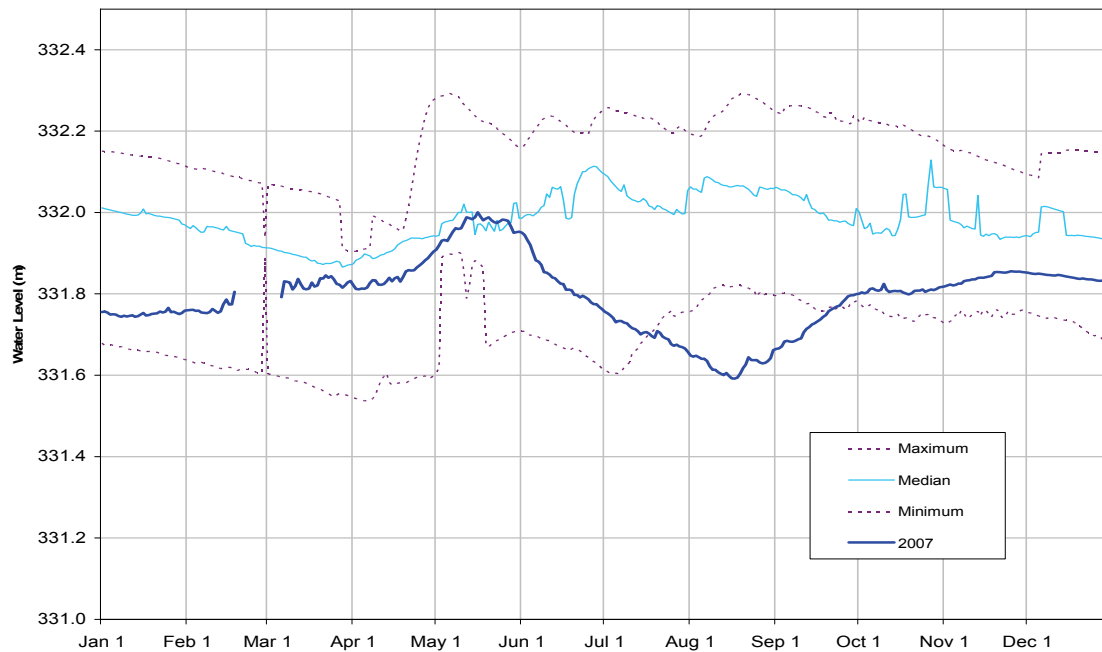
## C.2.4 2007 Hydrographs in Historical Context

Discharge and water level hydrographs for 2007 for each RAMP station are presented in Figure C.2-1 through Figure C.2-31 below. Each hydrograph is presented with some historical context to assist in interpreting the hydrographs. The context shown on the graphs consists of the historical maximum, minimum, and median daily values for that station. For stations with more than 8 years of record, the upper and lower quartile lines are shown as well. In cases where the period of record is less than 3 years, the mean daily values are used instead of the median values. In all cases, the current year is excluded from the calculation of the historical context, so that the current year is compared to the previous years.

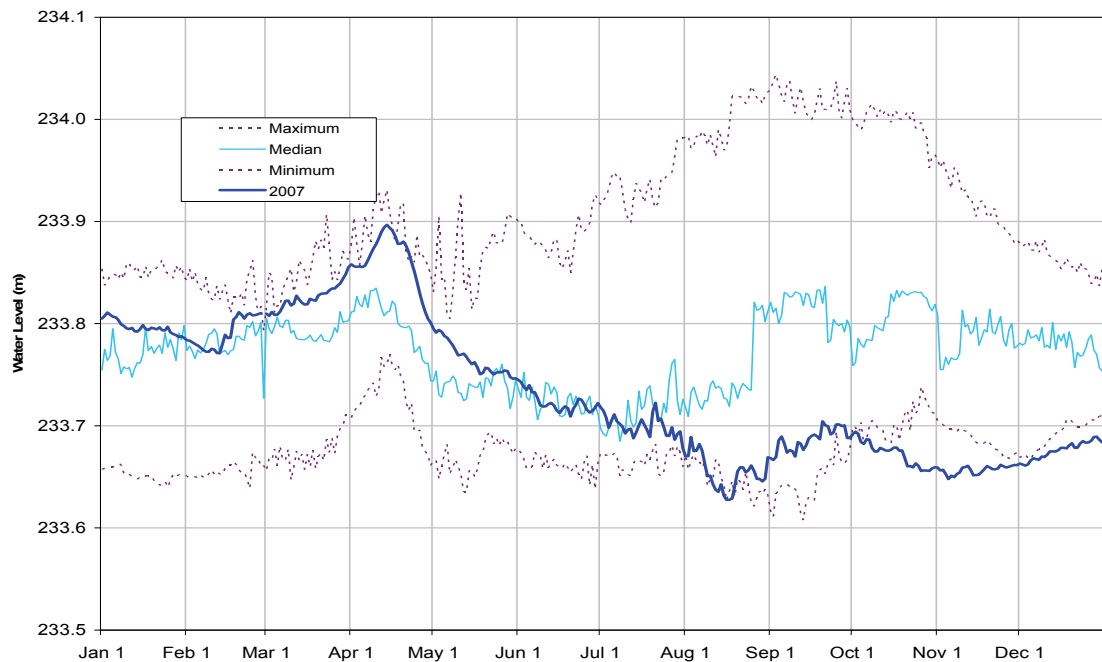
**Figure C.2-1 2007 water level hydrograph and historical context for Station L1, McClelland Lake.**



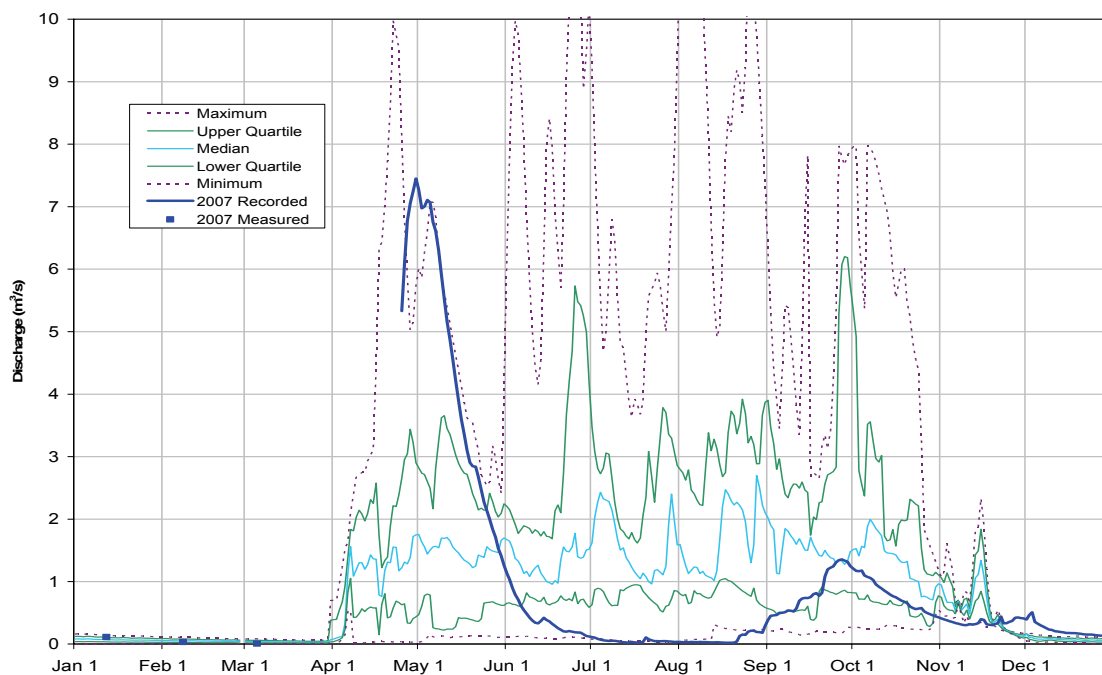
**Figure C.2-2 2007 water level hydrograph and historical context for Station L2, Kearl Lake.**



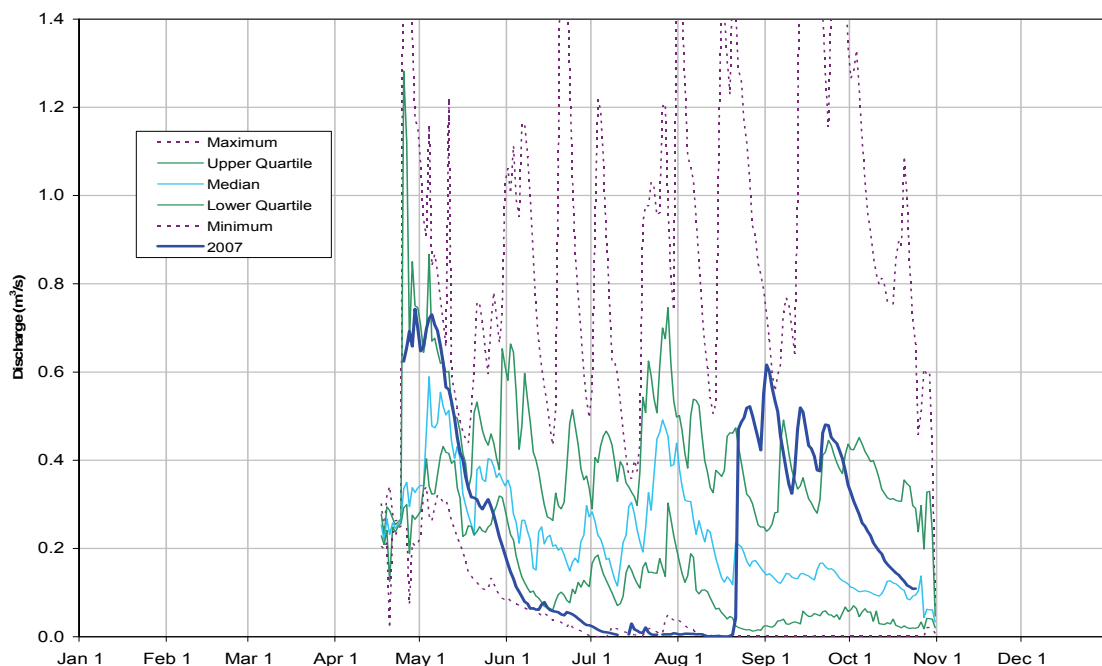
**Figure C.2-3 2007 water level hydrograph and historical context for Station L3, Isadore's Lake.**



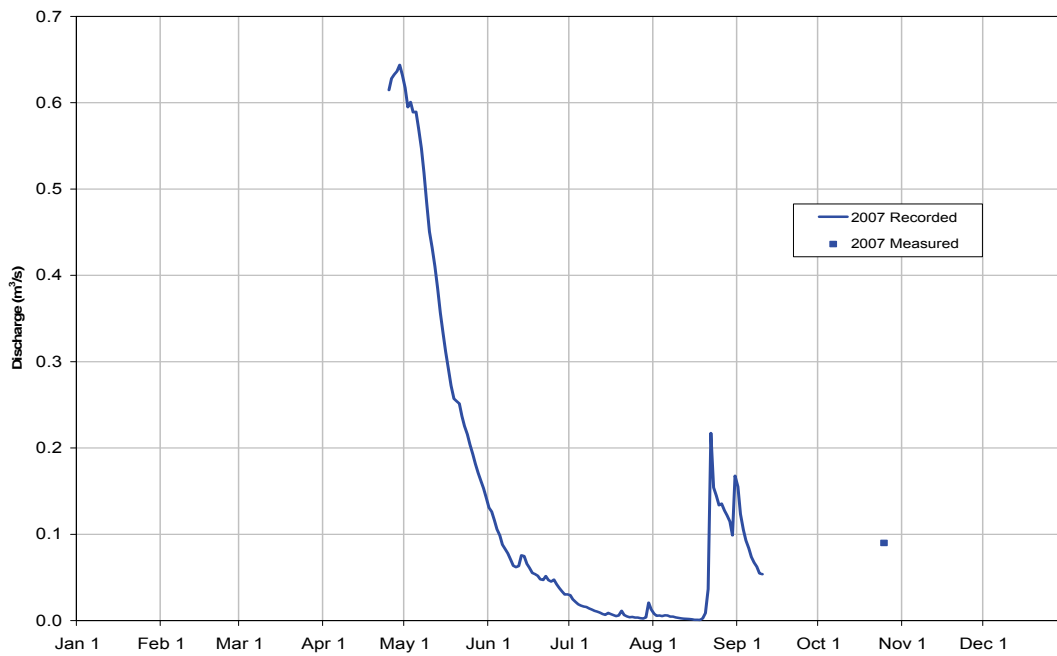
**Figure C.2-4 2007 discharge hydrograph and historical context for Station S2, Jackpine Creek at Canterra Road.**



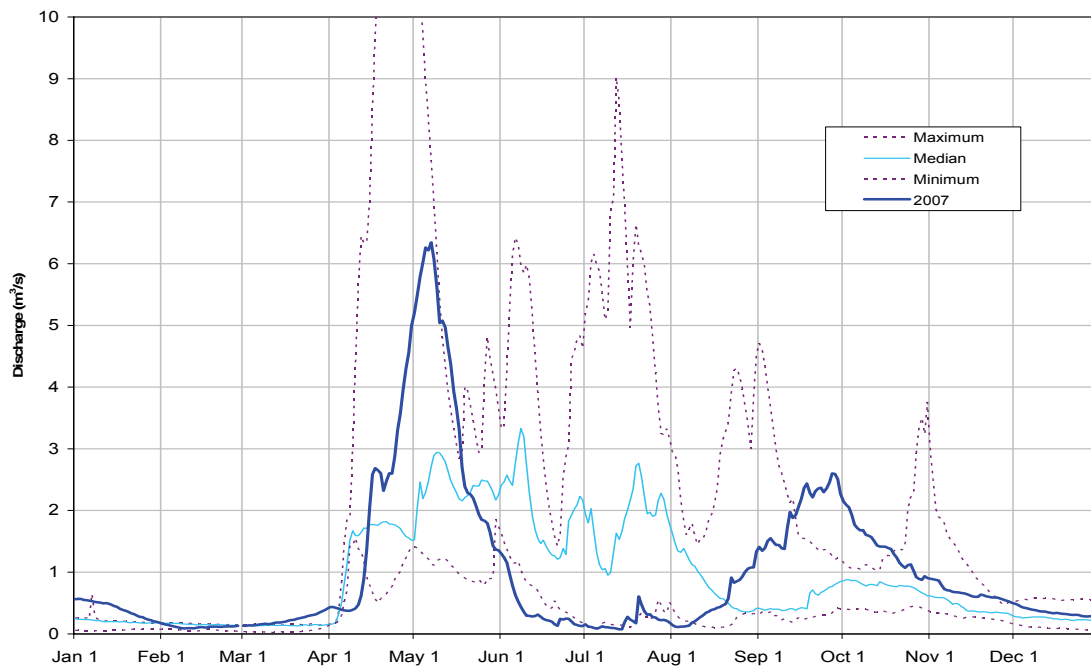
**Figure C.2-5 2007 discharge hydrograph and historical context for Station S3, Iynimin Creek above Kearl Lake.**



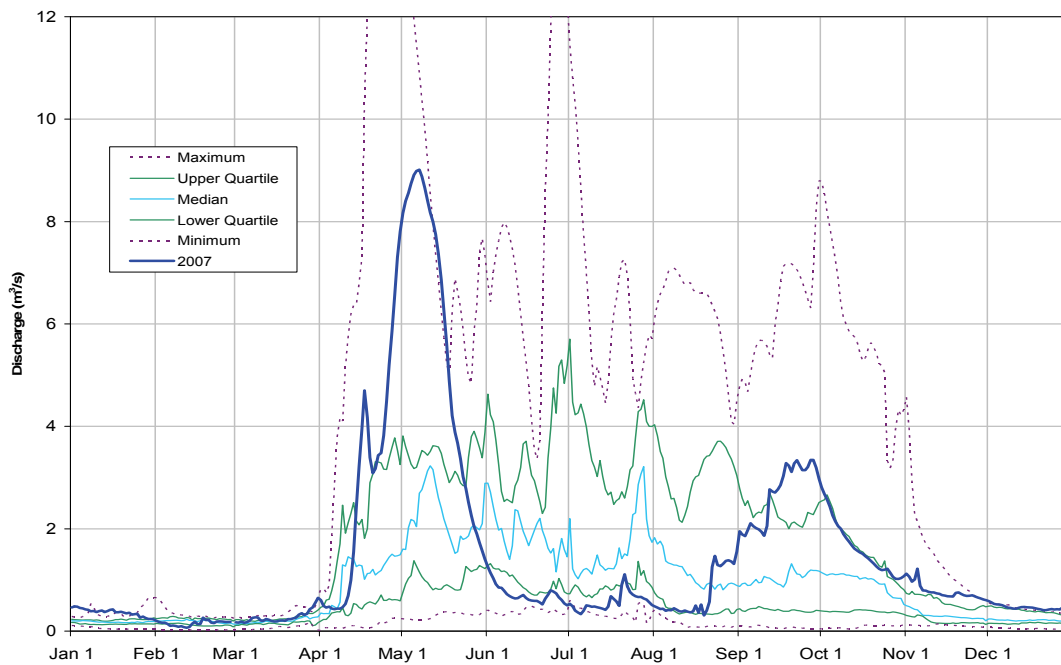
**Figure C.2-6 2007 discharge hydrograph for Station S4A, Blackfly Creek near the Mouth.**



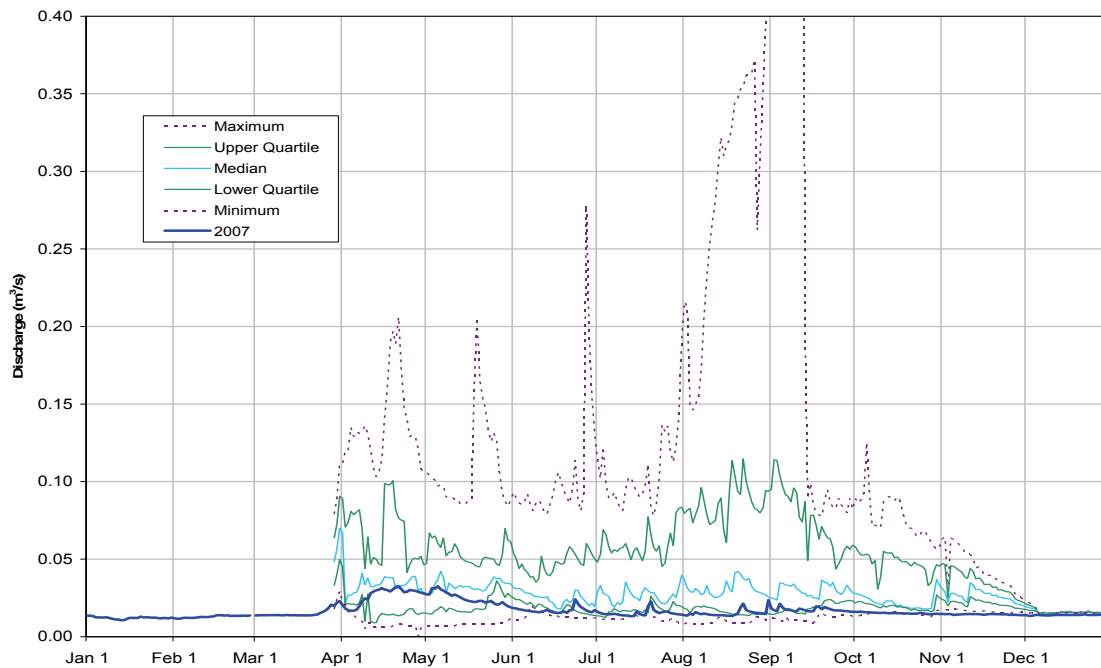
**Figure C.2-7 2007 discharge hydrograph and historical context for Station S5, Muskeg River above Stanley Creek.**



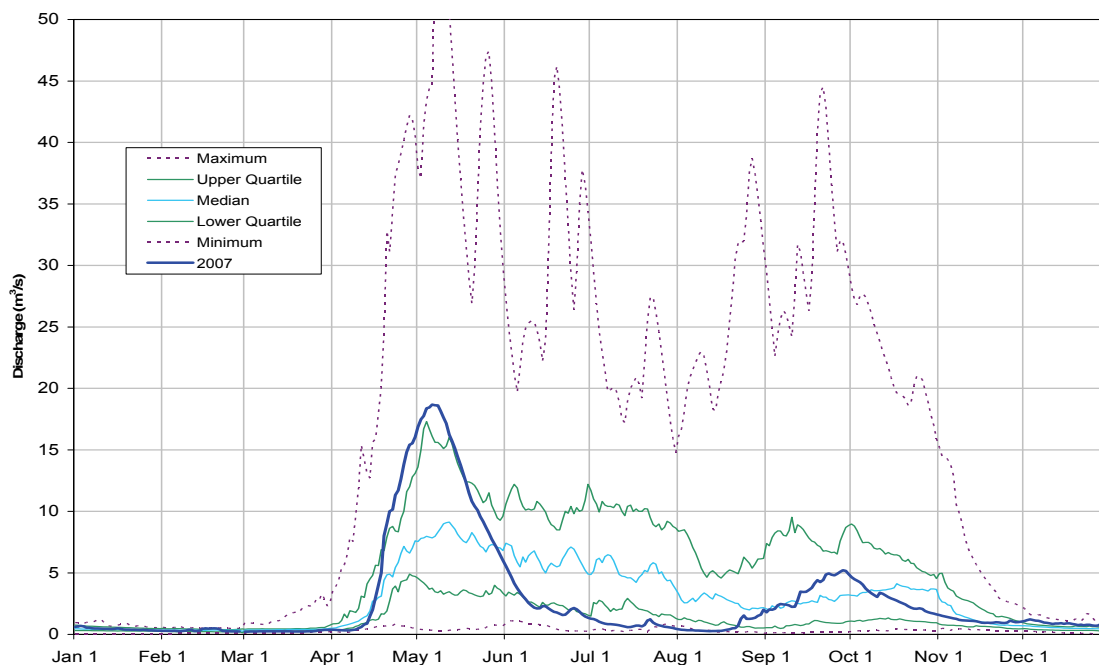
**Figure C.2-8 2007 discharge hydrograph and historical context for Station S5A, Muskeg River above Muskeg Creek.**



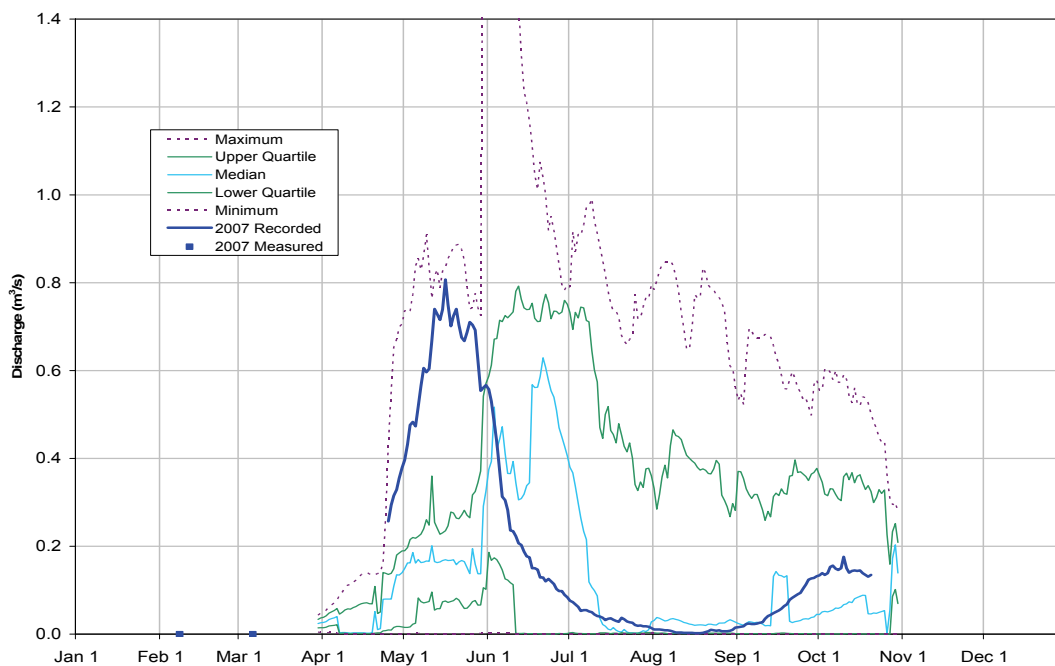
**Figure C.2-9 2007 discharge hydrograph and historical context for Station S6, Mills Creek at Highway 63.**



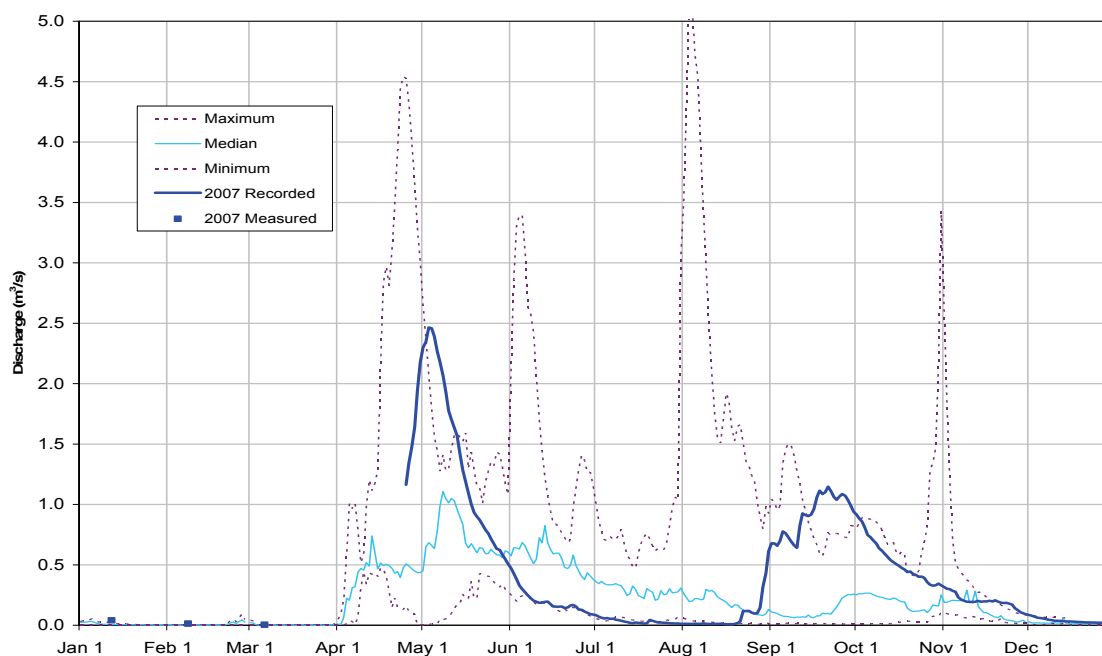
**Figure C.2-10 2007 discharge hydrograph and historical context for Station S7, Muskeg River near Fort McKay (07DA008).**



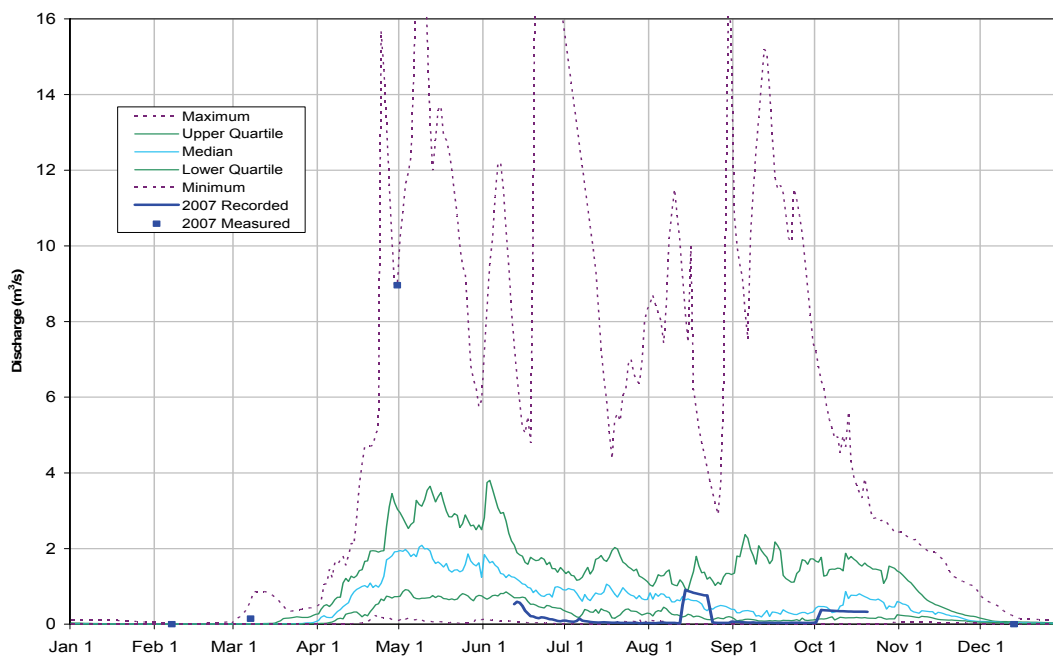
**Figure C.2-11 2007 discharge hydrograph and historical context for Station S9, Kearl Lake Outlet.**



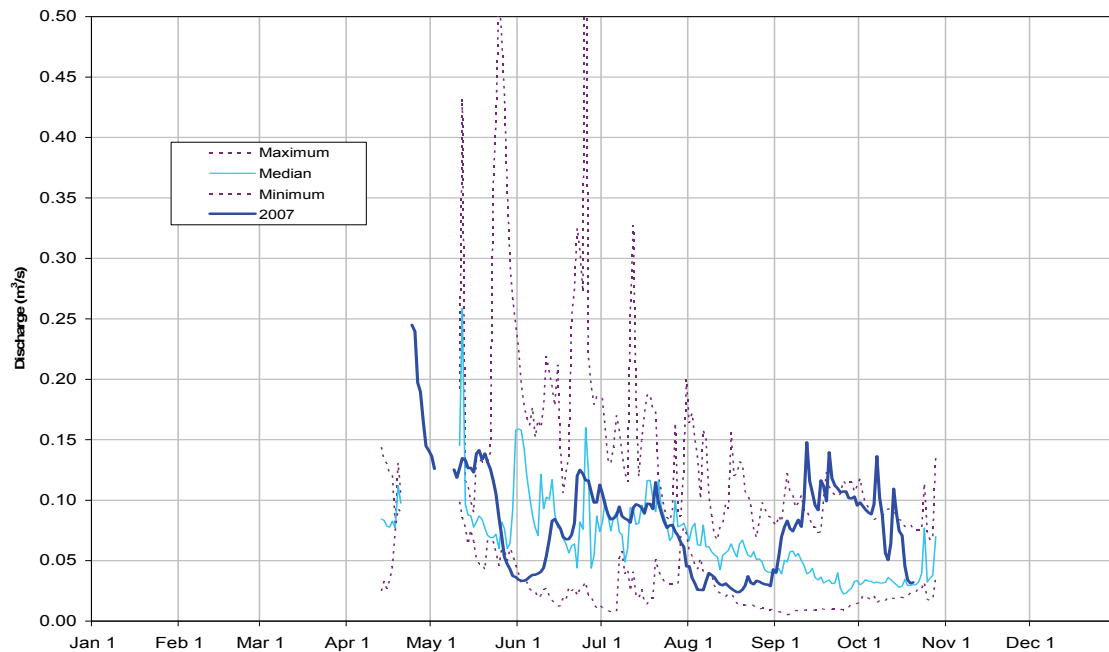
**Figure C.2-12 2007 discharge hydrograph and historical context for Station S10, Wapasu Creek at Canterra Road.**



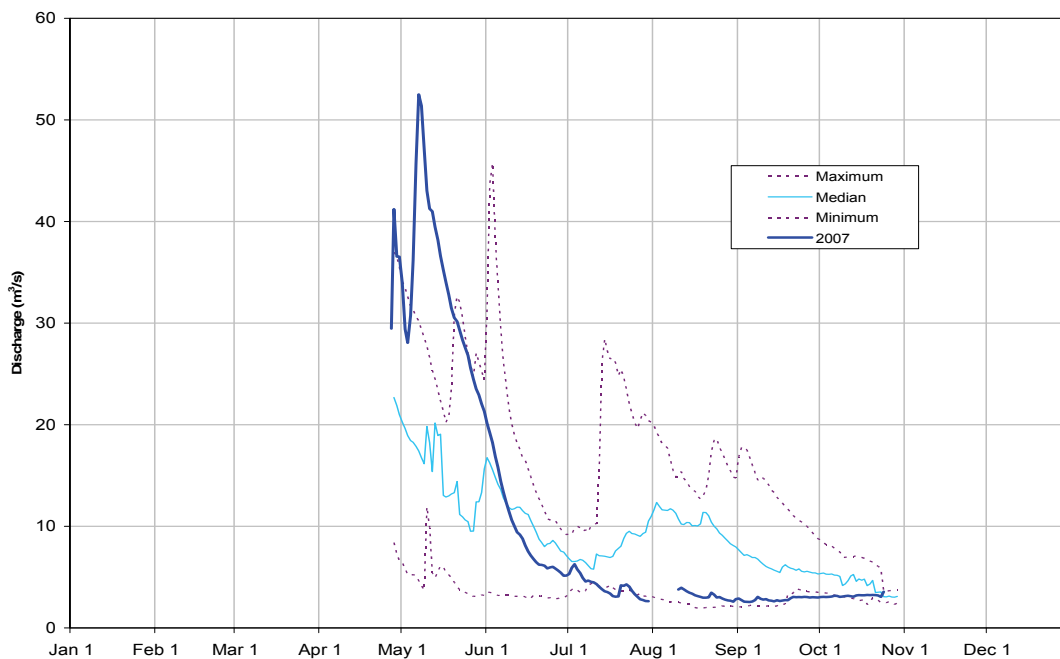
**Figure C.2-13 2007 discharge hydrograph and historical context for Station S11, Poplar Creek at Highway 63 (07DA007).**



**Figure C.2-14 2007 discharge hydrograph and historical context for Station S12, Fort Creek at Highway 63.**

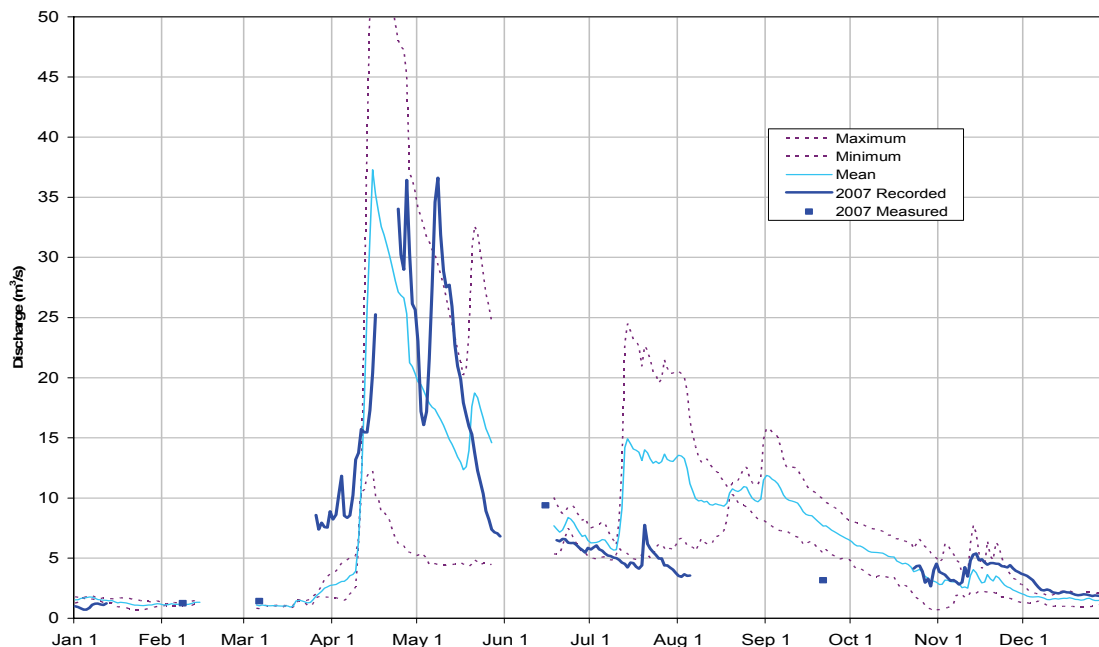


**Figure C.2-15 2007 discharge hydrograph and historical context for Station S14, Ells River above Joslyn Creek.**

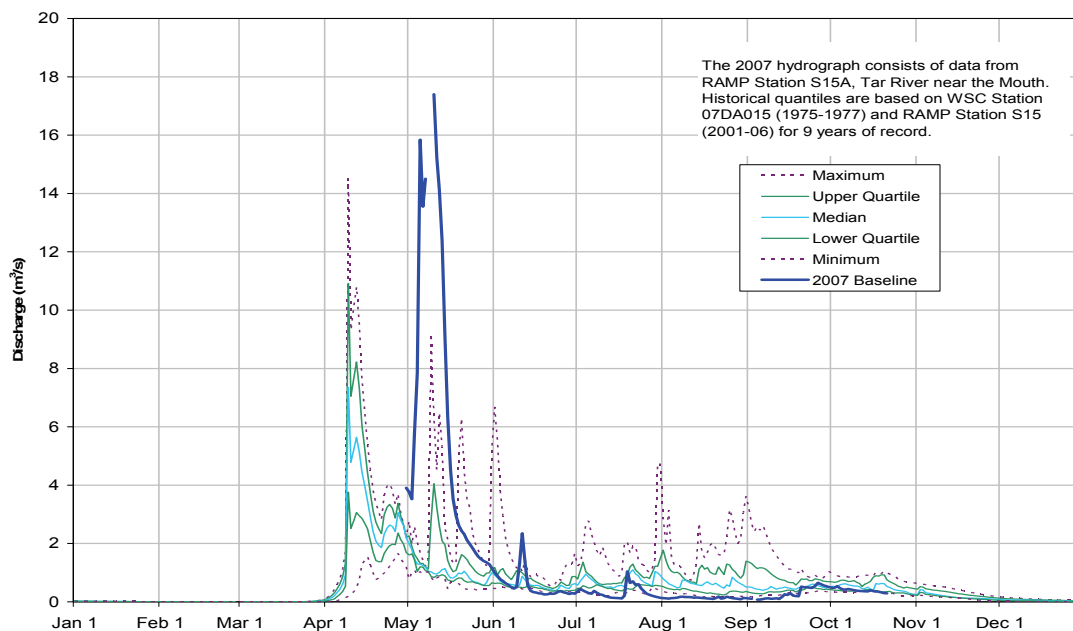




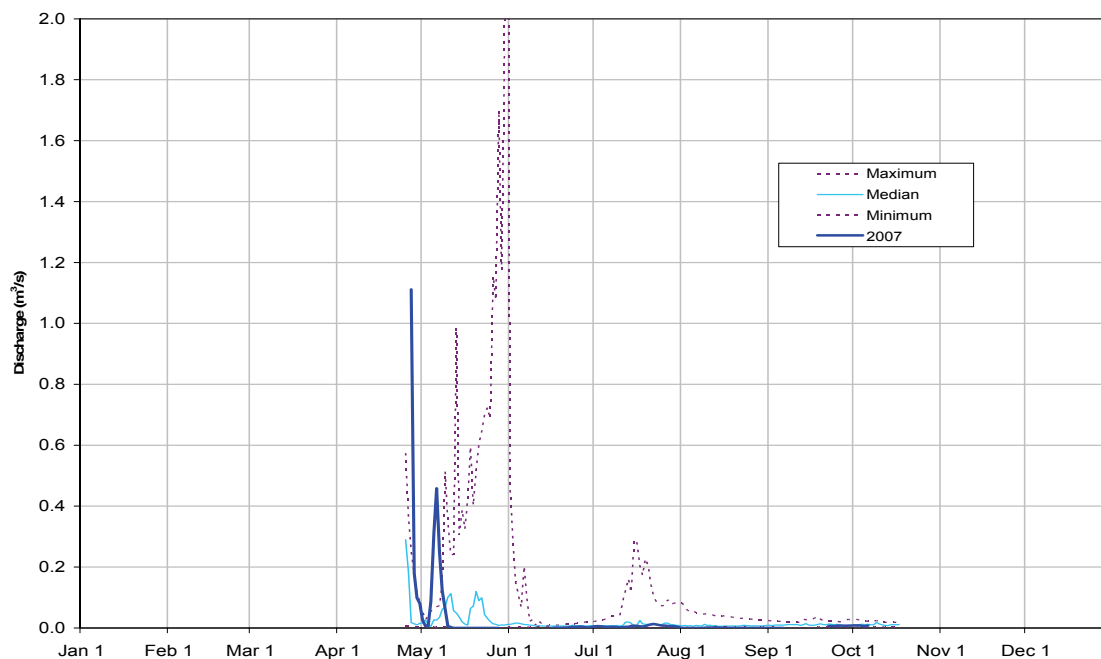
**Figure C.2-16 2007 discharge hydrograph and historical context for Station S14A, Ells River at the CNRL Bridge.**



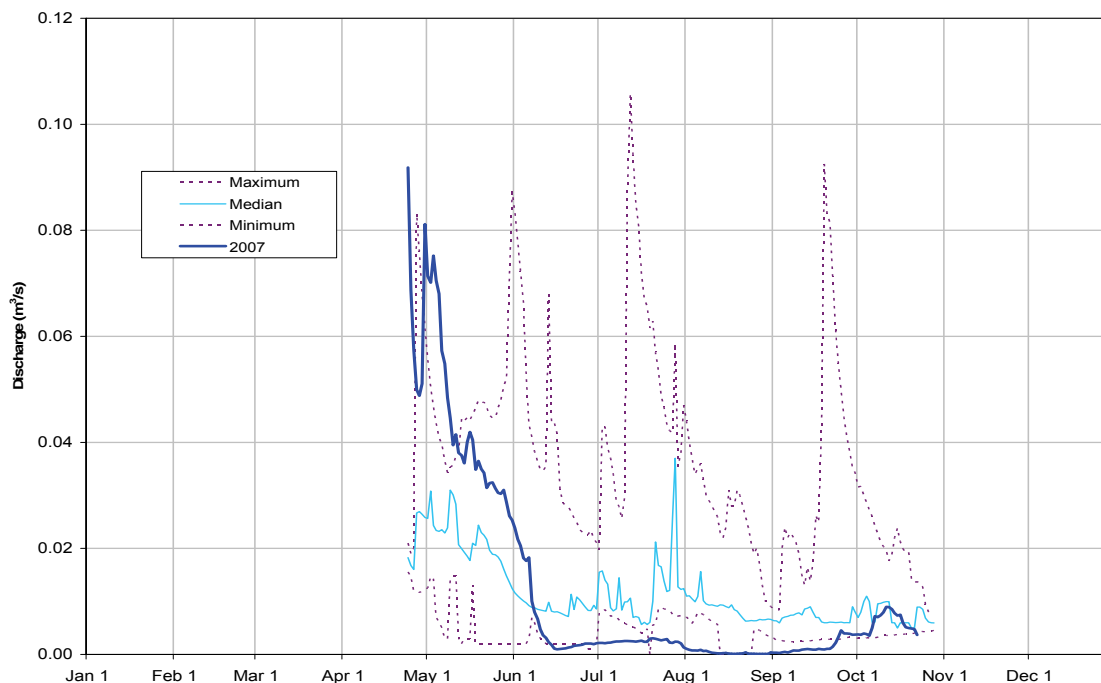
**Figure C.2-17 2007 discharge hydrograph for Station S15A, Tar River near the Mouth.**



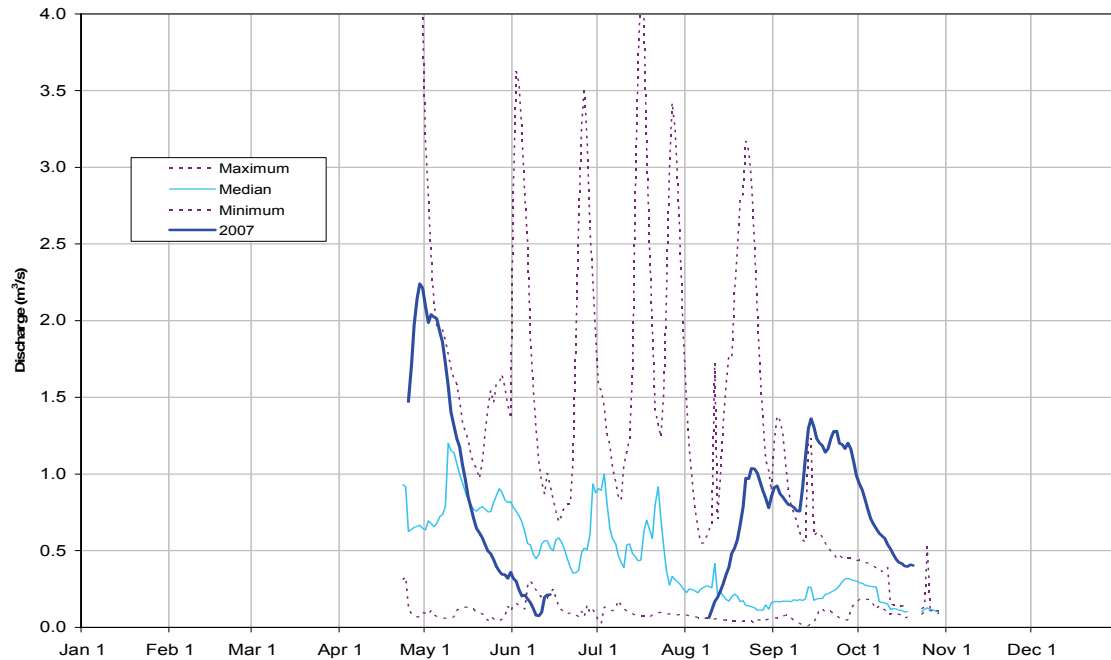
**Figure C.2-18 2007 discharge hydrograph and historical context for Station S18A, Calumet River Upland Tributary.**



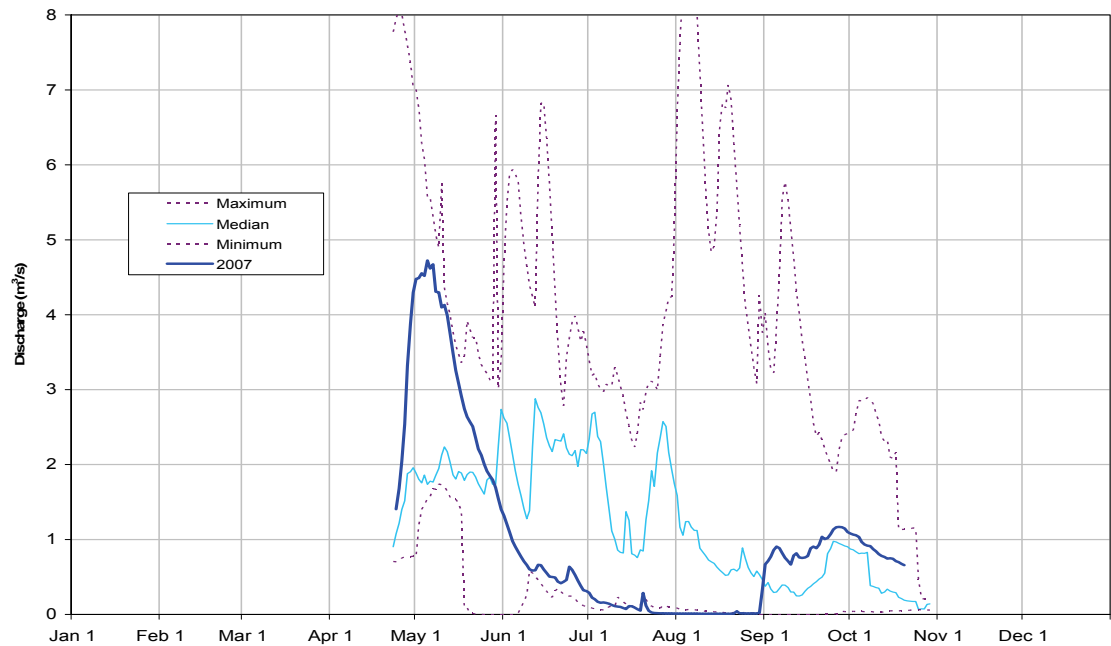
**Figure C.2-19 2007 discharge hydrograph and historical context for Station S19, Tar River Lowland Tributary near the Mouth.**



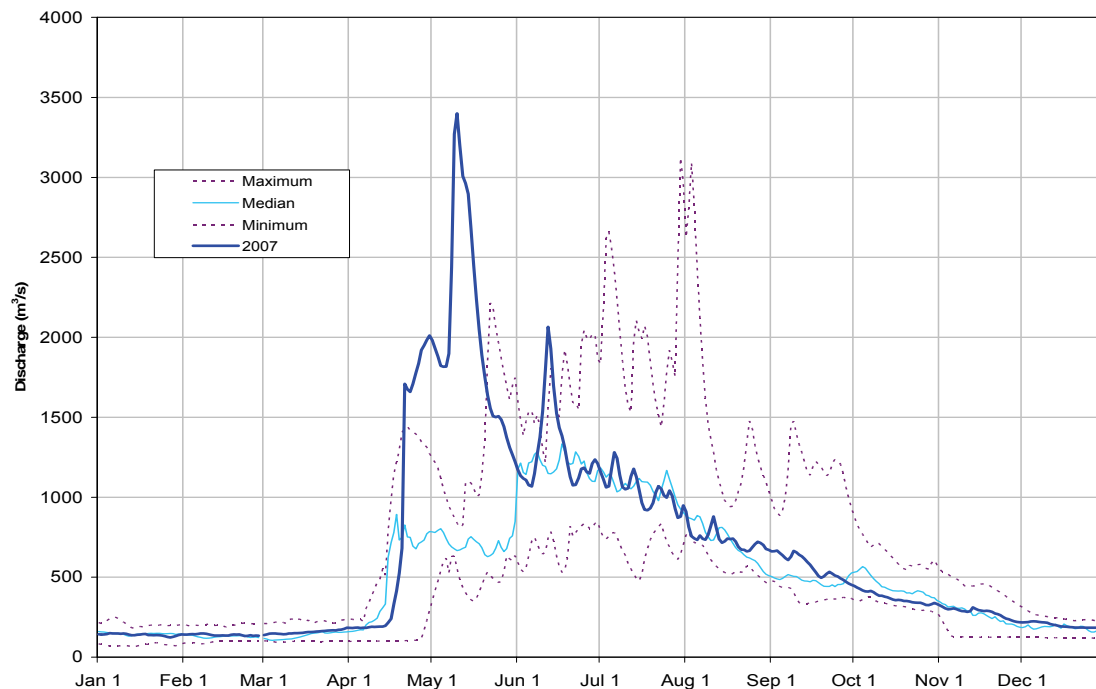
**Figure C.2-20 2007 discharge hydrograph and historical context for Station S20, Muskeg River Upland.**



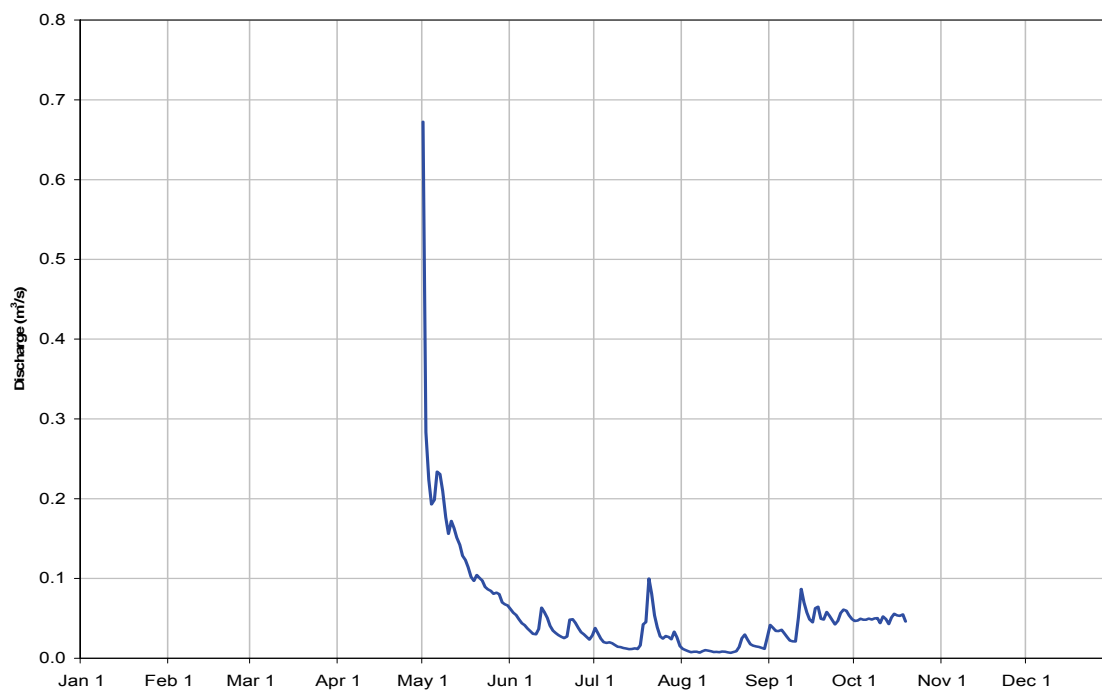
**Figure C.2-21 2007 discharge hydrograph and historical context for Station S22, Muskeg Creek near the Mouth.**



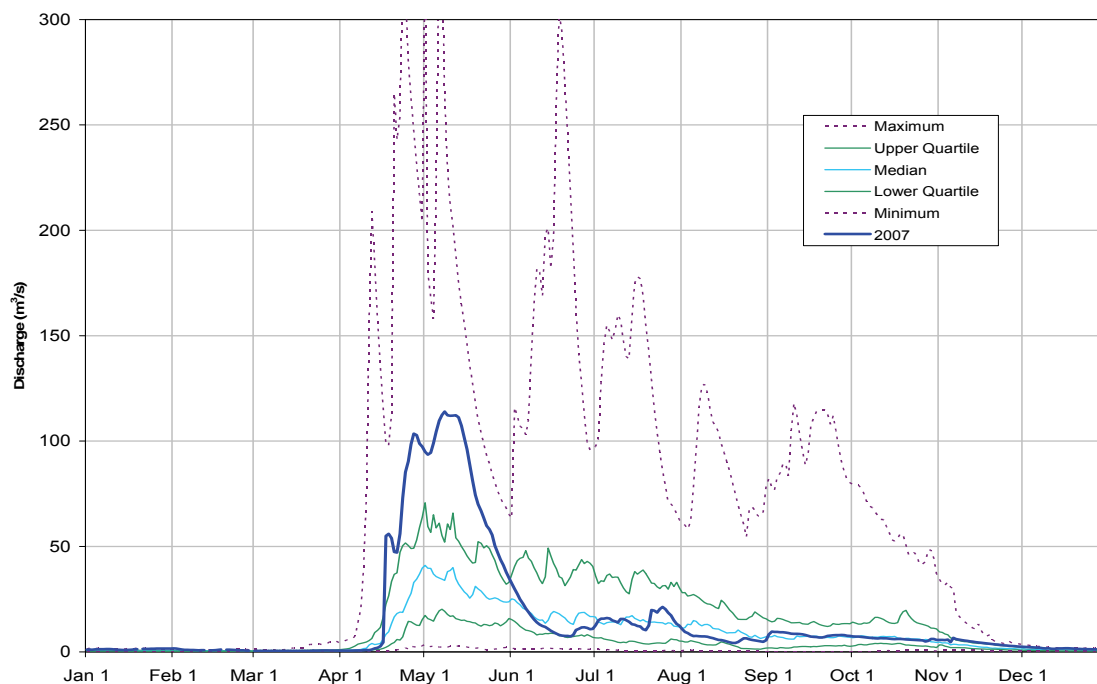
**Figure C.2-22 2007 discharge hydrograph and historical context for Station S24, Athabasca River below Eymundson Creek.**



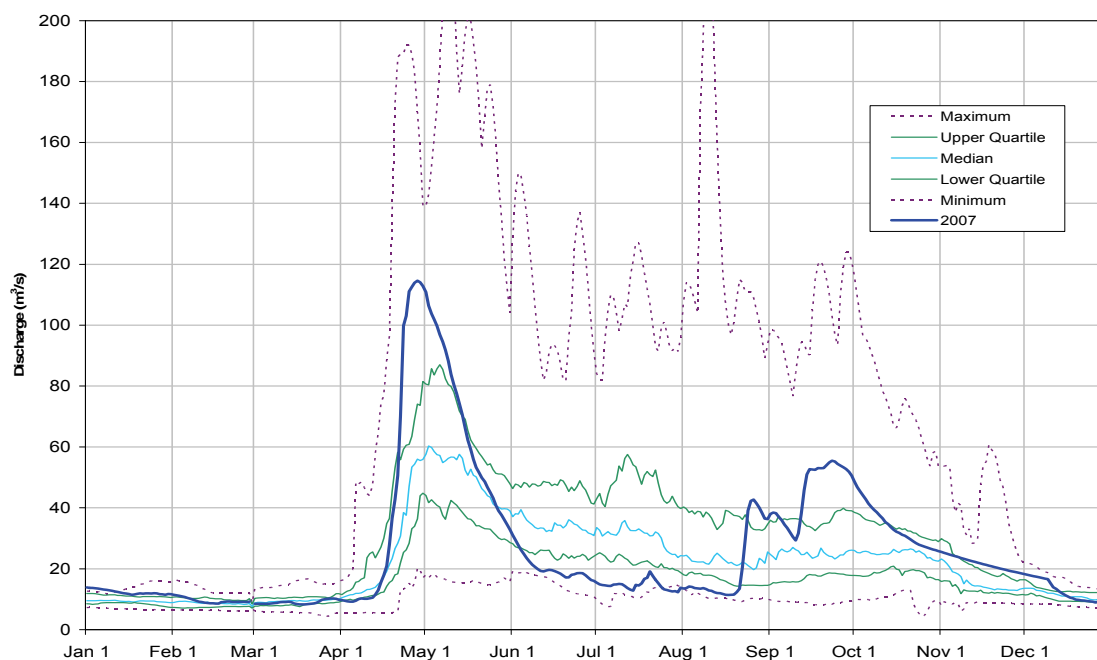
**Figure C.2-23 2007 discharge hydrograph for Station S25, Susan Lake Outlet.**



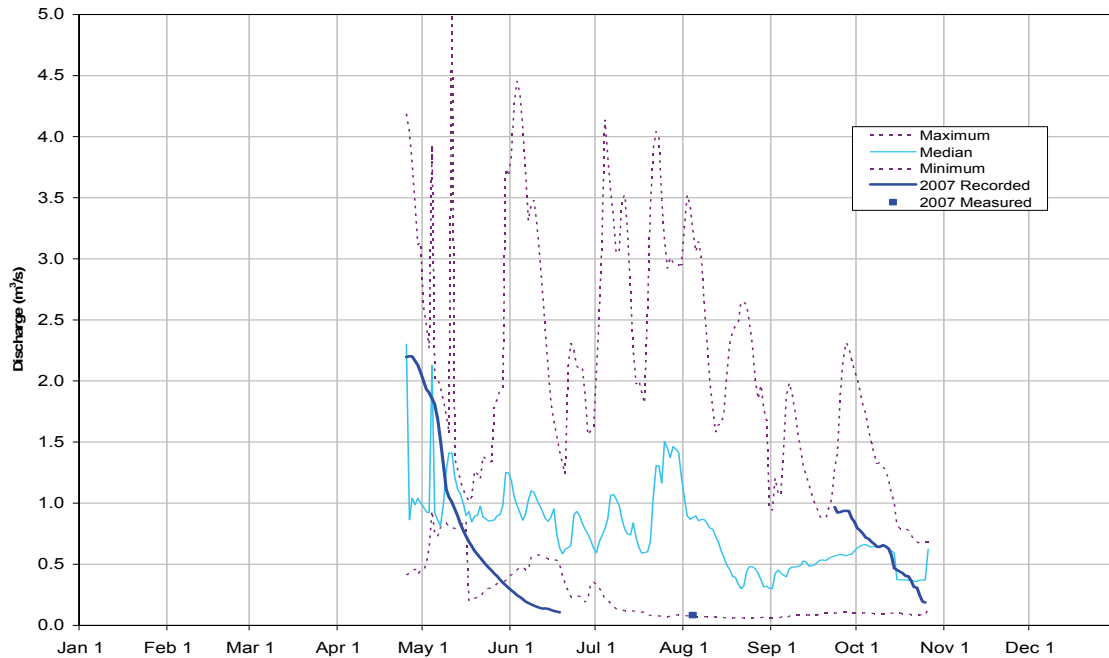
**Figure C.2-24 2007 discharge hydrograph and historical context for Station S26, MacKay River near Fort McKay (07DB001).**



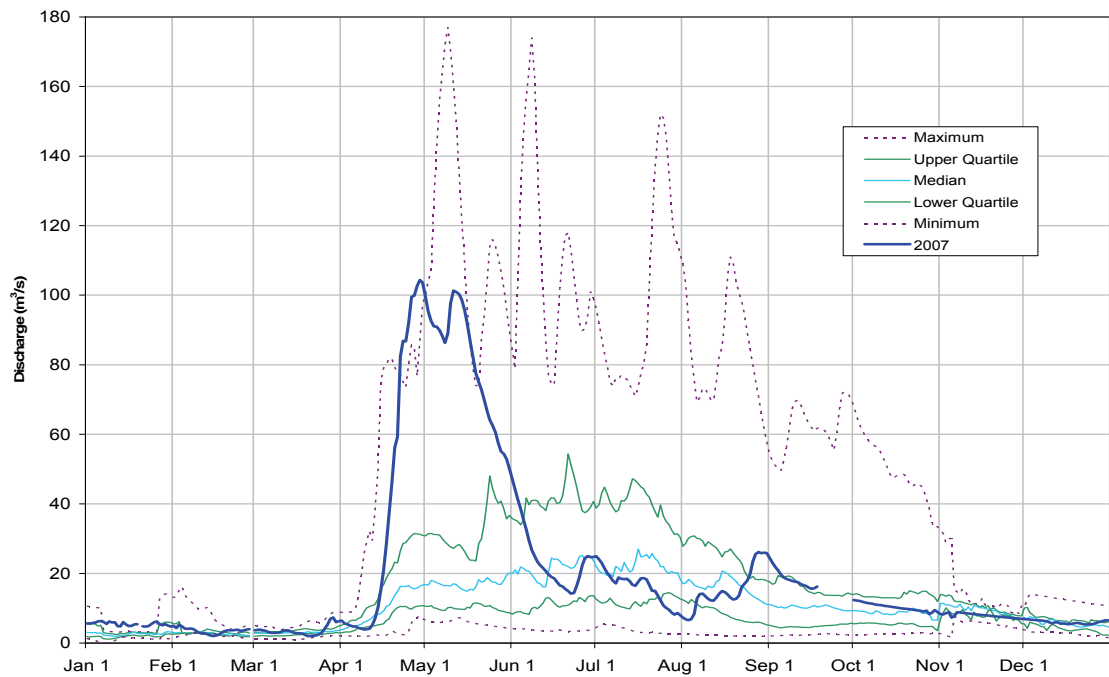
**Figure C.2-25 2007 discharge hydrograph and historical context for Station S27, Firebag River near the Mouth (07DC001).**



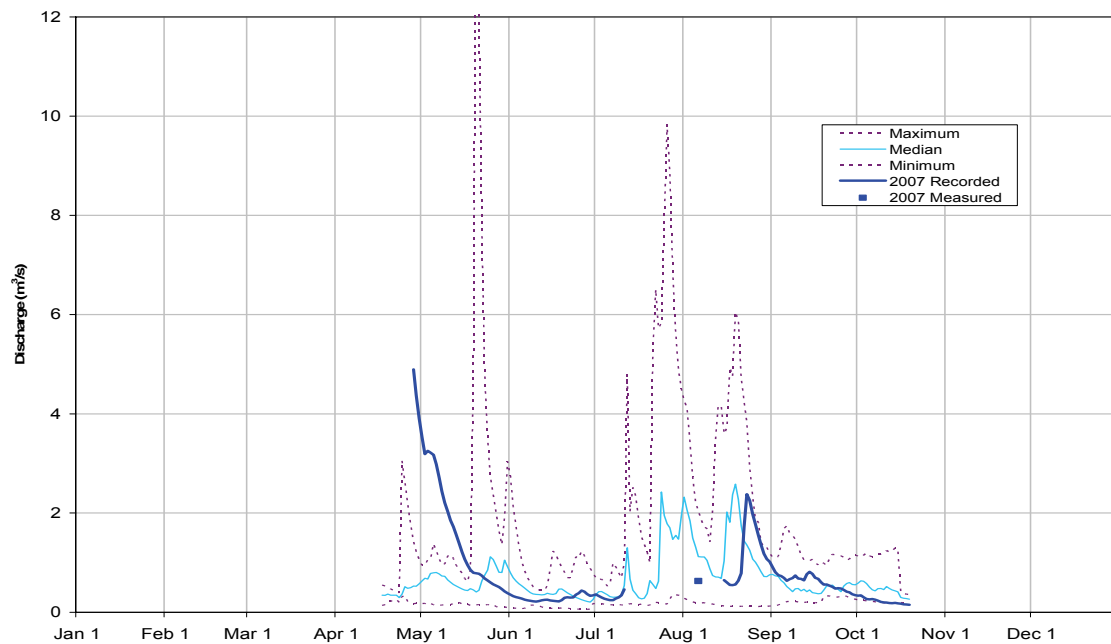
**Figure C.2-26 2007 discharge hydrograph and historical context for Station S28, Khahago Creek below Black Fly Creek.**



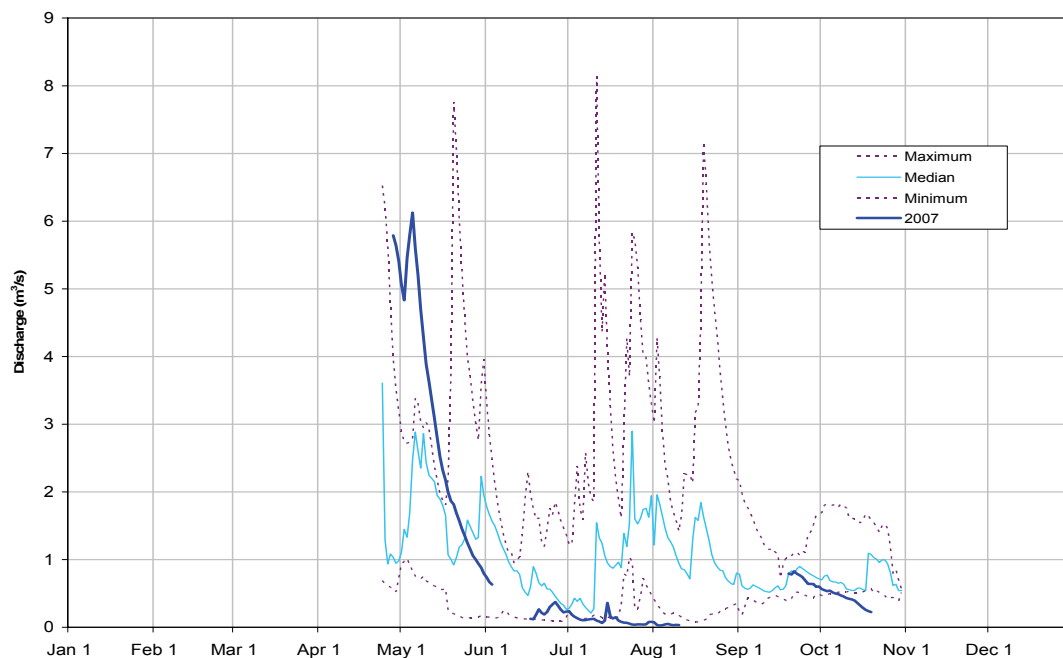
**Figure C.2-27 2007 discharge hydrograph and historical context for Station S29, Christina River near Chard (07CE002).**



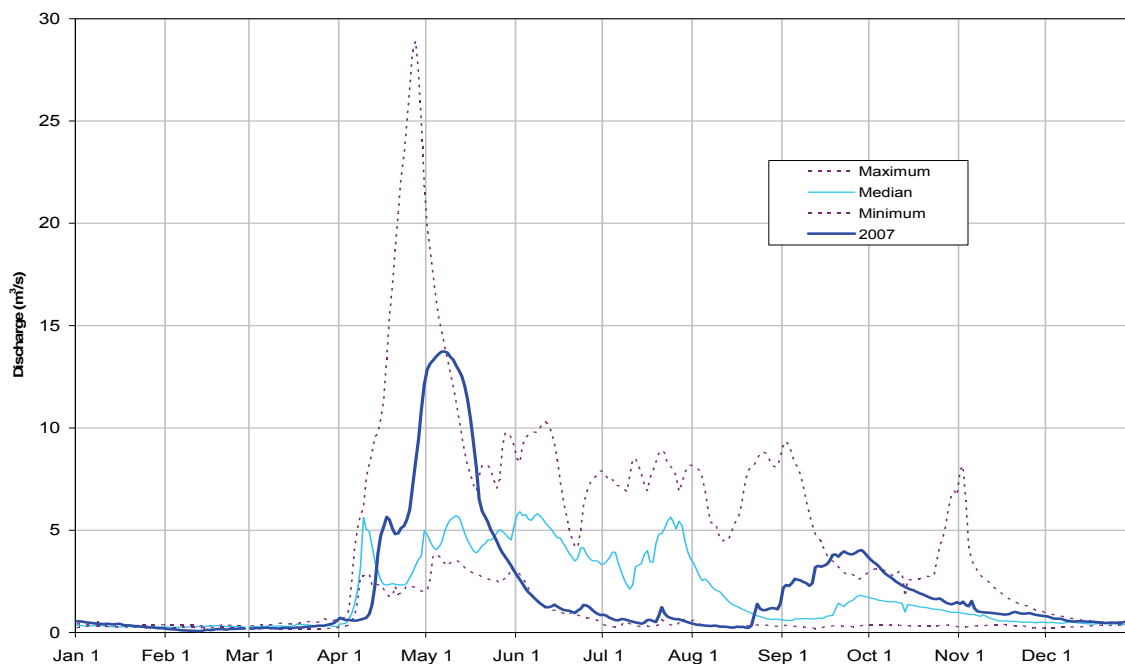
**Figure C.2-28 2007 discharge hydrograph and historical context for Station S31, Hangingstone Creek near the Mouth.**



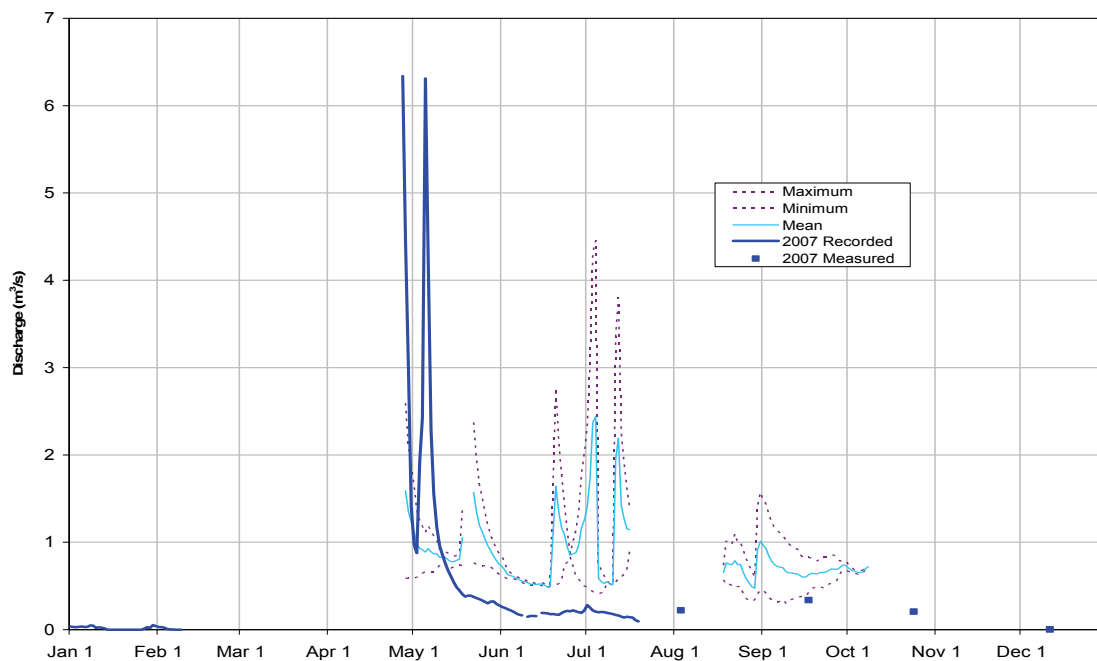
**Figure C.2-29 2007 discharge hydrograph and historical context for Station S32, Surmont Creek at Highway 31.**



**Figure C.2-30 2007 discharge hydrograph and historical context for Station S33, Muskeg River at the Aurora/Albian Boundary.**



**Figure C.2-31 2007 discharge hydrograph and historical context for Station S34, Tar River above CNRL Lake.**

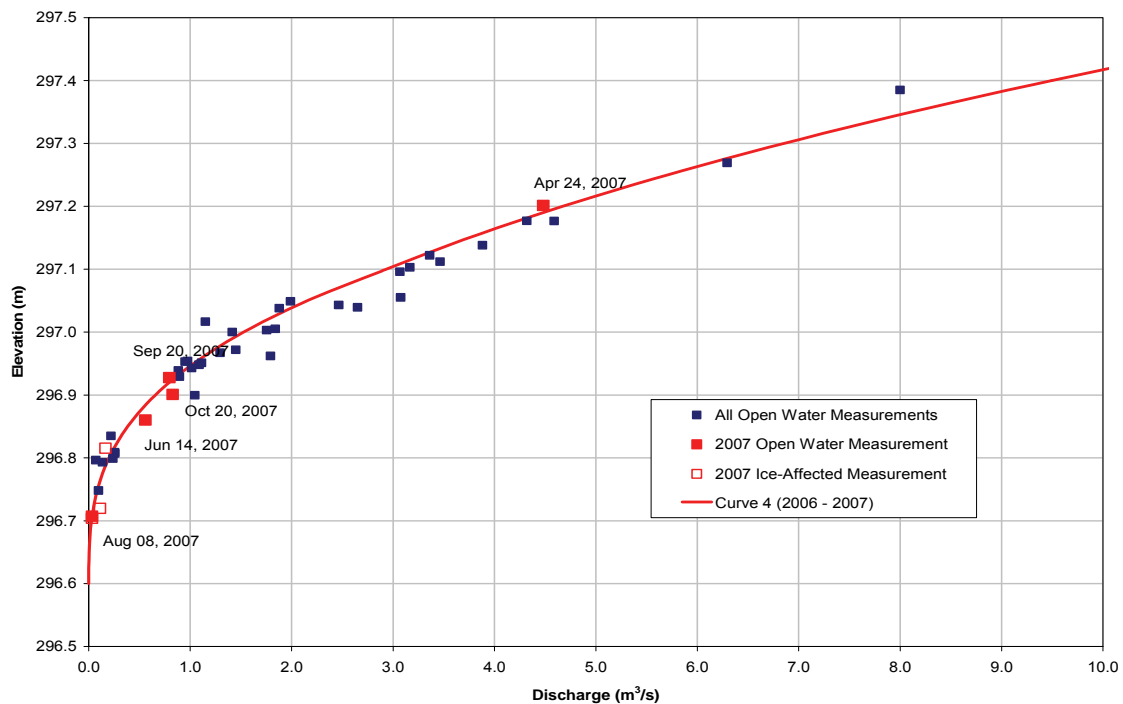




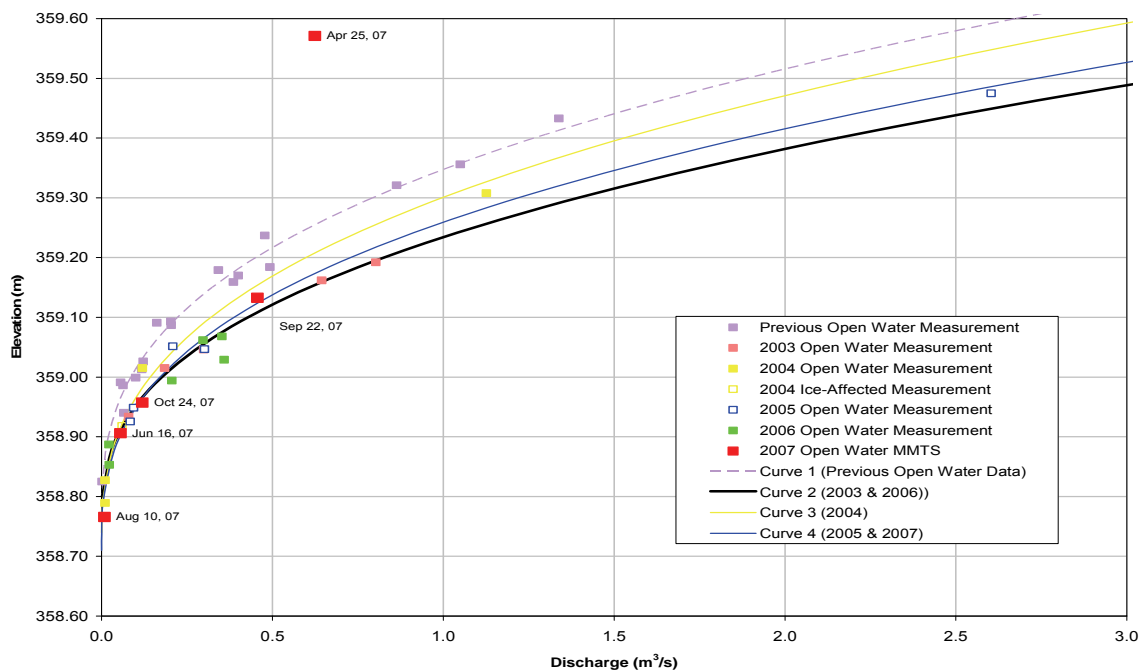
### C.2.5 Stage-Discharge Rating Curves

Water level and discharge measurements were used to derive or update stage-discharge rating curves. The derived rating curves are shown graphically for each station in Figure C.2-32 through Figure C.2-59 below. The figures are organized by station, and the stations are presented in numerical order.

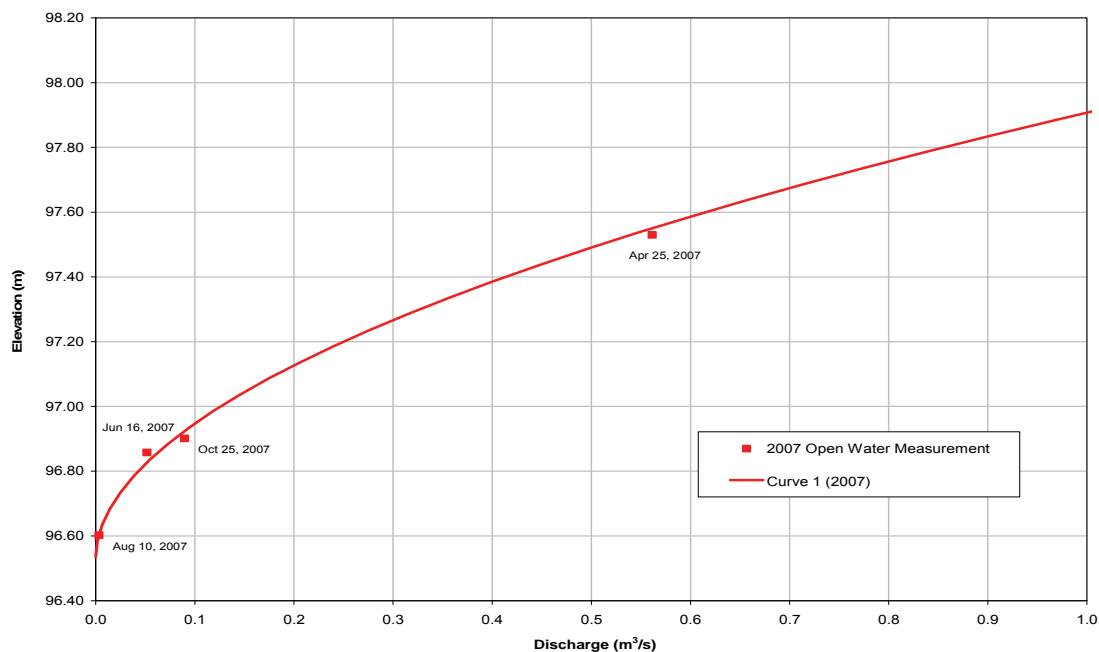
**Figure C.2-32 Stage-discharge rating curve for Station S02, Jackpine Creek at Canterra Road.**



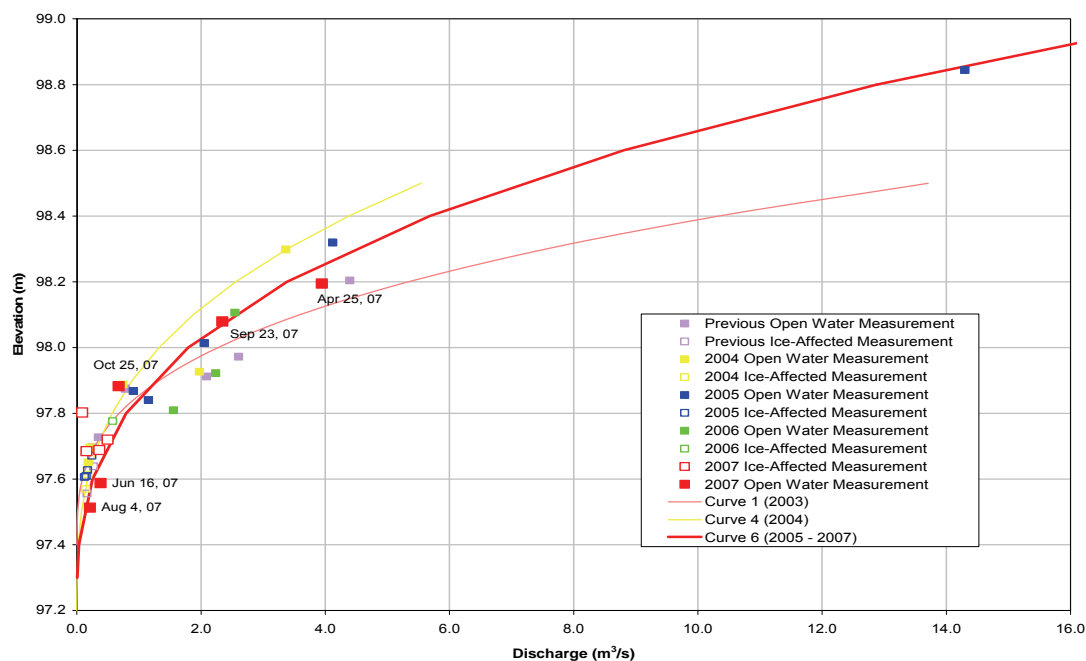
**Figure C.2-33 Stage-discharge rating curve for Station S03, Iyininim Creek above Kearl Lake.**



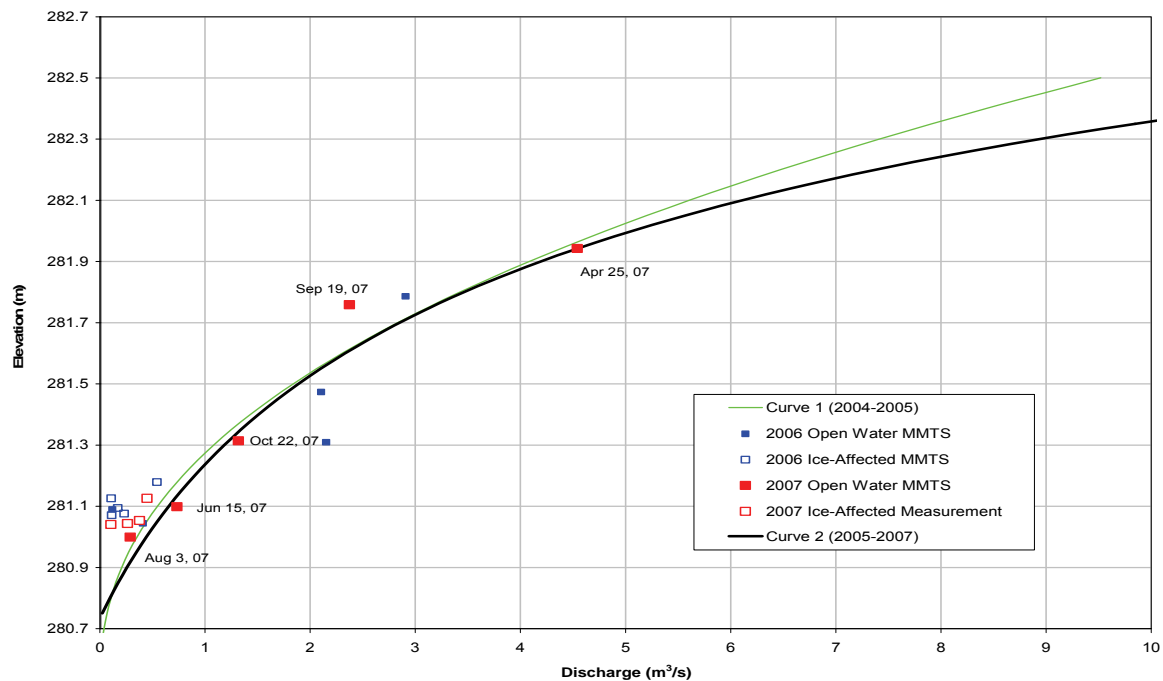
**Figure C.2-34 Stage-discharge rating curve for Station S04A, Blackfly Creek near the mouth.**



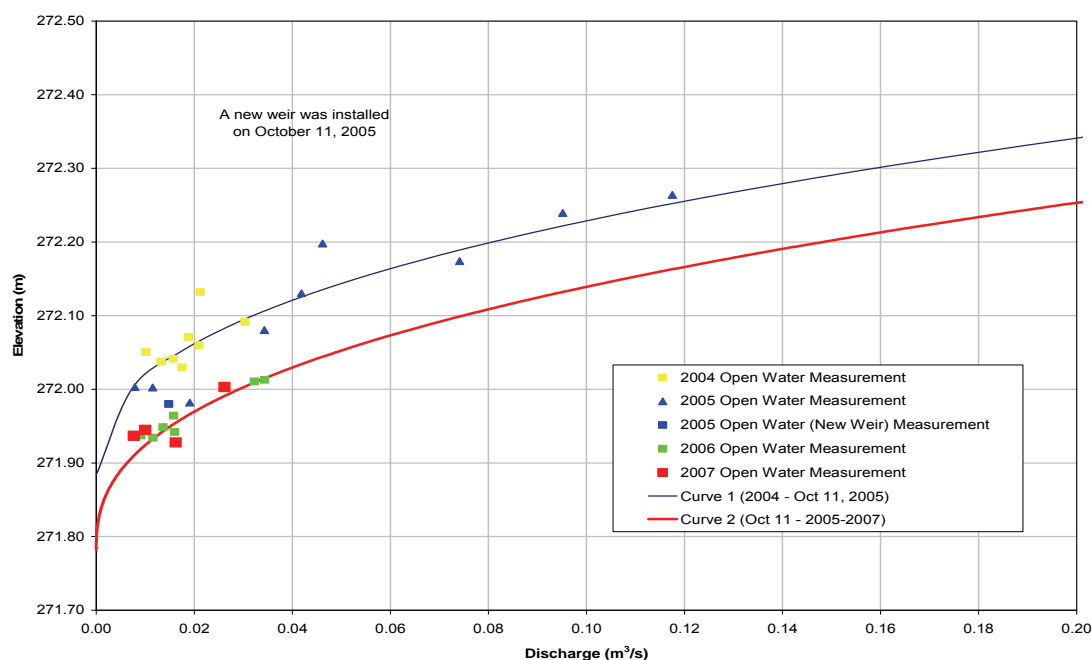
**Figure C.2-35 Stage-discharge rating curve for Station S05, Muskeg River above Stanley Creek.**



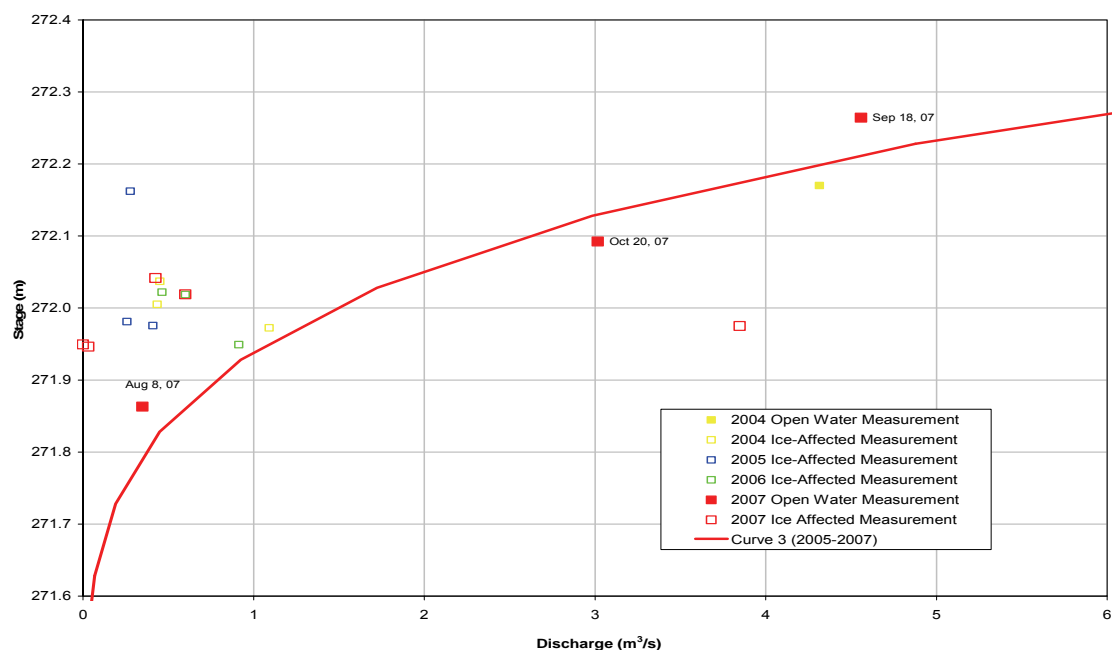
**Figure C.2-36 Stage-discharge rating curve for Station S05A, Muskeg River above Muskeg Creek.**



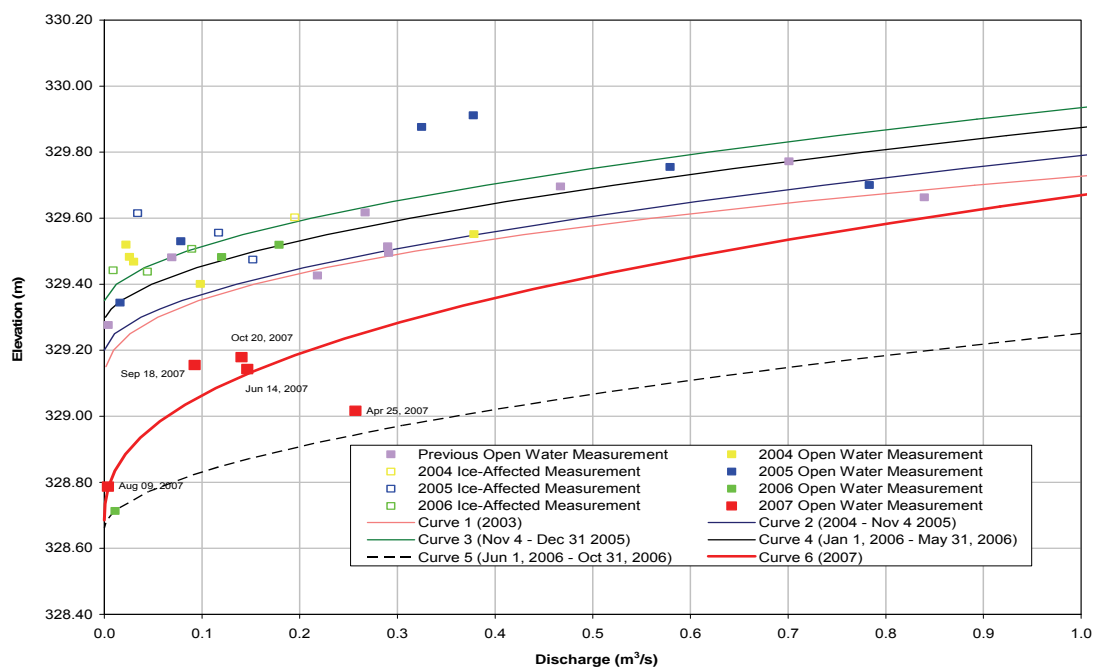
**Figure C.2-37 Stage-discharge rating curve for Station S6, Mills Creek at Highway 63.**



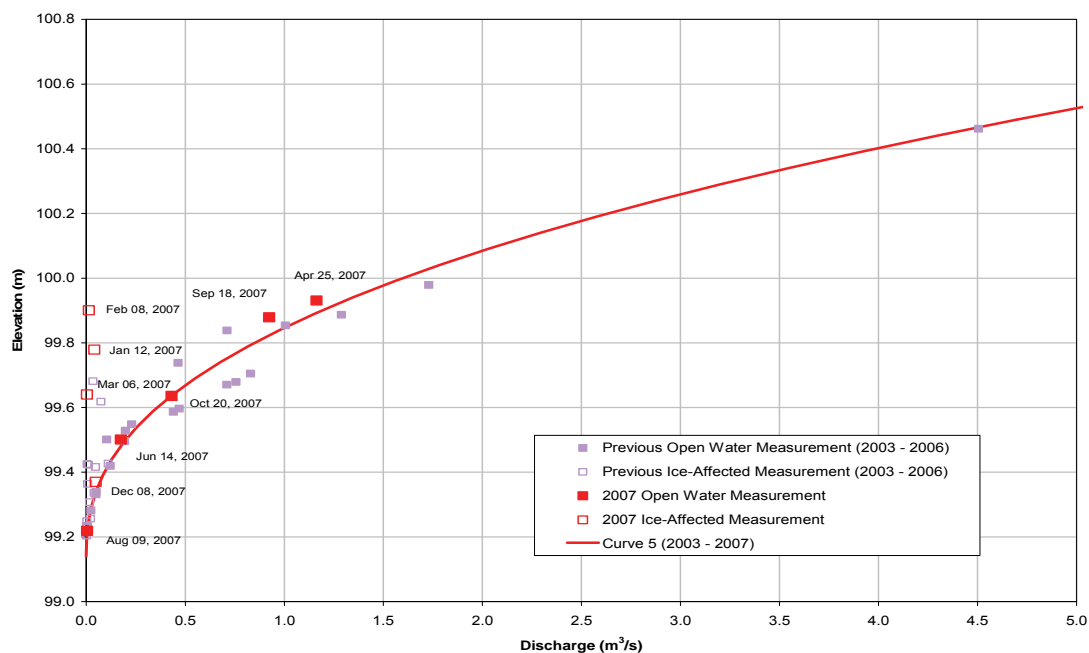
**Figure C.2-38 Stage-discharge rating curve for Station S7, Muskeg River near Fort McKay (07DA008).**



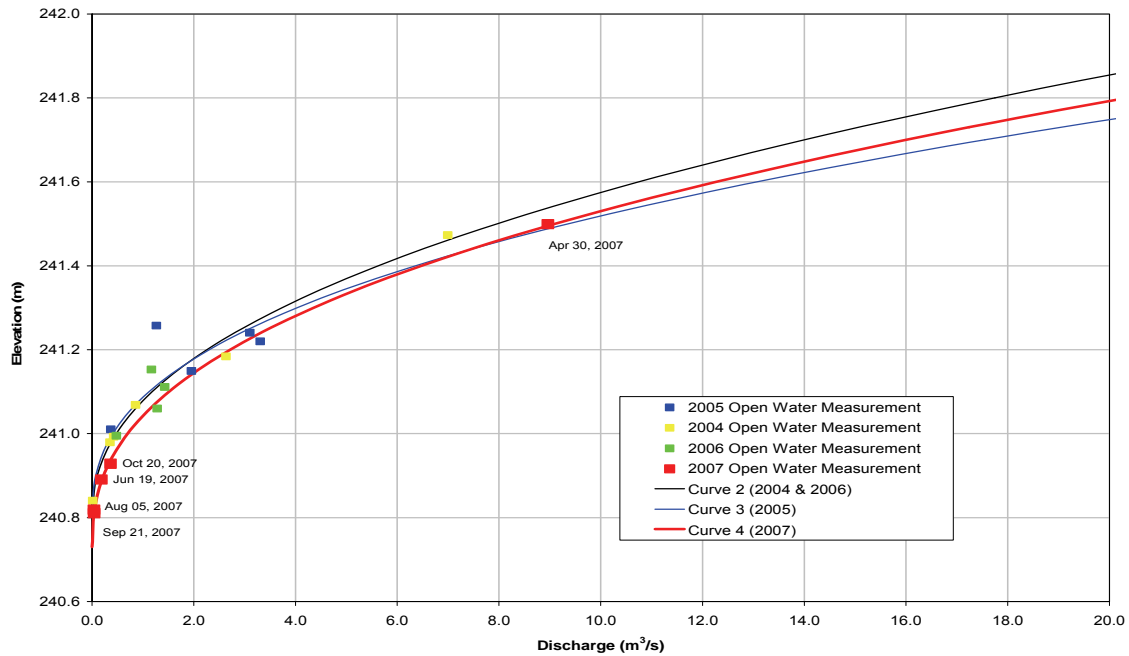
**Figure C.2-39 Stage-discharge rating curve for Station S9, Kearl Lake Outlet.**



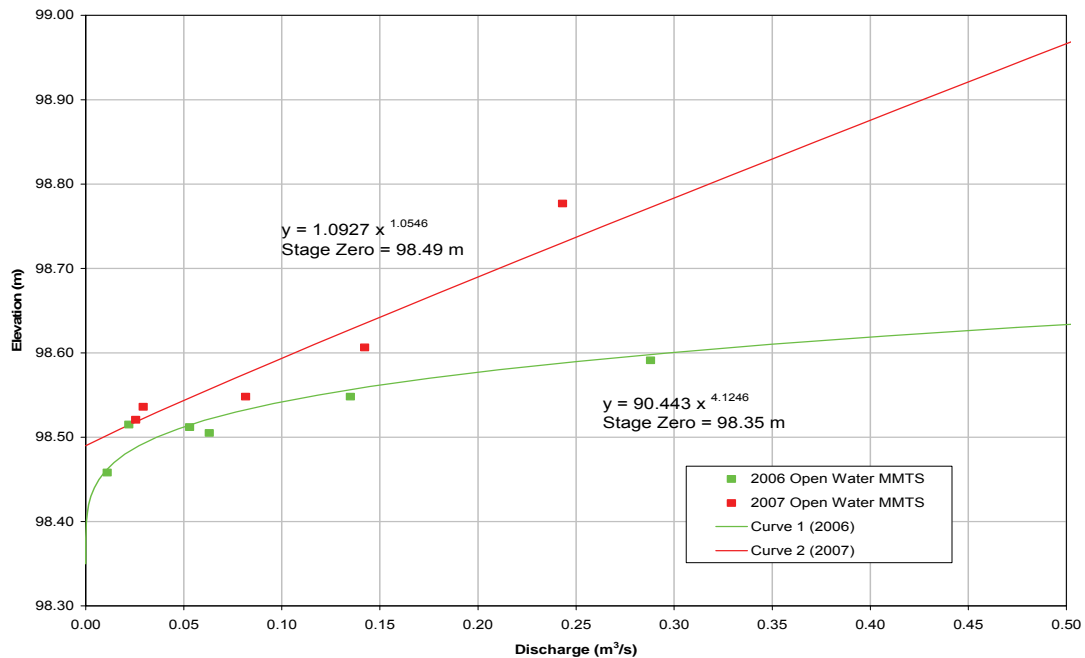
**Figure C.2-40 Stage-discharge rating curve for Station S10, Wapasu Creek at Canterra Road.**



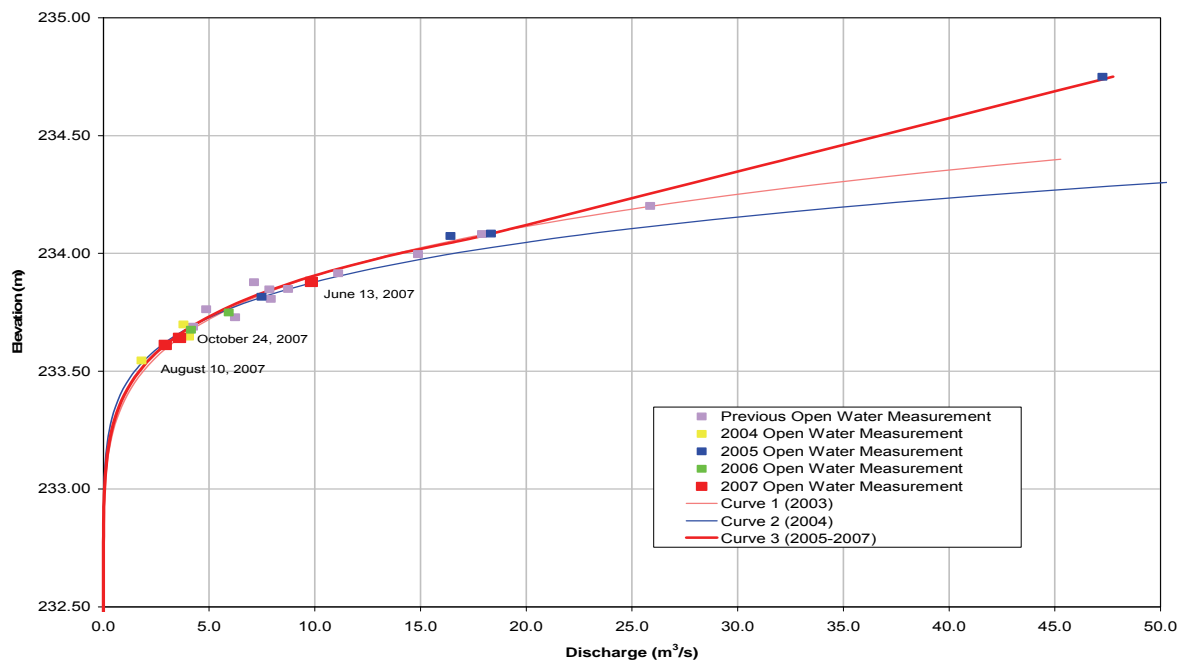
**Figure C.2-41 Stage-discharge rating curve for Station S11, Poplar Creek at Highway 61 (07DA007).**



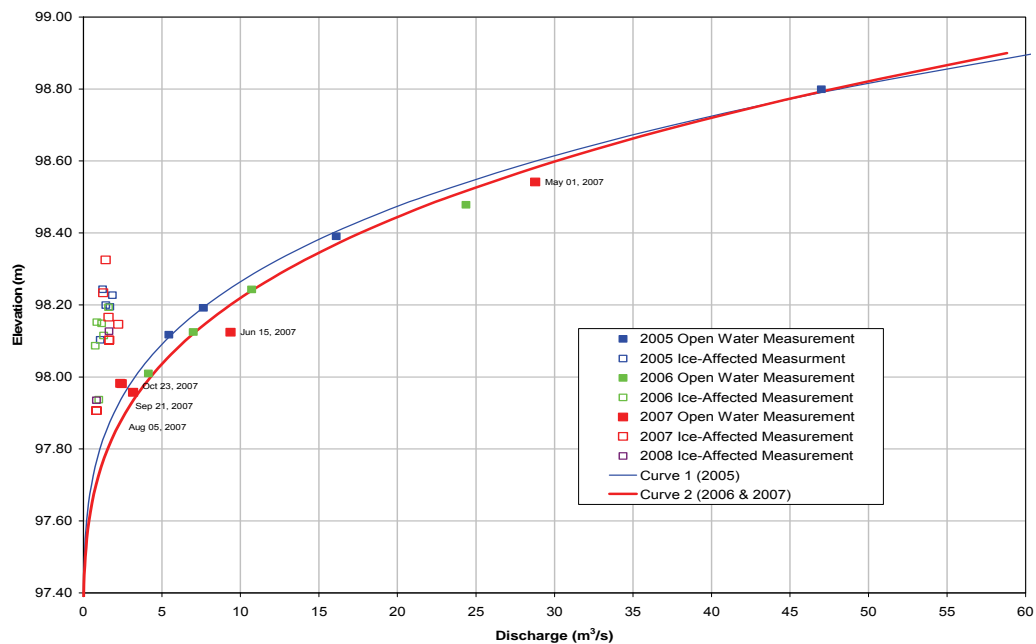
**Figure C.2-42 Stage-discharge rating curve for Station S12, Fort Creek at Highway 63.**



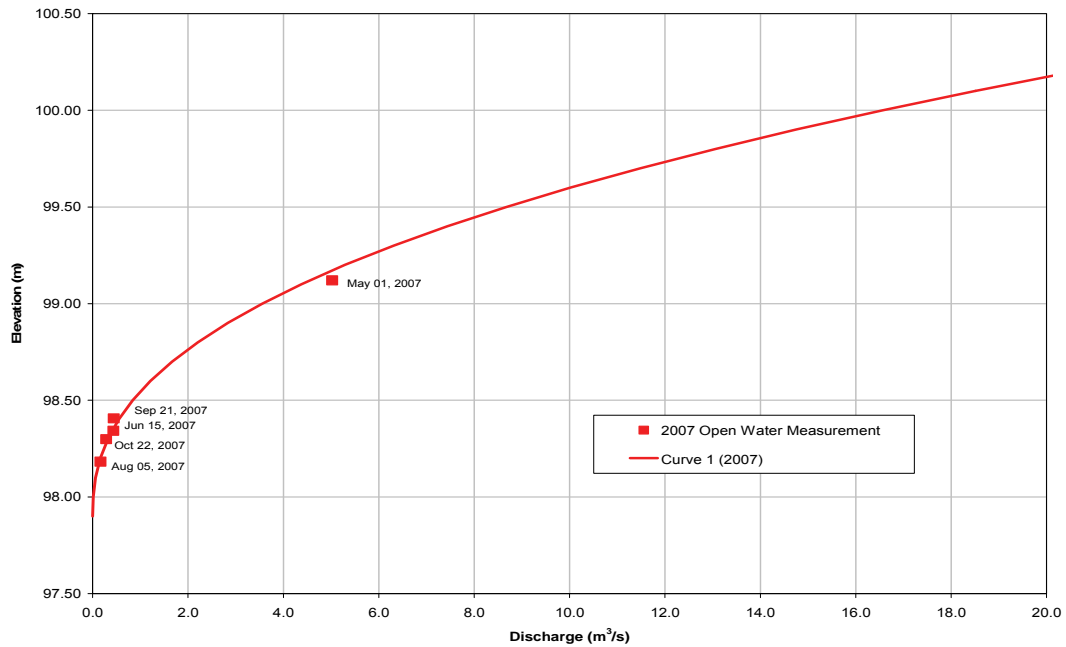
**Figure C.2-43 Stage-discharge rating curve for Station S14, Ells River above Joslyn Creek.**



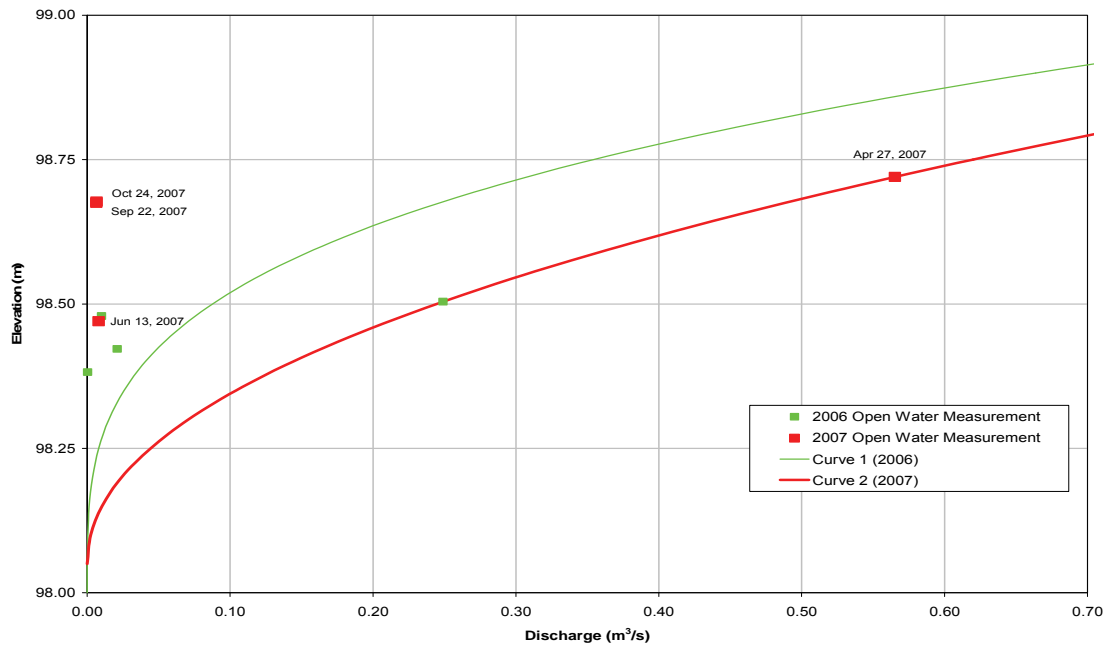
**Figure C.2-44 Stage-discharge rating curve for Station S14A, Ells River at the CNRL Bridge.**



**Figure C.2-45 Stage-discharge rating curve for Station S15A, Tar River near the mouth.**

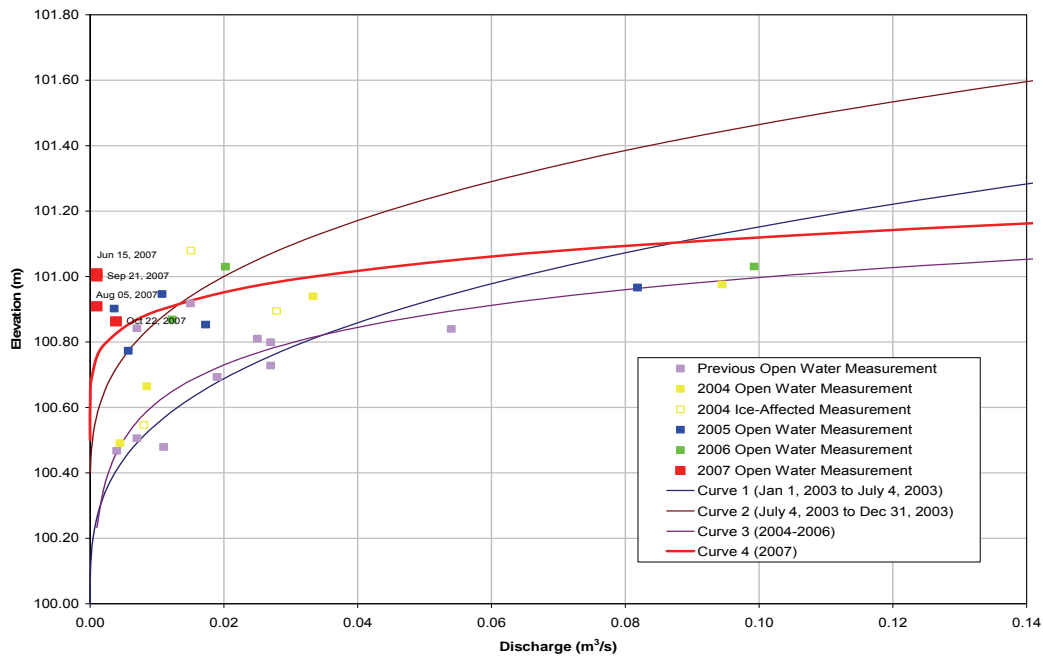


**Figure C.2-46 Stage-discharge rating curve for Station S18A, Calumet River Upland Tributary.**

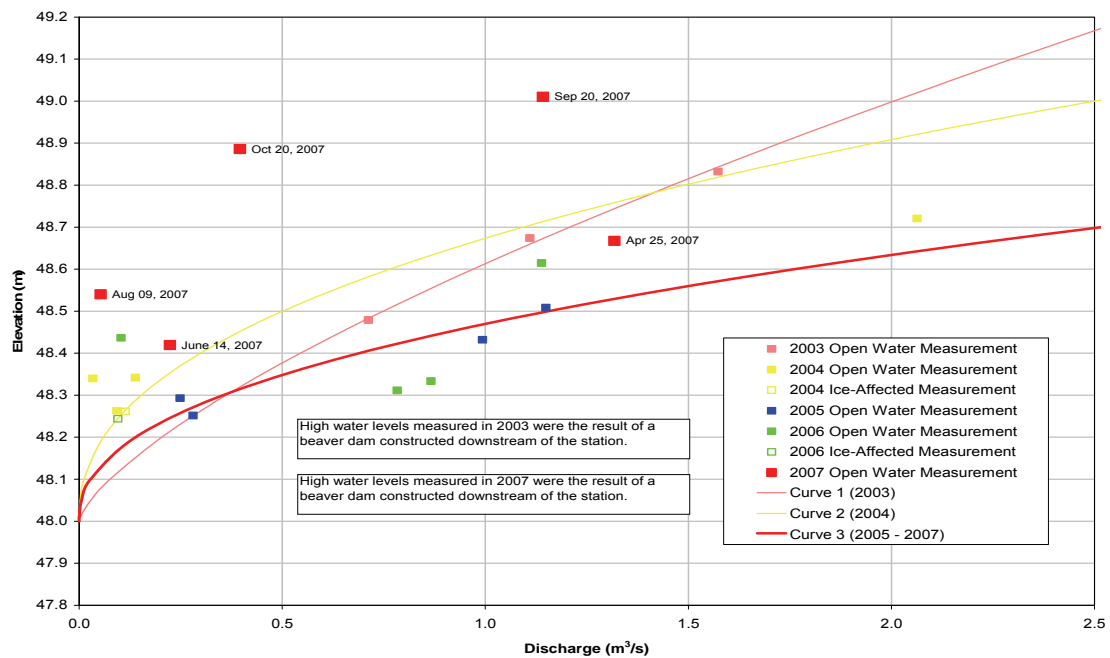




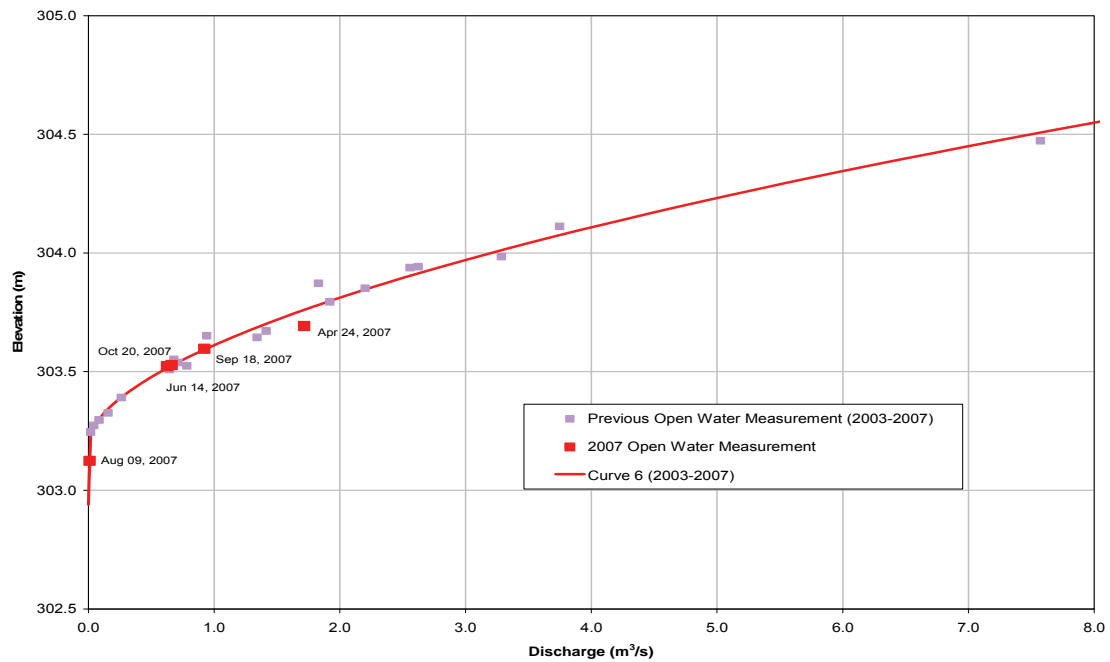
**Figure C.2-47 Stage-discharge rating curve for Station S19, Tar River Lowland Tributary near the Mouth.**



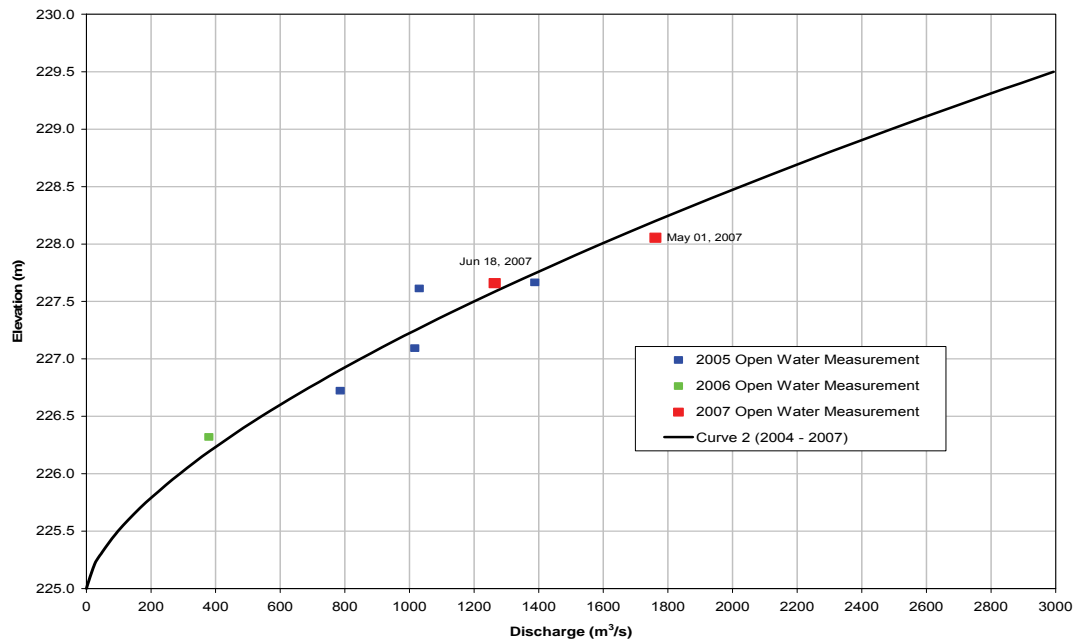
**Figure C.2-48 Stage-discharge rating curve for Station S20, Muskeg River Upland.**



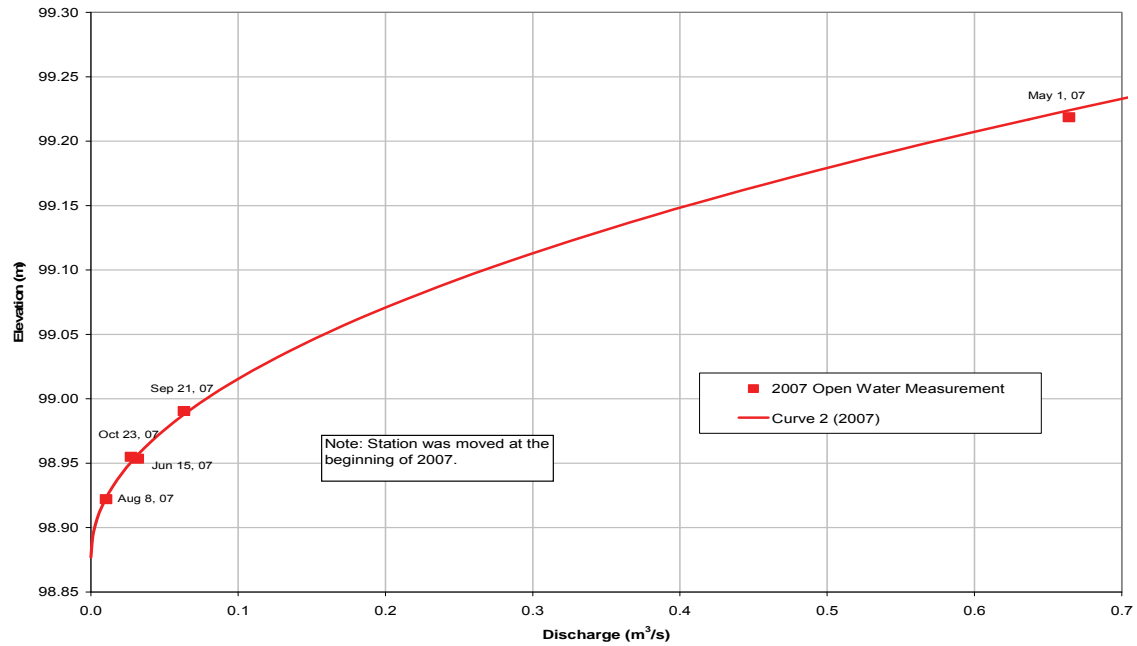
**Figure C.2-49 Stage-discharge rating curve for Station S22, Muskeg Creek near the Mouth.**



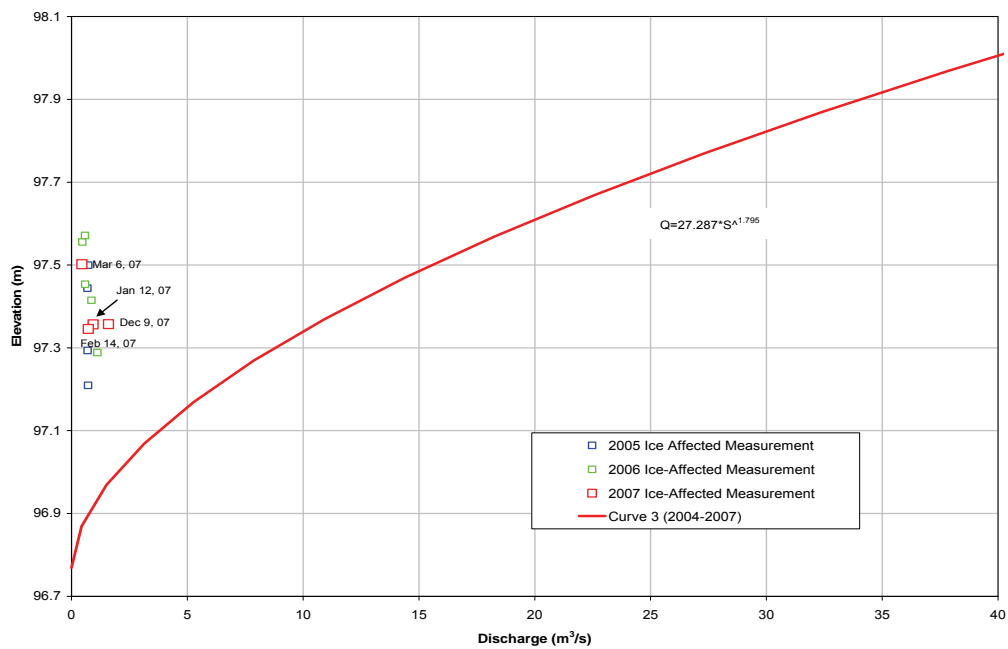
**Figure C.2-50 Stage-discharge rating curve for Station S24, Athabasca River below Eymundson Creek.**



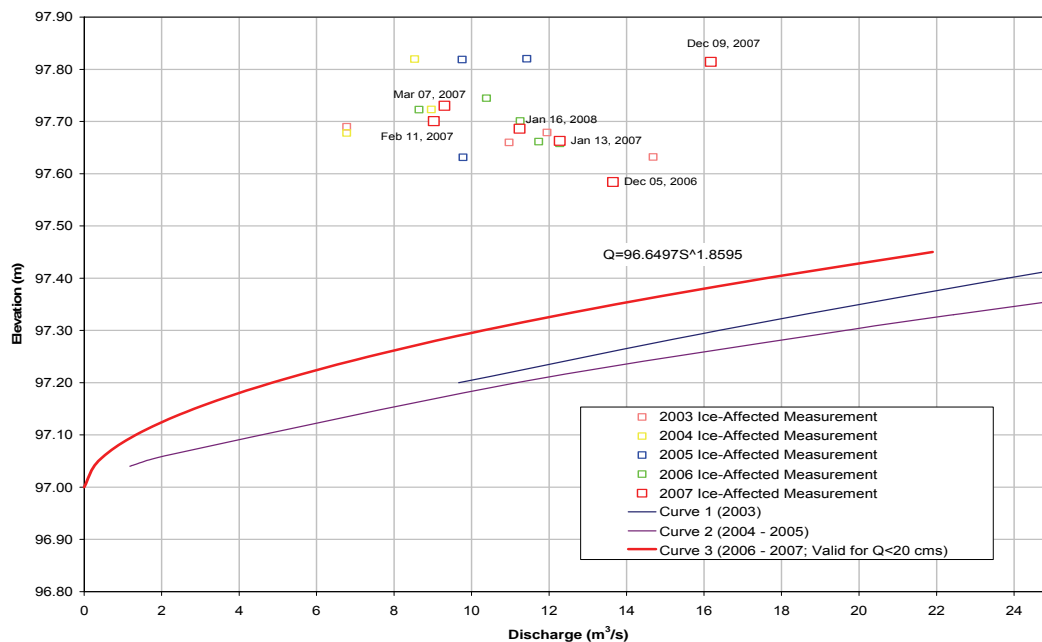
**Figure C.2-51 Stage-discharge rating curve for Station S25, Susan Lake Outlet.**



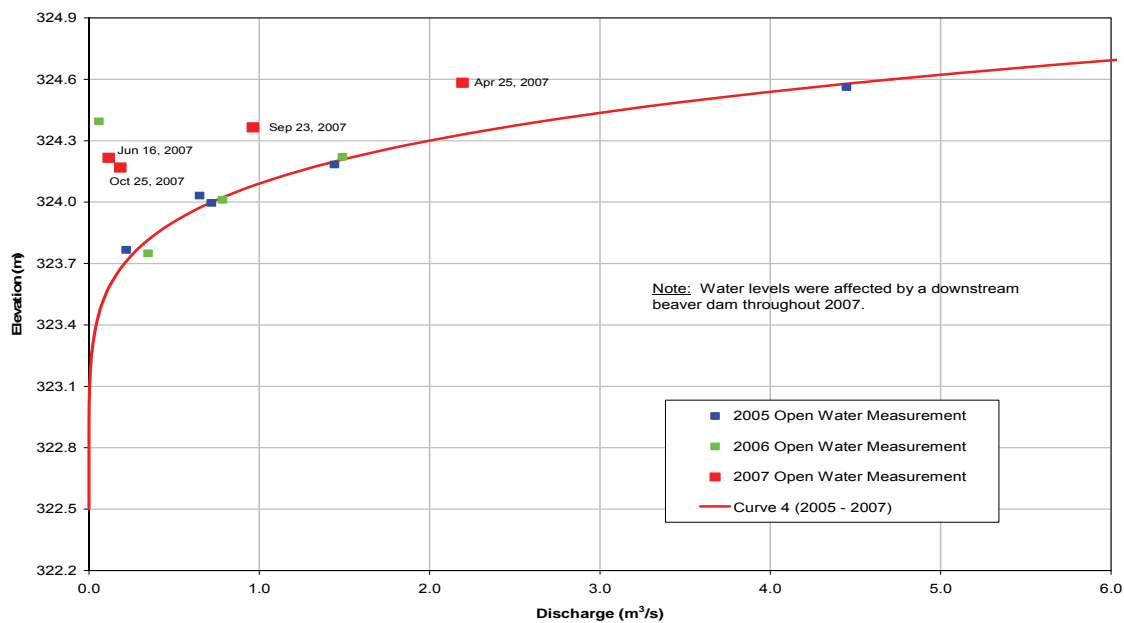
**Figure C.2-52 Stage-discharge rating curve for Station S26, MacKay River near Fort McKay (07DB001).**



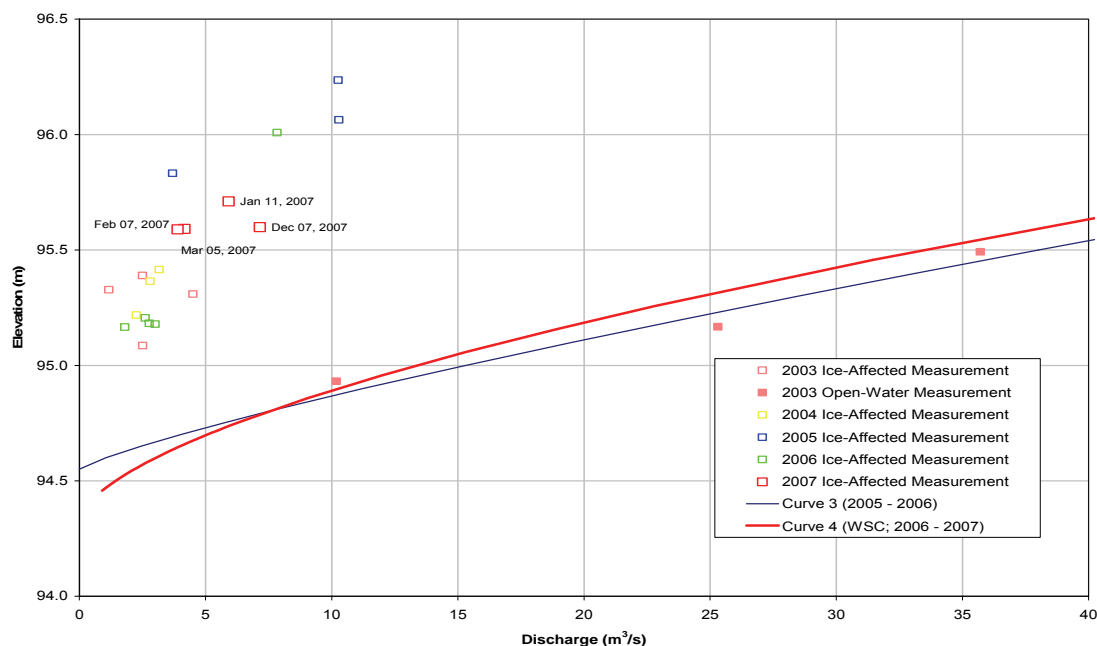
**Figure C.2-53 Stage-discharge rating curve for Station S27, Firebag River near the Mouth.**



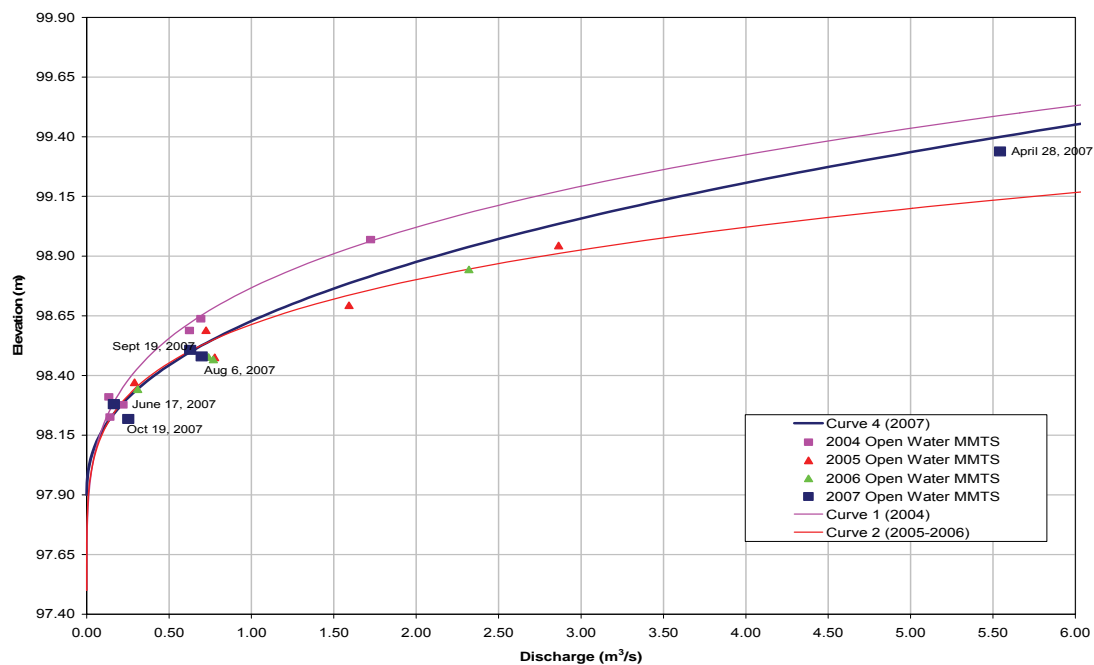
**Figure C.2-54 Stage-discharge rating curve for Station S28, Khahago Creek below Black Fly Creek.**



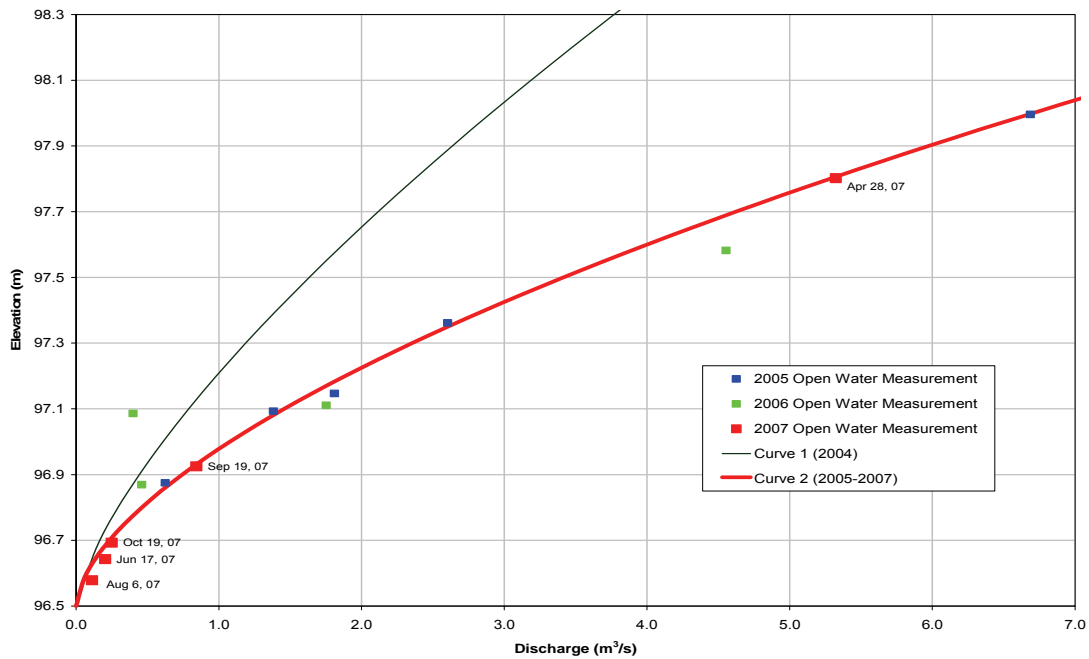
**Figure C.2-55 Stage-discharge rating curve for Station S29, Christina River near Chard (07CE002).**



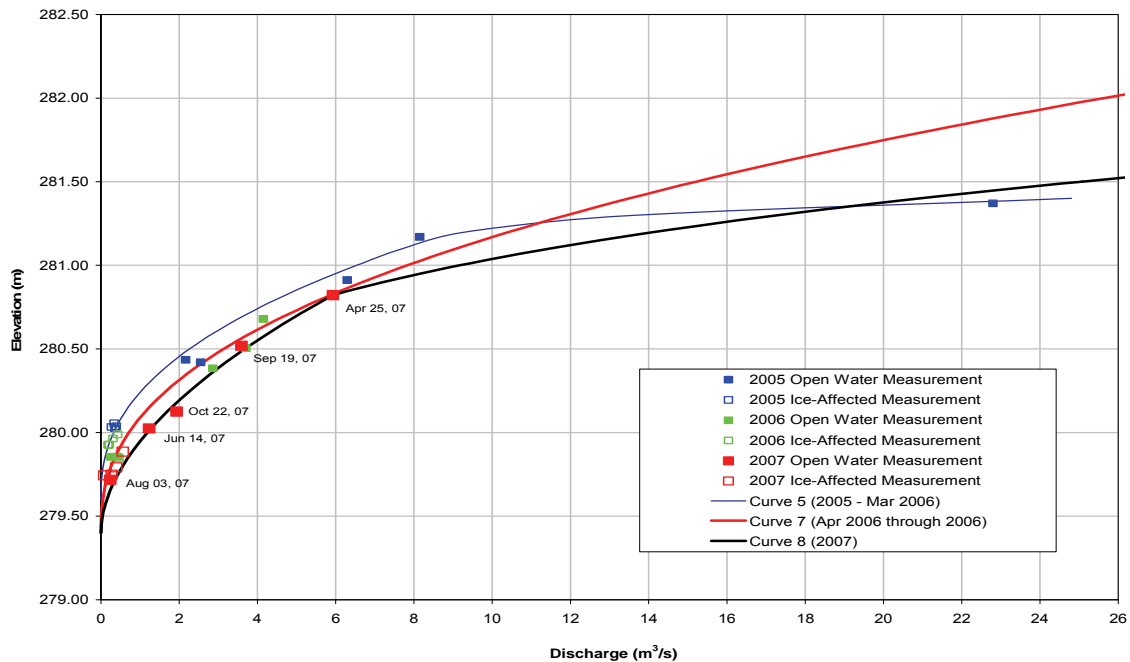
**Figure C.2-56 Stage-discharge rating curve for Station S31, Hangingstone Creek near the Mouth.**



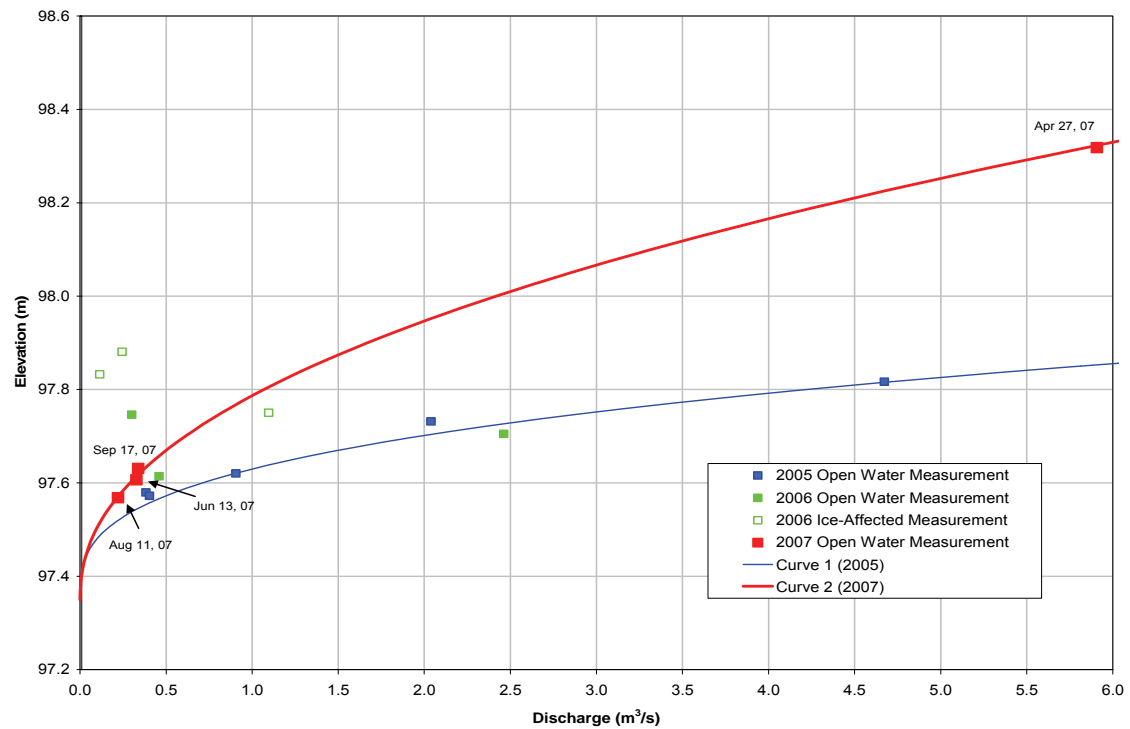
**Figure C.2-57 Stage-discharge rating curve for Station S32, Surmont Creek at Highway 31.**



**Figure C.2-58 Stage-discharge rating curve for Station S33, Muskeg River at the Aurora/Albian Boundary.**



**Figure C.2-59 Stage-discharge rating curve for Station S34, Tar River above CNRL Lake.**



### **C.3 STATION DESCRIPTION SHEETS**

Fact sheets are provided below for stations that were newly installed, moved or discontinued in 2007. The stations are:

- L2 – Kearl Lake
- S4A – Blackfly Creek near the Mouth
- S14 – Ells River above Joslyn Creek
- S15 – Tar River near the Mouth
- S15A – Tar River near the Mouth
- S37 – East Jackpine Creek near the 1300 m Contour



### Location and Purpose

Established to monitor water levels in Kearl Lake.

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

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

**Access:** 4WD road access

**Drainage Area:** 72.6 km<sup>2</sup>

**Coordinates:** 484839 E, 6351065 N (UTM NAD 83)

**ATS:** 4-16-96-11-W4

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

**NTS Map:** 74E06

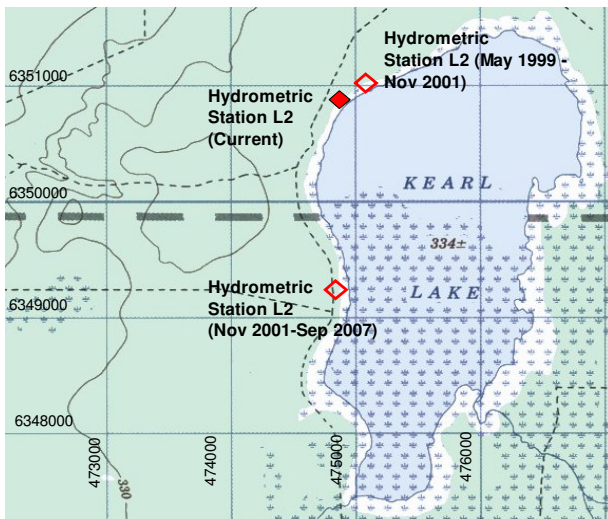
### Previous Locations:

**Period:** November 2001 to September 2007

**Coordinates:** 484935 E, 6349023 N (UTM NAD 83)

**Period:** May 1999 to November 2001

**Coordinates:** 485184 E, 6351267 N (UTM NAD 83)



Map Grid Based on UTM NAD 27



### Benchmarks

**BM:** 1  
**Elevation:** 332.571 (geodetic)  
**Basis:** Water level transfer from previous location  
**Location:** 3 m south of fenced off logger  
**Description:** Iron Pipe in ground, Extending 0.5 m

**BM:** 2  
**Elevation:** 332.493 (geodetic)  
**Basis:** Level survey from BM 1  
**Location:** 40 m West of logger at edge of tree line  
**Description:** Iron rod in PVC cover



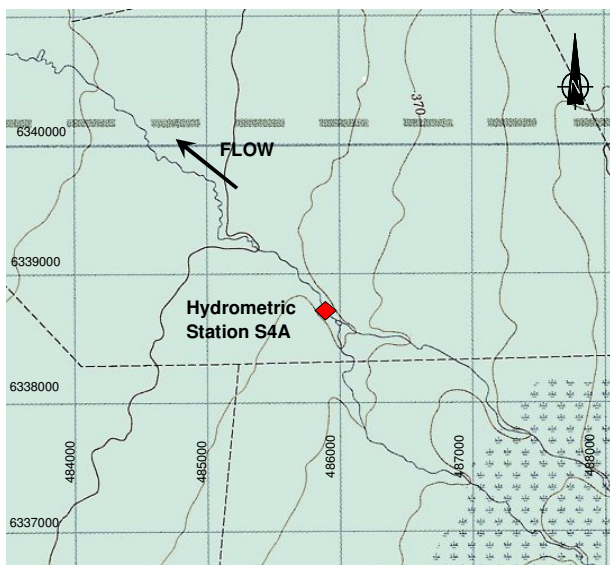


## Location and Purpose

Established in spring 2007 to monitor streamflow upstream of development in the Muskeg River catchment. Station S4A was intended to replace station S4, but was discontinued after the 2007 season because it was located too close to near-future mine development. Station S4A was replaced by station S37 (initiated Sept 2007) which is intended to operate over the long term.

**Variable Measured:** Discharge  
**Period of Record:** May 2007 to October 2007  
**Access:** Helicopter  
**Drainage Area:** 27 km<sup>2</sup>  
**Coordinates:** 485905 E, 6338825 N (UTM NAD 83)

**ATS:** SE-33-8-94-W4  
**Lat/Long:** 57°11'32.6" N, 111°13'59.6"  
**NTS Map:** 74E03



## Benchmarks

**BM:** 1  
**Elevation:** 100.000 m (assumed)  
**Basis:** Assumed  
**Location:** 0.3 m off the ground in the logger tree  
**Description:** Nail in tree

**BM:** 2  
**Elevation:** 99.504 m (assumed)  
**Basis:** Level survey from BM 1  
**Location:** 0.3 m off the ground on the security cable tree  
**Description:** Nail in tree





**Location and Purpose**

Established to monitor discharge on the Ells River in the vicinity of the inactive Environment Canada hydrometric station 07DA017. The station is located approximately 150 m upstream of the confluence with Joslyn Creek. Discontinued after the 2007 season; replaced by station S14A.

**Variable Measured:** Discharge

**Period of Record:** May 2001 to Oct 2007

**Access:** Helicopter

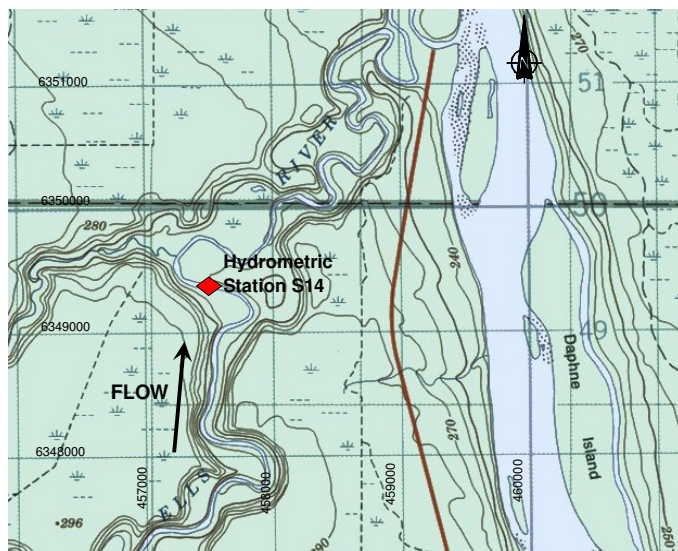
**Drainage Area:** 2450 km<sup>2</sup>

**Coordinates:** 457310 E, 6349466 N (UTM NAD 83)

**ATS:** NW-34-95-11-W4

**Lat/Long:** 57°17'10" N, 111°42'30" W

**NTS Map:** 74E05



Map Grid Based on UTM NAD 27



**Benchmarks**

**BM:** 1

**Elevation:** 236.416 m (geodetic)

**Basis:** Unknown

**Location:** In base of logger tree 0.3 m off the ground

**Description:** Nail in tree

**BM:** 2

**Elevation:** 236.556 m (geodetic)

**Basis:** Level survey from BM 1

**Location:** 5 m South East of logger tree in the brush

**Description:** Iron rod in the ground





**Location and Purpose**

Established in May 2003 to monitor discharge in the Tar River below development. Replaced by S15A in April 2007.

**Variable Measured:** Discharge

**Period of Record:** May 2003 to April 2007

**Access:** Truck

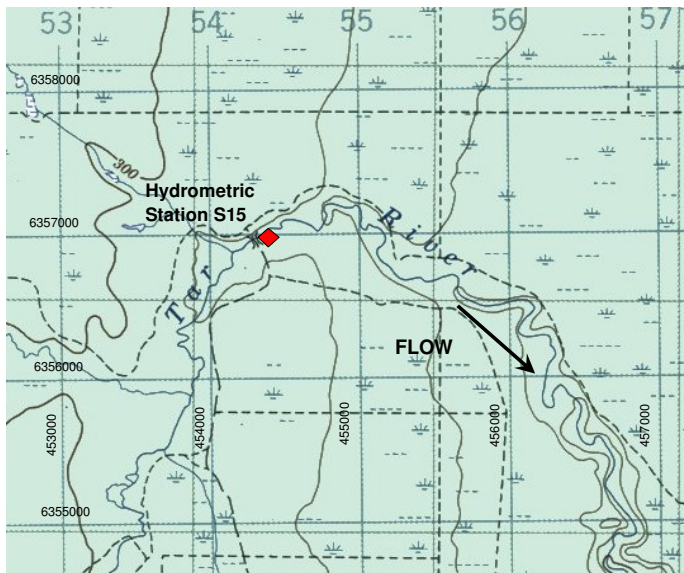
**Drainage Area:** 323 km<sup>2</sup>

**Coordinates:** 454453 E, 6356983 N (UTM NAD 83)

**ATS:** SE-29-11-96-W4

**Lat/Long:** 57°21'12.4" N, 111°45'25.1" W

**NTS Map:** 74E05



**Benchmarks**

**BM:** 1

**Elevation:** 285.908 m (geodetic)

**Basis:** Unknown

**Location:** 2 m north of data logger

**Description:** T-bar protruding 0.4 m from ground

**BM:** 2

**Elevation:** 286.544 m (geodetic)

**Basis:** Level survey from BM 1

**Location:** 10 m to the north east of data logger

**Description:** Nail in base of tree marked with orange flagging



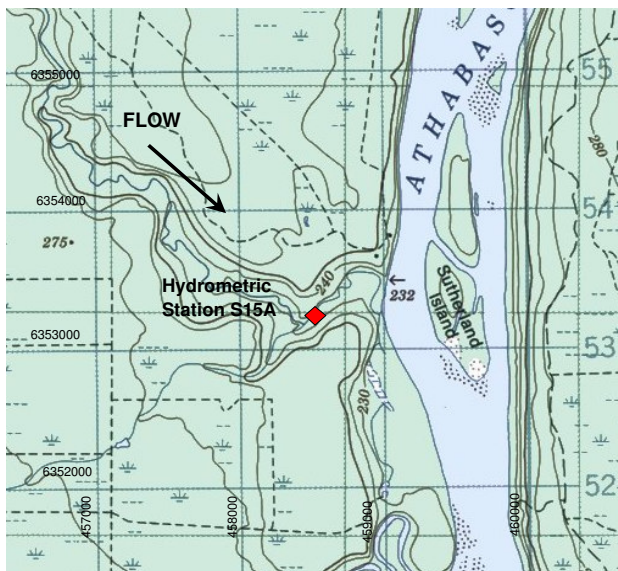


### Location and Purpose

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

**Variable Measured:** Discharge  
**Period of Record:** May 1st 2007 to present  
**Access:** Truck  
**Drainage Area:** 324 km<sup>2</sup>  
**Coordinates:** 458395 E, 6353391 N (UTM NAD 83)

**ATS:** 16-10-96-11-W4  
**Lat/Long:** 57°19'17.57" N, 111°41'27.08" W  
**NTS Map:** 74E05



### Benchmarks

**BM:** 1  
**Elevation:** 100.000 m (assumed)  
**Basis:** Assumed  
**Location:** At base of large log spanning river on RB side  
**Description:** Nail in stump with purple flagging.

**BM:** 2  
**Elevation:** 100.912 m (assumed)  
**Basis:** Level survey from BM 1  
**Location:** 1 metre DS from logger box on tree root  
**Description:** Nail in tree root with purple flagging.



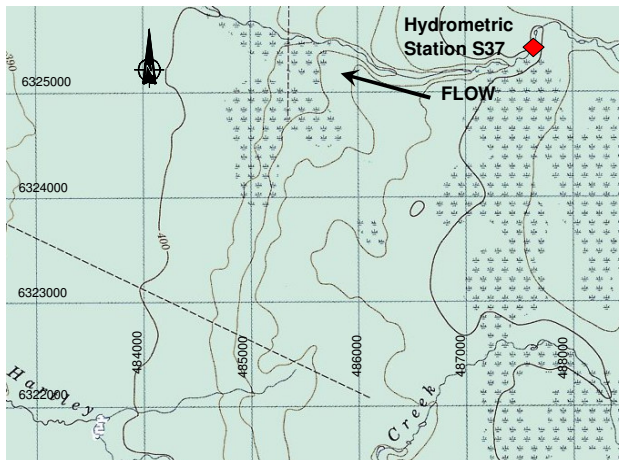


**Location and Purpose**

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

**Variable Measured:** Discharge  
**Period of Record:** September 2007 to Present  
**Access:** Helicopter  
**Drainage Area:** 33.0 km<sup>2</sup>  
**Coordinates:** 487840 E, 6325424 N (UTM NAD 83)

**ATS:** SE-15-8-93-W4  
**Lat/Long:** 57°4'19.4' N, 111°12'2.0" W  
**NTS Map:** 74E03



Map Grid Based on UTM NAD 27



**Benchmarks**

**BM:** 1  
**Elevation:** 100.000 m (assumed)  
**Basis:** Assumed  
**Location:** 6.9 m S of SW corner of gauge.  
**Description:** Top of bridge pair



#### **C.4 INVENTORY OF HYDROLOGIC DATA IN THE RAMP DATABASE**

A complete inventory of the daily hydrologic data contained in the RAMP database is provided on the following pages.

# ***RAMP Hydrologic Data Inventory***

<i><b>Station</b></i>	<i><b>Name</b></i>	<i><b>Time Step</b></i>	<i><b>Data Type</b></i>	<i><b>From Date</b></i>	<i><b>To Date</b></i>
07CD001	Clearwater River at Draper	Daily	1 - Discharge	1930-12-16	2007-12-31
07CD004	Hangingstone River at Fort McMurray	Daily	1 - Discharge	1965-03-12	2007-09-24
07CD005	Clearwater River above Christina River	Daily	1 - Discharge	1966-06-16	2007-10-24
07CE001	Gregoire Lake near Fort McMurray	Daily	8 - Water Level	1969-08-01	2004-10-31
07CE002	Christina River near Chard	Daily	1 - Discharge	1982-05-20	2007-09-18
07DA001	Athabasca River below McMurray	Daily	1 - Discharge	1930-12-15	2008-01-25
07DA006	Steepbank River near Fort McMurray	Daily	1 - Discharge	1972-09-20	2007-10-04
07DA007	Poplar Creek near Fort McMurray	Daily	1 - Discharge	1972-03-16	1986-12-31
07DA008	Muskeg River near Fort McKay	Daily	1 - Discharge	1974-01-01	2007-10-10
07DA015	Tar River near the Mouth	Daily	1 - Discharge	1975-08-24	1977-12-31
07DA016	Joslyn Creek near Fort McKay	Daily	1 - Discharge	1975-07-28	1993-10-31
07DA017	Ells River near the mouth	Daily	1 - Discharge	1975-07-28	1986-12-31
07DA018	Beaver River above Syncrude	Daily	1 - Discharge	1975-08-19	2007-09-18
07DB001	Mackay River near Fort McKay	Daily	1 - Discharge	1972-03-15	2007-10-10
07DC001	Firebag River near the Mouth	Daily	1 - Discharge	1971-05-06	2005-10-31
3060110	Algar LO	Daily	001 - Daily Maximum Temperature	1962-09-01	2007-09-13
		Daily	002 - Daily Minimum Temperature	1965-08-01	2007-09-14
		Daily	003 - Daily Mean Temperature	1965-08-01	2007-09-13
		Daily	010 - Total Rainfall	1959-04-17	2007-09-13
		Daily	011 - Total Snowfall	2006-05-01	2007-09-13
		Daily	012 - Total Precipitation	2004-05-06	2007-09-13
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-14
3060700	Birch Mountain LO				



<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	001 - Daily Maximum Temperature	1966-05-01	2007-09-12
		Daily	002 - Daily Minimum Temperature	1966-05-01	2007-09-13
		Daily	003 - Daily Mean Temperature	1966-05-01	2007-09-12
		Daily	010 - Total Rainfall	1960-06-01	2007-09-12
		Daily	011 - Total Snowfall	2006-05-01	2007-09-12
		Daily	012 - Total Precipitation	2004-05-01	2007-09-12
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-11
3060705	Bitumont LO				
		Daily	001 - Daily Maximum Temperature	1962-05-04	2007-09-13
		Daily	002 - Daily Minimum Temperature	1962-05-05	2007-09-14
		Daily	003 - Daily Mean Temperature	1962-05-05	2007-09-13
		Daily	010 - Total Rainfall	1962-05-04	2007-09-13
		Daily	011 - Total Snowfall	2006-05-01	2007-09-13
		Daily	012 - Total Precipitation	2004-04-21	2007-09-13
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-14
3060922	Buckton LO				
		Daily	001 - Daily Maximum Temperature	1965-06-01	2007-08-30
		Daily	002 - Daily Minimum Temperature	1965-06-01	2007-08-31
		Daily	003 - Daily Mean Temperature	1965-06-01	2007-08-30
		Daily	010 - Total Rainfall	1965-06-01	2007-08-30
		Daily	011 - Total Snowfall	2006-05-10	2007-08-30
		Daily	012 - Total Precipitation	2004-05-14	2007-08-30
		Daily	013 - Snow on the Ground	2006-06-01	2007-08-31
3061580	Christina LO				
		Daily	001 - Daily Maximum Temperature	1967-06-01	2002-05-17
		Daily	002 - Daily Minimum Temperature	1967-06-01	2002-05-18
		Daily	003 - Daily Mean Temperature	1967-06-01	2002-05-17
		Daily	010 - Total Rainfall	1967-06-01	2002-05-17
3061800	Conklin LO				
		Daily	001 - Daily Maximum Temperature	1965-05-01	2007-09-24
		Daily	002 - Daily Minimum Temperature	1965-05-02	2007-09-25
		Daily	003 - Daily Mean Temperature	1965-05-02	2007-09-24
		Daily	010 - Total Rainfall	1954-05-21	2007-09-21
		Daily	011 - Total Snowfall	2006-05-01	2007-09-21
		Daily	012 - Total Precipitation	2004-04-22	2007-09-21
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-22
3061930	Cowpar LO				
		Daily	001 - Daily Maximum Temperature	1965-05-02	2007-09-27
		Daily	002 - Daily Minimum Temperature	1965-05-01	2007-09-28
		Daily	003 - Daily Mean Temperature	1965-05-02	2007-09-27
		Daily	010 - Total Rainfall	1957-07-01	2007-09-26
		Daily	011 - Total Snowfall	2006-05-01	2007-09-26
		Daily	012 - Total Precipitation	2004-05-01	2007-09-26
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-30
3062300	Ells LO				

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	001 - Daily Maximum Temperature	1964-05-01	2007-09-03
		Daily	002 - Daily Minimum Temperature	1964-05-01	2007-09-04
		Daily	003 - Daily Mean Temperature	1964-05-01	2007-09-03
		Daily	010 - Total Rainfall	1961-04-18	2007-09-03
		Daily	011 - Total Snowfall	2006-05-01	2007-09-03
		Daily	012 - Total Precipitation	2004-05-05	2007-09-03
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-04
3062693	Fort McMurray A				
		Daily	001 - Daily Maximum Temperature	1944-01-01	2007-12-31
		Daily	002 - Daily Minimum Temperature	1944-01-01	2007-12-31
		Daily	003 - Daily Mean Temperature	1944-01-01	2007-12-31
		Daily	004 - Daily Max Relative Humidity	2006-01-01	2007-12-31
		Daily	005 - Daily Min Relative Humidity	2006-01-01	2007-12-31
		Daily	010 - Total Rainfall	1944-01-01	2007-09-30
		Daily	011 - Total Snowfall	1944-01-01	2007-09-30
		Daily	012 - Total Precipitation	1944-01-01	2007-12-31
		Daily	013 - Snow on the Ground	2006-04-01	2007-09-30
		Daily	024 - Speed of Extreme Gust	2006-01-01	2007-12-31
3062696	Fort McMurray CS				
		Daily	001 - Daily Maximum Temperature	1996-05-01	2007-12-31
		Daily	002 - Daily Minimum Temperature	1996-05-01	2007-12-31
		Daily	003 - Daily Mean Temperature	2006-01-01	2007-12-31
		Daily	004 - Daily Max Relative Humidity	2006-01-01	2007-12-31
		Daily	005 - Daily Min Relative Humidity	2006-01-01	2007-12-31
		Daily	010 - Total Rainfall	1996-05-01	2007-09-30
		Daily	011 - Total Snowfall	1996-05-01	2007-12-31
		Daily	012 - Total Precipitation	1996-05-01	2007-09-30
		Daily	013 - Snow on the Ground	2006-01-01	2007-12-31
		Hourly	074 - Dewpoint Temperature	1999-09-18	2006-02-11
		Hourly	076 - Hourly Wind Speed	2003-03-15	2004-04-07
		Hourly	078 - Dry bulb temperature	1999-09-18	2006-02-11
3062889	Gordon Lake LO				
		Daily	001 - Daily Maximum Temperature	1964-05-01	2007-09-09
		Daily	002 - Daily Minimum Temperature	1964-06-01	2007-09-10
		Daily	003 - Daily Mean Temperature	1964-06-01	2007-09-09
		Daily	010 - Total Rainfall	1964-05-01	2007-09-09
		Daily	011 - Total Snowfall	2006-05-03	2007-09-09
		Daily	012 - Total Precipitation	2004-05-06	2007-09-09
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-10
3062905	Grande Lookout				
		Daily	001 - Daily Maximum Temperature	1965-08-05	2007-09-09
		Daily	002 - Daily Minimum Temperature	1965-08-05	2007-09-10
		Daily	003 - Daily Mean Temperature	2006-05-01	2007-09-09
		Daily	010 - Total Rainfall	1965-08-04	2007-09-09
		Daily	011 - Total Snowfall	1965-08-01	2007-09-09

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	012 - Total Precipitation	1965-08-04	2007-09-09
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-10
3063120	Heart Lake Lookout				
		Daily	001 - Daily Maximum Temperature	2005-04-14	2007-09-27
		Daily	002 - Daily Minimum Temperature	2005-04-15	2007-09-28
		Daily	003 - Daily Mean Temperature	2005-04-17	2007-09-27
		Daily	010 - Total Rainfall	2005-04-14	2007-09-26
		Daily	011 - Total Snowfall	2006-04-01	2007-09-26
		Daily	012 - Total Precipitation	2006-04-01	2007-09-26
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-28
3063563	Johnson Lake LO				
		Daily	001 - Daily Maximum Temperature	1965-05-01	2007-08-29
		Daily	002 - Daily Minimum Temperature	1965-05-01	2007-08-30
		Daily	003 - Daily Mean Temperature	1965-05-01	2007-08-29
		Daily	010 - Total Rainfall	1965-05-01	2007-08-31
		Daily	011 - Total Snowfall	2006-05-08	2007-08-31
		Daily	012 - Total Precipitation	2004-05-14	2007-08-31
		Daily	013 - Snow on the Ground	2006-06-01	2007-08-31
3064528	Mildred Lake				
		Daily	001 - Daily Maximum Temperature	1994-01-01	2007-12-31
		Daily	002 - Daily Minimum Temperature	1994-01-01	2007-12-31
		Daily	003 - Daily Mean Temperature	1994-01-01	2007-12-31
		Daily	004 - Daily Max Relative Humidity	2006-01-01	2007-12-31
		Daily	005 - Daily Min Relative Humidity	2006-01-01	2007-12-31
		Daily	010 - Total Rainfall	1994-01-01	2007-12-27
		Daily	011 - Total Snowfall	1994-01-01	2007-12-27
		Daily	012 - Total Precipitation	1994-01-01	2007-12-31
		Daily	013 - Snow on the Ground	2006-01-01	2007-12-31
		Daily	024 - Speed of Extreme Gust	2006-01-01	2007-12-31
3064531	Mildred Lake				
		Daily	001 - Daily Maximum Temperature	1973-07-04	1996-07-31
		Daily	002 - Daily Minimum Temperature	1973-07-05	1996-07-31
		Daily	003 - Daily Mean Temperature	1973-07-05	1996-07-31
		Daily	010 - Total Rainfall	1973-07-01	1996-07-31
		Daily	011 - Total Snowfall	1973-07-01	1996-07-31
		Daily	012 - Total Precipitation	1973-07-01	1996-07-31
3064740	Muskeg LO				
		Daily	001 - Daily Maximum Temperature	1965-08-01	2007-09-06
		Daily	002 - Daily Minimum Temperature	1965-08-01	2007-09-07
		Daily	003 - Daily Mean Temperature	1965-08-01	2007-09-06
		Daily	010 - Total Rainfall	1965-04-27	2007-09-06
		Daily	011 - Total Snowfall	2006-05-01	2007-09-06
		Daily	012 - Total Precipitation	2004-05-07	2007-09-06
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-06
3065492	Richardson LO				

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	001 - Daily Maximum Temperature	1964-06-03	2007-09-20
		Daily	002 - Daily Minimum Temperature	1964-06-01	2007-09-21
		Daily	003 - Daily Mean Temperature	1964-06-03	2007-09-20
		Daily	010 - Total Rainfall	1960-04-25	2007-09-20
		Daily	011 - Total Snowfall	2006-05-13	2007-09-20
		Daily	012 - Total Precipitation	2004-05-07	2007-09-20
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-21
3065560	Round Hill LO				
		Daily	001 - Daily Maximum Temperature	1951-07-06	2007-08-29
		Daily	002 - Daily Minimum Temperature	1951-07-06	2007-08-30
		Daily	003 - Daily Mean Temperature	1951-07-06	2007-08-29
		Daily	010 - Total Rainfall	1952-04-28	2007-08-31
		Daily	011 - Total Snowfall	2006-05-01	2007-08-31
		Daily	012 - Total Precipitation	2004-05-01	2007-08-31
		Daily	013 - Snow on the Ground	2006-06-01	2007-08-31
3066160	Stoney Mountian LO				
		Daily	001 - Daily Maximum Temperature	1964-05-01	2007-09-20
		Daily	002 - Daily Minimum Temperature	1964-05-01	2007-09-21
		Daily	003 - Daily Mean Temperature	1964-05-01	2007-09-20
		Daily	010 - Total Rainfall	1954-05-01	2007-09-20
		Daily	011 - Total Snowfall	2006-05-01	2007-09-20
		Daily	012 - Total Precipitation	2004-04-19	2007-09-20
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-21
3066364	Tar Island				
		Daily	001 - Daily Maximum Temperature	1970-04-01	1984-06-29
		Daily	002 - Daily Minimum Temperature	1970-04-01	1984-06-30
		Daily	003 - Daily Mean Temperature	1970-04-01	1984-06-29
		Daily	010 - Total Rainfall	1970-06-01	1984-06-30
3066380	Thickwood LO				
		Daily	001 - Daily Maximum Temperature	1957-08-02	1992-08-27
		Daily	002 - Daily Minimum Temperature	1957-08-02	1992-08-28
		Daily	003 - Daily Mean Temperature	1957-08-02	1992-08-27
		Daily	010 - Total Rainfall	1957-04-08	1992-08-27
		Daily	011 - Total Snowfall	1957-04-08	1992-08-27
		Daily	012 - Total Precipitation	1957-04-08	1992-08-27
3067590	Winefred LO				
		Daily	001 - Daily Maximum Temperature	1965-05-01	2007-08-25
		Daily	002 - Daily Minimum Temperature	1965-05-01	2007-08-26
		Daily	003 - Daily Mean Temperature	1965-05-01	2007-08-25
		Daily	010 - Total Rainfall	1957-05-01	2007-08-31
		Daily	011 - Total Snowfall	2006-05-03	2007-08-31
		Daily	012 - Total Precipitation	2004-05-03	2007-08-31
		Daily	013 - Snow on the Ground	2006-06-01	2007-08-31
3073792	Legend LO				
		Daily	001 - Daily Maximum Temperature	1962-05-06	2007-09-06

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	002 - Daily Minimum Temperature	1962-05-06	2007-09-07
		Daily	003 - Daily Mean Temperature	1962-05-06	2007-09-06
		Daily	010 - Total Rainfall	1962-05-06	2007-09-06
		Daily	011 - Total Snowfall	2006-05-04	2007-09-06
		Daily	012 - Total Precipitation	2004-05-12	2007-09-06
		Daily	013 - Snow on the Ground	2006-06-01	2007-09-07
ALBATH	Albian Athabasca River Withdrawal				
	Daily	1 - Discharge		2004-01-01	2007-12-31
AUCWD	Aurora Clean Water Diversion				
	Daily	1 - Discharge		2003-05-18	2004-12-31
C1	Aurora Climate Station				
	Daily	001 - Daily Maximum Temperature		1995-05-10	2007-12-31
	Daily	002 - Daily Minimum Temperature		1995-05-10	2007-12-31
	Daily	003 - Daily Mean Temperature		1988-03-11	2007-12-31
	Daily	010 - Total Rainfall		1995-05-10	2007-01-11
	Daily	011 - Total Snowfall		1995-05-10	2007-01-11
	Daily	012 - Total Precipitation		1988-03-10	2007-12-12
	Daily	013 - Snow on the Ground		2003-01-01	2007-04-12
	Daily	024 - Speed of Extreme Gust		2006-01-01	2007-12-31
	Daily	061 - Global Solar Radiation (RF1)		1988-03-11	2007-11-18
	Daily	080 - Relative Humidity		2006-01-01	2007-12-31
	Daily	831 - Maximum 2-Minute Wind Speed		2006-01-01	2007-12-31
	Daily	832 - Maximum 10-Minute Wind Speed		2006-01-01	2007-12-31
CALUMET	Calumet River near the Mouth				
	Daily	1 - Discharge		2001-05-12	2007-10-24
CNRATHRL	CNRL Athabasca Release				
	Daily	1 - Discharge		2007-01-01	2007-12-31
CNRATHW	CNRL Athabasca Withdrawals				
	Daily	1 - Discharge		2007-01-01	2007-12-31
CR1	Calumet River				
	Daily	1 - Discharge		2005-05-04	2007-10-24
	Daily	8 - Water Level		2007-05-04	2007-10-24
FTCREEK	Petro Canada Release to Fort Creek				
	Daily	1 - Discharge		2007-01-01	2007-12-31
JC1	Joslyn Creek				
	Daily	1 - Discharge		2005-05-04	2005-10-21
L1	McClelland Lake				
	Daily	010 - Total Rainfall		2003-05-27	2006-07-14
	Daily	012 - Total Precipitation		2006-04-15	2006-12-31
	Daily	080 - Relative Humidity		2006-09-06	2006-12-31
	Daily	1 - Discharge		1999-04-30	2006-08-15
	Daily	8 - Water Level		1997-06-22	2008-02-15
L2	Kearl Lake				
	Daily	1 - Discharge		2006-01-01	2006-12-31

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
L3	Isadore's Lake	Daily	8 - Water Level	1989-01-19	2007-12-31
		Daily	1 - Discharge	2004-09-22	2007-01-14
		Daily	8 - Water Level	2000-02-22	2008-02-15
POND2	Pond 2 to Shelley Creek	Daily	1 - Discharge	2007-01-01	2007-10-22
		Daily	8 - Water Level	2007-01-01	2007-10-31
POND3	Pond 3 to Jackpine Creek	Daily	1 - Discharge	2007-04-30	2007-10-22
		Daily	8 - Water Level	2007-04-30	2007-11-02
POND4	Pond 4 to Khahago Creek	Daily	1 - Discharge	2007-04-30	2007-10-22
		Daily	8 - Water Level	2007-04-30	2007-10-22
POND6	Pond 6 to Jackpine Creek	Daily	1 - Discharge	2007-01-18	2007-10-22
		Daily	8 - Water Level	2007-01-18	2007-10-22
POPCKSP	Poplar Creek Spillway Release	Daily	1 - Discharge	2004-03-23	2007-11-30
RCHRSLK	Christina Lake near Winefred Lake	Daily	003 - Daily Mean Temperature	2003-01-01	2007-12-31
		Daily	010 - Total Rainfall	2001-09-28	2002-04-11
		Daily	012 - Total Precipitation	2003-01-01	2007-12-31
S01	Alsands Drain	Daily	1 - Discharge	1995-08-10	2002-12-31
		Daily	8 - Water Level	1997-04-16	2002-12-29
S02	Jackpine Creek at Canterra Road	Daily	1 - Discharge	1995-05-06	2007-12-31
		Daily	8 - Water Level	1997-04-17	2007-12-31
		Daily	998 - Water Temperature	2007-10-20	2007-12-31
S03	Iyinimin Creek above Kearn Lake	Daily	010 - Total Rainfall	2004-05-16	2005-10-08
		Daily	1 - Discharge	1989-01-18	2007-10-24
		Daily	8 - Water Level	1989-04-20	2007-10-24
S04	Blackfly Creek near the Mouth	Daily	8 - Water Level	1989-02-15	1998-10-27
S04A	Blackfly Creek near the Mouth	Daily	1 - Discharge	2007-04-25	2007-10-25
		Daily	8 - Water Level	2007-04-25	2007-10-25
S05	Muskeg River above Stanley Creek	Daily	1 - Discharge	2003-05-04	2007-12-31
		Daily	8 - Water Level	2003-05-04	2007-12-31
S05A	Muskeg River above Muskeg Creek	Daily	1 - Discharge	1995-08-11	2007-12-31

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	8 - Water Level	1997-04-17	2007-12-31
		Daily	998 - Water Temperature	2004-09-01	2007-02-10
S06	Mills Creek at Highway 63	Daily	1 - Discharge	1997-04-16	2007-12-31
		Daily	8 - Water Level	1997-04-16	2007-12-31
S07	Muskeg River near Fort MacKay (07DA008)	Daily	1 - Discharge	1974-01-01	2007-12-31
		Daily	8 - Water Level	2000-01-01	2007-12-31
S08	Stanley Creek near the Mouth	Daily	1 - Discharge	2003-05-03	2003-10-14
		Daily	8 - Water Level	1999-09-14	2003-10-14
S09	Kearl Lake Outlet	Daily	1 - Discharge	1989-01-18	2007-10-20
		Daily	8 - Water Level	1989-01-18	2007-12-08
S10	Wapasu Creek at Canterra Road	Daily	1 - Discharge	1997-05-08	2007-12-31
		Daily	8 - Water Level	1997-05-08	2007-12-31
S11	Poplar Creek at Highway 63 (07DA007)	Daily	1 - Discharge	1972-03-16	2007-12-13
		Daily	8 - Water Level	1995-05-05	2007-12-13
S12	Fort Creek at Highway 63	Daily	1 - Discharge	2000-04-02	2007-10-20
		Daily	8 - Water Level	2000-04-02	2007-10-20
S13	Albian Pond 3 Outlet	Daily	8 - Water Level	2000-03-02	2002-12-07
S14	Ells River above Joslyn Creek	Daily	1 - Discharge	2001-05-13	2007-10-24
		Daily	8 - Water Level	2001-05-13	2007-10-24
S14A	Ells River at CNRL Bridge	Daily	1 - Discharge	2004-10-30	2007-12-31
		Daily	8 - Water Level	2004-10-30	2007-12-31
		Daily	998 - Water Temperature	2005-07-14	2007-12-31
S15	Tar River near the Mouth (07DA015)	Daily	1 - Discharge	1975-08-24	2006-10-28
		Daily	8 - Water Level	2001-05-09	2006-10-28
S15A	Tar River near the mouth (new location start from 2007	Daily	1 - Discharge	2007-05-01	2007-10-22
		Daily	8 - Water Level	2007-05-01	2007-10-22
		Daily	998 - Water Temperature	2007-09-21	2007-10-22
S16	Calumet River near the Mouth	Daily	001 - Daily Maximum Temperature	2003-01-01	2005-10-11
		Daily	002 - Daily Minimum Temperature	2003-01-01	2005-10-11
		Daily	003 - Daily Mean Temperature	2003-01-01	2005-10-11

<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
		Daily	010 - Total Rainfall	2003-01-01	2005-05-02
		Daily	011 - Total Snowfall	2003-01-01	2005-03-23
		Daily	012 - Total Precipitation	2003-01-01	2005-05-01
		Daily	1 - Discharge	2001-05-12	2004-10-31
		Daily	8 - Water Level	2001-05-12	2004-10-31
		Daily	998 - Water Temperature	2004-09-01	2004-10-31
S17	Tar River Upland Tributary				
		Daily	1 - Discharge	2001-05-12	2004-10-31
		Daily	8 - Water Level	2001-05-12	2004-10-31
S18A	Calumet River Upland Tributary				
		Daily	1 - Discharge	2002-06-10	2007-10-24
		Daily	8 - Water Level	2002-06-10	2007-10-24
S19	Tar River Lowland Tributary near the Mouth				
		Daily	010 - Total Rainfall	2004-04-27	2005-12-31
		Daily	012 - Total Precipitation	2006-01-01	2006-12-31
		Daily	1 - Discharge	2001-05-09	2007-10-22
		Daily	8 - Water Level	2001-05-09	2007-10-22
S20	Muskeg River Upland				
		Daily	1 - Discharge	2001-05-09	2007-10-20
		Daily	8 - Water Level	2001-05-09	2007-10-20
S21	Shelley Creek near the Mouth				
		Daily	1 - Discharge	2003-05-04	2003-10-14
		Daily	8 - Water Level	2001-05-14	2003-10-14
S22	Muskeg Creek near the Mouth				
		Daily	1 - Discharge	1989-01-17	2007-10-20
		Daily	8 - Water Level	1989-01-17	2007-10-20
S23	Aurora Boundary Weir				
		Daily	8 - Water Level	2001-01-01	2002-12-31
S24	Athabasca River below Eymundson Creek				
		Daily	1 - Discharge	2001-06-21	2007-12-31
		Daily	8 - Water Level	2001-06-21	2007-12-31
S25	Susan Lake Outlet				
		Daily	1 - Discharge	2002-06-11	2007-10-23
		Daily	8 - Water Level	2002-06-11	2007-10-23
S26	MacKay River near Fort McKay (07DB001)				
		Daily	1 - Discharge	1972-03-15	2007-12-31
		Daily	8 - Water Level	2001-10-31	2007-12-31
S27	Firebag River near the Mouth (07DC001)				
		Daily	1 - Discharge	1971-05-06	2007-12-31
		Daily	8 - Water Level	2002-01-01	2007-12-31
S28	Khahago Creek below Black Fly Creek				
		Daily	1 - Discharge	1989-01-19	2007-10-25
		Daily	8 - Water Level	1989-01-19	2007-10-25



<i>Station</i>	<i>Name</i>	<i>Time Step</i>	<i>Data Type</i>	<i>From Date</i>	<i>To Date</i>
S29	Christina River near Chard (07CE002)				
	Daily	1 - Discharge		1982-05-20	2007-12-31
	Daily	8 - Water Level		2002-01-13	2007-12-31
S31	Hangingstone Creek at North Star Road				
	Daily	1 - Discharge		2002-04-10	2007-10-19
	Daily	8 - Water Level		2002-04-10	2007-10-19
S32	Surmont Creek at Highway 881				
	Daily	1 - Discharge		2002-05-18	2007-10-19
	Daily	8 - Water Level		2002-05-18	2007-10-19
S33	Muskeg River at the Aurora / Albian Boundary				
	Daily	1 - Discharge		2003-04-30	2007-12-31
	Daily	8 - Water Level		2003-04-30	2007-12-31
S34	Tar River above CNRL Lake				
	Daily	1 - Discharge		2005-04-26	2007-12-11
	Daily	8 - Water Level		2005-04-26	2007-12-11
SUNATH	Suncor Athabasca River Withdrawal				
	Daily	1 - Discharge		2002-01-01	2004-12-31
TR1	Tar River				
	Daily	1 - Discharge		2005-05-03	2005-10-21

## **C.5     MANUAL WATER LEVEL AND DISCHARGE MEASUREMENTS**

Records of the manual measurements made during each site visit are provided on the following pages. The quality and expected precision of each manual discharge measurement was assessed considering the hydraulic conditions at the measurement section at the time of the measurement.

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

### Time of Measurement

Date of Measurement: January 14, 2007  
 Start Time: 11:20 AM MST  
 End Time:

### Weather Conditions:

-30 C, overcast, light wind

### River Conditions:

Complete ice cover

### Personnel & Equipment

Measurement Made By: JS, FF  
 Data Entry By: FF Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: Rod by PLUVI 1.086  
 Water Level Reading: 1.438  
 Bench Mark Rod Near PVC  
 Transducer Reading & Calc'd El 1.216  
 Other:

### Setup No. 1

El: 294.865  
 El: 294.513  
 El: 295.951  
 El: 293.297  
 El: 295.951

### Setup No. 2

El: 294.865  
 El: 294.511  
 El: 295.986  
 El: 293.295  
 El: 295.986

### Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
						1.0	1	0.00						

Total Flow:		(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:		(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:	lake	

Datalogger Notes:	Database	607
Datalogger Internal Power:	5.24V	
Datalogger External Power:	13.37V	
Datalogger Memory Used:	52%	
Datalogger Clock:	Jan 14, 2006 11:19	MST
Laptop Clock:	Jan 14, 2006 11:23	MST
Dessicant:	100% Good	
Datalogger:	Optimum DD128, # 1526	
PT:	Keller 730-130-5 psi #503448	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

### Notes:

Rel Humidity = 69%, Air Temp = -33.6  
 RG = 512 tips  
 Snow gauge fluids slightly slushy, but not frozen.  
 TD wires appear to be in the wrong ports (white to ALG COMM and black to ALG11), TD rewired with this reversed.  
 Dolphin reconfigured for proper scaling of the temp and relative humidity sensors. Sensors appear to be working properly.  
 Data downloaded using 'download all' function. - Program indicated partial download only was obtained.  
 Program function was erratic - graphing utility would not graph data for which data had been downloaded.  
 After rewiring of TD, dolphin would not communicate with laptop. Ports & cables were checked but no communication was established.  
 Troubleshoot communication on next visit. Send bin files to Optimum for review.

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

### Time of Measurement

Date of Measurement: January 18, 2007  
 Start Time: 9:34AM MST  
 End Time:

### Weather Conditions:

-18 C, Scattered cloud

### River Conditions:

Complete ice cover

### Personnel & Equipment

Measurement Made By: JS, FF  
 Data Entry By: FF Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Rod by PLUV	1.282	1.260
Water Level Reading:	1.621	1.603
Top of Ice Level Reading:	1.598	1.576
Bench Mark Rod Near PVC		
Transducer Reading & Calc'd El	0.037	0.037
Other:		

### Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
						1.0	1	0.00						

Total Flow:	(m <sup>3</sup> /s)
Perceived Measurement Quality:	
Total Area:	(m <sup>2</sup> )
Top Width:	(m)
Hydraulic Depth:	(m)
Mean Velocity:	(m/s)
Froude Number	
Photographs taken looking at:	
lake	

Datalogger Notes:	Database	607
Datalogger Internal Power:	5.24V	
Datalogger External Power:	13.37V	
Datalogger Memory Used:	52%	
Datalogger Clock:	Jan 14, 2006 11:19	MST
Laptop Clock:	Jan 14, 2006 11:23	MST
Dessicant:	100% Good	
Datalogger:	Optimum DD128, # 1526	
PT:	Keller 730-130-5 psi #503448	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: Rel Humidity = 86%, Air Temp = -16.4  
 RG = 0 tips  
 TD currently wired to ALG11, trying ALG12. Still no change in TD reading after change, TD left on ALG12  
 Ignore tips on todays date from 10am - 11am

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

### Time of Measurement

Date of Measurement: February 13, 2007  
 Start Time: MST  
 End Time:

### Weather Conditions:

-25 C, Clear, Calm

### River Conditions:

Complete ice cover

### Personnel & Equipment

Measurement Made By: JS, PM  
 Data Entry By: JS Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Rod by PLUV	1.184	1.302
Water Level Reading:	1.530	1.649
Top of Ice Level Reading:	1.496	1.614
Bench Mark Rod Near PVC		
Transducer Reading & Calc'd El	0.066	0.066
Other:		

### Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
						1.0	1	0.00						

Total Flow:	(m <sup>3</sup> /s)
Perceived Measurement Quality:	
Total Area:	(m <sup>2</sup> )
Top Width:	(m)
Hydraulic Depth:	(m)
Mean Velocity:	(m/s)
Froude Number	
Photographs taken looking at:	
lake	

Notes: TBRG = 38cnts  
 Temp = -24°C  
 RH = 67.065960  
 New Logger SN: 01650160  
 New readings TD = -0.017295, RH = 58.3, Temp = -22.8°C

Snow gauge fluids are frozen solid. Poured into bucket and stirred and mixed with new antifreeze and alcohol. Still slushy, but working.

