



REGIONAL AQUATICS MONITORING PROGRAM

2005 Technical Report - Appendices

FINAL

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RAMP STEERING COMMITTEE

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Appendix A

Land Change Area Estimation for RAMP Focus Study Area

A.0 LAND CHANGE AREA ESTIMATION FOR RAMP FOCUS STUDY AREA

A.1 INTRODUCTION

The RAMP 2004 Technical Report provided information regarding the activities of each of the oil sands projects financed by RAMP member companies that occurred, oil sands projects financed by companies that are not members of RAMP, and other developments in the Regional Municipality of Wood Buffalo (RMWB).

The RAMP 2004 Technical Report used the area of land change from by oil sands development activities in a number of land change classes to as first-order effect for the assessment of RAMP monitoring results for 2004.

Much of this information was qualitative, however, and it was felt that improving the description of the type and extent of oil sands development activities would improve the understanding of the development pressures that may be influencing aquatic environmental resources within the RAMP Focus Study Area (FSA) and, particularly in the case of the Climate and Hydrology Component, strengthen the accuracy of the assessments that are made.

This appendix documents the efforts made at quantifying the extent and type of land change related to oil sands operations for the RAMP 2005 Technical Report through the use of satellite imagery.

A.2 METHODOLOGY

A.2.1 Key Assumptions

First, it was assumed that the analysis to be conducted in the RAMP 2005 Technical Report will be as in the RAMP 2004 Technical Report, i.e., cumulative effects of oil sands development.

Second, it was decided as a result of discussions among some of the RAMP consultants that spring would be the preferred season for obtaining imagery and determining land change areas because clearing and ditching is generally done in winter and these activities affect the runoff for the succeeding spring and summer. However, the results of the analysis of spring 2005 imagery results will need to be applied to all of 2005, including the time prior to the date on which the imagery was taken.

Third, the RAMP FSA was used as the area within which land change areas would be delineated, and Figure 2.2-1 in the RAMP 2004 Technical Report ("Extent of mine development for oil sands projects in operation as of 2004") was used to assist in the classification and boundaries of different land change types.

A.3 DETAILED APPROACH

A.3.1 Sources of Satellite Imagery

A set of Landsat TM and Landsat MSS (TM: Thematic Mapper, MSS: Multi-Spectral Scanner) images were either purchased by RAMP or obtained at no cost to RAMP (Table A.3-1). These images have a 30 m resolution.

Table A.3-1 Landsat TM / MSS imagery used in land change classification.

| RAMP Oil Sands Area | Image | Image Date | Use |
|------------------------|--------------|-------------|---|
| North of Fort McMurray | Landsat-5 TM | 30 May 2005 | Land Change Classification and Estimation |
| South of Fort McMurray | Landsat-5 TM | 30 May 2005 | Land Change Classification and Estimation |
| North of Fort McMurray | Landsat-5 TM | 28 Jun 2004 | Reference to screen out naturally-disturbed areas |
| North of Fort McMurray | Landsat-7 TM | 14 May 2002 | Reference to screen out naturally-disturbed areas |
| South of Fort McMurray | Landsat-7 TM | 15 Aug 2001 | Reference to screen out naturally-disturbed areas |
| South of Fort McMurray | Landsat-5 TM | 4 Sep 1988 | Reference to screen out naturally-disturbed areas |
| North of Fort McMurray | Landsat MSS | 20 Aug 1974 | Reference to screen out naturally-disturbed areas |

A.3.2 Land Change Classes

Natural land changes were not delineated; areas of wildfire, forest pest outbreaks, etc. were excluded from the analysis.

Eight separate land change classes are distinguished and delineated (Table A.3-2); the basic land change types are as follows:

- Cleared – logged areas;
- Bare – areas with little or no trace of vegetation remaining;
- Developed – areas on which various infrastructure facilities have been developed, but which may remain connected with the surrounding hydrology;
- Enclosed – areas from which runoff to the natural hydrologic system has likely been prevented (e.g., mines, tailings ponds, etc.); and
- Reclaimed.

Table A.3-2 Land change classes distinguished and delineated in the analysis.

| Land Change Type | Cause and Location of Land Change | |
|--|---|---|
| | As a Direct Result of Oil Sands Development | Not as a Direct Result of Oil Sands Development |
| Cleared – logged areas | √ | √ |
| Bare – areas with little or no trace of vegetation remaining | √ | √ |
| Developed – areas on which various infrastructure facilities have been developed but which may remain connected with the surrounding hydrology | √ | √ |
| Enclosed – areas from which runoff to the natural hydrologic system has likely been prevented (e.g., mines, tailings ponds, etc.) | √ | |
| Reclaimed | √ | |

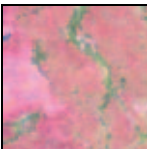
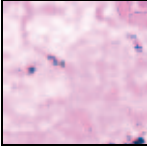
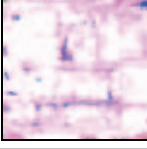
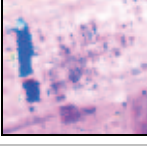
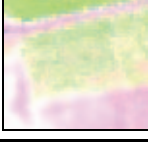
The first three of these classes are subdivided into whether or not the land change was likely to have been a direct result of oil sands development activities, rather than, say, logging as part of an FMA, quarry development, or other non-oil sands development activity.

Because of the resolution of the satellite imagery, it was not possible to efficiently delineate roads and small, very localized anthropogenic changes, such as seismic lines and exploratory wells. SAGD well pads were about the smallest oil sands development entity that was delineated, while an individual cut-block was approximately the smallest logging area that was delineated.

A.3.3 Development of Protocol for Land Change Classification

A manual on-screen approach was used to identify and classify land change areas from the satellite imagery. 2005 Landsat TM imagery, assisted by Figure 2.2-1 of the RAMP 2004 Technical Report, was used to define a 'classification interpretation' key containing thumbnails of Landsat-5 TM corresponding to each land change class (Table A.3-3).

Table A.3-3 Classification key for identifying land change classes.

| Land Change Class | Description | Landsat-5 TM | Additional Notes |
|-------------------|--|---|--|
| Cleared | Logged areas: Mostly bare but containing scattered or sparse vegetation |  | In Landsat TM 2005 images red signifies an absence of vegetation but presence of some water; green signifies presence of vegetation |
| Bare | Areas with little or no trace of vegetation remaining |  | In Landsat TM 2005 images: red signifies an absence of vegetation but presence of some water; white signifies absence of vegetation and dry conditions. White areas are somewhat scattered and generally not contiguous |
| Developed | Areas on which various infrastructure facilities have been developed but which may remain connected with the surrounding hydrology |  | Same as "Bare" but white areas are larger and more contiguous |
| Enclosed | Areas from which runoff to the natural hydrologic system has likely been prevented (e.g., mines, tailings ponds, etc.) |  | Class Key identified by comparing "Active Mine", Tailings Sand Area", and Tailings Settling Pond" land change designations in Figure 2.2-1 of the RAMP 2004 Technical Report with the characteristics of the Landsat TM 2005 imagery in the same locations |
| Reclaimed | Areas reclaimed |  | Class Key identified by comparing "Reclaimed Areas" land change designation in Figure 2.2-1 of the RAMP 2004 Technical Report with the characteristics of the Landsat TM 2005 imagery in the same locations |

Once the classification protocol was developed, the land change areas within the RAMP FSA were digitized and classified according to the classification protocol (Table A.3-3). Imagery from earlier years (Table A.3-1) was used to screen areas that met the criteria of the classification protocol (Table A.3-3), but were due to natural events or were natural landscape conditions.

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

A.4 RESULTS

Table A.4-1 to Table A.4-2 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.4-1 and Figure A.4-2 for the area north of Fort McMurray and in Figure A.4-3 and Figure A.4-4 for the area south of Fort McMurray. Estimated land change as of 2005 within the RAMP FSA is estimated at approximately 92,000 ha, of which about 57,000 ha is directly oil sands development related, and the remainder (about 35,000 ha) due to other human activities, primarily logging. The percentage of the area of watersheds with land change from oil sands development activities varies from less than 1% for many watersheds (Steepbank, Ells, Christina, Firebag, Horse, Hangingstone, and Calumet), 5% to 10% for the Poplar, Muskeg, and all the smaller Athabasca River Tributaries from Fort McMurray to the mouth of the Firebag, and more than 10% for the Beaver, McLean, and Tar watersheds.

While uncertainty exists in the classification of some areas of land change, the results are suitable for the hydrologic analysis and assessment of effects on other RAMP aquatic resources for the RAMP 2005 Technical Report. In addition, these results represent a marked improvement over the land change analyses contained in the RAMP 2004 Technical Report (RAMP 2005a).

Table A.4-1 Area of watersheds with land change, summarized by land change type.

| Watershed | Watershed Area with Land Change (ha) | | | | | | | | | | |
|---------------|--------------------------------------|---------------|--------------|---------------|--------------|---------------|---------------------|---------------|------------|---------------|------------------------------|
| | Land Change – Oil Sands | | | | | | Land Change - Other | | | | Total – Oil Sands Plus Other |
| | Cleared | Bare | Developed | Enclosed | Reclaimed | Total | Cleared | Bare | Developed | Total | |
| Ath. R. Tribs | 1,404 | 3,652 | 363 | 4,126 | | 9,545 | 121 | 149 | 23 | 293 | 9,838 |
| Beaver | 275 | 933 | 159 | 13,580 | 802 | 15,749 | | | | - | 15,749 |
| Calumet | 0 | 156 | | | | 156 | 820 | 2,714 | | 3,534 | 3,690 |
| Christina | 3,395 | 5,229 | 1,338 | | | 9,962 | 3,586 | 19,178 | 235 | 22,999 | 32,961 |
| Ells | 15 | 123 | | | | 138 | | 25 | | 25 | 163 |
| Firebag | 955 | 34 | 115 | | | 1,104 | | 690 | | 690 | 1,794 |
| Hangingstone | | | 227 | | | 227 | | | | - | 227 |
| Horse | | | 214 | | | 214 | | | | - | 214 |
| MacKay | | 66 | 148 | 23 | | 237 | 458 | 1,814 | 12 | 2,284 | 2,521 |
| McLean | | 737 | 43 | 72 | | 852 | | | | - | 852 |
| Muskeg | 2,202 | 743 | 179 | 5,420 | | 8,544 | 1,887 | 554 | 17 | 2,458 | 11,003 |
| Poplar | 142 | 378 | 731 | 1,726 | 370 | 3,347 | 588 | 1,736 | | 2,324 | 5,671 |
| Steepbank | 27 | 94 | 79 | 160 | | 360 | 379 | 230 | | 609 | 971 |
| Tar | 116 | 5,069 | 905 | | | 6,090 | 6 | 434 | | 440 | 6,530 |
| Total | 8,531 | 17,214 | 4,502 | 25,108 | 1,171 | 56,525 | 7,845 | 27,524 | 286 | 35,656 | 92,183 |

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

Table A.4-2 Percent of total watershed areas with land change, summarized by type of land change.

| Watershed | % Watershed Area with Land Change | | | | | | | | | | |
|--------------------------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|---------------------|-------------|-------------|-------------|------------------------------|
| | Land Change – Oil Sands | | | | | | Land Change - Other | | | | Total – Oil Sands Plus Other |
| | Cleared | Bare | Developed | Enclosed | Reclaimed | Total | Cleared | Bare | Developed | Total | |
| Ath. R. Tribs | 1.01 | 2.63 | 0.26 | 2.97 | | 6.87 | 0.09 | 0.11 | 0.02 | 0.22 | 7.09 |
| Beaver | 1.09 | 3.69 | 0.63 | 53.64 | 1.9 | 60.95 | | | | 0 | 60.95 |
| Calumet | 0.0 | 0.9 | | | | 0.9 | 4.7 | 15.4 | | 20.1 | 21.0 |
| Christina | 0.26 | 0.4 | 0.1 | | | 0.76 | 0.28 | 1.47 | 0.02 | 1.77 | 2.53 |
| Ells | 0.01 | 0.05 | | | | 0.06 | | 0.01 | | 0.01 | 0.07 |
| Firebag | 0.17 | 0.01 | 0.02 | | | 0.2 | | 0.12 | | 0.12 | 0.32 |
| Hangingstone | | | 0.21 | | | 0.21 | | | | 0 | 0.21 |
| Horse | | | 0.1 | | | 0.1 | | | | 0 | 0.1 |
| MacKay | | 0.01 | 0.03 | 0 | | 0.04 | 0.08 | 0.33 | 0 | 0.41 | 0.45 |
| McLean | | 15.62 | 0.91 | 1.52 | | 18.05 | | | | 0 | 18.05 |
| Muskeg | 1.54 | 0.52 | 0.13 | 3.78 | | 5.97 | 1.32 | 0.39 | 0.01 | 1.72 | 7.69 |
| Poplar | 0.3 | 0.8 | 1.55 | 3.65 | 0.47 | 6.77 | 1.25 | 3.67 | | 4.92 | 11.69 |
| Steepbank | 0.02 | 0.07 | 0.06 | 0.12 | | 0.27 | 0.28 | 0.17 | | 0.45 | 0.72 |
| Tar | 0.3 | 15.2 | 2.7 | | | 18.3 | | 1.3 | | 1.3 | 19.6 |
| Total¹ | 0.24 | 0.49 | 0.13 | 0.71 | 0.03 | 1.60 | 0.22 | 0.78 | 0.01 | 1.01 | 2.60 |

¹ % of total combined area of above watersheds.

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

Figure A.4-1 RAMP land change classes derived from Landsat-5 TM image of 30 May 2005, north of Fort McMurray.

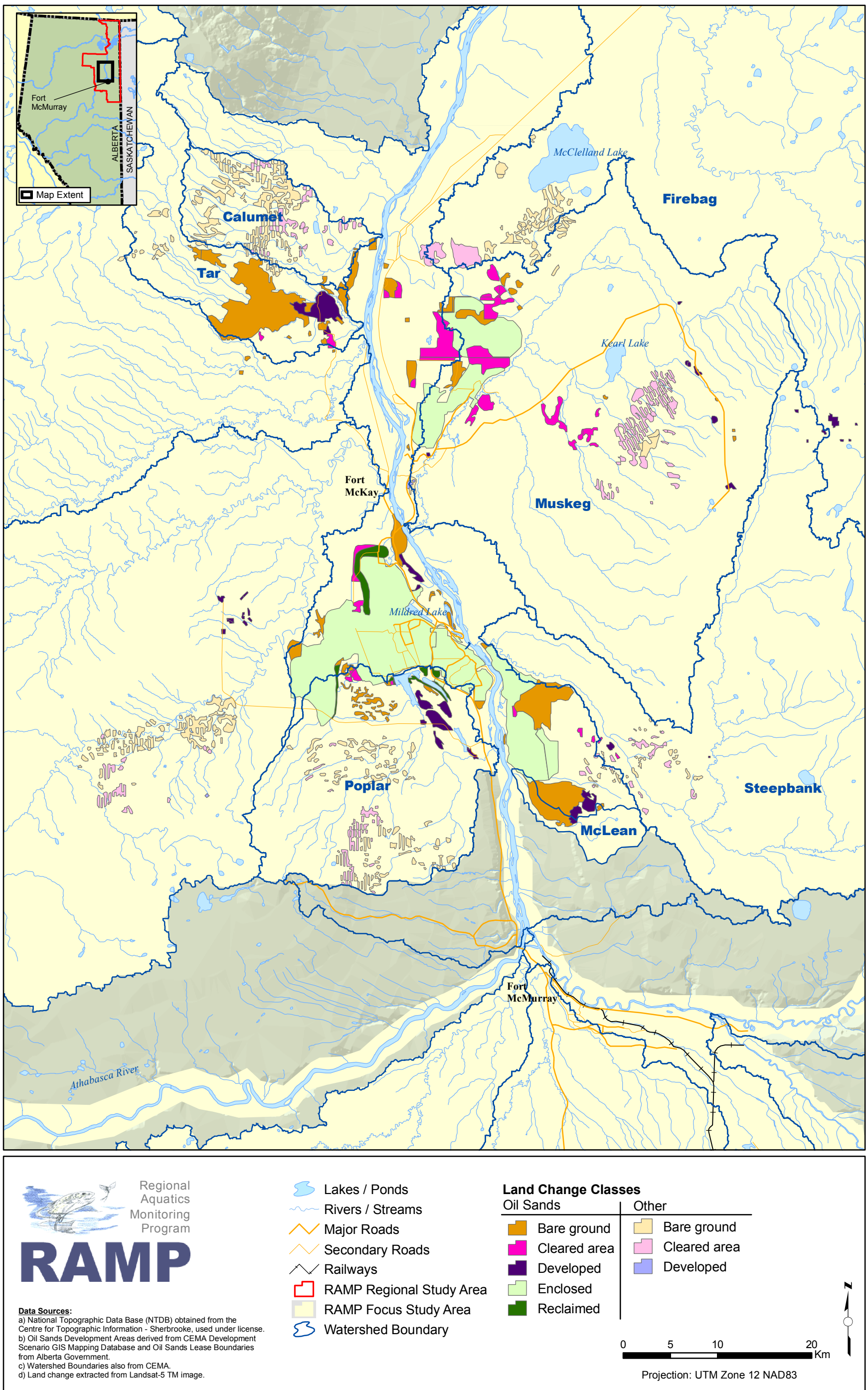


Figure A.4-2 RAMP land change classes overlaid on Landsat-5 TM image of 30 May 2005, north of Fort McMurray.

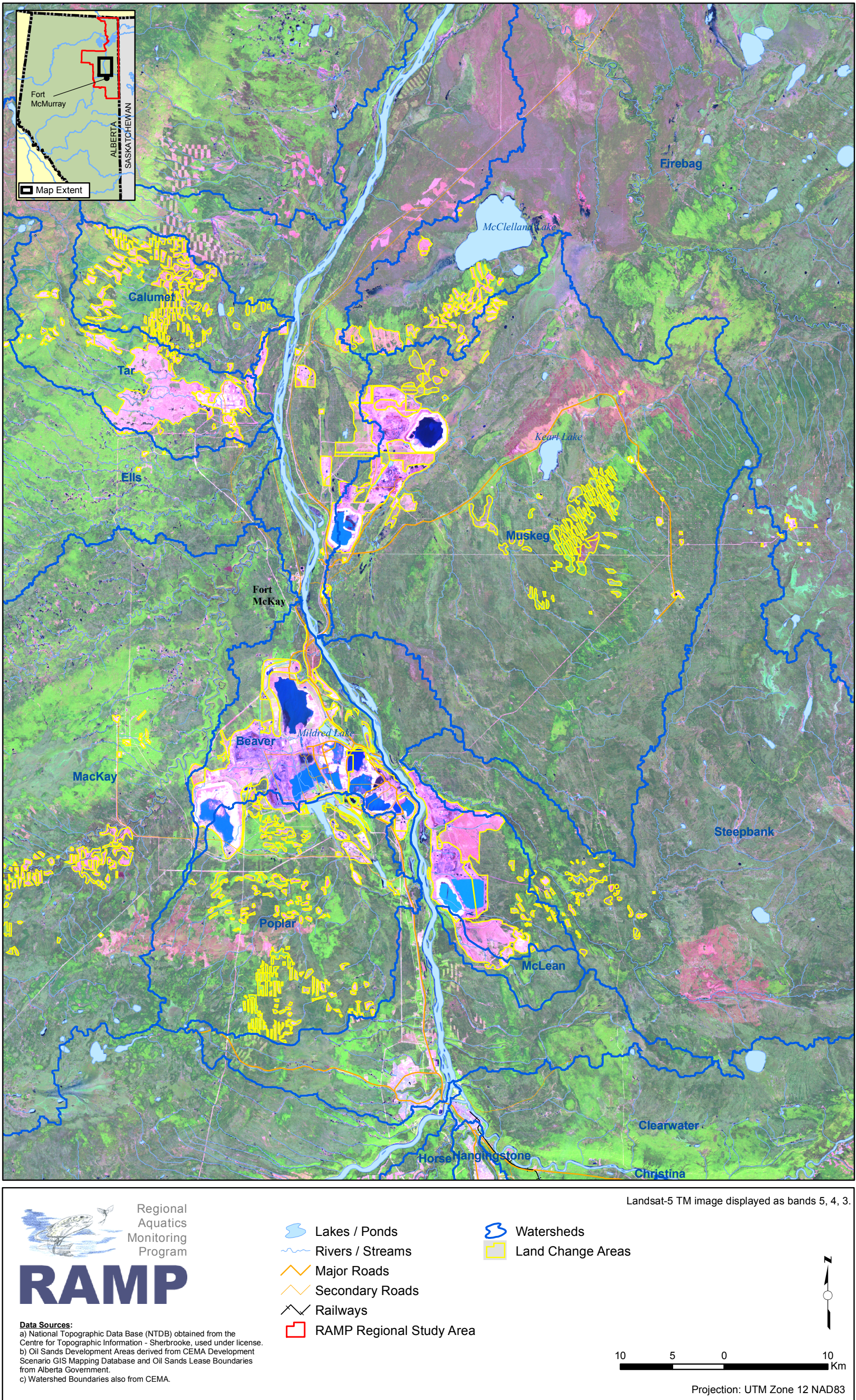


Figure A.4-3 RAMP land change classes derived from Landsat-5 TM image of 30 May 2005, south of Fort McMurray.

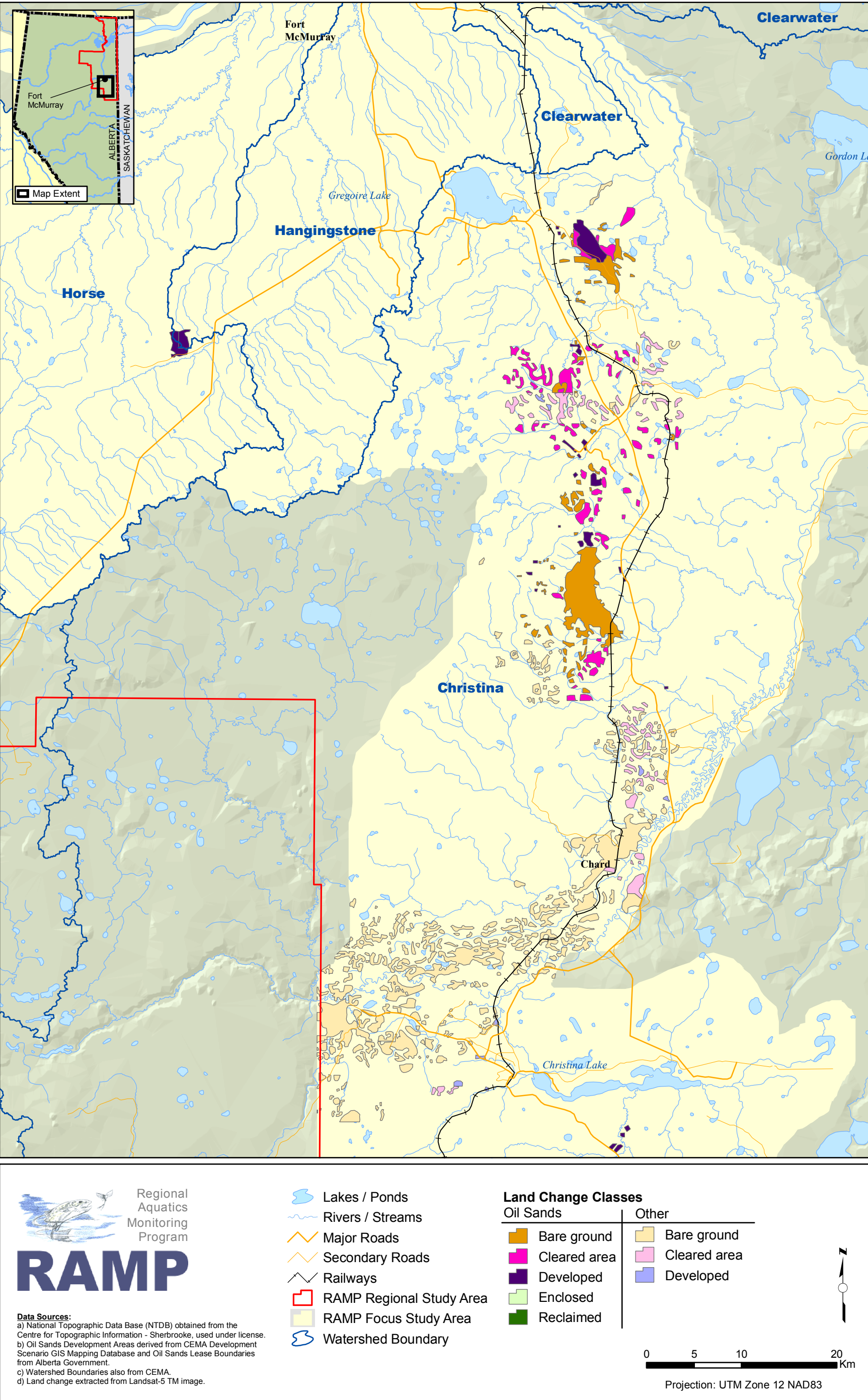
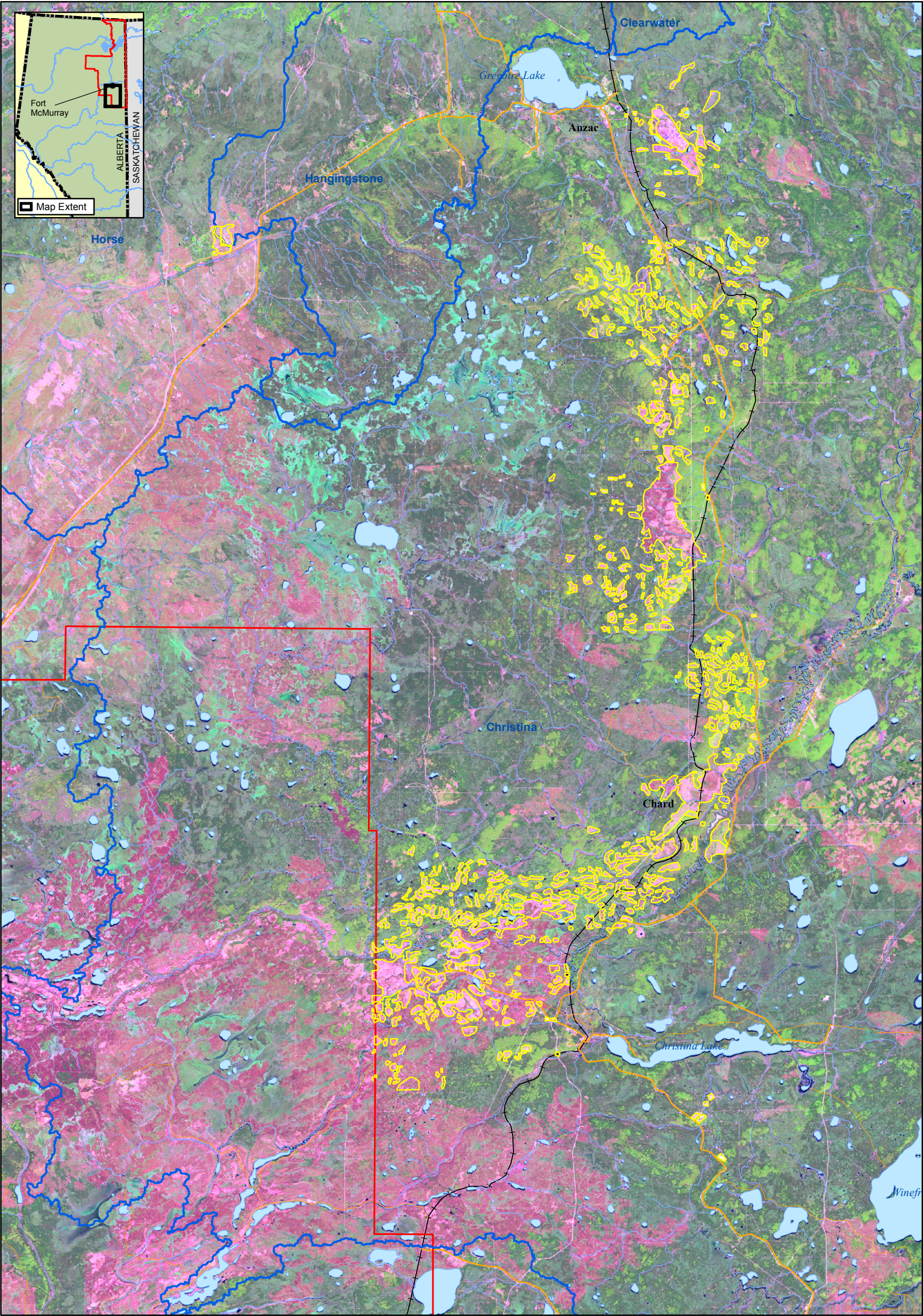


Figure A.4-4 RAMP land change classes overlaid on Landsat-5 TM image of 30 May 2005, south of Fort McMurray.



Data Sources:
a) National Topographic Data Base (NTDB) obtained from the Centre for Topographic Information - Sherbrooke, used under license.
b) Oil Sands Development Areas derived from CEMA Development Scenario GIS Mapping Database and Oil Sands Lease Boundaries from Alberta Government.
c) Watershed Boundaries also from CEMA.

- Lakes / Ponds
- Rivers / Streams
- Major Roads
- Secondary Roads
- Railways
- RAMP Regional Study Area

- Watersheds
- Land Change Areas

Landsat-5 TM image displayed as bands 5, 4, 3.

10 5 0 10 Km

Projection: UTM Zone 12 NAD83

Appendix B

Quality Assurance and Quality Control Procedures for 2005

B.0 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES FOR 2005

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 2005 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 2005 field crewmembers have 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).

2005 crewmembers have 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 were used during field surveys (all components) include:

- 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 ± 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 2005 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 2005 are described below.

B.2.1 Climate and Hydrology

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 (additional detail is provided in RAMP 2005b):

- 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 Appendix C, 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 installed at hydrologic monitoring stations were checked before they were reinstalled in the spring. 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 curves may shift due to changes in channel geometry or roughness.
- Snow course surveys were performed according to standard protocols as presented in RAMP 2005b.

B.2.1.1 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 (additional detail is provided in RAMP 2005b):

- 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 and snowfall data from tipping bucket rain gauges were compared to other local and regional precipitation and temperature data and observations recorded during site visits.

- All discharge measurements were prepared by one person and checked by another person. The check included review of the original field notes and calculations.
- 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 whether the calculated discharges were likely to be representative of actual conditions. In cases where the anomalous 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.

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 200 cm below the ice to minimize potential contamination from auger disturbance;
- 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 blanks were labeled with dummy RAMP-style codes (e.g., FBS-1 and FIB-1) to ensure “blind” laboratory analysis. Trip blanks were labeled as “Trip Blank”.

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 in every season to assess analytical precision. Split samples were collected from the Athabasca River downstream of all development (cross-channel composite; winter and summer), McLean Creek (spring), and Shipyard Lake (fall). A duplicate sample was collected from the Clearwater River (station CLR-1) in fall 2005 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 was 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 analytes in field blanks are shown in Table B.2-1. Conductivity in the winter, spring, and summer field blank exceeded the detection limit by more than five times. Sulphide concentrations in the winter field blank were six times greater than the detection limit, while the concentration of total phosphorus in the spring field blank exceeded the detection limit by 28 times. The concentration of several dissolved and total metals was greater than five times the detection limit in field blanks from all seasons, although the highest number of metals with such concentrations occurred in the fall field blank (10 dissolved metals, 13 total metals). Concentrations of dissolved metals in field blanks exceeded the detection limit by up to 41 times (boron, winter field blank), although most dissolved metal concentrations were less than 15 times the detection limit. Total metals exceeded the detection limit by up to 112 times (nickel, fall field blank). Total nickel concentrations in other samples collected on the same day as the field blank were lower than the field blank concentration of 0.000558 mg/L, indicating that nickel contamination is likely not an issue of concern.

The concentration of analytes in trip blanks from winter, spring, summer, and fall sampling are shown in Table B.2-2. Conductivity was greater than five times the detection limit in the winter, summer, and fall trip blank. Due to sampling error, concentrations of metals in the winter trip blank – with the exception of ultra-trace mercury – were not analyzed. Both dissolved and total metal concentrations exceeded five times the detection limit in the spring, summer, and fall trip blank. Metals exceeding the detection limit by the greatest amount included dissolved and total lead (68.6 and 68.8 times greater than the detection limit, respectively) and dissolved and total thallium (74.3 and 75.0 times, respectively) in the summer trip blank. For both these metals, greater than 99% of the total metal concentration was in the dissolved form.

The number of analytes with concentrations greater than five times the detection limit in trip blanks was lowest in the spring, highest in the summer, and moderate in the fall. A number of these elevated concentrations occurred for the same analytes in different seasons, suggesting that the source of these exceedances was related to consistent characteristics of laboratory water, sample bottle handling or storage, or analytical procedures. Similarly, the concentrations of a number of analytes in field blanks were greater than five times the detection limit in two or more seasons, suggesting that these exceedances resulted from a source consistent across seasons rather than accidental contamination in the field. Numerous analytes with concentrations greater than five times the detection limit in field and trip blanks were also elevated in QA/QC samples in 2004 (e.g., total phosphorus, nickel, lead), suggesting that accurate laboratory analysis of low concentrations of certain analytes may be consistently problematic.

Split Samples

Split samples were submitted for laboratory analysis in all four sampling seasons in 2005 (Table B.2-3 to Table B.2-6). The relative percent differences between samples for all analytes except metals were less than 20% in the winter and spring split samples, for analytes with concentrations greater than five times the detection limit. Relative percent differences greater than 20% were found for some dissolved and total metals in both winter and spring split samples.

In the summer split sample, the relative percent difference in total suspended solids between the two samples was 85%. Similarly, the relative percent difference between concentrations of phenols was 169% (ATR-DD-CC concentration was below detection limits). Only two dissolved metals (thorium and zinc) exhibited relative percent differences in concentration greater than 20%. The relative percent differences in all total metal concentrations were less than 20% (for analytes with concentrations greater than five times the detection limit).

Relative percent differences greater than 20% were observed for total dissolved phosphorus and some dissolved and total metals in the fall split sample.

Other Issues

As in previous years, the concentration of the dissolved form of some metals exceeded the concentration of the total form. This was observed in every season, and was not limited to particular stations or metal analytes. Concentrations of dissolved antimony exceeded concentrations of total antimony nineteen times over the four seasons of sampling in 2005; most dissolved concentrations were only slightly greater than total concentrations, although the dissolved concentration was six times greater than the total concentration in one sample (CHR-2, fall).

Duplicate Samples

Duplicate samples were collected at station CLR-1 on September 16, 2005. Conventional variables, major ions, nutrients, and hydrocarbon concentrations were generally quite similar in the duplicate samples (Table B.2-7). Total suspended solids, however, differed by 140%; TSS was less than 3 mg/L (below the detection limit) in CLR-1, but was 17 mg/L in the duplicate sample DUP-1.

The concentration of numerous metals differed substantially between the two samples. The relative percent difference between metals concentrations was greater than 20% for 19 of 31 dissolved metals and 27 of 32 total metals, and ranged up to 141.2% (total thorium). The differences in concentration for numerous metal analytes may be related to the difference in TSS concentration between the two samples. However, the concentration of metals was, in general, lower in DUP-1 than in CLR-1, even though TSS was substantially higher in DUP-1. For total metals, the concentrations of only two metals (selenium and tin) were higher in DUP-1 than in CLR-1. The differences between TSS and metal concentrations indicate a certain level of environmental variability at this station.

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. Nonetheless, elevated concentrations of some analytes in field and trip blanks indicate a potential source of contamination that should be further investigated. Large differences in TSS and metals concentrations between the duplicate samples indicates that environmental heterogeneity occurs at some stations, and should be taken into account during assessment and interpretation of analytical results.

Table B.2-1 Concentrations of water quality analytes in field blanks, 2005.

| Variable | Units | Detection Limit | Concentration in Field Blank | | | | Guideline Exceedance Ratio (if >5) | |
|---|--------|-----------------|------------------------------|------------|------------|------------|------------------------------------|---------|
| | | | 15-Mar-05 | 24-May-05 | 24-Jul-05 | 24-Sep-05 | Minimum | Maximum |
| Conventional Variables | | | | | | | | |
| Alkalinity, Total (as CaCO ₃) | mg/L | 5 | <5 | <5 | <5 | <5 | - | - |
| Bicarbonate | mg/L | 5 | <5 | <5 | <5 | <5 | - | - |
| Carbonate | mg/L | 5 | <5 | <5 | <5 | <5 | - | - |
| Color, True | T.C.U. | 3 | <3 | <3 | <3 | <3 | - | - |
| Conductivity | uS/cm | 0.2 | 1.1 | 1.3 | 1.4 | 1 | 5.5 | 7 |
| Dissolved Organic Carbon | mg/L | 1 | 1 | 1 | <1 | <1 | - | - |
| Hardness (as CaCO ₃) | mg/L | - | <1 | <1 | <1 | <1 | - | - |
| Hydroxide | mg/L | 5 | <5 | <5 | <5 | <5 | - | - |
| pH | pH | 0.1 | 5.8 | 6.1 | 6.0 | 6.0 | - | - |
| Total Dissolved Solids | mg/L | 10 | 10 | 20 | 10 | <10 | - | - |
| Total Organic Carbon | mg/L | 1 | 1 | 2 | <1 | <1 | - | - |
| Total Suspended Solids | mg/L | 3 | <3 | <3 | <3 | <3 | - | - |
| Major Ions | | | | | | | | |
| Calcium | mg/L | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - |
| Chloride | mg/L | 1 | <1 | <1 | <1 | <1 | - | - |
| Magnesium | mg/L | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | - |
| Potassium | mg/L | 0.1, 0.5* | <0.1 | <0.5 | <0.5 | <0.5 | - | - |
| Sodium | mg/L | 1 | <1 | <1 | <1 | <1 | - | - |
| Sulphate | mg/L | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - |
| Sulphide | mg/L | 0.003 | 0.018 | <0.003 | <0.003 | <0.003 | 6 | - |
| Nutrients & BOD | | | | | | | | |
| Ammonia | mg/L | 0.05 | 0.07 | <0.05 | <0.05 | <0.05 | - | - |
| Nitrate+Nitrite | mg/L | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | - |
| Phosphorus, Total Dissolved | mg/L | 0.001 | <0.001 | 0.003 | <0.001 | <0.001 | - | - |
| Phosphorus, Total | mg/L | 0.001 | 0.001 | 0.028 | <0.001 | 0.004 | 28.0 | - |
| Total Kjeldahl Nitrogen | mg/L | 0.2 | <0.2 | <0.2 | <0.2 | <0.2 | - | - |
| Biochemical Oxygen Demand | mg/L | 2 | <2 | <2 | <2 | <2 | - | - |
| Hydrocarbons | | | | | | | | |
| Hydrocarbons, Recoverable | mg/L | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - |
| Naphthenic Acids | mg/L | 1 | <1 | <1 | <1 | 2 | - | - |
| Phenols | mg/L | 0.001 | <0.001 | 0.002 | <0.001 | <0.001 | - | - |
| Chlorophyll a | | | | | | | | |
| Chlorophyll a | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - |
| Dissolved Metals | | | | | | | | |
| Aluminum | mg/L | 0.0002 | <0.0002 | 0.000837 | 0.00029 | 0.000274 | - | - |
| Antimony | mg/L | 0.0000005 | 0.0000013 | 0.00000094 | 0.0000022 | 0.00000133 | - | - |
| Arsenic | mg/L | 0.000002 | <0.000002 | <0.000002 | 0.00000499 | 0.0000112 | 5.6 | - |
| Barium | mg/L | 0.000004 | <0.000004 | 0.0000137 | 0.0000385 | 0.0000141 | 9.6 | - |
| Beryllium | mg/L | 0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 | - | - |
| Bismuth | mg/L | 0.000001 | <0.000001 | <0.000001 | <0.000001 | <0.000001 | - | - |
| Boron | mg/L | 0.00003 | 0.001232 | 0.000564 | 0.00041 | 0.0001 | 13.7 | 41.1 |
| Cadmium | mg/L | 0.000002 | <0.000002 | <0.000002 | <0.000002 | <0.000002 | - | - |
| Calcium | mg/L | 0.004 | 0.0104 | 0.0497 | 0.0572 | 0.0217 | 5.4 | 14.3 |
| Chlorine | mg/L | 0.1 | <0.1 | <0.1 | <0.1 | 0.507 | 5.1 | - |
| Chromium | mg/L | 0.00003 | 0.0000449 | 0.0000662 | 0.0000626 | 0.000168 | 5.6 | - |
| Cobalt | mg/L | 0.000001 | <0.000001 | <0.000001 | <0.000001 | <0.000001 | - | - |
| Copper | mg/L | 0.00005 | <0.00005 | 0.000051 | <0.00005 | 0.000115 | - | - |
| Iron | mg/L | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | - | - |
| Lead | mg/L | 0.000001 | <0.000001 | <0.000001 | 0.0000104 | 0.0000148 | 10.4 | 14.8 |
| Lithium | mg/L | 0.00002 | 0.000598 | 0.0000867 | <0.00002 | <0.00002 | 29.9 | - |

Exceedance ratio = measured concentration/detection limit.

Shaded values indicate sample concentrations were greater than five times the analytical detection limits.

* Detection limit was 0.5 mg/L for spring, summer, and fall sampling.