Datalogger Notes:	Database	607
Datalogger Internal Power:	5.24V	
Datalogger External Power:	13.37V	
Datalogger Memory Used:	52%	
Datalogger Clock:	Jan 14, 2006 11:19	MST
Laptop Clock:	Jan 14, 2006 11:23	MST
Dessicant:	100% Good	
Datalogger:	Optimum DD128, # 01650160	
PT:	Keller 730-130-5 psi #503448	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4  
**Time of Measurement**  
 Date of Measurement: March 10, 2007  
 Start Time: 10:20 AM MST  
 End Time:

**Weather Conditions:** -15 C, Overcast, Windy

**River Conditions:** Complete ice cover

### Personnel & Equipment

Measurement Made By: JS, FF  
 Data Entry By: JS Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Rod by PLUV	1.359	1.283
Water Level Reading:	1.664	1.594
Top of Ice Level Reading:	1.674	1.587
Bench Mark Rod Near PVC		296.148
Transducer Reading & Calc'd El	1.147	293.407
Other:	296.224	296.148

### Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
						1.0	1	0.00						

Total Flow:	(m <sup>3</sup> /s)
Perceived Measurement Quality:	
Total Area:	(m <sup>2</sup> )
Top Width:	(m)
Hydraulic Depth:	(m)
Mean Velocity:	(m/s)
Froude Number	
Photographs taken looking at:	
lake	

Datalogger Notes:	Database	607
Datalogger Internal Power:	5.24V	
Datalogger External Power:	13.37V	
Datalogger Memory Used:	52%	
Datalogger Clock:	Jan 14, 2006 11:19	MST
Laptop Clock:	Jan 14, 2006 11:23	MST
Dessicant:	100% Good	
Datalogger:	Optimum DD128, # 01650160	
PT:	Keller 730-130-5 psi #503448	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

**Notes:** Old TD reading=-0.0412m, humidity=52, TBRG=113 tips, main batt=4.42v, aux batt=14.72v memory=2%used

TD changed, new TD SN:14538  
 m=1.4063387, b=-0.0533069  
 new TD level reading = 1.146844m  
 humidity=50.152963, TBRG=113 tips, main batt=4.41v, aux batt=14.67v, memory=2.1% used  
 TBRG fluid is slushy, 2L of alcohol added, ignore tips +/- 1.5hours from 10:20am  
 IGNORE TBRG TIPS +/- 1.5 hours from 10:20 am

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: McClelland Lake  
Location: McClelland Lake  
Site Name: L1  
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

## Time of Measurement

Date of Measurement: March 28, 2007  
Start Time: 11:15 AM MST  
End Time: 11:25 AM

## Weather Conditions:

## River Conditions:

## Personnel & Equipment

Measurement Made By: JE, SE  
Data Entry By: PM Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Rod by PLUVI	1.282	1.285
Water Level Reading:	1.605	1.604
Top of Ice Level Reading:	1.623	1.624
Bench Mark Rod Near PVC		
Transducer Reading & Calc'd El	1.184	1.184
Other:		


Notes: Levelling done by HCL  
TBRG - 29.50  
Humidity 49.8%  
Record rate set to 15 min  
Logger Clock rest at 10:52 MST  
FF spoke with Jane Elsler on phone at L1 on march 28, 2007 @ 11:00 MDT

Datalogger Notes:	Database	411
Datalogger Internal Power:	4.5V	
Datalogger External Power:	14.37V	
Datalogger Memory Used:	2%	
Datalogger Clock:	9:19:00 AM	MST
Laptop Clock:	9:12:00 AM	MST
Dessicant:	100% Good	
Datalogger:	Optimum DD128, # 01650160	
PT:	Keller 730-130-5 psi #503448	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
Location: McClelland Lake  
Site Name: L1  
Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

### Time of Measurement

Date of Measurement: April 25, 2007  
Start Time: MDT  
End Time: MDT

### Weather Conditions:

+5°C, Overcast, Light rain

### River Conditions:

High stage

### Personnel & Equipment

Measurement Made By: JMS,PM  
Data Entry By: PM Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: Rod by Plu 1.224  
Water Level Reading: 1.471  
Bench Mark Rod Near PVC 0.247  
Transducer Reading & Calc'd El 1.230  
Other:

### Setup No. 1

El: 294.865  
El: 294.618  
El: 295.842  
El: 293.388

### Setup No. 2

El: 294.865  
El: 294.615  
El: 295.831  
El: 293.385

### Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
RB 1.50	0.00				0.000	1.0	1	1.50	2.75	0.007	0.007	0.05	0.06	0.000
4.00	0.18				0.027	1.0	2	2.75	4.75	0.027	0.027	0.18	0.36	0.010
5.50	0.21				0.046	1.0	3	4.75	6.00	0.046	0.046	0.21	0.26	0.012
6.50	0.24				0.000	1.0	4	6.00	7.00	0.000	0.000	0.24	0.24	0.000
7.50	0.24				0.012	1.0	5	7.00	8.00	0.012	0.012	0.24	0.24	0.003
8.50	0.18				0.015	1.0	6	8.00	9.00	0.015	0.015	0.18	0.18	0.003
9.50	0.20				0.021	1.0	7	9.00	10.00	0.021	0.021	0.20	0.20	0.004
10.50	0.20				0.037	1.0	8	10.00	10.55	0.037	0.037	0.20	0.11	0.004
10.60	0.40				0.055	1.0	9	10.55	10.65	0.055	0.055	0.40	0.04	0.002
10.70	0.45				0.085	1.0	10	10.65	10.75	0.085	0.085	0.45	0.05	0.004
10.80	0.45				0.113	1.0	11	10.75	10.85	0.113	0.113	0.45	0.05	0.005
10.90	0.47				0.064	1.0	12	10.85	10.95	0.064	0.064	0.47	0.05	0.003
11.00	0.45				0.049	1.0	13	10.95	11.05	0.049	0.049	0.45	0.05	0.002
11.10	0.44				0.040	1.0	14	11.05	11.35	0.040	0.040	0.44	0.13	0.005
11.60	0.50				0.024	1.0	15	11.35	12.05	0.024	0.024	0.50	0.35	0.009
12.50	0.40				0.018	1.0	16	12.05	12.95	0.018	0.018	0.40	0.36	0.007
13.40	0.30				0.027	1.0	17	12.95	14.20	0.027	0.027	0.30	0.38	0.010
15.00	0.20				0.024	1.0	18	14.20	15.50	0.024	0.024	0.20	0.26	0.006
16.00	0.20				0.049	1.0	19	15.50	16.50	0.049	0.049	0.20	0.20	0.010
17.00	0.20				0.027	1.0	20	16.50	17.60	0.027	0.027	0.20	0.22	0.006
LB 18.20	0.15				0.000	1.0	21	17.60	18.20	0.007	0.007	0.05	0.03	0.000
Total Flow:														0.106

Total Flow:	0.106	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	3.80	(m <sup>2</sup> )
Top Width:	16.70	(m)
Hydraulic Depth:	0.227	(m)
Mean Velocity:	0.028	(m/s)
Froude Number	0.019	
Photographs taken looking at: lake		

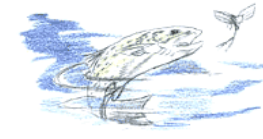
Notes: TBRG tips = 296  
Temp = 5.6°C  
RH = 69.6%

Datalogger Notes:	Database 607
Datalogger Internal Power:	4.57V
Datalogger External Power:	12.96V
Datalogger Memory Used:	10% Used
Datalogger Clock:	Apr 25, 2007 15:28 MST
Laptop Clock:	Apr 25, 2007 15:39 MST
Dessicant:	
Datalogger:	Optimum DD128, # 110220411
PT:	Keller 730-130-5 psi #14538
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller



# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

### Time of Measurement

Date of Measurement: June 16, 2007  
 Start Time: 5:50 PM MDT  
 End Time: 6:10 PM MDT

Weather Conditions: +20°C, partly cloudy

River Conditions: low

### Personnel & Equipment

Measurement Made By: sm pm  
 Data Entry By: sm Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: Rod by Pluvial 1.143  
 Water Level Reading: 1.443  
 Bench Mark Rod Near PVC  
 Transducer Reading & Calc'd El. 0.993  
 Other:

### Setup No. 1

El: 294.865  
 El: 294.565  
 El:  
 El: 293.572  
 El:

### Setup No. 2

El: 294.865  
 El: 294.538  
 El:  
 El: 293.545  
 El:

### Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
RB	19.20	0.00			0.000	1.0	1	19.20	19.98	0.000	0.000	0.08	0.06	0.000
	20.25	0.30			0.000	1.0	2	19.98	20.38	0.000	0.000	0.30	0.12	0.000
	20.50	0.30			0.000	1.0	3	20.38	20.63	0.000	0.000	0.30	0.08	0.000
	20.75	0.30			0.006	1.0	4	20.63	20.88	0.006	0.006	0.30	0.08	0.000
	21.00	0.21			0.012	1.0	5	20.88	21.13	0.012	0.012	0.21	0.05	0.001
	21.25	0.20			0.009	1.0	6	21.13	21.38	0.009	0.009	0.20	0.05	0.000
	21.50	0.46			0.012	1.0	7	21.38	21.63	0.012	0.012	0.46	0.12	0.001
	21.75	0.50			0.012	1.0	8	21.63	21.88	0.012	0.012	0.50	0.13	0.002
	22.00	0.46			0.003	1.0	9	21.88	22.13	0.003	0.003	0.46	0.12	0.000
	22.25	0.40			0.009	1.0	10	22.13	22.38	0.009	0.009	0.40	0.10	0.001
	22.50	0.40			0.006	1.0	11	22.38	22.63	0.006	0.006	0.40	0.10	0.001
	22.75	0.34			0.009	1.0	12	22.63	22.88	0.009	0.009	0.34	0.09	0.001
	23.00	0.26			0.000	1.0	13	22.88	23.50	0.000	0.000	0.26	0.16	0.000
	24.00	0.23			0.006	1.0	14	23.50	24.50	0.006	0.006	0.23	0.23	0.001
	25.00	0.19			0.009	1.0	15	24.50	25.50	0.009	0.009	0.19	0.19	0.002
LB	26.00	0.15			0.003	1.0	16	25.50	26.50	0.003	0.003	0.15	0.15	0.000
	27.00	0.00			0.000	1.0	17	26.50	27.00	0.001	0.001	0.04	0.02	0.000
Total Flow:													0.011	

Total Flow:	0.011	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	1.82	(m <sup>2</sup> )
Top Width:	7.80	(m)
Hydraulic Depth:	0.233	(m)
Mean Velocity:	0.006	(m/s)
Froude Number	0.004	
Photographs taken looking at: lake		

Notes: TBRG tips = 463  
 Temp = 20.17°C  
 RH = 46.6%

Datalogger Notes:	Database	607
Datalogger Internal Power:	4.9v	
Datalogger External Power:	13.67v	
Datalogger Memory Used:	17%	Used
Datalogger Clock:	Jun 16, 2007 13:07	MST
Laptop Clock:	Jun 16, 2007 13:20	MST
Dessicant:		
Datalogger:	Optimum DD128, # 110220411	
PT:	Keller 730-130-5 psi #14538	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

### Time of Measurement

Date of Measurement: August 10, 2007  
 Start Time: 8:25 AM MDT  
 End Time: MDT

### Weather Conditions:

+20 °C, partly cloudy

### River Conditions:

low

### Personnel & Equipment

Measurement Made By: sm jsl  
 Data Entry By: sm Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: Rod by Plu 1.140  
 Water Level Reading: 1.545  
 Bench Mark Rod Near PVC  
 Transducer Reading & Calc'd El. 1.247  
 Other:

### Setup No. 1

El: 294.865  
 El: 294.460  
 El:  
 El: 293.213  
 El:

### Setup No. 2

El: 294.865  
 El: 294.470  
 El:  
 El: 293.223  
 El:

### Measurement Data

Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
RB	19.20				0.000	1.0	1	19.20	19.98	0.000	0.000	0.00	0.00	0.000
	20.25				0.000	1.0	2	19.98	20.38	0.000	0.000	0.00	0.00	0.000
	20.50				0.000	1.0	3	20.38	20.63	0.000	0.000	0.00	0.00	0.000
	20.75				0.000	1.0	4	20.63	20.88	0.000	0.000	0.00	0.00	0.000
	21.00				0.000	1.0	5	20.88	21.13	0.000	0.000	0.00	0.00	0.000
	21.25				0.000	1.0	6	21.13	21.38	0.000	0.000	0.00	0.00	0.000
	21.50				0.000	1.0	7	21.38	21.63	0.000	0.000	0.00	0.00	0.000
	21.75				0.000	1.0	8	21.63	21.88	0.000	0.000	0.00	0.00	0.000
	22.00				0.000	1.0	9	21.88	22.13	0.000	0.000	0.00	0.00	0.000
	22.25				0.000	1.0	10	22.13	22.38	0.000	0.000	0.00	0.00	0.000
	22.50				0.000	1.0	11	22.38	22.63	0.000	0.000	0.00	0.00	0.000
	22.75				0.000	1.0	12	22.63	22.88	0.000	0.000	0.00	0.00	0.000
	23.00				0.000	1.0	13	22.88	23.50	0.000	0.000	0.00	0.00	0.000
	24.00				0.000	1.0	14	23.50	24.50	0.000	0.000	0.00	0.00	0.000
	25.00				0.000	1.0	15	24.50	25.50	0.000	0.000	0.00	0.00	0.000
LB	26.00				0.000	1.0	16	25.50	26.50	0.000	0.000	0.00	0.00	0.000
	27.00				0.000	1.0	17	26.50	27.00	0.000	0.000	0.00	0.00	0.000
Total Flow:													0.000	

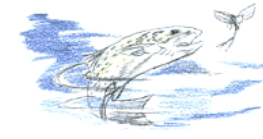
Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	7.80	(m)
Hydraulic Depth:	0.000	(m)
Mean Velocity:	#DIV/0!	(m/s)
Froude Number	#DIV/0!	
Photographs taken looking at: lake		

Notes: TBRG tips = 1026  
 Temp = 17.94 °C  
 RH = 40.6%

Datalogger Notes:	Database	471
Datalogger Internal Power:	4.89v	
Datalogger External Power:	13.47v	
Datalogger Memory Used:	28%	Used
Datalogger Clock:	Aug 10, 2007 05:34	MST
Laptop Clock:	Aug 10, 2007 11:18	MST
Dessicant:		
Datalogger:	Optimum DD128, # 110220411	
PT:	Keller 730-130-5 psi #14538	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

### Time of Measurement

Date of Measurement: September 22, 2007  
 Start Time: 8:25 AM MDT  
 End Time: MDT

### Weather Conditions:

partly cloudy

### River Conditions:

low

### Personnel & Equipment

Measurement Made By: sm jsl  
 Data Entry By: sm Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: Rod by Plu 1.132  
 Water Level Reading: 1.495  
 Bench Mark Rod Near PVC  
 Transducer Reading & Calc'd El. 1.255  
 Other:

### Setup No. 1

El: 294.865  
 El: 294.502  
 El:  
 El: 293.247  
 El:

### Setup No. 2

El: 294.865  
 El: 294.503  
 El:  
 El: 293.248  
 El:

### Measurement Data

Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
RB	19.20				0.000	1.0	1	19.20	19.98	0.000	0.000	0.00	0.00	0.000
	20.25				0.000	1.0	2	19.98	20.38	0.000	0.000	0.00	0.00	0.000
	20.50				0.000	1.0	3	20.38	20.63	0.000	0.000	0.00	0.00	0.000
	20.75				0.000	1.0	4	20.63	20.88	0.000	0.000	0.00	0.00	0.000
	21.00				0.000	1.0	5	20.88	21.13	0.000	0.000	0.00	0.00	0.000
	21.25				0.000	1.0	6	21.13	21.38	0.000	0.000	0.00	0.00	0.000
	21.50				0.000	1.0	7	21.38	21.63	0.000	0.000	0.00	0.00	0.000
	21.75				0.000	1.0	8	21.63	21.88	0.000	0.000	0.00	0.00	0.000
	22.00				0.000	1.0	9	21.88	22.13	0.000	0.000	0.00	0.00	0.000
	22.25				0.000	1.0	10	22.13	22.38	0.000	0.000	0.00	0.00	0.000
	22.50				0.000	1.0	11	22.38	22.63	0.000	0.000	0.00	0.00	0.000
	22.75				0.000	1.0	12	22.63	22.88	0.000	0.000	0.00	0.00	0.000
	23.00				0.000	1.0	13	22.88	23.50	0.000	0.000	0.00	0.00	0.000
	24.00				0.000	1.0	14	23.50	24.50	0.000	0.000	0.00	0.00	0.000
	25.00				0.000	1.0	15	24.50	25.50	0.000	0.000	0.00	0.00	0.000
LB	26.00				0.000	1.0	16	25.50	26.50	0.000	0.000	0.00	0.00	0.000
	27.00				0.000	1.0	17	26.50	27.00	0.000	0.000	0.00	0.00	0.000
Total Flow:													0.000	

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	7.80	(m)
Hydraulic Depth:	0.000	(m)
Mean Velocity:	#DIV/0!	(m/s)
Froude Number	#DIV/0!	
Photographs taken looking at: lake		

Notes: TBRG tips = 1617  
 Temp = 5.86°C  
 RH = 90.57%

Datalogger Notes:	Database	471
Datalogger Internal Power:	4.89v	
Datalogger External Power:	13.47v	
Datalogger Memory Used:	28%	Used
Datalogger Clock:	Sep 22, 2007 08:32	
Laptop Clock:	Sep 22, 2007 09:56	MST
Dessicant:		
Datalogger:	Optimum DD128, # 110220411	
PT:	Keller 730-130-5 psi #14538	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4

### Time of Measurement

Date of Measurement: October 25, 2007  
 Start Time: 10:00 AM MDT  
 End Time: MDT

Weather Conditions: partly cloudy

River Conditions: low

### Personnel & Equipment

Measurement Made By: ff sm  
 Data Entry By: sm Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: Rod by Fence 0.932  
 Water Level Reading: 3.285  
 Bench Mark Rod Near PVC 2.879  
 Transducer Reading & Calc'd El. 1.187  
 Other: Rod in PVC

### Setup No. 1

El: 294.865  
 El: 292.512  
 El: 2.870  
 El: 291.325  
 El: 1.898

### Setup No. 2

El: 294.865  
 El: 292.515  
 El: 2.870  
 El: 291.328  
 El: 293.889

### Measurement Data

Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
RB	19.20				0.000	1.0	1	19.20	19.98	0.000	0.000	0.00	0.00	0.000
	20.25				0.000	1.0	2	19.98	20.38	0.000	0.000	0.00	0.00	0.000
	20.50				0.000	1.0	3	20.38	20.63	0.000	0.000	0.00	0.00	0.000
	20.75				0.000	1.0	4	20.63	20.88	0.000	0.000	0.00	0.00	0.000
	21.00				0.000	1.0	5	20.88	21.13	0.000	0.000	0.00	0.00	0.000
	21.25				0.000	1.0	6	21.13	21.38	0.000	0.000	0.00	0.00	0.000
	21.50				0.000	1.0	7	21.38	21.63	0.000	0.000	0.00	0.00	0.000
	21.75				0.000	1.0	8	21.63	21.88	0.000	0.000	0.00	0.00	0.000
	22.00				0.000	1.0	9	21.88	22.13	0.000	0.000	0.00	0.00	0.000
	22.25				0.000	1.0	10	22.13	22.38	0.000	0.000	0.00	0.00	0.000
	22.50				0.000	1.0	11	22.38	22.63	0.000	0.000	0.00	0.00	0.000
	22.75				0.000	1.0	12	22.63	22.88	0.000	0.000	0.00	0.00	0.000
	23.00				0.000	1.0	13	22.88	23.50	0.000	0.000	0.00	0.00	0.000
	24.00				0.000	1.0	14	23.50	24.50	0.000	0.000	0.00	0.00	0.000
	25.00				0.000	1.0	15	24.50	25.50	0.000	0.000	0.00	0.00	0.000
LB	26.00				0.000	1.0	16	25.50	26.50	0.000	0.000	0.00	0.00	0.000
	27.00				0.000	1.0	17	26.50	27.00	0.000	0.000	0.00	0.00	0.000
Total Flow:													0.000	

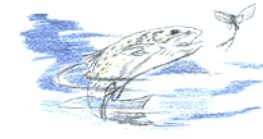
Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	7.80	(m)
Hydraulic Depth:	0.000	(m)
Mean Velocity:	#DIV/0!	(m/s)
Froude Number	#DIV/0!	
Photographs taken looking at: lake		

Notes: TBRG tips = 1667  
 Temp = 1.288°C  
 RH = 72.6%

Datalogger Notes:	Database	471
Datalogger Internal Power:	4.89v	
Datalogger External Power:	13.47v	
Datalogger Memory Used:	28%	Used
Datalogger Clock:	Oct 25, 2007 04:27	
Laptop Clock:	Oct 25, 2007 10:12	MST
Dessicant:		
Datalogger:	Optimum DD128, # 110220411	
PT:	Keller 730-130-5 psi #14538	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

L1 - McClelland Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: McClelland Lake  
 Location: McClelland Lake  
 Site Name: L1  
 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4  
**Time of Measurement**  
 Date of Measurement: December 10, 2007  
 Start Time: 10:00 AM MDT  
 End Time: MDT

**Weather Conditions:** partly cloudy

### River Conditions:

### Personnel & Equipment

Measurement Made By: ff sm  
 Data Entry By: sm Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: Rod by Incece  
 Water Level Reading: 1.508  
 Bench Mark Rod Near PVC  
 Transducer Reading & Calc'd El. 0.991  
 Other: Rod in PVC 1.152  
 ice 1.491

### Setup No. 1

El: 294.865  
 El: 293.357  
 El:  
 El: 292.366  
 El:  
 El:

### Setup No. 2

El: 294.865  
 El: 293.368  
 El:  
 El: 292.377  
 El:  
 El: 1.482

### Measurement Data

Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
RB	19.20				0.000	1.0	1	19.20	19.98	0.000	0.000	0.00	0.00	0.000
	20.25				0.000	1.0	2	19.98	20.38	0.000	0.000	0.00	0.00	0.000
	20.50				0.000	1.0	3	20.38	20.63	0.000	0.000	0.00	0.00	0.000
	20.75				0.000	1.0	4	20.63	20.88	0.000	0.000	0.00	0.00	0.000
	21.00				0.000	1.0	5	20.88	21.13	0.000	0.000	0.00	0.00	0.000
	21.25				0.000	1.0	6	21.13	21.38	0.000	0.000	0.00	0.00	0.000
	21.50				0.000	1.0	7	21.38	21.63	0.000	0.000	0.00	0.00	0.000
	21.75				0.000	1.0	8	21.63	21.88	0.000	0.000	0.00	0.00	0.000
	22.00				0.000	1.0	9	21.88	22.13	0.000	0.000	0.00	0.00	0.000
	22.25				0.000	1.0	10	22.13	22.38	0.000	0.000	0.00	0.00	0.000
	22.50				0.000	1.0	11	22.38	22.63	0.000	0.000	0.00	0.00	0.000
	22.75				0.000	1.0	12	22.63	22.88	0.000	0.000	0.00	0.00	0.000
	23.00				0.000	1.0	13	22.88	23.50	0.000	0.000	0.00	0.00	0.000
	24.00				0.000	1.0	14	23.50	24.50	0.000	0.000	0.00	0.00	0.000
	25.00				0.000	1.0	15	24.50	25.50	0.000	0.000	0.00	0.00	0.000
	26.00				0.000	1.0	16	25.50	26.50	0.000	0.000	0.00	0.00	0.000
LB	27.00				0.000	1.0	17	26.50	27.00	0.000	0.000	0.00	0.00	0.000
Total Flow:													0.000	

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	poor	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	7.80	(m)
Hydraulic Depth:	0.000	(m)
Mean Velocity:	#DIV/0!	(m/s)
Froude Number	#DIV/0!	
Photographs taken looking at: lake		

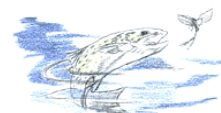
### Notes:

Temp = -14.57°C  
 RH = 0.08%  
 battery voltage too low

Datalogger Notes:	Database	471
Datalogger Internal Power:		
Datalogger External Power:		
Datalogger Memory Used:	51%	Used
Datalogger Clock:	Dec 10, 2007 10:04	
Laptop Clock:	Dec 10, 2007 10:06	MST
Dessicant:		
Datalogger:	Optimum DD128, # 110220411	
PT:	Keller 730-130-5 psi #14538	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kearl Lake  
Location: Kearl Lake  
Site Name: L2  
Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

## Time of Measurement

Date of Measurement: January 12, 2007  
Start Time: 9:05 AM MDT  
End Time: MDT

## Weather Conditions:

-27 C, Overcast, light wind

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.:

## Level Readings

Bench Mark Reading: nail in tree 1.969  
Water Level Reading: 3.269  
Top of Ice Level Reading: 3.256  
Transducer Reading & Calc'd El.: 0.833  
Other: Nail in tree (secondary, near DL)

## Setup No. 1

El: 333.063  
El: 331.763  
El: 330.930  
El: 335.032

## Setup No. 2

El: 333.063  
El: 331.762  
El: 330.929  
El: 334.967

## Average

331.763  
330.930

## Measurement Data

Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Flow:														-	

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		

Datalogger Notes:	Database # 657
Datalogger Internal Power:	4.89V
Datalogger External Power:	51.23V
Datalogger Memory Used:	40%
Datalogger Clock:	9:05AM MST
Laptop Clock:	9:08AM MST
Dessicant:	75% Used, Replaced
Datalogger:	Optimum Datalogger DD-128 #209170657
PT:	Keller 730-130 s/n 0303326 3 psi
Power:	Magnacharge 20V 10A DC Battery and Solar Panel

Notes: Dessicant tube was hanging outside logger box, did someone enter the box?

# Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kearl Lake  
 Location: Kearl Lake  
 Site Name: L2  
 Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

## Time of Measurement

Date of Measurement: March 6, 2007  
 Start Time: 10:10 AM MDT  
 End Time: MDT

## Weather Conditions:

-10 C, Overcast, light wind

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JS, FF  
 Data Entry By: FF  
 Meter Type and No.:

## Level Readings

Bench Mark Reading: nail in tree 2.087  
 Water Level Reading: 3.360  
 Top of Ice Level Reading: 3.352  
 Transducer Reading & Calc'd El.:  
 Other: Nail in tree (secondary, near DL) 1.524

## Setup No. 1

El: 333.063  
 El: 331.790  
 El: 331.790  
 El: 333.626

## Setup No. 2

El: 333.063  
 El: 331.793  
 El: 331.793  
 El: 333.628

## Average

331.792

331.792

Total Flow:			(m <sup>3</sup> /s)
Perceived Measurement Quality:			
Total Area:			(m <sup>2</sup> )
Top Width:			(m)
Hydraulic Depth:			(m)
Mean Velocity:			(m/s)
Froude Number			
Photographs taken looking at:			

Notes: Data spiky - transducer reading -0.039 m.  
 Battery power suspected to be a problem.  
 Return to change batteries; solar panel damaged.

Datalogger Notes:	Database # 657
Datalogger Internal Power:	4.19V
Datalogger External Power:	42.3V
Datalogger Memory Used:	45%
Datalogger Clock:	Mar 06, 2007 10:04 MST
Laptop Clock:	3/6/2007 10:11:00 AM MST
Dessicant:	75% Used, Replaced
Datalogger:	Optimum Datalogger DD-128 #209170657
PT:	Keller 730-130 s/n 0303326 3 psi
Power:	Magnacharge 20V 10A DC Battery and Solar Panel

# Hydrometric Measurement / Site Visit Record

L2 - Kears Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kears Lake  
Location: Kears Lake  
Site Name: L2  
Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

## Time of Measurement

Date of Measurement: March 27, 2007  
Start Time: MDT  
End Time: MDT

## Weather Conditions:

## River Conditions:

## Personnel & Equipment

Measurement Made By: JE, JM  
Data Entry By: PM  
Meter Type and No.:

## Level Readings

Bench Mark Reading: nail in tree  
Water Level Reading: 2.185  
Top of Ice Level Reading: 2.205  
Transducer Reading & Calc'd El.: 0.909  
Other: Nail in tree (secondary, near DL) 0.195

## Setup No. 1

El: 333.063  
El: 331.677  
El: 330.768  
El: 333.667

## Setup No. 2

El: 333.063  
El: 331.702  
El: 330.793  
El: 333.667

## Average

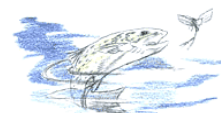
331.690  
330.781

Notes: HCL complete level measurement  
Appears HCL used Nail in Tree near DL for BM



# Hydrometric Measurement / Site Visit Record

L2 - Kearn Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kearn Lake  
 Location: Kearn Lake  
 Site Name: L2  
 Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

## Time of Measurement

Date of Measurement: April 25, 2007  
 Start Time: 7:10 PM MDT  
 End Time: MDT

## Weather Conditions:

+9°C, Cloudy, light wind

## River Conditions:

Open

## Personnel & Equipment

Measurement Made By: JS,JE  
 Data Entry By: JS  
 Meter Type and No.:

## Level Readings

Bench Mark Reading: nail in tree 1.879  
 Water Level Reading: 3.080  
 Top of Ice Level Reading:  
 Transducer Reading & Calc'd El.: 0.956  
 Other: Nail in tree (secondary, near DL) 1.321

## Setup No. 1

El: 333.063  
 El: 331.862  
 El: 330.906  
 El: 333.621

## Setup No. 2

El: 333.063  
 El: 331.870  
 El: 330.914  
 El: 333.624

## Average

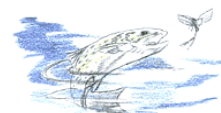
331.866  
 330.910  
 333.623

**Notes:** Did not have multimeter to check voltage on battery. Data appears to look ok, therefore it is safe to assume the batter is holding a good charge.

<b>Datalogger Notes:</b>	<b>Database # 657</b>
<b>Datalogger Internal Power:</b>	4.91 V
<b>Datalogger External Power:</b>	51.7 V
<b>Datalogger Memory Used:</b>	49%
<b>Datalogger Clock:</b>	Apr 25, 2007 19:10 MST
<b>Laptop Clock:</b>	Apr 25, 2007 19:27 MST
<b>Dessicant:</b>	Good
<b>Datalogger:</b>	Optimum Datalogger DD-128 #105010657
<b>PT:</b>	Keller 730-130 s/n 0303326 3 psi
<b>Power:</b>	Magnacharge 20V 10A DC Battery

# Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kearl Lake  
 Location: Kearl Lake  
 Site Name: L2  
 Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

## Time of Measurement

Date of Measurement: June 14, 2007  
 Start Time: 1:07 PM MDT  
 End Time: 1:10 PM MDT

## Weather Conditions:

+20 °C, Clear calm

## River Conditions:

open low stage

## Personnel & Equipment

Measurement Made By: sm pm wd  
 Data Entry By: sm  
 Meter Type and No.:

## Level Readings

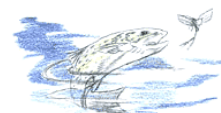
		Setup No. 1		Setup No. 2		Average
Bench Mark Reading: nail in tree	2.052	El:	333.063	2.126	El:	333.063
Water Level Reading:	3.308	El:	331.807	3.378	El:	331.811
Top of Ice Level Reading:		El:			El:	
Transducer Reading & Calc'd El.:	0.916	El:	330.891	0.916	El:	330.895
Other: Nail in tree (secondary, near DL)	1.118	El:	333.997	1.189	El:	334.000
						333.999

Notes: catterpillars everywhere

Datalogger Notes:	Database # 657
Datalogger Internal Power:	4.91 V
Datalogger External Power:	52.18 V
Datalogger Memory Used:	53%
Datalogger Clock:	Jun 14, 2007 13:07 MST
Laptop Clock:	Jun 14, 2007 13:14 MST
Dessicant:	Good
Datalogger:	Optimum Datalogger DD-128 #105010657
PT:	Keller 730-130 s/n 0303326 3 psi
Power:	Magnacharge 20V 10A DC Battery

# Hydrometric Measurement / Site Visit Record

L2 - Kears Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Kears Lake  
 Location: Kears Lake  
 Site Name: L2  
 Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

### Time of Measurement

Date of Measurement: August 9, 2007  
 Start Time: 11:30 AM MDT  
 End Time: MDT

### Weather Conditions:

Partly Cloudy

### River Conditions:

### Personnel & Equipment

Measurement Made By: SM, JSI  
 Data Entry By: PM  
 Meter Type and No.:

### Level Readings

		Setup No. 1		Setup No. 2		Average
Bench Mark Reading: nail in tree	2.111	El: 333.063	2.108	El: 333.063		
Water Level Reading:	3.564	El: 331.610	3.560	El: 331.611		331.611
Top of Ice Level Reading:		El:		El:		
Transducer Reading & Calc'd El.:	0.698	El: 330.912	0.698	El: 330.913		330.912
Other: Nail in tree (secondary, near DL)	1.171	El: 334.003	1.168	El: 334.003		334.003

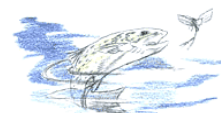
### Notes:

station to be decommissioned and relocated

Datalogger Notes:	Database # 657
Datalogger Internal Power:	4.9 V
Datalogger External Power:	51.80 V 10.72 V (volumeter)
Datalogger Memory Used:	53%
Datalogger Clock:	10:27 AM MST
Laptop Clock:	10:35 AM MST
Dessicant:	Good
Datalogger:	Optimum Datalogger DD-128 #105010657
PT:	Keller 730-130 s/n 0303326 3 psi
Power:	Magnacharge 20V 10A DC Battery

# Hydrometric Measurement / Site Visit Record

L2 - Kearl Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: **Kearl Lake**  
 Location: **Kearl Lake**  
 Site Name: **L2**  
 Coordinates & Legal: **SE-32-95-8-4**

## Time of Measurement

Date of Measurement: **September 25, 2007**  
 Start Time: **3:30 PM MDT**  
 End Time: **MDT**

## Weather Conditions:

**Partly Cloudy cool**

## River Conditions:

## Personnel & Equipment

Measurement Made By: **SM, JSI**  
 Data Entry By: **sm**  
 Meter Type and No.:

## Level Readings

		<b>Setup No. 1</b>		<b>Setup No. 2</b>		<b>Average</b>
Bench Mark Reading: silver pipe clos	<b>0.737</b>	El:	<b>332.571</b>	<b>0.738</b>	El:	<b>332.571</b>
Water Level Reading:	<b>1.517</b>	El:	<b>331.791</b>	<b>1.510</b>	El:	<b>331.799</b>
Top of Ice Level Reading:		El:			El:	
Transducer Reading & Calc'd El.:	<b>0.440</b>	El:	<b>331.351</b>	<b>0.440</b>	El:	<b>331.359</b>
Other: far north rebar in white pvc	<b>0.825</b>	El:	<b>332.483</b>	<b>0.825</b>	El:	<b>332.484</b>

## Notes:

station now at new location

**TD depth** 0.440086  
**TBRG** 23  
**AIR TEMP** 1.27  
**HUMIDITY** 29  
**WATER TEMP** 1.164

<b>Datalogger Notes:</b>	<b>Database # 657</b>
<b>Datalogger Internal Power:</b>	<b>4.9 V</b>
<b>Datalogger External Power:</b>	<b>10.62</b>
<b>Datalogger Memory Used:</b>	<b>61%</b>
<b>Datalogger Clock:</b>	<b>MST</b>
<b>Laptop Clock:</b>	<b>MST</b>
<b>Dessicant:</b>	<b>Good</b>
<b>Datalogger:</b>	Optimum Datalogger DD-128 #105010657
<b>PT:</b>	Keller 730-130 s/n 0303326 3 psi
<b>Power:</b>	Magnacharge 20V 10A DC Battery

# Hydrometric Measurement / Site Visit Record

L2 - Kears Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kears Lake  
Location: Kears Lake  
Site Name: L2  
Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

## Time of Measurement

Date of Measurement: October 20, 2007  
Start Time: 9:30 AM MDT  
End Time: MDT

## Weather Conditions:

Partly Cloudy

## River Conditions:

## Personnel & Equipment

Measurement Made By: ff sm  
Data Entry By: sm  
Meter Type and No.:

## Level Readings

Bench Mark Reading: silver pipe close t 1.160  
Water Level Reading: 1.932  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.: 0.476  
Other: far rebar in white PVC 1.252

## Setup No. 1

El: 332.571  
El: 331.799  
El: 331.323  
El: 332.479

## Setup No. 2

El: 332.571  
El: 331.800  
El: 331.324  
El: 332.477

## Average

331.800  
331.323  
332.478

TD depth 0.476418  
TBRG 41 104 after Snow adapter installation  
AIR TEMP 1.79  
HUMIDITY 33.6  
WATER TEMP 4.05

Datalogger Notes: Database # 657  
Datalogger Internal Power: 4.95 V  
Datalogger External Power: 11.95 10.72 V (volumeter)  
Datalogger Memory Used: 5%  
Datalogger Clock: MST  
Laptop Clock: MST  
Dessicant: Good  
Datalogger: Optimum Datalogger DD-128 #105010657  
PT: Keller 730-130 s/n 0303326 3 psi  
Power: Magnacharge 20V 10A DC Battery

Notes:

# Hydrometric Measurement / Site Visit Record

L2 - Kearn Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Kearn Lake  
 Location: Kearn Lake  
 Site Name: L2  
 Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

### Time of Measurement

Date of Measurement: October 22, 2007  
 Start Time: 12:15 PM MDT  
 End Time: 1:20 PM MDT

### Weather Conditions:

Partly Cloudy

### River Conditions:

### Personnel & Equipment

Measurement Made By: sm ff  
 Data Entry By: sm ff  
 Meter Type and No.:

### Level Readings

Bench Mark Reading: silver pipe close to 1.247  
 Water Level Reading: 2.000  
 Top of Ice Level Reading:  
 Transducer Reading & Calc'd El.: 0.930  
 Other: far rod in white PVC 1.338  
 Other: Rebar near road (golfer BM) 0.421

### Setup No. 1

El: 332.571  
 El: 331.818  
 El:  
 El: 330.888  
 El: 332.480  
 El: 333.397

### Setup No. 2

El: 332.571  
 El: 331.820  
 El:  
 El: 330.890  
 El: 332.480  
 El: 333.397

### Average

331.819  
 330.889  
 332.480  
 333.397

TD depth 0.93 meters  
 TBRG 104 tips  
 AIR TEMP 8.6 C  
 HUMIDITY 23.7 %  
 WATER TEMP 3.4 C

Datalogger Notes:	Database # 657
Datalogger Internal Power:	5
Datalogger External Power:	11.61 10.72 V (volmeter)
Datalogger Memory Used:	6%
Datalogger Clock:	MST
Laptop Clock:	MST
Dessicant:	Good
Datalogger:	Optimum Datalogger DD-128 #105010657
PT:	Keller 730-130 s/n 0303326 3 psi
Power:	Magnacharge 20V 10A DC Battery

Notes:

# Hydrometric Measurement / Site Visit Record

L2 - Kearn Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Kearn Lake  
Location: Kearn Lake  
Site Name: L2  
Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

### Time of Measurement

Date of Measurement: October 26, 2007  
Start Time: 2:15 PM MDT  
End Time: MDT

### Weather Conditions:

Partly Cloudy

### River Conditions:

TD depth 0.9305 meters  
TBRG 104 tips  
AIR TEMP -1.658 C  
HUMIDITY 24 %  
WATER TEMP 2.732415 C

### Personnel & Equipment

Measurement Made By: sm ff  
Data Entry By: sm ff  
Meter Type and No.:

### Level Readings

Bench Mark Reading: north BM in PVC  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other: Rebar near road (golfer BM)  
other: close silver tube

### Setup No. 1

El: 332.571  
El: 332.571  
El:  
El: 332.571  
El: 332.571

### Setup No. 2

El: 332.571  
El: 332.571  
El:  
El: 332.571  
El: 332.571

### Average

332.571  
332.571  
332.571  
332.571  
332.571

Datalogger Notes:		Database # 657	
Datalogger Internal Power:	5		
Datalogger External Power:	11.61	10.72 V (volmeter)	
Datalogger Memory Used:	7%		
Datalogger Clock:	12:57 PM	MST	
Laptop Clock:	1:06 PM	MST	
Dessicant:	Good		
Datalogger:	Optimum Datalogger DD-128 #105010657		
PT:	Keller 730-130 s/n 0303326 3 psi		
Power:	Magnacharge 20V 10A DC Battery		

Notes: solar panel wired with SUNSAVER 6.

# Hydrometric Measurement / Site Visit Record

Kearl Lake - L2



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kearl Lake  
Location: L2  
Site Name: Kearl Lake  
Coordinates & Legal: 484935 E, 6349023 N SE-32-95-8-4

## Time of Measurement

Date of Measurement: December 8, 2007  
Start Time:  
End Time:

## Weather Conditions:

River Conditions: Ice Cover

## Personnel & Equipment

Measurement Made By: SM, FF  
Data Entry By: SMS  
Meter Type and No.:

## Level Readings

Bench Mark Reading: silver tube clos 0.772  
Water Level Reading: 1.510  
Top of Ice Level Reading: 1.483  
Transducer Reading & Est. El.: 0.968  
Other: rebar in white PVC 0.866

## Setup No. 1

El: 332.571  
El: 331.833  
El: 331.860  
El: 330.865  
El: 332.477

## Setup No. 2

0.766 El: 332.571  
1.507 El: 331.830  
1.481 El: 331.856  
0.968 El: 330.862  
0.86 El: 332.477

## Average

331.832  
330.864

## Notes:

RG = 107. RH = 38. Air Temp = -17.36 C. Water Temp = 0.342 C. TD = 0.96799  
Data not downloading from logger.

Datalogger Notes:	Database #657
Datalogger Internal Power:	
Datalogger External Power:	12.0 V
Datalogger Memory Used:	16%
Datalogger Clock:	11:24 MST
Laptop Clock:	11:27 MST
Dessicant:	
Datalogger:	105010657 Optimum DD128
PT:	303326 Keller
Power:	Magnacharge 20V 10A DC Battery



# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: January 14, 2007  
Start Time: 2:20 PM MDT  
End Time:

### Weather Conditions:

-30° C, light wind, Overcast

### River Conditions:

Ice covered

### Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	1.612	1.598
Water Level Reading:	2.314	2.302
Top of Ice Level Reading:	2.292	2.279
Transducer Reading & Calc'd El	1.035	1.035
Other: Nail in tree	0.212	0.198

### Datalogger Notes:

Datalogger Internal Power:	11.34 V	100%
Datalogger External Power:	11.56	74%
Datalogger Memory Used:	25%	
Datalogger Clock:	Jan 14, 2007 14:19	MST
Laptop Clock:	Jan 14, 2007 14:21	MST
Dessicant:	100% good	
Datalogger:	94834-08	
PT:	509001-288	
Power:		

### Photographs taken looking at:

Lake

### Notes:

Data D/L looks good  
Battery changed. Voltage reading same as prior to switch.

# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: February 11, 2007  
Start Time: 1:45 PM MDT  
End Time:

### Weather Conditions:

-28 C, clear, calm

### River Conditions:

Ice covered

### Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	1.554 El: 234.506	1.543 El: 234.506
Water Level Reading:	2.285 El: 233.775	2.265 El: 233.784
Top of Ice Level Reading:	2.259 El: 233.801	2.245 El: 233.804
Transducer Reading & Calc'd El	1.018 El: 232.757	1.018 El: 232.766
Other: Nail in tree	0.148 El: 235.912	0.137 El: 235.912

### Datalogger Notes:

Datalogger Internal Power:	100%
Datalogger External Power:	74%
Datalogger Memory Used:	30%
Datalogger Clock:	1:37PM MST
Laptop Clock:	1:47PM MST
Dessicant:	Good
Datalogger:	94834-08
PT:	509001-288
Power:	Battery

### Photographs taken looking at:

Lake

Notes: Battery changed, reading 77%

# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: March 10, 2007  
Start Time: 12:35 PM MST  
End Time:

### Weather Conditions:

-10 C, cloudy, light wind

### River Conditions:

Ice covered

### Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: JS Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	2.042 El: 234.506	2.015 El: 234.506
Water Level Reading:	2.734 El: 233.814	2.704 El: 233.817
Top of Ice Level Reading:	2.686 El: 233.862	2.647 El: 233.874
Transducer Reading & Calc'd El	1.061 El: 232.753	1.061 El: 232.756
Other: Nail in tree	0.641 El: 235.907	0.612 El: 235.909

### Datalogger Notes:

Datalogger Internal Power:	3	100%
Datalogger External Power:	11.80	74%
Datalogger Memory Used:	35%	
Datalogger Clock:	12:33PM	MST
Laptop Clock:	12:40PM	MST
Dessicant:	5% used	
Datalogger:	94834-08	
PT:	509001-288	
Power:	Battery	

### Photographs taken looking at:

Lake

Notes: battery not changed, logger boxed dropped and repaired. Everything seems to be working correctly

# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: March 28, 2007  
Start Time: 14:09:00 PM MST  
End Time:

### Weather Conditions:

### River Conditions:

### Personnel & Equipment

Measurement Made By: JE, SE  
Data Entry By: PM Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	2.061 El: 234.506	2.076 El: 234.506
Water Level Reading:	2.395 El: 233.846	2.395 El: 233.831
Top of Ice Level Reading:	2.483 El: 233.758	2.475 El: 233.751
Transducer Reading & Calc'd El.:	El:	El:
Other: Nail in tree	0.334 El: 235.907	0.319 El: 235.907

### Datalogger Notes:

### Photographs taken looking at:

Lake

Notes: Leveling completed by HCL  
Nail in Tree used as BM

# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: April 26, 2007  
Start Time: 12:15 PM MST  
End Time:

**Weather Conditions:** +10° C, cloudy, 10-15km/hr winds

**River Conditions:** Open with some ice cover

### Personnel & Equipment

Measurement Made By: JS,JE  
Data Entry By: JS Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	El: 234.506	El: 234.506
Water Level Reading: 2.220	El: 232.286	El: 232.320
Top of Ice Level Reading:	El: 234.506	El: 234.506
Transducer Reading & Calc'd El 1.073	El: 231.213	El: 231.247
Other: Nail in tree 0.157	El: 234.349	El: 234.385

### Datalogger Notes:

Datalogger Internal Power:	11.34V	100%
Datalogger External Power:	12.17	78%
Datalogger Memory Used:	45%	used
Datalogger Clock:	Apr 26, 2007 12:11	MST
Laptop Clock:	Apr 26, 2007 12:30	MST
Dessicant:	5% used	
Datalogger:	94834-08	
PT:	509001-288	
Power:	Battery	

Photographs taken looking at:

Lake

**Notes:** Battery changed, new reading is 81% @ 12.65V

# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: June 18, 2007  
Start Time: 1:16 PM MST  
End Time: 1:20 PM MST

**Weather Conditions:** +20° C, clear, calm

**River Conditions:** open low stage

### Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	1.840	1.819
Water Level Reading:	2.635	2.610
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.965	0.965
Other: Nail in tree	0.442	0.418

### Datalogger Notes:

Datalogger Internal Power:	100%
Datalogger External Power:	81%
Datalogger Memory Used:	50% used
Datalogger Clock:	Jun 18, 2007 12:01 MST
Laptop Clock:	Jun 18, 2007 12:21 MST
Dessicant:	5% used
Datalogger:	94834-08
PT:	509001-288
Power:	Battery

Photographs taken looking at:

Lake

Notes: data looks good

# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: August 8, 2007  
Start Time: 1:01 PM MST  
End Time: 1:18 PM MST

**Weather Conditions:** +20° C, overcast

**River Conditions:** open low stage

### Personnel & Equipment

Measurement Made By: SM/JMS  
Data Entry By: JMS Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	1.775	1.755
Water Level Reading:	2.620	2.603
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.905	0.905
Other: Nail in tree	0.382	0.360

### Datalogger Notes:

Datalogger Internal Power:	100%
Datalogger External Power:	78%
Datalogger Memory Used:	used
Datalogger Clock:	Aug 08, 2007 12:01 MST
Laptop Clock:	Aug 08, 2007 12:11 MST
Dessicant:	Change next time
Datalogger:	94834-08
PT:	509001-288
Power:	Battery

Photographs taken looking at:

Lake

Notes:

# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: September 21, 2007  
Start Time: 3:43 PM MST  
End Time: MST

### Weather Conditions:

mostly clear

### River Conditions:

open low stage

### Personnel & Equipment

Measurement Made By: SM/JMS  
Data Entry By: SM/JMS Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	1.805 El: 234.506	1.768 El: 234.506
Water Level Reading:	2.618 El: 233.693	2.581 El: 233.693
Top of Ice Level Reading:	El: 236.311	El: 236.274
Transducer Reading & Calc'd El	0.948 El: 232.745	0.948 El: 232.745
Other: Nail in tree	0.407 El: 235.904	0.376 El: 235.898

### Datalogger Notes:

Datalogger Internal Power:	100%
Datalogger External Power:	76%
Datalogger Memory Used:	used
Datalogger Clock:	Aug 08, 2007 12:01 MST
Laptop Clock:	Aug 08, 2007 12:11 MST
Dessicant:	Change next time
Datalogger:	94834-08
PT:	509001-288
Power:	Battery

Photographs taken looking at:

Lake

Notes:



# Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Isadore's Lake  
Location: Isadore's Lake  
Site Name: L3  
Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4

### Time of Measurement

Date of Measurement: October 20, 2007  
Start Time: 5:11 PM MST  
End Time: MST

### Weather Conditions:

mostly clear

### River Conditions:

open low stage

### Personnel & Equipment

Measurement Made By: ff sm  
Data Entry By: sm Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: bar in PVC	1.875 El: 234.506	1.818 El: 234.506
Water Level Reading:	3.799 El: 232.582	3.741 El: 232.583
Top of Ice Level Reading:	El: 236.381	El: 236.324
Transducer Reading & Calc'd El	0.911 El: 231.671	0.911 El: 231.672
Other: Nail in tree	0.477 El: 235.904	0.423 El: 235.901

### Datalogger Notes:

Datalogger Internal Power:	100%	
Datalogger External Power:	76%	
Datalogger Memory Used:	used	
Datalogger Clock:		MST
Laptop Clock:		MST
Dessicant:	new	
Datalogger:	94834-08	
PT:	509001-288	
Power:	Battery	

### Photographs taken looking at:

Lake

### Notes:

memory cleared 100% free  
TD re-wired

# Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

### Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Time of Measurement

Date of Measurement: January 12, 2007  
Start Time: 10:10 AM MST  
End Time: 10:33 AM MST

### Level Readings

Bench Mark Reading: Pin on RB 0.814  
Water Level Reading: at TD 2.085  
Top of Ice Level Reading: 2.025  
Transducer Reading & Calc'd El.:  
Other:

### Setup No. 1

El: 297.990  
El: 296.719  
El: 296.779  
El:  
El:

### Setup No. 2

0.766 0.709 297.990  
2.036 El: 296.720  
1.990 El: 296.766  
El:  
El:

### Average

296.720

Weather Conditions: -27 °C, overcast, light wind

River Conditions: Complete ice cover

### Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
57.50	0.00	0.10			0.000	0.90	1	57.50	57.75	0.007	0.006	0.09	0.02	0.000	0%	
58.00	0.44	0.10			0.027	0.90	2	57.75	58.20	0.027	0.025	0.34	0.15	0.004	3%	
58.40	0.70	0.15			0.061	0.90	3	58.20	58.70	0.061	0.055	0.55	0.28	0.015	13%	
59.00	0.71	0.22			0.055	0.90	4	58.70	59.10	0.055	0.049	0.49	0.20	0.010	9%	
59.20	0.80	0.24			0.058	0.90	5	59.10	59.30	0.058	0.052	0.56	0.11	0.006	5%	
59.40	0.81	0.30			0.055	0.90	6	59.30	59.50	0.055	0.049	0.51	0.10	0.005	5%	
59.60	0.81	0.30			0.058	0.90	7	59.50	59.70	0.058	0.052	0.51	0.10	0.005	5%	
59.80	0.92	0.35			0.055	0.90	8	59.70	59.90	0.055	0.049	0.57	0.11	0.006	5%	
60.00	0.90	0.35			0.046	0.90	9	59.90	60.10	0.046	0.041	0.55	0.11	0.005	4%	
60.20	0.88	0.38			0.040	0.90	10	60.10	60.28	0.040	0.036	0.50	0.09	0.003	3%	
60.35	0.88	0.35			0.043	0.90	11	60.28	60.43	0.043	0.038	0.53	0.08	0.003	3%	
60.50	0.90	0.35			0.043	0.90	12	60.43	60.60	0.043	0.038	0.55	0.10	0.004	3%	
60.70	0.90	0.35			0.040	0.90	13	60.60	60.80	0.040	0.036	0.55	0.11	0.004	4%	
60.90	0.89	0.35			0.043	0.90	14	60.80	60.95	0.043	0.038	0.54	0.08	0.003	3%	
61.00	0.97	0.35			0.043	0.90	15	60.95	61.05	0.043	0.038	0.62	0.06	0.002	2%	
61.10	0.92	0.35			0.046	0.90	16	61.05	61.20	0.046	0.041	0.57	0.09	0.004	3%	
61.30	0.90	0.35			0.049	0.90	17	61.20	61.38	0.049	0.044	0.55	0.10	0.004	4%	
61.45	0.80	0.33			0.052	0.90	18	61.38	61.53	0.052	0.047	0.47	0.07	0.003	3%	
61.60	0.80	0.33			0.046	0.90	19	61.53	61.70	0.046	0.041	0.47	0.08	0.003	3%	
61.80	0.75	0.31			0.046	0.90	20	61.70	61.90	0.046	0.041	0.44	0.09	0.004	3%	
62.00	0.73	0.33			0.043	0.90	21	61.90	62.05	0.043	0.038	0.40	0.06	0.002	2%	
62.10	0.68	0.32			0.040	0.90	22	62.05	62.20	0.040	0.036	0.36	0.05	0.002	2%	
62.30	0.71	0.31			0.037	0.90	23	62.20	62.40	0.037	0.033	0.40	0.08	0.003	2%	
62.50	0.71	0.30			0.037	0.90	24	62.40	62.60	0.037	0.033	0.41	0.08	0.003	2%	
62.70	0.72	0.30			0.037	0.90	25	62.60	62.78	0.037	0.033	0.42	0.07	0.002	2%	
62.85	0.64	0.29			0.034	0.90	26	62.78	62.98	0.034	0.030	0.35	0.07	0.002	2%	
63.10	0.61	0.26			0.027	0.90	27	62.98	63.18	0.027	0.025	0.35	0.07	0.002	2%	
63.25	0.62	0.25			0.030	0.90	28	63.18	63.35	0.030	0.027	0.37	0.06	0.002	2%	
63.45	0.47	0.25			0.027	0.90	29	63.35	63.68	0.027	0.025	0.22	0.07	0.002	2%	
63.90	0.00	0.25			0.000	0.90	30	63.68	63.90	0.007	0.006	0.06	0.01	0.000	0%	
Total Flow:														0.112		

Total Flow:	0.112	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	2.76	(m <sup>2</sup> )
Top Width:	6.40	(m)
Hydraulic Depth:	0.432	(m)
Mean Velocity:	0.040	(m/s)
Froude Number	0.020	
Photographs taken looking at: Upstream, downstream, across		

### Datalogger Notes:

Datalogger Internal Power:

Datalogger External Power:

Datalogger Memory Used:

Datalogger Clock:

Laptop Clock:

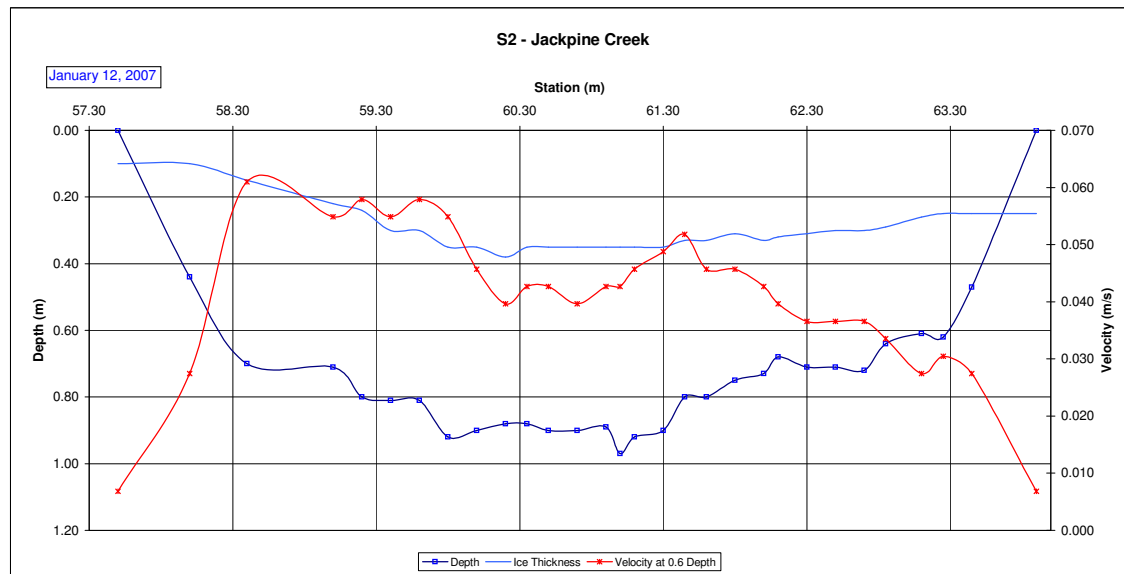
Dessicant:

Datalogger:

PT:

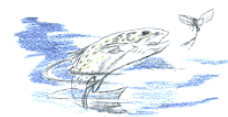
Power:

Notes: MMT done under the bridge.



# Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

## Time of Measurement

Date of Measurement: February 8, 2007  
Start Time: 12:30 PM MST  
End Time: 1:00 PM MST

## Weather Conditions:

-27 °C, overcast, light wind

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Pin on RB 0.726  
Water Level Reading: 2.009  
Top of Ice Level Reading: 1.981  
Transducer Reading & Calc'd El.:  
Other:

## Setup No. 1

El: 297.990  
El: 296.707  
El: 296.735  
El:  
El:

## Setup No. 2

0.704 0.709 297.990  
El: 296.701  
El: 296.735  
El:  
El:

296.704

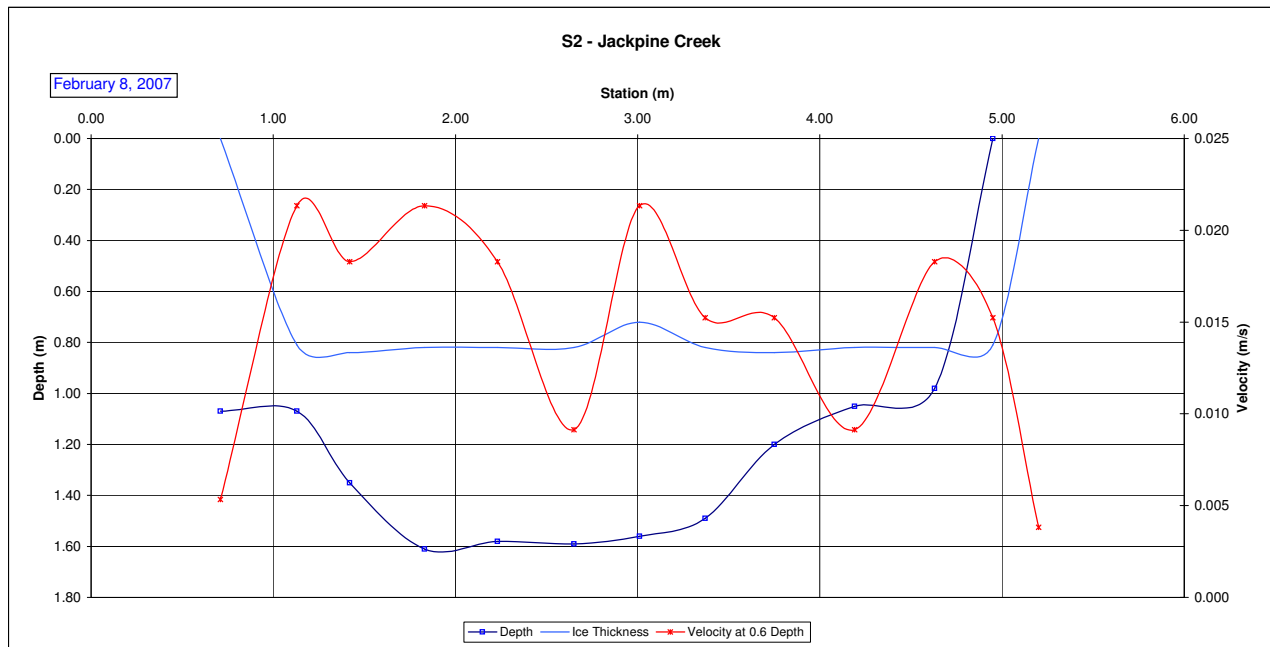
Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.71	0.00	0.00			0.000	0.90	1	0.71	0.92	0.005	0.005	0.07	0.01	0.000	0%	
1.13	1.07	0.81			0.021	0.90	2	0.92	1.28	0.021	0.019	0.26	0.09	0.002	5%	
1.42	1.07	0.84			0.018	0.90	3	1.28	1.63	0.018	0.016	0.51	0.18	0.003	9%	
1.83	1.35	0.82			0.021	0.90	4	1.63	2.03	0.021	0.019	0.79	0.32	0.006	19%	
2.23	1.61	0.82			0.018	0.90	5	2.03	2.44	0.018	0.016	0.76	0.31	0.005	16%	
2.65	1.58	0.82			0.009	0.90	6	2.44	2.83	0.009	0.008	0.77	0.30	0.002	8%	
3.01	1.59	0.72			0.021	0.90	7	2.83	3.19	0.021	0.019	0.84	0.30	0.006	18%	
3.37	1.56	0.82			0.015	0.90	8	3.19	3.56	0.015	0.014	0.67	0.25	0.003	11%	
3.75	1.49	0.84			0.015	0.90	9	3.56	3.97	0.015	0.014	0.36	0.15	0.002	6%	
4.19	1.20	0.82			0.009	0.90	10	3.97	4.41	0.009	0.008	0.23	0.10	0.001	3%	
4.63	1.05	0.82			0.018	0.90	11	4.41	4.79	0.018	0.016	0.16	0.06	0.001	3%	
4.95	0.98	0.81			0.015	0.90	12	4.79	5.08	0.015	0.014	0.17	0.05	0.001	2%	
5.20	0.00	0.00			0.000	0.90	13	5.08	5.20	0.004	0.003	0.04	0.01	0.000	0%	
Total Flow:														0.032	1	

Total Flow:	0.032	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	2.13	(m <sup>2</sup> )
Top Width:	4.49	(m)
Hydraulic Depth:	0.474	(m)
Mean Velocity:	0.015	(m/s)
Froude Number	0.007	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power:  
Datalogger External Power:  
Datalogger Memory Used:  
Datalogger Clock:  
Laptop Clock:  
Dessicant:  
Datalogger:  
PT:  
Power:

Notes: Very thick ice, water measured likely a pool where it has not frozen to depth yet.



# Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

## Time of Measurement

Date of Measurement: March 5, 2007  
Start Time: 4:30 PM MST  
End Time: 4:47 PM MST

## Weather Conditions:

-16 °C, overcast, light snow

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Pin on RB 0.927  
Water Level Reading: 2.191  
Top of Ice Level Reading: 2.038  
Transducer Reading & Calc'd El.:  
Other:

## Setup No. 1

El: 297.990  
El: 296.726  
El: 296.879  
El:

## Setup No. 2

0.709 297.990  
El: 296.726  
El: 296.864  
El:

296.726

## Measurement Data

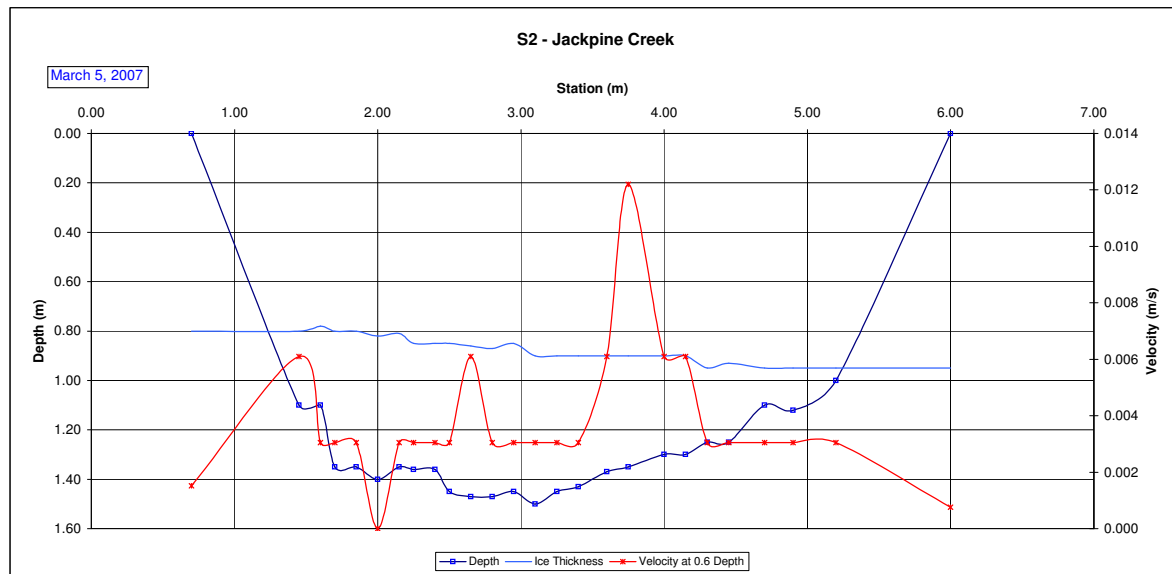
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
0.70	0.00	0.80			0.000	0.90	1	0.70	1.08	0.002	0.001	0.08	0.03	0.000	1%
1.45	1.10	0.80			0.006	0.90	2	1.08	1.53	0.006	0.005	0.30	0.14	0.001	11%
1.60	1.10	0.78			0.003	0.90	3	1.53	1.65	0.003	0.003	0.32	0.04	0.000	2%
1.70	1.35	0.80			0.003	0.90	4	1.65	1.78	0.003	0.003	0.55	0.07	0.000	3%
1.85	1.35	0.80			0.003	0.90	5	1.78	1.93	0.003	0.003	0.55	0.08	0.000	3%
2.00	1.40	0.82			0.000	0.90	6	1.93	2.08	0.000	0.000	0.58	0.09	0.000	0%
2.15	1.35	0.81			0.003	0.90	7	2.08	2.20	0.003	0.003	0.54	0.07	0.000	3%
2.25	1.36	0.85			0.003	0.90	8	2.20	2.33	0.003	0.003	0.51	0.06	0.000	3%
2.40	1.36	0.85			0.003	0.90	9	2.33	2.45	0.003	0.003	0.51	0.06	0.000	3%
2.50	1.45	0.85			0.003	0.90	10	2.45	2.58	0.003	0.003	0.60	0.08	0.000	3%
2.65	1.47	0.86			0.006	0.90	11	2.58	2.73	0.006	0.005	0.61	0.09	0.001	8%
2.80	1.47	0.87			0.003	0.90	12	2.73	2.88	0.003	0.003	0.60	0.09	0.000	4%
2.95	1.45	0.85			0.003	0.90	13	2.88	3.03	0.003	0.003	0.60	0.09	0.000	4%
3.10	1.50	0.90			0.003	0.90	14	3.03	3.18	0.003	0.003	0.60	0.09	0.000	4%
3.25	1.45	0.90			0.003	0.90	15	3.18	3.33	0.003	0.003	0.55	0.08	0.000	3%
3.40	1.43	0.90			0.003	0.90	16	3.33	3.50	0.003	0.003	0.53	0.09	0.000	4%
3.60	1.37	0.90			0.006	0.90	17	3.50	3.68	0.006	0.005	0.47	0.08	0.000	7%
3.75	1.35	0.90			0.012	0.90	18	3.68	3.88	0.012	0.011	0.45	0.09	0.001	15%
4.00	1.30	0.90			0.006	0.90	19	3.88	4.08	0.006	0.005	0.40	0.08	0.000	7%
4.15	1.30	0.90			0.006	0.90	20	4.08	4.23	0.006	0.005	0.40	0.06	0.000	5%
4.30	1.25	0.95			0.003	0.90	21	4.23	4.38	0.003	0.003	0.30	0.05	0.000	2%
4.45	1.25	0.93			0.003	0.90	22	4.38	4.58	0.003	0.003	0.32	0.06	0.000	3%
4.70	1.10	0.95			0.003	0.90	23	4.58	4.80	0.003	0.003	0.15	0.03	0.000	1%
4.90	1.12	0.95			0.003	0.90	24	4.80	5.05	0.003	0.003	0.17	0.04	0.000	2%
5.20	1.00	0.95			0.003	0.90	25	5.05	5.60	0.003	0.003	0.05	0.03	0.000	1%
6.00	0.00	0.95			0.000	0.90	26	5.60	6.00	0.001	0.001	0.01	0.01	0.000	0%
Total Flow:														0.007	

Total Flow:	0.007	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	1.78	(m <sup>2</sup> )
Top Width:	5.30	(m)
Hydraulic Depth:	0.335	(m)
Mean Velocity:	0.004	(m/s)
Froude Number	0.002	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power:  
Datalogger External Power:  
Datalogger Memory Used:  
Datalogger Clock:  
Laptop Clock:  
Dessicant:  
Datalogger:  
PT:  
Power:

Notes: Very thick ice, low velocity, measurement may underestimate flow.  
Flow measurement accuracy perceived to be low due to very low velocities.  
Minimal flow.



Hydrometric Measurement / Site Visit Record  
S2 - Jackpine Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

Time of Measurement

Date of Measurement: March 30, 2007  
Start Time: 11:05 AM MST  
End Time: MST

Weather Conditions: -3 °C, overcast, winds se 15-20 kph  
River Conditions: Snow covered with open sections

Notes:  
Levelling completed by HCL

Personnel & Equipment

Measurement Made By: JS, SE  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

Level Readings

		Setup No. 1		Setup No. 2	
Bench Mark Reading: Pin on RB	0.850	El:	297.990	0.816	0.709 297.990
Water Level Reading:	2.072	El:	296.768	2.034	El: 296.772 296.770
Top of Ice Level Reading:	2.068	El:	296.772	2.025	El: 296.781
Transducer Reading & Calc'd El.:		El:			El:
Other:		El:			El:

# Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

## Time of Measurement

Date of Measurement: April 24, 2007  
Start Time: 5:50 PM MDT  
End Time: 6:15 PM MDT

## Weather Conditions:

River Conditions: Open

## Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Pin on RB 0.706  
Water Level Reading: 1.496  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El. 0.798  
Other:

## Setup No. 1

El: 297.990  
El: 297.200  
El: 298.696  
El: 296.402  
El:

## Setup No. 2

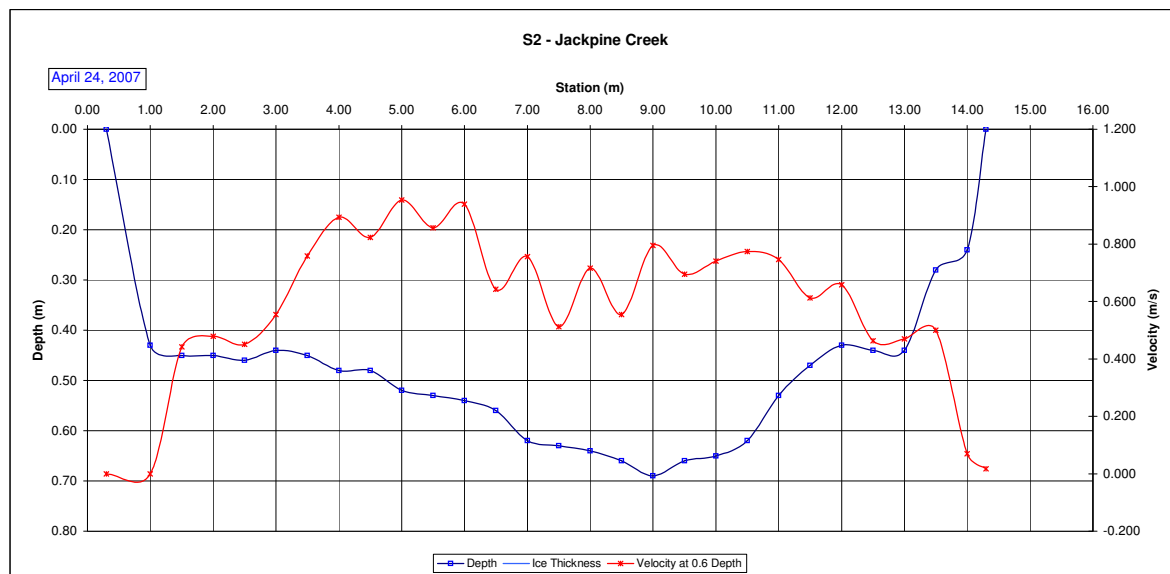
0.709 297.990  
1.443 297.201  
El: 298.644  
El: 296.403 296.403  
El:

Measured Data							Calculated Data								Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)	
LB	0.30	0.00			0.000	1.00	1	0.30	0.65	0.000	0.000	0.11	0.04	0.000	0%
	1.00	0.43			0.000	1.00	2	0.65	1.25	0.000	0.000	0.43	0.26	0.000	0%
	1.50	0.45			0.442	1.00	3	1.25	1.75	0.442	0.442	0.45	0.23	0.099	2%
	2.00	0.45			0.479	1.00	4	1.75	2.25	0.479	0.479	0.45	0.23	0.108	2%
	2.50	0.46			0.451	1.00	5	2.25	2.75	0.451	0.451	0.46	0.23	0.104	2%
	3.00	0.44			0.555	1.00	6	2.75	3.25	0.555	0.555	0.44	0.22	0.122	3%
	3.50	0.45			0.759	1.00	7	3.25	3.75	0.759	0.759	0.45	0.23	0.171	4%
	4.00	0.48			0.893	1.00	8	3.75	4.25	0.893	0.893	0.48	0.24	0.214	5%
	4.50	0.48			0.823	1.00	9	4.25	4.75	0.823	0.823	0.48	0.24	0.198	4%
	5.00	0.52			0.954	1.00	10	4.75	5.25	0.954	0.954	0.52	0.26	0.248	6%
	5.50	0.53			0.856	1.00	11	5.25	5.75	0.856	0.856	0.53	0.27	0.227	5%
	6.00	0.54			0.939	1.00	12	5.75	6.25	0.939	0.939	0.54	0.27	0.253	6%
	6.50	0.56			0.643	1.00	13	6.25	6.75	0.643	0.643	0.56	0.28	0.180	4%
	7.00	0.62			0.756	1.00	14	6.75	7.25	0.756	0.756	0.62	0.31	0.234	5%
	7.50	0.63			0.512	1.00	15	7.25	7.75	0.512	0.512	0.63	0.32	0.161	4%
	8.00	0.64			0.716	1.00	16	7.75	8.25	0.716	0.716	0.64	0.32	0.229	5%
	8.50	0.66			0.555	1.00	17	8.25	8.75	0.555	0.555	0.66	0.33	0.183	4%
	9.00	0.69			0.796	1.00	18	8.75	9.25	0.796	0.796	0.69	0.35	0.274	6%
	9.50	0.66			0.695	1.00	19	9.25	9.75	0.695	0.695	0.66	0.33	0.229	5%
	10.00	0.65			0.741	1.00	20	9.75	10.25	0.741	0.741	0.65	0.33	0.241	5%
	10.50	0.62			0.774	1.00	21	10.25	10.75	0.774	0.774	0.62	0.31	0.240	5%
	11.00	0.53			0.747	1.00	22	10.75	11.25	0.747	0.747	0.53	0.27	0.198	4%
	11.50	0.47			0.613	1.00	23	11.25	11.75	0.613	0.613	0.47	0.24	0.144	3%
	12.00	0.43			0.658	1.00	24	11.75	12.25	0.658	0.658	0.43	0.22	0.142	3%
	12.50	0.44			0.463	1.00	25	12.25	12.75	0.463	0.463	0.44	0.22	0.102	2%
	13.00	0.44			0.469	1.00	26	12.75	13.25	0.469	0.469	0.44	0.22	0.103	2%
	13.50	0.28			0.500	1.00	27	13.25	13.75	0.500	0.500	0.28	0.14	0.070	2%
	14.00	0.24			0.070	1.00	28	13.75	14.15	0.070	0.070	0.24	0.10	0.007	0%
RB	14.30	0.00			0.000	1.00	29	14.15	14.30	0.018	0.018	0.06	0.01	0.000	0%
Total Flow:														4.482	1

Total Flow:	4.482	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	6.96	(m <sup>2</sup> )
Top Width:	14.00	(m)
Hydraulic Depth:	0.497	(m)
Mean Velocity:	0.644	(m/s)
Froude Number	0.292	
Photographs taken looking at: Upstream, downstream, across		

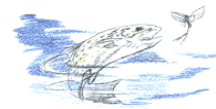
Datalogger Notes:	
Datalogger Internal Power:	100%
Datalogger External Power:	80%
Datalogger Memory Used:	0%
Datalogger Clock:	Apr 24, 2007 17:51
Laptop Clock:	Apr 25, 2007 17:51
Dessicant:	Good
Datalogger:	207085
PT:	971024
Power:	Battery

Notes:



# Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4  
Time of Measurement: June 14, 2007  
Date of Measurement: 7:54 AM MDT  
Start Time: 8:10 AM MDT  
End Time:

## Personnel & Equipment

Measurement Made By: sm, pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Pin on RB 0.765  
Water Level Reading: 1.890  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.: 0.457  
Other:

## Setup No. 1

El: 297.990  
El: 296.865  
El: 298.755  
El: 296.408  
El:

## Setup No. 2

0.807 0.709 297.990  
1.931 El: 296.866 296.866  
El: 298.797  
0.457 El: 296.409 296.409  
El:

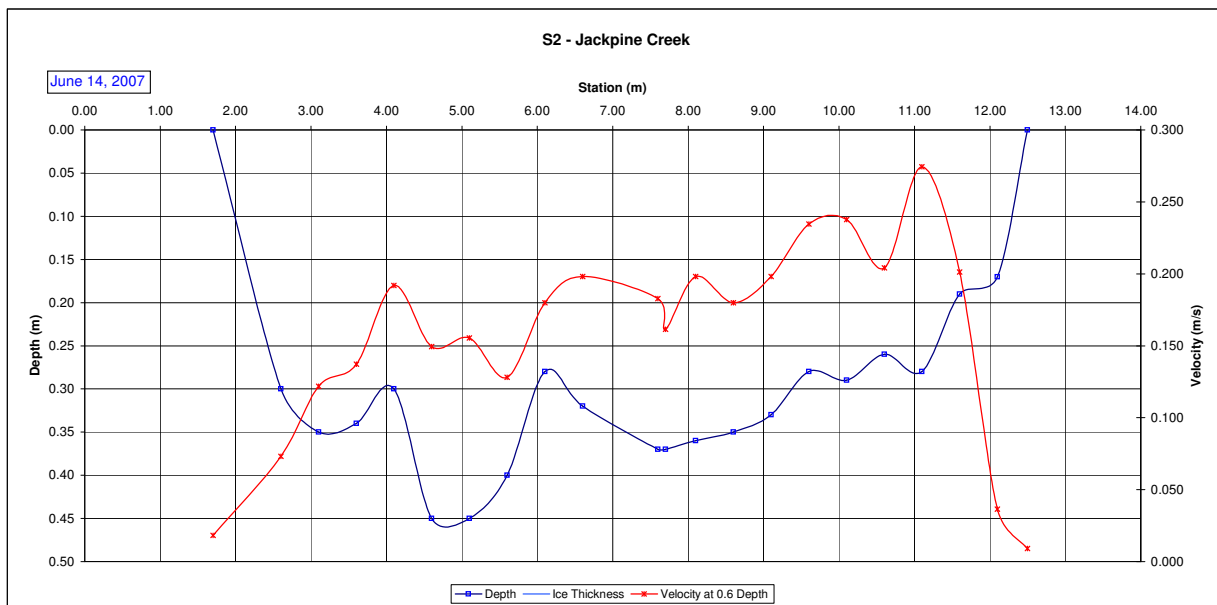
Weather Conditions: warm, clear, calm  
River Conditions: Open

Measured Data						Measurement Data										Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)		
1.70	0.00				0.000	1.00	1	1.70	2.15	0.018	0.018	0.08	0.03	0.001	0%	
2.60	0.30				0.073	1.00	2	2.15	2.85	0.073	0.073	0.30	0.21	0.015	3%	
3.10	0.35				0.122	1.00	3	2.85	3.35	0.122	0.122	0.35	0.18	0.021	4%	
3.60	0.34				0.137	1.00	4	3.35	3.85	0.137	0.137	0.34	0.17	0.023	4%	
4.10	0.30				0.192	1.00	5	3.85	4.35	0.192	0.192	0.30	0.15	0.029	5%	
4.60	0.45				0.149	1.00	6	4.35	4.85	0.149	0.149	0.45	0.23	0.034	6%	
5.10	0.45				0.155	1.00	7	4.85	5.35	0.155	0.155	0.45	0.23	0.035	6%	
5.60	0.40				0.128	1.00	8	5.35	5.85	0.128	0.128	0.40	0.20	0.026	5%	
6.10	0.28				0.180	1.00	9	5.85	6.35	0.180	0.180	0.28	0.14	0.025	5%	
6.60	0.32				0.198	1.00	10	6.35	7.10	0.198	0.198	0.32	0.24	0.048	9%	
7.60	0.37				0.183	1.00	11	7.10	7.65	0.183	0.183	0.37	0.20	0.037	7%	
7.70	0.37				0.162	1.00	12	7.65	7.90	0.162	0.162	0.37	0.09	0.015	3%	
8.10	0.36				0.198	1.00	13	7.90	8.35	0.198	0.198	0.36	0.16	0.032	6%	
8.60	0.35				0.180	1.00	14	8.35	8.85	0.180	0.180	0.35	0.18	0.031	6%	
9.10	0.33				0.198	1.00	15	8.85	9.35	0.198	0.198	0.33	0.17	0.033	6%	
9.60	0.28				0.235	1.00	16	9.35	9.85	0.235	0.235	0.28	0.14	0.033	6%	
10.10	0.29				0.238	1.00	17	9.85	10.35	0.238	0.238	0.29	0.15	0.034	6%	
10.60	0.26				0.204	1.00	18	10.35	10.85	0.204	0.204	0.26	0.13	0.027	5%	
11.10	0.28				0.274	1.00	19	10.85	11.35	0.274	0.274	0.28	0.14	0.038	7%	
11.60	0.19				0.201	1.00	20	11.35	11.85	0.201	0.201	0.19	0.10	0.019	3%	
12.10	0.17				0.037	1.00	21	11.85	12.30	0.037	0.037	0.17	0.08	0.003	1%	
12.50	0.00				0.000	1.00	22	12.30	12.50	0.009	0.009	0.04	0.01	0.000	0%	
													Total Flow:		0.559	1

Total Flow:	0.559	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	3.30	(m <sup>2</sup> )
Top Width:	10.80	(m)
Hydraulic Depth:	0.306	(m)
Mean Velocity:	0.169	(m/s)
Froude Number	0.098	
Photographs taken looking at: Upstream, downstream, across		

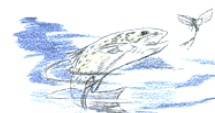
Datalogger Notes:	
Datalogger Internal Power:	100%
Datalogger External Power:	77%
Datalogger Memory Used:	15%
Datalogger Clock:	Jun 14, 2007 06:33
Laptop Clock:	Jun 14, 2007 06:33
Dessicant:	Good
Datalogger:	207085
PT:	971024
Power:	Battery

Notes:



# Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

## Time of Measurement

Date of Measurement: August 8, 2007  
Start Time: 4:10 PM MDT  
End Time: 4:20 PM MDT

## Weather Conditions:

20C Overcast

## River Conditions:

Open, Low Stage

## Personnel & Equipment

Measurement Made By: SM, JMS  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Pin on RB 0.878  
Water Level Reading: 2.095  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El. 0.304  
Other:

## Setup No. 1

El: 297.990  
El: 296.773  
El: 298.868  
El: 296.469

## Setup No. 2

El: 297.990  
El: 296.771  
El: 298.847  
El: 296.467

296.772

296.468

## Measurement Data

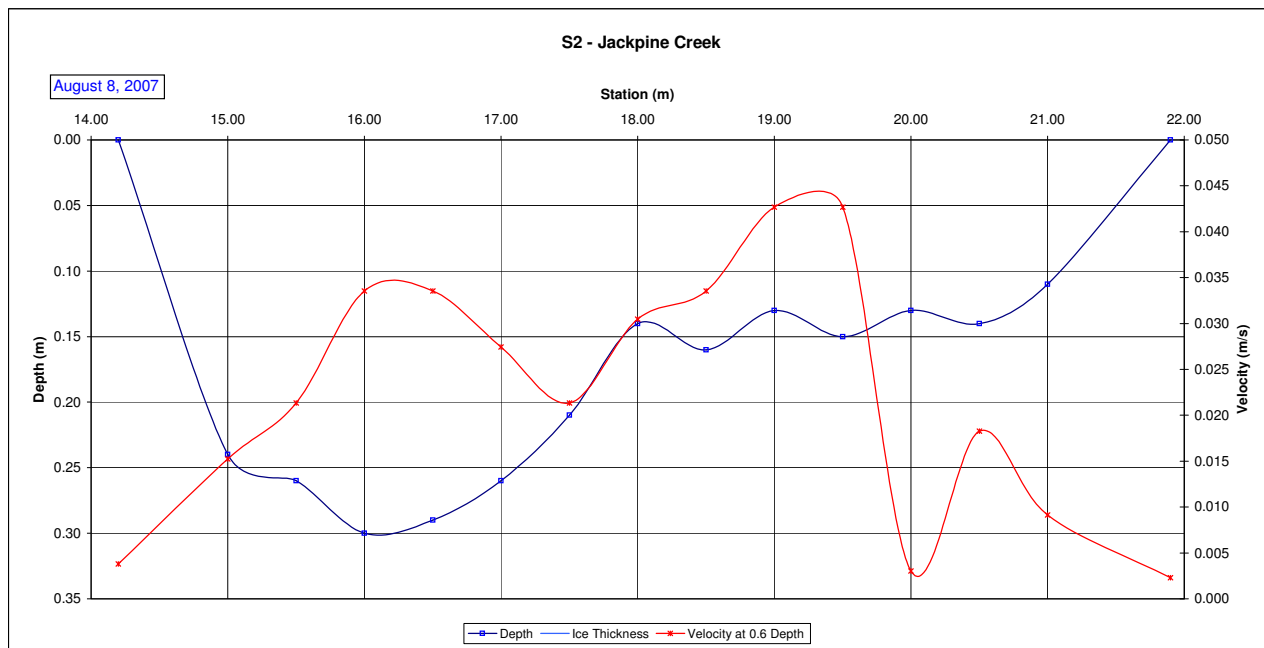
Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
14.20	0.00				0.000	1.00	1	14.20	14.60	0.004	0.004	0.06	0.02	0.000	0%	
15.00	0.24				0.015	1.00	2	14.60	15.25	0.015	0.015	0.24	0.16	0.002	7%	
15.50	0.26				0.021	1.00	3	15.25	15.75	0.021	0.021	0.26	0.13	0.003	8%	
16.00	0.30				0.034	1.00	4	15.75	16.25	0.034	0.034	0.30	0.15	0.005	15%	
16.50	0.29				0.034	1.00	5	16.25	16.75	0.034	0.034	0.29	0.15	0.005	15%	
17.00	0.26				0.027	1.00	6	16.75	17.25	0.027	0.027	0.26	0.13	0.004	11%	
17.50	0.21				0.021	1.00	7	17.25	17.75	0.021	0.021	0.21	0.11	0.002	7%	
18.00	0.14				0.030	1.00	8	17.75	18.25	0.030	0.030	0.14	0.07	0.002	6%	
18.50	0.16				0.034	1.00	9	18.25	18.75	0.034	0.034	0.16	0.08	0.003	8%	
19.00	0.13				0.043	1.00	10	18.75	19.25	0.043	0.043	0.13	0.07	0.003	8%	
19.50	0.15				0.043	1.00	11	19.25	19.75	0.043	0.043	0.15	0.08	0.003	10%	
20.00	0.13				0.003	1.00	12	19.75	20.25	0.003	0.003	0.13	0.07	0.000	1%	
20.50	0.14				0.018	1.00	13	20.25	20.75	0.018	0.018	0.14	0.07	0.001	4%	
21.00	0.11				0.009	1.00	14	20.75	21.00	0.009	0.009	0.11	0.03	0.000	1%	
21.90	0.00				0.000	1.00	15	21.00	21.90	0.002	0.002	0.03	0.02	0.000	0%	
Total Flow:														0.034		

Total Flow:	0.034	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.32	(m <sup>2</sup> )
Top Width:	7.70	(m)
Hydraulic Depth:	0.171	(m)
Mean Velocity:	0.025	(m/s)
Froude Number	0.020	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power:  
Datalogger Memory Used: 2/3  
Datalogger Clock: Aug 08, 2007 14:38  
Laptop Clock: Aug 08, 2007 14:39  
Dessicant: Good  
Datalogger: 207085  
PT: 971024  
Power: Battery

Notes: data looks acceptable  
current meter 50 m DS of station  
no thermister added no port





# Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

## Time of Measurement

Date of Measurement: September 20, 2007  
Start Time: 4:43 PM MDT  
End Time: 3:00 PM MDT

## Weather Conditions:

cloudy drizzle

## River Conditions:

higher

## Personnel & Equipment

Measurement Made By: SM, JMS  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Pin on RB 0.892  
Water Level Reading: 1.958  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El. 0.524  
Other:

## Setup No. 1

El: 297.990  
El: 296.924  
El: 298.882  
El: 296.400

## Setup No. 2

0.879 0.709 297.990  
1.945 El: 296.924 296.924  
El: 298.869  
0.524 El: 296.400 296.400  
El:

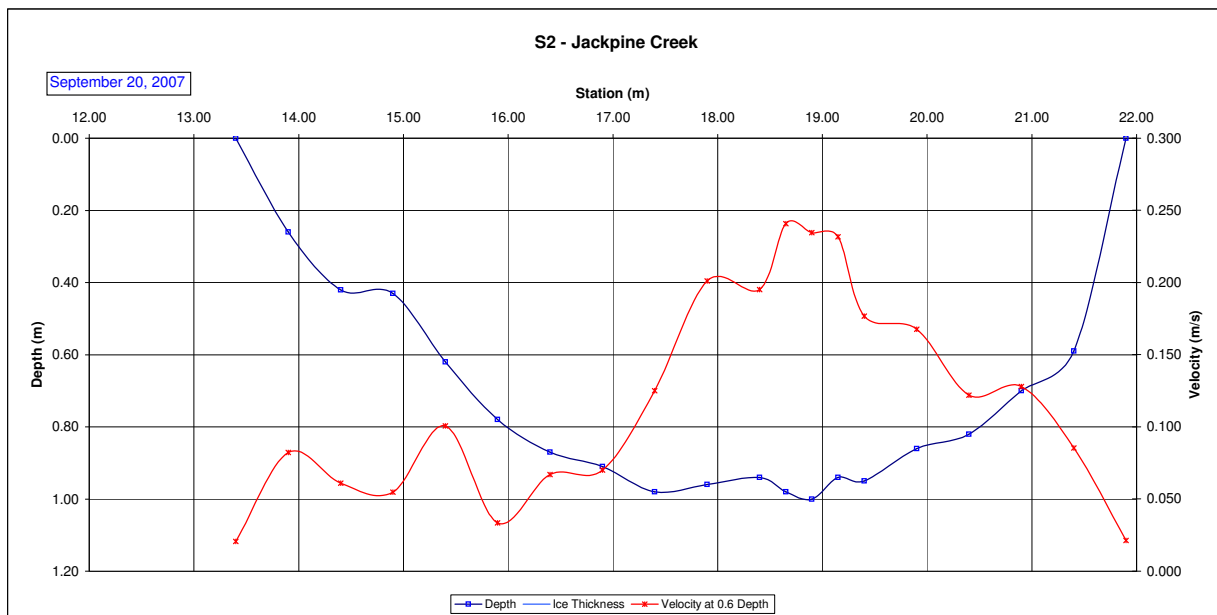
Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
13.40	0.00				0.000	1.00	1	13.40	13.65	0.021	0.021	0.07	0.02	0.000	0%	
13.90	0.26				0.082	1.00	2	13.65	14.15	0.082	0.082	0.26	0.13	0.011	1%	
14.40	0.42				0.061	1.00	3	14.15	14.65	0.061	0.061	0.42	0.21	0.013	2%	
14.90	0.43				0.055	1.00	4	14.65	15.15	0.055	0.055	0.43	0.22	0.012	1%	
15.40	0.62				0.101	1.00	5	15.15	15.65	0.101	0.101	0.62	0.31	0.031	4%	
15.90	0.78				0.034	1.00	6	15.65	16.15	0.034	0.034	0.78	0.39	0.013	2%	
16.40	0.87				0.067	1.00	7	16.15	16.65	0.067	0.067	0.87	0.44	0.029	4%	
16.90	0.91				0.070	1.00	8	16.65	17.15	0.070	0.070	0.91	0.46	0.032	4%	
17.40	0.98				0.125	1.00	9	17.15	17.65	0.125	0.125	0.98	0.49	0.061	8%	
17.90	0.96				0.201	1.00	10	17.65	18.15	0.201	0.201	0.96	0.48	0.097	12%	
18.40	0.94				0.195	1.00	11	18.15	18.53	0.195	0.195	0.94	0.35	0.069	9%	
18.65	0.98				0.241	1.00	12	18.53	18.78	0.241	0.241	0.98	0.25	0.059	7%	
18.90	1.00				0.235	1.00	13	18.78	19.03	0.235	0.235	1.00	0.25	0.059	7%	
19.15	0.94				0.232	1.00	14	19.03	19.28	0.232	0.232	0.94	0.24	0.054	7%	
19.40	0.95				0.177	1.00	15	19.28	19.65	0.177	0.177	0.95	0.36	0.063	8%	
19.90	0.86				0.168	1.00	16	19.65	20.15	0.168	0.168	0.86	0.43	0.072	9%	
20.40	0.82				0.122	1.00	17	20.15	20.65	0.122	0.122	0.82	0.41	0.050	6%	
20.90	0.70				0.128	1.00	18	20.65	21.15	0.128	0.128	0.70	0.35	0.045	6%	
21.40	0.59				0.085	1.00	19	21.15	21.65	0.085	0.085	0.59	0.30	0.025	3%	
21.90	0.00				0.000	1.00	20	21.65	21.90	0.021	0.021	0.15	0.04	0.001	0%	
Total Flow:														0.795	1	

Total Flow:	0.795	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	6.09	(m <sup>2</sup> )
Top Width:	8.50	(m)
Hydraulic Depth:	0.717	(m)
Mean Velocity:	0.131	(m/s)
Froude Number	0.049	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	
Datalogger Internal Power:	100%
Datalogger External Power:	
Datalogger Memory Used:	2/3
Datalogger Clock:	Aug 08, 2007 14:38
Laptop Clock:	Aug 08, 2007 14:39
Dessicant:	Good
Datalogger:	207085
PT:	971024
Power:	Battery

Notes:

flow high



## Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



## Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Jackpine Creek  
 Location: Jackpine Creek  
 Site Name: S2  
 Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

## Personnel &amp; Equipment

Measurement Made By: SM, JMS  
 Data Entry By: sm  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

## Time of Measurement

Date of Measurement: October 20, 2007  
 Start Time: 12:50 PM MDT  
 End Time: 1:03 PM MDT

## Level Readings

Bench Mark Reading: Pin on RB 0.858  
 Water Level Reading: 1.931  
 Top of Ice Level Reading:  
 Transducer Reading & Calc'd El. 0.498  
 Other:

## Setup No. 1

El: 297.990  
 El: 296.917  
 El: 298.848  
 El: 296.419

## Setup No. 2

El: 297.990  
 El: 296.914  
 El: 298.842  
 El: 296.416

## Weather Conditions:

Mostly cloudy, 5C, Calm

## River Conditions:

Moderate, Open

## Measurement Data

Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
13.10	0.00				0.000	1.00	1	13.10	13.25	0.025	0.025	0.06	0.01	0.000	0%
13.40	0.22				0.101	1.00	2	13.25	13.45	0.101	0.101	0.22	0.04	0.004	1%
13.50	0.24				0.131	1.00	3	13.45	13.75	0.131	0.131	0.24	0.07	0.009	1%
14.00	0.32				0.110	1.00	4	13.75	14.25	0.110	0.110	0.32	0.16	0.018	2%
14.50	0.34				0.155	1.00	5	14.25	14.63	0.155	0.155	0.34	0.13	0.020	2%
14.75	0.36				0.171	1.00	6	14.63	14.88	0.171	0.171	0.36	0.09	0.015	2%
15.00	0.37				0.201	1.00	7	14.88	15.13	0.201	0.201	0.37	0.09	0.019	2%
15.25	0.31				0.195	1.00	8	15.13	15.38	0.195	0.195	0.31	0.08	0.015	2%
15.50	0.30				0.180	1.00	9	15.38	15.63	0.180	0.180	0.30	0.08	0.013	2%
15.75	0.50				0.241	1.00	10	15.63	15.88	0.241	0.241	0.50	0.13	0.030	4%
16.00	0.55				0.189	1.00	11	15.88	16.13	0.189	0.189	0.55	0.14	0.026	3%
16.25	0.56				0.195	1.00	12	16.13	16.38	0.195	0.195	0.56	0.14	0.027	3%
16.50	0.55				0.165	1.00	13	16.38	16.63	0.165	0.165	0.55	0.14	0.023	3%
16.75	0.46				0.183	1.00	14	16.63	16.88	0.183	0.183	0.46	0.12	0.021	3%
17.00	0.47				0.186	1.00	15	16.88	17.13	0.186	0.186	0.47	0.12	0.022	3%
17.25	0.45				0.183	1.00	16	17.13	17.38	0.183	0.183	0.45	0.11	0.021	2%
17.50	0.45				0.235	1.00	17	17.38	17.63	0.235	0.235	0.45	0.11	0.026	3%
17.75	0.46				0.229	1.00	18	17.63	17.88	0.229	0.229	0.46	0.12	0.026	3%
18.00	0.42				0.268	1.00	19	17.88	18.13	0.268	0.268	0.42	0.11	0.028	3%
18.25	0.43				0.247	1.00	20	18.13	18.38	0.247	0.247	0.43	0.11	0.027	3%
18.50	0.35				0.250	1.00	21	18.38	18.63	0.250	0.250	0.35	0.09	0.022	3%
18.75	0.45				0.247	1.00	22	18.63	18.88	0.247	0.247	0.45	0.11	0.028	3%
19.00	0.43				0.250	1.00	23	18.88	19.13	0.250	0.250	0.43	0.11	0.027	3%
19.25	0.38				0.271	1.00	24	19.13	19.38	0.271	0.271	0.38	0.10	0.026	3%
19.50	0.35				0.293	1.00	25	19.38	19.63	0.293	0.293	0.35	0.09	0.026	3%
19.75	0.34				0.268	1.00	26	19.63	19.88	0.268	0.268	0.34	0.09	0.023	3%
20.00	0.40				0.232	1.00	27	19.88	20.25	0.232	0.232	0.40	0.15	0.035	4%
20.50	0.35				0.271	1.00	28	20.25	20.75	0.271	0.271	0.35	0.18	0.047	6%
21.00	0.32				0.320	1.00	29	20.75	21.25	0.320	0.320	0.32	0.16	0.051	6%
21.50	0.28				0.347	1.00	30	21.25	21.75	0.347	0.347	0.28	0.14	0.049	6%
22.00	0.23				0.372	1.00	31	21.75	22.25	0.372	0.372	0.23	0.12	0.043	5%
22.50	0.30				0.290	1.00	32	22.25	22.75	0.290	0.290	0.30	0.15	0.043	5%
23.00	0.15				0.165	1.00	33	22.75	23.50	0.165	0.165	0.15	0.11	0.019	2%
24.00	0.00				0.000	1.00	34	23.50	24.00	0.041	0.041	0.04	0.02	0.001	0%
Total Flow:														0.829	1

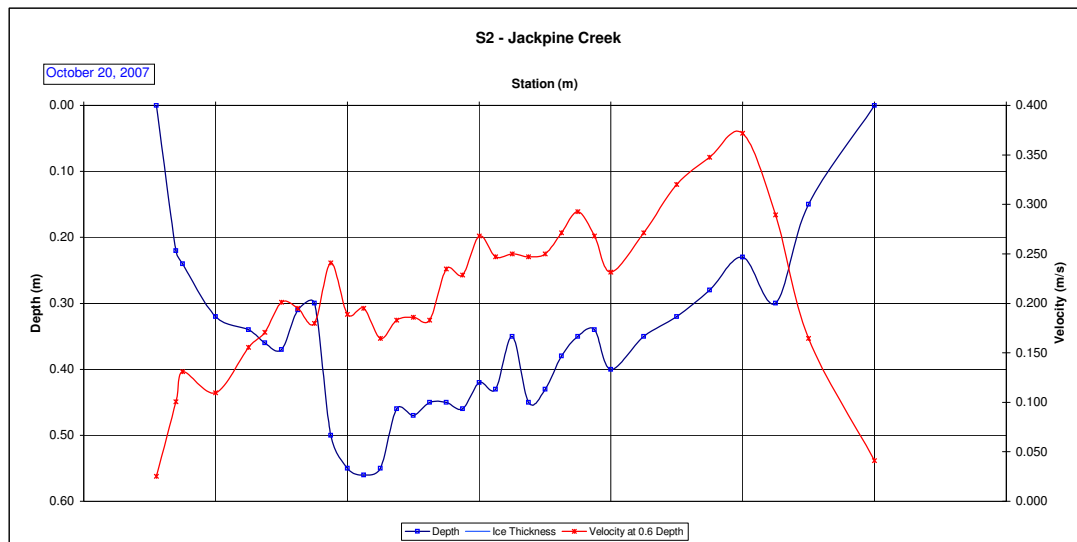
Total Flow:	0.829	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	3.67	(m <sup>2</sup> )
Top Width:	10.90	(m)
Hydraulic Depth:	0.337	(m)
Mean Velocity:	0.226	(m/s)
Froude Number	0.124	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power: 100% 11.34V  
 Datalogger External Power: 76% 11.8V  
 Datalogger Memory Used: 2/3  
 Datalogger Clock: Oct 20, 2007 11:26  
 Laptop Clock: Oct 20, 2007 11:29  
 Dessicant: Good  
 Datalogger: 207085  
 PT: 971024  
 Power: Battery

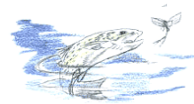
## Notes:

New datalogger installed - 206095 with 2 ports to allow for water thermistor operation.  
 Water temp 3.75C based on thermistor.



# Hydrometric Measurement / Site Visit Record

S2 - Jackpine Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Jackpine Creek  
Location: Jackpine Creek  
Site Name: S2  
Coordinates & Legal: 6343680 N, 475132 E SE-17-95-9-W4

## Personnel & Equipment

Measurement Made By: SM, FF  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Time of Measurement

Date of Measurement: December 8, 2007  
Start Time: 3:02 PM MST  
End Time: 3:27 PM MST

## Level Readings

Bench Mark Reading: Pin on RB 0.738  
Water Level Reading: 1.920  
Top of Ice Level Reading: 1.761  
Transducer Reading & Calc'd El. 0.412  
Other: WL at still well 1.825

## Setup No. 1

El: 297.990  
El: 296.808  
El: 296.967  
El: 296.396  
El:

## Setup No. 2

0.736 0.709 297.990  
1.912 El: 296.814 296.811  
1.756 El: 296.970  
0.412 El: 296.402 296.399  
1.817 El:

**Weather Conditions:** Mostly cloudy, -15C, Calm  
**River Conditions:** complete ice

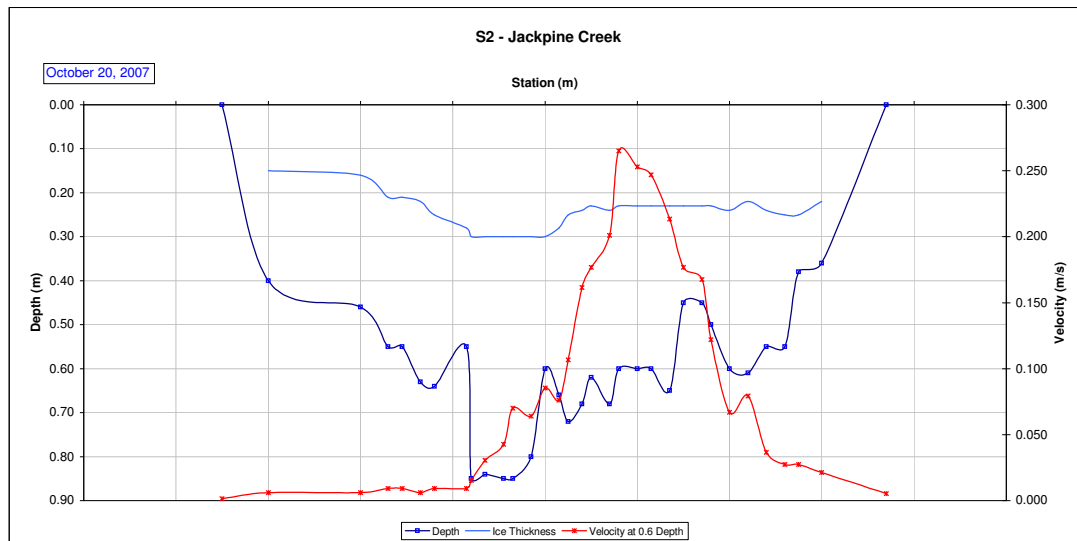
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
13.50	0.00				0.000	1.00	1	13.50	13.75	0.002	0.002	0.08	0.02	0.000	0%	
14.00	0.40	0.15			0.006	1.00	2	13.75	14.50	0.006	0.006	0.09	0.06	0.000	0%	
15.00	0.46	0.16			0.006	1.00	3	14.50	15.15	0.006	0.006	0.30	0.20	0.001	1%	
15.30	0.55	0.21			0.009	1.00	4	15.15	15.38	0.009	0.009	0.34	0.08	0.001	0%	
15.45	0.55	0.21			0.009	1.00	5	15.38	15.55	0.009	0.009	0.34	0.06	0.001	0%	
15.65	0.63	0.22			0.006	1.00	6	15.55	15.73	0.006	0.006	0.41	0.07	0.000	0%	
15.80	0.64	0.25			0.009	1.00	7	15.73	15.98	0.009	0.009	0.39	0.10	0.001	1%	
16.15	0.55	0.28			0.009	1.00	8	15.98	16.18	0.009	0.009	0.27	0.05	0.000	0%	
16.20	0.85	0.30			0.015	1.00	9	16.18	16.28	0.015	0.015	0.55	0.06	0.001	1%	
16.35	0.84	0.30			0.030	1.00	10	16.28	16.45	0.030	0.030	0.54	0.09	0.003	2%	
16.55	0.85	0.30			0.043	1.00	11	16.45	16.60	0.043	0.043	0.55	0.08	0.004	2%	
16.65	0.85	0.30			0.070	1.00	12	16.60	16.75	0.070	0.070	0.55	0.08	0.006	3%	
16.85	0.80	0.30			0.064	1.00	13	16.75	16.93	0.064	0.064	0.50	0.09	0.006	3%	
17.00	0.60	0.30			0.085	1.00	14	16.93	17.08	0.085	0.085	0.30	0.04	0.004	2%	
17.15	0.66	0.28			0.076	1.00	15	17.08	17.20	0.076	0.076	0.38	0.05	0.004	2%	
17.25	0.72	0.25			0.107	1.00	16	17.20	17.33	0.107	0.107	0.47	0.06	0.006	4%	
17.40	0.68	0.24			0.162	1.00	17	17.33	17.45	0.162	0.162	0.44	0.06	0.009	5%	
17.50	0.62	0.23			0.177	1.00	18	17.45	17.60	0.177	0.177	0.39	0.06	0.010	6%	
17.70	0.68	0.24			0.201	1.00	19	17.60	17.75	0.201	0.201	0.44	0.07	0.013	8%	
17.80	0.60	0.23			0.265	1.00	20	17.75	17.90	0.265	0.265	0.37	0.06	0.015	9%	
18.00	0.60	0.23			0.253	1.00	21	17.90	18.08	0.253	0.253	0.37	0.06	0.016	10%	
18.15	0.60	0.23			0.247	1.00	22	18.08	18.25	0.247	0.247	0.37	0.06	0.016	10%	
18.35	0.65	0.23			0.213	1.00	23	18.25	18.43	0.213	0.213	0.42	0.07	0.016	9%	
18.50	0.45	0.23			0.177	1.00	24	18.43	18.60	0.177	0.177	0.22	0.04	0.007	4%	
18.70	0.45	0.23			0.168	1.00	25	18.60	18.75	0.168	0.168	0.22	0.03	0.006	3%	
18.80	0.50	0.23			0.122	1.00	26	18.75	18.90	0.122	0.122	0.27	0.04	0.005	3%	
19.00	0.60	0.24			0.067	1.00	27	18.90	19.10	0.067	0.067	0.36	0.07	0.005	3%	
19.20	0.61	0.22			0.079	1.00	28	19.10	19.30	0.079	0.079	0.39	0.08	0.006	4%	
19.40	0.55	0.24			0.037	1.00	29	19.30	19.50	0.037	0.037	0.31	0.06	0.002	1%	
19.60	0.55	0.25			0.027	1.00	30	19.50	19.68	0.027	0.027	0.30	0.05	0.001	1%	
19.75	0.38	0.25			0.027	1.00	31	19.68	19.88	0.027	0.027	0.13	0.03	0.001	0%	
20.00	0.36	0.22			0.021	1.00	32	19.88	20.35	0.021	0.021	0.14	0.07	0.001	1%	
20.70	0.00				0.000	1.00	33	20.35	20.70	0.005	0.005	0.04	0.01	0.000	0%	
Total Flow:														0.166	1	

Total Flow:	0.166	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	2.11	(m <sup>2</sup> )
Top Width:	7.20	(m)
Hydraulic Depth:	0.293	(m)
Mean Velocity:	0.079	(m/s)
Froude Number	0.047	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	100%	11.34V
Datalogger External Power:	73%	11.31V
Datalogger Memory Used:	10%	
Datalogger Clock:	Dec 08, 2007 14:32	
Laptop Clock:	Dec 08, 2007 14:34	
Dessicant:	Good	
Datalogger:	206095	
PT:	971024	
Power:	Battery	

**Notes:** flow measurement made 20 feet upstream of bridge  
data downloaded is good



**S3 - Ivinimin Creek above Kearn Lake**



### Measurement Location

River/Stream:	Iyininim Creek
Location:	Iyininim Creek above Kears Lake
Site Name:	S3
Coordinates & Legal:	6345029 N, 489491 E NE-14-95-8-W4

### Personnel & Equipment

**Personnel & Equipment**  
Measurement Made By: JMS,PM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Time of Measurement

Date of Measurement: April 25, 2007  
Start Time: 9:00 AM MDT  
End Time: 9:35 AM MDT

### Level Readings

Setup No. 1	
Bench Mark Reading: Bar in PVC	1.897
Water Level Reading:	2.934
Top of Ice Level Reading:	
Transducer Reading & Calc'd El.	0.662
Other: 1 m mark on wide staff gauge	

### Setup No. 1

Re:	El:	360.610	1.844	El:	360.610	
El:	359.573	2.885		El:	359.569	359.571
El:				El:		
El:	358.911	0.662		El:	358.907	358.909
El:				El:		

### Setup No. 2

El:	360.610	
El:	359.569	359.571
El:		
El:	358.907	358.909
El:		

**Weather Conditions:**




+10°C, Overcast

**River Conditions:**

High stage. Anchor ice

### Measurement Data

	Measured Data					Calculated Data										Percentage of Total
	Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)	
LB	0.40	0.00				0.000	1.0	1	0.40	0.85	0.000	0.000	0.06	0.03	0.000	0%
	1.30	0.24				0.000	1.0	2	0.85	1.40	0.000	0.000	0.24	0.13	0.000	0%
	1.50	0.48				0.113	1.0	3	1.40	1.60	0.113	0.113	0.48	0.10	0.011	2%
	1.70	0.63				0.235	1.0	4	1.60	1.75	0.235	0.235	0.63	0.09	0.022	4%
	1.80	0.65				0.256	1.0	5	1.75	1.90	0.256	0.256	0.65	0.10	0.025	4%
	2.00	0.72				0.384	1.0	6	1.90	2.05	0.384	0.384	0.72	0.11	0.041	7%
	2.10	0.74				0.472	1.0	7	2.05	2.15	0.472	0.472	0.74	0.07	0.035	6%
	2.20	0.75				0.500	1.0	8	2.15	2.25	0.500	0.500	0.75	0.07	0.037	6%
	2.30	0.76				0.433	1.0	9	2.25	2.35	0.433	0.433	0.76	0.08	0.033	5%
	2.40	0.77				0.390	1.0	10	2.35	2.45	0.390	0.390	0.77	0.08	0.030	5%
	2.50	0.78				0.430	1.0	11	2.45	2.55	0.430	0.430	0.78	0.08	0.034	5%
	2.60	0.87				0.460	1.0	12	2.55	2.65	0.460	0.460	0.87	0.09	0.040	6%
	2.70	0.89				0.524	1.0	13	2.65	2.80	0.524	0.524	0.89	0.13	0.070	11%
	2.90	0.92				0.527	1.0	14	2.80	2.95	0.527	0.527	0.92	0.14	0.073	12%
	3.00	0.70				0.527	1.0	15	2.95	3.15	0.527	0.527	0.70	0.14	0.074	12%
	3.30	0.40				0.604	1.0	16	3.15	3.40	0.604	0.604	0.40	0.10	0.060	10%
	3.50	0.70				0.088	1.0	17	3.40	3.60	0.088	0.088	0.70	0.14	0.012	2%
	3.70	0.70				0.158	1.0	18	3.60	3.80	0.158	0.158	0.70	0.14	0.022	4%
	3.90	0.65				0.034	1.0	19	3.80	4.00	0.034	0.034	0.65	0.13	0.004	1%
	4.10	0.28				0.000	1.0	20	4.00	4.30	0.000	0.000	0.28	0.08	0.000	0%
RB	4.50	0.25				0.000	1.0	21	4.30	4.85	0.000	0.000	0.25	0.14	0.000	0%
	5.20	0.00				0.000	1.0	22	4.85	5.20	0.000	0.000	0.06	0.02	0.000	0%
														Total Flow:	0.624	

Total Flow:	0.624	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	2.19	(m <sup>2</sup> )
Top Width:	0.40	(m)
Hydraulic Depth:	5.467	(m)
Mean Velocity:	0.285	(m/s)
Froude Number	0.039	
Photographs taken looking at: <div>    </div>		

**Datalogger Notes:**

Datalogger Internal Power: 11.34V 100%

Datalogger External Power: 82%

Datalogger Memory Used:	2%
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Datalogger Clock: April 25, 2007 08:09 AM

**Laptop Clock:** April 25, 2007 08:10 AM

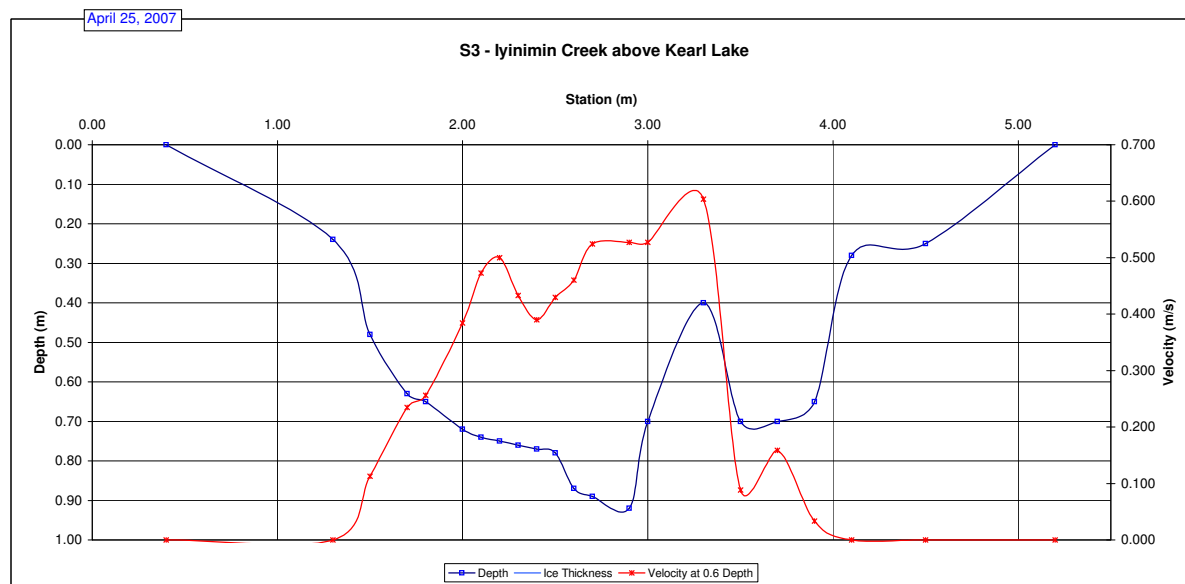
Dessicant: Good

**Datalogger:** Lakewood UltraLogger RX-2 #41174-08

**PT:** Keller Pressure Transducer LE8363K 5 psi #201747

<b>Power:</b>	Lakewood batter
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**Notes:** Bm check  
TB serial #:30496-402  
TD attached to metal pole  
TBRG tips = 3878



# Hydrometric Measurement / Site Visit Record

S3 - Iyininim Creek above Kearn Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Iyininim Creek  
Location: Iyininim Creek above Kearn Lake  
Site Name: S3  
Coordinates & Legal: 6345029 N, 489491 E NE-14-95-8-W4  
Time of Measurement: June 16, 2007  
Date of Measurement: 8:45 AM MDT  
Start Time: 9:05 AM MDT  
End Time:

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Bar in PVC 1.796  
Water Level Reading: 3.501  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.: 0.120  
Other: 1 m mark on wide staff gauge

## Setup No. 1

El: 360.610  
El: 358.905  
El:  
El: 358.785  
El:

## Setup No. 2

El: 360.610  
El: 358.906  
El: 358.906  
El: 358.786  
El: 358.786

Weather Conditions: +10 C, clear calm  
River Conditions: open low

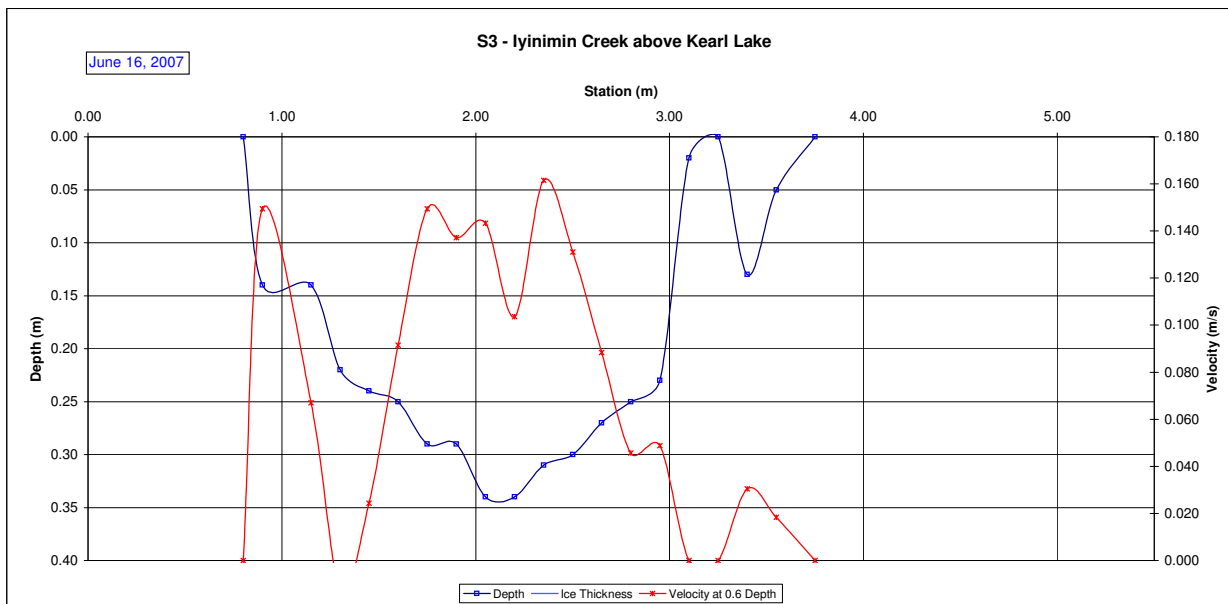
Measured Data						Measurement Data													
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)					
RB	0.80	0.00			0.000	1.0	1	0.80	0.85	0.037	0.037	0.04	0.00	0.000	0%				
	0.90	0.14			0.149	1.0	2	0.85	1.03	0.149	0.149	0.14	0.02	0.004	7%				
	1.15	0.14			0.067	1.0	3	1.03	1.23	0.067	0.067	0.14	0.03	0.002	3%				
	1.30	0.22			-0.012	1.0	4	1.23	1.38	-0.012	-0.012	0.22	0.03	0.000	-1%				
	1.45	0.24			0.024	1.0	5	1.38	1.53	0.024	0.024	0.24	0.04	0.001	2%				
	1.60	0.25			0.091	1.0	6	1.53	1.68	0.091	0.091	0.25	0.04	0.003	6%				
	1.75	0.29			0.149	1.0	7	1.68	1.83	0.149	0.149	0.29	0.04	0.006	12%				
	1.90	0.29			0.137	1.0	8	1.83	1.98	0.137	0.137	0.29	0.04	0.006	11%				
	2.05	0.34			0.143	1.0	9	1.98	2.13	0.143	0.143	0.34	0.05	0.007	13%				
	2.20	0.34			0.104	1.0	10	2.13	2.28	0.104	0.104	0.34	0.05	0.005	9%				
	2.35	0.31			0.162	1.0	11	2.28	2.43	0.162	0.162	0.31	0.05	0.008	13%				
	2.50	0.30			0.131	1.0	12	2.43	2.58	0.131	0.131	0.30	0.05	0.006	11%				
	2.65	0.27			0.088	1.0	13	2.58	2.73	0.088	0.088	0.27	0.04	0.004	6%				
	2.80	0.25			0.046	1.0	14	2.73	2.88	0.046	0.046	0.25	0.04	0.002	3%				
	2.95	0.23			0.049	1.0	15	2.88	3.03	0.049	0.049	0.23	0.03	0.002	3%				
	3.10	0.02			0.000	1.0	16	3.03	3.18	0.000	0.000	0.02	0.00	0.000	0%				
	3.25	0.00			0.000	1.0	17	3.18	3.33	0.000	0.000	0.00	0.00	0.000	0%				
	3.40	0.13			0.030	1.0	18	3.33	3.48	0.030	0.030	0.13	0.02	0.001	1%				
	3.55	0.05			0.018	1.0	19	3.48	3.65	0.018	0.018	0.05	0.01	0.000	0%				
LB	3.75	0.00			0.000	1.0	20	3.65	3.75	0.005	0.005	0.01	0.00	0.000	0%				
Total Flow:														0.056	1				

Total Flow:	0.056	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.59	(m <sup>2</sup> )
Top Width:	2.95	(m)
Hydraulic Depth:	0.199	(m)
Mean Velocity:	0.095	(m/s)
Froude Number	0.068	
Photographs taken looking at:		
Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power: 100  
Datalogger External Power: 80%  
Datalogger Memory Used: 60%  
Datalogger Clock: June 16, 2007 07:19 AM MST  
Laptop Clock: June 16, 2007 07:30 AM MST  
Dessicant: Good  
Datalogger: Lakewood UltraLogger RX-2 #41174-08  
PT: Keller Pressure Transducer LE8363K 5 psi #201747  
Power: Lakewood battery

Notes: rain gauge on ground  
TD data looks good approx 100 tips around May 31  
ignore tips on date of visit



# Hydrometric Measurement / Site Visit Record

S3 - Iyininim Creek above Kears Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Iyininim Creek  
Location: Iyininim Creek above Kears Lake  
Site Name: S3  
Coordinates & Legal: 6345029 N, 489491 E NE-14-95-8-W4

## Time of Measurement

Date of Measurement: August 10, 2007  
Start Time: 1:55 PM  
End Time: 2:48 PM

## Weather Conditions:

+10°C, clear calm

## River Conditions:

open low

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Bar in PVC 1.805  
Water Level Reading: 3.660  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El. 0.141  
Other: 1 m mark on wide staff gauge

## Setup No. 1

El: 360.610  
El: 358.755  
El: 358.614

## Setup No. 2

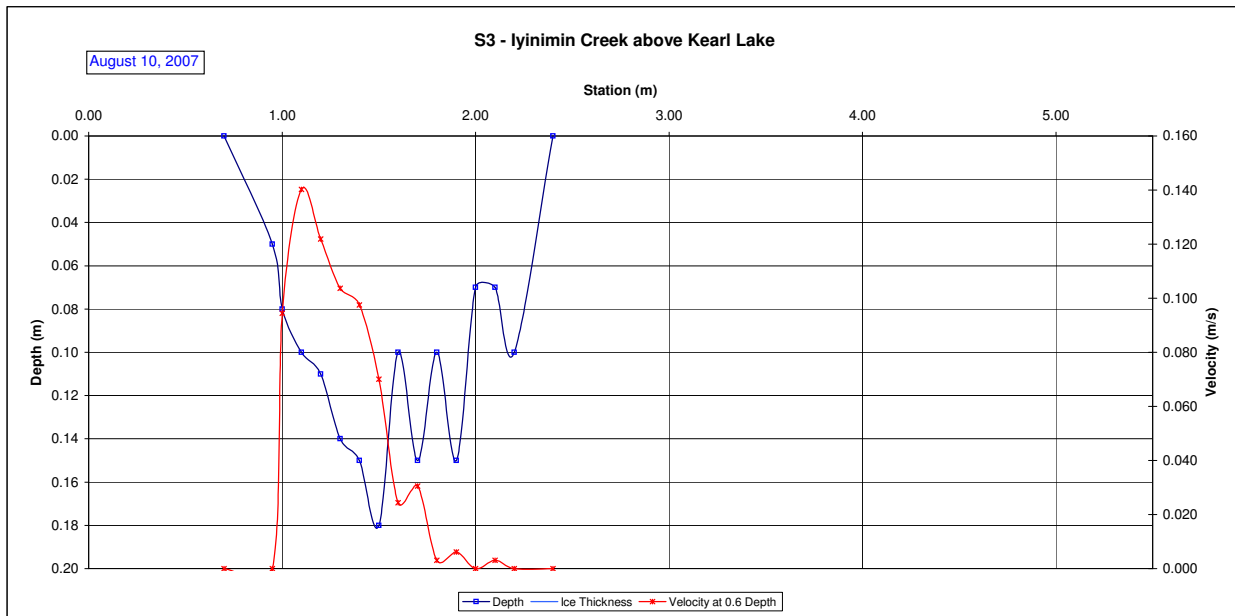
El: 360.610  
El: 358.752  
El: 358.611  
El: 358.613

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)					
0.70	0.00				0.000	1.0	1	0.70	0.83	0.000	0.000	0.01	0.00	0.000	0%				
0.95	0.05				0.000	1.0	2	0.83	0.98	0.000	0.000	0.05	0.01	0.000	0%				
1.00	0.08				0.094	1.0	3	0.98	1.05	0.094	0.094	0.08	0.01	0.001	7%				
1.10	0.10				0.140	1.0	4	1.05	1.15	0.140	0.140	0.10	0.01	0.001	17%				
1.20	0.11				0.122	1.0	5	1.15	1.25	0.122	0.122	0.11	0.01	0.001	16%				
1.30	0.14				0.104	1.0	6	1.25	1.35	0.104	0.104	0.14	0.01	0.001	17%				
1.40	0.15				0.098	1.0	7	1.35	1.45	0.098	0.098	0.15	0.02	0.001	18%				
1.50	0.18				0.070	1.0	8	1.45	1.55	0.070	0.070	0.18	0.02	0.001	15%				
1.60	0.10				0.024	1.0	9	1.55	1.65	0.024	0.024	0.10	0.01	0.000	3%				
1.70	0.15				0.030	1.0	10	1.65	1.75	0.030	0.030	0.15	0.02	0.000	5%				
1.80	0.10				0.003	1.0	11	1.75	1.85	0.003	0.003	0.10	0.01	0.000	0%				
1.90	0.15				0.006	1.0	12	1.85	1.95	0.006	0.006	0.15	0.02	0.000	1%				
2.00	0.07				0.000	1.0	13	1.95	2.05	0.000	0.000	0.07	0.01	0.000	0%				
2.10	0.07				0.003	1.0	14	2.05	2.15	0.003	0.003	0.07	0.01	0.000	0%				
2.20	0.10				0.000	1.0	15	2.15	2.20	0.000	0.000	0.10	0.00	0.000	0%				
2.40	0.00				0.000	1.0	16	2.20	2.40	0.000	0.000	0.03	0.00	0.000	0%				
														Total Flow:	0.008				

Total Flow:	0.008	(m <sup>3</sup> /s)
Perceived Measurement Quality:	fair	
Total Area:	0.16	(m <sup>2</sup> )
Top Width:	1.70	(m)
Hydraulic Depth:	0.092	(m)
Mean Velocity:	0.053	(m/s)
Froude Number	0.056	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	100	11.34
Datalogger External Power:	80%	12.4
Datalogger Memory Used:	100%	
Datalogger Clock:	August 10, 2007 12:57 PM	MST
Laptop Clock:	August 10, 2007 12:58 PM	MST
Dessicant:	Good	
Datalogger:	Lakewood UltraLogger RX-2 #41174-08	
PT:	Keller Pressure Transducer LE8363K 5 psi #201747	
Power:	Lakewood battery	

Notes: rain gauge leveled  
ignore tips on date of visit



# Hydrometric Measurement / Site Visit Record

S3 - Iyininim Creek above Kearl Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Iyininim Creek  
Location: Iyininim Creek above Kearl Lake  
Site Name: S3  
Coordinates & Legal: 6345029 N, 489491 E NE-14-95-8-W4

### Time of Measurement

Date of Measurement: September 22, 2007  
Start Time: 2:00 PM  
End Time: 2:57 PM

### Weather Conditions:

full cloud, little wind, cold

### River Conditions:

higher than before

### Personnel & Equipment

Measurement Made By: sm jms  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Level Readings

Bench Mark Reading: Bar in PVC 1.792  
Water Level Reading: 3.250  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.508  
Other: 1 m mark on wide staff gauge

### Setup No. 1

El: 360.610  
El: 359.152  
El: 358.644  
El:

### Setup No. 2

El: 360.610  
El: 359.150  
El: 358.642  
El:

359.151

358.643

### Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
0.20	0.00				0.000	1.0	1	0.20	0.35	0.021	0.021	0.07	0.01	0.000	0%
0.50	0.26				0.082	1.0	2	0.35	0.65	0.082	0.082	0.26	0.08	0.006	1%
0.80	0.39				0.302	1.0	3	0.65	0.90	0.302	0.302	0.39	0.10	0.029	6%
1.00	0.39				0.317	1.0	4	0.90	1.10	0.317	0.317	0.39	0.08	0.025	5%
1.20	0.50				0.375	1.0	5	1.10	1.30	0.375	0.375	0.50	0.10	0.037	8%
1.40	0.53				0.308	1.0	6	1.30	1.50	0.308	0.308	0.53	0.11	0.033	7%
1.60	0.57				0.314	1.0	7	1.50	1.70	0.314	0.314	0.57	0.11	0.036	8%
1.80	0.60				0.411	1.0	8	1.70	1.85	0.411	0.411	0.60	0.09	0.037	8%
1.90	0.55				0.375	1.0	9	1.85	1.95	0.375	0.375	0.55	0.05	0.021	5%
2.00	0.61				0.436	1.0	10	1.95	2.05	0.436	0.436	0.61	0.06	0.027	6%
2.10	0.61				0.405	1.0	11	2.05	2.15	0.405	0.405	0.61	0.06	0.025	5%
2.20	0.60				0.384	1.0	12	2.15	2.28	0.384	0.384	0.60	0.08	0.029	6%
2.35	0.58				0.357	1.0	13	2.28	2.43	0.357	0.357	0.58	0.09	0.031	7%
2.50	0.54				0.314	1.0	14	2.43	2.58	0.314	0.314	0.54	0.08	0.025	6%
2.65	0.51				0.262	1.0	15	2.58	2.73	0.262	0.262	0.51	0.08	0.020	4%
2.80	0.48				0.244	1.0	16	2.73	2.90	0.244	0.244	0.48	0.08	0.020	4%
3.00	0.37				0.259	1.0	17	2.90	3.10	0.259	0.259	0.37	0.07	0.019	4%
3.20	0.34				0.210	1.0	18	3.10	3.30	0.210	0.210	0.34	0.07	0.014	3%
3.40	0.30				0.165	1.0	19	3.30	3.50	0.165	0.165	0.30	0.06	0.010	2%
3.60	0.29				0.134	1.0	20	3.50	3.78	0.134	0.134	0.29	0.08	0.011	2%
3.95	0.00				0.000	1.0	21	3.78	3.95	0.034	0.034	0.07	0.01	0.000	0%

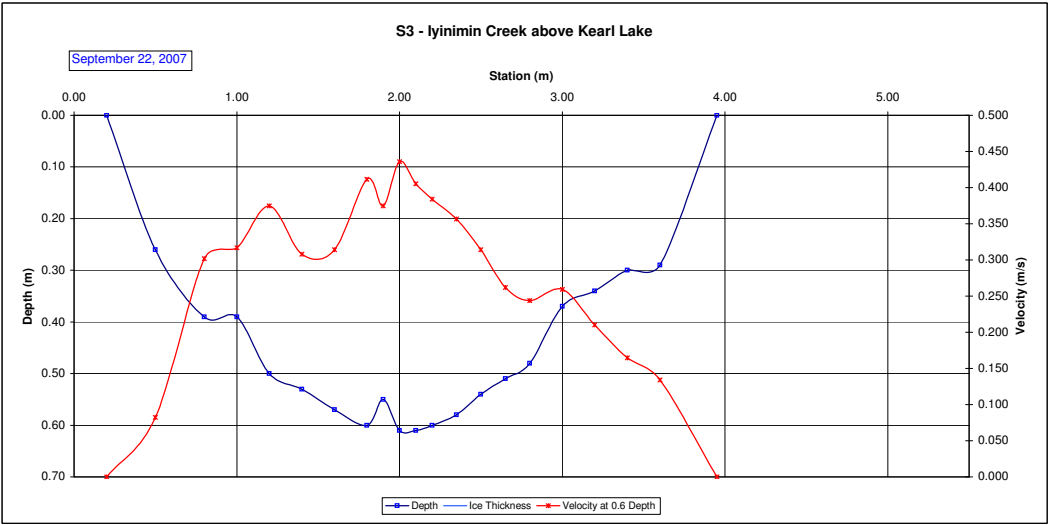
Total Flow:	0.456	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Total Area:	1.55	(m <sup>2</sup> )
Top Width:	3.75	(m)
Hydraulic Depth:	0.413	(m)
Mean Velocity:	0.294	(m/s)
Froude Number	0.146	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	100	11.34
Datalogger External Power:	77%	12.0
Datalogger Memory Used:	100%	
Datalogger Clock:	September 22, 2007 01:12 PM	MST
Laptop Clock:	September 22, 2007 01:14 PM	MST
Dessicant:	Good	
Datalogger:	Lakewood UltraLogger RX-2 #41174-08	
PT:	Keller Pressure Transducer LE8363K 5 psi #201747	
Power:	Lakewood battery	

Notes: DL memory cleared

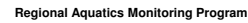
ignore tips on date of visit

TBRG 5366  
5393 after 200mL added  
5396 manual  
ignore 30 tips on date of visit





**S3 - Iyininmin Creek above Kearn Lake**



El:	360.610	
El:	359.150	359.050
El:		
El:	358.818	358.717
El:		

LB

<b>Datalogger Notes:</b> <b>Datalogger Internal Power:</b> <b>Datalogger External Power:</b> <b>Datalogger Memory Used:</b> <b>Datalogger Clock:</b> <b>Laptop Clock:</b>		<b>MST</b> <b>MST</b>
<b>Dessicant:</b> <u>Good</u>		
<hr/> <b>Datalogger:</b> Lakewood UltraLogger RX-2 #41174-08 <b>PT:</b> Keller Pressure Transducer LE836K3 5psi #201747 <b>Power:</b> Lakewood battery		

October 24, 2007

**S3 - Iyininmin Creek above Kearl Lake**



# Hydrometric Measurement / Site Visit Record

S04A - 485905, 6338825



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Blackfly Creek  
Location:  
Site Name: S04A  
Coordinates & Legal: 485905, 6338825

## Time of Measurement

Date of Measurement: April 25, 2007  
Start Time: 12:30 PM MST  
End Time: MST

## Weather Conditions:

+10°C, Overcast

## River Conditions:

Open with anchor ice, High stage

## Personnel & Equipment

Measurement Made By: JMS,PM  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

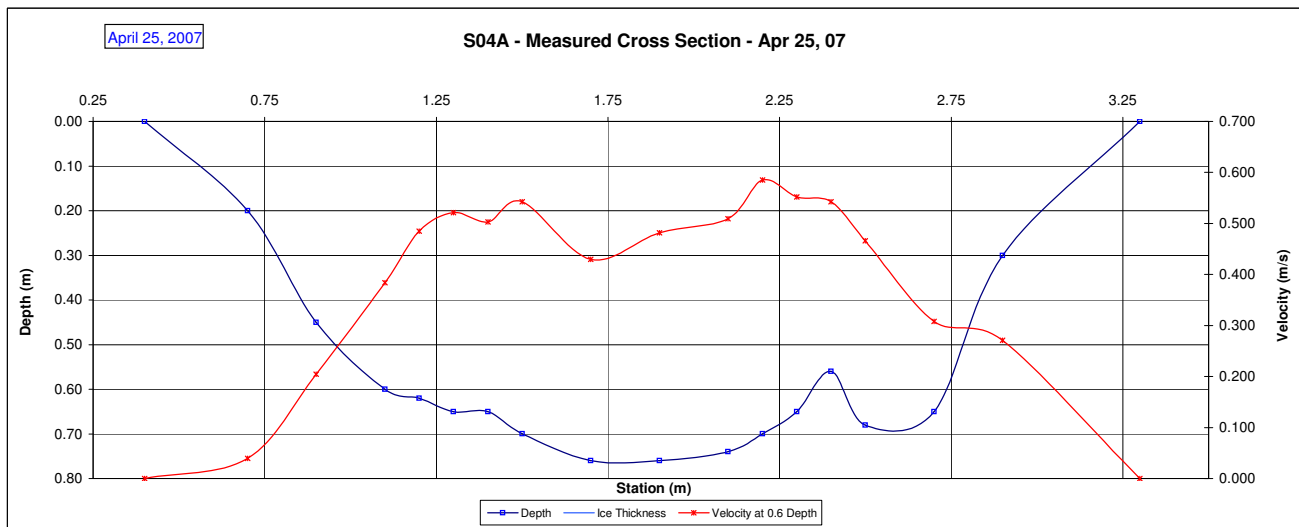
	Setup No. 1	Setup No. 2
Bench Mark Reading: Nail in Log	0.421	0.397
Water Level Reading:	2.881	2.864
Top of Ice Level Reading:		
Transducer Reading & Calc'd El.	0.854	0.854
Other: Nail in Tree	0.917	0.893

Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at	Panel Ends at	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
0.40	0.00				0.000	0.90	1	0.40	0.55	0.010	0.009	0.05	0.01	0.000
0.70	0.20				0.040	0.90	2	0.55	0.80	0.040	0.036	0.20	0.05	0.002
0.90	0.45				0.204	0.90	3	0.80	1.00	0.204	0.184	0.45	0.09	0.017
1.10	0.60				0.384	0.90	4	1.00	1.15	0.384	0.346	0.60	0.09	0.031
1.20	0.62				0.485	0.90	5	1.15	1.25	0.485	0.436	0.62	0.06	0.027
1.30	0.65				0.521	0.90	6	1.25	1.35	0.521	0.469	0.65	0.07	0.030
1.40	0.65				0.503	0.90	7	1.35	1.45	0.503	0.453	0.65	0.06	0.029
1.50	0.70				0.543	0.90	8	1.45	1.60	0.543	0.488	0.70	0.11	0.051
1.70	0.76				0.430	0.90	9	1.60	1.80	0.430	0.387	0.76	0.15	0.059
1.90	0.76				0.482	0.90	10	1.80	2.00	0.482	0.433	0.76	0.15	0.066
2.10	0.74				0.509	0.90	11	2.00	2.15	0.509	0.458	0.74	0.11	0.051
2.20	0.70				0.585	0.90	12	2.15	2.25	0.585	0.527	0.70	0.07	0.037
2.30	0.65				0.552	0.90	13	2.25	2.35	0.552	0.497	0.65	0.06	0.032
2.40	0.56				0.543	0.90	14	2.35	2.45	0.543	0.488	0.56	0.06	0.027
2.50	0.68				0.466	0.90	15	2.45	2.60	0.466	0.420	0.68	0.10	0.043
2.70	0.65				0.308	0.90	16	2.60	2.80	0.308	0.277	0.65	0.13	0.036
2.90	0.30				0.271	0.90	17	2.80	3.10	0.271	0.244	0.30	0.09	0.022
3.30	0.00				0.000	0.90	18	3.10	3.30	0.068	0.061	0.08	0.02	0.001
Total Flow:														0.561

Total Flow:	0.561	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Total Area:	1.48	(m <sup>2</sup> )
Top Width:	0.40	(m)
Hydraulic Depth:	3.694	(m)
Mean Velocity:	0.380	(m/s)
Froude Number	0.063	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	0	0%
Datalogger External Power:	0.00	0%
Datalogger Memory Used:	0.1%	
Datalogger Clock:	Apr 25, 2007 12:23	MST
Laptop Clock:	Apr 25, 2007 12:24	MST
Dessicant:	Good	
Datalogger:	Optimum DD400 S/N:1803	
PT:	Keller S/N:39682	
Power:		

Notes: Station installed below confluence  
Nail in logger tree = BM1  
Nail in tree = BM2  
TD possibly installed on anchor ice  
main battery reads 12.9V with multimeter



# Hydrometric Measurement / Site Visit Record

S04A - 485905, 6338825



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Blackfly Creek  
Location:  
Site Name: S04A  
Coordinates & Legal: 485905, 6338825

## Time of Measurement

Date of Measurement: June 16, 2007  
Start Time: 9:37 AM MST  
End Time: 9:50 AM MST

Weather Conditions: +15°C, clear calm  
River Conditions: open low stage

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Nail in Log	0.265	0.267
Water Level Reading:	3.415	3.419
Top of Ice Level Reading:		
Transducer Reading & Calc'd El.	0.262	0.262
Other: Nail in Tree	0.762	0.764

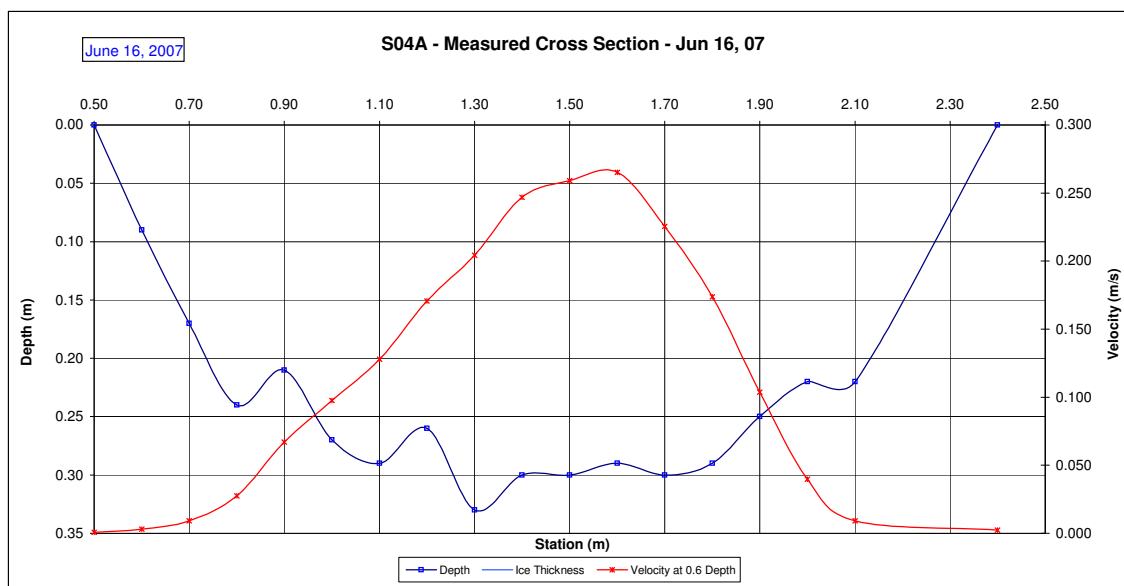
## Measurement Data

Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
RB 0.50	0.00				0.000	0.90	1	0.50	0.55	0.001	0.001	0.04	0.00	0.000
0.60	0.09				0.003	0.90	2	0.55	0.65	0.003	0.003	0.17	0.02	0.000
0.70	0.17				0.009	0.90	3	0.65	0.75	0.009	0.008	0.24	0.02	0.000
0.80	0.24				0.027	0.90	4	0.75	0.85	0.027	0.025	0.21	0.02	0.001
0.90	0.21				0.067	0.90	5	0.85	0.95	0.067	0.060	0.27	0.03	0.002
1.00	0.27				0.098	0.90	6	0.95	1.05	0.098	0.088	0.29	0.03	0.003
1.10	0.29				0.128	0.90	7	1.05	1.15	0.128	0.115	0.26	0.03	0.003
1.20	0.26				0.171	0.90	8	1.15	1.25	0.171	0.154	0.33	0.03	0.005
1.30	0.33				0.204	0.90	9	1.25	1.35	0.204	0.184	0.30	0.03	0.006
1.40	0.30				0.247	0.90	10	1.35	1.45	0.247	0.222	0.30	0.03	0.007
1.50	0.30				0.259	0.90	11	1.45	1.55	0.259	0.233	0.29	0.03	0.007
1.60	0.29				0.265	0.90	12	1.55	1.65	0.265	0.239	0.30	0.03	0.007
1.70	0.30				0.226	0.90	13	1.65	1.75	0.226	0.203	0.29	0.03	0.006
1.80	0.29				0.174	0.90	14	1.75	1.85	0.174	0.156	0.25	0.03	0.004
1.90	0.25				0.104	0.90	15	1.85	1.95	0.104	0.093	0.22	0.02	0.002
2.00	0.22				0.040	0.90	16	1.95	2.05	0.040	0.036	0.22	0.02	0.001
2.10	0.22				0.009	0.90	17	2.05	2.25	0.009	0.008	0.00	0.00	0.000
2.40	0.00				0.000	0.90	18	2.25	2.40	0.002	0.002	0.00	0.00	0.000
													Total Flow:	0.052

Total Flow:	0.052	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.40	(m <sup>2</sup> )
Top Width:	1.90	(m)
Hydraulic Depth:	0.208	(m)
Mean Velocity:	0.131	(m/s)
Froude Number	0.091	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	0	0%
Datalogger External Power:	0.00	0%
Datalogger Memory Used:	2.0%	
Datalogger Clock:	Jun 16, 2007 08:22	MST
Laptop Clock:	Jun 16, 2007 08:24	MST
Dessicant:	90% used	
Datalogger:	Optimum DD400 S/N:1803	
PT:	Keller S/N:39682	
Power:		

Notes: data looks good  
tss



# Hydrometric Measurement / Site Visit Record

S04A - 485905, 6338825



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Blackfly Creek  
Location:  
Site Name: S04A  
Coordinates & Legal: 485905, 6338825

### Time of Measurement

Date of Measurement: August 10, 2007  
Start Time: 3:37 PM MST  
End Time: 3:50 PM MST

Weather Conditions: +15°C, clear calm

River Conditions: open low stage

### Personnel & Equipment

Measurement Made By: sm jms  
Data Entry By: sm Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: Nail in Lo 0.376  
Water Level Reading: 3.770  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.096  
Other: Nail in Tree 0.873

### Setup No. 1

El: 100.000  
El: 96.606  
El: 100.376  
El: 96.510  
El: 99.503

### Setup No. 2

El: 100.000  
El: 96.609  
El: 100.377  
El: 96.513  
El: 99.502

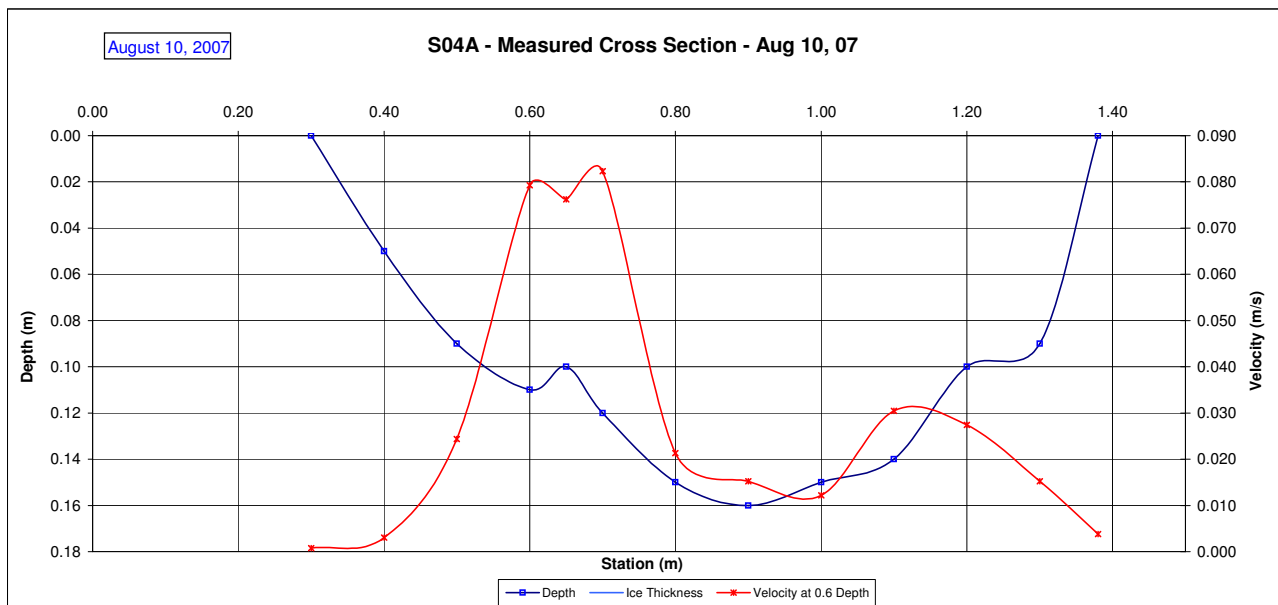
### Measurement Data

Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
RB	0.30	0.00			0.000	0.90	1	0.30	0.35	0.001	0.001	0.02	0.00	0.000
	0.40	0.05			0.003	0.90	2	0.35	0.45	0.003	0.003	0.09	0.01	0.000
	0.50	0.09			0.024	0.90	3	0.45	0.55	0.024	0.022	0.11	0.01	0.000
	0.60	0.11			0.079	0.90	4	0.55	0.63	0.079	0.071	0.10	0.01	0.001
	0.65	0.10			0.076	0.90	5	0.63	0.68	0.076	0.069	0.12	0.01	0.000
	0.70	0.12			0.082	0.90	6	0.68	0.75	0.082	0.074	0.15	0.01	0.001
	0.80	0.15			0.021	0.90	7	0.75	0.85	0.021	0.019	0.16	0.02	0.000
	0.90	0.16			0.015	0.90	8	0.85	0.95	0.015	0.014	0.15	0.02	0.000
	1.00	0.15			0.012	0.90	9	0.95	1.05	0.012	0.011	0.14	0.01	0.000
	1.10	0.14			0.030	0.90	10	1.05	1.15	0.030	0.027	0.10	0.01	0.000
LB	1.20	0.10			0.027	0.90	11	1.15	1.25	0.027	0.025	0.09	0.01	0.000
	1.30	0.09			0.015	0.90	12	1.25	1.34	0.015	0.014	0.00	0.00	0.000
	1.38	0.00			0.000	0.90	13	1.34	1.38	0.004	0.003	0.00	0.00	0.000
Total Flow:													0.003	

Total Flow:	0.003	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Total Area:	0.11	(m <sup>2</sup> )
Top Width:	1.08	(m)
Hydraulic Depth:	0.102	(m)
Mean Velocity:	0.029	(m/s)
Froude Number	0.029	
Photographs taken looking at: Upstream, downstream, across		

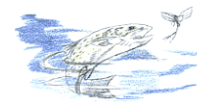
Datalogger Notes:		
Datalogger Internal Power:	0	0%
Datalogger External Power:	11.34	0%
Datalogger Memory Used:	4.0%	
Datalogger Clock:	Aug 10, 2007 14:11	MST
Laptop Clock:	Aug 10, 2007 14:15	MST
Dessicant:	90% used	
Datalogger:	Optimum DD400 S/N:1803	
PT:	Keller S/N:39682	
Power:		

Notes: data looks good  
tss



# Hydrometric Measurement / Site Visit Record

S04A - 485905, 6338825



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Blackfly Creek  
Location:  
Site Name: S04A  
Coordinates & Legal: 485905, 6338825

### Time of Measurement

Date of Measurement: October 25, 2007  
Start Time: 4:10 PM MST  
End Time: 4:28 PM MST

### Personnel & Equipment

Measurement Made By: FF.SM  
Data Entry By: JMS Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Level Readings

Bench Mark Reading: Nail in Lo: 0.274  
Water Level Reading: 3.371  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other: Nail in Tree 0.768

### Setup No. 1

El: 100.000  
El: 96.903  
El: 100.274  
El: 96.903  
El: 99.506

### Setup No. 2

0.232 El: 100.000  
3.332 El: 96.900  
El: 100.232  
El: 96.900  
El: 99.502

### Weather Conditions:

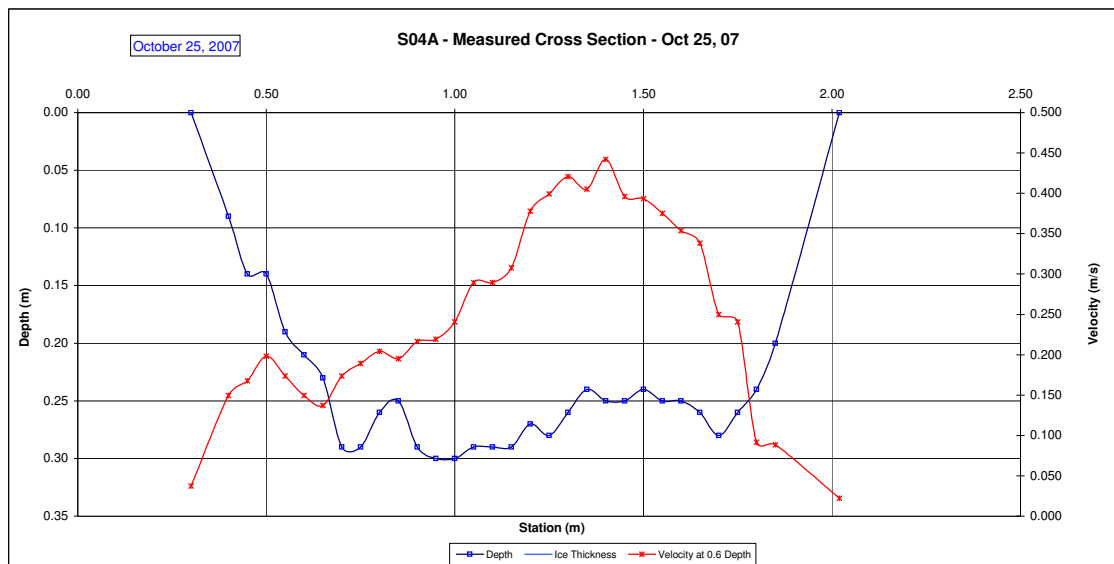
River Conditions: open low stage

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
2.02	0.00				0.000	0.90	1	2.02	1.94	0.022	0.020	0.06	0.01	0.000	
1.85	0.20				0.088	0.90	2	1.94	1.83	0.088	0.080	0.24	0.03	0.002	
1.80	0.24				0.091	0.90	3	1.83	1.78	0.091	0.082	0.26	0.01	0.001	
1.75	0.26				0.241	0.90	4	1.78	1.73	0.241	0.217	0.28	0.01	0.003	
1.70	0.28				0.250	0.90	5	1.73	1.68	0.250	0.225	0.26	0.01	0.003	
1.65	0.26				0.338	0.90	6	1.68	1.63	0.338	0.304	0.25	0.01	0.004	
1.60	0.25				0.354	0.90	7	1.63	1.58	0.354	0.318	0.25	0.01	0.004	
1.55	0.25				0.375	0.90	8	1.58	1.53	0.375	0.337	0.24	0.01	0.004	
1.50	0.24				0.393	0.90	9	1.53	1.48	0.393	0.354	0.25	0.01	0.004	
1.45	0.25				0.396	0.90	10	1.48	1.43	0.396	0.357	0.25	0.01	0.004	
1.40	0.25				0.442	0.90	11	1.43	1.38	0.442	0.398	0.24	0.01	0.005	
1.35	0.24				0.405	0.90	12	1.38	1.33	0.405	0.365	0.26	0.01	0.005	
1.30	0.26				0.421	0.90	13	1.33	1.28	0.421	0.379	0.28	0.01	0.005	
1.25	0.28				0.399	0.90	14	1.28	1.23	0.399	0.359	0.27	0.01	0.005	
1.20	0.27				0.378	0.90	15	1.23	1.18	0.378	0.340	0.29	0.01	0.005	
1.15	0.29				0.308	0.90	16	1.18	1.13	0.308	0.277	0.29	0.01	0.004	
1.10	0.29				0.290	0.90	17	1.13	1.08	0.290	0.261	0.29	0.01	0.004	
1.05	0.29				0.290	0.90	18	1.08	1.03	0.290	0.261	0.30	0.02	0.004	
1.00	0.30				0.241	0.90	19	1.03	0.98	0.241	0.217	0.30	0.02	0.003	
0.95	0.30				0.219	0.90	20	0.98	0.93	0.219	0.198	0.29	0.01	0.003	
0.90	0.29				0.216	0.90	21	0.93	0.88	0.216	0.195	0.25	0.01	0.002	
0.85	0.25				0.195	0.90	22	0.88	0.83	0.195	0.176	0.26	0.01	0.002	
0.80	0.26				0.204	0.90	23	0.83	0.78	0.204	0.184	0.29	0.01	0.003	
0.75	0.29				0.189	0.90	24	0.78	0.73	0.189	0.170	0.29	0.01	0.002	
0.70	0.29				0.174	0.90	25	0.73	0.68	0.174	0.156	0.23	0.01	0.002	
0.65	0.23				0.137	0.90	26	0.68	0.63	0.137	0.123	0.21	0.01	0.001	
0.60	0.21				0.149	0.90	27	0.63	0.58	0.149	0.134	0.19	0.01	0.001	
0.55	0.19				0.174	0.90	28	0.58	0.53	0.174	0.156	0.14	0.01	0.001	
0.50	0.14				0.198	0.90	29	0.53	0.48	0.198	0.178	0.14	0.01	0.001	
0.45	0.14				0.168	0.90	30	0.48	0.43	0.168	0.151	0.09	0.00	0.001	
0.40	0.09				0.149	0.90	31	0.43	0.35	0.149	0.134	0.00	0.00	0.000	
0.30	0.00				0.000	0.90	32	0.35	0.30	0.037	0.034	0.00	0.00	0.000	
													Total Flow:	0.090	

Total Flow:	0.090	(m <sup>3</sup> /s)
Perceived Measurement Quality:	-	
Total Area:	0.38	(m <sup>2</sup> )
Top Width:	1.72	(m)
Hydraulic Depth:	0.220	(m)
Mean Velocity:	0.237	(m/s)
Froude Number	0.161	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	
Datalogger Internal Power:	0%
Datalogger External Power:	0%
Datalogger Memory Used:	
Datalogger Clock:	MST
Laptop Clock:	MST
Dessicant:	ok
Datalogger:	Optimum DD400 S/N:1803
PT:	Keller S/N:39682
Power:	

Notes: equipment removed



# Hydrometric Measurement / Site Visit Record

S5 - Muskeg River Above Stanley Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Above Stanley Creek  
Site Name: S5  
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

## Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: January 14, 2007  
Start Time: 10:28 AM MST  
End Time: 10:56 AM MST

## Level Readings

Bench Mark Reading: 1.689  
Water Level Reading: 1.864  
Top of Ice Level Reading: 1.812  
Transducer Reading & El.: 1.259  
Other:

## Setup No. 1

El: 99.895  
El: 97.720  
El: 98.772  
El: 96.461  
El:

## Setup No. 2

El: 99.895  
El: 97.720  
El: 98.779  
El: 96.461  
El:

## Average

97.720

96.461

Weather Conditions: -30 C, partly cloudy, light wind

River Conditions: Complete ice cover

## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
57.50	0.00	0.25	0.00	0.00		0.90	1	57.50	57.85	0.010	0.009	0.46	0.16	0.001	0%	
58.20	2.10	0.25	0.04	0.04		0.90	2	57.85	58.45	0.041	0.037	1.85	1.11	0.041	8%	
58.70	1.94	0.25	0.04	0.04		0.90	3	58.45	58.90	0.041	0.037	1.69	0.76	0.028	6%	
59.10	1.90	0.28	0.05	0.04		0.90	4	58.90	59.28	0.044	0.040	1.62	0.61	0.024	5%	
59.45	1.83	0.32	0.05	0.04		0.90	5	59.28	59.63	0.046	0.041	1.51	0.53	0.022	4%	
59.80	1.91	0.35	0.05	0.05		0.90	6	59.63	60.00	0.047	0.043	1.56	0.59	0.025	5%	
60.20	1.99	0.36	0.05	0.06		0.90	7	60.00	60.40	0.056	0.051	1.63	0.65	0.033	7%	
60.60	1.98	0.35	0.05	0.05		0.90	8	60.40	60.75	0.055	0.049	1.63	0.57	0.028	6%	
60.90	1.97	0.34	0.05	0.05		0.90	9	60.75	61.08	0.049	0.044	1.63	0.53	0.023	5%	
61.25	1.96	0.32	0.05	0.05		0.90	10	61.08	61.43	0.052	0.047	1.64	0.57	0.027	5%	
61.60	1.97	0.30	0.04	0.05		0.90	11	61.43	61.75	0.043	0.038	1.67	0.54	0.021	4%	
61.90	1.96	0.30	0.05	0.05		0.90	12	61.75	62.05	0.047	0.043	1.66	0.50	0.021	4%	
62.20	1.95	0.30	0.05	0.04		0.90	13	62.05	62.33	0.043	0.038	1.65	0.45	0.017	4%	
62.45	1.95	0.30	0.05	0.09		0.90	14	62.33	62.58	0.070	0.063	1.65	0.41	0.026	5%	
62.70	1.85	0.30	0.04	0.05		0.90	15	62.58	62.90	0.045	0.041	1.55	0.50	0.020	4%	
63.10	1.68	0.30	0.05	0.04		0.90	16	62.90	63.23	0.045	0.041	1.38	0.45	0.018	4%	
63.35	1.65	0.30	0.04	0.05		0.90	17	63.23	63.53	0.045	0.041	1.35	0.41	0.016	3%	
63.70	1.62	0.25	0.04	0.05		0.90	18	63.53	63.90	0.045	0.041	1.37	0.51	0.021	4%	
64.10	1.54	0.22	0.04	0.04		0.90	19	63.90	64.30	0.040	0.036	1.32	0.53	0.019	4%	
64.50	1.47	0.20	0.04	0.04		0.90	20	64.30	64.75	0.040	0.036	1.27	0.57	0.021	4%	
65.00	1.40	0.19	0.03	0.03		0.90	21	64.75	65.25	0.030	0.027	1.21	0.61	0.016	3%	
65.50	1.10	0.15	0.03	0.03		0.90	22	65.25	66.25	0.030	0.027	0.95	0.95	0.026	5%	
67.00	0.00	0.15	0.00	0.00		0.90	23	66.25	67.00	0.000	0.000	0.24	0.18	0.000	0%	
Total Flow:														0.496	1	

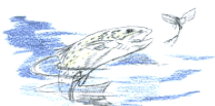
Total Flow:	0.496	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	12.69	(m <sup>2</sup> )
Top Width:	9.50	(m)
Hydraulic Depth:	1.336	(m)
Mean Velocity:	0.039	(m/s)
Froude Number	0.011	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database	845
Datalogger Internal Power:	4.21 V	
Datalogger External Power:	12.85V	
Datalogger Memory Used:	22%	
Datalogger Clock:	Jan 14, 2007 10:23	MST
Laptop Clock:	Jan 14, 2007 10:21	MST
Dessicant:	10% Used	
Datalogger:	Optimum datalogger s/n# 0308190845	
PT:	Keller s/n 021631 5 psi	
Power:	Magnacharge 20V 10A DC Battery and	
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller		

Notes:



Hydrometric Measurement / Site Visit Record
S5 - Muskeg River Above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location
River/Stream: Muskeg River
Location: Muskeg River Above Stanley Creek
Site Name: S5
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4
Time of Measurement
Date of Measurement: February 9, 2007
Start Time: 9:30 AM MST
End Time: 10:18 AM MST
Weather Conditions: -30 C, partly cloudy, light wind
River Conditions: Complete ice cover

Personnel & Equipment
Measurement Made By: JS, JM, PM
Data Entry By: JS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521
Level Readings
Bench Mark Reading: 0.974
Water Level Reading: 2.064
Top of Ice Level Reading: 2.025
Transducer Reading & El.: 1.248

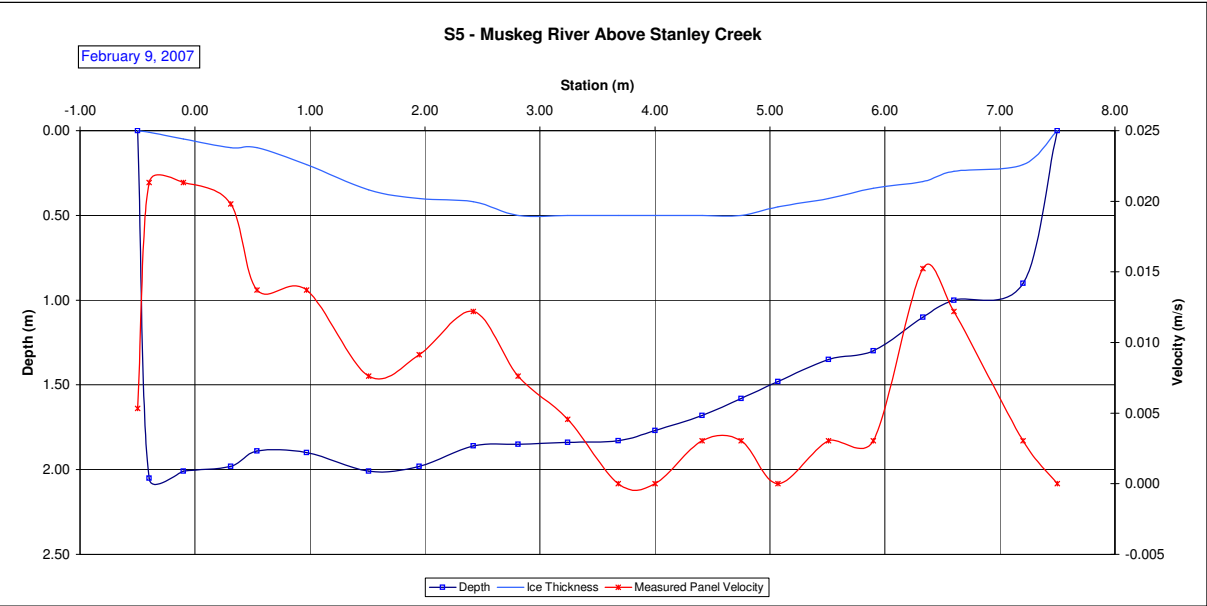
Table with 2 main sections: Setup No. 1 and Setup No. 2. Each section contains columns for El., values, and a Total column.

Table with 16 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Includes data for LB and RB sections.

Summary table with 3 columns: Metric, Value, Unit. Includes Total Flow, Perceived Measurement Quality, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number, and Photographs taken looking at.

Datalogger Notes table with 3 columns: Note, Value, Unit. Includes Datalogger Notes, Database, Datalogger Internal Power, Datalogger External Power, Datalogger Memory Used, Datalogger Clock, Laptop Clock, Dessicant, Datalogger, PT, Power, and PhotoWatt Int.

Notes:



# Hydrometric Measurement / Site Visit Record

S5 - Muskeg River Above Stanley Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Above Stanley Creek  
Site Name: S5  
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

## Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: March 10, 2007  
Start Time: 8:28 AM MST  
End Time: 8:29 AM MST

## Level Readings

Bench Mark Reading: 1.133  
Water Level Reading: 2.344  
Top of Ice Level Reading: 2.208  
Transducer Reading & El.: 1.238  
Other:

## Setup No. 1

El: 99.895  
El: 97.684  
El: 98.820  
El: 96.446

## Setup No. 2

El: 99.895  
El: 97.685  
El: 98.813  
El: 96.447

97.685

96.446

Weather Conditions: -17 C, partly cloudy, light wind

River Conditions: Complete ice cover

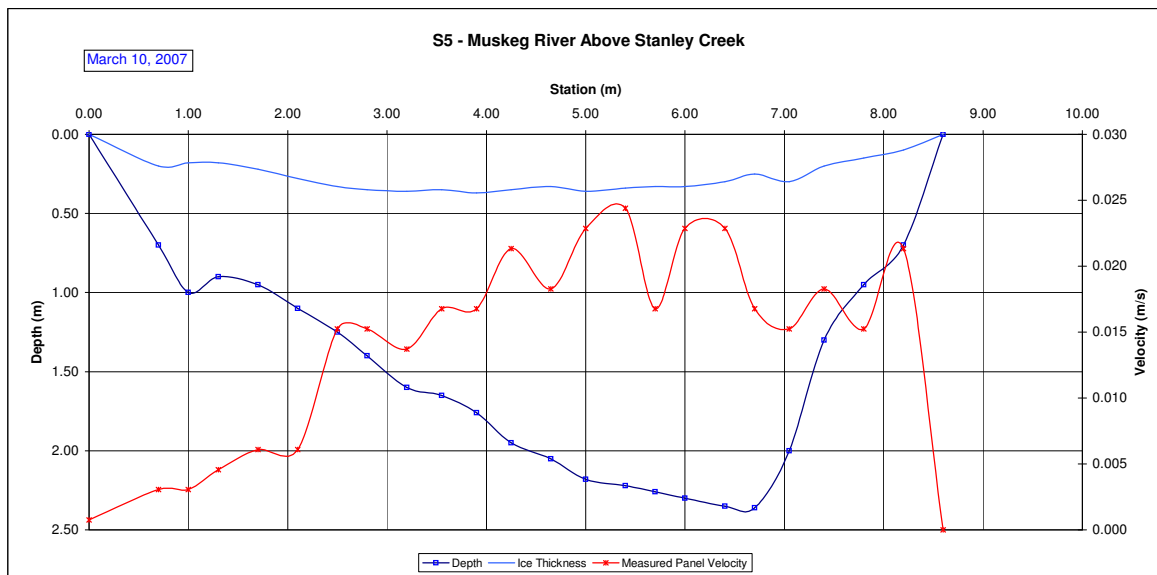
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
		Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
Station	Depth															
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.00	0.00	0.00			0.00	0.90	1	0.00	0.35	0.001	0.001	0.13	0.04	0.000	0%	
0.70	0.70	0.20			0.00	0.90	2	0.35	0.85	0.003	0.003	0.50	0.25	0.001	0%	
1.00	1.00	0.18			0.00	0.90	3	0.85	1.15	0.003	0.003	0.82	0.25	0.001	0%	
1.30	0.90	0.18			0.00	0.90	4	1.15	1.50	0.005	0.004	0.72	0.25	0.001	1%	
1.70	0.95	0.22			0.01	0.90	5	1.50	1.90	0.006	0.005	0.73	0.29	0.002	1%	
2.10	1.10	0.28			0.01	0.90	6	1.90	2.30	0.006	0.005	0.82	0.33	0.002	1%	
2.50	1.25	0.33			0.02	0.90	7	2.30	2.65	0.015	0.014	0.92	0.32	0.004	3%	
2.80	1.40	0.35			0.02	0.90	8	2.65	3.00	0.015	0.014	1.05	0.37	0.005	3%	
3.20	1.60	0.36	0.02	0.01		0.90	9	3.00	3.38	0.014	0.012	1.24	0.47	0.006	4%	
3.55	1.65	0.35	0.02	0.02		0.90	10	3.38	3.73	0.017	0.015	1.30	0.45	0.007	4%	
3.90	1.76	0.37	0.02	0.02		0.90	11	3.73	4.08	0.017	0.015	1.39	0.49	0.007	5%	
4.25	1.95	0.35	0.02	0.02		0.90	12	4.08	4.45	0.021	0.019	1.60	0.60	0.012	7%	
4.65	2.05	0.33	0.02	0.01		0.90	13	4.45	4.83	0.018	0.016	1.72	0.65	0.011	7%	
5.00	2.18	0.36	0.02	0.02		0.90	14	4.83	5.20	0.023	0.021	1.82	0.68	0.014	9%	
5.40	2.22	0.34	0.02	0.03		0.90	15	5.20	5.55	0.024	0.022	1.88	0.66	0.014	9%	
5.70	2.26	0.33	0.02	0.02		0.90	16	5.55	5.85	0.017	0.015	1.93	0.58	0.009	6%	
6.00	2.30	0.33	0.02	0.02		0.90	17	5.85	6.20	0.023	0.021	1.97	0.69	0.014	9%	
6.40	2.35	0.30	0.02	0.02		0.90	18	6.20	6.55	0.023	0.021	2.05	0.72	0.015	9%	
6.70	2.36	0.25	0.02	0.02		0.90	19	6.55	6.88	0.017	0.015	2.11	0.69	0.010	7%	
7.05	2.00	0.30	0.02	0.01		0.90	20	6.88	7.23	0.015	0.014	1.70	0.59	0.008	5%	
7.40	1.30	0.20			0.02	0.90	21	7.23	7.60	0.018	0.016	1.10	0.41	0.007	4%	
7.80	0.95	0.15			0.02	0.90	22	7.60	8.00	0.015	0.014	0.80	0.32	0.004	3%	
8.20	0.70	0.10			0.02	0.90	23	8.00	8.40	0.021	0.019	0.60	0.24	0.005	3%	
8.60	0.00	0.00			0.00	0.90	24	7.60	8.60	0.000	0.000	0.28	0.28	0.000	0%	
Total Flow:														0.158	1	

Total Flow:	0.158	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	10.61	(m <sup>2</sup> )
Top Width:	8.60	(m)
Hydraulic Depth:	1.233	(m)
Mean Velocity:	0.015	(m/s)
Froude Number	0.004	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database	845
Datalogger Internal Power:		
Datalogger External Power:		
Datalogger Memory Used:		
Datalogger Clock:		MST
Laptop Clock:		MST
Dessicant:		
Datalogger:	Optimum datalogger s/n# 0308190845	
PT:	Keller s/n 021631 5 psi	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes:





**S5 - Muskeg River Above Stanley Creek**



### Measurement Location

<b>Measurement Location:</b>	
River/Stream:	Muskeg River
Location:	Muskeg River Above Stanley Creek
Site Name:	S5
Coordinates & Legal:	6356737 N, 4798893 E SE-26-96-9-W4

### Personnel & Equipment

**Personnel & Equipment**  
Measurement Made By: JMS,PM  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Time of Measurement

Date of Measurement: April 25, 2007  
Start Time: 1:25 PM MST  
End Time: MST

### Level Readings

1.0 m placed on  
btm of DL box

Bench Mark Reading:  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & El.:  
Other:

### Setup No. 1

El:	99.895	1.060	El:	99.895
El:	98.190	1.756	El:	98.199
El:	101.010		El:	100.955
El:	96.343	1.847	El:	96.352
El:		2.763	El:	

### Setup No. 2

El:	99.895	
El:	98.199	98.195
El:	100.955	
El:	96.352	96.348
El:		

**Weather Conditions:** +10° C, Overcast

**River Conditions:**

### Measurement Data

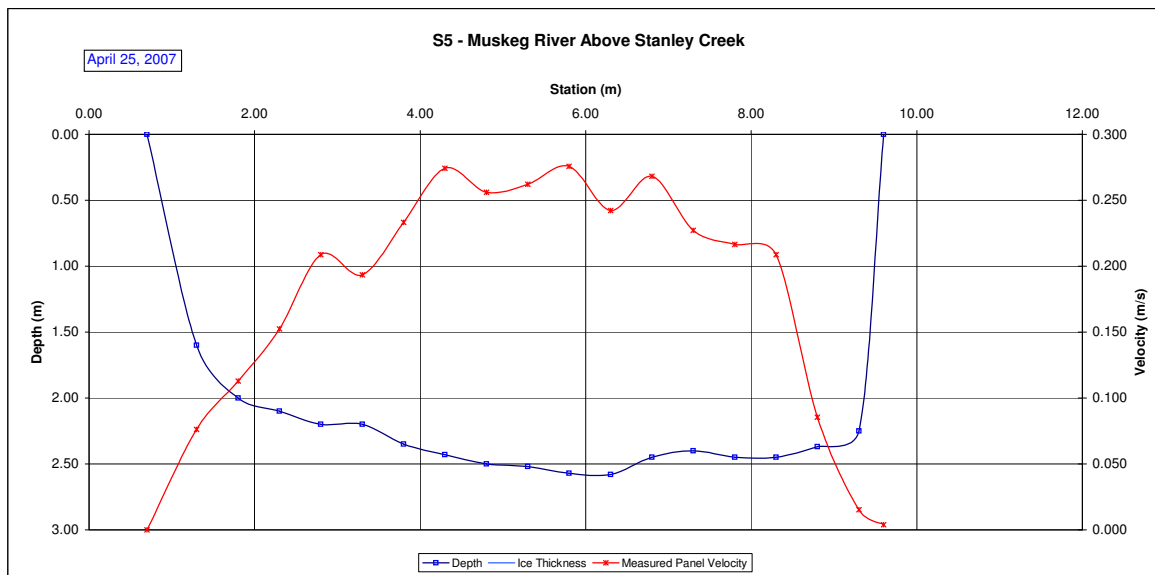
Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
9.60	0.00				0.00	1.00	1	9.60	9.45	0.004	0.004	0.56	0.08	0.000	0%
9.30	2.25		-0.01	0.04		1.00	2	9.45	9.05	0.015	0.015	2.25	0.90	0.014	0%
8.80	2.37		0.12	0.05		1.00	3	9.05	8.55	0.085	0.085	2.37	1.19	0.101	3%
8.30	2.45		0.20	0.22		1.00	4	8.55	8.05	0.209	0.209	2.45	1.23	0.256	6%
7.80	2.45		0.22	0.21		1.00	5	8.05	7.55	0.216	0.216	2.45	1.23	0.265	7%
7.30	2.40		0.29	0.16		1.00	6	7.55	7.05	0.227	0.227	2.40	1.20	0.272	7%
6.80	2.45		0.28	0.25		1.00	7	7.05	6.55	0.268	0.268	2.45	1.23	0.329	8%
6.30	2.58		0.29	0.20		1.00	8	6.55	6.05	0.242	0.242	2.58	1.29	0.313	8%
5.80	2.57		0.28	0.27		1.00	9	6.05	5.55	0.276	0.276	2.57	1.29	0.354	9%
5.30	2.52		0.31	0.22		1.00	10	5.55	5.05	0.262	0.262	2.52	1.26	0.330	8%
4.80	2.50		0.30	0.21		1.00	11	5.05	4.55	0.256	0.256	2.50	1.25	0.320	8%
4.30	2.43		0.32	0.23		1.00	12	4.55	4.05	0.274	0.274	2.43	1.22	0.333	8%
3.80	2.35		0.26	0.21		1.00	13	4.05	3.55	0.233	0.233	2.35	1.18	0.274	7%
3.30	2.20		0.20	0.19		1.00	14	3.55	3.05	0.194	0.194	2.20	1.10	0.213	5%
2.80	2.20		0.21	0.21		1.00	15	3.05	2.55	0.209	0.209	2.20	1.10	0.230	6%
2.30	2.10		0.16	0.14		1.00	16	2.55	2.05	0.152	0.152	2.10	1.05	0.160	4%
1.80	2.00		0.13	0.09		1.00	17	2.05	1.55	0.113	0.113	2.00	1.00	0.113	3%
1.30	1.60		0.12	0.03		1.00	18	1.55	1.00	0.076	0.076	1.60	0.88	0.067	2%
0.70	0.00				0.00	1.00	19	2.05	0.70	0.000	0.000	0.53	0.71	0.000	0%

Total Flow:	3.944	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	20.36	(m <sup>2</sup> )
Top Width:	8.90	(m)
Hydraulic Depth:	2.287	(m)
Mean Velocity:	0.194	(m/s)
Froude Number	0.041	

Photographs taken looking at:  
 1. upstream, downstream, across

<b>Datalogger Notes:</b>	<b>Database</b>	<b>845</b>
<b>Datalogger Internal Power:</b>	4.31V	
<b>Datalogger External Power:</b>	14.37V	
<b>Datalogger Memory Used:</b>	30%	Used
<b>Datalogger Clock:</b>	Apr 25, 2007 13:25	MST
<b>Laptop Clock:</b>	Apr 25, 2007 13:26	MST
<b>Dessicant:</b>	Good	
<b>Datalogger:</b>	Optimum datalogger s/n# 0308190845	
<b>PT:</b>	Keller s/n 104640	
<b>Power:</b>	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

**Notes:**



# Hydrometric Measurement / Site Visit Record

S5 - Muskeg River Above Stanley Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Above Stanley Creek  
Site Name: S5  
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

## Personnel & Equipment

Measurement Made By: PM, SM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: June 16, 2007  
Start Time: 12:25 PM MDT  
End Time: 1:15 PM MDT

## Level Readings

Bench Mark Reading: 0.840  
Water Level Reading: 2.151  
Top of Ice Level Reading:  
Transducer Reading & El.: 1.315  
Other: 2.522

## Setup No. 1

El: 99.895  
El: 97.584  
El: 100.735  
El: 96.269  
El:

## Setup No. 2

El: 99.895  
El: 97.592  
El: 100.741  
El: 96.277  
El:

Weather Conditions: +20 C, Scattered Cloud, Calm

River Conditions: Open, Low Stage

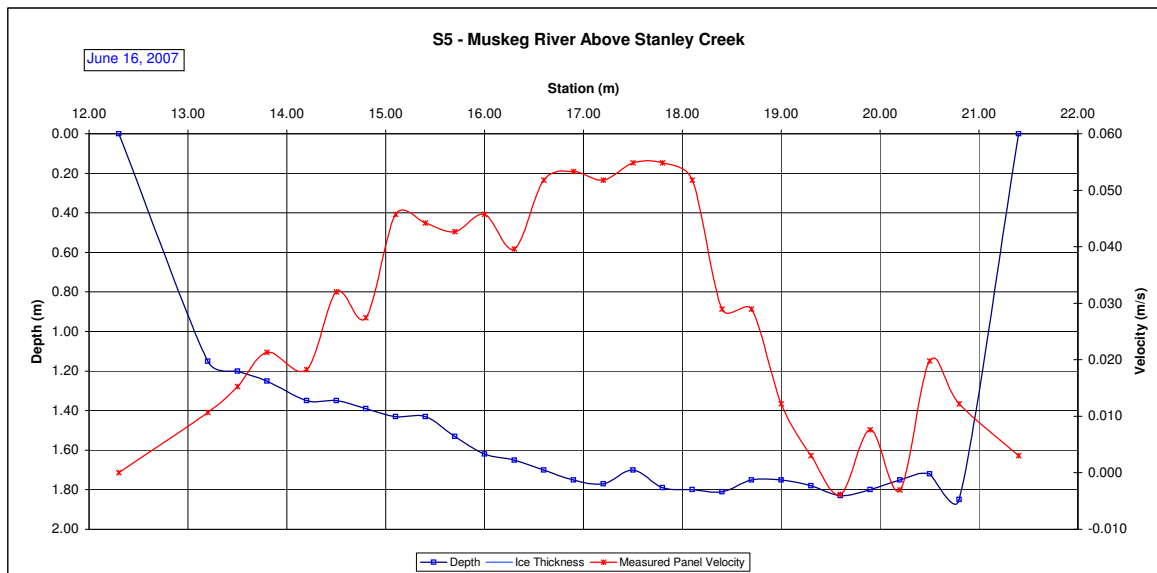
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
					0.00	1.00	1	21.40	21.10	0.003	0.003	0.46	0.14	0.000	0%	
21.40	0.00		0.02	0.00		1.00	2	21.10	20.65	0.012	0.012	1.85	0.83	0.010	3%	
20.80	1.85		0.02	0.02		1.00	3	20.65	20.35	0.020	0.020	1.72	0.52	0.010	3%	
20.50	1.72		0.01	-0.02		1.00	4	20.35	20.05	-0.003	-0.003	1.75	0.53	-0.002	0%	
20.20	1.75		0.01	0.00		1.00	5	20.05	19.75	0.008	0.008	1.80	0.54	0.004	1%	
19.90	1.80		0.00	-0.01		1.00	6	19.75	19.45	-0.004	-0.004	1.83	0.55	-0.002	-1%	
19.60	1.83		0.01	0.00		1.00	7	19.45	19.15	0.003	0.003	1.78	0.53	0.002	0%	
19.30	1.78		0.02	0.00		1.00	8	19.15	18.85	0.012	0.012	1.75	0.52	0.006	2%	
19.00	1.75		0.05	0.01		1.00	9	18.85	18.55	0.029	0.029	1.75	0.53	0.015	4%	
18.70	1.75		0.04	0.02		1.00	10	18.55	18.25	0.029	0.029	1.81	0.54	0.016	4%	
18.40	1.81		0.06	0.05		1.00	11	18.25	17.95	0.052	0.052	1.80	0.54	0.028	7%	
18.10	1.80		0.05	0.05		1.00	12	17.95	17.65	0.055	0.055	1.79	0.54	0.029	8%	
17.80	1.79		0.07	0.04		1.00	13	17.65	17.35	0.055	0.055	1.70	0.51	0.028	7%	
17.50	1.70		0.06	0.05		1.00	14	17.35	17.05	0.052	0.052	1.77	0.53	0.028	7%	
17.20	1.77		0.06	0.04		1.00	15	17.05	16.75	0.053	0.053	1.75	0.52	0.028	7%	
16.90	1.75		0.05	0.05		1.00	16	16.75	16.45	0.052	0.052	1.70	0.51	0.026	7%	
16.60	1.70		0.05	0.03		1.00	17	16.45	16.15	0.040	0.040	1.65	0.50	0.020	5%	
16.30	1.65		0.05	0.04		1.00	18	16.15	15.85	0.046	0.046	1.62	0.49	0.022	6%	
16.00	1.62		0.04	0.04		1.00	19	15.85	15.55	0.043	0.043	1.53	0.46	0.020	5%	
15.70	1.53		0.05	0.03		1.00	20	15.55	15.25	0.044	0.044	1.43	0.43	0.019	5%	
15.40	1.43		0.05	0.04		1.00	21	15.25	14.95	0.046	0.046	1.43	0.43	0.020	5%	
15.10	1.43		0.04	0.02		1.00	22	14.95	14.65	0.027	0.027	1.39	0.42	0.011	3%	
14.80	1.39		0.04	0.02		1.00	23	14.65	14.35	0.032	0.032	1.35	0.41	0.013	3%	
14.50	1.35		0.02	0.02		1.00	24	14.35	14.00	0.018	0.018	1.35	0.47	0.009	2%	
14.20	1.35		0.02	0.02		1.00	25	14.00	13.65	0.021	0.021	1.25	0.44	0.009	2%	
13.80	1.25		0.02	0.02		1.00	26	13.65	13.35	0.015	0.015	1.20	0.36	0.005	1%	
13.50	1.20		0.01	0.01		1.00	27	13.35	12.75	0.011	0.011	1.15	0.69	0.007	2%	
13.20	1.15				0.00	1.00	24	13.65	12.30	0.000	0.000	0.31	0.42	0.000	0%	
12.30	0.00											Total Flow:		0.383	1	

Total Flow:	0.383	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	13.88	(m <sup>2</sup> )
Top Width:	9.10	(m)
Hydraulic Depth:	1.526	(m)
Mean Velocity:	0.028	(m/s)
Froude Number	0.007	
Photographs taken looking at: Upstream, downstream, across		

Notes: Data looks Good

Datalogger Notes:	Database	845
Datalogger Internal Power:		
Datalogger External Power:		
Datalogger Memory Used:	35%	Used
Datalogger Clock:	10:53	MST
Laptop Clock:	10:55	MST
Dessicant:	Good	
Datalogger:	Optimum datalogger s/n# 0308190845	
PT:	Keller s/n 104640	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	



Hydrometric Measurement / Site Visit Record

S5 - Muskeg River Above Stanley Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Above Stanley Creek  
Site Name: S5  
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

Personnel & Equipment

Measurement Made By: PM, SM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: August 4, 2007  
Start Time: 9:15 AM MDT  
End Time: 9:45 AM MDT

Level Readings

Bench Mark Reading: 0.829  
Water Level Reading: 2.210  
Top of Ice Level Reading: 1.262  
Transducer Reading & El.: 2.491  
Other:

Setup No. 1

El: 99.895  
El: 97.514  
El: 100.724  
El: 96.252  
El:

Setup No. 2

El: 99.895  
El: 97.512  
El: 100.711  
El: 96.250  
El:

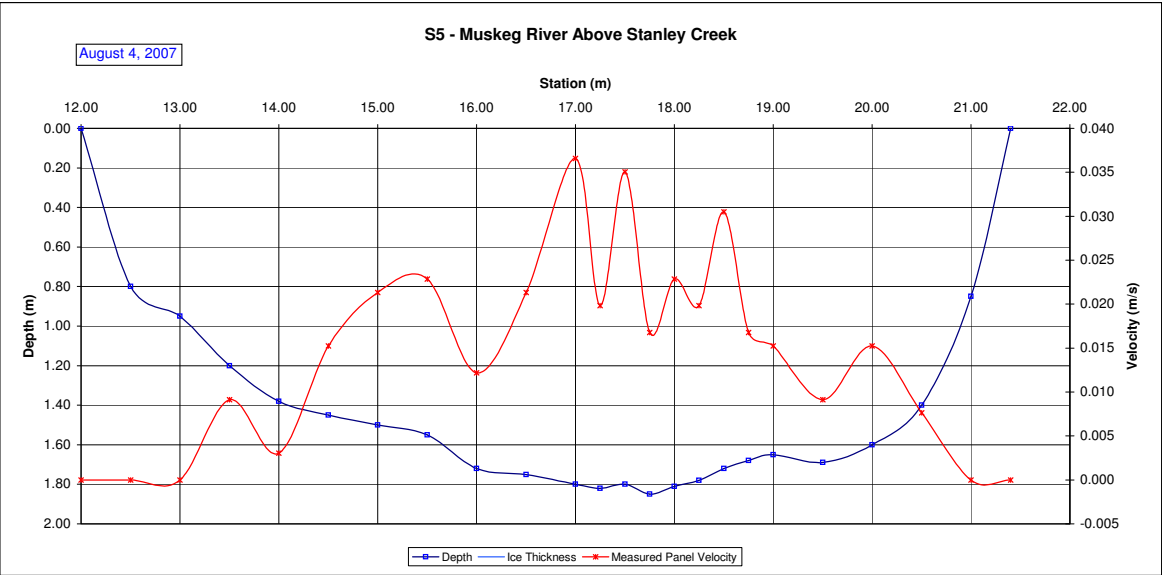
Weather Conditions: +20 C, Clear, Calm  
River Conditions: Open, Low Stage

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at	Panel Ends at	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
12.00	0.00				0.00	1.00	1	12.00	12.25	0.000	0.000	0.20	0.05	0.000	0%
12.50	0.80		0.00	0.00		1.00	2	12.25	12.75	0.000	0.000	0.80	0.40	0.000	0%
13.00	0.95		0.00	0.00		1.00	3	12.75	13.25	0.000	0.000	0.95	0.48	0.000	0%
13.50	1.20		0.02	0.00		1.00	4	13.25	13.75	0.009	0.009	1.20	0.60	0.005	3%
14.00	1.38		0.00	0.01		1.00	5	13.75	14.25	0.003	0.003	1.38	0.69	0.002	1%
14.50	1.45		0.02	0.01		1.00	6	14.25	14.75	0.015	0.015	1.45	0.73	0.011	5%
15.00	1.50		0.02	0.02		1.00	7	14.75	15.25	0.021	0.021	1.50	0.75	0.016	8%
15.50	1.55		0.02	0.02		1.00	8	15.25	15.75	0.023	0.023	1.55	0.78	0.018	8%
16.00	1.72		0.02	0.00		1.00	9	15.75	16.25	0.012	0.012	1.72	0.86	0.010	5%
16.50	1.75		0.02	0.02		1.00	10	16.25	16.75	0.021	0.021	1.75	0.88	0.019	9%
17.00	1.80		0.04	0.03		1.00	11	16.75	17.13	0.037	0.037	1.80	0.68	0.025	12%
17.25	1.82		0.02	0.02		1.00	12	17.13	17.38	0.020	0.020	1.82	0.46	0.009	4%
17.50	1.80		0.05	0.02		1.00	13	17.38	17.63	0.035	0.035	1.80	0.45	0.016	7%
17.75	1.85		0.02	0.02		1.00	14	17.63	17.88	0.017	0.017	1.85	0.46	0.008	4%
18.00	1.81		0.01	0.03		1.00	15	17.88	18.13	0.023	0.023	1.81	0.45	0.010	5%
18.25	1.78		0.02	0.02		1.00	16	18.13	18.38	0.020	0.020	1.78	0.45	0.009	4%
18.50	1.72		0.04	0.02		1.00	17	18.38	18.63	0.030	0.030	1.72	0.43	0.013	6%
18.75	1.68		0.02	0.01		1.00	18	18.63	18.88	0.017	0.017	1.68	0.42	0.007	3%
19.00	1.65		0.02	0.01		1.00	19	18.88	19.25	0.015	0.015	1.65	0.62	0.009	4%
19.50	1.69		0.01	0.01		1.00	20	19.25	19.75	0.009	0.009	1.69	0.85	0.008	4%
20.00	1.60		0.02	0.01		1.00	21	19.75	20.25	0.015	0.015	1.60	0.80	0.012	6%
20.50	1.40		0.01	0.00		1.00	22	20.25	20.75	0.008	0.008	1.40	0.70	0.005	3%
21.00	0.85		0.00	0.00		1.00	23	20.75	21.20	0.000	0.000	0.85	0.38	0.000	0%
21.40	0.00				0.00	1.00	24	20.25	21.40	0.000	0.000	0.40	0.46	0.000	0%
Total Flow:														0.213	1

Total Flow:	0.213	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	13.80	(m <sup>2</sup> )
Top Width:	9.40	(m)
Hydraulic Depth:	1.468	(m)
Mean Velocity:	0.015	(m/s)
Froude Number	0.004	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database	845
Datalogger Internal Power:	14.20 V	
Datalogger External Power:	4.32 V	
Datalogger Memory Used:	39%	Used
Datalogger Clock:	08:09	MST
Laptop Clock:	08:06	MST
Dessicant:	10 % used	
Datalogger:	Optimum datalogger s/n# 0308190845	
PT:	Keller s/n 104640	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: Data looks Good



# Hydrometric Measurement / Site Visit Record

S5 - Muskeg River Above Stanley Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Above Stanley Creek  
Site Name: S5  
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

## Personnel & Equipment

Measurement Made By: PM, SM  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: September 23, 2007  
Start Time: 8:39 AM MDT  
End Time: 9:40 AM MDT

## Level Readings

Bench Mark Reading: 1.0 m placed on top of DL box  
Water Level Reading: 0.892  
Top of Ice Level Reading: 1.710  
Transducer Reading & El.: 1.721  
Other: 2.561

## Setup No. 1

El: 99.895  
El: 98.077  
El: 100.787  
El: 96.356  
El:

## Setup No. 2

El: 99.895  
El: 98.082  
El: 100.794  
El: 96.361  
El:

Weather Conditions: mostly cloudy no wind

River Conditions: Open, Low Stage

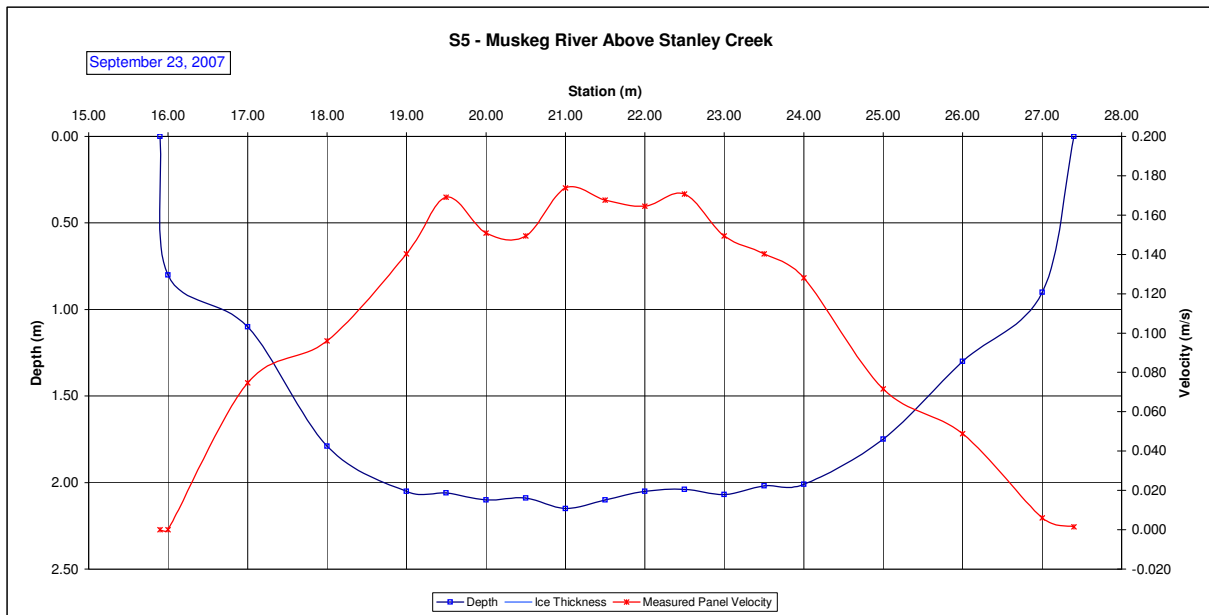
## Measurement Data

	Measured Data						Calculated Data									Percentage of Total
			Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	Station	Depth														
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	15.90	0.00				0.00	1.00	1	15.90	15.95	0.000	0.000	0.20	0.01	0.000	0%
	16.00	0.80		0.00	0.00	0.00	1.00	2	15.95	16.50	0.000	0.000	0.80	0.44	0.000	0%
	17.00	1.10		0.10	0.05		1.00	3	16.50	17.50	0.075	0.075	1.10	1.10	0.082	4%
	18.00	1.79		0.16	0.04		1.00	4	17.50	18.50	0.096	0.096	1.79	1.79	0.172	7%
	19.00	2.05		0.17	0.11		1.00	5	18.50	19.25	0.140	0.140	2.05	1.54	0.216	9%
	19.50	2.06		0.18	0.16		1.00	6	19.25	19.75	0.169	0.169	2.06	1.03	0.174	7%
	20.00	2.10		0.17	0.13		1.00	7	19.75	20.25	0.151	0.151	2.10	1.05	0.158	7%
	20.50	2.09		0.16	0.13		1.00	8	20.25	20.75	0.149	0.149	2.09	1.05	0.156	7%
	21.00	2.15		0.17	0.17		1.00	9	20.75	21.25	0.174	0.174	2.15	1.08	0.187	8%
	21.50	2.10		0.16	0.17		1.00	10	21.25	21.75	0.168	0.168	2.10	1.05	0.176	8%
	22.00	2.05		0.17	0.16		1.00	11	21.75	22.25	0.165	0.165	2.05	1.03	0.169	7%
	22.50	2.04		0.16	0.18		1.00	12	22.25	22.75	0.171	0.171	2.04	1.02	0.174	7%
	23.00	2.07		0.15	0.15		1.00	13	22.75	23.25	0.149	0.149	2.07	1.04	0.155	7%
	23.50	2.02		0.14	0.14		1.00	14	23.25	23.75	0.140	0.140	2.02	1.01	0.142	6%
	24.00	2.01		0.13	0.12		1.00	15	23.75	24.50	0.128	0.128	2.01	1.51	0.193	8%
	25.00	1.75		0.08	0.06		1.00	16	24.50	25.50	0.072	0.072	1.75	1.75	0.125	5%
	26.00	1.30		0.06	0.04		1.00	17	25.50	26.50	0.049	0.049	1.30	1.30	0.063	3%
	27.00	0.90		0.00		0.01	1.00	18	26.50	27.20	0.006	0.006	0.90	0.63	0.004	0%
	RB	27.40	0.00		0.00		0.00	1.00	19	27.20	27.40	0.002	0.002	0.23	0.04	0.000
Total Flow:														2.346	1	

Total Flow:	2.346	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	19.45	(m <sup>2</sup> )
Top Width:	11.50	(m)
Hydraulic Depth:	1.691	(m)
Mean Velocity:	0.121	(m/s)
Froude Number	0.030	
Photographs taken looking at: Upstream, downstream, across		

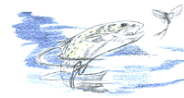
Datalogger Notes:	Database	845
Datalogger Internal Power:	14	
Datalogger External Power:	4.28	
Datalogger Memory Used:	43%	Used
Datalogger Clock:	07:58	MST
Laptop Clock:	07:59	MST
Dessicant:	new	
Datalogger:	Optimum datalogger s/n# 0308190845	
PT:	Keller s/n 104640	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: Data looks Good



# Hydrometric Measurement / Site Visit Record

## S5 - Muskeg River Above Stanley Creek



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Above Stanley Creek  
Site Name: S5  
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

### Personnel & Equipment

Measurement Made By: FF  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Time of Measurement

Date of Measurement: October 25, 2007  
Start Time: 10:09 AM MDT  
End Time: 10:34 AM MDT

### Level Readings

Bench Mark Reading: 0.823  
Water Level Reading: 1.836  
Top of Ice Level Reading:  
Transducer Reading & El.: 1.485  
Other: 2.494

### Setup No. 1

El: 99.895  
El: 97.882  
El: 100.718  
El: 96.397

### Setup No. 2

El: 99.895  
El: 97.883  
El: 100.694  
El: 96.398

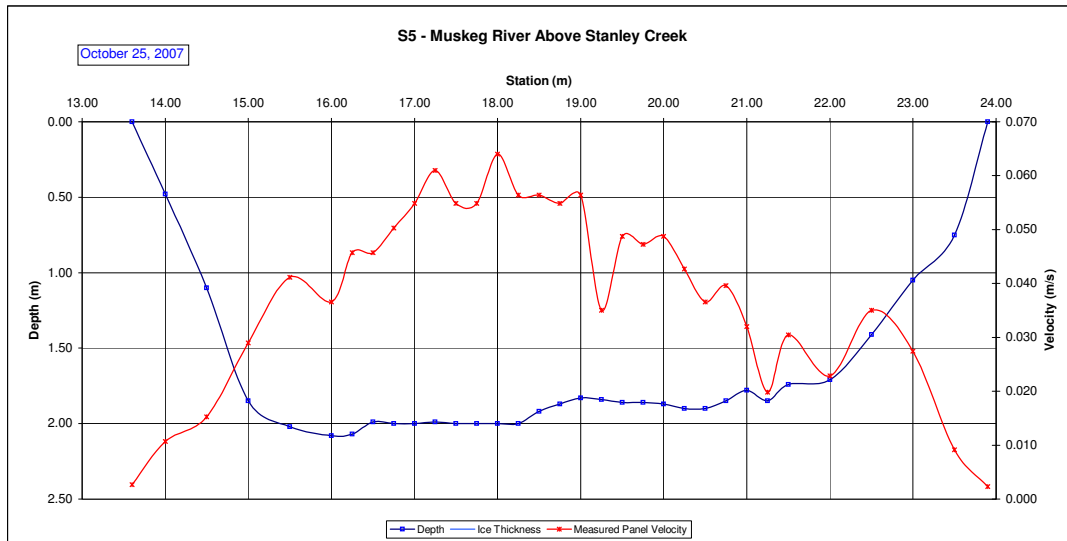
Weather Conditions: mostly cloudy no wind  
River Conditions: Open, Low Stage

Measured Data						Measurement Data										Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)							
13.60	0.00				0.00	1.00	1	13.60	13.80	0.003	0.003	0.12	0.02	0.000	0%						
14.00	0.48				0.01	1.00	2	13.80	14.25	0.011	0.011	0.48	0.22	0.002	0%						
14.50	1.10		0.03	0.00		1.00	3	14.25	14.75	0.015	0.015	1.10	0.55	0.008	1%						
15.00	1.85		0.04	0.02		1.00	4	14.75	15.25	0.029	0.029	1.85	0.93	0.027	4%						
15.50	2.02		0.04	0.04		1.00	5	15.25	15.75	0.041	0.041	2.02	1.01	0.042	6%						
16.00	2.08		0.04	0.03		1.00	6	15.75	16.13	0.037	0.037	2.08	0.78	0.029	4%						
16.25	2.07		0.05	0.04		1.00	7	16.13	16.38	0.046	0.046	2.07	0.52	0.024	4%						
16.50	1.99		0.05	0.05		1.00	8	16.38	16.63	0.046	0.046	1.99	0.50	0.023	3%						
16.75	2.00		0.06	0.04		1.00	9	16.63	16.88	0.050	0.050	2.00	0.50	0.025	4%						
17.00	2.00		0.06	0.05		1.00	10	16.88	17.13	0.055	0.055	2.00	0.50	0.027	4%						
17.25	1.99		0.07	0.05		1.00	11	17.13	17.38	0.061	0.061	1.99	0.50	0.030	4%						
17.50	2.00		0.07	0.04		1.00	12	17.38	17.63	0.055	0.055	2.00	0.50	0.027	4%						
17.75	2.00		0.07	0.04		1.00	13	17.63	17.88	0.055	0.055	2.00	0.50	0.027	4%						
18.00	2.00		0.07	0.06		1.00	14	17.88	18.13	0.064	0.064	2.00	0.50	0.032	5%						
18.25	2.00		0.06	0.05		1.00	15	18.13	18.38	0.056	0.056	2.00	0.50	0.028	4%						
18.50	1.92		0.06	0.05		1.00	16	18.38	18.63	0.056	0.056	1.92	0.48	0.027	4%						
18.75	1.87		0.06	0.05		1.00	17	18.63	18.88	0.055	0.055	1.87	0.47	0.026	4%						
19.00	1.83		0.06	0.05		1.00	18	18.88	19.13	0.056	0.056	1.83	0.46	0.026	4%						
19.25	1.84		0.03	0.04		1.00	19	19.13	19.38	0.035	0.035	1.84	0.46	0.016	2%						
19.50	1.86		0.06	0.04		1.00	20	19.38	19.63	0.049	0.049	1.86	0.47	0.023	3%						
19.75	1.86		0.06	0.04		1.00	21	19.63	19.88	0.047	0.047	1.86	0.47	0.022	3%						
20.00	1.87		0.06	0.04		1.00	22	19.88	20.13	0.049	0.049	1.87	0.47	0.023	3%						
20.25	1.90		0.06	0.03		1.00	23	20.13	20.38	0.043	0.043	1.90	0.48	0.020	3%						
20.50	1.90		0.05	0.03		1.00	24	20.38	20.63	0.037	0.037	1.90	0.48	0.017	3%						
20.75	1.85		0.05	0.03		1.00	25	20.63	20.88	0.040	0.040	1.85	0.46	0.018	3%						
21.00	1.78		0.05	0.02		1.00	26	20.88	21.13	0.032	0.032	1.78	0.45	0.014	2%						
21.25	1.85		0.03	0.01		1.00	27	21.13	21.38	0.020	0.020	1.85	0.46	0.009	1%						
21.50	1.74		0.04	0.02		1.00	28	21.38	21.75	0.030	0.030	1.74	0.65	0.020	3%						
22.00	1.71		0.03	0.01		1.00	29	21.75	22.25	0.023	0.023	1.71	0.86	0.020	3%						
22.50	1.41		0.04	0.03		1.00	30	22.25	22.75	0.035	0.035	1.41	0.71	0.025	4%						
23.00	1.05		0.03	0.03		1.00	31	22.75	23.25	0.027	0.027	1.05	0.53	0.014	2%						
23.50	0.75				0.01	1.00	32	23.25	23.70	0.009	0.009	0.75	0.34	0.003	0%						
23.90	0.00				0.00	1.00	33	23.70	23.90	0.002	0.002	0.19	0.04	0.000	0%						
Total Flow:														0.675	1						

Total Flow:	0.675	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	16.71	(m <sup>2</sup> )
Top Width:	10.30	(m)
Hydraulic Depth:	1.623	(m)
Mean Velocity:	0.040	(m/s)
Froude Number	0.010	
Photographs taken looking at: Upstream, downstream, across		

Notes: Data looks Good

Datalogger Notes:	Database	845
Datalogger Internal Power:	13	
Datalogger External Power:	4.27	
Datalogger Memory Used:	45%	Used
Datalogger Clock:	08:59	MST
Laptop Clock:	09:01	MST
Dessicant:	new	
Datalogger:	Optimum datalogger s/n# 0308190845	
PT:	Keller s/n 104640	
Power:	Magnacharge 20V 10A DC Battery and	
PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller		



# Hydrometric Measurement / Site Visit Record

S5 - Muskeg River Above Stanley Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Above Stanley Creek  
Site Name: S5  
Coordinates & Legal: 6356737 N, 479893 E SE-26-96-9-W4

## Personnel & Equipment

Measurement Made By: FF sm  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: December 11, 2007  
Start Time: 1:43 PM MDT  
End Time: 2:00 PM MDT

## Weather Conditions:

-15C partly cloudy

## River Conditions:

complete ice cover

## Level Readings

Bench Mark Reading: 0.860  
Water Level Reading: 2.070  
Top of Ice Level Reading: 2.040  
Transducer Reading & El.: 1.262  
Other:  
ice

## Setup No. 1

El: 99.895  
El: 97.685  
El: 98.715  
El: 96.424

## Setup No. 2

El: 99.895  
El: 97.691  
El: 98.721  
El: 96.430

97.688

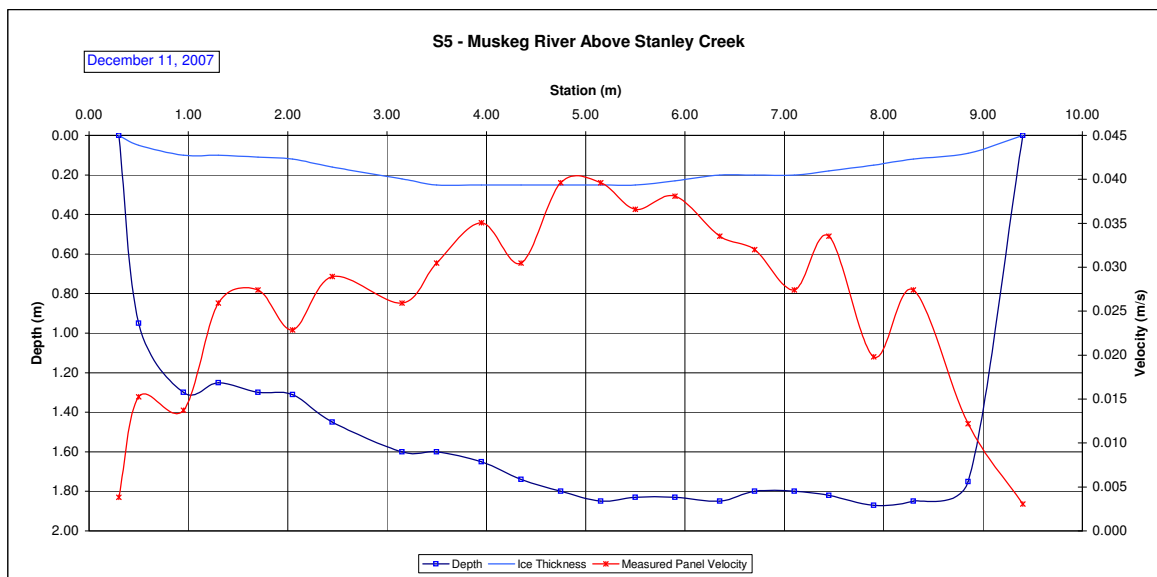
96.427

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.30	0.00	0.00			0.00	1.00	1	0.30	0.40	0.004	0.004	0.23	0.02	0.000	0%	
0.50	0.95	0.05			0.02	1.00	2	0.40	0.73	0.015	0.015	0.90	0.29	0.004	1%	
0.95	1.30	0.10	0.02	0.01		1.00	3	0.73	1.13	0.014	0.014	1.20	0.48	0.007	2%	
1.30	1.25	0.10	0.03	0.02		1.00	4	1.13	1.50	0.026	0.026	1.15	0.43	0.011	3%	
1.70	1.30	0.11	0.03	0.02		1.00	5	1.50	1.88	0.027	0.027	1.19	0.45	0.012	3%	
2.05	1.31	0.12	0.03	0.02		1.00	6	1.88	2.25	0.023	0.023	1.19	0.45	0.010	3%	
2.45	1.45	0.16	0.03	0.03		1.00	7	2.25	2.80	0.029	0.029	1.29	0.71	0.021	6%	
3.15	1.60	0.22	0.03	0.02		1.00	8	2.80	3.33	0.026	0.026	1.38	0.72	0.019	5%	
3.50	1.60	0.25	0.03	0.03		1.00	9	3.33	3.73	0.030	0.030	1.35	0.54	0.016	5%	
3.95	1.65	0.25	0.04	0.03		1.00	10	3.73	4.15	0.035	0.035	1.40	0.60	0.021	6%	
4.35	1.74	0.25	0.03	0.03		1.00	11	4.15	4.55	0.030	0.030	1.49	0.60	0.018	5%	
4.75	1.80	0.25	0.04	0.04		1.00	12	4.55	4.95	0.040	0.040	1.55	0.62	0.025	7%	
5.15	1.85	0.25	0.04	0.04		1.00	13	4.95	5.33	0.040	0.040	1.60	0.60	0.024	7%	
5.50	1.83	0.25	0.04	0.04		1.00	14	5.33	5.70	0.037	0.037	1.58	0.59	0.022	6%	
5.90	1.83	0.23	0.04	0.04		1.00	15	5.70	6.13	0.038	0.038	1.60	0.68	0.026	7%	
6.35	1.85	0.20	0.04	0.03		1.00	16	6.13	6.53	0.034	0.034	1.65	0.66	0.022	6%	
6.70	1.80	0.20	0.04	0.02		1.00	17	6.53	6.90	0.032	0.032	1.60	0.60	0.019	5%	
7.10	1.80	0.20	0.03	0.02		1.00	18	6.90	7.28	0.027	0.027	1.60	0.60	0.016	5%	
7.45	1.82	0.18	0.03	0.03		1.00	19	7.28	7.68	0.034	0.034	1.64	0.66	0.022	6%	
7.90	1.87	0.15	0.02	0.02		1.00	20	7.68	8.10	0.020	0.020	1.72	0.73	0.014	4%	
8.30	1.85	0.12	0.03	0.02		1.00	21	8.10	8.58	0.027	0.027	1.73	0.82	0.023	6%	
8.85	1.75	0.09	0.01	0.01		1.00	22	8.58	9.13	0.012	0.012	1.66	0.91	0.011	3%	
9.40	0.00	0.00			0.00	1.00	23	9.13	9.40	0.003	0.003	0.42	0.11	0.000	0%	
Total Flow:														0.364	1	

Total Flow:	0.364	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	12.87	(m <sup>2</sup> )
Top Width:	9.10	(m)
Hydraulic Depth:	1.415	(m)
Mean Velocity:	0.028	(m/s)
Froude Number	0.008	
Photographs taken looking at: Upstream, downstream, across		

Notes: Data looks Good

Datalogger Notes:	Database	845
Datalogger Internal Power:	4	
Datalogger External Power:	14.22	
Datalogger Memory Used:	45%	Used
Datalogger Clock:	13:10	MST
Laptop Clock:	13:13	MST
Dessicant:	blue	
Datalogger:	Optimum datalogger s/n# 0308190845	
PT:	Keller s/n 104640	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	



# Hydrometric Measurement / Site Visit Record

## S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

### Time of Measurement

Date of Measurement: January 12, 2007  
Start Time: 11:45 AM MST  
End Time: 11:54 AM MST

### Weather Conditions:

-24 C, Clear, Light wind

### River Conditions:

Ice covered above and below weir. Ice build up near weir. Section broken open for MMT.

### Personnel & Equipment

Measurement Made By: JS,FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Level Readings and Measurements

Bench Mark Reading: bar in PVC pi 1.003  
Water Level Reading: 2.665  
Top of Ice level Reading: 2.625  
Transducer Reading & Est. EL.: 0.444  
Other:

### Setup No. 1

EL: 273.600  
EL: 271.938  
EL: 271.978  
EL: 271.494  
EL: 274.603

### Setup No. 2

EL: 273.600  
EL: 271.930  
EL: 271.980  
EL: 271.486  
EL: 274.574

### Average

271.934  
271.980  
271.490

Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.50	0.00				0.000	1.00	1	0.50	0.55	0.003	0.003	0.01	0.00	0.000	0%	
0.60	0.05				0.012	1.00	2	0.55	0.65	0.012	0.012	0.05	0.00	0.000	0%	
0.70	0.08				0.094	1.00	3	0.65	0.73	0.094	0.094	0.08	0.01	0.001	3%	
0.75	0.11				0.082	1.00	4	0.73	0.78	0.082	0.082	0.11	0.01	0.000	3%	
0.80	0.12				0.052	1.00	5	0.78	0.83	0.052	0.052	0.12	0.01	0.000	2%	
0.85	0.13				0.113	1.00	6	0.83	0.88	0.113	0.113	0.13	0.01	0.001	5%	
0.90	0.09				0.204	1.00	7	0.88	0.93	0.204	0.204	0.09	0.00	0.001	6%	
0.95	0.06				0.226	1.00	8	0.93	0.98	0.226	0.226	0.06	0.00	0.001	4%	
1.00	0.07				0.335	1.00	9	0.98	1.03	0.335	0.335	0.07	0.00	0.001	7%	
1.05	0.06				0.341	1.00	10	1.03	1.08	0.341	0.341	0.06	0.00	0.001	6%	
1.10	0.10				0.223	1.00	11	1.08	1.13	0.223	0.223	0.10	0.00	0.001	7%	
1.15	0.07				0.338	1.00	12	1.13	1.18	0.338	0.338	0.07	0.00	0.001	7%	
1.20	0.08				0.396	1.00	13	1.18	1.23	0.396	0.396	0.08	0.00	0.002	10%	
1.25	0.08				0.302	1.00	14	1.23	1.28	0.302	0.302	0.08	0.00	0.001	7%	
1.30	0.08				0.213	1.00	15	1.28	1.33	0.213	0.213	0.08	0.00	0.001	5%	
1.35	0.06				0.168	1.00	16	1.33	1.38	0.168	0.168	0.06	0.00	0.001	3%	
1.40	0.06				0.210	1.00	17	1.38	1.43	0.210	0.210	0.06	0.00	0.001	4%	
1.45	0.07				0.158	1.00	18	1.43	1.48	0.158	0.158	0.07	0.00	0.001	3%	
1.50	0.08				0.119	1.00	19	1.48	1.53	0.119	0.119	0.08	0.00	0.000	3%	
1.55	0.07				0.125	1.00	20	1.53	1.58	0.125	0.125	0.07	0.00	0.000	3%	
1.60	0.06				0.241	1.00	21	1.58	1.63	0.241	0.241	0.06	0.00	0.001	4%	
1.65	0.07				0.101	1.00	22	1.63	1.73	0.101	0.101	0.07	0.01	0.001	4%	
1.80	0.05				0.049	1.00	23	1.73	1.85	0.049	0.049	0.05	0.01	0.000	2%	
1.90	0.00				0.000	1.00	24	1.85	1.90	0.012	0.012	0.01	0.00	0.000	0%	
Total Flow:														0.016	100%	

Total Flow:	0.016	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.10	(m <sup>2</sup> )
Top Width:	1.40	(m)
Hydraulic Depth:	0.070	(m)
Mean Velocity:	0.165	(m/s)
Froude Number	0.200	
Photographs taken looking at:		
Upstream, downstream, across		

### Notes:

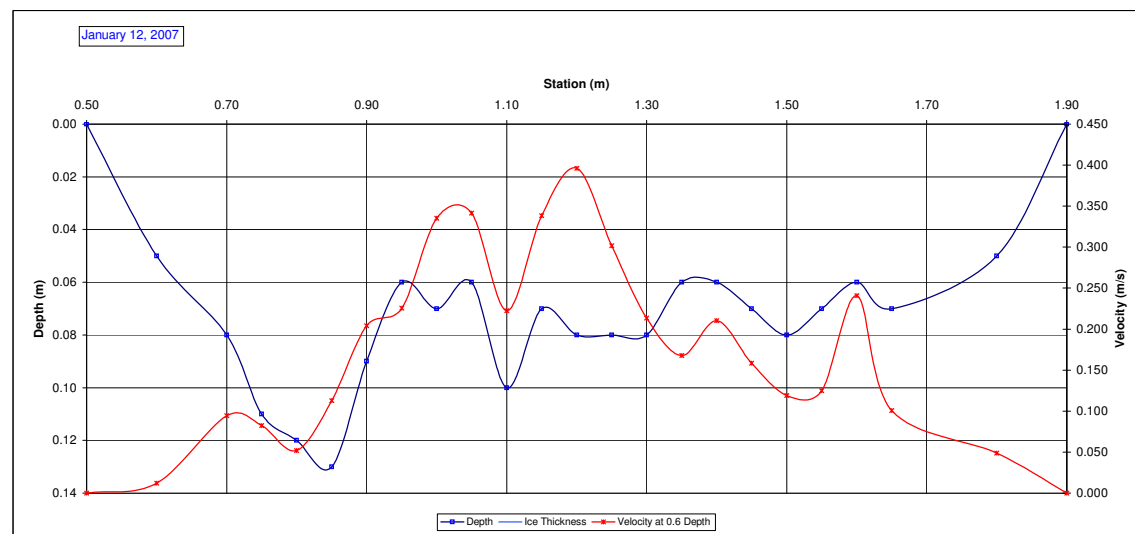
Problem loading txt file in Dataview software.

Memory cleared, clock synchronized to tablet.

MMT made at open section just upstream of culvert. Battery changed, reading 11.8 V after switch.

### Datalogger Notes:

Datalogger Internal Power: 11.34 100%  
Datalogger External Power: 11.44 74%  
Datalogger Memory Used: 90%  
Datalogger Clock: January 12, 2007 11:08 AM MST  
Laptop Clock: January 12, 2007 11:11 AM MST  
Dessicant: 50% used changed  
Datalogger: s/n 203149  
PT: s/n 609001-5903  
Power: Lakewood battery



# Hydrometric Measurement / Site Visit Record

## S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

### Time of Measurement

Date of Measurement: February 11, 2007  
Start Time: 12:05 PM MST  
End Time: 12:25 PM MST

### Weather Conditions:

-24 C, Clear, Light wind

### River Conditions:

Ice covered above and below weir. Ice build up near weir. Section broken open for MMT.

### Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings and Measurements

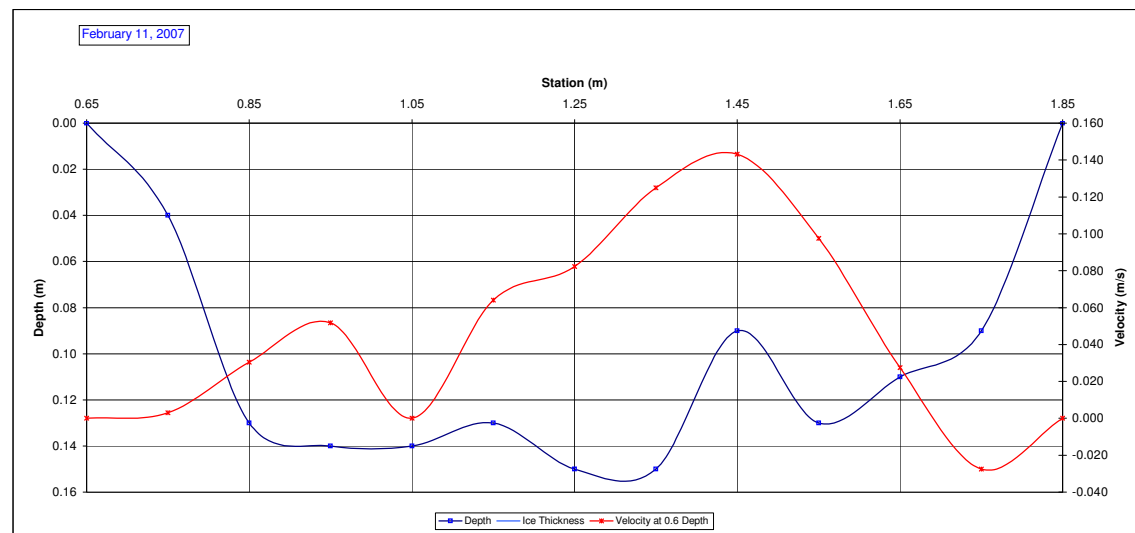
	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: bar in PVC pi	1.249	EI: 273.600	1.220
Water Level Reading:	2.913	EI: 271.936	2.875
Top of Ice level Reading:	2.886	EI: 271.963	2.854
Transducer Reading & Est. EI:	0.456	EI: 271.480	0.456
Other:		EI: 274.849	EI: 274.820

Measured Data						Measurement Data									Calculated Data				Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)					
0.65	0.00				0.000	1.00	1	0.65	0.70	0.001	0.001	0.01	0.00	0.000	0%				
0.75	0.04				0.003	1.00	2	0.70	0.80	0.003	0.003	0.04	0.00	0.000	0%				
0.85	0.13				0.030	1.00	3	0.80	0.90	0.030	0.030	0.13	0.01	0.000	5%				
0.95	0.14				0.052	1.00	4	0.90	1.00	0.052	0.052	0.14	0.01	0.001	9%				
1.05	0.14				0.000	1.00	5	1.00	1.10	0.000	0.000	0.14	0.01	0.000	0%				
1.15	0.13				0.064	1.00	6	1.10	1.20	0.064	0.064	0.13	0.01	0.001	11%				
1.25	0.15				0.082	1.00	7	1.20	1.30	0.082	0.082	0.15	0.02	0.001	16%				
1.35	0.15				0.125	1.00	8	1.30	1.40	0.125	0.125	0.15	0.02	0.002	24%				
1.45	0.09				0.143	1.00	9	1.40	1.50	0.143	0.143	0.09	0.01	0.001	17%				
1.55	0.13				0.098	1.00	10	1.50	1.60	0.098	0.098	0.13	0.01	0.001	17%				
1.65	0.11				0.027	1.00	11	1.60	1.70	0.027	0.027	0.11	0.01	0.000	4%				
1.75	0.09				-0.027	1.00	12	1.70	1.80	-0.027	-0.027	0.09	0.01	0.000	-3%				
1.85	0.00				0.000	1.00	13	1.80	1.85	-0.007	-0.007	0.02	0.00	0.000	0%				
Total Flow:														0.008	100%				

Total Flow:	0.008	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.13	(m <sup>2</sup> )
Top Width:	1.20	(m)
Hydraulic Depth:	0.110	(m)
Mean Velocity:	0.058	(m/s)
Froude Number:	0.056	
Photographs taken looking at:		
Upstream, downstream, across		

Notes:

Datalogger Notes:		
Datalogger Internal Power:	11.34	100%
Datalogger External Power:	11.68	75%
Datalogger Memory Used:	7%	Good cleared
Datalogger Clock:	12:04PM	MST
Laptop Clock:	12:16PM	MST
Dessicant:	10% used, Not changed	
Datalogger:	s/n 203149	
PT:	s/n 609001-5903	
Power:	Lakewood battery	





# Hydrometric Measurement / Site Visit Record

## S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

### Time of Measurement

Date of Measurement: March 7, 2007  
Start Time: 1:40 PM MST  
End Time: 1:51 PM MST

### Weather Conditions:

-10 C, Overcast, Light wind

### River Conditions:

Partially ice covered above and below weir. Ice build up near weir.

### Personnel & Equipment

Measurement Made By: JS,FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Level Readings and Measurements

Bench Mark Reading: bar in PVC pi 0.986  
Water Level Reading: 2.643  
Top of Ice level Reading: 2.641  
Transducer Reading & Est. EL: 0.467  
Other: 274.586

### Setup No. 1

EL: 273.600  
EL: 271.943  
EL: 271.945  
EL: 271.476  
EL: 274.586

### Setup No. 2

EL: 273.600  
EL: 271.943  
EL: 271.951  
EL: 271.476  
EL: 274.521

### Average

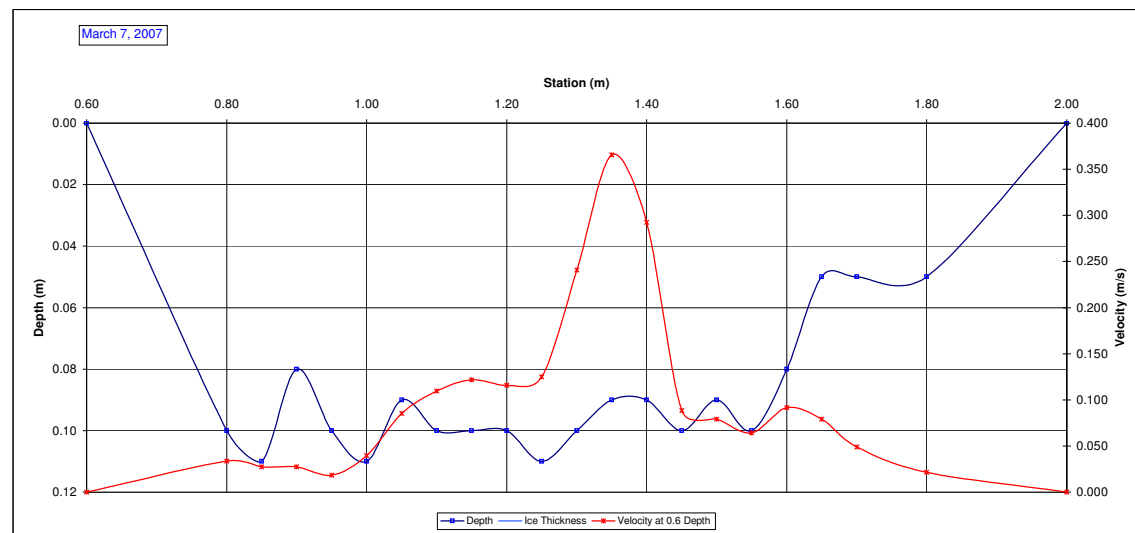
271.943  
271.476

Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.60	0.00				0.000	1.00	1	0.60	0.70	0.008	0.008	0.03	0.00	0.000	0%	
0.80	0.10				0.034	1.00	2	0.70	0.83	0.034	0.034	0.10	0.01	0.000	4%	
0.85	0.11				0.027	1.00	3	0.83	0.88	0.027	0.027	0.11	0.01	0.000	2%	
0.90	0.08				0.027	1.00	4	0.88	0.93	0.027	0.027	0.08	0.00	0.000	1%	
0.95	0.10				0.018	1.00	5	0.93	0.98	0.018	0.018	0.10	0.01	0.000	1%	
1.00	0.11				0.040	1.00	6	0.98	1.03	0.040	0.040	0.11	0.01	0.000	2%	
1.05	0.09				0.085	1.00	7	1.03	1.08	0.085	0.085	0.09	0.00	0.000	4%	
1.10	0.10				0.110	1.00	8	1.08	1.13	0.110	0.110	0.10	0.01	0.001	5%	
1.15	0.10				0.122	1.00	9	1.13	1.18	0.122	0.122	0.10	0.00	0.001	6%	
1.20	0.10				0.116	1.00	10	1.18	1.23	0.116	0.116	0.10	0.01	0.001	6%	
1.25	0.11				0.125	1.00	11	1.23	1.28	0.125	0.125	0.11	0.01	0.001	7%	
1.30	0.10				0.241	1.00	12	1.28	1.33	0.241	0.241	0.10	0.01	0.001	12%	
1.35	0.09				0.366	1.00	13	1.33	1.38	0.366	0.366	0.09	0.00	0.002	16%	
1.40	0.09				0.293	1.00	14	1.38	1.43	0.293	0.293	0.09	0.00	0.001	13%	
1.45	0.10				0.088	1.00	15	1.43	1.48	0.088	0.088	0.10	0.00	0.000	4%	
1.50	0.09				0.079	1.00	16	1.48	1.53	0.079	0.079	0.09	0.00	0.000	4%	
1.55	0.10				0.064	1.00	17	1.53	1.58	0.064	0.064	0.10	0.00	0.000	3%	
1.60	0.08				0.091	1.00	18	1.58	1.63	0.091	0.091	0.08	0.00	0.000	4%	
1.65	0.05				0.079	1.00	19	1.63	1.68	0.079	0.079	0.05	0.00	0.000	2%	
1.70	0.05				0.049	1.00	20	1.68	1.75	0.049	0.049	0.05	0.00	0.000	2%	
1.80	0.05				0.021	1.00	21	1.75	1.90	0.021	0.021	0.05	0.01	0.000	2%	
2.00	0.00				0.000	1.00	22	1.90	2.00	0.005	0.005	0.01	0.00	0.000	0%	
Total Flow:															0.010	100%

Total Flow:	0.010	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.11	(m <sup>2</sup> )
Top Width:	1.40	(m)
Hydraulic Depth:	0.077	(m)
Mean Velocity:	0.093	(m/s)
Froude Number	0.107	
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		
Problem loading txt file in Dataview software.		

Datalogger Notes:		
Datalogger Internal Power:	11.34	100%
Datalogger External Power:	11.92	77%
Datalogger Memory Used:	17%	Good
Datalogger Clock:	March 7, 2007 01:16 PM	MST
Laptop Clock:	March 7, 2007 01:21 PM	MST
Dessicant:	5% used changed	
Datalogger:	s/n 203149	
PT:	s/n 609001-5903	
Power:	Lakewood battery	

MMT made at open section just upstream of culvert. Battery changed, reading 12.41 V after switch.



# Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

### Time of Measurement

Date of Measurement: March 30, 2007  
Start Time: 2:09 PM MST  
End Time: 2:20 PM MST

### Weather Conditions:

Partly cloudy, windy, +2C

### River Conditions:

### Personnel & Equipment

Measurement Made By: JE, SE  
Data Entry By: PM Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings and Measurements

	Setup No. 1	
Bench Mark Reading: bar in PVC pi	1.187	El: 273.600
Water Level Reading:	2.851	El: 271.936
Top of Ice level Reading:	2.815	El: 271.972
Transducer Reading & Est. El.:	0.467	El: 271.469
Other:		El: 274.787

### Setup No. 2

	Setup No. 2	Average
	1.119 El: 273.600	
	2.844 El: 271.875	271.906
	2.811 El: 271.908	
	0.467 El: 271.408	271.439
		El: 274.719

### Notes:

Level Completed by HCL

# Hydrometric Measurement / Site Visit Record

## S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

### Time of Measurement

Date of Measurement: April 25, 2007  
Start Time: 9:25 AM MST  
End Time: 9:38 AM MST

### Weather Conditions:

River Conditions: Open

### Personnel & Equipment

Measurement Made By: JS, JE  
Data Entry By: JE  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Level Readings and Measurements

Bench Mark Reading: bar in PVC pi 0.845  
Water Level Reading: 2.437  
Top of Ice level Reading:  
Transducer Reading & Est. El.: 0.531  
Other:

### Setup No. 1

El: 273.600  
El: 272.008  
El: 274.445  
El: 271.478  
El: 274.445

### Setup No. 2

El: 273.600  
El: 272.011  
El: 274.407  
El: 271.481  
El: 274.407

### Average

272.010  
274.407  
271.479

Measured Data						Measurement Data									Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge						
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)						
0.39	0.00				0.000	1.00	1	0.39	0.65	0.005	0.005	0.02	0.01	0.000	0%					
0.90	0.09				0.018	1.00	2	0.65	0.93	0.018	0.018	0.09	0.03	0.000	2%					
0.95	0.12				0.076	1.00	3	0.93	0.98	0.076	0.076	0.12	0.01	0.000	2%					
1.00	0.15				0.110	1.00	4	0.98	1.03	0.110	0.110	0.15	0.01	0.001	3%					
1.05	0.15				0.058	1.00	5	1.03	1.08	0.058	0.058	0.15	0.01	0.000	2%					
1.10	0.19				0.110	1.00	6	1.08	1.13	0.110	0.110	0.19	0.01	0.001	4%					
1.15	0.20				0.171	1.00	7	1.13	1.18	0.171	0.171	0.20	0.01	0.002	7%					
1.20	0.20				0.180	1.00	8	1.18	1.23	0.180	0.180	0.20	0.01	0.002	7%					
1.25	0.21				0.192	1.00	9	1.23	1.28	0.192	0.192	0.21	0.01	0.002	8%					
1.30	0.21				0.131	1.00	10	1.28	1.33	0.131	0.131	0.21	0.01	0.001	5%					
1.35	0.21				0.198	1.00	11	1.33	1.38	0.198	0.198	0.21	0.01	0.002	8%					
1.40	0.18				0.201	1.00	12	1.38	1.43	0.201	0.201	0.18	0.01	0.002	7%					
1.45	0.22				0.155	1.00	13	1.43	1.48	0.155	0.155	0.22	0.01	0.002	7%					
1.50	0.21				0.162	1.00	14	1.48	1.53	0.162	0.162	0.21	0.01	0.002	6%					
1.55	0.21				0.152	1.00	15	1.53	1.58	0.152	0.152	0.21	0.01	0.002	6%					
1.60	0.22				0.177	1.00	16	1.58	1.63	0.177	0.177	0.22	0.01	0.002	7%					
1.65	0.22				0.140	1.00	17	1.63	1.68	0.140	0.140	0.22	0.01	0.002	6%					
1.70	0.21				0.088	1.00	18	1.68	1.73	0.088	0.088	0.21	0.01	0.001	4%					
1.75	0.20				0.082	1.00	19	1.73	1.78	0.082	0.082	0.20	0.01	0.001	3%					
1.80	0.18				0.076	1.00	20	1.78	1.83	0.076	0.076	0.18	0.01	0.001	3%					
1.85	0.14				0.049	1.00	21	1.83	1.88	0.049	0.049	0.14	0.01	0.000	1%					
1.90	0.12				0.061	1.00	22	1.88	1.93	0.061	0.061	0.12	0.01	0.000	1%					
1.95	0.12				0.055	1.00	23	1.93	1.98	0.055	0.055	0.12	0.01	0.000	1%					
2.00	0.09				0.021	1.00	24	1.98	2.03	0.021	0.021	0.09	0.00	0.000	0%					
2.05	0.09				0.015	1.00	25	2.03	2.08	0.015	0.015	0.09	0.00	0.000	0%					
2.10	0.09				0.009	1.00	26	2.08	2.13	0.009	0.009	0.09	0.00	0.000	0%					
2.15	0.10				0.000	1.00	27	2.13	2.18	0.000	0.000	0.10	0.00	0.000	0%					
2.20	0.09				0.000	1.00	28	2.18	2.23	0.000	0.000	0.09	0.00	0.000	0%					
2.25	0.09				0.000	1.00	29	2.23	2.28	0.000	0.000	0.09	0.00	0.000	0%					
2.30	0.06				0.000	1.00	30	2.28	2.33	0.000	0.000	0.06	0.00	0.000	0%					
2.35	0.05				0.000	1.00	31	2.33	2.43	0.000	0.000	0.05	0.00	0.000	0%					
2.50	0.00				0.000	1.00	32	2.43	2.50	0.000	0.000	0.01	0.00	0.000	0%					
Total Flow:															0.026	100%				

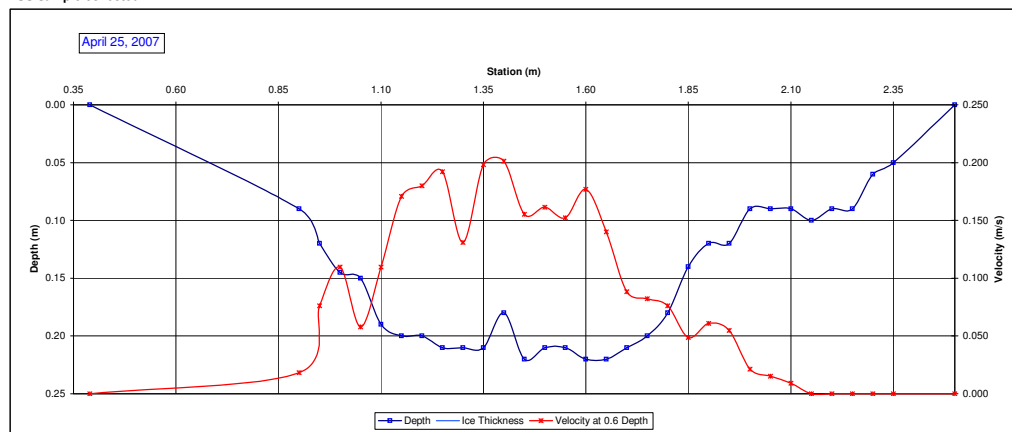
Total Flow:	0.026	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.26	(m <sup>2</sup> )
Top Width:	2.11	(m)
Hydraulic Depth:	0.124	(m)
Mean Velocity:	0.100	(m/s)
Froude Number	0.091	
Photographs taken looking at:		
Upstream, downstream, across		

### Notes:

TSS sample collected

### Datalogger Notes:

Datalogger Internal Power: 11.34 100%  
Datalogger External Power: 12.29 79%  
Datalogger Memory Used: 25%  
Datalogger Clock: April 25, 2007 07:59 AM MST  
Laptop Clock: April 26, 2007 08:16 AM MST  
Dessicant: 90% used changed  
Datalogger: s/n 203149  
PT: s/n 609001-5903  
Power: Lakewood battery



# Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

## Time of Measurement

Date of Measurement: June 14, 2007  
Start Time: 3:47 PM MST  
End Time: MST

## Weather Conditions:

River Conditions: Open

## Personnel & Equipment

Measurement Made By: sm, wd pm  
Data Entry By: sm Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings and Measurements

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: bar in PVC pi	1.530	1.517	1.517
Water Level Reading:	3.178	3.162	271.955
Top of Ice level Reading:			275.117
Transducer Reading & Est. EL:	0.487	0.487	271.468
Other:			275.117

Measured Data							Measurement Data								Calculated Data			Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)				
					0.000	1.00	1	0.00		0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	2			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	3			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	4			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	5			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	6			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	7			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	8			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	9			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	10			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	11			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	12			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	13			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	14			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	15			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	16			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	17			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	18			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	19			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	20			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	21			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	22			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	23			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	24			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	25			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	26			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	27			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	28			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	29			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	30			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	31			0.000	0.000	0.00	0.00	0.000				
					0.000	1.00	32		0.00	0.000	0.000	0.00	0.00	0.000				
Total Flow:														0.000				

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	0.00	(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		

## Notes:

TSS sample collected  
weir crest is 55 mm wide

## Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power: 81%  
Datalogger Memory Used: 45%  
Datalogger Clock: June 14, 2007 02:32 PM MST  
Laptop Clock: June 14, 2007 02:50 PM MST  
Dessicant: good  
Datalogger: s/n 203149  
PT: s/n 609001-5903  
Power: Lakewood battery

# Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Mills Creek  
 Location: Mills Creek at Hwy 63  
 Site Name: S6  
 Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

## Time of Measurement

Date of Measurement: August 5, 2007  
 Start Time: 4:45 PM MDT  
 End Time: 5:15 PM MDT

## Weather Conditions:

River Conditions: Open

## Personnel & Equipment

Measurement Made By: SM/PM  
 Data Entry By: JMS Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

## Level Readings and Measurement

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: bar in PVC pi	1.553	El: 273.600	1.565 El: 273.600
Water Level Reading:	3.198	El: 271.955	3.21 El: 271.955
Top of Ice level Reading:			
Transducer Reading & Est. El.:	0.488	El: 271.467	0.488 El: 271.467
Other:		El:	

Measured Data						Measurement Data									Calculated Data				Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)					
No Flow measurement made																			
Total Flow:														0.000	0%				

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		
TSS sample collected		

Datalogger Notes:		
Datalogger Internal Power:	100%	
Datalogger External Power:	78%	Good
Datalogger Memory Used:	25%	cleared
Datalogger Clock:	August 5, 2007 03:50 PM	MST
Laptop Clock:	August 5, 2007 03:58 PM	MST
Dessicant:	changed	
Datalogger:	s/n 203149	
PT:	s/n 609001-5903	
Power:	Lakewood battery	

# Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Mills Creek  
 Location: Mills Creek at Hwy 63  
 Site Name: S6  
 Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

## Time of Measurement

Date of Measurement: September 19, 2007  
 Start Time: 7:20 PM MDT  
 End Time: 7:35 PM MDT

## Weather Conditions:

River Conditions: Open

## Personnel & Equipment

Measurement Made By: SM JMS  
 Data Entry By: SM Checked:  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

## Level Readings and Measurement

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: bar in PVC pi	1.252	El: 273.600	1.249 El: 273.600
Water Level Reading:	2.889	El: 271.963	2.886 El: 271.963 271.963
Top of Ice level Reading:			
Transducer Reading & Est. El.:	0.494	El: 271.469	0.494 El: 271.469 271.469
Other:		El:	

Measured Data						Measurement Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
No Flow mmt made															
Total Flow:														0.000	0%

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		
TSS sample collected		

Datalogger Notes:			
Datalogger Internal Power:	11.34	100%	
Datalogger External Power:	11.80	76%	Good
Datalogger Memory Used:	75%		cleared
Datalogger Clock:	September 19, 2007 06:17 PM	MST	
Laptop Clock:	September 19, 2007 06:25 PM	MST	
Dessicant:	changed		
Datalogger:	s/n 203149		
PT:	s/n 609001-5903		
Power:	Lakewood battery		

## Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



### Regional Aquatics Monitoring Program

#### Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

#### Time of Measurement

Date of Measurement: October 20, 2007  
Start Time: 2:08 PM MDT  
End Time: MDT

#### Weather Conditions:

River Conditions: Open

#### Notes:

TSS sample collected

#### Personnel & Equipment

Measurement Made By: ff sm  
Data Entry By: SM Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

#### Level Readings and Measurement

	Setup No. 1	Setup No. 2	Average
Bench Mark Reading: bar in PVC pi	1.208	El: 273.600	1.093 El: 273.600
Water Level Reading:	2.860	El: 271.948	2.745 El: 271.948 271.948
Top of Ice level Reading:			
Transducer Reading & Est. El.:	0.484	El: 271.464	0.484 El: 271.464 271.464
Other:		El:	El:

#### Datalogger Notes:

Datalogger Internal Power:	11.34	100%	Good cleared
Datalogger External Power:	11.68	76%	
Datalogger Memory Used:	10%		
Datalogger Clock:	October 20, 2007 12:58 PM	MST	
Laptop Clock:	October 20, 2007 01:07 PM	MST	
Dessicant:	good		
Datalogger:	s/n 203149		
PT:	s/n 609001-5903		
Power:	Lakewood battery		

## Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



### Regional Aquatics Monitoring Program

#### Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

#### Time of Measurement

Date of Measurement: November 15, 2007  
Start Time:  
End Time:

#### Weather Conditions:

Cloudy

#### River Conditions:

Thin ice around edges approx. 4cm  
60% open

#### Notes:

TSS sample collected

#### Personnel & Equipment

Measurement Made By: JC/CE  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000  
Checked: s/n 2004521

#### Level Readings and Measurement

Bench Mark Reading: bar in PVC pi 0.780  
Water Level Reading: 2.434  
Top of Ice level Reading: 2.431  
Transducer Reading & Est. El.:  
Other:

#### Setup No. 1

El: 273.600  
El: 271.946  
El: 271.946  
El:

#### Setup No. 2

0.770 El: 273.600  
2.422 El: 271.948  
2.421  
0.000 El: 271.948  
El:

#### Average

271.947  
271.947  
271.947

#### Datalogger Notes:

Datalogger Internal Power:

Datalogger External Power:

Datalogger Memory Used:

Datalogger Clock:

Laptop Clock:

Dessicant:

Datalogger: s/n 203149

PT: s/n 609001-5903

Power: Lakewood battery

MST  
MST



# Hydrometric Measurement / Site Visit Record

S6 - Mills Creek at Hwy 63



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Mills Creek  
Location: Mills Creek at Hwy 63  
Site Name: S6  
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

### Time of Measurement

Date of Measurement: December 10, 2007  
Start Time: 4:30 PM MST  
End Time:

Weather Conditions: Overcast

River Conditions: Low

### Notes:

Depth of flow over notch = 12 cm  
TD reading = 0.4759

### Personnel & Equipment

Measurement Made By: SM/FF  
Data Entry By: SMS  
Checked:  
Meter Type and No.:

### Level Readings and Measurement

	Setup No. 1	
Bench Mark Reading: bar in PVC pipe	1.265	El: 273.600
Water Level Reading:	2.920	El: 271.945
Top of Ice level Reading:	2.888	El: 271.977
Transducer Reading & Est. El.:	0.477	El: 271.468
Other:		El:

### Setup No. 2

	Setup No. 2		Average
	1.260	El: 273.600	
	2.915	El: 271.945	271.945
	2.882	El: 271.978	
	0.477	El: 271.468	271.468
		El:	

### Datalogger Notes:

Datalogger Internal Power:	11.34 V	
Datalogger External Power:	11.07 V	
Datalogger Memory Used:	20%	
Datalogger Clock:	4:27 PM	MST
Laptop Clock:	4:39 PM	MST
Dessicant:	Good - new	

Datalogger:	s/n 203149
PT:	s/n 609001-5903
Power:	Lakewood battery

# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

### Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF Checked: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Time of Measurement

Date of Measurement: January 11, 2007  
Start Time: 3:30 PM MST  
End Time: 3:57 PM MST

### Level Readings

Bench Mark Reading: pin in tree 0.550  
Water Level Reading: 4.136  
Top of Ice Level Reading: 4.110  
Transducer Reading & Calc'd El: 0.751  
Other: Rod in ABS 0.702

### Setup No. 1

El: 275.565  
El: 271.979  
El: 271.455  
El: 271.228  
El: 275.413

### Setup No. 2

El: 275.565  
El: 271.975  
El: 271.486  
El: 271.224  
El: 275.414

### Average

271.977  
271.226

### Weather Conditions:

-25 C, clear, light wind

### River Conditions:

Full ice cover at MMT section.

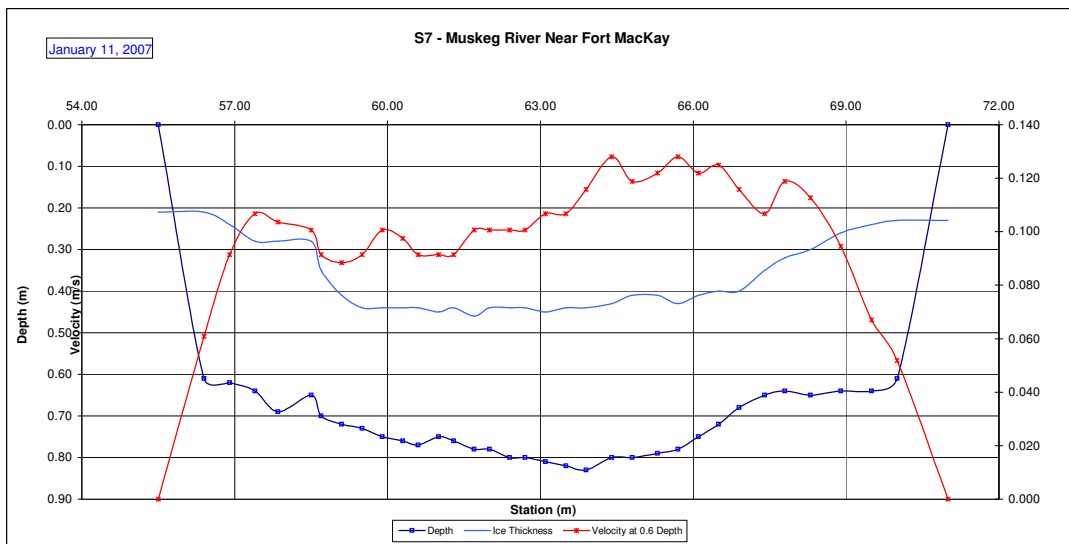
### Measurement Data

Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
55.50	0.00	0.21			0.000	0.90	1	55.50		0.015	0.014	0.10	-5.55	-0.076		
56.40	0.61	0.21			0.061	0.90	2			0.061	0.055	0.40	0.00	0.000		
56.90	0.62	0.24			0.091	0.90	3			0.091	0.082	0.38	0.00	0.000		
57.40	0.64	0.28			0.107	0.90	4			0.107	0.096	0.36	0.00	0.000		
57.85	0.69	0.28			0.104	0.90	5			0.104	0.093	0.41	0.00	0.000		
58.50	0.65	0.28			0.101	0.90	6			0.101	0.091	0.37	0.00	0.000		
58.70	0.70	0.35			0.091	0.90	7			0.091	0.082	0.35	0.00	0.000		
59.10	0.72	0.41			0.088	0.90	8			0.088	0.080	0.31	0.00	0.000		
59.50	0.73	0.44			0.091	0.90	9			0.091	0.082	0.29	0.00	0.000		
59.90	0.75	0.44			0.101	0.90	10			0.101	0.091	0.31	0.00	0.000		
60.30	0.76	0.44			0.098	0.90	11			0.098	0.088	0.32	0.00	0.000		
60.60	0.77	0.44			0.091	0.90	12			0.091	0.082	0.33	0.00	0.000		
61.00	0.75	0.45			0.091	0.90	13			0.091	0.082	0.30	0.00	0.000		
61.30	0.76	0.44			0.091	0.90	14			0.091	0.082	0.32	0.00	0.000		
61.70	0.78	0.46			0.101	0.90	15			0.101	0.091	0.32	0.00	0.000		
62.00	0.78	0.44			0.101	0.90	16			0.101	0.091	0.34	0.00	0.000		
62.40	0.80	0.44			0.101	0.90	17			0.101	0.091	0.36	0.00	0.000		
62.70	0.80	0.44			0.101	0.90	18			0.101	0.091	0.36	0.00	0.000		
63.10	0.81	0.45			0.107	0.90	19			0.107	0.096	0.36	0.00	0.000		
63.50	0.82	0.44			0.107	0.90	20			0.107	0.096	0.38	0.00	0.000		
63.90	0.83	0.44			0.116	0.90	21			0.116	0.104	0.39	0.00	0.000		
64.40	0.80	0.43			0.128	0.90	22			0.128	0.115	0.37	0.00	0.000		
64.80	0.80	0.41			0.119	0.90	23			0.119	0.107	0.39	0.00	0.000		
65.30	0.79	0.41			0.122	0.90	24			0.122	0.110	0.38	0.00	0.000		
65.70	0.78	0.43			0.128	0.90	25			0.128	0.115	0.35	0.00	0.000		
66.10	0.75	0.41			0.122	0.90	26			0.122	0.110	0.34	0.00	0.000		
66.50	0.72	0.40			0.125	0.90	27			0.125	0.112	0.32	0.00	0.000		
66.90	0.68	0.40			0.116	0.90	28			0.116	0.104	0.28	0.00	0.000		
67.40	0.65	0.35			0.107	0.90	29			0.107	0.096	0.30	0.00	0.000		
67.80	0.64	0.32			0.119	0.90	30			0.119	0.107	0.32	0.00	0.000		
68.30	0.65	0.30			0.113	0.90	31			0.113	0.101	0.35	0.00	0.000		
68.90	0.64	0.26			0.094	0.90	32		69.20	0.094	0.085	0.38	26.30	2.236		
69.50	0.64	0.24			0.067	0.90	33	69.50	70.00	0.067	0.060	0.40	27.80	1.678		
70.00	0.61	0.23			0.052	0.90	34	69.50	70.00	0.052	0.047	0.38	0.19	0.009	0%	
71.00	0.00	0.23			0.000	0.90	35	70.00	71.00	0.013	0.012	0.10	0.10	0.001	0%	
									0.00				Total Flow:	3.848	0%	

Total Flow:	3.848	(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:		(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database	269
Datalogger Internal Power:	4.57 V	
Datalogger External Power:	12.98	
Datalogger Memory Used:	40%	
Datalogger Clock:	Jan-11, 2007-03:05-PM	MST
Laptop Clock:	Jan-11, 2007-03:12-PM	MST
Dessicant:	50%	Changed
Datalogger:	Optimum DD128, # 0104170269	
PT:	Keller 730-130-3 psi #0101345	
Power:	Magnacharge 20V 10A DC Battery and	
	PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: Downloaded data appears error free.



# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4  
Time of Measurement  
Date of Measurement: February 7, 2007  
Start Time: 5:15 PM MST  
End Time: 5:45 PM MST

## Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS Checked: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: pin in tree 0.628  
Water Level Reading: 4.225  
Top of Ice Level Reading: 4.206  
Transducer Reading & Calc'd El: 0.741  
Other: Rod in ABS 0.780

## Setup No. 1

El: 275.565  
El: 271.968  
El: 271.359  
El: 271.227  
El: 275.413

## Setup No. 2

El: 275.565  
El: 271.961  
El: 271.371  
El: 271.220  
El: 275.412

## Weather Conditions:

-25 C, clear, light wind

## River Conditions:

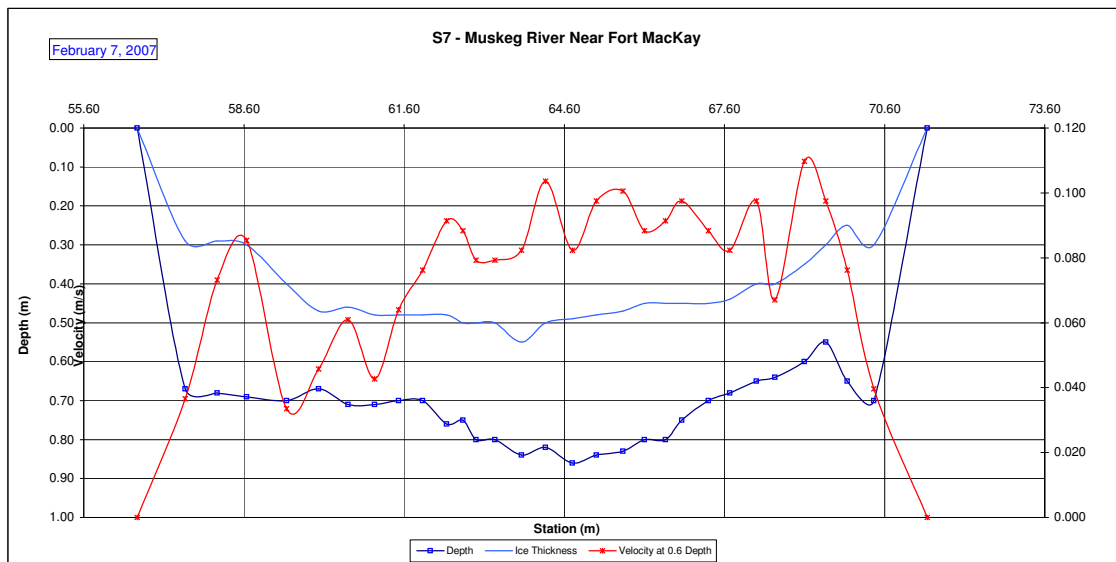
Full ice cover

Measured Data						Measurement Data										Calculated Data				
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)						
56.60	0.00	0.00			0.000	0.90	1	56.60		0.009	0.008	0.10	-5.38	-0.044						
57.50	0.67	0.29			0.037	0.90	2			0.037	0.033	0.38	0.00	0.000						
58.10	0.68	0.29			0.073	0.90	3			0.073	0.066	0.39	0.00	0.000						
58.65	0.69	0.30			0.085	0.90	4			0.085	0.077	0.39	0.00	0.000						
59.40	0.70	0.40			0.034	0.90	5			0.034	0.030	0.30	0.00	0.000						
60.00	0.67	0.47			0.046	0.90	6			0.046	0.041	0.24	0.00	0.000						
60.55	0.71	0.46			0.061	0.90	7			0.061	0.055	0.25	0.00	0.000						
61.05	0.71	0.48			0.043	0.90	8			0.043	0.038	0.22	0.00	0.000						
61.50	0.70	0.48			0.064	0.90	9			0.064	0.058	0.22	0.00	0.000						
61.95	0.70	0.48			0.076	0.90	10			0.076	0.069	0.28	0.00	0.000						
62.40	0.76	0.48			0.091	0.90	11			0.091	0.082	0.27	0.00	0.000						
62.70	0.75	0.50			0.088	0.90	12			0.088	0.080	0.30	0.00	0.000						
62.95	0.80	0.50			0.079	0.90	13			0.079	0.071	0.30	0.00	0.000						
63.30	0.80	0.50			0.079	0.90	14			0.079	0.071	0.34	0.00	0.000						
63.80	0.84	0.55			0.082	0.90	15			0.082	0.074	0.27	0.00	0.000						
64.25	0.82	0.50			0.104	0.90	16			0.104	0.093	0.36	0.00	0.000						
64.75	0.86	0.49			0.082	0.90	17			0.082	0.074	0.35	0.00	0.000						
65.20	0.84	0.48			0.098	0.90	18			0.098	0.088	0.35	0.00	0.000						
65.70	0.83	0.47			0.101	0.90	19			0.101	0.091	0.33	0.00	0.000						
66.10	0.80	0.45			0.088	0.90	20			0.088	0.080	0.35	0.00	0.000						
66.50	0.80	0.45			0.091	0.90	21			0.091	0.082	0.30	0.00	0.000						
66.80	0.75	0.45			0.098	0.90	22			0.098	0.088	0.25	0.00	0.000						
67.30	0.70	0.45			0.088	0.90	23			0.088	0.080	0.23	0.00	0.000						
67.70	0.68	0.44			0.082	0.90	24			0.082	0.074	0.21	0.00	0.000						
68.20	0.65	0.40			0.098	0.90	25			0.098	0.088	0.24	0.00	0.000						
68.55	0.64	0.40			0.067	0.90	26			0.067	0.060	0.20	0.00	0.000						
69.10	0.60	0.35			0.110	0.90	27			0.110	0.099	0.20	0.00	0.000						
69.50	0.55	0.30			0.098	0.90	28			0.098	0.088	0.35	0.00	0.000						
69.90	0.65	0.25			0.076	0.90	29			0.076	0.069	0.45	0.00	0.000						
70.40	0.70	0.30			0.040	0.90	30			0.040	0.036	-0.30	0.00	0.000						
71.40	0.00	0.00			0.000	0.90	31			0.010	0.009	-0.08	0.00	0.000						
Total Flow:															-0.044					

Total Flow:	-0.044	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	-5.38	(m <sup>2</sup> )
Top Width:	14.80	(m)
Hydraulic Depth:	-0.363	(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:	Upstream, downstream, across	

Notes: Downloaded data appears error free.

Datalogger Notes:	Database	269
Datalogger Internal Power:	4.56 V	
Datalogger External Power:	12.88 V	
Datalogger Memory Used:	43%	
Datalogger Clock:	4:56PM	MST
Laptop Clock:	5:04PM	MST
Dessicant:	0% Changed	
Datalogger:	Optimum DD128, # 0104170269	
PT:	Keller 730-130-3 psi #0101345	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	



# Hydrometric Measurement / Site Visit Record

## S7 - Muskeg River Near Fort MacKay



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

### Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Time of Measurement

Date of Measurement: March 5, 2007  
Start Time: 2:42 PM MST  
End Time: 2:59 PM MST

### Level Readings

Bench Mark Reading: pin in tree 0.736  
Water Level Reading: 4.345  
Top of Ice Level Reading: 4.280  
Transducer Reading & Calc'd El: 0.725  
Other: Rod in ABS 0.890

### Setup No. 1

El: 275.565  
El: 271.956  
El: 271.285  
El: 271.231  
El: 275.411

### Setup No. 2

El: 275.565  
El: 271.948  
El: 271.299  
El: 271.223  
El: 275.410

Weather Conditions: -15 C, calm, light snow

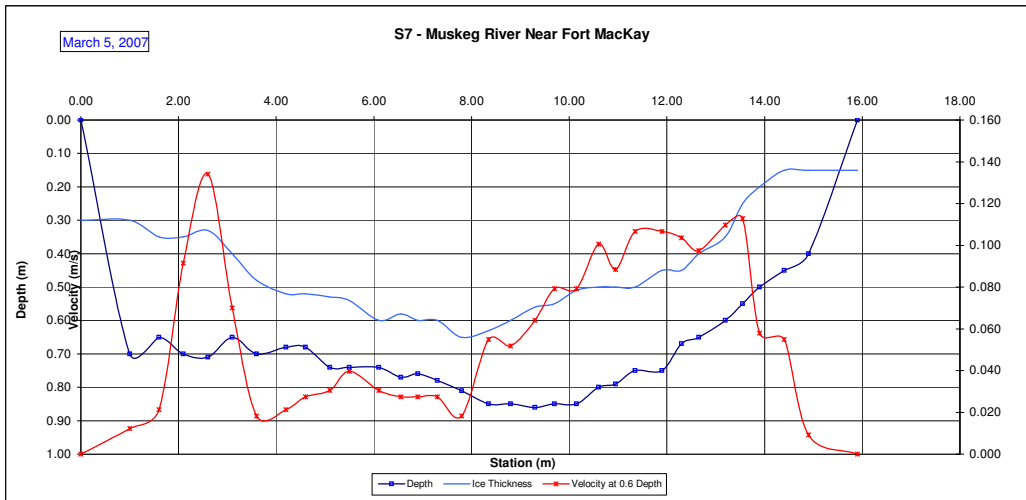
River Conditions: Full ice cover

Measured Data										Calculated Data						
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	Total	
0.00	0.00	0.30			0.000	0.90	1	0.00		0.003	0.003	0.10	0.00	0.000		
1.00	0.70	0.30			0.012	0.90	2			0.012	0.011	0.40	0.00	0.000		
1.60	0.65	0.35			0.021	0.90	3			0.021	0.019	0.30	0.00	0.000		
2.10	0.70	0.35			0.091	0.90	4			0.091	0.082	0.35	0.00	0.000		
2.60	0.71	0.33			0.134	0.90	5			0.134	0.121	0.38	0.00	0.000		
3.10	0.65	0.40			0.070	0.90	6			0.070	0.063	0.25	0.00	0.000		
3.60	0.70	0.48			0.018	0.90	7			0.018	0.016	0.22	0.00	0.000		
4.20	0.68	0.52			0.021	0.90	8			0.021	0.019	0.16	0.00	0.000		
4.60	0.68	0.52			0.027	0.90	9			0.027	0.025	0.16	0.00	0.000		
5.10	0.74	0.53			0.030	0.90	10			0.030	0.027	0.21	0.00	0.000		
5.50	0.74	0.54			0.040	0.90	11			0.040	0.036	0.20	0.00	0.000		
6.10	0.74	0.60			0.030	0.90	12			0.030	0.027	0.14	0.00	0.000		
6.55	0.77	0.58			0.027	0.90	13			0.027	0.025	0.19	0.00	0.000		
6.90	0.76	0.60			0.027	0.90	14			0.027	0.025	0.16	0.00	0.000		
7.30	0.78	0.60			0.027	0.90	15			0.027	0.025	0.18	0.00	0.000		
7.80	0.81	0.65			0.018	0.90	16			0.018	0.016	0.16	0.00	0.000		
8.35	0.85	0.63			0.055	0.90	17			0.055	0.049	0.22	0.00	0.000		
8.80	0.85	0.60			0.052	0.90	18			0.052	0.047	0.25	0.00	0.000		
9.30	0.86	0.56			0.064	0.90	19			0.064	0.058	0.30	0.00	0.000		
9.70	0.85	0.55			0.079	0.90	20			0.079	0.071	0.30	0.00	0.000		
10.15	0.85	0.51			0.079	0.90	21			0.079	0.071	0.34	0.00	0.000		
10.60	0.80	0.50			0.101	0.90	22			0.101	0.091	0.30	0.00	0.000		
10.95	0.79	0.50			0.088	0.90	23			0.088	0.080	0.29	0.00	0.000		
11.35	0.75	0.50			0.107	0.90	24			0.107	0.096	0.25	0.00	0.000		
11.90	0.75	0.45			0.107	0.90	25			0.107	0.096	0.30	0.00	0.000		
12.30	0.67	0.45			0.104	0.90	26			0.104	0.093	0.22	0.00	0.000		
12.65	0.65	0.40			0.098	0.90	27			0.098	0.088	0.25	0.00	0.000		
13.20	0.60	0.35			0.110	0.90	28			0.110	0.099	0.25	0.00	0.000		
13.55	0.55	0.25			0.113	0.90	29			0.113	0.101	0.30	0.00	0.000		
13.90	0.50	0.20			0.058	0.90	30			0.058	0.052	0.30	0.00	0.000		
14.40	0.45	0.15			0.055	0.90	31			0.055	0.049	0.30	0.00	0.000		
14.90	0.40	0.15			0.009	0.90	32		15.40	0.009	0.008	0.25	3.85	0.032		
15.90	0.00	0.15			0.000	0.90	33		15.90	0.000	0.000	0.06	0.99	0.000		
Total Flow:														0.032	0%	

Total Flow:	0.032	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	4.84	(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database	269
Datalogger Internal Power:	4.6 V	
Datalogger External Power:	14.79V	
Datalogger Memory Used:	45%	
Datalogger Clock:	Mar-5,-2007-02:20-PM	MST
Laptop Clock:	Mar-5,-2007-02:31-PM	MST
Dessicant:	100%	Good
Datalogger:	Optimum DD128, # 0104170269	
PT:	Keller 730-130-3 psi #0101345	
Power:	Magnacharge 20V 10A DC Battery and	
	PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: Downloaded data appears error free.  
Decending water level history.  
Low velocities and levels compromise measurement quality.



# Hydrometric Measurement / Site Visit Record

## S7 - Muskeg River Near Fort MacKay



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

### Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Time of Measurement

Date of Measurement: March 11, 2007  
Start Time: 8:31 AM MST  
End Time: 8:52 AM MST

### Level Readings

Bench Mark Reading: pin in tree 0.799  
Water Level Reading: 4.409  
Top of Ice Level Reading: 4.258  
Transducer Reading & Calc'd El: 0.729  
Other: Rod in ABS 0.950

### Setup No. 1

El: 275.565  
El: 271.955  
El: 271.307  
El: 271.227  
El: 275.414

### Setup No. 2

El: 275.565  
El: 271.961  
El: 271.374  
El: 271.233  
El: 275.412

### Weather Conditions:

-20 C, overcast, light snow, light wind

### River Conditions:

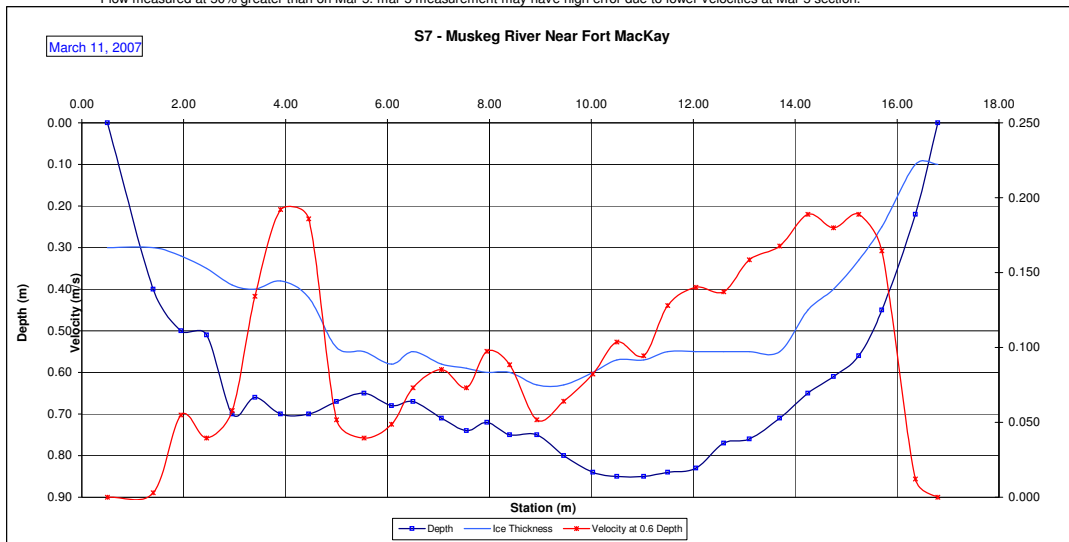
Full ice cover

Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.50	0.00	0.30			0.000	0.90	1	0.50		0.001	0.001	0.03	-0.01	0.000		
1.40	0.40	0.30			0.003	0.90	2			0.003	0.003	0.10	0.00	0.000		
1.95	0.50	0.32			0.055	0.90	3			0.055	0.049	0.18	0.00	0.000		
2.45	0.51	0.35			0.040	0.90	4			0.040	0.036	0.16	0.00	0.000		
2.95	0.70	0.39			0.058	0.90	5			0.058	0.052	0.31	0.00	0.000		
3.40	0.66	0.40			0.134	0.90	6			0.134	0.121	0.26	0.00	0.000		
3.90	0.70	0.38			0.192	0.90	7			0.192	0.173	0.32	0.00	0.000		
4.45	0.70	0.42			0.186	0.90	8			0.186	0.167	0.28	0.00	0.000		
5.00	0.67	0.54			0.052	0.90	9			0.052	0.047	0.13	0.00	0.000		
5.54	0.65	0.55			0.040	0.90	10			0.040	0.036	0.10	0.00	0.000		
6.08	0.68	0.58			0.049	0.90	11			0.049	0.044	0.10	0.00	0.000		
6.50	0.67	0.55			0.073	0.90	12			0.073	0.066	0.12	0.00	0.000		
7.06	0.71	0.58			0.085	0.90	13			0.085	0.077	0.13	0.00	0.000		
7.55	0.74	0.59			0.073	0.90	14			0.073	0.066	0.15	0.00	0.000		
7.95	0.72	0.60			0.098	0.90	15			0.098	0.088	0.12	0.00	0.000		
8.40	0.75	0.60			0.088	0.90	16			0.088	0.080	0.15	0.00	0.000		
8.93	0.75	0.63			0.052	0.90	17			0.052	0.047	0.12	0.00	0.000		
9.46	0.80	0.63			0.064	0.90	18			0.064	0.058	0.17	0.00	0.000		
10.03	0.84	0.60			0.082	0.90	19			0.082	0.074	0.24	0.00	0.000		
10.50	0.85	0.57			0.104	0.90	20			0.104	0.093	0.28	0.00	0.000		
11.03	0.85	0.57			0.094	0.90	21			0.094	0.085	0.28	0.00	0.000		
11.50	0.84	0.55			0.128	0.90	22			0.128	0.115	0.29	0.00	0.000		
12.05	0.83	0.55			0.140	0.90	23			0.140	0.126	0.28	0.00	0.000		
12.60	0.77	0.55			0.137	0.90	24			0.137	0.123	0.22	0.00	0.000		
13.10	0.76	0.55			0.158	0.90	25			0.158	0.143	0.21	0.00	0.000		
13.70	0.71	0.55			0.168	0.90	26			0.168	0.151	0.16	0.00	0.000		
14.25	0.65	0.45			0.189	0.90	27			0.189	0.170	0.20	0.00	0.000		
14.75	0.61	0.40			0.180	0.90	28			0.180	0.162	0.21	0.00	0.000		
15.25	0.56	0.33			0.189	0.90	29			0.189	0.170	0.23	0.00	0.000		
15.70	0.45	0.25			0.165	0.90	30			0.165	0.148	0.20	0.00	0.000		
16.36	0.22	0.10			0.012	0.90	31			0.012	0.011	0.12	0.00	0.000		
16.80	0.00	0.10			0.000	0.90	32		16.80	0.000	0.000	0.03	0.50	0.000		
											Total Flow:				0.000	

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.49	(m <sup>2</sup> )
Top Width:	16.30	(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database	269
Datalogger Internal Power:	4.6 V	
Datalogger External Power:	12.26V	
Datalogger Memory Used:	45%	
Datalogger Clock:	Mar-11,-2007-07:12-AM	MST
Laptop Clock:	Mar-11,-2007-07:23-AM	MST
Dessicant:	100%	Good
Datalogger:	Optimum DD128, # 0104170269	
PT:	Keller 730-130-3 psi #0101345	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: Downloaded data appears error free.  
Low velocities and levels compromise measurement quality.  
Flow measured at 50% greater than on Mar 5. mar 5 measurement may have high error due to lower velocities at Mar 5 section.



# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

### Time of Measurement

Date of Measurement: March 27, 2007  
Start Time: 9:31 AM MST  
End Time:

### Weather Conditions:

-2 C, overcast, 15-20 km/h wind, partly cloudy

### River Conditions:

Ice/slush

### Personnel & Equipment

Measurement Made By: JE, JM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Setup No. 1		Setup No. 2		
Bench Mark Reading: pin in tree				
Water Level Reading: 2.519	El: 273.553	1.410	El: 274.661	274.107
Top of Ice Level Reading: 2.520	El: 273.552	1.409	El: 274.662	
Transducer Reading & Calc'd El:	El:		El:	
Other: Rod in ABS 0.660	El: 275.412	0.659	El: 275.412	

### Level Readings

Setup No. 1		Setup No. 2		
Bench Mark Reading: pin in tree 0.660	El: 275.565	0.659	El: 275.565	
Water Level Reading: 2.519	El: 273.706	1.410	El: 274.814	274.260
Top of Ice Level Reading: 2.520	El: 273.705	1.409	El: 274.815	
Transducer Reading & Calc'd El:				
Other: Rod in ABS				

**Notes:** HCL Completed level and logger download  
Can't seem to make sense of HCL level data

Database	269
4.65 V	
14.65V	
46%	
9:25:00 AM	MST
9:27:00 AM	MST
100%	Good
Optimum DD128, # 0104170269	
Keller 730-130-3 psi #0101345	
Magnacharge 20V 10A DC Battery and	

# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

### Time of Measurement

Date of Measurement: April 11, 2007  
Start Time: MST  
End Time: MST

### Weather Conditions:

Overcast, 3°C

### River Conditions:

Saturated ice, open Sections

### Personnel & Equipment

Measurement Made By: JE, JM, SB  
Data Entry By:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: pin in tree	0.468	0.445	275.565
Water Level Reading:	3.924	3.906	272.109
Top of Ice Level Reading:	3.965	3.936	272.068
Transducer Reading & Calc'd El.:			272.074
Other: Rod in ABS			

272.107

Datalogger Notes:	Database	269
Datalogger Internal Power:		
Datalogger External Power:		
Datalogger Memory Used:		MST MST
Good		
Optimum DD128, # 0104170269 Keller 730-130-3 psi #0101345 Magnacharge 20V 10A DC Battery and		

Notes:

# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

### Time of Measurement

Date of Measurement: April 26, 2007  
Start Time: MST  
End Time: MST

**Weather Conditions:** 10km/hr winds, sunny w/clouds, +10°C

**River Conditions:** Open, Moderate stage

### Personnel & Equipment

Measurement Made By: JS, JE  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: pin in tree	0.601	El:	275.565	0.530	El:	275.565	
Water Level Reading:	3.684	El:	272.482	3.615	El:	272.480	272.481
Top of Ice Level Reading:		El:	276.166		El:	276.095	
Transducer Reading & Calc'd El	1.270		271.212	1.270		271.210	271.211
Other: Rod in ABS	0.758		275.408	0.686		275.409	275.409

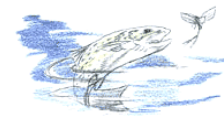
<b>Datalogger Notes:</b>	<b>Database</b>	<b>269</b>
<b>Datalogger Internal Power:</b>	4.67V	
<b>Datalogger External Power:</b>	14.22V	
<b>Datalogger Memory Used:</b>	49%	
	10:59:00 AM	MST
	11:21:00 AM	MST
	Good	
Optimum DD128, # 0104170269		
Keller 730-130-3 psi #0101345		
Magnacharge 20V 10A DC Battery and		

**Notes:** Data downloaded



# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

## Personnel & Equipment

Measurement Made By: sm. Pm  
Data Entry By: sm. Pm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: June 13, 2007  
Start Time: 5:37 PM MST  
End Time: 5:48 PM MST

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: pin in tree	El: 275.565	El: 275.565
Water Level Reading: 3.610	El: 272.047	El: 272.048
Top of Ice Level Reading:	El: 271.209	El: 271.210
Transducer Reading & Calc'd El: 0.838	El: 275.410	El: 275.409
Other: Rod in ABS		

Weather Conditions: +10 C, clear, calm

## River Conditions:

Measured Data						Measurement Data										
Calculated Data																Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
					0.000	0.90	1	0.00		0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	2			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	3			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	4			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	5			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	6			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	7			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	8			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	9			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	10			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	11			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	12			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	13			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	14			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	15			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	16			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	17			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	18			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	19			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	20			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	21			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	22			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	23			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	24			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	25			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	26			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	27			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	28			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	29			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	30			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	31			0.000	0.000	0.00	0.00	0.000		
					0.000	0.90	32		0.00	0.000	0.000	0.00	0.00	0.000		
					0.00					0.00			Total Flow:	0.000		

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	0.00	(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		

Notes: Downloaded data appears error free.  
Low velocities and levels compromise measurement quality.  
Flow measured at 50% greater than on Mar 5. Mar 5 measurement may have high error due to lower velocities at Mar 5 section.

Datalogger Notes:	Database	269
Datalogger Internal Power:	4.63 V	
Datalogger External Power:	13.32V	
Datalogger Memory Used:	53%	
Datalogger Clock:	Jun-13,-2007-05:37-PM	MST
Laptop Clock:	Jun-13,-2007-05:48-PM	MST
Dessicant:	100%	Good
Datalogger:	Optimum DD128, # 0104170269	
PT:	Keller 730-130-3 psi #0101345	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

## Personnel & Equipment

Measurement Made By: JMS, SM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: August 8, 2007  
Start Time: 2:42 PM MST  
End Time: 2:59 PM MST

## Level Readings

Bench Mark Reading: pin in tree 0.617  
Water Level Reading: 4.317  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.650  
Other: Rod in ABS 0.764

## Setup No. 1

El: 275.565  
El: 271.865  
El: 275.565  
El: 271.215  
El: 275.418

## Setup No. 2

El: 0.623  
El: 4.331  
El: 0.650  
El: 0.778  
El: 275.565  
El: 271.857  
El: 275.565  
El: 271.207  
El: 275.410

## Weather Conditions:

20 C, sunny

## River Conditions:

Open, Low Stage

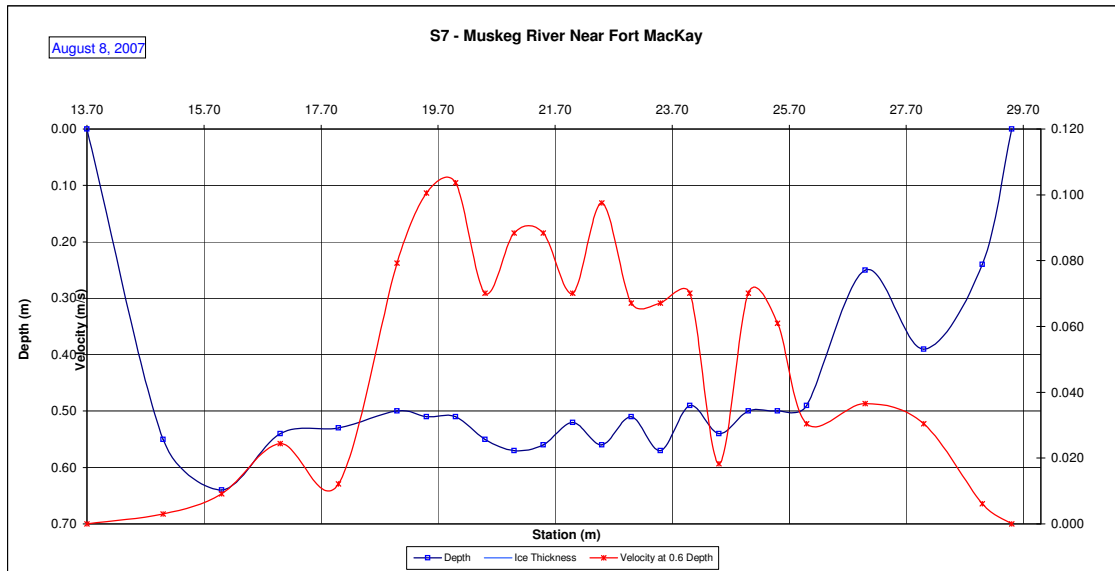
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
13.70	0.00				0.000	1.00	1	13.70	14.35	0.001	0.001	0.14	0.09	0.000		
15.00	0.55				0.003	1.00	2	14.35	15.50	0.003	0.003	0.55	0.63	0.002		
16.00	0.64				0.009	1.00	3	15.50	16.50	0.009	0.009	0.64	0.64	0.006		
17.00	0.54				0.024	1.00	4	16.50	17.50	0.024	0.024	0.54	0.54	0.013		
18.00	0.53				0.012	1.00	5	17.50	18.50	0.012	0.012	0.53	0.53	0.006		
19.00	0.50				0.079	1.00	6	18.50	19.25	0.079	0.079	0.50	0.38	0.030		
19.50	0.51				0.101	1.00	7	19.25	19.75	0.101	0.101	0.51	0.26	0.026		
20.00	0.51				0.104	1.00	8	19.75	20.25	0.104	0.104	0.51	0.26	0.026		
20.50	0.55				0.070	1.00	9	20.25	20.75	0.070	0.070	0.55	0.28	0.019		
21.00	0.57				0.088	1.00	10	20.75	21.25	0.088	0.088	0.57	0.29	0.025		
21.50	0.56				0.088	1.00	11	21.25	21.75	0.088	0.088	0.56	0.28	0.025		
22.00	0.52				0.070	1.00	12	21.75	22.25	0.070	0.070	0.52	0.26	0.018		
22.50	0.56				0.098	1.00	13	22.25	22.75	0.098	0.098	0.56	0.28	0.027		
23.00	0.51				0.067	1.00	14	22.75	23.25	0.067	0.067	0.51	0.26	0.017		
23.50	0.57				0.067	1.00	15	23.25	23.75	0.067	0.067	0.57	0.29	0.019		
24.00	0.49				0.070	1.00	16	23.75	24.25	0.070	0.070	0.49	0.25	0.017		
24.50	0.54				0.018	1.00	17	24.25	24.75	0.018	0.018	0.54	0.27	0.005		
25.00	0.50				0.070	1.00	18	24.75	25.25	0.070	0.070	0.50	0.25	0.018		
25.50	0.50				0.061	1.00	19	25.25	25.75	0.061	0.061	0.50	0.25	0.015		
26.00	0.49				0.030	1.00	20	25.75	26.50	0.030	0.030	0.49	0.37	0.011		
27.00	0.25				0.037	1.00	21	26.50	27.50	0.037	0.037	0.25	0.25	0.009		
28.00	0.39				0.030	1.00	22	27.50	28.50	0.030	0.030	0.39	0.39	0.012		
29.00	0.24				0.006	1.00	23	28.50	29.25	0.006	0.006	0.24	0.18	0.001		
29.50	0.00				0.000	1.00	24	29.25	29.50	0.000	0.000	0.06	0.02	0.000		
										0.00		Total Flow:		0.348		

Total Flow:	0.348	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	7.45	(m <sup>2</sup> )
Top Width:	15.80	(m)
Hydraulic Depth:	0.472	(m)
Mean Velocity:	0.047	(m/s)
Froude Number	0.022	
Photographs taken looking at:		
Upstream, downstream, across		

Notes: Downloaded data appears error free.

Database 269	
4.6 V	
14.07V	
57%	
Aug-8,-2007-01:13-PM MST	
Aug-8,-2007-01:26-PM MST	
Laptop Clock:	Good
Dessicant:	100%
Datalogger:	Optimum DD128, # 0104170269
PT:	Keller 730-130-3 psi #0101345
Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	



# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

## Personnel & Equipment

Measurement Made By: JMS, SM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: September 18, 2007  
Start Time: 5:08 PM MST  
End Time: 5:20 PM MST

## Level Readings

Bench Mark Reading: pin in tree 0.672  
Water Level Reading: 3.980  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 1.053  
Other: Rod in ABS 0.827

## Setup No. 1

El: 275.565  
El: 272.257  
El: 275.565  
El: 271.204  
El: 275.410

## Setup No. 2

El: 275.565  
El: 272.255  
El: 275.565  
El: 271.202  
El: 275.410

## Weather Conditions:

5°C, cloudy, drizzle

## River Conditions:

open high

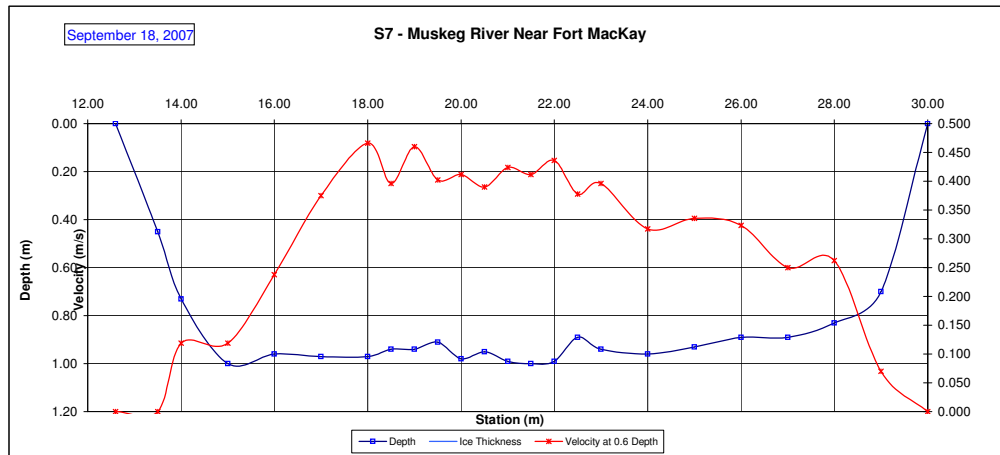
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
12.60	0.00				0.000	1.00	1	12.60	13.05	0.000	0.000	0.11	0.05	0.000		
13.50	0.45				0.000	1.00	2	13.05	13.75	0.000	0.000	0.45	0.32	0.000		
14.00	0.73				0.119	1.00	3	13.75	14.50	0.119	0.119	0.73	0.55	0.065		
15.00	1.00				0.119	1.00	4	14.50	15.50	0.119	0.119	1.00	1.00	0.119		
16.00	0.96				0.238	1.00	5	15.50	16.50	0.238	0.238	0.96	0.96	0.228		
17.00	0.97				0.375	1.00	6	16.50	17.50	0.375	0.375	0.97	0.97	0.364		
18.00	0.97				0.466	1.00	7	17.50	18.25	0.466	0.466	0.97	0.73	0.339		
18.50	0.94				0.396	1.00	8	18.25	18.75	0.396	0.396	0.94	0.47	0.186		
19.00	0.94				0.460	1.00	9	18.75	19.25	0.460	0.460	0.94	0.47	0.216		
19.50	0.91				0.402	1.00	10	19.25	19.75	0.402	0.402	0.91	0.46	0.183		
20.00	0.98				0.411	1.00	11	19.75	20.25	0.411	0.411	0.98	0.49	0.202		
20.50	0.95				0.390	1.00	12	20.25	20.75	0.390	0.390	0.95	0.48	0.185		
21.00	0.99				0.424	1.00	13	20.75	21.25	0.424	0.424	0.99	0.50	0.210		
21.50	1.00				0.411	1.00	14	21.25	21.75	0.411	0.411	1.00	0.50	0.206		
22.00	0.99				0.436	1.00	15	21.75	22.25	0.436	0.436	0.99	0.50	0.216		
22.50	0.89				0.378	1.00	16	22.25	22.75	0.378	0.378	0.89	0.45	0.168		
23.00	0.94				0.396	1.00	17	22.75	23.50	0.396	0.396	0.94	0.71	0.279		
24.00	0.96				0.317	1.00	18	23.50	24.50	0.317	0.317	0.96	0.96	0.304		
25.00	0.93				0.335	1.00	19	24.50	25.50	0.335	0.335	0.93	0.93	0.312		
26.00	0.89				0.323	1.00	20	25.50	26.50	0.323	0.323	0.89	0.89	0.288		
27.00	0.89				0.250	1.00	21	26.50	27.50	0.250	0.250	0.89	0.89	0.222		
28.00	0.83				0.262	1.00	22	27.50	28.50	0.262	0.262	0.83	0.83	0.218		
29.00	0.70				0.070	1.00	23	28.50	29.50	0.070	0.070	0.70	0.70	0.049		
30.00	0.00				0.000	1.00	24	29.50	30.00	0.000	0.000	0.18	0.09	0.000		
Total Flow:														4.559		

Total Flow:	4.559	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	14.86	(m <sup>2</sup> )
Top Width:	17.40	(m)
Hydraulic Depth:	0.854	(m)
Mean Velocity:	0.307	(m/s)
Froude Number	0.106	
Photographs taken looking at:		
Upstream, downstream, across		

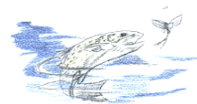
Database	269
4.6 V	
14.07V	
57%	
Aug-8, 2007-01:13-PM	MST
Aug-8, 2007-01:26-PM	MST
Laptop Clock:	
Dessicant:	100% Good
Datalogger:	Optimum DD128, # 0104170269
PT:	Keller 730-130-3 psi #0101345
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Notes: Downloaded data appears error free.



# Hydrographic Measurement / Site Visit Record

## S7 - Muskeg River Near Fort McKay



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort McKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

### Personnel & Equipment

Measurement Made By: SM,FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Time of Measurement

Date of Measurement: October 20, 2007  
Start Time: 6:28 AM MDT  
End Time: 6:52 AM MDT

### Level Readings

Bench Mark Reading: pin in tree 0.489  
Water Level Reading: 3.970  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.883  
Other: Rod in ABS 0.643

### Setup No. 1

El: 275.565  
El: 272.084  
El: 275.565  
El: 271.201  
El: 275.411

### Setup No. 2

El: 275.565  
El: 272.086  
El: 275.565  
El: 271.203  
El: 275.409

### Weather Conditions:

2° C, cloudy, calm

### River Conditions:

open, moderate stage

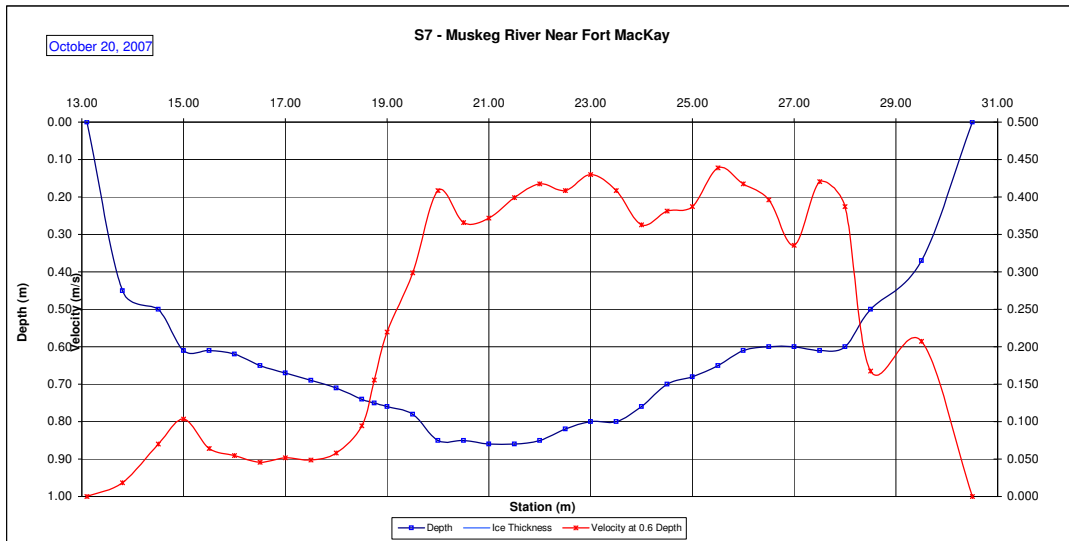
### Measurement Data

Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
13.10	0.00				0.000	1.00	1	13.10	13.45	0.005	0.005	0.11	0.04	0.000		
13.80	0.45				0.018	1.00	2	13.45	14.15	0.018	0.018	0.45	0.32	0.006		
14.50	0.50				0.070	1.00	3	14.15	14.75	0.070	0.070	0.50	0.30	0.021		
15.00	0.61				0.104	1.00	4	14.75	15.25	0.104	0.104	0.61	0.31	0.032		
15.50	0.61				0.064	1.00	5	15.25	15.75	0.064	0.064	0.61	0.31	0.020		
16.00	0.62				0.055	1.00	6	15.75	16.25	0.055	0.055	0.62	0.31	0.017		
16.50	0.65				0.046	1.00	7	16.25	16.75	0.046	0.046	0.65	0.33	0.015		
17.00	0.67				0.052	1.00	8	16.75	17.25	0.052	0.052	0.67	0.34	0.017		
17.50	0.69				0.049	1.00	9	17.25	17.75	0.049	0.049	0.69	0.35	0.017		
18.00	0.71				0.058	1.00	10	17.75	18.25	0.058	0.058	0.71	0.36	0.021		
18.50	0.74				0.094	1.00	11	18.25	18.63	0.094	0.094	0.74	0.28	0.026		
18.75	0.75				0.155	1.00	12	18.63	18.88	0.155	0.155	0.75	0.19	0.029		
19.00	0.76				0.219	1.00	13	18.88	19.25	0.219	0.219	0.76	0.29	0.063		
19.50	0.78				0.299	1.00	14	19.25	19.75	0.299	0.299	0.78	0.39	0.116		
20.00	0.85				0.408	1.00	15	19.75	20.25	0.408	0.408	0.85	0.43	0.174		
20.50	0.85				0.366	1.00	16	20.25	20.75	0.366	0.366	0.85	0.43	0.155		
21.00	0.86				0.372	1.00	17	20.75	21.25	0.372	0.372	0.86	0.43	0.160		
21.50	0.86				0.399	1.00	18	21.25	21.75	0.399	0.399	0.86	0.43	0.172		
22.00	0.85				0.418	1.00	19	21.75	22.25	0.418	0.418	0.85	0.43	0.177		
22.50	0.82				0.408	1.00	20	22.25	22.75	0.408	0.408	0.82	0.41	0.167		
23.00	0.80				0.430	1.00	21	22.75	23.25	0.430	0.430	0.80	0.40	0.172		
23.50	0.80				0.408	1.00	22	23.25	23.75	0.408	0.408	0.80	0.40	0.163		
24.00	0.76				0.363	1.00	23	23.75	24.25	0.363	0.363	0.76	0.38	0.138		
24.50	0.70				0.381	1.00	24	24.25	24.75	0.381	0.381	0.70	0.35	0.133		
25.00	0.68				0.387	1.00	25	24.75	25.25	0.387	0.387	0.68	0.34	0.132		
25.50	0.65				0.439	1.00	26	25.25	25.75	0.439	0.439	0.65	0.33	0.143		
26.00	0.61				0.418	1.00	27	25.75	26.25	0.418	0.418	0.61	0.31	0.127		
26.50	0.60				0.396	1.00	28	26.25	26.75	0.396	0.396	0.60	0.30	0.119		
27.00	0.60				0.335	1.00	29	26.75	27.25	0.335	0.335	0.60	0.30	0.101		
27.50	0.61				0.421	1.00	30	27.25	27.75	0.421	0.421	0.61	0.31	0.128		
28.00	0.60				0.387	1.00	31	27.75	28.25	0.387	0.387	0.60	0.30	0.116		
28.50	0.50				0.168	1.00	32	28.25	29.00	0.168	0.168	0.50	0.38	0.063		
29.50	0.37				0.207	1.00	33	29.00	30.00	0.207	0.207	0.37	0.37	0.077		
30.50	0.00				0.000	1.00	34	30.00	30.50	0.000	0.000	0.09	0.05	0.000	0%	0%
Total Flow:														3.016	0%	

Total Flow:	3.016	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:		(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database	269
Datalogger Internal Power:	4.6 V	
Datalogger External Power:	12.26	
Datalogger Memory Used:	63%	
Datalogger Clock:	Oct-20,-2007-05:02-AM	MST
Laptop Clock:	Oct-20,-2007-05:14-AM	MST
Dessicant:	100%	Good
Datalogger:	Optimum DD128, # 0104170269	
PT:	Keller 730-130-3 psi #0101345	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: Downloaded data appears error free.  
New beaver dam started near transducer section.



# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

### Time of Measurement

Date of Measurement: November 15, 2007  
Start Time: 12:30 PM MDT  
End Time: MDT

### Weather Conditions:

### River Conditions:

### Personnel & Equipment

Measurement Made By: SM,FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: pin in tree	0.344 El: 275.565	0.335 El: 275.565	
Water Level Reading:	3.985 El: 271.924	3.945 El: 271.955	271.940
Top of Ice Level Reading:	3.936 El: 271.629	3.935 El: 271.630	
Transducer Reading & Calc'd El	0.734 El: 271.190	0.734 El: 271.221	271.206
Other: Rod in ABS	0.499 El: 275.410	0.490 El: 275.410	

Notes: Downloaded data appears error free.  
New beaver dam started near transducer section.

Datalogger Notes:	Database	269
Datalogger Internal Power:	4.6 V	
Datalogger External Power:	12.26	
Datalogger Memory Used:	63%	
	Oct-20,-2007-05:02-AM	MST
	Oct-20,-2007-05:14-AM	MST
	100%	Good
Optimum DD128, # 0104170269		
Keller 730-130-3 psi #0101345		
Magnacharge 20V 10A DC Battery and		

# Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Near Fort MacKay  
Site Name: S7  
Coordinates & Legal: 6338944 N, 465408 E SE-32-94-10-W4

## Personnel & Equipment

Measurement Made By: SM,FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: December 8, 2007  
Start Time: 9:50 AM MDT  
End Time: 10:30 AM MDT

## Level Readings

Bench Mark Reading: pin in tree 0.785  
Water Level Reading: 4.380  
Top of Ice Level Reading: 4.361  
Transducer Reading & Calc'd El: 0.761  
Other: Rod in ABS 0.938

## Setup No. 1

El: 275.565  
El: 271.970  
El: 271.204  
El: 271.209  
El: 275.412

## Setup No. 2

El: 275.565  
El: 271.969  
El: 271.213  
El: 271.208  
El: 275.411

271.970

271.209

## Weather Conditions:

River Conditions: complete ice

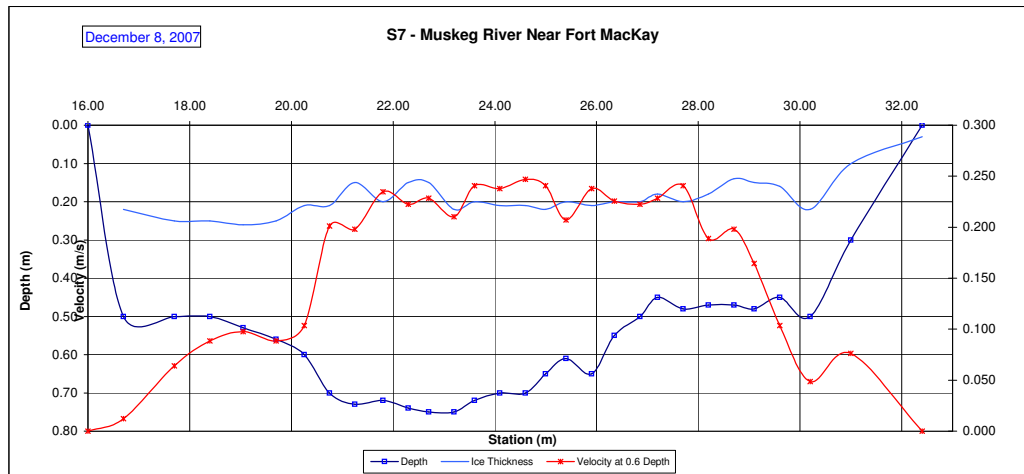
## Measurement Data

Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at	Panel Ends at	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
16.00	0.00				0.000	1.00	1	16.00	16.35	0.003	0.003	0.07	0.02	0.000	
16.70	0.50	0.22			0.012	1.00	2	16.35	17.20	0.012	0.012	0.28	0.24	0.003	
17.70	0.50	0.25			0.064	1.00	3	17.20	18.05	0.064	0.064	0.25	0.21	0.014	
18.40	0.50	0.25			0.088	1.00	4	18.05	18.73	0.088	0.088	0.25	0.17	0.015	
19.05	0.53	0.26			0.098	1.00	5	18.73	19.38	0.098	0.098	0.27	0.18	0.017	
19.70	0.56	0.25			0.088	1.00	6	19.38	19.98	0.088	0.088	0.31	0.19	0.016	
20.25	0.60	0.21			0.104	1.00	7	19.98	20.50	0.104	0.104	0.39	0.20	0.021	
20.75	0.70	0.21			0.201	1.00	8	20.50	21.00	0.201	0.201	0.49	0.25	0.049	
21.25	0.73	0.15			0.198	1.00	9	21.00	21.53	0.198	0.198	0.58	0.30	0.060	
21.80	0.72	0.20			0.235	1.00	10	21.53	22.05	0.235	0.235	0.52	0.27	0.064	
22.30	0.74	0.15			0.223	1.00	11	22.05	22.50	0.223	0.223	0.59	0.27	0.059	
22.70	0.75	0.15			0.229	1.00	12	22.50	22.95	0.229	0.229	0.60	0.27	0.062	
23.20	0.75	0.22			0.210	1.00	13	22.95	23.40	0.210	0.210	0.53	0.24	0.050	
23.60	0.72	0.20			0.241	1.00	14	23.40	23.85	0.241	0.241	0.52	0.23	0.056	
24.10	0.70	0.21			0.238	1.00	15	23.85	24.35	0.238	0.238	0.49	0.25	0.058	
24.60	0.70	0.21			0.247	1.00	16	24.35	24.80	0.247	0.247	0.49	0.22	0.054	
25.00	0.65	0.22			0.241	1.00	17	24.80	25.20	0.241	0.241	0.43	0.17	0.041	
25.40	0.61	0.20			0.207	1.00	18	25.20	25.65	0.207	0.207	0.41	0.18	0.038	
25.90	0.65	0.21			0.238	1.00	19	25.65	26.13	0.238	0.238	0.44	0.21	0.050	
26.35	0.55	0.20			0.226	1.00	20	26.13	26.60	0.226	0.226	0.35	0.17	0.037	
26.85	0.50	0.20			0.223	1.00	21	26.60	27.03	0.223	0.223	0.30	0.13	0.028	
27.20	0.45	0.18			0.229	1.00	22	27.03	27.45	0.229	0.229	0.27	0.11	0.026	
27.70	0.48	0.20			0.241	1.00	23	27.45	27.95	0.241	0.241	0.28	0.14	0.034	
28.20	0.47	0.18			0.189	1.00	24	27.95	28.45	0.189	0.189	0.29	0.15	0.027	
28.70	0.47	0.14			0.198	1.00	25	28.45	28.90	0.198	0.198	0.33	0.15	0.029	
29.10	0.48	0.15			0.165	1.00	26	28.90	29.35	0.165	0.165	0.33	0.15	0.024	
29.60	0.45	0.16			0.104	1.00	27	29.35	29.90	0.104	0.104	0.29	0.16	0.017	
30.20	0.50	0.22			0.049	1.00	28	29.90	30.60	0.049	0.049	0.28	0.20	0.010	
31.00	0.30	0.10			0.076	1.00	29	30.60	31.70	0.076	0.076	0.20	0.22	0.017	
32.40	0.00	0.03			0.000	1.00	30	31.70	32.40	0.000	0.000	0.05	0.04	0.000	
Total Flow:														0.979	

Total Flow:	0.979	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	5.67	(m <sup>2</sup> )
Top Width:	16.40	(m)
Hydraulic Depth:	0.346	(m)
Mean Velocity:	0.173	(m/s)
Froude Number		
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database	269
Datalogger Internal Power:	5	
Datalogger External Power:	9.75	
Datalogger Memory Used:	67%	
Datalogger Clock:	9:22:00 AM	MST
Laptop Clock:	9:36:00 AM	MST
Dessicant:	100%	Good
Datalogger:	Optimum DD128, #0104170269	
PT:	Keller 730-130-3 psi #0101345	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: batt voltage low  
battery replaced Dec 12



# Hydrometric Measurement / Site Visit Record

S9 - Kearl Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: [Kearl Lake Outlet](#)  
Location: [Kearl Lake Outlet](#)  
Site Name: [S9](#)  
Coordinates & Legal: [6346750 N, 483980 E](#) [SE-29-95-8-W4](#)

## Time of Measurement

Date of Measurement: [January 12, 2007](#)  
Start Time: [9:40 AM](#) [MST](#)  
End Time:

## Weather Conditions:

[-25°C, Clear, Light Wind](#)

## River Conditions:

[complete ice cover, dry, with no discharge through culverts](#)

## Personnel & Equipment

Measurement Made By:  
Data Entry By:  
Meter Type and No.:

[FF, JS](#)

Checked:

[Marsh McBirney FloMate 2000](#)  
[s/n 2004521](#)

## Level Readings

Bench Mark Reading: T-post  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & El.:  
Other: Nail in tree

## Setup No. 1

El: [330.979](#)  
El: [330.979](#)  
El:  
El: [330.979](#)  
El:

## Setup No. 2

El: [330.979](#)  
El: [330.979](#) 330.979  
El:  
El: [330.979](#) 330.979  
El:

## Notes:

No levels taken as there is no flow through the culverts. Bed dry/frozen.  
Photos taken.

# Hydrometric Measurement / Site Visit Record

S9 - Kearl Lake Outlet



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Kearl Lake Outlet  
Location: Kearl Lake Outlet  
Site Name: S9  
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

### Time of Measurement

Date of Measurement: February 8, 2007  
Start Time: MST  
End Time:

**Weather Conditions:** -32°C, Clear, Light Wind

**River Conditions:** complete ice cover, dry, with no discharge through culverts

### Personnel & Equipment

Measurement Made By: JS,JM,PM  
Data Entry By: Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: T-post  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & El.:  
Other: Nail in tree

### Setup No. 1

El: 330.979  
El: 330.979  
El:  
El: 330.979  
El:

### Setup No. 2

El: 330.979  
El: 330.979 330.979  
El:  
El: 330.979 330.979  
El:

**Notes:** No levels taken as there is no flow through the culverts. Bed dry/frozen.  
Photos taken.



# Hydrometric Measurement / Site Visit Record

S9 - Kearl Lake Outlet



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: [Kearl Lake Outlet](#)  
Location: [Kearl Lake Outlet](#)  
Site Name: [S9](#)  
Coordinates & Legal: [6346750 N, 483980 E](#) [SE-29-95-8-W4](#)

### Time of Measurement

Date of Measurement: [March 6, 2007](#)  
Start Time: [9:40 AM](#) [MST](#)  
End Time:

### Weather Conditions:

[-10°C, Overcast, Light Wind](#)

### River Conditions:

[complete ice cover, dry, with no discharge through culverts, frozen with ice build up in culverts.](#)

### Personnel & Equipment

Measurement Made By: [JS, FF](#)  
Data Entry By: [FF](#) Checked:  
Meter Type and No.: [Marsh McBirney FloMate 2000](#)  
[s/n 2004521](#)

### Level Readings

Bench Mark Reading: T-post  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & El.:  
Other: Nail in tree

### Setup No. 1

El: [330.979](#)  
El: [330.979](#)  
El:  
El: [330.979](#)  
El:

### Setup No. 2

El: [330.979](#)  
El: [330.979](#) [330.979](#)  
El:  
El: [330.979](#) [330.979](#)  
El:

Notes: No levels taken as there is no flow through the culverts. Bed dry/frozen.  
Photos taken.

# Hydrometric Measurement / Site Visit Record

S9 - Kearl Lake Outlet



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: [Kearl Lake Outlet](#)  
Location: [Kearl Lake Outlet](#)  
Site Name: [S9](#)  
Coordinates & Legal: [6346750 N, 483980 E](#) [SE-29-95-8-W4](#)

### Time of Measurement

Date of Measurement: [April 11, 2007](#)  
Start Time: [1:00 PM](#) [MST](#)  
End Time:

### Weather Conditions:

[Overcast, Winds 15-20km/h](#)

### River Conditions:

[Low volume of flowing water, no ice](#)

Notes:

### Personnel & Equipment

Measurement Made By: [JE, JM, SB](#)  
Data Entry By: [Checked:](#)  
Meter Type and No.: [MSA Marsh McBirney FloMate 2000](#)  
[s/n 2004521](#)

### Level Readings

Bench Mark Reading: T-post [1.028](#)  
Water Level Reading: [1.905](#)  
Top of Ice Level Reading:  
Transducer Reading & El.:  
Other: [Nail in tree](#)

### Setup No. 1

El: [330.979](#)  
El: [330.102](#)  
El:  
El: [330.102](#)  
El:

### Setup No. 2

El: [1.040](#) El: [330.979](#)  
El: [1.914](#) El: [330.105](#)  
El:  
El: [330.105](#)  
El:

[330.104](#)

[330.104](#)

# Hydrometric Measurement / Site Visit Record

S9 - Kearl Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kearl Lake Outlet  
Location: Kearl Lake Outlet  
Site Name: S9  
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4  
Time of Measurement  
Date of Measurement: April 25, 2007  
Start Time: 10:04 AM MDT  
End Time: 10:17 AM MDT

## Personnel & Equipment

Measurement Made By: JS, JE  
Data Entry By: JE Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: T-post 0.021  
Water Level Reading: 1.982  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.257  
Other: Nail in tree 1.225

## Setup No. 1

El: 330.979  
El: 329.018  
El: 328.761  
El: 329.775

## Setup No. 2

El: 0.078  
El: 2.041  
El: 0.257  
El: 1.284

Weather Conditions: +8°C, 15-20km/hr winds, Overcast  
River Conditions: Open

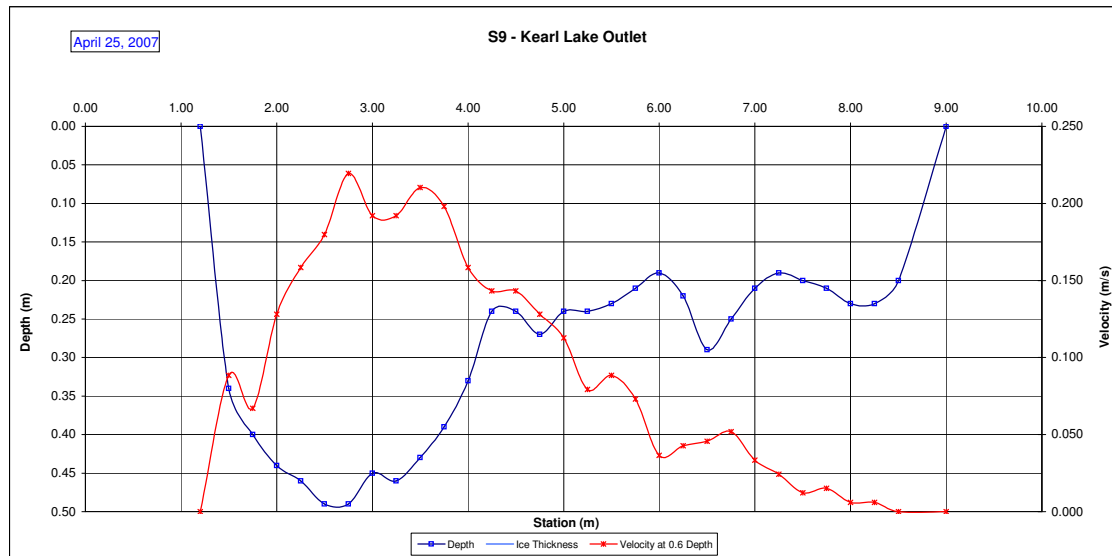
## Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
LB	1.20	0.00			0.000	1.00	1	1.20	1.35	0.022	0.022	0.09	0.01	0.000
	1.50	0.34			0.088	1.00	2	1.35	1.63	0.088	0.088	0.34	0.09	0.008
	1.75	0.40			0.067	1.00	3	1.63	1.88	0.067	0.067	0.40	0.10	0.007
	2.00	0.44			0.128	1.00	4	1.88	2.13	0.128	0.128	0.44	0.11	0.014
	2.25	0.46			0.158	1.00	5	2.13	2.38	0.158	0.158	0.46	0.12	0.018
	2.50	0.49			0.180	1.00	6	2.38	2.63	0.180	0.180	0.49	0.12	0.022
	2.75	0.49			0.219	1.00	7	2.63	2.88	0.219	0.219	0.49	0.12	0.027
	3.00	0.45			0.192	1.00	8	2.88	3.13	0.192	0.192	0.45	0.11	0.022
	3.25	0.46			0.192	1.00	9	3.13	3.38	0.192	0.192	0.46	0.12	0.022
	3.50	0.43			0.210	1.00	10	3.38	3.63	0.210	0.210	0.43	0.11	0.023
	3.75	0.39			0.198	1.00	11	3.63	3.88	0.198	0.198	0.39	0.10	0.019
	4.00	0.33			0.158	1.00	12	3.88	4.13	0.158	0.158	0.33	0.08	0.013
	4.25	0.24			0.143	1.00	13	4.13	4.38	0.143	0.143	0.24	0.06	0.009
	4.50	0.24			0.143	1.00	14	4.38	4.63	0.143	0.143	0.24	0.06	0.009
	4.75	0.27			0.128	1.00	15	4.63	4.88	0.128	0.128	0.27	0.07	0.009
	5.00	0.24			0.113	1.00	16	4.88	5.13	0.113	0.113	0.24	0.06	0.007
	5.25	0.24			0.079	1.00	17	5.13	5.38	0.079	0.079	0.24	0.06	0.005
	5.50	0.23			0.088	1.00	18	5.38	5.63	0.088	0.088	0.23	0.06	0.005
	5.75	0.21			0.073	1.00	19	5.63	5.88	0.073	0.073	0.21	0.05	0.004
	6.00	0.19			0.037	1.00	20	5.88	6.13	0.037	0.037	0.19	0.05	0.002
	6.25	0.22			0.043	1.00	21	6.13	6.38	0.043	0.043	0.22	0.06	0.002
	6.50	0.29			0.046	1.00	22	6.38	6.63	0.046	0.046	0.29	0.07	0.003
	6.75	0.25			0.052	1.00	23	6.63	6.88	0.052	0.052	0.25	0.06	0.003
	7.00	0.21			0.034	1.00	24	6.88	7.13	0.034	0.034	0.21	0.05	0.002
	7.25	0.19			0.024	1.00	25	7.13	7.38	0.024	0.024	0.19	0.05	0.001
	7.50	0.20			0.012	1.00	26	7.38	7.63	0.012	0.012	0.20	0.05	0.001
	7.75	0.21			0.015	1.00	27	7.63	7.88	0.015	0.015	0.21	0.05	0.001
	8.00	0.23			0.006	1.00	28	7.88	8.13	0.006	0.006	0.23	0.06	0.000
	8.25	0.23			0.006	1.00	29	8.13	8.38	0.006	0.006	0.23	0.06	0.000
	8.50	0.20			0.000	1.00	30	8.38	8.75	0.000	0.000	0.20	0.08	0.000
RB	9.00	0.00			0.000	1.00	31	8.75	9.00	0.000	0.000	0.05	0.01	0.000
Total Flow:														0.257

Total Flow:	0.257	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	2.25	(m <sup>2</sup> )
Top Width:	7.80	(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	
Datalogger Internal Power:	11.34 V 100%
Datalogger External Power:	12.17 78%
Datalogger Memory Used:	0%
Laptop Clock:	Apr 26, 2007 10:37 MST
Dessicant:	Good
Datalogger:	Lakewood UL RX 207110
PT:	Keller 971022, Port 2; Keller 1747 Port 1
Power:	Battery

Notes: Installed TD, placed logger box back on pole. Placed TD u/s of pole near middle of stream



# Hydrometric Measurement / Site Visit Record

S9 - Kearl Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kearl Lake Outlet  
Location: Kearl Lake Outlet  
Site Name: S9  
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

## Personnel & Equipment

Measurement Made By: sm, pm, wd  
Data Entry By: sm Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Time of Measurement

Date of Measurement: June 14, 2007  
Start Time: 12:12 PM MDT  
End Time: MDT

## Level Readings

Bench Mark Reading: T-post 0.532  
Water Level Reading: 2.371  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 0.187  
Other: Nail in tree 1.743

## Setup No. 1

El: 330.979  
El: 329.140  
El: 328.954  
El: 329.768

## Setup No. 2

El: 330.979  
El: 329.144  
El: 328.958  
El: 329.768

## Weather Conditions:

+20°C, clear calm

## River Conditions:

open moderate stage

## Measurement Data

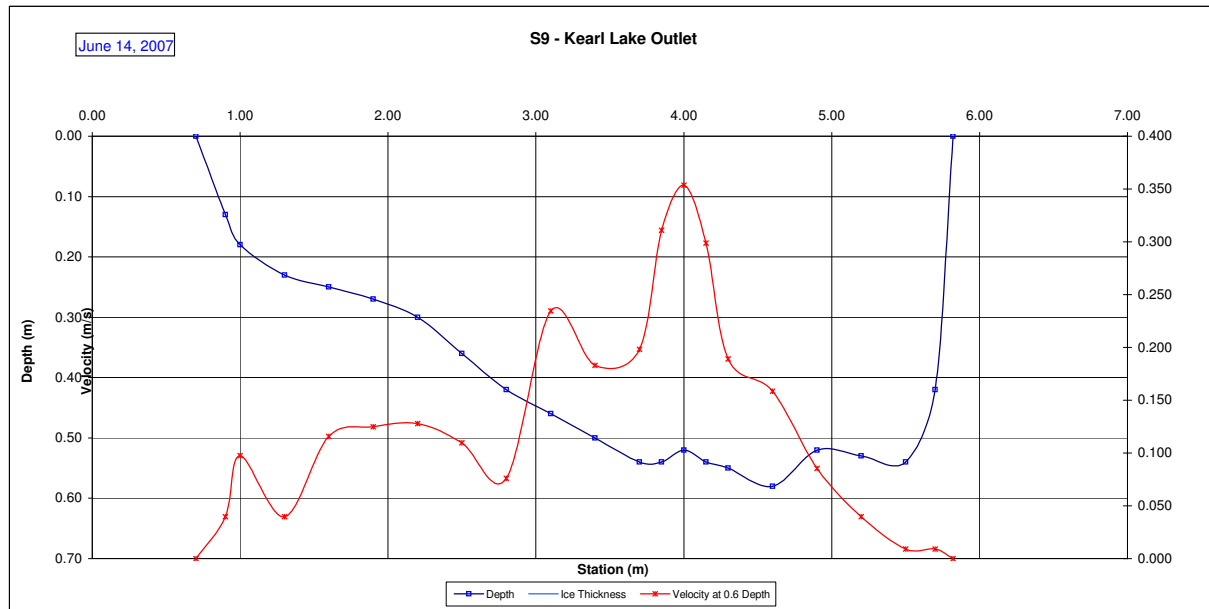
Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)
0.70	0.00				0.000	1.00	1	0.70	0.80	0.010	0.010	0.03	0.00	0.000
0.90	0.13				0.040	1.00	2	0.90	0.95	0.040	0.040	0.13	0.01	0.000
1.00	0.18				0.098	1.00	3	1.00	1.15	0.098	0.098	0.18	0.03	0.003
1.30	0.23				0.040	1.00	4	1.30	1.45	0.040	0.040	0.23	0.03	0.001
1.60	0.25				0.116	1.00	5	1.60	1.75	0.116	0.116	0.25	0.04	0.004
1.90	0.27				0.125	1.00	6	1.90	2.05	0.125	0.125	0.27	0.04	0.005
2.20	0.30				0.128	1.00	7	2.20	2.35	0.128	0.128	0.30	0.05	0.006
2.50	0.36				0.110	1.00	8	2.50	2.65	0.110	0.110	0.36	0.05	0.006
2.80	0.42				0.076	1.00	9	2.80	2.95	0.076	0.076	0.42	0.06	0.005
3.10	0.46				0.235	1.00	10	3.10	3.25	0.235	0.235	0.46	0.07	0.016
3.40	0.50				0.183	1.00	11	3.40	3.55	0.183	0.183	0.50	0.08	0.014
3.70	0.54				0.198	1.00	12	3.70	3.78	0.198	0.198	0.54	0.04	0.008
3.85	0.54				0.311	1.00	13	3.85	3.93	0.311	0.311	0.54	0.04	0.013
4.00	0.52				0.354	1.00	14	4.00	4.08	0.354	0.354	0.52	0.04	0.014
4.15	0.54				0.299	1.00	15	4.15	4.23	0.299	0.299	0.54	0.04	0.012
4.30	0.55				0.189	1.00	16	4.30	4.45	0.189	0.189	0.55	0.08	0.016
4.60	0.58				0.158	1.00	17	4.60	4.75	0.158	0.158	0.58	0.09	0.014
4.90	0.52				0.085	1.00	18	4.90	5.05	0.085	0.085	0.52	0.08	0.007
5.20	0.53				0.040	1.00	19	5.20	5.35	0.040	0.040	0.53	0.08	0.003
5.50	0.54				0.009	1.00	20	5.50	5.60	0.009	0.009	0.54	0.05	0.000
5.70	0.42				0.009	1.00	21	5.70	5.76	0.009	0.009	0.42	0.03	0.000
5.82	0.00				0.000	1.00	22	5.82	5.82	0.002	0.002	0.11	0.00	0.000
Total Flow:														0.147

Total Flow:	0.147	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.02	(m <sup>2</sup> )
Top Width:	5.12	(m)
Hydraulic Depth:	0.200	(m)
Mean Velocity:	0.143	(m/s)
Froude Number	0.102	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power: 11.34 V 100%  
Datalogger External Power: 12.17 79%  
Datalogger Memory Used: 5%  
Datalogger Clock: Jun 14, 2007 11:02 MST  
Laptop Clock: Jun 14, 2007 11:03 MST  
Dessicant: Good  
Datalogger: Lakewood UL RX 207110  
PT: Keller 971022, Port 2; Keller 1747 Port 1  
Power: Battery

Notes: appears TD moved at end of april  
td placed deeper in water  
new TD reads 0.2717



# Hydrometric Measurement / Site Visit Record

S9 - Kearl Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: **Kearl Lake Outlet**  
 Location: **Kearl Lake Outlet**  
 Site Name: **S9**  
 Coordinates & Legal: **6346750 N, 483980 E SE-29-95-8-W4**

## Time of Measurement

Date of Measurement: **August 9, 2007**  
 Start Time: **10:20 AM MDT**  
 End Time: **10:30 AM MDT**

## Weather Conditions:

**+20°C, clear calm**

## River Conditions:

**open moderate stage**

## Personnel & Equipment

Measurement Made By: **JMS, SM**  
 Data Entry By: **PM** Checked:  
 Meter Type and No.: **Marsh McBirney FloMate 2000 s/n 2004521**

## Level Readings

Bench Mark Reading: T-post **0.159** El: **330.979**  
 Water Level Reading: **2.352** El: **328.786**  
 Top of Ice Level Reading: El: **0.000**  
 Transducer Reading & Calc'd El. **0.000** El: **328.786**  
 Other: Nail in tree **1.373** El: **329.765**

## Setup No. 1

El: **330.979**  
 El: **328.786**  
 El: **0.000**  
 El: **328.786**  
 El: **329.765**

## Setup No. 2

El: **330.979**  
 El: **328.787**  
 El: **0.000**  
 El: **328.787**  
 El: **329.766**

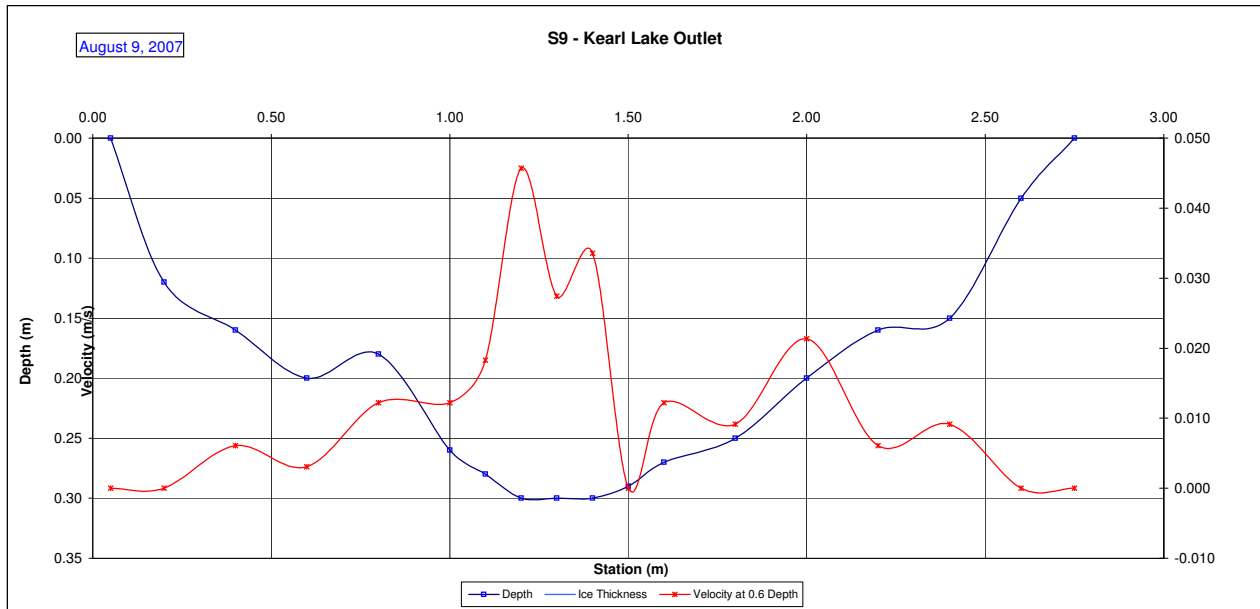
## Measurement Data

Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
LB	0.05	0.00			0.000	1.00	1	0.05	0.13	0.000	0.000	0.03	0.00	0.000
	0.20	0.12			0.000	1.00	2	0.20	0.30	0.000	0.000	0.12	0.01	0.000
	0.40	0.16			0.006	1.00	3	0.40	0.50	0.006	0.006	0.16	0.02	0.000
	0.60	0.20			0.003	1.00	4	0.60	0.70	0.003	0.003	0.20	0.02	0.000
	0.80	0.18			0.012	1.00	5	0.80	0.90	0.012	0.012	0.18	0.02	0.000
	1.00	0.26			0.012	1.00	6	1.00	1.05	0.012	0.012	0.26	0.01	0.000
	1.10	0.28			0.018	1.00	7	1.10	1.15	0.018	0.018	0.28	0.01	0.000
	1.20	0.30			0.046	1.00	8	1.20	1.25	0.046	0.046	0.30	0.02	0.001
	1.30	0.30			0.027	1.00	9	1.30	1.35	0.027	0.027	0.30	0.02	0.000
	1.40	0.30			0.034	1.00	10	1.40	1.45	0.034	0.034	0.30	0.02	0.001
	1.50	0.29			0.000	1.00	11	1.50	1.55	0.000	0.000	0.29	0.01	0.000
	1.60	0.27			0.012	1.00	12	1.60	1.70	0.012	0.012	0.27	0.03	0.000
	1.80	0.25			0.009	1.00	13	1.80	1.90	0.009	0.009	0.25	0.03	0.000
	2.00	0.20			0.021	1.00	14	2.00	2.10	0.021	0.021	0.20	0.02	0.000
	2.20	0.16			0.006	1.00	15	2.20	2.30	0.006	0.006	0.16	0.02	0.000
	2.40	0.15			0.009	1.00	16	2.40	2.50	0.009	0.009	0.15	0.02	0.000
	2.60	0.05			0.000	1.00	17	2.60	2.68	0.000	0.000	0.05	0.00	0.000
RB	2.75	0.00			0.000	1.00	18	2.75	2.75	0.000	0.000	0.01	0.00	0.000
													Total Flow:	0.004

Total Flow:	0.004	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.26	(m <sup>2</sup> )
Top Width:	2.70	(m)
Hydraulic Depth:	0.097	(m)
Mean Velocity:	0.014	(m/s)
Froude Number	0.014	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	11.34 V	100%
Datalogger External Power:	11.80	79%
Datalogger Memory Used:	15%	
Datalogger Clock:	9:57 AM	MST
Laptop Clock:	9:48 AM	MST
Dessicant:	Changed	
Datalogger:	Lakewood UL RX 207110	
PT:	Keller 971022, Port 2; Keller 1747 Port 1	
Power:	Battery	

Notes: TD not in water



# Hydrometric Measurement / Site Visit Record

S9 - Kearl Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kearl Lake Outlet  
Location: Kearl Lake Outlet  
Site Name: S9  
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

## Time of Measurement

Date of Measurement: September 18, 2007  
Start Time: 2:00 PM MDT  
End Time: 2:30 PM MDT

## Personnel & Equipment

Measurement Made By: JMS, SM  
Data Entry By: SM Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: T-post 0.101  
Water Level Reading: 1.924  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.516  
Other: Nail in tree 1.314

## Setup No. 1

El: 330.979  
El: 329.156  
El: 328.640  
El: 329.766

## Setup No. 2

El: 330.979  
El: 329.155  
El: 328.639  
El: 329.766

Weather Conditions: +8°C, overcast rain/drizzle  
River Conditions: open moderate stage

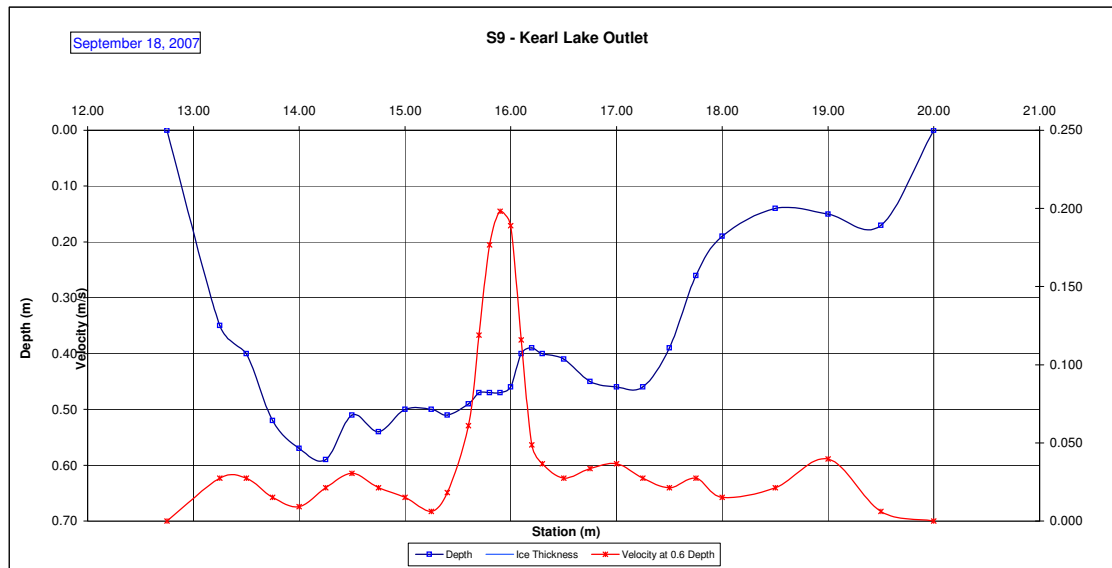
## Measurement Data

Measured Data						Calculated Data								
		Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
Station	Depth													
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
12.75	0.00				0.000	1.00	1	12.75	13.00	0.007	0.007	0.09	0.02	0.000
13.25	0.35				0.027	1.00	2	13.00	13.38	0.027	0.027	0.35	0.13	0.004
13.50	0.40				0.027	1.00	3	13.38	13.63	0.027	0.027	0.40	0.10	0.003
13.75	0.52				0.015	1.00	4	13.63	13.88	0.015	0.015	0.52	0.13	0.002
14.00	0.57				0.009	1.00	5	13.88	14.13	0.009	0.009	0.57	0.14	0.001
14.25	0.59				0.021	1.00	6	14.13	14.38	0.021	0.021	0.59	0.15	0.003
14.50	0.51				0.030	1.00	7	14.38	14.63	0.030	0.030	0.51	0.13	0.004
14.75	0.54				0.021	1.00	8	14.63	14.88	0.021	0.021	0.54	0.14	0.003
15.00	0.50				0.015	1.00	9	14.88	15.13	0.015	0.015	0.50	0.13	0.002
15.25	0.50				0.006	1.00	10	15.13	15.33	0.006	0.006	0.50	0.10	0.001
15.40	0.51				0.018	1.00	11	15.33	15.50	0.018	0.018	0.51	0.09	0.002
15.60	0.49				0.061	1.00	12	15.50	15.65	0.061	0.061	0.49	0.07	0.004
15.70	0.47				0.119	1.00	13	15.65	15.75	0.119	0.119	0.47	0.05	0.006
15.80	0.47				0.177	1.00	14	15.75	15.85	0.177	0.177	0.47	0.05	0.008
15.90	0.47				0.198	1.00	15	15.85	15.95	0.198	0.198	0.47	0.05	0.009
16.00	0.46				0.189	1.00	16	15.95	16.05	0.189	0.189	0.46	0.05	0.009
16.10	0.40				0.116	1.00	17	16.05	16.15	0.116	0.116	0.40	0.04	0.005
16.20	0.39				0.049	1.00	18	16.15	16.25	0.049	0.049	0.39	0.04	0.002
16.30	0.40				0.037	1.00	19	16.25	16.40	0.037	0.037	0.40	0.06	0.002
16.50	0.41				0.027	1.00	20	16.40	16.63	0.027	0.027	0.41	0.09	0.003
16.75	0.45				0.034	1.00	21	16.63	16.88	0.034	0.034	0.45	0.11	0.004
17.00	0.46				0.037	1.00	22	16.88	17.13	0.037	0.037	0.46	0.12	0.004
17.25	0.46				0.027	1.00	23	17.13	17.38	0.027	0.027	0.46	0.12	0.003
17.50	0.39				0.021	1.00	24	17.38	17.63	0.021	0.021	0.39	0.10	0.002
17.75	0.26				0.027	1.00	25	17.63	17.88	0.027	0.027	0.26	0.07	0.002
18.00	0.19				0.015	1.00	26	17.88	18.25	0.015	0.015	0.19	0.07	0.001
18.50	0.14				0.021	1.00	27	18.25	18.75	0.021	0.021	0.14	0.07	0.001
19.00	0.15				0.040	1.00	28	18.75	19.25	0.040	0.040	0.15	0.08	0.003
19.50	0.17				0.006	1.00	29	19.25	19.75	0.006	0.006	0.17	0.09	0.001
20.00	0.00				0.000	1.00	29	19.75	20.00	0.010	0.010	0.04	0.01	0.000
													Total Flow:	0.093

Total Flow:	0.093	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	2.56	(m <sup>2</sup> )
Top Width:	7.25	(m)
Hydraulic Depth:	0.353	(m)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	11.34 V	100%
Datalogger External Power:	11.56	74%
Datalogger Memory Used:	25%	
Datalogger Clock:	1:16 PM	MST
Dessicant:	Changed	
Datalogger:	Lakewood UL RX 207110	
PT:	Keller 971022, Port 2; Keller 1747 Port 1	
Power:	Battery	

Notes: TD moved back into water



# Hydrometric Measurement / Site Visit Record

S9 - Kears Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Kears Lake Outlet  
Location: Kears Lake Outlet  
Site Name: S9  
Coordinates & Legal: 6346750 N, 483980 E SE-29-95-8-W4

## Time of Measurement

Date of Measurement: October 20, 2007  
Start Time: 2:00 PM MDT  
End Time: 2:30 PM MDT

## Personnel & Equipment

Measurement Made By: ff sm  
Data Entry By: SM Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: T-post 1.321  
Water Level Reading: 3.098  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.280  
Other: Nail in tree 2.538

## Setup No. 1

El: 330.979  
El: 329.202  
El: 328.922  
El: 329.762

## Setup No. 2

El: 330.979  
El: 329.155  
El: 328.875  
El: 329.766

Weather Conditions: +5°C, overcast

River Conditions: open moderate stage

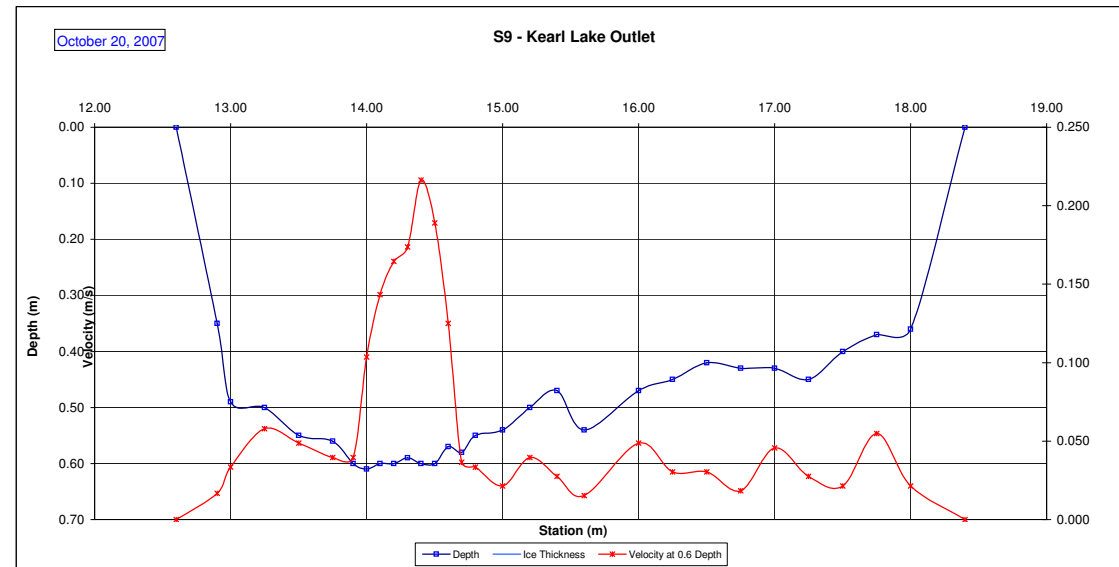
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
12.60	0.00				0.000	1.00	1	12.60	12.75	0.004	0.004	0.09	0.01	0.000	0%	
12.90	0.35				0.017	1.00	2	12.75	12.95	0.017	0.017	0.35	0.07	0.001	1%	
13.00	0.49				0.034	1.00	3	12.95	13.13	0.034	0.034	0.49	0.09	0.003	2%	
13.25	0.50				0.058	1.00	4	13.13	13.38	0.058	0.058	0.50	0.13	0.007	5%	
13.50	0.55				0.049	1.00	5	13.38	13.63	0.049	0.049	0.55	0.14	0.007	5%	
13.75	0.56				0.040	1.00	6	13.63	13.83	0.040	0.040	0.56	0.11	0.004	3%	
13.90	0.60				0.040	1.00	7	13.83	13.95	0.040	0.040	0.60	0.08	0.003	2%	
14.00	0.61				0.104	1.00	8	13.95	14.05	0.104	0.104	0.61	0.06	0.006	4%	
14.10	0.60				0.143	1.00	9	14.05	14.15	0.143	0.143	0.60	0.06	0.009	6%	
14.20	0.60				0.165	1.00	10	14.15	14.25	0.165	0.165	0.60	0.06	0.010	7%	
14.30	0.59				0.174	1.00	11	14.25	14.35	0.174	0.174	0.59	0.06	0.010	7%	
14.40	0.60				0.216	1.00	12	14.35	14.45	0.216	0.216	0.60	0.06	0.013	9%	
14.50	0.60				0.189	1.00	13	14.45	14.55	0.189	0.189	0.60	0.06	0.011	8%	
14.60	0.57				0.125	1.00	14	14.55	14.65	0.125	0.125	0.57	0.06	0.007	5%	
14.70	0.58				0.037	1.00	15	14.65	14.75	0.037	0.037	0.58	0.06	0.002	2%	
14.80	0.55				0.034	1.00	16	14.75	14.90	0.034	0.034	0.55	0.08	0.003	2%	
15.00	0.54				0.021	1.00	17	14.90	15.10	0.021	0.021	0.54	0.11	0.002	2%	
15.20	0.50				0.040	1.00	18	15.10	15.30	0.040	0.040	0.50	0.10	0.004	3%	
15.40	0.47				0.027	1.00	19	15.30	15.50	0.027	0.027	0.47	0.09	0.003	2%	
15.60	0.54				0.015	1.00	20	15.50	15.80	0.015	0.015	0.54	0.16	0.002	2%	
16.00	0.47				0.049	1.00	21	15.80	16.13	0.049	0.049	0.47	0.15	0.007	5%	
16.25	0.45				0.030	1.00	22	16.13	16.38	0.030	0.030	0.45	0.11	0.003	2%	
16.50	0.42				0.030	1.00	23	16.38	16.63	0.030	0.030	0.42	0.11	0.003	2%	
16.75	0.43				0.018	1.00	24	16.63	16.88	0.018	0.018	0.43	0.11	0.002	1%	
17.00	0.43				0.046	1.00	25	16.88	17.13	0.046	0.046	0.43	0.11	0.005	3%	
17.25	0.45				0.027	1.00	26	17.13	17.38	0.027	0.027	0.45	0.11	0.003	2%	
17.50	0.40				0.021	1.00	27	17.38	17.63	0.021	0.021	0.40	0.10	0.002	2%	
17.75	0.37				0.055	1.00	28	17.63	17.88	0.055	0.055	0.37	0.09	0.005	4%	
18.00	0.36				0.021	1.00	29	17.88	18.00	0.021	0.021	0.36	0.05	0.001	1%	
18.40	0.00				0.000	1.00	30	18.00	18.40	0.005	0.005	0.09	0.04	0.000	0%	
Total Flow:														0.141	100%	

Total Flow:	0.141	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	2.61	(m <sup>2</sup> )
Top Width:	5.80	(m)
Hydraulic Depth:	0.450	(m)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	11.34 V	100%
Datalogger External Power:	11.16	74%
Datalogger Memory Used:	25%	
Datalogger Clock:	10:07 AM	MST
Dessicant:	good	
Datalogger:	Lakewood UL RX 207110	
PT:	Keller 971022, Port 2; Keller 1747 Port 1	
Power:	Battery	

Notes: TD moved back into water



Hydrometric Measurement / Site Visit Record

Kearl Lake Outlet - S9



Regional Aquatics Monitoring Program

Measurement Location		Personnel & Equipment	
River/Stream:	Kearl Lake	Measurement Made By:	SM, FF
Location:	S9	Data Entry By:	SMS
Site Name:	Kearl Lake Outlet	Meter Type and No.:	March Mc Birney Flo-Mate 2000
Coordinates & Legal:	6346750 N, 483980 E SE-29-95-8-W4		s/n 2004521
Time of Measurement		Level Readings	
Date of Measurement:	December 8, 2007	Bench Mark Reading: T-Post	1.390
Start Time:		Water Level Reading:	3.110
End Time:		Top of Ice Level Reading:	3.218
Weather Conditions:		Transducer Reading & Est. El.:	
River Conditions:	Ice Cover	Other: Nail in Tre	2.607

Notes:

Flow pressurized likely due to downstream blockage. 10 cm of water came out of hole. Flow measurement not possible. Photos taken.



# Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

## Personnel & Equipment

Measurement Made By: FF/JS  
Data Entry By: FF Checked: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: January 12, 2007  
Start Time: 7:50 AM MST  
End Time: 8:10 AM MST

## Level Readings

Bench Mark Reading: rebar across 1.025  
Water Level Reading: 2.153  
Top of Ice Level Reading: 2.091  
Transducer Reading & Calc'd El.:  
Other:

## Setup No. 1

El: 100.908  
El: 99.780  
El: 99.842  
El:

## Setup No. 2

El: 100.908  
El: 99.778  
El: 99.824  
El:

## Weather Conditions:

-25°C light wind, clear

## River Conditions:

Complete ice cover

## Measurement Data

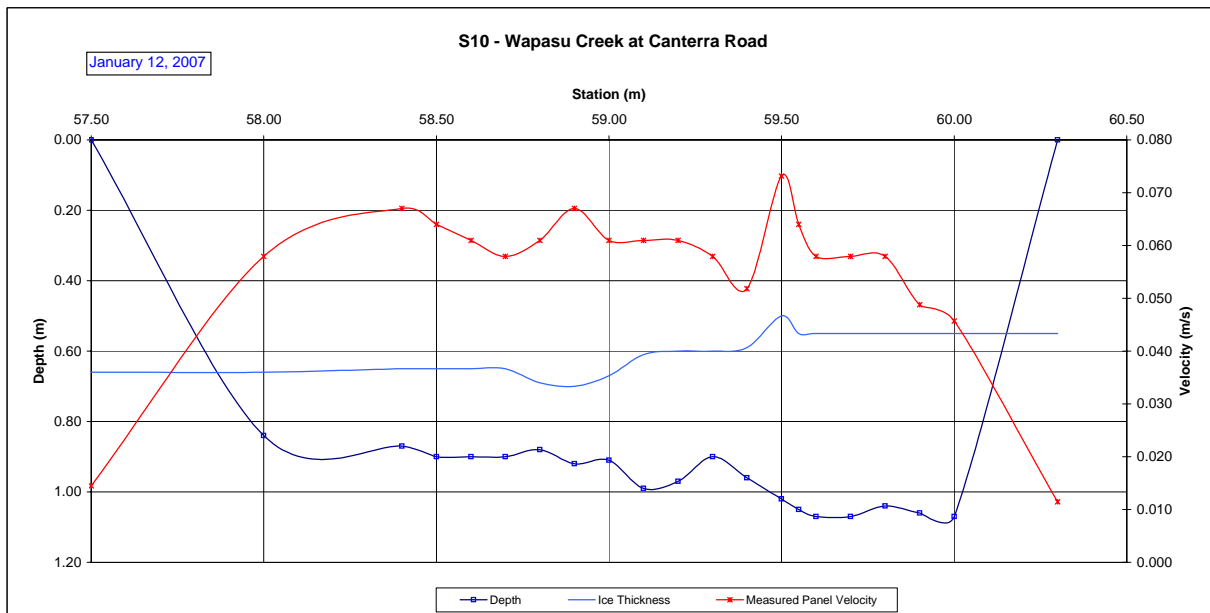
Measured Data							Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
57.50	0.00	0.66			0.000	0.90	1	57.50	57.75	0.014	0.013	0.05	0.01	0.000	0%
58.00	0.84	0.66			0.058	0.90	2	57.75	58.20	0.058	0.052	0.18	0.08	0.004	10%
58.40	0.87	0.65			0.067	0.90	3	58.20	58.45	0.067	0.060	0.22	0.06	0.003	8%
58.50	0.90	0.65			0.064	0.90	4	58.45	58.55	0.064	0.058	0.25	0.02	0.001	4%
58.60	0.90	0.65			0.061	0.90	5	58.55	58.65	0.061	0.055	0.25	0.03	0.001	3%
58.70	0.90	0.65			0.058	0.90	6	58.65	58.75	0.058	0.052	0.25	0.02	0.001	3%
58.80	0.88	0.69			0.061	0.90	7	58.75	58.85	0.061	0.055	0.19	0.02	0.001	3%
58.90	0.92	0.70			0.067	0.90	8	58.85	58.95	0.067	0.060	0.22	0.02	0.001	3%
59.00	0.91	0.67			0.061	0.90	9	58.95	59.05	0.061	0.055	0.24	0.02	0.001	3%
59.10	0.99	0.61			0.061	0.90	10	59.05	59.15	0.061	0.055	0.38	0.04	0.002	5%
59.20	0.97	0.60			0.061	0.90	11	59.15	59.25	0.061	0.055	0.37	0.04	0.002	5%
59.30	0.90	0.60			0.058	0.90	12	59.25	59.35	0.058	0.052	0.30	0.03	0.002	4%
59.40	0.96	0.59			0.052	0.90	13	59.35	59.45	0.052	0.047	0.37	0.04	0.002	4%
59.50	1.02	0.50			0.073	0.90	14	59.45	59.53	0.073	0.066	0.52	0.04	0.003	6%
59.55	1.05	0.55			0.064	0.90	15	59.53	59.58	0.064	0.058	0.50	0.03	0.001	4%
59.60	1.07	0.55			0.058	0.90	16	59.58	59.65	0.058	0.052	0.52	0.04	0.002	5%
59.70	1.07	0.55			0.058	0.90	17	59.65	59.75	0.058	0.052	0.52	0.05	0.003	7%
59.80	1.04	0.55			0.058	0.90	18	59.75	59.85	0.058	0.052	0.49	0.05	0.003	6%
59.90	1.06	0.55			0.049	0.90	19	59.85	59.95	0.049	0.044	0.51	0.05	0.002	5%
60.00	1.07	0.55			0.046	0.90	20	59.95	60.15	0.046	0.041	0.52	0.10	0.004	10%
60.30	0.00	0.55			0.000	0.90	21	60.15	60.30	0.011	0.010	0.13	0.02	0.000	0%
Total Flow:														0.041	1

Total Flow:	0.041	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.81	(m <sup>2</sup> )
Top Width:	2.80	(m)
Hydraulic Depth:	0.288	(m)
Mean Velocity:	0.051	(m/s)
Froude Number	0.030	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power:  
Datalogger External Power:  
Datalogger Memory Used:  
Datalogger Clock: MST  
Laptop Clock: MST  
Dessicant:  
Datalogger:  
PT:  
Power:

Notes: Bring cap for BM tube on next visit.  
No vertical velocity profile shot due to low depth.



# Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

## Time of Measurement

Date of Measurement: February 8, 2007  
Start Time: 8:30 AM MST  
End Time: 9:00 AM MST

## Weather Conditions:

-25°C light wind, clear

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS Checked: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: rebar across 1.050  
Water Level Reading: 2.058  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other:

## Setup No. 1

El: 100.908  
El: 99.900  
El: 101.958  
El:

## Setup No. 2

El: 100.908  
El: 99.901  
El: 102.027  
El:

99.90050

## Measurement Data

Measured Data							Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
RB 0.10	0.00	0.00			0.000	0.90	1	0.10	0.36	0.002	0.002	0.06	0.02	0.000	0%
0.42	0.69	0.46			0.009	0.90	2	0.36	0.65	0.009	0.008	0.23	0.07	0.001	4%
0.57	0.80	0.44			0.009	0.90	3	0.65	0.82	0.009	0.008	0.36	0.06	0.000	4%
0.73	0.85	0.45			0.009	0.90	4	0.82	0.98	0.009	0.008	0.40	0.07	0.001	4%
0.90	0.85	0.44			0.015	0.90	5	0.98	1.11	0.015	0.014	0.41	0.05	0.001	5%
1.06	0.73	0.45			0.018	0.90	6	1.11	1.30	0.018	0.016	0.28	0.05	0.001	7%
1.15	0.79	0.44			0.018	0.90	7	1.30	1.52	0.018	0.016	0.35	0.08	0.001	10%
1.45	0.87	0.43			0.018	0.90	8	1.52	1.67	0.018	0.016	0.44	0.07	0.001	8%
1.58	0.87	0.46			0.018	0.90	9	1.67	1.80	0.018	0.016	0.41	0.06	0.001	7%
1.75	0.83	0.48			0.015	0.90	10	1.80	1.99	0.015	0.014	0.35	0.07	0.001	7%
1.85	0.86	0.49			0.018	0.90	11	1.99	2.20	0.018	0.016	0.37	0.08	0.001	10%
2.13	1.01	0.53			0.018	0.90	12	2.20	2.33	0.018	0.016	0.48	0.06	0.001	8%
2.26	1.01	0.53			0.009	0.90	13	2.33	2.46	0.009	0.008	0.48	0.06	0.001	4%
2.39	0.99	0.53			0.015	0.90	14	2.46	2.79	0.015	0.014	0.46	0.15	0.002	16%
2.52	0.94	0.54			0.003	0.90	15	2.79	3.13	0.003	0.003	0.40	0.14	0.000	3%
3.05	0.65	0.53			0.006	0.90	16	3.13	3.27	0.006	0.005	0.12	0.02	0.000	1%
3.20	0.64	0.56			0.006	0.90	17	3.27	3.54	0.006	0.005	0.08	0.02	0.000	1%
3.33	0.57	0.56			0.012	0.90	18	3.54	3.83	0.012	0.011	0.01	0.00	0.000	0%
3.75	0.00	0.00			0.000	0.90	19	3.83	3.90	0.000	0.000	0.00	0.00	0.000	0%
LB 3.90	0.74	0.55			0.000	-0.10	20	3.90	3.90	0.000	0.000	0.00	0.00	0.000	0%
Total Flow:														0.013	1

Total Flow:	0.013	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.11	(m <sup>2</sup> )
Top Width:	3.80	(m)
Hydraulic Depth:	0.291	(m)
Mean Velocity:	0.012	(m/s)
Froude Number	0.007	
Photographs taken looking at:	Upstream, downstream, across	

## Datalogger Notes:

Datalogger Internal Power:

Datalogger External Power:

Datalogger Memory Used:

Datalogger Clock:

Laptop Clock:

Dessicant:

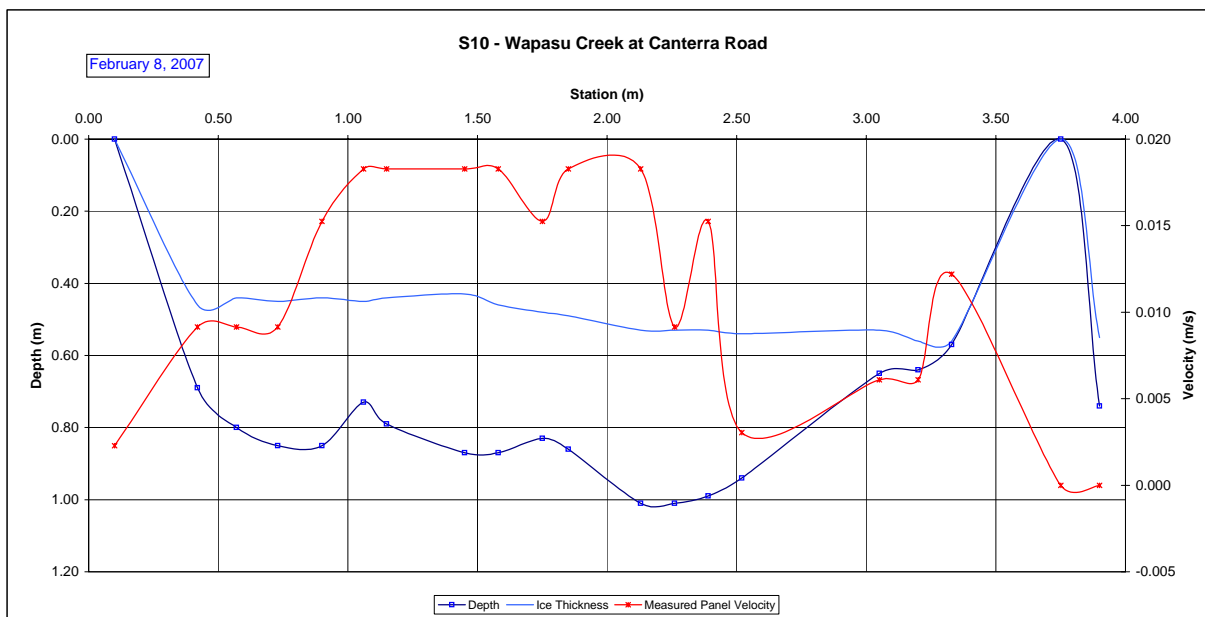
Datalogger:

PT:

Power:

MST  
MST

Notes: Bring cap for BM tube on next visit.  
No vertical velocity profile shot due to low depth.



# Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4  
Time of Measurement: March 6, 2007  
Date of Measurement: 7:42 AM MST  
Start Time: 8:02 AM MST  
End Time:

## Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: rebar across 1.159  
Water Level Reading: 2.425  
Top of Ice Level Reading: 2.146  
Transducer Reading & Calc'd El.:  
Other:

## Setup No. 1

El: 100.908  
El: 99.642  
El: 99.921  
El:  
El:

## Setup No. 2

El: 100.908  
El: 99.638  
El: 99.918  
El:  
El:

Weather Conditions: -10°C overcast, light wind

River Conditions: Complete ice cover

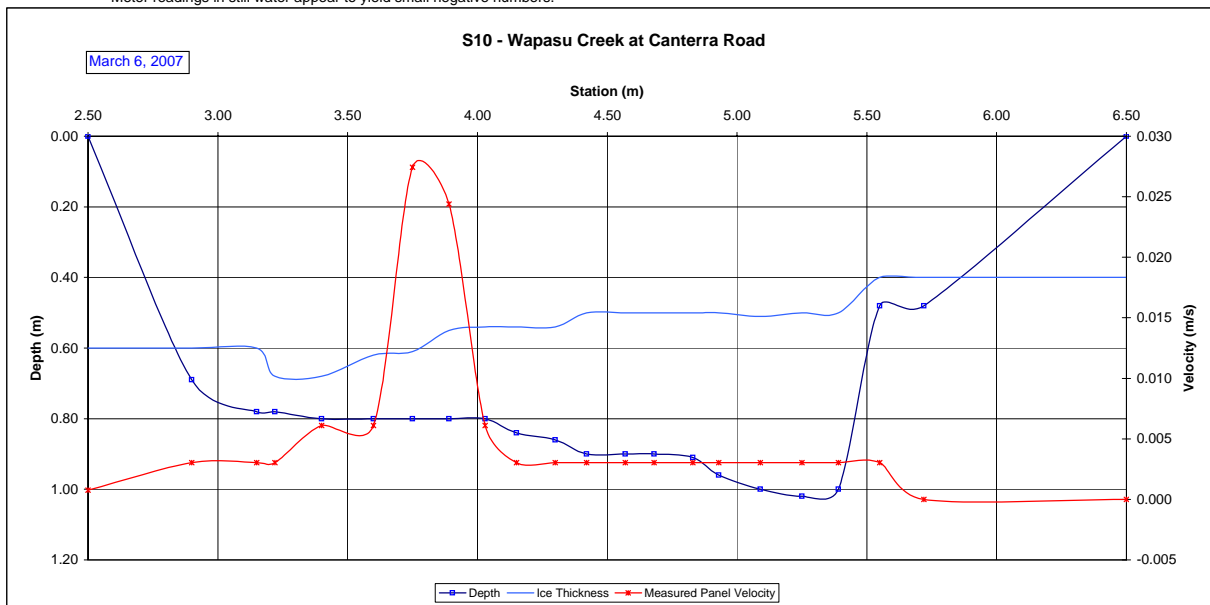
Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
															(m)	
2.50	0.00	0.60			0.000	0.90	1	2.50	2.85	0.001	0.001	0.02	0.01	0.000	0%	
2.90	0.69	0.60			0.003	0.90	2	2.85	3.19	0.003	0.003	0.09	0.03	0.000	2%	
3.15	0.78	0.60			0.003	0.90	3	3.19	3.31	0.003	0.003	0.18	0.02	0.000	2%	
3.22	0.78	0.68			0.003	0.90	4	3.31	3.50	0.003	0.003	0.10	0.02	0.000	1%	
3.40	0.80	0.68			0.006	0.90	5	3.50	3.68	0.006	0.005	0.12	0.02	0.000	3%	
3.60	0.80	0.62			0.006	0.90	6	3.68	3.82	0.006	0.005	0.18	0.03	0.000	4%	
3.75	0.80	0.61			0.027	0.90	7	3.82	3.96	0.027	0.025	0.19	0.03	0.001	17%	
3.89	0.80	0.55			0.024	0.90	8	3.96	4.09	0.024	0.022	0.25	0.03	0.001	19%	
4.03	0.80	0.54			0.006	0.90	9	4.09	4.23	0.006	0.005	0.26	0.04	0.000	5%	
4.15	0.84	0.54			0.003	0.90	10	4.23	4.36	0.003	0.003	0.30	0.04	0.000	3%	
4.30	0.86	0.54			0.003	0.90	11	4.36	4.50	0.003	0.003	0.32	0.04	0.000	3%	
4.42	0.90	0.50			0.003	0.90	12	4.50	4.63	0.003	0.003	0.40	0.05	0.000	4%	
4.57	0.90	0.50			0.003	0.90	13	4.63	4.76	0.003	0.003	0.40	0.05	0.000	4%	
4.68	0.90	0.50			0.003	0.90	14	4.76	4.88	0.003	0.003	0.40	0.05	0.000	4%	
4.83	0.91	0.50			0.003	0.90	15	4.88	5.01	0.003	0.003	0.41	0.05	0.000	4%	
4.93	0.96	0.50			0.003	0.90	16	5.01	5.17	0.003	0.003	0.46	0.07	0.000	5%	
5.09	1.00	0.51			0.003	0.90	17	5.17	5.32	0.003	0.003	0.49	0.07	0.000	5%	
5.25	1.02	0.50			0.003	0.90	18	5.32	5.47	0.003	0.003	0.52	0.08	0.000	6%	
5.39	1.00	0.50			0.003	0.90	19	5.47	5.64	0.003	0.003	0.50	0.08	0.000	6%	
5.55	0.48	0.40			0.003	0.90	20	5.64	6.11	0.003	0.003	0.08	0.04	0.000	3%	
5.72	0.48	0.40			0.000	0.90	21	6.11	6.50	0.000	0.000	0.08	0.03	0.000	0%	
6.50	0.00	0.40			0.000	0.90	22	6.50	6.50	0.000	0.000	0.02	0.00	0.000	0%	
Total Flow:														0.004	1	

Total Flow:	0.004	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.89	(m <sup>2</sup> )
Top Width:	4.00	(m)
Hydraulic Depth:	0.222	(m)
Mean Velocity:	0.004	(m/s)
Froude Number	0.003	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power:  
Datalogger External Power:  
Datalogger Memory Used:  
Datalogger Clock: MST  
Laptop Clock: MST  
Dessicant:  
Datalogger:  
PT:  
Power:

Notes: Negative velocities at some sections due to rocks. Flow very low, less than 10 L/s  
No vertical velocity profile shot due to low depth.  
Flow meter readings may not be accurate due to very low velocity. Zero mat need to be adjusted.  
Meter readings in still water appear to yield small negative numbers.



Hydrometric Measurement / Site Visit Record  
S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

Time of Measurement

Date of Measurement: March 27, 2007  
Start Time:  
End Time:

Weather Conditions:

River Conditions: Complete ice cover, Water on top of Ice

Notes: HCL complete Level Measurement, Appears that HCL didn't include the m reading on the rod ie. 183 = 2.183

Personnel & Equipment

Measurement Made By: JE, JM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

Level Readings

		Setup No. 1		Setup No. 2	
Bench Mark Reading: rebar across	0.964	El:	100.908	0.915	El: 100.908
Water Level Reading:	2.183	El:	99.689	2.178	El: 99.645
Top of Ice Level Reading:	2.182	El:	99.690	2.177	El: 99.646
Transducer Reading & Calc'd El.:		El:			El:
Other:		El:			El:

99.667

# Hydrometric Measurement / Site Visit Record

## S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

### Time of Measurement

Date of Measurement: April 25, 2007  
Start Time: 7:30 PM MDT  
End Time: 7:44 PM MDT

### Weather Conditions:

+9°C, Light Wind 5km/hr

### River Conditions:

Open

### Personnel & Equipment

Measurement Made By: JS, JE  
Data Entry By: JE Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: rebar in ABS 1.046  
Water Level Reading: 2.056  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 1.345  
Other: Rod in PVC on RB

### Setup No. 1

El: 100.908  
El: 99.898  
El: 99.904  
El: 98.553  
El: 101.954

### Setup No. 2

El: 100.908  
El: 99.904  
El: 98.559  
El: 101.901

99.901

98.556

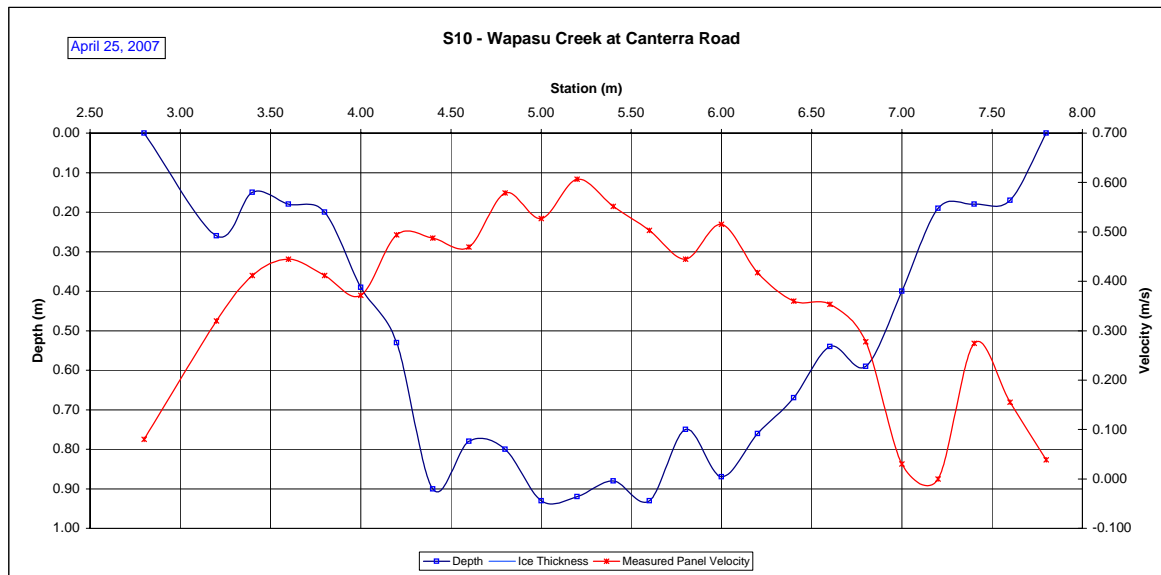
### Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)		
(m)	(m)		(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
2.80	0.00				0.000	1.00	1	2.80	3.00	0.080	0.080	0.07	0.01	0.001	0%	
3.20	0.26				0.320	1.00	2	3.00	3.30	0.320	0.320	0.26	0.08	0.025	2%	
3.40	0.15				0.411	1.00	3	3.30	3.50	0.411	0.411	0.15	0.03	0.012	1%	
3.60	0.18				0.445	1.00	4	3.50	3.70	0.445	0.445	0.18	0.04	0.016	1%	
3.80	0.20				0.411	1.00	5	3.70	3.90	0.411	0.411	0.20	0.04	0.016	1%	
4.00	0.39				0.372	1.00	6	3.90	4.10	0.372	0.372	0.39	0.08	0.029	2%	
4.20	0.53				0.494	1.00	7	4.10	4.30	0.494	0.494	0.53	0.11	0.052	5%	
4.40	0.90				0.488	1.00	8	4.30	4.50	0.488	0.488	0.90	0.18	0.088	8%	
4.60	0.78				0.469	1.00	9	4.50	4.70	0.469	0.469	0.78	0.16	0.073	6%	
4.80	0.80				0.579	1.00	10	4.70	4.90	0.579	0.579	0.80	0.16	0.093	8%	
5.00	0.93				0.527	1.00	11	4.90	5.10	0.527	0.527	0.93	0.19	0.098	8%	
5.20	0.92				0.607	1.00	12	5.10	5.30	0.607	0.607	0.92	0.18	0.112	10%	
5.40	0.88				0.552	1.00	13	5.30	5.50	0.552	0.552	0.88	0.18	0.097	8%	
5.60	0.93				0.503	1.00	14	5.50	5.70	0.503	0.503	0.93	0.19	0.094	8%	
5.80	0.75				0.445	1.00	15	5.70	5.90	0.445	0.445	0.75	0.15	0.067	6%	
6.00	0.87				0.515	1.00	16	5.90	6.10	0.515	0.515	0.87	0.17	0.090	8%	
6.20	0.76				0.418	1.00	17	6.10	6.30	0.418	0.418	0.76	0.15	0.063	5%	
6.40	0.67				0.360	1.00	18	6.30	6.50	0.360	0.360	0.67	0.13	0.048	4%	
6.60	0.54				0.354	1.00	19	6.50	6.70	0.354	0.354	0.54	0.11	0.038	3%	
6.80	0.59				0.277	1.00	20	6.70	6.90	0.277	0.277	0.59	0.12	0.033	3%	
7.00	0.40				0.030	1.00	21	6.90	7.10	0.030	0.030	0.40	0.08	0.002	0%	
7.20	0.19				0.000	1.00	22	7.10	7.30	0.000	0.000	0.19	0.04	0.000	0%	
7.40	0.18				0.274	1.00	23	7.30	7.50	0.274	0.274	0.18	0.04	0.010	1%	
7.60	0.17				0.155	1.00	24	7.50	7.70	0.155	0.155	0.17	0.03	0.005	0%	
7.80	0.00				0.000	1.00	25	7.70	7.80	0.039	0.039	0.04	0.00	0.000	0%	
Total Flow:														1.163		

Total Flow:	1.163	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	2.64	(m²)
Top Width:	5.00	(m)
Hydraulic Depth:	0.527	(m)
Mean Velocity:	0.441	(m/s)
Froude Number	0.194	
Photographs taken looking at:		
Upstream, downstream, across		

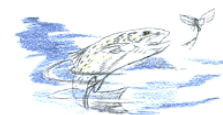
Datalogger Notes:		
Datalogger Internal Power:	11.34V	100%
Datalogger External Power:	11.80	76%
Datalogger Memory Used:	0%	
Datalogger Clock:	Apr 25, 2007 18:19	MST
Laptop Clock:	Apr 25, 2007 18:19	MST
Dessicant:	Good	
Datalogger:	ULRX s/n 203095	
PT:	Keller s/n 996022-5	5 psi
Power:	Lakewood battery	

Notes: Installed logger & TD. TD will not go into stiling well, therefore I put a weight on it and placed in pond area near stiling well.



# Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

## Time of Measurement

Date of Measurement: June 14, 2007  
Start Time: 10:15 AM MDT  
End Time: 10:26 AM MDT

## Weather Conditions:

+20°C, clear calm

## River Conditions:

Open

## Personnel & Equipment

Measurement Made By: pm, sm wd  
Data Entry By: sm Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: rebar in ABS c	0.970	0.990
Water Level Reading:	2.388	2.407
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.507	0.507
Other: Nail in Tree	1.158	1.177

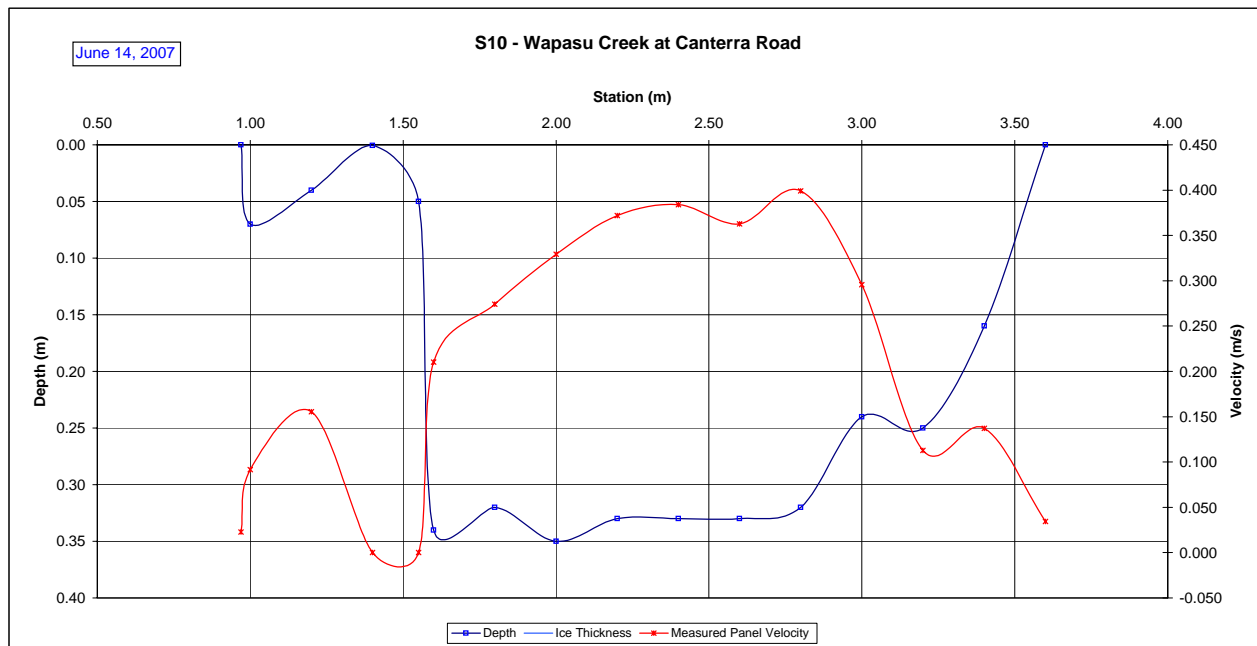
El: 100.908, 99.490, 98.983, 100.720  
El: 100.908, 99.491, 98.984, 100.721

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
0.97	0.00				0.000	1.00	1	0.97	0.99	0.023	0.023	0.02	0.00	0.000	0%
1.00	0.07				0.091	1.00	2	0.99	1.10	0.091	0.091	0.07	0.01	0.001	0%
1.20	0.04				0.155	1.00	3	1.10	1.30	0.155	0.155	0.04	0.01	0.001	1%
1.40	0.00				0.000	1.00	4	1.30	1.48	0.000	0.000	0.00	0.00	0.000	0%
1.55	0.05				0.000	1.00	5	1.48	1.58	0.000	0.000	0.05	0.01	0.000	0%
1.60	0.34				0.210	1.00	6	1.58	1.70	0.210	0.210	0.34	0.04	0.009	5%
1.80	0.32				0.274	1.00	7	1.70	1.90	0.274	0.274	0.32	0.06	0.018	10%
2.00	0.35				0.329	1.00	8	1.90	2.10	0.329	0.329	0.35	0.07	0.023	13%
2.20	0.33				0.372	1.00	9	2.10	2.30	0.372	0.372	0.33	0.07	0.025	14%
2.40	0.33				0.384	1.00	10	2.30	2.50	0.384	0.384	0.33	0.07	0.025	14%
2.60	0.33				0.363	1.00	11	2.50	2.70	0.363	0.363	0.33	0.07	0.024	14%
2.80	0.32				0.399	1.00	12	2.70	2.90	0.399	0.399	0.32	0.06	0.026	15%
3.00	0.24				0.296	1.00	13	2.90	3.10	0.296	0.296	0.24	0.05	0.014	8%
3.20	0.25				0.113	1.00	14	3.10	3.30	0.113	0.113	0.25	0.05	0.006	3%
3.40	0.16				0.137	1.00	15	3.30	3.50	0.137	0.137	0.16	0.03	0.004	3%
3.60	0.00				0.000	1.00	16	3.50	3.60	0.034	0.034	0.04	0.00	0.000	0%
Total Flow:												0.175			

Total Flow:	0.175	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.59	(m <sup>2</sup> )
Top Width:	2.63	(m)
Hydraulic Depth:	0.226	(m)
Mean Velocity:	0.295	(m/s)
Froude Number	0.198	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	11.34V	100%
Datalogger External Power:	11.80	75%
Datalogger Memory Used:	30%	
Datalogger Clock:	Jun 14, 2007 08:55	MST
Laptop Clock:	Jun 14, 2007 08:57	MST
Dessicant:	Good	
Datalogger:	ULRX s/n 203095	
PT:	Keller s/n 996022-5	5 psi
Power:	Lakewood battery	

Notes: new BM installed in dead tree near logger box and stilling well  
replaced battery @79% transducer installed in stilling well new depth 0.507  
mmt section under bridge



# Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

## Time of Measurement

Date of Measurement: August 9, 2007  
Start Time: 12:53 PM MDT  
End Time: MDT

## Weather Conditions:

Party cloudy

## River Conditions:

Open, low

## Personnel & Equipment

Measurement Made By: SM, JSI  
Data Entry By: PM Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: rebar in ABS on LB El: 100.908  
Water Level Reading: 2.502 El: 99.226 2.392 El: 99.222 99.224  
Top of Ice Level Reading: El: 98.997  
Transducer Reading & Calc'd El: 0.225 El: 98.997 98.999  
Other: Nail In Tree 1.007 El: 100.721 0.893 El: 100.721

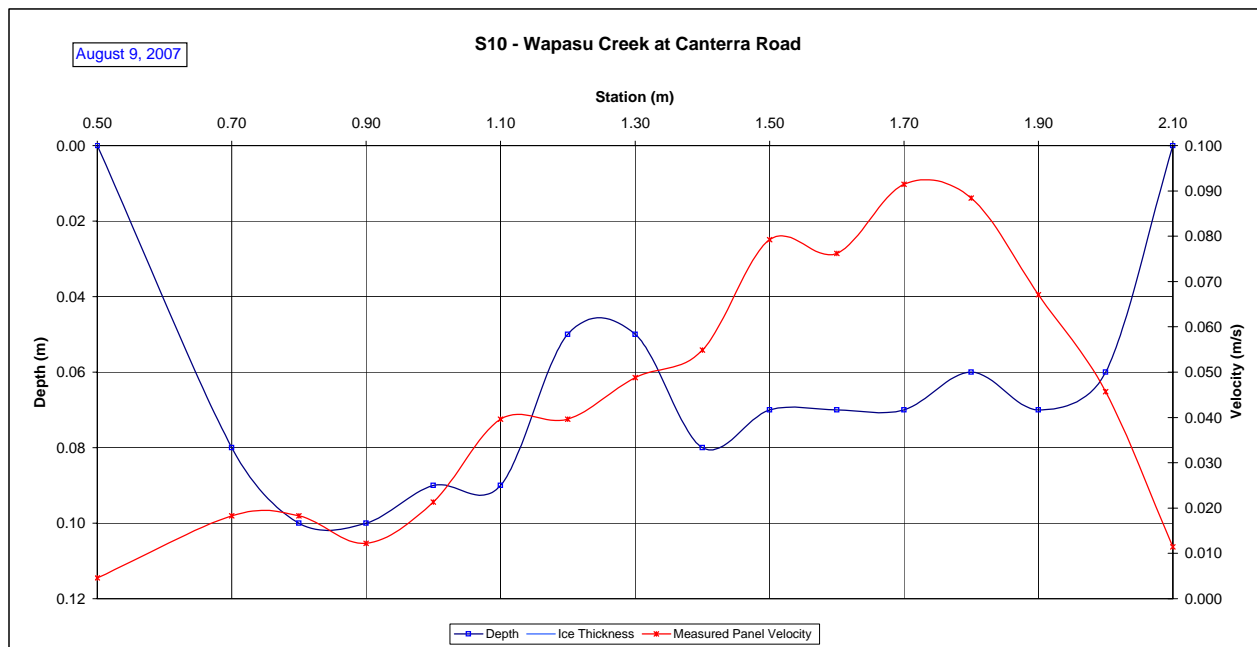
## Measurement Data

		Measured Data				Calculated Data										
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	0.50	0.00				0.012	1.00	1	0.50	0.60	0.005	0.005	0.02	0.00	0.000	0%
	0.70	0.08				0.018	1.00	2	0.60	0.75	0.018	0.018	0.08	0.01	0.000	4%
	0.80	0.10				0.018	1.00	3	0.75	0.85	0.018	0.018	0.10	0.01	0.000	4%
	0.90	0.10				0.012	1.00	4	0.85	0.95	0.012	0.012	0.10	0.01	0.000	2%
	1.00	0.09				0.021	1.00	5	0.95	1.05	0.021	0.021	0.09	0.01	0.000	4%
	1.10	0.09				0.040	1.00	6	1.05	1.15	0.040	0.040	0.09	0.01	0.000	7%
	1.20	0.05				0.040	1.00	7	1.15	1.25	0.040	0.040	0.05	0.01	0.000	4%
	1.30	0.05				0.049	1.00	8	1.25	1.35	0.049	0.049	0.05	0.01	0.000	5%
	1.40	0.08				0.055	1.00	9	1.35	1.45	0.055	0.055	0.08	0.01	0.000	9%
	1.50	0.07				0.079	1.00	10	1.45	1.55	0.079	0.079	0.07	0.01	0.001	11%
	1.60	0.07				0.076	1.00	11	1.55	1.65	0.076	0.076	0.07	0.01	0.001	11%
	1.70	0.07				0.091	1.00	12	1.65	1.75	0.091	0.091	0.07	0.01	0.001	13%
	1.80	0.06				0.088	1.00	13	1.75	1.85	0.088	0.088	0.06	0.01	0.001	11%
	1.90	0.07				0.067	1.00	14	1.85	1.95	0.067	0.067	0.07	0.01	0.000	9%
	2.00	0.06				0.046	1.00	15	1.95	2.05	0.046	0.046	0.06	0.01	0.000	6%
	2.10	0.00				0.000	1.00	16	2.05	2.10	0.011	0.011	0.02	0.00	0.000	0%
RB	Total Flow:												0.005		1	

Total Flow:	0.005	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.11	(m <sup>2</sup> )
Top Width:	1.60	(m)
Hydraulic Depth:	0.069	(m)
Mean Velocity:	0.045	(m/s)
Froude Number	0.054	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	11.34V	100%
Datalogger External Power:	11.92	77%
Datalogger Memory Used:	66%	
Datalogger Clock:	12:00 PM	MST
Laptop Clock:	11:56 PM	MST
Dessicant:	Good	
Datalogger:	ULRX s/n 203095	
PT:	Keller s/n 996022-5	5 psi
Power:	Lakewood battery	

Notes: Trucks removing water for dust suppression. No fish screen - running all day



Hydrometric Measurement / Site Visit Record
S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: Wapasu Creek at Canterra Road
Site Name: S10
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4
Time of Measurement: September 18, 2007
Date of Measurement: 12:53 PM MDT
Start Time: MDT
End Time: MDT

Personnel & Equipment

Measurement Made By: SM, Jms
Data Entry By: SM, Jms Checked: Marsh McBirney FloMate 2000
Meter Type and No.: s/n 2004521

Level Readings

Bench Mark Reading: rebar in ABS c 0.868
Water Level Reading: 1.888
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.885
Other: Nail In Tree 1.054

Setup No. 1

El: 100.908
El: 99.887
El:
El: 99.002
El: 100.721

Setup No. 2

El: 100.908
El: 99.880
El:
El: 98.995
El: 100.721

Weather Conditions: Party cloudy

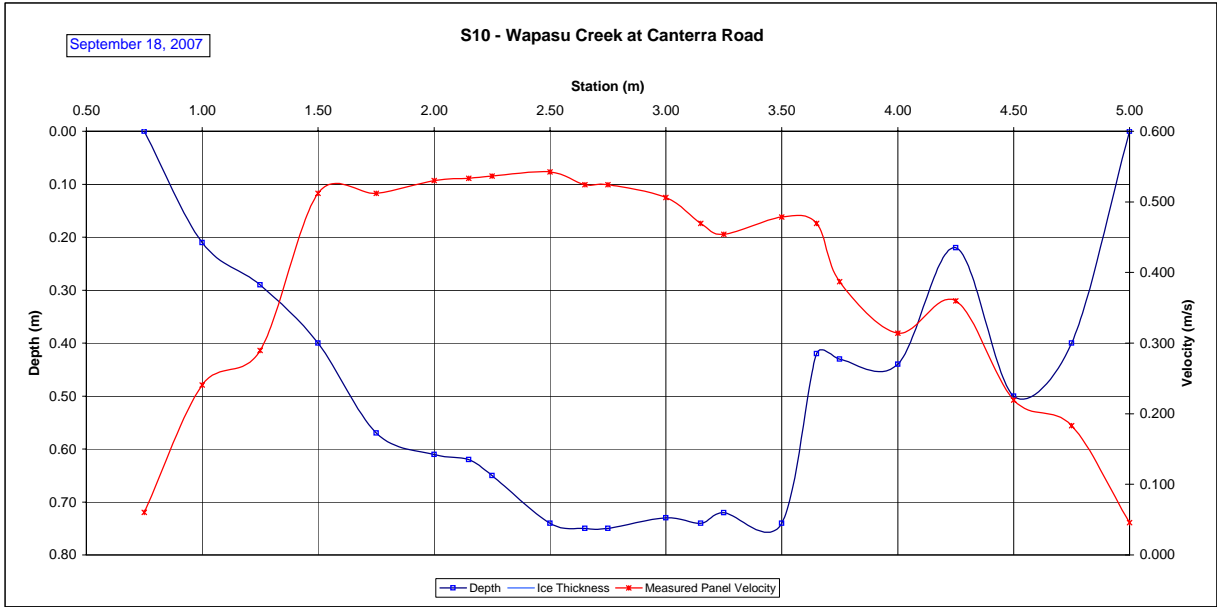
River Conditions: Open, low

Table with 17 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Rows include data for stations 0.75 to 5.00, with a total flow of 0.923 m³/s.

Summary table with 4 columns: Metric, Value, Unit. Includes Total Flow (0.923 m³/s), Perceived Measurement Quality (Good), Total Area (2.10 m²), Top Width (4.25 m), Hydraulic Depth (0.495 m), Mean Velocity (0.439 m/s), Froude Number (0.199), and Photographs taken looking at (Upstream, downstream, across).

Datalogger Notes table with 4 columns: Metric, Value 1, Value 2, Unit. Includes Datalogger Internal Power (11.56V, 74%), Datalogger External Power (11.33, 10%), Datalogger Memory Used (50%), Datalogger Clock (11:42 AM, MST), Laptop Clock (11:33 AM, MST), Dessicant (Good), Datalogger (ULRX s/n 203095), PT (Keller s/n 996022-5, 5 psi), and Power (Lakewood battery).

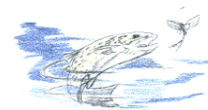
Notes: battery dead, battery changed





# Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

## Personnel & Equipment

Measurement Made By: SM,FF  
Data Entry By: FF Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Time of Measurement

Date of Measurement: October 20, 2007  
Start Time: 8:29 AM MDT  
End Time: 8:46 AM MDT

## Level Readings

Bench Mark Reading: rebar in ABS 1.058  
Water Level Reading: 2.321  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 0.642  
Other: Nail In Tree

## Setup No. 1

El: 100.908  
El: 99.645  
El: 99.003  
El:

## Setup No. 2

El: 100.908  
El: 99.643  
El: 99.001  
El:

99.644

99.002

Weather Conditions: 10C, Overcast, Calm  
River Conditions: Open, moderate stage

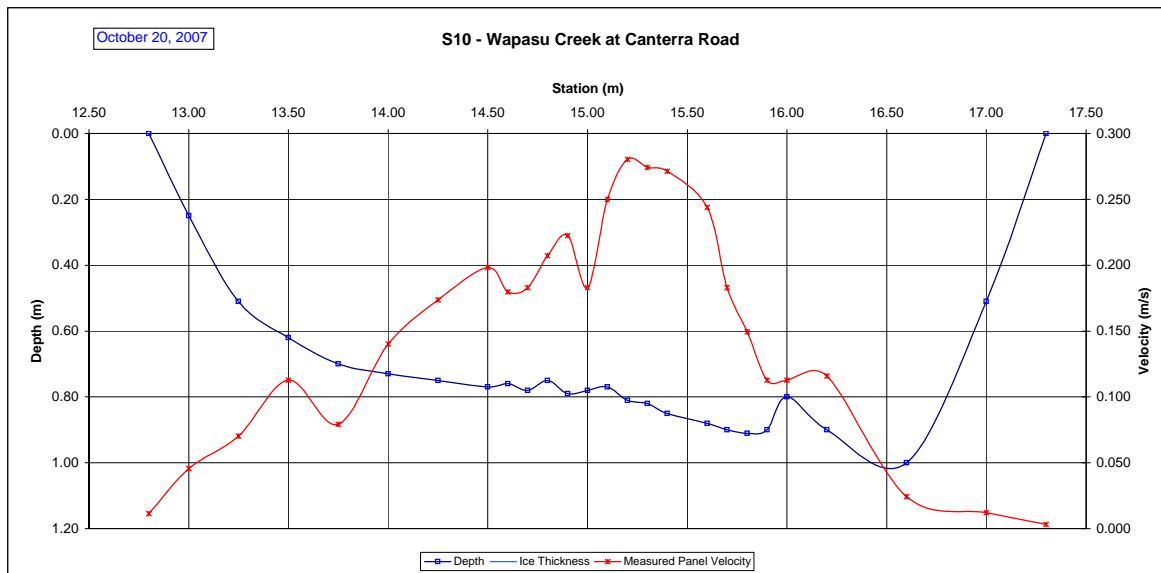
## Measurement Data

Measured Data							Calculated Data								Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)	
LB	12.80	0.00			0.000	1.00	1	12.80	12.90	0.011	0.011	0.06	0.01	0.000	0%
	13.00	0.25			0.046	1.00	2	12.90	13.13	0.046	0.046	0.25	0.06	0.003	1%
	13.25	0.51			0.070	1.00	3	13.13	13.38	0.070	0.070	0.51	0.13	0.009	2%
	13.50	0.62			0.113	1.00	4	13.38	13.63	0.113	0.113	0.62	0.16	0.017	4%
	13.75	0.70			0.079	1.00	5	13.63	13.88	0.079	0.079	0.70	0.18	0.014	3%
	14.00	0.73			0.140	1.00	6	13.88	14.13	0.140	0.140	0.73	0.18	0.026	6%
	14.25	0.75			0.174	1.00	7	14.13	14.38	0.174	0.174	0.75	0.19	0.033	8%
	14.50	0.77			0.198	1.00	8	14.38	14.55	0.198	0.198	0.77	0.13	0.027	6%
	14.60	0.76			0.180	1.00	9	14.55	14.65	0.180	0.180	0.76	0.08	0.014	3%
	14.70	0.78			0.183	1.00	10	14.65	14.75	0.183	0.183	0.78	0.08	0.014	3%
	14.80	0.75			0.207	1.00	11	14.75	14.85	0.207	0.207	0.75	0.08	0.016	4%
	14.90	0.79			0.223	1.00	12	14.85	14.95	0.223	0.223	0.79	0.08	0.018	4%
	15.00	0.78			0.183	1.00	13	14.95	15.05	0.183	0.183	0.78	0.08	0.014	3%
	15.10	0.77			0.250	1.00	14	15.05	15.15	0.250	0.250	0.77	0.08	0.019	4%
	15.20	0.81			0.280	1.00	15	15.15	15.25	0.280	0.280	0.81	0.08	0.023	5%
	15.30	0.82			0.274	1.00	16	15.25	15.35	0.274	0.274	0.82	0.08	0.022	5%
	15.40	0.85			0.271	1.00	17	15.35	15.50	0.271	0.271	0.85	0.13	0.035	8%
	15.60	0.88			0.244	1.00	18	15.50	15.65	0.244	0.244	0.88	0.13	0.032	7%
	15.70	0.90			0.183	1.00	19	15.65	15.75	0.183	0.183	0.90	0.09	0.016	4%
	15.80	0.91			0.149	1.00	20	15.75	15.85	0.149	0.149	0.91	0.09	0.014	3%
	15.90	0.90			0.113	1.00	21	15.85	15.95	0.113	0.113	0.90	0.09	0.010	2%
	16.00	0.80			0.113	1.00	22	15.95	16.10	0.113	0.113	0.80	0.12	0.014	3%
	16.20	0.90			0.116	1.00	23	16.10	16.40	0.116	0.116	0.90	0.27	0.031	7%
	16.60	1.00			0.024	1.00	24	16.40	16.80	0.024	0.024	1.00	0.40	0.010	2%
	17.00	0.51			0.012	1.00	25	16.80	17.15	0.012	0.012	0.51	0.18	0.002	1%
	17.30	0.00			0.000	1.00	26	17.15	17.30	0.003	0.003	0.13	0.02	0.000	0%
Total Flow:														0.431	1

Total Flow:	0.431	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	3.17	(m <sup>2</sup> )
Top Width:	4.50	(m)
Hydraulic Depth:	0.704	(m)
Mean Velocity:	0.136	(m/s)
Froude Number	0.052	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	11.34V	100%
Datalogger External Power:	11.92	74%
Datalogger Memory Used:	80%	
Datalogger Clock:	7:38 AM	MST
Laptop Clock:	7:30 AM	MST
Dessicant:	Good	
Datalogger:	ULRX s/n 203895	
PT:	Keller s/n 996022-5	5 psi
Power:	Lakewood battery	

Notes: TD sn# noted in software as 966022  
logger clock reset to laptop  
memory cleared  
Batt changed at 74%



# Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek at Canterra Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Wapasu Creek  
Location: Wapasu Creek at Canterra Road  
Site Name: S10  
Coordinates & Legal: 6355942 N, 490272 E SE-24-96-8-W4

## Time of Measurement

Date of Measurement: December 8, 2007  
Start Time: 12:30 PM MDT  
End Time: MDT

## Weather Conditions:

-18C

## River Conditions:

frozen

## Personnel & Equipment

Measurement Made By: SM,FF  
Data Entry By: FF Checked:  
Meter Type and No.: Marsh McBimney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: rebar in ABS 0.652  
Water Level Reading: 2.217  
Top of Ice Level Reading: 2.189  
Transducer Reading & Calc'd El 0.376  
Other: Nail In Tree

## Setup No. 1

El: 100.908  
El: 99.343  
El: 2.182  
El: 2.159  
El: 98.967  
El:

## Setup No. 2

El: 100.908  
El: 99.348  
El: 2.182  
El: 2.159  
El: 98.972  
El:

99.346

98.970

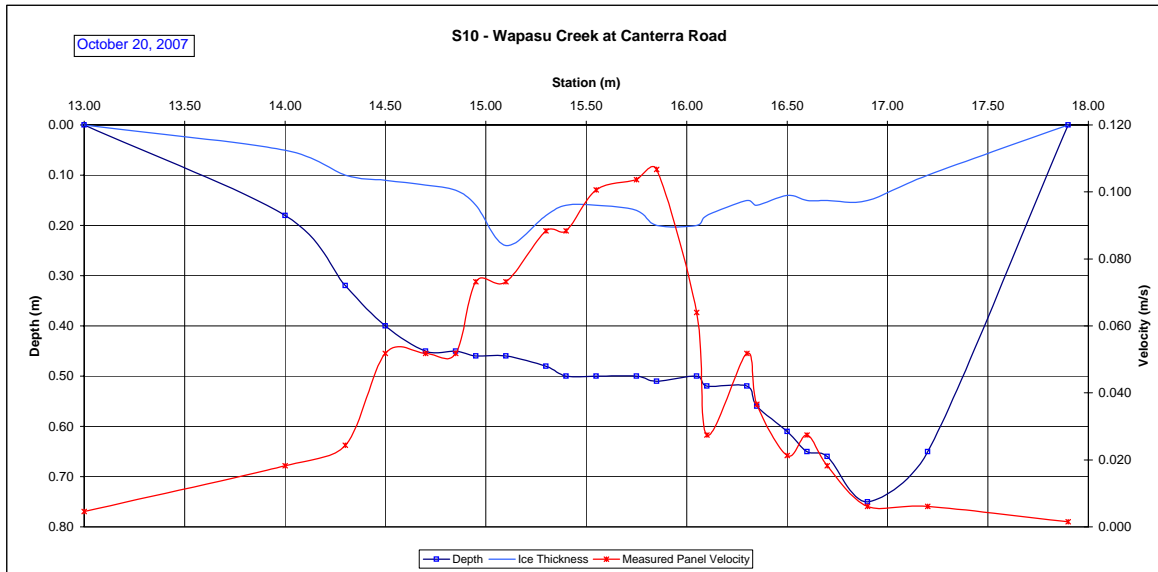
## Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
LB 13.00	0.00	0.00			0.000	0.90	1	13.00	13.50	0.005	0.004	0.03	0.02	0.000	0%
14.00	0.18	0.05			0.018	0.90	2	13.50	14.15	0.018	0.016	0.13	0.08	0.001	3%
14.30	0.32	0.10			0.024	0.90	3	14.15	14.40	0.024	0.022	0.22	0.06	0.001	3%
14.50	0.40	0.11			0.052	0.90	4	14.40	14.60	0.052	0.047	0.29	0.06	0.003	6%
14.70	0.45	0.12			0.052	0.90	5	14.60	14.78	0.052	0.047	0.33	0.06	0.003	6%
14.85	0.45	0.13			0.052	0.90	6	14.78	14.90	0.052	0.047	0.32	0.04	0.002	4%
14.95	0.46	0.16			0.073	0.90	7	14.90	15.03	0.073	0.066	0.30	0.04	0.002	5%
15.10	0.46	0.24			0.073	0.90	8	15.03	15.20	0.073	0.066	0.22	0.04	0.003	5%
15.30	0.48	0.18			0.088	0.90	9	15.20	15.35	0.088	0.080	0.30	0.05	0.004	7%
15.40	0.50	0.16			0.088	0.90	10	15.35	15.48	0.088	0.080	0.34	0.04	0.003	7%
15.55	0.50	0.16			0.101	0.90	11	15.48	15.65	0.101	0.091	0.34	0.06	0.005	11%
15.75	0.50	0.17			0.104	0.90	12	15.65	15.80	0.104	0.093	0.33	0.05	0.005	10%
15.85	0.51	0.20			0.107	0.90	13	15.80	15.95	0.107	0.096	0.31	0.05	0.004	9%
16.05	0.50	0.20			0.064	0.90	14	15.95	16.08	0.064	0.058	0.30	0.04	0.002	4%
16.10	0.52	0.18			0.027	0.90	15	16.08	16.20	0.027	0.025	0.34	0.04	0.001	2%
16.30	0.52	0.15			0.052	0.90	16	16.20	16.33	0.052	0.047	0.37	0.05	0.002	4%
16.35	0.56	0.16			0.037	0.90	17	16.33	16.43	0.037	0.033	0.40	0.04	0.001	3%
16.50	0.61	0.14			0.021	0.90	18	16.43	16.55	0.021	0.019	0.47	0.06	0.001	2%
16.60	0.65	0.15			0.027	0.90	19	16.55	16.65	0.027	0.025	0.50	0.05	0.001	3%
16.70	0.66	0.15			0.018	0.90	20	16.65	16.80	0.018	0.016	0.51	0.08	0.001	3%
16.90	0.75	0.15			0.006	0.90	21	16.80	17.05	0.006	0.005	0.60	0.15	0.001	2%
17.20	0.65	0.10			0.006	0.90	22	17.05	17.20	0.006	0.005	0.55	0.08	0.000	1%
RB 17.90	0.00	0.00			0.000	0.90	23	17.20	17.90	0.002	0.001	0.14	0.10	0.000	0%
Total Flow:														0.048	1

Total Flow:	0.048	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.31	(m <sup>2</sup> )
Top Width:	4.90	(m)
Hydraulic Depth:	0.268	(m)
Mean Velocity:	0.037	(m/s)
Froude Number	0.023	
Photographs taken looking at: Upstream, downstream, across		

Notes: temp 0.071

Datalogger Notes:		
Datalogger Internal Power:	11.34V	100%
Datalogger External Power:	11.92	74%
Datalogger Memory Used:	80%	
Datalogger Clock:	7:38 AM	MST
Laptop Clock:	7:30 AM	MST
Dessicant:	Good	
Datalogger:	ULRX s/n 203895	
PT:	Keller s/n 996022-5	5 psi
Power:	Lakewood battery	



Hydrometric Measurement / Site Visit Record
S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

Time of Measurement

Date of Measurement: January 13, 2007
Start Time: 3:00 PM MDT
End Time: MDT

Weather Conditions:

-25 °C, partly cloudy, wind from south

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: JS,FF,JE
Data Entry By: JS
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measurements

Bench Mark Reading: ASCM Marker 0.734 El: 242.081 0.711 El: 242.081
Water Level Reading: 2.261 El: 240.554 2.244 El: 240.548 240.551
Top of Ice Level Reading: 2.168 El: 2.143 El:
Transducer Reading & Est. El.: El: 240.554 0.000 El: 240.548
Other: El:

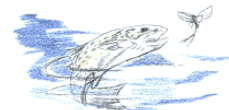
Table with 4 columns: Measurement Category, Value 1, Value 2, Unit. Rows include Perceived Measurement Quality, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number, and Photographs taken looking at.

Table with 2 columns: Datalogger Notes, Value. Rows include Datalogger Internal Power, Datalogger External Power, Datalogger Memory Used, Datalogger Clock, Laptop Clock, Dessicant, Datalogger, PT, and Power.

Notes: No discharge - Holes broken in ice, slushy, minimal flow
Seepag apparent enterinf river upstream of bridge.

# Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Poplar Creek  
Location: Poplar Creek  
Site Name: S11  
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

## Time of Measurement

Date of Measurement: February 7, 2007  
Start Time: MDT  
End Time: MDT

## Weather Conditions:

-25 °C, partly cloudy, wind from south

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Level Readings and Measurements

Bench Mark Reading: ASCM Marker	El:	242.081	El:	242.081
Water Level Reading:	El:	242.081	El:	242.081
Top of Ice Level Reading:	El:		El:	
Transducer Reading & Est. El.:	El:	242.081	El:	242.081
Other:	El:		El:	

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)					
						1.00	1	0.00											
														Total Flow:		0.000		0%	

Total Flow:		(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:		(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	
Datalogger Clock:	MST
Laptop Clock:	MST
Dessicant:	
Datalogger:	UltraLogger RX-1 s/n 203058
PT:	Keller 8363K s/n 101183
Power:	Lakewood battery

Notes: Frozen to depth all holes that were drilled are dry.

# Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Poplar Creek  
Location: Poplar Creek  
Site Name: S11  
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

## Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: March 7, 2007  
Start Time: 4:29 PM MDT  
End Time: 4:39 PM MDT

## Level Readings and Measurements

Bench Mark Reading: rebar on RB 1.235 El: 242.081 1.184 El: 242.081 Check BM elev  
Water Level Reading: 2.461 El: 240.855 2.423 El: 240.842 240.849  
Top of Ice Level Reading: 1.705 El: 1.655 El:  
Transducer Reading & Est. El.: 240.855 El: 240.842 240.849  
Other: El:

## Weather Conditions:

-5°C, overcast, light wind

## River Conditions:

Ice covered with seepage over thick set ice. Ice bridged over flow.

## Measurement Data

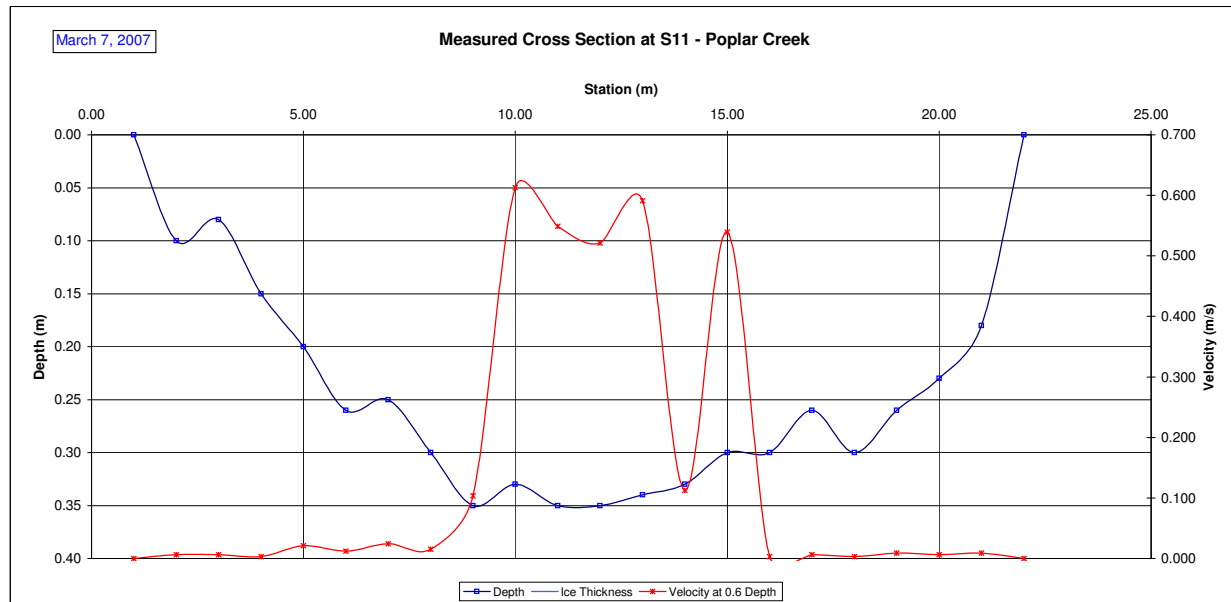
Measured Data							Calculated Data								Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)	
LB	1.70	0.00			0.000	1.00	1	1.70	1.95	0.002	0.002	0.03	0.01	0.000	0%
	2.20	0.10			0.006	1.00	2	1.95	2.28	0.006	0.006	0.10	0.03	0.000	0%
	2.35	0.08			0.006	1.00	3	2.28	2.48	0.006	0.006	0.08	0.02	0.000	0%
	2.60	0.15			0.003	1.00	4	2.48	2.68	0.003	0.003	0.15	0.03	0.000	0%
	2.75	0.20			0.021	1.00	5	2.68	2.83	0.021	0.021	0.20	0.03	0.001	0%
	2.90	0.26			0.012	1.00	6	2.83	2.98	0.012	0.012	0.26	0.04	0.000	0%
	3.05	0.25			0.024	1.00	7	2.98	3.13	0.024	0.024	0.25	0.04	0.001	1%
	3.20	0.30			0.015	1.00	8	3.13	3.20	0.015	0.015	0.30	0.02	0.000	0%
	3.35	0.35			0.104	1.00	9	3.20	3.55	0.104	0.104	0.35	0.12	0.013	9%
	3.55	0.33			0.613	1.00	10	3.55	3.63	0.613	0.613	0.33	0.02	0.015	10%
	3.70	0.35			0.549	1.00	11	3.63	3.75	0.549	0.549	0.35	0.04	0.024	16%
	3.80	0.35			0.521	1.00	12	3.75	3.88	0.521	0.521	0.35	0.04	0.023	15%
	3.95	0.34			0.591	1.00	13	3.88	4.03	0.591	0.591	0.34	0.05	0.030	20%
	4.10	0.33			0.113	1.00	14	4.03	4.18	0.113	0.113	0.33	0.05	0.006	4%
	4.25	0.30			0.539	1.00	15	4.18	4.38	0.539	0.539	0.30	0.06	0.032	22%
	4.50	0.30			0.003	1.00	16	4.38	4.58	0.003	0.003	0.30	0.06	0.000	0%
	4.65	0.26			0.006	1.00	17	4.58	4.75	0.006	0.006	0.26	0.05	0.000	0%
	4.85	0.30			0.003	1.00	18	4.75	4.93	0.003	0.003	0.30	0.05	0.000	0%
	5.00	0.26			0.009	1.00	19	4.93	5.13	0.009	0.009	0.26	0.05	0.000	0%
	5.25	0.23			0.006	1.00	20	5.13	5.33	0.006	0.006	0.23	0.05	0.000	0%
	5.40	0.18			0.009	1.00	21	5.33	5.65	0.009	0.009	0.18	0.06	0.001	0%
RB	5.90	0.00			0.000	1.00	22	5.65	5.90	0.002	0.002	0.05	0.01	0.000	0%
Total Flow:														0.147	100%

Total Flow:	0.147	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.93	(m <sup>2</sup> )
Top Width:	4.20	(m)
Hydraulic Depth:	0.223	(m)
Mean Velocity:	0.158	(m/s)
Froude Number	0.107	
Photographs taken looking at:	Upstream, downstream, across	

## Datalogger Notes:

Datalogger Internal Power:  
Datalogger External Power:  
Datalogger Memory Used:  
Datalogger Clock: MST  
Laptop Clock: MST  
Dessicant:  
Datalogger: UltraLogger RX-1 s/n 203058  
PT: Keller 8363K s/n 101183  
Power: Lakewood battery

Notes: ice 40 cm thick, and bridged 5 cm above water surface.  
Water at stilling well level hole flowing not parallel to the bank.  
Flow at level measurement hole seems to be flowing upstream and toward the right bank.



Hydrometric Measurement / Site Visit Record  
S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek  
Location: Poplar Creek  
Site Name: S11  
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

Time of Measurement

Date of Measurement: April 26, 2007  
Start Time: 3:36 PM MDT  
End Time: MDT

Weather Conditions:

+8 °C, 15-20km/hr winds, sunny with clouds

River Conditions:

Open, moderate stage

Personnel & Equipment

Measurement Made By: JS, JE  
Data Entry By: JS  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: ASCM Marker	1.086	El:	242.081	1.071	El:	242.081	Average
Water Level Reading:	1.905	El:	241.262	1.881	El:	241.271	241.267
Top of Ice Level Reading:		El:			El:		
Transducer Reading & Est. El.:		El:	241.262		El:	241.271	
Other:		El:			El:		

Notes: Frozen to depth all holes that were drilled are dry.

Datalogger Notes:  
Datalogger Internal Power:  
Datalogger External Power:  
Datalogger Memory Used:  
Datalogger Clock: MST  
Laptop Clock: MST  
Dessicant:  
Datalogger: UltraLogger RX-1 s/n 203058  
PT: Keller 8363K s/n 101183  
Power: Lakewood battery

## Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

**Measurement Location**

River/Stream: Poplar Creek  
 Location: Poplar Creek  
 Site Name: S11  
 Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

**Personnel & Equipment**

Measurement Made By: JMS, PM  
 Data Entry By: PM  
 Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

**Time of Measurement**

Date of Measurement: April 30, 2007  
 Start Time: 8:00 AM MST  
 End Time: MST

**Level Readings and Measurements**

Bench Mark Reading: ASCM Marker 1.385 El: 242.081 1.358 El: 242.081  
 Water Level Reading: 1.966 El: 241.500 1.941 El: 241.498 241.499  
 Top of Ice Level Reading: El: El: El: El:  
 Transducer Reading & Est. El.: 0.625 El: 240.875 0.625 El: 240.873 240.874  
 Other: Rebar on LB 1.104 El: 1.077 El: El:

**Weather Conditions:**

+10°C, sunny

**River Conditions:**

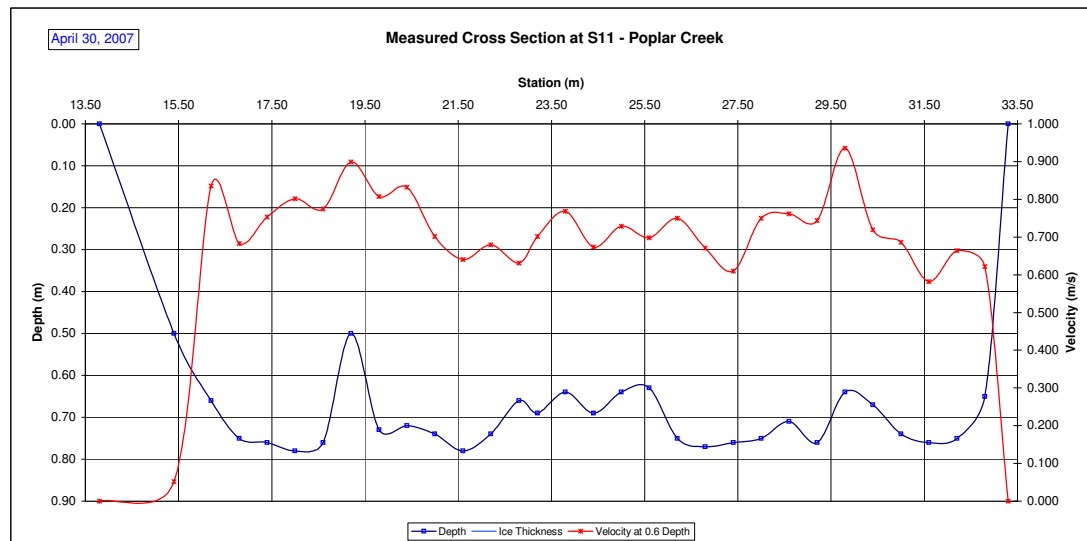
High stage

Measured Data							Measurement Data									Calculated Data				
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)						
RB	13.80	0.00			0.000	1.00	1	13.80	14.60	0.013	0.013	0.13	0.10	0.001	0%					
	15.40	0.50			0.052	1.00	2	14.60	15.80	0.052	0.052	0.50	0.60	0.031	0%					
	16.20	0.66			0.835	1.00	3	15.80	16.50	0.835	0.835	0.66	0.46	0.386	4%					
	16.80	0.75			0.683	1.00	4	16.50	17.10	0.683	0.683	0.75	0.45	0.307	3%					
	17.40	0.76			0.753	1.00	5	17.10	17.70	0.753	0.753	0.76	0.46	0.343	4%					
	18.00	0.78			0.802	1.00	6	17.70	18.30	0.802	0.802	0.78	0.47	0.375	4%					
	18.60	0.76			0.774	1.00	7	18.30	18.90	0.774	0.774	0.76	0.46	0.353	4%					
	19.20	0.50			0.899	1.00	8	18.90	19.50	0.899	0.899	0.50	0.30	0.270	3%					
	19.80	0.73			0.808	1.00	9	19.50	20.10	0.808	0.808	0.73	0.44	0.354	4%					
	20.40	0.72			0.832	1.00	10	20.10	20.70	0.832	0.832	0.72	0.43	0.359	4%					
	21.00	0.74			0.701	1.00	11	20.70	21.30	0.701	0.701	0.74	0.44	0.311	3%					
	21.60	0.78			0.640	1.00	12	21.30	21.90	0.640	0.640	0.78	0.47	0.300	3%					
	22.20	0.74			0.680	1.00	13	21.90	22.50	0.680	0.680	0.74	0.44	0.302	3%					
	22.80	0.66			0.631	1.00	14	22.50	23.00	0.631	0.631	0.66	0.33	0.208	2%					
	23.20	0.69			0.701	1.00	15	23.00	23.50	0.701	0.701	0.69	0.35	0.242	3%					
	23.80	0.64			0.768	1.00	16	23.50	24.10	0.768	0.768	0.64	0.38	0.295	3%					
	24.40	0.69			0.674	1.00	17	24.10	24.70	0.674	0.674	0.69	0.41	0.279	3%					
	25.00	0.64			0.728	1.00	18	24.70	25.30	0.728	0.728	0.64	0.38	0.280	3%					
	25.60	0.63			0.698	1.00	19	25.30	25.90	0.698	0.698	0.63	0.38	0.264	3%					
	26.20	0.75			0.750	1.00	20	25.90	26.50	0.750	0.750	0.75	0.45	0.337	4%					
	26.80	0.77			0.671	1.00	21	26.50	27.10	0.671	0.671	0.77	0.46	0.310	3%					
	27.40	0.76			0.610	1.00	22	27.10	27.70	0.610	0.610	0.76	0.46	0.278	3%					
	28.00	0.75			0.750	1.00	23	27.70	28.30	0.750	0.750	0.75	0.45	0.337	4%					
	28.60	0.71			0.762	1.00	24	28.30	28.90	0.762	0.762	0.71	0.43	0.325	4%					
	29.20	0.76			0.744	1.00	25	28.90	29.50	0.744	0.744	0.76	0.46	0.339	4%					
	29.80	0.64			0.936	1.00	26	29.50	30.10	0.936	0.936	0.64	0.38	0.359	4%					
	30.40	0.67			0.719	1.00	27	30.10	30.70	0.719	0.719	0.67	0.40	0.289	3%					
	31.00	0.74			0.686	1.00	28	30.70	31.30	0.686	0.686	0.74	0.44	0.304	3%					
	31.60	0.76			0.582	1.00	29	31.30	31.90	0.582	0.582	0.76	0.46	0.265	3%					
	32.20	0.75			0.664	1.00	30	31.90	32.50	0.664	0.664	0.75	0.45	0.299	3%					
	32.80	0.65			0.622	1.00	31	32.50	33.05	0.622	0.622	0.65	0.36	0.222	2%					
	33.30	0.00			0.000	1.00	32	31.90	33.30	0.155	0.155	0.16	0.23	0.035	0%					
LB													Total Flow:	8.961	100%					

Total Flow:	8.961	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	13.17	(m <sup>2</sup> )
Top Width:	19.50	(m)
Hydraulic Depth:	0.676	(m)
Mean Velocity:	0.680	(m/s)
Froude Number	0.264	
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		

Datalogger Notes:		
Datalogger Internal Power:	100%	
Datalogger External Power:	81%	
Datalogger Memory Used:	5%	Used
Datalogger Clock:	Apr 30, 2007 08:08	MST
Laptop Clock:	Apr 30, 2007 08:09	MST
Dessicant:	Good	
Datalogger:	UltraLogger RX-1 s/n 203058	
PT:	Keller 8363K s/n 101183	
Power:	Lakewood battery	

Data downloaded; no apparent problems.  
 TSS sample taken



# Hydrometric Measurement / Site Visit Record

## S11 - Poplar Creek



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Poplar Creek  
Location: Poplar Creek  
Site Name: S11  
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

### Time of Measurement

Date of Measurement: June 12, 2007  
Start Time: 5:12 PM MDT  
End Time: 5:31 PM MDT

### Weather Conditions:

+10°C, overcast

### River Conditions:

low stage

### Personnel & Equipment

Measurement Made By: sm, PM  
Data Entry By: sm, PM  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

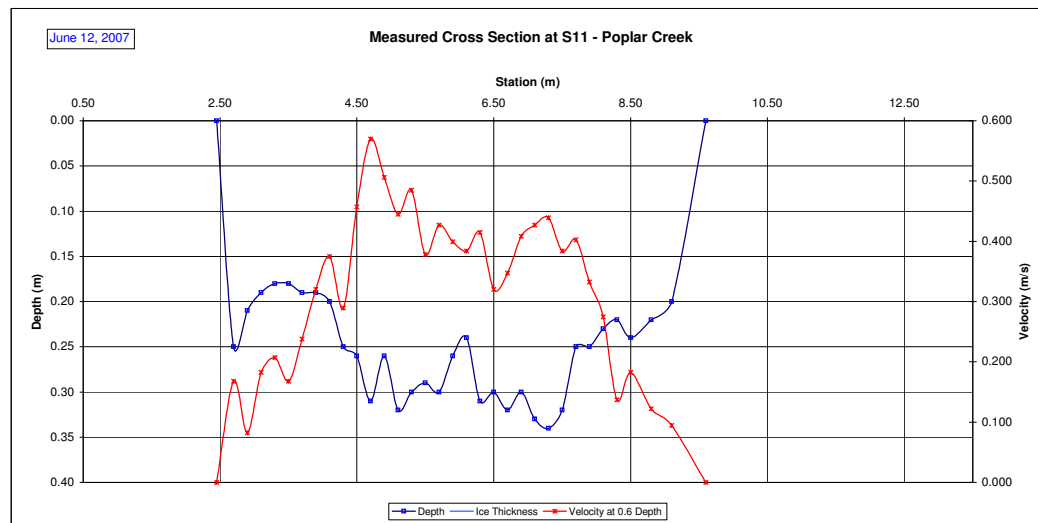
### Level Readings and Measurements

Bench Mark Reading: ASCM Marker El: 0.000  
Water Level Reading: El: 0.000  
Top of Ice Level Reading: El: 0.000  
Transducer Reading & Est. El.: 0.145 El: -0.145  
Other: Rebar on LB El: -0.073

Measured Data						Measurement Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
2.45	0.00				0.000	1.00	1	2.45	2.58	0.042	0.042	0.06	0.01	0.000	0%	
2.70	0.25				0.168	1.00	2	2.58	2.80	0.168	0.168	0.25	0.06	0.009	2%	
2.90	0.21				0.082	1.00	3	2.80	3.00	0.082	0.082	0.21	0.04	0.003	1%	
3.10	0.19				0.183	1.00	4	3.00	3.20	0.183	0.183	0.19	0.04	0.007	1%	
3.30	0.18				0.207	1.00	5	3.20	3.40	0.207	0.207	0.18	0.04	0.007	1%	
3.50	0.18				0.168	1.00	6	3.40	3.60	0.168	0.168	0.18	0.04	0.006	1%	
3.70	0.19				0.238	1.00	7	3.60	3.80	0.238	0.238	0.19	0.04	0.009	2%	
3.90	0.19				0.320	1.00	8	3.80	4.00	0.320	0.320	0.19	0.04	0.012	2%	
4.10	0.20				0.375	1.00	9	4.00	4.20	0.375	0.375	0.20	0.04	0.015	3%	
4.30	0.25				0.290	1.00	10	4.20	4.40	0.290	0.290	0.25	0.05	0.014	3%	
4.50	0.26				0.457	1.00	11	4.40	4.60	0.457	0.457	0.26	0.05	0.024	4%	
4.70	0.31				0.570	1.00	12	4.60	4.80	0.570	0.570	0.31	0.06	0.035	6%	
4.90	0.26				0.506	1.00	13	4.80	5.00	0.506	0.506	0.26	0.05	0.026	5%	
5.10	0.32				0.445	1.00	14	5.00	5.20	0.445	0.445	0.32	0.06	0.028	5%	
5.30	0.30				0.485	1.00	15	5.20	5.40	0.485	0.485	0.30	0.06	0.029	5%	
5.50	0.29				0.378	1.00	16	5.40	5.60	0.378	0.378	0.29	0.06	0.022	4%	
5.70	0.30				0.427	1.00	17	5.60	5.80	0.427	0.427	0.30	0.06	0.026	4%	
5.90	0.26				0.399	1.00	18	5.80	6.00	0.399	0.399	0.26	0.05	0.021	4%	
6.10	0.24				0.384	1.00	19	6.00	6.20	0.384	0.384	0.24	0.05	0.018	3%	
6.30	0.31				0.415	1.00	20	6.20	6.40	0.415	0.415	0.31	0.06	0.026	5%	
6.50	0.30				0.320	1.00	21	6.40	6.60	0.320	0.320	0.30	0.06	0.019	3%	
6.70	0.32				0.347	1.00	22	6.60	6.80	0.347	0.347	0.32	0.06	0.022	4%	
6.90	0.30				0.408	1.00	23	6.80	7.00	0.408	0.408	0.30	0.06	0.025	4%	
7.10	0.33				0.427	1.00	24	7.00	7.20	0.427	0.427	0.33	0.07	0.028	5%	
7.30	0.34				0.439	1.00	25	7.20	7.40	0.439	0.439	0.34	0.07	0.030	5%	
7.50	0.32				0.384	1.00	26	7.40	7.60	0.384	0.384	0.32	0.06	0.025	4%	
7.70	0.25				0.402	1.00	27	7.60	7.80	0.402	0.402	0.25	0.05	0.020	4%	
7.90	0.25				0.332	1.00	28	7.80	8.00	0.332	0.332	0.25	0.05	0.017	3%	
8.10	0.23				0.274	1.00	29	8.00	8.20	0.274	0.274	0.23	0.05	0.013	2%	
8.30	0.22				0.137	1.00	30	8.20	8.40	0.137	0.137	0.22	0.04	0.006	1%	
8.50	0.24				0.183	1.00	31	8.40	8.65	0.183	0.183	0.24	0.06	0.011	2%	
8.80	0.22				0.122	1.00	32	8.65	8.95	0.122	0.122	0.22	0.07	0.008	1%	
9.10	0.20				0.094	1.00	33	8.95	9.35	0.094	0.094	0.20	0.08	0.008	1%	
9.60	0.00				0.000	1.00	34	9.35	9.60	0.024	0.024	0.05	0.01	0.000	0%	

Total Flow:	0.571	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.74	(m <sup>2</sup> )
Top Width:	2.45	(m)
Hydraulic Depth:	0.711	(m)
Mean Velocity:	0.327	(m/s)
Froude Number:	0.124	
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		

Datalogger Notes:	
Datalogger Internal Power:	100%
Datalogger External Power:	80%
Datalogger Memory Used:	30% Used
Datalogger Clock:	Jun 12, 2007 16:40 MST
Laptop Clock:	Jun 12, 2007 16:41 MST
Dessicant:	changed
Datalogger:	UltraLogger RX-1 s/n 203058
PT:	Keller 8363K s/n 101163
Power:	Lakewood battery





# Hydrometric Measurement / Site Visit Record

## S11 - Poplar Creek



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Poplar Creek  
Location: Poplar Creek  
Site Name: S11  
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

### Time of Measurement

Date of Measurement: June 19, 2007  
Start Time: 9:00 AM MDT  
End Time: MDT

### Weather Conditions:

+10°C, overcast

### River Conditions:

low stage

### Personnel & Equipment

Measurement Made By: sm, PM  
Data Entry By: sm, PM  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

### Level Readings and Measurements

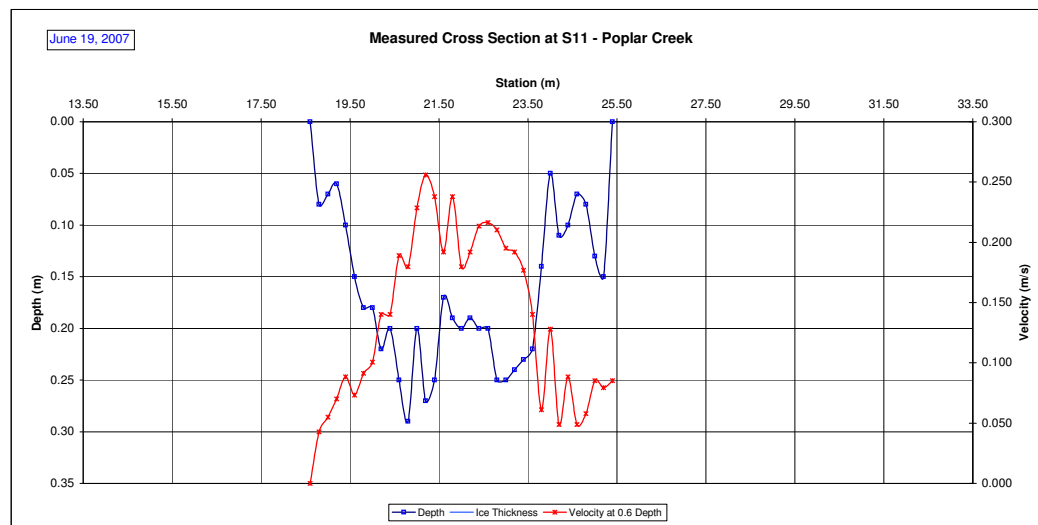
Bench Mark Reading: ASCM Marker 1.434 El: 242.081 1.42 El: 242.081  
Water Level Reading: 2.626 El: 240.889 2.616 El: 240.885 240.887  
Top of Ice Level Reading: El: 240.885  
Transducer Reading & Est. El.: 0.336 El: 240.553 0.336 El: 240.549 240.551  
Other: Rebar on LB 1.150 El: 242.365 1.139 El:

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
25.40	0.00				0.085	1.00	1	25.40	25.30	0.020	0.020	0.04	0.00	0.000	0%	
25.20	0.15				0.079	1.00	2	25.30	25.10	0.079	0.079	0.15	0.03	0.002	1%	
25.00	0.13				0.085	1.00	3	25.10	24.90	0.085	0.085	0.13	0.03	0.002	1%	
24.80	0.08				0.058	1.00	4	24.90	24.70	0.058	0.058	0.08	0.02	0.001	1%	
24.60	0.07				0.049	1.00	5	24.70	24.50	0.049	0.049	0.07	0.01	0.001	0%	
24.40	0.10				0.088	1.00	6	24.50	24.30	0.088	0.088	0.10	0.02	0.002	1%	
24.20	0.11				0.049	1.00	7	24.30	24.10	0.049	0.049	0.11	0.02	0.001	1%	
24.00	0.05				0.128	1.00	8	24.10	23.90	0.128	0.128	0.05	0.01	0.001	1%	
23.80	0.14				0.061	1.00	9	23.90	23.70	0.061	0.061	0.14	0.03	0.002	1%	
23.60	0.22				0.140	1.00	10	23.70	23.50	0.140	0.140	0.22	0.04	0.006	3%	
23.40	0.23				0.177	1.00	11	23.50	23.30	0.177	0.177	0.23	0.05	0.008	4%	
23.20	0.24				0.192	1.00	12	23.30	23.10	0.192	0.192	0.24	0.05	0.009	5%	
23.00	0.25				0.195	1.00	13	23.10	22.90	0.195	0.195	0.25	0.05	0.010	5%	
22.80	0.25				0.210	1.00	14	22.90	22.70	0.210	0.210	0.25	0.05	0.011	6%	
22.60	0.20				0.216	1.00	15	22.70	22.50	0.216	0.216	0.20	0.04	0.009	5%	
22.40	0.20				0.213	1.00	16	22.50	22.30	0.213	0.213	0.20	0.04	0.009	5%	
22.20	0.19				0.192	1.00	17	22.30	22.10	0.192	0.192	0.19	0.04	0.007	4%	
22.00	0.20				0.180	1.00	18	22.10	21.90	0.180	0.180	0.20	0.04	0.007	4%	
21.80	0.19				0.238	1.00	19	21.90	21.70	0.238	0.238	0.19	0.04	0.009	5%	
21.60	0.17				0.192	1.00	20	21.70	21.50	0.192	0.192	0.17	0.03	0.007	4%	
21.40	0.25				0.238	1.00	21	21.50	21.30	0.238	0.238	0.25	0.05	0.012	7%	
21.20	0.27				0.256	1.00	22	21.30	21.10	0.256	0.256	0.27	0.05	0.014	8%	
21.00	0.20				0.229	1.00	23	21.10	20.90	0.229	0.229	0.20	0.04	0.009	5%	
20.80	0.29				0.180	1.00	24	20.90	20.70	0.180	0.180	0.29	0.06	0.010	6%	
20.60	0.25				0.189	1.00	25	20.70	20.50	0.189	0.189	0.25	0.05	0.009	5%	
20.40	0.20				0.140	1.00	26	20.50	20.30	0.140	0.140	0.20	0.04	0.006	3%	
20.20	0.22				0.140	1.00	27	20.30	20.10	0.140	0.140	0.22	0.04	0.006	3%	
20.00	0.18				0.101	1.00	28	20.10	19.90	0.101	0.101	0.18	0.04	0.004	2%	
19.80	0.18				0.091	1.00	29	19.90	19.70	0.091	0.091	0.18	0.04	0.003	2%	
19.60	0.15				0.073	1.00	30	19.70	19.50	0.073	0.073	0.15	0.03	0.002	1%	
19.40	0.10				0.088	1.00	31	19.50	19.30	0.088	0.088	0.10	0.02	0.002	1%	
19.20	0.06				0.070	1.00	32	19.30	19.10	0.070	0.070	0.06	0.01	0.001	0%	
19.00	0.07				0.055	1.00	33	19.10	18.90	0.055	0.055	0.07	0.01	0.001	0%	
18.80	0.08				0.043	1.00	34	18.90	18.70	0.043	0.043	0.08	0.02	0.001	0%	
18.60	0.00				0.000	1.00	35	18.70	18.60	0.011	0.011	0.02	0.00	0.000	0%	
											</					

Total Flow:	0.183	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.13	(m <sup>2</sup> )
Top Width:	25.40	(m)
Hydraulic Depth:	0.044	(m)
Mean Velocity:	0.162	(m/s)
Froude Number	0.245	
Photographs taken looking at: Upstream, downstream, across		
Notes:		

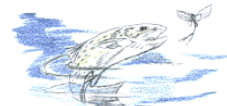
Datalogger Notes:		
Datalogger Internal Power:	100%	
Datalogger External Power:	80%	
Datalogger Memory Used:	30%	Used
Datalogger Clock:	Jun 19, 2007 07:47	MST
Laptop Clock:	Jun 19, 2007 07:52	MST
Dessicant:	half	
Datalogger:	UltraLogger RX-1 s/n 203058	
PT:	Keller 8363K s/n 101163	
Power:	Lakewood battery	

WL dropped significantly in past week, TD working fine  
TD moved to deeper flow 0.3357 new TD reading



# Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Poplar Creek  
Location: Poplar Creek  
Site Name: S11  
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

## Time of Measurement

Date of Measurement: August 5, 2007  
Start Time: 5:08 PM MDT  
End Time: 5:10 PM MDT

## Weather Conditions:

+15°C, Cloudy

## River Conditions:

Low Stage

## Personnel & Equipment

Measurement Made By: SM, PM  
Data Entry By: JMS  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Level Readings and Measurements

Bench Mark Reading: ASGM Marker	1.222	El:	242.081	1.257	El:	242.081	
Water Level Reading:	2.484	El:	240.819	2.525	El:	240.813	240.816
Top of Ice Level Reading:		El:			El:		
Transducer Reading & Est. El.:	0.239	El:	240.580	0.239	El:	240.574	240.577
Other: Rebar on LB	0.933	El:	242.370	0.973	El:		

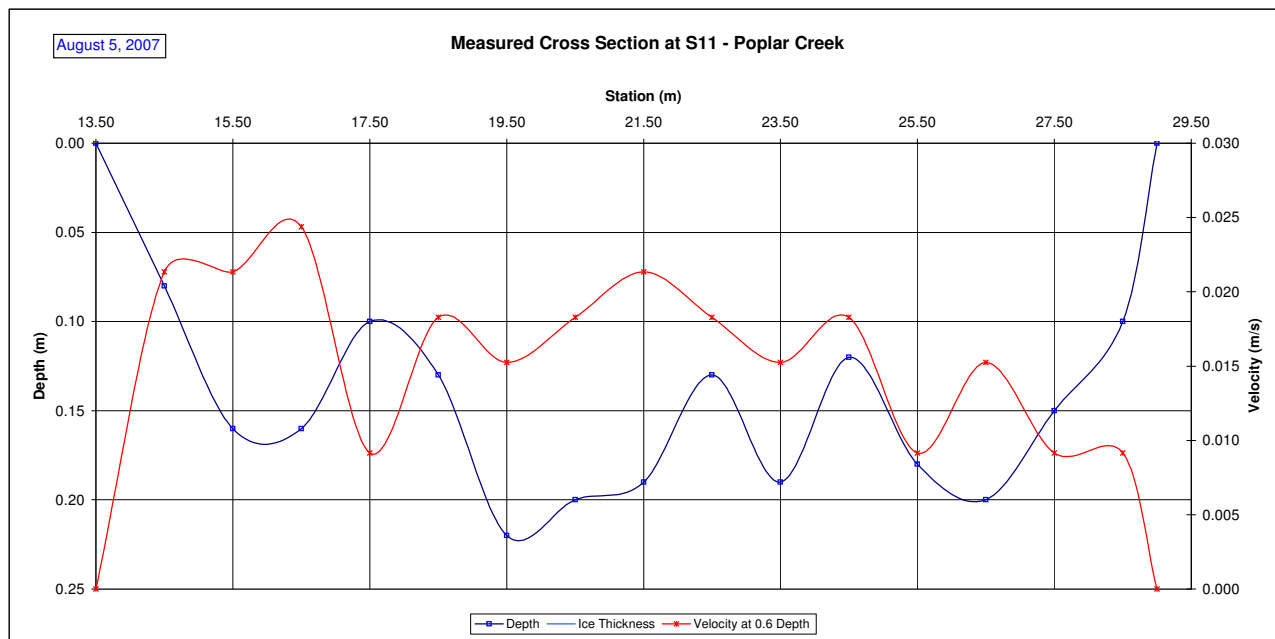
Measured Data						Measurement Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
																(m)
LB	13.50	0.00			0.000	1.00	1	13.50	14.00	0.005	0.005	0.02	0.01	0.000	0%	
	14.50	0.08			0.021	1.00	2	14.00	15.00	0.021	0.021	0.08	0.08	0.002	5%	
	15.50	0.16			0.021	1.00	3	15.00	16.00	0.021	0.021	0.16	0.16	0.003	9%	
	16.50	0.16			0.024	1.00	4	16.00	17.00	0.024	0.024	0.16	0.16	0.004	10%	
	17.50	0.10			0.009	1.00	5	17.00	18.00	0.009	0.009	0.10	0.10	0.001	2%	
	18.50	0.13			0.018	1.00	6	18.00	19.00	0.018	0.018	0.13	0.13	0.002	6%	
	19.50	0.22			0.015	1.00	7	19.00	20.00	0.015	0.015	0.22	0.22	0.003	9%	
	20.50	0.20			0.018	1.00	8	20.00	21.00	0.018	0.018	0.20	0.20	0.004	10%	
	21.50	0.19			0.021	1.00	9	21.00	22.00	0.021	0.021	0.19	0.19	0.004	11%	
	22.50	0.13			0.018	1.00	10	22.00	23.00	0.018	0.018	0.13	0.13	0.002	6%	
	23.50	0.19			0.015	1.00	11	23.00	24.00	0.015	0.015	0.19	0.19	0.003	8%	
	24.50	0.12			0.018	1.00	12	24.00	25.00	0.018	0.018	0.12	0.12	0.002	6%	
	25.50	0.18			0.009	1.00	13	25.00	26.00	0.009	0.009	0.18	0.18	0.002	4%	
	26.50	0.20			0.015	1.00	14	26.00	27.00	0.015	0.015	0.20	0.20	0.003	8%	
	27.50	0.15			0.009	1.00	15	27.00	28.00	0.009	0.009	0.15	0.15	0.001	4%	
	28.50	0.10			0.009	1.00	16	28.00	28.50	0.009	0.009	0.10	0.05	0.000	1%	
	RB	29.00	0.00			0.000	1.00	17	28.50	29.00	0.002	0.002	0.03	0.01	0.000	0%
Total Flow:														0.037	100%	

Total Flow:	0.037	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	2.28	(m <sup>2</sup> )
Top Width:	15.50	(m)
Hydraulic Depth:	0.147	(m)
Mean Velocity:	0.016	(m/s)
Froude Number	0.014	
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		

Datalogger Notes:	
Datalogger Internal Power:	100%
Datalogger External Power:	79%
Datalogger Memory Used:	55% Used
Datalogger Clock:	Aug 05, 2007 17:08 MST
Laptop Clock:	Aug 06, 2007 17:10 MST
Dessicant:	Replaced
Datalogger:	UltraLogger RX-1 s/n 203058
PT:	Keller 8363K s/n 101183
Power:	Lakewood battery

Data downloaded; no apparent problems.

TSS sample taken



# Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Poplar Creek  
Location: Poplar Creek  
Site Name: S11  
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

## Personnel & Equipment

Measurement Made By: SM, PM  
Data Entry By: sm  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: September 21, 2007  
Start Time: 7:30 AM MDT  
End Time: 8:30 AM MDT

## Level Readings and Measurements

Bench Mark Reading: ASCM Marker 1.423 El: 242.081 1.393 El: 242.081  
Water Level Reading: 2.688 El: 240.816 2.664 El: 240.810 240.813  
Top of Ice Level Reading: El: 240.586 0.239 El: 240.571 240.578  
Transducer Reading & Est. El.: 0.231 El: 242.368 1.106 El:  
Other: Rebar on LB

Weather Conditions: +5°C, Clear

River Conditions: Low Stage

## Measurement Data

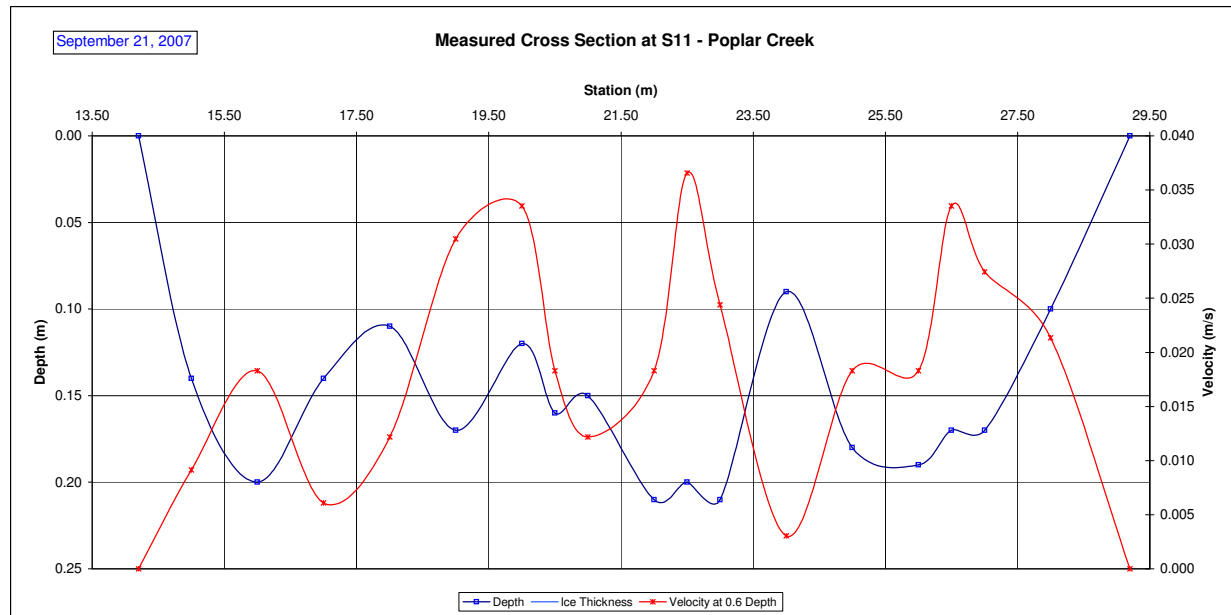
Measured Data						Calculated Data									Percentage of Total	
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	14.20	0.00			0.000	1.00	1	14.20	14.60	0.002	0.002	0.04	0.01	0.000	0%	
	15.00	0.14			0.009	1.00	2	14.60	15.50	0.009	0.009	0.14	0.13	0.001	3%	
	16.00	0.20			0.018	1.00	3	15.50	16.50	0.018	0.018	0.20	0.20	0.004	8%	
	17.00	0.14			0.006	1.00	4	16.50	17.50	0.006	0.006	0.14	0.14	0.001	2%	
	18.00	0.11			0.012	1.00	5	17.50	18.50	0.012	0.012	0.11	0.11	0.001	3%	
	19.00	0.17			0.030	1.00	6	18.50	19.50	0.030	0.030	0.17	0.17	0.005	12%	
	20.00	0.12			0.034	1.00	7	19.50	20.25	0.034	0.034	0.12	0.09	0.003	7%	
	20.50	0.16			0.018	1.00	8	20.25	20.75	0.018	0.018	0.16	0.08	0.001	3%	
	21.00	0.15			0.012	1.00	9	20.75	21.50	0.012	0.012	0.15	0.11	0.001	3%	
	22.00	0.21			0.018	1.00	10	21.50	22.25	0.018	0.018	0.21	0.16	0.003	7%	
	22.50	0.20			0.037	1.00	11	22.25	22.75	0.037	0.037	0.20	0.10	0.004	8%	
	23.00	0.21			0.024	1.00	12	22.75	23.50	0.024	0.024	0.21	0.16	0.004	9%	
	24.00	0.09			0.003	1.00	13	23.50	24.50	0.003	0.003	0.09	0.09	0.000	1%	
	25.00	0.18			0.018	1.00	14	24.50	25.50	0.018	0.018	0.18	0.18	0.003	8%	
	26.00	0.19			0.018	1.00	15	25.50	26.25	0.018	0.018	0.19	0.14	0.003	6%	
	26.50	0.17			0.034	1.00	16	26.25	26.75	0.034	0.034	0.17	0.09	0.003	7%	
	27.00	0.17			0.027	1.00	17	26.75	27.50	0.027	0.027	0.17	0.13	0.003	8%	
	RB	28.00	0.10			0.021	1.00	18	27.50	28.60	0.021	0.021	0.10	0.11	0.002	5%
		29.20	0.00			0.000	1.00	19	26.75	29.20	0.005	0.005	0.03	0.06	0.000	1%
Total Flow:														0.044	100%	

Total Flow:	0.044	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	2.25	(m <sup>2</sup> )
Top Width:	15.00	(m)
Hydraulic Depth:	0.150	(m)
Mean Velocity:	0.019	(m/s)
Froude Number	0.016	
Photographs taken looking at:		
Upstream, downstream, across		
Notes:		

## Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power: 79%  
Datalogger Memory Used: 55% Used  
Datalogger Clock: Sep 21, 2007 06:31 MST  
Laptop Clock: Sep 21, 2007 06:32 MST  
Dessicant: Replaced  
Datalogger: UltraLogger RX-1 s/n 203058  
PT: Keller 8363K s/n 101183  
Power: Lakewood battery

Data downloaded; no apparent problems.  
thermistor installed



# Hydrometric Measurement / Site Visit Record

S11 - Poplar Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Poplar Creek  
 Location: Poplar Creek  
 Site Name: S11  
 Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4  
 Time of Measurement  
 Date of Measurement: October 20, 2007  
 Start Time: 6:14 PM MDT  
 End Time: 6:20 PM MDT

## Personnel & Equipment

Measurement Made By: SM, PM  
 Data Entry By: FF  
 Meter Type and No.: March Mc Birney Flo-Mate 2000  
 s/n 2004521

## Level Readings and Measurements

Bench Mark Reading: ASCM Marke 1.379 El: 242.081 1.352 El: 242.081  
 Water Level Reading: 2.531 El: 240.929 2.507 El: 240.926 240.928  
 Top of Ice Level Reading: El: El: El: El:  
 Transducer Reading & Est. El.: 0.348 El: 240.581 0.348 El: 240.578 240.579  
 Other: Rebar on LB 1.090 El: 242.370 1.065 El: 242.368

## Weather Conditions:

+8°C, Partly cloudy, calm

## River Conditions:

Open, moerdge, higher than Sep

## Measurement Data

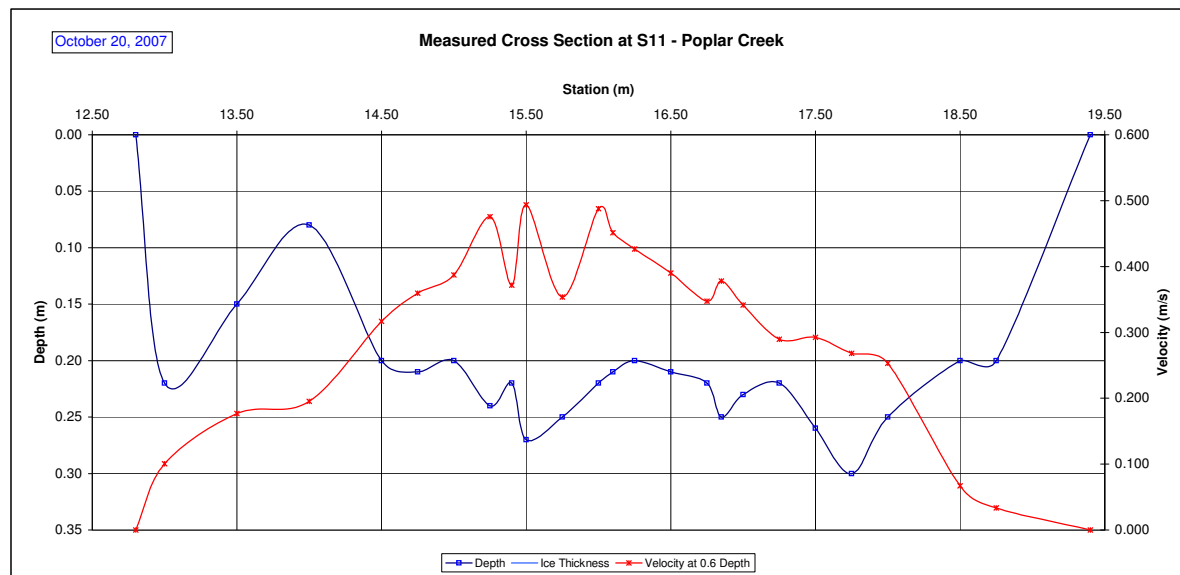
	Measured Data					Calculated Data										Percenta ge of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	12.80	0.00				0.000	1.00	1	12.80	12.90	0.025	0.025	0.06	0.01	0.000	0%
	13.00	0.22				0.101	1.00	2	12.90	13.25	0.101	0.101	0.22	0.08	0.008	2%
	13.50	0.15				0.177	1.00	3	13.25	13.75	0.177	0.177	0.15	0.08	0.013	4%
	14.00	0.08				0.195	1.00	4	13.75	14.25	0.195	0.195	0.08	0.04	0.008	2%
	14.50	0.20				0.317	1.00	5	14.25	14.63	0.317	0.317	0.20	0.08	0.024	6%
	14.75	0.21				0.360	1.00	6	14.63	14.88	0.360	0.360	0.21	0.05	0.019	5%
	15.00	0.20				0.387	1.00	7	14.88	15.13	0.387	0.387	0.20	0.05	0.019	5%
	15.25	0.24				0.475	1.00	8	15.13	15.33	0.475	0.475	0.24	0.05	0.023	6%
	15.40	0.22				0.372	1.00	9	15.33	15.45	0.372	0.372	0.22	0.03	0.010	3%
	15.50	0.27				0.494	1.00	10	15.45	15.63	0.494	0.494	0.27	0.05	0.023	6%
	15.75	0.25				0.354	1.00	11	15.63	15.88	0.354	0.354	0.25	0.06	0.022	6%
	16.00	0.22				0.488	1.00	12	15.88	16.05	0.488	0.488	0.22	0.04	0.019	5%
	16.10	0.21				0.451	1.00	13	16.05	16.18	0.451	0.451	0.21	0.03	0.012	3%
	16.25	0.20				0.427	1.00	14	16.18	16.38	0.427	0.427	0.20	0.04	0.017	5%
	16.50	0.21				0.390	1.00	15	16.38	16.63	0.390	0.390	0.21	0.05	0.020	6%
	16.75	0.22				0.347	1.00	16	16.63	16.80	0.347	0.347	0.22	0.04	0.013	4%
	16.85	0.25				0.378	1.00	17	16.80	16.93	0.378	0.378	0.25	0.03	0.012	3%
	17.00	0.23				0.341	1.00	18	16.93	17.13	0.341	0.341	0.23	0.05	0.016	4%
	17.25	0.22				0.290	1.00	19	17.13	17.38	0.290	0.290	0.22	0.06	0.016	4%
	17.50	0.26				0.293	1.00	20	17.38	17.63	0.293	0.293	0.26	0.07	0.019	5%
	17.75	0.30				0.268	1.00	21	17.63	17.88	0.268	0.268	0.30	0.08	0.020	5%
	18.00	0.25				0.253	1.00	22	17.88	18.25	0.253	0.253	0.25	0.09	0.024	6%
	18.50	0.20				0.067	1.00	23	18.25	18.63	0.067	0.067	0.20	0.08	0.005	1%
	18.75	0.20				0.034	1.00	24	18.63	19.08	0.034	0.034	0.20	0.09	0.003	1%
	19.40	0.00				0.000	1.00	25	16.80	19.40	0.008	0.008	0.05	0.13	0.001	0%
Total Flow:														0.366	100%	

Total Flow:	0.366	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	1.42	(m²)
Top Width:	6.60	(m)
Hydraulic Depth:	0.215	(m)
Mean Velocity:	0.259	(m/s)
Froude Number	0.178	
Photographs taken looking at:	Upstream, downstream, across	
Notes:		

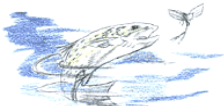
## Datalogger Notes:

Datalogger Internal Power: 11.34V 100%  
 Datalogger External Power: 11.80 76%  
 Datalogger Memory Used: 32% Used  
 Datalogger Clock: Oct 21, 2007 17:23 MST  
 Laptop Clock: Oct 21, 2007 17:25 MST  
 Dissicant: 50% used  
 Datalogger: UltraLogger RX-1 s/n 203058  
 PT: Keller 8363K s/n 101183  
 Power: Lakewood battery

Equipment removed for winter  
 Thermistor reading 5.1506C.



Hydrometric Measurement / Site Visit Record  
S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek  
Location: Poplar Creek  
Site Name: S11  
Coordinates & Legal: 6307650 N, 472000 E NE-24-91-19-W4

Time of Measurement

Date of Measurement: December 13, 2007  
Start Time: 11:07 AM MDT  
End Time: MDT

Weather Conditions:

River Conditions: ice broken, partial

Personnel & Equipment

Measurement Made By: sm ff  
Data Entry By: sm  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: ASCM Marker	1.502	El:	242.081	1.453	El:	242.081
Water Level Reading:	2.775	El:	240.808	2.719	El:	240.815 240.812
Top of Ice Level Reading:	2.749	El:			El:	
Transducer Reading & Est. El.:		El:	240.808		El:	240.815 240.812
Other: Rebar on LB	1.213	El:	242.370	1.164	El:	242.370

Measurement Data

Total Flow:	0.001		(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good		
Total Area:			(m <sup>2</sup> )
Top Width:			(m)
Hydraulic Depth:			(m)
Mean Velocity:			(m/s)
Froude Number			
Photographs taken looking at:			
Upstream, downstream, across			
Notes:			

Datalogger Notes:  
Datalogger Internal Power: 100%  
Datalogger External Power: 76%  
Datalogger Memory Used: Used  
Datalogger Clock: MST  
Laptop Clock: MST  
Dessicant: 50% used  
Datalogger: UltraLogger RX-1 s/n 203058  
PT: Keller 8363K s/n 101183  
Power: Lakewood battery

flow too small to measure

# Hydrometric Measurement / Site Visit Record

S12 - Fort Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Fort Creek  
Location: Fort Creek  
Site Name: S12  
Coordinates & Legal: 6363400 N, 462600 E SW-18-97-10-W4

## Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JM  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: April 24, 2007  
Start Time: 4:00 PM MDT  
End Time: 4:20 PM MDT

## Level Readings and Measurements

Bench Mark Reading: Rebar on LB 1.067 El: 100.000 1.040 El: 100.000  
Water Level Reading: 2.289 El: 98.778 2.265 El: 98.775  
Top of Ice Level Reading: El: El:  
Transducer Reading & Est. El.: 0.357 El: 98.421 0.357 El: 98.418  
Other: Top of logger box 0.080 El: 100.987 0.056 El: 100.984

Weather Conditions: +15°C, Overcast

River Conditions: Open

## Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
LB 0.95	0.00				0.000	1.00	1	0.95	1.03	0.071	0.071	0.10	0.01	0.001
1.10	0.41				0.283	1.00	2	1.03	1.15	0.283	0.283	0.41	0.05	0.015
1.20	0.33				0.527	1.00	3	1.15	1.25	0.527	0.527	0.33	0.03	0.017
1.30	0.46				0.482	1.00	4	1.25	1.35	0.482	0.482	0.46	0.05	0.022
1.40	0.36				0.561	1.00	5	1.35	1.45	0.561	0.561	0.36	0.04	0.020
1.50	0.36				0.503	1.00	6	1.45	1.55	0.503	0.503	0.36	0.04	0.018
1.60	0.36				0.393	1.00	7	1.55	1.65	0.393	0.393	0.36	0.04	0.014
1.70	0.36				0.351	1.00	8	1.65	1.75	0.351	0.351	0.36	0.04	0.013
1.80	0.30				0.372	1.00	9	1.75	1.85	0.372	0.372	0.30	0.03	0.011
1.90	0.34				0.390	1.00	10	1.85	1.95	0.390	0.390	0.34	0.03	0.013
2.00	0.35				0.466	1.00	11	1.95	2.05	0.466	0.466	0.35	0.03	0.016
2.10	0.35				0.475	1.00	12	2.05	2.15	0.475	0.475	0.35	0.04	0.017
2.20	0.30				0.485	1.00	13	2.15	2.25	0.485	0.485	0.30	0.03	0.015
2.30	0.28				0.421	1.00	14	2.25	2.35	0.421	0.421	0.28	0.03	0.012
2.40	0.27				0.335	1.00	15	2.35	2.45	0.335	0.335	0.27	0.03	0.009
2.50	0.25				0.311	1.00	16	2.45	2.55	0.311	0.311	0.25	0.02	0.008
2.60	0.26				0.290	1.00	17	2.55	2.65	0.290	0.290	0.26	0.03	0.008
2.70	0.31				0.253	1.00	18	2.65	2.75	0.253	0.253	0.31	0.03	0.008
2.80	0.32				0.116	1.00	19	2.75	2.85	0.116	0.116	0.32	0.03	0.004
2.90	0.20				0.143	1.00	20	2.85	2.95	0.143	0.143	0.20	0.02	0.003
3.00	0.15				0.052	1.00	21	2.95	3.05	0.052	0.052	0.15	0.01	0.001
3.10	0.13				0.015	1.00	22	3.05	3.18	0.015	0.015	0.13	0.02	0.000
RB 3.26	0.00				0.000	1.00	23	3.18	3.26	0.004	0.004	0.03	0.00	0.000
Total Flow:														0.243

Total Flow:	0.243	(m <sup>3</sup> /s)
Perceived Measurement Quality:	poor	
Total Area:	0.67	(m <sup>2</sup> )
Top Width:	2.31	(m)
Hydraulic Depth:	0.290	(m)
Mean Velocity:	0.363	(m/s)
Froude Number	0.215	

Photographs taken looking at:

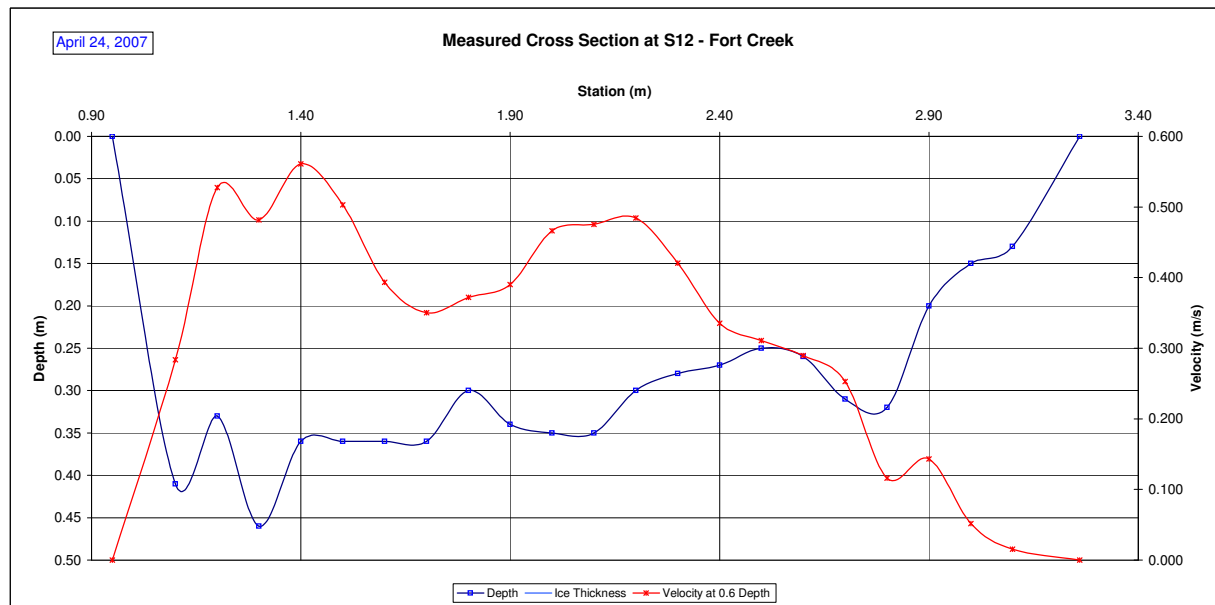
Upstream, downstream, across

Notes:

TSS taken. Data downloaded; looks reasonable.

## Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power: 81%  
Datalogger Memory Used: 0%  
Datalogger Clock: Apr 24, 2007 15:37 MST  
Laptop Clock: Apr 24, 2007 15:37 MST  
Dessicant: Good  
Datalogger: UltraLogger RX-1 s/n 703013  
PT: Keller 8363K 5 psi s/n 0604001-5926  
Power: Lakewood battery



# Hydrometric Measurement / Site Visit Record

S12 - Fort Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Fort Creek  
Location: Fort Creek  
Site Name: S12  
Coordinates & Legal: 6363400 N, 462600 E SW-18-97-10-W4

## Time of Measurement

Date of Measurement: June 14, 2007  
Start Time: 2:00 PM MDT  
End Time: MDT

## Weather Conditions:

+25°C, clear calm

## River Conditions:

Open

## Personnel & Equipment

Measurement Made By: sm, wd, pm  
Data Entry By: sm  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Level Readings and Measurements

Bench Mark Reading: Rebar on LB	1.320	El:	100.000	
Water Level Reading:	2.803	El:	98.517	98.517
Top of Ice Level Reading:		El:		
Transducer Reading & Est. El.:	0.123	El:	98.394	98.394
Other: Top of logger box	0.342	El:	100.978	
		El:	100.000	

## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	0.84	0.00			0.000	1.00	1	0.84	0.92	0.053	0.053	0.01	0.00	0.000	0%	
	1.00	0.04			0.210	1.00	2	0.92	1.05	0.210	0.210	0.04	0.01	0.001	1%	
	1.10	0.05			0.299	1.00	3	1.05	1.15	0.299	0.299	0.05	0.00	0.001	2%	
	1.20	0.08			0.317	1.00	4	1.15	1.25	0.317	0.317	0.08	0.01	0.003	3%	
	1.30	0.11			0.335	1.00	5	1.25	1.35	0.335	0.335	0.11	0.01	0.004	5%	
	1.40	0.10			0.430	1.00	6	1.35	1.45	0.430	0.430	0.10	0.01	0.004	5%	
	1.50	0.06			0.466	1.00	7	1.45	1.55	0.466	0.466	0.06	0.01	0.003	3%	
	1.60	0.08			0.366	1.00	8	1.55	1.65	0.366	0.366	0.08	0.01	0.003	4%	
	1.70	0.08			0.411	1.00	9	1.65	1.75	0.411	0.411	0.08	0.01	0.003	4%	
	1.80	0.09			0.408	1.00	10	1.75	1.85	0.408	0.408	0.09	0.01	0.004	5%	
	1.90	0.09			0.500	1.00	11	1.85	1.95	0.500	0.500	0.09	0.01	0.004	6%	
	2.00	0.12			0.518	1.00	12	1.95	2.05	0.518	0.518	0.12	0.01	0.006	8%	
	2.10	0.13			0.600	1.00	13	2.05	2.15	0.600	0.600	0.13	0.01	0.008	10%	
	2.20	0.12			0.701	1.00	14	2.15	2.25	0.701	0.701	0.12	0.01	0.008	10%	
	2.30	0.17			0.384	1.00	15	2.25	2.35	0.384	0.384	0.17	0.02	0.007	8%	
	2.40	0.18			0.494	1.00	16	2.35	2.45	0.494	0.494	0.18	0.02	0.009	11%	
	2.50	0.18			0.442	1.00	17	2.45	2.55	0.442	0.442	0.18	0.02	0.008	10%	
	2.60	0.18			0.287	1.00	18	2.55	2.65	0.287	0.287	0.18	0.02	0.005	6%	
	2.70	0.17			-0.012	1.00	19	2.65	2.75	-0.012	-0.012	0.17	0.02	0.000	0%	
	2.80	0.14			-0.006	1.00	20	2.75	2.85	-0.006	-0.006	0.14	0.01	0.000	0%	
	2.90	0.12			0.052	1.00	21	2.85	2.94	0.052	0.052	0.12	0.01	0.001	1%	
	2.98	0.00			0.000	1.00	22	2.94	2.98	0.013	0.013	0.03	0.00	0.000	0%	
Total Flow:														0.082	100%	

Total Flow:	0.082	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.23	(m <sup>2</sup> )
Top Width:	2.14	(m)
Hydraulic Depth:	0.108	(m)
Mean Velocity:	0.353	(m/s)
Froude Number	0.343	
Photographs taken looking at:	Upstream, downstream, across	

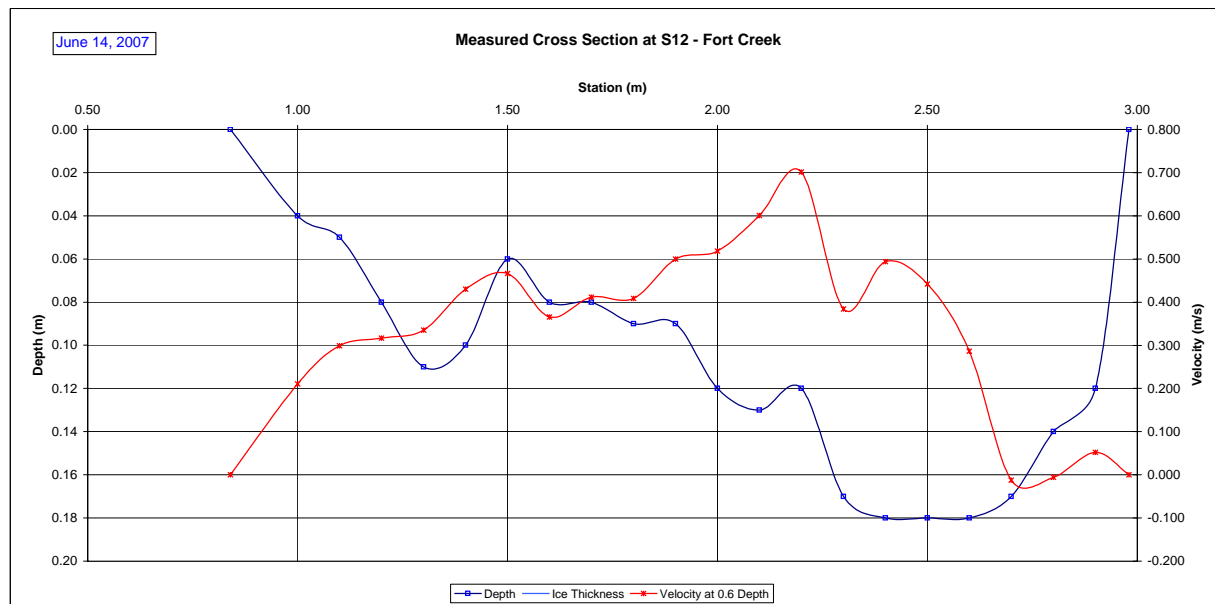
## Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power: 82%  
Datalogger Memory Used: 35%  
Datalogger Clock: Jun 14, 2007 13:30 MST  
Laptop Clock: Jun 14, 2007 13:40 MST  
Dessicant: replaced  
Datalogger: UltraLogger RX-1 s/n 703013  
PT: Keller 8363K 5 psi s/n 0604001-5926  
Power: Lakewood battery

## Notes:

TSS taken.

TD was washed downstream. The water level at that location was surveyed, and using the TD depth, the TD elevation was determined



Hydrometric Measurement / Site Visit Record  
S12 - Fort Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Fort Creek  
Location: Fort Creek  
Site Name: S12  
Coordinates & Legal: 6363400 N, 462600 E SW-18-97-10-W4

Personnel & Equipment

Measurement Made By: PM/SM  
Data Entry By: JMS  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: August 5, 2007  
Start Time: 5:15 PM MDT  
End Time: 5:50 PM MDT

Level Readings and Measurements

Bench Mark Reading: Rebar on LB 1.002 El: 100.000 1.010 El: 100.000  
Water Level Reading: 2.465 El: 98.537 2.475 El: 98.535  
Top of Ice Level Reading: El: 98.367 0.170 El: 98.365  
Transducer Reading & Est. El.: 0.170 El: 98.365  
Other: Top of logger box El:

Weather Conditions: +15°C, Overcast

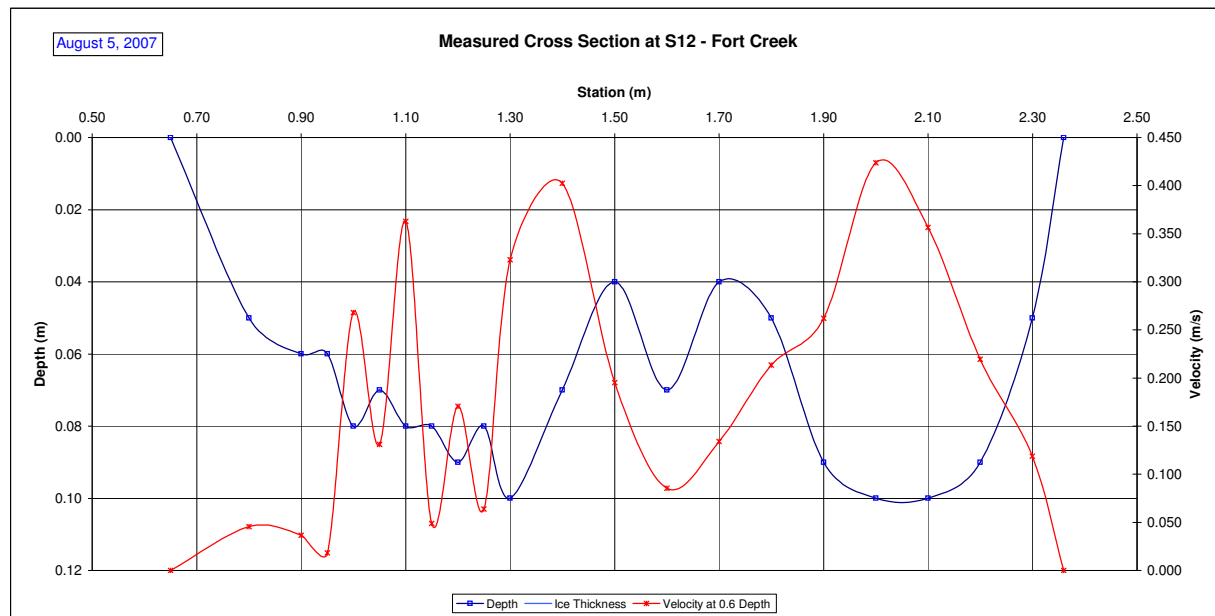
River Conditions: Open, Low Stage

Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
LB	0.65	0.00			0.000	1.00	1	0.65	0.73	0.011	0.011	0.01	0.00	0.000
	0.80	0.05			0.046	1.00	2	0.73	0.85	0.046	0.046	0.05	0.01	0.000
	0.90	0.06			0.037	1.00	3	0.85	0.93	0.037	0.037	0.06	0.00	0.000
	0.95	0.06			0.018	1.00	4	0.93	0.98	0.018	0.018	0.06	0.00	0.000
	1.00	0.08			0.268	1.00	5	0.98	1.03	0.268	0.268	0.08	0.00	0.001
	1.05	0.07			0.131	1.00	6	1.03	1.08	0.131	0.131	0.07	0.00	0.000
	1.10	0.08			0.363	1.00	7	1.08	1.13	0.363	0.363	0.08	0.00	0.001
	1.15	0.08			0.049	1.00	8	1.13	1.18	0.049	0.049	0.08	0.00	0.000
	1.20	0.09			0.171	1.00	9	1.18	1.23	0.171	0.171	0.09	0.00	0.001
	1.25	0.08			0.064	1.00	10	1.23	1.28	0.064	0.064	0.08	0.00	0.000
	1.30	0.10			0.323	1.00	11	1.28	1.35	0.323	0.323	0.10	0.01	0.002
	1.40	0.07			0.402	1.00	12	1.35	1.45	0.402	0.402	0.07	0.01	0.003
	1.50	0.04			0.195	1.00	13	1.45	1.55	0.195	0.195	0.04	0.00	0.001
	1.60	0.07			0.085	1.00	14	1.55	1.65	0.085	0.085	0.07	0.01	0.001
	1.70	0.04			0.134	1.00	15	1.65	1.75	0.134	0.134	0.04	0.00	0.001
	1.80	0.05			0.213	1.00	16	1.75	1.85	0.213	0.213	0.05	0.01	0.001
	1.90	0.09			0.262	1.00	17	1.85	1.95	0.262	0.262	0.09	0.01	0.002
	2.00	0.10			0.424	1.00	18	1.95	2.05	0.424	0.424	0.10	0.01	0.004
	2.10	0.10			0.357	1.00	19	2.05	2.15	0.357	0.357	0.10	0.01	0.004
	2.20	0.09			0.219	1.00	20	2.15	2.25	0.219	0.219	0.09	0.01	0.002
	2.30	0.05			0.119	1.00	21	2.25	2.33	0.119	0.119	0.05	0.00	0.000
RB	2.36	0.00			0.000	1.00	22	2.33	2.36	0.030	0.030	0.01	0.00	0.000
Total Flow:														0.026

Total Flow:	0.026	(m <sup>3</sup> /s)
Perceived Measurement Quality:	fair	
Total Area:	0.12	(m <sup>2</sup> )
Top Width:	1.71	(m)
Hydraulic Depth:	0.068	(m)
Mean Velocity:	0.221	(m/s)
Froude Number	0.272	
Photographs taken looking at: Upstream, downstream, across		
Notes: TSS taken. Data downloaded; looks reasonable.		

Datalogger Notes:		
Datalogger Internal Power:	100%	
Datalogger External Power:	79%	
Datalogger Memory Used:		
Datalogger Clock:	Aug 05, 2007 14:21	MST
Laptop Clock:	Aug 06, 2007 14:35	MST
Dessicant:	Good	
Datalogger:	UltraLogger RX-1 s/n 703013	
PT:	Keller 8363K 5 psi s/n 0604001-5926	
Power:	Lakewood battery	





# Hydrometric Measurement / Site Visit Record

S12 - Fort Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Fort Creek  
Location: Fort Creek  
Site Name: S12  
Coordinates & Legal: 6363400 N, 462600 E SW-18-97-10-W4

## Personnel & Equipment

Measurement Made By: PM/SM  
Data Entry By: JMS  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: September 20, 2007  
Start Time: 4:15 PM MDT  
End Time: MDT

## Level Readings and Measurements

Bench Mark Reading: Rebar on LB 0.711 El: 100.000 0.653 El: 100.000  
Water Level Reading: 2.115 El: 98.596 2.062 El: 98.591  
Top of Ice Level Reading: El: 98.341 0.255 El: 98.336  
Transducer Reading & Est. El.: 0.255 El: 98.341 0.255 El: 98.336  
Other: Top of logger box El: El:

Weather Conditions: +15°C, Overcast

River Conditions: Open, Low Stage

## Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
LB 0.15	0.00				0.000	1.00	1	0.15	0.18	0.054	0.054	0.04	0.00	0.000
0.20	0.14				0.216	1.00	2	0.18	0.25	0.216	0.216	0.14	0.01	0.002
0.30	0.18				0.351	1.00	3	0.25	0.35	0.351	0.351	0.18	0.02	0.006
0.40	0.23				0.060	1.00	4	0.35	0.45	0.060	0.060	0.23	0.02	0.001
0.50	0.30				0.314	1.00	5	0.45	0.55	0.314	0.314	0.30	0.03	0.009
0.60	0.28				0.430	1.00	6	0.55	0.65	0.430	0.430	0.28	0.03	0.012
0.70	0.27				0.433	1.00	7	0.65	0.75	0.433	0.433	0.27	0.03	0.012
0.80	0.26				0.160	1.00	8	0.75	0.85	0.160	0.160	0.26	0.03	0.004
0.90	0.25				0.533	1.00	9	0.85	0.95	0.533	0.533	0.25	0.03	0.013
1.00	0.22				0.210	1.00	10	0.95	1.05	0.210	0.210	0.22	0.02	0.005
1.10	0.20				0.509	1.00	11	1.05	1.15	0.509	0.509	0.20	0.02	0.010
1.20	0.20				0.515	1.00	12	1.15	1.25	0.515	0.515	0.20	0.02	0.010
1.30	0.15				0.491	1.00	13	1.25	1.35	0.491	0.491	0.15	0.02	0.007
1.40	0.18				0.183	1.00	14	1.35	1.45	0.183	0.183	0.18	0.02	0.003
1.50	0.16				0.488	1.00	15	1.45	1.55	0.488	0.488	0.16	0.02	0.008
1.60	0.15				0.607	1.00	16	1.55	1.65	0.607	0.607	0.15	0.02	0.009
1.70	0.16				0.558	1.00	17	1.65	1.75	0.558	0.558	0.16	0.02	0.009
1.80	0.14				0.543	1.00	18	1.75	1.85	0.543	0.543	0.14	0.01	0.008
1.90	0.14				0.472	1.00	19	1.85	1.95	0.472	0.472	0.14	0.01	0.007
2.00	0.10				0.369	1.00	20	1.95	2.10	0.369	0.369	0.10	0.02	0.006
RB 2.20	0.00				0.000	1.00	21	2.10	2.20	0.092	0.092	0.03	0.00	0.000
Total Flow:														0.142

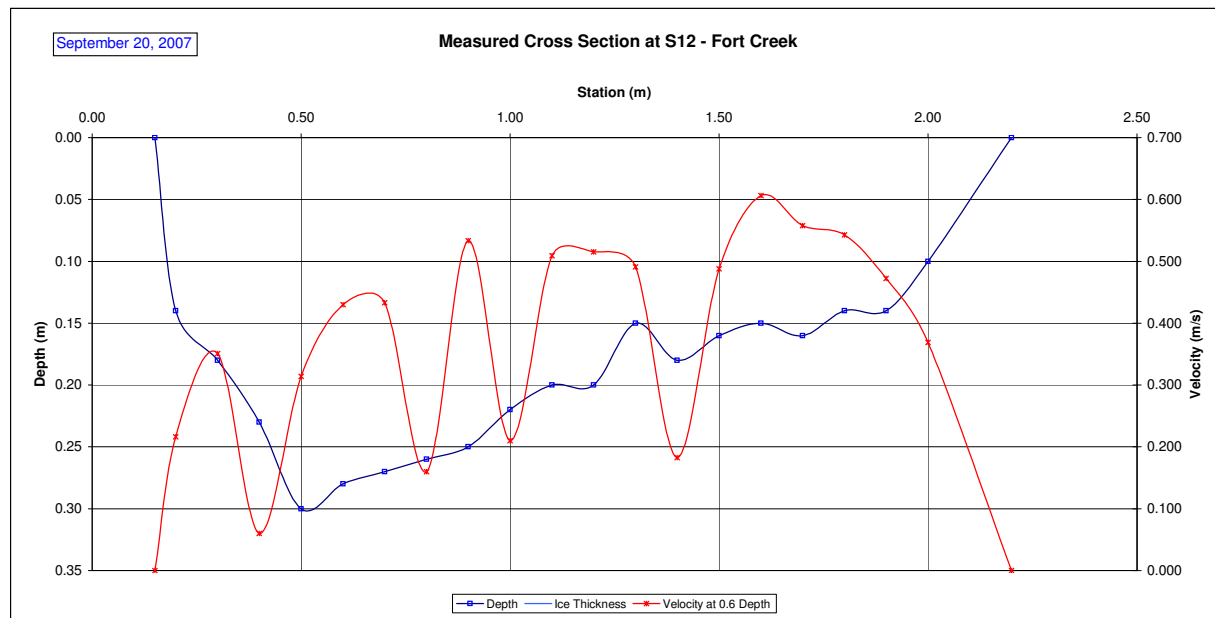
Total Flow:	0.142	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.38	(m <sup>2</sup> )
Top Width:	2.05	(m)
Hydraulic Depth:	0.183	(m)
Mean Velocity:	0.378	(m/s)
Froude Number	0.282	
Photographs taken looking at:	Upstream, downstream, across	

## Notes:

TSS taken. Data downloaded; looks reasonable.

## Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power: 75%  
Datalogger Memory Used: 90  
Datalogger Clock: Sep 20, 2007 15:16 MST  
Laptop Clock: Sep 20, 2007 15:18 MST  
Dessicant: Good  
Datalogger: UltraLogger RX-1 s/n 703013  
PT: Keller 8363K 5 psi s/n 0604001-5926  
Power: Lakewood battery



Hydrometric Measurement / Site Visit Record  
S12 - Fort Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Fort Creek  
Location: Fort Creek  
Site Name: S12  
Coordinates & Legal: 6363400 N, 462600 E SW-18-97-10-W4

Personnel & Equipment

Measurement Made By: FF SM  
Data Entry By: SM  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: October 20, 2007  
Start Time: 2:46 PM MDT  
End Time: 3:15 PM MDT

Level Readings and Measurements

Bench Mark Reading: Rebar on LB 0.818 El: 100.000 0.745 El: 100.000  
Water Level Reading: 2.288 El: 98.530 2.216 El: 98.529 98.530  
Top of Ice Level Reading: El: 98.345 0.185 El: 98.344 98.345  
Transducer Reading & Est. El.: 0.185 El:  
Other: Top of logger box El:

Weather Conditions: +10°C, Overcast  
River Conditions: Open, Low Stage

Measurement Data

	Measured Data					Calculated Data										Percentag e of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective	Panel Effective Depth	Panel Area	Panel Discharge	
												Average				
												Panel Velocity				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	0.19	0.00				0.000	1.00	1	0.19	0.22	0.005	0.005	0.01	0.00	0.000	0%
	0.25	0.05				0.018	1.00	2	0.22	0.30	0.018	0.018	0.05	0.00	0.000	0%
	0.35	0.16				0.152	1.00	3	0.30	0.38	0.152	0.152	0.16	0.01	0.002	6%
	0.40	0.18				0.143	1.00	4	0.38	0.43	0.143	0.143	0.18	0.01	0.001	4%
	0.45	0.18				0.146	1.00	5	0.43	0.48	0.146	0.146	0.18	0.01	0.001	4%
	0.50	0.19				0.168	1.00	6	0.48	0.53	0.168	0.168	0.19	0.01	0.002	5%
	0.55	0.20				0.158	1.00	7	0.53	0.58	0.158	0.158	0.20	0.01	0.002	5%
	0.60	0.20				0.183	1.00	8	0.58	0.63	0.183	0.183	0.20	0.01	0.002	6%
	0.65	0.18				0.195	1.00	9	0.63	0.68	0.195	0.195	0.18	0.01	0.002	6%
	0.70	0.18				0.189	1.00	10	0.68	0.73	0.189	0.189	0.18	0.01	0.002	6%
	0.75	0.18				0.183	1.00	11	0.73	0.78	0.183	0.183	0.18	0.01	0.002	6%
	0.80	0.13				0.195	1.00	12	0.78	0.85	0.195	0.195	0.13	0.01	0.002	6%
	0.90	0.10				0.186	1.00	13	0.85	0.95	0.186	0.186	0.10	0.01	0.002	6%
	1.00	0.12				0.134	1.00	14	0.95	1.05	0.134	0.134	0.12	0.01	0.002	5%
	1.10	0.06				0.198	1.00	15	1.05	1.15	0.198	0.198	0.06	0.01	0.001	4%
	1.20	0.05				0.189	1.00	16	1.15	1.25	0.189	0.189	0.05	0.01	0.001	3%
	1.30	0.05				0.152	1.00	17	1.25	1.35	0.152	0.152	0.05	0.01	0.001	3%
	1.40	0.04				0.158	1.00	18	1.35	1.45	0.158	0.158	0.04	0.00	0.001	2%
	1.50	0.07				0.149	1.00	19	1.45	1.55	0.149	0.149	0.07	0.01	0.001	4%
	1.60	0.07				0.186	1.00	20	1.55	1.65	0.186	0.186	0.07	0.01	0.001	4%
	1.70	0.05				0.198	1.00	21	1.65	1.75	0.198	0.198	0.05	0.01	0.001	3%
	1.80	0.05				0.198	1.00	22	1.75	1.85	0.198	0.198	0.05	0.01	0.001	3%
	1.90	0.06				0.186	1.00	23	1.85	1.98	0.186	0.186	0.06	0.01	0.001	5%
	2.06	0.00				0.000	1.00	24	1.98	2.06	0.046	0.046	0.02	0.00	0.000	0%
Total Flow:															0.029	100%

Total Flow:	0.029	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.18	(m <sup>2</sup> )
Top Width:	1.87	(m)
Hydraulic Depth:	0.094	(m)
Mean Velocity:	0.167	(m/s)
Froude Number	0.174	

Photographs taken looking at:  
Upstream, downstream, across

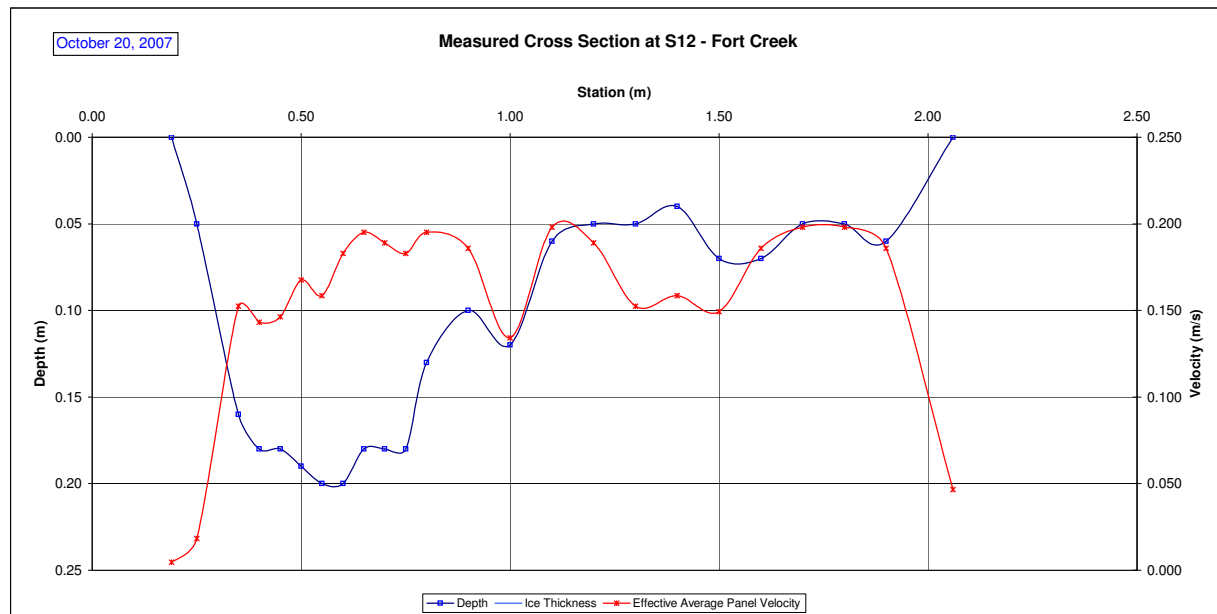
Notes:

TSS taken. Data downloaded; looks reasonable.  
Equipment removed for winter

Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power: 75%  
Datalogger Memory Used: 90  
Datalogger Clock: Sep 20, 2007 15:16 MST  
Laptop Clock: Sep 20, 2007 15:18 MST  
Dessicant: Good

Datalogger: UltraLogger RX-1 s/n 703013  
PT: Keller 8363K 5 psi s/n 0604001-5926  
Power: Lakewood battery



# Hydrometric Measurement / Site Visit Record

S14 - Ells River above Joslyn Creek



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Ells River  
 Location: Ells River above Joslyn Creek  
 Site Name: S14  
 Coordinates & Legal: 6349466 N, 457310 E NW-34-95-11-W4

### Time of Measurement

Date of Measurement: January 14, 2007  
 Start Time: 3:00 PM MDT  
 End Time: MDT

### Weather Conditions:

-25 C, Overcast, Calm

### River Conditions:

Ice Covered

### Personnel & Equipment

Measurement Made By: JS/FF  
 Data Entry By: FF  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: nail in tree 1.082  
 Water Level Reading: 3.706  
 Top of Ice Level Reading: 3.642  
 Transducer Reading & El.: 0.450  
 Other:

### Setup No. 1

El: 236.416  
 El: 233.792  
 El: 233.856  
 El: 233.342

### Setup No. 2

El: 236.416  
 El: 233.796  
 El: 233.856  
 El: 233.346  
 233.794  
 233.344

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:		(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:	Yes	

Notes:

Datalogger Notes:	Database	771
Datalogger Internal Power:	4.43 V	
Datalogger External Power:	11.75 V	
Datalogger Memory Used:	19%	
Datalogger Clock:	Jan 14, 2007 15:00	MST
Laptop Clock:	Jan 14, 2007 15:00	MST
Dessicant:	0% used	
Datalogger:	Optimum DD128, # 030430771	
PT:	Keller 730-130-3 psi #0101347	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

S14 - Ells River above Joslyn Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Ells River  
Location: Ells River above Joslyn Creek  
Site Name: S14  
Coordinates & Legal: 6349466 N, 457310 E NW-34-95-11-W4

## Time of Measurement

Date of Measurement: March 10, 2007  
Start Time: 12:05 PM MST  
End Time: MST

Weather Conditions: -14 C, cloudy, light wind

River Conditions: Ice Covered

## Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: nail in tree  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & El.:  
Other:

## Setup No. 1

El: 236.416  
El: 236.416  
El: 236.416  
El: 235.711

## Setup No. 2

El: 236.416  
El: 236.416  
El: 236.416  
El: 235.711

235.711

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:		(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:	Yes	

Notes:

Datalogger Notes:	Database	771
Datalogger Internal Power:	4.48 V	
Datalogger External Power:	12.94 V	
Datalogger Memory Used:	24%	
Datalogger Clock:	Mar 10, 2007 12:05	MST
Laptop Clock:	Mar 10, 2007 12:09	MST
Dessicant:	0% used	
Datalogger:	Optimum DD128, # 030430771	
PT:	Keller 730-130-3 psi #0101347	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

S14 - Ells River above Joslyn Creek



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Ells River  
 Location: Ells River above Joslyn Creek  
 Site Name: S14  
 Coordinates & Legal: 6349466 N, 457310 E NW-34-95-11-W4

### Time of Measurement

Date of Measurement: April 27, 2007  
 Start Time: MDT  
 End Time: MDT

**Weather Conditions:** + 15 C, Scattered clouds

**River Conditions:** High stage

### Personnel & Equipment

Measurement Made By: JMS/PM  
 Data Entry By: FF  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: nail in tree	1.378	El: 236.416
Water Level Reading:	3.095	El: 234.699
Top of Ice Level Reading:		El: 234.699
Transducer Reading & El.:		El: 234.690
Other: pipe in ground	1.237	El: 234.695

Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:		(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Yes		

**Notes:** TD installed in ALG 11, USB to Serial cable broken, could not comm w/station data not downloaded, new TD constants not programmed, manual mmt unsafe to complete

Datalogger Notes:	Database	771
Datalogger Internal Power:	4.58 V	
Datalogger External Power:	13.24 V	
Datalogger Memory Used:	28%	
Datalogger Clock:	Apr 27, 2007 00:00	MST
Laptop Clock:	Apr 27, 2007 00:00	MST
Dessicant:	0% used	
Datalogger:	Optimum DD128, # 030430771	
PT:	Keller 730-130-3 psi #14501	
Power:	Magnacharge 20V 10A DC Battery and	
	PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

S14 - Ells River above Joslyn Creek



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Ells River  
 Location: Ells River above Joslyn Creek  
 Site Name: S14  
 Coordinates & Legal: 6349466 N, 457310 E NW-34-95-11-W4

### Time of Measurement

Date of Measurement: April 28, 2007  
 Start Time: MDT  
 End Time: MDT

### Weather Conditions:

+ 5 C and overcast

### River Conditions:

open water

### Personnel & Equipment

Measurement Made By: JMS/PM  
 Data Entry By: FF  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: nail in tree	1.308	1.283
Water Level Reading:	3.088	3.064
Top of Ice Level Reading:		
Transducer Reading & El.:	0.981	0.981
Other: pipe in ground	1.168	1.145

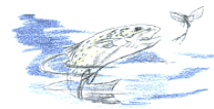
Total Flow:	-	(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:		(m <sup>2</sup> )
Top Width:		(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
Yes		

Notes: station communicated with record rate set to 15 mins, m and b programmed in

Datalogger Notes:	Database	771
Datalogger Internal Power:	4.58 V	
Datalogger External Power:	13.24 V	
Datalogger Memory Used:	28%	
Datalogger Clock:	Apr 28, 2007 07:29	MST
Laptop Clock:	Apr 29, 2007 07:29	MST
Dessicant:	0% used	
Datalogger:	Optimum DD128, # 030430771	
PT:	Keller 730-130-3 psi #0101347	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

# Hydrometric Measurement / Site Visit Record

S14 - Elys River above Joslyn Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Elys River  
Location: Elys River above Joslyn Creek  
Site Name: S14  
Coordinates & Legal: 6349466 N, 457310 E NW-34-95-11-W4  
Time of Measurement: June 13, 2007  
Date of Measurement: 6:12 PM MDT  
Start Time: 6:35 PM MDT  
End Time:

## Personnel & Equipment

Measurement Made By: pm wd  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: 1.076 El: 236.416 1.040 El: 236.416  
Water Level Reading: 3.610 El: 233.882 3.580 El: 233.876  
Top of Ice Level Reading: El:  
Transducer Reading & El.: 0.233 El: 233.649 0.233 El: 233.643  
Other: El:

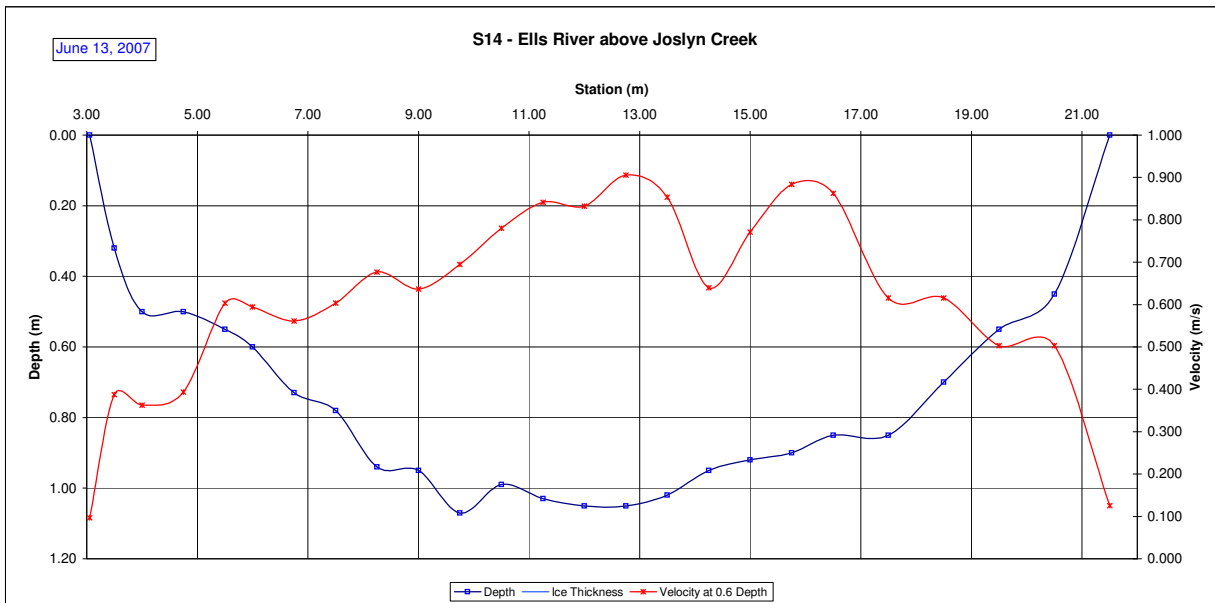
Weather Conditions: +20 C, clear, light wind  
River Conditions: Open, mod Stage

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
3.05	0.00				0.000	1.00	1	3.05	3.28	0.097	0.097	0.08	0.02	0.002	
3.50	0.32				0.387	1.00	2	3.28	3.75	0.387	0.387	0.32	0.15	0.059	
4.00	0.50				0.363	1.00	3	3.75	4.38	0.363	0.363	0.50	0.31	0.113	
4.75	0.50				0.393	1.00	4	4.38	5.13	0.393	0.393	0.50	0.38	0.147	
5.50	0.55				0.604	1.00	5	5.13	5.75	0.604	0.604	0.55	0.34	0.207	
6.00	0.60				0.594	1.00	6	5.75	6.38	0.594	0.594	0.60	0.38	0.223	
6.75	0.73				0.561	1.00	7	6.38	7.13	0.561	0.561	0.73	0.55	0.307	
7.50	0.78				0.604	1.00	8	7.13	7.88	0.604	0.604	0.78	0.59	0.353	
8.25	0.94				0.677	1.00	9	7.88	8.63	0.677	0.677	0.94	0.71	0.477	
9.00	0.95				0.637	1.00	10	8.63	9.38	0.637	0.637	0.95	0.71	0.454	
9.75	1.07				0.695	1.00	11	9.38	10.13	0.695	0.695	1.07	0.80	0.558	
10.50	0.99				0.780	1.00	12	10.13	10.88	0.780	0.780	0.99	0.74	0.579	
11.25	1.03				0.841	1.00	13	10.88	11.63	0.841	0.841	1.03	0.77	0.650	
12.00	1.05				0.832	1.00	14	11.63	12.38	0.832	0.832	1.05	0.79	0.655	
12.75	1.05				0.905	1.00	15	12.38	13.13	0.905	0.905	1.05	0.79	0.713	
13.50	1.02				0.853	1.00	16	13.13	13.88	0.853	0.853	1.02	0.77	0.653	
14.25	0.95				0.640	1.00	17	13.88	14.63	0.640	0.640	0.95	0.71	0.456	
15.00	0.92				0.771	1.00	18	14.63	15.38	0.771	0.771	0.92	0.69	0.532	
15.75	0.90				0.884	1.00	19	15.38	16.13	0.884	0.884	0.90	0.68	0.597	
16.50	0.85				0.863	1.00	20	16.13	17.00	0.863	0.863	0.85	0.74	0.642	
17.50	0.85				0.616	1.00	21	17.00	18.00	0.616	0.616	0.85	0.85	0.523	
18.50	0.70				0.616	1.00	22	18.00	19.00	0.616	0.616	0.70	0.70	0.431	
19.50	0.55				0.503	1.00	23	19.00	20.00	0.503	0.503	0.55	0.55	0.277	
20.50	0.45				0.503	1.00	24	20.00	21.00	0.503	0.503	0.45	0.45	0.226	
21.50	0.00				0.000	1.00	25	21.00	21.50	0.126	0.126	0.11	0.06	0.007	
													Total Flow:	9.841	

Total Flow:	9.841	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Total Area:	14.21	(m <sup>2</sup> )
Top Width:	18.45	(m)
Hydraulic Depth:	0.770	(m)
Mean Velocity:	0.693	(m/s)
Froude Number	0.329	
Photographs taken looking at: no - camera broken		

Datalogger Notes:	Database	771
Datalogger Internal Power:	4.65V	
Datalogger External Power:	14.25V	
Datalogger Memory Used:	0%	
Datalogger Clock:	Jun 13, 2007 16:53	MST
Laptop Clock:	Jun 13, 2007 16:53	MST
Dessicant:	10	
Datalogger:	Optimum DD128, # 030430771	
PT:	Keller 730-130-3 psi #0101347	
Power:	Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: TSS sample collected.  
appears to be a large amount of noise in data, does not appear to be battery problem



# Hydrometric Measurement / Site Visit Record

S14 - Ells River above Joslyn Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Ells River  
Location: Ells River above Joslyn Creek  
Site Name: S14  
Coordinates & Legal: 6349466 N, 457310 E NW-34-95-11-W4

## Time of Measurement

Date of Measurement: August 10, 2007  
Start Time: 4:42 PM MDT  
End Time: 5:00 PM MDT

## Weather Conditions:

+20 C, clear, light wind

## River Conditions:

Open, low Stage

## Personnel & Equipment

Measurement Made By: sm jsm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: 236.416  
Water Level Reading: 236.416  
Top of Ice Level Reading: 236.416  
Transducer Reading & El.: 0.000  
Other:

## Setup No. 1

El: 236.416  
El: 236.416  
El: 236.416  
El: 236.416

## Setup No. 2

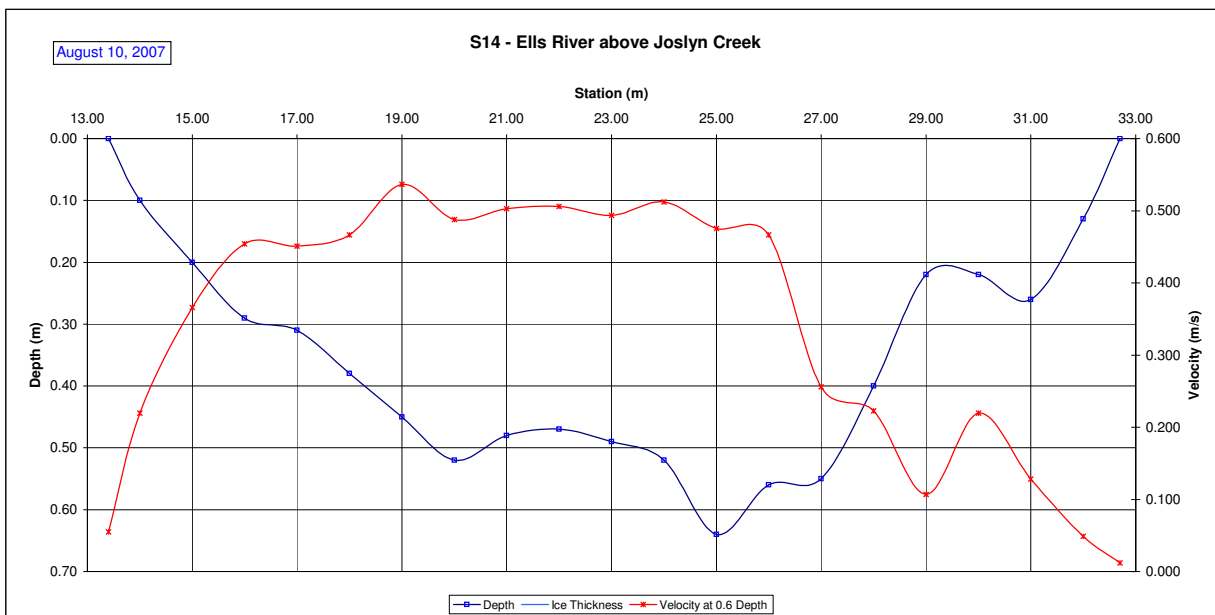
El: 236.416  
El: 236.416  
El: 236.416  
El: 236.416

Measurement Data														
Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
LB	13.40	0.00			0.000	1.00	1	13.40	13.70	0.055	0.055	0.03	0.01	0.000
	14.00	0.10			0.219	1.00	2	13.70	14.50	0.219	0.219	0.10	0.08	0.018
	15.00	0.20			0.366	1.00	3	14.50	15.50	0.366	0.366	0.20	0.20	0.073
	16.00	0.29			0.454	1.00	4	15.50	16.50	0.454	0.454	0.29	0.29	0.132
	17.00	0.31			0.451	1.00	5	16.50	17.50	0.451	0.451	0.31	0.31	0.140
	18.00	0.38			0.466	1.00	6	17.50	18.50	0.466	0.466	0.38	0.38	0.177
	19.00	0.45			0.536	1.00	7	18.50	19.50	0.536	0.536	0.45	0.45	0.241
	20.00	0.52			0.488	1.00	8	19.50	20.50	0.488	0.488	0.52	0.52	0.254
	21.00	0.48			0.503	1.00	9	20.50	21.50	0.503	0.503	0.48	0.48	0.241
	22.00	0.47			0.506	1.00	10	21.50	22.50	0.506	0.506	0.47	0.47	0.238
	23.00	0.49			0.494	1.00	11	22.50	23.50	0.494	0.494	0.49	0.49	0.242
	24.00	0.52			0.512	1.00	12	23.50	24.50	0.512	0.512	0.52	0.52	0.266
	25.00	0.64			0.475	1.00	13	24.50	25.50	0.475	0.475	0.64	0.64	0.304
	26.00	0.56			0.466	1.00	14	25.50	26.50	0.466	0.466	0.56	0.56	0.261
	27.00	0.55			0.256	1.00	15	26.50	27.50	0.256	0.256	0.55	0.55	0.141
	28.00	0.40			0.223	1.00	16	27.50	28.50	0.223	0.223	0.40	0.40	0.089
	29.00	0.22			0.107	1.00	17	28.50	29.50	0.107	0.107	0.22	0.22	0.023
	30.00	0.22			0.219	1.00	18	29.50	30.50	0.219	0.219	0.22	0.22	0.048
	31.00	0.26			0.128	1.00	19	30.50	31.50	0.128	0.128	0.26	0.26	0.033
	32.00	0.13			0.049	1.00	20	31.50	32.35	0.049	0.049	0.13	0.11	0.005
RB	32.70	0.00			0.000	1.00	21	32.35	32.70	0.012	0.012	0.03	0.01	0.000
													Total Flow:	2.928

Total Flow:	2.928	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Total Area:	7.17	(m <sup>2</sup> )
Top Width:	19.30	(m)
Hydraulic Depth:	0.371	(m)
Mean Velocity:	0.408	(m/s)
Froude Number	0.281	
Photographs taken looking at:	no - camera broken	

Datalogger Notes:	Database	771
Datalogger Internal Power:	4.66V	
Datalogger External Power:	14.25V	
Datalogger Memory Used:	0%	
Datalogger Clock:	Aug 09, 2007 15:42	MST
Laptop Clock:	Aug 09, 2007 15:43	MST
Dessicant:	change next time	
Datalogger:	Optimum DD128, # 030430771	
PT:	Keller 730-130-3 psi #0101347	
Power:	Magnacharge 20V 10A DC Battery and	
	PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

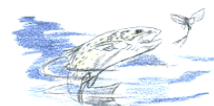
Notes: TSS sample collected. TD out of water - deployed into water.  
put back into water





# Hydrometric Measurement / Site Visit Record

S14 - Ells River above Joslyn Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Ells River  
Location: Ells River above Joslyn Creek  
Site Name: S14  
Coordinates & Legal: 6349466 N, 457310 E NW-34-95-11-W4

## Time of Measurement

Date of Measurement: August 11, 2007  
Start Time: 9:00 AM MDT  
End Time: MDT

## Weather Conditions:

+20° C, clear, light wind

## River Conditions:

Open, low Stage

## Personnel & Equipment

Measurement Made By: sm jsm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: 1.299  
Water Level Reading: 4.103  
Top of Ice Level Reading:  
Transducer Reading & El.: 0.099  
Other:

## Setup No. 1

El: 236.416  
El: 233.612  
El:  
El: 233.513

## Setup No. 2

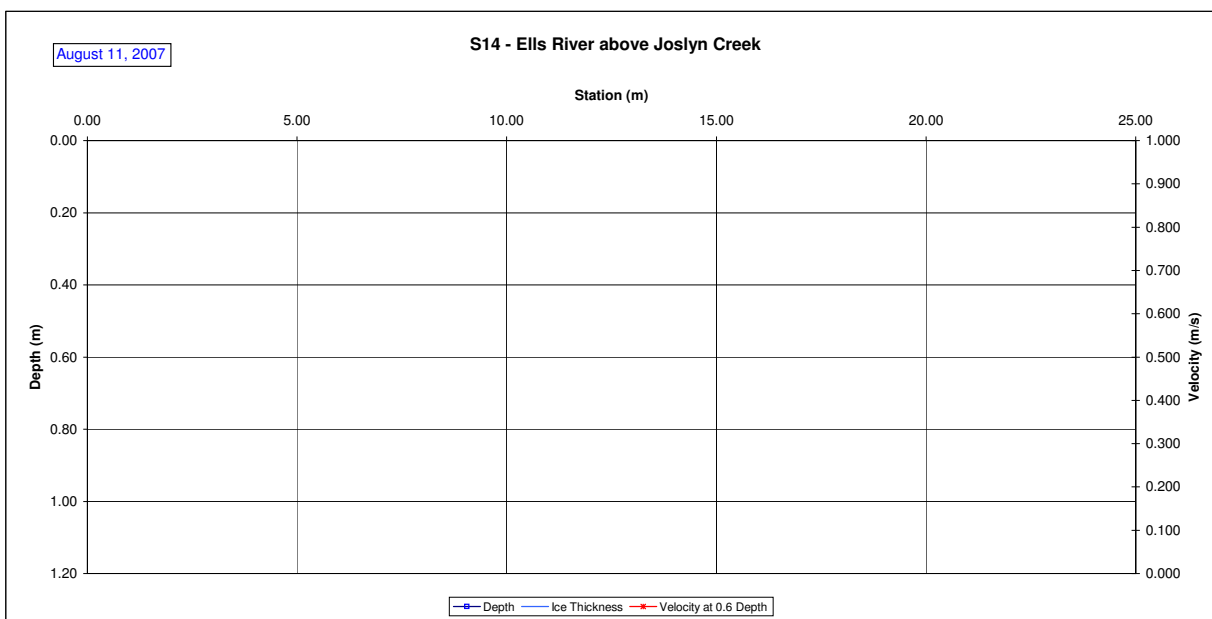
El: 236.416  
El: 233.610  
El:  
El: 233.511

Measured Data						Measurement Data									Calculated Data				
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)					
					0.000	1.00	1	0.00		0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	2			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	3			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	4			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	5			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	6			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	7			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	8			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	9			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	10			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	11			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	12			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	13			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	14			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	15			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	16			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	17			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	18			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	19			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	20			0.000	0.000	0.00	0.00	0.000					
					0.000	1.00	21			0.000	0.000	0.00	0.00	0.000					
													Total Flow:	0.000					

Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	good	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	0.00	(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:	no - camera broken	

Datalogger Notes:	Database	771
Datalogger Internal Power:	4.66V	
Datalogger External Power:	14.25V	
Datalogger Memory Used:	0%	
Datalogger Clock:	Aug 09, 2007 15:42	MST
Laptop Clock:	Aug 09, 2007 15:43	MST
Dessicant:	change next time	
Datalogger:	Optimum DD128, # 030430771	
PT:	Keller 730-130-3 psi #0101347	
Power:	Magnacharge 20V 10A DC Battery and	
	PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller	

Notes: TSS sample collected.



# Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

### Time of Measurement

Date of Measurement: January 12, 2007  
Start Time: 2:07 PM MST  
End Time: 2:26 PM MST

### Weather Conditions:

-20 C, Clear, Light wind

### River Conditions:

Full ice cover.

### Personnel & Equipment

Measurement Made By: FF/JS  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: rebar on LB 2.205  
Water Level Reading: 4.038  
Top of Ice Level Reading: 4.014  
Transducer Reading & El.: 1.112  
Other: Bubbler TD Reading:

### Setup No. 1

El: 100.000  
El: 98.167  
El: 98.191  
El: 97.055

### Setup No. 2

2.230 El: 100.000  
4.065 El: 98.165  
4.047 El: 98.183  
1.112 El: 97.053

### Average

98.166  
98.183  
97.054

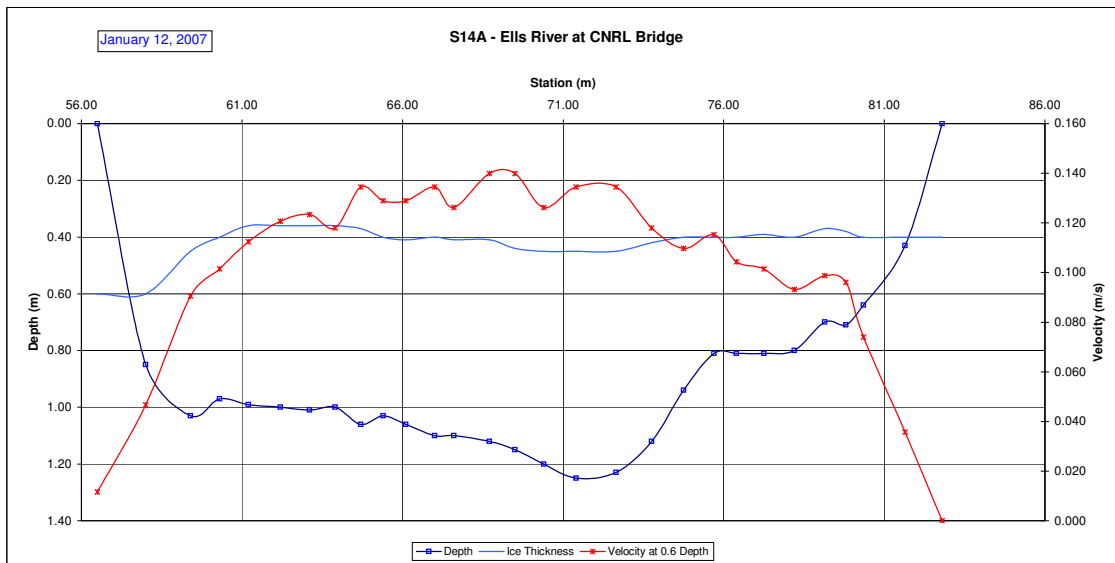
### Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
56.50	0.00	0.60			0.000	0.90	1	56.50	57.25	0.013	0.012	0.06	0.05	0.001	0%	
58.00	0.85	0.60			0.052	0.90	2	57.25	58.70	0.052	0.047	0.25	0.36	0.017	1%	
59.40	1.03	0.45			0.101	0.90	3	58.70	59.85	0.101	0.091	0.58	0.67	0.060	4%	
60.30	0.97	0.40			0.113	0.90	4	59.85	60.75	0.113	0.101	0.57	0.51	0.052	3%	
61.20	0.99	0.36			0.125	0.90	5	60.75	61.70	0.125	0.112	0.63	0.60	0.067	4%	
62.20	1.00	0.36			0.134	0.90	6	61.70	62.65	0.134	0.121	0.64	0.61	0.073	5%	
63.10	1.01	0.36			0.137	0.90	7	62.65	63.50	0.137	0.123	0.65	0.55	0.068	4%	
63.90	1.00	0.36			0.131	0.90	8	63.50	64.30	0.131	0.118	0.64	0.51	0.060	4%	
64.70	1.06	0.37			0.149	0.90	9	64.30	65.05	0.149	0.134	0.69	0.52	0.070	4%	
65.40	1.03	0.40			0.143	0.90	10	65.05	65.75	0.143	0.129	0.63	0.44	0.057	4%	
66.10	1.06	0.41			0.143	0.90	11	65.75	66.55	0.143	0.129	0.65	0.52	0.067	4%	
67.00	1.10	0.40			0.149	0.90	12	66.55	67.30	0.149	0.134	0.70	0.53	0.071	4%	
67.60	1.10	0.41			0.140	0.90	13	67.30	68.15	0.140	0.126	0.69	0.59	0.074	5%	
68.70	1.12	0.41			0.155	0.90	14	68.15	69.10	0.155	0.140	0.71	0.67	0.094	6%	
69.50	1.15	0.44			0.155	0.90	15	69.10	69.95	0.155	0.140	0.71	0.60	0.084	5%	
70.40	1.20	0.45			0.140	0.90	16	69.95	70.90	0.140	0.126	0.75	0.71	0.090	6%	
71.40	1.25	0.45			0.149	0.90	17	70.90	72.03	0.149	0.134	0.80	0.90	0.121	8%	
72.65	1.23	0.45			0.149	0.90	18	72.03	73.20	0.149	0.134	0.78	0.92	0.123	8%	
73.75	1.12	0.42			0.131	0.90	19	73.20	74.25	0.131	0.118	0.70	0.73	0.087	5%	
74.75	0.94	0.40			0.122	0.90	20	74.25	75.23	0.122	0.110	0.54	0.53	0.058	4%	
75.70	0.81	0.40			0.128	0.90	21	75.23	76.05	0.128	0.115	0.41	0.34	0.039	2%	
76.40	0.81	0.40			0.116	0.90	22	76.05	76.83	0.116	0.104	0.41	0.32	0.033	2%	
77.25	0.81	0.39			0.113	0.90	23	76.83	77.73	0.113	0.101	0.42	0.38	0.038	2%	
78.20	0.80	0.40			0.104	0.90	24	77.73	78.68	0.104	0.093	0.40	0.38	0.035	2%	
79.15	0.70	0.37			0.110	0.90	25	78.68	79.48	0.110	0.099	0.33	0.26	0.026	2%	
79.80	0.71	0.38			0.107	0.90	26	79.48	80.08	0.107	0.096	0.33	0.20	0.019	1%	
80.35	0.64	0.40			0.082	0.90	27	80.08	81.00	0.082	0.074	0.24	0.22	0.016	1%	
81.65	0.43	0.40			0.040	0.90	28	81.00	82.23	0.040	0.036	0.03	0.04	0.001	0%	
82.80	0.00	0.40			0.000	0.90	29	82.23	82.80	0.000	0.000	0.01	0.00	0.000	0%	
Total Flow:														1.603	1	

Total Flow:	1.603	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	13.66	(m <sup>2</sup> )
Top Width:	26.30	(m)
Hydraulic Depth:	0.519	(m)
Mean Velocity:	0.117	(m/s)
Froude Number	0.052	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes: Lakewood transducer/logger		
Datalogger Internal Power:	11.34	100%
Datalogger External Power:	11.56	74%
Datalogger Memory Used:	12%	
Datalogger Clock:	Jan 12, 2007 13:39	MST
Laptop Clock:	Jan 12, 2007 13:34	MST
Dessicant:	50% used - changed	
Datalogger:	206095 Lakewood UL-RX	
PT:	505006-5872	
Power:	Lakewood battery	

Notes: Water Temp 0.3 C  
Full ice cover.  
Bubbler not checked.



# Hydrometric Measurement / Site Visit Record

## S14A - Ells River at CNRL Bridge



### Regional Aquatics Monitoring Program

#### Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

#### Time of Measurement

Date of Measurement: February 8, 2007  
Start Time: 3:45 PM MST  
End Time: 4:30 PM MST

#### Weather Conditions:

-30°C, Overcast, Light wind

#### River Conditions:

Full ice cover.

#### Personnel & Equipment

Measurement Made By: JS,JM,PM  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

#### Level Readings

Bench Mark Reading: rebar on LB 2.185  
Water Level Reading: 3.956  
Top of Ice Level Reading: 3.913  
Transducer Reading & El.: 1.394  
Other: Top of pipe 0.232

#### Setup No. 1

El: 100.000  
El: 98.229  
El: 98.272  
El: 96.835  
El:

#### Setup No. 2

2.202 El: 100.000  
3.964 El: 98.238  
3.930 El: 98.272  
1.394 El: 96.844  
0.245 El:

LB

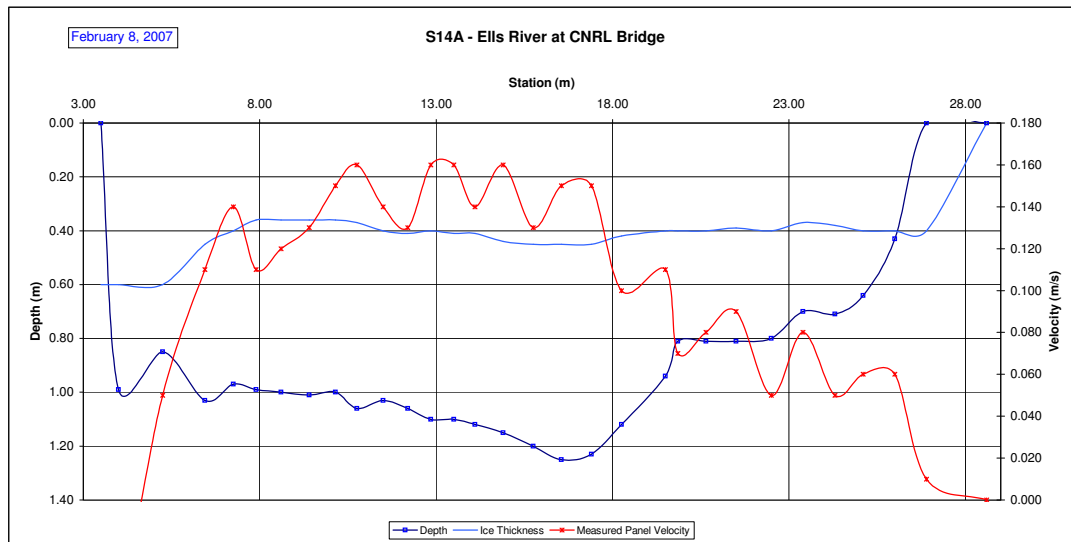
RB

Measured Data										Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	Total		
3.50	0.00	0.60			0.000	0.90	1	3.50	3.75	-0.013	-0.011	0.10	0.02	0.000	0%		
4.00	0.99	0.60			-0.050	0.90	2	3.75	4.63	-0.050	-0.045	0.39	0.34	-0.015	-1%		
5.25	0.85	0.60			0.050	0.90	3	4.63	5.85	0.050	0.045	0.25	0.31	0.014	1%		
6.45	1.03	0.45			0.110	0.90	4	5.85	6.85	0.110	0.099	0.58	0.58	0.057	5%		
7.25	0.97	0.40			0.140	0.90	5	6.85	7.58	0.140	0.126	0.57	0.41	0.052	4%		
7.90	0.99	0.36			0.110	0.90	6	7.58	8.25	0.110	0.099	0.63	0.43	0.042	3%		
8.60	1.00	0.36			0.120	0.90	7	8.25	9.00	0.120	0.108	0.64	0.48	0.052	4%		
9.40	1.01	0.36			0.130	0.90	8	9.00	9.78	0.130	0.117	0.65	0.50	0.059	5%		
10.15	1.00	0.36			0.150	0.90	9	9.78	10.45	0.150	0.135	0.64	0.43	0.058	5%		
10.75	1.06	0.37			0.160	0.90	10	10.45	11.13	0.160	0.144	0.69	0.47	0.067	5%		
11.50	1.03	0.40			0.140	0.90	11	11.13	11.85	0.140	0.126	0.63	0.46	0.058	5%		
12.20	1.06	0.41			0.130	0.90	12	11.85	12.53	0.130	0.117	0.65	0.44	0.051	4%		
12.85	1.10	0.40			0.160	0.90	13	12.53	13.18	0.160	0.144	0.70	0.46	0.066	5%		
13.50	1.10	0.41			0.160	0.90	14	13.18	13.80	0.160	0.144	0.69	0.43	0.062	5%		
14.10	1.12	0.41			0.140	0.90	15	13.80	14.50	0.140	0.126	0.71	0.50	0.063	5%		
14.90	1.15	0.44			0.160	0.90	16	14.50	15.33	0.160	0.144	0.71	0.59	0.084	7%		
15.75	1.20	0.45			0.130	0.90	17	15.33	16.15	0.130	0.117	0.75	0.62	0.072	6%		
16.55	1.25	0.45			0.150	0.90	18	16.15	16.98	0.150	0.135	0.80	0.66	0.089	7%		
17.40	1.23	0.45			0.150	0.90	19	16.98	17.83	0.150	0.135	0.78	0.66	0.090	7%		
18.25	1.12	0.42			0.100	0.90	20	17.83	18.88	0.100	0.090	0.70	0.74	0.066	5%		
19.50	0.84	0.40			0.110	0.90	21	18.88	19.68	0.110	0.099	0.54	0.43	0.043	3%		
19.85	0.81	0.40			0.070	0.90	22	19.68	20.25	0.070	0.063	0.41	0.24	0.015	1%		
20.65	0.81	0.40			0.080	0.90	23	20.25	21.08	0.080	0.072	0.41	0.34	0.024	2%		
21.50	0.81	0.39			0.090	0.90	24	21.08	22.00	0.090	0.081	0.42	0.39	0.031	2%		
22.50	0.80	0.40			0.050	0.90	25	22.00	22.95	0.050	0.045	0.40	0.38	0.017	1%		
23.40	0.70	0.37			0.080	0.90	26	22.95	23.85	0.080	0.072	0.33	0.30	0.021	2%		
24.30	0.71	0.38			0.050	0.90	27	23.85	24.70	0.050	0.045	0.33	0.28	0.013	1%		
25.10	0.64	0.40			0.060	0.90	28	24.70	25.55	0.060	0.054	0.24	0.20	0.011	1%		
26.00	0.43	0.40			0.060	0.90	29	25.55	26.45	0.060	0.054	0.03	0.03	0.001	0%		
26.90	0.00	0.40			0.010	0.90	30	26.45	27.75	0.010	0.009	-0.40	-0.52	-0.005	0%		
28.60	0.00	0.00			0.000	0.90	31	27.75	28.60	0.000	0.000	-0.10	-0.09	0.000	0%		
Total Flow:														1.259			

Total Flow:	1.259	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	11.55	(m <sup>2</sup> )
Top Width:	22.90	(m)
Hydraulic Depth:	0.504	(m)
Mean Velocity:	0.109	(m/s)
Froude Number	0.049	
Photographs taken looking at:	Upstream, downstream, across	

Datalogger Notes:	Lakewood transducer/logger	
Datalogger Internal Power:	11.34	100%
Datalogger External Power:	12.17	78%
Datalogger Memory Used:	25%	
Datalogger Clock:	3:10 PM	MST
Laptop Clock:	3:08 PM	MST
Dessicant:	0% used - Not changed	
Datalogger:	206095 Lakewood UL-RX	
PT:	505006-5872	
Power:	Lakewood battery	

Notes: Water temp = 0.343°C  
Battery not changed.  
Measurement appears to have been done in m/s, velocities replaced PM, 2007-2-21



# Hydrometric Measurement / Site Visit Record

S14A - Eils River at CNRL Bridge



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Eils River at CNRL Bridge  
Location: Eils River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

## Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Time of Measurement

Date of Measurement: March 6, 2007  
Start Time: 3:08 PM MST  
End Time: 3:23 PM MST

## Level Readings

Bench Mark Reading: rebar on LB 2.187  
Water Level Reading: 3.863  
Top of Ice Level Reading: 3.802  
Transducer Reading & El.: 1.596  
Other: Top of pipe 0.235

## Setup No. 1

El: 100.000  
El: 98.324  
El: 98.385  
El: 96.729  
El:

## Setup No. 2

El: 100.000  
El: 98.326  
El: 98.396  
El: 96.731  
El: 96.730

Weather Conditions: -16°C, Moderate snow, Light wind

River Conditions: Full ice cover.

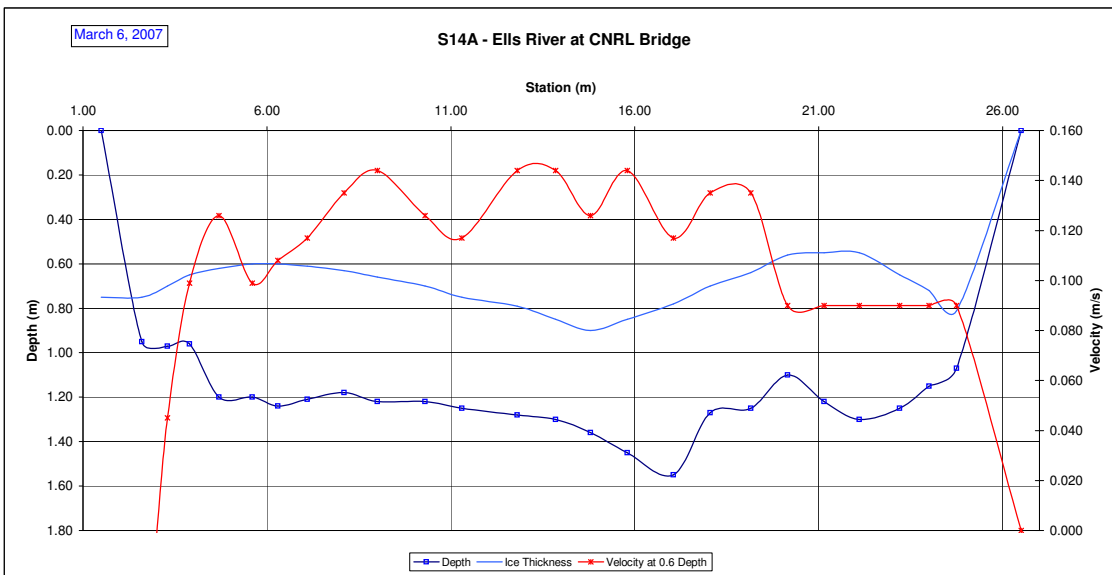
## Measurement Data

Measured Data							Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
LB	1.50	0.00	0.75		0.000	0.90	1	1.50	2.05	-0.013	-0.011	0.05	0.03	0.000	0%	
	2.60	0.95	0.75		-0.050	0.90	2	2.05	2.95	-0.050	-0.045	0.20	0.18	-0.008	-1%	
	3.30	0.97	0.70		0.050	0.90	3	2.95	3.60	0.050	0.045	0.27	0.18	0.008	1%	
	3.90	0.96	0.65		0.110	0.90	4	3.60	4.30	0.110	0.099	0.31	0.22	0.021	2%	
	4.70	1.20	0.62		0.140	0.90	5	4.30	5.15	0.140	0.126	0.58	0.49	0.062	4%	
	5.60	1.20	0.60		0.110	0.90	6	5.15	5.95	0.110	0.099	0.60	0.48	0.048	3%	
	6.30	1.24	0.60		0.120	0.90	7	5.95	6.70	0.120	0.108	0.64	0.48	0.052	4%	
	7.10	1.21	0.61		0.130	0.90	8	6.70	7.60	0.130	0.117	0.60	0.54	0.063	4%	
	8.10	1.18	0.63		0.150	0.90	9	7.60	8.55	0.150	0.135	0.55	0.52	0.071	5%	
	9.00	1.22	0.66		0.160	0.90	10	8.55	9.65	0.160	0.144	0.56	0.62	0.089	6%	
	10.30	1.22	0.70		0.140	0.90	11	9.65	10.80	0.140	0.126	0.52	0.60	0.075	5%	
	11.30	1.25	0.75		0.130	0.90	12	10.80	12.05	0.130	0.117	0.50	0.63	0.073	5%	
	12.80	1.28	0.79		0.160	0.90	13	12.05	13.33	0.160	0.144	0.49	0.62	0.090	6%	
	13.85	1.30	0.85		0.160	0.90	14	13.33	14.33	0.160	0.144	0.45	0.45	0.065	5%	
	14.80	1.36	0.90		0.140	0.90	15	14.33	15.30	0.140	0.126	0.46	0.45	0.057	4%	
	15.80	1.45	0.85		0.160	0.90	16	15.30	16.43	0.160	0.144	0.60	0.68	0.097	7%	
	17.05	1.55	0.78		0.130	0.90	17	16.43	17.55	0.130	0.117	0.77	0.87	0.101	7%	
	18.05	1.27	0.70		0.150	0.90	18	17.55	18.60	0.150	0.135	0.57	0.60	0.081	6%	
	19.15	1.25	0.64		0.150	0.90	19	18.60	19.65	0.150	0.135	0.61	0.64	0.086	6%	
	20.15	1.10	0.56		0.100	0.90	20	19.65	20.65	0.100	0.090	0.54	0.54	0.049	3%	
	21.15	1.22	0.55		0.100	0.90	21	20.65	21.63	0.100	0.090	0.67	0.65	0.059	4%	
	22.10	1.30	0.55		0.100	0.90	22	21.63	22.65	0.100	0.090	0.75	0.77	0.069	5%	
	23.20	1.25	0.65		0.100	0.90	23	22.65	23.60	0.100	0.090	0.60	0.57	0.051	4%	
	24.00	1.15	0.72		0.100	0.90	24	23.60	24.38	0.100	0.090	0.43	0.33	0.030	2%	
	24.75	1.07	0.81		0.100	0.90	25	24.38	25.63	0.100	0.090	0.26	0.33	0.029	2%	
RB	26.50	0.00	0.00		0.000	0.90	26	25.63	26.50	0.000	0.000	0.07	0.06	0.000	0%	
Total Flow:														1.418	1	

Total Flow:	1.418	(m <sup>3</sup> /s)
Percieved Measurement Quality:	Good	
Total Area:	12.42	(m <sup>2</sup> )
Top Width:	22.15	(m)
Hydraulic Depth:	0.561	(m)
Mean Velocity:	0.114	(m/s)
Froude Number	0.049	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes: Lakewood transducer/logger		
Datalogger Internal Power:	11.34	100%
Datalogger External Power:	12.17	78%
Datalogger Memory Used:	25%	
Datalogger Clock:	2007-03-06 14:28	MST
Laptop Clock:	2007-03-06 14:29	MST
Dessicant:	0% used - Not changed	
Datalogger:	206095 Lakewood UL-RX	
PT:	505006-5872	
Power:	Lakewood battery	

Notes: Water temp = 0.40°C  
Battery changed.



Hydrometric Measurement / Site Visit Record  
S14A - Eils River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Eils River at CNRL Bridge  
Location: Eils River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: April 24, 2007  
Start Time: 10:55 AM MST  
End Time: MST

Weather Conditions:

Calm, overcast

River Conditions:

Open, ice on banks and icy spots

Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

Level Readings

Bench Mark Reading: rebar on LB 2.350  
Water Level Reading: 3.749  
Top of Ice Level Reading:  
Transducer Reading & El.: 1.085  
Other: Top of pipe 0.400

Setup No. 1

El: 100.000  
El: 98.601  
El: 102.350  
El: 97.516  
El: 101.950

Setup No. 2

El: 100.000  
El: 98.617  
El: 102.299  
El: 97.532  
El: 101.951

Setup No. 3

El: 100.000  
El: 98.637  
El: 102.299  
El: 97.552  
El: 101.951

Setup No. 4

El: 100.000  
El: 98.695  
El: 102.299  
El: 97.610  
El: 101.953

Notes: Water temp = 0.3430 °C  
Battery changed.

Datalogger Notes:	Lakewood transducer/logger	
Datalogger Internal Power:	11.34	100%
Datalogger External Power:	12.65	81%
Datalogger Memory Used:	25%	
Datalogger Clock:	2007-04-24 10:45	MST
Laptop Clock:	2007-04-24 10:48	MST
Dessicant:	0% used - Not changed	
Datalogger:	41199-08	Lakewood UL-RX
PT:	505006-5872	
Power:	Lakewood battery	

Hydrometric Measurement / Site Visit Record  
S14A - Ells River at CNRL Bridge



Regional Aquatics Monitoring Program

97.608 td  
98.638

**Measurement Location**

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E  
**Time of Measurement**  
Date of Measurement: April 24, 2007  
Start Time: 11:00 AM MST  
End Time: MST

**Weather Conditions:**

Calm, overcast

**River Conditions:**

Open, ice on banks and icy spots

**Personnel & Equipment**

Measurement Made By: JS, JM, PM  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

**Level Readings**

Bench Mark Reading: rebar on LB  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & El.:  
Other: Top of pipe

**Setup No. 1**

2.350 El: 100.000  
3.749 El: 98.601  
1.029 El: 102.350  
0.400 El: 97.572  
101.950

**Setup No. 2**

2.299 El: 100.000  
3.682 El: 98.617  
1.029 El: 102.299  
0.348 El: 97.588  
101.951

**Setup No. 3**

2.292 El: 100.000  
3.662 El: 98.637  
1.029 El: 102.299  
0.341 El: 97.608  
101.951

**Setup No. 4**

2.261 El: 100.000  
3.604 El: 98.695  
1.029 El: 102.299  
0.308 El: 97.666  
101.953

98.638

Notes: Tank appears empty, gauge reading 0 psi

Datalogger Notes:		Lakewood transducer/logger	
Datalogger Internal Power:		11.34	100%
Datalogger External Power:		12.04	77%
Datalogger Memory Used:		100%	
Datalogger Clock:		2007-04-24 10:55	MST
Laptop Clock:		2007-04-24 11:07	MST
Dessicant:		0% used - Not changed	
Datalogger:		206095 Lakewood UL-RX	
PT:		WLS100	
Power:		Lakewood battery	

# Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

## Time of Measurement

Date of Measurement: May 1, 2007  
Start Time: 6:05 AM MST  
End Time: 6:45 AM MST

## Weather Conditions:

+10°C; overcast

## River Conditions:

High stage

## Personnel & Equipment

Measurement Made By: JMS, PM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: rebar on LB 2.209  
Water Level Reading: 3.672  
Top of Ice Level Reading:  
Transducer Reading & El.: 1.006  
Other: Top of pipe 0.272

## Setup No. 1

El: 100.000  
El: 98.537  
El: 102.209  
El: 97.531  
El:

## Setup No. 2

2.263 El: 100.000  
3.717 El: 98.546  
El: 102.263  
1.006 El: 97.540  
0.326 El:

98.542

97.536

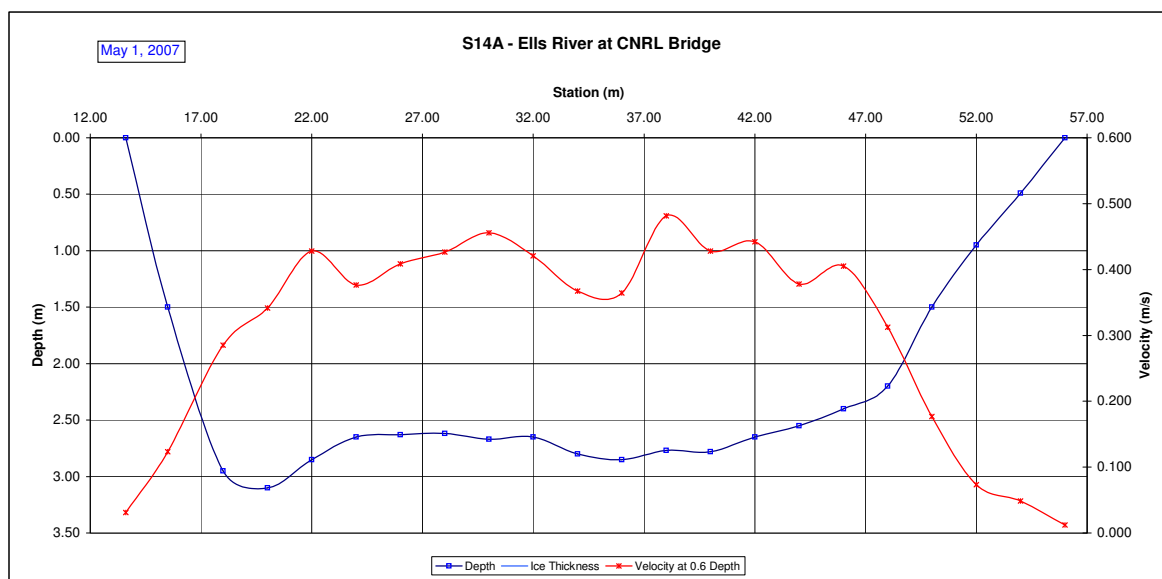
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
13.60	0.00				0.000	1.00	1	13.60	14.55	0.031	0.031	0.38	0.36	0.011	0%	
15.50	1.50		0.180	0.067		1.00	2	14.55	16.75	0.123	0.123	1.50	3.30	0.407	1%	
18.00	2.95		0.323	0.247		1.00	3	16.75	19.00	0.285	0.285	2.95	6.64	1.892	5%	
20.00	3.10		0.430	0.253		1.00	4	19.00	21.00	0.341	0.341	3.10	6.20	2.117	6%	
22.00	2.85		0.503	0.354		1.00	5	21.00	23.00	0.428	0.428	2.85	5.70	2.441	7%	
24.00	2.65		0.445	0.308		1.00	6	23.00	25.00	0.376	0.376	2.65	5.30	1.995	6%	
26.00	2.63		0.518	0.299		1.00	7	25.00	27.00	0.408	0.408	2.63	5.26	2.148	6%	
28.00	2.62		0.491	0.363		1.00	8	27.00	29.00	0.427	0.427	2.62	5.24	2.236	6%	
30.00	2.67		0.509	0.402		1.00	9	29.00	31.00	0.456	0.456	2.67	5.34	2.433	7%	
32.00	2.65		0.515	0.326		1.00	10	31.00	33.00	0.421	0.421	2.65	5.30	2.229	6%	
34.00	2.80		0.494	0.241		1.00	11	33.00	35.00	0.367	0.367	2.80	5.60	2.057	6%	
36.00	2.85		0.430	0.299		1.00	12	35.00	37.00	0.364	0.364	2.85	5.70	2.076	6%	
38.00	2.77		0.503	0.460		1.00	13	37.00	39.00	0.482	0.482	2.77	5.54	2.668	8%	
40.00	2.78		0.460	0.396		1.00	14	39.00	41.00	0.428	0.428	2.78	5.56	2.381	7%	
42.00	2.65		0.475	0.408		1.00	15	41.00	43.00	0.442	0.442	2.65	5.30	2.342	7%	
44.00	2.55		0.393	0.363		1.00	16	43.00	45.00	0.378	0.378	2.55	5.10	1.928	5%	
46.00	2.40		0.405	0.405		1.00	17	45.00	47.00	0.405	0.405	2.40	4.80	1.946	5%	
48.00	2.20		0.323	0.302		1.00	18	47.00	49.00	0.312	0.312	2.20	4.40	1.375	4%	
50.00	1.50		0.235	0.119		1.00	19	49.00	51.00	0.177	0.177	1.50	3.00	0.530	1%	
52.00	0.95				0.073	1.00	20	51.00	54.00	0.073	0.073	0.95	2.85	0.208	1%	
54.00	0.49				0.049	1.00	21	54.00	55.00	0.049	0.049	0.49	0.49	0.024	0%	
56.00	0.00				0.000	1.00	22	55.00	56.00	0.012	0.012	0.12	0.12	0.001	0%	
Total Flow:														35.435	1	

Total Flow:	35.435	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	96.74	(m <sup>2</sup> )
Top Width:	42.40	(m)
Hydraulic Depth:	2.282	(m)
Mean Velocity:	0.366	(m/s)
Froude Number	0.077	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Lakewood transducer/logger
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	
Datalogger Clock:	MST
Laptop Clock:	MST
Dessicant:	
Datalogger:	Lakewood UL-RX
PT:	
Power:	Battery

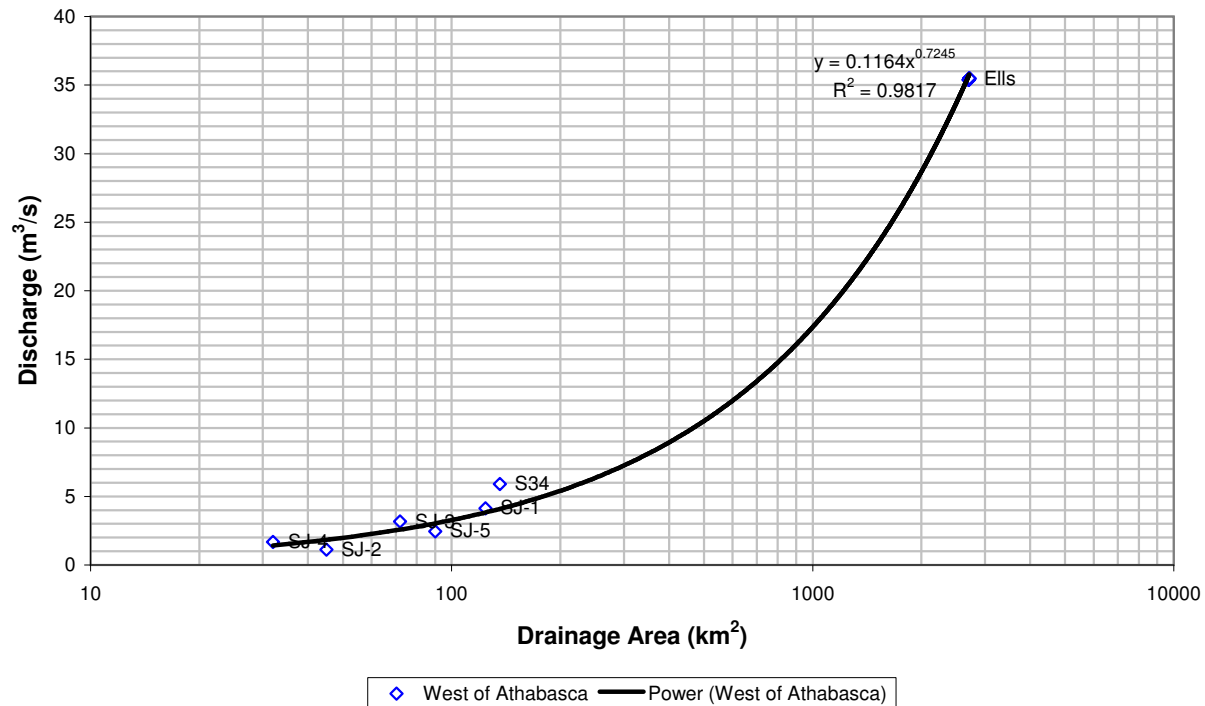
Notes: Water thermistor at S14A appears to be malfunctioning  
Stilling well damaged by ice  
Flow measurement done at mouth  
See next sheet for S14A Flow



Methods for determining flows at S14 & S14A based on flow measurement at mouth of Ells river

Method I: Determine the relationship between drainage area and discharge based on flows measured west of the Athabasca river during April field trip

### Apr 2007 MMT Unit Area Discharges



Weighing the graph towards the manual measurement performed on the mouth of Ells is necessary, or the power

Calculated flows:

Site	Drainage Area	Flow
S14	2430	33.02
S14A	2450	33.22

Measured Flow:

Ells at mou	2710	35.44
-------------	------	-------



Method II: using the same relationship between drainage area and discharge, calculated the discharge at Joslyn Creek as it joins the Ells River, subtracting this flow from the measured flow at the mouth should give us the flow at S14

Calculated flow

Site	Drainage Area	Flow
Joslyn at mouth	257	6.49

Measured flow - Calculated flow at mouth of Joslyn = Flow at S14

35.44 - 6.49 = 28.95

Flows at S14A are not historically much smaller than flows at S14

Method III: Use established rating curves for S14 & S14A and measured water levels to determine flows.