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

| Variable | Units | Detection Limit | Concentration in Field Blank | | | | Guideline Exceedance Ratio (if >5) | |
|--------------------------|-------|-----------------|------------------------------|------------|-------------|-------------|------------------------------------|---------|
| | | | 15-Mar-05 | 24-May-05 | 24-Jul-05 | 24-Sep-05 | Minimum | Maximum |
| Dissolved Metals, cont'd | | | | | | | | |
| Manganese | mg/L | 0.000003 | 0.0000109 | 0.0000424 | 0.0000485 | 0.000103 | 14.1 | 34.3 |
| Mercury | mg/L | 0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | - | - |
| Molybdenum | mg/L | 0.000001 | <0.000001 | 0.00000309 | 0.00000415 | 0.000001721 | - | - |
| Nickel | mg/L | 0.000005 | 0.0000333 | <0.000005 | <0.000005 | 0.0000764 | 6.7 | 15.3 |
| Selenium | mg/L | 0.0001 | <0.0001 | 0.0001464 | <0.0001 | 0.000128 | - | - |
| Silver | mg/L | 0.0000005 | <0.0000005 | <0.0000005 | <0.0000005 | <0.0000005 | - | - |
| Strontium | mg/L | 0.000004 | 0.000025372 | 0.0000851 | 0.0001281 | 0.0000429 | 6.3 | 32 |
| Sulphur | mg/L | 0.2 | <0.2 | <0.2 | <0.2 | <0.2 | - | - |
| Thallium | mg/L | 0.0000003 | <0.0000003 | <0.0000003 | <0.0000003 | <0.0000003 | - | - |
| Thorium | mg/L | 0.0000003 | <0.0000003 | 0.00000454 | <0.0000003 | <0.0000003 | 15.1 | - |
| Tin | mg/L | 0.00003 | <0.00003 | <0.00003 | <0.00003 | <0.00003 | - | - |
| Titanium | mg/L | 0.00004 | <0.00004 | 0.0000453 | <0.00004 | <0.00004 | - | - |
| Uranium | mg/L | 0.0000001 | 0.000000111 | <0.0000001 | 0.000000149 | 0.000000184 | - | - |
| Vanadium | mg/L | 0.000005 | 0.0000159 | 0.0000156 | 0.0000219 | 0.0000669 | 13.4 | - |
| Zinc | mg/L | 0.00005 | 0.000845 | 0.00019 | 0.00027 | 0.00028 | 5.4 | 16.9 |
| Total Metals | | | | | | | | |
| Aluminum | mg/L | 0.0005 | <0.0005 | 0.00169 | 0.0005 | <0.0005 | - | - |
| Antimony | mg/L | 0.0000005 | 0.00000194 | 0.00000134 | 0.00000656 | 0.00000138 | 13.1 | - |
| Arsenic | mg/L | 0.000002 | <0.000002 | <0.000002 | 0.00000551 | 0.000011 | 5.5 | - |
| Barium | mg/L | 0.000004 | <0.000004 | 0.0000364 | 0.000125 | 0.0000236 | 5.9 | 31.3 |
| Beryllium | mg/L | 0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 | - | - |
| Bismuth | mg/L | 0.000001 | <0.000001 | <0.000001 | <0.000001 | <0.000001 | - | - |
| Boron | mg/L | 0.00005 | 0.0012 | 0.000566 | 0.00052 | 0.00051 | 10.2 | 24.0 |
| Cadmium | mg/L | 0.000002 | <0.000002 | <0.000002 | <0.000002 | <0.000002 | - | - |
| Calcium | mg/L | 0.004 | 0.0104 | 0.0655 | 0.0572 | 0.0225 | 5.6 | 16.4 |
| Chlorine | mg/L | 0.1 | <0.1 | 0.379 | <0.1 | 0.508 | 5.1 | - |
| Chromium | mg/L | 0.00003 | 0.0000407 | 0.0000997 | 0.0000623 | 0.000173 | 5.8 | - |
| Cobalt | mg/L | 0.000001 | <0.000001 | <0.000001 | <0.000001 | <0.000001 | - | - |
| Copper | mg/L | 0.00005 | <0.00005 | 0.0000736 | <0.00005 | 0.000119 | - | - |
| Iron | mg/L | 0.002 | <0.002 | <0.002 | <0.002 | <0.002 | - | - |
| Lead | mg/L | 0.000001 | 0.0000146 | 0.00000407 | 0.0000102 | 0.0000162 | 10.2 | 16.2 |
| Lithium | mg/L | 0.00002 | 0.000612 | 0.0000884 | <0.00002 | 0.000217 | 10.9 | 30.6 |
| Manganese | mg/L | 0.000003 | 0.0000128 | 0.0000762 | 0.0000951 | 0.000122 | 25.4 | 40.7 |
| Mercury | mg/L | 0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | - | - |
| Mercury, ultra-trace | ng/L | 0.6 | <0.6 | <0.6 | <0.6 | <0.6 | - | - |
| Molybdenum | mg/L | 0.000001 | <0.000001 | 0.00000326 | 0.00000408 | 0.00000176 | - | - |
| Nickel | mg/L | 0.000005 | 0.0000339 | <0.000005 | <0.000005 | 0.000558 | 6.8 | 112 |
| Selenium | mg/L | 0.0001 | <0.0001 | 0.000149 | <0.0001 | 0.000137 | - | - |
| Silver | mg/L | 0.0000005 | <0.0000005 | 0.0000455 | <0.0000005 | <0.0000005 | 91 | - |
| Strontium | mg/L | 0.000004 | 0.0000251 | 0.0000996 | 0.000129 | 0.0000482 | 6.3 | 32.3 |
| Sulphur | mg/L | 0.2 | <0.2 | <0.2 | <0.2 | <0.2 | - | - |
| Thallium | mg/L | 0.0000003 | <0.0000003 | <0.0000003 | 0.000000352 | <0.0000003 | - | - |
| Thorium | mg/L | 0.0000003 | <0.0000003 | 0.0000046 | <0.0000003 | <0.0000003 | 15.3 | - |
| Tin | mg/L | 0.00003 | <0.00003 | <0.00003 | <0.00003 | <0.00003 | - | - |
| Titanium | mg/L | 0.00004 | <0.00004 | 0.0000598 | 0.000409 | 0.000256 | 6.4 | 10.2 |
| Uranium | mg/L | 0.0000001 | 0.000000168 | 0.0000001 | 0.00000154 | 0.000000428 | 15.4 | - |
| Vanadium | mg/L | 0.000005 | 0.0000152 | 0.0000204 | 0.0000406 | 0.0000668 | 8.1 | 13.4 |
| Zinc | mg/L | 0.0001 | 0.000862 | 0.00069 | 0.00038 | 0.00043 | 6.9 | 8.6 |

Exceedance ratio = measured concentration/detection limit.

Shaded values indicate sample concentrations were greater than five times the analytical detection limits.

* Detection limit was 0.5 mg/L for spring, summer, and fall sampling.

Table B.2-2 Concentrations of water quality analytes in trip blanks, 2005.

| Variable | Units | Detection Limit | Concentration in Field Blank | | | | Guideline Exceedance Ratio (if >5) | |
|---|--------|-----------------|------------------------------|------------|------------|------------|------------------------------------|---------|
| | | | 17-Mar-05 | 2-Jun-05 | 24-Jul-05 | 24-Sep-05 | Minimum | Maximum |
| Conventional Variables | | | | | | | | |
| Alkalinity, Total (as CaCO ₃) | mg/L | 5 | <5 | <5 | <5 | <5 | - | - |
| Bicarbonate | mg/L | 5 | <5 | <5 | <5 | <5 | - | - |
| Carbonate | mg/L | 5 | <5 | <5 | <5 | <5 | - | - |
| Color, True | T.C.U. | 3 | <3 | <3 | <3 | <3 | - | - |
| Conductivity | uS/cm | 0.2 | 1.3 | 1 | 1.1 | 1.2 | 5.5 | 6.5 |
| Dissolved Organic Carbon | mg/L | 1 | 1 | <1 | <1 | <1 | - | - |
| Hardness (as CaCO ₃) | mg/L | - | <1 | <1 | <1 | <1 | - | - |
| Hydroxide | mg/L | 5 | <5 | <5 | <5 | <5 | - | - |
| pH | pH | 0.1 | 5.8 | 6 | 6.2 | 5.8 | - | - |
| Total Dissolved Solids | mg/L | 10 | <10 | <10 | 10 | <10 | - | - |
| Total Organic Carbon | mg/L | 1 | 2 | <1 | <1 | <1 | - | - |
| Total Suspended Solids | mg/L | 3 | <3 | <3 | <3 | <3 | - | - |
| Major Ions | | | | | | | | |
| Calcium | mg/L | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - |
| Chloride | mg/L | 1 | <1 | <1 | <1 | <1 | - | - |
| Magnesium | mg/L | 0.1 | <0.1 | <0.1 | <0.1 | 0.2 | - | - |
| Potassium | mg/L | 0.1, 0.5* | <0.1 | <0.5 | <0.5 | <0.5 | - | - |
| Sodium | mg/L | 1 | <1 | <1 | <1 | <1 | - | - |
| Sulphate | mg/L | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - |
| Sulphide | mg/L | 0.003 | 0.003 | <0.003 | <0.003 | <0.003 | - | - |
| Nutrients & BOD | | | | | | | | |
| Ammonia | mg/L | 0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | - |
| Nitrate+Nitrite | mg/L | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | - |
| Phosphorus, Total 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 | - | - |
| Biochemical Oxygen Demand | mg/L | 2 | <2 | <2 | <2 | <2 | - | - |
| Hydrocarbons | | | | | | | | |
| Hydrocarbons, Recoverable | mg/L | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | - | - |
| Naphthenic Acids | mg/L | 1 | <1 | <1 | <1 | <1 | - | - |
| Phenols | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - |
| Chlorophyll a | | | | | | | | |
| Chlorophyll a | mg/L | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - |
| Dissolved Metals ** | | | | | | | | |
| Aluminum | mg/L | 0.0002 | - | <0.0002 | <0.0002 | <0.0002 | - | - |
| Antimony | mg/L | 0.0000005 | - | <0.0000005 | 0.00000226 | 0.00000133 | - | - |
| Arsenic | mg/L | 0.000002 | - | <0.000002 | 0.00000935 | 0.00000503 | - | - |
| Barium | mg/L | 0.000004 | - | 0.0000092 | 0.0000301 | 0.00000521 | 7.5 | - |
| Beryllium | mg/L | 0.000003 | - | <0.000003 | <0.000003 | 0.00000307 | - | - |
| Bismuth | mg/L | 0.000001 | - | 0.00000148 | 0.00000257 | <0.000001 | - | - |
| Boron | mg/L | 0.00003 | - | <0.00003 | <0.00003 | 0.0000506 | - | - |
| Cadmium | mg/L | 0.000002 | - | <0.000002 | <0.000002 | <0.000002 | - | - |
| Calcium | mg/L | 0.004 | - | <0.004 | <0.004 | 0.0119 | - | - |
| Chlorine | mg/L | 0.1 | - | 0.131 | 0.677 | 0.293 | 6.8 | - |
| Chromium | mg/L | 0.00003 | - | 0.0000772 | 0.000102 | 0.000134 | - | - |
| Cobalt | mg/L | 0.000001 | - | <0.000001 | <0.000001 | <0.000001 | - | - |
| Copper | mg/L | 0.00005 | - | 0.0000824 | <0.00005 | <0.00005 | - | - |
| Iron | mg/L | 0.002 | - | <0.002 | <0.002 | <0.002 | - | - |
| Lead | mg/L | 0.000001 | - | 0.00000159 | 0.0000686 | <0.000001 | 68.6 | - |
| Lithium | mg/L | 0.00002 | - | <0.00002 | 0.000129 | 0.000133 | 6.5 | 6.7 |

Exceedance ratio = measured concentration/detection limit.

Shaded values indicate sample concentrations were greater than five times the analytical detection limits.

* Detection limit was 0.5 mg/L for spring, summer, and fall sampling.

** Except for ultra-trace Hg, dissolved and total metals were not analyzed in winter 2005.

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

| Variable | Units | Detection Limit | Concentration in Field Blank | | | | Guideline Exceedance Ratio (if >5) | |
|-----------------------------|-------|-----------------|------------------------------|------------|------------|------------|------------------------------------|---------|
| | | | 17-Mar-05 | 2-Jun-05 | 24-Jul-05 | 24-Sep-05 | Minimum | Maximum |
| Dissolved Metals, cont'd ** | | | | | | | | |
| Manganese | mg/L | 0.000003 | - | 0.00001197 | 9.252E-06 | 0.0000906 | 30.2 | - |
| Mercury | mg/L | 0.00001 | - | <0.00001 | 0.0000191 | <0.00001 | - | - |
| Molybdenum | mg/L | 0.000001 | - | <0.000001 | 0.00000145 | 0.00000131 | - | - |
| Nickel | mg/L | 0.000005 | - | <0.000005 | 0.0000106 | <0.000005 | - | - |
| Selenium | mg/L | 0.0001 | - | <0.0001 | <0.0001 | 0.000134 | - | - |
| Silver | mg/L | 0.0000005 | - | <0.0000005 | <0.0000005 | <0.0000005 | - | - |
| Strontium | mg/L | 0.000004 | - | 0.00001032 | 0.00000923 | <0.000004 | - | - |
| Sulphur | mg/L | 0.2 | - | 0.457 | <0.2 | 0.225 | - | - |
| Thallium | mg/L | 0.0000003 | - | 0.00000627 | 0.0000223 | <0.0000003 | 20.9 | 74.3 |
| Thorium | mg/L | 0.0000003 | - | <0.0000003 | 0.00001218 | <0.0000003 | 40.6 | - |
| Tin | mg/L | 0.00003 | - | <0.00003 | <0.00003 | <0.00003 | - | - |
| Titanium | mg/L | 0.00004 | - | <0.00004 | 0.0000112 | 0.0000715 | - | - |
| Uranium | mg/L | 0.0000001 | - | 0.0000001 | 2.74E-07 | 0.0000001 | - | - |
| Vanadium | mg/L | 0.000005 | - | 0.0000141 | 0.0000908 | 0.0000449 | 9.0 | 18.2 |
| Zinc | mg/L | 0.00005 | - | 0.00014 | 0.000267 | 0.000263 | 5.26 | 5.34 |
| Total Metals ** | | | | | | | | |
| Aluminum | mg/L | 0.0005 | - | 0.000981 | 0.00052 | 0.00051 | - | - |
| Antimony | mg/L | 0.0000005 | - | <0.0000005 | 0.000001 | 0.00000141 | - | - |
| Arsenic | mg/L | 0.000002 | - | <0.000002 | 0.00000991 | 0.00000504 | - | - |
| Barium | mg/L | 0.000004 | - | 0.00000993 | 0.0000351 | 0.00000922 | 8.8 | - |
| Beryllium | mg/L | 0.000003 | - | <0.000003 | <0.000003 | 0.00000832 | - | - |
| Bismuth | mg/L | 0.000001 | - | 0.00000148 | 0.000003 | <0.000001 | - | - |
| Boron | mg/L | 0.00005 | - | 0.00021 | 0.000232 | 0.000446 | 8.9 | - |
| Cadmium | mg/L | 0.000002 | - | 0.00000217 | <0.000002 | <0.000002 | - | - |
| Calcium | mg/L | 0.004 | - | <0.004 | <0.004 | 0.0127 | - | - |
| Chlorine | mg/L | 0.1 | - | 0.167 | 0.682 | 0.299 | 6.8 | - |
| Chromium | mg/L | 0.00003 | - | 0.0000752 | 0.000107 | 0.000138 | - | - |
| Cobalt | mg/L | 0.000001 | - | <0.000001 | <0.000001 | <0.000001 | - | - |
| Copper | mg/L | 0.00005 | - | 0.00009 | <0.00005 | 0.000123 | - | - |
| Iron | mg/L | 0.002 | - | <0.002 | <0.002 | <0.002 | - | - |
| Lead | mg/L | 0.000001 | - | 0.00000195 | 0.0000688 | 0.00000679 | 6.8 | 68.8 |
| Lithium | mg/L | 0.00002 | - | <0.00002 | 0.000129 | 0.000135 | 6.5 | 6.8 |
| Manganese | mg/L | 0.000003 | - | 0.0000125 | 0.00000974 | 0.0000905 | 30.2 | - |
| Mercury | mg/L | 0.00001 | - | <0.00001 | 0.0000191 | <0.00001 | - | - |
| Mercury, ultra-trace | ng/L | 0.6 | <0.6 | <0.6 | <0.6 | <0.6 | - | - |
| Molybdenum | mg/L | 0.000001 | - | <0.000001 | 0.00000197 | 0.00000132 | - | - |
| Nickel | mg/L | 0.000005 | - | <0.000005 | 0.0000106 | <0.000005 | - | - |
| Selenium | mg/L | 0.0001 | - | <0.0001 | <0.0001 | 0.000151 | - | - |
| Silver | mg/L | 0.0000005 | - | 0.0000017 | 0.0000011 | <0.0000005 | - | - |
| Strontium | mg/L | 0.000004 | - | 0.0000109 | 0.00000659 | <0.000004 | - | - |
| Sulphur | mg/L | 0.2 | - | 0.53 | <0.2 | 0.224 | - | - |
| Thallium | mg/L | 0.0000003 | - | 0.00000651 | 0.0000225 | <0.0000003 | 21.7 | 75 |
| Thorium | mg/L | 0.0000003 | - | <0.0000003 | 0.0000153 | <0.0000003 | 51 | - |
| Tin | mg/L | 0.00003 | - | 0.0000578 | <0.00003 | <0.00003 | - | - |
| Titanium | mg/L | 0.00004 | - | 0.000186 | 0.000211 | 0.000222 | 5.3 | 5.6 |
| Uranium | mg/L | 0.0000001 | - | 2.73E-07 | 0.00000053 | 1.64E-07 | 5.3 | - |
| Vanadium | mg/L | 0.000005 | - | 0.0000141 | 0.0000909 | 0.0000451 | 9.0 | 18.2 |
| Zinc | mg/L | 0.0001 | - | 0.00024 | 0.000269 | 0.00037 | - | - |

Exceedance ratio = measured concentration/detection limit.

Shaded values indicate sample concentrations were greater than five times the analytical detection limits.

* Detection limit was 0.5 mg/L for spring, summer, and fall sampling.

** Except for ultra-trace Hg, dissolved and total metals were not analyzed in winter 2005.

Table B.2-3 Relative percent difference between split water quality samples collected from the Athabasca River (ATR-DD-CC), March 2005 (Winter).

| Variable | Units | Detection Limit | Split Samples - March 18/05 | | Relative Percent Difference |
|---|--------|-----------------|-----------------------------|------------|-----------------------------|
| | | | ATR-DD-CC | ATR-DD-SS | |
| Conventional Variables | | | | | |
| Alkalinity, Total (as CaCO ₃) | mg/L | 5 | 135 | 134 | 0.7 |
| Bicarbonate | mg/L | 5 | 164 | 164 | 0.0 |
| Carbonate | mg/L | 5 | <5 | <5 | 0.0 |
| Color, True | T.C.U. | 3 | 50 | 50 | 0.0 |
| Conductivity | uS/cm | 0.2 | 364 | 364 | 0.0 |
| Dissolved Organic Carbon | mg/L | 1 | 10 | 9 | 10.5 |
| Hardness (as CaCO ₃) | mg/L | - | 154 | 154 | 0.0 |
| Hydroxide | mg/L | 5 | <5 | <5 | 0.0 |
| pH | pH | 0.1 | 8 | 8 | 0.0 |
| Total Dissolved Solids | mg/L | 10 | 240 | 230 | 4.3 |
| Total Organic Carbon | mg/L | 1 | 10 | 10 | 0.0 |
| Total Suspended Solids | mg/L | 3 | 6 | 4 | 40.0 |
| Major Ions | | | | | |
| Calcium | mg/L | 0.5 | 42.5 | 42.1 | 0.9 |
| Chloride | mg/L | 1 | 14 | 14 | 0.0 |
| Magnesium | mg/L | 0.1 | 11.7 | 11.8 | -0.9 |
| Potassium | mg/L | 0.1 | 4.9 | 4.8 | 2.1 |
| Sodium | mg/L | 1 | 22 | 22 | 0.0 |
| Sulphate | mg/L | 0.5 | 32 | 32.4 | -1.2 |
| Sulphide | mg/L | 0.003 | 0.005 | <0.003 | 50.0 |
| Nutrients & BOD | | | | | |
| Ammonia | mg/L | 0.05 | 0.15 | 0.15 | 0.0 |
| Nitrate+Nitrite | mg/L | 0.1 | 0.3 | 0.3 | 0.0 |
| Phosphorus, Total Dissolved | mg/L | 0.001 | 0.1 | 0.098 | 2.0 |
| Phosphorus, Total | mg/L | 0.001 | 0.116 | 0.098 | 16.8 |
| Total Kjeldahl Nitrogen | mg/L | 0.2 | 0.7 | 0.8 | -13.3 |
| Biochemical Oxygen Demand | mg/L | 2 | <2 | <2 | 0.0 |
| Hydrocarbons | | | | | |
| Hydrocarbons, Recoverable | mg/L | 0.5 | <0.5 | <0.5 | 0.0 |
| Naphthenic Acids | mg/L | 1 | 1 | 1 | 0.0 |
| Phenols | mg/L | 0.001 | 0.004 | <0.001 | 120.0 |
| Chlorophyll a | | | | | |
| Chlorophyll a | mg/L | 0.001 | 0.001 | 0.002 | -66.7 |
| Dissolved Metals | | | | | |
| Aluminum | mg/L | 0.0002 | 0.00546 | 0.00402 | 30.4 |
| Antimony | mg/L | 0.0000005 | 0.0000582 | 0.0000596 | -2.4 |
| Arsenic | mg/L | 0.000002 | 0.000562 | 0.000574 | -2.1 |
| Barium | mg/L | 0.000004 | 0.0626 | 0.0667 | -6.3 |
| Beryllium | mg/L | 0.000003 | 0.00000401 | <0.000003 | 28.8 |
| Bismuth | mg/L | 0.000001 | <0.000001 | 0.00000433 | -125.0 |
| Boron | mg/L | 0.00003 | 0.0277 | 0.0291 | -4.9 |
| Cadmium | mg/L | 0.000002 | 0.0000196 | 0.0000226 | -14.2 |
| Calcium | mg/L | 0.004 | 34.1 | 37.6 | -9.8 |
| Chlorine | mg/L | 0.1 | 12.9 | 12.8 | 0.8 |
| Chromium | mg/L | 0.00003 | 0.000388 | 0.000373 | 3.9 |
| Cobalt | mg/L | 0.000001 | 0.0000993 | 0.000126 | -23.7 |
| Copper | mg/L | 0.00005 | 0.00113 | 0.0013 | -14.0 |
| Iron | mg/L | 0.002 | 0.0785 | 0.0376 | 70.5 |
| Lead | mg/L | 0.000001 | 0.0000435 | 0.000032 | 30.5 |
| Lithium | mg/L | 0.00002 | 0.00765 | 0.008024 | -4.8 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