Station	Water Level	Flow
S14	234.6355	42.69885
S14A	98.5415	25.96452

Summary: Using these methods we arrive at three answers for S14 & S14A

Method	S14	S14A
I	33.02	33.22
II	28.95	28.78
III	42.70	25.96

Conclusion: Comparison of these methods shows that S14 rating curve is not of high quality. As the low end of the unit area discharge relationship is better defined than the high end, as well as two of the flow measurements used to define the curve come directly from two main Joslyn tributaries, Method II will be used to predict flows at S14 & S14A

Site	Flow
S14	28.95
S14A	28.78

Hydrometric Measurement / Site Visit Record  
S14A - Ells River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

Time of Measurement

Date of Measurement: June 15, 2007  
Start Time: 12:56 PM MST  
End Time: 1:12 PM MST

Weather Conditions:

+20 °C, clear light wind

River Conditions:

mod stage

Personnel & Equipment

Measurement Made By: pm jm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

Level Readings

Bench Mark Reading: rebar on LB 2.447  
Water Level Reading: 4.323  
Top of Ice Level Reading:  
Transducer Reading & El.: -0.023  
Other: Top of pipe 0.526

Setup No. 1

El: 100.000  
El: 98.124  
El: 102.447  
El: 98.147

Setup No. 2

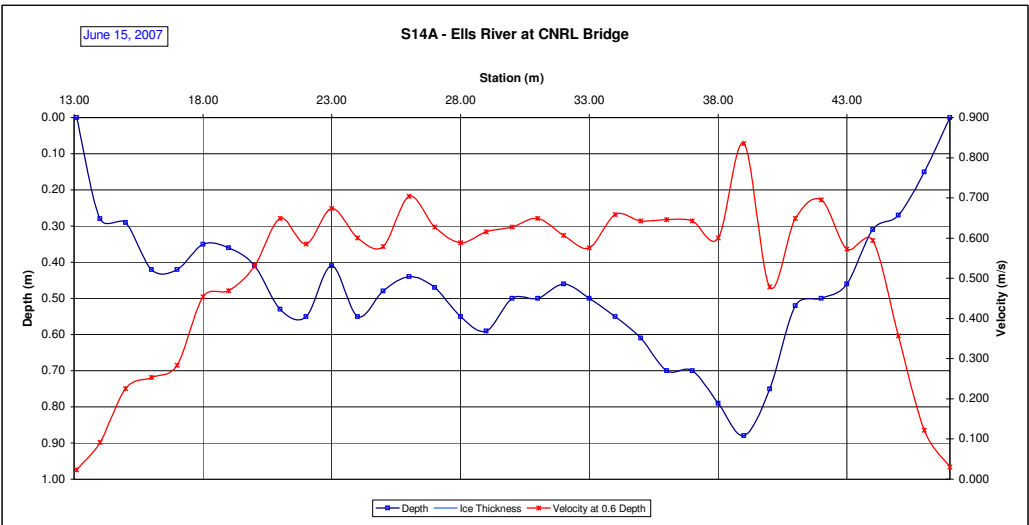
El: 100.000  
El: 98.124  
El: 102.380  
El: 98.147

Measurement Data															Percentage of Total
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
13.10	0.00				0.000	1.00	1	13.10	13.55	0.023	0.023	0.12	0.05	0.001	0%
14.00	0.28				0.091	1.00	2	13.55	14.50	0.091	0.091	0.28	0.27	0.024	0%
15.00	0.29				0.226	1.00	3	14.50	15.50	0.226	0.226	0.29	0.29	0.065	1%
16.00	0.42				0.253	1.00	4	15.50	16.50	0.253	0.253	0.42	0.42	0.106	1%
17.00	0.42				0.283	1.00	5	16.50	17.50	0.283	0.283	0.42	0.42	0.119	1%
18.00	0.35				0.454	1.00	6	17.50	18.50	0.454	0.454	0.35	0.35	0.159	2%
19.00	0.36				0.469	1.00	7	18.50	19.50	0.469	0.469	0.36	0.36	0.169	2%
20.00	0.41				0.530	1.00	8	19.50	20.50	0.530	0.530	0.41	0.41	0.217	2%
21.00	0.53				0.649	1.00	9	20.50	21.50	0.649	0.649	0.53	0.53	0.344	4%
22.00	0.55				0.585	1.00	10	21.50	22.50	0.585	0.585	0.55	0.55	0.322	3%
23.00	0.41				0.674	1.00	11	22.50	23.50	0.674	0.674	0.41	0.41	0.276	3%
24.00	0.55				0.600	1.00	12	23.50	24.50	0.600	0.600	0.55	0.55	0.330	4%
25.00	0.48				0.579	1.00	13	24.50	25.50	0.579	0.579	0.48	0.48	0.278	3%
26.00	0.44				0.704	1.00	14	25.50	26.50	0.704	0.704	0.44	0.44	0.310	3%
27.00	0.47				0.628	1.00	15	26.50	27.50	0.628	0.628	0.47	0.47	0.295	3%
28.00	0.55				0.588	1.00	16	27.50	28.50	0.588	0.588	0.55	0.55	0.324	3%
29.00	0.59				0.616	1.00	17	28.50	29.50	0.616	0.616	0.59	0.59	0.363	4%
30.00	0.50				0.628	1.00	18	29.50	30.50	0.628	0.628	0.50	0.50	0.314	3%
31.00	0.50				0.649	1.00	19	30.50	31.50	0.649	0.649	0.50	0.50	0.325	3%
32.00	0.46				0.607	1.00	20	31.50	32.50	0.607	0.607	0.46	0.46	0.279	3%
33.00	0.50				0.576	1.00	21	32.50	33.50	0.576	0.576	0.50	0.50	0.288	3%
34.00	0.55				0.658	1.00	22	33.50	34.50	0.658	0.658	0.55	0.55	0.362	4%
35.00	0.61				0.643	1.00	23	34.50	35.50	0.643	0.643	0.61	0.61	0.392	4%
36.00	0.70				0.646	1.00	24	35.50	36.50	0.646	0.646	0.70	0.70	0.452	5%
37.00	0.70				0.643	1.00	25	36.50	37.50	0.643	0.643	0.70	0.70	0.450	5%
38.00	0.79				0.600	1.00	26	37.50	38.50	0.600	0.600	0.79	0.79	0.474	5%
39.00	0.88				0.835	1.00	27	38.50	39.50	0.835	0.835	0.88	0.88	0.735	8%
40.00	0.75				0.479	1.00	28	39.50	40.50	0.479	0.479	0.75	0.75	0.359	4%
41.00	0.52				0.649	1.00	29	40.50	41.50	0.649	0.649	0.52	0.52	0.338	4%
42.00	0.50				0.695	1.00	30	41.50	42.50	0.695	0.695	0.50	0.50	0.347	4%
43.00	0.46				0.573	1.00	31	42.50	43.50	0.573	0.573	0.46	0.46	0.264	3%
44.00	0.31				0.594	1.00	32	43.50	44.50	0.594	0.594	0.31	0.31	0.184	2%
45.00	0.27				0.357	1.00	33	44.50	45.50	0.357	0.357	0.27	0.27	0.096	1%
46.00	0.15				0.122	1.00	34	45.50	46.50	0.122	0.122	0.15	0.15	0.018	0%
47.00	0.00				0.000	1.00	35	46.50	47.00	0.030	0.030	0.04	0.02	0.001	0%
Total Flow:														6.661	

Total Flow:	9.302	(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:	16.31	(m <sup>2</sup> )
Top Width:	33.90	(m)
Hydraulic Depth:	0.461	(m)
Mean Velocity:	0.575	(m/s)
Froude Number:	0.265	
Photographs taken looking at: Upstream, downstream, across		

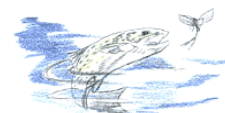
Notes: some large spikes and shifts in data, water therm destroyed  
td appear non functional  
co=-1.0546, c1=2.1092  
100% memory used  
77% battery

Datalogger Notes:	Lakewood transducer/logger
Datalogger Internal Power:	100.00
Datalogger External Power:	81.00
Datalogger Memory Used:	55%
Datalogger Clock:	12:56 MST
Laptop Clock:	1:12 MST
Dessicant:	good
Datalogger:	Lakewood UL-RX
PT:	
Power:	Battery



# Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

### Time of Measurement

Date of Measurement: June 19, 2007  
Start Time: 7:36 AM MST  
End Time: MST

**Weather Conditions:** +10°C, cloud recent rain

**River Conditions:** mod stage

### Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: rebar on LB 2.513  
Water Level Reading: 4.414  
Top of Ice Level Reading:  
Transducer Reading & El.: 1.053  
Other: Top of pipe 0.591

### Setup No. 1

El: 100.000  
El: 98.099  
El: 102.513  
El: 97.046  
El:

### Setup No. 2

El: 100.000  
El: 98.093 98.096  
El: 102.462  
El: 97.040 97.043  
El:

Datalogger Notes:		Lakewood transducer/logger
Datalogger Internal Power:	100.00	
Datalogger External Power:	81.00	
Datalogger Memory Used:	55%	
Datalogger Clock:	12:56	MST
Laptop Clock:	1:12	MST
Dessicant:	good	
Datalogger:	Lakewood UL-RX	
PT:	703001	
Power:	Battery	

**Notes:** TD 7030001 installed June 19/07 07:30  
unable to open TD constants on laptop b/c pdf file and laptop cannot read pdf  
**black serial to usb is questionable**  
**memory cleared, clock reset**  
voltage 1.1213v

# Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

## Time of Measurement

Date of Measurement: August 5, 2007  
Start Time: 12:45 PM MST  
End Time: 11:50 PM MST

## Weather Conditions:

+20°C, overcast

## River Conditions:

Low stage

## Personnel & Equipment

Measurement Made By: SM, PM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: rebar on LB 2.111  
Water Level Reading: 4.176  
Top of Ice Level Reading:  
Transducer Reading & El.: 0.951  
Other: Top of pipe 0.195

## Setup No. 1

El: 100.000  
El: 97.935  
El: 102.111  
El: 96.984  
El:

## Setup No. 2

2.150 El: 100.000  
4.215 El: 97.935  
El: 102.150  
0.951 El: 96.984  
0.235 El:

LB

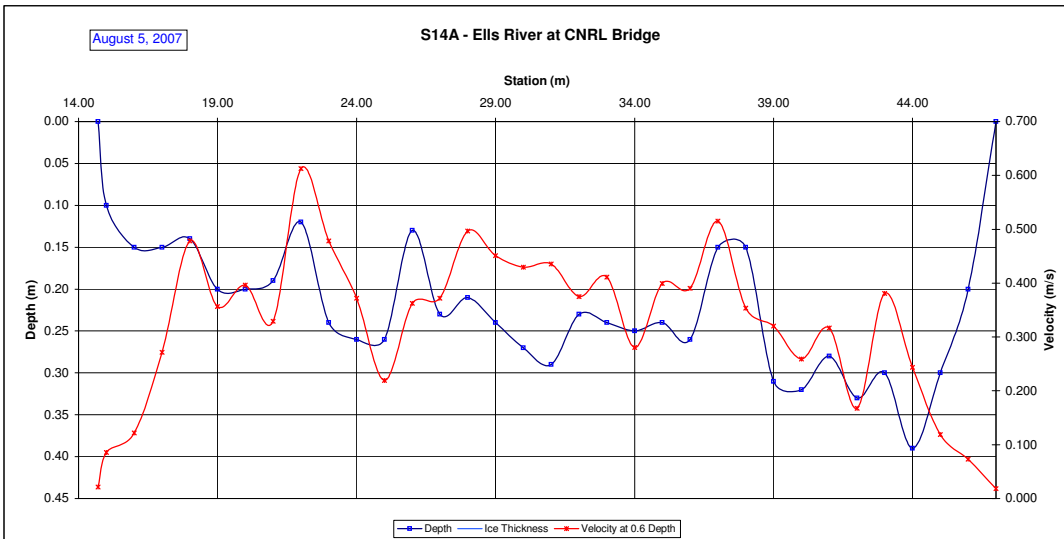
RB

Measured Data							Calculated Data								Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
14.70	0.00				0.000	1.00	1	14.70	14.85	0.021	0.021	0.03	0.00	0.000	0%
15.00	0.10				0.085	1.00	2	14.85	15.50	0.085	0.085	0.10	0.07	0.006	0%
16.00	0.15				0.122	1.00	3	15.50	16.50	0.122	0.122	0.15	0.15	0.018	1%
17.00	0.15				0.271	1.00	4	16.50	17.50	0.271	0.271	0.15	0.15	0.041	2%
18.00	0.14				0.479	1.00	5	17.50	18.50	0.479	0.479	0.14	0.14	0.067	3%
19.00	0.20				0.357	1.00	6	18.50	19.50	0.357	0.357	0.20	0.20	0.071	3%
20.00	0.20				0.396	1.00	7	19.50	20.50	0.396	0.396	0.20	0.20	0.079	3%
21.00	0.19				0.329	1.00	8	20.50	21.50	0.329	0.329	0.19	0.19	0.063	3%
22.00	0.12				0.613	1.00	9	21.50	22.50	0.613	0.613	0.12	0.12	0.074	3%
23.00	0.24				0.479	1.00	10	22.50	23.50	0.479	0.479	0.24	0.24	0.115	5%
24.00	0.26				0.372	1.00	11	23.50	24.50	0.372	0.372	0.26	0.26	0.097	4%
25.00	0.26				0.219	1.00	12	24.50	25.50	0.219	0.219	0.26	0.26	0.057	2%
26.00	0.13				0.363	1.00	13	25.50	26.50	0.363	0.363	0.13	0.13	0.047	2%
27.00	0.23				0.372	1.00	14	26.50	27.50	0.372	0.372	0.23	0.23	0.086	4%
28.00	0.21				0.497	1.00	15	27.50	28.50	0.497	0.497	0.21	0.21	0.104	4%
29.00	0.24				0.451	1.00	16	28.50	29.50	0.451	0.451	0.24	0.24	0.108	4%
30.00	0.27				0.430	1.00	17	29.50	30.50	0.430	0.430	0.27	0.27	0.116	5%
31.00	0.29				0.436	1.00	18	30.50	31.50	0.436	0.436	0.29	0.29	0.126	5%
32.00	0.23				0.375	1.00	19	31.50	32.50	0.375	0.375	0.23	0.23	0.086	4%
33.00	0.24				0.411	1.00	20	32.50	33.50	0.411	0.411	0.24	0.24	0.099	4%
34.00	0.25				0.280	1.00	21	33.50	34.50	0.280	0.280	0.25	0.25	0.070	3%
35.00	0.24				0.399	1.00	22	34.50	35.50	0.399	0.399	0.24	0.24	0.096	4%
36.00	0.26				0.390	1.00	23	35.50	36.50	0.390	0.390	0.26	0.26	0.101	4%
37.00	0.15				0.515	1.00	24	36.50	37.50	0.515	0.515	0.15	0.15	0.077	3%
38.00	0.15				0.354	1.00	25	37.50	38.50	0.354	0.354	0.15	0.15	0.053	2%
39.00	0.31				0.320	1.00	26	38.50	39.50	0.320	0.320	0.31	0.31	0.099	4%
40.00	0.32				0.259	1.00	27	39.50	40.50	0.259	0.259	0.32	0.32	0.083	3%
41.00	0.28				0.317	1.00	28	40.50	41.50	0.317	0.317	0.28	0.28	0.089	4%
42.00	0.33				0.168	1.00	29	41.50	42.50	0.168	0.168	0.33	0.33	0.055	2%
43.00	0.30				0.381	1.00	30	42.50	43.50	0.381	0.381	0.30	0.30	0.114	5%
44.00	0.39				0.244	1.00	31	43.50	44.50	0.244	0.244	0.39	0.39	0.095	4%
45.00	0.30				0.119	1.00	32	44.50	45.50	0.119	0.119	0.30	0.30	0.036	1%
46.00	0.20				0.073	1.00	33	45.50	46.50	0.073	0.073	0.20	0.20	0.015	1%
47.00	0.00				0.000	1.00	34	46.50	47.00	0.018	0.018	0.05	0.03	0.000	0%
Total Flow:														2.443	1

Total Flow:	2.444	(m <sup>3</sup> /s)
Percieved Measurement Quality:	Excellent	
Total Area:	7.32	(m <sup>2</sup> )
Top Width:	32.30	(m)
Hydraulic Depth:	0.227	(m)
Mean Velocity:	0.334	(m/s)
Froude Number	0.224	
Photographs taken looking at:		
Upstream, downstream, across		

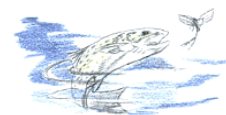
Datalogger Notes: Lakewood transducer/logger	
Datalogger Internal Power:	100%
Datalogger External Power:	79%
Datalogger Memory Used:	
Datalogger Clock:	11:56 AM MST
Laptop Clock:	11:59 AM MST
Dessicant:	Changed
Datalogger:	Lakewood UL-RX
PT:	
Power:	Battery

Notes:



# Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

### Time of Measurement

Date of Measurement: August 9, 2007  
Start Time: 12:45 PM MST  
End Time: 11:50 PM MST

**Weather Conditions:** +20°C, overcast

**River Conditions:** Low stage

### Personnel & Equipment

Measurement Made By: SM, PM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: rebar on LB 2.478  
Water Level Reading: 4.530  
Top of Ice Level Reading:  
Transducer Reading & El.: 0.320  
Other: Top of pipe 0.554

### Setup No. 1

El: 100.000  
El: 97.948  
El: 102.478  
El: 97.628  
El:

### Setup No. 2

El: 100.000  
El: 97.940  
El: 102.438  
El: 97.620  
El:

Datalogger Notes:	Lakewood transducer/logger
Datalogger Internal Power:	100%
Datalogger External Power:	79%
Datalogger Memory Used:	
Datalogger Clock:	11:56 AM MST
Laptop Clock:	11:59 AM MST
Dessicant:	Changed
Datalogger:	Lakewood UL-RX
PT:	
Power:	Battery

Notes:

Hydrometric Measurement / Site Visit Record
S14A - Ells River at CNRL Bridge



Regional Aquatics Monitoring Program

Measurement Location
River/Stream: Ells River at CNRL Bridge
Location: Ells River at CNRL Bridge
Site Name: S14A
Coordinates & Legal: 6344947 N, 455748 E
Time of Measurement
Date of Measurement: September 21, 2007
Start Time: 9:45 AM MST
End Time: 10:30 AM MST
Weather Conditions: +11°C, overcast
River Conditions: Low stage

Personnel & Equipment
Measurement Made By: sm jms
Data Entry By: JMS
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521
Level Readings
Bench Mark Reading: rebar on LB 2.452
Water Level Reading: 4.495
Top of Ice Level Reading:
Transducer Reading & El.:
Other: Top of pipe

Table with 2 columns: Setup No. 1 and Setup No. 2. Rows include El., 100.000, 2.451, 97.957, 4.494, 102.452, 97.957, 0.000, 97.957.

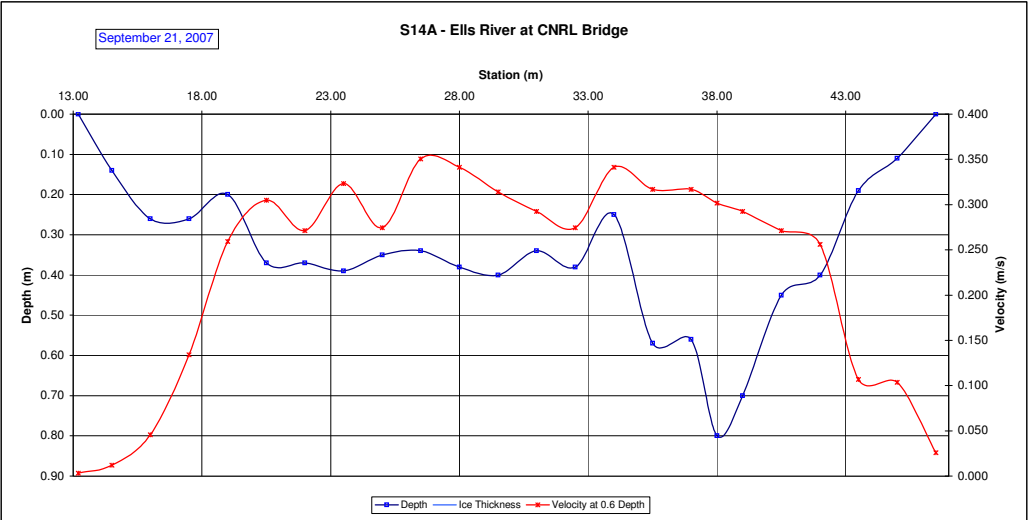
Table with 15 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Rows include data for stations 13.20 to 46.50.

Summary table with 4 columns: Total Flow, Percieved Measurement Quality, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number. Values include 3.165, Good, 11.57, 33.30, 0.347, 0.274, 0.148.

Datalogger Notes table with 4 columns: Datalogger Notes, Datalogger Internal Power, Datalogger External Power, Datalogger Memory Used, Datalogger Clock, Laptop Clock, Dessicant, Datalogger, PT, Power. Values include Lakewood transducer/logger, 1, 11:45 PM, 8:22 AM, Changed, Lakewood UL-RX, Battery.

Notes:
Optimum NFG level is suspect too much up and down
lakewood level NFG, temp ok

lakewood thermistor 6.152
lakewood SN# 41045-0406
Datalogger Clock: 8:35 AM
Laptop Clock: 8:36 AM
Datalogger Internal Power: 11.34v 100%
Datalogger External Power: 11.56 74%
Datalogger Memory Used: 60%



# Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

## Time of Measurement

Date of Measurement: September 25, 2007  
Start Time: 9:45 AM MST  
End Time: 10:30 AM MST

**Weather Conditions:** +11 °C, overcast

**River Conditions:** Low stage

## Personnel & Equipment

Measurement Made By: sm jms  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: rebar on LB 2.475  
Water Level Reading: 4.522  
Top of Ice Level Reading:  
Transducer Reading & El.: 0.910  
Other: Top of pipe 0.560

## Setup No. 1

El: 100.000  
El: 97.953  
El: 102.475  
El: 97.043  
El:

## Setup No. 2

2.472 El: 100.000  
4.520 El: 97.952 97.953  
El: 102.472  
0.910 El: 97.042 97.043  
0.557 El:

Datalogger Notes:	Lakewood transducer/logger		
Datalogger Internal Power:			
Datalogger External Power:			
Datalogger Memory Used:	1		
Datalogger Clock:	11:45 PM		MST
Laptop Clock:	8:22 AM		MST
Dessicant:	Changed		
Datalogger:	Lakewood UL-RX		
PT:			
Power:	Battery		

## Notes:

data logger wired incorrectly  
problem resolved

# Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

## Time of Measurement

Date of Measurement: October 23, 2007  
Start Time: 7:08 AM MST  
End Time: 8:00 AM MST

## Weather Conditions:

+3°C, overcast

## River Conditions:

Low stage

## Personnel & Equipment

Measurement Made By: ff sm  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: rebar on LB 2.551  
Water Level Reading: 4.588  
Top of Ice Level Reading:  
Transducer Reading & El.: 0.899  
Other: Top of pipe 0.631

## Setup No. 1

El: 100.000  
El: 97.963  
El: 102.551  
El: 97.064

## Setup No. 2

El: 100.000  
El: 97.965  
El: 102.420  
El: 97.066

## Measurement Data

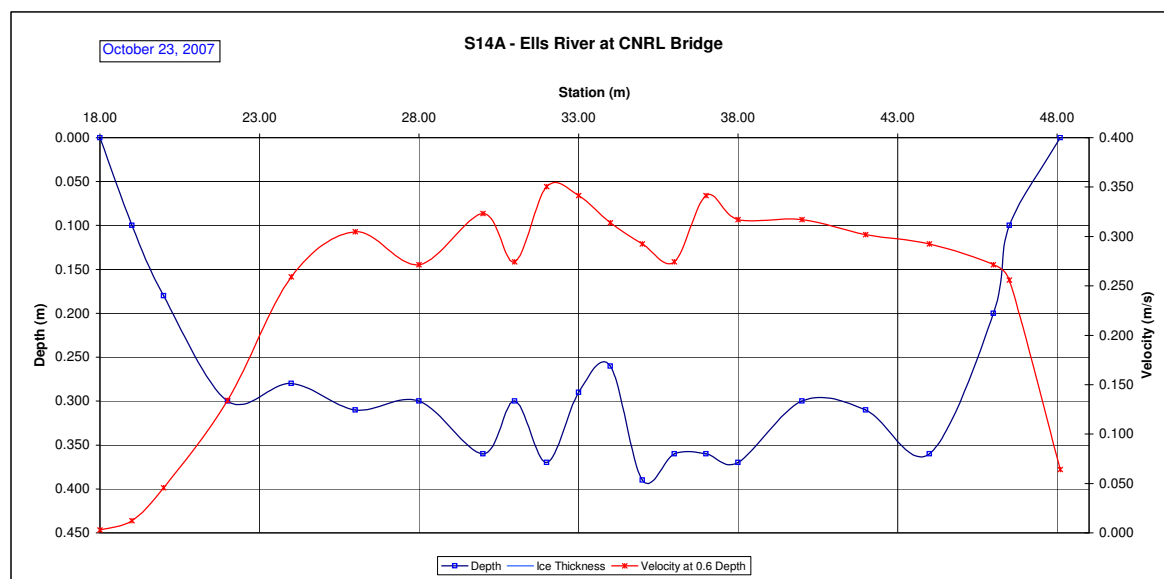
Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
18.00	0.000				0.000	1.00	1	18.00	18.50	0.003	0.003	0.03	0.01	0.000	0%	
19.00	0.100				0.012	1.00	2	18.50	19.50	0.012	0.012	0.10	0.10	0.001	0%	
20.00	0.180				0.046	1.00	3	19.50	21.00	0.046	0.046	0.18	0.27	0.012	1%	
22.00	0.300				0.134	1.00	4	21.00	23.00	0.134	0.134	0.30	0.60	0.080	3%	
24.00	0.280				0.259	1.00	5	23.00	25.00	0.259	0.259	0.28	0.56	0.145	6%	
26.00	0.310				0.305	1.00	6	25.00	27.00	0.305	0.305	0.31	0.62	0.189	8%	
28.00	0.300				0.271	1.00	7	27.00	29.00	0.271	0.271	0.30	0.60	0.163	7%	
30.00	0.360				0.323	1.00	8	29.00	30.50	0.323	0.323	0.36	0.54	0.174	7%	
31.00	0.300				0.274	1.00	9	30.50	31.50	0.274	0.274	0.30	0.30	0.082	3%	
32.00	0.370				0.351	1.00	10	31.50	32.50	0.351	0.351	0.37	0.37	0.130	6%	
33.00	0.290				0.341	1.00	11	32.50	33.50	0.341	0.341	0.29	0.29	0.099	4%	
34.00	0.260				0.314	1.00	12	33.50	34.50	0.314	0.314	0.26	0.26	0.082	3%	
35.00	0.390				0.293	1.00	13	34.50	35.50	0.293	0.293	0.39	0.39	0.114	5%	
36.00	0.360				0.274	1.00	14	35.50	36.50	0.274	0.274	0.36	0.36	0.099	4%	
37.00	0.360				0.341	1.00	15	36.50	37.50	0.341	0.341	0.36	0.36	0.123	5%	
38.00	0.370				0.317	1.00	16	37.50	39.00	0.317	0.317	0.37	0.56	0.176	7%	
40.00	0.300				0.317	1.00	17	39.00	41.00	0.317	0.317	0.30	0.60	0.190	8%	
42.00	0.310				0.302	1.00	18	41.00	43.00	0.302	0.302	0.31	0.62	0.187	8%	
44.00	0.360				0.293	1.00	19	43.00	45.00	0.293	0.293	0.36	0.72	0.211	9%	
46.00	0.200				0.271	1.00	20	45.00	46.25	0.271	0.271	0.20	0.25	0.068	3%	
46.50	0.100				0.256	1.00	21	46.25	47.30	0.256	0.256	0.10	0.11	0.027	1%	
48.10	0.000				0.000	1.00	22	47.30	48.10	0.064	0.064	0.03	0.02	0.001	0%	
Total Flow:														2.354	1	

Total Flow:	2.354	(m <sup>3</sup> /s)
Percieved Measurement Quality:	Good	
Total Area:	8.50	(m <sup>2</sup> )
Top Width:	30.10	(m)
Hydraulic Depth:	0.282	(m)
Mean Velocity:	0.277	(m/s)
Froude Number	0.166	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Lakewood transducer/logger
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	1
Datalogger Clock:	6:31 AM MST
Laptop Clock:	6:41 AM MST
Dessicant:	Changed
Datalogger:	Lakewood UL-RX
PT:	
Power:	Battery

Notes:

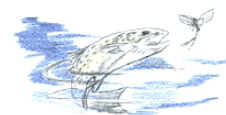
optimum TD showed very little change but manual tests indicates proper function  
lakewood thermistor is not recording temp properly





# Hydrometric Measurement / Site Visit Record

S14A - Ells River at CNRL Bridge



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Ells River at CNRL Bridge  
Location: Ells River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

### Time of Measurement

Date of Measurement: October 26, 2007  
Start Time: 10:30 AM MST  
End Time: MST

**Weather Conditions:** -2°C, overcast

**River Conditions:** Low stage

### Personnel & Equipment

Measurement Made By: ff sm  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: rebar on LB 2.425  
Water Level Reading: 4.452  
Top of Ice Level Reading:  
Transducer Reading & El.: 0.807  
Other: Top of pipe 0.505

### Setup No. 1

El: 100.000  
El: 97.973  
El: 102.425  
El: 97.166  
El:

### Setup No. 2

El: 100.000  
El: 97.973  
El: 102.394  
El: 97.166  
El: 97.166

Datalogger Notes:	Lakewood transducer/logger
Datalogger Internal Power:	4.85
Datalogger External Power:	12.50
Datalogger Memory Used:	1
Datalogger Clock:	MST
Laptop Clock:	MST
Dessicant:	good
Datalogger:	Lakewood UL-RX
PT:	
Power:	Battery

### Notes:

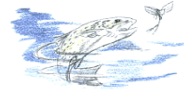
therm 0.34 C

Thermistor added on ALG 11, TD on ALG 13  
record rate set to 30 min for winter

|

# Hydrometric Measurement / Site Visit Record

## S14A - Eils River at CNRL Bridge



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Eils River  
Location: Eils River at CNRL Bridge  
Site Name: S14A  
Coordinates & Legal: 6344947 N, 455748 E

### Time of Measurement

Date of Measurement: December 9, 2007  
Start Time: 12:20 PM MST  
End Time: 1:03 PM MST

### Weather Conditions:

Overcast

### River Conditions:

Ice Cover

### Personnel & Equipment

Measurement Made By: JMS/JS/JV  
Data Entry By: SMS  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: rebar 2.253  
Water Level Reading: 4.112  
Top of Ice Level Reading: 4.083  
Transducer Reading & Est. El.: 0.976  
Other: top of logger box 0.332

### Setup No. 1

El: 100.000 2.213  
El: 98.141 4.075  
El: 98.170 4.069  
El: 97.165 0.976  
El: 101.921 0.292

### Setup No. 2

El: 100.000  
El: 98.138  
El: 98.144  
El: 97.162  
El: 101.921

### Average

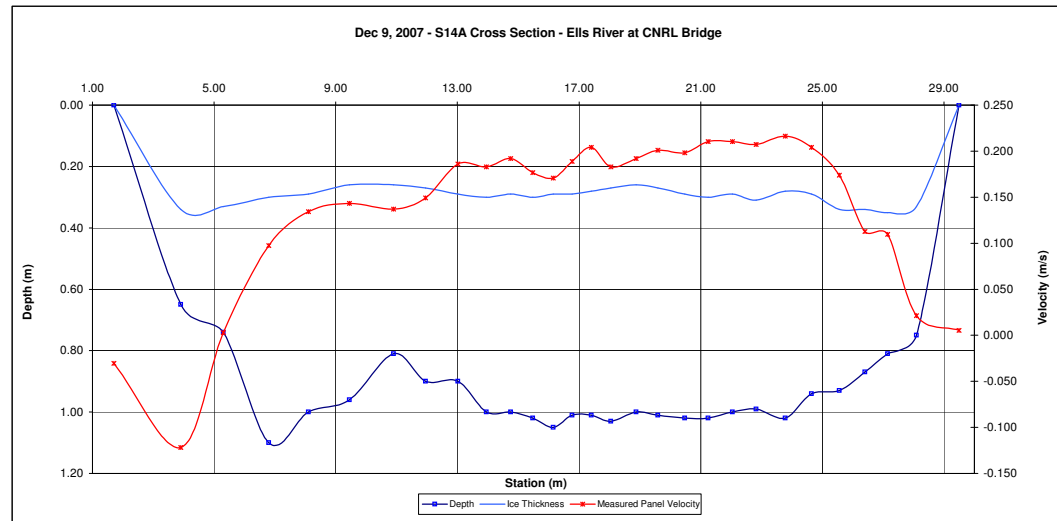
98.140  
97.163  
101.921

Measured Data						Measurement Data										Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)							
1.70	0.00	0.00				0.90	1	1.70	2.80	-0.030	-0.027	0.08	0.09	-0.002	0%						
3.90	0.65	0.34			-0.122	0.90	2	2.80	4.60	-0.122	-0.110	0.31	0.56	-0.061	-3%						
5.30	0.74	0.33			0.003	0.90	3	4.60	6.05	0.003	0.003	0.41	0.59	0.002	0%						
6.80	1.10	0.30			0.098	0.90	4	6.05	7.45	0.098	0.088	0.80	1.12	0.098	4%						
8.10	1.00	0.29			0.134	0.90	5	7.45	8.78	0.134	0.121	0.71	0.94	0.114	5%						
9.45	0.96	0.26			0.143	0.90	6	8.78	10.18	0.143	0.129	0.70	0.98	0.126	6%						
10.90	0.81	0.26			0.137	0.90	7	10.18	11.43	0.137	0.123	0.55	0.69	0.085	4%						
11.95	0.90	0.27			0.149	0.90	8	11.43	12.49	0.149	0.134	0.63	0.67	0.090	4%						
13.02	0.90	0.29			0.186	0.90	9	12.49	13.49	0.186	0.167	0.61	0.61	0.102	5%						
13.95	1.00	0.30			0.183	0.90	10	13.49	14.35	0.183	0.165	0.70	0.61	0.100	4%						
14.75	1.00	0.29			0.192	0.90	11	14.35	15.12	0.192	0.173	0.71	0.54	0.094	4%						
15.48	1.02	0.30			0.177	0.90	12	15.12	15.82	0.177	0.159	0.72	0.50	0.080	4%						
16.15	1.05	0.29			0.171	0.90	13	15.82	16.46	0.171	0.154	0.76	0.49	0.075	3%						
16.77	1.01	0.29			0.189	0.90	14	16.46	17.09	0.189	0.170	0.72	0.45	0.077	3%						
17.40	1.01	0.28			0.204	0.90	15	17.09	17.73	0.204	0.184	0.73	0.47	0.086	4%						
18.05	1.03	0.27			0.183	0.90	16	17.73	18.47	0.183	0.165	0.76	0.56	0.093	4%						
18.88	1.00	0.26			0.192	0.90	17	18.47	19.24	0.192	0.173	0.74	0.57	0.098	4%						
19.59	1.01	0.27			0.201	0.90	18	19.24	20.04	0.201	0.181	0.74	0.59	0.107	5%						
20.48	1.02	0.29			0.198	0.90	19	20.04	20.87	0.198	0.178	0.73	0.61	0.108	5%						
21.25	1.02	0.30			0.210	0.90	20	20.87	21.65	0.210	0.189	0.72	0.57	0.107	5%						
22.05	1.00	0.29			0.210	0.90	21	21.65	22.44	0.210	0.189	0.71	0.56	0.105	5%						
22.82	0.99	0.31			0.207	0.90	22	22.44	23.30	0.207	0.187	0.68	0.59	0.110	5%						
23.78	1.02	0.28			0.216	0.90	23	23.30	24.21	0.216	0.195	0.74	0.67	0.131	6%						
24.64	0.94	0.29			0.204	0.90	24	24.21	25.10	0.204	0.184	0.65	0.58	0.106	5%						
25.56	0.93	0.34			0.174	0.90	25	25.10	25.98	0.174	0.156	0.59	0.52	0.081	4%						
26.40	0.87	0.34			0.113	0.90	26	25.98	26.78	0.113	0.101	0.53	0.42	0.043	2%						
27.15	0.81	0.35			0.110	0.90	27	26.78	28.25	0.110	0.099	0.46	0.68	0.067	3%						
28.10	0.75	0.33			0.021	0.90	28	28.25	28.80	0.021	0.019	0.42	0.23	0.004	0%						
29.50	0.00	0.00				0.90	29	28.80	29.50	0.005	0.005	0.11	0.07	0.000	0%						
Total Flow:														2.226	1.000						

Total Flow:	2.226	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	16.52	(m <sup>2</sup> )
Top Width:	27.80	(m)
Hydraulic Depth:	0.594	(m)
Mean Velocity:	0.135	(m/s)
Froude Number:	0.056	
Photographs taken looking at:		
Photographs taken:		

Datalogger Notes:	
Datalogger Internal Power:	0.00
Datalogger External Power:	0.00
Datalogger Memory Used:	14%
Datalogger Clock:	12:09
Laptop Clock:	12:14
Dessicant:	Good
Datalogger:	1797
PT:	39666
Power:	Battery

Notes: TD reading = 0.957259  
Volt meter reading 12.48 V on external battery.  
Water Temp = 0.180676 C



# Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River  
Location: Tar River  
Site Name: S15A  
Coordinates & Legal: 6353391 N, 458395 E

## Time of Measurement

Date of Measurement: May 1, 2007  
Start Time: 4:15 PM MDT  
End Time: 4:45 PM MDT

## Weather Conditions:

+15 C, Overcast

## River Conditions:

High Stage

## Personnel & Equipment

Measurement Made By: JMS/PM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in stump  
Water Level Reading: 2.441  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 1.012  
Other: nail in tree 0.687

## Setup No. 1

El: 100.000  
El: 99.118  
El: 98.106  
El: 100.872

## Setup No. 2

El: 100.000  
El: 99.119  
El: 98.107  
El: 100.871

99.119

98.106

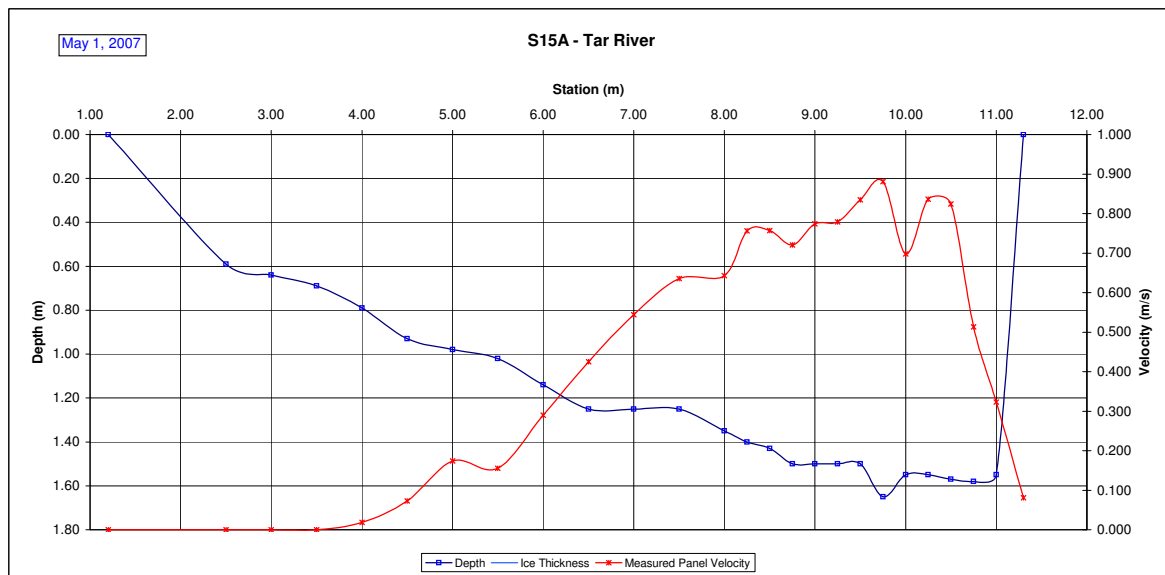
## Measurement Data

Measured Data						Calculated Data									Percentage of Total
		Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
Station (m)	Depth (m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
	1.20	0.00			0.00	1.00	1	1.20	1.85	0.000	0.000	0.15	0.10	0.000	0%
	2.50	0.59			0.00	1.00	2	1.85	2.75	0.000	0.000	0.59	0.53	0.000	0%
	3.00	0.64			0.00	1.00	3	2.75	3.25	0.000	0.000	0.64	0.32	0.000	0%
	3.50	0.69			0.00	1.00	4	3.25	3.75	0.000	0.000	0.69	0.35	0.000	0%
	4.00	0.79			0.02	1.00	5	3.75	4.25	0.018	0.018	0.79	0.40	0.007	0%
	4.50	0.93			0.07	1.00	6	4.25	4.75	0.073	0.073	0.93	0.47	0.034	1%
	5.00	0.98			0.17	1.00	7	4.75	5.25	0.174	0.174	0.98	0.49	0.085	2%
	5.50	1.02			0.16	1.00	8	5.25	5.75	0.155	0.155	1.02	0.51	0.079	2%
	6.00	1.14			0.29	1.00	9	5.75	6.25	0.290	0.290	1.14	0.57	0.165	3%
	6.50	1.25	0.36	0.49		1.00	10	6.25	6.75	0.425	0.425	1.25	0.63	0.266	5%
	7.00	1.25	0.49	0.60		1.00	11	6.75	7.25	0.544	0.544	1.25	0.63	0.340	7%
	7.50	1.25	0.61	0.66		1.00	12	7.25	7.75	0.636	0.636	1.25	0.63	0.397	8%
	8.00	1.35	0.68	0.61		1.00	13	7.75	8.13	0.643	0.643	1.35	0.51	0.326	6%
	8.25	1.40	0.74	0.77		1.00	14	8.13	8.38	0.756	0.756	1.40	0.35	0.265	5%
	8.50	1.43	0.79	0.73		1.00	15	8.38	8.63	0.757	0.757	1.43	0.36	0.271	5%
	8.75	1.50	0.86	0.59		1.00	16	8.63	8.88	0.721	0.721	1.50	0.38	0.270	5%
	9.00	1.50	0.84	0.71		1.00	17	8.88	9.13	0.774	0.774	1.50	0.38	0.290	6%
	9.25	1.50	0.78	0.78		1.00	18	9.13	9.38	0.779	0.779	1.50	0.38	0.292	6%
	9.50	1.50	0.78	0.89		1.00	19	9.38	9.63	0.835	0.835	1.50	0.38	0.313	6%
	9.75	1.65	0.94	0.82		1.00	20	9.63	9.88	0.881	0.881	1.65	0.41	0.363	7%
	10.00	1.55	0.75	0.65		1.00	21	9.88	10.13	0.698	0.698	1.55	0.39	0.270	5%
	10.25	1.55	1.03	0.65		1.00	22	10.13	10.38	0.837	0.837	1.55	0.39	0.324	6%
	10.50	1.57	0.97	0.68		1.00	23	10.38	10.63	0.824	0.824	1.57	0.39	0.324	6%
	10.75	1.58	0.59	0.44		1.00	24	10.63	10.88	0.514	0.514	1.58	0.40	0.203	4%
	11.00	1.55	0.24	0.41		1.00	25	10.88	11.15	0.323	0.323	1.55	0.43	0.138	3%
	11.30	0.00			0.00	1.00	26	11.30	11.30	0.081	0.081	0.00	0.00	0.000	0%
Total Flow:													5.023	1	

Total Flow:	5.023	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	10.71	(m <sup>2</sup> )
Top Width:	10.10	(m)
Hydraulic Depth:	1.061	(m)
Mean Velocity:	0.469	(m/s)
Froude Number	0.145	
Photographs taken looking at:		
Upstream, downstream, across		

Notes: TSS sample taken.

Datalogger Notes:		Database # 608
Datalogger Internal Power:	4.69 V	
Datalogger External Power:	13.01	
Datalogger Memory Used:	16% used	
Datalogger Clock:	May 01, 2007 15:04	MST
Laptop Clock:	May 02, 2007 15:12	MST
Dessicant:	Good	
Datalogger:	Optimum DD-128 #0204100608	
PT:	Keller 3psi #0101356	
Power:	Solar panel and internal battery	



# Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River  
Location: Tar River  
Site Name: S15A  
Coordinates & Legal: 6353391 N, 458395 E

## Time of Measurement

Date of Measurement: June 15, 2007  
Start Time: 12:35 PM MDT  
End Time: 12:40 PM MDT

## Weather Conditions:

+10 C, scattered cloud

## River Conditions:

open low stage

## Personnel & Equipment

Measurement Made By: JMS/PM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in Slump 1.568  
Water Level Reading: 3.266  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 0.310  
Other: nail in tree 0.650

## Setup No. 1

El: 100.000 1.613  
El: 98.302 3.310  
El: 97.992 0.310  
El: 100.918 0.700

## Setup No. 2

El: 100.000  
El: 98.303  
El: 97.993  
El: 100.913

98.303

97.992

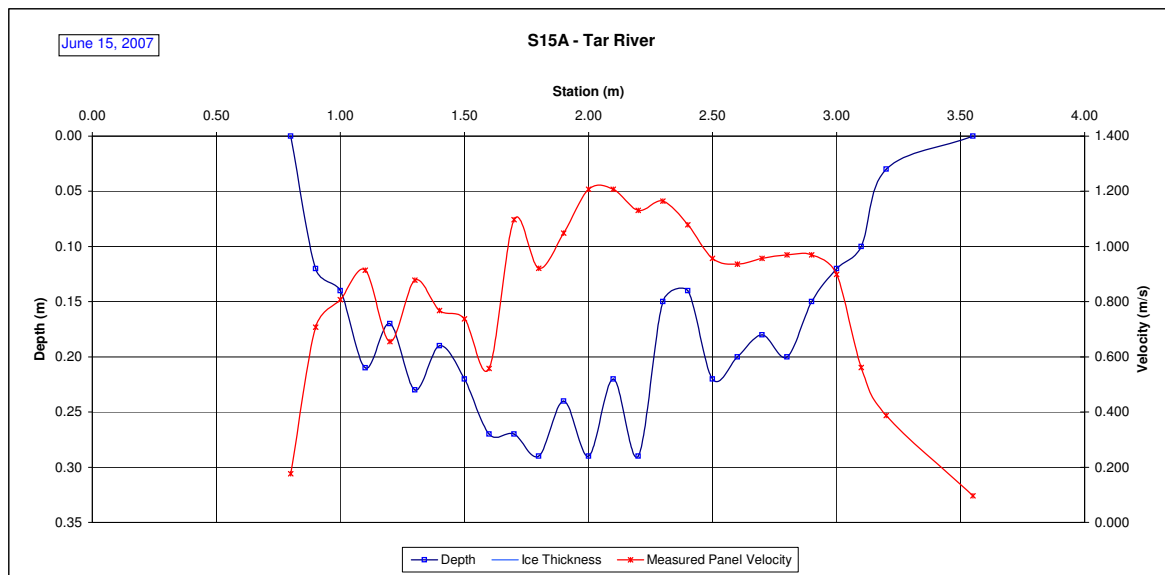
## Measurement Data

Measured Data							Calculated Data								Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)	
RB	0.80	0.00			0.00	1.00	1	0.80	0.85	0.177	0.177	0.03	0.00	0.000	0%
	0.90	0.12			0.71	1.00	2	0.85	0.95	0.707	0.707	0.12	0.01	0.008	2%
	1.00	0.14			0.81	1.00	3	0.95	1.05	0.808	0.808	0.14	0.01	0.011	3%
	1.10	0.21			0.91	1.00	4	1.05	1.15	0.914	0.914	0.21	0.02	0.019	4%
	1.20	0.17			0.66	1.00	5	1.15	1.25	0.655	0.655	0.17	0.02	0.011	3%
	1.30	0.23			0.88	1.00	6	1.25	1.35	0.878	0.878	0.23	0.02	0.020	5%
	1.40	0.19			0.77	1.00	7	1.35	1.45	0.768	0.768	0.19	0.02	0.015	3%
	1.50	0.22			0.74	1.00	8	1.45	1.55	0.738	0.738	0.22	0.02	0.016	4%
	1.60	0.27			0.56	1.00	9	1.55	1.65	0.558	0.558	0.27	0.03	0.015	3%
	1.70	0.27			1.10	1.00	10	1.65	1.75	1.097	1.097	0.27	0.03	0.030	7%
	1.80	0.29			0.92	1.00	11	1.75	1.85	0.920	0.920	0.29	0.03	0.027	6%
	1.90	0.24			1.05	1.00	12	1.85	1.95	1.049	1.049	0.24	0.02	0.025	6%
	2.00	0.29			1.21	1.00	13	1.95	2.05	1.207	1.207	0.29	0.03	0.035	8%
	2.10	0.22			1.21	1.00	14	2.05	2.15	1.207	1.207	0.22	0.02	0.027	6%
	2.20	0.29			1.13	1.00	15	2.15	2.25	1.131	1.131	0.29	0.03	0.033	8%
	2.30	0.15			1.16	1.00	16	2.25	2.35	1.164	1.164	0.15	0.01	0.017	4%
	2.40	0.14			1.08	1.00	17	2.35	2.45	1.079	1.079	0.14	0.01	0.015	3%
	2.50	0.22			0.96	1.00	18	2.45	2.55	0.957	0.957	0.22	0.02	0.021	5%
	2.60	0.20			0.94	1.00	19	2.55	2.65	0.936	0.936	0.20	0.02	0.019	4%
	2.70	0.18			0.96	1.00	20	2.65	2.75	0.957	0.957	0.18	0.02	0.017	4%
	2.80	0.20			0.97	1.00	21	2.75	2.85	0.969	0.969	0.20	0.02	0.019	4%
	2.90	0.15			0.97	1.00	22	2.85	2.95	0.969	0.969	0.15	0.02	0.015	3%
	3.00	0.12			0.90	1.00	23	2.95	3.05	0.899	0.899	0.12	0.01	0.011	2%
	3.10	0.10			0.56	1.00	24	3.05	3.15	0.561	0.561	0.10	0.01	0.006	1%
	3.20	0.03			0.39	1.00	25	3.15	3.38	0.387	0.387	0.03	0.01	0.003	1%
LB	3.55	0.00			0.00	1.00	26	3.55	3.55	0.097	0.097	0.00	0.00	0.000	0%
Total Flow:														0.435	1

Total Flow:	0.435	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.47	(m <sup>2</sup> )
Top Width:	2.75	(m)
Hydraulic Depth:	0.171	(m)
Mean Velocity:	0.927	(m/s)
Froude Number	0.716	
Photographs taken looking at:		
Upstream, downstream, across		

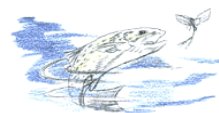
Datalogger Notes:	Database # 608
Datalogger Internal Power:	4.7v
Datalogger External Power:	14.15v
Datalogger Memory Used:	16% used
Datalogger Clock:	Jun 15, 2007 10:51 MST
Laptop Clock:	Jun 15, 2007 10:58 MST
Dessicant:	Good
Datalogger:	Optimum DD-128 #0204100608
PT:	Keller 3psi #0101356
Power:	Solar panel and internal battery

Notes: TSS sample taken.  
TD appears to have over-ranged briefly may 8- may 11



# Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River  
Location: Tar River  
Site Name: S15A  
Coordinates & Legal: 6353391 N, 458395 E

## Time of Measurement

Date of Measurement: August 5, 2007  
Start Time: 10:00 AM MDT  
End Time: 11:00 AM MDT

## Weather Conditions:

+15°C, Overcast

## River Conditions:

Low Stage

## Personnel & Equipment

Measurement Made By: PM/SM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in stump 1.559  
Water Level Reading: 3.305  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El. 0.236  
Other: nail in tree

## Setup No. 1

El: 100.000  
El: 98.254  
El: 98.018

## Setup No. 2

El: 100.000  
El: 98.246  
El: 98.010  
98.250  
98.014

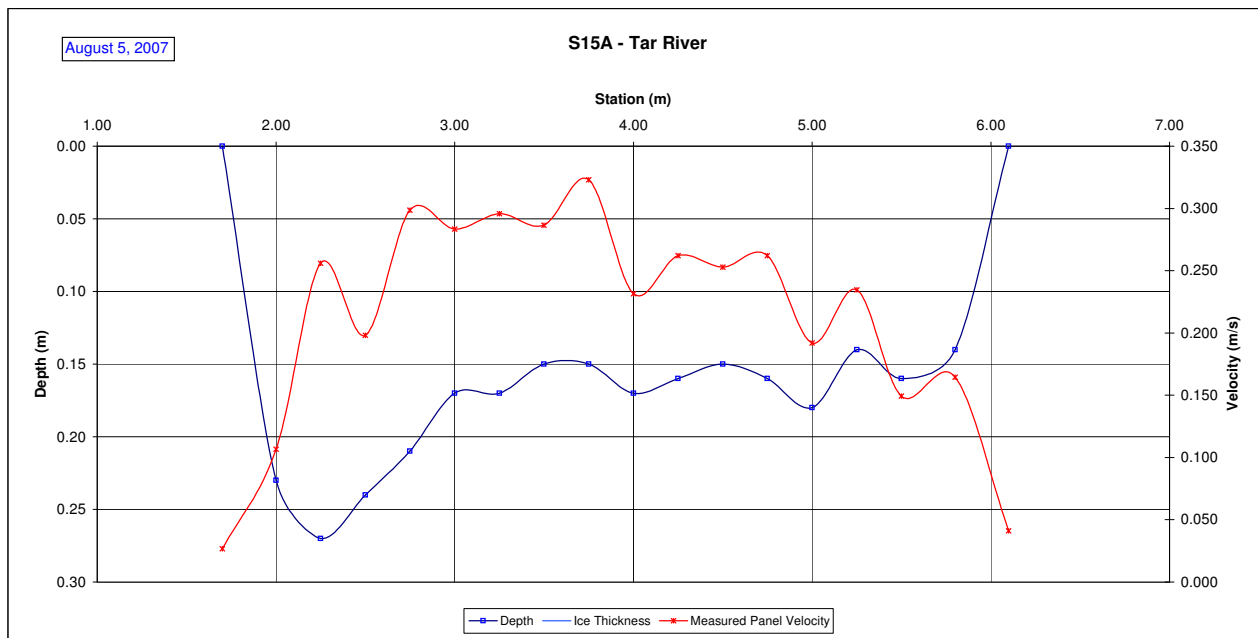
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
6.10	0.00				0.00	1.00	1	6.10	5.95	0.041	0.041	0.04	0.01	0.000	0%	
5.80	0.14				0.16	1.00	2	5.95	5.65	0.165	0.165	0.14	0.04	0.007	4%	
5.50	0.16				0.15	1.00	3	5.65	5.38	0.149	0.149	0.16	0.04	0.007	4%	
5.25	0.14				0.23	1.00	4	5.38	5.13	0.235	0.235	0.14	0.04	0.008	5%	
5.00	0.18				0.19	1.00	5	5.13	4.88	0.192	0.192	0.18	0.05	0.009	5%	
4.75	0.16				0.26	1.00	6	4.88	4.63	0.262	0.262	0.16	0.04	0.010	6%	
4.50	0.15				0.25	1.00	7	4.63	4.38	0.253	0.253	0.15	0.04	0.009	6%	
4.25	0.16				0.26	1.00	8	4.38	4.13	0.262	0.262	0.16	0.04	0.010	6%	
4.00	0.17				0.23	1.00	9	4.13	3.88	0.232	0.232	0.17	0.04	0.010	6%	
3.75	0.15				0.32	1.00	10	3.88	3.63	0.323	0.323	0.15	0.04	0.012	7%	
3.50	0.15				0.29	1.00	11	3.63	3.38	0.287	0.287	0.15	0.04	0.011	6%	
3.25	0.17				0.30	1.00	12	3.38	3.13	0.296	0.296	0.17	0.04	0.013	8%	
3.00	0.17				0.28	1.00	13	3.13	2.88	0.283	0.283	0.17	0.04	0.012	7%	
2.75	0.21				0.30	1.00	14	2.88	2.63	0.299	0.299	0.21	0.05	0.016	9%	
2.50	0.24				0.20	1.00	15	2.63	2.38	0.198	0.198	0.24	0.06	0.012	7%	
2.25	0.27				0.26	1.00	16	2.38	2.13	0.256	0.256	0.27	0.07	0.017	10%	
2.00	0.23				0.11	1.00	17	2.13	2.00	0.107	0.107	0.23	0.03	0.003	2%	
1.70	0.00				0.00	1.00	18	1.70	1.70	0.027	0.027	0.00	0.00	0.000	0%	
									0.00					Total Flow:	0.166	

Total Flow:	0.166	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.70	(m <sup>2</sup> )
Top Width:	4.40	(m)
Hydraulic Depth:	0.159	(m)
Mean Velocity:	0.237	(m/s)
Froude Number	0.190	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	4.69 V	
Datalogger External Power:	13.09	
Datalogger Memory Used:	25% used	
Datalogger Clock:	Aug 05, 2007 10:00	MST
Laptop Clock:	Aug 05, 2007 11:00	MST
Dessicant:	Bad, Change next time	
Datalogger:	Optimum DD-128 #0204100608	
PT:	Keller 3psi #0101356	
Power:	Solar panel and internal battery	

Notes: TSS sample taken.



# Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River  
Location: Tar River  
Site Name: S15A  
Coordinates & Legal: 6353391 N, 458395 E

## Time of Measurement

Date of Measurement: September 21, 2007  
Start Time: 5:16 PM MDT  
End Time: MDT

## Weather Conditions:

Weather Conditions: sunny calm

## River Conditions:

River Conditions: Low Stage

## Personnel & Equipment

Measurement Made By: jms  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in stump 1.610  
Water Level Reading: 3.217  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 0.540  
Other: nail in tree

## Setup No. 1

El: 100.000  
El: 98.393  
El: 97.853

## Setup No. 2

El: 100.000  
El: 98.392  
El: 97.852  
El: 98.393  
El: 97.853

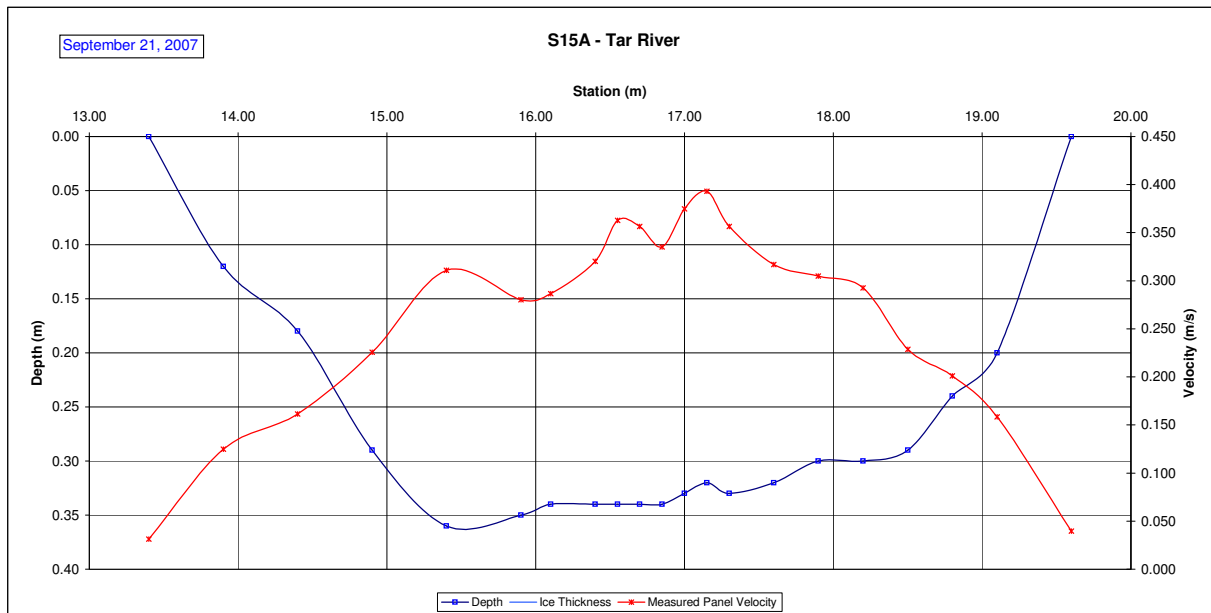
Measured Data						Measurement Data										
						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
					0.00	1.00	1	19.60	19.35	0.040	0.040	0.05	0.01	0.000	0%	
19.60	0.00				0.16	1.00	2	19.35	18.95	0.158	0.158	0.20	0.08	0.013	3%	
19.10	0.20				0.20	1.00	3	18.95	18.65	0.201	0.201	0.24	0.07	0.014	3%	
18.80	0.24				0.23	1.00	4	18.65	18.35	0.229	0.229	0.29	0.09	0.020	4%	
18.50	0.29				0.29	1.00	5	18.35	18.05	0.293	0.293	0.30	0.09	0.026	6%	
18.20	0.30				0.30	1.00	6	18.05	17.75	0.305	0.305	0.30	0.09	0.027	6%	
17.90	0.30				0.32	1.00	7	17.75	17.45	0.317	0.317	0.32	0.10	0.030	7%	
17.60	0.32				0.36	1.00	8	17.45	17.23	0.357	0.357	0.33	0.07	0.026	6%	
17.30	0.33				0.39	1.00	9	17.23	17.08	0.393	0.393	0.32	0.05	0.019	4%	
17.15	0.32				0.37	1.00	10	17.08	16.93	0.375	0.375	0.33	0.05	0.019	4%	
17.00	0.33				0.34	1.00	11	16.93	16.78	0.335	0.335	0.34	0.05	0.017	4%	
16.85	0.34				0.36	1.00	12	16.78	16.63	0.357	0.357	0.34	0.05	0.018	4%	
16.70	0.34				0.36	1.00	13	16.63	16.48	0.363	0.363	0.34	0.05	0.018	4%	
16.55	0.34				0.32	1.00	14	16.48	16.25	0.320	0.320	0.34	0.08	0.024	6%	
16.40	0.34				0.29	1.00	15	16.25	16.00	0.287	0.287	0.34	0.09	0.024	5%	
16.10	0.34				0.28	1.00	16	16.00	15.65	0.280	0.280	0.35	0.12	0.034	8%	
15.90	0.35				0.31	1.00	17	15.65	15.15	0.311	0.311	0.36	0.18	0.056	13%	
15.40	0.36				0.23	1.00	18	15.15	14.65	0.226	0.226	0.29	0.15	0.033	7%	
14.90	0.29				0.16	1.00	19	14.65	14.15	0.162	0.162	0.18	0.09	0.015	3%	
14.40	0.18				0.12	1.00	20	14.15	13.65	0.125	0.125	0.12	0.06	0.007	2%	
13.90	0.12				0.00	1.00	21	13.40	13.40	0.031	0.031	0.03	0.00	0.000	0%	
13.40	0.00							0.00					Total Flow:		0.443	1

Total Flow:	0.443	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.61	(m <sup>2</sup> )
Top Width:	6.20	(m)
Hydraulic Depth:	0.260	(m)
Mean Velocity:	0.275	(m/s)
Froude Number	0.172	
Photographs taken looking at:		
Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power: 4.69 V  
Datalogger External Power: 13.09  
Datalogger Memory Used: 25% used  
Datalogger Clock: Sep 21, 2007 16:11 MST  
Laptop Clock: Sep 21, 2007 16:19 MST  
Dessicant: new  
Datalogger: Optimum DD-128 #0204100608  
PT: Keller 3psi #0101356  
Power: Solar panel and internal battery

Notes: battery dead, replaced battery  
removed solar panel from wiring



# Hydrometric Measurement / Site Visit Record

S15A - Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River  
Location: Tar River  
Site Name: S15A  
Coordinates & Legal: 6353391 N, 458395 E

## Time of Measurement

Date of Measurement: October 22, 2007  
Start Time: 2:39 PM MDT  
End Time: 2:51 PM MDT

## Weather Conditions:

overcast cool

## River Conditions:

Low Stage

## Personnel & Equipment

Measurement Made By: FF/SM  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Nail in stump	1.740	1.721
Water Level Reading:	3.465	3.442
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.485	0.485
Other: nail in tree	0.829	0.809

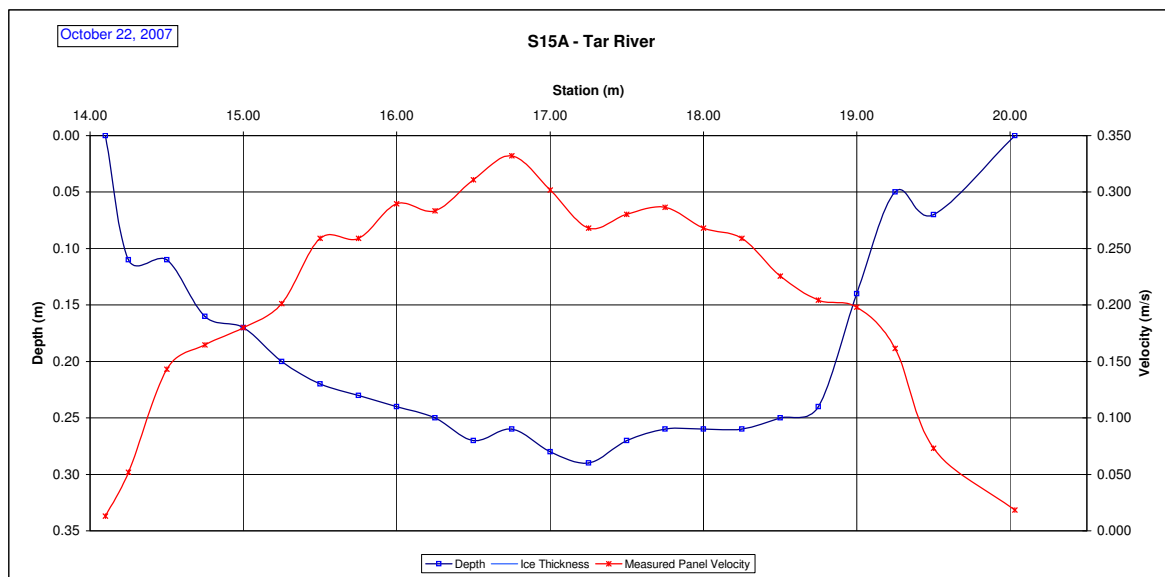
## Measurement Data

Measured Data							Calculated Data								Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)	
14.10	0.00				0.00	1.00	1	14.10	14.18	0.013	0.013	0.03	0.00	0.000	0%
14.25	0.11				0.05	1.00	2	14.18	14.38	0.052	0.052	0.11	0.02	0.001	0%
14.50	0.11				0.14	1.00	3	14.38	14.63	0.143	0.143	0.11	0.03	0.004	1%
14.75	0.16				0.16	1.00	4	14.63	14.88	0.165	0.165	0.16	0.04	0.007	2%
15.00	0.17				0.18	1.00	5	14.88	15.13	0.180	0.180	0.17	0.04	0.008	3%
15.25	0.20				0.20	1.00	6	15.13	15.38	0.201	0.201	0.20	0.05	0.010	4%
15.50	0.22				0.26	1.00	7	15.38	15.63	0.259	0.259	0.22	0.06	0.014	5%
15.75	0.23				0.26	1.00	8	15.63	15.88	0.259	0.259	0.23	0.06	0.015	5%
16.00	0.24				0.29	1.00	9	15.88	16.13	0.290	0.290	0.24	0.06	0.017	6%
16.25	0.25				0.28	1.00	10	16.13	16.38	0.283	0.283	0.25	0.06	0.018	6%
16.50	0.27				0.31	1.00	11	16.38	16.63	0.311	0.311	0.27	0.07	0.021	7%
16.75	0.26				0.33	1.00	12	16.63	16.88	0.332	0.332	0.26	0.07	0.022	8%
17.00	0.28				0.30	1.00	13	16.88	17.13	0.302	0.302	0.28	0.07	0.021	7%
17.25	0.29				0.27	1.00	14	17.13	17.38	0.268	0.268	0.29	0.07	0.019	7%
17.50	0.27				0.28	1.00	15	17.38	17.63	0.280	0.280	0.27	0.07	0.019	7%
17.75	0.26				0.29	1.00	16	17.63	17.88	0.287	0.287	0.26	0.07	0.019	7%
18.00	0.26				0.27	1.00	17	17.88	18.13	0.268	0.268	0.26	0.07	0.017	6%
18.25	0.26				0.26	1.00	18	18.13	18.38	0.259	0.259	0.26	0.07	0.017	6%
18.50	0.25				0.23	1.00	19	18.38	18.63	0.226	0.226	0.25	0.06	0.014	5%
18.75	0.24				0.20	1.00	20	18.63	18.88	0.204	0.204	0.24	0.06	0.012	4%
19.00	0.14				0.20	1.00	21	18.88	19.13	0.198	0.198	0.14	0.04	0.007	2%
19.25	0.05				0.16	1.00	22	19.13	19.38	0.162	0.162	0.05	0.01	0.002	1%
19.50	0.07				0.07	1.00	23	19.38	19.77	0.073	0.073	0.07	0.03	0.002	1%
20.03	0.00				0.00	1.00	24	20.03	20.03	0.018	0.018	0.02	0.00	0.000	0%
Total Flow:														0.286	100%

Total Flow:	0.286	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.15	(m <sup>2</sup> )
Top Width:	5.93	(m)
Hydraulic Depth:	0.195	(m)
Mean Velocity:	0.248	(m/s)
Froude Number	0.179	
Photographs taken looking at: Upstream, downstream, across		

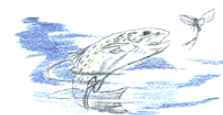
Datalogger Notes:		
Datalogger Internal Power:	4.85V	
Datalogger External Power:	11.81V	
Datalogger Memory Used:	32% used	
Datalogger Clock:	Oct 22, 2007 13:23	MST
Laptop Clock:	Oct 22, 2007 13:32	MST
Dessicant:	new	
Datalogger:	Optimum DD-128 #0204100608	
PT:	Keller 3psi #0101356	
Power:	Solar panel and internal battery	

Notes: td removed for winter  
thermistor scaling may be suspect  
thermistor submerged in sediment  
Water thermistor reading 18.9°C - Wrong scaling?



# Hydrometric Measurement / Site Visit Record

## S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Calumet River  
Location: Calumet River Upland Tributary  
Site Name: S18A  
Coordinates & Legal:

### Time of Measurement

Date of Measurement: April 27, 2007  
Start Time: 10:05 AM MDT  
End Time: MDT

Weather Conditions: +10 C, scattered clouds

River Conditions: High stage

### Personnel & Equipment

Measurement Made By: JMS, PM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Nail in Tree	0.794	0.791
Water Level Reading:	2.074	2.072
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	1.115	1.115
Other:		

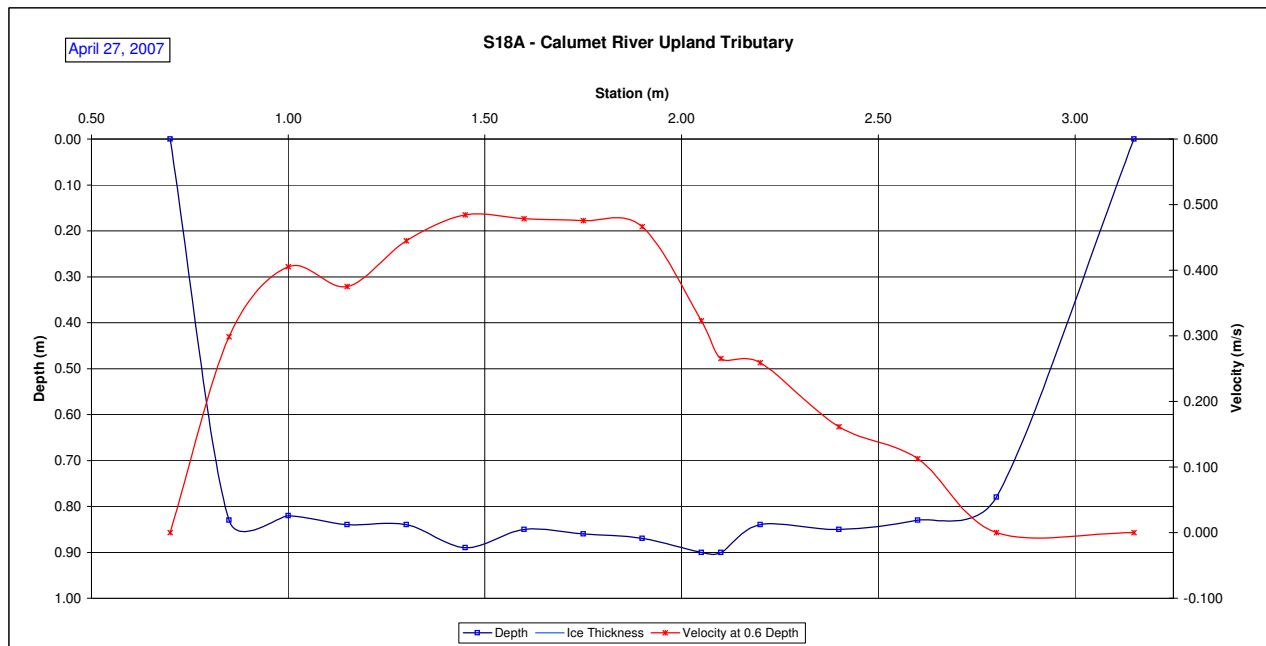
### Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.70	0.00				0.000	1.00	1	0.70	0.78	0.075	0.075	0.21	0.02	0.001	0%	
0.85	0.83				0.299	1.00	2	0.78	0.93	0.299	0.299	0.83	0.12	0.037	7%	
1.00	0.82				0.405	1.00	3	0.93	1.08	0.405	0.405	0.82	0.12	0.050	9%	
1.15	0.84				0.375	1.00	4	1.08	1.23	0.375	0.375	0.84	0.13	0.047	8%	
1.30	0.84				0.445	1.00	5	1.23	1.38	0.445	0.445	0.84	0.13	0.056	10%	
1.45	0.89				0.485	1.00	6	1.38	1.53	0.485	0.485	0.89	0.13	0.065	11%	
1.60	0.85				0.479	1.00	7	1.53	1.68	0.479	0.479	0.85	0.13	0.061	11%	
1.75	0.86				0.475	1.00	8	1.68	1.83	0.475	0.475	0.86	0.13	0.061	11%	
1.90	0.87				0.466	1.00	9	1.83	1.98	0.466	0.466	0.87	0.13	0.061	11%	
2.05	0.90				0.323	1.00	10	1.98	2.08	0.323	0.323	0.90	0.09	0.029	5%	
2.10	0.90				0.265	1.00	11	2.08	2.15	0.265	0.265	0.90	0.07	0.018	3%	
2.20	0.84				0.259	1.00	12	2.15	2.30	0.259	0.259	0.84	0.13	0.033	6%	
2.40	0.85				0.162	1.00	13	2.30	2.50	0.162	0.162	0.85	0.17	0.027	5%	
2.60	0.83				0.113	1.00	14	2.50	2.70	0.113	0.113	0.83	0.17	0.019	3%	
2.80	0.78				0.000	1.00	15	2.70	2.98	0.000	0.000	0.78	0.21	0.000	0%	
3.15	0.00				0.000	1.00	16	2.98	3.15	0.000	0.000	0.20	0.03	0.000	0%	
Total Flow:														0.565	1.000	

Total Flow:	0.565	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.90	(m <sup>2</sup> )
Top Width:	2.45	(m)
Hydraulic Depth:	0.777	(m)
Mean Velocity:	0.297	(m/s)
Froude Number	0.108	
Photographs taken looking at: upstream, downstream, across		

Datalogger Notes:	Database
Datalogger Internal Power:	3.65V
Datalogger External Power:	12.4V
Datalogger Memory Used:	33%
Datalogger Clock:	Apr 27, 2007 08:48 MST
Laptop Clock:	Apr 27, 2007 08:48 MST
Dessicant:	Good - 100%
Datalogger:	Optimum datalogger DD-128 # 0304300770
PT:	Keller # 304989, 5 psi
Power:	Optimum battery

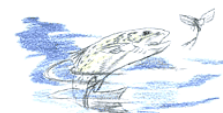
Notes: Station installed





# Hydrometric Measurement / Site Visit Record

## S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Calumet River  
Location: Calumet River Upland Tributary  
Site Name: S18A  
Coordinates & Legal:

### Time of Measurement

Date of Measurement: June 13, 2007  
Start Time: 3:30 PM MDT  
End Time: MDT

Weather Conditions: +15 C, scattered clouds

River Conditions: open, low flow

### Personnel & Equipment

Measurement Made By: pm wd  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: Nail in Tree 0.805  
Water Level Reading: 2.333  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other:

### Setup No. 1

El: 100.000  
El: 98.472  
El: 98.472  
El:

### Setup No. 2

El: 100.000  
El: 98.468 98.470  
El:  
El: 98.468 98.470  
El:

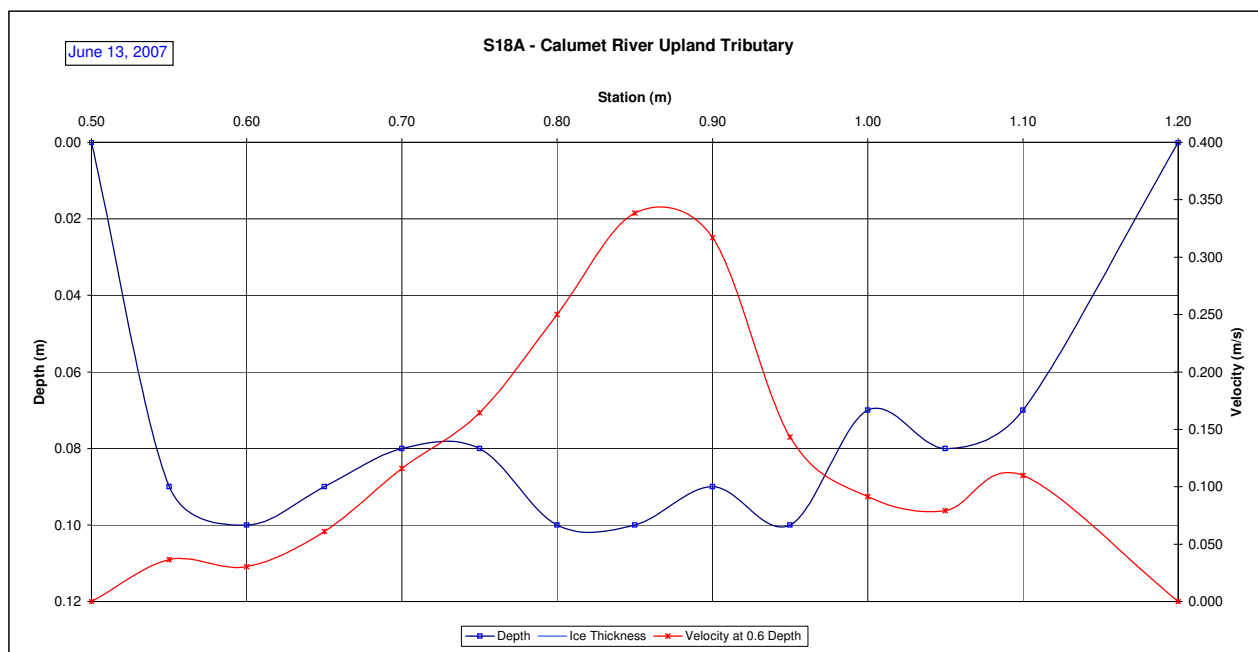
### Measurement Data

		Measured Data					Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	0.50	0.00			0.000	1.00	1	0.50	0.53	0.009	0.009	0.02	0.00	0.000	0%	
	0.55	0.09			0.037	1.00	2	0.53	0.58	0.037	0.037	0.09	0.00	0.000	2%	
	0.60	0.10			0.030	1.00	3	0.58	0.63	0.030	0.030	0.10	0.01	0.000	2%	
	0.65	0.09			0.061	1.00	4	0.63	0.68	0.061	0.061	0.09	0.00	0.000	3%	
	0.70	0.08			0.116	1.00	5	0.68	0.73	0.116	0.116	0.08	0.00	0.000	6%	
	0.75	0.08			0.165	1.00	6	0.73	0.78	0.165	0.165	0.08	0.00	0.001	8%	
	0.80	0.10			0.250	1.00	7	0.78	0.83	0.250	0.250	0.10	0.00	0.001	16%	
	0.85	0.10			0.338	1.00	8	0.83	0.88	0.338	0.338	0.10	0.01	0.002	21%	
	0.90	0.09			0.317	1.00	9	0.88	0.93	0.317	0.317	0.09	0.00	0.001	18%	
	0.95	0.10			0.143	1.00	10	0.93	0.98	0.143	0.143	0.10	0.00	0.001	9%	
	1.00	0.07			0.091	1.00	11	0.98	1.03	0.091	0.091	0.07	0.00	0.000	4%	
	1.05	0.08			0.079	1.00	12	1.03	1.08	0.079	0.079	0.08	0.00	0.000	4%	
	1.10	0.07			0.110	1.00	13	1.08	1.15	0.110	0.110	0.07	0.01	0.001	7%	
RB	1.20	0.00			0.000	1.00	14	1.15	1.20	0.027	0.027	0.02	0.00	0.000	0%	
Total Flow:													0.008	1.000		

Total Flow:	0.008	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.06	(m <sup>2</sup> )
Top Width:	0.70	(m)
Hydraulic Depth:	0.080	(m)
Mean Velocity:	0.144	(m/s)
Froude Number	0.163	
Photographs taken looking at: upstream, downstream, across		

Datalogger Notes:	Database
Datalogger Internal Power:	11.82V
Datalogger External Power:	3.95V
Datalogger Memory Used:	36%
Datalogger Clock:	Jun 13, 2007 15:39 MST
Laptop Clock:	Jun 13, 2007 15:40 MST
Dessicant:	Good - 100%
Datalogger:	Optimum datalogger DD-128 # 0304300770
PT:	Keller # 304989, 5 psi
Power:	Optimum battery

Notes: TD destroyed june 8



# Hydrometric Measurement / Site Visit Record

S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Calumet River  
Location: Calumet River Upland Tributary  
Site Name: S18A  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: June 16, 2007  
Start Time: 6:30 PM MDT  
End Time: MDT

Weather Conditions: scattered clouds

## River Conditions:

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Nail in Tree	0.918	0.948
Water Level Reading:	2.454	2.486
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.287	0.287
Other:		

El: 100.000  
El: 98.464  
El: 98.177  
El: 100.000  
El: 98.462  
El: 98.175

98.463  
98.176

## Measurement Data

	Measured Data					Calculated Data										Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB						0.000	1.00	1	0.00		0.000	0.000	0.00			
						0.000	1.00	2	0.00		0.000	0.000	0.00			
						0.000	1.00	3	0.00		0.000	0.000	0.00			
						0.000	1.00	4	0.00		0.000	0.000	0.00			
						0.000	1.00	5	0.00		0.000	0.000	0.00			
						0.000	1.00	6	0.00		0.000	0.000	0.00			
						0.000	1.00	7	0.00		0.000	0.000	0.00			
						0.000	1.00	8	0.00		0.000	0.000	0.00			
						0.000	1.00	9	0.00		0.000	0.000	0.00			
						0.000	1.00	10	0.00		0.000	0.000	0.00			
						0.000	1.00	11	0.00		0.000	0.000	0.00			
						0.000	1.00	12	0.00		0.000	0.000	0.00			
						0.000	1.00	13	0.00		0.000	0.000	0.00			
						0.000	1.00	14	0.00		0.000	0.000	0.00			
RB													Total Flow:	0.000		

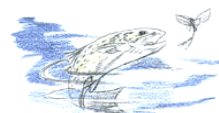
Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	0.00	(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at:		
upstream, downstream, across		

Notes: new battery and TD installed 602738

Datalogger Notes:	Database
Datalogger Internal Power:	13.07V
Datalogger External Power:	3.95V
Datalogger Memory Used:	
Datalogger Clock:	MST
Laptop Clock:	MST
Dessicant:	
Datalogger:	Optimum datalogger DD-128 # 0304300770
PT:	Keller # 304989, 5 psi
Power:	Optimum battery

# Hydrometric Measurement / Site Visit Record

S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Calumet River  
Location: Calumet River Upland Tributary  
Site Name: S18A  
Coordinates & Legal:

## Time of Measurement

Date of Measurement:  
Start Time: MDT  
End Time: MDT

Weather Conditions: scattered clouds

## River Conditions:

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in Tree LB  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other:

## Setup No. 1

El: 100.000  
El: 100.000  
El: 100.000  
El:

## Setup No. 2

El: 100.000  
El: 100.000 100.000  
El:  
El: 100.000 100.000  
El:

## Measurement Data

		Measured Data					Calculated Data									
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
LB						0.000	1.00	1	0.00		0.000	0.000	0.00			
						0.000	1.00	2	0.00		0.000	0.000	0.00			
						0.000	1.00	3	0.00		0.000	0.000	0.00			
						0.000	1.00	4	0.00		0.000	0.000	0.00			
						0.000	1.00	5	0.00		0.000	0.000	0.00			
						0.000	1.00	6	0.00		0.000	0.000	0.00			
						0.000	1.00	7	0.00		0.000	0.000	0.00			
						0.000	1.00	8	0.00		0.000	0.000	0.00			
						0.000	1.00	9	0.00		0.000	0.000	0.00			
						0.000	1.00	10	0.00		0.000	0.000	0.00			
						0.000	1.00	11	0.00		0.000	0.000	0.00			
						0.000	1.00	12	0.00		0.000	0.000	0.00			
						0.000	1.00	13	0.00		0.000	0.000	0.00			
						0.000	1.00	14	0.00		0.000	0.000	0.00			
RB														Total Flow:	0.000	

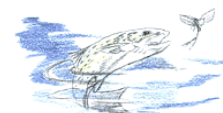
Total Flow:	0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.00	(m <sup>2</sup> )
Top Width:	0.00	(m)
Hydraulic Depth:		(m)
Mean Velocity:		(m/s)
Froude Number		
Photographs taken looking at: upstream, downstream, across		

Notes: no land 602738

Datalogger Notes:	Database
Datalogger Internal Power:	13.07V
Datalogger External Power:	3.95V
Datalogger Memory Used:	
Datalogger Clock:	MST
Laptop Clock:	MST
Dessicant:	
Datalogger:	Optimum datalogger DD-128 # 0304300770
PT:	Keller # 304989, 5 psi
Power:	Optimum battery

# Hydrometric Measurement / Site Visit Record

## S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Calumet River  
Location: Calumet River Upland Tributary  
Site Name: S18A  
Coordinates & Legal:

### Time of Measurement

Date of Measurement: September 22, 2007  
Start Time: 10:46 AM MDT  
End Time: MDT

### Weather Conditions:

scattered clouds

### River Conditions:

### Personnel & Equipment

Measurement Made By: sm JMS  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Nail in Tree	0.840	0.835
Water Level Reading:	2.157	2.150
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.495	0.495
Other:		

El: 100.000  
El: 98.683  
El: 98.188  
El: 100.000  
El: 98.685  
El: 98.190

Measurement Data															
Measured Data							Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
0.40	0.00				0.000	1.00	1	0.40	0.60	0.000	0.000	0.07	0.01	0.000	0%
0.80	0.28				0.000	1.00	2	0.80	1.00	0.000	0.000	0.28	0.06	0.000	0%
1.20	0.40				0.003	1.00	3	1.20	1.40	0.003	0.003	0.40	0.08	0.000	4%
1.60	0.49				0.009	1.00	4	1.60	1.80	0.009	0.009	0.49	0.10	0.001	14%
2.00	0.59				0.012	1.00	5	2.00	2.20	0.012	0.012	0.59	0.12	0.001	22%
2.40	0.65				0.015	1.00	6	2.40	2.60	0.015	0.015	0.65	0.13	0.002	30%
2.80	0.57				0.015	1.00	7	2.80	3.00	0.015	0.015	0.57	0.11	0.002	26%
3.20	0.48				0.003	1.00	8	3.20	3.40	0.003	0.003	0.48	0.10	0.000	4%
3.60	0.45				0.000	1.00	9	3.60	3.60	0.000	0.000	0.45	0.00	0.000	0%
3.80	0.00				0.000	1.00	10	3.80	3.80	0.000	0.000	0.11	0.00	0.000	0%
Total Flow:														0.007	1

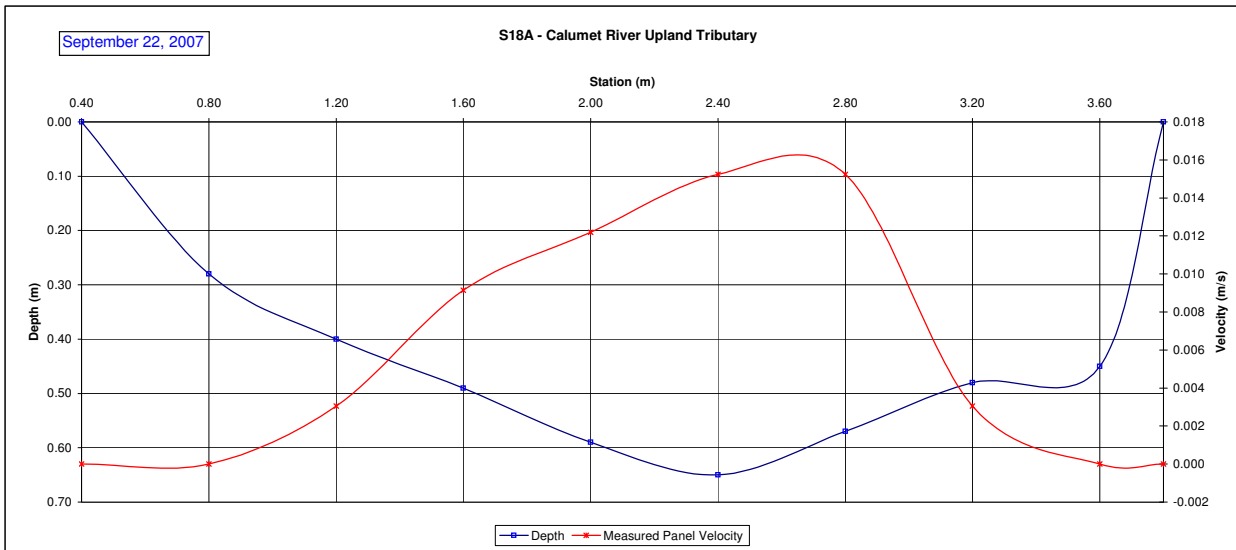
Total Flow:	0.007	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	0.71	(m <sup>2</sup> )
Top Width:	3.40	(m)
Hydraulic Depth:	0.208	(m)
Mean Velocity:	0.009	(m/s)
Froude Number	0.007	
Photographs taken looking at: upstream, downstream, across		

Datalogger Notes:	Database
Datalogger Internal Power:	12.2v
Datalogger External Power:	3.87v
Datalogger Memory Used:	
Datalogger Clock:	Sep 22, 2007 09:49 MST
Laptop Clock:	Sep 22, 2007 09:49 MST
Dessicant:	changed
Datalogger:	Optimum datalogger DD-128 # 0304300770
PT:	Keller # 304989, 5 psi
Power:	Optimum battery

Notes:

602738

battery dead  
battery replaced



# Hydrometric Measurement / Site Visit Record

S18A - Calumet River Upland Tributary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Calumet River  
Location: Calumet River Upland Tributary  
Site Name: S18A  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: October 24, 2007  
Start Time: 9:54 AM MDT  
End Time: 10:02 AM MDT

## Weather Conditions:

rain earlier

## River Conditions:

low open

## Personnel & Equipment

Measurement Made By: sm JMS  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in Tree I 0.898  
Water Level Reading: 2.222  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 0.163  
Other:

## Setup No. 1

El: 100.000 0.835  
El: 98.676 2.161  
El: 98.513 0.163  
El:

## Setup No. 2

El: 100.000  
El: 98.674 98.675  
El:  
El: 98.511 98.512  
El:

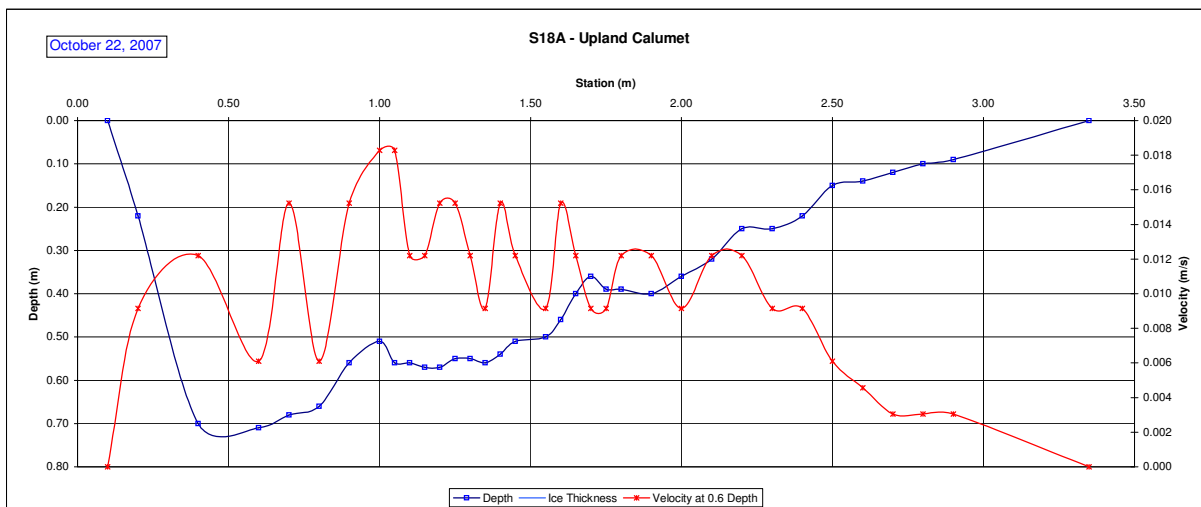
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)		
0.10	0.00				0.000	1.00	1	0.10	0.15	0.002	0.002	0.06	0.00	0.000	0%	
0.20	0.22				0.009	1.00	2	0.20	0.30	0.009	0.009	0.22	0.02	0.000	3%	
0.40	0.70				0.012	1.00	3	0.40	0.50	0.012	0.012	0.70	0.07	0.001	13%	
0.60	0.71				0.006	1.00	4	0.60	0.65	0.006	0.006	0.71	0.04	0.000	3%	
0.70	0.68				0.015	1.00	5	0.70	0.75	0.015	0.015	0.68	0.03	0.001	8%	
0.80	0.66				0.006	1.00	6	0.80	0.85	0.006	0.006	0.66	0.03	0.000	3%	
0.90	0.56				0.015	1.00	7	0.90	0.95	0.015	0.015	0.56	0.03	0.000	7%	
1.00	0.51				0.018	1.00	8	1.00	1.03	0.018	0.018	0.51	0.01	0.000	4%	
1.05	0.56				0.018	1.00	9	1.05	1.08	0.018	0.018	0.56	0.01	0.000	4%	
1.10	0.56				0.012	1.00	10	1.10	1.13	0.012	0.012	0.56	0.01	0.000	3%	
1.15	0.57				0.012	1.00	11	1.15	1.18	0.012	0.012	0.57	0.01	0.000	3%	
1.20	0.57				0.015	1.00	12	1.20	1.23	0.015	0.015	0.57	0.01	0.000	3%	
1.25	0.55				0.015	1.00	13	1.25	1.28	0.015	0.015	0.55	0.01	0.000	3%	
1.30	0.55				0.012	1.00	14	1.30	1.33	0.012	0.012	0.55	0.01	0.000	3%	
1.35	0.56				0.009	1.00	15	1.35	1.38	0.009	0.009	0.56	0.01	0.000	2%	
1.40	0.54				0.015	1.00	16	1.40	1.43	0.015	0.015	0.54	0.01	0.000	3%	
1.45	0.51				0.012	1.00	17	1.45	1.50	0.012	0.012	0.51	0.03	0.000	5%	
1.55	0.50				0.009	1.00	18	1.55	1.58	0.009	0.009	0.50	0.01	0.000	2%	
1.60	0.46				0.015	1.00	19	1.60	1.63	0.015	0.015	0.46	0.01	0.000	3%	
1.65	0.40				0.012	1.00	20	1.65	1.68	0.012	0.012	0.40	0.01	0.000	2%	
1.70	0.36				0.009	1.00	21	1.70	1.73	0.009	0.009	0.36	0.01	0.000	1%	
1.75	0.39				0.009	1.00	22	1.75	1.78	0.009	0.009	0.39	0.01	0.000	1%	
1.80	0.39				0.012	1.00	23	1.80	1.85	0.012	0.012	0.39	0.02	0.000	4%	
1.90	0.40				0.012	1.00	24	1.90	1.95	0.012	0.012	0.40	0.02	0.000	4%	
2.00	0.36				0.009	1.00	25	2.00	2.05	0.009	0.009	0.36	0.02	0.000	3%	
2.10	0.32				0.012	1.00	26	2.10	2.15	0.012	0.012	0.32	0.02	0.000	3%	
2.20	0.25				0.012	1.00	27	2.20	2.25	0.012	0.012	0.25	0.01	0.000	2%	
2.30	0.25				0.009	1.00	28	2.30	2.35	0.009	0.009	0.25	0.01	0.000	2%	
2.40	0.22				0.009	1.00	29	2.40	2.45	0.009	0.009	0.22	0.01	0.000	2%	
2.50	0.15				0.006	1.00	30	2.50	2.55	0.006	0.006	0.15	0.01	0.000	1%	
2.60	0.14				0.005	1.00	31	2.60	2.65	0.005	0.005	0.14	0.01	0.000	0%	
2.70	0.12				0.003	1.00	32	2.70	2.75	0.003	0.003	0.12	0.01	0.000	0%	
2.80	0.10				0.003	1.00	33	2.80	2.85	0.003	0.003	0.10	0.00	0.000	0%	
2.90	0.09				0.003	1.00	34	2.90	3.13	0.003	0.003	0.09	0.02	0.000	1%	
3.35	0.00				0.000	1.00	35	3.35	3.35	0.001	0.001	0.02	0.00	0.000	0%	
Total Flow:														0.006	1	

Total Flow:	0.006	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.58	(m <sup>2</sup> )
Top Width:	3.25	(m)
Hydraulic Depth:	0.179	(m)
Mean Velocity:	0.011	(m/s)
Froude Number	0.008	
Photographs taken looking at: upstream, downstream, across		

Datalogger Notes:	Database
Datalogger Internal Power:	3.82
Datalogger External Power:	4.48
Datalogger Memory Used:	47%
Datalogger Clock:	Oct 24, 2007 08:43 MST
Laptop Clock:	Oct 24, 2007 08:42 MST
Dessicant:	changed
Datalogger:	Optimum datalogger DD-128 # 0304300770
PT:	Keller # 304989, 5 psi
Power:	Optimum battery

Notes: td removed 602738



# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Lowland Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

## Time of Measurement

Date of Measurement: January 12, 2007  
Start Time: MDT  
End Time: MDT

## Weather Conditions:

-20, overcast, light wind

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in tree  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other: Highest spot on ring on abandoned rain gauge pc

## Setup No. 1

El: 101.478  
El: 101.478  
El:  
El: 101.478  
El:

## Setup No. 2

El: 101.478  
El: 101.478  
El:  
El: 101.478  
El:

Total Flow:			(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair		
Total Area:			(m <sup>2</sup> )
Top Width:			(m)
Hydraulic Depth:			(m)
Mean Velocity:			(m/s)
Froude Number			
Photographs taken looking at:			
Upstream, downstream, across			

Notes: +/- 50 tips on RG

Datalogger Notes:	Database # 271
Datalogger Internal Power:	4.55 V
Datalogger External Power:	13.60 V
Datalogger Memory Used:	67%
Datalogger Clock:	1:01PM MST
Laptop Clock:	12:59PM MST
Dessicant:	
Datalogger:	Optimum DD-128 with modem #0104170271
PT:	Keller 730-130 3 psi Pressure Transducer #101352
Power:	12V 20A battery and solar panel

# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Lowland Tar River  
 Location: Lowland Tar River  
 Site Name: S19  
 Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

## Time of Measurement

Date of Measurement: March 6, 2007  
 Start Time: 1:02 PM MST  
 End Time: MST

**Weather Conditions:** -16, snowing, calm  
**River Conditions:** Complete ice cover

## Personnel & Equipment

Measurement Made By: JS/FF  
 Data Entry By: JS  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

## Level Readings

Bench Mark Reading: Nail in tree  
 Water Level Reading:  
 Top of Ice Level Reading:  
 Transducer Reading & Calc'd El.:  
 Other: Highest spot on ring on abandoned rain gauge po

## Setup No. 1

El: 101.478  
 El: 101.478  
 El: 101.478  
 El: 101.478  
 El: 101.478

## Setup No. 2

El: 101.478  
 El: 101.478  
 El: 101.478  
 El: 101.478  
 El: 101.478

Total Flow:			(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair		
Total Area:			(m <sup>2</sup> )
Top Width:			(m)
Hydraulic Depth:			(m)
Mean Velocity:			(m/s)
Froude Number			
Photographs taken looking at:			
Upstream, downstream, across			

## Notes:

Recent tips correspond with snowfall.  
 Snow gauge fluid level appeared to be slightly below overflow tube.  
 1000 mL of alcohol added to the fluid mixture; initial level low.  
 Snow gauge reading 8586; Upon return to site tips incremented to 8589.

Datalogger Notes:	Database # 271
Datalogger Internal Power:	4.58 V
Datalogger External Power:	15.01 V
Datalogger Memory Used:	50%
Datalogger Clock:	Mar 06, 2007 13:06 MST
Laptop Clock:	Mar 06, 2007 13:06 MST
Dessicant:	
Datalogger:	Optimum DD-128 with modem #0104170271
PT:	Keller 730-130 3 psi Pressure Transducer #101352
Power:	12V 20A battery and solar panel

# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Lowland Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

## Time of Measurement

Date of Measurement: March 30, 2007  
Start Time: 1:02 PM MST  
End Time: MST

## Weather Conditions:

## River Conditions:

## Personnel & Equipment

Measurement Made By: JS, SE  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in tree  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other: Highest spot on ring on abandoned rain gauge po

## Setup No. 1

El: 101.478  
El: 101.478  
El: 101.478  
El: 101.478  
El: 101.478

## Setup No. 2

El: 101.478  
El: 101.478  
El: 101.478  
El: 101.478  
El: 101.478

Total Flow:			(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair		
Total Area:			(m <sup>2</sup> )
Top Width:			(m)
Hydraulic Depth:			(m)
Mean Velocity:			(m/s)
Froude Number			
Photographs taken looking at:			
Upstream, downstream, across			

## Notes:

Tips @ 8794

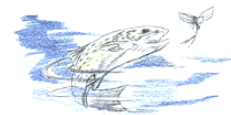
Levelling completed by HCL

Datalogger Notes:	Database # 271
Datalogger Internal Power:	4.64 V
Datalogger External Power:	14.17 V
Datalogger Memory Used:	50%
Datalogger Clock:	4:53:00 PM MST
Laptop Clock:	4:53:00 PM MST
Dessicant:	
Datalogger:	Optimum DD-128 with modem #0104170271
PT:	Keller 730-130 3 psi Pressure Transducer #101352
Power:	12V 20A battery and solar panel



# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Lowland Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

## Time of Measurement

Date of Measurement: April 24, 2007  
Start Time: 4:00 PM MST  
End Time: MST

## Weather Conditions:

## River Conditions:

## Personnel & Equipment

Measurement Made By: JS, JMS, PM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Nail in tree	El: 101.478	El: 101.478
Water Level Reading:	El: 101.478	El: 101.478 101.478
Top of Ice Level Reading:	El:	El:
Transducer Reading & Calc'd El.:	El: 101.478 0.000	El: 101.478 101.478
Other: Highest spot on ring on abandoned rain gauge post	El:	El:

Datalogger Notes:	Database # 271
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	
Datalogger Clock:	
Laptop Clock:	
Dessicant:	
Datalogger:	Optimum DD-128 with modem #0104170271
PT:	Keller 730-130 3 psi Pressure Transducer #101352
Power:	12V 20A battery and solar panel

## Notes:

Original measurement sheet lost. Manula measurement was undertaken. Snow Gauge adapter removed TD installed.  
Road D/S station washed out, culverts replaced April 26, 2007

# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Lowland Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

## Time of Measurement

Date of Measurement: June 15, 2007  
Start Time: 1:40 PM MST  
End Time: MST

Weather Conditions: 20C clear, light breeze

River Conditions: open high stage

## Personnel & Equipment

Measurement Made By: JMS, PM  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Nail in tree	1.209	1.239
Water Level Reading:	1.680	1.715
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.545	0.545
Other: Highest spot on ring on abandoned rain gauge post		

## Notes:

RG plugged ignore tips 9132 9134  
no measurable velocity at TD  
very low depth and evidence of seepage at culvert  
no mmt take

Datalogger Notes:	Database # 271
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	
Datalogger Clock:	6/15/07 12:08
Laptop Clock:	6/15/2007 12:11
Dessicant:	good
Datalogger:	Optimum DD-128 with modem #0104170271
PT:	Keller 730-130 3 psi Pressure Transducer #101352
Power:	12V 20A battery and solar panel

# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Lowland Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

## Time of Measurement

Date of Measurement: August 5, 2007  
Start Time: 10:07 AM MDT  
End Time: 10:12 AM MDT

Weather Conditions: 20C cloudy, calm

River Conditions: open low stage

## Personnel & Equipment

Measurement Made By: SM, PM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: NEW Nail in	1.293 El: 101.630	1.255 El: 101.630
Water Level Reading:	2.025 El: 100.898	1.983 El: 100.902
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.444 El: 100.454	
Other: Highest spot on ring on abandoned rain gauge post		

Datalogger Notes:	Database # 271
Datalogger Internal Power:	13.82V
Datalogger External Power:	4.64V
Datalogger Memory Used:	2%
Datalogger Clock:	8/5/07 10:08 mst
Laptop Clock:	8/5/07 10:12 mst
Dessicant:	good
Datalogger:	Optimum DD-128 with modem #0104170271
PT:	Keller 730-130 3 psi Pressure Transducer #101352
Power:	12V 20A battery and solar panel

## Notes:

no measurable velocity at TD

station tree blown over but still working  
slaney and mccartney installed new mast and moved station a few meters closer to creek  
station working properly upon departure

installed new hail in tree

# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Lowland Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

### Time of Measurement

Date of Measurement: September 21, 2007  
Start Time: 7:37 PM MDT  
End Time: MDT

Weather Conditions: 10C cloudy, calm

River Conditions: moderate stage

### Personnel & Equipment

Measurement Made By: SM JMS  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: NEW Nail in	1.015 El: 101.630	0.993 El: 101.630
Water Level Reading:	1.634 El: 101.011	1.610 El: 101.013
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.535 El: 100.476	
Other: Highest spot on ring on abandoned rain gauge post		

Datalogger Notes:	Database # 271
Datalogger Internal Power:	
Datalogger External Power:	13.15v
Datalogger Memory Used:	2%
Datalogger Clock:	9/21/07 18:30 mst
Laptop Clock:	9/21/07 18:31 mst
Dessicant:	good
Datalogger:	Optimum DD-128 with modem #0104170271
PT:	Keller 730-130 3 psi Pressure Transducer #101352
Power:	12V 20A battery and solar panel

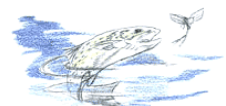
### Notes:

no measurable velocity at TD

TNRG not working

Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Lowland Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4  
Time of Measurement  
Date of Measurement: September 25, 2007  
Start Time: 7:37 PM MDT  
End Time: MDT

Weather Conditions: 10C cloudy, calm  
River Conditions: moderate stage

Personnel & Equipment

Measurement Made By: SM JMS  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: NEW Nail in tree  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other: Highest spot on ring on abandoned rain gauge post

Setup No. 1

El: 101.630  
El: 101.630  
El:  
El: 101.630  
El:

Setup No. 2

El: 101.630 101.630  
El: 101.630  
El: 101.630  
El: 101.630  
El:

Datalogger Notes:	Database # 271
Datalogger Internal Power:	5
Datalogger External Power:	13.15v
Datalogger Memory Used:	2%
Datalogger Clock:	9/21/07 18:30 mst
Laptop Clock:	9/21/07 18:31 mst
Dessicant:	good
Datalogger:	Optimum DD-128 with modem #0104170271
PT:	Keller 730-130 3 psi Pressure Transducer #101352
Power:	12V 20A battery and solar panel

Notes:

RG wired to input 4, but programmed for input 2

manual tips 2  
test start 2 manual count 13  
test finish 15

100mL added

Beaver dam removed on this visit

# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Lowland Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

## Time of Measurement

Date of Measurement: October 22, 2007  
Start Time: 3:15 PM MDT  
End Time: 3:59 PM MDT

## Weather Conditions:

10C cloudy, calm

## River Conditions:

moderate stage

## Personnel & Equipment

Measurement Made By: SM/FF  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: NEW Nail in 1.185  
Water Level Reading: 1.950  
Top of Ice Level Reading:  
Transducer Reading & Calc'd E 0.398  
Other: Highest spot on ring on abandoned rain gauge po

## Setup No. 1

El: 101.630  
El: 100.865  
El: 100.467

## Setup No. 2

El: 101.630  
El: 100.863  
El: 100.466

## Measurement Data

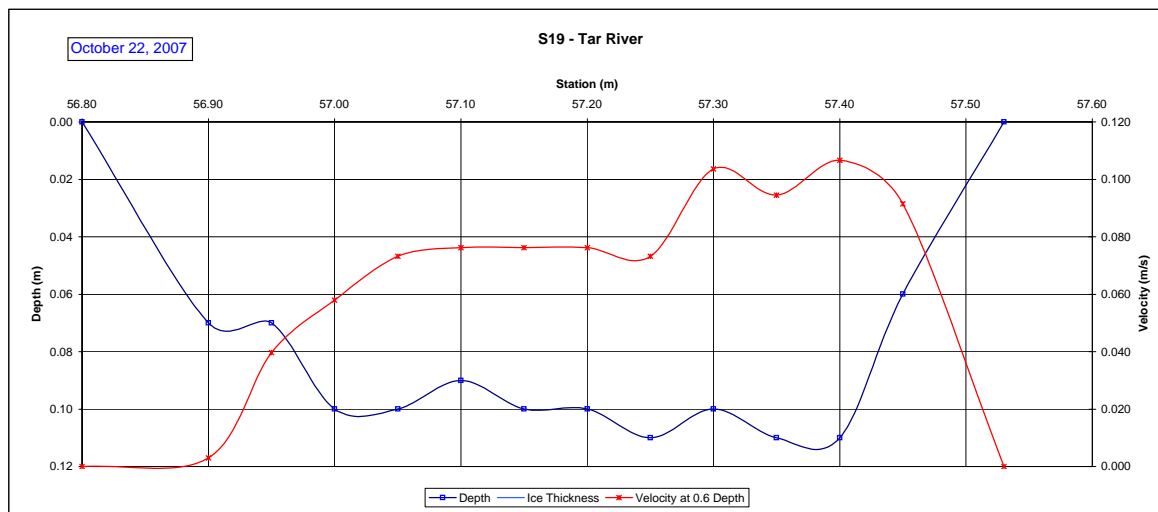
		Measured Data					Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
RB	56.80	0.00			0.000	0.90	1	56.80	56.85	0.001	0.001	0.02	0.00	0.000	0%	
	56.90	0.07			0.003	0.90	2	56.85	56.93	0.003	0.003	0.07	0.01	0.000	0%	
	56.95	0.07			0.040	0.90	3	56.93	56.98	0.040	0.036	0.07	0.00	0.000	3%	
	57.00	0.10			0.058	0.90	4	56.98	57.03	0.058	0.052	0.10	0.00	0.000	7%	
	57.05	0.10			0.073	0.90	5	57.03	57.08	0.073	0.066	0.10	0.01	0.000	8%	
	57.10	0.09			0.076	0.90	6	57.08	57.13	0.076	0.069	0.09	0.00	0.000	8%	
	57.15	0.10			0.076	0.90	7	57.13	57.18	0.076	0.069	0.10	0.00	0.000	9%	
	57.20	0.10			0.076	0.90	8	57.18	57.23	0.076	0.069	0.10	0.01	0.000	9%	
	57.25	0.11			0.073	0.90	9	57.23	57.28	0.073	0.066	0.11	0.01	0.000	9%	
	57.30	0.10			0.104	0.90	10	57.28	57.33	0.104	0.093	0.10	0.01	0.000	12%	
	57.35	0.11			0.094	0.90	11	57.33	57.38	0.094	0.085	0.11	0.01	0.000	12%	
	57.40	0.11			0.107	0.90	12	57.38	57.43	0.107	0.096	0.11	0.01	0.001	14%	
	57.45	0.06			0.091	0.90	13	57.43	57.49	0.091	0.082	0.06	0.00	0.000	8%	
	57.53	0.00			0.000	0.90	14	57.49	57.53	0.023	0.021	0.02	0.00	0.000	0%	
													Total Flow:	0.004	100%	

Total Flow:	0.004	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.06	(m <sup>2</sup> )
Top Width:	0.73	(m)
Hydraulic Depth:	0.082	(m)
Mean Velocity:	0.065	(m/s)
Froude Number	0.072	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power: 4.55  
Datalogger External Power: 14.11  
Datalogger Memory Used: 12.0%  
Datalogger Clock: Oct 22, 2007 14:22 MST  
Laptop Clock: Oct 22, 2007 14:23 MST  
Dessicant: new  
Datalogger:  
PT:  
Power:

Notes: RG moved to channel 4 named precip  
ignore all tips oct 22, 07  
681 tips at departure  
snow adapter added to rain gauge  
td removed for winter



# Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River  
Location: Lowland Tar River  
Site Name: S19  
Coordinates & Legal: 6352849 N, 457329 E

## Time of Measurement

Date of Measurement: December 13, 2007  
Start Time:  
End Time:

## Personnel & Equipment

Measurement Made By: SM/FF  
Data Entry By: SMS  
Meter Type and No.:

## Weather Conditions:

River Conditions: Ice covered

Datalogger Notes:		
Datalogger Internal Power:	4.46 V	
Datalogger External Power:	12.31 V	
Datalogger Memory Used:	16%	
Datalogger Clock:	9:26 AM	MST
Laptop Clock:	9:29 AM	MST
Dessicant:		
Datalogger:	Optimum DD-128 with modem #0104170271	
PT:		
Power:		

Notes: Rain Gauge tips = 771

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Hydrometric Measurement / Site Visit Record  
S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Upland Muskeg River  
Location: Upland Muskeg River  
Site Name: S20  
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4  
Time of Measurement: April 25, 2007  
Start Time: 2:28 PM MDT  
End Time: 2:41 PM MDT

Personnel & Equipment

Measurement Made By: JS, JE  
Data Entry By: JE  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rebar on LB 1.299  
Water Level Reading: 2.625  
Top of Ice Level Reading: 0.831  
Transducer Reading & Calc'd EI: 0.831  
Other: T-post on LB near DL 0.124

Setup No. 1

EI: 50.000  
EI: 48.674  
EI: 47.843  
EI: 51.175

Setup No. 2

EI: 50.000  
EI: 48.683  
EI: 47.852  
EI: 51.175

Weather Conditions:

Open

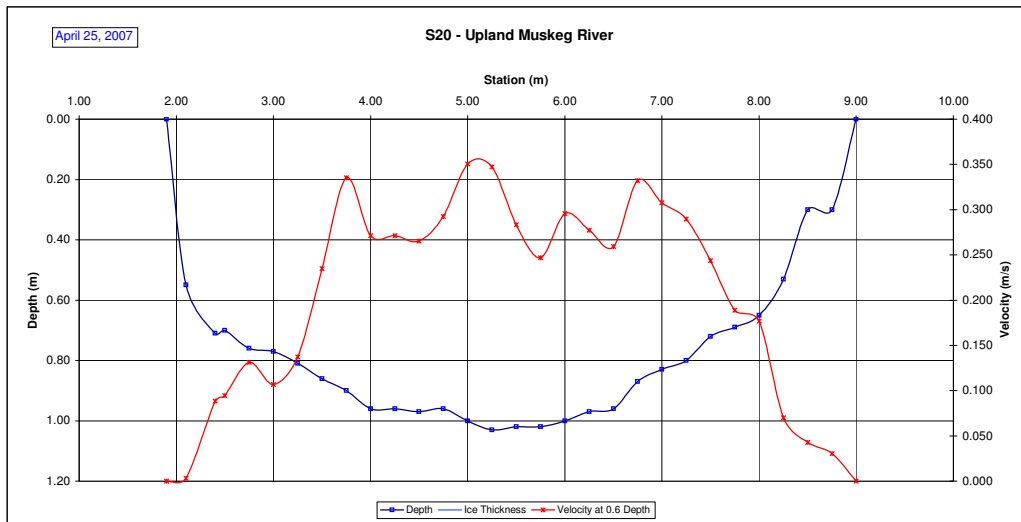
River Conditions:

Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)					
1.90	0.00				0.000	1.00	1	1.90	2.00	0.001	0.001	0.14	0.01	0.000	0%				
2.10	0.55				0.003	1.00	2	2.00	2.25	0.003	0.003	0.55	0.14	0.000	0%				
2.40	0.71				0.088	1.00	3	2.25	2.45	0.088	0.088	0.71	0.14	0.013	1%				
2.50	0.70				0.094	1.00	4	2.45	2.63	0.094	0.094	0.70	0.12	0.012	1%				
2.75	0.76				0.131	1.00	5	2.63	2.88	0.131	0.131	0.76	0.19	0.025	2%				
3.00	0.77				0.107	1.00	6	2.88	3.13	0.107	0.107	0.77	0.19	0.021	2%				
3.25	0.81				0.137	1.00	7	3.13	3.38	0.137	0.137	0.81	0.20	0.028	2%				
3.50	0.86				0.235	1.00	8	3.38	3.63	0.235	0.235	0.86	0.22	0.050	4%				
3.75	0.90				0.335	1.00	9	3.63	3.88	0.335	0.335	0.90	0.23	0.075	6%				
4.00	0.96				0.271	1.00	10	3.88	4.13	0.271	0.271	0.96	0.24	0.065	5%				
4.25	0.96				0.271	1.00	11	4.13	4.38	0.271	0.271	0.96	0.24	0.065	5%				
4.50	0.97				0.265	1.00	12	4.38	4.63	0.265	0.265	0.97	0.24	0.064	5%				
4.75	0.96				0.293	1.00	13	4.63	4.88	0.293	0.293	0.96	0.24	0.070	5%				
5.00	1.00				0.351	1.00	14	4.88	5.13	0.351	0.351	1.00	0.25	0.088	7%				
5.25	1.03				0.347	1.00	15	5.13	5.38	0.347	0.347	1.03	0.26	0.089	7%				
5.50	1.02				0.283	1.00	16	5.38	5.63	0.283	0.283	1.02	0.26	0.072	5%				
5.75	1.02				0.247	1.00	17	5.63	5.88	0.247	0.247	1.02	0.26	0.063	5%				
6.00	1.00				0.296	1.00	18	5.88	6.13	0.296	0.296	1.00	0.25	0.074	6%				
6.25	0.97				0.277	1.00	19	6.13	6.38	0.277	0.277	0.97	0.24	0.067	5%				
6.50	0.96				0.259	1.00	20	6.38	6.63	0.259	0.259	0.96	0.24	0.062	5%				
6.75	0.87				0.332	1.00	21	6.63	6.88	0.332	0.332	0.87	0.22	0.072	5%				
7.00	0.83				0.308	1.00	22	6.88	7.13	0.308	0.308	0.83	0.21	0.064	5%				
7.25	0.80				0.290	1.00	23	7.13	7.38	0.290	0.290	0.80	0.20	0.058	4%				
7.50	0.72				0.244	1.00	24	7.38	7.63	0.244	0.244	0.72	0.18	0.044	3%				
7.75	0.69				0.189	1.00	25	7.63	7.88	0.189	0.189	0.69	0.17	0.033	2%				
8.00	0.65				0.177	1.00	26	7.88	8.13	0.177	0.177	0.65	0.16	0.029	2%				
8.25	0.53				0.070	1.00	27	8.13	8.38	0.070	0.070	0.53	0.13	0.009	1%				
8.50	0.30				0.043	1.00	28	8.38	8.63	0.043	0.043	0.30	0.08	0.003	0%				
8.75	0.30				0.030	1.00	29	8.63	8.88	0.030	0.030	0.30	0.08	0.002	0%				
9.00	0.00				0.000	1.00	30	8.88	9.00	0.008	0.008	0.08	0.01	0.000	0%				
Total Flow:															1.318	100%			

Total Flow:	1.318	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	5.59	(m <sup>2</sup> )
Top Width:	7.10	(m)
Hydraulic Depth:	0.787	(m)
Mean Velocity:	0.236	(m/s)
Froude Number	0.085	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database # 277
Datalogger Internal Power:	4.51V
Datalogger External Power:	14.37V
Datalogger Memory Used:	16% Cleared
Datalogger Clock:	Apr 25, 2007 13:21 MST
Laptop Clock:	Apr 25, 2007 13:21 MST
Dessicant:	Good - 100%
Datalogger:	Optimum DD-128 #109050402
PT:	Keller 5 psi #104638
Power:	Solar panel and internal battery

Notes:  
TSS sample taken.  
Data downloaded, daily trend in levels suggested problem with power or connections.  
Transducer removed and rewired, TD reading 0.777 m after rewiring.





# Hydrometric Measurement / Site Visit Record

S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Upland Muskeg River  
Location: Upland Muskeg River  
Site Name: S20  
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4  
Time of Measurement: June 14, 2007  
Date of Measurement: 10:50 AM MDT  
Start Time: 11:15 AM MDT  
End Time:

## Personnel & Equipment

Measurement Made By: sm, pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Rebar on LB 2.488  
Water Level Reading: 4.076  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.583  
Other: T-post on LB near DL 1.323

## Setup No. 1

El: 50.000  
El: 48.412  
El:  
El:  
El: 47.829  
El: 51.165

## Setup No. 2

El: 50.000  
El: 48.415  
El:  
El:  
El: 47.832  
El: 51.159

## Weather Conditions:

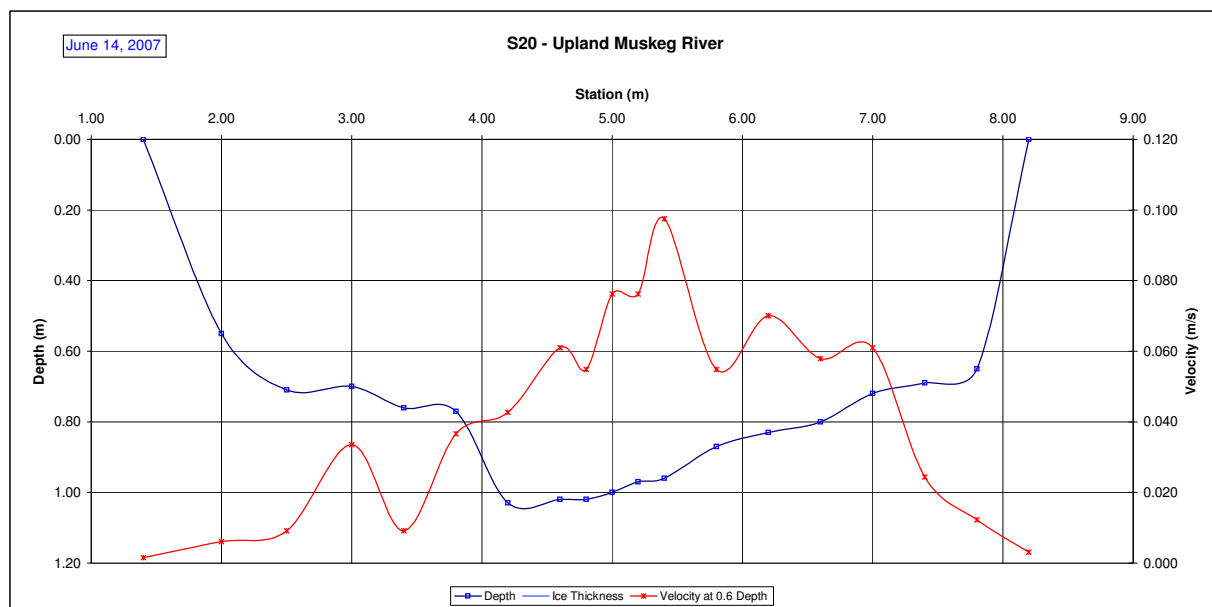
River Conditions: Open

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
1.40	0.00				0.000	1.00	1	1.40	1.70	0.002	0.002	0.14	0.04	0.000	0%	
2.00	0.55				0.006	1.00	2	1.70	2.25	0.006	0.006	0.55	0.30	0.002	1%	
2.50	0.71				0.009	1.00	3	2.25	2.75	0.009	0.009	0.71	0.36	0.003	1%	
3.00	0.70				0.034	1.00	4	2.75	3.20	0.034	0.034	0.70	0.32	0.011	5%	
3.40	0.76				0.009	1.00	5	3.20	3.60	0.009	0.009	0.76	0.30	0.003	1%	
3.80	0.77				0.037	1.00	6	3.60	4.00	0.037	0.037	0.77	0.31	0.011	5%	
4.20	1.03				0.043	1.00	7	4.00	4.40	0.043	0.043	1.03	0.41	0.018	8%	
4.60	1.02				0.061	1.00	8	4.40	4.70	0.061	0.061	1.02	0.31	0.019	8%	
4.80	1.02				0.055	1.00	9	4.70	4.90	0.055	0.055	1.02	0.20	0.011	5%	
5.00	1.00				0.076	1.00	10	4.90	5.10	0.076	0.076	1.00	0.20	0.015	7%	
5.20	0.97				0.076	1.00	11	5.10	5.30	0.076	0.076	0.97	0.19	0.015	7%	
5.40	0.96				0.098	1.00	12	5.30	5.60	0.098	0.098	0.96	0.29	0.028	13%	
5.80	0.87				0.055	1.00	13	5.60	6.00	0.055	0.055	0.87	0.35	0.019	9%	
6.20	0.83				0.070	1.00	14	6.00	6.40	0.070	0.070	0.83	0.33	0.023	10%	
6.60	0.80				0.058	1.00	15	6.40	6.80	0.058	0.058	0.80	0.32	0.019	8%	
7.00	0.72				0.061	1.00	16	6.80	7.20	0.061	0.061	0.72	0.29	0.018	8%	
7.40	0.69				0.024	1.00	17	7.20	7.60	0.024	0.024	0.69	0.28	0.007	3%	
7.80	0.65				0.012	1.00	18	7.60	8.00	0.012	0.012	0.65	0.26	0.003	1%	
8.20	0.00				0.000	1.00	19	8.00	8.20	0.003	0.003	0.16	0.03	0.000	0%	
Total Flow:														0.224	100%	

Total Flow:	0.224	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	5.09	(m <sup>2</sup> )
Top Width:	6.80	(m)
Hydraulic Depth:	0.748	(m)
Mean Velocity:	0.044	(m/s)
Froude Number	0.016	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database # 277
Datalogger Internal Power:	4.56V
Datalogger External Power:	14.20V
Datalogger Memory Used:	4% Cleared
Datalogger Clock:	Jun 14, 2007 09:59 MST
Laptop Clock:	Jun 14, 2007 09:59 MST
Dessicant:	Good - 100%
Datalogger:	Optimum DD-128 #109050402
PT:	Keller 5 psi #104638
Power:	Solar panel and internal battery

Notes:  
TSS sample taken.  
data looks good



# Hydrometric Measurement / Site Visit Record

S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Upland Muskeg River  
Location: Upland Muskeg River  
Site Name: S20  
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4

## Time of Measurement

Date of Measurement: August 9, 2007  
Start Time: 2:15 PM MDT  
End Time: MDT

## Weather Conditions:

Partly Cloudy

## River Conditions:

Low

## Personnel & Equipment

Measurement Made By: SM, JSI  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

	Setup No. 1	Setup No. 2
Bench Mark Reading: Rebar on LB	1.994	2.018
Water Level Reading:	3.458	3.484
Top of Ice Level Reading:		
Transducer Reading & Calc'd El	0.704	0.704
Other: T-post on LB near DL	0.830	0.854

## Measurement Data

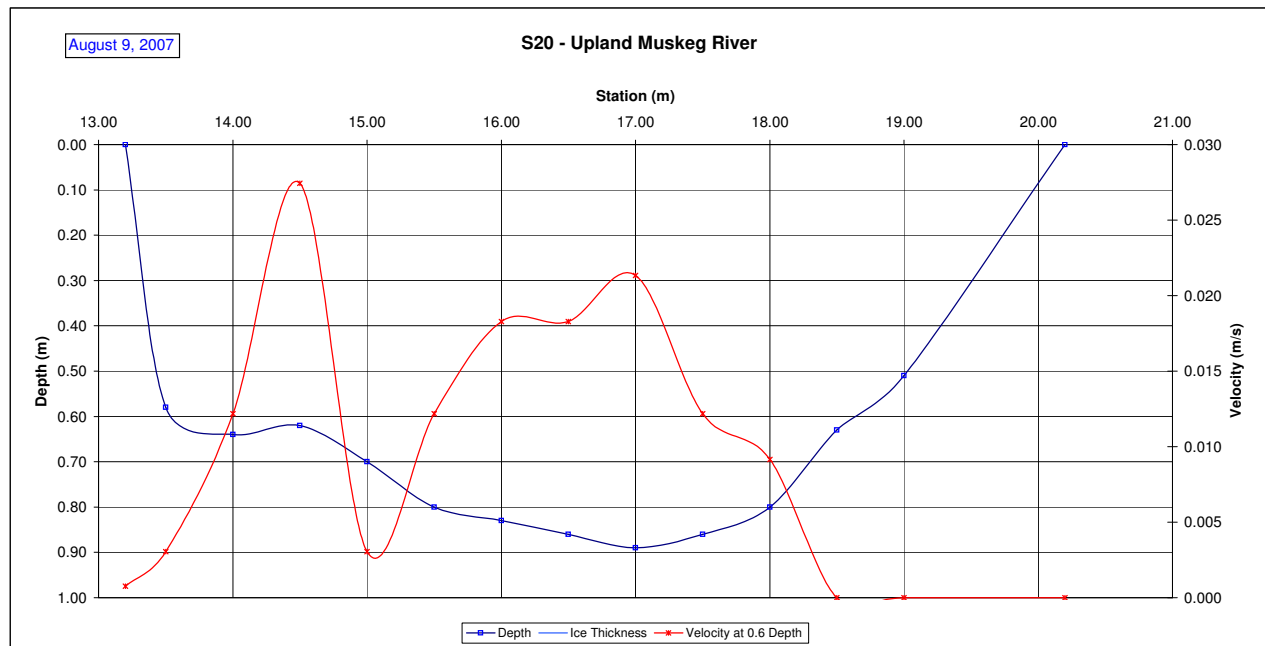
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
LB	13.20	0.00			0.000	1.00	1	13.20	13.35	0.001	0.001	0.15	0.02	0.000	0%
	13.50	0.58			0.003	1.00	2	13.35	13.75	0.003	0.003	0.58	0.23	0.001	1%
	14.00	0.64			0.012	1.00	3	13.75	14.25	0.012	0.012	0.64	0.32	0.004	7%
	14.50	0.62			0.027	1.00	4	14.25	14.75	0.027	0.027	0.62	0.31	0.009	16%
	15.00	0.70			0.003	1.00	5	14.75	15.25	0.003	0.003	0.70	0.35	0.001	2%
	15.50	0.80			0.012	1.00	6	15.25	15.75	0.012	0.012	0.80	0.40	0.005	9%
	16.00	0.83			0.018	1.00	7	15.75	16.25	0.018	0.018	0.83	0.42	0.008	14%
	16.50	0.86			0.018	1.00	8	16.25	16.75	0.018	0.018	0.86	0.43	0.008	15%
	17.00	0.89			0.021	1.00	9	16.75	17.25	0.021	0.021	0.89	0.45	0.009	18%
	17.50	0.86			0.012	1.00	10	17.25	17.75	0.012	0.012	0.86	0.43	0.005	10%
	18.00	0.80			0.009	1.00	11	17.75	18.25	0.009	0.009	0.80	0.40	0.004	7%
	18.50	0.63			0.000	1.00	12	18.25	18.75	0.000	0.000	0.63	0.32	0.000	0%
	19.00	0.51			0.000	1.00	13	18.75	19.60	0.000	0.000	0.51	0.43	0.000	0%
RB	20.20	0.00			0.000	1.00	14	19.60	20.20	0.000	0.000	0.13	0.08	0.000	0%
Total Flow:														0.053	100%

Total Flow:	0.053	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	4.58	(m <sup>2</sup> )
Top Width:	7.00	(m)
Hydraulic Depth:	0.654	(m)
Mean Velocity:	0.012	(m/s)
Froude Number	0.005	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database # 277
Datalogger Internal Power:	4.55V
Datalogger External Power:	14.32V
Datalogger Memory Used:	9%
Datalogger Clock:	1:20 PM MST
Laptop Clock:	1:20 PM MST
Dessicant:	Changed
Datalogger:	Optimum DD-128 #109050402
PT:	Keller 5 psi #104638
Power:	Solar panel and internal battery

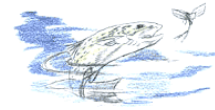
## Notes:

dessicant changed



# Hydrometric Measurement / Site Visit Record

S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Upland Muskeg River  
Location: Upland Muskeg River  
Site Name: S20  
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4

## Time of Measurement

Date of Measurement: September 20, 2007  
Start Time: 1:30 PM MDT  
End Time: MDT

## Weather Conditions:

rain, cloud  
River Conditions: higher than august

## Personnel & Equipment

Measurement Made By: SM, JSI  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Rebar on LB 1.580  
Water Level Reading: 2.572  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 1.174  
Other: T-post on LB near DL 0.422

## Setup No. 1

El: 50.000  
El: 49.008  
El: 47.834  
El: 51.158

## Setup No. 2

El: 50.000  
El: 49.018  
El: 47.844  
El: 51.158

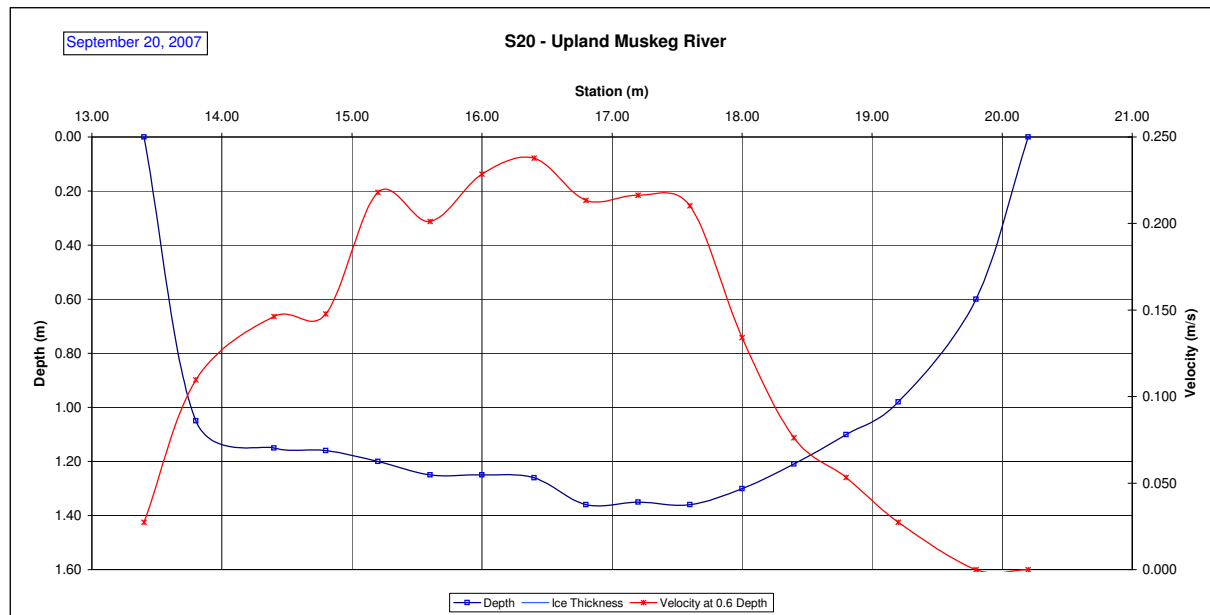
Measured Data						Measurement Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
13.40	0.00		0.000	0.000	0.000	1.00	1	13.40	13.60	0.027	0.027	0.26	0.05	0.001	0%	
13.80	1.05		0.131	0.088		1.00	2	13.60	14.10	0.110	0.110	1.05	0.53	0.058	5%	
14.40	1.15		0.174	0.119		1.00	3	14.10	14.60	0.146	0.146	1.15	0.58	0.084	7%	
14.80	1.16		0.198	0.098		1.00	4	14.60	15.00	0.148	0.148	1.16	0.46	0.069	6%	
15.20	1.20		0.262	0.174		1.00	5	15.00	15.40	0.218	0.218	1.20	0.48	0.105	9%	
15.60	1.25		0.241	0.162		1.00	6	15.40	15.80	0.201	0.201	1.25	0.50	0.101	9%	
16.00	1.25		0.250	0.207		1.00	7	15.80	16.20	0.229	0.229	1.25	0.50	0.114	10%	
16.40	1.26		0.265	0.210		1.00	8	16.20	16.60	0.238	0.238	1.26	0.50	0.120	10%	
16.80	1.36		0.283	0.143		1.00	9	16.60	17.00	0.213	0.213	1.36	0.54	0.116	10%	
17.20	1.35		0.265	0.168		1.00	10	17.00	17.40	0.216	0.216	1.35	0.54	0.117	10%	
17.60	1.36		0.265	0.155		1.00	11	17.40	17.80	0.210	0.210	1.36	0.54	0.114	10%	
18.00	1.30		0.168	0.101		1.00	12	17.80	18.20	0.134	0.134	1.30	0.52	0.070	6%	
18.40	1.21		0.073	0.079		1.00	13	18.20	18.60	0.076	0.076	1.21	0.48	0.037	3%	
18.80	1.10		0.037	0.070		1.00	14	18.60	19.00	0.053	0.053	1.10	0.44	0.023	2%	
19.20	0.98		0.012	0.043		1.00	15	19.00	19.50	0.027	0.027	0.98	0.49	0.013	1%	
19.80	0.60		0.000	0.000		1.00	16	19.50	20.00	0.000	0.000	0.60	0.30	0.000	0%	
20.20	0.00				0.000	1.00	16	20.00	20.20	0.000	0.000	0.15	0.03	0.000	0%	
Total Flow:														1.142	100%	

Total Flow:	1.142	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	7.49	(m <sup>2</sup> )
Top Width:	6.80	(m)
Hydraulic Depth:	1.102	(m)
Mean Velocity:	0.152	(m/s)
Froude Number	0.046	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database # 277
Datalogger Internal Power:	4.55V
Datalogger External Power:	13.82v
Datalogger Memory Used:	12%
Datalogger Clock:	12:20 PM MST
Laptop Clock:	12:12 PM MST
Dessicant:	good
Datalogger:	Optimum DD-128 #109050402
PT:	Keller 5 psi #104638
Power:	Solar panel and internal battery

## Notes:

data good, water high



Hydrometric Measurement / Site Visit Record  
S20 - Upland Muskeg River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Upland Muskeg River  
Location: Upland Muskeg River  
Site Name: S20  
Coordinates & Legal: 6354787 N, 492178 E SE-19-96-7-W4

Time of Measurement

Date of Measurement: October 20, 2007  
Start Time: 8:00 AM MDT  
End Time: 8:12 AM MDT

Weather Conditions:

5°C, overcast, calm  
River Conditions: open, beaver affected at site, flow mmt done near bridge

Personnel & Equipment

Measurement Made By: SM, JSI  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rebar on LB 1.798  
Water Level Reading: 2.915  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 1.050  
Other: T-post on LB near DL 0.632

Setup No. 1

El: 50.000  
El: 48.883  
El: 2.906  
El: 1.050  
El: 51.166

Setup No. 2

El: 50.000  
El: 48.883  
El: 2.906  
El: 1.050  
El: 51.166

48.883

47.833

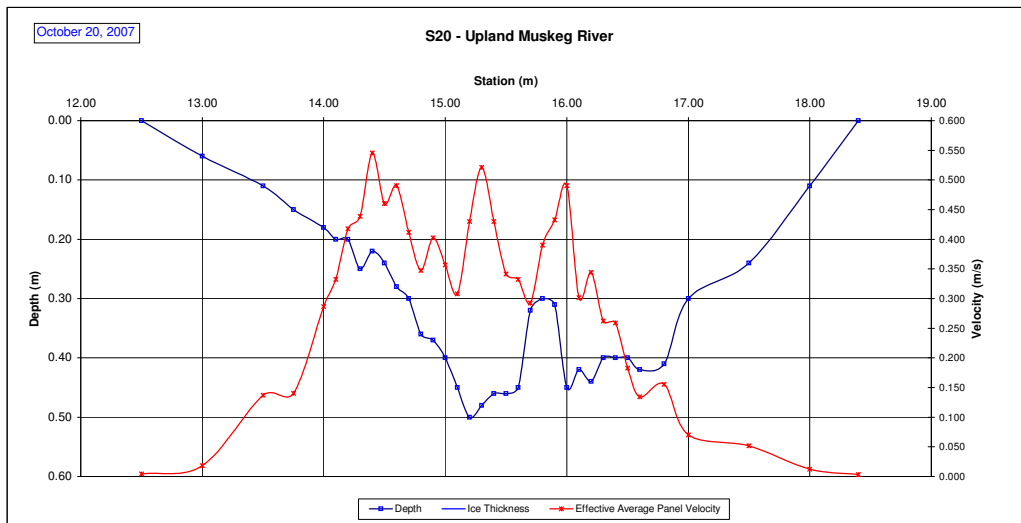
Measured Data						Measurement Data										Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)							
12.50	0.00				0.000	1.00	1	12.50	12.75	0.005	0.005	0.02	0.00	0.000	0%						
13.00	0.06				0.018	1.00	2	12.75	13.25	0.018	0.018	0.06	0.03	0.001	0%						
13.50	0.11				0.137	1.00	3	13.25	13.63	0.137	0.137	0.11	0.04	0.006	1%						
13.75	0.15				0.140	1.00	4	13.63	13.88	0.140	0.140	0.15	0.04	0.005	1%						
14.00	0.18				0.287	1.00	5	13.88	14.05	0.287	0.287	0.18	0.03	0.009	2%						
14.10	0.20				0.332	1.00	6	14.05	14.15	0.332	0.332	0.20	0.02	0.007	2%						
14.20	0.20				0.418	1.00	7	14.15	14.25	0.418	0.418	0.20	0.02	0.008	2%						
14.30	0.25				0.439	1.00	8	14.25	14.35	0.439	0.439	0.25	0.03	0.011	3%						
14.40	0.22				0.546	1.00	9	14.35	14.45	0.546	0.546	0.22	0.02	0.012	3%						
14.50	0.24				0.460	1.00	10	14.45	14.55	0.460	0.460	0.24	0.02	0.011	3%						
14.60	0.28				0.491	1.00	11	14.55	14.65	0.491	0.491	0.28	0.03	0.014	3%						
14.70	0.30				0.411	1.00	12	14.65	14.75	0.411	0.411	0.30	0.03	0.012	3%						
14.80	0.36				0.347	1.00	13	14.75	14.85	0.347	0.347	0.36	0.04	0.013	3%						
14.90	0.37				0.402	1.00	14	14.85	14.95	0.402	0.402	0.37	0.04	0.015	4%						
15.00	0.40				0.357	1.00	15	14.95	15.05	0.357	0.357	0.40	0.04	0.014	4%						
15.10	0.45				0.308	1.00	16	15.05	15.15	0.308	0.308	0.45	0.04	0.014	3%						
15.20	0.50				0.430	1.00	17	15.15	15.25	0.430	0.430	0.50	0.05	0.021	5%						
15.30	0.48				0.521	1.00	18	15.25	15.35	0.521	0.521	0.48	0.05	0.025	6%						
15.40	0.46				0.430	1.00	19	15.35	15.45	0.430	0.430	0.46	0.05	0.020	5%						
15.50	0.46				0.341	1.00	20	15.45	15.55	0.341	0.341	0.46	0.05	0.016	4%						
15.60	0.45				0.332	1.00	21	15.55	15.65	0.332	0.332	0.45	0.04	0.015	4%						
15.70	0.32				0.293	1.00	22	15.65	15.75	0.293	0.293	0.32	0.03	0.009	2%						
15.80	0.30				0.390	1.00	23	15.75	15.85	0.390	0.390	0.30	0.03	0.012	3%						
15.90	0.31				0.433	1.00	24	15.85	15.95	0.433	0.433	0.31	0.03	0.013	3%						
16.00	0.45				0.491	1.00	25	15.95	16.05	0.491	0.491	0.45	0.05	0.022	6%						
16.10	0.42				0.302	1.00	26	16.05	16.15	0.302	0.302	0.42	0.04	0.013	3%						
16.20	0.44				0.344	1.00	27	16.15	16.25	0.344	0.344	0.44	0.04	0.015	4%						
16.30	0.40				0.262	1.00	28	16.25	16.35	0.262	0.262	0.40	0.04	0.010	3%						
16.40	0.40				0.259	1.00	29	16.35	16.45	0.259	0.259	0.40	0.04	0.010	3%						
16.50	0.40				0.183	1.00	30	16.45	16.55	0.183	0.183	0.40	0.04	0.007	2%						
16.60	0.42				0.134	1.00	31	16.55	16.70	0.134	0.134	0.42	0.06	0.008	2%						
16.80	0.41				0.155	1.00	32	16.70	16.90	0.155	0.155	0.41	0.08	0.013	3%						
17.00	0.30				0.070	1.00	33	16.90	17.25	0.070	0.070	0.30	0.11	0.007	2%						
17.50	0.24				0.052	1.00	34	17.25	17.75	0.052	0.052	0.24	0.12	0.006	2%						
18.00	0.11				0.012	1.00	35	17.75	18.20	0.012	0.012	0.11	0.05	0.001	0%						
18.40	0.00				0.000	1.00	35	18.20	18.40	0.003	0.003	0.03	0.01	0.000	0%						
Total Flow:														0.396	100%						

Total Flow:	0.396	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	1.48	(m <sup>2</sup> )
Top Width:	5.90	(m)
Hydraulic Depth:	0.250	(m)
Mean Velocity:	0.268	(m/s)
Froude Number	0.171	
Photographs taken looking at: Upstream, downstream, across		

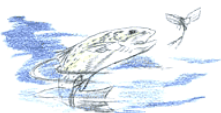
Datalogger Notes:	Database # 277
Datalogger Internal Power:	4.55V
Datalogger External Power:	13.82v
Datalogger Memory Used:	12%
Datalogger Clock:	12:20 PM MST
Laptop Clock:	12:12 PM MST
Dessicant:	good
Datalogger:	Optimum DD-128 #109050402
PT:	Keller 5 psi #104638
Power:	Solar panel and internal battery

Notes:

Transducer left in pool for winter.  
Dessicant cap on - transducer may not have been vented to atmosphere properly.  
Flow MMT made under bridge due to beaver effects. Dams photographed. 1.2m high dam present 30 m u/s of bridge.



Hydrometric Measurement / Site Visit Record  
S22 - Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg Creek  
Location: Muskeg Creek  
Site Name: S22  
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4

Time of Measurement

Date of Measurement: March 27, 2007  
Start Time: MDT  
End Time: MDT

Weather Conditions:

River Conditions: Snow Covered, Water flowing down the hill & under ice

Notes:

Hattfield conducted Water Level measurements, Assumed HCL used t post as BM

Personnel & Equipment

Measurement Made By: JE/JM  
Data Entry By:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

Level Readings

		Setup No. 1	Setup No. 2	Average
Bench Mark Reading: t post	0.977	El: 306.476	0.932 El: 306.476	
Water Level Reading:	4.264	El: 303.189	4.212 El: 303.196	303.193
Top of Ice Level Reading:	4.158	El: 303.295	4.114 El: 303.294	
Transducer Reading & Calc'd El.:		El: 303.189	0.000 El: 303.196	303.193
Other: Nail in tree on RB		El: 307.453	El: 307.408	

March 27, 2007



# Hydrometric Measurement / Site Visit Record

S22 - Muskeg Creek



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg Creek  
Location: Muskeg Creek  
Site Name: S22  
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4  
Time of Measurement: June 14, 2007  
Start Time: 8:55 AM MST  
End Time: 9:10 AM MST

Weather Conditions: +15°C, Clear, calm  
River Conditions: Open, moderate stage

### Personnel & Equipment

Measurement Made By: sm, Pm, wd  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Level Readings

Bench Mark Reading: t post 0.036  
Water Level Reading: 2.993  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.: 0.756  
Other: Nail in tree on RB 1.282

### Setup No. 1

El: 306.476  
El: 303.519  
El: 306.512  
El: 302.763  
El: 305.230

### Setup No. 2

El: 306.476  
El: 303.518  
El: 306.491  
El: 302.762  
El: 305.231

### Average

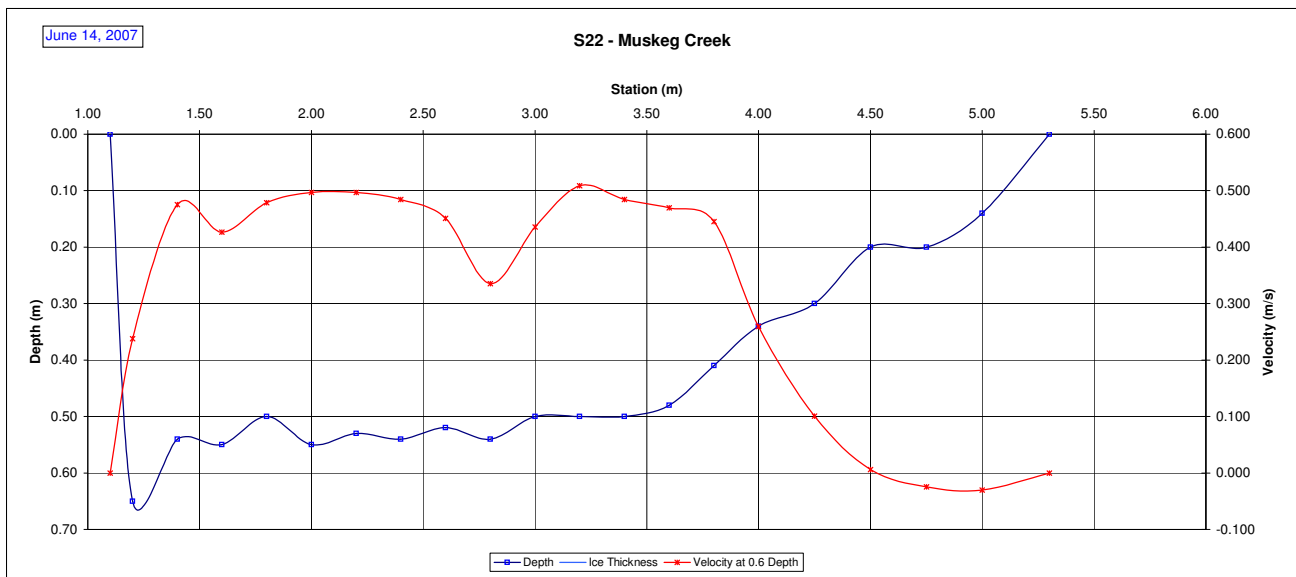
303.519  
302.763

Measured Data							Measurement Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
1.10	0.00				0.000	1.00	1	1.10	1.15	0.059	0.059	0.16	0.01	0.000	0.1%	
1.20	0.65				0.238	1.00	2	1.15	1.30	0.238	0.238	0.65	0.10	0.023	3.5%	
1.40	0.54				0.475	1.00	3	1.30	1.50	0.475	0.475	0.54	0.11	0.051	7.8%	
1.60	0.55				0.427	1.00	4	1.50	1.70	0.427	0.427	0.55	0.11	0.047	7.1%	
1.80	0.50				0.479	1.00	5	1.70	1.90	0.479	0.479	0.50	0.10	0.048	7.2%	
2.00	0.55				0.497	1.00	6	1.90	2.10	0.497	0.497	0.55	0.11	0.055	8.3%	
2.20	0.53				0.497	1.00	7	2.10	2.30	0.497	0.497	0.53	0.11	0.053	8.0%	
2.40	0.54				0.485	1.00	8	2.30	2.50	0.485	0.485	0.54	0.11	0.052	7.9%	
2.60	0.52				0.451	1.00	9	2.50	2.70	0.451	0.451	0.52	0.10	0.047	7.1%	
2.80	0.54				0.335	1.00	10	2.70	2.90	0.335	0.335	0.54	0.11	0.036	5.5%	
3.00	0.50				0.436	1.00	11	2.90	3.10	0.436	0.436	0.50	0.10	0.044	6.6%	
3.20	0.50				0.509	1.00	12	3.10	3.30	0.509	0.509	0.50	0.10	0.051	7.7%	
3.40	0.50				0.485	1.00	13	3.30	3.50	0.485	0.485	0.50	0.10	0.048	7.3%	
3.60	0.48				0.469	1.00	14	3.50	3.70	0.469	0.469	0.48	0.10	0.045	6.8%	
3.80	0.41				0.445	1.00	15	3.70	3.90	0.445	0.445	0.41	0.08	0.036	5.5%	
4.00	0.34				0.259	1.00	16	3.90	4.13	0.259	0.259	0.34	0.08	0.020	3.0%	
4.25	0.30				0.101	1.00	17	4.13	4.38	0.101	0.101	0.30	0.08	0.008	1.1%	
4.50	0.20				0.006	1.00	18	4.38	4.63	0.006	0.006	0.20	0.05	0.000	0.0%	
4.75	0.20				-0.024	1.00	19	4.63	4.88	-0.024	-0.024	0.20	0.05	-0.001	-0.2%	
5.00	0.14				-0.030	1.00	20	4.88	5.15	-0.030	-0.030	0.14	0.04	-0.001	-0.2%	
5.30	0.00				0.000	1.00	21	5.15	5.30	-0.008	-0.008	0.04	0.01	0.000	0%	
															100.0%	

Total Flow:	0.662	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.73	(m <sup>2</sup> )
Top Width:	4.20	(m)
Hydraulic Depth:	0.413	(m)
Mean Velocity:	0.382	(m/s)
Froude Number	0.190	
Photographs taken looking at: Upstream, downstream, across.		

Datalogger Notes:	Database # 602
Datalogger Internal Power:	4.74V
Datalogger External Power:	13.69V
Datalogger Memory Used:	35%
Datalogger Clock:	Jun 14, 2007 07:45 MST
Laptop Clock:	Jun 14, 2007 07:45 MST
Dessicant:	none
Datalogger:	0204100602
PT:	101353
Power:	Battery & Solar panel

Notes:



Hydrometric Measurement / Site Visit Record
S22 - Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg Creek
Location: Muskeg Creek
Site Name: S22
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4

Personnel & Equipment

Measurement Made By: SM, JSI
Data Entry By: PM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: August 9, 2007
Start Time: 9:00 AM MST
End Time: MST

Weather Conditions: +8°C, Cloudy, No wind
River Conditions: Very Low stage

Level Readings

Bench Mark Reading: t post 0.309
Water Level Reading: 3.675
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 0.352
Other: Nail in tree on RB 1.561

Setup No. 1

El: 306.476
El: 303.110
El: 306.785
El: 302.758
El: 305.224

Setup No. 2

El: 306.476
El: 303.113
El: 306.808
El: 302.761
El: 305.225

Average

303.112

302.760

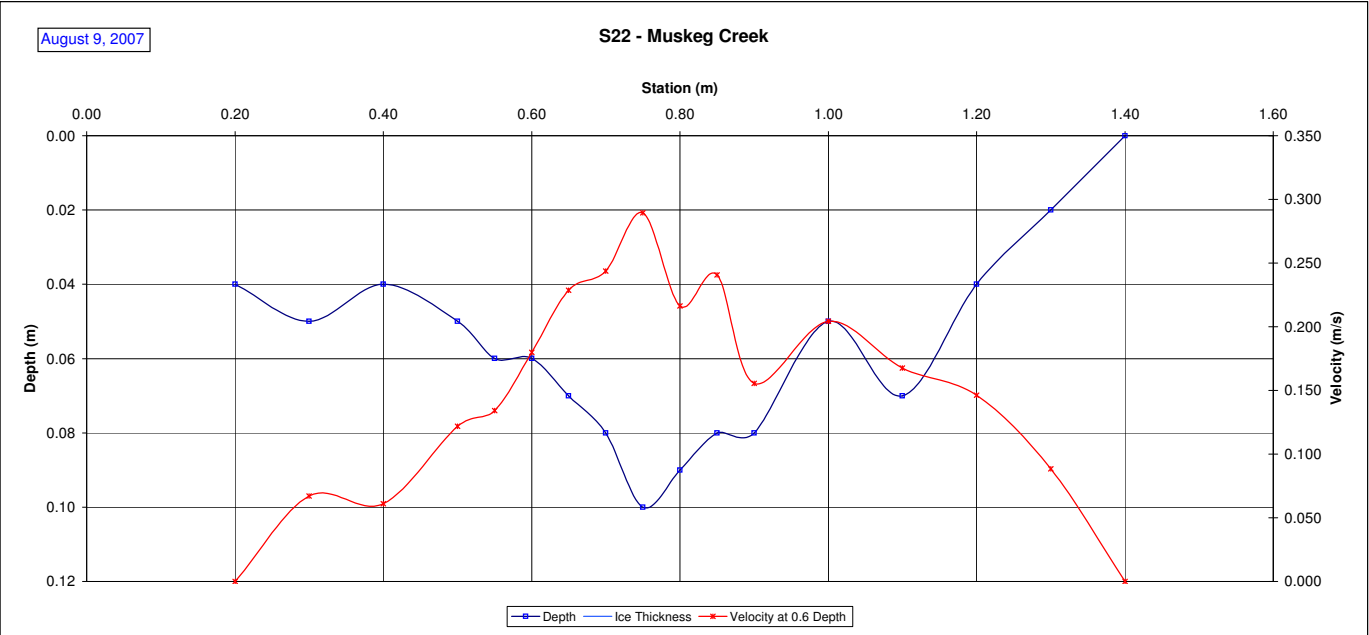
Table with 16 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Rows include data for LB and RB stations.

100.0%

Summary table with 4 columns: Metric, Value, Unit, and Notes. Includes Total Flow (0.011 m³/s), Perceived Measurement Quality (FAIR), Total Area (0.06 m²), Top Width (1.20 m), Hydraulic Depth (0.054 m), Mean Velocity (0.171 m/s), Froude Number (0.235), and Photographs taken looking at (Upstream, downstream, across).

Datalogger Notes table with 2 columns: Metric and Value. Includes Datalogger Internal Power (4.74V), Datalogger External Power (13.87V), Datalogger Memory Used (40%), Datalogger Clock (8:10 AM MST), Laptop Clock (8:10 AM MST), Dessicant (Changed), Datalogger (0204100602), PT (101353), and Power (Battery & Solar panel).

Notes: all good





Hydrometric Measurement / Site Visit Record

S22 - Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg Creek  
Location: Muskeg Creek  
Site Name: S22  
Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4

Time of Measurement

Date of Measurement: Sept 18 2007  
Start Time: 3:10 PM MST  
End Time: MST

Weather Conditions:

+5°C, Cloudy

River Conditions:

higher stage

Personnel & Equipment

Measurement Made By: SM JMS  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: t post 0.300  
Water Level Reading: 3.185  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.: 0.824  
Other: Nail in tree on RB 1.550

Setup No. 1

El: 306.476  
El: 303.591  
El: 306.776  
El: 302.767  
El: 305.226

Setup No. 2

El: 306.476  
El: 303.592  
El: 306.784  
El: 302.768  
El: 305.227

Average

303.592

306.784

302.768

305.227

Measurement Data

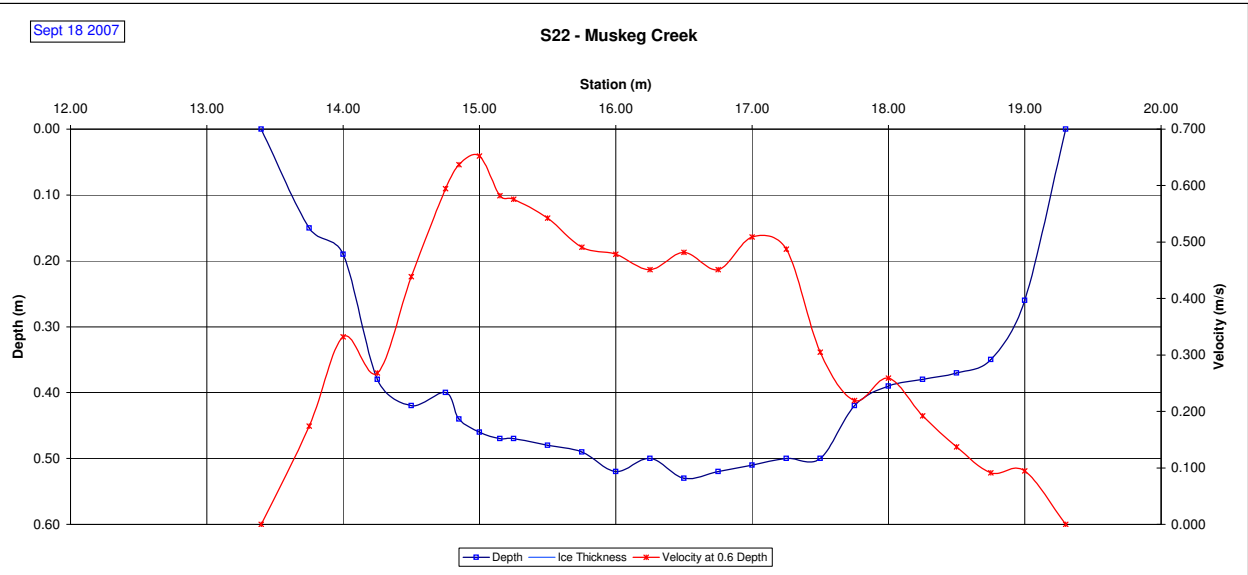
Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
13.40	0.00				0.000	1.00	1	13.40	13.58	0.043	0.043	0.04	0.01	0.000	0%
13.75	0.15				0.174	1.00	2	13.58	13.88	0.174	0.174	0.15	0.05	0.008	1%
14.00	0.19				0.332	1.00	3	13.88	14.13	0.332	0.332	0.19	0.05	0.016	2%
14.25	0.38				0.268	1.00	4	14.13	14.38	0.268	0.268	0.38	0.10	0.025	3%
14.50	0.42				0.439	1.00	5	14.38	14.63	0.439	0.439	0.42	0.11	0.046	5%
14.75	0.40				0.594	1.00	6	14.63	14.80	0.594	0.594	0.40	0.07	0.042	5%
14.85	0.44				0.637	1.00	7	14.80	14.93	0.637	0.637	0.44	0.06	0.035	4%
15.00	0.46				0.652	1.00	8	14.93	15.08	0.652	0.652	0.46	0.07	0.045	5%
15.15	0.47				0.582	1.00	9	15.08	15.20	0.582	0.582	0.47	0.06	0.034	4%
15.25	0.47				0.576	1.00	10	15.20	15.38	0.576	0.576	0.47	0.08	0.047	5%
15.50	0.48				0.543	1.00	11	15.38	15.63	0.543	0.543	0.48	0.12	0.065	7%
15.75	0.49				0.491	1.00	12	15.63	15.88	0.491	0.491	0.49	0.12	0.060	7%
16.00	0.52				0.479	1.00	13	15.88	16.13	0.479	0.479	0.52	0.13	0.062	7%
16.25	0.50				0.451	1.00	14	16.13	16.38	0.451	0.451	0.50	0.13	0.056	6%
16.50	0.53				0.482	1.00	15	16.38	16.63	0.482	0.482	0.53	0.13	0.064	7%
16.75	0.52				0.451	1.00	16	16.63	16.88	0.451	0.451	0.52	0.13	0.059	6%
17.00	0.51				0.509	1.00	17	16.88	17.13	0.509	0.509	0.51	0.13	0.065	7%
17.25	0.50				0.488	1.00	18	17.13	17.38	0.488	0.488	0.50	0.13	0.061	7%
17.50	0.50				0.305	1.00	19	17.38	17.63	0.305	0.305	0.50	0.13	0.038	4%
17.75	0.42				0.219	1.00	20	17.63	17.88	0.219	0.219	0.42	0.11	0.023	2%
18.00	0.39				0.259	1.00	21	17.88	18.13	0.259	0.259	0.39	0.10	0.025	3%
18.25	0.38				0.192	1.00	22	18.13	18.38	0.192	0.192	0.38	0.10	0.018	2%
18.50	0.37				0.137	1.00	23	18.38	18.63	0.137	0.137	0.37	0.09	0.013	1%
18.75	0.35				0.091	1.00	24	18.63	18.88	0.091	0.091	0.35	0.09	0.008	1%
19.00	0.26				0.094	1.00	25	18.88	19.15	0.094	0.094	0.26	0.07	0.007	1%
19.30	0.00				0.000	1.00	26	19.15	19.30	0.024	0.024	0.07	0.01	0.000	0%

100.0%

Total Flow:	0.923	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	2.33	(m <sup>2</sup> )
Top Width:	5.90	(m)
Hydraulic Depth:	0.395	(m)
Mean Velocity:	0.396	(m/s)
Froude Number	0.201	
Photographs taken looking at: Upstream, downstream, across.		

Notes: all good

Datalogger Notes:	Database # 602
Datalogger Internal Power:	4.74V
Datalogger External Power:	13.87V
Datalogger Memory Used:	40%
Datalogger Clock:	2:12 PM MST
Laptop Clock:	2:14 PM MST
Dessicant:	Changed
Datalogger:	0204100602
PT:	101353
Power:	Battery & Solar panel



# Hydrometric Measurement / Site Visit Record

S22 - Muskeg Creek



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Muskeg Creek  
 Location: Muskeg Creek  
 Site Name: S22  
 Coordinates & Legal: 6348856 N, 481036 E SE-36-95-9-W4  
 Time of Measurement: October 20, 2007  
 Date of Measurement: 11:50 AM MDT  
 Start Time: 12:12 PM MDT  
 End Time:

### Personnel & Equipment

Measurement Made By: SM/FF  
 Data Entry By: SM  
 Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521  
 Level Readings  
 Bench Mark Reading: t post 0.321  
 Water Level Reading: 3.262  
 Top of Ice Level Reading:  
 Transducer Reading & Calc'd El.: 0.751  
 Other: Nail in tree on RB 1.570

### Setup No. 1

El: 306.476  
 El: 303.535  
 El: 306.797  
 El: 302.784  
 El: 305.227

### Setup No. 2

El: 306.476  
 El: 303.542  
 El: 306.792  
 El: 302.791  
 El: 305.229

### Average

303.539  
 302.788

Weather Conditions: +10°C, overcast, calm  
 River Conditions: Open, moderate stage

### Measurement Data

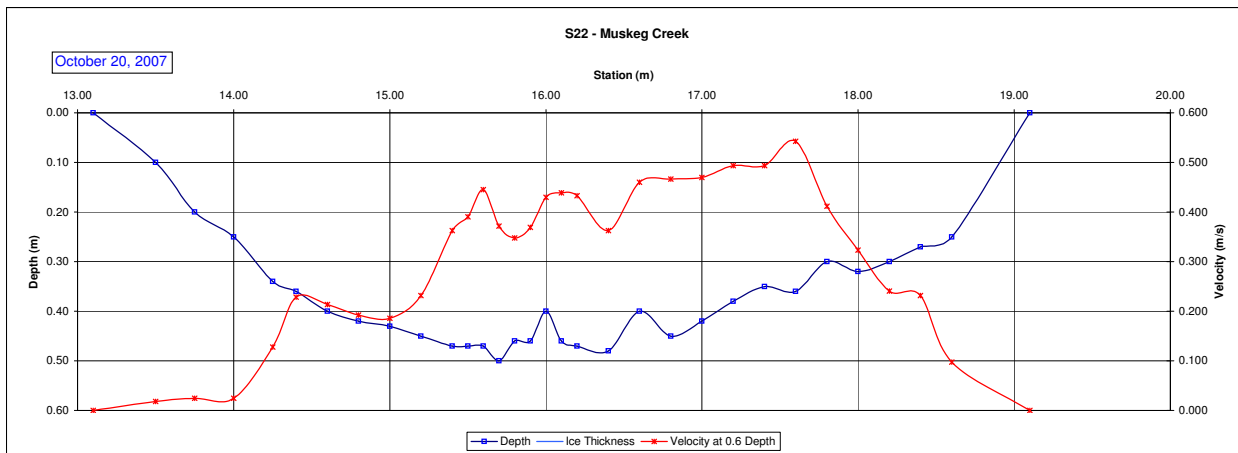
Measured Data						Calculated Data									
		Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)	Percentage of Total
Station (m)	Depth (m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)			
					0.000	1.00	1	13.10	13.30	0.005	0.005	0.03	0.01	0.000	0.0%
13.10	0.00				0.018	1.00	2	13.30	13.63	0.018	0.018	0.10	0.03	0.001	0.1%
13.50	0.10				0.024	1.00	3	13.63	13.88	0.024	0.024	0.20	0.05	0.001	0.2%
13.75	0.20				0.024	1.00	4	13.88	14.13	0.024	0.024	0.25	0.06	0.002	0.2%
14.00	0.25				0.128	1.00	5	14.13	14.33	0.128	0.128	0.34	0.07	0.009	1.4%
14.25	0.34				0.229	1.00	6	14.33	14.50	0.229	0.229	0.36	0.06	0.014	2.3%
14.40	0.36				0.213	1.00	7	14.50	14.70	0.213	0.213	0.40	0.08	0.017	2.7%
14.60	0.40				0.192	1.00	8	14.70	14.90	0.192	0.192	0.42	0.08	0.016	2.6%
14.80	0.42				0.186	1.00	9	14.90	15.10	0.186	0.186	0.43	0.09	0.016	2.6%
15.00	0.43				0.232	1.00	10	15.10	15.30	0.232	0.232	0.45	0.09	0.021	3.3%
15.20	0.45				0.363	1.00	11	15.30	15.45	0.363	0.363	0.47	0.07	0.026	4.1%
15.40	0.47				0.390	1.00	12	15.45	15.55	0.390	0.390	0.47	0.05	0.018	2.9%
15.50	0.47				0.445	1.00	13	15.55	15.65	0.445	0.445	0.47	0.05	0.021	3.3%
15.60	0.47				0.372	1.00	14	15.65	15.75	0.372	0.372	0.50	0.05	0.019	3.0%
15.70	0.50				0.347	1.00	15	15.75	15.85	0.347	0.347	0.46	0.05	0.016	2.6%
15.80	0.46				0.369	1.00	16	15.85	15.95	0.369	0.369	0.46	0.05	0.017	2.7%
15.90	0.46				0.430	1.00	17	15.95	16.05	0.430	0.430	0.40	0.04	0.017	2.7%
16.00	0.40				0.439	1.00	18	16.05	16.15	0.439	0.439	0.46	0.05	0.020	3.2%
16.10	0.46				0.433	1.00	19	16.15	16.30	0.433	0.433	0.47	0.07	0.031	4.9%
16.20	0.47				0.363	1.00	20	16.30	16.50	0.363	0.363	0.48	0.10	0.035	5.6%
16.40	0.48				0.460	1.00	21	16.50	16.70	0.460	0.460	0.40	0.08	0.037	5.9%
16.60	0.40				0.466	1.00	22	16.70	16.90	0.466	0.466	0.45	0.09	0.042	6.7%
16.80	0.45				0.469	1.00	23	16.90	17.10	0.469	0.469	0.42	0.08	0.039	6.3%
17.00	0.42				0.494	1.00	24	17.10	17.30	0.494	0.494	0.38	0.08	0.038	6.0%
17.20	0.38				0.494	1.00	25	17.30	17.50	0.494	0.494	0.35	0.07	0.035	5.5%
17.40	0.35				0.543	1.00	26	17.50	17.70	0.543	0.543	0.36	0.07	0.039	6.2%
17.60	0.36				0.411	1.00	27	17.70	17.90	0.411	0.411	0.30	0.06	0.025	3.9%
17.80	0.30				0.323	1.00	28	17.90	18.10	0.323	0.323	0.32	0.06	0.021	3.3%
18.00	0.32				0.241	1.00	29	18.10	18.30	0.241	0.241	0.30	0.06	0.014	2.3%
18.20	0.30				0.232	1.00	30	18.30	18.50	0.232	0.232	0.27	0.05	0.013	2.0%
18.40	0.27				0.098	1.00	31	18.50	18.85	0.098	0.098	0.25	0.09	0.009	1.4%
18.60	0.25				0.000	1.00	32	18.85	19.10	0.024	0.024	0.06	0.02	0.000	0%
19.10	0.00														
															100.0%

Total Flow:	0.626	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	1.99	(m <sup>2</sup> )
Top Width:	6.00	(m)
Hydraulic Depth:	0.332	(m)
Mean Velocity:	0.314	(m/s)
Froude Number	0.174	
Photographs taken looking at: Upstream, downstream, across.		

Datalogger Notes:	Database # 602
Datalogger Internal Power:	4.74V
Datalogger External Power:	13.76
Datalogger Memory Used:	35%
Datalogger Clock:	Oct 20, 2007 10:42 MST
Laptop Clock:	Oct 20, 2007 10:44 MST
Dessicant:	good 80%
Datalogger:	0204100602
PT:	101353
Power:	Battery & Solar panel

### Notes:

TD removed for winter



# Hydrometric Measurement / Site Visit Record

## S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Athabasca River below Edmundson Creek  
Location: Athabasca River below Edmundson Creek  
Site Name: S24  
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

### Time of Measurement

Date of Measurement: January 17, 2007  
Start Time: 10:25 AM MST  
End Time: 11:51 AM MST

### Weather Conditions:

-17 C, Partly cloudy, wind from W at 15 kph

### River Conditions:

Complete ice cover. Ice rough and uneven.

### Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: nail in tree 0.395  
Water Level Reading: 5.510  
Top of Ice Level Reading: 5.504  
Transducer Reading & Calc'd El.: 1.907  
Other: T-post 0.136

### Setup No. 1

El: 231.096  
El: 225.981  
El: 225.987  
El: 224.074  
El: 231.355

### Setup No. 2

El: 231.096  
El: 225.979  
El: 225.993  
El: 224.072  
El: 231.354

225.980

224.073

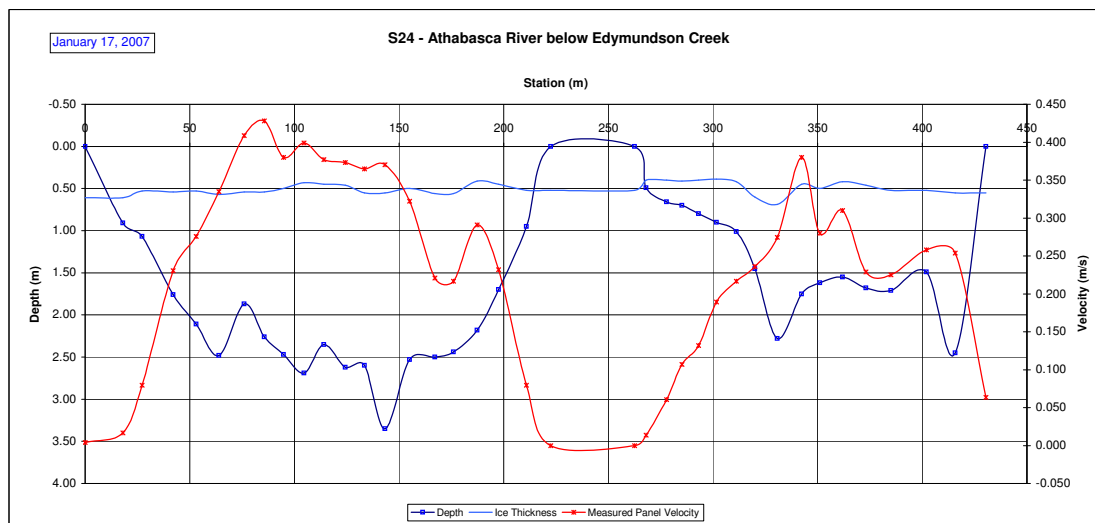
Measured Data						Measurement Data										
						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.0	0.00	0.610			0.000	0.9	1	0.0	9.0	0.005	0.004	0.075	0.675	0.003	0%	
18.0	0.91	0.610			0.018	0.9	2	9.0	22.6	0.018	0.016	0.300	4.080	0.067	0%	
27.2	1.07	0.530			0.088	0.9	3	22.6	34.7	0.088	0.080	0.540	6.507	0.518	0%	
42.1	1.76	0.540	0.229	0.283		0.9	4	34.7	47.6	0.256	0.230	1.220	15.799	3.641	3%	
53.1	2.11	0.530	0.232	0.381		0.9	5	47.6	58.5	0.306	0.276	1.580	17.222	4.748	3%	
63.9	2.48	0.570	0.302	0.442		0.9	6	58.5	70.0	0.372	0.335	1.910	21.870	7.319	5%	
76.0	1.87	0.540	0.442	0.466		0.9	7	70.0	80.8	0.454	0.409	1.330	14.431	5.898	4%	
85.6	2.26	0.540	0.454	0.497		0.9	8	80.8	90.2	0.475	0.428	1.720	16.168	6.919	5%	
94.8	2.47	0.500	0.363	0.482		0.9	9	90.2	99.7	0.422	0.380	1.970	18.715	7.110	5%	
104.6	2.69	0.430	0.375	0.512		0.9	10	99.7	109.4	0.443	0.399	2.260	21.809	8.705	6%	
114.1	2.35	0.450	0.384	0.454		0.9	11	109.4	119.2	0.419	0.377	1.900	18.763	7.077	5%	
124.4	2.62	0.460	0.405	0.424		0.9	12	119.2	129.0	0.415	0.373	2.160	21.006	7.837	5%	
133.6	2.60	0.550	0.347	0.463		0.9	13	129.0	138.4	0.405	0.365	2.050	19.424	7.087	5%	
143.3	3.35	0.550	0.378	0.445		0.9	14	138.4	149.2	0.411	0.370	2.800	30.030	11.121	8%	
155.0	2.53	0.500	0.341	0.375		0.9	15	149.2	161.1	0.358	0.322	2.030	24.157	7.786	5%	
167.1	2.50	0.560	0.235	0.256		0.9	16	161.1	171.6	0.245	0.221	1.940	20.370	4.498	3%	
176.0	2.44	0.560	0.238	0.244		0.9	17	171.6	181.7	0.241	0.217	1.880	18.988	4.115	3%	
187.3	2.18	0.410	0.277	0.369		0.9	18	181.7	192.4	0.323	0.291	1.770	19.028	5.533	4%	
197.5	1.70	0.450	0.229	0.287		0.9	19	192.4	204.2	0.258	0.232	1.250	14.688	3.405	2%	
210.8	0.95	0.520			0.088	0.9	20	204.2	216.7	0.088	0.080	0.430	5.375	0.428	0%	
222.5	0.00	0.520			0.000	0.9	21	216.7	242.5	0.000	0.000	-0.520	-13.442	0.000	0%	
262.5	0.00	0.520			0.000	0.9	22	242.5	265.3	0.000	0.000	-0.520	-11.856	0.000	0%	
268.1	0.49	0.400			0.015	0.9	23	265.3	273.0	0.015	0.014	0.090	0.689	0.009	0%	
277.8	0.66	0.400			0.067	0.9	24	273.0	281.5	0.067	0.060	0.260	2.223	0.134	0%	
285.2	0.70	0.410			0.119	0.9	25	281.5	289.2	0.119	0.107	0.290	2.218	0.237	0%	
293.1	0.80	0.400			0.146	0.9	26	289.2	297.4	0.146	0.132	0.400	3.300	0.435	0%	
301.7	0.90	0.390			0.210	0.9	27	297.4	306.5	0.210	0.189	0.510	4.616	0.874	1%	
311.2	1.01	0.420			0.241	0.9	28	306.5	315.7	0.241	0.217	0.590	5.428	1.176	1%	
320.1	1.45	0.600			0.262	0.9	29	315.7	325.5	0.262	0.236	0.850	8.330	1.965	1%	
330.8	2.28	0.690	0.341	0.268		0.9	30	325.5	336.6	0.305	0.274	1.590	17.752	4.870	3%	
342.4	1.75	0.450	0.485	0.360		0.9	31	336.6	346.7	0.422	0.380	1.300	13.150	4.996	3%	
351.0	1.62	0.500			0.311	0.9	32	346.7	356.5	0.311	0.280	1.120	10.920	3.055	2%	
361.9	1.55	0.420			0.344	0.9	33	356.5	367.5	0.344	0.310	1.130	12.430	3.853	3%	
373.0	1.68	0.460	0.314	0.195		0.9	34	367.5	379.0	0.255	0.229	1.220	14.091	3.228	2%	
385.0	1.71	0.520			0.250	0.9	35	379.0	393.5	0.250	0.225	1.190	17.231	3.876	3%	
402.0	1.49	0.520			0.287	0.9	36	393.5	408.8	0.287	0.258	0.970	14.870	3.894	3%	
415.7	2.45	0.550	0.338	0.226		0.9	37	408.8	423.1	0.282	0.254	1.900	27.075	6.870	5%	
430.5	0.00	0.550			0.000	0.9	38	423.1	430.5	0.070	0.063	0.475	3.515	0.223	0%	
Total Flow														143.45		

Total Flow:	143.45	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	461.64	(m <sup>2</sup> )
Top Width:	430.49	(m)
Hydraulic Depth:	1.072	(m)
Mean Velocity:	0.311	(m/s)
Froude Number:	0.096	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database #278
Datalogger Internal Power:	4.62 V
Datalogger External Power:	15.18 V
Datalogger Memory Used:	3%
Datalogger Clock:	Jan 17, 2007 09:47 MST
Laptop Clock:	Jan 17, 2007 09:41 MST
Dessicant:	Good
Datalogger:	Optimum DD-128 #104170278
PT:	#0014503
Power:	Battery and Solar Panel

### Notes:

Manual Measurement made at measurement section 2.2 km downstream of level monitoring station at 466313 E, 6372760 N.



# Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Athabasca River below Edmundson Creek  
Location: Athabasca River below Edmundson Creek  
Site Name: S24  
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

## Personnel & Equipment

Measurement Made By: JS/JM/RM  
Data Entry By: JM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Time of Measurement

Date of Measurement: February 14, 2007  
Start Time: 9:45 AM MST  
End Time: 12:17 AM MST

## Level Readings

Bench Mark Reading: nail in tree  
Water Level Reading: 5.032  
Top of Ice Level Reading: 4.992  
Transducer Reading & Calc'd El.: 1.849  
Other: T-post

## Setup No. 1

El: 231.096  
El: 225.895  
El: 226.363  
El: 224.046  
El: 231.355

## Setup No. 2

El: 231.096  
El: 225.908  
El: 226.069  
El: 224.059  
El: 231.355

## Weather Conditions:

-24 C, Blizzard

## River Conditions:

Ice Covered

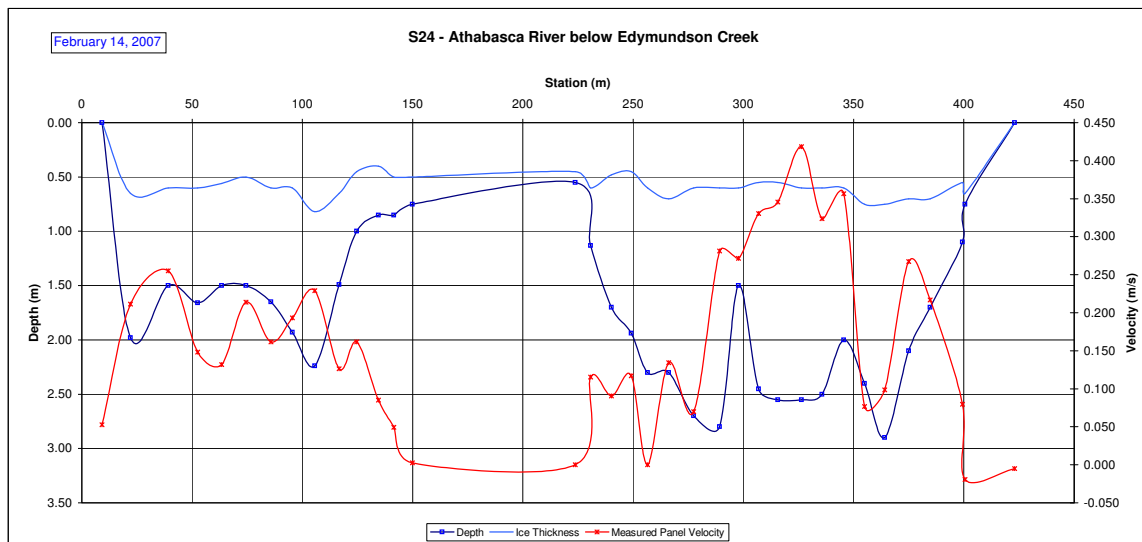
## Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
9.1	0.00	0.000			0.000	0.9	1	9.1	15.6	0.059	0.053	0.333	2.145	0.113	0%	
22.0	1.98	0.650	0.210	0.259		0.9	2	15.6	30.6	0.235	0.211	1.330	20.017	4.228	5%	
39.2	1.50	0.600			0.283	0.9	3	30.6	45.9	0.283	0.255	0.900	13.770	3.513	4%	
52.6	1.66	0.600			0.165	0.9	4	45.9	58.0	0.165	0.148	1.060	12.826	1.900	2%	
63.4	1.50	0.560			0.146	0.9	5	58.0	69.0	0.146	0.132	0.940	10.293	1.355	2%	
74.5	1.50	0.500			0.238	0.9	6	69.0	80.1	0.238	0.214	1.000	11.150	2.386	3%	
85.7	1.65	0.600			0.180	0.9	7	80.1	90.6	0.180	0.162	1.050	11.051	1.789	2%	
95.6	1.93	0.600	0.143	0.287		0.9	8	90.6	100.6	0.215	0.193	1.330	13.234	2.559	3%	
105.6	2.24	0.820	0.250	0.259		0.9	9	100.6	111.1	0.255	0.229	1.420	14.946	3.423	4%	
116.6	1.49	0.650			0.140	0.9	10	111.1	120.7	0.140	0.126	0.840	8.022	1.012	1%	
124.7	1.00	0.450			0.180	0.9	11	120.7	129.6	0.180	0.162	0.550	4.909	0.794	1%	
134.5	0.85	0.400			0.094	0.9	12	129.6	138.0	0.094	0.085	0.450	3.780	0.321	0%	
141.5	0.85	0.500			0.055	0.9	13	138.0	145.7	0.055	0.049	0.350	2.704	0.134	0%	
149.9	0.75	0.500			0.003	0.9	14	145.7	186.9	0.003	0.003	0.250	10.288	0.028	0%	
223.8	0.55	0.450			0.000	0.9	15	186.9	227.3	0.000	0.000	0.100	4.045	0.000	0%	
230.8	1.13	0.600			0.128	0.9	16	227.3	235.5	0.128	0.115	0.530	4.346	0.501	1%	
240.2	1.70	0.480	0.180	0.122	0.000	0.9	17	235.5	244.7	0.101	0.091	1.220	11.224	1.016	1%	
249.2	1.94	0.450	0.192	0.198	0.000	0.9	18	244.7	252.9	0.130	0.117	1.490	12.218	1.430	2%	
256.6	2.30	0.600			0.000	0.9	19	252.9	261.4	0.000	0.000	1.700	14.450	0.000	0%	
266.2	2.30	0.700	0.189	0.110		0.9	20	261.4	271.8	0.149	0.134	1.600	16.640	2.237	3%	
277.4	2.70	0.600	0.125	0.030		0.9	21	271.8	283.3	0.078	0.070	2.100	24.150	1.689	2%	
289.2	2.80	0.600	0.311	0.314		0.9	22	283.3	293.5	0.312	0.281	2.200	22.440	6.310	8%	
297.8	1.50	0.600			0.302	0.9	23	293.5	302.4	0.302	0.272	0.900	7.965	2.163	3%	
306.9	2.45	0.550	0.415	0.320		0.9	24	302.4	311.3	0.367	0.331	1.900	16.910	5.590	7%	
315.6	2.55	0.550	0.381	0.387		0.9	25	311.3	321.0	0.384	0.346	2.000	19.400	6.705	8%	
326.3	2.55	0.600	0.488	0.442		0.9	26	321.0	331.0	0.465	0.418	1.950	19.500	8.158	10%	
335.6	2.50	0.600	0.411	0.308		0.9	27	331.0	340.6	0.360	0.324	1.900	18.240	5.904	7%	
345.5	2.00	0.600	0.418	0.375		0.9	28	340.6	350.2	0.396	0.357	1.400	13.510	4.818	6%	
354.9	2.40	0.750	0.101	0.070		0.9	29	350.2	359.5	0.085	0.077	1.650	15.345	1.179	1%	
364.1	2.90	0.750	0.122	0.098		0.9	30	359.5	369.6	0.110	0.099	2.150	21.608	2.134	3%	
375.0	2.10	0.700	0.326	0.268		0.9	31	369.6	379.9	0.297	0.267	1.400	14.420	3.857	5%	
384.7	1.70	0.700			0.241	0.9	32	379.9	392.1	0.241	0.217	1.000	12.200	2.644	3%	
399.4	1.10	0.550			0.088	0.9	33	392.1	400.0	0.088	0.080	0.550	4.345	0.346	0%	
400.5	0.75	0.650			-0.021	0.9	34	400.0	411.8	-0.021	-0.019	0.100	1.180	-0.023	0%	
423.0	0.00	0.000			0.000	0.9	35	411.8	423.0	-0.005	-0.005	0.025	0.281	-0.001	0%	
Total Flow													80.21			

Total Flow:	80.21	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	413.55	(m <sup>2</sup> )
Top Width:	413.90	(m)
Hydraulic Depth:	0.999	(m)
Mean Velocity:	0.194	(m/s)
Froude Number	0.062	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		Database #278
Datalogger Internal Power:	4.65 V	
Datalogger External Power:	12.38 V	
Datalogger Memory Used:	6%	
Datalogger Clock:	Feb 14, 2007 00:44	MST
Laptop Clock:	Feb 14, 2007 00:41	MST
Dessicant:	Good	
Datalogger:	Optimum DD-128 #104170278	
PT:	#0014503	
Power:	Battery and Solar Panel	

Notes:



# Hydrometric Measurement / Site Visit Record

## S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Athabasca River below Edmundson Creek  
Location: Athabasca River below Edmundson Creek  
Site Name: S24  
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

### Personnel & Equipment

Measurement Made By: JS/JM/RM  
Data Entry By: JM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Time of Measurement

Date of Measurement: February 14, 2007  
Start Time: 9:45 AM MST  
End Time: 12:17 AM MST

### Level Readings

Bench Mark Reading: nail in tree  
Water Level Reading: 5.032  
Top of Ice Level Reading: 4.992  
Transducer Reading & Calc'd EL.: 1.849  
Other: T-post

### Setup No. 1

El: 231.096  
El: 225.895  
El: 226.363  
El: 224.046  
El: 231.355

### Setup No. 2

El: 231.096  
El: 225.908  
El: 226.069  
El: 224.059  
El: 231.355

### Weather Conditions:

-24 C, Blizzard

### River Conditions:

Ice Covered

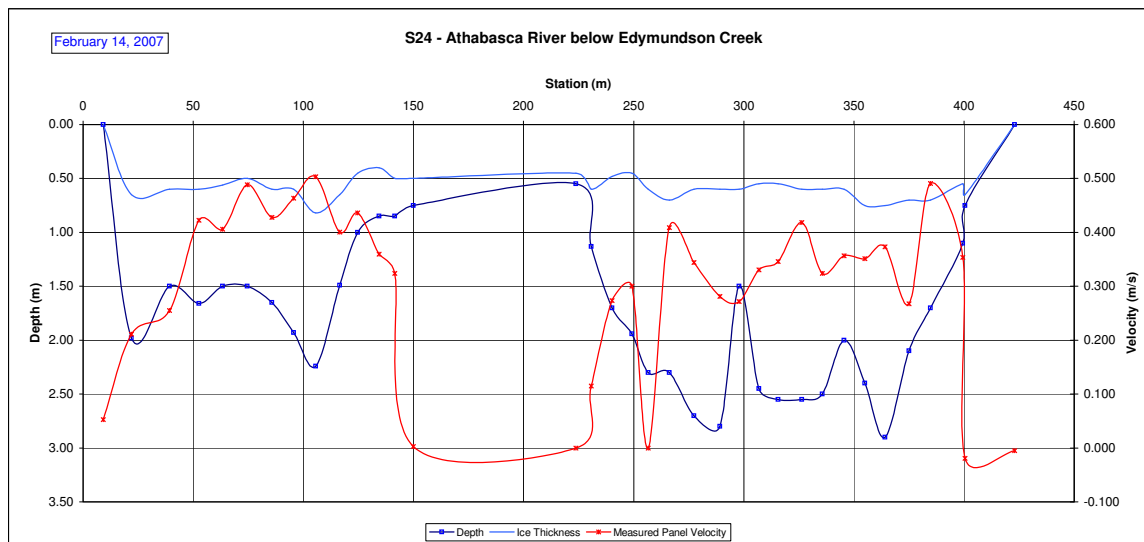
### Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
9.1	0.00	0.000			0.000	0.9	1	9.1	15.6	0.059	0.053	0.333	2.145	0.113	0%	
22.0	1.98	0.650	0.210	0.259		0.9	2	15.6	30.6	0.235	0.211	1.330	20.017	4.228	3%	
39.2	1.50	0.600			0.283	0.9	3	30.6	45.9	0.283	0.255	0.900	13.770	3.513	3%	
52.6	1.66	0.600			0.469	0.9	4	45.9	58.0	0.469	0.422	1.060	12.826	5.418	4%	
63.4	1.50	0.560			0.451	0.9	5	58.0	69.0	0.451	0.406	0.940	10.293	4.179	3%	
74.5	1.50	0.500			0.543	0.9	6	69.0	80.1	0.543	0.488	1.000	11.150	5.444	4%	
85.7	1.65	0.600			0.475	0.9	7	80.1	90.6	0.475	0.428	1.050	11.051	4.729	3%	
95.6	1.93	0.600	0.448	0.582		0.9	8	90.6	100.6	0.515	0.464	1.330	13.234	6.135	5%	
105.6	2.24	0.820	0.555	0.564		0.9	9	100.6	111.1	0.559	0.503	1.420	14.946	7.523	6%	
116.6	1.49	0.650			0.445	0.9	10	111.1	120.7	0.445	0.401	0.840	8.022	3.213	2%	
124.7	1.00	0.450			0.485	0.9	11	120.7	129.6	0.485	0.436	0.550	4.909	2.141	2%	
134.5	0.85	0.400			0.399	0.9	12	129.6	138.0	0.399	0.359	0.450	3.780	1.358	1%	
141.5	0.85	0.500			0.360	0.9	13	138.0	145.7	0.360	0.324	0.350	2.704	0.875	1%	
149.9	0.75	0.500			0.003	0.9	14	145.7	186.9	0.003	0.003	0.250	10.288	0.028	0%	
223.8	0.55	0.450			0.000	0.9	15	186.9	227.3	0.000	0.000	0.100	4.045	0.000	0%	
230.8	1.13	0.600			0.128	0.9	16	227.3	235.5	0.128	0.115	0.530	4.346	0.501	0%	
240.2	1.70	0.480	0.485	0.427	0.000	0.9	17	235.5	244.7	0.304	0.273	1.220	11.224	3.069	2%	
249.2	1.94	0.450	0.497	0.503	0.000	0.9	18	244.7	252.9	0.333	0.300	1.490	12.218	3.664	3%	
256.6	2.30	0.600			0.000	0.9	19	252.9	261.4	0.000	0.000	1.700	14.450	0.000	0%	
266.2	2.30	0.700	0.494	0.415		0.9	20	261.4	271.8	0.454	0.409	1.600	16.640	6.801	5%	
277.4	2.70	0.600	0.430	0.335		0.9	21	271.8	283.3	0.383	0.344	2.100	24.150	8.314	6%	
289.2	2.80	0.600	0.311	0.314		0.9	22	283.3	293.5	0.312	0.281	2.200	22.440	6.310	5%	
297.8	1.50	0.600			0.302	0.9	23	293.5	302.4	0.302	0.272	0.900	7.965	2.163	2%	
306.9	2.45	0.550	0.415	0.320		0.9	24	302.4	311.3	0.367	0.331	1.900	16.910	5.590	4%	
315.6	2.55	0.550	0.381	0.387		0.9	25	311.3	321.0	0.384	0.346	2.000	19.400	6.705	5%	
326.3	2.55	0.600	0.488	0.442		0.9	26	321.0	331.0	0.465	0.418	1.950	19.500	8.158	6%	
335.6	2.50	0.600	0.411	0.308		0.9	27	331.0	340.6	0.360	0.324	1.900	18.240	5.904	4%	
345.5	2.00	0.600	0.418	0.375		0.9	28	340.6	350.2	0.396	0.357	1.400	13.510	4.818	4%	
354.9	2.40	0.750	0.405	0.375		0.9	29	350.2	359.5	0.390	0.351	1.650	15.345	5.388	4%	
364.1	2.90	0.750	0.427	0.402		0.9	30	359.5	369.6	0.415	0.373	2.150	21.608	8.061	6%	
375.0	2.10	0.700	0.326	0.268		0.9	31	369.6	379.9	0.297	0.267	1.400	14.420	3.857	3%	
384.7	1.70	0.700			0.546	0.9	32	379.9	392.1	0.546	0.491	1.000	12.200	5.991	4%	
399.4	1.10	0.550			0.393	0.9	33	392.1	400.0	0.393	0.354	0.550	4.345	1.538	1%	
400.5	0.75	0.650			-0.021	0.9	34	400.0	411.8	-0.021	-0.019	0.100	1.180	-0.023	0%	
423.0	0.00	0.000			0.000	0.9	35	411.8	423.0	-0.005	-0.005	0.025	0.281	-0.001	0%	
Total Flow													135.71			

Total Flow:	135.71	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	413.55	(m <sup>2</sup> )
Top Width:	413.90	(m)
Hydraulic Depth:	0.999	(m)
Mean Velocity:	0.328	(m/s)
Froude Number	0.105	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database #278
Datalogger Internal Power:	4.65 V
Datalogger External Power:	12.38 V
Datalogger Memory Used:	6%
Datalogger Clock:	Feb 14, 2007 00:44 MST
Laptop Clock:	Feb 14, 2007 00:41 MST
Dessicant:	Good
Datalogger:	Optimum DD-128 #104170278
PT:	#0014503
Power:	Battery and Solar Panel

Notes:



# Hydrometric Measurement / Site Visit Record

## S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Athabasca River below Edmundson Creek  
Location: Athabasca River below Edmundson Creek  
Site Name: S24  
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

### Time of Measurement

Date of Measurement: March 8, 2007  
Start Time: 1:37 PM MST  
End Time: 2:30 PM MST

### Weather Conditions:

0°C, Overcast, Light Wind  
Complete ice cover.

### Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: nail in tree 0.425  
Water Level Reading: 5.587  
Top of Ice Level Reading: 5.540  
Transducer Reading & Calc'd El.: 1.879  
Other: T-post 0.165

### Setup No. 1

El.: 231.096  
El.: 225.934  
El.: 225.981  
El.: 224.055  
El.: 231.356

### Setup No. 2

El.: 231.096  
El.: 225.944  
El.: 225.989  
El.: 224.065  
El.: 231.356

225.939

224.060

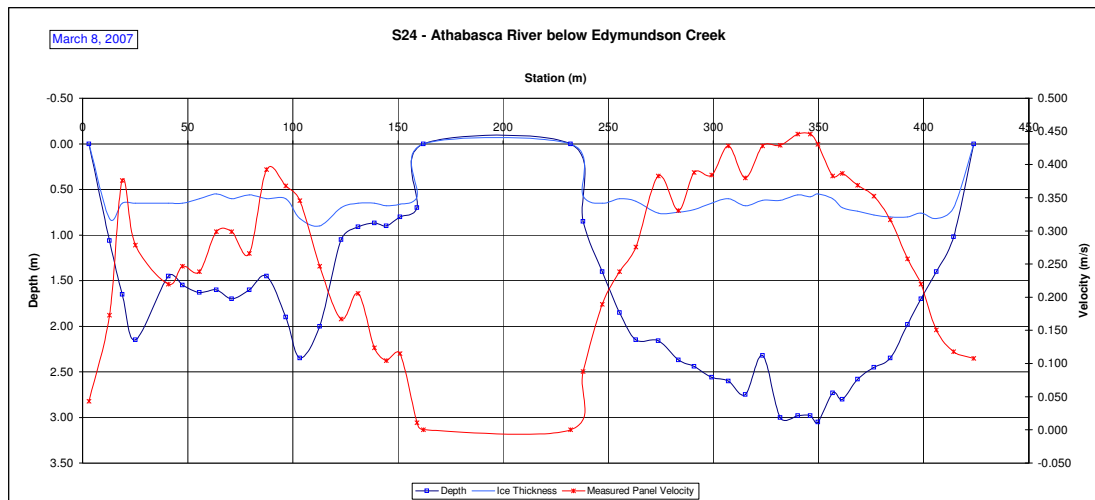
Measured Data						Measurement Data										Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)							
3.0	0.00	0.000			0.000	0.9	1	3.0	7.9	0.048	0.043	0.060	0.293	0.013							
12.8	1.06	0.820			0.192	0.9	2	7.9	15.8	0.192	0.173	0.240	1.910	0.330							
18.9	1.65	0.650			0.418	0.9	3	15.8	22.0	0.418	0.376	1.000	6.200	2.330							
25.2	2.15	0.650	0.372	0.247		0.9	4	22.0	33.0	0.309	0.278	1.500	16.373	4.559							
40.8	1.45	0.650			0.244	0.9	5	33.0	44.1	0.244	0.219	0.800	8.956	1.965							
47.5	1.55	0.650			0.274	0.9	6	44.1	51.6	0.274	0.247	0.900	6.683	1.650							
55.6	1.63	0.600			0.265	0.9	7	51.6	59.6	0.265	0.239	1.030	8.245	1.968							
63.6	1.60	0.550			0.332	0.9	8	59.6	67.3	0.332	0.299	1.050	8.069	2.413							
71.0	1.70	0.600			0.332	0.9	9	67.3	75.2	0.332	0.299	1.100	8.696	2.600							
79.4	1.60	0.560			0.296	0.9	10	75.2	83.5	0.296	0.266	1.040	8.637	2.298							
87.6	1.45	0.600			0.436	0.9	11	83.5	92.1	0.436	0.392	0.850	7.336	2.878							
96.6	1.90	0.600	0.433	0.384		0.9	12	92.1	99.9	0.408	0.368	1.300	10.199	3.749							
103.3	2.35	0.820	0.421	0.347		0.9	13	99.9	108.0	0.384	0.346	1.530	12.355	4.270							
112.8	2.00	0.900			0.274	0.9	14	108.0	117.9	0.274	0.247	1.100	10.835	2.675							
123.0	1.05	0.700			0.186	0.9	15	117.9	127.0	0.186	0.167	0.350	3.190	0.534							
131.0	0.91	0.650			0.229	0.9	16	127.0	134.9	0.229	0.206	0.260	2.058	0.423							
138.8	0.87	0.650			0.137	0.9	17	134.9	141.6	0.137	0.123	0.220	1.470	0.181							
144.4	0.90	0.680			0.116	0.9	18	141.6	147.7	0.116	0.104	0.220	1.338	0.139							
151.0	0.80	0.660			0.128	0.9	19	147.7	155.0	0.128	0.115	0.140	1.029	0.119							
159.1	0.70	0.580			0.012	0.9	20	155.0	160.6	0.012	0.011	0.120	0.666	0.007							
162.1	0.00	0.000			0.000	0.9	21	160.6	197.1	0.000	0.000	0.000	0.000	0.000							
232.1	0.00	0.000			0.000	0.9	22	197.1	235.0	0.000	0.000	0.000	0.000	0.000							
237.9	0.85	0.570			0.098	0.9	23	235.0	242.5	0.098	0.088	0.280	2.108	0.185							
247.1	1.40	0.650			0.210	0.9	24	242.5	251.2	0.210	0.189	0.750	6.529	1.236							
255.4	1.85	0.600	0.299	0.232		0.9	25	251.2	259.2	0.265	0.239	1.250	9.988	2.384							
263.1	2.15	0.630	0.372	0.241		0.9	26	259.2	268.4	0.306	0.276	1.520	13.969	3.851							
273.7	2.16	0.760	0.442	0.408		0.9	27	268.4	278.6	0.425	0.383	1.400	14.210	5.438							
283.4	2.37	0.750	0.415	0.320		0.9	28	278.6	287.1	0.367	0.331	1.620	13.883	4.589							
290.9	2.44	0.720	0.479	0.384		0.9	29	287.1	295.1	0.431	0.388	1.720	13.640	5.294							
299.3	2.56	0.650	0.506	0.347		0.9	30	295.1	303.2	0.427	0.384	1.910	15.557	5.975							
307.2	2.60	0.600	0.485	0.466		0.9	31	303.2	311.2	0.475	0.428	2.000	15.950	6.826							
315.2	2.75	0.680	0.466	0.378		0.9	32	311.2	319.3	0.422	0.380	2.070	16.777	6.374							
323.4	2.32	0.620	0.518	0.433		0.9	33	319.3	327.6	0.475	0.428	1.700	14.101	6.035							
331.8	3.00	0.620	0.527	0.427		0.9	34	327.6	335.9	0.477	0.429	2.380	19.873	8.532							
340.1	2.98	0.560	0.506	0.485		0.9	35	335.9	343.1	0.495	0.446	2.420	17.327	7.724							
346.1	2.98	0.580	0.558	0.433		0.9	36	343.1	347.9	0.495	0.446	2.400	11.592	5.167							
349.7	3.05	0.550	0.530	0.427		0.9	37	347.9	353.2	0.479	0.431	2.500	13.288	5.723							
356.8	2.73	0.600	0.460	0.390		0.9	38	353.2	359.0	0.425	0.383	2.130	12.226	4.679							
361.2	2.80	0.700	0.466	0.393		0.9	39	359.0	364.9	0.430	0.387	2.100	12.485	4.829							
368.6	2.58	0.740	0.448	0.372		0.9	40	364.9	372.5	0.410	0.369	1.840	13.947	5.146							
376.4	2.45	0.780	0.411	0.372		0.9	41	372.5	380.2	0.392	0.353	1.670	12.926	4.556							
384.1	2.35	0.800				0.9	42	380.2	388.2	0.352	0.317	1.550	12.385	3.924							
392.4	1.98	0.800			0.287	0.9	43	388.2	395.5	0.287	0.258	1.180	8.585	2.214							
398.7	1.70	0.760			0.244	0.9	44	395.5	402.3	0.244	0.219	0.940	6.415	1.408							
406.0	1.40	0.820			0.168	0.9	45	402.3	410.1	0.168	0.151	0.580	4.524	0.683							
414.3	1.02	0.700			0.131	0.9	46	410.1	419.1	0.131	0.118	0.320	2.859	0.337							
423.9	0.00	0.000			0.000	0.9	47	419.1	423.9	0.120	0.108	0.625	44.144	4.753							
Total Flow														142.96							

Total Flow:	142.96	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	453.82	(m <sup>2</sup> )
Top Width:	420.87	(m)
Hydraulic Depth:	1.078	(m)
Mean Velocity:	0.315	(m/s)
Froude Number	0.097	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database #278
Datalogger Internal Power:	4.62 V
Datalogger External Power:	15.18 V
Datalogger Memory Used:	3%
Datalogger Clock:	Jan 17, 2007 09:47 MST
Laptop Clock:	Jan 17, 2007 09:41 MST
Dessicant:	Good
Datalogger:	Optimum DD-128 #104170278
PT:	#0014503
Power:	Battery and Solar Panel

### Notes:

Manual Measurement made at measurement section 2.2 km downstream of level monitoring station at 466313 E, 6372760 N.



Hydrometric Measurement / Site Visit Record
S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmundson Creek
Location: Athabasca River below Edmundson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Date of Measurement: May 1, 2007
Start Time: 10:00 AM MST
End Time: 11:15 AM MST

Weather Conditions:

+15° C Clear, Calm

River Conditions:

Open, High Stage

Personnel & Equipment

Measurement Made By: PM/JMS
Data Entry By: PM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.458
Water Level Reading: 2.927
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 4.187
Other: T-post 0.200

Setup No. 1

El: 231.096
El: 228.627
El: 231.554
El: 224.440
El: 231.354

Setup No. 2

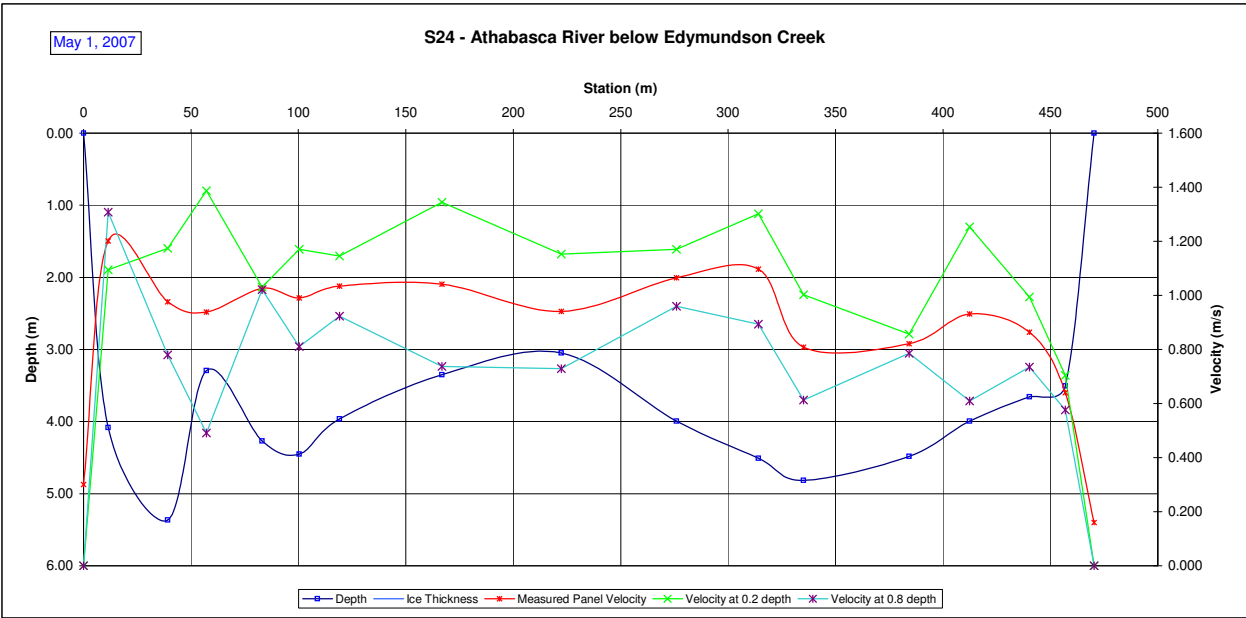
El: 231.096
El: 228.624
El: 231.601
El: 224.437
El: 231.356

Table with 16 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Rows include data for stations 0, 12, 39, 57, 83, 100, 119, 167, 222, 276, 314, 335, 384, 412, 440, 457, 470 and a Total Flow row.

Summary table with 3 columns: Measurement, Value, Unit. Rows include Total Flow (1761.37 m³/s), Perceived Measurement Quality (Good), Total Area (1834.50 m²), Top Width (470.32 m), Hydraulic Depth (3.901 m), Mean Velocity (0.960 m/s), Froude Number (0.155), and Photographs taken looking at (Upstream, downstream, across).

Datalogger Notes table with 2 columns: Note, Value. Rows include Database #278, Datalogger Internal Power (4.71 V), Datalogger External Power (14.50 V), Datalogger Memory Used (10%), Datalogger Clock (May 01, 2007 08:40 MST), Laptop Clock (May 01, 2007 08:40 MST), Dessicant (Good), Datalogger (Optimum DD-128 #104170278), PT (s/n 14528), and Power (Battery and Solar Panel).

Notes: Old TD destroyed new TD installed from boat.





# Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Athabasca River below Edmundson Creek  
Location: Athabasca River below Edmundson Creek  
Site Name: S24  
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

## Time of Measurement

Date of Measurement: June 18, 2007  
Start Time: 9:00 AM MST  
End Time: 11:15 AM MST

## Weather Conditions:

+15° C overcast light rain

## River Conditions:

Open, High Stage

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: nail in tree 0.566  
Water Level Reading: 3.991  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.: 3.792  
Other: T-post 0.309

## Setup No. 1

El: 231.096  
El: 227.671  
El: 231.662  
El: 223.879  
El: 231.353

## Setup No. 2

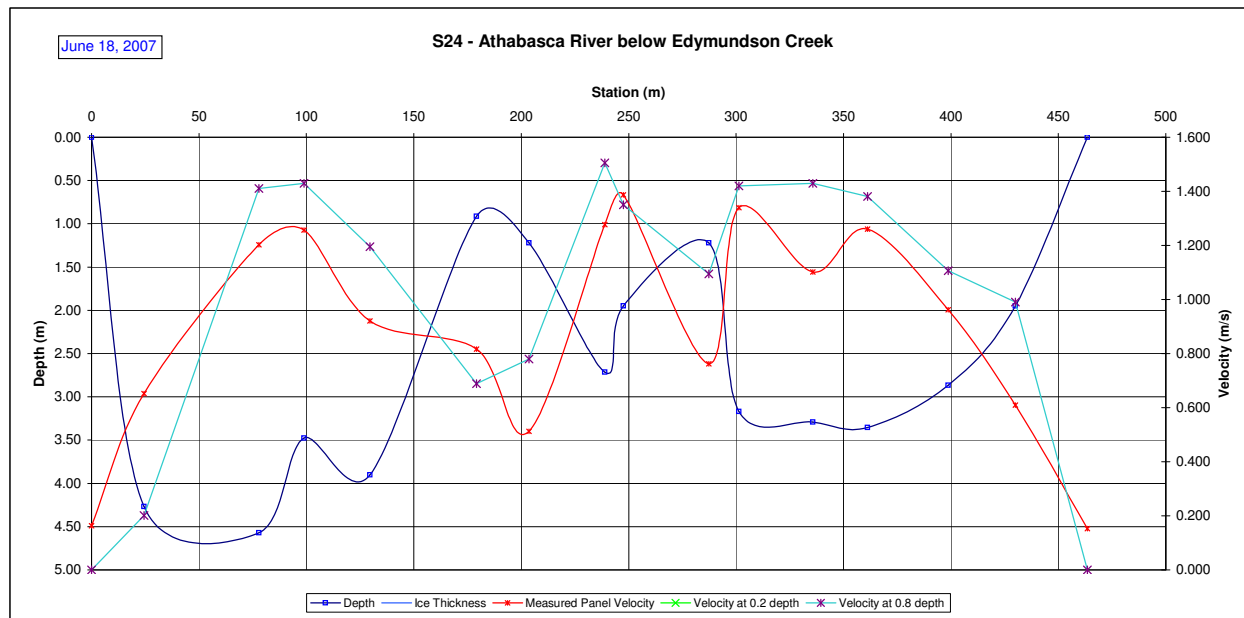
El: 231.096  
El: 227.673  
El: 231.538  
El: 223.881  
El: 231.355

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
0	0.00			0.000	0.000	1.0	1	0.0	12.3	0.163	0.163	1.067	13.068	2.131	0%	
25	4.27			0.201	1.103	1.0	2	12.3	51.2	0.652	0.652	4.267	166.208	108.413	9%	
78	4.57			1.411	0.994	1.0	3	51.2	88.4	1.202	1.202	4.572	170.079	204.509	16%	
99	3.47			1.430	1.085	1.0	4	88.4	114.3	1.257	1.257	3.475	89.822	112.933	9%	
130	3.90			1.195	0.646	1.0	5	114.3	154.4	0.920	0.920	3.901	156.643	144.190	11%	
179	0.91			0.689	0.945	1.0	6	154.4	191.4	0.817	0.817	0.914	33.833	27.637	2%	
204	1.22			0.780	0.244	1.0	7	191.4	221.3	0.512	0.512	1.219	36.393	18.636	1%	
239	2.71			1.506	1.049	1.0	8	221.3	243.2	1.277	1.277	2.713	59.626	76.149	6%	
248	1.95			1.350	1.423	1.0	9	243.2	267.5	1.387	1.387	1.951	47.266	65.551	5%	
287	1.22			1.094	0.430	1.0	10	267.5	294.4	0.762	0.762	1.219	32.797	24.991	2%	
301	3.17			1.420	1.259	1.0	11	294.4	318.5	1.340	1.340	3.170	76.554	102.551	8%	
336	3.29			1.430	0.774	1.0	12	318.5	348.4	1.102	1.102	3.292	98.426	108.451	9%	
361	3.35			1.381	1.140	1.0	13	348.4	380.0	1.260	1.260	3.353	105.781	133.321	11%	
399	2.87			1.106	0.817	1.0	14	380.0	414.4	0.962	0.962	2.865	98.704	94.918	8%	
430	1.95			0.991	0.229	1.0	15	414.4	446.8	0.610	0.610	1.951	63.204	38.529	3%	
464	0.00			0.000	0.000	1.0	16	446.8	464	0.152	0.152	0.488	8.169	1.245	0%	
													Total Flow	1264.15		

Total Flow:	1264.15	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1256.57	(m <sup>2</sup> )
Top Width:	463.56	(m)
Hydraulic Depth:	2.711	(m)
Mean Velocity:	1.006	(m/s)
Froude Number	0.195	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database #278
Datalogger Internal Power:	4.71 V
Datalogger External Power:	14.50 V
Datalogger Memory Used:	10%
Datalogger Clock:	May 01, 2007 08:40 MST
Laptop Clock:	May 01, 2007 08:40 MST
Dessicant:	Good
Datalogger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel

Notes: TD cable taut and slightly above water  
data looks good





# Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Athabasca River below Edmundson Creek  
Location: Athabasca River below Edmundson Creek  
Site Name: S24  
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

## Time of Measurement

Date of Measurement: August 8, 2007  
Start Time: 9:00 AM MST  
End Time: 11:15 AM MST

## Weather Conditions:

+15° C overcast light rain

## River Conditions:

Open, High Stage

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: nail in tree 0.500  
Water Level Reading: 4.770  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.: 2.952  
Other: T-post 0.239

## Setup No. 1

El: 231.096  
El: 226.826  
El: 231.596  
El: 223.874  
El: 231.357

## Setup No. 2

0.450 El: 231.096  
4.712 El: 226.834 226.830  
El: 231.546  
2.952 El: 223.882 223.878  
0.189 El: 231.357

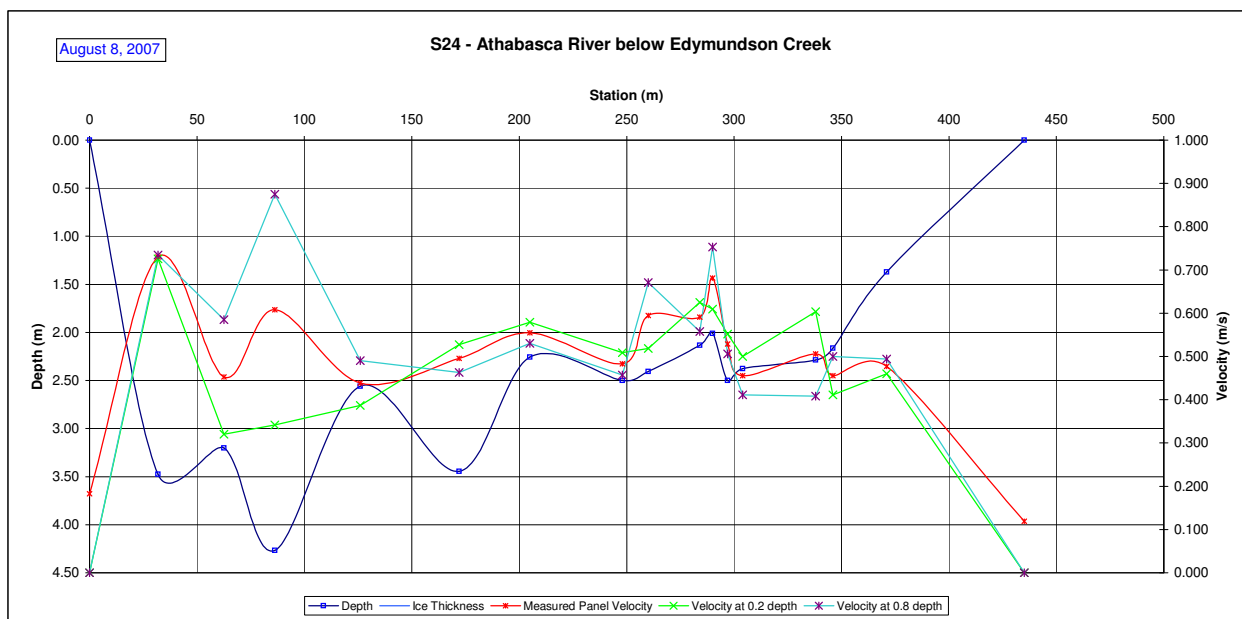
Measured Data						Measurement Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
0	0.00		0.000	0.000		1.0	1	0.0	15.9	0.182	0.182	0.869	13.812	2.521	0%	
32	3.47		0.725	0.735		1.0	2	15.9	47.2	0.730	0.730	3.475	108.759	79.393	14%	
63	3.20		0.320	0.585		1.0	3	47.2	74.4	0.453	0.453	3.200	87.051	39.402	7%	
86	4.27		0.341	0.875		1.0	4	74.4	106.1	0.608	0.608	4.267	135.270	82.255	15%	
126	2.56		0.387	0.491		1.0	5	106.1	149.0	0.439	0.439	2.560	109.838	48.209	9%	
172	3.44		0.527	0.463		1.0	6	149.0	188.5	0.495	0.495	3.444	136.047	67.384	12%	
205	2.26		0.579	0.530		1.0	7	188.5	226.5	0.555	0.555	2.256	85.710	47.546	9%	
248	2.50		0.509	0.457		1.0	8	226.5	254.0	0.483	0.483	2.499	68.732	33.205	6%	
260	2.41		0.518	0.671		1.0	9	254.0	272.0	0.594	0.594	2.408	43.343	25.761	5%	
284	2.13		0.625	0.558		1.0	10	272.0	287.0	0.591	0.591	2.134	32.004	18.924	3%	
290	2.01		0.610	0.753		1.0	11	287.0	293.5	0.681	0.681	2.012	13.076	8.908	2%	
297	2.50		0.552	0.506		1.0	12	293.5	300.5	0.529	0.529	2.499	17.496	9.252	2%	
304	2.38		0.500	0.411		1.0	13	300.5	321.0	0.456	0.456	2.377	48.738	22.209	4%	
338	2.29		0.604	0.408		1.0	14	321.0	342.0	0.506	0.506	2.286	48.006	24.289	4%	
346	2.16		0.411	0.500		1.0	15	342.0	358.5	0.456	0.456	2.164	35.707	16.271	3%	
371	1.37		0.460	0.494		1.0	16	358.5	403.0	0.477	0.477	1.372	61.036	29.115	5%	
435	0.00		0.000	0.000		1.0	17	403.0	435	0.119	0.119	0.343	10.973	1.309	0%	
													Total Flow	555.95		

Total Flow:	555.95	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1055.60	(m <sup>2</sup> )
Top Width:	435.00	(m)
Hydraulic Depth:	2.427	(m)
Mean Velocity:	0.527	(m/s)
Froude Number	0.108	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database #278
Datalogger Internal Power:	4.71 V
Datalogger External Power:	14.50 V
Datalogger Memory Used:	10%
Datalogger Clock:	May 01, 2007 08:40 MST
Laptop Clock:	May 01, 2007 08:40 MST
Dessicant:	Good
Datalogger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel

Notes:

data looks good



Hydrometric Measurement / Site Visit Record
S24 - Athabasca River below Edmundson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmundson Creek
Location: Athabasca River below Edmundson Creek
Site Name: S24
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Date of Measurement: September 21, 2007
Start Time: 12:45 PM MDT
End Time: MDT

Weather Conditions:

+10° C mostly clear calm

River Conditions:

Open, Low Stage

Personnel & Equipment

Measurement Made By: SM JMS
Data Entry By: sm Checked:
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree 0.465
Water Level Reading: 5.070
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 2.600
Other: T-post 0.201

Setup No. 1

El: 231.096
El: 226.491
El: 231.561
El: 223.891
El: 231.360

Setup No. 2

0.455 El: 231.096
5.060 El: 226.491
El: 231.551
2.600 El: 223.891
0.195 El: 231.356

226.491

223.891

Measurement Data

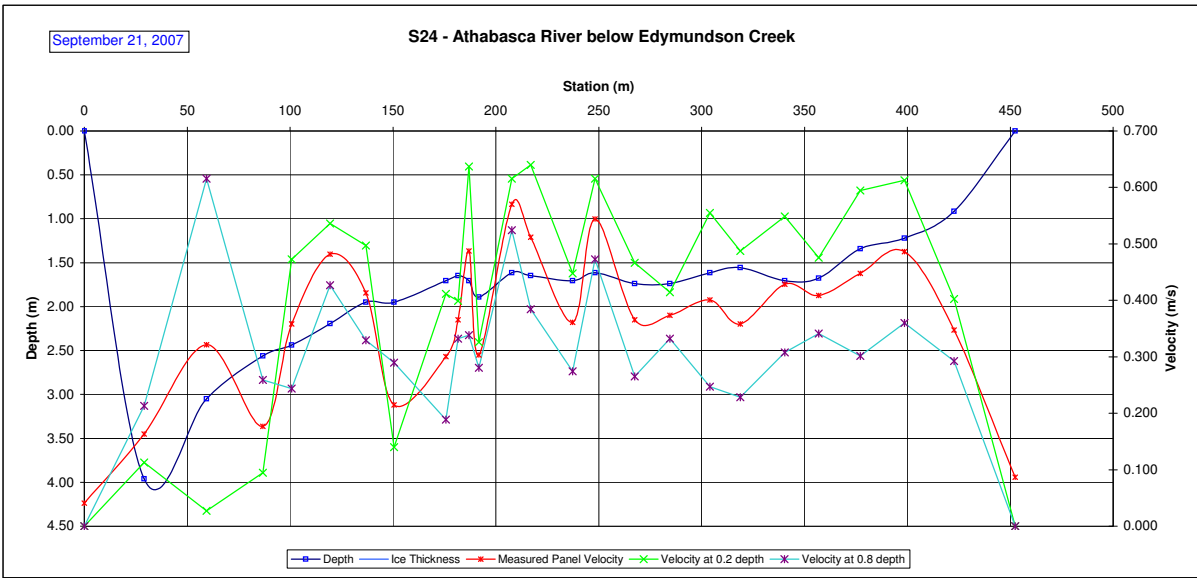
Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
0	0.00		0.000	0.000		1.0	1	0.0	14.6	0.041	0.041	0.991	14.413	0.588	
29	3.96		0.113	0.213		1.0	2	14.6	44.3	0.163	0.163	3.962	117.683	19.190	
59	3.05		0.027	0.616		1.0	3	44.3	73.1	0.322	0.322	3.048	87.935	28.277	
87	2.56		0.094	0.259		1.0	4	73.1	93.8	0.177	0.177	2.560	52.871	9.347	
101	2.44		0.472	0.244		1.0	5	93.8	110.1	0.358	0.358	2.438	39.868	14.278	
120	2.19		0.536	0.427		1.0	6	110.1	128.2	0.482	0.482	2.195	39.722	19.129	
137	1.95		0.497	0.329		1.0	7	128.2	143.7	0.413	0.413	1.951	30.236	12.488	
151	1.95		0.140	0.290		1.0	8	143.7	163.2	0.215	0.215	1.951	37.942	8.153	
176	1.71		0.411	0.189		1.0	9	163.2	178.8	0.300	0.300	1.707	26.644	7.999	
182	1.65		0.399	0.332		1.0	10	178.8	184.3	0.366	0.366	1.646	9.102	3.329	
187	1.71		0.637	0.338		1.0	11	184.3	189.3	0.488	0.488	1.707	8.569	4.179	
192	1.89		0.326	0.280		1.0	12	189.3	199.8	0.303	0.303	1.890	19.748	5.989	
208	1.62		0.616	0.524		1.0	13	199.8	212.4	0.570	0.570	1.615	20.371	11.611	
217	1.65		0.640	0.384		1.0	14	212.4	227.2	0.512	0.512	1.646	24.376	12.482	
237	1.71		0.448	0.274		1.0	15	227.2	242.8	0.361	0.361	1.707	26.713	9.648	
248	1.62		0.616	0.472		1.0	16	242.8	257.9	0.544	0.544	1.615	24.312	13.228	
267	1.74		0.466	0.265		1.0	17	257.9	276.1	0.366	0.366	1.737	31.620	11.565	
285	1.74		0.415	0.332		1.0	18	276.1	294.3	0.373	0.373	1.737	31.707	11.839	
304	1.62		0.555	0.247		1.0	19	294.3	311.4	0.401	0.401	1.615	27.624	11.072	
319	1.55		0.488	0.229		1.0	20	311.4	329.6	0.358	0.358	1.554	28.292	10.132	
340	1.71		0.549	0.308		1.0	21	329.6	348.7	0.428	0.428	1.707	32.516	13.925	
357	1.68		0.475	0.341		1.0	22	348.7	367.1	0.408	0.408	1.676	30.846	12.598	
377	1.34		0.594	0.302		1.0	23	367.1	387.9	0.448	0.448	1.341	27.895	12.499	
399	1.22		0.613	0.360		1.0	24	387.9	410.6	0.486	0.486	1.219	27.737	13.484	
423	0.91		0.402	0.293		1.0	25	410.6	437.6	0.347	0.347	0.914	24.643	8.563	
452	0.00		0.000	0.000		1.0	26	437.6	452	0.087	0.087	0.229	3.406	0.296	
Total Flow														285.89	

Total Flow:	285.89	(m³/s)
Perceived Measurement Quality:	Excellent	
Total Area:	846.79	(m²)
Top Width:	452.48	(m)
Hydraulic Depth:	1.871	(m)
Mean Velocity:	0.338	(m/s)
Froude Number	0.079	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database #278
Datalogger Internal Power:	4.71 V
Datalogger External Power:	13.09 V
Datalogger Memory Used:	10%
Datalogger Clock:	Sep 21, 2007 11:14 MST
Laptop Clock:	Sep 21, 2007 11:14 MST
Dessicant:	new
Datalogger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel

Notes:

data looks good



Hydrometric Measurement / Site Visit Record

S24 - Athabasca River below Edmondson Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Athabasca River below Edmondson Creek  
Location: Athabasca River below Edmondson Creek  
Site Name: S24  
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

Time of Measurement

Date of Measurement: October 23, 2007  
Start Time: 10:59 AM MDT  
End Time: 11:30 AM MDT

Weather Conditions:

+5° C, scattered cloud, light wind

River Conditions:

Open, Very low stage

Personnel & Equipment

Measurement Made By: SM,FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: nail in tree  
Water Level Reading: 5.648  
Top of Ice Level Reading:  
Transducer Reading & Calc'd EL: 2.184  
Other: T-post 0.340

Setup No. 1

El: 231.096  
El: 226.047  
El: 231.695  
El: 223.863  
El: 231.355

Setup No. 2

El: 231.096  
El: 226.048  
El: 231.678  
El: 223.864  
El: 231.355

226.048

223.864

Measurement Data

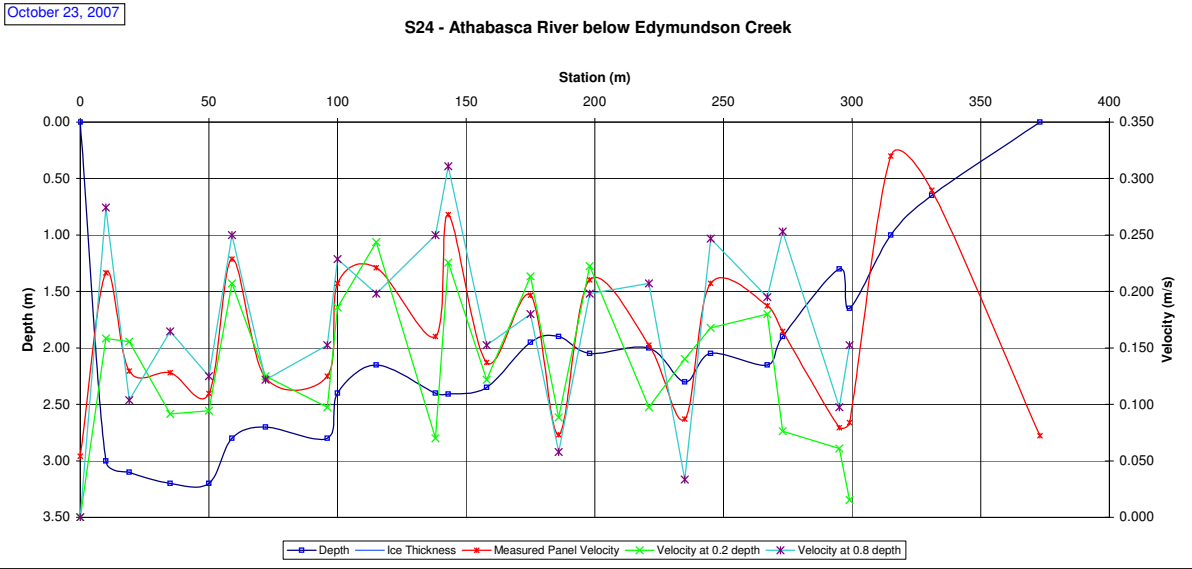
Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
0	0.00		0.000	0.000		1.0	1	0.0	5.0	0.054	0.054	0.750	3.8	0.203	0%
10	3.00		0.158	0.274		1.0	2	5.0	14.5	0.216	0.216	3.000	28.5	6.168	5%
19	3.10		0.155	0.104		1.0	3	14.5	27.0	0.130	0.130	3.100	38.8	5.020	4%
35	3.20		0.091	0.165		1.0	4	27.0	42.5	0.128	0.128	3.200	49.6	6.350	5%
50	3.20		0.094	0.125		1.0	5	42.5	54.5	0.110	0.110	3.200	38.4	4.214	3%
59	2.80		0.207	0.250		1.0	6	54.5	65.5	0.229	0.229	2.800	30.8	7.041	6%
72	2.70		0.125	0.122		1.0	7	65.5	84.0	0.123	0.123	2.700	50.0	6.166	5%
96	2.80		0.098	0.152		1.0	8	84.0	98.0	0.125	0.125	2.800	39.2	4.899	4%
100	2.40		0.186	0.229		1.0	9	98.0	107.5	0.207	0.207	2.400	22.8	4.726	4%
115	2.15		0.244	0.198		1.0	10	107.5	126.5	0.221	0.221	2.150	40.9	9.027	7%
138	2.40		0.070	0.250		1.0	11	126.5	140.5	0.160	0.160	2.400	33.6	5.377	4%
143	2.41		0.226	0.311		1.0	12	140.5	150.5	0.268	0.268	2.410	24.1	6.464	5%
158	2.35		0.122	0.152		1.0	13	150.5	166.5	0.137	0.137	2.350	37.6	5.157	4%
175	1.95		0.213	0.180		1.0	14	166.5	180.5	0.197	0.197	1.950	27.3	5.367	4%
186	1.90		0.088	0.058		1.0	15	180.5	192.0	0.073	0.073	1.900	21.9	1.598	1%
198	2.05		0.223	0.198		1.0	16	192.0	209.5	0.210	0.210	2.050	35.9	7.545	6%
221	2.00		0.098	0.207		1.0	17	209.5	228.0	0.152	0.152	2.000	37.0	5.639	5%
235	2.30		0.140	0.034		1.0	18	228.0	240.0	0.087	0.087	2.300	27.6	2.398	2%
245	2.05		0.168	0.247		1.0	19	240.0	256.0	0.207	0.207	2.050	32.8	6.798	5%
267	2.15		0.180	0.195		1.0	20	256.0	270.0	0.187	0.187	2.150	30.1	5.642	5%
273	1.90		0.076	0.253		1.0	21	270.0	284.0	0.165	0.165	1.900	26.6	4.378	4%
295	1.30		0.061	0.098		1.0	22	284.0	297.0	0.079	0.079	1.300	16.9	1.339	1%
299	1.65		0.015	0.152		1.0	23	297.0	307.0	0.084	0.084	1.650	16.5	1.383	1%
315	1.00				0.32	1.0	24	307.0	323.0	0.320	0.320	1.000	16.0	5.121	4%
331	0.65				0.29	1.0	25	323.0	352.0	0.290	0.290	0.650	18.9	5.458	4%
373	0.00				0.00	1.0	26	352.0	373	0.072	0.072	0.163	3.4	0.247	0%
Total Flow														123.72	

Total Flow:	123.72	(m³/s)
Perceived Measurement Quality:	Poor	
Total Area:	748.69	(m²)
Top Width:	373.00	(m)
Hydraulic Depth:	2.007	(m)
Mean Velocity:	0.165	(m/s)
Froude Number	0.037	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database #278
Datalogger Internal Power:	4.74 V
Datalogger External Power:	14.25 V
Datalogger Memory Used:	20%
Datalogger Clock:	Oct 23, 2007 11:12 MST
Laptop Clock:	Oct 23, 2007 11:13 MST
Dessicant:	100% good
Datalogger:	Optimum DD-128 #104170278
PT:	s/n 14528
Power:	Battery and Solar Panel

Notes:

Downloaded data appears error free. Stage very low. Bars evident throughout main channel.  
TD cable buried in a shallow trench to prevent disturbance during ice-in. Submerged cable buried with rocks and plates of oil/sand/asphalt.  
TD may have been shifted by cable burying efforts.  
Velocity measurements made from boat without an anchor, so boat position was maintained by idling. Velocity shots are questionable.



# Hydrometric Measurement / Site Visit Record

Athabasca River - S24



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Athabasca River  
Location: S24  
Site Name: Athabasca River  
Coordinates & Legal: 466313 E, 6372760 N NE-9-98-10-W4

## Time of Measurement

Date of Measurement: December 10, 2007  
Start Time: 11:15 AM MST  
End Time:

## Weather Conditions:

Mostly Clear  
River Conditions: Ice

## Personnel & Equipment

Measurement Made By: SM, FF  
Data Entry By: SMS  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in Tree 0.525  
Water Level Reading: 5.220  
Top of Ice Level Reading: 5.240  
Transducer Reading & Est. El.: 2.548  
Other: T-post 0.216

## Setup No. 1

El: 231.096  
El: 226.401  
El: 226.381  
El: 223.853  
El: 231.405

## Setup No. 2

El: 231.096  
El: 226.411  
El: 226.403  
El: 223.863  
El: 231.411

## Average

226.406  
223.858

Datalogger Notes:	Database #278
Datalogger Internal Power:	4.66 V
Datalogger External Power:	14.93 V
Datalogger Memory Used:	30%
Datalogger Clock:	11:30 MST
Laptop Clock:	11:30 MST
Dessicant:	Good
Datalogger:	104170278 Optimum DD128
PT:	14528 Keller
Power:	Battery and Solar Panel

## Notes:

Data downloaded is good. No flow mmt made because of ice conditions. Photos taken

# Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Susan Lake Outlet  
Location: Susan Lake Outlet  
Site Name: S25  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: May 1, 2007  
Start Time: 12:30 PM MDT  
End Time: 1:00 PM MDT

## Weather Conditions:

+15 °C, Scattered clouds

## River Conditions:

backwatered by the athabasca

## Personnel & Equipment

Measurement Made By: PM,JMS  
Data Entry By: PM  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings and Measurements

Bench Mark Reading: T Post 0.970 El: 100.000 1.016 El: 100.000  
Water Level Reading: 1.743 El: 99.227 1.781 El: 99.235 99.231  
Top of Ice Level Reading: El: 98.786 0.441 El: 98.794 98.790  
Transducer Reading & Est. El.: 0.441 El: 100.020 0.992 El: 100.024  
Other: NIT on RB

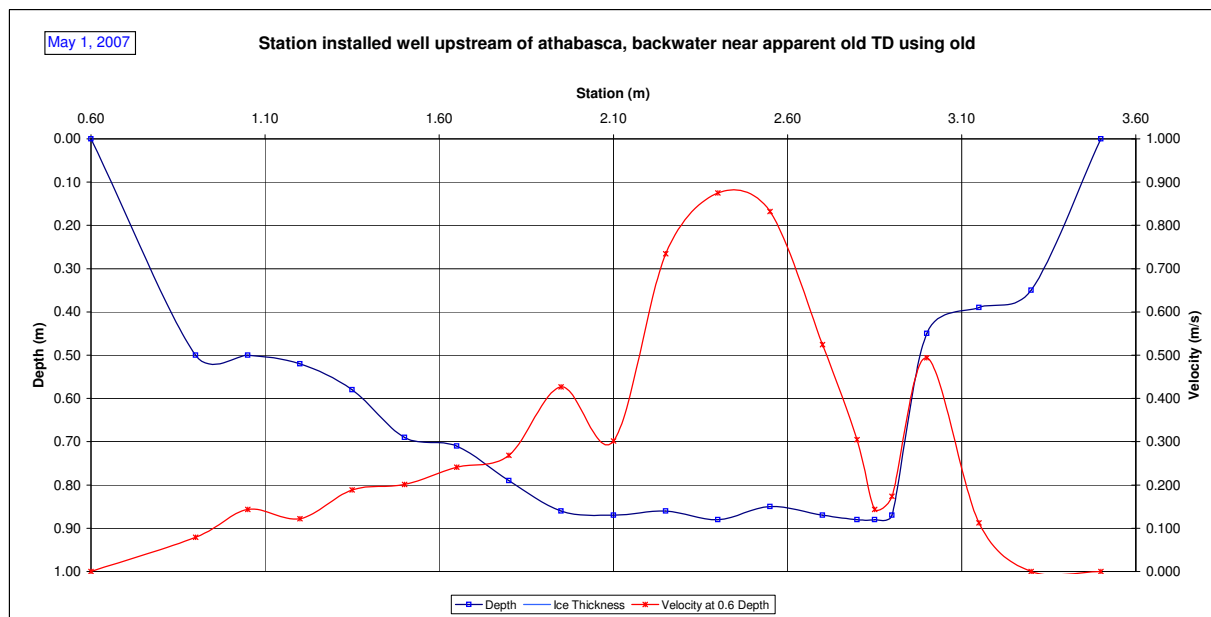
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
0.60	0.00				0.000	1.00	1	0.60	0.75	0.020	0.020	0.13	0.02	0.000	0.1%	
0.90	0.50				0.079	1.00	2	0.75	0.98	0.079	0.079	0.50	0.11	0.009	1.3%	
1.05	0.50				0.143	1.00	3	0.98	1.13	0.143	0.143	0.50	0.08	0.011	1.6%	
1.20	0.52				0.122	1.00	4	1.13	1.28	0.122	0.122	0.52	0.08	0.010	1.4%	
1.35	0.58				0.189	1.00	5	1.28	1.43	0.189	0.189	0.58	0.09	0.016	2.5%	
1.50	0.69				0.201	1.00	6	1.43	1.58	0.201	0.201	0.69	0.10	0.021	3.1%	
1.65	0.71				0.241	1.00	7	1.58	1.73	0.241	0.241	0.71	0.11	0.026	3.9%	
1.80	0.79				0.268	1.00	8	1.73	1.88	0.268	0.268	0.79	0.12	0.032	4.8%	
1.95	0.86				0.427	1.00	9	1.88	2.03	0.427	0.427	0.86	0.13	0.055	8.3%	
2.10	0.87				0.302	1.00	10	2.03	2.18	0.302	0.302	0.87	0.13	0.039	5.9%	
2.25	0.86				0.735	1.00	11	2.18	2.33	0.735	0.735	0.86	0.13	0.095	14.3%	
2.40	0.88				0.875	1.00	12	2.33	2.48	0.875	0.875	0.88	0.13	0.115	17.4%	
2.55	0.85				0.832	1.00	13	2.48	2.63	0.832	0.832	0.85	0.13	0.106	16.0%	
2.70	0.87				0.524	1.00	14	2.63	2.75	0.524	0.524	0.87	0.11	0.057	8.6%	
2.80	0.88				0.305	1.00	15	2.75	2.83	0.305	0.305	0.88	0.07	0.020	3.0%	
2.85	0.88				0.143	1.00	16	2.83	2.88	0.143	0.143	0.88	0.04	0.006	0.9%	
2.90	0.87				0.174	1.00	17	2.88	2.95	0.174	0.174	0.87	0.07	0.011	1.7%	
3.00	0.45				0.494	1.00	18	2.95	3.08	0.494	0.494	0.45	0.06	0.028	4.2%	
3.15	0.39				0.113	1.00	19	3.08	3.23	0.113	0.113	0.39	0.06	0.007	1.0%	
3.30	0.35				0.000	1.00	20	3.23	3.40	0.000	0.000	0.35	0.06	0.000	0.0%	
3.50	0.00				0.000	1.00	21	3.40	3.50	0.000	0.000	0.09	0.01	0.000	0.0%	

Total Flow:	0.664	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	1.82	(m <sup>2</sup> )
Top Width:	0.60	(m)
Hydraulic Depth:	3.028	(m)
Mean Velocity:	0.366	(m/s)
Froude Number	0.067	
Photographs taken looking at:		
Upstream, downstream, across		

Notes: Station installed well upstream of athabasca, backwater near apparent old TD using old t-post as BM, flow appears to be rapidly increasing during site visit

Datalogger Notes:	
Datalogger Internal Power:	5.03V
Datalogger External Power:	11.01V
Datalogger Memory Used:	3% Used
Datalogger Clock:	May 01, 2007 10:44 MST
Laptop Clock:	May 01, 2007 11:07 MST
Dessicant:	Good
Datalogger:	610 - DD400
PT:	603610 - KPSI 5PSI # 735-13B
Power:	Optimum Battery



# Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Susan Lake Outlet  
Location: Susan Lake Outlet  
Site Name: S25

Coordinates & Legal:

## Time of Measurement

Date of Measurement: June 15, 2007  
Start Time: 2:30 PM MDT  
End Time: 2:43 PM MDT

## Weather Conditions:

+15 °C, Scattered clouds

## River Conditions:

open low stage

## Personnel & Equipment

Measurement Made By: PM,sm  
Data Entry By: sm  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings and Measurements

Bench Mark Reading: T Post 1.048 El: 100.000 1.125 El: 100.000  
Water Level Reading: 2.103 El: 98.945 2.178 El: 98.947 98.946  
Top of Ice Level Reading: El: El:  
Transducer Reading & Est. El.: 0.176 El: 98.769 0.176 El: 98.771 98.770  
Other: NIT on Right Bank El: 101.048 El: 101.125

## Measurement Data

	Measured Data							Calculated Data								Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
RB	0.25	0.00				0.000	1.00	1	0.25	0.28	-0.005	-0.005	0.05	0.00	0.000	0.0%
	0.30	0.12				-0.018	1.00	2	0.28	0.35	-0.018	-0.018	0.12	0.01	0.000	-0.5%
	0.40	0.18				0.000	1.00	3	0.35	0.45	0.000	0.000	0.18	0.02	0.000	0.0%
	0.50	0.20				0.006	1.00	4	0.45	0.55	0.006	0.006	0.20	0.02	0.000	0.4%
	0.60	0.15				0.116	1.00	5	0.55	0.65	0.116	0.116	0.15	0.02	0.002	5.5%
	0.70	0.16				0.125	1.00	6	0.65	0.75	0.125	0.125	0.16	0.02	0.002	6.3%
	0.80	0.15				0.137	1.00	7	0.75	0.85	0.137	0.137	0.15	0.02	0.002	6.5%
	0.90	0.17				0.268	1.00	8	0.85	0.93	0.268	0.268	0.17	0.01	0.003	10.8%
	0.95	0.17				0.421	1.00	9	0.93	0.98	0.421	0.421	0.17	0.01	0.004	11.2%
	1.00	0.19				0.491	1.00	10	0.98	1.03	0.491	0.491	0.19	0.01	0.005	14.7%
	1.05	0.18				0.539	1.00	11	1.03	1.08	0.539	0.539	0.18	0.01	0.005	15.3%
	1.10	0.13				0.585	1.00	12	1.08	1.13	0.585	0.585	0.13	0.01	0.004	12.0%
	1.15	0.11				0.460	1.00	13	1.13	1.18	0.460	0.460	0.11	0.01	0.003	8.0%
	1.20	0.10				0.271	1.00	14	1.18	1.25	0.271	0.271	0.10	0.01	0.002	6.4%
	1.30	0.10				0.131	1.00	15	1.25	1.33	0.131	0.131	0.10	0.01	0.001	3.1%
	1.35	0.10				0.064	1.00	16	1.33	1.36	0.064	0.064	0.10	0.00	0.000	0.6%
	1.36	0.00				0.000	1.00	17	1.36	1.36	0.016	0.016	0.03	0.00	0.000	0.0%
Total Flow:															0.032	100%

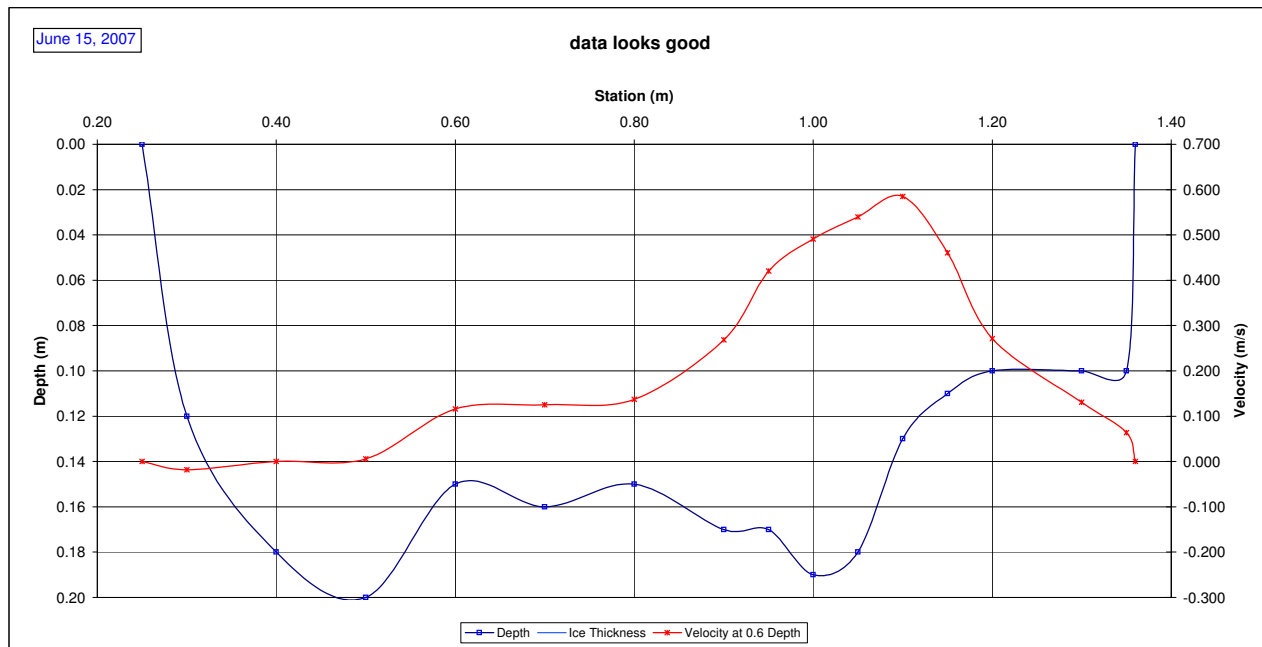
Total Flow:	0.032	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.16	(m <sup>2</sup> )
Top Width:	1.11	(m)
Hydraulic Depth:	0.148	(m)
Mean Velocity:	0.194	(m/s)
Froude Number	0.161	

Photographs taken looking at:

Upstream, downstream, across

Notes: data looks good  
no desicant tube

Datalogger Notes: 278  
Datalogger Internal Power: 5.02  
Datalogger External Power: 12.10  
Datalogger Memory Used: 4% Used  
Datalogger Clock: Jun 18, 2007 10:14 MST  
Laptop Clock: Jun 18, 2007 10:38 MST  
Dessicant: none  
Datalogger: 610 - DD400  
PT: 603610 - KPSI 5PSI # 735-13B  
Power: Optimum Battery



# Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Susan Lake Outlet  
Location: Susan Lake Outlet  
Site Name: S25

Coordinates & Legal:

## Time of Measurement

Date of Measurement: August 8, 2007  
Start Time: 11:25 AM MDT  
End Time: 11:50 AM MDT

## Weather Conditions:

+15 °C, Scattered clouds

## River Conditions:

Open flow

## Personnel & Equipment

Measurement Made By: SM,JMS  
Data Entry By: JMS  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings and Measurements

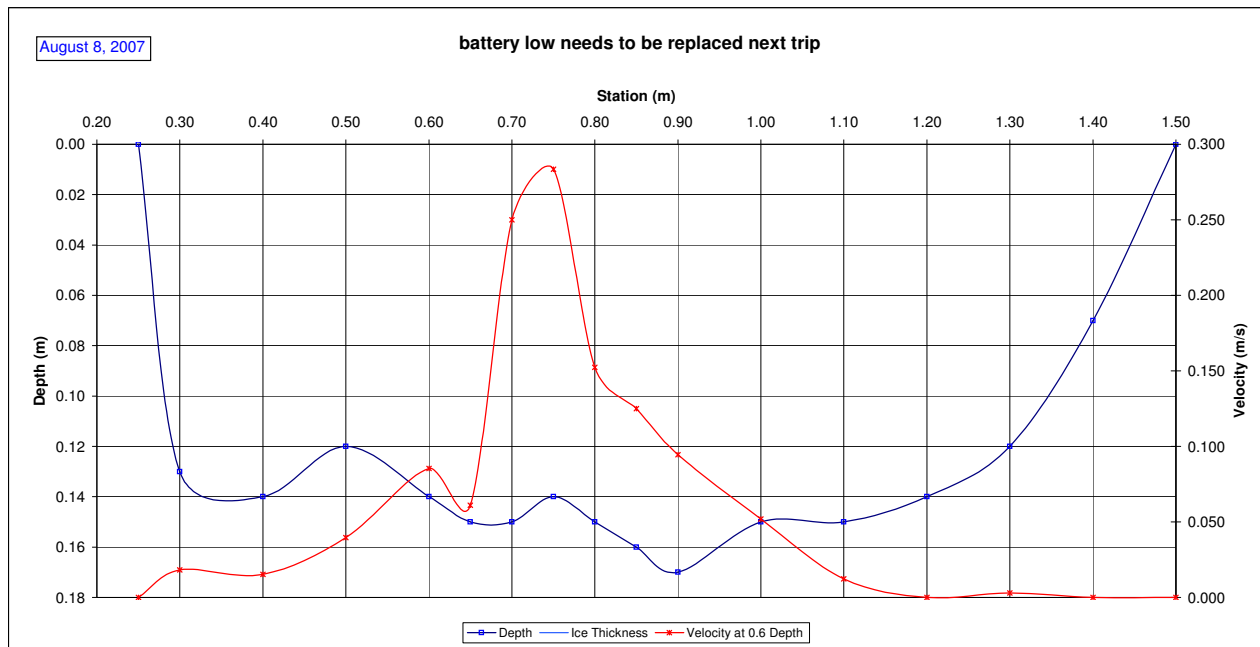
Bench Mark Reading: T post	1.106	El:	100.000	1.088	El:	100.000
Water Level Reading:	2.185	El:	98.921	2.165	El:	98.923
Top of Ice Level Reading:		El:			El:	
Transducer Reading & Est. El.:	0.144	El:	98.777	0.144	El:	98.779
Other: NIT on RB	1.108	El:	99.998	1.089	El:	99.999

Measured Data										Calculated Data						
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at	Panel Ends at	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
LB	1.50	0.00			0.000	1.00	1	1.50	1.45	0.000	0.000	0.02	0.00	0.000	0.0%	
	1.40	0.07			0.000	1.00	2	1.45	1.35	0.000	0.000	0.07	0.01	0.000	0.0%	
	1.30	0.12			0.003	1.00	3	1.35	1.25	0.003	0.003	0.12	0.01	0.000	0.4%	
	1.20	0.14			0.000	1.00	4	1.25	1.15	0.000	0.000	0.14	0.01	0.000	0.0%	
	1.10	0.15			0.012	1.00	5	1.15	1.05	0.012	0.012	0.15	0.02	0.000	1.8%	
	1.00	0.15			0.052	1.00	6	1.05	0.95	0.052	0.052	0.15	0.02	0.001	7.5%	
	0.90	0.17			0.094	1.00	7	0.95	0.88	0.094	0.094	0.17	0.01	0.001	11.6%	
	0.85	0.16			0.125	1.00	8	0.88	0.83	0.125	0.125	0.16	0.01	0.001	9.6%	
	0.80	0.15			0.152	1.00	9	0.83	0.78	0.152	0.152	0.15	0.01	0.001	11.0%	
	0.75	0.14			0.283	1.00	10	0.78	0.73	0.283	0.283	0.14	0.01	0.002	19.1%	
	0.70	0.15			0.250	1.00	11	0.73	0.68	0.250	0.250	0.15	0.01	0.002	18.1%	
	0.65	0.15			0.061	1.00	12	0.68	0.63	0.061	0.061	0.15	0.01	0.000	4.4%	
	0.60	0.14			0.085	1.00	13	0.63	0.55	0.085	0.085	0.14	0.01	0.001	8.6%	
	0.50	0.12			0.040	1.00	14	0.55	0.45	0.040	0.040	0.12	0.01	0.000	4.6%	
	0.40	0.14			0.015	1.00	15	0.45	0.35	0.015	0.015	0.14	0.01	0.000	2.1%	
	0.30	0.13			0.018	1.00	16	0.35	0.30	0.018	0.018	0.13	0.01	0.000	1.1%	
	0.25	0.00			0.000	1.00	17	0.30	0.25	0.005	0.005	0.03	0.00	0.000	0.1%	
Total Flow:														0.010	100%	

Total Flow:	0.010	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.16	(m <sup>2</sup> )
Top Width:	1.50	(m)
Hydraulic Depth:	0.106	(m)
Mean Velocity:	0.065	(m/s)
Froude Number	0.064	
Photographs taken looking at: Upstream, downstream, across		

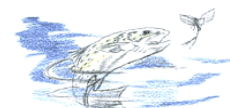
Notes: battery low needs to be replaced next trip

Datalogger Notes:	
Datalogger Internal Power:	5.8V
Datalogger External Power:	9.76V
Datalogger Memory Used:	5% Used
Datalogger Clock:	Aug 08, 2007 10:07 MST
Laptop Clock:	Aug 08, 2007 10:37 MST
Dessicant:	None Present
Datalogger:	610 - DD400
PT:	603610 - KPSI 5PSI # 735-13B
Power:	Optimum Battery



# Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Susan Lake Outlet  
Location: Susan Lake Outlet  
Site Name: S25  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: September 21, 2007  
Start Time: 2:00 PM MDT  
End Time: MDT

## Weather Conditions:

mostly clear

## River Conditions:

higher

## Personnel & Equipment

Measurement Made By: SM,JMS  
Data Entry By: sm  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

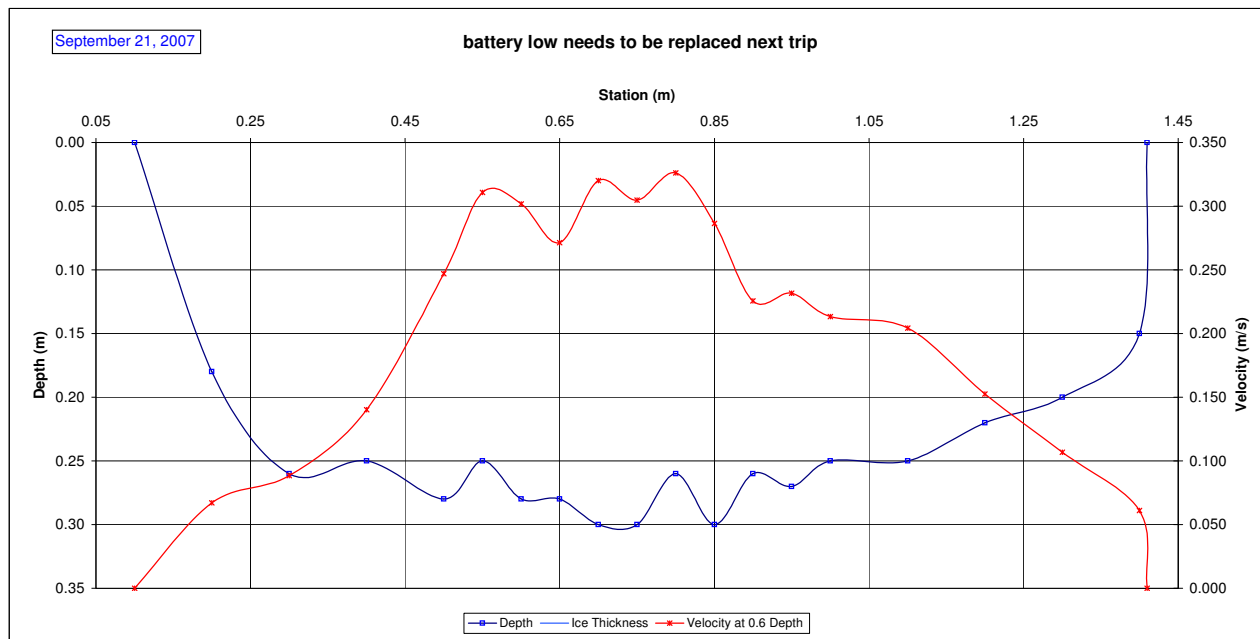
## Level Readings and Measurements

Bench Mark Reading: T post 0.868 El: 100.000 0.782 El: 100.000  
Water Level Reading: 1.879 El: 98.989 1.8 El: 98.982 98.986  
Top of Ice Level Reading: El: El: El:  
Transducer Reading & Est. El.: 0.213 El: 98.776 0.213 El: 98.769 98.773  
Other: NIT on RB 0.868 El: 100.000 0.781 El: 100.001

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB	1.41	0.00			0.000	1.00	1	1.41	1.41	0.015	0.015	0.04	0.00	0.000	0.0%
	1.40	0.15			0.061	1.00	2	1.41	1.35	0.061	0.061	0.15	0.01	0.001	0.8%
	1.30	0.20			0.107	1.00	3	1.35	1.25	0.107	0.107	0.20	0.02	0.002	3.4%
	1.20	0.22			0.152	1.00	4	1.25	1.15	0.152	0.152	0.22	0.02	0.003	5.3%
	1.10	0.25			0.204	1.00	5	1.15	1.05	0.204	0.204	0.25	0.03	0.005	8.1%
	1.00	0.25			0.213	1.00	6	1.05	0.98	0.213	0.213	0.25	0.02	0.004	6.3%
	0.95	0.27			0.232	1.00	7	0.98	0.93	0.232	0.232	0.27	0.01	0.003	4.9%
	0.90	0.26			0.226	1.00	8	0.93	0.88	0.226	0.226	0.26	0.01	0.003	4.6%
	0.85	0.30			0.287	1.00	9	0.88	0.83	0.287	0.287	0.30	0.02	0.004	6.8%
	0.80	0.26			0.326	1.00	10	0.83	0.78	0.326	0.326	0.26	0.01	0.004	6.7%
	0.75	0.30			0.305	1.00	11	0.78	0.73	0.305	0.305	0.30	0.02	0.005	7.2%
	0.70	0.30			0.320	1.00	12	0.73	0.68	0.320	0.320	0.30	0.02	0.005	7.6%
	0.65	0.28			0.271	1.00	13	0.68	0.63	0.271	0.271	0.28	0.01	0.004	6.0%
	0.60	0.28			0.302	1.00	14	0.63	0.58	0.302	0.302	0.28	0.01	0.004	6.7%
	0.55	0.25			0.311	1.00	15	0.58	0.53	0.311	0.311	0.25	0.01	0.004	6.1%
	0.50	0.28			0.247	1.00	16	0.53	0.45	0.247	0.247	0.28	0.02	0.005	8.2%
	0.40	0.25			0.140	1.00	17	0.45	0.35	0.140	0.140	0.25	0.03	0.004	5.5%
	0.30	0.26			0.088	1.00	18	0.35	0.25	0.088	0.088	0.26	0.03	0.002	3.6%
	0.20	0.18			0.067	1.00	19	0.25	0.15	0.067	0.067	0.18	0.02	0.001	1.9%
RB	0.10	0.00			0.000	1.00	20	0.15	0.10	0.017	0.017	0.05	0.00	0.000	0.1%
Total Flow: 0.063															100%

Total Flow:	0.063	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.31	(m <sup>2</sup> )
Top Width:	1.41	(m)
Hydraulic Depth:	0.221	(m)
Mean Velocity:	0.203	(m/s)
Froude Number	0.138	
Photographs taken looking at:		
Upstream, downstream, across		
Notes: battery low needs to be replaced next trip		

Datalogger Notes:	
Datalogger Internal Power:	5
Datalogger External Power:	9.35
Datalogger Memory Used:	6% Used
Datalogger Clock:	Sep 21, 2007 13:32 MST
Laptop Clock:	Sep 21, 2007 13:02 MST
Dessicant:	good
Datalogger:	610 - DD400
PT:	603610 - KPSI 5PSI # 735-13B
Power:	Optimum Battery





# Hydrometric Measurement / Site Visit Record

S25 - Susan Lake Outlet



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Susan Lake Outlet  
Location: Susan Lake Outlet  
Site Name: S25  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: October 23, 2007  
Start Time: 1:07 PM MDT  
End Time: 1:21 PM MDT

## Weather Conditions:

overcast calm

## River Conditions:

open

## Personnel & Equipment

Measurement Made By: sm ff  
Data Entry By: sm  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings and Measurements

Bench Mark Reading: T<sub>post</sub> 0.748 El: 100.000 0.713 El: 100.000  
Water Level Reading: 1.790 El: 98.958 1.761 El: 98.952 98.955  
Top of Ice Level Reading: El: 98.852 0.106 El: 98.846 98.849  
Transducer Reading & Est. El.: 0.106 El: 99.999 0.712 El: 100.001  
Other: NIT on RB

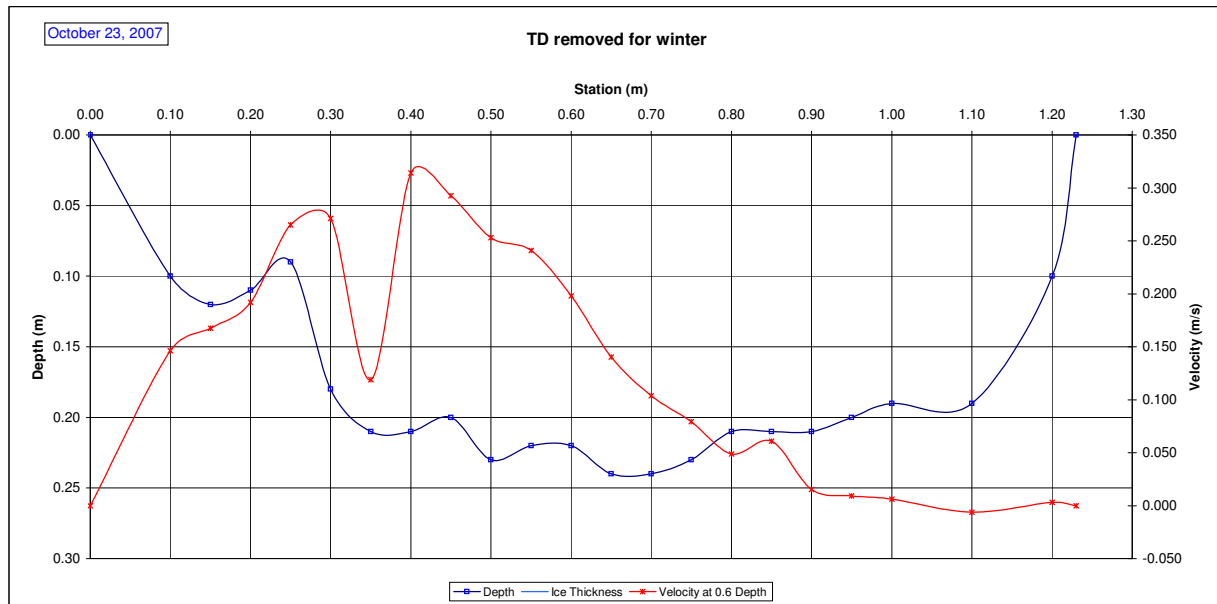
## Measurement Data

Measured Data						Calculated Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
0.00	0.00				0.000	1.00	1	0.00	0.05	0.037	0.037	0.03	0.00	0.000	0.2%
0.10	0.10				0.146	1.00	2	0.05	0.13	0.146	0.146	0.10	0.01	0.001	4.0%
0.15	0.12				0.168	1.00	3	0.13	0.18	0.168	0.168	0.12	0.01	0.001	3.7%
0.20	0.11				0.192	1.00	4	0.18	0.23	0.192	0.192	0.11	0.01	0.001	3.9%
0.25	0.09				0.265	1.00	5	0.23	0.28	0.265	0.265	0.09	0.00	0.001	4.4%
0.30	0.18				0.271	1.00	6	0.28	0.33	0.271	0.271	0.18	0.01	0.002	8.9%
0.35	0.21				0.119	1.00	7	0.33	0.38	0.119	0.119	0.21	0.01	0.001	4.6%
0.40	0.21				0.314	1.00	8	0.38	0.43	0.314	0.314	0.21	0.01	0.003	12.1%
0.45	0.20				0.293	1.00	9	0.43	0.48	0.293	0.293	0.20	0.01	0.003	10.7%
0.50	0.23				0.253	1.00	10	0.48	0.53	0.253	0.253	0.23	0.01	0.003	10.7%
0.55	0.22				0.241	1.00	11	0.53	0.58	0.241	0.241	0.22	0.01	0.003	9.7%
0.60	0.22				0.198	1.00	12	0.58	0.63	0.198	0.198	0.22	0.01	0.002	8.0%
0.65	0.24				0.140	1.00	13	0.63	0.68	0.140	0.140	0.24	0.01	0.002	6.2%
0.70	0.24				0.104	1.00	14	0.68	0.73	0.104	0.104	0.24	0.01	0.001	4.6%
0.75	0.23				0.079	1.00	15	0.73	0.78	0.079	0.079	0.23	0.01	0.001	3.3%
0.80	0.21				0.049	1.00	16	0.78	0.83	0.049	0.049	0.21	0.01	0.001	1.9%
0.85	0.21				0.061	1.00	17	0.83	0.88	0.061	0.061	0.21	0.01	0.001	2.3%
0.90	0.21				0.015	1.00	18	0.88	0.93	0.015	0.015	0.21	0.01	0.000	0.6%
0.95	0.20				0.009	1.00	19	0.93	0.98	0.009	0.009	0.20	0.01	0.000	0.3%
1.00	0.19				0.006	1.00	20	0.98	1.05	0.006	0.006	0.19	0.01	0.000	0.3%
1.10	0.19				-0.006	1.00	21	1.05	1.15	-0.006	-0.006	0.19	0.02	0.000	-0.4%
1.20	0.10				0.003	1.00	22	1.15	1.22	0.003	0.003	0.10	0.01	0.000	0.1%
1.23	0.00				0.000	1.00	23	1.22	1.23	0.001	0.001	0.03	0.00	0.000	0.0%

Total Flow:	0.027	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.22	(m <sup>2</sup> )
Top Width:	1.23	(m)
Hydraulic Depth:	0.175	(m)
Mean Velocity:	0.127	(m/s)
Froude Number	0.097	
Photographs taken looking at: Upstream, downstream, across		

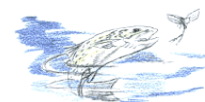
Notes: TD removed for winter  
condensation in enclosure  
sample rate set to 24hr

Datalogger Notes:	
Datalogger Internal Power:	5
Datalogger External Power:	6.17
Datalogger Memory Used:	7% Used
Datalogger Clock:	Oct 23, 2007 11:38 MST
Laptop Clock:	Oct 23, 2007 12:11 MST
Dessicant:	good
Datalogger:	610 - DD400
PT:	603610 - KPSI 5PSI # 735-13B
Power:	Optimum Battery



# Hydrometric Measurement / Site Visit Record

S26 - MacKay River near Fort MacKay WSC 07DB001



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: MacKay River  
Location: MacKay River near Fort MacKay WSC 07DB001  
Site Name: S26  
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4

## Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF  
Meter Type and No.: Marsh Mc Birney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: January 12, 2007  
Start Time: 3:48 PM MST  
End Time: 4:08 PM MST

## Level Readings and Measurement

Bench Mark Reading: Yellow mark 1.497  
Water Level Reading: at WSC Shack 4.141  
Top of Ice Level Reading: 4.140  
Transducer Reading:  
Other:

Set Up #1

El: 100.000  
El: 97.356  
El: 97.357  
El:  
El:

Set Up #2

El: 100.000  
El: 97.357  
El: 97.358  
El:  
El:

Average

97.357

Weather Conditions: -19 °C, Partly cloudy, light wind

River Conditions: Complete ice cover.

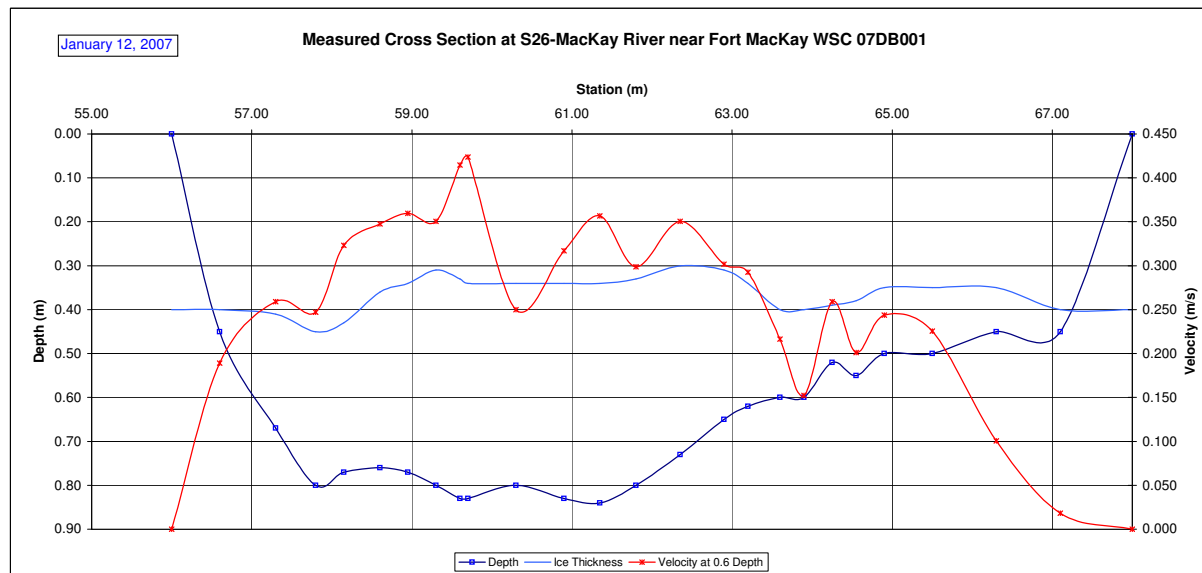
Measured Data										Measurement Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of total		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)			
56.00	0.00	0.40			0.000	0.90	1	56.00	56.30	0.047	0.043	0.01	0.00	0.000	0.0%		
56.60	0.45	0.40			0.189	0.90	2	56.30	56.95	0.189	0.170	0.05	0.03	0.006	0.6%		
57.30	0.67	0.41			0.259	0.90	3	56.95	57.55	0.259	0.233	0.26	0.16	0.036	3.9%		
57.80	0.80	0.45			0.247	0.90	4	57.55	57.98	0.247	0.222	0.35	0.15	0.033	3.5%		
58.15	0.77	0.43			0.323	0.90	5	57.98	58.38	0.323	0.291	0.34	0.14	0.040	4.2%		
58.60	0.76	0.36			0.347	0.90	6	58.38	58.78	0.347	0.313	0.40	0.16	0.050	5.3%		
58.95	0.77	0.34			0.360	0.90	7	58.78	59.13	0.360	0.324	0.43	0.15	0.049	5.2%		
59.30	0.80	0.31			0.351	0.90	8	59.13	59.45	0.351	0.315	0.49	0.16	0.050	5.4%		
59.60	0.83	0.33			0.415	0.90	9	59.45	59.65	0.415	0.373	0.50	0.10	0.037	4.0%		
59.70	0.83	0.34			0.424	0.90	10	59.65	60.00	0.424	0.381	0.49	0.17	0.065	7.0%		
60.30	0.80	0.34			0.250	0.90	11	60.00	60.60	0.250	0.225	0.46	0.28	0.062	6.6%		
60.90	0.83	0.34			0.317	0.90	12	60.60	61.13	0.317	0.285	0.49	0.26	0.073	7.8%		
61.35	0.84	0.34			0.357	0.90	13	61.13	61.58	0.357	0.321	0.50	0.23	0.072	7.7%		
61.80	0.80	0.33			0.299	0.90	14	61.58	62.08	0.299	0.269	0.47	0.24	0.063	6.7%		
62.35	0.73	0.30			0.351	0.90	15	62.08	62.63	0.351	0.315	0.43	0.24	0.075	7.9%		
62.90	0.65	0.31			0.302	0.90	16	62.63	63.90	0.302	0.272	0.34	0.43	0.118	12.5%		
63.20	0.62	0.34			0.293	0.90	17	63.90	64.27	0.293	0.263	0.28	0.10	0.027	2.9%		
63.60	0.60	0.40			0.216	0.90	18	64.27	64.71	0.216	0.195	0.20	0.09	0.017	1.8%		
63.90	0.60	0.40			0.152	0.90	19	64.71	65.21	0.152	0.137	0.20	0.10	0.014	1.5%		
64.25	0.52	0.39			0.259	0.90	20	65.21	65.80	0.259	0.233	0.13	0.08	0.018	1.9%		
64.55	0.55	0.38			0.201	0.90	21	65.80	66.06	0.201	0.181	0.17	0.04	0.008	0.8%		
64.90	0.50	0.35			0.244	0.90	22	66.06	66.36	0.244	0.219	0.15	0.05	0.010	1.1%		
65.50	0.50	0.35			0.226	0.90	23	66.36	66.73	0.226	0.203	0.15	0.05	0.011	1.2%		
66.30	0.45	0.35			0.101	0.90	24	66.73	67.13	0.101	0.091	0.10	0.04	0.004	0.4%		
67.10	0.45	0.40			0.018	0.90	25	67.13	67.55	0.018	0.016	0.05	0.02	0.000	0.0%		
68.00	0.00	0.40			0.000	0.90	26	67.55	68.00	0.005	0.004	0.01	0.01	0.000	0.0%		
Total Flow:														0.939	100%		

Total Flow:	0.939	(m <sup>3</sup> /s)
Perceived Quality of Measurement:	Good	
Total Area:	3.46	(m <sup>2</sup> )
Top Width:	12.00	(m)
Hydraulic Depth:	0.288	(m)
Mean Velocity:	0.271	(m/s)
Froude Number	0.161	
Photographs taken looking at: Upstream, downstream, across		

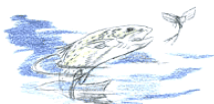
Datalogger Notes:	
Datalogger Internal Power:	no transducer
Datalogger External Power:	using WSC Levels
Datalogger Memory Used:	
Datalogger Clock:	
Laptop Clock:	
Dessicant:	
Datalogger:	
PT:	
Power:	

## Notes:

Manual MMT done upstream of WSC cableway.



Hydrometric Measurement / Site Visit Record
S26 - MacKay River near Fort MacKay WSC 07DB001



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: MacKay River
Location: MacKay River near Fort MacKay WSC 07DB001
Site Name: S26
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4
Time of Measurement: February 14, 2007
Date of Measurement: 2:50 PM MST
Start Time: 3:47 PM MST
End Time:

Personnel & Equipment

Measurement Made By: JM/JSS
Data Entry By: JM
Checked: Marsh Mc Birney FloMate 2000
Meter Type and No.: s/n 2004521

Level Readings and Measurement:

Bench Mark Reading: Yellow mark 1.007
Water Level Reading: at WSC Shack 3.662
Top of Ice Level Reading: 3.625
Transducer Reading:
Other:

Table with 4 columns: Set Up #1, Set Up #2, Average, and various elevation readings (El:).

Weather Conditions: -10° C, Blizzard, strong wind
River Conditions: Complete ice cover.

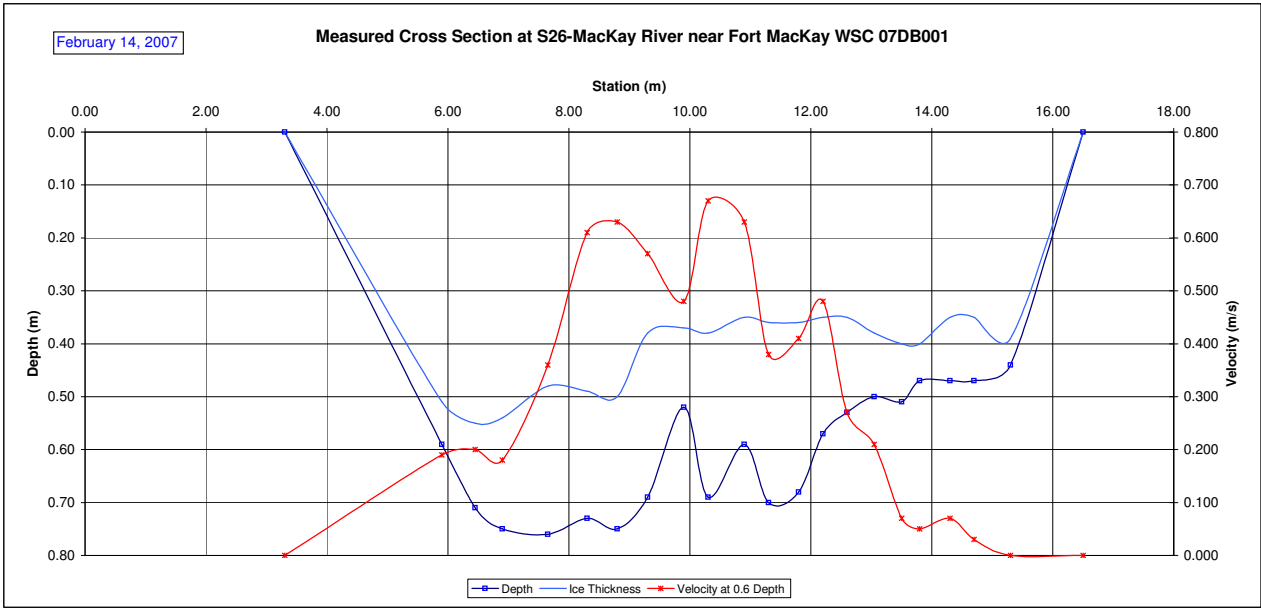
Measurement Data

Table with 17 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, and Percentage of total.

Summary table with 4 columns: Total Flow, Perceived Quality of Measurement, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number, and Photographs taken looking at.

Datalogger Notes:
Datalogger Internal Power: no transducer
Datalogger External Power: using WSC Levels
Datalogger Memory Used:
Datalogger Clock:
Laptop Clock:
Dessicant:
Datalogger:
PT:
Power:

Notes:
Manual MMT done upstream of WSC cableway.



# Hydrometric Measurement / Site Visit Record

S26 - MacKay River near Fort MacKay WSC 07DB001



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: MacKay River  
Location: MacKay River near Fort MacKay WSC 07DB001  
Site Name: S26  
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4

## Time of Measurement

Date of Measurement: March 6, 2007  
Start Time: 4:20 PM MST  
End Time: 4:35 PM MST

## Weather Conditions:

-16° C, Light snow, light wind

## River Conditions:

Complete ice cover.

## Personnel & Equipment

Measurement Made By: JS, FF  
Data Entry By: FF  
Meter Type and No.: Marsh Mc Birney FloMate 2000 s/n 2004521

## Level Readings and Measurement:

Bench Mark Reading: Yellow mark 0.796  
Water Level Reading: at WSC Shack 3.292  
Top of Ice Level Reading: 3.255  
Transducer Reading:  
Other:

## Set Up #1

El: 100.000  
El: 97.504  
El: 97.541  
El:

## Set Up #2

El: 100.000  
El: 97.500  
El: 97.572  
El: 97.500  
El:

## Average

97.502

## Measurement Data

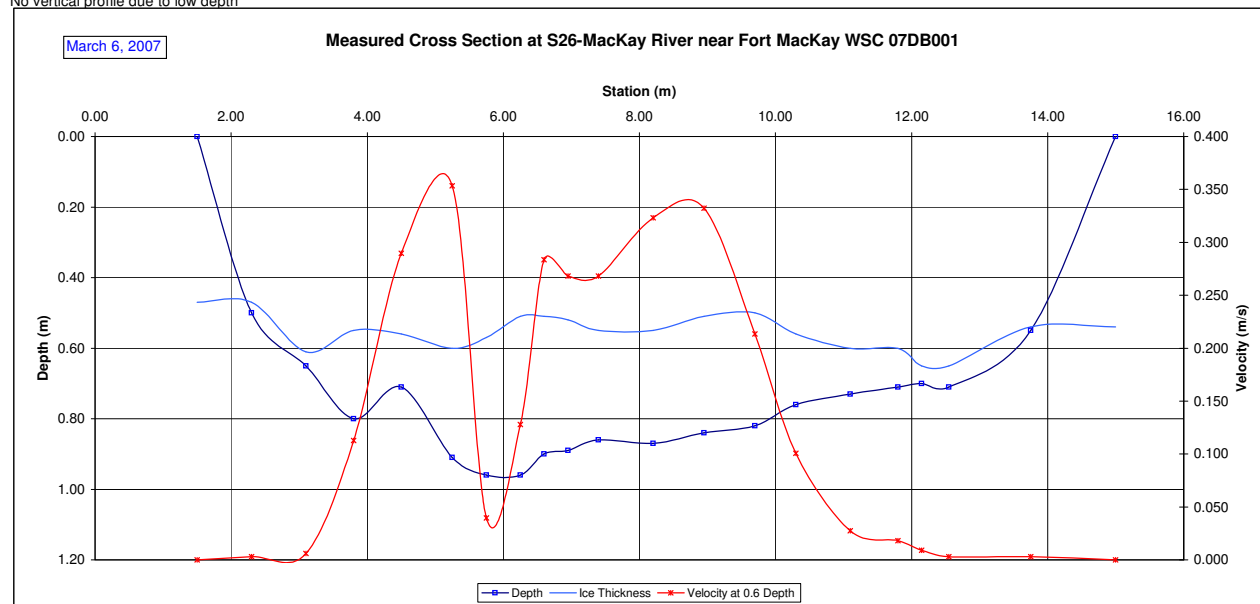
	Measured Data						Calculated Data									
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of total
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
LB	1.50	0.00	0.47			0.000	0.90	1	1.50	1.90	0.001	0.001	0.01	0.00	0.000	0.0%
	2.30	0.50	0.47			0.003	0.90	2	1.90	2.70	0.003	0.003	0.03	0.02	0.000	0.0%
	3.10	0.65	0.61			0.006	0.90	3	2.70	3.45	0.006	0.005	0.04	0.03	0.000	0.0%
	3.80	0.80	0.55			0.113	0.90	4	3.45	4.15	0.113	0.101	0.25	0.18	0.018	3.9%
	4.50	0.71	0.56			0.290	0.90	5	4.15	4.88	0.290	0.261	0.15	0.11	0.028	6.2%
	5.25	0.91	0.60			0.354	0.90	6	4.88	5.50	0.354	0.318	0.31	0.19	0.062	13.5%
	5.75	0.96	0.57			0.040	0.90	7	5.50	6.00	0.040	0.036	0.39	0.20	0.007	1.5%
	6.25	0.96	0.51			0.128	0.90	8	6.00	6.43	0.128	0.115	0.45	0.19	0.022	4.8%
	6.60	0.90	0.51			0.283	0.90	9	6.43	6.78	0.283	0.255	0.39	0.14	0.035	7.6%
	6.95	0.89	0.52			0.268	0.90	10	6.78	7.18	0.268	0.241	0.37	0.15	0.036	7.8%
RB	7.40	0.86	0.55			0.268	0.90	11	7.18	7.80	0.268	0.241	0.31	0.19	0.047	10.2%
	8.20	0.87	0.55			0.323	0.90	12	7.80	8.58	0.323	0.291	0.32	0.25	0.072	15.7%
	8.95	0.84	0.51			0.332	0.90	13	8.58	9.33	0.332	0.299	0.33	0.25	0.074	16.1%
	9.70	0.82	0.50			0.213	0.90	14	9.33	10.00	0.213	0.192	0.32	0.22	0.041	9.1%
	10.30	0.76	0.56			0.101	0.90	15	10.00	10.70	0.101	0.091	0.20	0.14	0.013	2.8%
	11.10	0.73	0.60			0.027	0.90	16	10.70	11.45	0.027	0.025	0.13	0.10	0.002	0.5%
	11.80	0.71	0.60			0.018	0.90	17	11.45	11.98	0.018	0.016	0.11	0.06	0.001	0.2%
	12.15	0.70	0.65			0.009	0.90	18	11.98	12.35	0.009	0.008	0.05	0.02	0.000	0.0%
	12.55	0.71	0.65			0.003	0.90	19	12.35	13.15	0.003	0.003	0.06	0.05	0.000	0.0%
	13.75	0.55	0.54			0.003	0.90	20	13.15	14.38	0.003	0.003	0.01	0.01	0.000	0.0%
	15.00	0.00	0.54			0.000	0.90	21	14.38	15.00	0.001	0.001	0.00	0.00	0.000	0.0%
Total Flow:															0.458	100%

Total Flow:	0.458	(m <sup>3</sup> /s)
Perceived Quality of Measurement:	Fair	
Total Area:	2.49	(m <sup>2</sup> )
Top Width:	13.50	(m)
Hydraulic Depth:	0.184	(m)
Mean Velocity:	0.184	(m/s)
Froude Number	0.137	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	
Datalogger Internal Power:	no transducer
Datalogger External Power:	using WSC Levels
Datalogger Memory Used:	
Datalogger Clock:	
Laptop Clock:	
Dessicant:	
Datalogger:	
PT:	
Power:	

## Notes:

Manual MMT done upstream of WSC cableway.  
No vertical profile due to low depth



# Hydrometric Measurement / Site Visit Record

## S26 - Mackay River WSC



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Mackay River  
Location: S26  
Site Name: Mackay River WSC  
Coordinates & Legal: 458031 E, 6341078 N SE-3-95-11-W4

### Time of Measurement

Date of Measurement: December 9, 2007  
Start Time: 11:14 AM MST  
End Time: 11:25 AM MST

### Weather Conditions:

-20 C, Overcast

### River Conditions:

Ice Cover

### Personnel & Equipment

Measurement Made By: SM, FF  
Data Entry By: SMS  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: Paint on Rock 0.682  
Water Level Reading: 3.300  
Top of Ice Level Reading: 3.290  
Transducer Reading & Est. El.:  
Other:

### Setup No. 1

El: 100.000  
El: 97.382  
El: 97.392  
El: 97.382

### Setup No. 2

El: 100.000  
El: 97.332  
El: 97.375  
El: 97.332

RB	Measured Data						Measurement Data									Calculated Data				
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge					
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)					
	1.00	0.00	0.00				1.00	1	1.00	1.65	0.009	0.009	0.02	0.01	0.000					
	2.30	0.32	0.26			0.037	1.00	2	1.65	2.75	0.037	0.037	0.06	0.07	0.002					
	3.20	0.35	0.22			0.107	1.00	3	2.75	3.55	0.107	0.107	0.13	0.10	0.011					
	3.90	0.35	0.22			0.082	1.00	4	3.55	4.25	0.082	0.082	0.13	0.09	0.007					
	4.60	0.37	0.30			0.119	1.00	5	4.25	5.00	0.119	0.119	0.07	0.05	0.006					
	5.40	0.42	0.25			0.216	1.00	6	5.00	5.80	0.216	0.216	0.17	0.14	0.029					
	6.20	0.45	0.20			0.314	1.00	7	5.80	6.60	0.314	0.314	0.25	0.20	0.063					
	7.00	0.46	0.22			0.229	1.00	8	6.60	7.40	0.229	0.229	0.24	0.19	0.044					
	7.80	0.45	0.22			0.256	1.00	9	7.40	8.10	0.256	0.256	0.23	0.16	0.041					
	8.40	0.48	0.24			0.277	1.00	10	8.10	8.85	0.277	0.277	0.24	0.18	0.050					
	9.30	0.50	0.25			0.277	1.00	11	8.85	9.65	0.277	0.277	0.25	0.20	0.055					
	10.00	0.52	0.24			0.296	1.00	12	9.65	10.40	0.296	0.296	0.28	0.21	0.062					
	10.80	0.56	0.25			0.317	1.00	13	10.40	11.10	0.317	0.317	0.31	0.22	0.069					
	11.40	0.61	0.21			0.351	1.00	14	11.10	11.75	0.351	0.351	0.40	0.26	0.091					
	12.10	0.52	0.27			0.326	1.00	15	11.75	12.55	0.326	0.326	0.25	0.20	0.065					
	13.00	0.70	0.25			0.280	1.00	16	12.55	13.30	0.280	0.280	0.45	0.34	0.095					
	13.60	0.70	0.26			0.436	1.00	17	13.30	14.00	0.436	0.436	0.44	0.31	0.134					
	14.40	0.75	0.30			0.357	1.00	18	14.00	14.75	0.357	0.357	0.45	0.34	0.120					
	15.10	0.72	0.27			0.418	1.00	19	14.75	15.45	0.418	0.418	0.45	0.32	0.132					
	15.80	0.77	0.30			0.402	1.00	20	15.45	16.25	0.402	0.402	0.47	0.38	0.151					
	16.70	0.70	0.30			0.311	1.00	21	16.25	17.20	0.311	0.311	0.40	0.38	0.118					
	17.70	0.65	0.30			0.287	1.00	22	17.20	18.03	0.287	0.287	0.35	0.29	0.083					
	18.35	0.57	0.27			0.223	1.00	23	18.03	18.75	0.223	0.223	0.30	0.22	0.048					
	19.15	0.51	0.26			0.219	1.00	24	18.75	19.48	0.219	0.219	0.25	0.18	0.040					
	19.80	0.53	0.26			0.165	1.00	25	19.48	20.10	0.165	0.165	0.27	0.17	0.028					
	20.40	0.55	0.25			0.143	1.00	26	20.10	20.70	0.143	0.143	0.30	0.18	0.026					
	21.00	0.50	0.25			0.107	1.00	27	20.70	21.20	0.107	0.107	0.25	0.13	0.013					
	21.40	0.39	0.22			0.076	1.00	28	21.20	21.75	0.076	0.076	0.17	0.09	0.007					
	22.10	0.32	0.20			0.073	1.00	29	21.75	22.40	0.073	0.073	0.12	0.08	0.006					
	22.70	0.30	0.17			0.058	1.00	30	22.40	22.70	0.058	0.058	0.13	0.04	0.002					
	23.40	0.00	0.00				1.00	31	22.70	23.40	0.014	0.014	0.03	0.02	0.000					
LB																				
	Total Flow:														1.601					

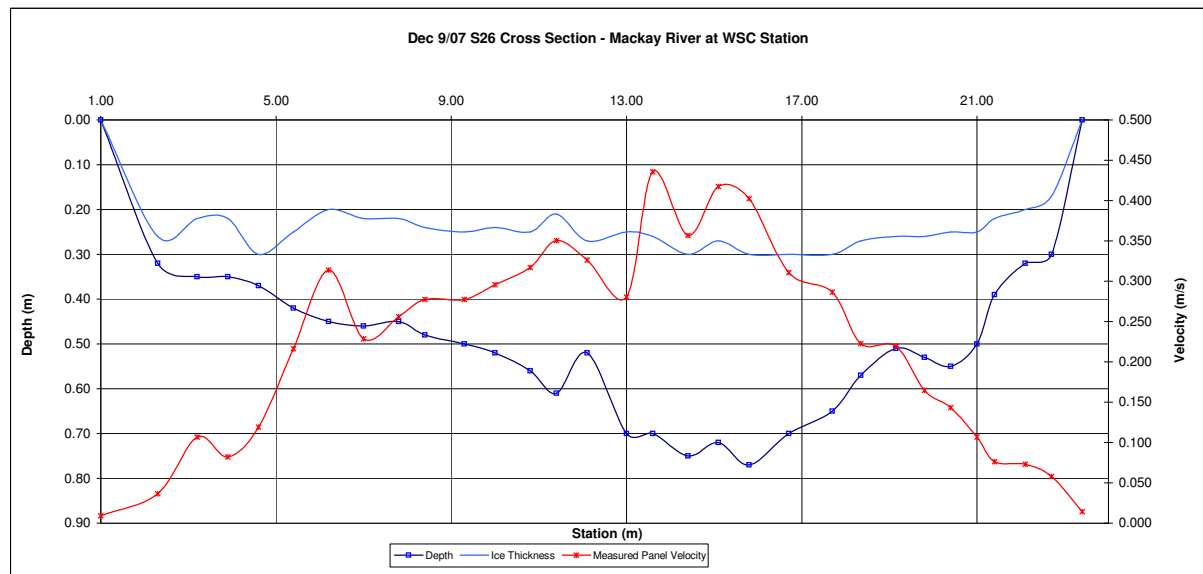
Total Flow:	1.601	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	5.73	(m <sup>2</sup> )
Top Width:	22.40	(m)
Hydraulic Depth:	0.256	(m)
Mean Velocity:	0.279	(m/s)
Froude Number	0.176	
Photographs taken looking at:		
Photographs taken.		

### Datalogger Notes:

Datalogger Internal Power:  
Datalogger External Power:  
Datalogger Memory Used:  
Datalogger Clock:  
Laptop Clock:  
Dessicant:  
Datalogger:  
PT:  
Power:

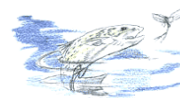
### Notes:

-20 C, overcast. Complete ice cover. 2 layers of ice with slush flow between. Some seepage evident.



# Hydrometric Measurement / Site Visit Record

S27 - Firebag River Near the Mouth (07DC001)



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Firebag River  
Location: Firebag River Near the Mouth (07DC001)  
Site Name: S27  
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4

## Personnel & Equipment

Measurement Made By: JS/FF/JE  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Time of Measurement

Date of Measurement: January 13, 2007  
Start Time: 8:47 AM MST  
End Time: 9:53 AM MST

## Level Readings and Measurements

Bench Mark Reading: Rod in PVC 1.438  
Water Level Reading: 3.553  
Top of Ice Level Reading: 3.665  
Transducer Reading & Calc'd El.: 1.063  
Other:

Set up #1 Set up #2

El: 99.773  
El: 97.658  
El: 97.546  
El: 96.595  
El:  
El:

average

97.658  
97.658  
96.595

## Weather Conditions:

-29, clear, light wind

## River Conditions:

Full ice cover - recently flooded at ice bridge.

## Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
57.00	0.00	0.47			0.000	0.90	1	57.00	57.90	0.261	0.235	0.16	0.14	0.033	0%	
58.80	1.10	0.47			1.042	0.90	2	57.90	59.50	1.042	0.938	0.63	1.01	0.946	8%	
60.20	1.10	0.53			0.963	0.90	3	59.50	60.60	0.963	0.867	0.57	0.63	0.544	4%	
61.00	1.06	0.55			0.936	0.90	4	60.60	61.40	0.936	0.842	0.51	0.41	0.344	3%	
61.80	1.05	0.55			0.786	0.90	5	61.40	62.25	0.786	0.708	0.50	0.43	0.301	2%	
62.70	0.95	0.55			0.786	0.90	6	62.25	63.20	0.786	0.708	0.40	0.38	0.269	2%	
63.70	0.98	0.57			0.896	0.90	7	63.20	64.25	0.896	0.807	0.41	0.43	0.347	3%	
64.80	1.04	0.60			1.042	0.90	8	64.25	65.40	1.042	0.938	0.44	0.51	0.475	4%	
66.00	1.10	0.60			0.872	0.90	9	65.40	66.55	0.872	0.785	0.50	0.57	0.451	4%	
67.10	1.12	0.61			0.994	0.90	10	66.55	67.65	0.994	0.894	0.51	0.56	0.502	4%	
68.20	1.23	0.59			0.936	0.90	11	67.65	68.60	0.936	0.842	0.64	0.61	0.512	4%	
69.00	1.21	0.59			0.939	0.90	12	68.60	69.50	0.939	0.845	0.62	0.56	0.471	4%	
70.00	1.20	0.60			0.884	0.90	13	69.50	70.60	0.884	0.796	0.60	0.66	0.525	4%	
71.20	1.13	0.60			0.844	0.90	14	70.60	71.75	0.844	0.760	0.53	0.61	0.463	4%	
72.30	1.10	0.61			0.728	0.90	15	71.75	73.05	0.728	0.656	0.49	0.64	0.418	3%	
73.80	1.01	0.62			0.576	0.90	16	73.05	74.58	0.576	0.518	0.39	0.59	0.308	3%	
75.35	0.95	0.65			0.591	0.90	17	74.58	75.93	0.591	0.532	0.30	0.41	0.216	2%	
76.50	0.90	0.57			0.680	0.90	18	75.93	77.05	0.680	0.612	0.33	0.37	0.227	2%	
77.60	0.91	0.55			0.683	0.90	19	77.05	78.40	0.683	0.614	0.36	0.49	0.299	2%	
79.20	0.88	0.55			0.357	0.90	20	78.40	79.85	0.357	0.321	0.33	0.48	0.154	1%	
80.50	0.85	0.56			0.421	0.90	21	79.85	81.55	0.421	0.379	0.29	0.49	0.187	2%	
82.60	0.77	0.53			0.494	0.90	22	81.55	83.40	0.494	0.444	0.24	0.44	0.197	2%	
84.20	0.68	0.52			0.610	0.90	23	83.40	85.05	0.610	0.549	0.16	0.26	0.145	1%	
85.90	0.75	0.58			0.640	0.90	24	85.05	87.25	0.640	0.576	0.17	0.37	0.215	2%	
88.60	0.66	0.55			0.463	0.90	25	87.25	89.40	0.463	0.417	0.11	0.24	0.099	1%	
90.20	0.85	0.64			0.506	0.90	26	89.40	91.05	0.506	0.455	0.21	0.35	0.158	1%	
91.90	0.49	0.47			0.030	0.90	27	91.05	97.80	0.030	0.027	0.02	0.14	0.004	0%	
103.70	0.74	0.60			0.253	0.90	28	97.80	104.40	0.253	0.228	0.14	0.92	0.210	2%	
105.10	0.96	0.60			0.539	0.90	29	104.40	105.50	0.539	0.486	0.36	0.40	0.192	2%	
105.90	1.05	0.58			0.811	0.90	30	105.50	106.45	0.811	0.730	0.47	0.45	0.326	3%	
107.00	1.09	0.59			0.960	0.90	31	106.45	107.60	0.960	0.864	0.50	0.57	0.497	4%	
108.20	0.92	0.60			0.777	0.90	32	107.60	108.65	0.777	0.700	0.32	0.34	0.235	2%	
109.10	0.92	0.61			0.707	0.90	33	108.65	109.60	0.707	0.636	0.31	0.29	0.187	2%	
110.10	0.88	0.61			0.689	0.90	34	109.60	110.60	0.689	0.620	0.27	0.27	0.167	1%	
111.10	0.81	0.61			0.741	0.90	35	110.60	111.75	0.741	0.667	0.20	0.23	0.153	1%	
112.40	1.07	0.61			0.722	0.90	36	111.75	112.85	0.722	0.650	0.46	0.51	0.329	3%	
113.30	1.17	0.65			0.744	0.90	37	112.85	113.90	0.744	0.669	0.52	0.55	0.365	3%	
114.50	1.00	0.60			0.655	0.90	38	113.90	115.10	0.655	0.590	0.40	0.48	0.283	2%	
115.70	0.86	0.61			0.579	0.90	39	115.10	116.25	0.579	0.521	0.25	0.29	0.150	1%	
116.80	0.75	0.55			0.597	0.90	40	116.25	117.40	0.597	0.538	0.20	0.23	0.124	1%	
118.00	0.72	0.45			0.622	0.90	41	117.40	119.00	0.622	0.560	0.27	0.43	0.242	2%	
120.00	0.00	0.45			0.000	0.90	42	119.00	120.00	0.155	0.140	0.07	0.07	0.009	0%	
Total:														12.278		

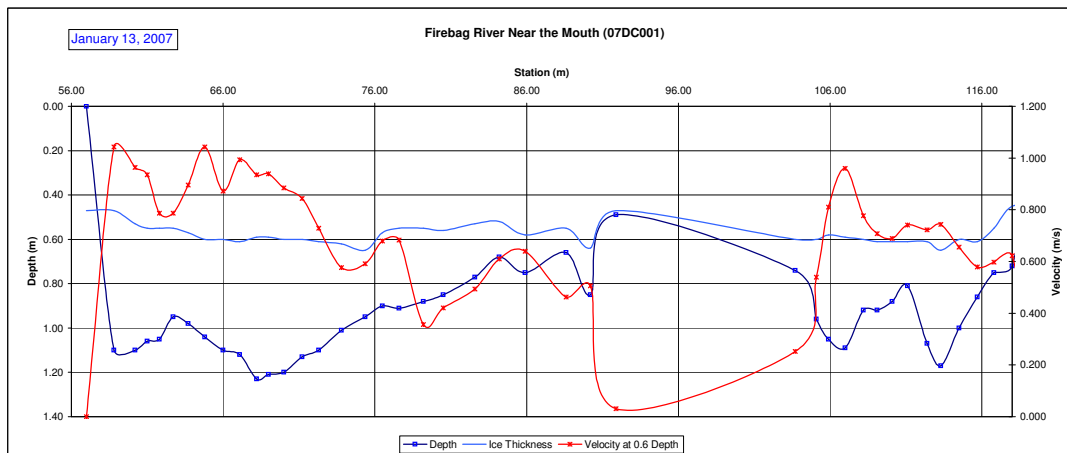
Notes:

Total Flow:	12.278	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	18.78	(m <sup>2</sup> )
Top Width:	63.00	(m)
Hydraulic Depth:	0.298	(m)
Mean Velocity:	0.654	(m/s)
Froude Number	0.382	
Photographs taken looking at:		
Upstream, downstream, across		

Notes:

Data downloaded.

Datalogger Notes:	Database #333
Datalogger Internal Power:	4.66V
Datalogger External Power:	12.11V
Datalogger Memory Used:	25%
Datalogger Clock:	Jan 13, 2007 08:01 MST
Laptop Clock:	Jan 13, 2007 08:12 MST
Dessicant:	100% good
Datalogger:	Optimum DD128, # 0106040333
PT:	Keller 730-130-3 psi #0101348
Power:	Magnacharge 20V 10A DC Battery



# Hydrometric Measurement / Site Visit Record

## S27 - Firebag River Near the Mouth (07DC001)



### Regional Aquatics Monitoring Program

#### Measurement Location

River/Stream: Firebag River  
Location: Firebag River Near the Mouth (07DC001)  
Site Name: S27  
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4

#### Time of Measurement

Date of Measurement: February 11, 2007  
Start Time: 8:50 AM MST  
End Time: 9:00 AM MST

#### Weather Conditions:

-37, clear, windy

#### River Conditions:

Full ice cover

#### Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

#### Level Readings and Measurements

Bench Mark Reading: Rod in PVC 1.388  
Water Level Reading: 3.479  
Top of Ice Level Reading: 3.367  
Transducer Reading & Calc'd El.: 1.101  
Set up #1 El: 99.773  
Set up #2 El: 1.354  
El: 97.682  
El: 97.794  
El: 96.581  
El: 99.773  
El: 3.426  
El: 3.334  
El: 1.101  
El: 97.701  
El: 97.793  
El: 96.600

#### Measurement Data

Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
4.70	0.00	0.00			0.000	0.90	1	4.70	4.90	0.028	0.025	0.04	0.01	0.000	0%	
5.10	0.95	0.80			0.113	0.90	2	4.90	5.63	0.113	0.101	0.15	0.11	0.011	0%	
6.15	1.07	0.80			0.146	0.90	3	5.63	6.54	0.146	0.132	0.27	0.25	0.033	0%	
6.93	1.14	0.81			0.262	0.90	4	6.54	7.29	0.262	0.236	0.33	0.25	0.058	1%	
7.65	1.21	0.82			0.375	0.90	5	7.29	7.97	0.375	0.337	0.39	0.26	0.089	1%	
8.28	1.14	0.82			0.472	0.90	6	7.97	8.69	0.472	0.425	0.32	0.23	0.099	1%	
9.10	1.25	0.84			0.335	0.90	7	8.69	9.49	0.335	0.302	0.41	0.33	0.098	1%	
9.87	1.30	0.84			0.472	0.90	8	9.49	10.28	0.472	0.425	0.46	0.36	0.155	2%	
10.68	1.25	0.84			0.491	0.90	9	10.28	11.02	0.491	0.442	0.41	0.30	0.134	1%	
11.35	1.20	0.84			0.335	0.90	10	11.02	11.73	0.335	0.302	0.36	0.26	0.077	1%	
12.10	1.10	0.85			0.506	0.90	11	11.73	12.40	0.506	0.455	0.25	0.17	0.077	1%	
12.70	1.09	0.80			0.472	0.90	12	12.40	13.03	0.472	0.425	0.29	0.18	0.077	1%	
13.35	1.13	0.74			0.744	0.90	13	13.03	13.73	0.744	0.669	0.39	0.27	0.183	2%	
14.10	1.12	0.70			0.652	0.90	14	13.73	14.49	0.652	0.587	0.42	0.32	0.189	2%	
14.88	1.05	0.65			0.643	0.90	15	14.49	15.04	0.643	0.579	0.40	0.22	0.127	1%	
15.20	1.00	0.65			0.597	0.90	16	15.04	15.38	0.597	0.538	0.35	0.12	0.063	1%	
15.55	0.95	0.63			0.637	0.90	17	15.38	15.80	0.637	0.573	0.32	0.14	0.078	1%	
16.05	0.85	0.65			0.335	0.90	18	15.80	16.27	0.335	0.302	0.20	0.09	0.028	0%	
16.48	0.79	0.65			0.341	0.90	19	16.27	16.87	0.341	0.307	0.14	0.08	0.026	0%	
17.25	0.75	0.68			0.034	0.90	20	16.87	25.70	0.034	0.030	0.07	0.62	0.019	0%	
34.15	0.85	0.70			0.259	0.90	21	25.70	34.53	0.259	0.233	0.15	1.32	0.309	3%	
34.90	0.90	0.68			0.466	0.90	22	34.53	35.40	0.466	0.420	0.22	0.19	0.081	1%	
35.90	0.85	0.65			0.558	0.90	23	35.40	36.59	0.558	0.502	0.20	0.24	0.119	1%	
37.28	0.85	0.68			0.588	0.90	24	36.59	37.94	0.588	0.529	0.17	0.23	0.122	1%	
38.60	0.92	0.72			0.357	0.90	25	37.94	39.00	0.357	0.321	0.20	0.21	0.068	1%	
39.40	0.90	0.70			0.235	0.90	26	39.00	39.84	0.235	0.211	0.20	0.17	0.035	0%	
40.27	0.85	0.73			0.408	0.90	27	39.84	40.71	0.408	0.368	0.12	0.11	0.039	0%	
41.15	0.87	0.72			0.451	0.90	28	40.71	41.63	0.451	0.406	0.15	0.14	0.056	1%	
42.10	0.90	0.70			0.439	0.90	29	41.63	42.54	0.439	0.395	0.20	0.18	0.072	1%	
42.98	0.95	0.73			0.287	0.90	30	42.54	43.37	0.287	0.258	0.22	0.18	0.047	1%	
43.75	0.95	0.77			0.357	0.90	31	43.37	44.15	0.357	0.321	0.18	0.14	0.045	1%	
44.55	0.95	0.80			0.253	0.90	32	44.15	45.01	0.253	0.228	0.15	0.13	0.029	0%	
45.47	1.00	0.85			0.216	0.90	33	45.01	45.94	0.216	0.195	0.15	0.14	0.027	0%	
46.40	1.02	0.84			0.280	0.90	34	45.94	46.92	0.280	0.252	0.18	0.18	0.045	0%	
47.43	1.00	0.78			0.418	0.90	35	46.92	47.86	0.418	0.376	0.22	0.21	0.078	1%	
48.28	1.12	0.78			0.381	0.90	36	47.86	48.65	0.381	0.343	0.34	0.27	0.093	1%	
49.02	1.15	0.77			0.427	0.90	37	48.65	49.46	0.427	0.384	0.38	0.31	0.118	1%	
49.90	1.17	0.75			0.506	0.90	38	49.46	50.33	0.506	0.455	0.42	0.36	0.165	2%	
50.75	1.20	0.76			0.539	0.90	39	50.33	51.23	0.539	0.486	0.44	0.40	0.192	2%	
51.70	1.30	0.76			0.576	0.90	40	51.23	52.18	0.576	0.518	0.54	0.51	0.266	3%	
52.65	1.35	0.75			0.655	0.90	41	52.18	53.08	0.655	0.590	0.60	0.54	0.318	4%	
53.50	1.30	0.77			0.774	0.90	42	53.08	53.88	0.774	0.697	0.53	0.42	0.295	3%	
54.25	1.40	0.80			0.774	0.90	43	53.88	54.65	0.774	0.697	0.60	0.46	0.324	4%	
55.05	1.30	0.80			0.771	0.90	44	54.65	55.48	0.771	0.694	0.50	0.41	0.286	3%	
55.90	1.35	0.80			0.792	0.90	45	55.48	56.35	0.792	0.713	0.55	0.48	0.343	4%	
56.80	1.30	0.76			0.728	0.90	46	56.35	57.25	0.728	0.656	0.54	0.49	0.319	4%	
57.70	1.25	0.75			1.024	0.90	47	57.25	58.13	1.024	0.922	0.50	0.44	0.403	4%	
58.55	1.10	0.75			1.067	0.90	48	58.13	59.03	1.067	0.960	0.35	0.32	0.302	3%	
59.50	1.07	0.70			1.064	0.90	49	59.03	59.93	1.064	0.957	0.37	0.33	0.319	4%	
60.35	1.10	0.65			0.985	0.90	50	59.93	60.80	0.985	0.886	0.45	0.39	0.349	4%	
61.25	1.20	0.60			1.122	0.90	51	60.80	61.83	1.122	1.009	0.60	0.62	0.621	7%	
62.40	1.25	0.50			0.853	0.90	52	61.83	62.78	0.853	0.768	0.75	0.71	0.547	6%	
63.15	1.15	0.45			0.942	0.90	53	62.78	63.43	0.942	0.848	0.70	0.45	0.386	4%	
63.70	1.28	0.43			0.707	0.90	54	63.43	63.93	0.707	0.636	0.85	0.43	0.270	3%	
64.15	1.25	0.45			0.567	0.90	55	63.93	64.28	0.567	0.510	0.80	0.28	0.143	2%	
64.40	0.00	0.00			0.000	0.90	40	51.23	64.40	0.135	0.121	0.11	1.45	0.176	2%	
Notes:														Total:	9.028	

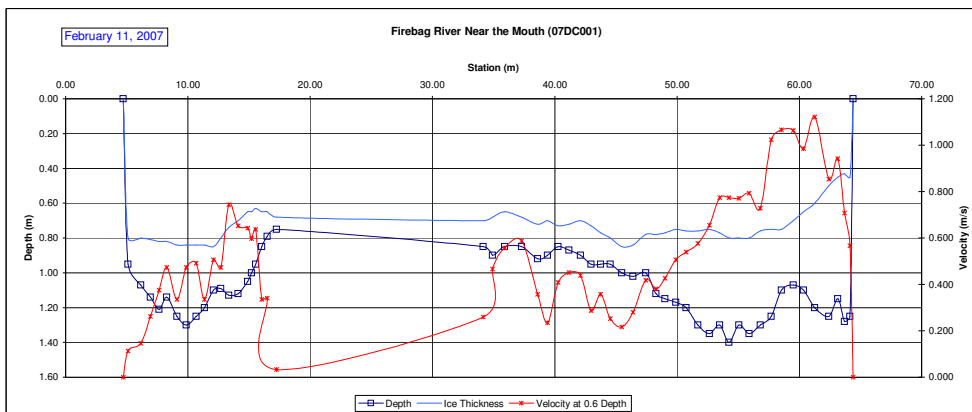
Notes:

Total Flow:	9.028	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	18.40	(m <sup>2</sup> )
Top Width:	59.70	(m)
Hydraulic Depth:	0.308	(m)
Mean Velocity:	0.491	(m/s)
Froude Number	0.282	
Photographs taken looking at:		
Upstream, downstream, across		

#### Notes:

Data downloaded.

Datalogger Notes:	Database #333
Datalogger Internal Power:	4.65V
Datalogger External Power:	12.09V
Datalogger Memory Used:	30%
Datalogger Clock:	7:48AM MST
Laptop Clock:	8:01AM MST
Dessicant:	0% Used
Datalogger:	Optimum DD128, # 0106040333
PT:	Keller 730-130-3 psi #0101348
Power:	Magnacharge 20V 10A DC Battery





# Hydrometric Measurement / Site Visit Record

S27 - Firebag River Near the Mouth (07DC001)



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Firebag River  
Location: Firebag River Near the Mouth (07DC001)  
Site Name: S27  
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4

### Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

### Time of Measurement

Date of Measurement: March 7, 2007  
Start Time: 8:17 AM MST  
End Time: 8:50 AM MST

### Level Readings and Measurements

Bench Mark Reading: Rod in PVC 1.463 El: 99.773 1.438 El: 99.773  
Water Level Reading: 3.515 El: 97.721 3.475 El: 97.736  
Top of Ice Level Reading: 3.459 El: 97.777 3.394 El: 97.817  
Transducer Reading & Calc'd El.: 1.130 El: 96.591 1.130 El: 96.606  
Other: El: average 97.729  
96.599

Weather Conditions: -16, overcast, light wind

River Conditions: Full ice cover

### Measurement Data

Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)	Percentage of Total
0.00	0.00	0.79			0.000	0.90	1	0.00	1.05	0.004	0.003	0.02	0.02	0.000	0%
2.10	0.85	0.79			0.015	0.90	2	1.05	3.80	0.015	0.014	0.06	0.17	0.002	0%
5.50	0.95	0.80			0.277	0.90	3	3.80	6.18	0.277	0.250	0.15	0.36	0.089	1%
6.85	1.00	0.65			0.661	0.90	4	6.18	7.58	0.661	0.595	0.35	0.49	0.292	3%
8.30	0.98	0.68			0.591	0.90	5	7.58	9.00	0.591	0.532	0.30	0.43	0.228	2%
9.70	0.95	0.75			0.524	0.90	6	9.00	10.43	0.524	0.472	0.20	0.29	0.134	1%
11.15	1.00	0.68			0.059	0.90	7	10.43	11.80	0.059	0.053	0.32	0.44	0.023	0%
12.45	0.92	0.66			0.701	0.90	8	11.80	13.73	0.701	0.631	0.26	0.50	0.316	3%
15.00	0.00	0.00			0.000	0.90	9	13.73	20.50	0.000	0.000	0.00	0.00	0.000	0%
26.00	0.00	0.00			0.000	0.90	10	20.50	27.23	0.000	0.000	0.00	0.00	0.000	0%
28.45	0.80	0.69			0.082	0.90	11	27.23	29.45	0.082	0.074	0.11	0.24	0.018	0%
30.45	0.78	0.65			0.189	0.90	12	29.45	31.78	0.189	0.170	0.13	0.30	0.051	1%
33.10	0.81	0.60			0.384	0.90	13	31.78	34.13	0.384	0.346	0.21	0.49	0.171	2%
35.15	0.86	0.70			0.326	0.90	14	34.13	36.25	0.326	0.294	0.16	0.34	0.100	1%
37.35	0.95	0.68			0.503	0.90	15	36.25	38.33	0.503	0.453	0.27	0.56	0.254	3%
39.30	0.96	0.64			0.396	0.90	16	38.33	40.23	0.396	0.357	0.32	0.61	0.217	2%
41.15	0.91	0.68			0.555	0.90	17	40.23	41.98	0.555	0.499	0.23	0.40	0.201	2%
42.80	0.94	0.74			0.460	0.90	18	41.98	43.58	0.460	0.414	0.20	0.32	0.133	1%
44.35	1.08	0.70			0.628	0.90	19	43.58	45.18	0.628	0.565	0.38	0.61	0.344	4%
46.00	1.21	0.65			0.744	0.90	20	45.18	46.88	0.744	0.669	0.56	0.95	0.637	7%
47.75	1.25	0.65			0.853	0.90	21	46.88	48.53	0.853	0.768	0.60	0.99	0.760	8%
49.30	1.22	0.65			0.988	0.90	22	48.53	50.20	0.988	0.889	0.57	0.95	0.849	9%
51.10	1.15	0.67			0.945	0.90	23	50.20	52.10	0.945	0.850	0.48	0.91	0.776	8%
53.10	1.10	0.68			0.738	0.90	24	52.10	53.90	0.738	0.664	0.42	0.76	0.502	5%
54.70	1.10	0.60			0.796	0.90	25	53.90	55.40	0.796	0.716	0.50	0.75	0.537	6%
56.10	1.18	0.47			0.792	0.90	26	55.40	56.68	0.792	0.713	0.71	0.91	0.646	7%
57.25	1.25	0.32			0.963	0.90	27	56.68	57.70	0.963	0.867	0.93	0.95	0.826	9%
58.15	1.28	0.20			0.920	0.90	28	57.70	58.50	0.920	0.828	1.08	0.86	0.716	8%
58.85	1.15	0.20			0.835	0.90	29	58.50	59.15	0.835	0.752	0.95	0.62	0.464	5%
59.45	1.00	0.45			0.046	0.90	30	59.15	59.98	0.046	0.041	0.55	0.45	0.019	0%
60.50	0.00	0.45			0.000	0.90	31	59.98	60.50	0.011	0.010	0.14	0.07	0.001	0%
Total:														9.303	

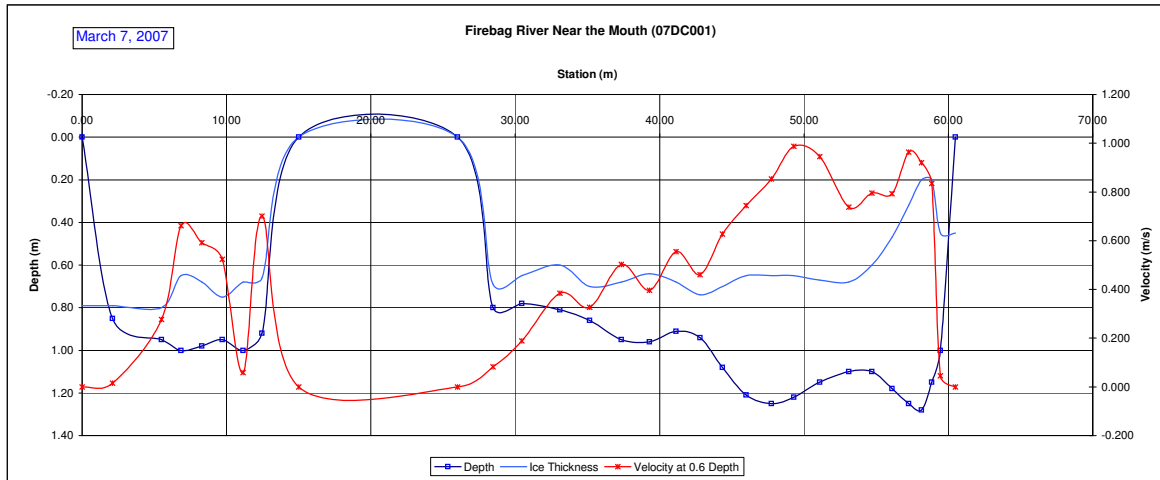
Notes:

Total Flow:	9.303	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	15.74	(m²)
Top Width:	60.50	(m)
Hydraulic Depth:	0.260	(m)
Mean Velocity:	0.591	(m/s)
Froude Number	0.370	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database #333
Datalogger Internal Power:	4.73V
Datalogger External Power:	12.18V
Datalogger Memory Used:	32%
Datalogger Clock:	Mar 07, 2007 07:18 MST
Laptop Clock:	Mar 07, 2007 07:33 MST
Dessicant:	100% good
Datalogger:	Optimum DD128, # 0106040333
PT:	Keller 730-130-3 psi #0101348
Power:	Magnacharge 20V 10A DC Battery

Notes:

Data downloaded.





Hydrometric Measurement / Site Visit Record  
S27 - Firebag River Near the Mouth (07DC001)



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Firebag River  
Location: Firebag River Near the Mouth (07DC001)  
Site Name: S27  
Coordinates & Legal: 63887706 N, 488685 E SE-35-99-8-W4

Time of Measurement

Date of Measurement: April 27, 2007  
Start Time: MST  
End Time: MST

Weather Conditions: +5, scattered clouds

River Conditions: High stage

Personnel & Equipment

Measurement Made By: JMS, PM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

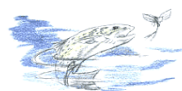
Level Readings and Measurements

	Set up #1	Set up #2	average	
Bench Mark Reading: Rod in PVC	1.417	El: 99.773 1.375	El: 99.773	
Water Level Reading:	2.744	El: 98.446 2.706	El: 98.442	98.444
Top of Ice Level Reading:		El: 101.190	El: 101.148	
Transducer Reading & Calc'd El.:	1.832	El: 96.614 1.832	El: 96.610	96.612
Other:		El:	El:	

Notes:  
Data downloaded. Logger set to hourly measurements

Datalogger Notes:	Database #333
Datalogger Internal Power:	4.79V
Datalogger External Power:	12.19V
Datalogger Memory Used:	30%
Datalogger Clock:	Apr 27, 2007 07:00 MST
Laptop Clock:	Apr 27, 2007 07:15 MST
Dessicant:	Good
Datalogger:	Optimum DD128, # 0106040333
PT:	Keller 730-130-3 psi #0101348
Power:	Magnacharge 20V 10A DC Battery

Hydrometric Measurement / Site Visit Record  
Firebag River near the Mouth - S27



Regional Aquatics Monitoring Program

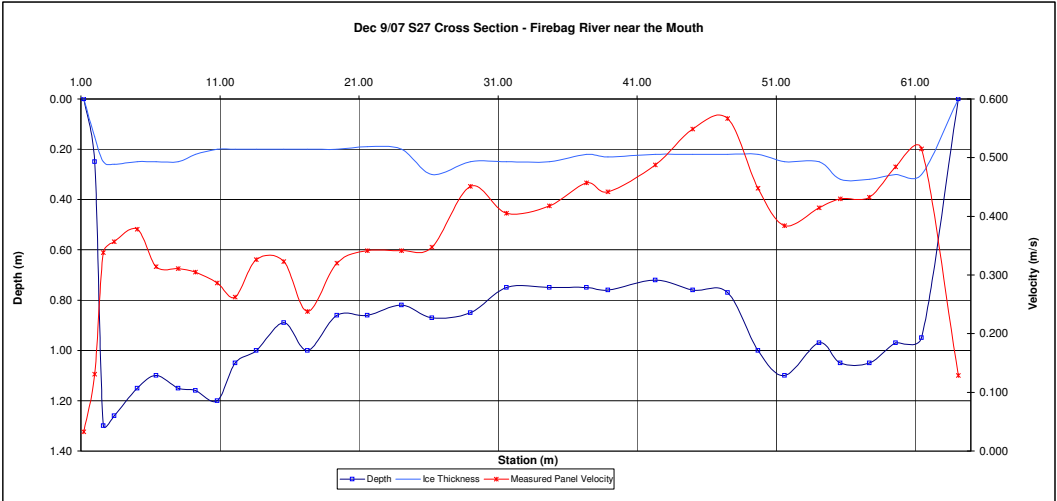
<u>Measurement Location</u>		<u>Personnel &amp; Equipment</u>							
River/Stream:	Firebag River	Measurement Made By:	SM, FF						
Location:	S27	Data Entry By:	SMS						
Site Name:	Firebag River near the Mouth	Meter Type and No.:	March Mc Birney Flo-Mate 2000						
Coordinates & Legal:	63887706 N, 488685 E SE-35-99-8-W4		s/n 2004521						
<u>Time of Measurement</u>		<u>Level Readings</u>		<u>Setup No. 1</u>		<u>Setup No. 2</u>		<u>Average</u>	
Date of Measurement:	December 9, 2007	Bench Mark Reading:	Rod in PVC RB	1.560	El:	99.773	1.588	El:	99.773
Start Time:	3:17 PM MST	Water Level Reading:		3.519	El:	97.814	3.551	El:	97.810
End Time:	3:33 PM MST	Top of Ice Level Reading:		3.551	El:	97.782	3.579	El:	97.782
		Transducer Reading & Est. El.:		1.214	El:	96.600	1.214	El:	96.596
		Other:			El:			El:	
<u>Weather Conditions:</u>		Overcast, -20 C							
<u>River Conditions:</u>		Ice Cover							

Measured Data						Measurement Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
1.20	0.00	0.00				1.00	1	1.20	1.60	0.033	0.033	0.03	0.01	0.000	0%	
2.00	0.25	0.15			0.131	1.00	2	1.60	2.30	0.131	0.131	0.10	0.07	0.009	0%	
2.60	1.30	0.25			0.338	1.00	3	2.30	3.00	0.338	0.338	1.05	0.74	0.249	2%	
3.40	1.26	0.26			0.357	1.00	4	3.00	4.23	0.357	0.357	1.00	1.23	0.437	3%	
5.05	1.15	0.25			0.378	1.00	5	4.23	5.73	0.378	0.378	0.90	1.35	0.510	3%	
6.40	1.10	0.25			0.314	1.00	6	5.73	7.20	0.314	0.314	0.85	1.25	0.394	2%	
8.00	1.15	0.25			0.311	1.00	7	7.20	8.63	0.311	0.311	0.90	1.28	0.399	2%	
9.25	1.16	0.22			0.305	1.00	8	8.63	10.03	0.305	0.305	0.94	1.32	0.401	2%	
10.80	1.20	0.20			0.287	1.00	9	10.03	11.45	0.287	0.287	1.00	1.43	0.408	3%	
12.10	1.05	0.20			0.262	1.00	10	11.45	12.85	0.262	0.262	0.85	1.19	0.312	2%	
13.60	1.00	0.20			0.326	1.00	11	12.85	14.60	0.326	0.326	0.80	1.40	0.457	3%	
15.60	0.89	0.20			0.323	1.00	12	14.60	16.45	0.323	0.323	0.69	1.28	0.412	3%	
17.30	1.00	0.20			0.238	1.00	13	16.45	18.35	0.238	0.238	0.80	1.52	0.361	2%	
19.40	0.86	0.20			0.320	1.00	14	18.35	20.50	0.320	0.320	0.66	1.42	0.454	3%	
21.60	0.86	0.19			0.341	1.00	15	20.50	22.83	0.341	0.341	0.67	1.56	0.532	3%	
24.05	0.82	0.20			0.341	1.00	16	22.83	25.15	0.341	0.341	0.62	1.44	0.492	3%	
26.25	0.87	0.30			0.347	1.00	17	25.15	27.63	0.347	0.347	0.57	1.41	0.490	3%	
29.00	0.85	0.25			0.451	1.00	18	27.63	30.30	0.451	0.451	0.60	1.61	0.724	4%	
31.60	0.75	0.25			0.405	1.00	19	30.30	33.15	0.405	0.405	0.50	1.43	0.578	4%	
34.70	0.75	0.25			0.418	1.00	20	33.15	36.03	0.418	0.418	0.50	1.44	0.600	4%	
37.35	0.75	0.22			0.457	1.00	21	36.03	38.13	0.457	0.457	0.53	1.11	0.509	3%	
38.90	0.76	0.23			0.442	1.00	22	38.13	40.60	0.442	0.442	0.53	1.31	0.580	4%	
42.30	0.72	0.22			0.488	1.00	23	40.60	43.65	0.488	0.488	0.50	1.53	0.744	5%	
45.00	0.76	0.22			0.549	1.00	24	43.65	46.25	0.549	0.549	0.54	1.40	0.770	5%	
47.50	0.77	0.22			0.567	1.00	25	46.25	48.60	0.567	0.567	0.55	1.29	0.733	5%	
49.70	1.00	0.22			0.448	1.00	26	48.60	50.65	0.448	0.448	0.78	1.60	0.716	4%	
51.60	1.10	0.25			0.384	1.00	27	50.65	52.85	0.384	0.384	0.85	1.87	0.718	4%	
54.10	0.97	0.25			0.415	1.00	28	52.85	54.85	0.415	0.415	0.72	1.44	0.597	4%	
55.60	1.05	0.32			0.430	1.00	29	54.85	56.65	0.430	0.430	0.73	1.31	0.565	3%	
57.70	1.05	0.32			0.433	1.00	30	56.65	58.65	0.433	0.433	0.73	1.46	0.632	4%	
59.60	0.97	0.30			0.485	1.00	31	58.65	60.53	0.485	0.485	0.67	1.26	0.609	4%	
61.45	0.95	0.30			0.515	1.00	32	60.53	62.78	0.515	0.515	0.65	1.46	0.753	5%	
64.10	0.00	0.00				1.00	33	62.78	64.10	0.129	0.129	0.16	0.22	0.028	0%	
Total Flow:															16.173	1.000

Total Flow:	16.173	(m³/s)
Perceived Measurement Quality:	Good	
Total Area:	41.61	(m²)
Top Width:	62.90	(m)
Hydraulic Depth:	0.662	(m)
Mean Velocity:	0.389	(m/s)
Froude Number:	0.153	
Photographs taken looking at:		
Photographs taken:		

Datalogger Notes:		Database #333
Datalogger Internal Power:	4.73 V	
Datalogger External Power:	12.77 V	
Datalogger Memory Used:	41%	
Datalogger Clock:	14:37	MST
Laptop Clock:	14:57	MST
Dessicant:	Changed	
Datalogger:	106040333 Optimum DD128	
PT:	101348 Keller	
Power:	Magnacharge 20V 10A DC Battery	

Notes:  
Battery replaced. Dessicant new. Data looks suspect around Oct 26???



## Hydrometric Measurement / Site Visit Record

Firebag River near the Mouth - S27 WSC



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Firebag River  
Location: S27 WSC  
Site Name: Firebag River near the Mouth  
Coordinates & Legal:

### Time of Measurement

Date of Measurement: December 10, 2007  
Start Time: 9:08 AM MST  
End Time: 9:50 AM MST

### Weather Conditions:

Partly Cloudy

### River Conditions:

Ice Cover

### Personnel & Equipment

Measurement Made By: SM, FF  
Data Entry By: SMS  
Meter Type and No.:

### Level Readings

Bench Mark Reading: 1.957  
Water Level Reading: 3.230  
Top of Ice Level Reading: 3.239  
Transducer Reading & Est. El.:  
Other:

### Setup No. 1

El:  
El: -1.273  
El: -1.282  
El: -1.273  
El:

### Setup No. 2

1.945 El:  
3.222 El: -1.277  
3.22 El: -1.275  
El: -1.277  
El:

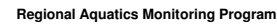
### Average

-1.275  
-1.275  
-1.275

### Notes:

Discharge measurement made at RAMP station.

**S28 - Khahago Creek below Black Fly Creek**



El:	325.175	
El:	324.577	324.580
El:		
El:	323.209	323.212
El:	324.577	

**Notes:**



# Hydrometric Measurement / Site Visit Record

S28 - Khahago Creek below Black Fly Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Khahago Creek  
Location: Khahago Creek below Black Fly Creek  
Site Name: S28  
Coordinates & Legal: 6342185 N, 480489 E SW-12-95-9-W4

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: June 16, 2007  
Start Time: 10:21 AM MDT  
End Time: 11:35 AM MDT

## Level Readings

Bench Mark Reading: Rebar 0.687  
Water Level Reading: 1.645  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 1.011  
Other: TD after battery change

## Setup No. 1

El: 325.175  
El: 324.217  
El: 323.206  
El: 324.217

## Setup No. 2

El: 325.175  
El: 324.220  
El: 323.209  
El: 324.220

## Weather Conditions:

+20 C, haze calm

## River Conditions:

open low stage

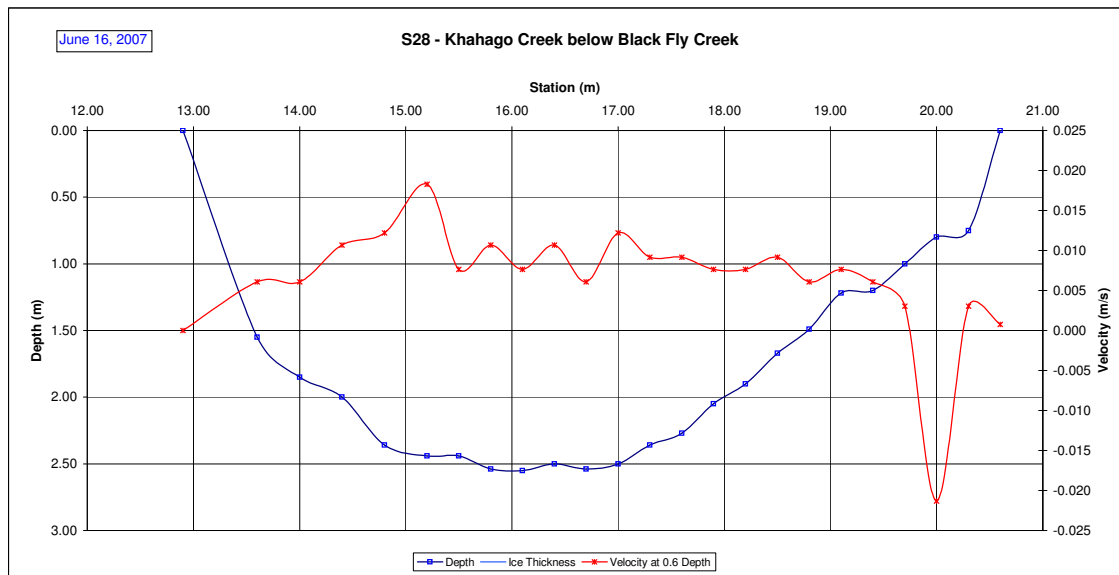
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
12.90	0.00		0.00	0.00		1.00	1	12.90	13.25	0.00	0.000	0.39	0.14	0.000	0%	
13.60	1.55		0.01	0.00		1.00	2	13.25	13.80	0.006	0.006	1.55	0.85	0.005	4%	
14.00	1.85		0.01	0.01		1.00	3	13.80	14.20	0.006	0.006	1.85	0.74	0.005	4%	
14.40	2.00		0.01	0.01		1.00	4	14.20	14.60	0.011	0.011	2.00	0.80	0.009	7%	
14.80	2.36		0.01	0.01		1.00	5	14.60	15.00	0.012	0.012	2.36	0.94	0.012	10%	
15.20	2.44		0.02	0.02		1.00	6	15.00	15.35	0.018	0.018	2.44	0.85	0.016	13%	
15.50	2.44		0.01	0.01		1.00	7	15.35	15.65	0.008	0.008	2.44	0.73	0.006	5%	
15.80	2.54		0.01	0.01		1.00	8	15.65	15.95	0.011	0.011	2.54	0.76	0.008	7%	
16.10	2.55		0.01	0.00		1.00	9	15.95	16.25	0.008	0.008	2.55	0.76	0.006	5%	
16.40	2.50		0.01	0.01		1.00	10	16.25	16.55	0.011	0.011	2.50	0.75	0.008	7%	
16.70	2.54		0.01	0.01		1.00	11	16.55	16.85	0.006	0.006	2.54	0.76	0.005	4%	
17.00	2.50		0.02	0.01		1.00	12	16.85	17.15	0.012	0.012	2.50	0.75	0.009	8%	
17.30	2.36		0.01	0.01		1.00	13	17.15	17.45	0.009	0.009	2.36	0.71	0.006	6%	
17.60	2.27		0.02	0.00		1.00	14	17.45	17.75	0.009	0.009	2.27	0.68	0.006	5%	
17.90	2.05		0.01	0.01		1.00	15	17.75	18.05	0.008	0.008	2.05	0.61	0.005	4%	
18.20	1.90		0.01	0.00		1.00	16	18.05	18.35	0.008	0.008	1.90	0.57	0.004	4%	
18.50	1.67		0.01	0.01		1.00	17	18.35	18.65	0.009	0.009	1.67	0.50	0.005	4%	
18.80	1.49		0.01	0.01		1.00	18	18.65	18.95	0.006	0.006	1.49	0.45	0.003	2%	
19.10	1.22		0.01	0.01		1.00	19	18.95	19.25	0.008	0.008	1.22	0.37	0.003	2%	
19.40	1.20				0.01	1.00	20	19.25	19.55	0.006	0.006	1.20	0.36	0.002	2%	
19.70	1.00				0.00	1.00	21	19.55	19.85	0.003	0.003	1.00	0.30	0.001	1%	
20.00	0.80				-0.02	1.00	22	19.85	20.15	-0.021	-0.021	0.80	0.24	-0.005	-4%	
20.30	0.75				0.00	1.00	23	20.15	20.45	0.003	0.003	0.75	0.23	0.001	1%	
20.60	0.00				0.00	1.00	24	20.45	20.60	0.001	0.001	0.19	0.03	0.000	0%	
												Total Flow:		0.117	1	

Total Flow:	0.117	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	13.89	(m <sup>2</sup> )
Top Width:	7.70	(m)
Hydraulic Depth:	1.804	(m)
Mean Velocity:	0.008	(m/s)
Froude Number	0.002	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database	274
Datalogger Internal Power:	12.34v	
Datalogger External Power:	4.79v	Bad
Datalogger Memory Used:	12%	
Datalogger Clock:	Jun 16, 2007 09:14	MST
Laptop Clock:	Jun 16, 2007 09:14	MST
Dessicant:	Good	
Datalogger:	Optimum DD-128 s/n#0104170274	
PT:	Keller 3 psi s/n 0101354	
Power:	12 V Optimum Battery	

Notes: data looks good, appears to have beaver dam removed/destroyed



# Hydrometric Measurement / Site Visit Record

S28 - Khahago Creek below Black Fly Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Khahago Creek  
Location: Khahago Creek below Black Fly Creek  
Site Name: S28  
Coordinates & Legal: 6342185 N, 480489 E SW-12-95-9-W4

## Time of Measurement

Date of Measurement: August 4, 2007  
Start Time: 10:41 AM MDT  
End Time: 11:14 AM MDT

## Weather Conditions:

Light wind, mostly cloudy

## River Conditions:

Open, Low stage

## Personnel & Equipment

Measurement Made By: PM, SM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: T-post 0.721  
Water Level Reading: 1.510  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El 1.190

## Setup No. 1

El: 325.175  
El: 324.386  
El: 323.196  
El: 324.386

## Setup No. 2

El: 325.175  
El: 324.387  
El: 323.197  
El: 324.387

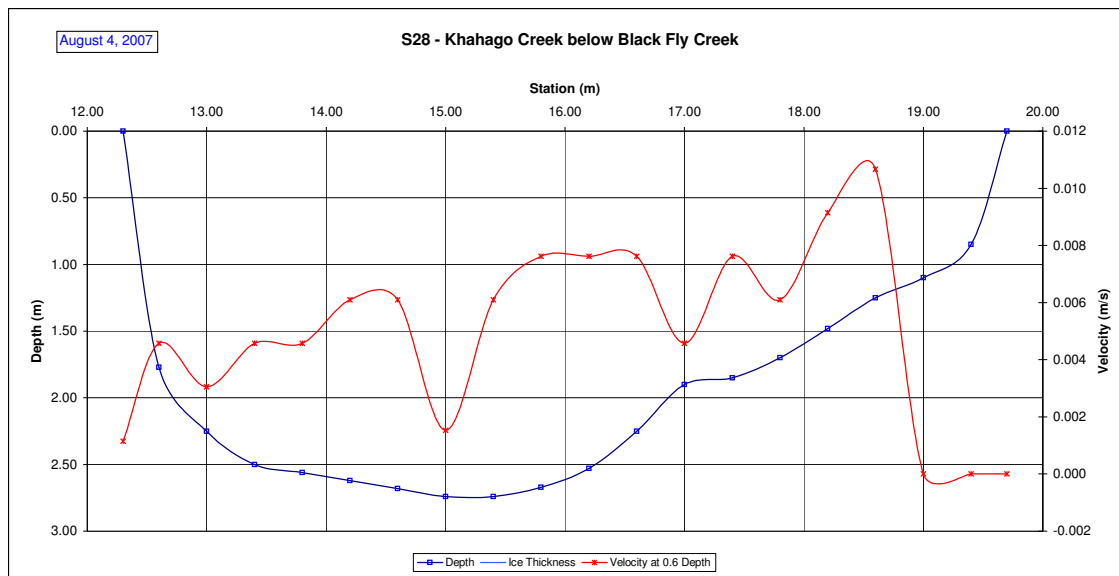
## Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
19.70	0.00		0.00	0.00		1.00	1	19.70	19.55	0.000	0.000	0.21	0.03	0.000	0%
19.40	0.85		0.00	0.00		1.00	2	19.55	19.20	0.000	0.000	0.85	0.30	0.000	0%
19.00	1.10		0.00	0.00		1.00	3	19.20	18.80	0.000	0.000	1.10	0.44	0.000	0%
18.60	1.25		0.02	0.00		1.00	4	18.80	18.40	0.011	0.011	1.25	0.50	0.005	6%
18.20	1.48		0.01	0.01		1.00	5	18.40	18.00	0.009	0.009	1.48	0.59	0.005	7%
17.80	1.70		0.00	0.01		1.00	6	18.00	17.60	0.006	0.006	1.70	0.68	0.004	5%
17.40	1.85		0.00	0.01		1.00	7	17.60	17.20	0.008	0.008	1.85	0.74	0.006	7%
17.00	1.90		0.00	0.01		1.00	8	17.20	16.80	0.005	0.005	1.90	0.76	0.003	4%
16.60	2.25		0.01	0.01		1.00	9	16.80	16.40	0.008	0.008	2.25	0.90	0.007	8%
16.20	2.53		0.01	0.01		1.00	10	16.40	16.00	0.008	0.008	2.53	1.01	0.008	9%
15.80	2.67		0.01	0.01		1.00	11	16.00	15.60	0.008	0.008	2.67	1.07	0.008	10%
15.40	2.74		0.01	0.00		1.00	12	15.60	15.20	0.006	0.006	2.74	1.10	0.007	8%
15.00	2.74		0.00	0.00		1.00	13	15.20	14.80	0.002	0.002	2.74	1.10	0.002	2%
14.60	2.68		0.00	0.01		1.00	14	14.80	14.40	0.006	0.006	2.68	1.07	0.007	8%
14.20	2.62		0.01	0.01		1.00	15	14.40	14.00	0.006	0.006	2.62	1.05	0.006	8%
13.80	2.56		0.01	0.00		1.00	16	14.00	13.60	0.005	0.005	2.56	1.02	0.005	6%
13.40	2.50		0.01	0.00		1.00	17	13.60	13.20	0.005	0.005	2.50	1.00	0.005	6%
13.00	2.25		0.00	0.01		1.00	18	13.20	12.80	0.003	0.003	2.25	0.90	0.003	3%
12.60	1.77		0.01	0.00		1.00	19	12.80	12.45	0.005	0.005	1.77	0.62	0.003	3%
12.30	0.00				0.00	1.00	20	12.45	12.30	0.001	0.001	0.44	0.07	0.000	0%
Total Flow:														0.083	1

Total Flow:	0.083	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Poor	
Total Area:	14.94	(m <sup>2</sup> )
Top Width:	7.40	(m)
Hydraulic Depth:	2.019	(m)
Mean Velocity:	0.006	(m/s)
Froude Number	0.001	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database	274
Datalogger Internal Power:	10.41V	
Datalogger External Power:	4.79V	Bad
Datalogger Memory Used:	16%	
Datalogger Clock:	09:42 AM	MST
Laptop Clock:	09:42 AM	MST
Dessicant:	Good	
Datalogger:	Optimum DD-128 s/n#0104170274	
PT:	Keller 3 psi s/n 0101354	
Power:	12 V Optimum Battery	

Notes: always bring 3 sections for wading rod



# Hydrometric Measurement / Site Visit Record

S28 - Khahago Creek below Black Fly Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Khahago Creek  
Location: Khahago Creek below Black Fly Creek  
Site Name: S28  
Coordinates & Legal: 6342185 N, 480489 E SW-12-95-9-W4  
Time of Measurement: September 23, 2007  
Date of Measurement: 10:41 AM MDT  
Start Time: 11:55 AM MDT  
End Time:

## Personnel & Equipment

Measurement Made By: PM, SM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: T-post 0.711  
Water Level Reading: 1.514  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 1.177

## Setup No. 1

El: 325.175  
El: 324.372  
El:  
El: 323.195  
El: 324.372

## Setup No. 2

El: 325.175  
El: 324.370  
El:  
El: 323.193  
El: 324.370

Weather Conditions: Light wind, mostly cloudy  
River Conditions: Open, Low stage

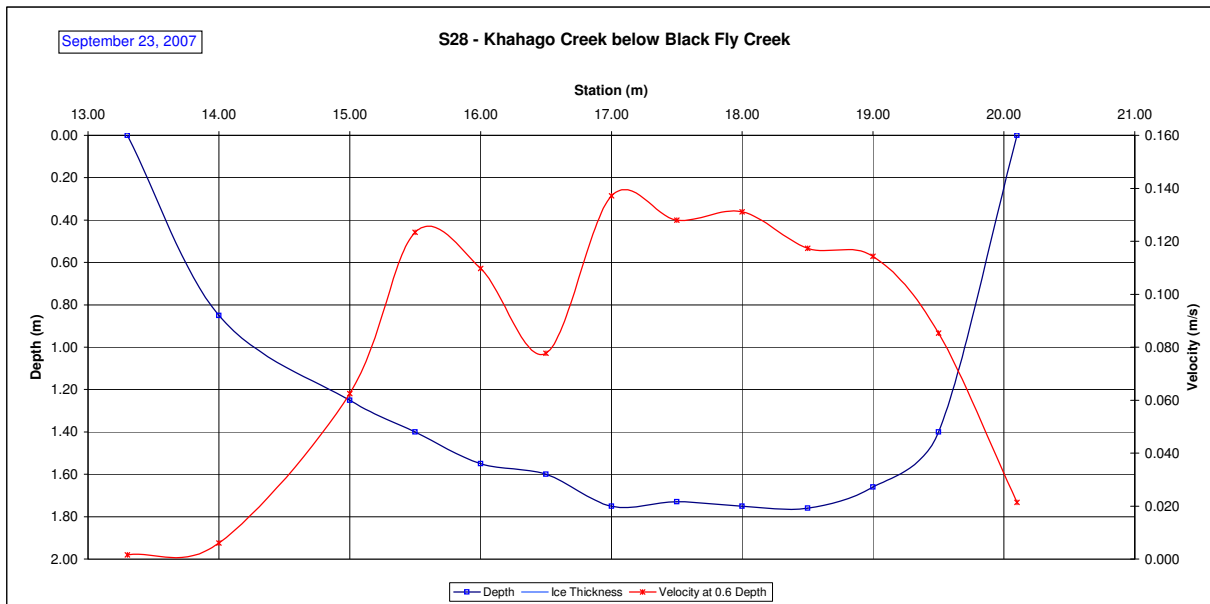
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
20.10	0.00		0.00	0.00		1.00	1	20.10	19.80	0.021	0.021	0.35	0.11	0.002		
19.50	1.40		0.08	0.09		1.00	2	19.80	19.00	0.085	0.085	1.40	1.12	0.096		
19.00	1.66		0.13	0.09		1.00	3	19.00	18.50	0.114	0.114	1.66	0.83	0.095		
18.50	1.76		0.13	0.11		1.00	4	18.50	18.00	0.117	0.117	1.76	0.88	0.103		
18.00	1.75		0.12	0.14		1.00	5	18.00	17.50	0.131	0.131	1.75	0.88	0.115		
17.50	1.73		0.14	0.12		1.00	6	17.50	17.00	0.128	0.128	1.73	0.87	0.111		
17.00	1.75		0.13	0.15		1.00	7	17.00	16.50	0.137	0.137	1.75	0.88	0.120		
16.50	1.60		0.06	0.09		1.00	8	16.50	16.00	0.078	0.078	1.60	0.80	0.062		
16.00	1.55		0.12	0.10		1.00	9	16.00	15.50	0.110	0.110	1.55	0.78	0.085		
15.50	1.40		0.13	0.11		1.00	10	15.50	14.83	0.123	0.123	1.40	0.93	0.115		
15.00	1.25		0.10	0.02		1.00	11	14.83	14.10	0.062	0.062	1.25	0.92	0.057		
14.00	0.85				0.01	1.00	12	14.10	13.65	0.006	0.006	0.85	0.38	0.002		
13.30	0.00				0.00	1.00	13	13.65	13.30	0.002	0.002	0.21	0.07	0.000		
													Total Flow:	0.964		

Total Flow:	0.964	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	9.43	(m <sup>2</sup> )
Top Width:	6.80	(m)
Hydraulic Depth:	1.387	(m)
Mean Velocity:	0.102	(m/s)
Froude Number	0.028	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database	274
Datalogger Internal Power:	5	
Datalogger External Power:	12.52	new battery
Datalogger Memory Used:	20%	
Datalogger Clock:	09:32 AM	MST
Laptop Clock:	09:32 AM	MST
Dessicant:	Good	
Datalogger:	Optimum DD-128 s/n#0104170274	
PT:	Keller 3 psi s/n 0101354	
Power:	12 V Optimum Battery	

Notes: battery dead  
battery replace  
new level 1.17m



# Hydrometric Measurement / Site Visit Record

S28 - Khahago Creek below Black Fly Creek



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Khahago Creek  
Location: Khahago Creek below Black Fly Creek  
Site Name: S28  
Coordinates & Legal: 6342185 N, 480489 E SW-12-95-9-W4  
Time of Measurement: October 25, 2007  
Date of Measurement: 10:41 AM MDT  
Start Time: 11:55 AM MDT  
End Time:

## Personnel & Equipment

Measurement Made By: PM, SM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: T-post 0.631  
Water Level Reading: 1.648  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El. 0.987

## Setup No. 1

El: 325.175  
El: 324.158  
El: 324.158  
El: 323.171  
El: 324.158

## Setup No. 2

El: 325.175  
El: 324.167  
El: 324.167  
El: 323.180  
El: 324.167

Weather Conditions: Light wind, mostly cloudy  
River Conditions: Open, Low stage

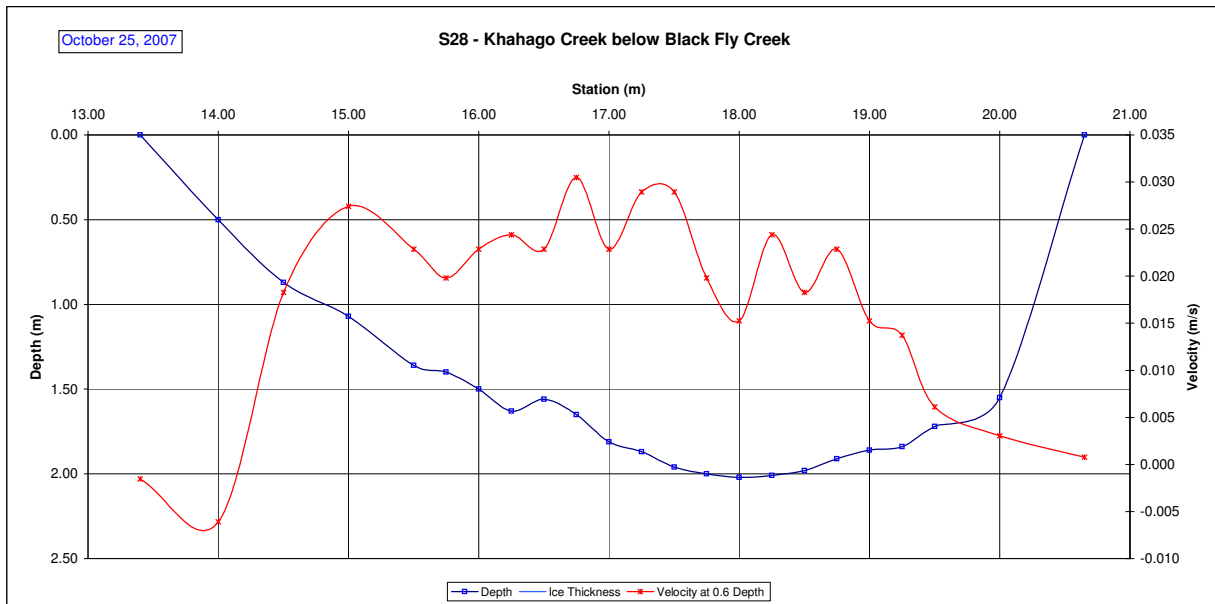
## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
13.40	0.00				0.00	1.00	1	13.40	13.70	-0.002	-0.002	0.13	0.04	0.000	0%	
14.00	0.50				-0.01	1.00	2	13.70	14.50	-0.006	-0.006	0.50	0.40	-0.002	-1%	
14.50	0.87				0.02	1.00	3	14.50	15.00	0.018	0.018	0.87	0.44	0.008	4%	
15.00	1.07				0.03	1.00	4	15.00	15.42	0.027	0.027	1.07	0.45	0.012	7%	
15.50	1.36		0.02	0.02		1.00	5	15.42	15.75	0.023	0.023	1.36	0.45	0.010	6%	
15.75	1.40		0.02	0.02		1.00	6	15.75	16.00	0.020	0.020	1.40	0.35	0.007	4%	
16.00	1.50		0.02	0.03		1.00	7	16.00	16.25	0.023	0.023	1.50	0.38	0.009	5%	
16.25	1.63		0.02	0.03		1.00	8	16.25	16.50	0.024	0.024	1.63	0.41	0.010	5%	
16.50	1.56		0.03	0.02		1.00	9	16.50	16.75	0.023	0.023	1.56	0.39	0.009	5%	
16.75	1.65		0.03	0.03		1.00	10	16.75	17.00	0.030	0.030	1.65	0.41	0.013	7%	
17.00	1.81		0.03	0.02		1.00	11	17.00	17.25	0.023	0.023	1.81	0.45	0.010	6%	
17.25	1.87		0.03	0.02		1.00	12	17.25	17.50	0.029	0.029	1.87	0.47	0.014	7%	
17.50	1.96		0.03	0.03		1.00	13	17.50	17.75	0.029	0.029	1.96	0.49	0.014	8%	
17.75	2.00		0.02	0.02		1.00	14	17.75	18.00	0.020	0.020	2.00	0.50	0.010	5%	
18.00	2.02		0.02	0.01		1.00	15	18.00	18.25	0.015	0.015	2.02	0.51	0.008	4%	
18.25	2.01		0.03	0.02		1.00	16	18.25	18.50	0.024	0.024	2.01	0.50	0.012	7%	
18.50	1.98		0.02	0.02		1.00	17	18.50	18.75	0.018	0.018	1.98	0.50	0.009	5%	
18.75	1.91		0.02	0.03		1.00	18	18.75	19.00	0.023	0.023	1.91	0.48	0.011	6%	
19.00	1.86		0.02	0.02		1.00	19	19.00	19.25	0.015	0.015	1.86	0.47	0.007	4%	
19.25	1.84		0.02	0.01		1.00	20	19.25	19.58	0.014	0.014	1.84	0.61	0.008	5%	
19.50	1.72		0.01	0.01		1.00	21	19.58	20.05	0.006	0.006	1.72	0.80	0.005	3%	
20.00	1.55		0.00	0.00		1.00	22	20.05	20.33	0.003	0.003	1.55	0.43	0.001	1%	
20.65	0.00				0.00	1.00	23	20.33	20.65	0.001	0.001	0.39	0.13	0.000	0%	
													Total Flow:		0.185	1

Total Flow:	0.185	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	10.03	(m <sup>2</sup> )
Top Width:	7.25	(m)
Hydraulic Depth:	1.383	(m)
Mean Velocity:	0.018	(m/s)
Froude Number	0.005	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	Database 274
Datalogger Internal Power:	5
Datalogger External Power:	11.00 new battery
Datalogger Memory Used:	16%
Datalogger Clock:	07:57 AM MST
Laptop Clock:	07:57 AM MST
Dessicant:	Good
Datalogger:	Optimum DD-128 s/n#0104170274
PT:	Keller 3 psi s/n 0101354
Power:	12 V Optimum Battery

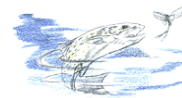
Notes: record rate set to hourly  
TD left in water for winter





# Hydrometric Measurement / Site Visit Record

## S29 - Christina River Near Chard WSC 07CE002



### Regional Aquatics Monitoring Program

#### Measurement Location

River/Stream: Christina River  
Location: Christina River Near Chard WSC 07CE002  
Site Name: S29  
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4

#### Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: JS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

#### Time of Measurement

Date of Measurement: January 11, 2007  
Start Time: 12:05 PM MST  
End Time: 12:29 PM MST

AT WSC

#### Level Readings

Bench Mark Reading: T-bar 1.543  
Water Level Reading: 4.904  
Top of Ice Level Reading: 4.808  
Transducer Reading & Calc'd El.:  
Nail in Tree on LB 1.023

#### Setup No. 1

El: 99.076  
El: 95.709  
El: 4.800  
El: 95.709  
El: 99.590

#### Setup No. 2

El: 99.076  
El: 95.707  
El: 4.875  
El: 95.707  
El: 99.590

#### Average

95.708

#### Weather Conditions:

River Conditions: Complete ice cover

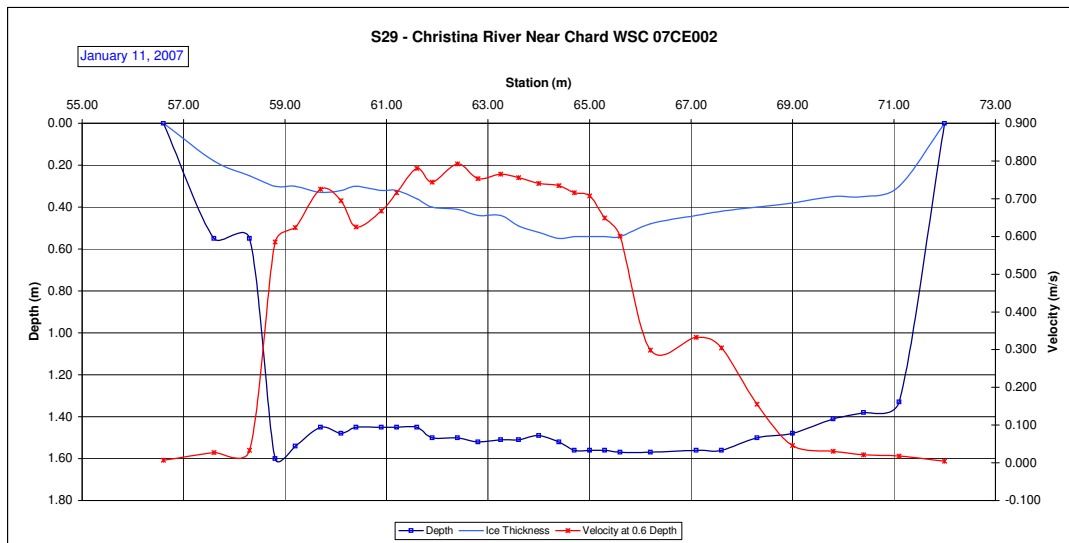
#### Measurement Data

Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
56.60	0.00	0.00			0.000	0.90	1	56.60	57.10	0.007	0.006	0.09	0.05	0.000	0%
57.60	0.55	0.18			0.027	0.90	2	57.10	57.95	0.027	0.025	0.37	0.31	0.008	0.1%
58.30	0.55	0.25			0.034	0.90	3	57.95	58.55	0.034	0.030	0.30	0.18	0.005	0%
58.80	1.60	0.30	0.643	0.527		0.90	4	58.55	59.00	0.585	0.527	1.30	0.59	0.308	5%
59.20	1.54	0.30	0.649	0.597		0.90	5	59.00	59.45	0.623	0.561	1.24	0.56	0.313	5%
59.70	1.45	0.33			0.725	0.90	6	59.45	59.90	0.725	0.653	1.12	0.50	0.329	6%
60.10	1.48	0.32			0.695	0.90	7	59.90	60.25	0.695	0.625	1.16	0.41	0.254	4%
60.40	1.45	0.30			0.625	0.90	8	60.25	60.65	0.625	0.562	1.15	0.46	0.259	4%
60.90	1.45	0.32			0.668	0.90	9	60.65	61.05	0.668	0.601	1.13	0.45	0.272	5%
61.20	1.45	0.32			0.716	0.90	10	61.05	61.40	0.716	0.645	1.13	0.40	0.255	4%
61.60	1.45	0.36			0.780	0.90	11	61.40	61.75	0.780	0.702	1.09	0.38	0.268	5%
61.90	1.50	0.40			0.744	0.90	12	61.75	62.15	0.744	0.669	1.10	0.44	0.295	5%
62.40	1.50	0.41			0.792	0.90	13	62.15	62.60	0.792	0.713	1.09	0.49	0.350	6%
62.80	1.52	0.44			0.753	0.90	14	62.60	63.03	0.753	0.678	1.08	0.46	0.311	5%
63.25	1.51	0.44			0.765	0.90	15	63.03	63.43	0.765	0.689	1.07	0.43	0.295	5%
63.60	1.51	0.49			0.756	0.90	16	63.43	63.80	0.756	0.680	1.02	0.38	0.260	4%
64.00	1.49	0.52			0.741	0.90	17	63.80	64.20	0.741	0.667	0.97	0.39	0.259	4%
64.40	1.52	0.55			0.735	0.90	18	64.20	64.55	0.735	0.661	0.97	0.34	0.224	4%
64.70	1.56	0.54			0.716	0.90	19	64.55	64.85	0.716	0.645	1.02	0.31	0.197	3%
65.00	1.56	0.54			0.707	0.90	20	64.85	65.15	0.707	0.636	1.02	0.31	0.195	3%
65.30	1.56	0.54			0.649	0.90	21	65.15	65.45	0.649	0.584	1.02	0.31	0.179	3%
65.60	1.57	0.54			0.600	0.90	22	65.45	65.90	0.600	0.540	1.03	0.46	0.250	4%
66.20	1.57	0.48			0.299	0.90	23	65.90	66.65	0.299	0.269	1.09	0.82	0.220	4%
67.10	1.56	0.44			0.332	0.90	24	66.65	67.35	0.332	0.299	1.12	0.78	0.234	4%
67.60	1.56	0.42			0.305	0.90	25	67.35	67.95	0.305	0.274	1.14	0.68	0.188	3%
68.30	1.50	0.40			0.155	0.90	26	67.95	68.65	0.155	0.140	1.10	0.77	0.108	2%
69.00	1.48	0.38			0.046	0.90	27	68.65	69.40	0.046	0.041	1.10	0.83	0.034	1%
69.80	1.41	0.35			0.030	0.90	28	69.40	70.10	0.030	0.027	1.06	0.74	0.020	0%
70.40	1.38	0.35			0.021	0.90	29	70.10	70.75	0.021	0.019	1.03	0.67	0.013	0%
71.10	1.33	0.30			0.018	0.90	30	70.75	71.55	0.018	0.016	1.03	0.82	0.014	0%
72.00	0.00	0.00			0.000	0.90	31	71.55	72.00	0.005	0.004	0.26	0.12	0.000	0%
													Total Flow:	5.916	100%

Total Flow:	5.916	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	12.47	(m <sup>2</sup> )
Top Width:	12.40	(m)
Hydraulic Depth:	1.006	(m)
Mean Velocity:	0.474	(m/s)
Froude Number	0.151	
Photographs taken looking at: US, DS and across		

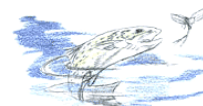
Datalogger Notes:	Database
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	
Datalogger Clock:	
Laptop Clock:	
Dessicant:	
Datalogger:	
PT:	
Power:	

Notes:



# Hydrometric Measurement / Site Visit Record

S29 - Christina River Near Chard WSC 07CE002



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Christina River  
Location: Christina River Near Chard WSC 07CE002  
Site Name: S29  
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4

## Personnel & Equipment

Measurement Made By: JS, JM, PM  
Data Entry By: JS Checked: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: February 7, 2007  
Start Time: 12:40 PM MST  
End Time: MST

AT WSC

## Level Readings

Bench Mark Reading: T-bar 1.233

Water Level Reading: 4.705

Top of Ice Level Reading: 4.658

Transducer Reading & Calc'd El.: 0.715

Nail in Tree on LB

## Setup No. 1

El: 99.076

El: 95.600

El: 95.600

El: 99.590

## Setup No. 2

El: 99.076

El: 95.599

El: 95.599

El: 99.590

## Average

95.600

## Weather Conditions:

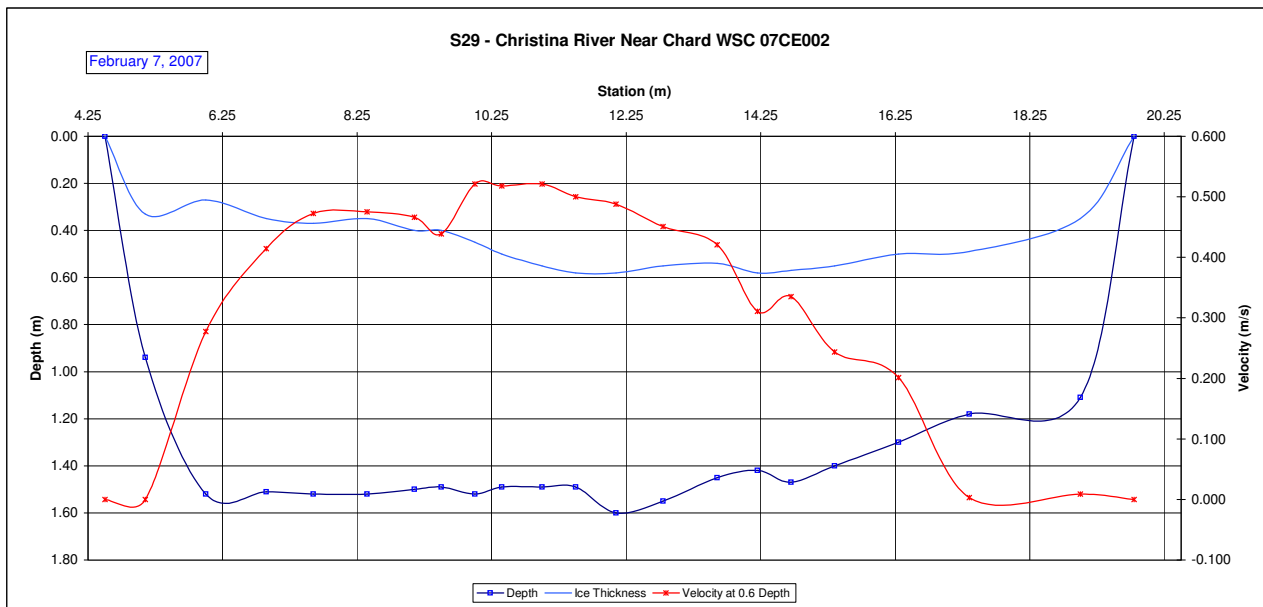
River Conditions: Complete ice cover

Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
								(m)	(m)	(m/s)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
4.50	0.00	0.00			0.000	0.90	1	4.50	4.80	0.000	0.000	0.15	0.05	0.000	0%	
5.10	0.94	0.33			0.000	0.90	2	4.80	5.55	0.000	0.000	0.61	0.46	0.000	0%	
6.00	1.52	0.27			0.277	0.90	3	5.55	6.45	0.277	0.250	1.25	1.13	0.281	7%	
6.90	1.51	0.35			0.415	0.90	4	6.45	7.25	0.415	0.373	1.16	0.93	0.346	8%	
7.60	1.52	0.37			0.472	0.90	5	7.25	8.00	0.472	0.425	1.15	0.86	0.367	9%	
8.40	1.52	0.35			0.475	0.90	6	8.00	8.75	0.475	0.428	1.17	0.88	0.376	9%	
9.10	1.50	0.40			0.466	0.90	7	8.75	9.30	0.466	0.420	1.10	0.61	0.254	6%	
9.50	1.49	0.40			0.439	0.90	8	9.30	9.75	0.439	0.395	1.09	0.49	0.194	5%	
10.00	1.52	0.45			0.521	0.90	9	9.75	10.20	0.521	0.469	1.07	0.48	0.226	5%	
10.40	1.49	0.50			0.518	0.90	10	10.20	10.70	0.518	0.466	0.99	0.50	0.231	6%	
11.00	1.49	0.55			0.521	0.90	11	10.70	11.25	0.521	0.469	0.94	0.52	0.243	6%	
11.50	1.49	0.58			0.500	0.90	12	11.25	11.80	0.500	0.450	0.91	0.50	0.225	5%	
12.10	1.60	0.58			0.488	0.90	13	11.80	12.45	0.488	0.439	1.02	0.66	0.291	7%	
12.80	1.55	0.55			0.451	0.90	14	12.45	13.20	0.451	0.406	1.00	0.75	0.304	7%	
13.60	1.45	0.54			0.421	0.90	15	13.20	13.90	0.421	0.379	0.91	0.64	0.241	6%	
14.20	1.42	0.58			0.311	0.90	16	13.90	14.45	0.311	0.280	0.84	0.46	0.129	3%	
14.70	1.47	0.57			0.335	0.90	17	14.45	15.03	0.335	0.302	0.90	0.52	0.156	4%	
15.35	1.40	0.55			0.244	0.90	18	15.03	15.83	0.244	0.219	0.85	0.68	0.149	4%	
16.30	1.30	0.50			0.201	0.90	19	15.83	16.83	0.201	0.181	0.80	0.80	0.145	3%	
17.35	1.18	0.49			0.003	0.90	20	16.83	18.18	0.003	0.003	0.69	0.93	0.003	0%	
19.00	1.11	0.35			0.009	0.90	21	18.18	19.40	0.009	0.008	0.76	0.93	0.008	0%	
19.80	0.00	0.00			0.000	0.90	22	19.40	19.80	0.000	0.000	0.19	0.08	0.000	0%	
Total Flow:														4.168	100%	

Total Flow:	4.168	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	13.83	(m <sup>2</sup> )
Top Width:	15.30	(m)
Hydraulic Depth:	0.904	(m)
Mean Velocity:	0.301	(m/s)
Froude Number	0.101	
Photographs taken looking at: US, DS and across		

Datalogger Notes:	Database
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	
Datalogger Clock:	
Laptop Clock:	
Dessicant:	
Datalogger:	
PT:	
Power:	

Notes:



# Hydrometric Measurement / Site Visit Record

S29 - Christina River Near Chard WSC 07CE002



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Christina River  
Location: Christina River Near Chard WSC 07CE002  
Site Name: S29  
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4

## Time of Measurement

Date of Measurement: March 5, 2007  
Start Time: 11:07 AM MST  
End Time: 11:31 AM MST

AT WSC

## Personnel & Equipment

Measurement Made By: JS,FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: T-bar 1.652  
Water Level Reading: 5.140  
Top of Ice Level Reading: 5.131  
Transducer Reading & Calc'd El.:  
Nail in Tree on LB 1.134

## Setup No. 1

El: 99.076  
El: 95.584  
El: 5.108  
El: 95.584  
El: 99.590

## Setup No. 2

El: 1.610  
El: 5.105  
El: 5.108  
El: 95.577  
El: 99.590

## Average

95.581

## Weather Conditions:

## River Conditions:

Complete ice cover, WL exceeded ice by 3 to 5 cm in centre of section

RB

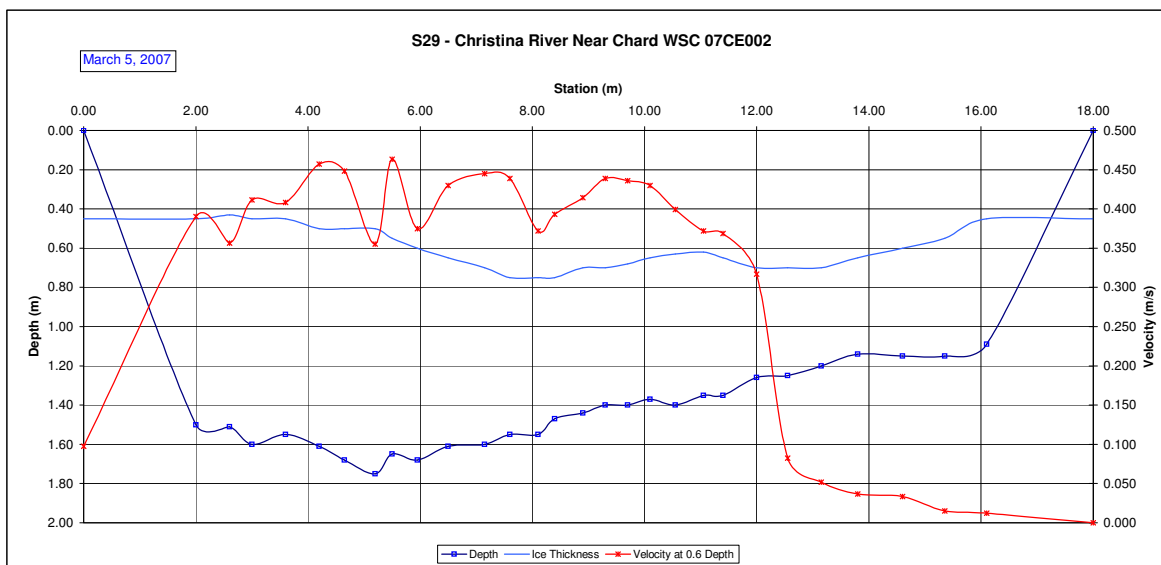
LB

Measured Data						Measurement Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
0.00	0.00	0.45			0.000	0.90	1	0.00	1.00	0.098	0.088	0.26	0.26	0.023		
2.00	1.50	0.45			0.390	0.90	2	1.00	2.30	0.390	0.351	1.05	1.37	0.479		
2.60	1.51	0.43			0.357	0.90	3	2.30	2.80	0.357	0.321	1.08	0.54	0.173		
3.00	1.60	0.45			0.411	0.90	4	2.80	3.30	0.411	0.370	1.15	0.58	0.213		
3.60	1.55	0.45			0.408	0.90	5	3.30	3.90	0.408	0.368	1.10	0.66	0.243		
4.20	1.61	0.50			0.457	0.90	6	3.90	4.43	0.457	0.411	1.11	0.58	0.240		
4.65	1.68	0.50			0.448	0.90	7	4.43	4.93	0.448	0.403	1.18	0.59	0.238		
5.20	1.75	0.50	0.28	0.43		0.90	8	4.93	5.35	0.355	0.320	1.25	0.53	0.170		
5.50	1.65	0.55			0.463	0.90	9	5.35	5.73	0.463	0.417	1.10	0.41	0.172		
5.95	1.68	0.60	0.32	0.43		0.90	10	5.73	6.23	0.375	0.337	1.08	0.54	0.182		
6.50	1.61	0.65			0.430	0.90	11	6.23	6.83	0.430	0.387	0.96	0.58	0.223		
7.15	1.60	0.70			0.445	0.90	12	6.83	7.38	0.445	0.401	0.90	0.50	0.198		
7.60	1.55	0.75			0.439	0.90	13	7.38	7.85	0.439	0.395	0.80	0.38	0.150		
8.10	1.55	0.75			0.372	0.90	14	7.85	8.25	0.372	0.335	0.80	0.32	0.107		
8.40	1.47	0.75			0.393	0.90	15	8.25	8.65	0.393	0.354	0.72	0.29	0.102		
8.90	1.44	0.70			0.415	0.90	16	8.65	9.10	0.415	0.373	0.74	0.33	0.124		
9.30	1.40	0.70			0.439	0.90	17	9.10	9.50	0.439	0.395	0.70	0.28	0.111		
9.70	1.40	0.68			0.436	0.90	18	9.50	9.90	0.436	0.392	0.72	0.29	0.113		
10.10	1.37	0.65			0.430	0.90	19	9.90	10.33	0.430	0.387	0.72	0.31	0.118		
10.55	1.40	0.63			0.399	0.90	20	10.33	10.80	0.399	0.359	0.77	0.37	0.131		
11.05	1.35	0.62			0.372	0.90	21	10.80	11.23	0.372	0.335	0.73	0.31	0.104		
11.40	1.35	0.65			0.369	0.90	22	11.23	11.70	0.369	0.332	0.70	0.33	0.110		
12.00	1.26	0.70			0.317	0.90	23	11.70	12.28	0.317	0.285	0.56	0.32	0.092		
12.55	1.25	0.70			0.082	0.90	24	12.28	12.85	0.082	0.074	0.55	0.32	0.023		
13.15	1.20	0.70			0.052	0.90	25	12.85	13.48	0.052	0.047	0.50	0.31	0.015		
13.80	1.14	0.65			0.037	0.90	26	13.48	14.20	0.037	0.033	0.49	0.36	0.012		
14.60	1.15	0.60			0.034	0.90	27	14.20	14.98	0.034	0.030	0.55	0.43	0.013		
15.35	1.15	0.55			0.015	0.90	28	14.98	15.73	0.015	0.014	0.60	0.45	0.006		
16.10	1.09	0.45			0.012	0.90	29	15.73	17.05	0.012	0.011	0.64	0.85	0.009		
18.00	0.00	0.45			0.000	0.90	30	17.05	18.00	0.000	0.000	0.16	0.15	0.000		
Total Flow:														3.895	100%	

Total Flow:	3.895	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	13.52	(m <sup>2</sup> )
Top Width:	18.00	(m)
Hydraulic Depth:	0.751	(m)
Mean Velocity:	0.288	(m/s)
Froude Number	0.106	
Photographs taken looking at: US, DS and across		

Notes:

Datalogger Notes:	Database
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	
Datalogger Clock:	
Laptop Clock:	
Dessicant:	
Datalogger:	
PT:	
Power:	



Hydrometric Measurement / Site Visit Record
S29 - Christina River Near Chard WSC 07CE002



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Christina River
Location: Christina River Near Chard WSC 07CE002
Site Name: S29
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4

Time of Measurement

Date of Measurement: October 19, 2007
Start Time: 1:00 PM MDT
End Time: 1:20 PM MDT
WSC

Weather Conditions:

River Conditions: Open, Low stage

Personnel & Equipment

Measurement Made By: SM/FF
Data Entry By: FF
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: T-bar 1.885
Water Level Reading: 6.056
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Nail in Tree on LB: 1.355
Point on Bridge - BM3: 1.588

Setup No. 1

El.: 99.076
El.: 94.905
El.: 94.905
El.: 99.590

Setup No. 2

El.:
El.:
El.:
El.:

Average

94.905

Table with 15 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at, Panel Ends at, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Rows include data for LB and RB sections.