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

| Variable | Units | Detection Limit | Split Samples - March 18/05 | | Relative Percent Difference |
|--------------------------|-------|-----------------|-----------------------------|------------|-----------------------------|
| | | | ATR-DD-CC | ATR-DD-SS | |
| Dissolved Metals, cont'd | | | | | |
| Manganese | mg/L | 0.000003 | 0.00685 | 0.0072 | -5.0 |
| Mercury | mg/L | 0.00001 | <0.00001 | 0.0000159 | -45.6 |
| Molybdenum | mg/L | 0.000001 | 0.000778 | 0.000841 | -7.8 |
| Nickel | mg/L | 0.000005 | 0.00107 | 0.00135 | -23.1 |
| Selenium | mg/L | 0.0001 | 0.00027 | 0.000211 | 24.5 |
| Silver | mg/L | 0.0000005 | <0.0000005 | 0.00000322 | -146.2 |
| Strontium | mg/L | 0.000004 | 0.235 | 0.255 | -8.2 |
| Sulphur | mg/L | 0.2 | 9.35 | 10.1 | -7.7 |
| Thallium | mg/L | 0.0000003 | 0.0000354 | 0.0000378 | -6.6 |
| Thorium | mg/L | 0.0000003 | 0.0000126 | 0.0000271 | -73.0 |
| Tin | mg/L | 0.00003 | <0.00003 | <0.00003 | 0.0 |
| Titanium | mg/L | 0.00004 | 0.00134 | 0.00122 | 9.4 |
| Uranium | mg/L | 0.0000001 | 0.000449 | 0.000475 | -5.6 |
| Vanadium | mg/L | 0.000005 | 0.000109 | 0.000306 | -94.9 |
| Zinc | mg/L | 0.00005 | 0.00812 | 0.00845 | -4.0 |
| Total Metals | | | | | |
| Aluminum | mg/L | 0.0005 | 0.209 | 0.15 | 32.9 |
| Antimony | mg/L | 0.0000005 | 0.0000586 | 0.0000599 | -2.2 |
| Arsenic | mg/L | 0.000002 | 0.000692 | 0.000713 | -3.0 |
| Barium | mg/L | 0.000004 | 0.0703 | 0.0719 | -2.3 |
| Beryllium | mg/L | 0.000003 | 0.0000128 | 0.00000968 | 27.8 |
| Bismuth | mg/L | 0.000001 | 0.00000181 | 0.00000601 | -107.4 |
| Boron | mg/L | 0.00005 | 0.0284 | 0.03 | -5.5 |
| Cadmium | mg/L | 0.000002 | 0.0000419 | 0.0000369 | 12.7 |
| Calcium | mg/L | 0.004 | 34.9 | 38.1 | -8.8 |
| Chlorine | mg/L | 0.1 | 12.8 | 12.8 | 0.0 |
| Chromium | mg/L | 0.00003 | 0.000656 | 0.000654 | 0.3 |
| Cobalt | mg/L | 0.000001 | 0.000179 | 0.000202 | -12.1 |
| Copper | mg/L | 0.00005 | 0.0014 | 0.00144 | -2.8 |
| Iron | mg/L | 0.002 | 0.491 | 0.501 | -2.0 |
| Lead | mg/L | 0.000001 | 0.000231 | 0.000244 | -5.5 |
| Lithium | mg/L | 0.00002 | 0.00763 | 0.008 | -4.7 |
| Manganese | mg/L | 0.000003 | 0.0146 | 0.015 | -2.7 |
| Mercury | mg/L | 0.00001 | <0.00001 | 0.00003 | -100.0 |
| Mercury, ultra-trace | ng/L | 0.6 | 1.4 | | 200.0 |
| Molybdenum | mg/L | 0.000001 | 0.000803 | 0.00085 | -5.7 |
| Nickel | mg/L | 0.000005 | 0.00122 | 0.00132 | -7.9 |
| Selenium | mg/L | 0.0001 | 0.000361 | 0.000323 | 11.1 |
| Silver | mg/L | 0.0000005 | <0.0000005 | 0.0000209 | -190.7 |
| Strontium | mg/L | 0.000004 | 0.244 | 0.253 | -3.6 |
| Sulphur | mg/L | 0.2 | 9.92 | 10.1 | -1.8 |
| Thallium | mg/L | 0.0000003 | 0.0000351 | 0.0000377 | -7.1 |
| Thorium | mg/L | 0.0000003 | 0.0000265 | 0.0000307 | -14.7 |
| Tin | mg/L | 0.00003 | <0.00003 | <0.00003 | 0.0 |
| Titanium | mg/L | 0.00004 | 0.00524 | 0.00354 | 38.7 |
| Uranium | mg/L | 0.0000001 | 0.000496 | 0.000504 | -1.6 |
| Vanadium | mg/L | 0.000005 | 0.000495 | 0.000486 | 1.8 |
| Zinc | mg/L | 0.0001 | 0.0086 | 0.00847 | 1.5 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

Table B.2-4 Relative percent difference between split water quality samples collected from McLean Creek, June 2005 (Spring).

| Variable | Units | Detection Limit | Split Samples - June 02/05 | | Relative Percent Difference |
|---|--------|-----------------|----------------------------|------------|-----------------------------|
| | | | MCC-1 | SSL-1 | |
| Conventional Variables | | | | | |
| Alkalinity, Total (as CaCO ₃) | mg/L | 5 | 130 | 130 | 0.0 |
| Bicarbonate | mg/L | 5 | 159 | 158 | 0.6 |
| Carbonate | mg/L | 5 | <5 | <5 | 0.0 |
| Color, True | T.C.U. | 3 | 100 | 88 | 12.8 |
| Conductivity | uS/cm | 0.2 | 281 | 280 | 0.4 |
| Dissolved Organic Carbon | mg/L | 1 | 25 | 24 | 4.1 |
| Hardness (as CaCO ₃) | mg/L | - | 136 | 130 | 4.5 |
| Hydroxide | mg/L | 5 | <5 | <5 | 0.0 |
| pH | pH | 0.1 | 8.2 | 8.3 | -1.2 |
| Total Dissolved Solids | mg/L | 10 | 210 | 210 | 0.0 |
| Total Organic Carbon | mg/L | 1 | 25 | 25 | 0.0 |
| Total Suspended Solids | mg/L | 3 | 22 | 20 | 9.5 |
| Major Ions | | | | | |
| Calcium | mg/L | 0.5 | 38.9 | 37 | 5.0 |
| Chloride | mg/L | 1 | 9 | 9 | 0.0 |
| Magnesium | mg/L | 0.1 | 9.5 | 9.2 | 3.2 |
| Potassium | mg/L | 0.5 | 2 | 1.3 | 42.4 |
| Sodium | mg/L | 1 | 16 | 14 | 13.3 |
| Sulphate | mg/L | 0.5 | 10.5 | 9.6 | 9.0 |
| Sulphide | mg/L | 0.003 | 0.004 | 0.006 | -40.0 |
| Nutrients & BOD | | | | | |
| Ammonia | mg/L | 0.05 | <0.05 | <0.05 | 0.0 |
| Nitrate+Nitrite | mg/L | 0.1 | <0.1 | <0.1 | 0.0 |
| Phosphorus, Total Dissolved | mg/L | 0.001 | 0.014 | 0.015 | -6.9 |
| Phosphorus, Total | mg/L | 0.001 | 0.039 | 0.037 | 5.3 |
| Total Kjeldahl Nitrogen | mg/L | 0.2 | 0.9 | 0.8 | 11.8 |
| Biochemical Oxygen Demand | mg/L | 2 | <2 | 2 | 0.0 |
| Hydrocarbons | | | | | |
| Hydrocarbons, Recoverable | mg/L | 0.5 | <0.5 | <0.5 | 0.0 |
| Naphthenic Acids | mg/L | 1 | <1 | <1 | 0.0 |
| Phenols | mg/L | 0.001 | 0.012 | 0.013 | -8.0 |
| Chlorophyll a | | | | | |
| Chlorophyll a | mg/L | 0.001 | 0.002 | <0.001 | 66.7 |
| Dissolved Metals | | | | | |
| Aluminum | mg/L | 0.0002 | 0.0143 | 0.0198 | -32.3 |
| Antimony | mg/L | 0.0000005 | 0.00004194 | 0.0000444 | -5.7 |
| Arsenic | mg/L | 0.000002 | 0.000647 | 0.000662 | -2.3 |
| Barium | mg/L | 0.000004 | 0.0207 | 0.022 | -6.1 |
| Beryllium | mg/L | 0.000003 | 0.00000677 | 0.00000422 | 46.4 |
| Bismuth | mg/L | 0.000001 | 0.00000105 | <0.000001 | 4.9 |
| Boron | mg/L | 0.00003 | 0.0504 | 0.0516 | -2.4 |
| Cadmium | mg/L | 0.000002 | 0.00000555 | 0.00000432 | 24.9 |
| Calcium | mg/L | 0.004 | 31.7 | 32.2 | -1.6 |
| Chlorine | mg/L | 0.1 | 7.53 | 7.66 | -1.7 |
| Chromium | mg/L | 0.00003 | 0.000361 | 0.000347 | 4.0 |
| Cobalt | mg/L | 0.000001 | 0.000211 | 0.00022 | -4.2 |
| Copper | mg/L | 0.00005 | 0.000807 | 0.000529 | 41.6 |
| Iron | mg/L | 0.002 | 0.0912 | 0.108 | -16.9 |
| Lead | mg/L | 0.000001 | 0.0002 | 0.0000811 | 84.6 |
| Lithium | mg/L | 0.00002 | 0.00965 | 0.0105 | -8.4 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

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

| Variable | Units | Detection Limit | Split Samples - June 02/05 | | Relative Percent Difference |
|--------------------------|-------|-----------------|----------------------------|------------|-----------------------------|
| | | | MCC-1 | SSL-1 | |
| Dissolved Metals, cont'd | | | | | |
| Manganese | mg/L | 0.000003 | 0.0565 | 0.0591 | -4.5 |
| Mercury | mg/L | 0.00001 | <0.00001 | <0.00001 | 0.0 |
| Molybdenum | mg/L | 0.000001 | 0.000243 | 0.000255 | -4.8 |
| Nickel | mg/L | 0.000005 | 0.0011 | 0.000749 | 38.0 |
| Selenium | mg/L | 0.0001 | <0.0001 | <0.0001 | 0.0 |
| Silver | mg/L | 0.000001 | 0.00000193 | 0.00000209 | -8.0 |
| Strontium | mg/L | 0.000004 | 0.124 | 0.132 | -6.3 |
| Sulphur | mg/L | 0.2 | 2.677 | 2.96 | -10.0 |
| Thallium | mg/L | 0.0000003 | 0.000047 | 0.0000455 | 3.2 |
| Thorium | mg/L | 0.0000003 | 0.00000105 | 0.0000557 | -192.6 |
| Tin | mg/L | 0.00003 | 0.00005143 | 0.0000377 | 30.8 |
| Titanium | mg/L | 0.00004 | 0.00144 | 0.00188 | -26.5 |
| Uranium | mg/L | 0.0000001 | 0.000142 | 0.000151 | -6.1 |
| Vanadium | mg/L | 0.000005 | 0.000434 | 0.000479 | -9.9 |
| Zinc | mg/L | 0.00005 | 0.00956 | 0.00942 | 1.5 |
| Total Metals | | | | | |
| Aluminum | mg/L | 0.0005 | 0.951 | 0.915 | 3.9 |
| Antimony | mg/L | 0.0000005 | 0.0000451 | 0.0000454 | -0.7 |
| Arsenic | mg/L | 0.000002 | 0.000809 | 0.00084 | -3.8 |
| Barium | mg/L | 0.000004 | 0.0275 | 0.0279 | -1.4 |
| Beryllium | mg/L | 0.000003 | 0.0000352 | 0.000032 | 9.5 |
| Bismuth | mg/L | 0.000001 | 0.00000523 | 0.00000602 | -14.0 |
| Boron | mg/L | 0.00005 | 0.0579 | 0.0537 | 7.5 |
| Cadmium | mg/L | 0.000002 | 0.0000138 | 0.0000111 | 21.7 |
| Calcium | mg/L | 0.004 | 31.5 | 32.6 | -3.4 |
| Chlorine | mg/L | 0.1 | 7.54 | 7.64 | -1.3 |
| Chromium | mg/L | 0.00003 | 0.00135 | 0.00148 | -9.2 |
| Cobalt | mg/L | 0.000001 | 0.00047 | 0.000459 | 2.4 |
| Copper | mg/L | 0.00005 | 0.00104 | 0.000965 | 7.5 |
| Iron | mg/L | 0.002 | 0.664 | 0.672 | -1.2 |
| Lead | mg/L | 0.000001 | 0.000419 | 0.000449 | -6.9 |
| Lithium | mg/L | 0.00002 | 0.0112 | 0.0113 | -0.9 |
| Manganese | mg/L | 0.000003 | 0.103 | 0.103 | 0.0 |
| Mercury | mg/L | 0.00001 | <0.00001 | <0.00001 | 0.0 |
| Mercury, ultra-trace | ng/L | 0.6 | <0.6 | <0.6 | 0.0 |
| Molybdenum | mg/L | 0.000001 | 0.000252 | 0.000265 | -5.0 |
| Nickel | mg/L | 0.000005 | 0.00127 | 0.00115 | 9.9 |
| Selenium | mg/L | 0.0001 | <0.0001 | 0.000174 | -54.0 |
| Silver | mg/L | 0.0000005 | 0.00000488 | 0.00000659 | -29.8 |
| Strontium | mg/L | 0.000004 | 0.127 | 0.132 | -3.9 |
| Sulphur | mg/L | 0.2 | 2.69 | 2.93 | -8.5 |
| Thallium | mg/L | 0.0000003 | 0.0000586 | 0.0000566 | 3.5 |
| Thorium | mg/L | 0.0000003 | 0.000195 | 0.00018 | 8.0 |
| Tin | mg/L | 0.00003 | 0.0000514 | 0.0000694 | -29.8 |
| Titanium | mg/L | 0.00004 | 0.0219 | 0.0198 | 10.1 |
| Uranium | mg/L | 0.0000001 | 0.000172 | 0.000178 | -3.4 |
| Vanadium | mg/L | 0.000005 | 0.00242 | 0.00241 | 0.4 |
| Zinc | mg/L | 0.0001 | 0.0228 | 0.0204 | 11.1 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

Table B.2-5 Relative percent difference between split water quality samples collected from the Athabasca River (ATR-DD-CC), August 2005 (Summer).

| Variable | Units | Detection Limit | Split Samples - August 01/05 | | Relative Percent Difference |
|---|--------|-----------------|------------------------------|------------|-----------------------------|
| | | | ATR-DD-CC | SSL-1 | |
| Conventional Variables | | | | | |
| Alkalinity, Total (as CaCO ₃) | mg/L | 5 | 83 | 83 | 0.0 |
| Bicarbonate | mg/L | 5 | 102 | 102 | 0.0 |
| Carbonate | mg/L | 5 | <5 | <5 | 0.0 |
| Color, True | T.C.U. | 3 | 175 | 150 | 15.4 |
| Conductivity | uS/cm | 0.2 | 205 | 204 | 0.5 |
| Dissolved Organic Carbon | mg/L | 1 | 17 | 16 | 6.1 |
| Hardness (as CaCO ₃) | mg/L | - | 92 | 94 | -2.2 |
| Hydroxide | mg/L | 5 | <5 | <5 | 0.0 |
| pH | pH | 0.1 | 8.1 | 8.1 | 0.0 |
| Total Dissolved Solids | mg/L | 10 | 140 | 140 | 0.0 |
| Total Organic Carbon | mg/L | 1 | 17 | 17 | 0.0 |
| Total Suspended Solids | mg/L | 3 | 33 | 82 | -85.2 |
| Major Ions | | | | | |
| Calcium | mg/L | 0.5 | 25.6 | 26.1 | -1.9 |
| Chloride | mg/L | 1 | 5 | 5 | 0.0 |
| Magnesium | mg/L | 0.1 | 6.8 | 7 | -2.9 |
| Potassium | mg/L | 0.5 | 0.8 | 1.1 | -31.6 |
| Sodium | mg/L | 1 | 9 | 9 | 0.0 |
| Sulphate | mg/L | 0.5 | 17.4 | 17.6 | -1.1 |
| Sulphide | mg/L | 0.003 | 0.005 | 0.006 | -18.2 |
| Nutrients & BOD | | | | | |
| Ammonia | mg/L | 0.05 | <0.05 | <0.05 | 0.0 |
| Nitrate+Nitrite | mg/L | 0.1 | <0.1 | <0.1 | 0.0 |
| Phosphorus, Total Dissolved | mg/L | 0.001 | 0.003 | 0.003 | 0.0 |
| Phosphorus, Total | mg/L | 0.001 | 0.027 | 0.026 | 3.8 |
| Total Kjeldahl Nitrogen | mg/L | 0.2 | 0.9 | 0.8 | 11.8 |
| Biochemical Oxygen Demand | mg/L | 2 | <2 | <2 | 0.0 |
| Hydrocarbons | | | | | |
| Hydrocarbons, Recoverable | mg/L | 0.5 | <0.5 | <0.5 | 0.0 |
| Naphthenic Acids | mg/L | 1 | <1 | 1 | 0.0 |
| Phenols | mg/L | 0.001 | <0.001 | 0.012 | -169.2 |
| Chlorophyll a | | | | | |
| Chlorophyll a | mg/L | 0.001 | 0.002 | <0.001 | 66.7 |
| Dissolved Metals | | | | | |
| Aluminum | mg/L | 0.0002 | 0.0462 | 0.0463 | -0.2 |
| Antimony | mg/L | 0.0000005 | 0.000115 | 0.000109 | 5.4 |
| Arsenic | mg/L | 0.000002 | 0.000654 | 0.00064 | 2.2 |
| Barium | mg/L | 0.000004 | 0.0392 | 0.0375 | 4.4 |
| Beryllium | mg/L | 0.000003 | 0.0000107 | 0.0000113 | -5.5 |
| Bismuth | mg/L | 0.000001 | 0.00000503 | 0.00000489 | 2.8 |
| Boron | mg/L | 0.00003 | 0.0236 | 0.0238 | -0.8 |
| Cadmium | mg/L | 0.000002 | 0.0000168 | 0.0000165 | 1.8 |
| Calcium | mg/L | 0.004 | 24.2 | 22.9 | 5.5 |
| Chlorine | mg/L | 0.1 | 2.76 | 2.47 | 11.1 |
| Chromium | mg/L | 0.00003 | 0.00032 | 0.000291 | 9.5 |
| Cobalt | mg/L | 0.000001 | 0.000104 | 0.000106 | -1.9 |
| Copper | mg/L | 0.00005 | 0.00195 | 0.00191 | 2.1 |
| Iron | mg/L | 0.002 | 0.234 | 0.241 | -2.9 |
| Lead | mg/L | 0.000001 | 0.000174 | 0.000176 | -1.1 |
| Lithium | mg/L | 0.00002 | 0.00563 | 0.00541 | 4.0 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

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

| Variable | Units | Detection Limit | Split Samples - August 01/05 | | Relative Percent Difference |
|--------------------------|-------|-----------------|------------------------------|------------|-----------------------------|
| | | | ATR-DD-CC | SSL-1 | |
| Dissolved Metals, cont'd | | | | | |
| Manganese | mg/L | 0.000003 | 0.0027 | 0.00279 | -3.3 |
| Mercury | mg/L | 0.00001 | <0.00001 | <0.00001 | 0.0 |
| Molybdenum | mg/L | 0.000001 | 0.0005022 | 0.000475 | 5.6 |
| Nickel | mg/L | 0.000005 | 0.00176 | 0.0017 | 3.5 |
| Selenium | mg/L | 0.0001 | 0.000185 | 0.000166 | 10.8 |
| Silver | mg/L | 0.0000005 | 0.00000181 | 0.00000269 | -39.1 |
| Strontium | mg/L | 0.000004 | 0.154 | 0.15 | 2.6 |
| Sulphur | mg/L | 0.2 | 3.87 | 3.39 | 13.2 |
| Thallium | mg/L | 0.0000003 | 0.00000518 | 0.00000442 | 15.8 |
| Thorium | mg/L | 0.0000003 | 0.0000338 | 0.0000434 | -24.9 |
| Tin | mg/L | 0.00003 | <0.00003 | <0.00003 | 0.0 |
| Titanium | mg/L | 0.00004 | 0.00534 | 0.00519 | 2.8 |
| Uranium | mg/L | 0.0000001 | 0.000346 | 0.000339 | 2.0 |
| Vanadium | mg/L | 0.000005 | 0.00051 | 0.000486 | 4.8 |
| Zinc | mg/L | 0.00005 | 0.00432 | 0.00664 | -42.3 |
| Total Metals | | | | | |
| Aluminum | mg/L | 0.0005 | 4.97 | 4.59 | 7.9 |
| Antimony | mg/L | 0.0000005 | 0.000116 | 0.000113 | 2.6 |
| Arsenic | mg/L | 0.000002 | 0.00207 | 0.00196 | 5.5 |
| Barium | mg/L | 0.000004 | 0.107 | 0.105 | 1.9 |
| Beryllium | mg/L | 0.000003 | 0.000183 | 0.000203 | -10.4 |
| Bismuth | mg/L | 0.000001 | 0.0000419 | 0.0000386 | 8.2 |
| Boron | mg/L | 0.00005 | 0.0296 | 0.029 | 2.0 |
| Cadmium | mg/L | 0.000002 | 0.0000989 | 0.0000938 | 5.3 |
| Calcium | mg/L | 0.004 | 24.2 | 23.6 | 2.5 |
| Chlorine | mg/L | 0.1 | 2.76 | 2.54 | 8.3 |
| Chromium | mg/L | 0.00003 | 0.00646 | 0.00593 | 8.6 |
| Cobalt | mg/L | 0.000001 | 0.00177 | 0.00165 | 7.0 |
| Copper | mg/L | 0.00005 | 0.00481 | 0.00453 | 6.0 |
| Iron | mg/L | 0.002 | 4.36 | 4.12 | 5.7 |
| Lead | mg/L | 0.000001 | 0.00336 | 0.00317 | 5.8 |
| Lithium | mg/L | 0.00002 | 0.00863 | 0.00815 | 5.7 |
| Manganese | mg/L | 0.000003 | 0.102 | 0.0982 | 3.8 |
| Mercury | mg/L | 0.00001 | <0.00001 | <0.00001 | 0.0 |
| Mercury, ultra-trace | ng/L | 0.6 | 0.8 | 2 | -85.7 |
| Molybdenum | mg/L | 0.000001 | 0.000508 | 0.00048 | 5.7 |
| Nickel | mg/L | 0.000005 | 0.00517 | 0.0049 | 5.4 |
| Selenium | mg/L | 0.0001 | 0.000342 | 0.000309 | 10.1 |
| Silver | mg/L | 0.0000005 | 0.0000371 | 0.0000355 | 4.4 |
| Strontium | mg/L | 0.000004 | 0.155 | 0.151 | 2.6 |
| Sulphur | mg/L | 0.2 | 3.91 | 3.49 | 11.4 |
| Thallium | mg/L | 0.0000003 | 0.0000947 | 0.0000902 | 4.9 |
| Thorium | mg/L | 0.0000003 | 0.000809 | 0.000731 | 10.1 |
| Tin | mg/L | 0.00003 | 0.0000902 | 0.000082 | 9.5 |
| Titanium | mg/L | 0.00004 | 0.0839 | 0.0907 | -7.8 |
| Uranium | mg/L | 0.0000001 | 0.00068 | 0.000668 | 1.8 |
| Vanadium | mg/L | 0.000005 | 0.0127 | 0.012 | 5.7 |
| Zinc | mg/L | 0.0001 | 0.0181 | 0.0162 | 11.1 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

Table B.2-6 Relative percent difference between split water quality samples collected from Shipyard Lake, September 2005 (Fall).