Summary table with 4 columns: Parameter, Value, Unit, and another column. Rows include Total Flow, Perceived Measurement Quality, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number, and Photographs taken looking at.

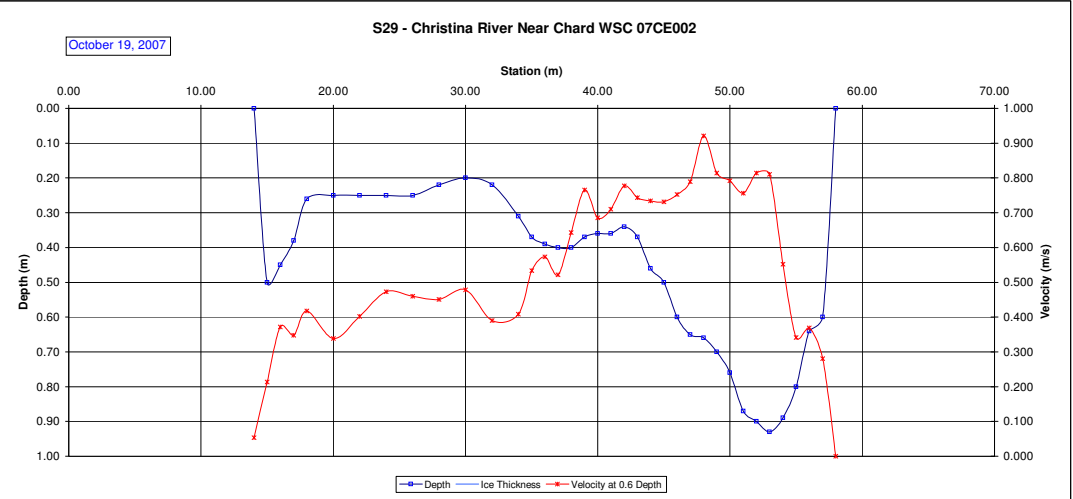
Datalogger Notes table with 2 columns: Note and Database. Rows include Datalogger Internal Power, Datalogger External Power, Datalogger Memory Used, Datalogger Clock, Laptop Clock, Dessicant, Datalogger, PT, and Power.

Notes:

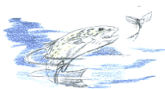
Additional Survey to Tie in to WSC BM:

Table with 4 columns: Point, Rdg, Elevation, Rdg, Elevation. Rows include WL at WSC shack, Point on Bridge - BM3, BM 94-1 (damaged), and BM 90-1.

WSC BM 94-1 has been damaged and is no longer likely reliable.



Hydrometric Measurement / Site Visit Record  
S29 - Christina River Near Chard WSC 07CE002



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Christina River  
Location: Christina River Near Chard WSC 07CE002  
Site Name: S29  
Coordinates & Legal: 6252434 N, 476998 E SE-16-79-6-W4  
Time of Measurement: December 7, 2007  
Date of Measurement: 12:52 PM MDT  
Start Time: 1:27 PM MDT  
End Time:  
Weather Conditions: -22C light wind  
River Conditions: ice cover

Personnel & Equipment

Measurement Made By: FF/JVR  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521  
Level Readings  
Bench Mark Reading: T-bar 1.494  
Water Level Reading: 5.354  
Top of Ice Level Reading: 5.305  
Transducer Reading & Calc'd EL: BM 94-1 1.252  
Point on Bridge - BM3 other 3.860

Setup No. 1

Et: 99.466  
Et: 95.606  
Et: 5.277  
Et: 95.606

Setup No. 2

Et: 1.443  
Et: 5.315  
Et: 5.277  
Et: 1.211

Average

95.600

Measured Data						Measurement Data										Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)							
0.80	0.00				0.000	0.90	1	0.80	1.30	0.017	0.015	0.11	0.06	0.001							
1.80	0.45				0.067	0.90	2	1.30	2.15	0.067	0.060	0.45	0.38	0.023							
2.50	1.20				0.162	0.90	3	2.15	2.75	0.162	0.145	1.20	0.72	0.105							
3.00	1.31				0.204	0.90	4	2.75	3.25	0.204	0.184	1.31	0.66	0.120							
3.50	1.45		0.274	0.491		0.90	5	3.25	3.75	0.383	0.344	1.45	0.73	0.250							
4.00	1.46		0.396	0.616		0.90	6	3.75	4.30	0.506	0.455	1.46	0.80	0.366							
4.60	1.46		0.393	0.576		0.90	7	4.30	4.93	0.485	0.436	1.46	0.91	0.398							
5.25	1.50		0.735	0.570		0.90	8	4.93	5.48	0.652	0.587	1.50	0.83	0.484							
5.70	1.45		0.765	0.604		0.90	9	5.48	6.00	0.684	0.616	1.45	0.76	0.469							
6.30	1.45		0.872	0.765		0.90	10	6.00	6.65	0.818	0.737	1.45	0.94	0.694							
7.00	1.47		0.719	0.735		0.90	11	6.65	7.25	0.727	0.654	1.47	0.88	0.577							
7.50	1.45		0.780	0.744		0.90	12	7.25	7.85	0.762	0.686	1.45	0.87	0.597							
8.20	1.44		0.661	0.698		0.90	13	7.85	8.50	0.680	0.612	1.44	0.94	0.573							
8.80	1.44		0.649	0.707		0.90	14	8.50	9.15	0.678	0.610	1.44	0.94	0.571							
9.50	1.41		0.497	0.710		0.90	15	9.15	9.80	0.604	0.543	1.41	0.92	0.498							
10.10	1.40		0.183	0.671		0.90	16	9.80	10.45	0.427	0.384	1.40	0.91	0.349							
10.80	1.40		0.174	0.576		0.90	17	10.45	11.10	0.375	0.337	1.40	0.91	0.307							
11.40	1.40		0.152	0.527		0.90	18	11.10	11.75	0.340	0.306	1.40	0.91	0.278							
12.10	1.41		0.067	0.384		0.90	19	11.75	12.45	0.226	0.203	1.41	0.99	0.200							
12.80	1.37		0.061	0.152		0.90	20	12.45	13.25	0.107	0.096	1.37	1.10	0.105							
13.70	1.30		0.015	0.027		0.90	21	13.25	14.10	0.021	0.019	1.30	1.11	0.021							
14.50	1.30		0.009	0.012		0.90	22	14.10	14.90	0.011	0.010	1.30	1.04	0.010							
15.30	1.32		0.006	0.018		0.90	23	14.90	15.65	0.012	0.011	1.32	0.99	0.011							
16.00	1.30		0.009	0.012		0.90	24	15.65	16.35	0.011	0.010	1.30	0.91	0.009							
16.70	1.25				0.009	0.90	25	16.35	17.20	0.009	0.008	1.25	1.06	0.009							
17.70	1.20				0.012	0.90	26	17.20	18.10	0.012	0.011	1.20	1.08	0.012							
18.50	1.18				0.009	0.90	27	18.10	19.10	0.009	0.008	1.18	0.82	0.073							
19.20	1.15				0.006	0.90	28	19.10	20.01	0.006	0.005	1.15	0.51	0.003							
19.90	1.10				0.006	0.90	29	20.01	20.47	0.006	0.005	1.10	0.50	0.003							
20.70	1.10				0.006	0.90	30	20.47	20.94	0.006	0.005	1.10	0.52	0.003							
21.50	1.15				0.006	0.90	31	20.94	21.42	0.006	0.005	1.15	0.55	0.003							
22.50	1.20				0.012	0.90	32	21.42	21.91	0.012	0.011	1.20	0.59	0.006							
23.20	1.18				0.006	0.90	33	21.91	22.40	0.006	0.005	1.18	0.58	0.003							
24.20	1.20				0.006	0.90	34	22.40	22.92	0.006	0.005	1.20	0.62	0.003							
25.10	1.18				0.006	0.90	35	22.92	23.44	0.006	0.005	1.18	0.62	0.003							
26.00	1.12				0.006	0.90	36	23.44	23.99	0.006	0.005	1.12	0.61	0.003							
27.00	1.14				0.003	0.90	37	23.99	24.56	0.003	0.003	1.14	0.65	0.002							
27.90	1.14				0.009	0.90	38	24.56	25.15	0.009	0.008	1.14	0.68	0.006							
29.00	1.16				0.006	0.90	39	25.15	25.80	0.006	0.005	1.16	0.75	0.004							
30.20	1.13				0.003	0.90	40	25.80	26.50	0.003	0.003	1.13	0.79	0.002							
31.30	1.12				0.003	0.90	41	26.50	27.27	0.003	0.003	1.12	0.86	0.002							
32.50	0.96				0.000	0.90	42	27.27	28.25	0.000	0.000	0.96	0.94	0.000							
36.00	0.00				0.000	0.90	43	28.25	36.00	0.000	0.000	0.24	0.42	0.000							
Total Flow:														7.157	100%						

Total Flow:	7.157	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	41.33	(m <sup>2</sup> )
Top Width:	35.20	(m)
Hydraulic Depth:	1.174	(m)
Mean Velocity:	0.173	(m/s)
Froude Number	0.051	
Photographs taken looking at: US, DS and across		

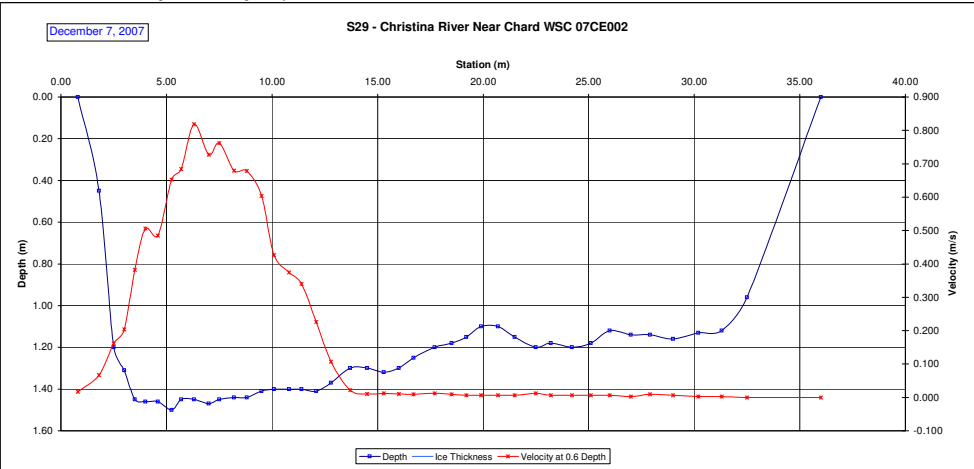
Datalogger Notes:	Database
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	
Datalogger Clock:	
Laptop Clock:	
Dessicant:	
Datalogger:	
PT:	
Power:	

Notes:

Additional Survey to Tie in to WSC BM:

	Rdg	Elevation	Rdg	Elevation
WL at WSC shack	6.453		6.454	
Point on Bridge - BM3	1.182		1.586	
BM 94-1 (damaged)	1.653		1.651	
BM 90-1	1.895		1.891	

WSC BM 94-1 has been damaged and is no longer likely reliable.



# Hydrometric Measurement / Site Visit Record

S31 - Hangingstone Creek at North Star Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Hangingstone Creek  
Location: Hangingstone Creek at North Star Road  
Site Name: S31  
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

## Personnel & Equipment

Measurement Made By: PM/JMS  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Time of Measurement

Date of Measurement: April 28, 2007  
Start Time: 2:40 PM MDT  
End Time: MDT

## Level Readings

Bench Mark Reading: Nail on LB 1.275  
Water Level Reading: 1.933  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 1.467  
Other: T-post on RB 1.121

## Setup No. 1

El: 100.000 1.250  
El: 99.342 1.916  
El: 97.875 1.467  
El: 100.154 1.097

## Setup No. 2

El: 100.000  
El: 99.334  
El: 97.867  
El: 100.153

99.338

97.871

Weather Conditions: +10 °C, Overcast  
River Conditions: Open water conditions, very high stage

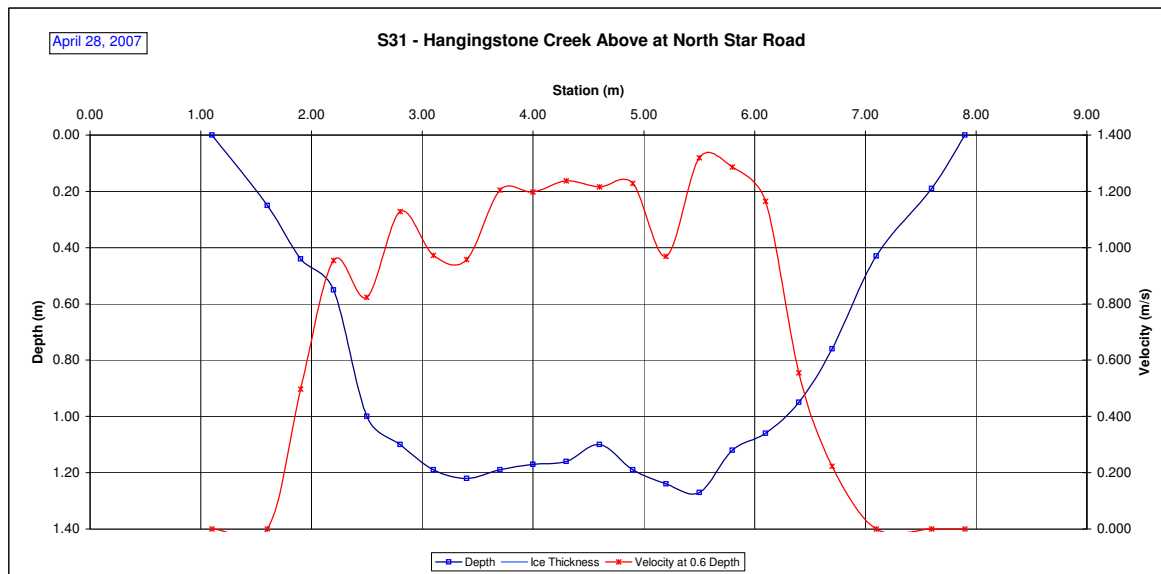
## Measurement Data

Measured Data							Calculated Data								Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)	
RB	7.90	0.00			0.000	1.00	1	7.90	7.75	0.000	0.000	0.05	0.01	0.000	0%
	7.60	0.19			0.000	1.00	2	7.75	7.35	0.000	0.000	0.19	0.08	0.000	0%
	7.10	0.43			0.000	1.00	3	7.35	6.90	0.000	0.000	0.43	0.19	0.000	0%
	6.70	0.76			0.223	1.00	4	6.90	6.55	0.223	0.223	0.76	0.27	0.059	1%
	6.40	0.95			0.555	1.00	5	6.55	6.25	0.555	0.555	0.95	0.29	0.158	3%
	6.10	1.06			1.164	1.00	6	6.25	5.95	1.164	1.164	1.06	0.32	0.370	7%
	5.80	1.12			1.286	1.00	7	5.95	5.65	1.286	1.286	1.12	0.34	0.432	8%
	5.50	1.27			1.320	1.00	8	5.65	5.35	1.320	1.320	1.27	0.38	0.503	9%
	5.20	1.24			0.969	1.00	9	5.35	5.05	0.969	0.969	1.24	0.37	0.361	7%
	4.90	1.19			1.228	1.00	10	5.05	4.75	1.228	1.228	1.19	0.36	0.439	8%
	4.60	1.10			1.216	1.00	11	4.75	4.45	1.216	1.216	1.10	0.33	0.401	7%
	4.30	1.16			1.237	1.00	12	4.45	4.15	1.237	1.237	1.16	0.35	0.431	8%
	4.00	1.17			1.198	1.00	13	4.15	3.85	1.198	1.198	1.17	0.35	0.420	8%
	3.70	1.19			1.204	1.00	14	3.85	3.55	1.204	1.204	1.19	0.36	0.430	8%
	3.40	1.22			0.957	1.00	15	3.55	3.25	0.957	0.957	1.22	0.37	0.350	6%
	3.10	1.19			0.972	1.00	16	3.25	2.95	0.972	0.972	1.19	0.36	0.347	6%
	2.80	1.10			1.128	1.00	17	2.95	2.65	1.128	1.128	1.10	0.33	0.372	7%
	2.50	1.00			0.823	1.00	18	2.65	2.35	0.823	0.823	1.00	0.30	0.247	4%
	2.20	0.55			0.954	1.00	19	2.35	2.05	0.954	0.954	0.55	0.17	0.157	3%
	1.90	0.44			0.497	1.00	20	2.05	1.75	0.497	0.497	0.44	0.13	0.066	1%
LB	1.60	0.25			0.000	1.00	21	1.75	1.35	0.000	0.000	0.25	0.10	0.000	0%
	1.10	0.00			0.000	1.00	1	1.10	1.10	0.000	0.000	0.00	0.00	0.000	0%
Total Flow:														5.543	1

Total Flow:	5.543	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	5.73	(m <sup>2</sup> )
Top Width:	6.80	(m)
Hydraulic Depth:	0.842	(m)
Mean Velocity:	0.968	(m/s)
Froude Number	0.337	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:	
Datalogger Internal Power:	100%
Datalogger External Power:	81%
Datalogger Memory Used:	3%
Datalogger Clock:	Apr 28, 2007 13:11 MST
Laptop Clock:	Apr 28, 2007 13:11 MST
Dessicant:	100% Good
Datalogger:	Lakewood UltraLogger RX 1A #95185-05
PT:	Keller Pressure Transducer 3 psi #3499
Power:	Lakewood battery

Notes: TSS sample collected. Measurement at 0.20 would be overly affected by fishcat wake.



# Hydrometric Measurement / Site Visit Record

S31 - Hangingstone Creek at North Star Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Hangingstone Creek  
Location: Hangingstone Creek at North Star Road  
Site Name: S31  
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

## Personnel & Equipment

Measurement Made By: pm sm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Time of Measurement

Date of Measurement: June 17, 2007  
Start Time: 2:30 PM MDT  
End Time: 2:43 PM MDT

## Level Readings

Bench Mark Reading: Nail on LB 0.581  
Water Level Reading: 2.300  
Top of Ice Level Reading: 0.213  
Transducer Reading & Calc'd El: 0.421  
Other: T-post on RB 0.454

## Setup No. 1

El: 100.000 0.618  
El: 98.281 2.339  
El: 97.860 0.421  
El: 100.127 0.485

## Setup No. 2

El: 100.000  
El: 98.279  
El: 97.858  
El: 100.133

Weather Conditions: +20C light wind partly cloudy  
River Conditions: open low stage

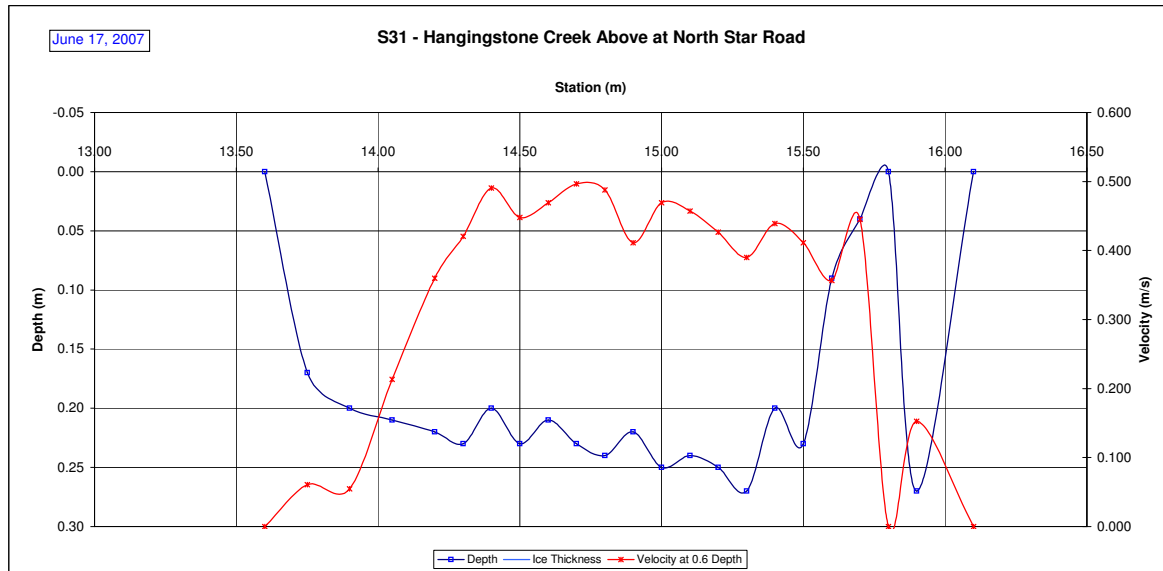
## Measurement Data

Measured Data							Calculated Data								Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m <sup>2</sup> )	Panel Discharge (m <sup>3</sup> /s)	
Lb	13.60	0.00			0.000	1.00	1	13.60	13.68	0.015	0.015	0.04	0.00	0.000	0%
	13.75	0.17			0.061	1.00	2	13.68	13.83	0.061	0.061	0.17	0.03	0.002	1%
	13.90	0.20			0.055	1.00	3	13.83	13.98	0.055	0.055	0.20	0.03	0.002	1%
	14.05	0.21			0.213	1.00	4	13.98	14.13	0.213	0.213	0.21	0.03	0.007	4%
	14.20	0.22			0.360	1.00	5	14.13	14.25	0.360	0.360	0.22	0.03	0.010	6%
	14.30	0.23			0.421	1.00	6	14.25	14.35	0.421	0.421	0.23	0.02	0.010	6%
	14.40	0.20			0.491	1.00	7	14.35	14.45	0.491	0.491	0.20	0.02	0.010	6%
	14.50	0.23			0.448	1.00	8	14.45	14.55	0.448	0.448	0.23	0.02	0.010	6%
	14.60	0.21			0.469	1.00	9	14.55	14.65	0.469	0.469	0.21	0.02	0.010	6%
	14.70	0.23			0.497	1.00	10	14.65	14.75	0.497	0.497	0.23	0.02	0.011	7%
	14.80	0.24			0.488	1.00	11	14.75	14.85	0.488	0.488	0.24	0.02	0.012	7%
	14.90	0.22			0.411	1.00	12	14.85	14.95	0.411	0.411	0.22	0.02	0.009	5%
	15.00	0.25			0.469	1.00	13	14.95	15.05	0.469	0.469	0.25	0.03	0.012	7%
	15.10	0.24			0.457	1.00	14	15.05	15.15	0.457	0.457	0.24	0.02	0.011	7%
	15.20	0.25			0.427	1.00	15	15.15	15.25	0.427	0.427	0.25	0.03	0.011	6%
	15.30	0.27			0.390	1.00	16	15.25	15.35	0.390	0.390	0.27	0.03	0.011	6%
	15.40	0.20			0.439	1.00	17	15.35	15.45	0.439	0.439	0.20	0.02	0.009	5%
	15.50	0.23			0.411	1.00	18	15.45	15.55	0.411	0.411	0.23	0.02	0.009	6%
	15.60	0.09			0.357	1.00	19	15.55	15.65	0.357	0.357	0.09	0.01	0.003	2%
	15.70	0.04			0.445	1.00	20	15.65	15.75	0.445	0.445	0.04	0.00	0.002	1%
	15.80	0.00			0.000	1.00	21	15.75	15.85	0.000	0.000	0.00	0.00	0.000	0%
	15.90	0.27			0.152	1.00	22	15.85	16.00	0.152	0.152	0.27	0.04	0.006	4%
rb	16.10	0.00			0.000	1.00	23	16.00	16.10	0.038	0.038	0.07	0.01	0.000	0%
Total Flow:														0.165	1.000

Total Flow:	0.165	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	0.48	(m <sup>2</sup> )
Top Width:	2.50	(m)
Hydraulic Depth:	0.191	(m)
Mean Velocity:	0.346	(m/s)
Froude Number	0.253	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	100%	
Datalogger External Power:	78%	
Datalogger Memory Used:	75%	
Datalogger Clock:	Jun 17, 2007 13:04	MST
Laptop Clock:	Jun 17, 2007 13:15	MST
Dessicant:	good	
Datalogger:	Lakewood UltraLogger RX 1A #95185-05	
PT:	Keller Pressure Transducer 3 psi #3499	
Power:	Lakewood battery	

Notes: TSS sample collected. Data looks good



# Hydrometric Measurement / Site Visit Record

S31 - Hanginstone Creek at North Star Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Hanginstone Creek  
Location: Hanginstone Creek at North Star Road  
Site Name: S31  
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M  
Time of Measurement: August 6, 2007  
Date of Measurement: 6:40 PM MDT  
Start Time: 7:10 PM MDT  
End Time:

## Personnel & Equipment

Measurement Made By: SM/JMS  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Nail on LB  
Water Level Reading: 2.104  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other: T-post on RB 0.485

## Setup No. 1

El: 100.000  
El: 98.509  
El:  
El: 98.509  
El: 100.128

## Setup No. 2

El: 100.000  
El: 98.505 98.507  
El:  
El: 98.505 98.507  
El: 100.128

## Weather Conditions:

+20 °C, Sunny

## River Conditions:

Open water conditions, Low Stage

Measurement Data															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
					0.000	1.00	1	12.80	12.90	0.020	0.020	0.02	0.00	0.000	0%
12.80	0.00				0.079	1.00	2	12.90	13.15	0.079	0.079	0.07	0.02	0.001	0%
13.00	0.07				0.287	1.00	3	13.15	13.45	0.287	0.287	0.15	0.04	0.013	2%
13.30	0.15				0.223	1.00	4	13.45	13.75	0.223	0.223	0.34	0.10	0.023	4%
13.60	0.34				0.399	1.00	5	13.75	14.05	0.399	0.399	0.40	0.12	0.048	8%
13.90	0.40				0.725	1.00	6	14.05	14.30	0.725	0.725	0.40	0.10	0.073	12%
14.20	0.40				0.783	1.00	7	14.30	14.50	0.783	0.783	0.38	0.08	0.060	9%
14.40	0.38				0.756	1.00	8	14.50	14.70	0.756	0.756	0.35	0.07	0.053	8%
14.60	0.35				0.689	1.00	9	14.70	14.90	0.689	0.689	0.34	0.07	0.047	7%
14.80	0.34				0.747	1.00	10	14.90	15.10	0.747	0.747	0.35	0.07	0.052	8%
15.00	0.35				0.738	1.00	11	15.10	15.30	0.738	0.738	0.33	0.07	0.049	8%
15.20	0.33				0.707	1.00	12	15.30	15.50	0.707	0.707	0.32	0.06	0.045	7%
15.40	0.32				0.728	1.00	13	15.50	15.70	0.728	0.728	0.33	0.07	0.048	8%
15.60	0.33				0.710	1.00	14	15.70	15.90	0.710	0.710	0.32	0.06	0.045	7%
15.80	0.32				0.643	1.00	15	15.90	16.10	0.643	0.643	0.25	0.05	0.032	5%
16.00	0.25				0.570	1.00	16	16.10	16.30	0.570	0.570	0.25	0.05	0.028	5%
16.20	0.25				0.396	1.00	17	16.30	16.40	0.396	0.396	0.30	0.03	0.012	2%
16.40	0.30				0.000	1.00	18	16.55	16.55	0.000	0.000	0.08	0.00	0.000	0%
16.55	0.00											Total Flow:		0.629	

Total Flow:	0.629	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.06	(m <sup>2</sup> )
Top Width:	3.75	(m)
Hydraulic Depth:	0.283	(m)
Mean Velocity:	0.593	(m/s)
Froude Number	0.356	
Photographs taken looking at: Upstream, downstream, across		

## Datalogger Notes:

Datalogger Internal Power:

Datalogger External Power:

Datalogger Memory Used:

Datalogger Clock:

Laptop Clock:

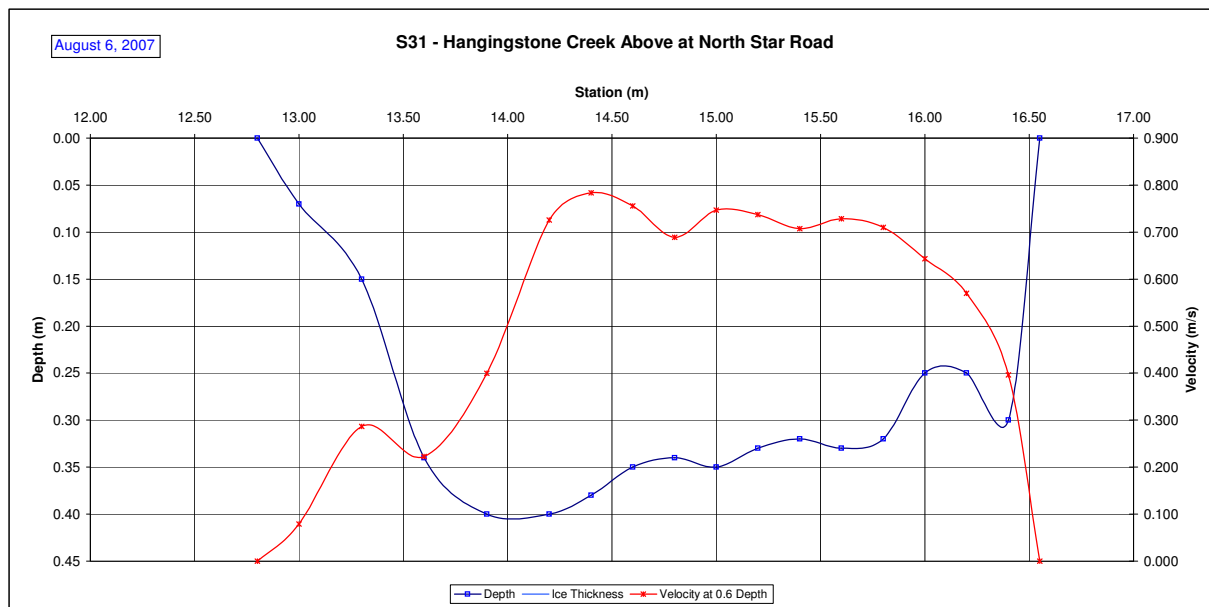
Dessicant:

Datalogger: Lakewood UltraLogger RX 1A #95185-05

PT: Keller Pressure Transducer 3 psi #3499

Power: Lakewood battery

Notes: when downloading TD value fluctuating a lot generates error messages





# Hydrometric Measurement / Site Visit Record

S31 - Hanginstone Creek at North Star Road



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Hanginstone Creek  
Location: Hanginstone Creek at North Star Road  
Site Name: S31  
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

### Time of Measurement

Date of Measurement: August 15, 2007  
Start Time: 9:00 AM MDT  
End Time: MDT

### Weather Conditions:

+20 °C, Sunny

### River Conditions:

Open water conditions, Low Stage

### Personnel & Equipment

Measurement Made By: SM  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: Nail on LB  
Water Level Reading:  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El.:  
Other: T-post on RB

### Setup No. 1

El: 100.000  
El: 100.128  
El:  
El: 100.128  
El: 100.128

### Setup No. 2

El: 100.000  
El: 100.128 100.128  
El:  
El: 100.128 100.128  
El: 100.128

### Datalogger Notes:

Datalogger Internal Power:

Datalogger External Power:

Datalogger Memory Used:

Datalogger Clock:

MST

Laptop Clock:

MST

### Dessicant:

Datalogger: Lakewood UltraLogger RX 1A #95185-05

PT: Keller Pressure Transducer 3 psi #3499

Power: Lakewood battery

Notes: solinst installed

# Hydrometric Measurement / Site Visit Record

S31 - Hanginstone Creek at North Star Road



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Hanginstone Creek  
Location: Hanginstone Creek at North Star Road  
Site Name: S31  
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

## Personnel & Equipment

Measurement Made By: SM/JMS  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: September 19, 2007  
Start Time: 9:00 AM MDT  
End Time: 11:00 AM MDT

## Level Readings

Bench Mark Reading: Nail on LB  
Water Level Reading: 2.188  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.4589  
Other: T-post on RB 0.537

## Setup No. 1

El: 100.000  
El: 98.477  
El: 98.018  
El: 100.128

## Setup No. 2

El: 100.000  
El: 98.482  
El: 98.023  
El: 100.128

98.480

98.021

Weather Conditions: +2 °C, overcast

River Conditions: moderate stage

## Measurement Data

Measured Data						Calculated Data										Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
12.55	0.00				0.000	1.00	1	12.55	12.68	0.040	0.040	0.01	0.00	0.000	0%	
12.80	0.05				0.158	1.00	2	12.68	12.90	0.158	0.158	0.05	0.01	0.002	0%	
13.00	0.20				0.256	1.00	3	12.90	13.15	0.256	0.256	0.20	0.05	0.013	2%	
13.30	0.36				0.384	1.00	4	13.15	13.38	0.384	0.384	0.36	0.08	0.031	4%	
13.45	0.41				0.442	1.00	5	13.38	13.53	0.442	0.442	0.41	0.06	0.027	4%	
13.60	0.42				0.512	1.00	6	13.53	13.65	0.512	0.512	0.42	0.05	0.027	4%	
13.70	0.39				0.652	1.00	7	13.65	13.75	0.652	0.652	0.39	0.04	0.025	4%	
13.80	0.43				0.710	1.00	8	13.75	13.90	0.710	0.710	0.43	0.06	0.046	7%	
14.00	0.38				0.829	1.00	9	13.90	14.05	0.829	0.829	0.38	0.06	0.047	7%	
14.10	0.37				0.792	1.00	10	14.05	14.15	0.792	0.792	0.37	0.04	0.029	4%	
14.20	0.36				0.826	1.00	11	14.15	14.30	0.826	0.826	0.36	0.05	0.045	6%	
14.40	0.35				0.835	1.00	12	14.30	14.50	0.835	0.835	0.35	0.07	0.058	8%	
14.60	0.34				0.832	1.00	13	14.50	14.70	0.832	0.832	0.34	0.07	0.057	8%	
14.80	0.34				0.829	1.00	14	14.70	14.90	0.829	0.829	0.34	0.07	0.056	8%	
15.00	0.32				0.783	1.00	15	14.90	15.10	0.783	0.783	0.32	0.06	0.050	7%	
15.20	0.31				0.738	1.00	16	15.10	15.30	0.738	0.738	0.31	0.06	0.046	7%	
15.40	0.31				0.744	1.00	17	15.30	15.50	0.744	0.744	0.31	0.06	0.046	7%	
15.60	0.35				0.646	1.00	18	15.50	15.70	0.646	0.646	0.35	0.07	0.045	6%	
15.80	0.32				0.570	1.00	19	15.70	15.90	0.570	0.570	0.32	0.06	0.036	5%	
16.00	0.25				0.296	1.00	20	15.90	16.05	0.296	0.296	0.25	0.04	0.011	2%	
16.10	0.00				0.000	1.00	21	16.10	16.10	0.000	0.000	0.06	0.00	0.000	0%	
Total Flow:														0.698	1	

Total Flow:	0.698	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.07	(m <sup>2</sup> )
Top Width:	3.55	(m)
Hydraulic Depth:	0.303	(m)
Mean Velocity:	0.650	(m/s)
Froude Number	0.377	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:		
Datalogger Internal Power:	100%	11.340
Datalogger External Power:	75%	11.680
Datalogger Memory Used:	80	
Datalogger Clock:	Sep 19, 2007 08:00	MST
Laptop Clock:	Sep 19, 2007 08:06	MST
Dessicant:		
Datalogger:	Lakewood UltraLogger RX 1A #95185-05	
PT:	pressure Transducer 3 psi #00871	
Power:	Lakewood battery	

Notes: TD sheared off replaced TD with 000871 use S31.fmt

Solinst Depth 0.44858

## Level Readings

Bench Mark Reading: Nail on LB  
Water Level Reading: 2.188  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.4589  
Other: T-post on RB 0.537

## Setup No. 1

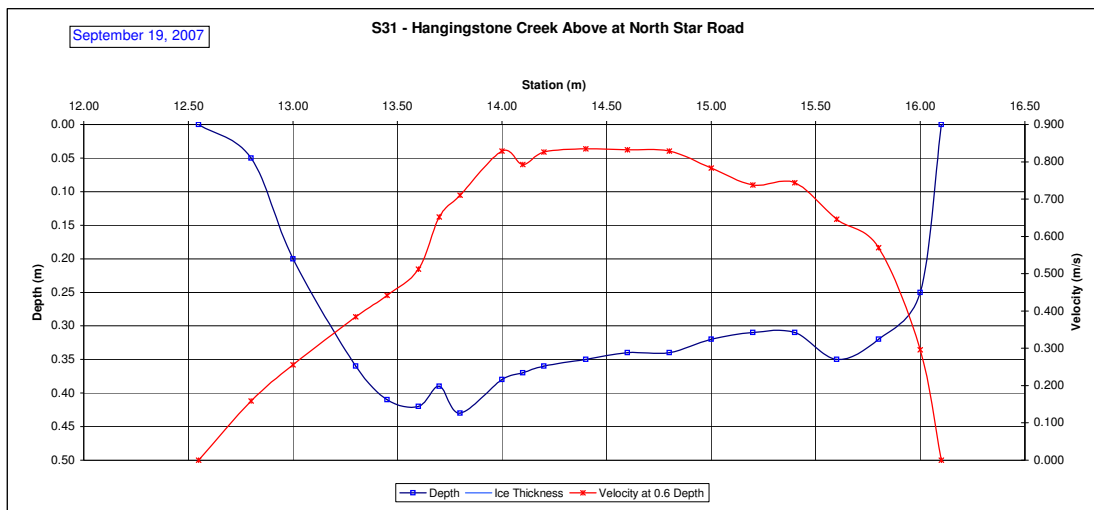
El: 100.000  
El: 98.477  
El: 98.018  
El: 100.128

## Setup No. 2

El: 100.000  
El: 98.482  
El: 98.023  
El: 100.128

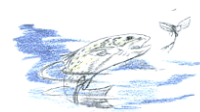
98.480

98.021



# Hycrometric Measurement / Site Visit Record

## S31 - Hanginstone Creek at North Star Road



### Regional Aquatics Monitoring Program

#### Measurement Location

River/Stream: Hanginstone Creek  
Location: Hanginstone Creek at North Star Road  
Site Name: S31  
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

#### Time of Measurement

Date of Measurement: October 19, 2007  
Start Time: 10:50 AM MDT  
End Time: 11:08 AM MDT

#### Weather Conditions:

+1 °C, overcast

#### River Conditions:

Open, low stage

#### Personnel & Equipment

Measurement Made By: SM/FF  
Data Entry By: FF  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

#### Level Readings

Bench Mark Reading: Nail on LB 1.281  
Water Level Reading: 2.934  
Top of Ice Level Reading:  
Transducer Reading & Calc'd El: 0.3112  
Other: T-post on RB 1.153

#### Setup No. 1

El: 100.000 1.290  
El: 98.219 2.945  
El: 97.908 0.311  
El: 100.128 1.162

#### Setup No. 2

El: 100.000 98.218  
El: 98.217 98.218  
El: 97.906 97.907  
El: 100.128

#### Measurement Data

Measured Data						Calculated Data										Percentag e of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
12.50	0.00				0.000	1.00	1	12.50	12.60	0.002	0.002	0.04	0.00	0.000	0%	
12.70	0.16				0.009	1.00	2	12.60	12.85	0.009	0.009	0.16	0.04	0.000	0%	
13.00	0.25				0.008	1.00	3	12.85	13.13	0.008	0.008	0.25	0.07	0.001	0%	
13.25	0.30				0.009	1.00	4	13.13	13.38	0.009	0.009	0.30	0.08	0.001	0%	
13.50	0.32				0.012	1.00	5	13.38	13.63	0.012	0.012	0.32	0.08	0.001	0%	
13.75	0.37				0.073	1.00	6	13.63	13.88	0.073	0.073	0.37	0.09	0.007	3%	
14.00	0.37				0.094	1.00	7	13.88	14.13	0.094	0.094	0.37	0.09	0.009	3%	
14.25	0.46				0.116	1.00	8	14.13	14.38	0.116	0.116	0.46	0.12	0.013	5%	
14.50	0.48				0.119	1.00	9	14.38	14.63	0.119	0.119	0.48	0.12	0.014	6%	
14.75	0.55				0.125	1.00	10	14.63	14.88	0.125	0.125	0.55	0.14	0.017	7%	
15.00	0.43				0.107	1.00	11	14.88	15.13	0.107	0.107	0.43	0.11	0.011	5%	
15.25	0.37				0.149	1.00	12	15.13	15.38	0.149	0.149	0.37	0.09	0.014	5%	
15.50	0.40				0.146	1.00	13	15.38	15.63	0.146	0.146	0.40	0.10	0.015	6%	
15.75	0.42				0.168	1.00	14	15.63	15.88	0.168	0.168	0.42	0.11	0.018	7%	
16.00	0.42				0.152	1.00	15	15.88	16.13	0.152	0.152	0.42	0.11	0.016	6%	
16.25	0.33				0.180	1.00	16	16.13	16.38	0.180	0.180	0.33	0.08	0.015	6%	
16.50	0.42				0.155	1.00	17	16.38	16.63	0.155	0.155	0.42	0.11	0.016	6%	
16.75	0.34				0.155	1.00	18	16.63	16.88	0.155	0.155	0.34	0.09	0.013	5%	
17.00	0.30				0.162	1.00	19	16.88	17.13	0.162	0.162	0.30	0.08	0.012	5%	
17.25	0.27				0.128	1.00	20	17.13	17.38	0.128	0.128	0.27	0.07	0.009	3%	
17.50	0.26				0.155	1.00	21	17.38	17.63	0.155	0.155	0.26	0.07	0.010	4%	
17.75	0.26				0.165	1.00	22	17.63	17.88	0.165	0.165	0.26	0.07	0.011	4%	
18.00	0.24				0.134	1.00	23	17.88	18.13	0.134	0.134	0.24	0.06	0.008	3%	
18.25	0.22				0.122	1.00	24	18.13	18.38	0.122	0.122	0.22	0.06	0.007	3%	
18.50	0.21				0.122	1.00	25	18.38	18.63	0.122	0.122	0.21	0.05	0.006	3%	
18.75	0.19				0.088	1.00	26	18.63	18.88	0.088	0.088	0.19	0.05	0.004	2%	
19.00	0.16				0.094	1.00	27	18.88	19.20	0.094	0.094	0.16	0.05	0.005	2%	
19.40	0.00				0.000	1.00	28	19.20	19.40	0.024	0.024	0.04	0.01	0.000	0%	
Total Flow:														0.253	100%	

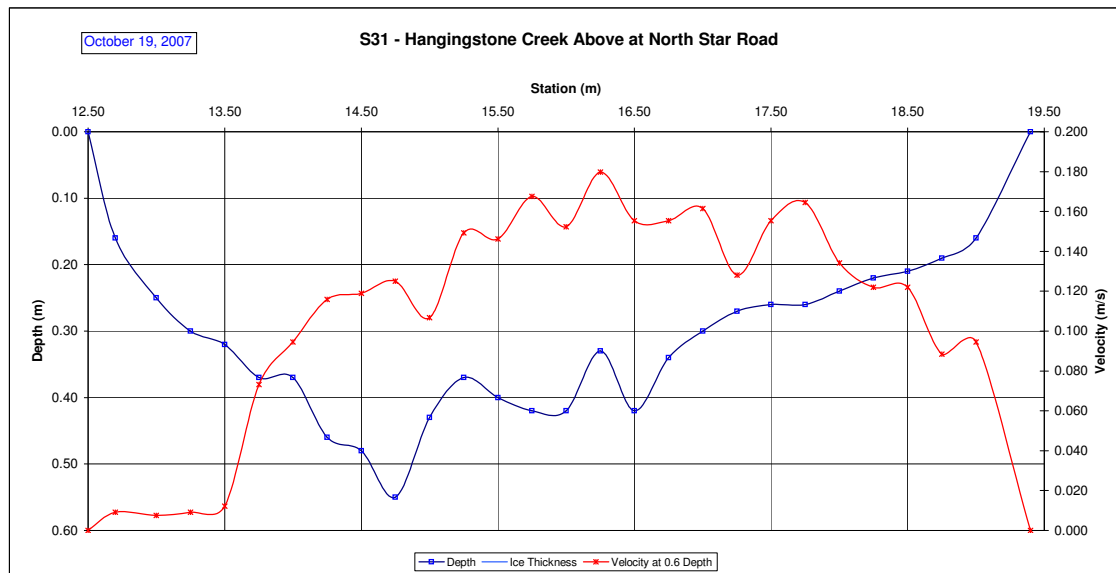
Total Flow:	0.253	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Excellent	
Total Area:	2.16	(m <sup>2</sup> )
Top Width:	6.90	(m)
Hydraulic Depth:	0.312	(m)
Mean Velocity:	0.117	(m/s)
Froude Number	0.067	
Photographs taken looking at:		
Upstream, downstream, across		

#### Datalogger Notes:

Datalogger Internal Power: 100% 11.340  
Datalogger External Power: 74% 11.680  
Datalogger Memory Used: 25  
Datalogger Clock: Oct 19, 2007 09:20 MST  
Laptop Clock: Oct 19, 2007 09:28 MST  
Dessicant:  
Datalogger: Lakewood UltraLogger RX 1A #95185-05  
PT: pressure Transducer 3 psi #00871  
Power: Lakewood battery

#### Notes:

Equipment removed for winter.  
New beaver dam 20 m d/s of site .does not appear to be significantly influencing flow. TD may need to be relocated next year  
Solinst logger pulled out at 10:30 am.



# Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Surmont Creek  
Location: Surmont Creek at Highway 881  
Site Name: S32  
Coordinates & Legal: 6254511 N, 490252 E NE 3-86-8 W4M  
Time of Measurement: April 28, 2007  
Start Time: 5:15 PM MDT  
End Time: 5:36 PM MDT

## Personnel & Equipment

Measurement Made By: JMS.PM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney 2000 SN#2004521

## Level Readings

Bench Mark Reading: nail in bridge 2.062  
Water Level Reading: 2.200  
Top of Ice Level Reading:  
Transducer Reading & Est. El.: 1.452  
Other: Rebar on LB 1.024

## Setup No. 1

El: 97.942  
El: 97.804  
El:  
El: 96.352  
El: 98.980

## Setup No. 2

El: 97.942  
El: 97.806  
El:  
El: 96.354  
El: 98.982

## Weather Conditions:

+8 °C, sunny  
Open, high stage.

## River Conditions:

## Measurement Data

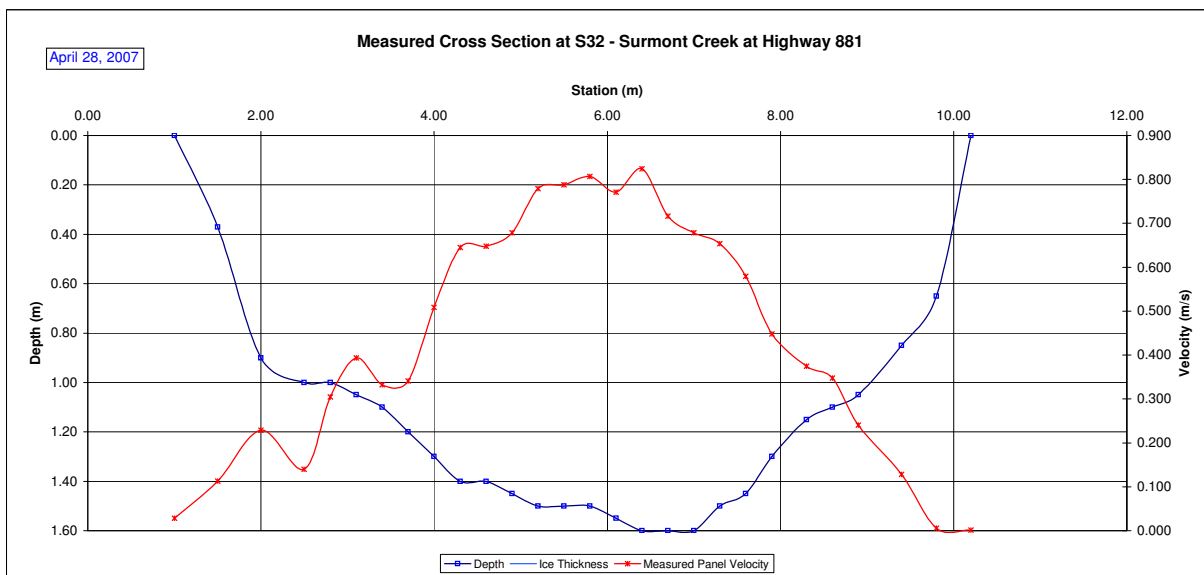
Measured Data							Calculated Data							
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
10.20	0.00				0.000	1.00	1	10.20	10.00	0.002	0.002	0.16	0.03	0.000
9.80	0.65				0.006	1.00	2	10.00	9.60	0.006	0.006	0.85	0.26	0.002
9.40	0.85				0.128	1.00	3	9.60	9.15	0.128	0.128	0.85	0.38	0.049
8.90	1.05				0.241	1.00	4	9.15	8.75	0.241	0.241	1.05	0.42	0.101
8.60	1.10				0.347	1.00	5	8.75	8.45	0.347	0.347	1.10	0.33	0.115
8.30	1.15				0.375	1.00	6	8.45	8.10	0.375	0.375	1.15	0.40	0.151
7.90	1.30		0.564	0.332		1.00	7	8.10	7.75	0.448	0.448	1.30	0.46	0.204
7.60	1.45		0.597	0.561		1.00	8	7.75	7.45	0.579	0.579	1.45	0.44	0.252
7.30	1.50		0.646	0.661		1.00	9	7.45	7.15	0.654	0.654	1.50	0.45	0.294
7.00	1.60		0.728	0.628		1.00	10	7.15	6.85	0.678	0.678	1.60	0.48	0.326
6.70	1.60		0.759	0.674		1.00	11	6.85	6.55	0.716	0.716	1.60	0.48	0.344
6.40	1.60		0.920	0.728		1.00	12	6.55	6.25	0.824	0.824	1.60	0.48	0.396
6.10	1.55		0.829	0.713		1.00	13	6.25	5.95	0.771	0.771	1.55	0.47	0.359
5.80	1.50		0.890	0.723		1.00	14	5.95	5.65	0.807	0.807	1.50	0.45	0.363
5.50	1.50		0.744	0.832		1.00	15	5.65	5.35	0.788	0.788	1.50	0.45	0.355
5.20	1.50		0.814	0.744		1.00	16	5.35	5.05	0.779	0.779	1.50	0.45	0.350
4.90	1.45		0.710	0.646		1.00	17	5.05	4.75	0.678	0.678	1.45	0.44	0.295
4.60	1.40		0.652	0.643		1.00	18	4.75	4.45	0.648	0.648	1.40	0.42	0.272
4.30	1.40		0.579	0.710		1.00	19	4.45	4.15	0.645	0.645	1.40	0.42	0.271
4.00	1.30		0.469	0.549		1.00	20	4.15	3.85	0.509	0.509	1.30	0.39	0.199
3.70	1.20				0.341	1.00	21	3.85	3.55	0.341	0.341	1.20	0.36	0.123
3.40	1.10				0.332	1.00	22	3.55	3.25	0.332	0.332	1.10	0.33	0.110
3.10	1.05				0.393	1.00	23	3.25	2.95	0.393	0.393	1.05	0.32	0.124
2.80	1.00				0.305	1.00	24	2.95	2.65	0.305	0.305	1.00	0.30	0.091
2.50	1.00				0.140	1.00	25	2.65	2.25	0.140	0.140	1.00	0.40	0.056
2.00	0.90				0.229	1.00	26	2.25	1.75	0.229	0.229	0.90	0.45	0.103
1.50	0.37				0.113	1.00	27	1.75	1.25	0.113	0.113	0.37	0.19	0.021
1.00	0.00				0.000	1.00	28	1.25	1.00	0.028	0.028	0.09	0.02	0.001
Total Flow:													5.324	

Total Flow:	5.324	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	10.45	(m <sup>2</sup> )
Top Width:	9.20	(m)
Hydraulic Depth:	1.136	(m)
Mean Velocity:	0.509	(m/s)
Froude Number	0.153	
Photographs taken looking at:	Upstream, downstream, across	

## Datalogger Notes:

Datalogger Internal Power: 11.34V 100%  
Datalogger External Power: 78%  
Datalogger Memory Used: 28075  
Datalogger Clock: Apr 28, 2007 17:14 MST  
Laptop Clock: Apr 29, 2007 17:05 MST  
Dessicant: Good  
Datalogger: 45  
PT: 0604002-5926  
Power:

## Notes:



# Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Surmont Creek  
Location: Surmont Creek at Highway 881  
Site Name: S32  
Coordinates & Legal: 6254511 N, 490252 E NE 3-86-8 W4M

## Time of Measurement

Date of Measurement: June 17, 2007  
Start Time: 5:05 PM MDT  
End Time: 5:17 PM MDT

## Weather Conditions:

+15 °C, partly cloudy

## River Conditions:

open low stage

## Personnel & Equipment

Measurement Made By: sm pm  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney 2000 SN#2004521

## Level Readings

Bench Mark Reading: nail in bridge 2.063  
Water Level Reading: 3.367  
Top of Ice Level Reading:  
Transducer Reading & Est. El.: 0.413  
Other: Rebar on LB 1.021

## Setup No. 1

El: 97.942  
El: 96.638  
El:  
El: 96.225  
El: 98.984

## Setup No. 2

El: 97.942  
El: 96.636  
El:  
El: 96.223  
El: 98.980

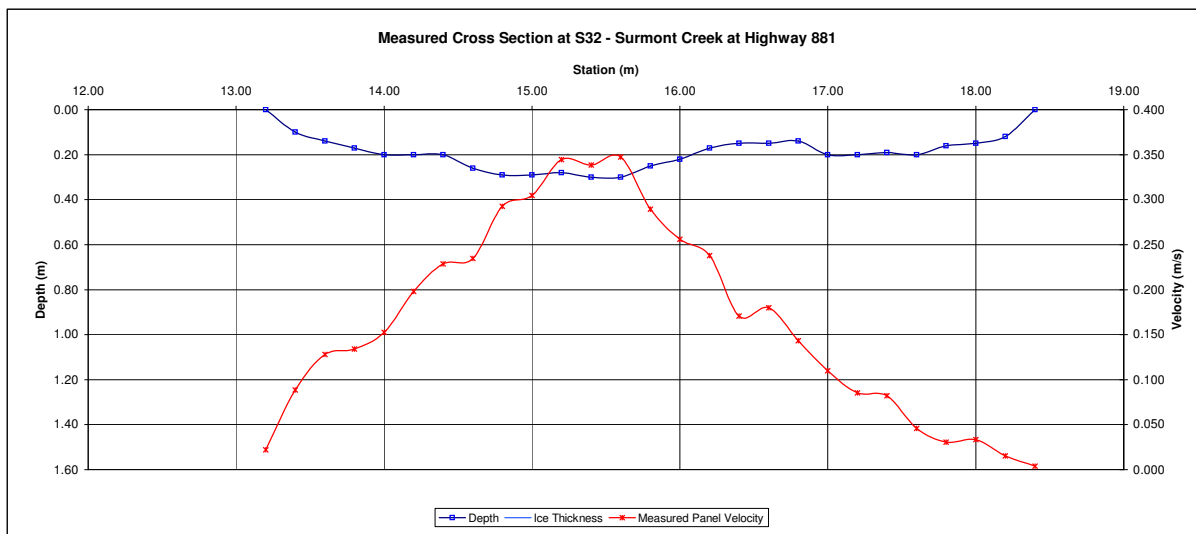
## Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
13.20	0.00				0.000	1.00	1	13.20	13.30	0.022	0.022	0.03	0.00	0.000
13.40	0.10				0.088	1.00	2	13.30	13.50	0.088	0.088	0.10	0.02	0.002
13.60	0.14				0.128	1.00	3	13.50	13.70	0.128	0.128	0.14	0.03	0.004
13.80	0.17				0.134	1.00	4	13.70	13.90	0.134	0.134	0.17	0.03	0.005
14.00	0.20				0.152	1.00	5	13.90	14.10	0.152	0.152	0.20	0.04	0.006
14.20	0.20				0.198	1.00	6	14.10	14.30	0.198	0.198	0.20	0.04	0.008
14.40	0.20				0.229	1.00	7	14.30	14.50	0.229	0.229	0.20	0.04	0.009
14.60	0.26				0.235	1.00	8	14.50	14.70	0.235	0.235	0.26	0.05	0.012
14.80	0.29				0.293	1.00	9	14.70	14.90	0.293	0.293	0.29	0.06	0.017
15.00	0.29				0.305	1.00	10	14.90	15.10	0.305	0.305	0.29	0.06	0.018
15.20	0.28				0.344	1.00	11	15.10	15.30	0.344	0.344	0.28	0.06	0.019
15.40	0.30				0.338	1.00	12	15.30	15.50	0.338	0.338	0.30	0.06	0.020
15.60	0.30				0.347	1.00	13	15.50	15.70	0.347	0.347	0.30	0.06	0.021
15.80	0.25				0.290	1.00	14	15.70	15.90	0.290	0.290	0.25	0.05	0.014
16.00	0.22				0.256	1.00	15	15.90	16.10	0.256	0.256	0.22	0.04	0.011
16.20	0.17				0.238	1.00	16	16.10	16.30	0.238	0.238	0.17	0.03	0.008
16.40	0.15				0.171	1.00	17	16.30	16.50	0.171	0.171	0.15	0.03	0.005
16.60	0.15				0.180	1.00	18	16.50	16.70	0.180	0.180	0.15	0.03	0.005
16.80	0.14				0.143	1.00	19	16.70	16.90	0.143	0.143	0.14	0.03	0.004
17.00	0.20				0.110	1.00	20	16.90	17.10	0.110	0.110	0.20	0.04	0.004
17.20	0.20				0.085	1.00	21	17.10	17.30	0.085	0.085	0.20	0.04	0.003
17.40	0.19				0.082	1.00	22	17.30	17.50	0.082	0.082	0.19	0.04	0.003
17.60	0.20				0.046	1.00	23	17.50	17.70	0.046	0.046	0.20	0.04	0.002
17.80	0.16				0.030	1.00	24	17.70	17.90	0.030	0.030	0.16	0.03	0.001
18.00	0.15				0.034	1.00	25	17.90	18.10	0.034	0.034	0.15	0.03	0.001
18.20	0.12				0.015	1.00	26	18.10	18.30	0.015	0.015	0.12	0.02	0.000
18.40	0.00				0.000	1.00	27	18.30	18.40	0.004	0.004	0.03	0.00	0.000
Total Flow:													0.204	

Total Flow:	0.204	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.01	(m <sup>2</sup> )
Top Width:	13.20	(m)
Hydraulic Depth:	0.076	(m)
Mean Velocity:	0.202	(m/s)
Froude Number	0.234	
Photographs taken looking at:	Upstream, down	

Datalogger Notes:		
Datalogger Internal Power:	11.34V	100%
Datalogger External Power:		80%
Datalogger Memory Used:	28075	
Datalogger Clock:	Jun 17, 2007 15:56	MST
Laptop Clock:	Jun 17, 2007 15:57	MST
Dessicant:	Good	
Datalogger:	45	
PT:	0604002-5926	
Power:		

Notes: memory full  
june 3 data looks good, strobe disabled, memory cleared, clocks synched  
beaver dam u/s of bridge  
tss taken



# Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Surmont Creek  
Location: Surmont Creek at Highway 881  
Site Name: S32  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: August 6, 2007  
Start Time: 5:00 PM MDT  
End Time: 5:25 PM MDT

## Weather Conditions:

Clear, 20C, sunny

## River Conditions:

Open, low

## Personnel & Equipment

Measurement Made By: JMS/SM  
Data Entry By: JMS  
Meter Type and No.: Marsh McBirney 2000 SN#2004521

## Level Readings

Bench Mark Reading: nail in brick 1.850 El: 97.942  
Water Level Reading: 3.208 El: 96.584  
Top of Ice Level Reading: El: 96.589  
Transducer Reading & Est. El.: 0.354 El: 96.230  
Other: IR by Logger 0.812 El: 96.235

## Setup No. 1

## Setup No. 2

Measurement Data														
Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)
					0.000	1.00	1	13.10	13.30	0.006	0.006	0.02	0.00	0.000
13.10	0.00				0.024	1.00	2	13.30	13.63	0.024	0.024	0.08	0.03	0.001
13.50	0.08				0.015	1.00	3	13.63	13.88	0.015	0.015	0.14	0.04	0.001
13.75	0.14				0.070	1.00	4	13.88	14.13	0.070	0.070	0.20	0.05	0.004
14.00	0.20				0.125	1.00	5	14.13	14.38	0.125	0.125	0.26	0.07	0.008
14.25	0.26				0.143	1.00	6	14.38	14.63	0.143	0.143	0.32	0.08	0.011
14.50	0.32				0.201	1.00	7	14.63	14.88	0.201	0.201	0.35	0.09	0.018
14.75	0.35				0.189	1.00	8	14.88	15.13	0.189	0.189	0.38	0.10	0.018
15.00	0.38				0.232	1.00	9	15.13	15.38	0.232	0.232	0.34	0.09	0.020
15.25	0.34				0.192	1.00	10	15.38	15.63	0.192	0.192	0.30	0.08	0.014
15.50	0.30				0.125	1.00	11	15.63	15.88	0.125	0.125	0.25	0.06	0.008
15.75	0.25				0.128	1.00	12	15.88	16.13	0.128	0.128	0.20	0.05	0.006
16.00	0.20				0.079	1.00	13	16.13	16.38	0.079	0.079	0.10	0.03	0.002
16.25	0.10				0.061	1.00	14	16.38	16.75	0.061	0.061	0.07	0.03	0.002
16.50	0.07				0.006	1.00	15	16.75	17.25	0.006	0.006	0.08	0.04	0.000
17.00	0.08				0.000	1.00	16	17.25	17.50	0.000	0.000	0.10	0.03	0.000
17.50	0.10				0.000	1.00	17	17.50	18.00	0.000	0.000	0.03	0.01	0.000
18.00	0.00													
Total Flow:													0.112	

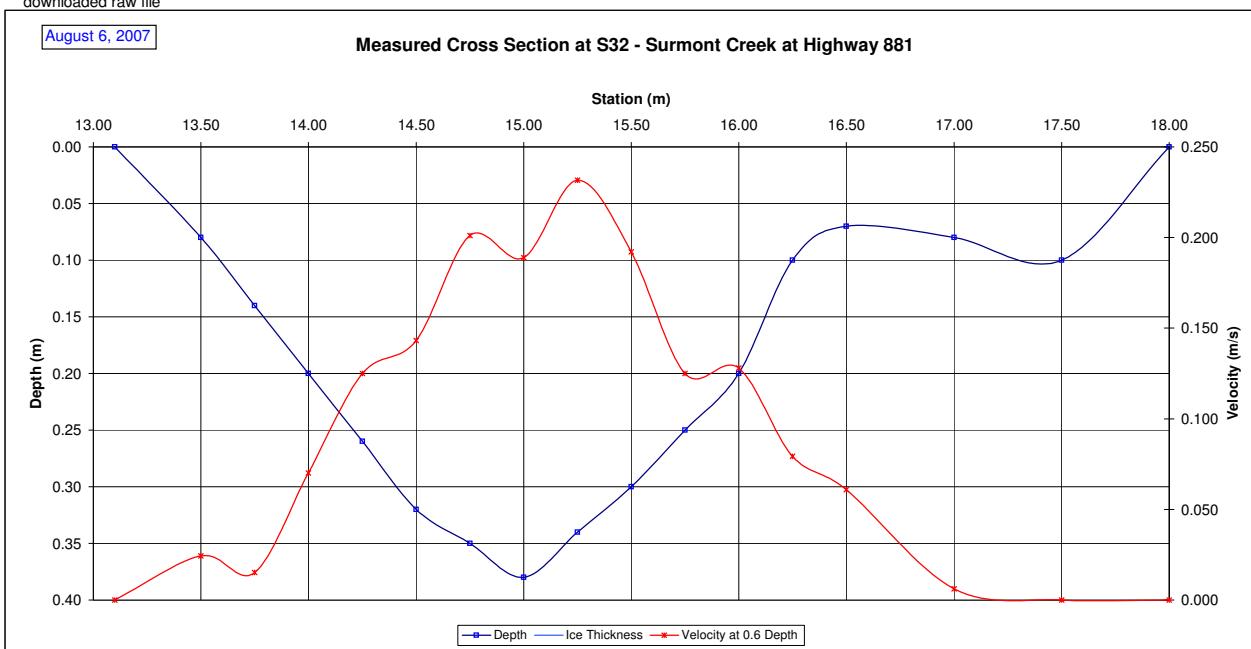
Total Flow:	0.112	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	0.84	(m <sup>2</sup> )
Top Width:	4.90	(m)
Hydraulic Depth:	0.172	(m)
Mean Velocity:	0.133	(m/s)
Froude Number	0.102	
Photographs taken looking at:		
Upstream, downstream, across		

## Notes:

TSS Sample Taken  
error code 4 read clock failed  
downloaded raw file

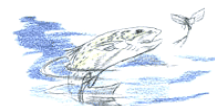
## Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power: 100%  
Datalogger Memory Used:  
Datalogger Clock: Aug 06 2007 5:23 MST  
Laptop Clock: Aug 06 2007 5:13 MDT  
Dessicant: 100%  
Datalogger:  
PT:  
Power:



# Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Surmont Creek  
Location: Surmont Creek at Highway 881  
Site Name: S32  
Coordinates & Legal:

## Personnel & Equipment

Measurement Made By: JMS/SM  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney 2000 SN#2004521

## Time of Measurement

Date of Measurement: September 19, 2007  
Start Time: 7:15 AM MDT  
End Time: 8:00 AM MDT

## Level Readings

Bench Mark Reading: nail in brick 1.938  
Water Level Reading: 2.955  
Top of Ice Level Reading:  
Transducer Reading & Est. El.: 0.706  
Other: IR by Logger 0.902

## Setup No. 1

## Setup No. 2

El: 97.942 1.85 El: 97.942  
El: 96.925 2.871 El: 96.921  
El: 96.219 0.706 El: 96.215  
El: 0.813

## Weather Conditions:

overcast -1c

## River Conditions:

higher than before

## Measurement Data

Measured Data						Calculated Data								
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)
LB	13.60	0.00			0.000	1.00	1	13.60	13.80	-0.001	-0.001	0.05	0.01	0.000
	14.00	0.18			-0.003	1.00	2	13.80	14.38	-0.003	-0.003	0.18	0.10	0.000
	14.75	0.36			0.000	1.00	3	14.38	15.13	0.000	0.000	0.36	0.27	0.000
	15.50	0.35			0.034	1.00	4	15.13	15.75	0.034	0.034	0.35	0.22	0.007
	16.00	0.36			0.064	1.00	5	15.75	16.25	0.064	0.064	0.36	0.18	0.012
	16.50	0.40			0.149	1.00	6	16.25	16.65	0.149	0.149	0.40	0.16	0.024
	16.80	0.41			0.216	1.00	7	16.65	16.95	0.216	0.216	0.41	0.12	0.027
	17.10	0.44			0.311	1.00	8	16.95	17.25	0.311	0.311	0.44	0.13	0.041
	17.40	0.53			0.369	1.00	9	17.25	17.55	0.369	0.369	0.53	0.16	0.059
	17.70	0.58			0.424	1.00	10	17.55	17.85	0.424	0.424	0.58	0.17	0.074
	18.00	0.64			0.399	1.00	11	17.85	18.10	0.399	0.399	0.64	0.16	0.064
	18.20	0.76			0.457	1.00	12	18.10	18.30	0.457	0.457	0.76	0.15	0.069
	18.40	0.77			0.463	1.00	13	18.30	18.50	0.463	0.463	0.77	0.15	0.071
	18.60	0.74			0.524	1.00	14	18.50	18.70	0.524	0.524	0.74	0.15	0.078
	18.80	0.79			0.488	1.00	15	18.70	18.90	0.488	0.488	0.79	0.16	0.077
	19.00	0.68			0.591	1.00	16	18.90	19.10	0.591	0.591	0.68	0.14	0.080
	19.20	0.50			0.539	1.00	17	19.10	19.30	0.539	0.539	0.50	0.10	0.054
	19.40	0.47			0.485	1.00	18	19.30	19.50	0.485	0.485	0.47	0.09	0.046
	19.60	0.39			0.378	1.00	19	19.50	19.70	0.378	0.378	0.39	0.08	0.029
	19.80	0.34			0.189	1.00	20	19.70	20.00	0.189	0.189	0.34	0.10	0.019
	20.20	0.21			0.189	1.00	21	20.00	20.30	0.189	0.189	0.21	0.06	0.012
RB	20.40	0.00			0.000	1.00	22	20.30	20.40	0.047	0.047	0.05	0.01	0.000
Total Flow:														0.843

Total Flow:	0.843	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	2.88	(m <sup>2</sup> )
Top Width:	6.80	(m)
Hydraulic Depth:	0.423	(m)
Mean Velocity:	0.293	(m/s)
Froude Number	0.144	

## Photographs taken looking at:

Upstream, downstream, across

## Notes:

memory was full, no data after aug 10

memory cleared and DL reset

appears beaver dam washed out

## Datalogger Notes:

Datalogger Internal Power: 100%  
Datalogger External Power: 74%  
Datalogger Memory Used: 100%  
Datalogger Clock: Sep 19, 2007 06:28 MST  
Laptop Clock: Sep 19, 2007 06:19 MST  
Dessicant: 100%

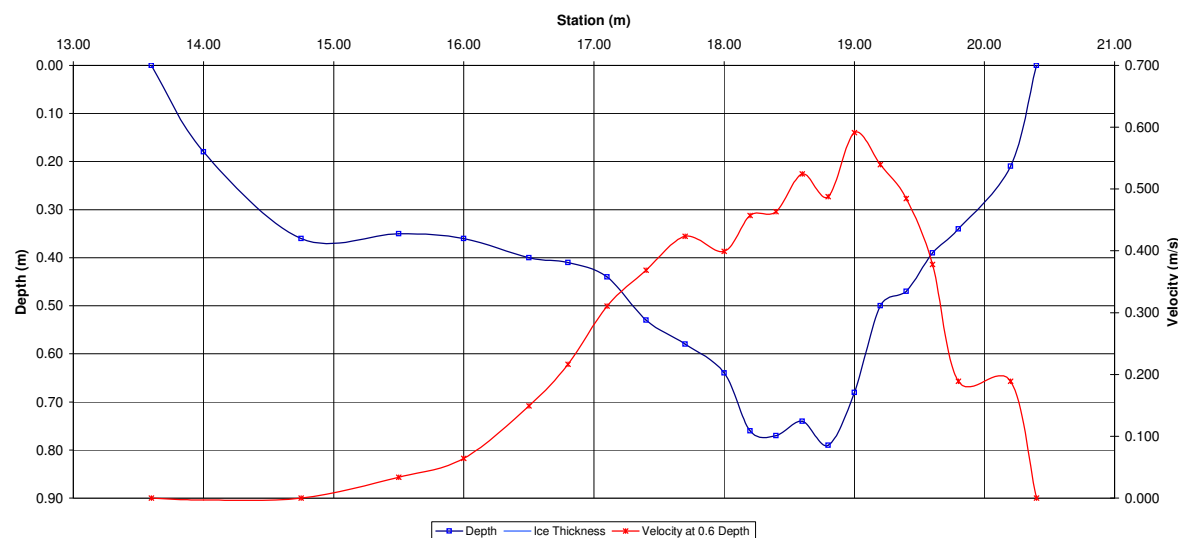
## Datalogger:

PT:

Power:

September 19, 2007

## Measured Cross Section at S32 - Surmont Creek at Highway 881



# Hydrometric Measurement / Site Visit Record

S32 - Surmont Creek at Highway 881



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Surmont Creek  
Location: Surmont Creek at Highway 881  
Site Name: S32

## Time of Measurement

Date of Measurement: October 19, 2007  
Start Time: 6:01 PM MDT  
End Time: 6:45 PM MDT

## Weather Conditions:

overcast, +5c, calm

## River Conditions:

low stage

## Personnel & Equipment

Measurement Made By: SM/FF  
Data Entry By: SM  
Meter Type and No.: Marsh McBirney 2000 SN#2004521

## Level Readings

Bench Mark Reading: nail in brick 1.799 El: 97.942  
Water Level Reading: 3.049 El: 96.692  
Top of Ice Level Reading: El: 96.690  
Transducer Reading & Est. El.: 0.478 El: 96.215  
Other: IR by Logger 0.760 El: 98.981

## Setup No. 1

## Setup No. 2

## Measurement Data

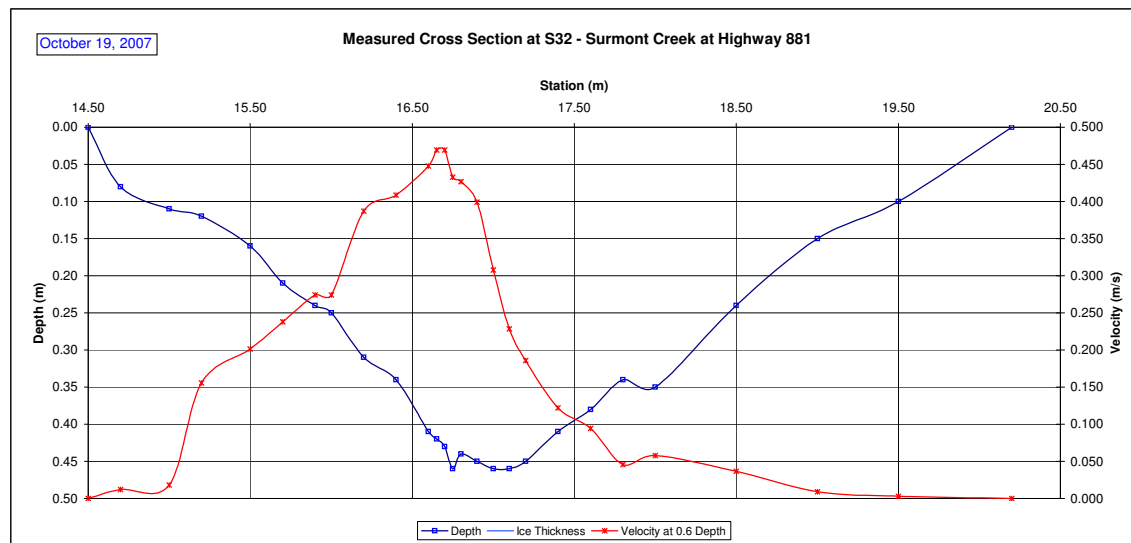
Measured Data						Calculated Data									
		Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
Station (m)	Depth (m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
14.50	0.00				0.000	1.00	1	14.50	14.60	0.003	0.003	0.02	0.00	0.000	0%
14.70	0.08				0.012	1.00	2	14.60	14.85	0.012	0.012	0.08	0.02	0.000	0%
15.00	0.11				0.018	1.00	3	14.85	15.10	0.018	0.018	0.11	0.03	0.001	0%
15.20	0.12				0.155	1.00	4	15.10	15.35	0.155	0.155	0.12	0.03	0.005	2%
15.50	0.16				0.201	1.00	5	15.35	15.60	0.201	0.201	0.16	0.04	0.008	3%
15.70	0.21				0.238	1.00	6	15.60	15.80	0.238	0.238	0.21	0.04	0.010	4%
15.90	0.24				0.274	1.00	7	15.80	15.95	0.274	0.274	0.24	0.04	0.010	4%
16.00	0.25				0.274	1.00	8	15.95	16.10	0.274	0.274	0.25	0.04	0.010	4%
16.20	0.31				0.387	1.00	9	16.10	16.30	0.387	0.387	0.31	0.06	0.024	10%
16.40	0.34				0.408	1.00	10	16.30	16.50	0.408	0.408	0.34	0.07	0.028	11%
16.60	0.41				0.448	1.00	11	16.50	16.63	0.448	0.448	0.41	0.05	0.023	9%
16.65	0.42				0.469	1.00	12	16.63	16.68	0.469	0.469	0.42	0.02	0.010	4%
16.70	0.43				0.469	1.00	13	16.68	16.73	0.469	0.469	0.43	0.02	0.010	4%
16.75	0.46				0.433	1.00	14	16.73	16.78	0.433	0.433	0.46	0.02	0.010	4%
16.80	0.44				0.427	1.00	15	16.78	16.85	0.427	0.427	0.44	0.03	0.014	6%
16.90	0.45				0.399	1.00	16	16.85	16.95	0.399	0.399	0.45	0.04	0.018	7%
17.00	0.46				0.308	1.00	17	16.95	17.05	0.308	0.308	0.46	0.05	0.014	6%
17.10	0.46				0.229	1.00	18	17.05	17.15	0.229	0.229	0.46	0.05	0.011	4%
17.20	0.45				0.186	1.00	19	17.15	17.30	0.186	0.186	0.45	0.07	0.013	5%
17.40	0.41				0.122	1.00	20	17.30	17.50	0.122	0.122	0.41	0.08	0.010	4%
17.60	0.38				0.094	1.00	21	17.50	17.70	0.094	0.094	0.38	0.08	0.007	3%
17.80	0.34				0.046	1.00	22	17.70	17.90	0.046	0.046	0.34	0.07	0.003	1%
18.00	0.35				0.058	1.00	23	17.90	18.25	0.058	0.058	0.35	0.12	0.007	3%
18.50	0.24				0.037	1.00	24	18.25	18.75	0.037	0.037	0.24	0.12	0.004	2%
19.00	0.15				0.009	1.00	25	18.75	19.25	0.009	0.009	0.15	0.08	0.001	0%
19.50	0.10				0.003	1.00	26	19.25	19.85	0.003	0.003	0.10	0.06	0.000	0%
20.20	0.00				0.000	1.00	27	19.85	20.20	0.001	0.001	0.03	0.01	0.000	0%
															100%

Total Flow:	0.2502	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	1.33	(m <sup>2</sup> )
Top Width:	5.70	(m)
Hydraulic Depth:	0.234	(m)
Mean Velocity:	0.188	(m/s)
Froude Number	0.124	
Photographs taken looking at:		
Upstream, downstream, across		

## Notes:

Equipment removed for winter. Software did not prompt for format file. Format file translation of voltage confirmed manually. \*software appears to have used S14A's .fmt file  
Debris present within stream from apparent washed out beaver dam. May need to relocate station next year.

Datalogger Notes:		
Datalogger Internal Power:	100%	11.34V
Datalogger External Power:	73%	11.3
Datalogger Memory Used:	73%	
Datalogger Clock:	Oct 19, 2007 16:58	MST
Laptop Clock:	Oct 19, 2007 16:49	MST
Dessicant:	100%	
Datalogger:	206095	
PT:	604002	
Power:		





# Hydrometric Measurement / Site Visit Record

S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Aurora/Albian Boundary  
Site Name: S33  
Coordinates & Legal: 6350204 N, 474876 E SE-5-96-5-W4

## Time of Measurement

Date of Measurement: January 13, 2007  
Start Time: 1:08 PM MST  
End Time: 1:30 PM MST

## Weather Conditions:

-29 C, Clear, light wind

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JS/FF/JE  
Data Entry By: FF  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: rebar on § 0.828  
Water Level Reading: 2.774  
Top of Ice Level Reading: 2.727  
Transducer Reading & Est. El.: 1.161

## Setup No. 1

El: 281.740 0.811  
El: 279.794 2.750  
El: 270.6 2.706  
El: 278.633 1.161  
El:

## Setup No. 2

El: 281.740  
El: 279.801 279.798  
El:  
El: 278.640 278.636  
El:

## Average

LB

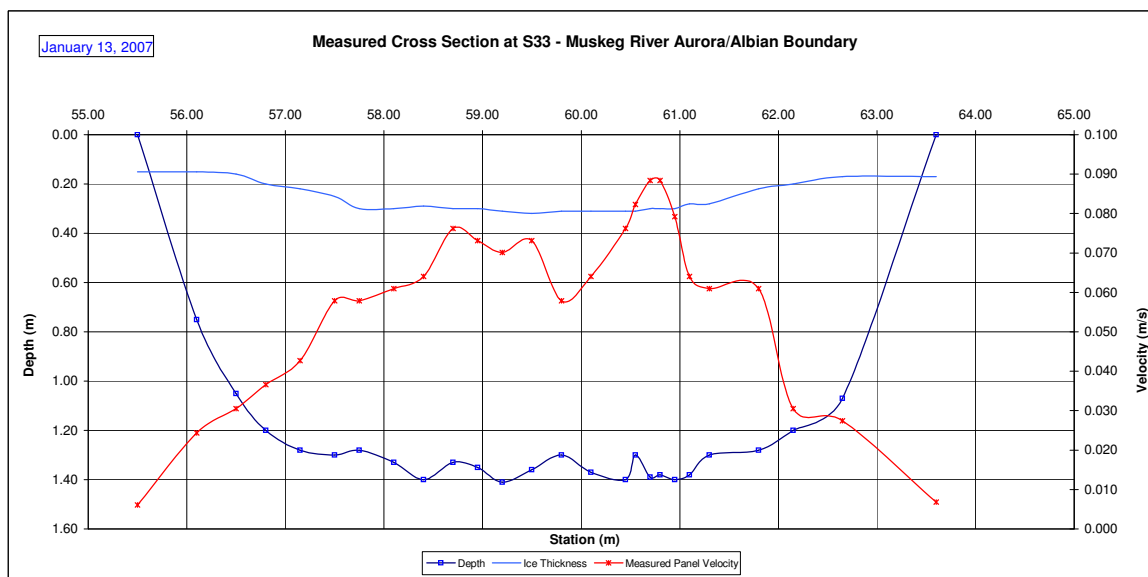
RB

Measured Data							Measurement Data								Calculated Data					Percentage of Total
Station (m)	Depth (m)	Ice Thickness (m)	Velocity at 0.2 Depth (m/s)	Velocity at 0.8 Depth (m/s)	Velocity at 0.6 Depth (m/s)	Velocity Correction Factor	Panel No.	Panel Starts at Station (m)	Panel Ends at Station (m)	Measured Panel Velocity (m/s)	Effective Average Panel Velocity (m/s)	Panel Effective Depth (m)	Panel Area (m²)	Panel Discharge (m³/s)						
55.50	0.00	0.15			0.00	0.90	1	55.50	55.80	0.006	0.005	0.15	0.04	0.000	0%					
56.10	0.75	0.15			0.02	0.90	2	55.80	56.30	0.024	0.022	0.60	0.30	0.007	2%					
56.50	1.05	0.16			0.03	0.90	3	56.30	56.65	0.030	0.027	0.89	0.31	0.009	2%					
56.80	1.20	0.20			0.04	0.90	4	56.65	56.98	0.037	0.033	1.00	0.32	0.011	3%					
57.15	1.28	0.22			0.04	0.90	5	56.98	57.33	0.043	0.038	1.06	0.37	0.014	4%					
57.50	1.30	0.25			0.06	0.90	6	57.33	57.63	0.058	0.052	1.05	0.31	0.016	4%					
57.75	1.28	0.30			0.06	0.90	7	57.63	57.93	0.058	0.052	0.98	0.29	0.015	4%					
58.10	1.33	0.30			0.06	0.90	8	57.93	58.25	0.061	0.055	1.03	0.33	0.018	5%					
58.40	1.40	0.29			0.06	0.90	9	58.25	58.55	0.064	0.058	1.11	0.33	0.019	5%					
58.70	1.33	0.30			0.08	0.90	10	58.55	58.83	0.076	0.069	1.03	0.28	0.019	5%					
58.95	1.35	0.30			0.07	0.90	11	58.83	59.08	0.073	0.066	1.05	0.26	0.017	4%					
59.20	1.41	0.31			0.07	0.90	12	59.08	59.35	0.070	0.063	1.10	0.30	0.019	5%					
59.50	1.36	0.32			0.07	0.90	13	59.35	59.65	0.073	0.066	1.04	0.31	0.021	5%					
59.80	1.30	0.31			0.06	0.90	14	59.65	59.95	0.058	0.052	0.99	0.30	0.015	4%					
60.10	1.37	0.31			0.06	0.90	15	59.95	60.28	0.064	0.058	1.06	0.34	0.020	5%					
60.45	1.40	0.31			0.08	0.90	16	60.28	60.50	0.076	0.069	1.09	0.25	0.017	4%					
60.55	1.30	0.31			0.08	0.90	17	60.50	60.63	0.082	0.074	0.99	0.12	0.009	2%					
60.70	1.39	0.30			0.09	0.90	18	60.63	60.75	0.088	0.080	1.09	0.14	0.011	3%					
60.80	1.38	0.30			0.09	0.90	19	60.75	60.88	0.088	0.080	1.08	0.14	0.011	3%					
60.95	1.40	0.30			0.08	0.90	20	60.88	61.46	0.079	0.071	1.10	0.64	0.046	12%					
61.10	1.38	0.28			0.06	0.90	21	61.46	61.80	0.064	0.058	1.10	0.37	0.022	5%					
61.30	1.30	0.28			0.06	0.90	22	61.80	62.30	0.061	0.055	1.02	0.51	0.028	7%					
61.80	1.28	0.22			0.06	0.90	23	62.30	62.55	0.061	0.055	1.06	0.27	0.015	4%					
62.15	1.20	0.20			0.03	0.90	24	62.55	62.80	0.030	0.027	1.00	0.25	0.007	2%					
62.65	1.07	0.17			0.03	0.90	25	62.80	63.13	0.027	0.025	0.90	0.29	0.007	2%					
63.60	0.00	0.17			0.00	0.90	26	63.13	63.60	0.007	0.006	0.23	0.11	0.001	0%					

Total Flow: 0.394

Total Flow:	0.394	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	7.51	(m <sup>2</sup> )
Top Width:	8.10	(m)
Hydraulic Depth:	0.928	(m)
Mean Velocity:	0.052	(m/s)
Froude Number	0.017	
Photographs taken looking at:		
U/S, D/S, across		
Notes:		

Datalogger Notes: Database #290	
Datalogger Internal Power:	4.67V
Datalogger External Power:	15.45V
Datalogger Memory Used:	15%
Datalogger Clock:	Jan 13, 2007 12:53 MST
Laptop Clock:	Jan 13, 2007 12:52 MST
Dessicant:	100% Good
Datalogger:	105010290
PT:	304988
Power:	



# Hydrometric Measurement / Site Visit Record

S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Aurora/Albian Boundary  
Site Name: S33  
Coordinates & Legal: 6350204 N, 474876 E SE-5-96-5-W4

## Time of Measurement

Date of Measurement: February 10, 2007  
Start Time: 3:45 PM MST  
End Time: 4:00 PM MST

## Weather Conditions:

-25 C, overcast, calm

## River Conditions:

Complete ice cover

## Personnel & Equipment

Measurement Made By: JM, PM  
Data Entry By: JM  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: rebar on 1.008  
Water Level Reading: 3.000  
Top of Ice Level Reading: 2.928  
Transducer Reading & Est. El.: 1.116  
Other:

## Setup No. 1

El: 281.740 1.018  
El: 279.748 3.006  
El: 279.752 2.936  
El: 278.632 1.116  
El:

## Setup No. 2

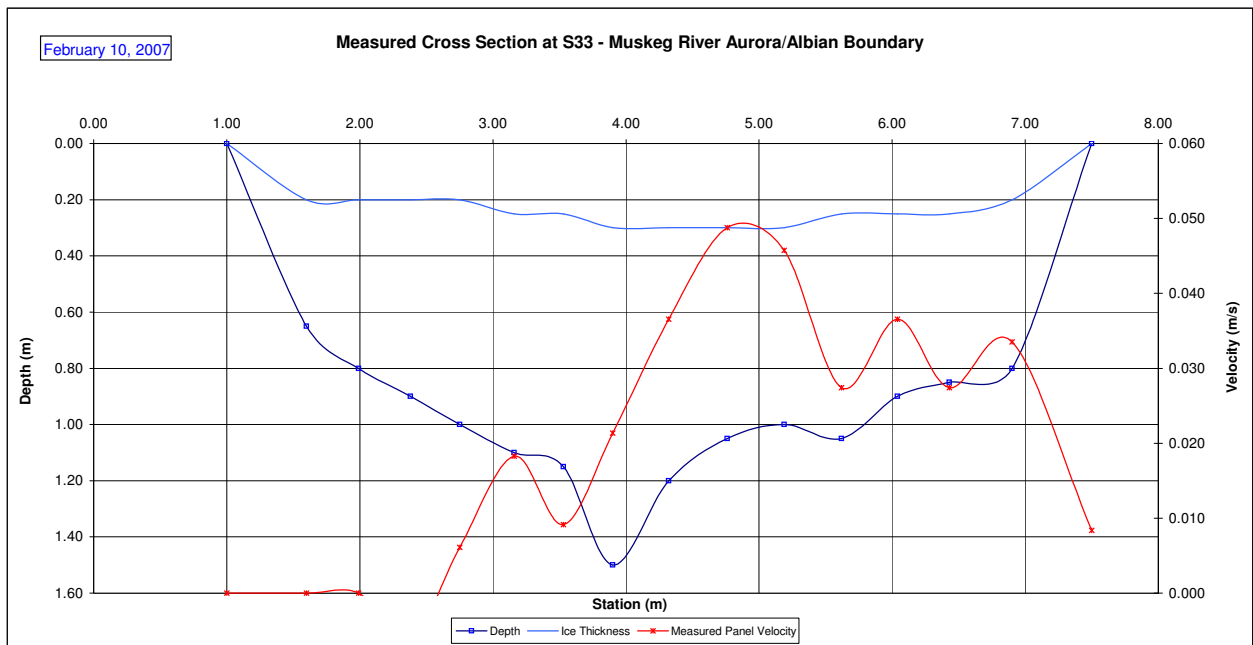
El: 281.740  
El: 279.752 279.750  
El:  
El: 278.636 278.634  
El:

## Average

Measurement Data																
Measured Data						Calculated Data										
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)		
1.00	0.00	0.00			0.00	0.90	1	1.00	1.30	0.000	0.000	0.11	0.03	0.000	0%	
1.60	0.65	0.20			0.00	0.90	2	1.30	1.80	0.000	0.000	0.45	0.22	0.000	0%	
1.99	0.80	0.20			0.00	0.90	3	1.80	2.19	0.000	0.000	0.60	0.23	0.000	0%	
2.38	0.90	0.20			-0.01	0.90	4	2.19	2.57	-0.006	-0.005	0.70	0.27	-0.001	-2%	
2.75	1.00	0.20			0.01	0.90	5	2.57	2.96	0.006	0.005	0.80	0.31	0.002	2%	
3.16	1.10	0.25			0.02	0.90	6	2.96	3.35	0.018	0.016	0.85	0.33	0.005	6%	
3.53	1.15	0.25			0.01	0.90	7	3.35	3.72	0.009	0.008	0.90	0.33	0.003	3%	
3.90	1.50	0.30			0.02	0.90	8	3.72	4.11	0.021	0.019	1.20	0.47	0.009	10%	
4.32	1.20	0.30			0.04	0.90	9	4.11	4.54	0.037	0.033	0.90	0.39	0.013	14%	
4.76	1.05	0.30			0.05	0.90	10	4.54	4.98	0.049	0.044	0.75	0.33	0.014	16%	
5.19	1.00	0.30			0.05	0.90	11	4.98	5.41	0.046	0.041	0.70	0.30	0.012	14%	
5.62	1.05	0.25			0.03	0.90	12	5.41	5.83	0.027	0.025	0.80	0.34	0.008	9%	
6.04	0.90	0.25			0.04	0.90	13	5.83	6.24	0.037	0.033	0.65	0.26	0.009	10%	
6.43	0.85	0.25			0.03	0.90	14	6.24	6.67	0.027	0.025	0.60	0.26	0.006	7%	
6.90	0.80	0.20			0.03	0.90	15	6.67	7.20	0.034	0.030	0.60	0.32	0.010	11%	
7.50	0.00	0.00			0.00	0.90	16	7.20	7.50	0.008	0.008	0.15	0.05	0.000	0%	

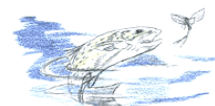
Total Flow:	0.090	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	4.45	(m <sup>2</sup> )
Top Width:	6.50	(m)
Hydraulic Depth:	0.684	(m)
Mean Velocity:	0.020	(m/s)
Froude Number	0.008	
Photographs taken looking at:		
U/S, D/S, across		
Notes:		

Datalogger Notes:	Database #290
Datalogger Internal Power:	4.67V
Datalogger External Power:	15.45V
Datalogger Memory Used:	15%
Datalogger Clock:	Jan 13, 2007 12:53 MST
Laptop Clock:	Jan 13, 2007 12:52 MST
Dessicant:	100% Good
Datalogger:	105010290
PT:	304988
Power:	



# Hydrometric Measurement / Site Visit Record

S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Aurora/Albian Boundary  
Site Name: S33  
Coordinates & Legal: 6350204 N, 474876 E SE-5-96-5-W4

## Personnel & Equipment

Measurement Made By: JS/FF  
Data Entry By: FF  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Time of Measurement

Date of Measurement: March 7, 2007  
Start Time: 12:25 PM MST  
End Time: 1:39 PM MST

## Level Readings

Bench Mark Reading: rebar on 0.817  
Water Level Reading: 2.808  
Top of Ice Level Reading: 2.615  
Transducer Reading & Est. El.: 1.122  
Other:

## Setup No. 1

El: 281.740 0.776  
El: 279.749 2.768  
El: 278.627 1.122

## Setup No. 2

El: 281.740  
El: 279.748 279.749  
El: 278.626 278.627

Weather Conditions: -15 C, overcast, light wind

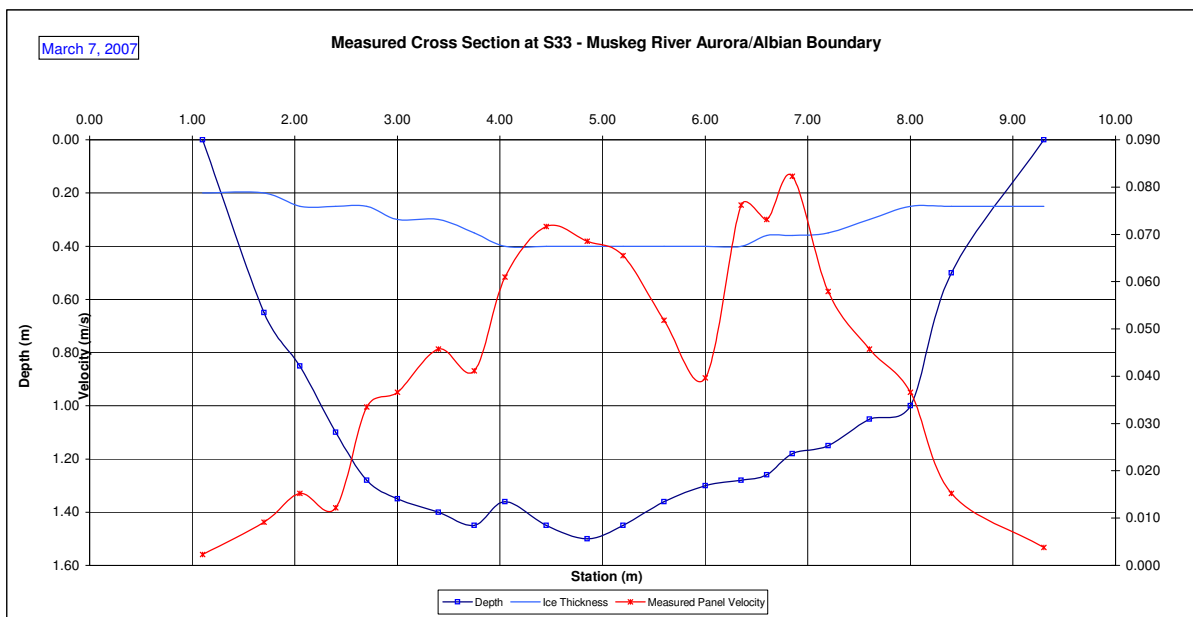
River Conditions: Complete ice cover

## Measurement Data

	Measured Data						Calculated Data									Percentage of Total
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
LB																
	1.10	0.00	0.20			0.00	0.90	1	1.10	1.40	0.002	0.002	0.11	0.03	0.000	0%
	1.70	0.65	0.20			0.01	0.90	2	1.40	1.88	0.009	0.008	0.45	0.21	0.002	1%
	2.05	0.85	0.25			0.02	0.90	3	1.88	2.23	0.015	0.014	0.60	0.21	0.003	1%
	2.40	1.10	0.25			0.01	0.90	4	2.23	2.55	0.012	0.011	0.85	0.28	0.003	1%
	2.70	1.28	0.25			0.03	0.90	5	2.55	2.85	0.034	0.030	1.03	0.31	0.009	3%
	3.00	1.35	0.30			0.04	0.90	6	2.85	3.20	0.037	0.033	1.05	0.37	0.012	4%
	3.40	1.40	0.30			0.05	0.90	7	3.20	3.58	0.046	0.041	1.10	0.41	0.017	6%
	3.75	1.45	0.35	0.05	0.03		0.90	8	3.58	3.90	0.041	0.037	1.10	0.36	0.013	5%
	4.05	1.36	0.40	0.06	0.06		0.90	9	3.90	4.25	0.061	0.055	0.96	0.34	0.018	7%
	4.45	1.45	0.40	0.07	0.07		0.90	10	4.25	4.65	0.072	0.064	1.05	0.42	0.027	10%
	4.85	1.50	0.40	0.07	0.07		0.90	11	4.65	5.03	0.069	0.062	1.10	0.41	0.025	9%
	5.20	1.45	0.40	0.07	0.06		0.90	12	5.03	5.40	0.066	0.059	1.05	0.39	0.023	8%
	5.60	1.36	0.40			0.05	0.90	13	5.40	5.80	0.052	0.047	0.96	0.38	0.018	7%
	6.00	1.30	0.40			0.04	0.90	14	5.80	6.18	0.040	0.036	0.90	0.34	0.012	4%
	6.35	1.28	0.40			0.08	0.90	15	6.18	6.48	0.076	0.069	0.88	0.26	0.018	7%
	6.60	1.26	0.36			0.07	0.90	16	6.48	6.73	0.073	0.066	0.90	0.23	0.015	5%
	6.85	1.18	0.36			0.08	0.90	17	6.73	7.03	0.082	0.074	0.82	0.25	0.018	7%
	7.20	1.15	0.35			0.06	0.90	18	7.03	7.40	0.058	0.052	0.80	0.30	0.016	6%
	7.60	1.05	0.30			0.05	0.90	19	7.40	7.80	0.046	0.041	0.75	0.30	0.012	4%
	8.00	1.00	0.25			0.04	0.90	20	7.80	8.20	0.037	0.033	0.75	0.30	0.010	4%
	8.40	0.50	0.25			0.02	0.90	21	8.20	8.85	0.015	0.014	0.25	0.16	0.002	1%
9.30	0.00	0.25			0.00	0.90	22	8.85	9.30	0.004	0.003	0.06	0.03	0.000	0%	
RB																
Total Flow:																0.275

Total Flow:	0.275	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	6.29	(m <sup>2</sup> )
Top Width:	8.20	(m)
Hydraulic Depth:	0.767	(m)
Mean Velocity:	0.044	(m/s)
Froude Number	0.016	
Photographs taken looking at: U/S, D/S, across		
Notes:		

Datalogger Notes: Database #290	
Datalogger Internal Power:	4.74V
Datalogger External Power:	14.81V
Datalogger Memory Used:	19%
Datalogger Clock:	Mar 07, 2007 12:06 MST
Laptop Clock:	Mar 07, 2007 12:10 MST
Dessicant:	100% Good
Datalogger:	105010290
PT:	304988
Power:	



# Hydrometric Measurement / Site Visit Record

S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Aurora/Albian Boundary  
Site Name: S33  
Coordinates & Legal: 6350204 N, 474876 E SE-5-96-5-W4

## Time of Measurement

Date of Measurement: April 11, 2007  
Start Time: MST  
End Time: MST

## Weather Conditions:

0°C, overcast, raining

## River Conditions:

open sections, water flowing on top of ice

## Personnel & Equipment

Measurement Made By: JE, JM, SB  
Data Entry By:  
Meter Type and No.: Marsh McBirney Flo-Mate 2000  
s/n 2004521

## Level Readings

	Setup No. 1		Setup No. 2	Average	
Bench Mark Reading: rebar on c	0.570	El: 281.740	0.455	El: 281.740	
Water Level Reading:	2.389	El: 279.921	2.272	El: 279.923	279.922
Top of Ice Level Reading:	2.425	El:	2.305	El:	
Transducer Reading & Est. El.:		El: 279.921	0.000	El: 279.923	279.922
Other:		El:		El:	

## Notes:

Datalogger Notes: Database #290  
Datalogger Internal Power:  
Datalogger External Power:  
Datalogger Memory Used:  
Datalogger Clock: MST  
Laptop Clock: MST  
Dessicant:  
Datalogger: 105010290  
PT: 304988  
Power:

# Hydrometric Measurement / Site Visit Record

S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Aurora/Albian Boundary  
Site Name: S33

## Time of Measurement

Date of Measurement: April 25, 2007  
Start Time: 11:14 AM MDT  
End Time: 12:05 PM MDT

## Weather Conditions:

+15°C, Cloudy, windy - 15km/hr

## River Conditions:

Open

## Personnel & Equipment

Measurement Made By: JS,JE  
Data Entry By: JE  
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Rebar in ABS c  
Water Level Reading: 1.507  
Top of Ice Level Reading:  
Transducer Reading & Est. El.: 2.201  
Other: T Post on RB

## Setup No. 1

El: 281.740  
El: 280.814  
El:  
El: 278.613  
El:

## Setup No. 2

El: 281.740  
El: 280.818  
El:  
El: 278.617  
El:

## Average

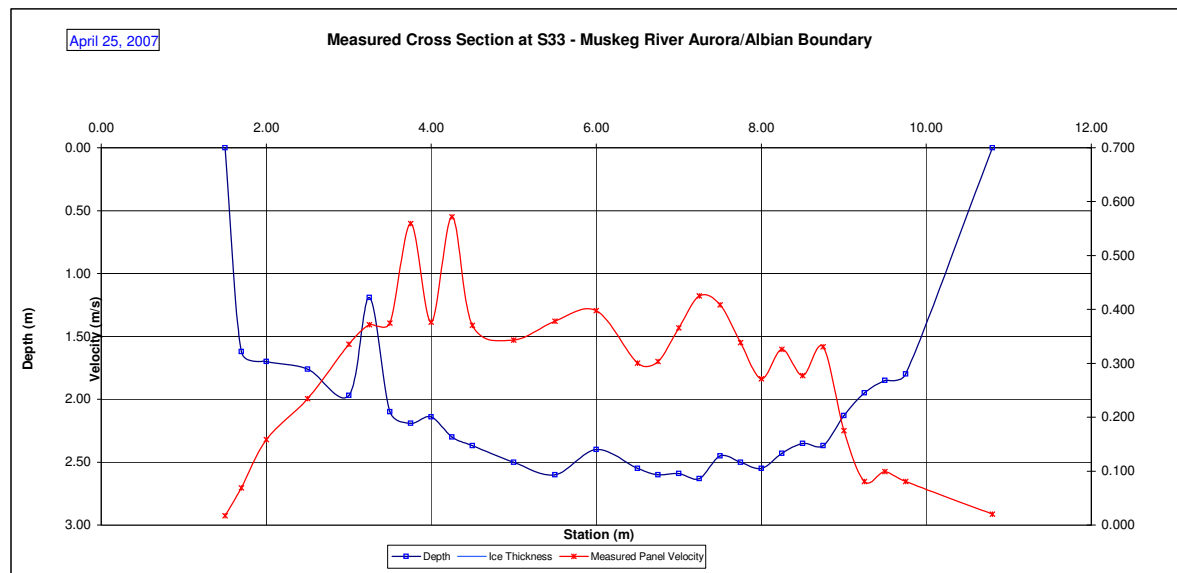
280.816  
278.615

Measured Data							Measurement Data									Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
1.50	0.00				0.000	1.00	1	1.50	1.60	0.017	0.017	0.41	0.04	0.001	0%	
1.70	1.62		0.082	0.055		1.00	2	1.60	1.85	0.069	0.069	1.62	0.41	0.028	0%	
2.00	1.70		0.250	0.067		1.00	3	1.85	2.25	0.158	0.158	1.70	0.68	0.108	2%	
2.50	1.76		0.317	0.152		1.00	4	2.25	2.75	0.235	0.235	1.76	0.88	0.207	3%	
3.00	1.97		0.369	0.302		1.00	5	2.75	3.13	0.335	0.335	1.97	0.74	0.248	4%	
3.25	1.19		0.363	0.381		1.00	6	3.13	3.38	0.372	0.372	1.19	0.30	0.111	2%	
3.50	2.10		0.482	0.268		1.00	7	3.38	3.63	0.375	0.375	2.10	0.53	0.197	3%	
3.75	2.19		0.668	0.451		1.00	8	3.63	3.88	0.559	0.559	2.19	0.55	0.306	5%	
4.00	2.14		0.393	0.360		1.00	9	3.88	4.13	0.376	0.376	2.14	0.54	0.201	3%	
4.25	2.30		0.701	0.442		1.00	10	4.13	4.38	0.572	0.572	2.30	0.58	0.329	6%	
4.50	2.37		0.430	0.311		1.00	11	4.38	4.75	0.370	0.370	2.37	0.89	0.329	6%	
5.00	2.50		0.357	0.329		1.00	12	4.75	5.25	0.343	0.343	2.50	1.25	0.429	7%	
5.50	2.60		0.418	0.338		1.00	13	5.25	5.75	0.378	0.378	2.60	1.30	0.491	8%	
6.00	2.40		0.442	0.354		1.00	14	5.75	6.25	0.398	0.398	2.40	1.20	0.477	8%	
6.50	2.55		0.280	0.320		1.00	15	6.25	6.63	0.300	0.300	2.55	0.96	0.287	5%	
6.75	2.60		0.326	0.280		1.00	16	6.63	6.88	0.303	0.303	2.60	0.65	0.197	3%	
7.00	2.59		0.415	0.317		1.00	17	6.88	7.13	0.366	0.366	2.59	0.65	0.237	4%	
7.25	2.63		0.561	0.290		1.00	18	7.13	7.38	0.425	0.425	2.63	0.66	0.280	5%	
7.50	2.45		0.530	0.287		1.00	19	7.38	7.63	0.408	0.408	2.45	0.61	0.250	4%	
7.75	2.50		0.415	0.262		1.00	20	7.63	7.88	0.338	0.338	2.50	0.63	0.211	4%	
8.00	2.55		0.335	0.207		1.00	21	7.88	8.13	0.271	0.271	2.55	0.64	0.173	3%	
8.25	2.43		0.381	0.271		1.00	22	8.13	8.38	0.326	0.326	2.43	0.61	0.198	3%	
8.50	2.35		0.357	0.198		1.00	23	8.38	8.63	0.277	0.277	2.35	0.59	0.163	3%	
8.75	2.37		0.421	0.241		1.00	24	8.63	8.88	0.331	0.331	2.37	0.59	0.196	3%	
9.00	2.13		0.259	0.091		1.00	25	8.88	9.13	0.175	0.175	2.13	0.53	0.093	2%	
9.25	1.95		0.110	0.052		1.00	26	9.13	9.38	0.081	0.081	1.95	0.49	0.039	1%	
9.50	1.85		0.098	0.101		1.00	27	9.38	9.63	0.099	0.099	1.85	0.46	0.046	1%	
9.75	1.80		0.104	0.058		1.00	28	9.63	10.28	0.081	0.081	1.80	1.17	0.095	2%	
10.80	0.00				0.000	1.00	29	10.28	10.80	0.020	0.020	0.45	0.24	0.005	0%	

Total Flow: 5.930

Total Flow:	5.931	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	19.29	(m <sup>2</sup> )
Top Width:	9.10	(m)
Hydraulic Depth:	2.119	(m)
Mean Velocity:	0.308	(m/s)
Froude Number	0.067	
Photographs taken looking at:	US, DS, across	
Notes:		

Datalogger Notes:	Database #290
Datalogger Internal Power:	4.74V
Datalogger External Power:	14.27V
Datalogger Memory Used:	23%
Datalogger Clock:	Apr 25, 2007 09:16 MST
Laptop Clock:	Apr 25, 2007 09:16 MST
Dessicant:	2% used, Not changed
Datalogger:	105010290 Optimum DD128
PT:	304988 Keller
Power:	12V 20Ahr & 20 W Solar Panel



Hydrometric Measurement / Site Visit Record
S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Aurora/Albian Boundary
Site Name: S33

Time of Measurement

Date of Measurement: June 14, 2007
Start Time: 10:30 AM MDT
End Time: 11:15 PM MDT

Weather Conditions:

+15°C, Cloudy, windy - 15km/hr

River Conditions:

Open

Personnel & Equipment

Measurement Made By: JS,JE
Data Entry By: JE
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rebar in ABS o 0.695
Water Level Reading: 2.388
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.408
Other: T Post on RB

Setup No. 1

El: 281.740
El: 280.047
El:
El: 278.639
El:

Setup No. 2

El: 281.740
El: 280.008
El:
El: 278.600
El:

Average

280.028
278.620

Table with 17 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Rows include data for RB and LB stations.

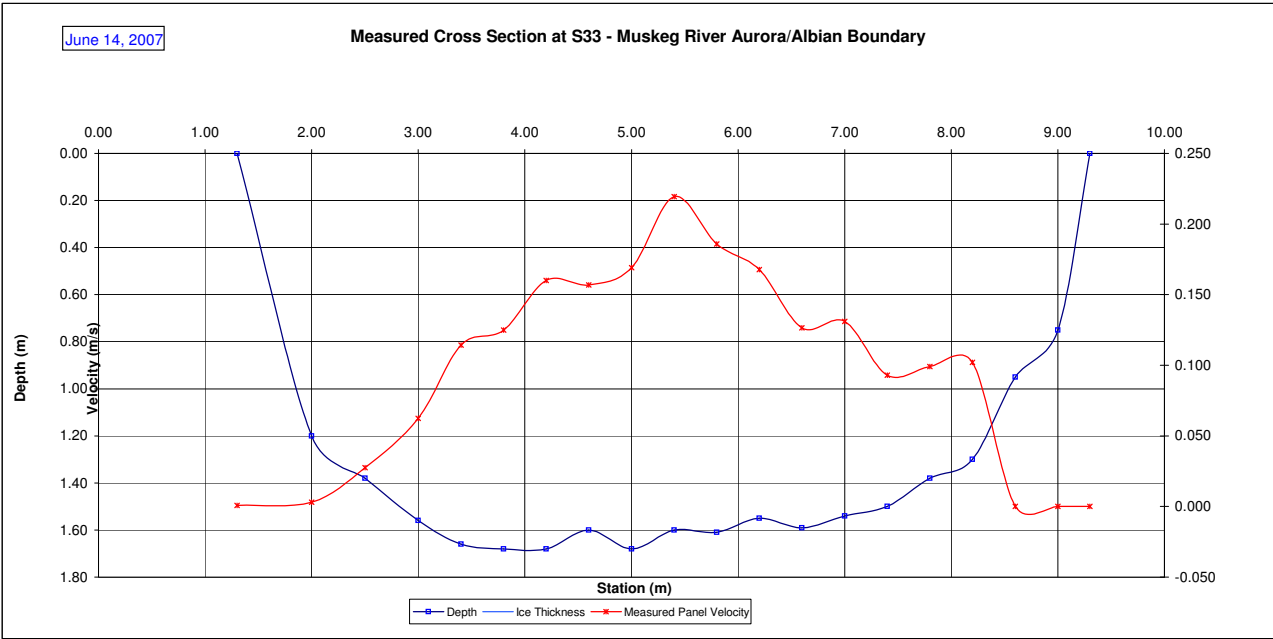
Total Flow: 1.235

Summary table with 4 columns: Parameter, Value, Unit. Rows include Total Flow, Pervived Measurement Quality, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number, and Photographs taken looking at.

Notes:

Data Looks Good

Datalogger Notes table with 2 columns: Note, Value. Rows include Datalogger Internal Power, Datalogger External Power, Datalogger Memory Used, Datalogger Clock, Laptop Clock, Dessicant, Datalogger, PT, and Power.



# Hydrometric Measurement / Site Visit Record

S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Aurora/Albian Boundary  
Site Name: S33  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: July 6, 2007  
Start Time: 10:30 AM MDT  
End Time: MDT

## Weather Conditions:

+15°C, Cloudy, windy - 15km/hr

## River Conditions:

Open

## Personnel & Equipment

Measurement Made By: JM  
Data Entry By: JM  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Rebar in ABS o 0.596  
Water Level Reading: 2.528  
Top of Ice Level Reading:  
Transducer Reading & Est. El.: 1.195  
Other: T Post on RB

## Setup No. 1

El: 281.740  
El: 279.808  
El:  
El: 278.613  
El:

## Setup No. 2

El: 0.63  
El: 2.565  
El:  
El: 1.195  
El:

## Average

281.740  
279.805  
279.807  
278.610  
278.612

Datalogger Notes:	Database #290
Datalogger Internal Power:	4.74V
Datalogger External Power:	13.94V
Datalogger Memory Used:	27%
Datalogger Clock:	08:38 MST
Laptop Clock:	08:44 MST
Dessicant:	Good
Datalogger:	1.1E+08 Optimum DD128
PT:	304988 Keller
Power:	12V 20Ahr & 20 W Solar Panel

## Notes:

Data Looks Good HCL

# Hydrometric Measurement / Site Visit Record

S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Aurora/Albian Boundary  
Site Name: S33  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: August 3, 2007  
Start Time: 10:30 AM MDT  
End Time: MDT

## Weather Conditions:

+15°C, Cloudy, windy - 15km/hr  
River Conditions: Open

## Personnel & Equipment

Measurement Made By: SM  
Data Entry By: SM  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Rebar in ABS o 0.769  
Water Level Reading: 2.786  
Top of Ice Level Reading:  
Transducer Reading & Est. El.: 1.107  
Other: T Post on RB

## Setup No. 1

El: 281.740  
El: 279.723  
El:  
El: 278.616  
El:

## Setup No. 2

El: 281.740  
El: 279.716  
El:  
El: 278.609  
El:

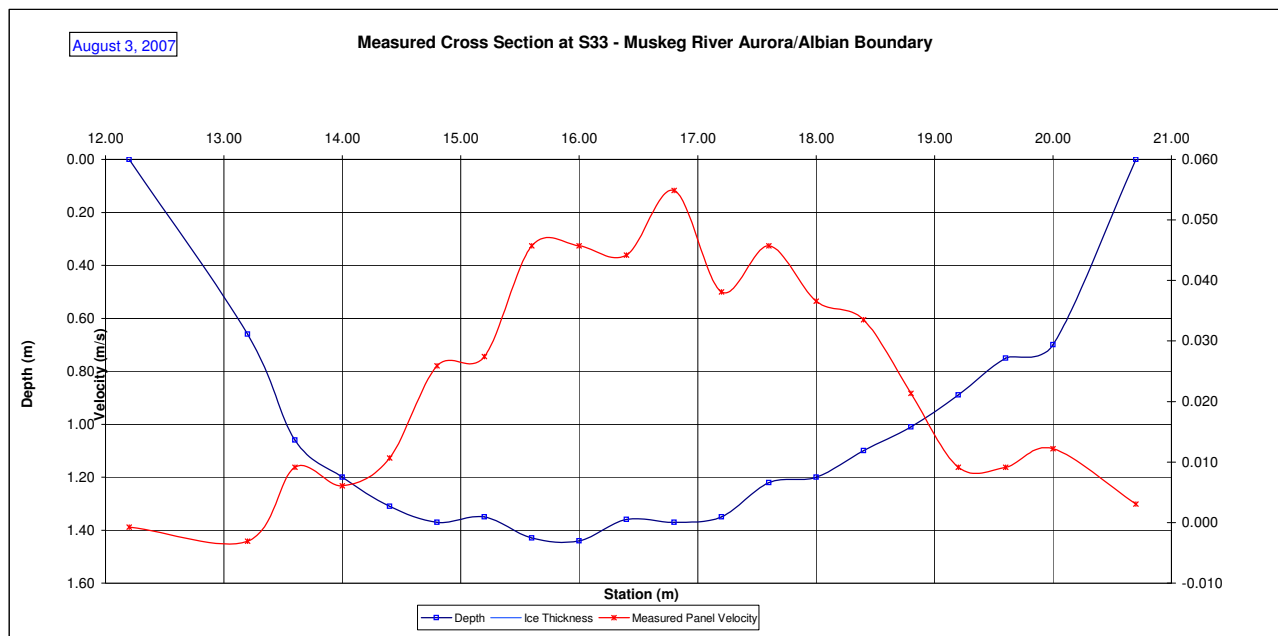
## Average

279.720  
278.613

Measured Data						Measurement Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)	
20.70	0.00				0.000	1.00	1	20.70	20.35	0.003	0.003	0.18	0.06	0.000	0%
20.00	0.70				0.012	1.00	2	20.35	19.80	0.012	0.012	0.70	0.39	0.005	2%
19.60	0.75				0.009	1.00	3	19.80	19.40	0.009	0.009	0.75	0.30	0.003	1%
19.20	0.89				0.009	1.00	4	19.40	19.00	0.009	0.009	0.89	0.36	0.003	1%
18.80	1.01				0.021	1.00	5	19.00	18.60	0.021	0.021	1.01	0.40	0.009	4%
18.40	1.10		0.034	0.034		1.00	6	18.60	18.20	0.034	0.034	1.10	0.44	0.015	6%
18.00	1.20		0.030	0.043		1.00	7	18.20	17.80	0.037	0.037	1.20	0.48	0.018	7%
17.60	1.22		0.058	0.034		1.00	8	17.80	17.40	0.046	0.046	1.22	0.49	0.022	9%
17.20	1.35		0.055	0.021		1.00	9	17.40	17.00	0.038	0.038	1.35	0.54	0.021	9%
16.80	1.37		0.064	0.046		1.00	10	17.00	16.60	0.055	0.055	1.37	0.55	0.030	12%
16.40	1.36		0.046	0.043		1.00	11	16.60	16.20	0.044	0.044	1.36	0.54	0.024	10%
16.00	1.44		0.058	0.034		1.00	12	16.20	15.80	0.046	0.046	1.44	0.58	0.026	11%
15.60	1.43		0.049	0.043		1.00	13	15.80	15.40	0.046	0.046	1.43	0.57	0.026	11%
15.20	1.35		0.040	0.015		1.00	14	15.40	15.00	0.027	0.027	1.35	0.54	0.015	6%
14.80	1.37		0.027	0.024		1.00	15	15.00	14.60	0.026	0.026	1.37	0.55	0.014	6%
14.40	1.31		0.018	0.003		1.00	16	14.60	14.20	0.011	0.011	1.31	0.52	0.006	2%
14.00	1.20		0.012	0.000		1.00	17	14.20	13.80	0.006	0.006	1.20	0.48	0.003	1%
13.60	1.06				0.009	1.00	18	13.80	13.40	0.009	0.009	1.06	0.42	0.004	2%
13.20	0.66				-0.003	1.00	19	13.40	12.70	-0.003	-0.003	0.66	0.46	-0.001	-1%
12.20	0.00				0.000	1.00	20	12.70	12.20	-0.001	-0.001	0.17	0.08	0.000	0%
Total Flow:													0.241	1.000	

Total Flow:	0.241	(m <sup>3</sup> /s)
Pereived Measurement Quality:	Good	
Total Area:	8.69	(m <sup>2</sup> )
Top Width:	7.80	(m)
Hydraulic Depth:	1.115	(m)
Mean Velocity:	0.028	(m/s)
Froude Number	0.008	
Photographs taken looking at:		
US, DS, across		
Notes:		
Data Looks Good		

Datalogger Notes:	Database #290
Datalogger Internal Power:	4.81V
Datalogger External Power:	13.99V
Datalogger Memory Used:	31%
Datalogger Clock:	13:00 MST
Laptop Clock:	13:06 MST
Dessicant:	Good
Datalogger:	105010290 Optimum DD128
PT:	304988 Keller
Power:	12V 20Ahr & 20 W Solar Panel





# Hydrometric Measurement / Site Visit Record

S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: Muskeg River Aurora/Albian Boundary  
Site Name: S33  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: September 19, 2007  
Start Time: 6:07 PM MDT  
End Time: 6:30 PM MDT

## Weather Conditions:

+5°C, Clear,

River Conditions: Open

## Personnel & Equipment

Measurement Made By: JMS  
Data Entry By: SM  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Rebar in ABS o 0.735  
Water Level Reading: 1.963  
Top of Ice Level Reading:  
Transducer Reading & Est. El.: 1.913  
Other: T Post on RB

## Setup No. 1

El: 281.740  
El: 280.512  
El:  
El: 278.599  
El:

## Setup No. 2

El: 281.740  
El: 280.510  
El:  
El: 278.597  
El:

## Average

280.511  
278.598

## Measurement Data

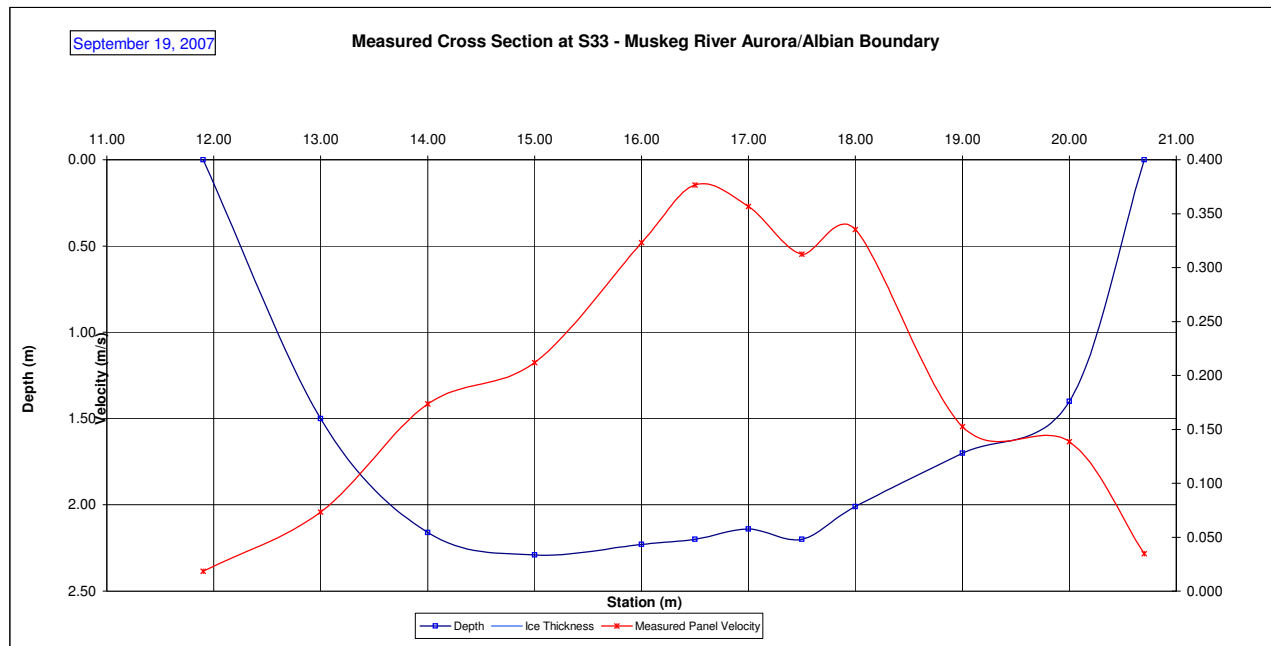
MEASUREMENT DATA															
Measured Data						Calculated Data									
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
RB 20.70	0.00		0.000	0.000		1.00	1	20.70	20.35	0.035	0.035	0.35	0.12	0.004	0%
20.00	1.40		0.107	0.171		1.00	2	20.35	19.50	0.139	0.139	1.40	1.19	0.165	5%
19.00	1.70		0.101	0.204		1.00	3	19.50	18.50	0.152	0.152	1.70	1.70	0.259	7%
18.00	2.01		0.314	0.357		1.00	4	18.50	17.75	0.335	0.335	2.01	1.51	0.505	14%
17.50	2.20		0.253	0.372		1.00	5	17.75	17.25	0.312	0.312	2.20	1.10	0.344	10%
17.00	2.14		0.357	0.357		1.00	6	17.25	16.75	0.357	0.357	2.14	1.07	0.382	11%
16.50	2.20		0.381	0.372		1.00	7	16.75	16.25	0.376	0.376	2.20	1.10	0.414	12%
16.00	2.23		0.280	0.366		1.00	8	16.25	15.50	0.323	0.323	2.23	1.67	0.540	15%
15.00	2.29		0.143	0.280		1.00	9	15.50	14.50	0.212	0.212	2.29	2.29	0.485	14%
14.00	2.16		0.067	0.280		1.00	10	14.50	13.50	0.174	0.174	2.16	2.16	0.375	10%
13.00	1.50		0.034	0.113		1.00	11	13.50	12.45	0.073	0.073	1.50	1.58	0.115	3%
11.90	0.00		0.000	0.000		1.00	12	12.45	11.90	0.018	0.018	0.38	0.21	0.004	0%
LB															
Total Flow:														3.593	

Total Flow:	3.593	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Fair	
Total Area:	15.69	(m <sup>2</sup> )
Top Width:	8.80	(m)
Hydraulic Depth:	1.783	(m)
Mean Velocity:	0.229	(m/s)
Froude Number	0.055	
Photographs taken looking at:		
US, DS, across		

## Notes:

Data Looks Good

Datalogger Notes:	Database #290
Datalogger Internal Power:	4.81V
Datalogger External Power:	13.99V
Datalogger Memory Used:	31%
Datalogger Clock:	13:00 MST
Laptop Clock:	13:06 MST
Dessicant:	Good
Datalogger:	105010290 Optimum DD128
PT:	304988 Keller
Power:	12V 20Ahr & 20 W Solar Panel



Hydrometric Measurement / Site Visit Record
S33 - Muskeg River Aurora/Albian Boundary



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Aurora/Albian Boundary
Site Name: S33
Coordinates & Legal:

Time of Measurement

Date of Measurement: October 22, 2007
Start Time: 8:00 AM MDT
End Time: 8:19 AM MDT

Weather Conditions:

+5°C, Clear, Open

Personnel & Equipment

Measurement Made By: ff sm
Data Entry By: SM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: Rebar in ABS o 0.803
Water Level Reading: 2.427
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.522
Other: T Post on RB

Setup No. 1

El: 281.740
El: 280.116
El:
El: 278.594
El:

Setup No. 2

El: 281.740
El: 280.123
El:
El: 278.601
El:

Average

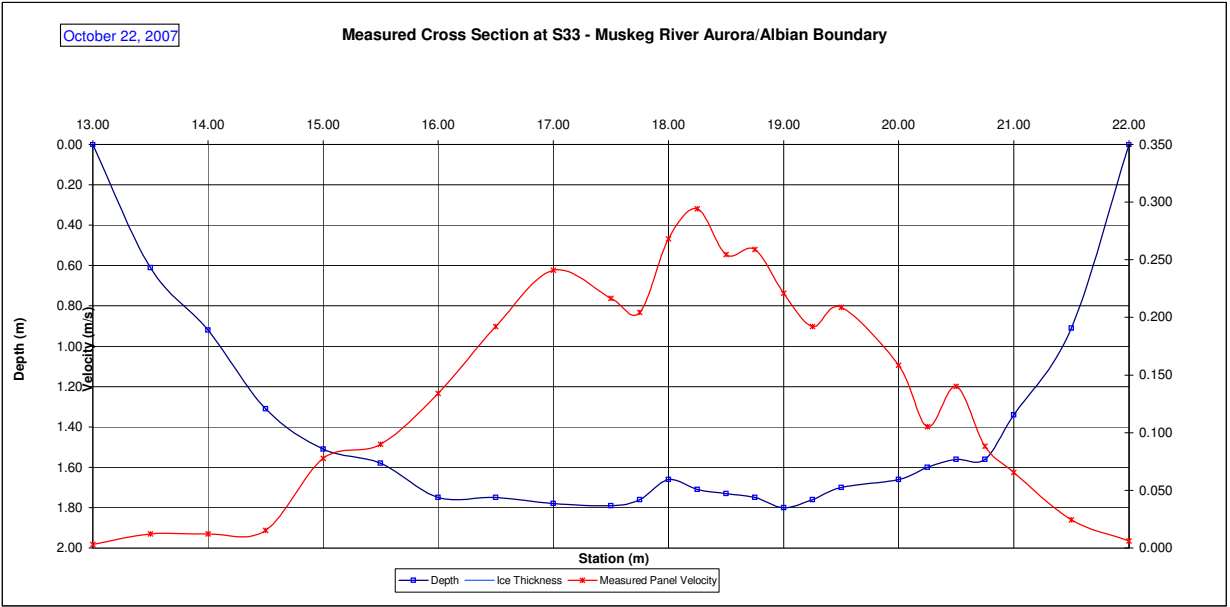
280.120
278.598

Table with 17 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Rows include data for RB and LB stations.

Summary table with 4 columns: Parameter, Value, Unit. Rows include Total Flow, Pervel Measurement Quality, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number, and Photographs taken looking at.

Notes:
Data Looks Good

Datalogger Notes table with 2 columns: Parameter, Value. Rows include Datalogger Internal Power, Datalogger External Power, Datalogger Memory Used, Datalogger Clock, Laptop Clock, Dessicant, Datalogger, PT, and Power.



# Hydrometric Measurement / Site Visit Record

Muskeg River Aurora/Albian Boundary - S33



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Muskeg River  
Location: S33  
Site Name: Muskeg River Aurora/Albian Boundary  
Coordinates & Legal:

## Time of Measurement

Date of Measurement: December 9, 2007  
Start Time: 9:00 AM MST  
End Time: 9:25 AM MST

## Weather Conditions:

River Conditions: Overcast  
Ice Cover

## Personnel & Equipment

Measurement Made By: SM, FF  
Data Entry By: SMS  
Meter Type and No.: March Mc Birney Flo-Mate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Rebar in ABS c 0.799  
Water Level Reading: 2.645  
Top of Ice Level Reading: 2.623  
Transducer Reading & Est. El.: 1.287  
Other: T Post on RB

## Setup No. 1

El: 281.740  
El: 279.894  
El: 279.916  
El: 278.607  
El:

## Setup No. 2

El: 281.740  
El: 279.899  
El: 279.922  
El: 278.612  
El:

## Average

279.897  
278.610

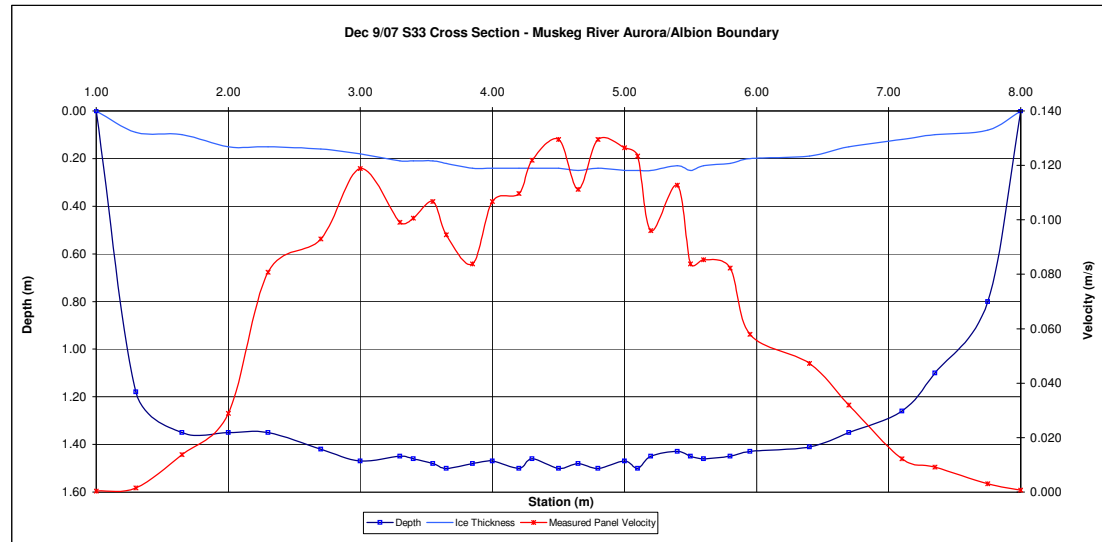
Measured Data						Measurement Data										Calculated Data			
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total				
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)					
1.00	0.00	0.00				1.00	1	1.00	1.15	0.000	0.000	0.27	0.04	0.000	0%				
1.30	1.18	0.09			0.002	1.00	2	1.15	1.48	0.002	0.002	1.09	0.35	0.001	0%				
1.65	1.35	0.10	0.015	0.012		1.00	3	1.48	1.83	0.014	0.014	1.25	0.44	0.006	1%				
2.00	1.35	0.15	0.030	0.027		1.00	4	1.83	2.15	0.029	0.029	1.20	0.39	0.011	2%				
2.30	1.35	0.15	0.073	0.088		1.00	5	2.15	2.50	0.081	0.081	1.20	0.42	0.034	6%				
2.70	1.42	0.16	0.107	0.079		1.00	6	2.50	2.85	0.093	0.093	1.26	0.44	0.041	7%				
3.00	1.47	0.18	0.082	0.155		1.00	7	2.85	3.15	0.119	0.119	1.29	0.39	0.046	8%				
3.30	1.45	0.21	0.107	0.091		1.00	8	3.15	3.35	0.099	0.099	1.24	0.25	0.025	4%				
3.40	1.46	0.21	0.119	0.082		1.00	9	3.35	3.48	0.101	0.101	1.25	0.16	0.016	3%				
3.55	1.48	0.21	0.116	0.098		1.00	10	3.48	3.60	0.107	0.107	1.27	0.16	0.017	3%				
3.65	1.50	0.22	0.125	0.064		1.00	11	3.60	3.75	0.094	0.094	1.28	0.19	0.018	3%				
3.85	1.48	0.24	0.094	0.073		1.00	12	3.75	3.93	0.084	0.084	1.24	0.22	0.018	3%				
4.00	1.47	0.24	0.119	0.094		1.00	13	3.93	4.10	0.107	0.107	1.23	0.22	0.023	4%				
4.20	1.50	0.24	0.122	0.098		1.00	14	4.10	4.25	0.110	0.110	1.26	0.19	0.021	4%				
4.30	1.46	0.24	0.113	0.131		1.00	15	4.25	4.40	0.122	0.122	1.22	0.18	0.022	4%				
4.50	1.50	0.24	0.110	0.149		1.00	16	4.40	4.58	0.130	0.130	1.26	0.22	0.029	5%				
4.65	1.48	0.25	0.128	0.094		1.00	17	4.58	4.73	0.111	0.111	1.23	0.18	0.021	4%				
4.80	1.50	0.24	0.134	0.125		1.00	18	4.73	4.90	0.130	0.130	1.26	0.22	0.029	5%				
5.00	1.47	0.25	0.131	0.122		1.00	19	4.90	5.05	0.126	0.126	1.22	0.18	0.023	4%				
5.10	1.50	0.25	0.119	0.128		1.00	20	5.05	5.15	0.123	0.123	1.25	0.13	0.015	3%				
5.20	1.45	0.25	0.073	0.119		1.00	21	5.15	5.30	0.096	0.096	1.20	0.18	0.017	3%				
5.40	1.43	0.23	0.104	0.122		1.00	22	5.30	5.45	0.113	0.113	1.20	0.18	0.020	4%				
5.50	1.45	0.25	0.061	0.107		1.00	23	5.45	5.55	0.084	0.084	1.20	0.12	0.010	2%				
5.60	1.46	0.23	0.076	0.094		1.00	24	5.55	5.70	0.085	0.085	1.23	0.18	0.016	3%				
5.80	1.45	0.22	0.070	0.094		1.00	25	5.70	5.88	0.082	0.082	1.23	0.22	0.018	3%				
5.95	1.43	0.20	0.055	0.061		1.00	26	5.88	6.18	0.058	0.058	1.23	0.37	0.021	4%				
6.40	1.41	0.19	0.049	0.046		1.00	27	6.18	6.55	0.047	0.047	1.22	0.46	0.022	4%				
6.70	1.35	0.15	0.030	0.034		1.00	28	6.55	6.90	0.032	0.032	1.20	0.42	0.013	2%				
7.10	1.26	0.12	0.006	0.018		1.00	29	6.90	7.23	0.012	0.012	1.14	0.37	0.005	1%				
7.35	1.10	0.10			0.009	1.00	30	7.23	7.55	0.009	0.009	1.00	0.33	0.003	1%				
7.75	0.80	0.08			0.003	1.00	31	7.55	7.88	0.003	0.003	0.72	0.23	0.001	0%				
8.00	0.00	0.00				1.00	32	7.88	8.00	0.001	0.001	0.18	0.02	0.000	0%				
Total Flow:														0.560	1.000				

Total Flow:	0.560	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	
Total Area:	8.04	(m <sup>2</sup> )
Top Width:	7.00	(m)
Hydraulic Depth:	1.149	(m)
Mean Velocity:	0.070	(m/s)
Froude Number:	0.021	
Photographs taken looking at:		
Photographs taken.		

Datalogger Notes:	Database #290
Datalogger Internal Power:	4.69 V
Datalogger External Power:	12.85 V
Datalogger Memory Used:	42%
Datalogger Clock:	08:45 MST
Laptop Clock:	08:54 MST
Dessicant:	Good
Datalogger:	105010290 Optimum DD128
PT:	304988 Keller
Power:	12V 20Ahr & 20 W Solar Panel

## Notes:

Data downloaded is good.



# Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Tar River above CNRL Lake  
 Location: Tar River above CNRL Lake  
 Site Name: S34  
 Coordinates & Legal: 6361689 N, 440729 E

### Time of Measurement

Date of Measurement: January 14, 2007  
 Start Time: 1:30 PM MST  
 End Time: MST

### Weather Conditions:

-30° C, Overcast, light wind, very light snow

### River Conditions:

Ice Covered, seepage apparent on surface.

Practically dry. Hole augered in ice for water level survey only became slushy after a few minutes, despite being drilled to bed.

### Personnel & Equipment

Measurement Made By: JS/FF  
 Data Entry By: FF  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: Nail in tree  
 Water Level Reading:  
 Top of Ice Level Reading:  
 Transducer Reading & El.:  
 Other:

### Setup No. 1

El: 98.815  
 El: 97.589  
 El: 97.816  
 El: 97.400

### Setup No. 2

El: 98.815  
 El: 97.579  
 El: 97.819  
 El: 97.390

97.584

97.395

Total Flow:		0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:			
Total Area:			(m <sup>2</sup> )
Top Width:			(m)
Hydraulic Depth:			(m)
Mean Velocity:			(m/s)
Froude Number			
Photographs taken looking at:			

Datalogger Notes:	Database #272
Datalogger Internal Power:	4.39 V
Datalogger External Power:	13.32V
Datalogger Memory Used:	22%
Datalogger Clock:	Jan 14, 2007 13:29 MST
Laptop Clock:	Jan 14, 2007 13:27 MST
Dessicant:	45% used- replaced
Datalogger:	Optimum DD-128 #0104170272
PT:	Keller 3 psi #0101878
Power:	Solar panel and internal battery

### Notes:

Beaver activity in area. Trees near logger chewed down by beavers.  
 Flow immeasurably low; effectively zero.

# Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Tar River above CNRL Lake  
 Location: Tar River above CNRL Lake  
 Site Name: S34  
 Coordinates & Legal: 6361689 N, 440729 E

### Time of Measurement

Date of Measurement: February 9, 2007  
 Start Time: 3:20 PM MST  
 End Time: MST

### Weather Conditions:

-20 C, Overcast, light wind

### River Conditions:

Ice Covered, seepage apparent on surface.

### Personnel & Equipment

Measurement Made By: JS, JM, PM  
 Data Entry By: JS  
 Meter Type and No.: Marsh McBirney FloMate 2000  
 s/n 2004521

### Level Readings

Bench Mark Reading: Rebar in Gmc 1.009  
 Water Level Reading: El: 101.009  
 Top of Ice Level Reading: 3.122 El: 97.887  
 Transducer Reading & El.: 0.119 El: 100.890  
 Other: Nail in Tree 2.169 El: 98.840

### Setup No. 1

El: 100.000  
 El: 101.009  
 El: 97.887  
 El: 100.890  
 El: 98.840

### Setup No. 2

El: 100.000  
 El: 100.993  
 El: 97.889  
 El: 100.874  
 El: 98.849

Measured Data						Measurement Data										Calculated Data				
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total					
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)			(m)	(m)	(m/s)	(m/s)	(m)	(m <sup>2</sup> )	(m <sup>3</sup> /s)						
																Total Flow:				

Total Flow:		0.000	(m <sup>3</sup> /s)
Perceived Measurement Quality:			
Total Area:			(m <sup>2</sup> )
Top Width:			(m)
Hydraulic Depth:			(m)
Mean Velocity:			(m/s)
Froude Number			
Photographs taken looking at:			

Datalogger Notes:	Database #272
Datalogger Internal Power:	4.38V
Datalogger External Power:	13.94V
Datalogger Memory Used:	24%
Datalogger Clock:	Feb 09, 2007 15:20 MST
Laptop Clock:	Feb 09, 2007 15:28 MST
Dessicant:	0% .used- replaced
Datalogger:	Optimum DD-128 #0104170272
PT:	Keller 3 psi #0101878
Power:	Solar panel and internal battery

### Notes:

A lot of beaver activity in area, frozen to depth 100m up stream and down stream of TD

# Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River above CNRL Lake  
Location: Tar River above CNRL Lake  
Site Name: S34  
Coordinates & Legal: 6361689 N, 440729 E

## Time of Measurement

Date of Measurement: April 27, 2007  
Start Time: 11:15 AM MDT  
End Time: 11:45 AM MDT

## Weather Conditions:

+12 C, Clear

## River Conditions:

bankfull

## Personnel & Equipment

Measurement Made By: JMS, PM  
Data Entry By: PM  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Rebar 0.228  
Water Level Reading: 1.900  
Transducer Reading & El.: 0.929  
Other: NIT

## Setup No. 1

El.: 100.000  
El.: 98.328  
El.: 97.399  
El.: 98.861

## Setup No. 2

El.: 0.225  
El.: 1.899  
El.: 0.929  
El.: 98.861

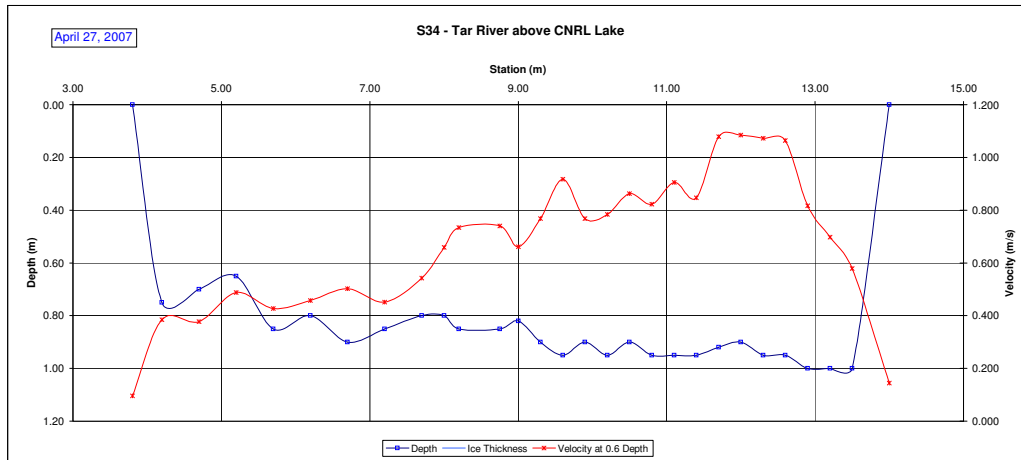
## Measurement Data

	Measured Data					Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth										
	(m)	(m)	(m)	(m/s)	(m/s)	(m/s)		(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
LB	3.80	0.00				0.000	1.00	1	3.80	4.00	0.096	0.096	0.19	0.04	0.004	0%
	4.20	0.75				0.384	1.00	2	4.00	4.45	0.384	0.384	0.75	0.34	0.130	2%
	4.70	0.70				0.378	1.00	3	4.45	4.95	0.378	0.378	0.70	0.35	0.132	2%
	5.20	0.65				0.488	1.00	4	4.95	5.45	0.488	0.488	0.65	0.33	0.158	3%
	5.70	0.85				0.427	1.00	5	5.45	5.95	0.427	0.427	0.85	0.43	0.181	3%
	6.20	0.80				0.457	1.00	6	5.95	6.45	0.457	0.457	0.80	0.40	0.183	3%
	6.70	0.90				0.503	1.00	7	6.45	6.95	0.503	0.503	0.90	0.45	0.226	4%
	7.20	0.85				0.451	1.00	8	6.95	7.45	0.451	0.451	0.85	0.43	0.192	3%
	7.70	0.80				0.543	1.00	9	7.45	7.85	0.543	0.543	0.80	0.32	0.174	3%
	8.00	0.80				0.658	1.00	10	7.85	8.10	0.658	0.658	0.80	0.20	0.132	2%
	8.20	0.85				0.735	1.00	11	8.10	8.48	0.735	0.735	0.85	0.32	0.234	4%
	8.75	0.85				0.741	1.00	12	8.48	8.88	0.741	0.741	0.85	0.34	0.252	4%
	9.00	0.82				0.661	1.00	13	8.88	9.15	0.661	0.661	0.82	0.23	0.149	3%
	9.30	0.90				0.768	1.00	14	9.15	9.45	0.768	0.768	0.90	0.27	0.207	4%
	9.60	0.95				0.917	1.00	15	9.45	9.75	0.917	0.917	0.95	0.29	0.261	4%
	9.90	0.90				0.768	1.00	16	9.75	10.05	0.768	0.768	0.90	0.27	0.207	4%
	10.20	0.95				0.783	1.00	17	10.05	10.35	0.783	0.783	0.95	0.28	0.223	4%
	10.50	0.90				0.863	1.00	18	10.35	10.65	0.863	0.863	0.90	0.27	0.233	4%
	10.80	0.95				0.823	1.00	19	10.65	10.95	0.823	0.823	0.95	0.28	0.235	4%
	11.10	0.95				0.905	1.00	20	10.95	11.25	0.905	0.905	0.95	0.29	0.258	4%
	11.40	0.95				0.847	1.00	21	11.25	11.55	0.847	0.847	0.95	0.29	0.241	4%
	11.70	0.92				1.079	1.00	22	11.55	11.85	1.079	1.079	0.92	0.28	0.298	5%
	12.00	0.90				1.085	1.00	23	11.85	12.15	1.085	1.085	0.90	0.27	0.293	5%
	12.30	0.95				1.073	1.00	24	12.15	12.45	1.073	1.073	0.95	0.28	0.306	5%
	12.60	0.95				1.064	1.00	25	12.45	12.75	1.064	1.064	0.95	0.29	0.303	5%
	12.90	1.00				0.817	1.00	26	12.75	13.05	0.817	0.817	1.00	0.30	0.245	4%
	13.20	1.00				0.698	1.00	27	13.05	13.35	0.698	0.698	1.00	0.30	0.209	4%
	13.50	1.00				0.579	1.00	28	13.35	13.75	0.579	0.579	1.00	0.40	0.232	4%
	14.00	0.00				0.000	1.00	29	13.75	14.00	0.145	0.145	0.25	0.06	0.009	0%
													Total Flow:	5.908		1

Total Flow:	5.908	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	(m <sup>3</sup> )
Total Area:	8.57	(m)
Top Width:	10.20	(m)
Hydraulic Depth:	0.840	(m/s)
Mean Velocity:	0.690	
Froude Number:	0.240	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:		Database #272
Datalogger Internal Power:	4.41V	
Datalogger External Power:	14.19V	
Datalogger Memory Used:	31%	Used
Datalogger Clock:	Apr 27, 2007 10:01	MST
Laptop Clock:	Apr 27, 2007 10:04	MST
Dessicant:	Good	
Datalogger:	Optimum DD-128 #0104170272	
PT:	Keller 3 psi #0101878	
Power:	Solar panel and internal battery	

Notes: TSS Sample taken.



# Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River above CNRL Lake  
Location: Tar River above CNRL Lake  
Site Name: S34  
Coordinates & Legal: 6361689 N, 440729 E

## Personnel & Equipment

Measurement Made By: pm wd  
Data Entry By: sm Checked: Marsh McBirney FloMate 2000  
Meter Type and No.: s/n 2004521

## Time of Measurement

Date of Measurement: June 13, 2007  
Start Time: 3:45 PM MDT  
End Time: MDT

## Level Readings

Bench Mark Reading: Nail in tree 1.221  
Water Level Reading: 2.431  
Transducer Reading & El.: 0.188  
Other:

## Setup No. 1

El: 98.815  
El: 97.605  
El: 97.417  
El: 100.036

## Setup No. 2

El: 1.237  
El: 2.444  
El: 0.188  
El: 100.052

## Weather Conditions:

+15 C, overcast

## River Conditions:

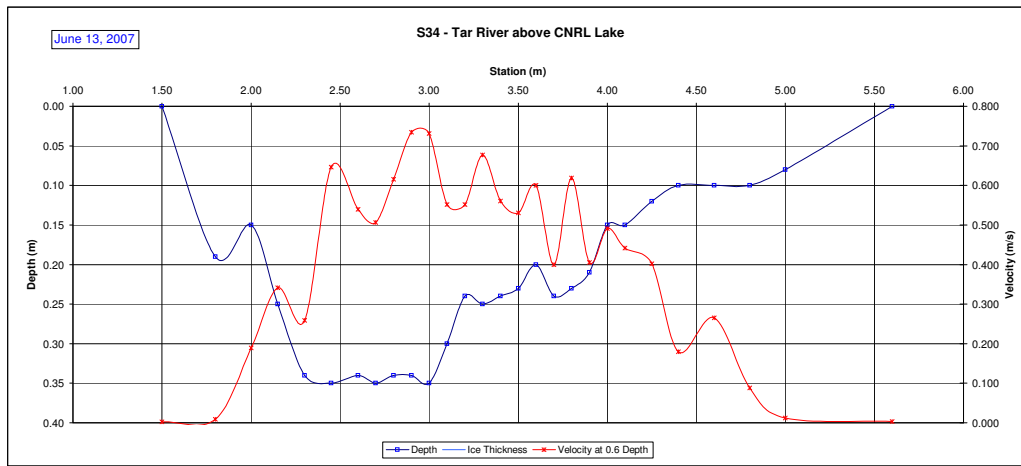
open moderate

Measurement Data						Calculated Data									
Measured Data						Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)	
	(m)	(m)	(m)	(m/s)	(m/s)										
B	1.50	0.00			0.000	1.00	1	1.50	1.65	0.002	0.002	0.00	0.00	0.000	0%
	1.80	0.19			0.009	1.00	2	1.65	1.90	0.009	0.009	0.19	0.05	0.000	0%
	2.00	0.15			0.189	1.00	3	1.90	2.08	0.189	0.189	0.15	0.03	0.005	2%
	2.15	0.25			0.341	1.00	4	2.08	2.23	0.341	0.341	0.25	0.04	0.013	4%
	2.30	0.34			0.259	1.00	5	2.23	2.38	0.259	0.259	0.34	0.05	0.013	4%
	2.45	0.35			0.646	1.00	6	2.38	2.53	0.646	0.646	0.35	0.05	0.034	10%
	2.60	0.34			0.539	1.00	7	2.53	2.65	0.539	0.539	0.34	0.04	0.023	7%
	2.70	0.35			0.506	1.00	8	2.65	2.75	0.506	0.506	0.35	0.03	0.018	5%
	2.80	0.34			0.616	1.00	9	2.75	2.85	0.616	0.616	0.34	0.03	0.021	6%
	2.90	0.34			0.735	1.00	10	2.85	2.95	0.735	0.735	0.34	0.03	0.025	8%
	3.00	0.35			0.732	1.00	11	2.95	3.05	0.732	0.732	0.35	0.03	0.026	8%
	3.10	0.30			0.552	1.00	12	3.05	3.15	0.552	0.552	0.30	0.03	0.017	5%
	3.20	0.24			0.552	1.00	13	3.15	3.25	0.552	0.552	0.24	0.02	0.013	4%
	3.30	0.25			0.677	1.00	14	3.25	3.35	0.677	0.677	0.25	0.02	0.017	5%
	3.40	0.24			0.561	1.00	15	3.35	3.45	0.561	0.561	0.24	0.02	0.013	4%
	3.50	0.23			0.530	1.00	16	3.45	3.55	0.530	0.530	0.23	0.02	0.012	4%
	3.60	0.20			0.600	1.00	17	3.55	3.65	0.600	0.600	0.20	0.02	0.012	4%
	3.70	0.24			0.399	1.00	18	3.65	3.75	0.399	0.399	0.24	0.02	0.010	3%
	3.80	0.23			0.619	1.00	19	3.75	3.85	0.619	0.619	0.23	0.02	0.014	4%
	3.90	0.21			0.405	1.00	20	3.85	3.95	0.405	0.405	0.21	0.02	0.009	3%
	4.00	0.15			0.491	1.00	21	3.95	4.05	0.491	0.491	0.15	0.01	0.007	2%
	4.10	0.15			0.442	1.00	22	4.05	4.18	0.442	0.442	0.15	0.02	0.008	3%
	4.25	0.12			0.402	1.00	23	4.18	4.33	0.402	0.402	0.12	0.02	0.007	2%
	4.40	0.10			0.180	1.00	24	4.33	4.50	0.180	0.180	0.10	0.02	0.003	1%
	4.60	0.10			0.265	1.00	25	4.50	4.70	0.265	0.265	0.10	0.02	0.005	2%
	4.80	0.10			0.088	1.00	26	4.70	4.90	0.088	0.088	0.10	0.02	0.002	1%
	5.00	0.08			0.012	1.00	27	4.90	5.00	0.012	0.012	0.08	0.01	0.000	0%
	B	5.60	0.00			0.000	1.00	28	5.00	5.60	0.003	0.003	0.02	0.01	0.000
												Total Flow:		0.327	1

Total Flow:	0.327	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	(m <sup>3</sup> )
Total Area:	0.74	(m)
Top Width:	4.10	(m)
Hydraulic Depth:	0.180	(m/s)
Mean Velocity:	0.443	
Froude Number:	0.334	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database #272
Datalogger Internal Power:	4.45V
Datalogger External Power:	12.02V
Datalogger Memory Used:	34% Used
Datalogger Clock:	Jun 13, 2007 14:29 MST
Laptop Clock:	Jun 13, 2007 14:30 MST
Dessicant:	Good
Datalogger:	Optimum DD-128 #0104170272
PT:	Keller 3 psi #0101878
Power:	Solar panel and internal battery

Notes: TSS Sample taken.  
data has gaps but is currently functioning properly  
battery reads ok



# Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River above CNRL Lake  
Location: Tar River above CNRL Lake  
Site Name: S34  
Coordinates & Legal: 6361689 N, 440729 E

## Time of Measurement

Date of Measurement: August 11, 2007  
Start Time: 9:30 AM MDT  
End Time: 10:44 AM MDT

## Weather Conditions:

+15°C, overcast

## River Conditions:

open moderate

## Personnel & Equipment

Measurement Made By: JMS SM  
Data Entry By: sm  
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

## Level Readings

Bench Mark Reading: Nail in tree 1.285  
Water Level Reading: 2.532  
Transducer Reading & El.: 0.185  
Other: 0.101

## Setup No. 1

El: 98.815  
El: 97.568  
El: 97.383  
El: 99.999

## Setup No. 2

El: 1.273  
El: 2.520  
El: 0.185  
El: 0.097

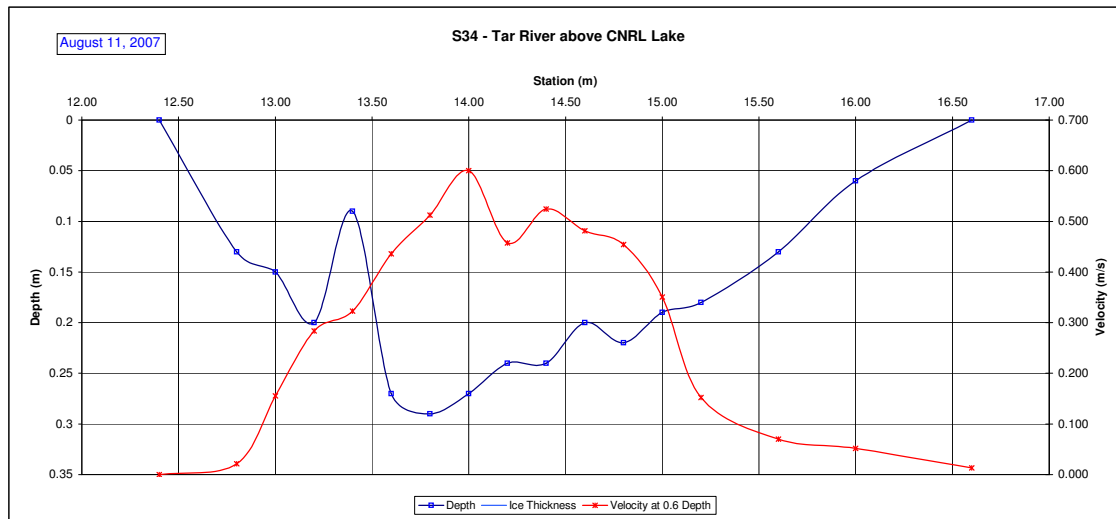
## Measurement Data

Measurement Data						Calculated Data										
Measured Data						Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth			(m)	(m)	(m/s)	(m/s)	(m)	(m²)	(m³/s)		
(m)	(m)	(m)	(m/s)	(m/s)	(m/s)											
LB	16.60	0			0.000	1.00	1	16.60	16.30	0.013	0.013	0.02	0.00	0.000	0%	
	16.00	0.06			0.052	1.00	2	16.30	15.80	0.052	0.052	0.06	0.03	0.002	1%	
	15.60	0.13			0.070	1.00	3	15.80	15.40	0.070	0.070	0.13	0.05	0.004	2%	
	15.20	0.18			0.152	1.00	4	15.40	15.10	0.152	0.152	0.18	0.05	0.008	4%	
	15.00	0.19			0.351	1.00	5	15.10	14.90	0.351	0.351	0.19	0.04	0.013	6%	
	14.80	0.22			0.454	1.00	6	14.90	14.70	0.454	0.454	0.22	0.04	0.020	9%	
	14.60	0.20			0.482	1.00	7	14.70	14.50	0.482	0.482	0.20	0.04	0.019	9%	
	14.40	0.24			0.524	1.00	8	14.50	14.30	0.524	0.524	0.24	0.05	0.025	11%	
	14.20	0.24			0.457	1.00	9	14.30	14.10	0.457	0.457	0.24	0.05	0.022	10%	
	14.00	0.27			0.600	1.00	10	14.10	13.90	0.600	0.600	0.27	0.05	0.032	15%	
	13.80	0.29			0.512	1.00	11	13.90	13.70	0.512	0.512	0.29	0.06	0.030	13%	
	13.60	0.27			0.436	1.00	12	13.70	13.50	0.436	0.436	0.27	0.05	0.024	11%	
	13.40	0.09			0.323	1.00	13	13.50	13.30	0.323	0.323	0.09	0.02	0.006	3%	
	13.20	0.20			0.283	1.00	14	13.30	13.10	0.283	0.283	0.20	0.04	0.011	5%	
	13.00	0.15			0.155	1.00	15	13.10	12.90	0.155	0.155	0.15	0.03	0.005	2%	
	12.80	0.130			0.021	1.00	16	12.90	12.60	0.021	0.021	0.13	0.04	0.001	0%	
	12.40	0.00			0.000	1.00	17	12.60	12.40	0.000	0.000	0.03	0.01	0.000	0%	
RB																
												Total Flow:		0.221	1	

Total Flow:	0.221	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	(m <sup>2</sup> )
Total Area:	0.66	(m)
Top Width:	4.20	(m)
Hydraulic Depth:	0.157	(m/s)
Mean Velocity:	0.337	
Froude Number	0.272	
Photographs taken looking at:		
Upstream, downstream, across		

Datalogger Notes:	Database #272
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	Used
Datalogger Clock:	
Laptop Clock:	
Dessicant:	Good
Datalogger:	Optimum DD-128 #0104170272
PT:	Keller 3 psi #0101878
Power:	Solar panel and internal battery

Notes: TSS Sample taken.  
station is not working





# Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

## Measurement Location

River/Stream: Tar River above CNRL Lake  
Location: Tar River above CNRL Lake  
Site Name: S34  
Coordinates & Legal: 6361689 N, 440729 E

## Time of Measurement

Date of Measurement: September 17, 2007  
Start Time: 9:45 AM MDT  
End Time: 10:04 AM MDT

## Weather Conditions:

+12 C, overcast

## River Conditions:

open moderate

## Personnel & Equipment

Measurement Made By: SM JMS  
Data Entry By: sm Checked:  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

## Level Readings

Bench Mark Reading: Nail in tree 1.261  
Water Level Reading: 2.445  
Transducer Reading & El.: 0.473  
Other: 0.076

## Setup No. 1

El: 98.815  
El: 97.631  
El: 97.158  
El: 100.000

## Setup No. 2

El: 1.239  
El: 2.423  
El: 0.473  
El: 0.054

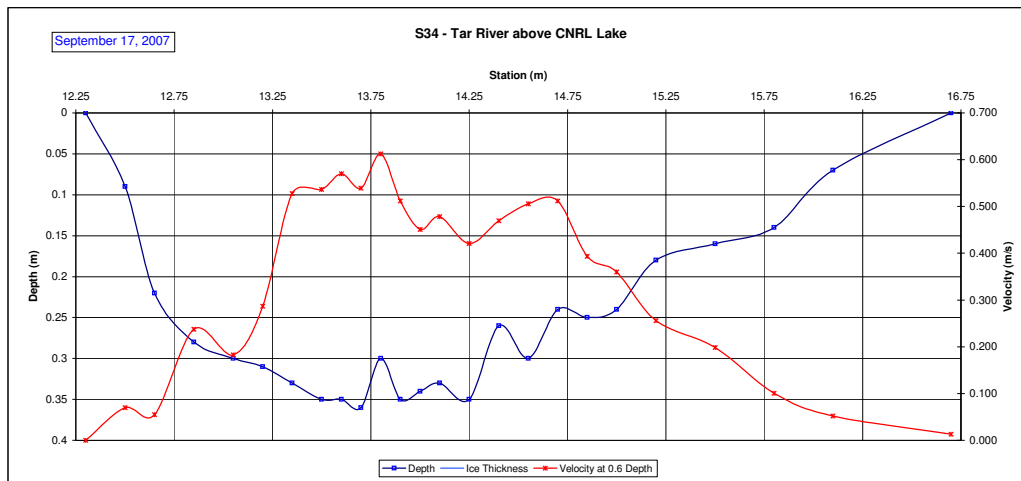
## Measurement Data

LB	Measured Data					Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge	Percentage of Total	
	Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth											Velocity at 0.6 Depth
	(m)	(m)	(m)	(m/s)	(m/s)											(m/s)
	16.70	0				0.000	1.00	1	16.70	16.40	0.013	0.013	0.02	0.01	0.000	0%
	16.10	0.07				0.052	1.00	2	16.40	15.95	0.052	0.052	0.07	0.03	0.002	0%
	15.80	0.14				0.101	1.00	3	15.95	15.65	0.101	0.101	0.14	0.04	0.004	1%
	15.50	0.16				0.198	1.00	4	15.65	15.35	0.198	0.198	0.16	0.05	0.010	3%
	15.20	0.18				0.256	1.00	5	15.35	15.10	0.256	0.256	0.18	0.05	0.012	3%
	15.00	0.24				0.360	1.00	6	15.10	14.93	0.360	0.360	0.24	0.04	0.015	4%
	14.85	0.25				0.393	1.00	7	14.93	14.78	0.393	0.393	0.25	0.04	0.015	4%
	14.70	0.24				0.512	1.00	8	14.78	14.63	0.512	0.512	0.24	0.04	0.018	5%
	14.55	0.30				0.506	1.00	9	14.63	14.48	0.506	0.506	0.30	0.04	0.023	7%
	14.40	0.26				0.469	1.00	10	14.48	14.33	0.469	0.469	0.26	0.04	0.018	5%
	14.25	0.35				0.421	1.00	11	14.33	14.18	0.421	0.421	0.35	0.05	0.022	7%
	14.10	0.33				0.479	1.00	12	14.18	14.05	0.479	0.479	0.33	0.04	0.020	6%
	14.00	0.34				0.451	1.00	13	14.05	13.95	0.451	0.451	0.34	0.03	0.015	5%
	13.90	0.35				0.512	1.00	14	13.95	13.85	0.512	0.512	0.35	0.03	0.018	5%
	13.80	0.30				0.613	1.00	15	13.85	13.75	0.613	0.613	0.30	0.03	0.018	5%
	13.70	0.36				0.539	1.00	16	13.75	13.65	0.539	0.539	0.36	0.04	0.019	6%
	13.60	0.35				0.570	1.00	17	13.65	13.55	0.570	0.570	0.35	0.03	0.020	6%
	13.50	0.35				0.536	1.00	18	13.55	13.43	0.536	0.536	0.35	0.04	0.023	7%
	13.35	0.33				0.527	1.00	19	13.43	13.28	0.527	0.527	0.33	0.05	0.026	8%
	13.20	0.31				0.287	1.00	20	13.28	13.13	0.287	0.287	0.31	0.05	0.013	4%
	13.05	0.30				0.183	1.00	21	13.13	12.95	0.183	0.183	0.30	0.05	0.010	3%
	12.85	0.28				0.238	1.00	22	12.95	12.75	0.238	0.238	0.28	0.06	0.013	4%
	12.65	0.22				0.055	1.00	23	12.75	12.58	0.055	0.055	0.22	0.04	0.002	1%
RB	12.50	0.090				0.070	1.00	24	12.58	12.40	0.070	0.070	0.09	0.02	0.001	0%
	12.30	0.00				0.000	1.00	25	12.40	12.30	0.000	0.000	0.02	0.00	0.000	0%
														Total Flow:	0.338	1

Total Flow:	0.338	(m <sup>3</sup> /s)
Perceived Measurement Quality:	Good	(m <sup>2</sup> )
Total Area:	0.94	(m)
Top Width:	4.40	(m)
Hydraulic Depth:	0.214	(m/s)
Mean Velocity:	0.360	
Froude Number	0.249	
Photographs taken looking at: Upstream, downstream, across		

Datalogger Notes:		Database #1772
Datalogger Internal Power:		
Datalogger External Power:		
Datalogger Memory Used:	Used	
Datalogger Clock:		
Laptop Clock:		
Dessicant:	Good	
Datalogger:	Optimum DD-128 #1772	
PT:	Keller 3 psi #0101878	
Power:	Solar panel and internal battery	

Notes: data logger removed, new one installed  
transducer removed  
data logger used to be called S35, all data before Sept 17 is junk  
thermistor installed but recored as a voltage



# Hydrometric Measurement / Site Visit Record

## S34 - Tar River above CNRL Lake



Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Tar River  
Location: Tar River above CNRL Lake  
Site Name: S34  
Coordinates & Legal: 6361689 N, 440729 E

### Time of Measurement

Date of Measurement: October 24, 2007  
Start Time: 10:30 AM MDT  
End Time: 10:50 AM MDT

### Weather Conditions:

+10 C, overcast, Light wind

### River Conditions:

open, low stage

### Personnel & Equipment

Measurement Made By: SM/FF  
Data Entry By: SM/SM  
Meter Type and No.: Marsh McBirney FloMate 2000  
s/n 2004521

### Level Readings

Bench Mark Reading: Nail in tree 2.751 El: 98.815 2.673 El: 98.815  
Water Level Reading: 3.965 El: 97.601 3.875 El: 97.613 97.607  
Transducer Reading & El.: 0.326 El: 97.275 0.326 El: 97.287 97.281  
Other: rebar 1.565 El: 100.001 1.488 El: 100.000

### Setup No. 1

### Setup No. 2

LB

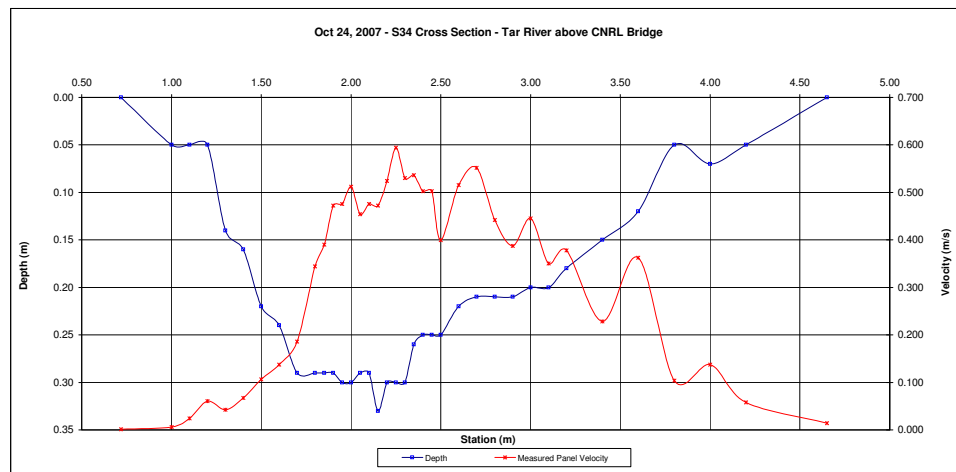
RB

Measured Data						Measurement Data										Calculated Data					Percentage of Total
Station	Depth	Ice Thickness	Velocity at 0.2 Depth	Velocity at 0.8 Depth	Velocity at 0.6 Depth	Velocity Correction Factor	Panel No.	Panel Starts at Station	Panel Ends at Station	Measured Panel Velocity	Effective Average Panel Velocity	Panel Effective Depth	Panel Area	Panel Discharge							
0.72	0.00					1.00	1	0.72	0.86	0.002	0.002	0.01	0.00	0.000	0%						
1.00	0.05				0.006	1.00	2	0.86	1.05	0.006	0.006	0.05	0.01	0.000	0%						
1.10	0.05				0.024	1.00	3	1.05	1.15	0.024	0.024	0.05	0.00	0.000	0%						
1.20	0.05				0.061	1.00	4	1.15	1.25	0.061	0.061	0.05	0.01	0.000	0%						
1.30	0.14				0.043	1.00	5	1.25	1.35	0.043	0.043	0.14	0.01	0.001	0%						
1.40	0.16				0.067	1.00	6	1.35	1.45	0.067	0.067	0.16	0.02	0.001	1%						
1.50	0.22				0.107	1.00	7	1.45	1.55	0.107	0.107	0.22	0.02	0.002	1%						
1.60	0.24				0.137	1.00	8	1.55	1.65	0.137	0.137	0.24	0.02	0.003	2%						
1.70	0.29				0.186	1.00	9	1.65	1.75	0.186	0.186	0.29	0.03	0.005	3%						
1.80	0.29				0.344	1.00	10	1.75	1.83	0.344	0.344	0.29	0.02	0.007	4%						
1.85	0.29				0.390	1.00	11	1.83	1.88	0.390	0.390	0.29	0.01	0.006	3%						
1.90	0.29				0.472	1.00	12	1.88	1.93	0.472	0.472	0.29	0.01	0.007	3%						
1.95	0.30				0.475	1.00	13	1.93	1.98	0.475	0.475	0.30	0.02	0.007	3%						
2.00	0.30				0.512	1.00	14	1.98	2.03	0.512	0.512	0.30	0.01	0.008	4%						
2.05	0.29				0.454	1.00	15	2.03	2.08	0.454	0.454	0.29	0.01	0.007	3%						
2.10	0.29				0.475	1.00	16	2.08	2.13	0.475	0.475	0.29	0.01	0.007	3%						
2.15	0.33				0.472	1.00	17	2.13	2.18	0.472	0.472	0.33	0.02	0.008	4%						
2.20	0.30				0.524	1.00	18	2.18	2.23	0.524	0.524	0.30	0.02	0.008	4%						
2.25	0.30				0.594	1.00	19	2.23	2.28	0.594	0.594	0.30	0.01	0.009	4%						
2.30	0.30				0.530	1.00	20	2.28	2.33	0.530	0.530	0.30	0.02	0.008	4%						
2.35	0.26				0.536	1.00	21	2.33	2.38	0.536	0.536	0.26	0.01	0.007	3%						
2.40	0.25				0.503	1.00	22	2.38	2.43	0.503	0.503	0.25	0.01	0.006	3%						
2.45	0.25				0.503	1.00	23	2.43	2.48	0.503	0.503	0.25	0.01	0.006	3%						
2.50	0.25				0.399	1.00	24	2.48	2.55	0.399	0.399	0.25	0.02	0.007	4%						
2.60	0.22				0.515	1.00	25	2.55	2.65	0.515	0.515	0.22	0.02	0.011	5%						
2.70	0.21				0.552	1.00	26	2.65	2.75	0.552	0.552	0.21	0.02	0.012	6%						
2.80	0.21				0.442	1.00	27	2.75	2.85	0.442	0.442	0.21	0.02	0.009	4%						
2.90	0.21				0.387	1.00	28	2.85	2.95	0.387	0.387	0.21	0.02	0.008	4%						
3.00	0.20				0.445	1.00	29	2.95	3.05	0.445	0.445	0.20	0.02	0.009	4%						
3.10	0.20				0.351	1.00	30	3.05	3.15	0.351	0.351	0.20	0.02	0.007	3%						
3.20	0.18				0.378	1.00	31	3.15	3.30	0.378	0.378	0.18	0.03	0.010	5%						
3.40	0.15				0.229	1.00	32	3.30	3.50	0.229	0.229	0.15	0.03	0.007	3%						
3.60	0.12				0.363	1.00	33	3.50	3.70	0.363	0.363	0.12	0.02	0.009	4%						
3.80	0.05				0.104	1.00	34	3.70	3.90	0.104	0.104	0.05	0.01	0.001	1%						
4.00	0.07				0.137	1.00	35	3.90	4.00	0.137	0.137	0.07	0.01	0.001	0%						
4.20	0.05				0.058	1.00	36	4.00	4.43	0.058	0.058	0.05	0.02	0.001	1%						
4.65	0.00				1.00	37	4.43	4.65	0.014	0.014	0.01	0.00	0.000	0%							
Total Flow:														0.206	1.000						

Total Flow:	0.206	(m <sup>3</sup> /s)
Perceived Measurement Quality:		
Total Area:	0.60	(m <sup>2</sup> )
Top Width:	3.93	(m)
Hydraulic Depth:	0.153	(m)
Mean Velocity:	0.343	(m/s)
Froude Number	0.280	
Photographs taken looking at:		
Photographs taken.		

Datalogger Notes:	Database #1772
Datalogger Internal Power:	
Datalogger External Power:	
Datalogger Memory Used:	Used
Datalogger Clock:	MST
Laptop Clock:	MST
Dessicant:	Good
Datalogger:	Optimum DD-128 #1772
PT:	Keller 3 psi #0101878
Power:	Solar panel and internal battery

Notes: Date on logger not set  
TD removed for winter  
Clock reset  
Thermistor still active on ALG 18, Reading 1.1 volts  
Thermistor and logger removed



# Hydrometric Measurement / Site Visit Record

S34 - Tar River above CNRL Lake



## Regional Aquatics Monitoring Program

### Measurement Location

River/Stream: Tar River above CNRL Lake  
Location: Tar River above CNRL Lake  
Site Name: S34  
Coordinates & Legal: 6361689 N, 440729 E

### Time of Measurement

Date of Measurement: December 11, 2007  
Start Time: 12:03 PM MDT  
End Time: MDT

Weather Conditions: -15 C, overcast, Light wind

River Conditions: ice

### Personnel & Equipment

Measurement Made By: SM/FF  
Data Entry By: SM Checked: Marsh McBirney FloMate 2000  
Meter Type and No.: s/n 2004521

### Level Readings

	Setup No. 1	Setup No. 2	
Bench Mark Reading: Nail in tree	2.776	El: 98.815	2.818 El: 98.815
Water Level Reading:	4.092	El: 97.499	4.130 El: 97.503
Transducer Reading & El.:		El: 97.499	El: 97.503
Other:	1.589	El: 100.002	1.630 El: 100.003
ice	4.010		4.130

97.501  
97.501

### Notes:

not enough flow to measure

Datalogger Notes:		Database #1772
Datalogger Internal Power:		
Datalogger External Power:		
Datalogger Memory Used:		Used
Datalogger Clock:		MST
Laptop Clock:		MST
Dessicant:		Good
Datalogger:		Optimum DD-128 #1772
PT:		Keller 3 psi #0101878
Power:		Solar panel and internal battery

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**Appendix D**  
**Water Quality Component**

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## D.0 WATER QUALITY COMPONENT

### D.1 PCA AND CLUSTER ANALYSIS OF WATER QUALITY DATA

#### D.1.1 RAMP Stations

##### D.1.1.1 Introduction

RAMP water quality data from 1997 to 2007 for the Athabasca River, Athabasca River Delta (ARD), tributaries of the Athabasca River within the RAMP FSA, and regional lakes were analyzed using objective classification analysis (OCA) to determine if there were any spatial or temporal patterns present. OCA is a multivariate statistical technique that first uses principal components analysis (PCA) to reduce the dataset, followed by cluster analysis to classify stations based on water or sediment quality. More information on this approach is provided in Appendix E of RAMP (2005a).

##### D.1.1.2 Analysis of Water Chemistry Data

The historical water chemistry dataset included 65 monitoring stations (Table D.1-1), which had been monitored in the fall for two to ten years (data for other seasons were excluded) from 1997 to 2007, for a total of 335 observations (i.e., station/year combinations).

**Table D.1-1 RAMP water quality stations included in the historical dataset, 1997 to 2007.**

Region	Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Athabasca River	ATR-DC-CC						✓	✓	✓	✓	✓	✓
	ATR-DC-CC-D	✓										
	ATR-DC-E		✓		✓	✓	✓	✓	✓	✓	✓	✓
	ATR-DC-M				✓							
	ATR-DC-W		✓		✓	✓	✓	✓	✓	✓	✓	✓
	ATR-DD-CC						✓	✓	✓	✓		
	ATR-DD-E									✓	✓	✓
	ATR-DD-W									✓	✓	✓
	ATR-ER				✓	✓			✓			
	ATR-FC-CC-D	✓										
	ATR-FC-E				✓	✓	✓	✓				
	ATR-FC-E-D		✓									
	ATR-FC-M				✓							
	ATR-FC-W				✓	✓	✓	✓				
	ATR-FC-W-D		✓									
	ATR-FR-CC											✓
	ATR-FR						✓	✓	✓	✓	✓	
	ATR-MR-E				✓	✓	✓	✓	✓	✓	✓	✓
	ATR-MR-E-D		✓									
	ATR-MR-M				✓							
	ATR-MR-W				✓	✓	✓	✓	✓	✓	✓	✓
	ATR-MR-W-D		✓									
	ATR-SR-E				✓	✓	✓	✓	✓	✓	✓	✓
	ATR-SR-M				✓							
	ATR-SR-W				✓	✓	✓	✓	✓	✓	✓	✓
	EMR-1							✓				

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

Region	Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Athabasca River Delta	ARD-1				✓	✓		✓	✓			
Eastern Tributaries	FIR-1						✓	✓	✓	✓	✓	✓
	FIR-2							✓	✓	✓	✓	✓
	FIR-2X						✓					
	FOC-1				✓	✓	✓	✓			✓	✓
	MCC-1			✓	✓	✓	✓	✓	✓	✓	✓	✓
	UNC-1				✓							
Western Tributaries	BER-1							✓	✓	✓	✓	✓
	CAR-1						✓	✓	✓	✓	✓	✓
	CAR-2									✓	✓	✓
	ELR-1		✓				✓	✓	✓	✓	✓	✓
	ELR-2							✓	✓	✓	✓	✓
	MAR-1		✓		✓	✓	✓	✓	✓	✓	✓	✓
	MAR-2						✓	✓	✓	✓	✓	✓
	POC-1				✓	✓	✓	✓	✓	✓	✓	✓
	TAR-1		✓				✓	✓	✓	✓	✓	✓
	TAR-2								✓	✓	✓	✓
	IYC-1											✓
Southern Tributaries	CHR-1						✓	✓	✓	✓	✓	✓
	CHR-2						✓	✓	✓	✓	✓	✓
	CHR-2A											✓
	CLR-1					✓	✓	✓	✓	✓	✓	✓
	CLR-2					✓	✓	✓	✓	✓	✓	✓
	HAR-1								✓	✓	✓	✓
Muskeg River	ALD-1			✓								
	JAC-1			✓	✓	✓	✓	✓	✓	✓	✓	✓
	MUC-1			✓	✓	✓	✓	✓	✓	✓	✓	✓
	MUR-1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	MUR-2			✓								
	MUR-4			✓								
	MUR-6		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	SHC-1			✓							✓	✓
	STC-1					✓	✓	✓	✓	✓	✓	✓
	WAC-1		✓	✓					✓	✓	✓	✓
Steepbank River	NSR-1						✓	✓	✓	✓	✓	✓
	STR-1	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	STR-2						✓	✓	✓	✓	✓	✓
	STR-3								✓	✓	✓	✓
Lakes	ISL-1				✓	✓			✓	✓	✓	✓
	KEL-1		✓		✓	✓	✓	✓	✓	✓	✓	✓
	MCL-1				✓	✓	✓	✓			✓	✓
	SHL-1			✓	✓	✓	✓	✓	✓	✓	✓	✓

### D.1.1.3 Methods

#### ***Principal Components Analysis (PCA)***

PCA was used to reduce the water chemistry dataset, and to facilitate broad comparisons of water quality among stations.