| Variable | Units | Detection Limit | Split Samples - September 24/05 | | Relative Percent Difference |
|---|--------|-----------------|---------------------------------|------------|-----------------------------|
| | | | SHL-1 | SSL-1 | |
| Conventional Variables | | | | | |
| Alkalinity, Total (as CaCO ₃) | mg/L | 5 | 201 | 202 | -0.5 |
| Bicarbonate | mg/L | 5 | 245 | 246 | -0.4 |
| Carbonate | mg/L | 5 | <5 | <5 | 0.0 |
| Color, True | T.C.U. | 3 | 50 | 50 | 0.0 |
| Conductivity | uS/cm | 0.2 | 421 | 422 | -0.2 |
| Dissolved Organic Carbon | mg/L | 1 | 24 | 24 | 0.0 |
| Hardness (as CaCO ₃) | mg/L | - | 180 | 182 | -1.1 |
| Hydroxide | mg/L | 5 | <5 | <5 | 0.0 |
| pH | pH | 0.1 | 8.1 | 8.1 | 0.0 |
| Total Dissolved Solids | mg/L | 10 | 280 | 270 | 3.6 |
| Total Organic Carbon | mg/L | 1 | 24 | 24 | 0.0 |
| Total Suspended Solids | mg/L | 3 | 8 | 11 | -31.6 |
| Major Ions | | | | | |
| Calcium | mg/L | 0.5 | 52.3 | 52.7 | -0.8 |
| Chloride | mg/L | 1 | 15 | 15 | 0.0 |
| Magnesium | mg/L | 0.1 | 12 | 12.2 | -1.7 |
| Potassium | mg/L | 0.5 | 1.9 | 1.8 | 5.4 |
| Sodium | mg/L | 1 | 20 | 20 | 0.0 |
| Sulphate | mg/L | 0.5 | 6.2 | 6.1 | 1.6 |
| Sulphide | mg/L | 0.003 | <0.003 | 0.005 | -50.0 |
| Nutrients & BOD | | | | | |
| Ammonia | mg/L | 0.05 | <0.05 | <0.05 | 0.0 |
| Nitrate+Nitrite | mg/L | 0.1 | <0.1 | <0.1 | 0.0 |
| Phosphorus, Total Dissolved | mg/L | 0.001 | 0.014 | 0.01 | 33.3 |
| Phosphorus, Total | mg/L | 0.001 | 0.019 | 0.019 | 0.0 |
| Total Kjeldahl Nitrogen | mg/L | 0.2 | 0.9 | 0.7 | 25.0 |
| Biochemical Oxygen Demand | mg/L | 2 | <2 | <2 | 0.0 |
| Hydrocarbons | | | | | |
| Hydrocarbons, Recoverable | mg/L | 0.5 | <0.5 | <0.5 | 0.0 |
| Naphthenic Acids | mg/L | 1 | 2 | 2 | 0.0 |
| Phenols | mg/L | 0.001 | 0.01 | 0.011 | -9.5 |
| Chlorophyll a | | | | | |
| Chlorophyll a | mg/L | 0.001 | <0.001 | <0.001 | 0.0 |
| Dissolved Metals | | | | | |
| Aluminum | mg/L | 0.0002 | 0.00049 | 0.00082 | -50.4 |
| Antimony | mg/L | 0.0000005 | 0.0000195 | 0.0000195 | 0.0 |
| Arsenic | mg/L | 0.000002 | 0.000499 | 0.000495 | 0.8 |
| Barium | mg/L | 0.000004 | 0.0377 | 0.038 | -0.8 |
| Beryllium | mg/L | 0.000003 | <0.000003 | <0.000003 | 0.0 |
| Bismuth | mg/L | 0.000001 | 0.00000215 | 0.00000196 | 9.2 |
| Boron | mg/L | 0.00003 | 0.0446 | 0.0482 | -7.8 |
| Cadmium | mg/L | 0.000002 | 0.0000038 | 0.000002 | 62.1 |
| Calcium | mg/L | 0.004 | 48.3 | 48.59 | -0.6 |
| Chlorine | mg/L | 0.1 | 14.4 | 15.4 | -6.7 |
| Chromium | mg/L | 0.00003 | 0.00071 | 0.000627 | 12.4 |
| Cobalt | mg/L | 0.000001 | 0.0000529 | 0.0000583 | -9.7 |
| Copper | mg/L | 0.00005 | 0.000181 | 0.000126 | 35.8 |
| Iron | mg/L | 0.002 | 0.438 | 0.424 | 3.2 |
| Lead | mg/L | 0.000001 | 0.00000796 | 0.00000823 | -3.3 |
| Lithium | mg/L | 0.00002 | 0.0122 | 0.0126 | -3.2 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

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

| Variable | Units | Detection Limit | Split Samples - September 24/05 | | Relative Percent Difference |
|--------------------------|-------|-----------------|---------------------------------|-------------|-----------------------------|
| | | | SHL-1 | SSL-1 | |
| Dissolved Metals, cont'd | | | | | |
| Manganese | mg/L | 0.000003 | 0.0173 | 0.0157 | 9.7 |
| Mercury | mg/L | 0.00001 | 0.0000178 | 0.0000123 | 36.5 |
| Molybdenum | mg/L | 0.000001 | 0.0000462 | 0.0000451 | 2.4 |
| Nickel | mg/L | 0.000005 | <0.000005 | 0.000107 | -182.1 |
| Selenium | mg/L | 0.0001 | 0.000533 | 0.000485 | 9.4 |
| Silver | mg/L | 0.0000005 | <0.0000005 | <0.0000005 | 0.0 |
| Strontium | mg/L | 0.000004 | 0.156 | 0.16 | -2.5 |
| Sulphur | mg/L | 0.2 | 1.48 | 1.66 | -11.5 |
| Thallium | mg/L | 0.0000003 | 0.00000152 | 0.00000123 | 21.1 |
| Thorium | mg/L | 0.0000003 | 0.00000786 | 0.00000612 | 24.9 |
| Tin | mg/L | 0.00003 | <0.00003 | <0.00003 | 0.0 |
| Titanium | mg/L | 0.00004 | 0.000848 | 0.000878 | -3.5 |
| Uranium | mg/L | 0.0000001 | 0.0000332 | 0.0000322 | 3.1 |
| Vanadium | mg/L | 0.000005 | 0.000249 | 0.000248 | 0.4 |
| Zinc | mg/L | 0.00005 | 0.00321 | 0.00146 | 74.9 |
| Total Metals | | | | | |
| Aluminum | mg/L | 0.0005 | 0.00412 | 0.0233 | -139.9 |
| Antimony | mg/L | 0.0000005 | 0.0000199 | 0.0000197 | 1.0 |
| Arsenic | mg/L | 0.000002 | 0.000509 | 0.000509 | 0.0 |
| Barium | mg/L | 0.000004 | 0.0396 | 0.0394 | 0.5 |
| Beryllium | mg/L | 0.000003 | 0.00000544 | <0.000003 | 57.8 |
| Bismuth | mg/L | 0.000001 | 0.00000218 | 0.00000198 | 9.6 |
| Boron | mg/L | 0.00005 | 0.0481 | 0.0497 | -3.3 |
| Cadmium | mg/L | 0.000002 | 0.00000442 | 0.000000636 | 149.7 |
| Calcium | mg/L | 0.004 | 49.2 | 48.6 | 1.2 |
| Chlorine | mg/L | 0.1 | 14.8 | 15.4 | -4.0 |
| Chromium | mg/L | 0.00003 | 0.00085 | 0.000628 | 30.0 |
| Cobalt | mg/L | 0.000001 | 0.0000609 | 0.0000684 | -11.6 |
| Copper | mg/L | 0.00005 | 0.000252 | 0.000134 | 61.1 |
| Iron | mg/L | 0.002 | 0.733 | 0.796 | -8.2 |
| Lead | mg/L | 0.000001 | 0.0000216 | 0.0000145 | 39.3 |
| Lithium | mg/L | 0.00002 | 0.0123 | 0.0126 | -2.4 |
| Manganese | mg/L | 0.000003 | 0.038 | 0.0392 | -3.1 |
| Mercury | mg/L | 0.00001 | 0.0000182 | 0.0000123 | 38.7 |
| Mercury, ultra-trace | ng/L | 0.6 | 0.7 | 1.2 | -52.6 |
| Molybdenum | mg/L | 0.000001 | 0.0000886 | 0.0000496 | 56.4 |
| Nickel | mg/L | 0.000005 | 0.0000691 | 0.000136 | -65.2 |
| Selenium | mg/L | 0.0001 | 0.000539 | 0.00049 | 9.5 |
| Silver | mg/L | 0.0000005 | <0.0000005 | 0.000000636 | -23.9 |
| Strontium | mg/L | 0.000004 | 0.156 | 0.159 | -1.9 |
| Sulphur | mg/L | 0.2 | 1.55 | 1.7 | -9.2 |
| Thallium | mg/L | 0.0000003 | 0.00000154 | 0.00000125 | 20.8 |
| Thorium | mg/L | 0.0000003 | 0.00000218 | 0.00000613 | -95.1 |
| Tin | mg/L | 0.00003 | <0.00003 | <0.00003 | 0.0 |
| Titanium | mg/L | 0.00004 | 0.000895 | 0.00112 | -22.3 |
| Uranium | mg/L | 0.0000001 | 0.000034 | 0.0000346 | -1.7 |
| Vanadium | mg/L | 0.000005 | 0.000259 | 0.000325 | -22.6 |
| Zinc | mg/L | 0.0001 | 0.00459 | 0.00155 | 99.0 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

Dark shading 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 Clearwater River, September 2005.

| Variable | Units | Detection Limit | Duplicate Samples - Fall 2005 | | Relative Percent Difference |
|---|--------|-----------------|-------------------------------|------------|-----------------------------|
| | | | CLR-1 | DUP-1 | |
| Conventional Variables | | | | | |
| Alkalinity, Total (as CaCO ₃) | mg/L | 5 | 63 | 63 | 0.0 |
| Bicarbonate | mg/L | 5 | 77 | 77 | 0.0 |
| Carbonate | mg/L | 5 | <5 | <5 | 0.0 |
| Color, True | T.C.U. | 3 | 80 | 100 | -22 |
| Conductivity | uS/cm | 0.2 | 197 | 198 | -0.5 |
| Dissolved Organic Carbon | mg/L | 1 | 14 | 14 | 0.0 |
| Hardness (as CaCO ₃) | mg/L | - | 62 | 62 | 0.0 |
| Hydroxide | mg/L | 5 | <5 | <5 | 0.0 |
| pH | pH | 0.1 | 7.5 | 7.5 | 0.0 |
| Total Dissolved Solids | mg/L | 10 | 130 | 110 | 16.7 |
| Total Organic Carbon | mg/L | 1 | 14 | 14 | 0.0 |
| Total Suspended Solids | mg/L | 3 | <3 | 17 | -140.0 |
| Major Ions | | | | | |
| Calcium | mg/L | 0.5 | 16.2 | 16.2 | 0.0 |
| Chloride | mg/L | 1 | 21 | 21 | 0.0 |
| Magnesium | mg/L | 0.1 | 5.2 | 5.3 | -1.9 |
| Potassium | mg/L | 0.5 | 1.1 | 1.1 | 0 |
| Sodium | mg/L | 1 | 17 | 17 | 0.0 |
| Sulphate | mg/L | 0.5 | 5.7 | 5.7 | 0.0 |
| Sulphide | mg/L | 0.003 | 0.004 | 0.003 | 28.6 |
| Nutrients & BOD | | | | | |
| Ammonia | mg/L | 0.05 | <0.05 | <0.05 | 0.0 |
| Nitrate+Nitrite | mg/L | 0.1 | <0.1 | <0.1 | 0.0 |
| Phosphorus, Total Dissolved | mg/L | 0.001 | 0.028 | 0.032 | -13.3 |
| Phosphorus, Total | mg/L | 0.001 | 0.063 | 0.067 | -6.2 |
| Total Kjeldahl Nitrogen | mg/L | 0.2 | 0.5 | 0.6 | -18.2 |
| Biochemical Oxygen Demand | mg/L | 2 | <2 | <2 | 0.0 |
| Hydrocarbons | | | | | |
| Hydrocarbons, Recoverable | mg/L | 0.5 | <0.5 | <0.5 | 0.0 |
| Naphthenic Acids | mg/L | 1 | 2 | 1 | 66.7 |
| Phenols | mg/L | 0.001 | <0.001 | 0.002 | -66.7 |
| Chlorophyll a | | | | | |
| Chlorophyll a | mg/L | 0.001 | <0.001 | 0.005 | -133.3 |
| Dissolved Metals | | | | | |
| Aluminum | mg/L | 0.0002 | 0.0148 | 0.0098 | 40.7 |
| Antimony | mg/L | 0.0000005 | 0.0000396 | 0.0000201 | 65.3 |
| Arsenic | mg/L | 0.000002 | 0.000842 | 0.000492 | 52.5 |
| Barium | mg/L | 0.000004 | 0.0233 | 0.0145 | 46.6 |
| Beryllium | mg/L | 0.000003 | 0.00000647 | 0.00000706 | -8.7 |
| Bismuth | mg/L | 0.000001 | 0.00000319 | 0.00000188 | 51.7 |
| Boron | mg/L | 0.00003 | 0.0512 | 0.0225 | 77.9 |
| Cadmium | mg/L | 0.000002 | 0.00000318 | <0.000002 | 45.6 |
| Calcium | mg/L | 0.004 | 23.9 | 14.5 | 49.0 |
| Chlorine | mg/L | 0.1 | 18.2 | 17.8 | 2.2 |
| Chromium | mg/L | 0.00003 | 0.000441 | 0.000291 | 41.0 |
| Cobalt | mg/L | 0.000001 | 0.0000853 | 0.0000555 | 42.3 |
| Copper | mg/L | 0.00005 | 0.000559 | 0.000293 | 62.4 |
| Iron | mg/L | 0.002 | 0.756 | 0.727 | 3.9 |
| Lead | mg/L | 0.000001 | 0.0000913 | 0.000045 | 67.9 |
| Lithium | mg/L | 0.00002 | 0.0102 | 0.00446 | 78.3 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

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

| Variable | Units | Detection Limit | Duplicate Samples - Fall 2005 | | Relative Percent Difference |
|--------------------------|-------|-----------------|-------------------------------|------------|-----------------------------|
| | | | CLR-1 | DUP-1 | |
| Dissolved Metals, cont'd | | | | | |
| Manganese | mg/L | 0.000003 | 0.00244 | 0.013 | -136.8 |
| Mercury | mg/L | 0.00001 | <0.00001 | <0.00001 | 0.0 |
| Molybdenum | mg/L | 0.000001 | 0.00031 | 0.000155 | 66.7 |
| Nickel | mg/L | 0.000005 | 0.000646 | 0.000283 | 78.1 |
| Selenium | mg/L | 0.0001 | 0.000289 | 0.000503 | -54.0 |
| Silver | mg/L | 0.0000005 | 0.00000134 | <0.0000005 | 91.3 |
| Strontium | mg/L | 0.000004 | 0.111 | 0.0748 | 39.0 |
| Sulphur | mg/L | 0.2 | 2.81 | 0.762 | 114.7 |
| Thallium | mg/L | 0.0000003 | 0.00000239 | 0.00000163 | 37.8 |
| Thorium | mg/L | 0.0000003 | 0.0000148 | 0.0000133 | 10.7 |
| Tin | mg/L | 0.00003 | <0.00003 | <0.00003 | 0.0 |
| Titanium | mg/L | 0.00004 | 0.00269 | 0.00126 | 72.4 |
| Uranium | mg/L | 0.0000001 | 0.000116 | 0.000051 | 77.8 |
| Vanadium | mg/L | 0.000005 | 0.000392 | 0.000446 | -12.9 |
| Zinc | mg/L | 0.00005 | 0.00124 | 0.00134 | -7.8 |
| Total Metals | | | | | |
| Aluminum | mg/L | 0.0005 | 1.46 | 0.568 | 88.0 |
| Antimony | mg/L | 0.0000005 | 0.0000402 | 0.0000205 | 64.9 |
| Arsenic | mg/L | 0.000002 | 0.00139 | 0.000724 | 63.0 |
| Barium | mg/L | 0.000004 | 0.0405 | 0.0226 | 56.7 |
| Beryllium | mg/L | 0.000003 | 0.0000754 | 0.0000228 | 107.1 |
| Bismuth | mg/L | 0.000001 | 0.0000147 | 0.00000499 | 98.6 |
| Boron | mg/L | 0.00005 | 0.0548 | 0.0258 | 72.0 |
| Cadmium | mg/L | 0.000002 | 0.0000208 | 0.00000631 | 106.9 |
| Calcium | mg/L | 0.004 | 24.6 | 15.3 | 46.6 |
| Chlorine | mg/L | 0.1 | 18.4 | 18.3 | 0.5 |
| Chromium | mg/L | 0.00003 | 0.00219 | 0.000889 | 84.5 |
| Cobalt | mg/L | 0.000001 | 0.000693 | 0.000311 | 76.1 |
| Copper | mg/L | 0.00005 | 0.00134 | 0.000513 | 89.3 |
| Iron | mg/L | 0.002 | 2.43 | 1.72 | 34.2 |
| Lead | mg/L | 0.000001 | 0.000749 | 0.000284 | 90.0 |
| Lithium | mg/L | 0.00002 | 0.011 | 0.00476 | 79.2 |
| Manganese | mg/L | 0.000003 | 0.106 | 0.0779 | 30.6 |
| Mercury | mg/L | 0.00001 | <0.00001 | <0.00001 | 0.0 |
| Mercury, ultra-trace | ng/L | 0.6 | <0.6 | <0.6 | 0.0 |
| Molybdenum | mg/L | 0.000001 | 0.00036 | 0.000168 | 72.7 |
| Nickel | mg/L | 0.000005 | 0.00168 | 0.000701 | 82.2 |
| Selenium | mg/L | 0.0001 | 0.000355 | 0.00068 | -62.8 |
| Silver | mg/L | 0.0000005 | 0.00000859 | 0.00000283 | 100.9 |
| Strontium | mg/L | 0.000004 | 0.118 | 0.0805 | 37.8 |
| Sulphur | mg/L | 0.2 | 2.84 | 1.04 | 92.8 |
| Thallium | mg/L | 0.0000003 | 0.0000238 | 0.00000955 | 85.5 |
| Thorium | mg/L | 0.0000003 | 0.000247 | 0.0000426 | 141.2 |
| Tin | mg/L | 0.00003 | 0.000044 | <0.00003 | 37.8 |
| Titanium | mg/L | 0.00004 | 0.0443 | 0.0127 | 110.9 |
| Uranium | mg/L | 0.0000001 | 0.000184 | 0.0000794 | 79.4 |
| Vanadium | mg/L | 0.000005 | 0.00362 | 0.00192 | 61.4 |
| Zinc | mg/L | 0.0001 | 0.00613 | 0.00349 | 54.9 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

B.2.3 Sediment Quality Component

B.2.3.1 Methods

The 2005 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.

Sample Collection

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.

A split and field duplicate sample was collected from the Ells River mouth (station ELR-1) to assess environmental variation, analytical precision, and potential contamination. In addition, an equipment rinsate blank was collected to assess the effectiveness of cleaning and equipment decontamination, which if not done effectively could lead to sample contamination. Rinsate samples were prepared by pouring deionized water over the surface of cleaned equipment and collecting this rinsate. The rinsate sample was submitted to the laboratory for analysis of total metals and PAH concentrations.

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

Analyte concentrations in the equipment rinsate blank were compared to analytical detection limits; analyte levels greater than five times the detection limit may indicate potential contamination of sampling equipment or quality control concerns with the sample (e.g., contamination during laboratory analysis).

B.2.3.2 Results and Discussion

Duplicate Samples

Relative percent differences in physical properties, hydrocarbons, and metals between duplicate samples from station ELR-1 are shown in Table B.2-8. The duplicate samples

were very similar for most analytes; % moisture was the only analyte (with concentrations greater than five times the analytical detection limit) greater than 20% relative percent difference. The relative percent differences between the concentrations of all metals were less than 20%, indicating the homogeneity of metals concentrations in sediments at this station.

Relative percent differences in PAHs between duplicate samples from station ELR-1 are shown in Table B.2-9. Numerous PAHs differed by more than 20% between duplicates, although the actual magnitude of differences between most PAHs was very small (generally on the order of micrograms per kilogram of sediment). However, substantial differences between duplicate samples were found for the following analytes: retene (188%), C4-Phenanthrenes/Anthracenes (102%), and C2-Benzofluoranthenes/Pyrenes (109%).

Split Samples

Relative percent differences in physical properties, hydrocarbons, and metals between split sediment samples from station ELR-1 are shown in Table B.2-10. The split samples were generally very similar, with only three analytes differing by more than 20%. These analytes include inorganic carbon (24% difference), chromium (42%), and nickel (27%). All other analytes differed by no more than 13%.

Relative percent differences in PAH concentrations between split sediment samples are shown in Table B.2-11. Several PAHs varied by more than 20% between samples (where the analyte was detectable in both samples), including C2-Benzofluoranthenes/Pyrenes (81.4%), C1-Naphthalenes (53.2%), biphenyl (48.3%), and others.

The similarity in physical properties, hydrocarbons, and metals between split samples indicates a high degree of homogeneity in sample mixing. Differences in some PAH concentrations between split samples may result from the relatively large particle size (i.e., silt to sand) of bitumen.

Equipment Rinsate Blank

An equipment rinsate blank was collected and analyzed for concentrations of total metals and PAHs to assess potential contamination of samples resulting from sampling equipment.

The concentrations of most metals were non-detectable or slightly above the analytical detection limit (Table B.2-12). The concentrations of barium, copper, iron, and strontium were greater than five times the analytical detection limit.

The concentrations of PAHs in the rinsate blank are shown in Table B.2-13. The concentrations of C3-Dibenzothiophenes, C4-Phenanthrenes/Anthracenes, C2-Fluoranthenes/Pyrenes, C3-Fluoranthenes/Pyrenes, and C2-Benz[a]-anthracenes/Chrysenes were greater than five times the concentration in the lab blank; the concentration of C2-Benz[a]anthracenes/Chrysenes was 125 times the concentration of this analyte in the lab blank.