#### **Data Screening**

Before PCA were conducted, data were screened to exclude:

- Any variables with concentrations below detection limits in over 50% of observations (i.e., station/year combinations); and
- Any variables with missing values for 15% or more of observations (i.e., station/year combinations).

For the remaining analytes in the dataset, non-detectable values were substituted with a value equal to the detection limit and missing values were substituted with the mean for all years for a given station.

The historical dataset was comprised of results of metals analyses conducted by two different laboratories, EnviroTest Laboratories (ETL, now a component of ALS Environmental Ltd. [ALS]), which conducted the analyses from 1997-2001, and Alberta Research Council (ARC), which conducted analyses from 2002 to 2006. In general, detection limits for metals were higher (i.e., analytical methods were less sensitive) at ALS/ETL. As a result, the analytical detection limits reported by ARC were revised to be consistent with results reported by ALS/ETL, to ensure the variable detection limits did not confound results of the statistical analyses.

#### **Data Reduction**

Data were ranked prior to PCA to standardize the dataset. Separate PCAs, using no rotation, were conducted for dissolved metals, total metals, and major ions. Organic compounds were excluded from these analyses because of the high numbers of non-detectable and missing values present in the dataset. Unstandardized principal components were saved for use as summary variables in subsequent analysis.

Relationships between the input variables and output summary variables were evaluated using correlation analysis to determine which input variables were most strongly influencing the summary variables. The magnitude and direction of these correlations were used to interpret PC scores in subsequent analyses.  $r$ -values between either 0.50 and 0.75 or -0.50 and -0.75 were classified as moderate correlations, while those  $> |0.75|$  were classified as strong. The direction of correlation was used to determine whether metals or ion input variables increased or decreased with PCs.

#### ***Cluster Analysis***

Cluster analysis was conducted in two steps. First, hierarchical clustering was conducted using Ward's linkage methods and Euclidean distance measures. Second, k-means cluster analysis was used to identify groupings of stations/years, using the results of the hierarchical clustering as a guide to selecting the number of clusters used in the k-means cluster analysis.

All cluster analyses were conducted on PC scores using SYSTAT v. 10.

## **Correlation Analyses**

Rank correlations were used to evaluate the relationships between conventional variables, nutrients, and PCs.

### **D.1.1.4 Results**

#### ***Principal Components Analysis***

##### Data Screening

The following analytes with missing values for 15% or more of station/year combinations and/or non-detectable values for 50% or more of station/year combinations, were excluded from the dataset:

- **Non-detectable values:**
  - **Dissolved metals** – aluminum, antimony, beryllium, bismuth, cadmium, chromium, lead, mercury, selenium, silver, tin, and thallium;
  - **Total metals** – antimony, arsenic, beryllium, bismuth, cadmium, chromium, copper, mercury, mercury (ultra-trace) , selenium, silver, thallium, and tin;
  - **Ions and nutrients** – carbonate, nitrate+nitrite, ammonia, and BOD; and
  - **Organic compounds** – total recoverable hydrocarbons.
- **Missing values:**
  - **Metals** – dissolved chlorine, thallium, thorium, and tin, and total bismuth, chlorine, ultra-trace mercury, total sulfur, thorium; and
  - **Ions** – hydroxide.

##### Data Reduction

##### **Dissolved Metals**

The dissolved metals PCA produced a total of four principal components (PCs; Table D.1-2). The first three PCs accounted for a total of 51.6% (24.2, 17.2, 10.2%, respectively) of the variance of the dataset and were used in subsequent analyses. A fourth PC accounted for little variance (8.8%) and was excluded from the subsequent analyses.

The first summary variable, DISMET PC1 explained a majority of the variance of the data set and was moderately or strongly correlated with 6 of the 18 input variables: uranium, nickel, cobalt, strontium, copper, and molybdenum.

DISMET PC2, the second summary variable, was moderately correlated with 3 of the 18 input variables: lithium, iron, and boron.

The final principal component used in the analyses was DISMET PC3 and it was moderately and negatively correlated with: vanadium, arsenic, and zinc.



**Table D.1-2 Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for dissolved metals.**

Input Variable	Summary Variable (Principal Component)			
	DISMET PC1	DISMET PC2	DISMET PC3	DISMET PC4
Uranium	0.758	-0.417	-0.161	-0.253
Nickel	0.741	0.009	0.170	-0.008
Cobalt	0.663	0.371	0.234	0.060
Strontium	0.663	-0.095	0.056	-0.580
Copper	0.661	-0.398	0.217	0.060
Molybdenum	0.639	-0.457	-0.314	-0.016
Lithium	0.344	0.712	0.250	-0.353
Iron	0.108	0.712	-0.070	0.409
Boron	0.284	0.704	0.098	-0.279
Manganese	0.252	0.662	0.384	0.153
Vanadium	0.465	0.036	-0.542	0.060
Arsenic	0.494	0.246	-0.540	0.127
Zinc	0.314	-0.331	0.512	0.097
Aluminum	0.482	-0.134	-0.032	0.057
Antimony	0.159	-0.127	0.274	0.412
Titanium	0.249	0.386	-0.462	0.351
Lead	0.396	-0.290	0.429	0.350
Chromium	0.439	0.141	-0.114	-0.123
#	moderate correlation ( $ 0.50  < r <  0.75 $ ) between input variable and summary variable (i.e., PC)			
#	strong correlation ( $r >  0.75 $ ) between input variable and summary variable (i.e., PC)			

### Total Metals

The total metals PCA produced a total of four PCs (Table D.1-3). Three of the four PCs accounted for a total of 55.9% (31.5, 14.8, 9.6% respectively) of the total variance of the in the dataset and were used in subsequent analyses. The fourth PC accounted for little of the variance in the dataset and was therefore excluded from subsequent analyses.

TOTMET PC1 was strongly or moderately correlated with 14 of the 22 input variables, including cobalt, vanadium, titanium, lead, aluminum, nickel, copper, chromium, iron, barium, zinc, molybdenum, strontium, and manganese. The second principal component, TOTMET PC2, was strongly correlated with Lithium and was moderately correlated with calcium and boron. Finally, TOTMET PC3 was moderately correlated with only zinc.

### Ions

The ion PCA generated three PCs (Table D.1-4), which accounted for a total of 81.2% (45.7, 23, 12.5% respectively) of the variance in the dataset; all three PCs were used in subsequent analyses.

ION PC1 was strongly correlated with magnesium, calcium, and bicarbonate and moderately correlated with potassium and sodium. ION PC2 was strongly correlated with chloride and moderately correlated with sodium. ION PC3 was strongly and negatively correlated with sulphide.

**Table D.1-3 Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for total metals.**

Input Variable	Summary Variable (Principal Component)			
	TOTMET PC1	TOTMET PC2	TOTMET PC3	TOTMET PC4
Cobalt	0.810	0.069	-0.08	0.296
Vanadium	0.792	-0.392	-0.181	0.122
Titanium	0.790	-0.343	-0.333	-0.123
Lead	0.775	-0.258	0.110	0.122
Aluminum	0.770	-0.381	-0.283	-0.190
Nickel	0.725	0.170	0.118	0.113
Copper	0.690	-0.051	0.343	-0.004
Chromium	0.676	-0.117	0.098	0.314
Iron	0.647	0.107	-0.474	0.372
Barium	0.598	0.419	0.239	-0.222
Zinc	0.574	0.045	0.551	0.248
Molybdenum	0.564	-0.128	0.076	-0.559
Strontium	0.543	0.487	0.137	-0.550
Manganese	0.506	0.298	-0.444	0.400
Lithium	0.034	0.821	-0.277	0.039
Calcium	0.170	0.776	0.253	-0.029
Boron	-0.052	0.736	-0.378	-0.046
Tin	0.237	0.170	0.622	0.227
Cadmium	0.118	0.159	0.044	0.360
Uranium	0.467	-0.027	0.069	-0.338
Sodium	0.272	0.465	-0.349	-0.247
Thallium	0.083	0.322	0.346	0.061

# moderate correlation ( $|0.50| > r < |0.75|$ ) between input variable and summary variable (i.e., PC)

# strong correlation ( $r > |0.75|$ ) between input variable and summary variable (i.e., PC)

**Table D.1-4 Pearson correlation coefficients of input variables with output summary variables (i.e., principal components) for ions.**

Input Variable	Summary Variable (Principal Component)		
	ION PC1	ION PC2	ION PC3
Magnesium	0.878	-0.412	0.079
Calcium	0.865	-0.371	0.136
Bicarbonate	0.851	-0.456	-0.021
Potassium	0.750	0.135	0.016
Sodium	0.565	0.685	-0.173
Chloride	0.444	0.778	0.034
Sulphide	0.311	0.016	-0.896
Sulphate	0.485	0.475	0.373

# moderate correlation ( $|0.50| > r < |0.75|$ ) between input variable and summary variable (i.e., PC)

# strong correlation ( $r > |0.75|$ ) between input variable and summary variable (i.e., PC)

## Relationships among Principal Components

Rank correlations were used to assess whether any strong relationships exist among the principal components both within and between the input variable types (total metals, dissolved metals, and ions; Table D.1-5). The only strong correlation was between DISMET PC1 and TOTMET PC2 ( $r_s=0.784$ ) and there were three moderate correlations: ION PC1 versus TOTMET PC1 (0.697), ION PC2 versus TOTMET PC2 (0.641), and ION PC3 versus TOTMET PC3 (0.536).

With a total number of station/year combinations of 349, the critical  $r_s$  coefficient value is  $|0.113|$ . Although a large number of correlations were statistically significant (22 of 36) among the principal components, many of the observed correlations were weak because of the high sample size and consequent significance of small coefficients; any correlation greater than  $|0.113|$  was statistically significant.

## Cluster Analysis

Based on the results of hierarchical cluster analysis, k-means cluster analysis was completed that produced three groupings (i.e. clusters; Table D.1-6 to Table D.1-7).

### Cluster Membership

Cluster 1 is comprised of a total of 125 station/year combinations (Table D.1-6 and Table D.1-7), predominantly including Firebag (all Firebag sites), Jackpine, Muskeg (upstream of Wapasu and the mouth) Christina, Clearwater (upstream of Christina River), Steepbank (upstream of Project Millenium), North Steepbank (upstream of P.C. Lewis), and Ells (upstream of CNRL Horizon: 2004-2007) Rivers and Kearnl (2000-2007) and McClelland Lakes (2000-2007). Some combinations of Shipyard Lake, Muskeg, Stanley, Wapasu, Iyininmin Creeks and the Athabasca River (ATR-DC sites in 2006) also fall into the first clustering.

The second cluster is composed of 110 station/year combinations, including, Fort (mouth; 2000, 2001, 2003, 2006, 2007), McLean (mouth: 1999, 2001-2007), and Poplar Creeks (all years), Isadore's (2001, 2006, 2007) and Shipyard Lakes (2001-2002, 2004-2007), Muskeg (upstream of Muskeg Creek: all years; upstream of Canterra Road Crossing 1999, 2001, 2006), Calumet (all years), MacKay (most years: upstream of P.C. MacKay and mouth), and Tar Rivers (seven of eleven years). Infrequent contributions (less than 5) to the second clustering included Alsands Drain, Christina, Hangingstone, Beaver, and Ells Rivers, and Jackpine, Muskeg, Shelley, Stanley, and Wapsau Creeks.

Finally, Cluster 3 is composed of 114 site/year combinations, of which 90 are from the Athabasca River. Minor contributions are made by Poplar and Unnamed Creeks, Kearnl Lake, and the Muskeg, Christina, Clearwater, Hangingstone, Ells, and Tar Rivers.

**Table D.1-5 Rank correlations among ion, dissolved metal, and total metal principal components.**

	Rank Correlation ( $r_s$ )								
	DISMET PC1	DISMET PC2	DISMET PC3	ION PC1	ION PC2	ION PC3	TOTMET PC1	TOTMET PC2	TOTMET PC3
DISMET PC1	1								
DISMET PC2	0.002	1							
DISMET PC3	<b>0.264</b>	<b>0.067</b>	1						
ION PC1	<b>0.387</b>	<b>0.440</b>	<b>0.343</b>	1					
ION PC2	<b>0.347</b>	<b>-0.196</b>	<b>-0.456</b>	0.021	1				
ION PC3	<b>0.266</b>	<b>-0.441</b>	0.062	-0.062	0.038	1			
TOTMET P	<b>0.224</b>	<b>0.444</b>	<b>0.382</b>	<b>0.697</b>	<b>-0.193</b>	-0.094	1		
TOTMET PC2	<b>0.784</b>	<b>-0.162</b>	0.024	<b>0.320</b>	<b>0.641</b>	<b>0.400</b>	0.006	1	
TOTMET PC3	0.051	<b>-0.321</b>	<b>0.414</b>	-0.031	<b>-0.472</b>	<b>0.536</b>	-0.019	-0.011	1

**Bold** values represent significant correlation where  $|r_s| \geq |0.113|$  for  $n=349$

Light shading indicates a moderate correlation ( $|0.50| > r_s < |0.75|$ ) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ( $r_s > |0.75|$ ) exists between the input variable and summary variable (i.e., PC).

**Table D.1-6 Summary of cluster membership by region.**

Region/Waterbody	Total No. of Station/Year Combinations	Cluster		
		1	2	3
<b>Athabasca River</b>	<b>93</b>	<b>3</b>		<b>90</b>
<b>Athabasca River Delta</b>	<b>5</b>			<b>5</b>
<b>Eastern tributaries</b>	<b>28</b>	<b>13</b>	<b>13</b>	<b>2</b>
Firebag River	12	12		
Fort Creek	6	1	5	
McLean Creek	9		8	1
Unnamed Creek	1			1
<b>Regional Lakes</b>	<b>30</b>	<b>19</b>	<b>10</b>	<b>1</b>
Isadore's Lake	6	3	3	
Kearl Lake	9	8	1	
McClelland Lake	6	6		
Shipyard Lake	9	2	6	1
<b>Muskeg River</b>	<b>76</b>	<b>44</b>	<b>31</b>	<b>1</b>
Alsands Drain	1		1	
Jackpine Creek	9	8	1	
Muskeg Creek	10	6	4	
Muskeg River	39	19	19	1
Shelley Creek	3		3	
Stanley Creek	8	6	2	
Wapasu Creek	6	5	1	
<b>Southern tributaries</b>	<b>31</b>	<b>19</b>	<b>7</b>	<b>5</b>
Christina River	13	7	4	2
Clearwater River	14	12		2
Hangingstone River	4		3	1
Steepbank River	26	19	5	2
<b>North Steepbank River</b>	<b>6</b>	<b>6</b>		
Steepbank River	20	13	5	2
<b>Western tributaries</b>	<b>60</b>	<b>8</b>	<b>44</b>	<b>8</b>
Beaver River	5		5	
Calumet River	9		9	
Ells River	11	6	3	2
MacKay River	15	1	12	2
Poplar Creek	8		8	
Iyininmin Creek	1	1		
Tar River	11		7	4
<b>Total</b>	<b>349</b>	<b>125</b>	<b>110</b>	<b>114</b>

**Table D.1-7 Summary of cluster membership by station and year for the water quality dataset.**

Region	Station	Year	Cluster	Station	Year	Cluster
Athabasca River	ATR-DC-CC	2002	3	ATR-FC-W	2001	3
	ATR-DC-CC	2003	3	ATR-FC-W	2002	3
	ATR-DC-CC	2004	3	ATR-FC-W	2003	3
	ATR-DC-CC	2005	3	ATR-FC-W-D	1998	3
	ATR-DC-CC	2006	1	ATR-FR	2002	3
	ATR-DC-CC	2007	3	ATR-FR	2003	3
	ATR-DC-CC-D	1997	3	ATR-FR	2004	3
	ATR-DC-E	1998	3	ATR-FR-CC	2005	3
	ATR-DC-E	2000	3	ATR-FR-CC	2006	3
	ATR-DC-E	2001	3	ATR-FR-CC	2007	3
	ATR-DC-E	2002	3	ATR-MR-E	2000	3
	ATR-DC-E	2003	1	ATR-MR-E	2001	3
	ATR-DC-E	2004	3	ATR-MR-E	2002	3
	ATR-DC-E	2005	3	ATR-MR-E	2003	3
	ATR-DC-E	2006	3	ATR-MR-E	2004	3
	ATR-DC-E	2007	3	ATR-MR-E	2005	3
	ATR-DC-M	2000	3	ATR-MR-E	2006	3
	ATR-DC-W	1998	3	ATR-MR-E	2007	3
	ATR-DC-W	2000	3	ATR-MR-E-D	1998	3
	ATR-DC-W	2001	3	ATR-MR-M	2000	3
	ATR-DC-W	2002	3	ATR-MR-W	2000	3
	ATR-DC-W	2003	3	ATR-MR-W	2001	3
	ATR-DC-W	2004	3	ATR-MR-W	2002	3
	ATR-DC-W	2005	3	ATR-MR-W	2003	3
	ATR-DC-W	2006	1	ATR-MR-W	2004	3
	ATR-DC-W	2007	3	ATR-MR-W	2005	3
	ATR-DD	2002	3	ATR-MR-W	2006	3
	ATR-DD	2003	3	ATR-MR-W	2007	3
	ATR-DD	2004	3	ATR-MR-W-D	1998	3
	ATR-DD	2005	3	ATR-SR-E	2000	3
	ATR-DD-E	2005	3	ATR-SR-E	2001	3
	ATR-DD-E	2006	3	ATR-SR-E	2002	3
	ATR-DD-E	2007	3	ATR-SR-E	2003	3
	ATR-DD-W	2005	3	ATR-SR-E	2004	3
	ATR-DD-W	2006	3	ATR-SR-E	2005	3
	ATR-DD-W	2007	3	ATR-SR-E	2006	3
	ATR-ER	2000	3	ATR-SR-E	2007	3
	ATR-ER	2001	3	ATR-SR-M	2000	3
	ATR-ER	2004	3	ATR-SR-W	2000	3
	ATR-FC-CC-D	1997	3	ATR-SR-W	2001	3
	ATR-FC-E	2000	3	ATR-SR-W	2002	3
	ATR-FC-E	2001	3	ATR-SR-W	2003	3
	ATR-FC-E	2002	3	ATR-SR-W	2004	3
	ATR-FC-E	2003	3	ATR-SR-W	2005	3
	ATR-FC-E-D	1998	3	ATR-SR-W	2006	3
	ATR-FC-M	2000	3	ATR-SR-W	2007	3
	ATR-FC-W	2000	3			

**Table D.7 (Cont'd.)**

Region	Station	Year	Cluster	Station	Year	Cluster
<b>Athabasca River Delta</b>	EMR-1	2003	3	ARD-1	2003	3
	ARD-1	2000	3	ARD-1	2004	3
	ARD-1	2001	3			
<b>Eastern Tributaries</b>	FIR-1	2002	1	FOC-1	2001	2
	FIR-1	2003	1	FOC-1	2002	1
	FIR-1	2004	1	FOC-1	2003	2
	FIR-1	2005	1	FOC-1	2006	2
	FIR-1	2006	1	FOC-1	2007	2
	FIR-1	2007	1	MCC-1	1999	2
	FIR-2	2003	1	MCC-1	2000	3
	FIR-2	2004	1	MCC-1	2001	2
	FIR-2	2005	1	MCC-1	2002	2
	FIR-2	2006	1	MCC-1	2003	2
	FIR-2	2007	1	MCC-1	2004	2
	FIR-2X	2002	1	MCC-1	2005	2
	UNC-1	2000	3	MCC-1	2006	2
	FOC-1	2000	2	MCC-1	2007	2
<b>Lakes</b>	ISL-1	2000	1	MCL-1	2000	1
	ISL-1	2001	2	MCL-1	2001	1
	ISL-1	2004	1	MCL-1	2002	1
	ISL-1	2005	1	MCL-1	2003	1
	ISL-1	2006	2	MCL-1	2006	1
	ISL-1	2007	2	MCL-1	2007	1
	KEL-1	1998	3	SHL-1	1999	1
	KEL-1	2000	1	SHL-1	2000	3
	KEL-1	2001	1	SHL-1	2001	2
	KEL-1	2002	1	SHL-1	2002	2
	KEL-1	2003	1	SHL-1	2003	1
	KEL-1	2004	1	SHL-1	2004	2
	KEL-1	2005	1	SHL-1	2005	2
	KEL-1	2006	1	SHL-1	2006	2
	KEL-1	2007	1	SHL-1	2007	2
<b>Muskeg River Watershed</b>	ALD-1	1999	2	MUR-4	1999	2
	JAC-1	1999	2	MUR-4	2000	1
	JAC-1	2000	1	MUR-4	2001	2
	JAC-1	2001	1	MUR-4	2002	1
	JAC-1	2002	1	MUR-4	2006	2
	JAC-1	2003	1	MUR-4	2006	2
	JAC-1	2004	1	MUR-5	1999	2
	JAC-1	2005	1	MUR-5	2000	2
	JAC-1	2006	1	MUR-5	2001	2
	JAC-1	2007	1	MUR-5	2002	2
	MUC-1	1998	2	MUR-5	2006	2
	MUC-1	1999	2	MUR-6	1998	2
	MUC-1	2000	1	MUR-6	1999	2
	MUC-1	2001	1	MUR-6	2000	1
	MUC-1	2002	1	MUR-6	2001	1
	MUC-1	2003	1	MUR-6	2002	1
	MUC-1	2004	2	MUR-6	2003	1

**Table D.7 (Cont'd.)**

Region	Station	Year	Cluster	Station	Year	Cluster
<b>Muskeg River Watershed (cont'd.)</b>	MUC-1	2005	1	MUR-6	2004	1
	MUC-1	2006	2	MUR-6	2005	1
	MUC-1	2007	1	MUR-6	2006	1
	MUR-1	1997	3	MUR-6	2007	1
	MUR-1	1998	2	SHC-1	1999	2
	MUR-1	1999	2	SHC-1	2006	2
	MUR-1	2000	1	SHC-1	2007	2
	MUR-1	2001	1	STC-1	1999	1
	MUR-1	2002	1	STC-1	2001	1
	MUR-1	2003	1	STC-1	2002	1
	MUR-1	2004	2	STC-1	2003	1
	MUR-1	2005	1	STC-1	2004	1
	MUR-1	2006	1	STC-1	2005	2
	MUR-1	2007	1	STC-1	2006	2
	MUR-2	1999	2	STC-1	2007	1
	MUR-2	1999	2	WAC-1	1998	2
	MUR-2	2000	1	WAC-1	1999	1
	MUR-2	2001	2	WAC-1	2004	1
	MUR-2	2002	1	WAC-1	2005	1
	MUR-2	2006	2	WAC-1	2006	1
	MUR-4	1999	2	WAC-1	2007	1
<b>Southern Tributaries</b>	CHR-1	2002	3	CLR-1	2004	3
	CHR-1	2003	2	CLR-1	2005	3
	CHR-1	2004	2	CLR-1	2006	1
	CHR-1	2005	1	CLR-1	2007	1
	CHR-1	2006	2	CLR-2	2001	1
	CHR-1	2007	3	CLR-2	2002	1
	CHR-2	2002	1	CLR-2	2003	1
	CHR-2	2003	1	CLR-2	2004	1
	CHR-2	2004	1	CLR-2	2005	1
	CHR-2	2005	1	CLR-2	2006	1
	CHR-2	2006	1	CLR-2	2007	1
	CHR-2	2007	1	HAR-1	2004	2
	CHR-2A	2007	2	HAR-1	2005	3
	CLR-1	2001	1	HAR-1	2006	2
	CLR-1	2002	1	HAR-1	2007	2
	CLR-1	2003	1			
<b>Steepbank River Watershed</b>	NSR-1	2002	1	STR-1	2005	1
	NSR-1	2003	1	STR-1	2006	1
	NSR-1	2004	1	STR-1	2007	1
	NSR-1	2005	1	STR-2	2002	1
	NSR-1	2006	1	STR-2	2003	1
	NSR-1	2007	1	STR-2	2004	2
	STR-1	1997	3	STR-2	2005	1
	STR-1	1998	2	STR-2	2006	1
	STR-1	2000	3	STR-2	2007	1
	STR-1	2001	2	STR-3	2004	1
	STR-1	2002	1	STR-3	2005	1
	STR-1	2003	1	STR-3	2006	2
	STR-1	2004	2	STR-3	2007	1



**Table D.7 (Cont'd.)**

Region	Station	Year	Cluster	Station	Year	Cluster
<b>Western Tributaries</b>	BER-1	2003	2	MAR-1	2004	2
	BER-1	2004	2	MAR-1	2005	2
	BER-1	2005	2	MAR-1	2006	2
	BER-1	2006	2	MAR-1	2007	2
	BER-1	2007	2	MAR-2	2002	2
	CAR-1	2002	2	MAR-2	2003	2
	CAR-1	2003	2	MAR-2	2004	2
	CAR-1	2004	2	MAR-2	2005	1
	CAR-1	2005	2	MAR-2	2006	2
	CAR-1	2006	2	MAR-2	2007	2
	CAR-1	2007	2	IYC-1	2007	1
	CAR-2	2005	2	POC-1	2000	2
	CAR-2	2006	2	POC-1	2001	2
	CAR-2	2007	2	POC-1	2002	2
	ELR-1	1998	3	POC-1	2003	2
	ELR-1	2002	1	POC-1	2004	2
	ELR-1	2003	2	POC-1	2005	2
	ELR-1	2004	2	POC-1	2006	2
	ELR-1	2005	3	POC-1	2007	2
	ELR-1	2006	1	TAR-1	1998	2
	ELR-1	2007	2	TAR-1	2002	3
	ELR-2	2004	1	TAR-1	2003	2
	ELR-2	2005	1	TAR-1	2004	3
	ELR-2	2006	1	TAR-1	2005	3
	ELR-2	2007	1	TAR-1	2006	2
	MAR-1	1998	2	TAR-1	2007	2
	MAR-1	2000	3	TAR-2	2004	2
	MAR-1	2001	3	TAR-2	2005	3
	MAR-1	2002	2	TAR-2	2006	2
	MAR-1	2003	2	TAR-2	2007	2

#### Detailed Cluster Characteristics

The characteristics of each of the three site clusters were evaluated by visually examining plots of the principal components for dissolved and total metals and ions to identify trends in water quality common to each grouping (Figure D.1-1 to Figure D.1-3); each plot used only the first two respective PCs.

#### **Dissolved Metals**

The clustering of water quality sites using the dissolved metals PCs exhibited overlap between all three site groups (Figure D.1-1). Cluster 1 generally had low concentrations of uranium, nickel, and cobalt, etc (DISMET PC1 axis), along with varying concentrations of lithium, iron, and boron (DISMET PC2 axis). The second clustering showed a slightly positive relationship with both axes, but DISMET PC1 was more variable and approximately 30% of sites had lower concentrations of the metals associated with the axis. Finally, the third clustering of sites tends towards lower concentrations of lithium, boron, and iron (metals associated with DISMET PC2), with slightly positive values along DISMET PC2.

### **Total Metals**

Clustering of water quality sites based on the total metal principal components (Figure D.1-2) exhibited a similar pattern to the dissolved metals plot. The first grouping of sites generally had lower concentrations of cobalt, vanadium, titanium, lead and aluminum, etc. (negative values along TOTMET PC1) and slightly lower concentrations of lithium, calcium, and boron (negative values of TOTMET PC2), but approximately 25% of sites fell in the positive range of TOTMET PC2. The second cluster of sites has positive values of TOTMET PC2 (increased concentrations of lithium, boron, and calcium) and varying concentrations of the metals associated with TOTMET PC1. The final cluster of sites, cluster 3, has increasing concentrations of cobalt, vanadium, titanium, etc. and lower concentrations of lithium, calcium, and boron.

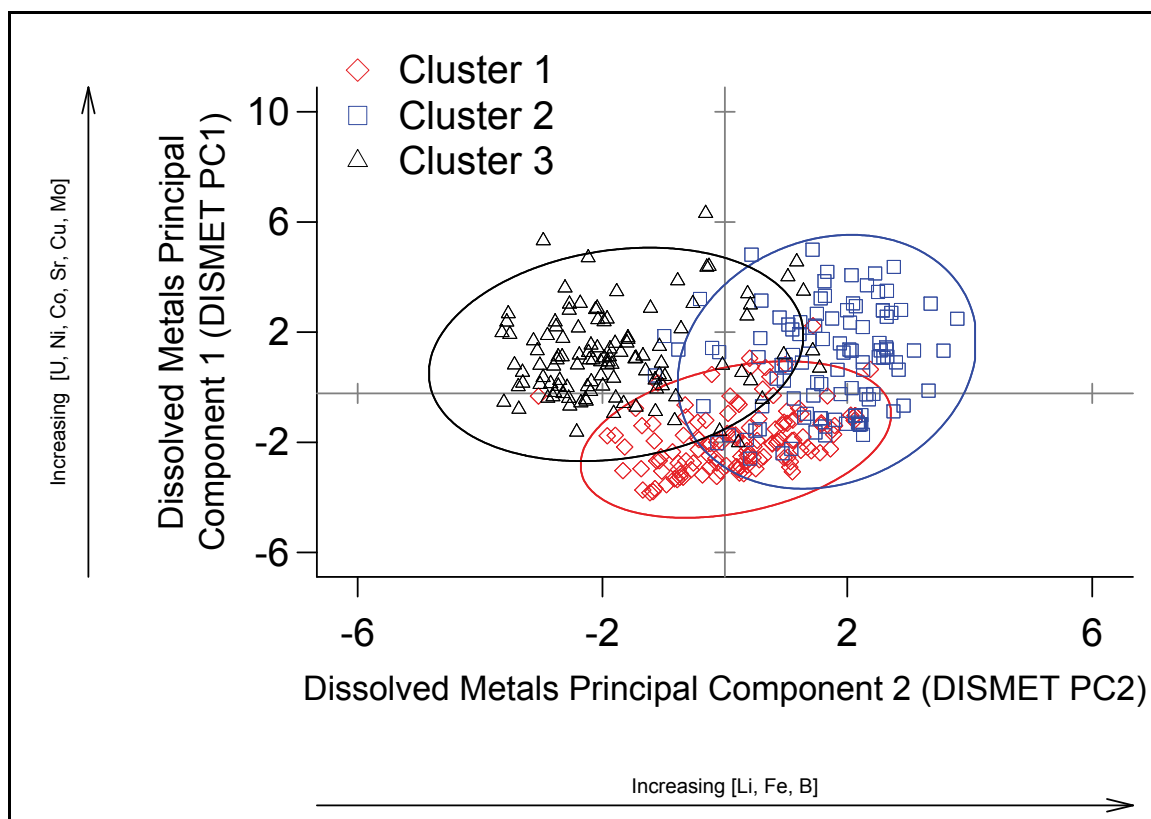
### **Ions**

Clusters of water quality sites separated by ION PC1 and ION PC2 values showed a higher degree of overlap versus the total or dissolved metals groupings (Figure D.1-3). The first cluster of sites again tended towards lower concentrations of ions associated with ION PC1 (Magnesium, calcium, and bicarbonate) with variable concentrations of sodium and chloride (ions associated with ION PC2). The second cluster has variable concentrations of sodium and chloride and has slightly positive values along ION PC1. The final cluster has variable concentrations of ions associated with ION PC1 and slightly higher concentrations of sodium and chloride.

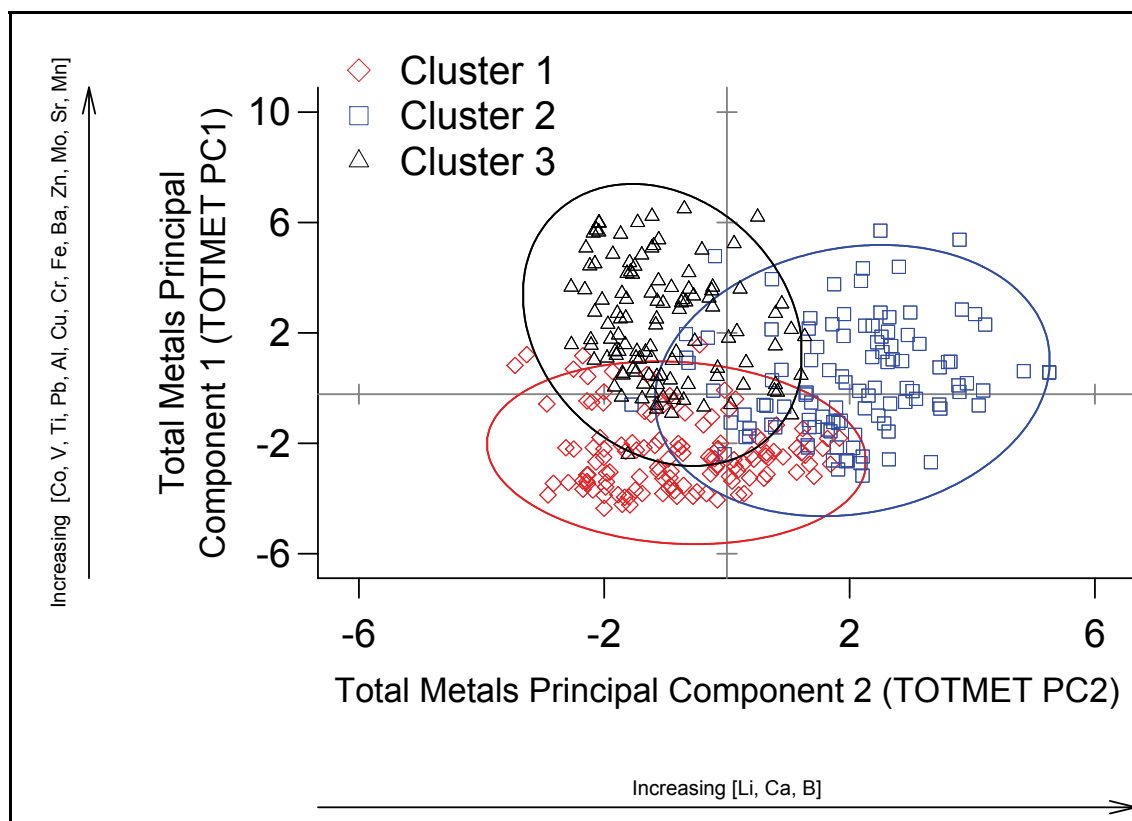
### **Other Variables**

Variables that also exhibited strong correlations with the principal components were used to characterize clustering. Additional analyses included conventional variables (conductivity, hardness, etc.), nutrients (ammonia, phosphorus, etc.) and general organics (naphthenic acids, total phenolics, recoverable hydrocarbons; Table D.1-8) and their relationships with the PCs and the input variables relationships amongst each other (Table D.1-9).

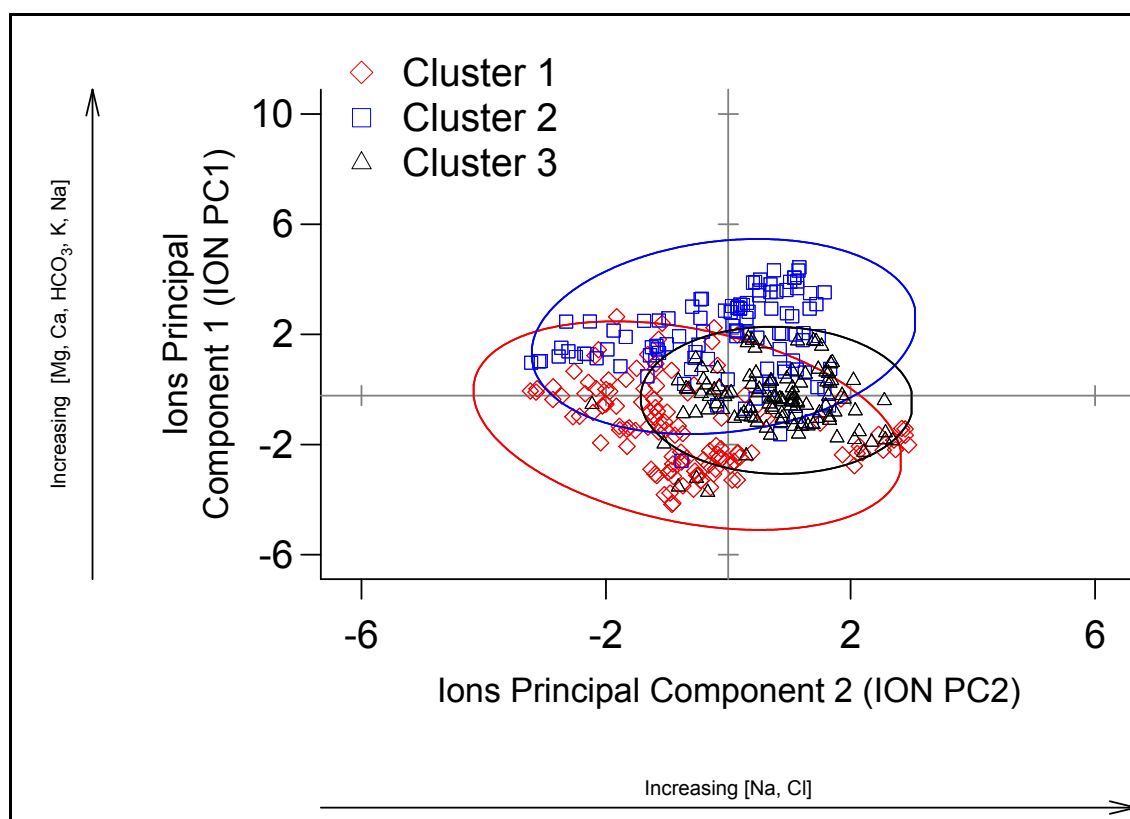
**Figure D.1-1 Relationship dissolved metals principal component 1 (DISMET PC1) versus dissolved metals principal component 2 (DISMET PC2) for all sites with water quality data (1998-2007); Ellipses represent 95% confidence intervals.**



**Figure D.1-2 Relationship total metals principal component 1 (TOTMET PC1) versus total metals principal component 2 (TOTMET PC2) for all sites with water quality data (1998-2007); Ellipses represent 95% confidence intervals.**



**Figure D.1-3 Relationship ions principal component 1 (ION PC1) versus ions principal component 2 (ION PC2) for all sites with water quality data (1998-2007); Ellipses represent 95% confidence intervals.**



There are a total of 17 strong or moderate correlations between the principal components and the selected water quality variables. Of these 17, only two were between either a general organic (naphthenic acids and ION PC1; 0.543) or a nutrient (total phosphorus and DISMET PC2; 0.514) and a summary variable. The remainder of the strong to moderate correlations were found between the Conventional Variables and the principal components. ION PC1 and TOTMET PC2 exhibited strong correlations with several of the conventional variables: ION PC1, which is driven by magnesium, calcium and bicarbonate ions, had correlation coefficients exceeding 0.834 with conductivity, hardness, total alkalinity and total dissolved solids. TOTMET PC2, driven by lithium, calcium, and boron, had correlations of 0.799 and 0.767 with total alkalinity and total dissolved solids, respectively. Several moderate correlations of note are between DISMET PC2 and dissolved organic carbon (0.717), DISMET PC2 and total organic carbon (0.702), conductivity and TOTMET PC2 (0.740), and TOTMET PC2 and hardness (0.717). Most of these correlations are driven by the relationships between input variables of the PC's and of the water quality variables, such as conductivity and TOTMET PC2.

Many input variables had strong correlations with each other (Table D.1-9). Notably, conductivity is strongly associated with bicarbonate, calcium, and magnesium ions and with dissolved magnesium and total calcium. Hardness was also associated with dissolved barium and magnesium, total calcium, and bicarbonate, calcium, and magnesium ions. These relationships are largely due to known relationships between water quality variables such, conductivity and hardness and their component parts, dissolved metals. Naphthenic acids had strong correlations with chloride and sodium ions (>0.78). TOTMET PC1 exhibited a moderate correlations with TSS (0.69) suggesting that total metals were bound to particulate matter or were present in a particulate form.

#### Summary of Cluster Characteristics

Cluster 1 includes site/year combinations of the Firebag, Muskeg, Jackpine, Clearwater, and Steepbank Rivers, as well as Kearn Lake. These sites are characterized by low to moderate concentrations of metals, and low ionic content. Other supporting variables, such as pH, hardness, and alkalinity show a range of values.

Cluster 2 includes site/year combinations of McLean moderate to high concentrations of total and dissolved metals, and ions. Relatively high levels of supporting environmental variables, such as hardness, alkalinity, and TDS were also observed at these sites.

Cluster 3 was composed almost exclusively of sites on the Athabasca River and the Athabasca River Delta. There were high concentrations of metals associated with TOTMET PC1 (cobalt, vanadium, titanium, etc.) and low concentrations of metals associated with TOTMET PC2 (lithium, calcium, and boron). Dissolved metals associated with DISMET PC2 were found at low concentrations and those associated with DISMET PC1 (cobalt, strontium, and copper, etc). Ions were measured at moderate to high concentrations and alkalinity, hardness, and conductivity, were relatively low, while TSS was relatively high.

**Table D.1-8 Rank correlations among conventional variables, general organics, nutrients and total metal principal components.**

	DISMET PC1	DISMET PC2	DISMET PC3	ION PC1	ION PC2	ION PC3	TOTMET PC1	TOTMET PC2	TOTMET PC3
<b>Conventional Variables</b>									
Conductivity	<b>0.379</b>	<b>0.270</b>	<b>0.336</b>	<b>0.940</b>	0.058	<b>0.277</b>	<b>0.242</b>	<b>0.740</b>	0.107
DOC	-0.088	<b>0.717</b>	0.016	0.074	<b>-0.200</b>	<b>-0.599</b>	<b>-0.310</b>	<b>0.328</b>	<b>-0.465</b>
Hardness	<b>0.238</b>	<b>0.283</b>	<b>0.378</b>	<b>0.900</b>	<b>-0.313</b>	<b>0.303</b>	0.079	<b>0.717</b>	<b>0.201</b>
pH	<b>0.150</b>	0.086	<b>-0.238</b>	<b>0.293</b>	-0.034	<b>0.165</b>	0.031	<b>0.210</b>	<b>-0.248</b>
Total Alkalinity	<b>0.186</b>	<b>0.466</b>	<b>0.394</b>	<b>0.868</b>	<b>-0.353</b>	<b>0.129</b>	-0.039	<b>0.799</b>	0.102
TDS	<b>0.322</b>	<b>0.460</b>	<b>0.301</b>	<b>0.834</b>	-0.037	0.094	0.110	<b>0.767</b>	-0.002
TOC	-0.046	<b>0.702</b>	0.062	0.107	<b>-0.203</b>	<b>-0.582</b>	<b>-0.267</b>	<b>0.350</b>	<b>0.398</b>
TSS	<b>0.338</b>	<b>-0.321</b>	<b>-0.153</b>	-0.077	<b>0.345</b>	<b>0.220</b>	<b>0.689</b>	<b>-0.278</b>	-0.071
Total Colour	0.076	<b>0.536</b>	<b>-0.224</b>	<b>-0.120</b>	-0.042	<b>-0.491</b>	-0.006	0.035	<b>-0.523</b>
<b>General Organics</b>									
Naphthenic Acids	<b>0.492</b>	<b>0.372</b>	<b>-0.112</b>	<b>0.543</b>	<b>0.708</b>	-0.082	<b>0.342</b>	<b>0.475</b>	<b>-0.384</b>
Total Phenolics	-0.053	<b>0.335</b>	<b>-0.169</b>	0.020	<b>-0.152</b>	<b>-0.327</b>	<b>-0.172</b>	0.093	<b>-0.385</b>
Total Recoverable Hydrocarbons	-0.030	<b>0.205</b>	-0.067	<b>0.118</b>	-0.087	<b>-0.175</b>	-0.072	<b>0.136</b>	<b>-0.209</b>
<b>Nutrients</b>									
Ammonia	0.068	<b>-0.198</b>	<b>0.363</b>	0.030	-0.110	<b>0.128</b>	0.095	0.023	<b>0.343</b>
BOD	<b>0.131</b>	0.055	<b>0.123</b>	0.105	0.021	-0.047	0.048	<b>0.147</b>	0.016
Nitrate-Nitrite	<b>-0.168</b>	<b>0.263</b>	<b>-0.427</b>	0.053	0.010	<b>-0.130</b>	<b>-0.224</b>	0.016	<b>-0.422</b>
Dissolved Phosphorus	0.009	<b>0.431</b>	<b>-0.140</b>	<b>-0.124</b>	-0.082	<b>-0.347</b>	-0.065	0.005	<b>-0.364</b>
Total Phosphorus	0.027	<b>0.514</b>	<b>0.045</b>	<b>0.168</b>	<b>-0.134</b>	<b>-0.375</b>	<b>-0.139</b>	<b>0.312</b>	<b>-0.211</b>
Total Kjehdahl Nitrogen	0.026	<b>0.530</b>	0.019	<b>0.181</b>	<b>-0.115</b>	<b>-0.371</b>	<b>-0.138</b>	<b>0.317</b>	<b>-0.227</b>
Total Nitrogen	0.026	<b>0.530</b>	0.019	<b>0.181</b>	<b>-0.115</b>	<b>-0.371</b>	<b>-0.138</b>	<b>0.317</b>	<b>-0.227</b>

**Bold** values represent significant correlations where  $|r_s| \geq |0.110|$  for  $n=333$ .

Light shading indicates a moderate correlation ( $|0.50| < r_s < |0.75|$ ) exists between variables.

Dark shading indicates a strong correlation ( $r_s > |0.75|$ ) exists between variables.

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Table D.1-9 Rank correlations of conventional variables, nutrients, and general organics with dissolved and total metals and major ions for the water quality dataset.

	Conventional Variables									General Organics			Nutrients						
	Conductivity	DOC	Hardness	pH	Alkalinity	TDS	TOC	TSS	Colour	Naphthenic Acids	Phenolics	Hydrocarbons	Ammonia	BOD	Nitrate + Nitrite	Dissolved Phosphorus	Total Phosphorus	Total Kjeda hl Nitrogen	Total Nitrogen
Dissolved Metals																			
Arsenic	0.072	0.187	-0.042	0.155	-0.015	0.094	0.190	0.088	0.309	0.347	0.101	0.105	-0.206	0.050	0.239	0.342	0.159	0.185	0.185
Barium	0.634	-0.394	0.668	0.178	0.521	0.482	-0.368	0.151	-0.355	0.111	-0.149	-0.041	0.150	0.073	-0.118	-0.277	-0.159	-0.162	-0.162
Boron	0.352	0.529	0.278	0.213	0.443	0.462	0.524	-0.220	0.241	0.572	0.128	0.171	-0.087	0.120	0.094	0.121	0.384	0.397	0.397
Cobalt	0.370	0.242	0.322	0.018	0.344	0.426	0.270	0.110	0.251	0.374	0.079	0.075	0.048	0.193	-0.110	0.116	0.226	0.225	0.225
Coppe	0.165	-0.304	0.104	0.073	0.026	0.092	-0.248	0.385	-0.133	0.091	-0.196	-0.111	0.164	0.061	-0.251	-0.236	-0.141	-0.140	-0.140
Iron	-0.017	0.536	-0.034	-0.132	0.114	0.137	0.545	-0.136	0.663	0.190	0.297	0.088	-0.176	0.037	0.150	0.604	0.364	0.368	0.368
Lithium	0.513	0.462	0.489	0.147	0.614	0.574	0.471	-0.202	0.188	0.438	0.103	0.174	-0.031	0.140	0.060	0.106	0.388	0.397	0.397
Magnesium	0.848	0.125	0.968	0.319	0.929	0.768	0.154	-0.221	-0.134	0.223	0.055	0.120	0.056	0.068	0.042	-0.103	0.217	0.225	0.225
Molybdenum	0.005	-0.485	-0.120	0.192	-0.231	-0.150	-0.468	0.336	-0.193	0.188	-0.170	-0.084	0.043	-0.042	-0.134	-0.089	-0.349	-0.348	-0.348
Nickel	0.235	-0.062	0.148	0.000	0.122	0.245	-0.030	0.280	0.123	0.266	0.050	-0.031	0.152	0.094	-0.272	-0.022	0.046	0.039	0.039
Strontium	0.621	-0.283	0.527	0.265	0.403	0.439	-0.268	0.240	-0.235	0.456	-0.118	-0.037	0.072	0.116	-0.074	-0.264	-0.104	-0.094	-0.094
Titanium	-0.022	0.214	-0.035	0.199	0.011	0.124	0.188	0.042	0.328	0.227	0.268	0.045	-0.372	-0.048	0.353	0.253	0.172	0.188	0.188
Uranium	0.242	-0.442	0.144	0.175	-0.003	0.094	-0.428	0.336	-0.188	0.290	-0.159	-0.111	0.051	0.032	-0.056	-0.265	-0.240	-0.233	-0.233
Vanadium	0.040	0.017	-0.137	0.020	-0.148	0.000	0.028	0.262	0.166	0.448	-0.091	-0.049	-0.086	-0.060	0.158	0.127	0.104	0.123	0.123
Zinc	0.135	-0.192	0.046	-0.234	0.003	0.053	-0.133	0.170	-0.179	-0.005	-0.228	-0.216	0.250	0.053	-0.380	-0.099	-0.080	-0.100	-0.100
Total Metals																			
Aluminum	-0.145	-0.312	-0.301	0.075	-0.406	-0.251	-0.298	0.722	0.064	0.179	-0.141	-0.125	-0.046	-0.034	-0.055	-0.026	-0.234	-0.226	-0.226
Barium	0.565	-0.394	0.576	0.191	0.419	0.418	-0.363	0.324	-0.298	0.102	-0.115	-0.010	0.122	0.076	-0.127	-0.240	-0.152	-0.153	-0.153
Boron	0.396	0.524	0.316	0.221	0.471	0.503	0.517	-0.172	0.253	0.578	0.165	0.187	-0.110	0.194	0.121	0.105	0.375	0.389	0.389
Calcium	0.834	0.065	0.914	0.202	0.862	0.777	0.099	-0.108	-0.089	0.210	0.043	0.080	0.133	0.089	-0.053	-0.075	0.135	0.138	0.138
Colbalt	0.122	-0.097	-0.002	-0.078	-0.068	0.051	-0.062	0.650	0.160	0.231	0.000	0.041	0.127	0.075	-0.240	0.030	-0.021	-0.021	-0.021
Iron	0.044	0.192	-0.023	-0.093	-0.005	0.097	0.223	0.507	0.498	0.240	0.130	0.065	-0.001	0.014	-0.014	0.383	0.169	0.167	0.167
Lead	-0.030	-0.288	-0.121	-0.097	-0.201	-0.067	-0.244	0.611	-0.006	0.068	-0.210	-0.147	0.083	0.072	-0.288	-0.107	-0.170	-0.188	-0.188
Lithium	0.492	0.471	0.482	0.171	0.607	0.572	0.480	-0.196	0.240	0.423	0.152	0.176	-0.079	0.153	0.104	0.116	0.383	0.390	0.390
Manganese	0.275	0.189	0.194	-0.008	0.179	0.284	0.216	0.417	0.332	0.257	0.173	0.145	-0.014	0.089	0.087	0.293	0.223	0.232	0.232
Molybdenum	0.024	-0.488	-0.076	0.162	-0.186	-0.138	-0.469	0.297	-0.208	0.153	-0.143	-0.032	0.046	0.003	-0.125	-0.153	-0.310	-0.307	-0.307
Nickel	0.144	-0.108	0.046	-0.046	0.010	0.142	-0.071	0.420	0.090	0.217	-0.046	-0.030	0.165	0.077	-0.363	-0.056	-0.018	-0.031	-0.031
Strontium	0.625	-0.296	0.523	0.282	0.396	0.437	-0.278	0.238	-0.253	0.462	-0.110	-0.037	0.082	0.124	-0.082	-0.276	-0.105	-0.096	-0.096
Titanium	-0.107	-0.290	-0.251	0.108	-0.352	-0.209	-0.281	0.686	0.076	0.185	-0.082	-0.062	-0.094	-0.030	0.000	0.027	-0.211	-0.198	-0.198
Uranium	0.128	-0.172	0.165	0.110	0.092	0.112	-0.173	0.210	0.012	0.053	0.089	-0.013	0.043	-0.030	0.122	-0.093	0.002	0.008	0.008
Vanadium	-0.090	-0.320	-0.202	0.001	-0.315	-0.186	-0.304	0.691	0.012	0.126	-0.128	-0.101	0.061	-0.030	-0.084	-0.088	-0.206	-0.208	-0.208
Zinc	0.181	-0.280	0.108	-0.273	0.043	0.105	-0.211	0.387	-0.163	0.028	-0.314	-0.205	0.286	0.026	-0.442	-0.114	-0.090	-0.104	-0.104
Major Ions																			
Bicarbonate	0.843	0.284	0.938	0.262	1.000	0.830	0.312	-0.275	0.015	0.274	0.134	0.164	0.089	0.087	0.032	-0.008	0.301	0.305	0.305
Calcium	0.877	0.053	0.976	0.249	0.906	0.800	0.090	-0.144	-0.097	0.236	0.069	0.091	0.098	0.063	0.026	-0.077	0.127	0.135	0.135
Chloride	0.458	-0.134	0.153	0.092	0.095	0.308	-0.125	0.231	-0.097	0.787	-0.082	-0.041	-0.075	0.035	0.030	-0.043	-0.007	0.015	0.015
Magnesium	0.848	0.125	0.968	0.319	0.929	0.768	0.154	-0.221	-0.134	0.223	0.055	0.120	0.056	0.068	0.042	-0.103	0.217	0.225	0.225
Potassium	0.601	0.009	0.531	0.156	0.505	0.505	0.013	0.015	-0.185	0.429	-0.074	0.140	-0.024	0.148	0.101	-0.200	0.127	0.144	0.144
Sodium	0.530	0.152	0.234	0.174	0.287	0.489	0.157	0.073	0.083	0.994	0.023	0.051	-0.107	0.110	0.060	0.006	0.126	0.148	0.148
Sulphate	0.462	-0.426	0.324	0.131	0.149	0.286	-0.395	0.215	-0.328	0.351	-0.234	-0.038	0.051	0.085	-0.062	-0.282	-0.229	-0.216	-0.216
Sulphide	0.201	0.449	0.184	-0.054	0.246	0.287	0.471	-0.146	0.363	0.229	0.270	0.249	-0.051	0.093	0.092	0.162	0.319	0.318	0.318

**Bold** values represent significant correlations where |rs| ≥ |0.110| for n=333.  
Light shading indicates a moderate correlation (|0.50| < rs < |0.75|) exists between variables.  
Dark shading indicates a strong correlation (rs > |0.75|) exists between variables.



**Table D.1-10 Summary of cluster membership and characteristics.**

Cluster	Predominant Stations Present in Cluster	General Characteristics of Cluster			
		Total Metal Concentrations	Dissolved Metal Concentrations	Ion Concentrations	Other Variables
1	Firebag River Kearl Lake Muskeg River Jackpine Creek Clearwater River Steepbank River	Low/moderate concentrations of metals	Variable metal concentrations	Low sodium, chloride, calcium, magnesium, bicarbonate, potassium	Range of pH, hardness, TDS, Alkalinity, TP, etc.
2	McLean Creek Muskeg River MacKay River Calumet River Poplar Creek	Moderate/high concentrations	High/moderate concentrations	Moderate levels of sodium and chloride; high magnesium, calcium, bicarbonate, potassium	Relatively high hardness, alkalinity, TDS, TOC, TP
3	Athabasca River Athabasca River Delta	High concentrations of cobalt, vanadium, titanium, lead, aluminum, copper, chromium, iron, barium, zinc, molybdenum, strontium, and manganese; Low lithium, calcium, and boron	Low concentrations of lithium, iron, and boron; high uranium, nickel, cobalt, strontium, copper, molybdenum	High sodium and chloride; moderate magnesium, calcium, bicarbonate, potassium	Relatively low alkalinity, hardness, and conductivity; Relatively high TSS levels

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**Appendix E**

**Benthic Invertebrate  
Community Component**

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## **E.0 BENTHIC INVERTEBRATE COMMUNITY COMPONENT**

### **E.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, and the results of Quality Assurance/Quality Control (QA/QC). This appendix also documents the calculations used to estimate the normal ranges of variability for indices of composition that were used in Section 5 as a measure against which to judge the significance of temporal trends in reaches exposed to focal project activities.

### **E.2 BENTHIC INVERTEBRATE SAMPLE PROCESSING PROCEDURES**

#### **E.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 after a minimum exposure of 72 hours to formalin. 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 ( $250\ \mu\text{m} - 1.00$  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 E.2-1.

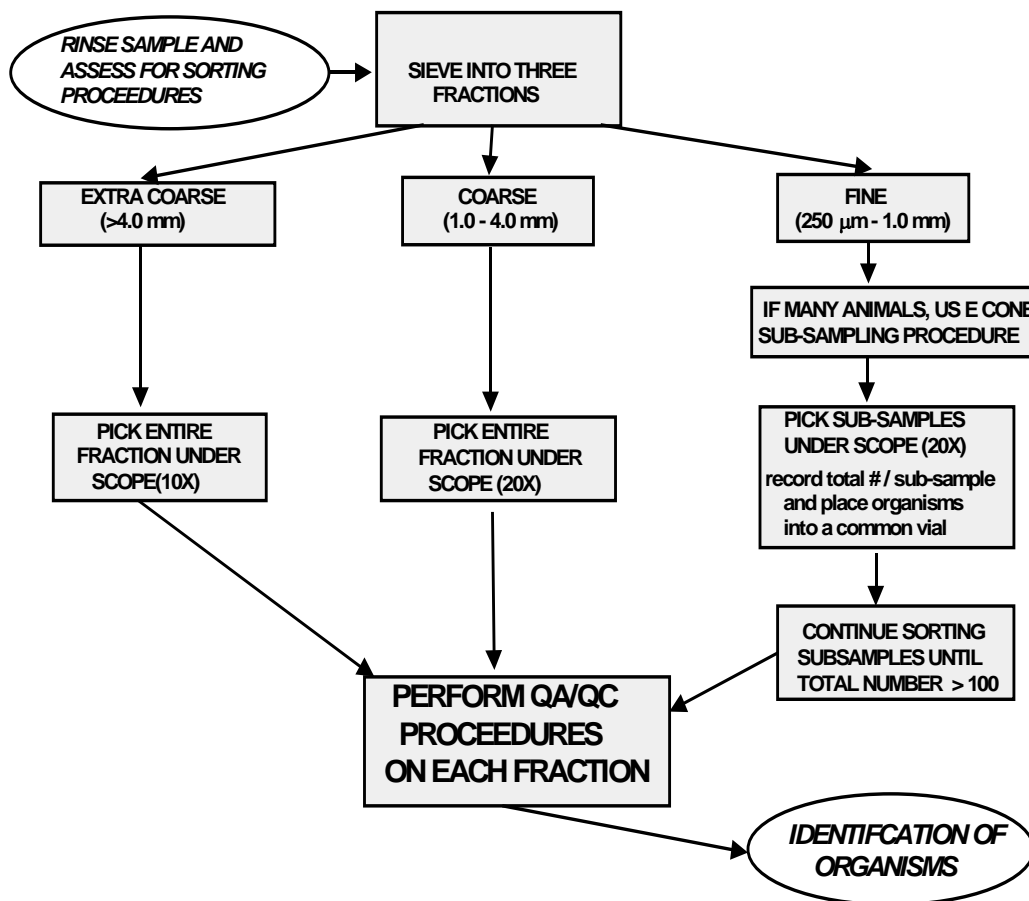
#### **E.2.2 Coarse Fraction**

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  $\frac{1}{4}$  of the coarse fraction was sorted, with the amount of material sorted determined either by volume or weight.

#### **E.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 a magnifying glass for heavy-shelled or stone-cased animals.

**Figure E.2-1 Benthic invertebrate sorting and sub-sampling protocol, which would be applicable for samples with large detrital material and large numbers of small organisms. This is an illustrative example only, which is modified as necessary for station-specific samples.**



When there was a great deal 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  $\frac{1}{4}$  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.

## E.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 1986; McCafferty and Randolph 1988; Stewart and Stark 1988; Brinkhurst 1989; Pennak 1989; Clifford 1991; Merritt and Cummins 1996; Westfall and May 1996; Wiggins 1996; Zloty and Pritchard 1997; Epler 2001). Animals were identified to the lowest practical level, typically genus with the exception of Oligochaeta, which were identified to family (see Table E.2-1). Small, early-instar or damaged specimens were identified to the lowest level possible, generally to family.

**Table E.2-1 Level of taxonomic identification.**

Group	Level
Nematoda	Phylum
Oligochaeta	Family
Gastropoda	Genus/Species
Turbellaria	Family
Hirudinea	Species
Mollusca	Genus/Species
Hydracarina	Leave at this level
Cladocera	Leave at this level
Copepoda	Order
Ostracoda	Leave at this level
Amphipoda	Genus
Insecta	Genus/Species
Terrestrial	Left at this level

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, Permount, Hohers's). The most common species that were distinguishable on the basis of gross morphology were mounted less frequently as double checks. All rare or less-commonly occurring species were mounted for identification.

### **E.3 CALCULATING NORMAL RANGES**

Though rigorous analyses of variance can be used to test for effects of focal projects by comparison of potentially influenced watercourses to those that are not, the RAMP design has considerable statistical power, and thus capable of detecting very small changes. The variability observed in regional reference locations can be used to set observed effects into context, as per Kilgour *et al.* (1998). Here we classified waterbodies as erosional or depositional river reaches, or a lake, and then calculated the "normal range of variability" for reference waterbodies within each of those habitat types. Observed variations in operational waterbodies were then compared to the observed normal ranges for reference waterbodies.

As in the main text, the following indices of composition were calculated:

- Total abundance (No. individuals/m<sup>2</sup>);
- Richness (number of distinct taxa);
- Simpson's Diversity;
- Evenness; and
- % EPT (percent of the fauna as Ephemeroptera, Plecoptera and Trichoptera).

Reference ranges for abundance, richness, diversity, evenness, and percent EPT were derived based on habitat type (erosional, depositional, lake) and are summarized in Table E.3-1. Regional reference ranges were determined as means  $\pm$  2 standard deviations (SD), representing the range about the mean over which approximately 95% of observations can be expected to lie.

**Table E.3-1 Means and standard deviations of indices of benthic community composition for reference waterbodies in the RAMP FSA.**

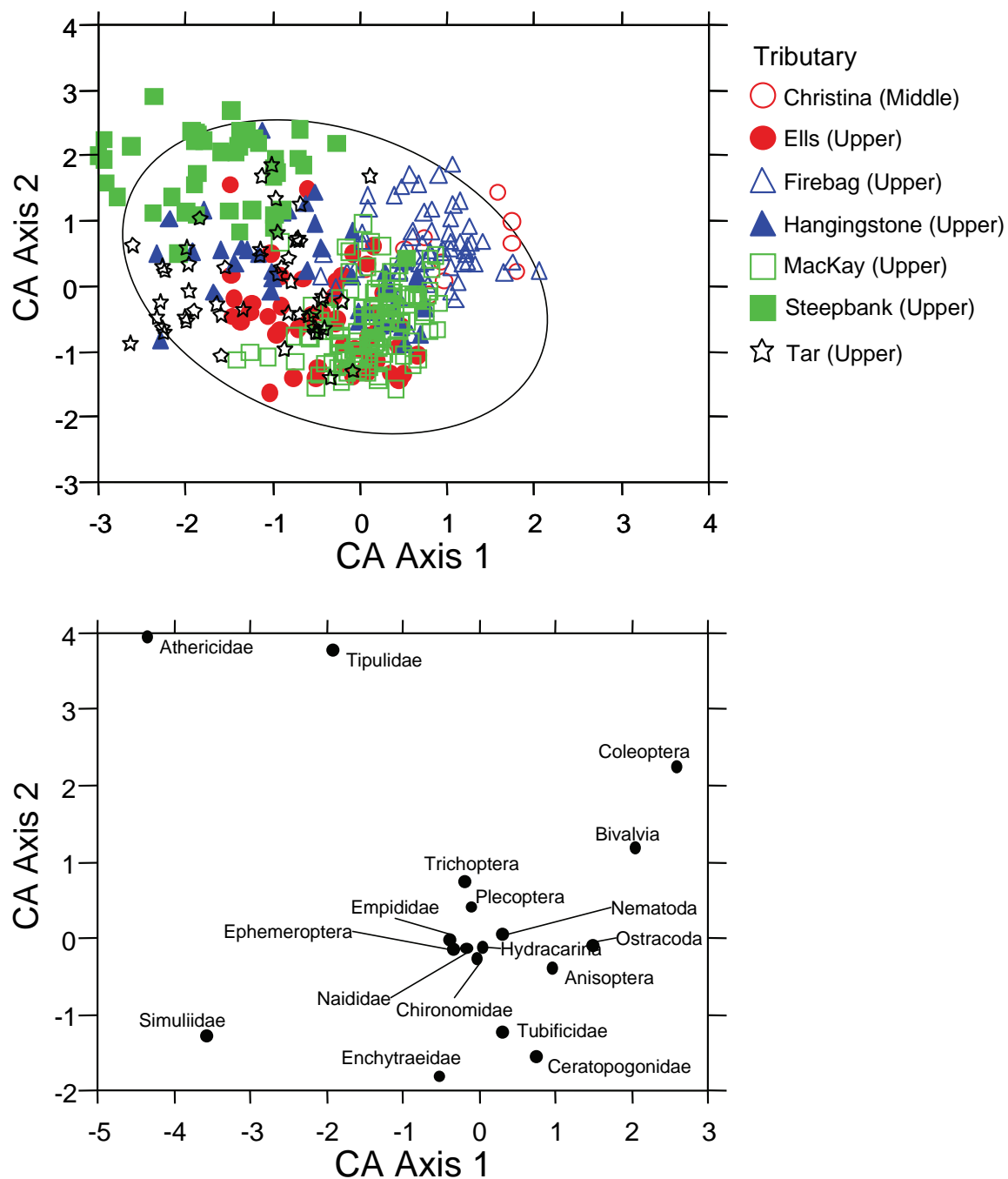
Index	Erosional Habitats			Depositional Habitats			Lakes		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
Log <sub>10</sub> Total abundance	3.92	0.49	376	3.78	0.65	712	3.66	0.62	129
Log <sub>10</sub> Richness	1.49	0.13		1.02	0.29		1.00	0.26	
Simpson's Diversity	0.86	0.10		0.65	0.24		0.710	0.15	
Evenness	0.88	0.10		0.75	0.23		0.81	0.13	
Log <sub>10</sub> EPT (%)	1.36	0.30		0.21	0.37		0.31	0.42	

We also used Correspondence Analysis (CA), a multivariate ordination procedure. CA orders the sites such that a biplot of site scores represents the similarities among sites. Sites close together in the biplot have similar fauna, while sites far apart tend to have fewer similarities in their fauna. CA also orders the taxa, and a biplot of taxa can be overlain over the biplot of sites. The position of taxa in the biplot indicates, roughly, the samples in which taxa are their most abundant. The CA was generated using the data from both reference and potentially-influenced watercourses. Separate analyses were performed for depositional river reaches, erosional river reaches, and for lakes, on the basis that those three habitat classes contained very different types of benthic invertebrates as determined from analyses from previous years. Differences in composition among those three basic habitat types were borne out again this year.

With CA, the configuration of ordination diagrams tends to be sensitive to rare taxa (Gauch, 1982). Therefore, the taxonomy was summarized to family level identifications and only those taxa (i.e., families) found in at least 10% of samples from a system were retained for the analysis. Taxa abundances were log-transformed prior to analysis. The CA was conducted using an Excel add-in (Biplot 1.1; Lipkovich and Smith 2002). The results of the CA, and ellipses around the baseline data for each of erosional, depositional and lake reference datasets from 1998 to 2007 are shown in Figure E.3-1 to Figure E.3-3.

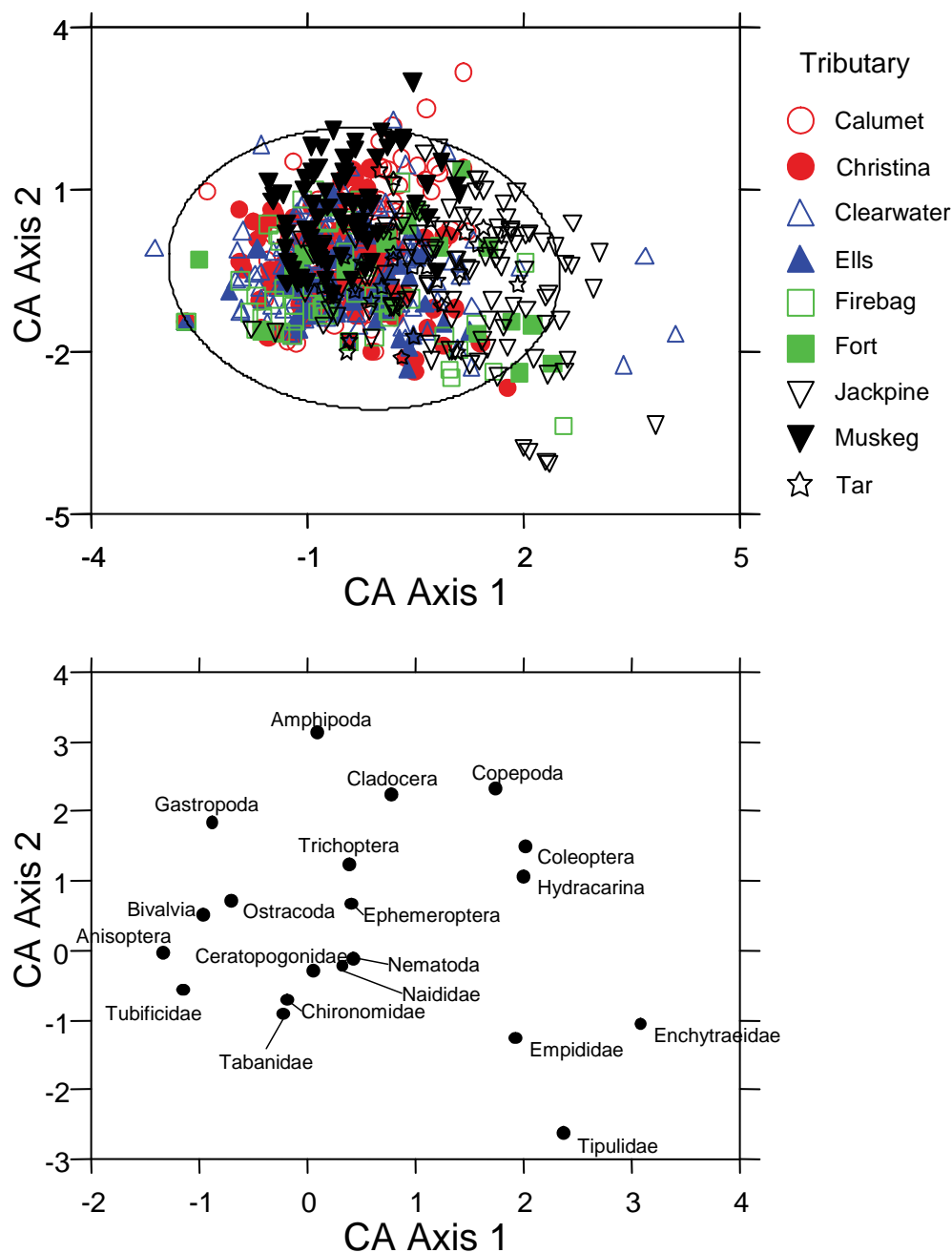


**Figure E.3-1 Ordination (Correspondence Analysis) of benthic invertebrate community samples from reference erosional habitats, 1998 to 2007.**



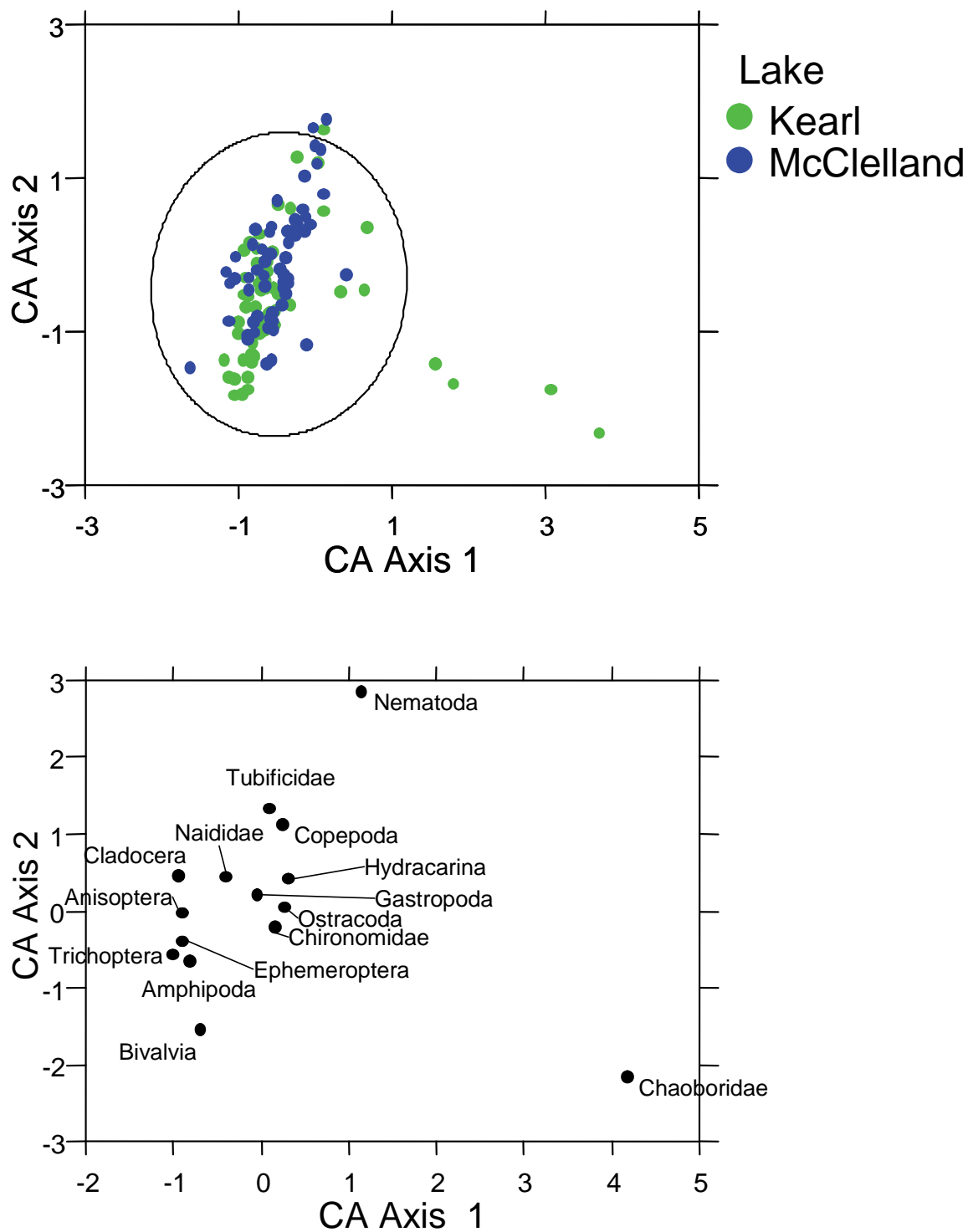
Note: Upper Panel is the scatterplot of sample scores while the Lower Panel is the scatterplot of taxa scores. The ellipse in the Upper Panel is for the reference data.

**Figure E.3-2 Ordination (Correspondence Analysis) of benthic invertebrate community samples from reference depositional habitats, 1998 to 2007.**



Note: Upper Panel is the scatterplot of sample scores while the Lower Panel is the scatterplot of taxa scores. The ellipse in the Upper Panel is for the reference data.

**Figure E.3-3 Ordination (Correspondence Analysis) of benthic invertebrate community samples from reference lake habitats, 1998 to 2007.**



Note: Upper Panel is the scatterplot of sample scores while the Lower Panel is the scatterplot of taxa scores. The ellipse in the Upper Panel is for the reference data.

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## **Appendix F**

### **Principal Components Analysis and Spearman's Rank Correlation of Sediment Quality Data**

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## **F.0 PRINCIPAL COMPONENTS ANALYSIS AND SPEARMAN'S RANK CORRELATION OF SEDIMENT QUALITY DATA**

### **F.1 INTRODUCTION**

Sediment quality has potential to predict the benthic community because of the close association of the organisms and the substrate. The close association of organism to habitat suggests that degradation of one (i.e. habitat) will lead to a measurable response in the other (i.e. organism; Griffith and Kravitz 2008). Exposure of organisms to contaminants, such as PAHs or high levels of metals can lead to mortality and reproductive or respiratory impairment (Scoggins et al. 2007; Kiffney and Clements 1994; Clements 1994). Accumulation of contaminants in sediments can lead to similar effects, including direct toxicity or indirect impacts (Scoggins et al. 2007; Peterson 2001). Many of these impacts have been investigated through sediment bioassays (Faria et al. 2008), but collection of field data (invertebrates and sediment quality) is inherently more variable and results of bioassays may not translate accurately from lab to field settings (Griffith and Kravitz 2008; Paine et al. 1996; Krantzberg 1994). Complex interactions of contaminants in field settings can also be absent from lab studies (Millward et al. 2004). Additionally, in field settings, gross factors, such as flow rate, temperature and habitat features (i.e. erosional versus depositional) are likely to exert influence on the resulting benthic community (Cover et al. 2008; Wetzel 2001). The relationships between benthos and habitat features (flow, temperature, substrate, etc.) are likely to control distributions and may obscure any influence of sediment quality on the resulting benthic community, especially in naturally varying systems.

Sediment samples and invertebrates were collected from depositional sites during the RAMP programmes in 2006 and 2007. In 2006 samples were collected from the Calumet, Christina, Ells, Firebag, Jackpine, Muskeg, Fort, and Tar Rivers and McClelland, Kearl, Shipyard, and Isadore's Lakes. In 2007, the Christina, Jackpine, Ells, Firebag, Fort, and Muskeg Rivers and McClelland, Kearl, Shipyard, and Isadore's Lakes were sampled. Additionally, samples of invertebrates and sediments were collected at several sites in Athabasca Delta, including Big Point, Fletcher, and Goose Island during 2007. Relationships among endpoints of sediment quality and between sediment quality and indices of the benthic communities pooled across sample years were examined for strength and significance; they were assessed using Spearman's rank correlation analysis. Total metals within the sediment quality were reduced to summary variables using Principal Components Analysis (PCA) because of the probable correlation among the individual metals; All other sediment quality variables were included in the analyses independently.

### **F.2 METHODS**

#### **F.2.1 Principal Components Analysis**

Principle Components Analysis (PCA) was used to reduce the sediment chemistry dataset and to facilitate broad comparisons of sediment quality among stations; PCA was conducted on all total metals in the dataset. Data was prepared and analyzed using the same methods used for the water quality dataset, which are described in Appendix D.

## F.2.2 Spearman's Rank Correlation Analysis

Spearman's Rank Correlations were used to determine the relationships between sediment quality endpoints and metrics of the benthic invertebrate community (abundance, Simpson's Diversity, richness, evenness, and percent EPT). Two-tailed correlations ( $\alpha=0.1$ ) were used in order to account for either positive or inverse relationships. Significance was determined by comparison to published correlation coefficients ( $r_s$ ) beyond a critical threshold for a given sample size; if  $r_s$  of the analysis exceeded the critical  $|r_s|$ , then the correlation was significant. For the data set analyzed here, the critical value for a sample size of 30 is  $|0.306|$ ; therefore, all  $|r_s|$  beyond  $|0.306|$  were statistically significant. The strength of correlations, regardless of statistical significance, was assigned using the following criteria:

- Weak correlations:  $r_s < |0.5|$ ;
- Moderate correlations:  $|0.5| < r_s < |0.75|$ ; and
- Strong correlations:  $r_s > |0.75|$ .

## F.3 RESULTS

### F.3.1 Total Metal Principal Components Analysis

#### *Data Screening*

Analytes with missing values for 15% or greater a variable or non-detectable values for over 50% of the observations were excluded from the data set. A number of metals had a high rate of non-detection (Table 4.1), but none were deleted because of a high number of missing values. Non-detectable values that remained in the data were replaced with values at the detection limit for the remainder of the analyses.

**Table F.3-1 Total metals removed from the dataset prior to analysis during initial screening.**

Analyte	Percent Below Detection Limit (%)
Antimony	100
Beryllium	73
Bismuth	100
Cadmium	73
Mercury	100
Molybdenum	60
Silver	100
Thallium	70
Tin	97
Uranium	50

## Data Reduction

One PCA was conducted on the total metals that remained following the initial data screening. The total metals PCA (TOTMET) produced three principal components (PCs) which accounted for a total 82.33% of the variance in the dataset (65.14% PC1 and 17.19% for PC2 and PC3 combined; Table F.3-2).

**Table F.3-2 Pearson correlations of input variables with output summary variables (i.e. principal components) for the total metals data set.**

Input Variable	Summary Variable (Principle Components)		
	TOTMET PC1	TOTMET PC2	TOTMET PC3
Copper	0.952	-0.044	0.169
Nickel	0.942	0.065	0.233
Aluminum	0.93	0.204	0.193
Cobalt	0.923	0.241	0.246
Potassium	0.908	0.22	0.281
Vanadium	0.907	0.179	0.242
Chromium	0.904	0.272	0.203
Magnesium	0.897	0.234	-0.092
Arsenic	0.874	-0.008	0.205
Calcium	0.845	-0.165	-0.448
Strontium	0.827	-0.273	-0.425
Barium	0.804	0.039	-0.505
Zinc	0.797	-0.406	0.199
Lead	0.79	-0.055	0.121
Iron	0.781	0.121	-0.413
Selenium	0.719	-0.503	0.23
Manganese	0.673	0.286	-0.398
Sodium	0.671	-0.622	0.156
Uranium	0.651	0.192	-0.18
Boron	0.552	-0.564	-0.313
Titanium	0.268	0.513	-0.179

Light shading indicates a moderate correlation ( $|0.50| < r < |0.75|$ ) between input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ( $r > |0.75|$ ) between input variable and summary variable (i.e., PC).

TOTMET PC1 explained most of the variance in the dataset and, with the exception of titanium, was strongly or moderately correlated with all of the input variables. TOTMET PC2 exhibited moderate correlations with selenium, sodium, boron, and titanium; selenium and sodium had stronger correlations with PC1 and boron and titanium did not. Only barium had a moderate correlation with TOTMET PC3. Because all metals (except titanium and boron) had a stronger correlation with TOTMET PC1, TOTMET PC2 and TOTMET PC3 were not used in the Spearman correlation analyses and because they accounted for a small portion of the variance in the dataset.

## F.3.2 Spearman's Rank Correlation Analysis

### Data Screening

Prior to the correlation analysis, analytes with missing values for 15% or greater of observations or non-detectable values for over 50% of observations were excluded from the data set. A number of variables were removed because they violated these criteria (Table F.3-3). Non-detectable values that remained in the data were replaced with values at the detection limit for the remainder of the analyses.

**Table F.3-3 Analytes removed from the dataset prior to conducting the Spearman rank correlation.**

Analyte	Percent below detection limit (%)	Percent of missing values (%)
Acenaphthylene	86	-
Anthracene	62	-
Benzene	100	-
Dibenzo[a,h]anthracene	62	-
Ethylbenzene	100	-
F1 (C6-C10)	90	-
F1-BTEX	90	-
Methyl Acenaphthene	55	-
Toluene	97	-
Xylenes	97	-
2-Bromobenzotrifluoride	-	53
Recoverable Hydrocarbons	-	97
CaCO <sub>3</sub> Equivalent	-	47
<i>Chironomus tentans</i> (10 day growth)	-	23
<i>Chironomus tentans</i> (10 day survival)	-	23
<i>Hyalella azteca</i> (10 day growth)	-	23
<i>Hyalella azteca</i> (10 day survival)	-	23

### Correlations

There were no strong correlations between any of the sediment quality endpoints and the benthic community metrics (Table F.3-4). Only two correlations were greater than 0.5: both % Silt (0.509) and inorganic carbon (0.503) had moderate correlations with abundance. However, several correlations were statistically significant: abundance had six significant relationships with sediment qualities (% sand, % silt, inorganic carbon, naphthalene, retene, and dibenzothiopenes) and evenness had five (F3, total hydrocarbons, total organic carbon, total carbon by combustion, and retene). Amongst sediment endpoints, retene has the highest rate of significant correlation with the benthic metrics at 3/5.

Spearman's rank correlations comparing the results between sediment quality endpoints had 77 of 153 (50%) statistically significant results (Table F.4-1). The strongest correlations



were between F3, F4, and total hydrocarbons (>0.89), total PAHs, F3, F4, total hydrocarbons, LMW PAHs (>0.70), total organic carbon and total combusted carbon (0.964), and total combusted carbon and naphthalene (0.78).

**Table F.3-4 Spearman's Rank correlations between benthic invertebrate community indices and sediment quality endpoints.**

Sediment Endpoint	Abundance	Richness	Simpson's Diversity	Evenness	EPT
F2 (C10-C16)	0.084	0.085	-0.028	0.026	-0.255
F3 (C16-C34)	0.179	0.124	0.24	<b>0.333</b>	0.007
F4 (C34-C50)	0.002	-0.011	0.13	0.199	-0.196
Total Hydrocarbons	0.118	0.104	0.256	<b>0.342</b>	-0.032
% Clay	0.289	-0.035	-0.014	0.007	0.08
% Sand	<b>-0.471</b>	0.01	0.119	0.113	0.085
% Silt	<b>0.509</b>	-0.035	-0.187	-0.201	-0.226
Total Organic Carbon	0.106	0.152	<b>0.425</b>	<b>0.437</b>	0.288
Inorganic Carbon	<b>0.503</b>	0.145	-0.07	-0.148	-0.141
Total Carbon by combustion	0.204	0.138	<b>0.343</b>	<b>0.384</b>	0.265
Naphthalene	<b>0.421</b>	0.137	0.068	-0.004	0.155
Retene	<b>0.327</b>	0.216	<b>0.321</b>	<b>0.343</b>	0.249
Dibenzothiopenes	<b>0.337</b>	0.167	0.118	0.167	-0.008
Total PAHS	0.253	0.07	0.109	0.143	-0.209
HMW PAH	0.208	-0.055	-0.083	-0.134	<b>-0.39</b>
LMW PAH	0.295	0.162	0.128	0.195	-0.07
Predicted PAH Toxicity	0.189	0.042	0.019	0.005	-0.146
TOTMET PC1	0.214	-0.167	-0.106	-0.084	-0.134

Critical value = |0.306|; n=30

## F.4 DISCUSSION

No major responses were detected between the sediment quality endpoints and the estimates of the benthic community, although several were statistically significant. The strongest correlations were between % Silt and abundance (0.509), but many were statistically significant, including several involving evenness and abundance.

A large number of sediment quality endpoints had very strong correlations with one another. Several (TOC and TCC, F3 and total hydrocarbons, F4 and total hydrocarbons, and LMW PAH and PAH) had  $r_s$  exceeding |0.95|. These results are not surprising and support that many of the sediment quality endpoints are either measuring closely-related chemicals (TOC and TCC), sums of chemicals (PAHs), or that some unmeasured factor is influencing both.

**Table F.4-1 Spearman's Rank Correlation Coefficients for the sediment quality endpoints**

	F2	F3	F4	Total Hydrocarbons	% Clay	% Sand	% Silt	TOC	Inorganic Carbon	TCC
F2	1.000									
F3	<b>0.376</b>	1.000								
F4	<b>0.420</b>	<b>0.892</b>	1.000							
Total Hydrocarbons	<b>0.385</b>	<b>0.988</b>	<b>0.915</b>	1.000						
% Clay	-0.226	0.083	-0.093	0.049	1.000					
% Sand	0.003	-0.089	-0.010	-0.049	<b>-0.838</b>	1.000				
% Silt	0.038	0.099	0.111	0.070	<b>0.719</b>	<b>-0.965</b>	1.000			
TOC	-0.281	<b>0.481</b>	<b>0.331</b>	<b>0.475</b>	<b>0.548</b>	<b>-0.349</b>	<b>0.309</b>	1.000		
Inorganic Carbon	-0.151	-0.002	-0.017	0.019	<b>0.593</b>	<b>-0.717</b>	<b>0.713</b>	<b>0.422</b>	1.000	
TCC	-0.247	<b>0.456</b>	0.300	<b>0.456</b>	<b>0.595</b>	<b>-0.462</b>	<b>0.429</b>	<b>0.964</b>	<b>0.577</b>	1.000
Naphthalene	<b>-0.409</b>	0.215	0.027	0.168	<b>0.715</b>	<b>-0.694</b>	<b>0.624</b>	<b>0.711</b>	<b>0.632</b>	<b>0.780</b>
Retene	0.118	<b>0.588</b>	<b>0.472</b>	<b>0.620</b>	0.239	-0.119	0.086	<b>0.585</b>	0.177	<b>0.602</b>
Dibenzothiopene	<b>0.627</b>	<b>0.567</b>	<b>0.488</b>	<b>0.522</b>	0.194	<b>-0.343</b>	<b>0.341</b>	0.177	0.207	0.218
Total PAH	<b>0.624</b>	<b>0.770</b>	<b>0.714</b>	<b>0.759</b>	0.034	-0.026	0.041	0.188	-0.267	0.159
HMW PAH	<b>0.490</b>	<b>0.509</b>	<b>0.514</b>	<b>0.486</b>	0.180	-0.212	0.206	-0.016	-0.081	-0.014
LMW PAH	<b>0.590</b>	<b>0.708</b>	<b>0.639</b>	<b>0.712</b>	0.077	-0.011	0.002	0.208	-0.248	0.183
Predicted Toxicity	<b>0.546</b>	0.074	0.062	0.066	-0.125	0.073	-0.072	-0.141	-0.224	-0.090
Total Metals (PC1)	-0.042	0.042	-0.002	-0.029	<b>0.728</b>	<b>-0.869</b>	<b>0.850</b>	<b>0.363</b>	<b>0.578</b>	<b>0.426</b>

Critical value = |0.306|; n=30

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

	<b>Naphthalene</b>	<b>Retene</b>	<b>Dibenzothiophene</b>	<b>Total PAH</b>	<b>HMW PAH</b>	<b>LMW PAH</b>	<b>Predicted Toxicity</b>	<b>Total Metals (PC1)</b>
Naphthalene	1.000							
Retene	0.267	1.000						
Dibenzothiophene	0.163	0.295	1.000					
Total PAH	-0.071	0.452	0.693	1.000				
HMW PAH	0.036	0.168	0.756	0.803	1.000			
LMW PAH	-0.117	0.555	0.600	0.953	0.684	1.000		
Predicted Toxicity	-0.185	0.229	0.526	0.582	0.515	0.615	1.000	
Total Metals (PC1)	0.664	0.035	0.352	0.025	0.234	-0.051	-0.017	1.000

Critical value = |0.306|; n=30

Within the abundance and evenness correlations with sediment quality (SQ), the correlation among the SQ endpoints explains a great deal of these relationships, weak and significant as they may be. For instance, within the factors with significant correlations to abundance, % sand and % silt are correlated by -0.965; and the relationship of % sand and % silt to inorganic carbon, naphthalene, retene, and dibenzothiopenes exceeds |0.624| in all instances. This is also the case for several SQ variables and evenness. It is unclear if the invertebrates are responding to the measured endpoints, the cumulative impacts of many chemicals related to one another, or unmeasured factors.

Correlation of benthic community measurements and sediment quality may not yield accurate responses. Sediment quality is a point estimate and can vary greatly on small time scales, whereas benthos generally respond more slowly to sub-lethal and subtle impacts. The analyses integrated both temporal (2 years) and spatial (many sites) variability into both the sediment quality and benthic community indices; it is well established that individual metals and PAH's are toxic above certain concentrations (Millward et al. 2004), but the variability of the benthic environments obscures any definite relationship between the sediment quality and the benthos in the oil sands region. Additionally, important factors in the habitats may buffer expected impacts of metals or PAHs on the benthos (Paine et al. 1996).

A major lack of response of the benthic community to an increased contaminant loading at the potentially influenced sites can result from a number of additional factors. The resolution of the benthic community, especially in richness and related estimates (evenness), may be insufficient to detect important responses. For instance, the loss of important species will be obscured if higher levels of organization are used to determine richness especially if many species are in the remaining families (Lenat and Resh 2001).

The community-level endpoint and its comparison to sediment quality can also ignore important responses, including differential mortality across developmental stages. A study in metal-impacted systems found that larger individuals were more tolerant of contamination than individuals of an earlier developmental stage, but of the same species (Kiffney and Clements 1994).

## **F.5 CONCLUSION**

Some significant correlations were found between benthic community metrics and sediment quality examined across many sites and two years of study. The strength of these correlations, however, suggests that there is little impact of sediment quality on the benthic community. A number of strong correlations within the sediment quality data were related to known relationships between variables and these likely influenced the results of the benthos/sediment correlations. It is probable that sediment quality is impacting the benthic communities, but we are unable to measure those responses adequately and accurately. If definitive relationships are to be discerned, follow-up studies must be designed and implemented with high precision and replication.

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**Appendix G**  
**Fish Population Component**

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## G.0 FISH POPULATION COMPONENT

### G.1 COMMON AND SCIENTIFIC NAMES FOR FISH SPECIES CAPTURED IN THE 2007 RAMP FISH POPULATION COMPONENT

**Table G.1-1 Common and scientific names for fish species captured for the RAMP Fish Population component, 2007.**

Common Name	Scientific Name	Code
arctic grayling	<i>Thymallus arcticus</i>	ARGR
brook stickleback	<i>Culaea inconstans</i>	BRST
burbot	<i>Lota lota</i>	BURB
cisco	<i>Coregonus artedii</i>	CISC
emerald shiner	<i>Notropis atherinoides</i>	EMSH
flathead chub	<i>Platygobio gracilis</i>	FLCH
goldeye	<i>Hiodon alosoides</i>	GOLD
lake chub	<i>Couesius plumbeus</i>	LKCH
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
pearl dace	<i>Semotilus margarita</i>	PRDC
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

## G.2 EXTERNAL PATHOLOGY CODES FOR FISH EXAMINATION

**Table G.2-1 External pathology codes for fish examination.**

Variable	Variable Condition	Code	Pathology Index Value
eyes	no aberrations; good "clear" eye	N	0
	blind; an opaque eye (one or both)	B	30
	swollen, protruding eye (one or both)	E	30
	hemorrhaging or bleeding in the eye (one or both)	H	30
	missing one or both eyes	M	30
	other; any condition not covered above	OT	30
gills	normal; no apparent aberrations	N	0
	frayed; erosion of tips of gill lamellae resulting in "ragged" gills	F	30
	clubbed; swelling of the tips of gill lamellae	C	30
	marginate; gills with light, discoloured margin along tips the lamellae	M	30
	pale; very light in colour	P	30
	other; any condition not covered above	OT	30
pseudobranchs	normal; flat, containing no aberrations	N	0
	swollen; convex in aspect	S	30
	lithic; mineral deposits, white, somewhat amorphous spots	L	30
	inflamed; redness, hemorrhage, or other	I	30
	other; any condition not covered above	OT	30
thymus	no hemorrhage	0	0
	mild hemorrhage	1	10
	moderate hemorrhage	2	20
	severe hemorrhage	3	30
skin	normal; no skin aberrations	0	0
	mild skin aberrations	1	10
	moderate skin aberrations	2	20
	severe skin aberrations	3	30
fins	no active erosion	0	0
	light active erosion	1	10
	moderate active erosion with some hemorrhaging	2	20
	severe active erosion with hemorrhaging	3	30
opercle	no shortening	0	0
	mild shortening	1	30
	severe shortening	2	30
hindgut	normal; no inflammation or reddening	0	0
	slight inflammation or reddening	1	10
	moderate inflammation or reddening	2	20
	severe inflammation or reddening	3	30

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

Variable	Variable Condition	Code	Pathology Index Value
body deformities	none	none	0
	any deformity (provide details)	n/a	30
mesenteric fat	none	0	n/a
	< 50 % coverage of mesentery	1	n/a
	50 % coverage of mesentery	2	n/a
	> 50 % coverage of mesentery	3	n/a
	100% of mesentery covered	4	n/a
liver	normal; solid red or light red colour	A	0
	"fatty" liver; "coffee with cream" colour	C	30
	nodules in the liver; cysts or nodules	D	
	focal discolouration; distinct localized colour changes	E	30
	general discolouration; colour change in whole liver	F	30
	other; any condition not covered above	OT	30
spleen	normal; black, very dark red, or red	B	0
	granular; rough appearance of spleen	G	30
	nodular; containing fistulas or nodules of varying sizes	D	30
	enlarged; noticeable enlarged	E	30
	other; any condition not covered above	OT	30
gall bladder	normal	0	0
	enlarged	1	30
	parasites	2	n/a
kidney	normal; firm dark red colour, lying relatively flat along vertebral column	N	0
	swollen; enlarged or swollen wholly or in part	S	30
	mottled; gray discolouration	M	30
	granular; granular appearance and texture	G	30
	urolithiasis/nephrocalcinosis; white/cream mineral material in tubules	U	30
	other; any condition not covered above	OT	30
parasites	no observed parasites	0	0
	few observed parasites	1	10
	moderate parasite infestation	2	20
	numerous parasites	3	30



### G.3 HABITAT SITE CARDS

<i>Referencing Information</i>	
<b>Project Name:</b>	RAMP Sentinel Sp.
<b>Project Number:</b>	RAMP 1312-3105
<b>Waterbody Name:</b>	Athabasca River
<b>Site Type:</b>	Reference
<b>Site Name:</b>	Site 1
<b>Date:</b>	15-Aug-07
<b>Time:</b>	1224
<b>Crew Members:</b>	NM / DM / AD / CE
<b>Site UTM:</b>	12. 472941. 6284723
<b>Access:</b>	Boat

<i>Water Quality</i>	
<b>Temperature (°C):</b>	17.7
<b>Conductivity (µS/cm):</b>	251
<b>Dissolved Oxygen (mg/L):</b>	9.4
<b>Visibility:</b>	Clear

<i>Channel Characteristics</i>	
<b>Avg. Channel Width (m):</b>	
<b>Avg. Wetted Width (m):</b>	
<b>Gradient (%):</b>	
<b>Stage:</b>	
<b>Average Velocity (m/s):</b>	0.3

<i>Cover</i>	
<b>Total Cover:</b>	None
<b>Dominant Cover Type:</b>	None
<b>Secondary Cover Type:</b>	Grasses
<b>Functional LWD:</b>	Few
<b>Functional SWD:</b>	Few
<b>Bank Shape:</b>	Vertical
<b>Bank Texture:</b>	Fine
<b>Riparian Vegetation:</b>	Grasses, Shrubs
<b>Vegetation Stage:</b>	Shrub/Herb
<b>Instream Vegetation:</b>	None
<b>Crown Closure (%):</b>	0

<i>Channel Morphology</i>	
<b>Dominant Bed Material:</b>	Sand
<b>Sub-Dom. Bed Material:</b>	Gravel
<b>Flood Signs:</b>	None
<b>Pattern:</b>	Meandering
<b>Islands:</b>	None
<b>Bars:</b>	Mid-stream
<b>Confinement:</b>	Confined
<b>Disturbance Indicators:</b>	None
<b>Morphology:</b>	Glide

Looking Upstream at Site



Looking Downstream at Site



<i>Referencing Information</i>	
<b>Project Name:</b>	RAMP Sentinel Sp.
<b>Project Number:</b>	RAMP 1312-3105
<b>Waterbody Name:</b>	Athabasca River
<b>Site Type:</b>	Reference
<b>Site Name:</b>	Site 2
<b>Date:</b>	16-Aug-07
<b>Time:</b>	1340
<b>Crew Members:</b>	NM / DM / AD / CE
<b>Site UTM:</b>	12. 473393. 6303047
<b>Access:</b>	Boat

<i>Water Quality</i>	
<b>Temperature (°C):</b>	16.9
<b>Conductivity (µS/cm):</b>	249
<b>Dissolved Oxygen (mg/L):</b>	8.9
<b>Visibility:</b>	Clear

<i>Channel Characteristics</i>	
<b>Avg. Channel Width (m):</b>	22
<b>Avg. Wetted Width (m):</b>	200
<b>Gradient (%):</b>	<5
<b>Stage:</b>	na
<b>Average Velocity (m/s):</b>	0.3

<i>Cover</i>	
<b>Total Cover:</b>	Trace
<b>Dominant Cover Type:</b>	Gravel, Cobble
<b>Secondary Cover Type:</b>	Grass
<b>Functional LWD:</b>	Few
<b>Functional SWD:</b>	Few
<b>Bank Shape:</b>	Sloping
<b>Bank Texture:</b>	Fine
<b>Riparian Vegetation:</b>	Grasses, Trees
<b>Vegetation Stage:</b>	Shrub/Herb
<b>Instream Vegetation:</b>	vascular
<b>Crown Closure (%):</b>	na

<i>Channel Morphology</i>	
<b>Dominant Bed Material:</b>	Fines
<b>Sub-Dom. Bed Material:</b>	Cobble
<b>Flood Signs:</b>	None
<b>Pattern:</b>	Meandering
<b>Islands:</b>	None
<b>Bars:</b>	None
<b>Confinement:</b>	Confined
<b>Disturbance Indicators:</b>	None
<b>Morphology:</b>	Glide

Looking Upstream at Site



Looking Downstream at Site



#### Referencing Information

<b>Project Name:</b>	RAMP Sentinel Sp.
<b>Project Number:</b>	RAMP 1312-3105
<b>Waterbody Name:</b>	Athabasca River
<b>Site Type:</b>	Potentially Influenced
<b>Site Name:</b>	Site 3
<b>Date:</b>	18-Aug-07
<b>Time:</b>	1053
<b>Crew Members:</b>	NM / DM / AD / CE
<b>Site UTM:</b>	12. 464187. 6330151
<b>Access:</b>	Boat

#### Water Quality

<b>Temperature (°C):</b>	17.3
<b>Conductivity (µS/cm):</b>	259
<b>Dissolved Oxygen (mg/L):</b>	8.6
<b>Visibility:</b>	Clear

#### Channel Characteristics

<b>Avg. Channel Width (m):</b>	250
<b>Avg. Wetted Width (m):</b>	200
<b>Gradient (%):</b>	<5
<b>Stage:</b>	na
<b>Average Velocity (m/s):</b>	0.84

#### Cover

<b>Total Cover:</b>	Trace
<b>Dominant Cover Type:</b>	Gravel, Cobble
<b>Secondary Cover Type:</b>	Grass
<b>Functional LWD:</b>	Few
<b>Functional SWD:</b>	Few
<b>Bank Shape:</b>	Sloping
<b>Bank Texture:</b>	Fine
<b>Riparian Vegetation:</b>	Grasses, Trees
<b>Vegetation Stage:</b>	Pole-Sapling Stage
<b>Instream Vegetation:</b>	vascular
<b>Crown Closure (%):</b>	na

#### Channel Morphology

<b>Dominant Bed Material:</b>	Fines
<b>Sub-Dom. Bed Material:</b>	Boulder
<b>Flood Signs:</b>	None
<b>Pattern:</b>	Meandering
<b>Islands:</b>	None
<b>Bars:</b>	Mid-stream
<b>Confinement:</b>	Confined
<b>Disturbance Indicators:</b>	None
<b>Morphology:</b>	Glide

Looking Upstream at Site



Looking Downstream at Site



#### Referencing Information

<b>Project Name:</b>	RAMP Sentinel Sp.
<b>Project Number:</b>	RAMP 1312-3105
<b>Waterbody Name:</b>	Athabasca River
<b>Site Type:</b>	Potentially Influenced
<b>Site Name:</b>	Site 4
<b>Date:</b>	17-Aug-07
<b>Time:</b>	1038
<b>Crew Members:</b>	NM / DM / AD / CE
<b>Site UTM:</b>	12. 462814. 6334244
<b>Access:</b>	Boat

#### Water Quality

<b>Temperature (°C):</b>	16.2
<b>Conductivity (µS/cm):</b>	270
<b>Dissolved Oxygen (mg/L):</b>	8.6
<b>Visibility:</b>	Clear

#### Channel Characteristics

<b>Avg. Channel Width (m):</b>	110
<b>Avg. Wetted Width (m):</b>	100
<b>Gradient (%):</b>	<5
<b>Stage:</b>	na
<b>Average Velocity (m/s):</b>	0.3

#### Cover

<b>Total Cover:</b>	Trace
<b>Dominant Cover Type:</b>	Boulder
<b>Secondary Cover Type:</b>	Overhanging Veg.
<b>Functional LWD:</b>	Few
<b>Functional SWD:</b>	None
<b>Bank Shape:</b>	Sloping
<b>Bank Texture:</b>	Fine
<b>Riparian Vegetation:</b>	Mixed Forest
<b>Vegetation Stage:</b>	Young Forest
<b>Instream Vegetation:</b>	Trace
<b>Crown Closure (%):</b>	1-20

#### Channel Morphology

<b>Dominant Bed Material:</b>	Boulders
<b>Sub-Dom. Bed Material:</b>	Fines
<b>Flood Signs:</b>	None
<b>Pattern:</b>	Meandering
<b>Islands:</b>	Few
<b>Bars:</b>	Mid-stream
<b>Confinement:</b>	Confined
<b>Disturbance Indicators:</b>	None
<b>Morphology:</b>	Glide

Looking Upstream at Site



Looking Downstream at Site





#### Referencing Information

<b>Project Name:</b>	RAMP Sentinel Sp.
<b>Project Number:</b>	RAMP 1312-3105
<b>Waterbody Name:</b>	Athabasca River
<b>Site Type:</b>	Potentially Influenced
<b>Site Name:</b>	Site 5
<b>Date:</b>	14-Aug-07
<b>Time:</b>	1712
<b>Crew Members:</b>	NM / DM / AD / CE
<b>Site UTM:</b>	12. 478864. 6410528
<b>Access:</b>	Boat

#### Water Quality

<b>Temperature (°C):</b>	15.6
<b>Conductivity (µS/cm):</b>	268
<b>Dissolved Oxygen (mg/L):</b>	8.6
<b>Visibility:</b>	Clear

#### Channel Characteristics

<b>Avg. Channel Width (m):</b>	230
<b>Avg. Wetted Width (m):</b>	200
<b>Gradient (%):</b>	<5
<b>Stage:</b>	na
<b>Average Velocity (m/s):</b>	0.3

#### Cover

<b>Total Cover:</b>	Moderate
<b>Dominant Cover Type:</b>	Boulder
<b>Secondary Cover Type:</b>	Large Woody Debris
<b>Functional LWD:</b>	Few
<b>Functional SWD:</b>	Few
<b>Bank Shape:</b>	Vertical
<b>Bank Texture:</b>	Fines
<b>Riparian Vegetation:</b>	Shrubs, Mixed Forest
<b>Vegetation Stage:</b>	Shrub/Herb
<b>Instream Vegetation:</b>	Vascular
<b>Crown Closure (%):</b>	1-20

#### Channel Morphology

<b>Dominant Bed Material:</b>	Cobble
<b>Sub-Dom. Bed Material:</b>	Fines
<b>Flood Signs:</b>	None
<b>Pattern:</b>	Meandering
<b>Islands:</b>	None
<b>Bars:</b>	Mid-stream
<b>Confinement:</b>	Confined
<b>Disturbance Indicators:</b>	None
<b>Morphology:</b>	Glide

Looking Upstream at Site



Looking Downstream at Site



#### Referencing Information

<b>Project Name:</b>	RAMP Sentinel Sp.
<b>Project Number:</b>	RAMP 1312-3106
<b>Waterbody Name:</b>	Lower Ells River
<b>Site Type:</b>	Reference
<b>Site Name:</b>	Lower Ells
<b>Date:</b>	19-Aug-07
<b>Time:</b>	1530
<b>Crew Members:</b>	JE / SE
<b>Site UTM:</b>	12. 457356. 6349944
<b>Access:</b>	Helicopter

#### Water Quality

<b>Temperature (°C):</b>	12
<b>Conductivity (µS/cm):</b>	237
<b>Dissolved Oxygen (mg/L):</b>	8.5
<b>Visibility:</b>	Clear

#### Channel Characteristics

<b>Avg. Channel Width (m):</b>	39.4
<b>Avg. Wetted Width (m):</b>	37.2
<b>Gradient (%):</b>	1
<b>Stage:</b>	Low
<b>Average Velocity (m/s):</b>	3.32

#### Cover

<b>Total Cover:</b>	Half
<b>Dominant Cover Type:</b>	Instream vegetation
<b>Secondary Cover Type:</b>	Boulder
<b>Functional LWD:</b>	Trace
<b>Functional SWD:</b>	Trace
<b>Bank Shape:</b>	Sloping
<b>Bank Texture:</b>	Fine
<b>Riparian Vegetation:</b>	Shrubs, Grasses
<b>Vegetation Stage:</b>	Pole-Sapling Stage
<b>Instream Vegetation:</b>	Vascular
<b>Crown Closure (%):</b>	0%

#### Channel Morphology

<b>Dominant Bed Material:</b>	Gravel
<b>Sub-Dom. Bed Material:</b>	Boulder
<b>Flood Signs:</b>	Spring water level
<b>Pattern:</b>	Irregular Meandering
<b>Islands:</b>	None
<b>Bars:</b>	Mid-stream
<b>Confinement:</b>	Confined
<b>Disturbance Indicators:</b>	None
<b>Morphology:</b>	Riffle-Pool

Looking Upstream at Site



Looking Downstream at Site



<i>Referencing Information</i>	
<b>Project Name:</b>	RAMP Sentinel Sp.
<b>Project Number:</b>	RAMP 1110-3106
<b>Waterbody Name:</b>	Upper Ells River
<b>Site Type:</b>	Reference
<b>Site Name:</b>	Upper Ells
<b>Date:</b>	19-Aug-07
<b>Time:</b>	1522
<b>Crew Members:</b>	NM / RM
<b>Site UTM:</b>	12. 440621. 6342443
<b>Access:</b>	Helicopter

<i>Water Quality</i>	
<b>Temperature (°C):</b>	19.1
<b>Conductivity (µS/cm):</b>	228
<b>Dissolved Oxygen (mg/L):</b>	10.4
<b>Visibility:</b>	Clear

<i>Channel Characteristics</i>	
<b>Avg. Channel Width (m):</b>	25
<b>Avg. Wetted Width (m):</b>	15
<b>Gradient (%):</b>	1
<b>Stage:</b>	Low
<b>Average Velocity (m/s):</b>	3.2

<i>Cover</i>	
<b>Total Cover:</b>	Moderate
<b>Dominant Cover Type:</b>	Vegetation
<b>Secondary Cover Type:</b>	Boulders
<b>Functional LWD:</b>	Trace
<b>Functional SWD:</b>	Trace
<b>Bank Shape:</b>	Vertical
<b>Bank Texture:</b>	Fine
<b>Riparian Vegetation:</b>	Grasses, Sedges
<b>Vegetation Stage:</b>	Shrub/Herb
<b>Instream Vegetation:</b>	Algae
<b>Crown Closure (%):</b>	<1

<i>Channel Morphology</i>	
<b>Dominant Bed Material:</b>	Cobble
<b>Sub-Dom. Bed Material:</b>	Boulder
<b>Flood Signs:</b>	Spring water level
<b>Pattern:</b>	Meandering
<b>Islands:</b>	Few
<b>Bars:</b>	Gravel
<b>Confinement:</b>	Confined
<b>Disturbance Indicators:</b>	None
<b>Morphology:</b>	Riffle-Glide

Looking Upstream at Site



Looking Downstream at Site



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**Appendix H**  
**Acid-Sensitive Lakes Component**

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## H.0 ACID-SENSITIVE LAKES COMPONENT

Appendix H presents the descriptive portions of the Acid-Sensitive Lakes (ASL) component for 2007. Results of between-year comparisons of endpoint parameters, calculations of critical loads of acidity for each lake, and trend analyses on the ASL measurement endpoints can be found in Section 6.5. Appendix H covers the following:

- The chemical characteristics of the RAMP ASL lakes were reviewed in greater detail than in Section 6.5 with the addition of the 2007 data. Summary statistics were calculated on the updated dataset that now includes six years of data on all 50 lakes. Using Analysis of Variance (ANOVA), between-year comparisons were conducted on most chemical variables in order to detect changes in lake chemistry, over the entire set of 50 lakes. The results of these analyses were described briefly for the ASL measurement endpoints in Section 6.5. The results of the ANOVA are presented here in greater detail;
- The chemistry of the 50 ASL lakes in 2007 was compared to that in 450 lakes within the Oil Sands region reported by the NO<sub>x</sub>SO<sub>x</sub> Management Working Group (NSMWG);
- The ion chemistry of the ASL lakes in 2007 was characterized using Piper plots;
- Trace metal concentrations in the RAMP ASL lakes were summarized and relationships between metal concentrations, lake location and chemistry were noted; and
- Estimates of the seasonal variability in water quality parameters in ten of the ASL lakes were updated with the 2007 data and summary statistics were calculated.

## H.1 SUMMARY STATISTICS

The chemical variables for the 50 RAMP ASL lakes, augmented with data from the 2007 field season, are contained in the RAMP database. Table H.1-1 presents the summary statistics for all data between 2002 and 2007 as well as for 2007 individually. An analysis of variance (ANOVA) was performed on the six years of data in order to determine whether there have been any significant changes in the lake chemistry of the 50 lakes, as a whole, over this period. Tukey's post hoc test was used when significant differences were noted. A non-parametric test (Kruskal-Wallis) or a suitable transformation was used when the variances were significantly different. Statistically significant changes in potassium, calcium, ammonia and silica were observed over the 6 years of monitoring. Tukey's post hoc tests indicated that:

- Potassium was significantly less in 2005 relative to all previous years;
- Calcium was significantly greater in 2005 than in 2006;
- Ammonia was significantly greater in 2004 than in 2005, 2006, and 2003; and
- Silica was greater in 2006 than in 2003 and 2005.

**Table H.1-1 Summary statistics for lakes sampled for the RAMP ASL component, 2002 to 2007.**

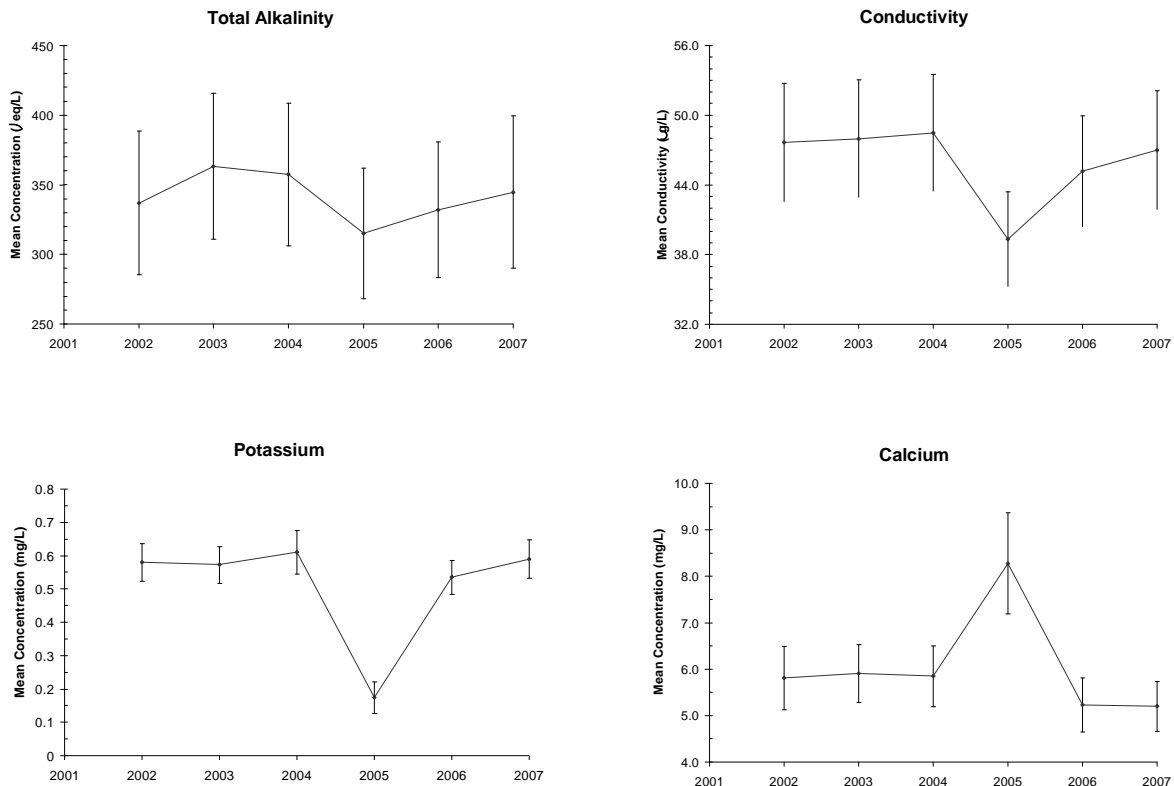
Parameter	Min		Max		Mean		Median		5th Percentile 2007	95th Percentile 2007
	1999- 2007	2007	1999- 2007	2007	1999- 2007	2007	1999- 2007	2007		
pH	3.97	4.28	9.46	8.16	6.55	6.51	6.76	6.66	4.88	7.67
Total Alkalinity (µeq/L)	ND	ND	1784	1784	310	345	214	224	29.24	1219.2
Gran Alkalinity (µeq/L)	-57.2	-19.6	1802	1802	298	337	194	198	2.03	1216.9
Specific Cond. (µS/cm)	10.5	10.5	180.4	180	43.6	47.0	32.4	33.5	11.6	120
Turbidity (NTU)	0.38	0.40	53.0	14.0	3.91	3.71	1.80	2.20	0.52	11.7
Colour (TCU)	8.00	11.5	948	948	149	151	119	113	19.9	316
Sodium (mg/L)	0.18	0.69	10.4	10.4	1.93	2.28	1.26	1.33	0.73	7.16
Potassium (mg/L)	ND	0.12	2.40	2.11	0.51	0.59	0.44	0.44	0.19	1.26
Calcium (mg/L)	0.20	0.75	32.2	16.57	5.65	5.20	4.62	4.57	1.02	13.8
Magnesium (mg/L)	0.11	0.27	13.6	6.08	1.79	1.71	1.40	1.28	0.36	4.34
Bicarbonate (mg/L)	ND	ND	109	109	18.8	21.1	13.1	13.8	1.80	74.0
Chloride (mg/L)	ND	0.08	2.64	2.52	0.37	0.31	0.19	0.19	0.10	1.02
Sulphate (mg/L)	ND	ND	16.7	14.1	2.21	2.59	1.13	1.51	0.39	10.7
Total Diss. Nitrogen (µg/L)	105	273.00	2891	1830	853	736	695	640	312	1376
Ammonia (µg/L)	ND	ND	1509	233	42.0	20.9	15.7	14.5	ND	54.3
Nitrate + Nitrite (µg/L)	ND	ND	733	302	21.4	16.1	3.00	2	ND	51.5
Total Phosphate (µg/L)	3.60	7.00	341	163	56.5	62.9	40.9	52.0	16.7	133
Diss. Phosphate (µg/L)	1.20	3.00	156	102	20.3	22.0	11.7	13.0	3.00	69.5
Diss. Inorg. Carbon (mg/L)	0.03	0.20	20.3	19.4	3.17	3.69	2.00	2.20	0.40	14.0
Diss. Organic Carbon (mg/L)	6.82	7.20	81.2	45.9	22.7	21.3	21.5	20.0	10.7	39.3
Chlorophyll a (µg/L)	0.60	1.94	371	162	20.3	20.0	9.64	10.8	2.85	57.4
Iron (mg/L)	ND	0.02	3.88	1.58	0.34	0.28	0.16	0.11	0.02	0.86
Silica (mg/L)	ND	ND	5.04	5.04	1.10	1.06	0.62	0.57	ND	3.34
Total Nitrogen (µg/L)	0.00	274	6558	3250	1256	1056	998	887	380	2586
Sum Base Cations (µeq/L)	0.00	38.2	2291	1643	563	515	430	444	108	1466
Aluminum (µg/L)	0.10	0.10	681	430	71.0	55.9	22.3	16.00	0.60	224.10

Note: Shaded parameters represent significant differences between years as described in the text. ND – not detectable.

The reason(s) for the between-year changes in ammonia and silica are unclear and may be related to unique events such as the natural occurrences of algal blooms and other biological events during individual sampling years. Without accompanying changes in endpoint parameters, these occurrences are not assumed to be the direct effect of regional development, in particular, acidifying emissions, on lake chemistry. Trends in these variables will be monitored in future years of the ASL component.

The significant changes in major ion chemistry (calcium and potassium) were attributable to one unusual year - 2005. During 2005, potassium was significantly less and calcium significantly greater than in the other five years. Although not statistically significant, conductivity and alkalinity were low in 2005 relative to the other years while magnesium was unusually high in concentration (Figure H.1-1). The unusual lake chemistry observed in 2005 may be the result of the high rates of precipitation and surface runoff that occurred during this year, as noted in the 2005 hydrology studies on the Muskeg, MacKay and Christina watersheds (RAMP 2006). The lake chemistry in 2005 may reflect a greater contribution of runoff vs. groundwater to the overall chemical composition of the lakes. The ion chemistry in 2006 and 2007 would represent a return to more "typical" conditions.

**Figure H.1-1 Mean concentrations of selected parameters in the 50 RAMP ASL lakes over the five year monitoring period, 2002 to 2007.**



## H.2 COMPARISON OF ASL LAKE CHEMISTRY IN 2006 TO REGIONAL LAKES

The 50 RAMP ASL Lakes in 2006 displayed characteristics similar to lakes in a database of 432 lakes (RAMP ASL lakes excluded) within the Oil Sands region reported by the NO<sub>x</sub>SO<sub>x</sub> Management Working Group (NSMWG), but with distinct differences. The two populations are compared statistically in Table H.2-1 and selected variables are presented graphically in box plots (Figure H.2-1). Key results of this comparison are as follows:

- The RAMP ASL lakes covered a slightly narrower pH range (4.28 to 8.16) with a lower median value (6.67 vs. 7.69). The mean pH of the RAMP ASL lakes is significantly less than that of the NSMWG regional database ( $P < 0.005$ );
- Total alkalinity in the 2007 RAMP ASL lakes ranged from 0 µeq/L to 1,784 µeq/L with a median of 224 µeq/L, much lower than the regional median (1,020 µeq/L). Mean total alkalinity in the RAMP ASL lakes in 2007 was significantly less than that in the NSMWG database ( $P < 0.05$ );
- Conductivity was relatively low in the RAMP ASL lakes and ranged from 10.5 µS/cm to 180.4 µS/cm (median: 35.0 µS/cm). The regional median for conductivity was 125 µS/cm. The mean conductivity of the RAMP ASL lakes in 2007 was significantly less than that of the regional lakes;
- Consistent with the lower conductivity in the RAMP ASL lakes, the mean and median concentrations of the principal cations (calcium, magnesium, sodium and potassium) and the sum of base cations (SBC) were all less than the values in the NSMWG database. Median SBC in the RAMP ASL lakes in 2007 was 447 µeq/L compared to 1,247 µeq/L in the regional lakes. The mean values of these parameters were all significantly less in the RAMP ASL lakes ( $P < 0.05$ );
- The mean and medium concentrations of the major anions (chloride, sulphate and titration bicarbonate) were all less than those in the regional database;
- Total P was exceptionally high in individual lakes attaining a concentration as high as 163 µg/L in Lake 457 (L49) in the Birch Mountains. There was no significant difference in Total P between the 2007 RAMP ASL lakes and the regional lakes; and
- Nitrate concentrations in the RAMP ASL lakes were generally low (median: 2.00 µg/L), although several lakes had values two orders of magnitude greater (e.g., 302 µg/L in Lake 457 (L49) in the Birch Mountains. Total Nitrogen concentrations were significantly greater in the RAMP ASL lakes.

The chemical differences between the RAMP ASL lakes and the regional lakes reflect the bias in the selection process for the RAMP ASL component. The RAMP ASL lakes were selected for their acid sensitivity which, in practice, meant selecting lakes having the lowest pH, alkalinity and conductivity. These types of lakes are often the smallest lakes and are often located in the upland regions where catchments were dominated by fens.

**Table H.2-1 Comparison between RAMP ASL lakes and 450 regional lakes in the NSMWG database.**

Variable	Units	RAMP ASL Lakes (2007)				Regional Lakes				
		Minimum	Maximum	Median	Mean	No.	Minimum	Maximum	Median	Mean
Lake Area	km <sup>2</sup>	0.031	43.4	1.3	2.86	431	0.01	214	1.6	6.26
Catchment Area	km <sup>2</sup>	0.70	224	15.3	28.1	432	0.08	1769	17.4	89.3
Drainage Ratio		0.22	88.6	10.1	15.7	431	1.43	1178	13.0	26.2
Runoff	m <sup>3</sup> /s	0.00	8.57	0.04	0.30	432	0.00	5	0.0	0.258
Lab pH		4.28	8.16	6.67	6.5	432	4.2	10	7.7	7.66
Total Alkalinity	µeq/L	0	1784	224	345	432	0	4797	1020	1241.2
Specific Conductivity	µS/cm	10.5	180.4	35.0	47.5	399	11	481	125	144.3
Dissolved Organic Carbon	mg/L	7.20	45.9	20.0	21.3	383	0.2	60	19.4	20.4
Sodium	mg/L	0.69	10.41	1.34	2.31	432	0.28	49	2.0	4.07
Potassium	mg/L	0.12	2.11	0.45	0.60	432	0.05	14	0.62	0.943
Calcium	mg/L	0.75	16.57	4.57	5.24	432	0.25	64	14.3	17.0
Magnesium	mg/L	0.27	6.08	1.32	1.72	432	0.05	28	4.3	5.34
Sum of Base Cations	µeq/L	120	1794	447	519	432	46	5770	1247	1487
Chloride	mg/L	0.08	2.52	0.19	0.31	431	0	18	0.47	1.08
Sulphate	mg/L	0.2	14.06	1.5	2.6	432	0	99	2.5	6.71
Nitrate + Nitrite	µg/L	0.50	302	2.00	16.2	432	0	1860	1.0	16.4
Ammonia	µg/L	1	233	14	21	335	0	650	11.0	30.4
Total Nitrogen	µg/L	274	3250	912	1063	150	183	1904	861	869.47
Total Phosphate	µg/L	7.00	163	52.0	63.1	426	3	495	49.0	66.6

Shaded parameters represent significantly different means using a student's T test or non-parametric test when variances were non-homogenous (P<0.05).

**Figure H.2-1 Box plots of selected chemical parameters for the RAMP ASL lakes in 2007 versus 450 regional lakes reported by the NSMWG (WRS 2004).**

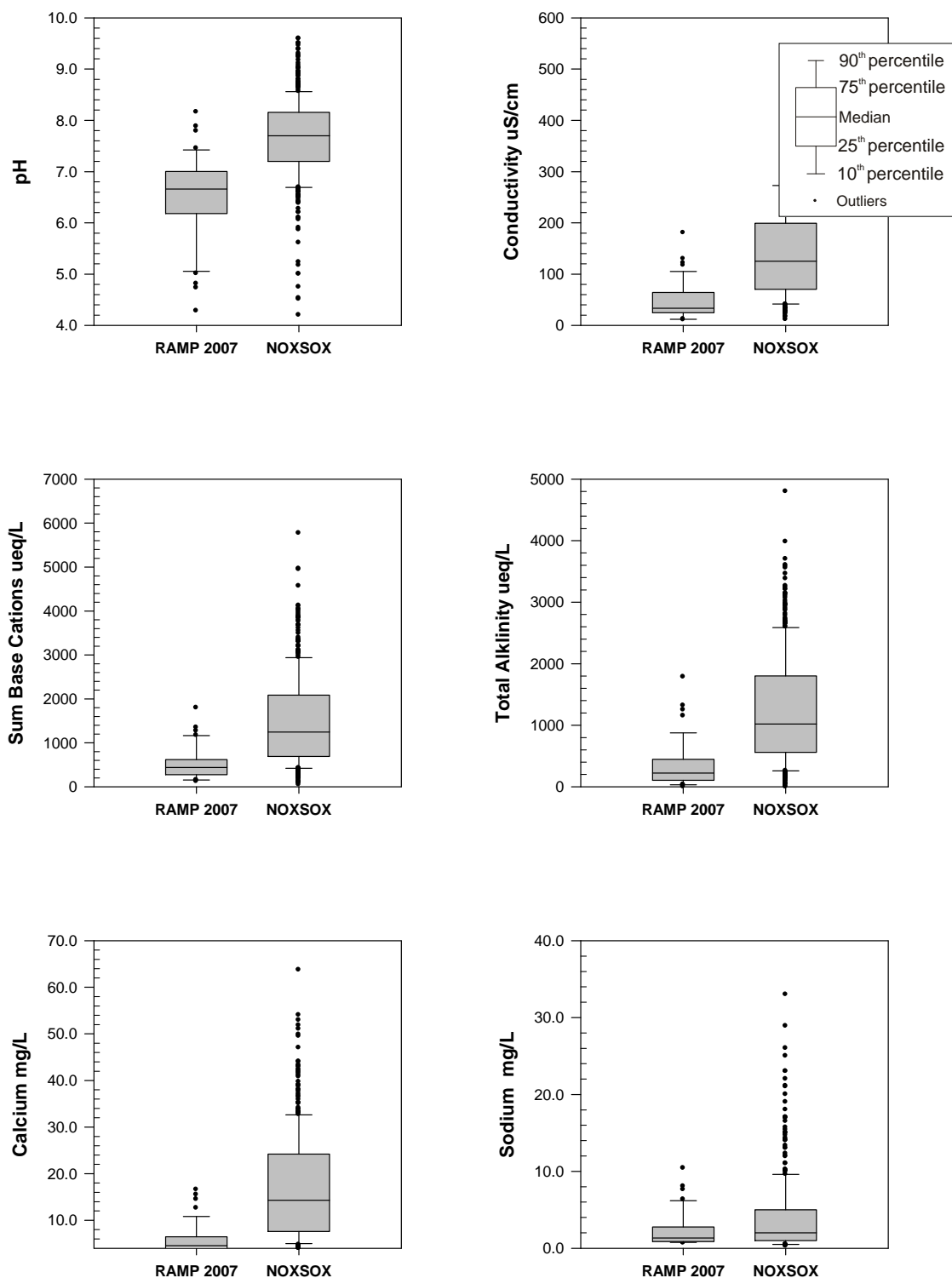
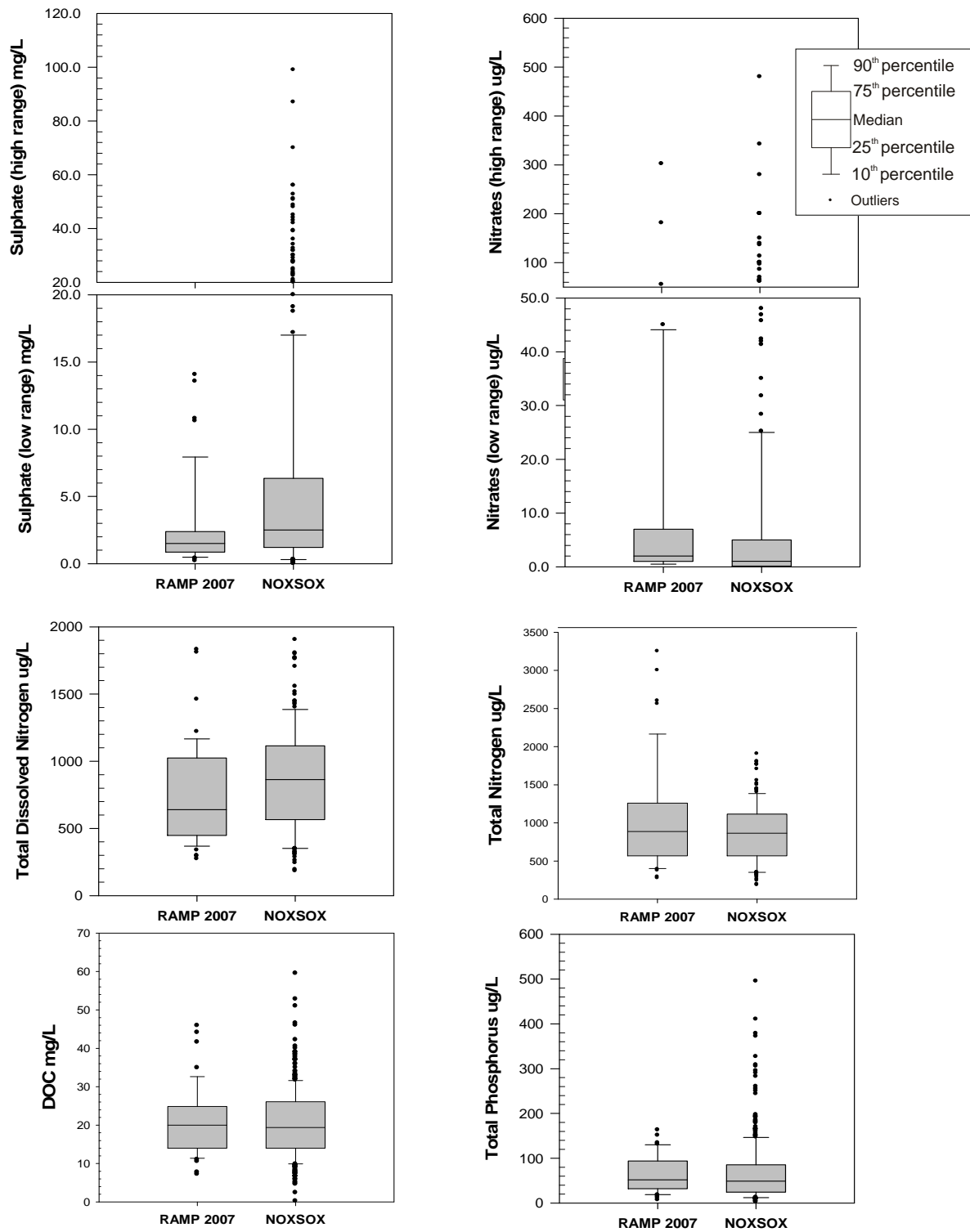


Figure H.2-1 (Cont'd.)



### H.3 CHARACTERIZATION OF RAMP ASL LAKES BY ION CHEMISTRY

In order to characterize the waters in each RAMP ASL lake, the major anions and cations were displayed in Piper plots (Figure H.4-1). A Piper diagram is a multivariate graphical technique that is used to divide the lakes into four water types on the basis of major cation constituents (Guler *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  $\text{Ca}^{2+}$  -  $\text{Mg}^{2+}$  -  $\text{Cl}^-$  -  $\text{SO}_4^{2-}$ .

The Piper diagrams, displayed for the 2007 data, show that the majority of the lakes are of the Ca-Mg-Bicarbonate type (Type I). In 2007, seven lakes had greater than 40% of the anion charge attributable to sulphate and chloride rather than bicarbonates and carbonates and tended towards the Type IV water type. One lake, (Clayton Lake) had virtually no bicarbonate and the anion chemistry was controlled entirely by sulphate and chloride. These seven lakes are listed in Table H.3-1 with other relevant chemical characteristics. All of these lakes are found in the Birch Mountains and Stony Mountains subregions and represent lakes that are small (in both area and volume), low in Gran alkalinity, pH, conductivity and relatively high in DOC. Six lakes in 2007 had over 40% of the cationic charge attributable to sodium and potassium (Table H.3-2). These were largely the same set of lakes identified in Table H.3-1.

**Table H.3-1 Key chemical characteristics of ten RAMP ASL lakes having greater than 40% of anion charge attributable to sulphate and chloride (2007 data).**

Lake	Original Name	pH	Gran Alkalinity ( $\mu\text{eq/L}$ )	Conductivity ( $\mu\text{S/cm}$ )	DOC (mg/L)	Lake Area ( $\text{km}^2$ )	Lake Volume ( $10^9\text{m}^3$ )
<b>Stony Mountains Sub-Region</b>							
168	A21	5.01	-19.6	12.14	17.4	1.38	0.24
169	A24	4.73	-13.2	11.83	15.8	1.45	0.21
170	A26	5.56	10.0	11.22	13.5	2.78	0.14
287	25	5.16	5.8	10.49	11.0	2.176	0.12
<b>Birch Mountains Sub-Region</b>							
448	L29 Clayton	4.28	0.0	16.44	13.1	0.65	0.56
455	L47	6.67	267	67.00	20.0	4.31	0.27
457	L49	6.15	90	55.70	20.3	2.16	0.35



**Table H.3-2 Key chemical characteristics of ten RAMP ASL lakes having greater than 40% of cation charge attributable to sodium and potassium (2007 data).**

Lake	Original Name	pH	Gran Alkalinity (µeq/L)	Conductivity (µS/cm)	DOC (mg/L)	Lake Area (km <sup>2</sup> )	Lake Volume (10 <sup>9</sup> m <sup>3</sup> )
<b>Stony Mountains Sub-Region</b>							
169	A24	4.73	-13.2	11.83	15.8	1.45	0.21
170	A26	5.56	10.0	11.22	13.5	2.78	0.14
287	25	5.16	5.8	10.49	11.0	2.176	0.12
<b>Birch Mountains Sub-Region</b>							
448	L29	4.28	0.0	16.44	13.1	0.65	0.56
<b>Northeast of Fort McMurray Sub-Region</b>							
268	E15	6.72	266	35.00	32.0	1.87	0.19
400	L39	6.57	165	26.6	12.3	1.12	0.69

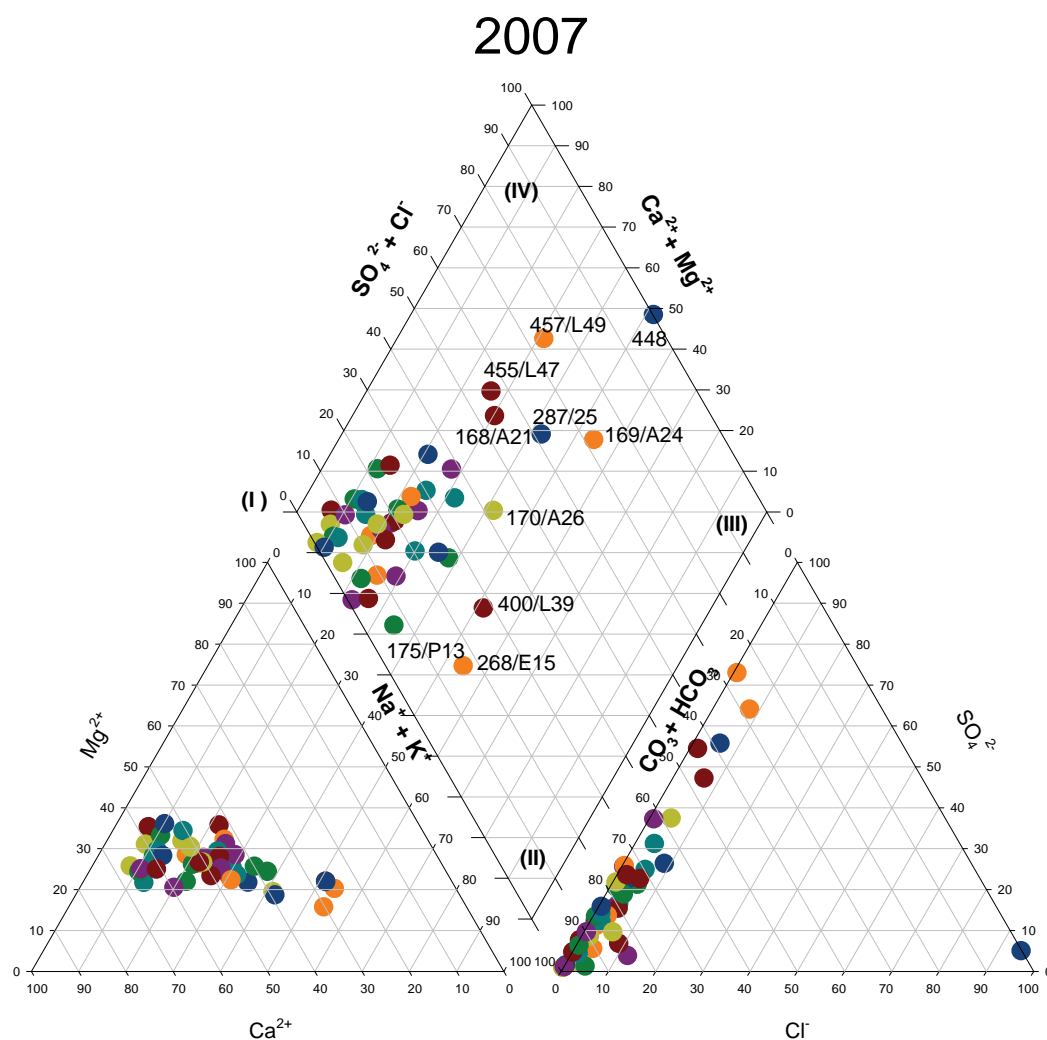
## H.4 ANALYSIS OF METALS IN THE RAMP ASL LAKES

Metals, in particular, aluminum, can serve as important indicators of lake acidification. The results of the metals sampling in the RAMP ASL lakes over 6 years are contained in the RAMP database and are summarized in Table H.4-1 and H.4-2 for the total and dissolved fractions, respectively. Table H.4-3 presents the mean concentration of each trace metal for the lakes in each sub-region.

In general, most metals were quite low in concentration and many were less than detection limits. Differences were evident in the metal concentrations between sub regions. Table H.4-3 shows that the Birch Mountains had the highest concentrations of metals. In this sub-region, 45 individual metals over 11 lakes had mean concentrations greater than the 95<sup>th</sup> percentile for the entire lake population (Table H.4-4).

Lakes with the highest metals concentrations include those identified in the Piper plots (Figure H.4-1; Table H.3-1) as having more than 40% of the anionic charge attributable to chloride and sulphate rather than bicarbonates. The reasons for the high metals concentrations in the Birch Mountains are unclear. The mean pH of the Birch Mountain lakes was not significantly less than that in other regions and in fact exceeded the pH of the Stony Mountains which had only three lakes with metal concentrations exceeding the 95<sup>th</sup> percentile (Table H.4-4). The high levels of chlorides/sulphates as well as high levels of barium in the Birch Mountain lakes, suggest a potential groundwater source for these metals. The relatively high concentrations of metals in these lakes are natural in origin rather than the result of emissions from regional industry.

**Figure H.4-1** Piper plots showing the proportion of major cations and anions in the 2007 RAMP ASL lakes.



**Table H.4-1 Statistical summary of total metals in the RAMP ASL lakes over all lakes and years.**

Metal	All Years (2001-2007) Totals					2007 Totals				
	Minimum	Maximum	Mean	Median	95 <sup>th</sup> Percentile	Minimum	Maximum	Mean	Median	95 <sup>th</sup> Percentile
Ag	ND	0.042	0.0042	0.0025	0.0180	ND	0.0204	0.0028	0.0015	0.0086
Al	0.25	8694	246	64.4	906	8.54	1350	165	54.7	689
As	0.13	2.9	0.509	0.4	1.22	0.157	1.66	0.499	0.401	1.07
Ba	3.55	83.2	15.1	12.2	32.5	3.76	45.9	15.0	12.7	31.9
Be	ND	55.7	2.22	0.02	12.6	ND	0.0746	0.0129	0.0075	0.041
Bi	ND	0.359	0.0080	0.0028	0.0245	ND	0.359	0.011	0.002	0.015
B	0.0005	62	9.92	6.9	28.3	3.72	49.9	12.4	8.77	28.8
Cd	0.001	9.94	0.0581	0.0111	0.0656	0.0025	9.94	0.228	0.0143	0.050
Cl	ND	9.2	0.736	0.3	2.6	ND	2.31	0.244	0.153	0.795
Co	0.0005	2.2	0.171	0.0981	0.515	0.0048	0.601	0.133	0.084	0.382
Cr	ND	7.3	0.469	0.27	1.51	ND	2.15	0.355	0.188	1.311
Cu	ND	15.8	0.735	0.3635	2.41	ND	15.8	0.709	0.231	1.347
Fe	2.37	6528	635	374	2195	7.9	2750	563	347	1506
Hg	ND	0.074	0.0082	0.005	0.0256	ND	0.015	0.0053	0.005	0.005
Li	ND	15.3	2.56	1.79	8.00	ND	10.5	2.29	1.55	7.35
Mg	0.129	6.83	1.97	1.58	5.07	0.166	6.83	2.01	1.59	5.28
Mn	5.8	231	41.6	29.5	119	6.47	149	39.1	29	92.1
Mo	0.0029	0.586	0.127	0.09	0.382	0.0093	0.512	0.120	0.096	0.327
Ni	ND	46	0.878	0.3615	3.35	ND	3.78	0.5631	0.235	1.959
P	2.56	303	56.2	41.6	133	2.56	175	57.8	43.6	133.9
Pb	0.0079	95.3	0.601	0.1535	0.813	0.0079	95.3	2.26	0.172	0.821
Sb	0.002	0.2	0.0292	0.02	0.09	0.0077	0.169	0.031	0.021	0.084
Se	ND	0.9	0.156	0.1215	0.298	ND	0.285	0.076	0.05	0.157
Si	0.0995	4.93	1.47	1.12	3.54	0.0995	4.93	1.47	1.21	3.487
Sn	ND	3.02	0.163	ND	1.34	ND	0.812	0.043	ND	0.090
Sr	2.61	90	23.3	18.75	56.6	3.36	68.3	23.7	18.9	58.5
Th	ND	0.72	0.0331	0.00995	0.131	ND	0.336	0.033	0.0098	0.123
Ti	0.1	79	3.69	1.095	13.9	0.232	27	3.22	1.2	10.9
Tl	ND	0.077	0.0041	0.0018	0.015	ND	0.0218	0.0040	0.0026	0.015
U	0.0009	0.41	0.044	0.016	0.198	0.0016	0.407	0.039	0.012	0.132
V	0.0025	15.5	0.877	0.383	3.25	0.0627	6.68	0.809	0.359	2.98
Zn	0.52	30.1	4.30	3.52	9.59	0.865	24.8	3.89	3.15	7.93

ND = non-detectable. For the purposes of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory.

**Table H.4-2 Statistical summary of dissolved metals in the RAMP ASL lakes over all lakes and years.**

Metal	2003-2007 Dissolved Metals <sup>1</sup>					2007 Dissolved Metals <sup>1</sup>				
	Minimum	Maximum	Mean	Median	95th Percentile	Minimum	Maximum	Mean	Median	95th Percentile
Ag	ND	0.012	0.0016	0.0006	0.0061	ND	0.005	0.001	ND	0.003
Al	ND	681	72.4	24	331.95	ND	430	55.9	16	224.1
As	0.08	1.8	0.432	0.346	0.926	0.129	1.41	0.405	0.326	0.825
Ba	1.71	32.1	11.3	9.48	24.39	1.71	32.1	11.1	9.83	24.42
Be	ND	0.300	0.020	0.009	0.070	ND	0.052	0.008	0.005	0.023
Bi	ND	0.028	0.004	0.003	0.013	ND	0.015	0.003	0.001	0.008
B	1.8	62.3	10.9	7.34	25.95	2.43	47.7	11.0	7.11	26.6
Cd	ND	5.82	0.0474	0.0071	0.0458	ND	5.82	0.134	0.0080	0.0278
Co	ND	0.679	0.110	0.046	0.399	ND	0.379	0.075	0.036	0.273
Cr	ND	1.88	0.244	0.175	0.727	ND	0.781	0.192	0.14	0.466
Cu	ND	2.13	0.476	0.3	1.60	ND	2.09	0.334	0.213	1.11
Fe	ND	2909	354	118	1519	ND	1840	298	79.5	978
Hg						ND	0.0149	0.0052	ND	0.005
Li	ND	15.2	2.37	1.51	6.78	ND	10.1	2.17	1.44	6.99
Mg						0.116	6.48	1.90	1.46	5.03
Mn	0.07	140	16.4	3.11	59.32	0.07	140	12.6	1.65	43.3
Mo	ND	1.43	0.12	0.08	0.37	ND	0.493	0.10	0.07	0.30
Ni	ND	3.4	0.50	0.20	2.51	ND	2.89	0.40	0.12	1.73
P						ND	91	16.6	7.24	63.6
Pb	ND	16.30	0.21	0.05	0.43	ND	16.3	0.44	0.04	0.43
Sb	ND	0.167	0.027	0.019	0.083	0.008	0.167	0.031	0.021	0.084
Se	ND	0.9	0.128	0.058	0.25	ND	0.209	0.059	0.05	0.155
Sn	ND	0.065	0.028	ND	ND	ND	ND	ND	ND	ND
Sr	2.4	70	21.7	16.0	54.3	2.92	64.6	22.8	18.4	56.2
Th	ND	0.196	0.0237	0.0	0.1135	ND	0.196	0.0267	0.0094	0.1167
Ti	ND	13.8	1.26	0.47	5.92	ND	10.4	1.16	0.473	4.34
Tl	ND	0.043	0.0032	ND	0.0087	ND	0.0075	0.0023	0.0019	0.0052
U	0.0004	0.308	0.0271	0.0090	0.1147	0.0004	0.308	0.0280	0.0071	0.1210
V	0.011	3.03	0.403	0.218	1.60	0.038	2.74	0.371	0.216	0.993
Zn	0.48	12	3.51	3.03	8.73	0.86	12	3.16	2.49	6.27

ND = non-detectable. For the purposes of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory.

<sup>1</sup> All concentrations in µg/L.

**Table H.4-3 Mean concentration of total and dissolved metals in the RAMP ASL lakes in each sub-region (all years).**

Metal	Units	Mean Dissolved Metals Concentrations – all Years						Mean Total Metals Concentration – all Years					
		SM	WFM	NEFM	BM	CS	CM	SM	WFM	NEFM	BM	CS	CM
Ag	µg/L	0.0015	0.0011	0.0010	0.0028	0.0011	0.0014	0.0046	0.0030	0.0034	0.0067	0.0019	0.0031
Al	µg/L	83.2	19.2	29.1	154	16.1	57.1	360	55.1	67.5	557	32.3	152
As	µg/L	0.336	0.343	0.400	0.672	0.186	0.483	0.410	0.403	0.418	0.841	0.195	0.580
Ba	µg/L	8.21	9.92	10.24	16.63	6.00	14.55	10.9	14.1	12.8	23.5	7.03	17.5
Be	µg/L	0.020	0.006	0.014	0.033	0.034	0.014	1.38	2.98	2.54	3.12	1.23	1.08
Bi	µg/L	0.0042	0.0028	0.0039	0.0052	0.0034	0.0045	0.0078	0.0061	0.0094	0.0110	0.0036	0.0058
B	µg/L	6.42	13.67	11.39	17.23	5.47	5.06	6.42	12.5	9.37	15.6	5.90	5.41
Cd	µg/L	0.0224	0.0090	0.174	0.0156	0.0063	0.0108	0.0333	0.0182	0.1852	0.0259	0.0081	0.0219
Cl	µg/L	0.242	0.213	0.224	0.276	1.546	0.474	0.701	0.578	0.568	0.634	1.84	0.550
Co	µg/L	0.159	0.049	0.052	0.193	0.018	0.063	0.234	0.090	0.092	0.317	0.037	0.122
Cr	µg/L	0.256	0.161	0.158	0.363	0.207	0.252	0.428	0.227	0.287	0.944	0.244	0.394
Cu	µg/L	0.438	0.215	0.301	0.770	0.414	0.676	0.703	0.360	0.725	1.01	0.406	1.006
Fe	µg/L	282	118	165	757	147	469	492	310	417	1243	308	743
Hg	µg/L							0.005	0.005	0.008	0.005	0.005	0.025
Li	µg/L	0.886	2.64	2.08	4.79	1.20	1.44	0.925	2.938	1.90	5.21	1.45	1.70
Mn	µg/L	26.5	23.0	8.5	16.9	1.7	6.2	42.9	70.5	39.3	44.2	22.9	16.5
Mo	µg/L	0.123	0.056	0.054	0.188	0.147	0.116	0.113	0.074	0.066	0.203	0.160	0.145
Ni	µg/L	0.380	0.119	0.116	1.265	0.108	0.636	1.39	0.328	0.223	1.72	0.145	0.792
P	µg/L							48.1	51.5	54.4	97.9	14.3	43.0
Pb	µg/L	0.120	0.076	0.501	0.214	0.027	0.115	0.267	0.169	1.78	0.423	0.194	0.234
Sb	µg/L	0.023	0.016	0.016	0.051	0.013	0.031	0.024	0.020	0.017	0.057	0.012	0.032
Se	µg/L	0.117	0.103	0.117	0.159	0.142	0.135	0.154	0.118	0.143	0.203	0.137	0.150
Sn	µg/L	0.024	0.026	0.030	0.028	0.035	0.030	0.133	0.031	0.091	0.222	0.276	0.305
Sr	µg/L	9.31	32.5	26.1	25.3	29.0	12.2	9.97	34.4	25.0	27.5	31.4	13.1
Th	µg/L	0.0232	0.007	0.009	0.050	0.011	0.025	0.026	0.012	0.010	0.085	0.010	0.028
Ti	µg/L	1.20	0.394	0.479	2.90	0.405	0.921	3.59	1.28	1.27	9.21	0.777	2.47
Tl	µg/L	0.0052	0.001	0.002	0.003	0.005	0.002	0.005	0.002	0.002	0.008	0.003	0.003
U	µg/L	0.014	0.005	0.006	0.045	0.087	0.050	0.026	0.009	0.009	0.069	0.131	0.064
V	µg/L	0.371	0.203	0.277	0.807	0.089	0.295	0.767	0.393	0.493	2.04	0.145	0.607
Zn	µg/L	3.92	3.29	3.12	4.42	1.44	2.92	4.66	3.80	4.20	5.64	1.64	4.03

SM = Stony Mountains, WFM = west of fort McMurray, NEFM = north east of Fort McMurray, BM = Birch Mountains, CS = Canadian Shield, CM = Caribou Mountains; ND = non-detectable  
For the purposes of calculating statistics, non-detectable metal concentrations were assumed to be one-half of the detection limit reported by the laboratory.

**Table H.4-4 Number of lakes in each region having mean individual trace metal concentrations greater than the 95<sup>th</sup> percentile.**

Sub-Region	No. of Lakes in Region	No. of Metals Where Mean > 95 <sup>th</sup> Percentile <sup>1</sup>	Ratio of No. of Metals > 95 <sup>th</sup> Percentile to No. of Lakes <sup>2</sup>	Mean pH in Sub-Region (2007)
Stony Mountains	10	3	0.300	5.87
West of Fort McMurray	8	4	0.500	6.78
North-East of Fort McMurray	11	13	1.182	6.82
Birch Mountains	11	45	4.091	6.41
Canadian Shield	5	1	0.200	6.99
Caribou Mountains	5	2	0.400	6.64
<b>Sum</b>	<b>50</b>	<b>68</b>		

<sup>1</sup> Mean metal concentration for each lake calculated over all years

<sup>2</sup> 95<sup>th</sup> percentile calculated for each metal over all lakes and years

The number of exceedances of CCME Surface Water Quality Guidelines for Protection of Aquatic Life and the lakes in which these are found are indicated in Table H.4-5 for the 2007 data. Exceedances were observed for aluminum, cadmium, iron, lead and copper. The guideline exceedances are scattered throughout the various sub-regions, with a large representation from lakes in the Birch Mountains and the Stony Mountains, consistent with the high metal concentrations found in lakes from these two regions. Cadmium was exceeded in 4 lakes. As the CCME guideline for cadmium (0.018 µg/L; hardness of 50 mg/L) is extremely low, exceedances of this metal occur occasionally in surface waters in the Athabasca oil sands region. The exceedances in Table H.4-5 are considered to be natural occurrences.

**Table H.4-5 List of exceedances of CCME Surface Water Quality Guidelines for metals in 2007.**

Metal	Number of Exceedances	Lakes with Exceedances
Al	16	168,169,170,287,452,470,400,209,447,448,454,455, 457,146,89,97
Fe	25	168,169,170,287,165,172,470,452,471,400,182,209, 270,447,448,454,455,457,464,90,146,152,89
Cd	4	268, 209, 457, 199
Cu	2	209, 457
Pb	1	209

## H.5 SEASONAL VARIABILITY IN ASL MEASUREMENT ENDPOINTS

In order to detect chemical changes in the RAMP ASL lakes, it is necessary to determine the natural seasonal variation in measurement endpoints. Seasonal variations in six measurement endpoints on ten of the ASL lakes are summarized in Table H.5-1 and Figure H.5-1 from data collected by Alberta Environment. The normalized variables in the figures allow comparison of the variability in a measurement endpoint among lakes on the same scale.

Distinct chemical changes occurred during the monitoring years in most of the lakes:

- There were large changes in pH over the seasons. These included seasonal ranges of 2.38 pH units in Lake 175 (P13), 2.20 units in Lake 271 and 1.23 units in Clayton Lake (448). An increase in pH was evident in most lakes during the summer months (July and August) while minima occurred in winter. An opposite trend seemed to occur in several lakes including Clayton Lake (Lake 448). Changes representing 2-3 standard deviations from the mean value were observed;
- Changes in Gran alkalinity over the seasons were very significant especially in some of the ponds. A seasonal range of 5,346 µeq/L was observed in Lake 175 (P13), 2118 µeq/L in Lake 223 (P94) and 2,072 µeq/L in Lake 271. Gran alkalinity in Kearn Lake changed by 874 µeq/L over the seasons. In most lakes, the highest values of Gran Alkalinity were observed in April under ice representing winter conditions (e.g., Lake 271). Changes equivalent to 3 standard deviations from the mean values were observed (Figure H.5-1);
- Very large changes were observed in base cations over the seasons. Changes of 5,828 µeq/L, 2,060 µeq/L and 2,040 µeq/L were observed in Lake 175 (P13), Lake 223 (P94) and Lake 271, respectively. Kearn Lake showed a SBC range of 1,163 µeq/L. As with Gran alkalinity, the highest concentrations occurred in April under ice representing winter conditions;
- Seasonal changes in sulphate were measurable but relatively small compared to those for Gran alkalinity and base cations. The largest seasonal changes in sulphate occurred in Lake 223 (10.1 mg/L), Lake 271 (5.14 mg/L) and Clayton Lake (448) (4.48 mg/L). Peak values were observed in both summer and winter;
- Seasonal changes in DOC were also highly significant, especially in the ponds. The largest seasonal changes occurred in Lake 175 (P13) (149 mg/L), in Lake 223 (P 94) (77.6 mg/L) and Lake 271 (42.0 mg/L). Peaks in DOC occurred both in winter and in summer. Some of the highest values of DOC ever observed in the RAMP ASL lakes were recorded in these data, especially in the shallow ponds in April under ice; and
- Seasonal changes in nitrates were also extremely large. Nitrates increased by as much as three orders of magnitude during a season, peaking in winter. The largest changes occurred in Lake 166 (453 µg/L) Lake 175 (292 µg/L) and Clayton Lake (206 µg/L).

In summary, the results from the seasonal sampling program show that there are very significant changes in the chemistry of the RAMP ASL lakes between seasons. The shallow ponds, in particular Lakes 175 and 223, show extremely large decreases in pH, increases in base cations, Gran alkalinity, DOC and nitrates during the winter. These changes may be the result of a large proportion of the water volume in these small water bodies freezing during the winter. This high degree of variability must be accounted for in attempting to detect incipient acidification.



**Table H.5-1 Seasonal variability in ASL measurement endpoint parameters in ten lakes, 2004 to 2007 (AENV data).**

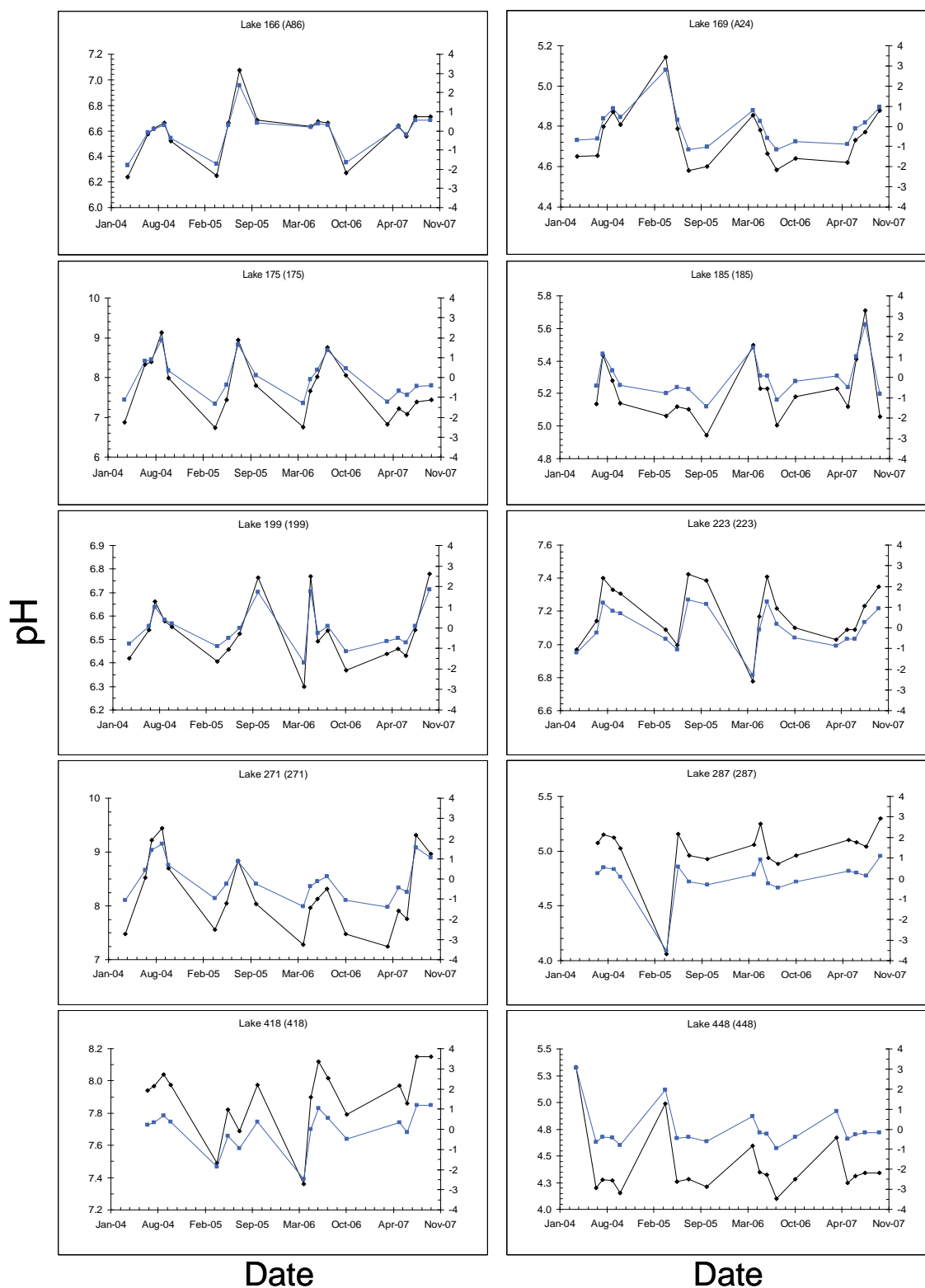
	Lake:	166/A86	169/A24	287/25	175/P13	199/P49	448/Clayton	223/P94	271/6	185/P27	418/Kearl
	Region:	SM	SM	SM	BM	BM	BM	W. FtMc	N-E FtMc	N-E FtMc	N-E FtMc
pH	Minimum	6.24	4.58	4.06	6.74	6.30	4.10	6.78	7.24	4.94	7.36
	Maximum	7.08	5.14	5.30	9.12	6.78	5.33	7.42	9.44	5.71	8.15
	Mean	6.60	4.75	5.00	7.72	6.53	4.40	7.18	8.22	5.22	7.89
	SD	0.20	0.14	0.27	0.74	0.14	0.31	0.18	0.70	0.19	0.22
	CV (%)	3.04	2.98	5.36	9.62	2.08	6.95	2.48	8.49	3.68	2.75
Gran Alkalinity (µeq/L)	Minimum	104	-50	-55	198	70.2	-48.2	548.6	745.4	16	1201
	Maximum	202	43.6	33.8	5544	439.6	52	2666	2818	140.2	2075
	Mean	136	-6.01	-10.3	1259	187	-4.73	938	1377	49.3	1553
	SD	28.6	22.5	23.3	1219	115	21.4	601	461	31.6	218
	CV (%)	21.0	-375	-226	96.8	61.6	-452	64.0	33.5	64.0	14.0
Base Cations (µeq/L)	Minimum	277	86	93	349	227	52	863	905	165	1348
	Maximum	373	287	135	6177	589	534	3723	2944	482	2512
	Mean	307	132	112	1683	341	116	1516	1511	271	1803
	SD	29.3	49.2	10.6	1329	100.0	110	723	494	76.8	280
	CV (%)	9.55	37.4	9.43	79.0	29.3	94.6	47.7	32.7	28.3	15.5
Sulphate (mg/L)	Minimum	1.51	0.64	0.723	1.12	0.46	0	0.77	0.02	0.39	1.99
	Maximum	2.47	1.874	1.978	4.7	2.47	4.48	10.9	5.16	1.43	4.33
	Mean	1.98	0.98	1.35	3.08	1.07	0.76	7.70	0.52	0.75	3.55
	SD	0.29	0.33	0.30	1.03	0.46	1.10	2.52	1.14	0.29	0.57
	CV (%)	14.7	33.5	22.3	33.3	42.6	145	32.7	219	38.4	16.2
Dissolved Organic Carbon (mg/L)	Minimum	13.2	14.7	11.0	14.2	14.8	12.3	29.9	11.6	15.4	19.6
	Maximum	29.0	48.6	44.1	163.6	28.5	34.9	108	53.6	49.4	41.5
	Mean	18.0	22.6	17.3	55.2	19.2	19.4	54.7	23.1	30.6	24.8
	SD	3.5	9.9	9.1	34.0	3.8	6.4	17.7	10.2	8.1	4.9
	CV (%)	19.7	43.7	52.4	61.5	19.7	32.8	32.3	43.9	26.6	19.8
Nitrates +Nitrite (µg/L)	Minimum	0.5	0	0.45	0.15	0	0	0	0	0	0.38
	Maximum	453	37.9	75.6	292	6.33	206	31.4	724	38.3	58.6
	Mean	138	5.11	16.1	20.8	1.84	19.0	8.86	46.1	5.71	7.14
	SD	173	8.88	24.9	66.6	1.93	53.2	12.3	166	10.6	14.2
	CV (%)	125	174	155	320	105	281	139	360	186	199

<sup>1</sup> Regions included Stony Mountains (SM), Birch Mountains (BM), West of Fort McMurray (W. FtMc), and North East of Fort McMurray (N-E FtMc).

<sup>2</sup> Standard deviation.

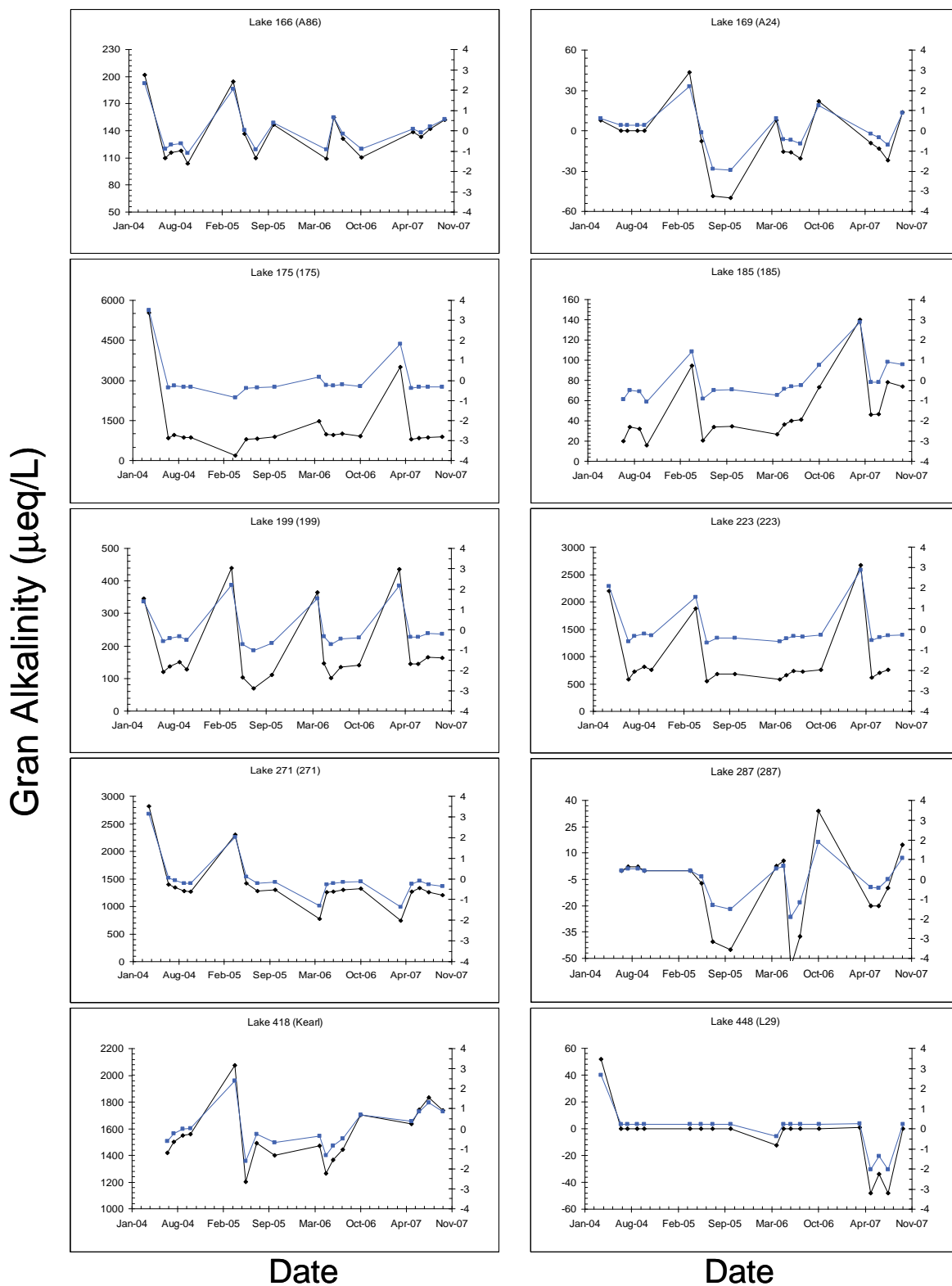
<sup>3</sup> Coefficient of variation.

**Figure H.5-1 Seasonal changes in chemical variables in ten RAMP ASL lakes.**



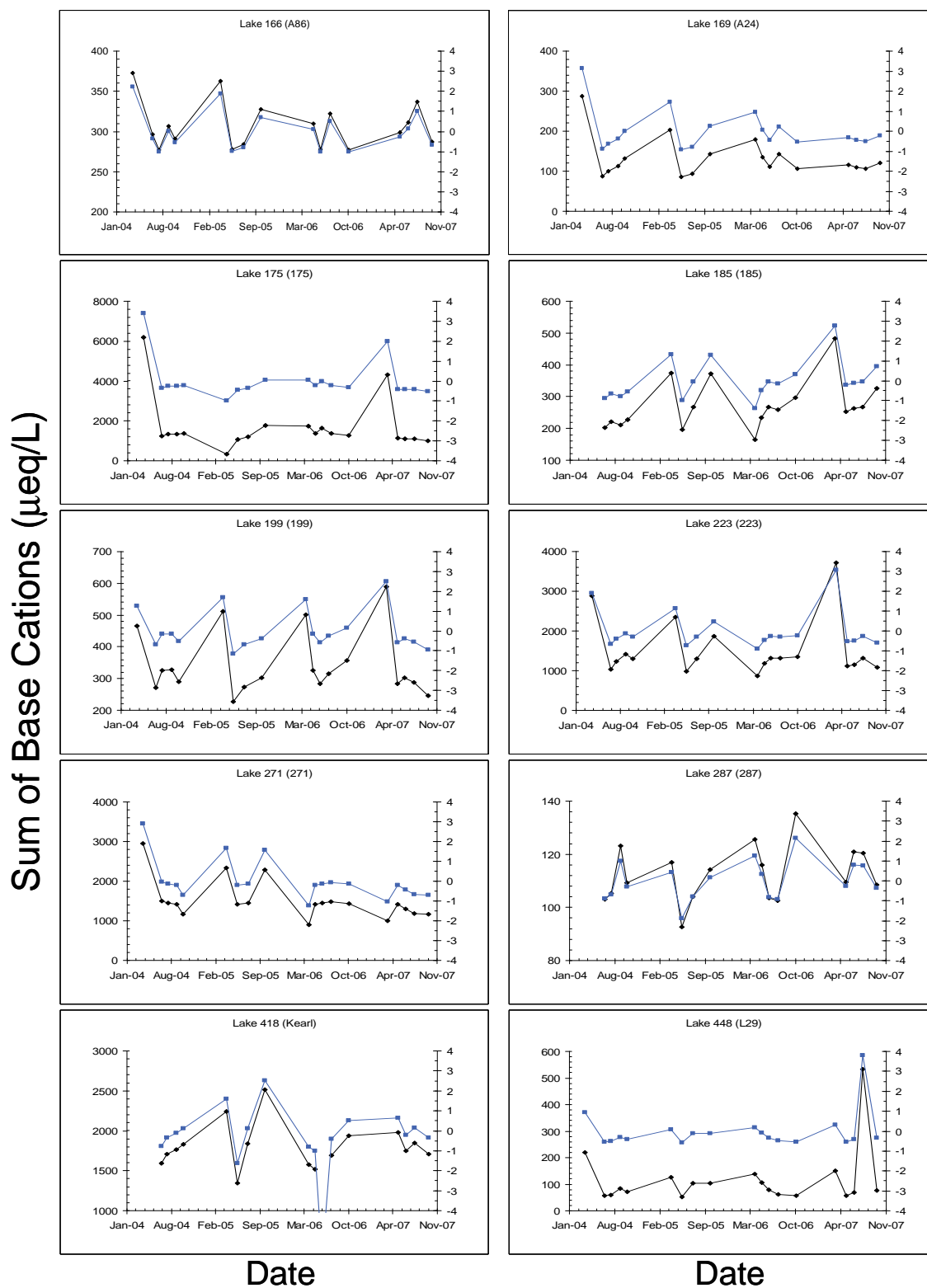
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

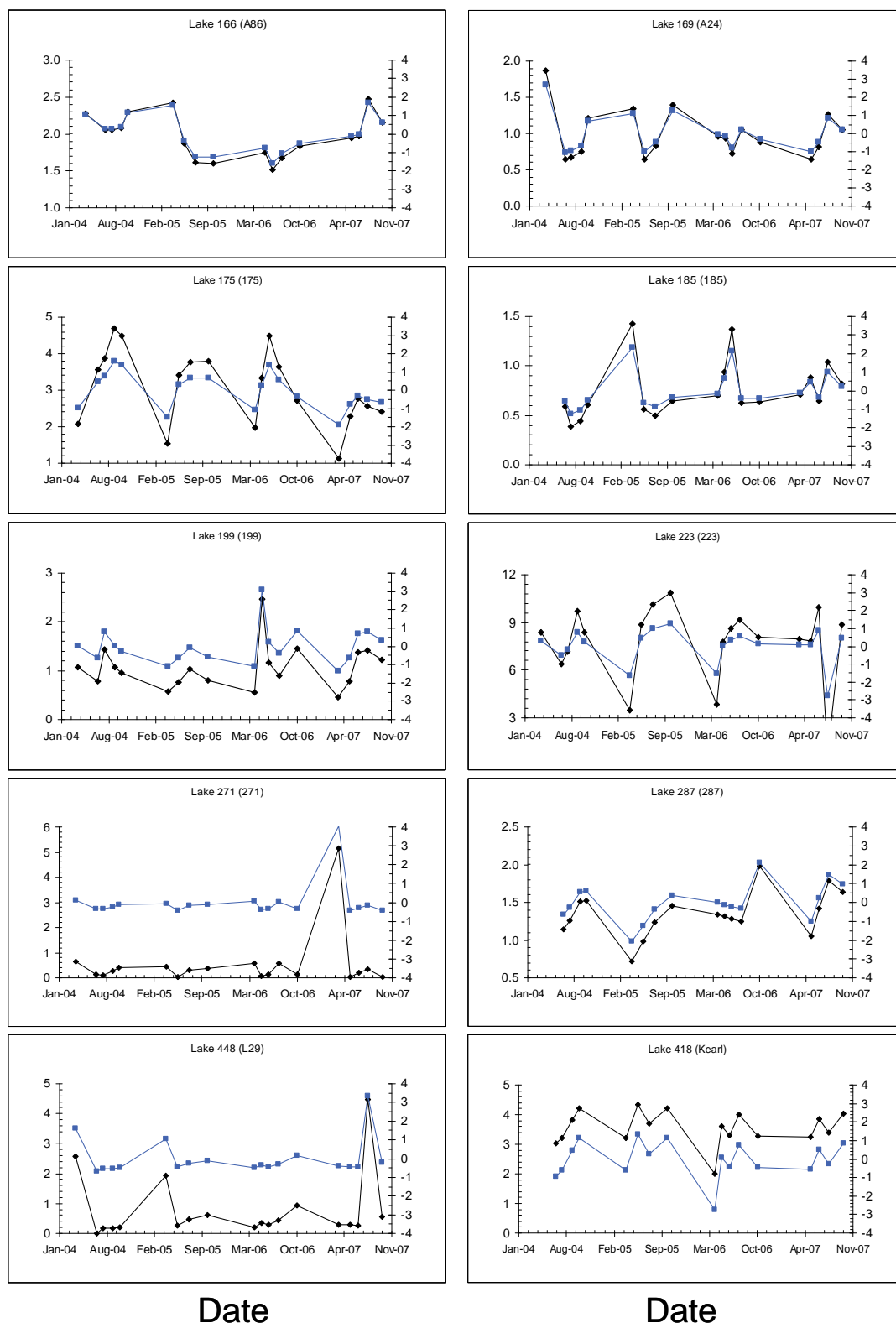
Figure H.5-1 (Cont'd.)



Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

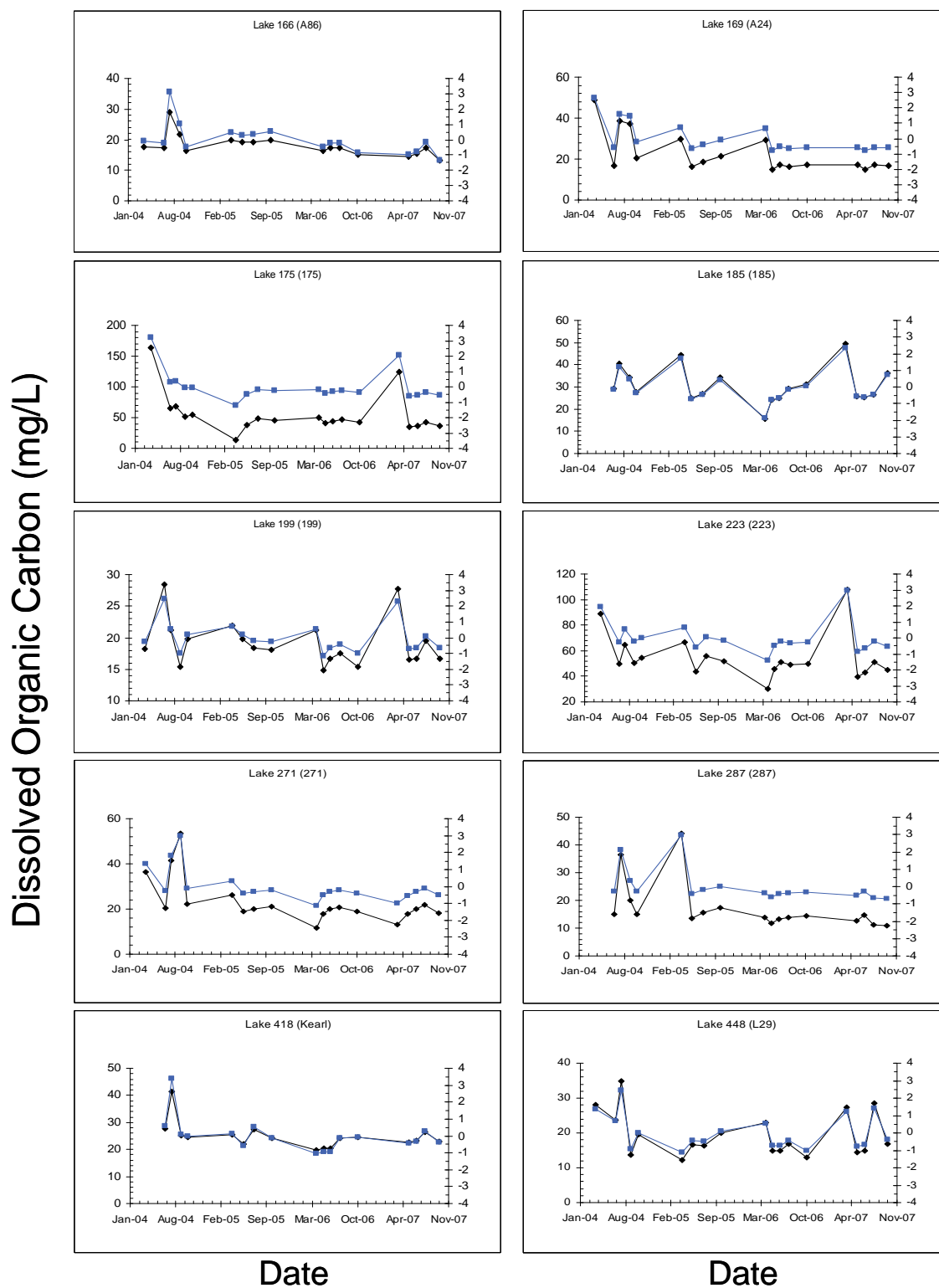
Figure H.5-1 (Cont'd.)

Sulphate (mg/L)



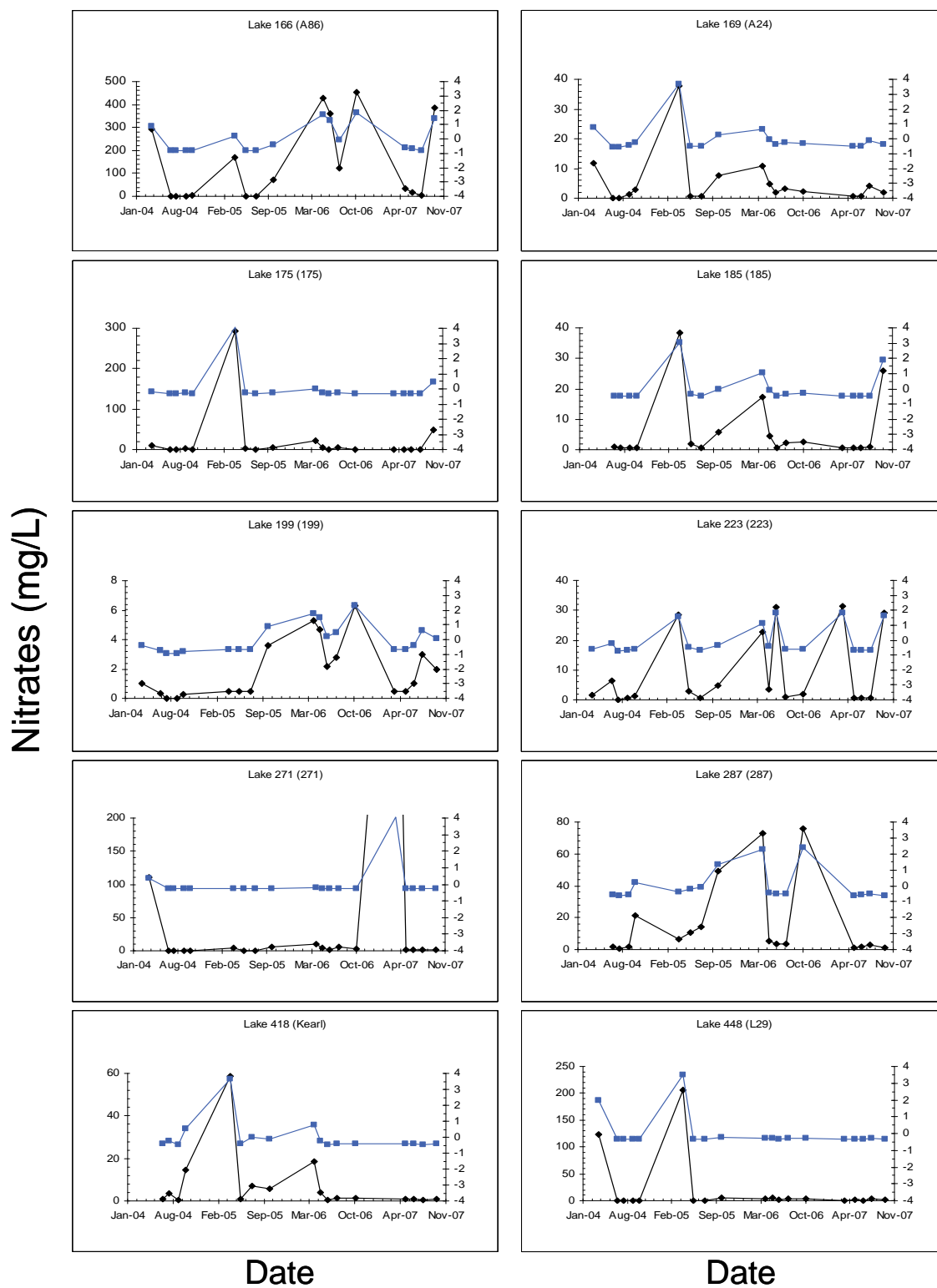
Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.

Figure H.5-1 (Cont'd.)



Note: Variables in blue normalized by dividing the deviation from mean by the standard deviation on each date.