These results suggest that, in general, sediment sampling equipment was free of contamination, although some metal or PAH analytes may potentially have contributed to sample contamination.

Table B.2-8 Relative percent difference in physical properties, hydrocarbons, and metals between duplicate sediment quality samples, Ells River, September 2005.

| Analyte | Unit | Detection Limit | Result | | Relative Percent Difference |
|----------------------------------|-------|-----------------|--------|-------|-----------------------------|
| | | | ELR-1A | DUP-1 | |
| Conventional Variables | | | | | |
| % Sand | % | 1 | 30 | 36 | -18.2 |
| % Silt | % | 1 | 48 | 44 | 8.7 |
| % Clay | % | 1 | 22 | 20 | 9.5 |
| Texture | - | - | Loam | Loam | - |
| % Moisture | % | 0.1 | 30 | 17 | 55.3 |
| Total Hydrocarbons | | | | | |
| F1 (C6-C10) | mg/kg | 5 | -5 | -5 | 0.0 |
| F1-BTEX | mg/kg | 5 | -5 | -5 | 0.0 |
| F2 (C10-C16) | mg/kg | 5 | 260 | 220 | 16.7 |
| F3 (C16-C34) | mg/kg | 5 | 2400 | 2100 | 13.3 |
| F4 (C34-C50) | mg/kg | 5 | 1100 | 1000 | 9.5 |
| Total Hydrocarbons (C6-C50) | mg/kg | 5 | 3800 | 3300 | 14.1 |
| Chromatogram to baseline at nC50 | | - | Yes | Yes | - |
| BTEX | | | | | |
| Benzene | mg/kg | 0.005 | -0.005 | 0.02 | -120.0 |
| Toluene | mg/kg | 0.03 | -0.03 | -0.03 | 0.0 |
| Ethylbenzene | mg/kg | 0.03 | -0.03 | -0.03 | 0.0 |
| Xylenes | mg/kg | 0.09 | -0.09 | -0.09 | 0.0 |
| Nutrients & BOD | | | | | |
| Inorganic Carbon | % | 0.01 | 0.29 | 0.27 | 7.1 |
| Total Organic Carbon | % | 0.1 | 3.5 | 3.7 | -5.6 |
| Total Carbon by Combustion | % | 0.1 | 3.8 | 4 | -5.1 |
| Total Metals | | | | | |
| Arsenic (As) | mg/kg | 0.1 | 6.6 | 6.7 | -1.5 |
| Barium (Ba) | mg/kg | 0.5 | 124 | 122 | 1.6 |
| Beryllium (Be) | mg/kg | 0.2 | 0.6 | 0.5 | 18.2 |
| Bismuth (Bi) | mg/kg | 0.5 | -0.5 | -0.5 | 0.0 |
| Cadmium (Cd) | mg/kg | 0.1 | 0.2 | 0.2 | 0.0 |
| Chromium (Cr) | mg/kg | 0.2 | 15.1 | 14.4 | 4.7 |
| Cobalt (Co) | mg/kg | 0.1 | 8.3 | 8.5 | -2.4 |
| Copper (Cu) | mg/kg | 0.5 | 13.4 | 13.7 | -2.2 |
| Lead (Pb) | mg/kg | 0.5 | 8.5 | 8.6 | -1.2 |
| Mercury (Hg) | mg/kg | 0.05 | -0.05 | -0.05 | 0.0 |
| Molybdenum (Mo) | mg/kg | 0.1 | 0.4 | 0.4 | 0.0 |
| Nickel (Ni) | mg/kg | 0.5 | 17.9 | 18.4 | -2.8 |
| Selenium (Se) | mg/kg | 0.2 | 0.5 | 0.5 | 0.0 |
| Silver (Ag) | mg/kg | 0.2 | -0.2 | -0.2 | 0.0 |
| Strontium (Sr) | mg/kg | 1 | 36 | 37 | -2.7 |
| Thallium (Tl) | mg/kg | 0.05 | 0.16 | 0.17 | -6.1 |
| Tin (Sn) | mg/kg | 2 | -2 | -2 | 0.0 |
| Uranium (U) | mg/kg | 0.05 | 0.95 | 0.94 | 1.1 |
| Vanadium (V) | mg/kg | 0.2 | 25.3 | 24.8 | 2.0 |
| Zinc (Zn) | mg/kg | 5 | 61 | 61 | 0.0 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

Table B.2-9 Relative percent difference in PAH concentrations between duplicate sediment quality samples, Ells River, September 2005.

| Analyte | Unit | Duplicate Samples, Fall 2005 | | Relative Percent Difference |
|---------------------------------|-------|------------------------------|----------|-----------------------------|
| | | ELR-1A | DUP-1 | |
| PAHs | | | | |
| Naphthalene | mg/kg | 0.00702 | 0.00503 | 33.0 |
| Biphenyl | mg/kg | 0.00212 | 0.00371 | -54.5 |
| Acenaphthylene | mg/kg | <0.0046 | <0.0075 | -47.9 |
| Acenaphthene | mg/kg | 0.0147 | 0.00972 | 40.8 |
| Fluorene | mg/kg | <0.012 | <0.00864 | 32.6 |
| Phenanthrene | mg/kg | 0.073 | 0.0587 | 21.7 |
| Anthracene | mg/kg | <0.03 | <0.0189 | 45.4 |
| Fluoranthene | mg/kg | <0.0183 | 0.0156 | 15.9 |
| Pyrene | mg/kg | 0.088 | 0.0639 | 31.7 |
| Benz[a]anthracene | mg/kg | <0.61 | 0.0275 | 182.7 |
| Chrysene | mg/kg | 0.2 | 0.212 | -5.8 |
| Benzo[b/j/k]fluoranthene | mg/kg | 0.0848 | 0.0852 | -0.5 |
| Benzo[a]pyrene | mg/kg | 0.0454 | 0.0279 | 47.7 |
| Dibenz[ah]anthracene | mg/kg | 0.0166 | 0.0255 | -42.3 |
| Indeno[1,2,3-cd]pyrene | mg/kg | 0.023 | 0.024 | -4.3 |
| Benzo[ghi]perylene | mg/kg | 0.0534 | 0.0455 | 16.0 |
| C1-Naphthalenes | mg/kg | 0.00923 | 0.00848 | 8.5 |
| Methyl-Biphenyl | mg/kg | <0.000967 | <0.00187 | -63.7 |
| Dimethyl-Biphenyl | mg/kg | 0.0155 | 0.0185 | -17.6 |
| C2-Naphthalenes | mg/kg | 0.0701 | 0.0664 | 5.4 |
| C3-Naphthalenes | mg/kg | 0.495 | 0.39 | 23.7 |
| C4-Naphthalenes | mg/kg | 1.28 | 1.05 | 19.7 |
| Methyl Acenaphthene | mg/kg | 0.0049 | 0.00544 | -10.4 |
| C1-Fluorenes | mg/kg | 0.109 | 0.0925 | 16.4 |
| C2-Fluorenes | mg/kg | 0.548 | 0.565 | -3.1 |
| C3-Fluorenes | mg/kg | 1.27 | 0.952 | 28.6 |
| Dibenzothiophene | mg/kg | <0.0203 | <0.0209 | -2.9 |
| C1-Dibenzothiophenes | mg/kg | 0.522 | 0.412 | 23.6 |
| C2-Dibenzothiophenes | mg/kg | 2.62 | 2.59 | 1.2 |
| C3-Dibenzothiophenes | mg/kg | 4.58 | 4.17 | 9.4 |
| C4-Dibenzothiophenes | mg/kg | 4.46 | 3.74 | 17.6 |
| C1-Phenanthrenes/Anthracenes | mg/kg | 0.591 | 0.49 | 18.7 |
| C2-Phenanthrenes/Anthracenes | mg/kg | 1.56 | 1.26 | 21.3 |
| C3-Phenanthrenes/Anthracenes | mg/kg | 1.74 | 1.65 | 5.3 |
| Retene | mg/kg | 0.301 | 9.54 | -187.8 |
| C4-Phenanthrenes/Anthracenes | mg/kg | 4.24 | 13 | -101.6 |
| C1-Fluoranthenes/Pyrenes | mg/kg | 0.401 | 0.534 | -28.4 |
| C2-Fluoranthenes/Pyrenes | mg/kg | 0.872 | 0.79 | 9.9 |
| C3-Fluoranthenes/Pyrenes | mg/kg | 0.897 | 0.96 | -6.8 |
| C1-Benz[a]anthracenes/Chrysenes | mg/kg | 2.86 | 2.21 | 25.6 |
| C2-Benz[a]anthracenes/Chrysenes | mg/kg | 1.11 | 0.969 | 13.6 |
| C1-Benzofluoranthenes/Pyrenes | mg/kg | 0.227 | 0.25 | -9.6 |
| C2-Benzofluoranthenes/Pyrenes | mg/kg | 0.0641 | 0.217 | -108.8 |
| % Moisture | % | 43.8 | 49.2 | -11.6 |

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

Relative percent difference for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Results were not assessed against 5 times the detection limit due to variability in detection limits between samples.

Light shading indicates analytes differ by > 20% between duplicates but concentrations of analytes in one or both samples were below detection limits.

Dark shading indicates analytes differ by > 20% between duplicates.

Table B.2-10 Relative percent difference in physical properties, hydrocarbons, and metals between split sediment quality samples, Ells River, September 2005.

| Analyte | Unit | Detection Limit | Result | | Relative Percent Difference |
|----------------------------------|-------|-----------------|--------|---------|-----------------------------|
| | | | ELR-1A | SPLIT-1 | |
| Conventional Variables | | | | | |
| % Sand | % | 1 | 30 | 33 | -9.5 |
| % Silt | % | 1 | 48 | 42 | 13.3 |
| % Clay | % | 1 | 22 | 25 | -12.8 |
| Texture | - | - | Loam | Loam | - |
| % Moisture | % | 0.1 | 30 | 30 | 0.0 |
| Total Hydrocarbons | | | | | |
| F1 (C6-C10) | mg/kg | 5 | <5 | <5 | 0.0 |
| F1-BTEX | mg/kg | 5 | <5 | <5 | 0.0 |
| F2 (C10-C16) | mg/kg | 5 | 260 | 230 | 12.2 |
| F3 (C16-C34) | mg/kg | 5 | 2400 | 2200 | 8.7 |
| F4 (C34-C50) | mg/kg | 5 | 1100 | 1100 | 0.0 |
| Total Hydrocarbons (C6-C50) | mg/kg | 5 | 3800 | 3500 | 8.2 |
| Chromatogram to baseline at nC50 | | - | Yes | Yes | - |
| BTEX | | | | | |
| Benzene | mg/kg | 0.005 | <0.005 | <0.005 | 0.0 |
| Toluene | mg/kg | 0.03 | <0.03 | <0.03 | 0.0 |
| Ethylbenzene | mg/kg | 0.03 | <0.03 | <0.03 | 0.0 |
| Xylenes | mg/kg | 0.09 | <0.09 | <0.09 | 0.0 |
| Nutrients & BOD | | | | | |
| Inorganic Carbon | % | 0.01 | 0.29 | 0.37 | -24.2 |
| Total Organic Carbon | % | 0.1 | 3.5 | 3.4 | 2.9 |
| Total Carbon by Combustion | % | 0.1 | 3.8 | 3.7 | 2.7 |
| Total Metals | | | | | |
| Arsenic (As) | mg/kg | 0.1 | 6.6 | 7.3 | -10.1 |
| Barium (Ba) | mg/kg | 0.5 | 124 | 139 | -11.4 |
| Beryllium (Be) | mg/kg | 0.2 | 0.6 | 0.6 | 0.0 |
| Bismuth (Bi) | mg/kg | 0.5 | <0.5 | <0.5 | 0.0 |
| Cadmium (Cd) | mg/kg | 0.1 | 0.2 | 0.2 | 0.0 |
| Chromium (Cr) | mg/kg | 0.2 | 15.1 | 23.2 | -42.3 |
| Cobalt (Co) | mg/kg | 0.1 | 8.3 | 9.1 | -9.2 |
| Copper (Cu) | mg/kg | 0.5 | 13.4 | 15.2 | -12.6 |
| Lead (Pb) | mg/kg | 0.5 | 8.5 | 9.3 | -9.0 |
| Mercury (Hg) | mg/kg | 0.05 | <0.05 | <0.05 | 0.0 |
| Molybdenum (Mo) | mg/kg | 0.1 | 0.4 | 0.5 | -22.2 |
| Nickel (Ni) | mg/kg | 0.5 | 17.9 | 23.6 | -27.5 |
| Selenium (Se) | mg/kg | 0.2 | 0.5 | 0.5 | 0.0 |
| Silver (Ag) | mg/kg | 0.2 | <0.2 | <0.2 | 0.0 |
| Strontium (Sr) | mg/kg | 1 | 36 | 40 | -10.5 |
| Thallium (Tl) | mg/kg | 0.05 | 0.16 | 0.18 | -11.8 |
| Tin (Sn) | mg/kg | 2 | <2 | <2 | 0.0 |
| Uranium (U) | mg/kg | 0.05 | 0.95 | 0.99 | -4.1 |
| Vanadium (V) | mg/kg | 0.2 | 25.3 | 27.5 | -8.3 |
| Zinc (Zn) | mg/kg | 5 | 61 | 65 | -6.3 |

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

Relative percent difference 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.

Light shading indicates analytes differ by > 20% between duplicates but concentrations are < 5 times the detection limit.

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

Table B.2-11 Relative percent difference in PAH concentrations between split sediment quality samples, Ells River, September 2005.

| Analyte | Unit | Split Samples, Fall 2005 | | Relative Percent Difference |
|---------------------------------|-------|--------------------------|----------|-----------------------------|
| | | ELR-1A | SPLIT-1 | |
| PAHs | | | | |
| Naphthalene | mg/kg | 0.00702 | 0.0102 | -36.9 |
| Biphenyl | mg/kg | 0.00212 | 0.00347 | -48.3 |
| Acenaphthylene | mg/kg | <0.0046 | <0.0056 | -19.6 |
| Acenaphthene | mg/kg | 0.0147 | 0.0116 | 23.6 |
| Fluorene | mg/kg | <0.012 | <0.00831 | 36.3 |
| Phenanthrene | mg/kg | 0.073 | 0.058 | 22.9 |
| Anthracene | mg/kg | <0.03 | <0.0225 | 28.6 |
| Fluoranthene | mg/kg | <0.0183 | 0.0231 | -23.2 |
| Pyrene | mg/kg | 0.088 | 0.0833 | 5.5 |
| Benz[a]anthracene | mg/kg | <0.61 | 0.0259 | 183.7 |
| Chrysene | mg/kg | 0.2 | 0.234 | -15.7 |
| Benzo[b/j/k]fluoranthene | mg/kg | 0.0848 | 0.0856 | -0.9 |
| Benzo[a]pyrene | mg/kg | 0.0454 | 0.0366 | 21.5 |
| Dibenz[ah]anthracene | mg/kg | 0.0166 | <0.0144 | 14.2 |
| Indeno[1,2,3-cd]pyrene | mg/kg | 0.023 | 0.0219 | 4.9 |
| Benzo[ghi]perylene | mg/kg | 0.0534 | 0.0453 | 16.4 |
| C1-Naphthalenes | mg/kg | 0.00923 | 0.00535 | 53.2 |
| Methyl-Biphenyl | mg/kg | <0.000967 | <0.00271 | -94.8 |
| Dimethyl-Biphenyl | mg/kg | 0.0155 | 0.022 | -34.7 |
| C2-Naphthalenes | mg/kg | 0.0701 | 0.0584 | 18.2 |
| C3-Naphthalenes | mg/kg | 0.495 | 0.48 | 3.1 |
| C4-Naphthalenes | mg/kg | 1.28 | 1.36 | -6.1 |
| Methyl Acenaphthene | mg/kg | 0.0049 | 0.00502 | -2.4 |
| C1-Fluorenes | mg/kg | 0.109 | 0.114 | -4.5 |
| C2-Fluorenes | mg/kg | 0.548 | 0.581 | -5.8 |
| C3-Fluorenes | mg/kg | 1.27 | 1.43 | -11.9 |
| Dibenzothiophene | mg/kg | <0.0203 | 0.0197 | 3.0 |
| C1-Dibenzothiophenes | mg/kg | 0.522 | 0.444 | 16.1 |
| C2-Dibenzothiophenes | mg/kg | 2.62 | 2.59 | 1.2 |
| C3-Dibenzothiophenes | mg/kg | 4.58 | 4.72 | -3.0 |
| C4-Dibenzothiophenes | mg/kg | 4.46 | 5.03 | -12.0 |
| C1-Phenanthrenes/Anthracenes | mg/kg | 0.591 | 0.5 | 16.7 |
| C2-Phenanthrenes/Anthracenes | mg/kg | 1.56 | 1.3 | 18.2 |
| C3-Phenanthrenes/Anthracenes | mg/kg | 1.74 | 1.71 | 1.7 |
| Retene | mg/kg | 0.301 | 0.371 | -20.8 |
| C4-Phenanthrenes/Anthracenes | mg/kg | 4.24 | 4.87 | -13.8 |
| C1-Fluoranthenes/Pyrenes | mg/kg | 0.401 | 0.472 | -16.3 |
| C2-Fluoranthenes/Pyrenes | mg/kg | 0.872 | 0.935 | -7.0 |
| C3-Fluoranthenes/Pyrenes | mg/kg | 0.897 | 0.977 | -8.5 |
| C1-Benz[a]anthracenes/Chrysenes | mg/kg | 2.86 | 2.73 | 4.7 |
| C2-Benz[a]anthracenes/Chrysenes | mg/kg | 1.11 | 1.04 | 6.5 |
| C1-Benzofluoranthenes/Pyrenes | mg/kg | 0.227 | 0.345 | -41.3 |
| C2-Benzofluoranthenes/Pyrenes | mg/kg | 0.0641 | 0.152 | -81.4 |
| % Moisture | % | 43.8 | 53.4 | -19.8 |

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

Relative percent difference for undetectable analytes (i.e., < detection limit) was calculated assuming a concentration equal to the detection limit.

Results were not assessed against 5 times the detection limit due to variability in detection limits between samples.

Light shading indicates analytes differ by > 20% between split samples but concentrations of analytes in one or both samples were below detection limits.

Dark shading indicates analytes differ by > 20% between split samples.

Table B.2-12 Concentrations of metals in sediment rinsate blank, September 2005.

| Analyte | Unit | Detection Limit | Result | Exceedance Ratio (Result/DL) |
|-----------------|------|-----------------|---------|------------------------------|
| Total Metals | | | | |
| Aluminum (Al) | mg/L | 0.02 | 0.09 | 4.5 |
| Antimony (Sb) | mg/L | 0.0004 | <0.0004 | 1.0 |
| Arsenic (As) | mg/L | 0.0004 | <0.0004 | 1.0 |
| Barium (Ba) | mg/L | 0.0002 | 0.0011 | 5.5 |
| Beryllium (Be) | mg/L | 0.001 | <0.001 | 1.0 |
| Bismuth (Bi) | mg/L | 0.0001 | <0.0001 | 1.0 |
| Boron (B) | mg/L | 0.02 | <0.02 | 1.0 |
| Cadmium (Cd) | mg/L | 0.0002 | <0.0002 | 1.0 |
| Calcium (Ca) | mg/L | 0.5 | <0.5 | 1.0 |
| Chromium (Cr) | mg/L | 0.0008 | 0.003 | 3.8 |
| Cobalt (Co) | mg/L | 0.0002 | <0.0002 | 1.0 |
| Copper (Cu) | mg/L | 0.001 | 0.007 | 7.0 |
| Iron (Fe) | mg/L | 0.005 | 0.125 | 25.0 |
| Lead (Pb) | mg/L | 0.0001 | 0.0004 | 4.0 |
| Lithium (Li) | mg/L | 0.006 | <0.006 | 1.0 |
| Magnesium (Mg) | mg/L | 0.1 | <0.1 | 1.0 |
| Manganese (Mn) | mg/L | 0.001 | 0.002 | 2.0 |
| Mercury (Hg) | mg/L | 0.0002 | <0.0002 | 1.0 |
| Molybdenum (Mo) | mg/L | 0.0001 | 0.0001 | 1.0 |
| Nickel (Ni) | mg/L | 0.0002 | <0.0002 | 1.0 |
| Potassium (K) | mg/L | 0.1 | <0.1 | 1.0 |
| Selenium (Se) | mg/L | 0.0004 | <0.0004 | 1.0 |
| Silver (Ag) | mg/L | 0.0004 | <0.0004 | 1.0 |
| Sodium (Na) | mg/L | 1 | <1 | 1.0 |
| Strontium (Sr) | mg/L | 0.0002 | 0.0016 | 8.0 |
| Thallium (Tl) | mg/L | 0.0001 | 0.0001 | 1.0 |
| Tin (Sn) | mg/L | 0.0004 | <0.0004 | 1.0 |
| Titanium (Ti) | mg/L | 0.005 | <0.005 | 1.0 |
| Uranium (U) | mg/L | 0.0001 | <0.0001 | 1.0 |
| Vanadium (V) | mg/L | 0.0002 | 0.0004 | 2.0 |
| Zinc (Zn) | mg/L | 0.004 | 0.008 | 2.0 |

Shaded values indicate concentrations are greater than five times the analytical detection limits.

Table B.2-13 Concentrations of PAHs in sediment rinsate blank, September 2005.

| Analyte | Unit | Rinsate | Lab Blank | Exceedance Ratio (Result/Lab Blank) |
|---------------------------------|------|---------|-----------|--|
| PAHs | | | | |
| Acenaphthylene | ng/L | <0.68 | NQ | - |
| Acenaphthene | ng/L | <1.71 | NQ | - |
| Fluorene | ng/L | <0.962 | <0.658 | 1.5 |
| Phenanthrene | ng/L | 2.86 | 0.925 | 3.1 |
| Anthracene | ng/L | <0.801 | <0.472 | 1.7 |
| Fluoranthene | ng/L | 0.737 | 0.317 | 2.3 |
| Pyrene | ng/L | 0.973 | 0.228 | 4.3 |
| Benz[a]anthracene | ng/L | 0.864 | <0.202 | 4.3 |
| Chrysene | ng/L | 0.843 | <0.198 | 4.3 |
| Benzo[b/j/k]fluoranthene | ng/L | 0.499 | <0.502 | 1.0 |
| Benzo[a]pyrene | ng/L | <0.8 | <0.514 | 1.6 |
| Dibenz[ah]anthracene | ng/L | <0.388 | <0.384 | 1.0 |
| Indeno[1,2,3-cd]pyrene | ng/L | <0.494 | <0.312 | 1.6 |
| Benzo[ghi]perylene | ng/L | <0.502 | <0.301 | 1.7 |
| Methyl Acenaphthene | ng/L | <1.62 | NQ | - |
| C1-Fluorenes | ng/L | 7.4 | NQ | - |
| C2-Fluorenes | ng/L | 29.5 | NQ | - |
| C3-Fluorenes | ng/L | 23.8 | NQ | - |
| Dibenzothiophene | ng/L | 0.927 | <0.611 | 1.5 |
| C1-Dibenzothiophenes | ng/L | 2.44 | 2.09 | 1.2 |
| C2-Dibenzothiophenes | ng/L | 10.7 | 5.37 | 2.0 |
| C3-Dibenzothiophenes | ng/L | 9.52 | <0.864 | 11.0 |
| C4-Dibenzothiophenes | ng/L | 11.8 | 4.46 | 2.6 |
| C1 Phenanthrenes/Anthracenes | ng/L | 7.01 | 1.71 | 4.1 |
| C2 Phenanthrenes/Anthracenes | ng/L | 6.26 | 2.96 | 2.1 |
| C3-Phenanthrenes/Anthracenes | ng/L | 5.16 | 1.38 | 3.7 |
| Retene | ng/L | <1.92 | <1.02 | 1.9 |
| C4-Phenanthrenes/Anthracenes | ng/L | 6.18 | <1.02 | 6.1 |
| C1-Fluoranthenes/Pyrenes | ng/L | <0.476 | <0.437 | 1.1 |
| C2-Fluoranthenes/Pyrenes | ng/L | 4.58 | <0.364 | 12.6 |
| C3-Fluoranthenes/Pyrenes | ng/L | 2.85 | <0.401 | 7.1 |
| C1-Benz[a]anthracenes/Chrysenes | ng/L | 1.27 | <1.36 | 0.9 |
| C2-Benz[a]anthracenes/Chrysenes | ng/L | 38 | <0.304 | 125.0 |
| C1-Benzofluoranthenes/Pyrenes | ng/L | 1.71 | <0.59 | 2.9 |
| C2-Benzofluoranthenes/Pyrenes | ng/L | <0.817 | <0.649 | 1.3 |

NQ indicates non-quantifiable due to analytical difficulties.

Italicized values indicate laboratory flags: peak detected, but did not meet quantification criteria - result reported represents the estimated maximum possible concentration.

Shaded values indicate concentrations are greater than five times the analytical detection limits.

B.2.3.3 Conclusions and Recommendations

The low degree of variability between physical properties, hydrocarbon, and metal analytes for duplicate and split samples indicates that samples were generally homogeneous – with respect to these variables - within the compositing tray and in the environment at station ELR-1. This indicates that samples were, in general, representative of site conditions. Differences between PAH concentrations in duplicate and split samples indicate that homogenization of PAH content in samples is more difficult and that PAH concentrations may be spatially variable in the environment at small scales. The low concentrations of most metals and PAHs in the sediment equipment rinsate blank indicate that sampling equipment was not a significant source of contamination.

B.2.4 Benthic Invertebrate Community Component

B.2.4.1 Quality Control Activities – Field

Field methods used for benthic invertebrate collection are considered to follow accepted methods for environmental effects monitoring (AENV 1990, Glozier *et al.* 2002). Instruments used for measuring supporting variables (e.g., temperature, dissolved oxygen, conductivity, pH, current velocity and depth) were calibrated according to manufacturer instructions (up to daily for water quality meters).

B.2.4.2 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 over the past five years. Laboratory methods used by Dr. Zloty in 2005 included resorting of 5% of samples as a confirmation of the overall sorting efficiency of all samples. In 2005, a total of 13 samples were resorting. 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 was 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.2.4.3 Quality Control Activities – Results

Results for quality control samples (5% re-sorts) from the 2005 RAMP benthic invertebrate community component indicate that this objective was consistently achieved (Table B.2-14).

Invertebrate sorting efficiency ranged from 95.1% to 100%. 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.2-14 Results of quality control checks on sorting efficiency of benthic invertebrate samples, RAMP 2005.

| Sample | % Sorting Efficiency |
|-----------|-----------------------------------|
| SHL #4 | $[1-(18/(823+18))] * 100 = 97.9$ |
| KEL #10 | $[1-(10/(204+10))] * 100 = 95.3$ |
| GIC #2 | $[1-(3/(303+3))] * 100 = 99.0$ |
| ELR-E #1 | $[1-(20/(391+20))] * 100 = 95.1$ |
| MUR-D #5 | $[1-(6/(156+6))] * 100 = 96.3$ |
| FIR-E #7 | $[1-(24/(1244+24))] * 100 = 98.1$ |
| HAR-E #9 | $[1-(2/(67+2))] * 100 = 97.1$ |
| JAC-D #3 | $[1-(0/(12+0))] * 100 = 100$ |
| FOC #2 | $[1-(0/(41+0))] * 100 = 100$ |
| TAR-E #1 | $[1-(4/(234+4))] * 100 = 98.3$ |
| STR-E #3 | $[1-(8/(460+8))] * 100 = 98.3$ |
| MAR-E #7 | $[1-(12/(347+12))] * 100 = 96.7$ |
| CHR-D #15 | $[1-(0/(44+0))] * 100 = 100$ |
| Average | 97.8% recovery of animals |

Note: Sorting efficiency (%) is determined as:

$$efficiency = 1 - \left(\frac{b}{a + b} \right); \text{ where } a = \text{No. of animals recovered during the first sorting, and}$$

$$b = \text{No. of animals recovered during the re-sorting process.}$$

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 2002) 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 (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 EnviroTest Laboratories [ETL]) was conducted using lab-provided COC forms.

B.2.5.2 Quality Control Activities – Laboratory

In 2005, 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 from the oil sands region. Fish aging structures (e.g., fin rays or otoliths) were read three times by independent persons and each structure is 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 2005 fish program (Athabasca River and Clearwater River).

Fish tissue analysis results from ETL 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 ETL and Flett include method blanks, laboratory duplicates, spike samples, calibration control, use of certified reference standards and internal standards.

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.

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.

Appendix C

Climate and Hydrology Component

C.0 CLIMATE AND HYDROLOGY COMPONENT

C.1 INVENTORY OF CLIMATE DATA COLLECTED IN 2005

C.1.1 RAMP 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 throughout 2005.

Precipitation was recorded upon occurrence. Other parameters were sensed every 5 seconds. Table C.1-1 lists the hourly climate parameters developed from the sensor readings. Daily readings were computed from the hourly records.

Table C.1-1 Aurora Climate Station (C1) 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. |
| Precipitation Tipping bucket rain gauge | Total | (mm) | Sum of 0.1 mm tips. |
| Snowfall Water Equivalent Tipping Bucket rain gauge with snow adaptor | 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 ²) | Sum of time integrated readings every 5 sec. |
| Wind Speed and Direction Wind Vane and Propeller | Mean Daily Wind Speed | (km/h) | Magnitude of daily mean wind vector from readings averaged every 5 sec. |
| | 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. |

Under severe winter conditions, variation in temperature and solar radiation can impact the performance of tipping bucket rain gauges used to collect snowfall data. Tipping bucket snow gauge data were therefore verified by considering concurrent temperature and snow depth readings and data collected at other RAMP or MSC stations.

The data logger had some problems towards at the beginning of 2005, which resulted in missing data for all parameters from 1 to 19 January. Monthly observations for 2005 are summarized in Table C.1-2, and daily observations are contained in the RAMP database and are provided on the RAMP report CD.

C.1.1.2 Other RAMP Climate Stations

Table C.1-3 summarizes the climate parameters monitored at RAMP stations other than the Aurora Climate Station. Station S16 was discontinued in spring 2005 and was replaced by Station S19. The sensors at Station S16 were left in place until October 2005 but only the air temperature sensor operated correctly after May 1.

Climate sensors at Stations S16 and S5A 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 Rain Gauge: Missing July 3 – September 6 due to damage caused by wildlife;
- S3 Rain Gauge: Missing July 31 – September 2 due to damage caused by wildlife;
- S5A Water Thermistor: Missing November 2 – December 31 due to equipment malfunction; and
- S14A Water Thermistor: Data recorded after October 13 were affected by the bubbler installed in the same stilling tube as the thermistor and were discarded.

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 2005 Technical Report CD. Daily and cumulative precipitation depths at the various stations are compared to precipitation recorded at Fort McMurray A (Environment Canada station 3062693) in Figure C.1-1.

C.1.1.3 Notes to Climate Data Tables

The following notes apply to the monthly climate data (Table C.1-2 and Table C.1-4) and to the daily data provided in the RAMP database (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 not have occurred on the date that it is recorded;
- The precipitation gauges fitted with snowfall adaptors (at C1 and S16) measure total precipitation but do not differentiate between rainfall and snowfall. Precipitation, temperature, and snow on the ground data were all considered in assessing whether a specific precipitation event was rain or snow;
- 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;

Table C.1-2 Summary of 2005 monthly climate data collected at C1 Aurora Climate Station.

| Month | Temperature | | | Total Precip. (mm) | Snowfall Water Equivalent (mm) | Rainfall Depth (mm) | Month End Depth of Snow on Ground (cm) | Mean Relative Humidity (%) | Total Global Solar Radiation (kWh/m ²) | Maximum Sustained Wind Speeds | | |
|-------------|--------------|--------------|--------------|-----------------------|-----------------------------------|------------------------|---|-------------------------------|---|-------------------------------|------------------|-------------------|
| | Min. (°C) | Mean (°C) | Max. (°C) | | | | | | | 5 sec. (km/h) | 2 min. (km/h) | 10 min. (km/h) |
| 2004 | | | | | | | | | | | | |
| January | -45.8 | -22.2 | -8.9 | 0.0 | 0.0 | 0.0 | M | 76.1 | 4.7 | 25.5 | 15.4 | 12.0 |
| February | -33.5 | -8.6 | 13.6 | 12.8 P | 0.2 P | 12.6 P | 40 | 77.1 | 31.9 | 40.2 | 23.6 | 17.8 |
| March | -34.7 | -3.7 | 5.1 | M | M | M | 25 | 61.9 | 89.3 | 45.4 | 26.3 | 22.6 |
| April | -14.1 | 5.3 | 22.3 | 4.4 P | 0.0 P | 4.4 P | 1 | 54.8 | 137.3 | 47.2 | 29.1 | 24.8 |
| May | -10.5 | 8.0 | 27.7 | 54.6 | 2.2 | 52.4 | 0 | 59.5 | 155.5 | 43.6 | 22.8 | 18.0 |
| June | -1.4 | 17.1 | 34.7 | 11.0 | 0.0 | 11.0 | 0 | 56.6 | 196.3 | 40.3 | 22.1 | 18.9 |
| July | 2.0 | 21.3 | 37.5 | 49.0 | 0.0 | 49.0 | 0 | 65.2 | 185.3 | 30.6 | 20.0 | 14.2 |
| August | -1.2 | 15.8 | 36.3 | 33.6 | 0.0 | 33.6 | 0 | 76.6 | 123.2 | 31.6 | 16.1 | 12.9 |
| September | -9.1 P | 9.6 P | 25.0 P | 72.4 P | 0.0 P | 72.4 P | 0 | 78.0 P | 63.5 P | 53.4 P | 33.8 P | 24.1 P |
| October | -16.8 | 3.0 | 22.7 | 13.0 | 1.4 | 11.6 | 6 | 75.7 | 44.7 | 42.4 | 23.6 | 18.6 |
| November | -16.6 P | -0.5 P | 12.6 P | 2.4 P | 0.8 P | 1.6 P | M | 77.6 P | 9.0 P | 40.8 P | 26.8 P | 20.3 P |
| December | M | M | M | M | M | M | M | M | M | M | M | M |
| 2004 Annual | -45.8 | 4.1 | 37.5 | 253.2 | 4.6 | 248.6 | | 69.0 | 1041 | 53.4 | 33.8 | 24.8 |
| 2005 | | | | | | | | | | | | |
| January* | -36.4 P | -12.4 P | 8.4 P | 0.2 P | 0.2 P | 0.0 P | 52 | 83.5 P | 1.9 P | 31.5 P | 19.7 P | 15.4 P |
| February | -29.4 | -10.6 | 11.5 | 27.2 | 1.4 | 25.8 | 40 | 78.7 | 39.9 | 38.8 | 26.9 | 16.8 |
| March | -28.4 | -2.8 | 19.5 | 22.0 | 10.6 | 11.4 | 25 | 69.8 | 87.3 | 36.6 | 22.6 | 17.8 |
| April | -5.9 | 7.3 | 29.9 | 33.0 | 1.0 | 32.0 | 1 | 58.9 | 129 | 44.7 | 28.9 | 20.8 |
| May | -9.6 | 13.0 | 34.6 | 39.6 | 0.0 | 39.6 | 0 | 57.7 | 177 | 38.5 | 21.6 | 18.4 |
| June | 0.8 | 16.8 | 32.2 | 78.2 | 0.0 | 78.2 | 0 | 73.8 | 155 | 55.7 | 26.7 | 19.3 |
| July | 3.8 | 19.2 | 34.8 | 108.6 | 0.0 | 108.6 | 0 | 76.6 | 160 | 45.1 | 23.6 | 15.6 |
| August | 4.0 | 16.2 | 32.9 | 106.2 | 0.0 | 106.2 | 0 | 81.3 | 124 | 49.8 | 29.5 | 23.0 |
| September | -5.5 | 10.9 | 26.7 | 18.8 | 0.0 | 18.8 | 0 | 79.8 | 86.3 | 37.2 | 21.1 | 16.8 |
| October | -9.0 | 5.7 | 20.4 | 2.6 | 0.0 | 2.6 | 6 | 71.9 | 52.5 | 33.9 | 21.6 | 17.8 |
| November | -29.1 | -2.3 | 16.2 | 7.8 | 0.0 | 7.8 | 1 | 84.8 | 12.1 | 41.8 | 24.9 | 20.3 |
| December | -27.4 | -6.3 | 7.8 | 19.6 | 0.0 | 19.6 | 1 | 89.8 | 10.2 | 33.3 | 24.5 | 22.8 |
| 2005 Annual | -36.4 | 4.6 | 34.8 | 463.8 | 13.2 | 450.6 | | 75.6 | 1035 | 55.7 | 29.5 | 23.0 |

See notes in section C.1.1.3.

* January 2005 data include only the period January 19-31.

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

| Station | Parameter | Sensor |
|--|------------------------------|--------------------------------|
| L1 McClelland Lake | Rainfall | Tipping Bucket Rain Gauge |
| S3 Ilyinimin Creek above Kearn Lake | Rainfall | Tipping Bucket Rain Gauge |
| S5A Muskeg River above Muskeg Creek | Barometric Pressure | Pressure Transducer |
| | Water Temperature | Thermistor |
| S14A Elys River at CNRL Bridge | Water Temperature | Thermistor |
| S16 Calumet River near the mouth | Rainfall ¹ | Tipping Bucket Rain/Snow Gauge |
| | Snowfall ¹ | Thermistor |
| | Air Temperature ² | |
| S19 Tar River Lowland Tributary near the mouth | Rainfall ³ | Tipping Bucket Rain Gauge |
| | Snowfall ³ | |

¹ Until May 1.

² Until October 11.

³ After April 27.

- Wind direction is the direction from which the wind is blowing, measured in degrees clockwise from North;
- Mean daily wind speed and direction describe the resultant vector obtained by adding the hourly wind vectors, which in turn were based on 5 second averaged readings. The daily aggregate values were used to determine monthly wind speed values;
- Mean annual wind speed and direction describe the vector resultant of the monthly wind vectors; and
- M = Missing.

C.1.2 2004 Snowcourse Survey Results

Snowcourse surveys were made at sites representing five 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 4 and 11, March 3 and March 9, and April 5 and 9, 2005, with the results shown in Table C.1-5.

Table C.1-4 Summary of 2005 climate data collected at other RAMP climate stations.

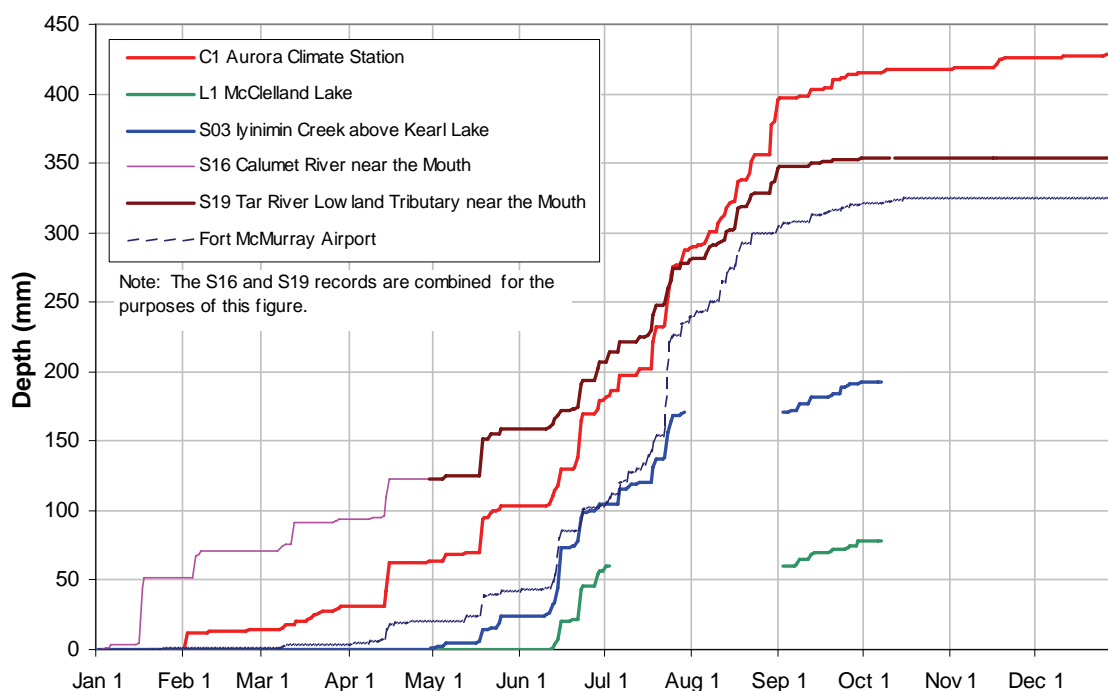
| Station | S3 Iyininimin Creek above Kearl Lake | S19 Tar River Lowland Tributary near the mouth | | S16 Calumet River near the Mouth | | S14A Ells River at CNRL Bridge | S5A Muskeg River above Muskeg Creek | | L1 McClelland Lake |
|------------------------|---|--|---------------------------|---|----------------------------|--------------------------------------|---|---------------------------------|---------------------------|
| Period of Operation | Apr 25-Oct 8 | Apr 27-Oct 7 | Oct 11-Dec 31 | Jan 1-May 1 | Jan 1-Oct 11 | Jul 14-Oct 12 | Jan 1-Nov 2 | Jan 1-Dec 31 | Jun 2-Oct 8 |
| Month | Rainfall Depth (mm) | Rainfall Depth (mm) | Snowfall Depth (mm) | Total Precipitation Depth (mm) | Air Temperature (°C) | Water Temperature (°C) | Water Temperature (°C) | Barometric Pressure (kPa) | Rainfall Depth (mm) |
| Jan | | | | 53.6 | -21.6 | | 1.4 | 98.6 | |
| Feb | | | | 18.8 | -14.4 | | 1.7 | 98.2 | |
| Mar | | | | 23.3 | -6.4 | | 2.0 | 98.0 | |
| Apr | 1.5 P | 0.1 P | | 28.0 | 4.0 | | 3.8 | 98.1 | |
| May | 23.1 | 36.8 | | | 9.3 | | 10.5 | 98.1 | |
| Jun | 80.0 | 47.1 | | | 13.6 | | 15.3 | 97.8 | 56.0 |
| Jul | 66.3 P | 74.0 | | | 15.8 | 18.5 P | 17.4 | 97.5 | |
| Aug | M | 66.4 | | | 13.2 | 16.5 | 16.2 | 98.0 | |
| Sep | 22.9 P | 6.3 | | | 7.7 | 10.7 | 10.7 | 97.6 | 16.5 P |
| Oct | 1.0 P | 0.0 P | 0.7 P | | | 4.8 P | 4.1 | 97.4 | |
| Nov | | | 1.4 | | | | 1.5 P | 97.8 | |
| Dec | | | 20.9 | | | | | 97.9 | |
| Annual ¹ | 103.1 | 230.7 | 23.0 | | | 12.6 | 7.7 | 97.9 | |

P = Partial month.

M = Missing month.

¹ Annual values shown consist of extremes, averages or totals, depending on the parameter.

Figure C.1-1 Precipitation at Fort McMurray and RAMP Climate Stations, 2005.



C.1.3 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.2.4, below.

Table C.1-5 Summary of 2005 snowcourse surveys.

| Terrain Type | Survey Plot No | February 2005 | | March 2005 | | April 2005 | |
|------------------------|----------------|-----------------|----------------------------|-----------------|----------------------------|-----------------|----------------------------|
| | | 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-00-1 | 68.8 | 117 | 63.0 | 119 | 0.0 | 0 |
| | FL-02-3 | 72.8 | 83 | 65.7 | 105 | M | M |
| | FL-04-4 | 70.5 | 100 | 57.3 | 115 | 0 | 0 |
| | FL-04-1 | 70.2 | 113 | 58.5 | 111 | 0.0 | 0 |
| | Mean | 70.6 | 103 | 61.1 | 112 | 0 | 0 |
| Open Land or Lake Area | OP-02-3 (land) | 58.2 | 63 | 55.6 | 50 | M | M |
| | OP-97-1 (land) | 56.1 | 86 | 48.3 | 99 | 0.0 | 0 |

Notes: Survey dates: Feb 4-11, March 3-9, April 5-9.

M = Missing because the site was not accessible due to the poor condition of the access road.

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

| Terrain Type | Survey Plot No | February 2005 | | March 2005 | | April 2005 | |
|--------------------------------|----------------|-----------------|----------------------------|-----------------|----------------------------|-----------------|----------------------------|
| | | Snow Depth (cm) | Snow Water Equivalent (mm) | Snow Depth (cm) | Snow Water Equivalent (mm) | Snow Depth (cm) | Snow Water Equivalent (mm) |
| Open Land or Lake Area, cont'd | OP-04-1 (lake) | 39.5 | 61 | 14.7 | 47 | 0.0 | 0 |
| | OP-99-2 (land) | 62.2 | 97 | 53.0 | 97 | 0.0 | 0 |
| | Mean | 54.0 | 77 | 42.9 | 73 | 0 | 0 |
| Mixed Deciduous | MD-04-1 | 60.8 | 90 | 53.4 | 96 | 24.0 | 70 |
| | MD-04-2 | 52.3 | 82 | 48.0 | 82 | 0.0 | 0 |
| | MD-00-2 | 70.6 | 119 | 61.9 | 121 | 33.0 | 106 |
| | MD-02-4 | 68.7 | 100 | 61.0 | 89 | M | M |
| | MD-04-3 | 71.8 | 122 | 57.2 | 105 | 36.6 | 96 |
| | Mean | 64.8 | 102 | 56.3 | 99 | 23.4 | 68 |
| Jack Pine | JP-04-1 | 58.5 | 90 | 58.1 | 111 | 35.1 | 90 |
| | JP-00-1 | 69.0 | 107 | 60.4 | 106 | 36.2 | 88 |
| | JP-97-2 | 59.3 | 86 | 56.8 | 106 | 35.9 | 91 |
| | Mean | 62.3 | 94 | 58.4 | 108 | 35.7 | 90 |

Notes: Survey dates: Feb 4-11, March 3-9, April 5-9.

M = Missing because the site was not accessible due to the poor condition of the access road.

C.2 HYDROMETRIC DATA COLLECTED IN 2005

C.2.1 RAMP Data

C.2.1.1 Hydrometric Monitoring

Table C.2-1 summarizes the hydrometric monitoring carried out at various stations in 2005. 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, as discussed in Section C.5.

C.2.1.2 Water Temperature

Water temperatures were measured at Station S5A – Muskeg River above Muskeg Creek, and at Station S14A – Elys River above CNRL Bridge. The water temperatures were monitored year round at Station S5A, and Station S14A; however, due to equipment malfunction these measurements only effectively cover the open water season. Water temperatures measured at S5A and S14A during 2005 are shown in Figure C.2-1. Daily mean water temperatures are contained in the RAMP database and are provided on the RAMP report CD.

Table C.2-1 Summary of 2005 hydrometric monitoring.

| Station | Catchment Area (km ²) | Monitored Period 2005 | Maximum Daily Discharge | | Minimum Daily Discharge ¹ | | Runoff Volume ¹ | | Data Quality Assessment ² | |
|---|-----------------------------------|------------------------------|--------------------------|--------------------------|--------------------------------------|--------------------------|----------------------------|--------------------------|--------------------------------------|------------------|
| | | | 2005 (m ³ /s) | Mean (m ³ /s) | 2005 (m ³ /s) | Mean (m ³ /s) | 2005 (dam ³) | Mean (dam ³) | Winter | Open-Water |
| Athabasca River | | | | | | | | | | |
| S24 - Athabasca River below Eymundson Creek | 146,000 | 1 Jan – 31 Dec ³ | 2660 | 2210 | 472 | 334 | 15,500,000 | 12,800,000 | | |
| Athabasca River at McMurray (07DA001) | 133,000 | 1 Jan – 31 Dec | 2410 | 2440 | 486 | 437 | 17,000,000 | 15,800,000 | | |
| Muskeg River Watershed | | | | | | | | | | |
| S2 - Jackpine Creek at Canterra Road | 358 | 1 Jan – 31 Dec | 9.98 | 8.75 | 0.708 | 0.332 | 37,100 | 31,800 | Fair | Good |
| S3 - Iyininim Creek above Kearl Lake | 32.2 | 25 Apr – 8 Oct ³ | 2.23 | 1.36 | 0.043 | 0.065 | 4,540 | 5,370 | - | Good |
| S5 - Muskeg River above Stanley Creek | 395 | 1 Jan – 31 Dec | 14.2 | 9.91 | 0.704 | 0.177 | 38,900 | 26,800 | Good | Good |
| S5A - Muskeg River above Muskeg Creek | 552 | 1 Jan – 31 Dec | 16.9 | 7.43 | 0.760 | 0.492 | 57,200 | 33,400 | Good | Good |
| S7 - Muskeg River near Fort McKay (07DA008) | 1460 | 1 Jan – 31 Dec | 33.8 | 21.1 | 2.86 | 1.08 | 157,000 | 105,000 | Fair | Good |
| S9 - Kearl Lake Outlet | 73.6 | 23 Apr – 31 Dec | 0.91 | 0.711 | 0.224 | 0.062 | 8,190 | 3,970 | Fair | Fair |
| S10 - Wapasu Creek at Canterra Road | 90.7 | 1 Jan – 31 Dec | 4.54 | 2.87 | 0.174 | 0.074 | 9,530 | 7,540 | Fair | Good |
| S20 - Muskeg River Upland | 157 | 23 Apr – 7 Oct ³ | 10.9 | 4.09 | 0.186 | 0.086 | 15,000 | 6,670 | - | Fair |
| S22 - Muskeg Creek near the mouth | 157 | 23 Apr – 7 Oct ³ | 8.07 | 6.61 | 1.01 | 0.239 | 37,800 | 25,200 | - | Good |
| S28 - Khahago Creek below Blackfly Creek | 212 | 25 Apr – 8 Oct ³ | 4.19 | 3.66 | 0.453 | 0.151 | 17,700 | 14,600 | - | Fair |
| S33 - Muskeg River at the Aurora/Albian Boundary | 728 | 1 Jan – 31 Dec | 28.9 | 12.2 | 1.19 | 0.501 | 84,700 | 50,800 | Good | Good |
| L2 - Kearl Lake | 72.6 | 1 Jan – 31 Dec | n/a ⁴ | n/a ⁴ | n/a ⁴ | n/a ⁴ | n/a ⁴ | n/a ⁴ | n/a ⁴ | n/a ⁴ |
| Athabasca River Tributaries Upstream of Fort McMurray | | | | | | | | | | |
| S29 - Christina River near Chard (07CE002) | 4,860 | 1 Jan – 31 Dec | 116 | 98.9 | 10.3 | 5.99 | 663,000 | 342,000 | | |
| S31 - Hangingstone Creek at North Star Road | 160 | 24 Apr – 10 Oct ³ | 15.7 | 8.43 | 0.302 | 0.085 | 23,800 | 9,600 | - | Poor |
| S32 - Surmont Creek at Highway 881 | 158 | 24 Apr – 9 Oct3 | 7.76 | 5.33 | 0.637 | 0.084 | 26,700 | 11,300 | - | Good |

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

² Quality assessment refers to RAMP discharge data only.

³ Runoff volume and minimum daily discharge are based on a shorter period than at other stations.

⁴ Not applicable.

⁵ Higher peak occurred at S14 outside the monitoring period.

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

| Station | Catchment Area (km ²) | Monitored Period 2005 | Maximum Daily Discharge | | Minimum Daily Discharge ¹ | | Runoff Volume ¹ | | Data Quality Assessment ² | |
|---|-----------------------------------|------------------------------|--------------------------|--------------------------|--------------------------------------|--------------------------|----------------------------|--------------------------|--------------------------------------|------------------|
| | | | 2005 (m ³ /s) | Mean (m ³ /s) | 2005 (m ³ /s) | Mean (m ³ /s) | 2005 (dam ³) | Mean (dam ³) | Winter | Open-Water |
| Athabasca River Tributaries Downstream of Fort McMurray | | | | | | | | | | |
| S6 - Mills Creek at Highway 63 | 23.8 | 21 Apr – 31 Dec | 0.21 | 0.19 | 0.026 | 0.019 | 1,360 | 750 | Good | Fair |
| S11 - Poplar Creek at Highway 63 (07DA007) | 422 | 24 Apr – 5 Oct ³ | 15.7 | 8.26 | 0.482 | 0.122 | 19,100 | 23,600 | - | Poor |
| S14 - Ells River above Joslyn Creek | 2,450 | 25 Apr – 8 Oct ³ | 47.5 ⁵ | 30.9 | 4.84 | 5.30 | 181,000 | 147,000 | - | Fair |
| S14A - Ells River at CNRL bridge | 2,430 | 1 Jan – 31 Dec ³ | 62.3 | 24.3 | 4.89 | 6.78 | 198,000 | 198,000 | Fair | Fair |
| S15 - Tar River near the mouth | 301 | 27 Apr – 11 Oct ³ | 6.29 | 6.27 | 0.388 | 0.307 | 13,500 | 12,200 | - | Good |
| S18A - Calumet River Upland Tributary | 53.4 | 25 Apr – 8 Oct ³ | 0.57 | 1.15 | 0.001 | 0.003 | 145 | 1,100 | - | Poor |
| S19 - Tar River Lowland Tributary near the mouth | 11.5 | 27 Apr – 7 Oct ³ | 0.08 | 0.07 | 0.004 | 0.002 | 164 | 273 | - | Fair |
| S26 - MacKay River near Fort McKay (07DB001) | 5570 | 1 Jan – 31 Dec | 99.7 | 42.1 | 3.50 | 3.58 | 401,000 | 371,000 | | |
| S27 - Firebag River near the mouth (07DC001) | 5990 | 1 Jan – 31 Dec | 192 | 141 | 28.0 | 15.2 | 928,000 | 583,000 | Fair | Good |
| S34 - Tar River above CNRL Lake | 136 | 26 Apr – 8 Oct ³ | 10.2 | | 0.50 | | 8,480 | | - | Fair |
| L1 - McClelland Lake | 28 | 2 Jun – 31 Dec ³ | n/a ⁴ | n/a ⁴ | n/a ⁴ | 0.001 | n/a ⁴ | 565 | n/a ⁴ | n/a ⁴ |
| L3 - Isadore's Lake | 191 | 1 Jan – 31 Dec | n/a ⁴ | n/a ⁴ | n/a ⁴ | | n/a ⁴ | | n/a ⁴ | n/a ⁴ |

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

² Quality assessment refers to RAMP discharge data only.

³ Runoff volume and minimum daily discharge are based on a shorter period than at other stations.

⁴ Not applicable.

⁵ Higher peak occurred at S14 outside the monitoring period.

Figure C.2-1 2005 daily water temperatures.



C.2.1.3 Suspended Sediment

Suspended sediment samples were collected at 24 RAMP streamflow stations for a total of 106 measurements during 2005. The suspended sediment data are provided in Table C.2-2.

C.2.2 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 report CD.

C.2.3 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 are provided in Section C.2.4.

C.2.4 Inventory of Hydrologic Data in the RAMP Database

A complete inventory of the daily hydrologic data contained in the RAMP database are provided in Table C.2-4.

Table C.2-2 Suspended sediment data collected at RAMP hydrometric stations in 2005.

| Station | Apr 23-28 | May 29-30 | Jun 01-02 | Jul 11-16 | Aug 31 | Sep 01-05 | Oct 05-12 |
|---------|--------------|--------------|--------------|--------------|-----------|--------------|--------------|
| L1 | | | 4 | <3 | | 3 | 81 |
| S2 | 26 | 5 | | <3 | | <3 | <3 |
| S3 | 584 | | 16 | 7 | | 7 | 7 |
| S5 | | | <3 | 79 | | 8 | 4 |
| S5A | 4 | <3 | | <3 | 4 | | <3 |
| S6 | <3 | 7 | | <3 | 7 | | <3 |
| S7 | 17 | 4 | | <3 | | 3 | <3 |
| S9 | <3 | 8 | | 7 | | 7 | 60 |
| S10 | 13 | <3 | | <3 | | <3 | <3 |
| S11 | 71 | 8 | | 5 | 20 | | 4 |
| S14 | 814 | | 71 | 8 | | 61 | 4 |
| S14A | 436 | | 47 | <3 | 21 | | 7 |
| S15 | 543 | | 42 | 15 | 144 | | <3 |
| S16 | 6 | | | | | | |
| S18A | 9 | | 6 | 6 | | 5 | 3 |
| S19 | <3 | | <3 | 18 | 8 | | 8 |
| S20 | 18 | <3 | | <3 | | 4 | <3 |
| S22 | 27 | 6 | | <3 | | 8 | 3 |
| S24 | 238 | | 258 | 98 | | 47 | 13 |
| S28 | 4 | | <3 | <3 | | 13 | <3 |
| S31 | 21 | 9 | | 4 | | 5 | <3 |
| S32 | 258 | 89 | | 18 | | 26 | <3 |
| S33 | 3 | 3 | | <3 | 5 | | <3 |
| S34 | 298 | | 15 | 6 | | 67 | <3 |

Table C.2-3 Hydrologic information received from oil sands operators.

| Operator | Component | Location | Annual Volume (dam ³) | Daily Discharge Provided |
|----------------------------|---|------------------------------|-----------------------------------|--------------------------|
| Albian - Muskeg River Mine | Withdrawals from the Athabasca River | | 21,900 | √ |
| | Releases | | 0 | |
| CNRL Horizon | Streamflows | | | |
| | Calumet River | 458953 E; 6362309 N (NAD 27) | 6,100 | √ |
| | Tar River | 458418 E; 6353371 N (NAD 83) | 19,300 | √ |
| | Joslyn Creek | 456352 E; 6349600 N (NAD 27) | 7,420 | √ |
| | Withdrawals from the Athabasca River | | | |
| | North Gravel Pit | SW12-97-11-W4 | 38.1 | |
| | Athabasca Temporary Water Intake | SW14-97-11-W4 | 356 | √ |
| | Releases to the Athabasca River | | | |
| | Release from Temporary Wastewater Treatment Plant | 7-21-96-11-W4 | 16.9 | √ |
| Petro-Canada (Fort Hills) | Withdrawals from the Athabasca River | | 271 | |
| Suncor | Withdrawals from the Athabasca River | 471871 E; 6317855 N (NAD 83) | 48,000 | |
| | Releases to the Athabasca River | | | |
| | Cooling Water / Pond E Duckpond | 471848 E; 6317949 N | 8,207 | |
| | Industrial Wastewater / Pond C Duckpond | 471848 E; 6317949 N | 0 | |
| | Lease 86/17 Domestic Sewage Lagoons | 470680 E; 6319193 N | 151 | |
| Syncrude | Withdrawals from the Athabasca River | NW35-92-10-W4 | 28,200 | |
| | Diversions | | | |
| | Clean water diversion to Stanley Creek | SW-21-96-9-W4 | 4,360 | |
| | Poplar Creek Spillway releases | | 17,400 | √ |

Table C.2-4 Daily hydrologic data currently contained in the RAMP database.

| <i>Station</i> | <i>Name</i> | <i>Time Step</i> | <i>Data Type</i> | <i>From Date</i> |
|----------------|--|------------------|---------------------------------|------------------|
| 07CD001 | Clearwater River at Draper | Daily | 1 - Discharge | 17-Dec-30 |
| 07CD004 | Hangingstone River at Fort McMurray | Daily | 1 - Discharge | 12-Mar-65 |
| 07CD005 | Clearwater River above Christina River | Daily | 1 - Discharge | 16-Jun-66 |
| 07CE001 | Gregoire Lake near Fort McMurray | Daily | 8 - Water Level | 01-Aug-69 |
| 07CE002 | Christina River near Chard | Daily | 1 - Discharge | 20-May-82 |
| 07DA001 | Athabasca River below McMurray | Daily | 1 - Discharge | 15-Dec-30 |
| 07DA006 | Steepbank River near Fort McMurray | Daily | 1 - Discharge | 20-Sep-72 |
| 07DA007 | Poplar Creek near Fort McMurray | Daily | 1 - Discharge | 16-Mar-72 |
| 07DA008 | Muskeg River near Fort McKay | Daily | 1 - Discharge | 01-Jan-74 |
| 07DA015 | Tar River near the Mouth | Daily | 1 - Discharge | 24-Aug-75 |
| 07DA016 | Joslyn Creek near Fort McKay | Daily | 1 - Discharge | 28-Jul-75 |
| 07DA017 | Ells River near the mouth | Daily | 1 - Discharge | 28-Jul-75 |
| 07DA018 | Beaver River above Syncrude | Daily | 1 - Discharge | 19-Aug-75 |
| 07DB001 | MacKay River near Fort McKay | Daily | 1 - Discharge | 15-Mar-72 |
| 07DC001 | Firebag River near the Mouth | Daily | 1 - Discharge | 06-May-71 |
| 3060110 | Algar LO | Daily | 001 - Daily Maximum Temperature | 01-Aug-65 |
| | | Daily | 002 - Daily Minimum Temperature | 01-Aug-65 |
| | | Daily | 003 - Daily Mean Temperature | 01-Aug-65 |
| | | Daily | 010 - Total Rainfall | 17-Apr-59 |
| | | Daily | 012 - Total Precipitation | 06-May-04 |
| 3060700 | Birch Mountain LO | Daily | 001 - Daily Maximum Temperature | 01-May-66 |
| | | Daily | 002 - Daily Minimum Temperature | 01-May-66 |
| | | Daily | 003 - Daily Mean Temperature | 01-May-66 |
| | | Daily | 010 - Total Rainfall | 01-Jun-60 |
| | | Daily | 012 - Total Precipitation | 01-May-04 |

Table C.2-4 (Cont'd., 2 of 7)

| <i>Station</i> | <i>Name</i> | <i>Time Step</i> | <i>Data Type</i> | <i>From Date</i> |
|----------------|------------------|------------------|---------------------------------|------------------|
| 3060705 | Bitumont LO | Daily | 001 - Daily Maximum Temperature | 04-May-62 |
| | | Daily | 002 - Daily Minimum Temperature | 05-May-62 |
| | | Daily | 003 - Daily Mean Temperature | 05-May-62 |
| | | Daily | 010 - Total Rainfall | 04-May-62 |
| | | Daily | 012 - Total Precipitation | 21-Apr-04 |
| | | | | |
| 3060922 | Buckton LO | Daily | 001 - Daily Maximum Temperature | 01-Jun-65 |
| | | Daily | 002 - Daily Minimum Temperature | 01-Jun-65 |
| | | Daily | 003 - Daily Mean Temperature | 01-Jun-65 |
| | | Daily | 010 - Total Rainfall | 01-Jun-65 |
| | | Daily | 012 - Total Precipitation | 14-May-04 |
| | | | | |
| 3061580 | Christina LO | Daily | 001 - Daily Maximum Temperature | 01-Jun-67 |
| | | Daily | 002 - Daily Minimum Temperature | 01-Jun-67 |
| | | Daily | 003 - Daily Mean Temperature | 01-Jun-67 |
| | | Daily | 010 - Total Rainfall | 01-Jun-67 |
| | | | | |
| 3061800 | Conklin LO | Daily | 001 - Daily Maximum Temperature | 01-May-65 |
| | | Daily | 002 - Daily Minimum Temperature | 02-May-65 |
| | | Daily | 003 - Daily Mean Temperature | 02-May-65 |
| | | Daily | 010 - Total Rainfall | 21-May-54 |
| | | Daily | 012 - Total Precipitation | 22-Apr-04 |
| | | | | |
| 3061930 | Cowpar LO | Daily | 001 - Daily Maximum Temperature | 02-May-65 |
| | | Daily | 002 - Daily Minimum Temperature | 01-May-65 |
| | | Daily | 003 - Daily Mean Temperature | 02-May-65 |
| | | Daily | 010 - Total Rainfall | 01-Jul-57 |
| | | Daily | 012 - Total Precipitation | 01-May-04 |
| | | | | |
| 3062300 | Ells LO | Daily | 001 - Daily Maximum Temperature | 01-May-64 |
| | | Daily | 002 - Daily Minimum Temperature | 01-May-64 |
| | | Daily | 003 - Daily Mean Temperature | 01-May-64 |
| | | Daily | 010 - Total Rainfall | 18-Apr-61 |
| | | Daily | 012 - Total Precipitation | 05-May-04 |
| | | | | |
| 3062693 | Fort McMurray A | Daily | 001 - Daily Maximum Temperature | 01-Jan-44 |
| | | Daily | 002 - Daily Minimum Temperature | 01-Jan-44 |
| | | Daily | 003 - Daily Mean Temperature | 01-Jan-44 |
| | | Daily | 010 - Total Rainfall | 01-Jan-44 |
| | | Daily | 011 - Total Snowfall | 01-Jan-44 |
| | | Daily | 012 - Total Precipitation | 01-Jan-44 |
| | | | | |
| 3062696 | Fort McMurray CS | Daily | 001 - Daily Maximum Temperature | 01-May-96 |
| | | Daily | 002 - Daily Minimum Temperature | 01-May-96 |
| | | Daily | 010 - Total Rainfall | 01-May-96 |
| | | Daily | 011 - Total Snowfall | 01-May-96 |
| | | Daily | 012 - Total Precipitation | 01-May-96 |
| | | Hourly | 074 - Dewpoint Temperature | 18-Sep-99 |
| | | Hourly | 076 - Hourly Wind Speed | 15-Mar-03 |
| | | Hourly | 078 - Dry bulb temperature | 18-Sep-99 |

Table C.2-4 (Cont'd., 3 of 7)

| <i>Station</i> | <i>Name</i> | <i>Time Step</i> | <i>Data Type</i> | <i>From Date</i> |
|----------------|--------------------|------------------|---------------------------------|------------------|
| 3062889 | Gordon Lake LO | Daily | 001 - Daily Maximum Temperature | 01-May-64 |
| | | Daily | 002 - Daily Minimum Temperature | 01-Jun-64 |
| | | Daily | 003 - Daily Mean Temperature | 01-Jun-64 |
| | | Daily | 010 - Total Rainfall | 01-May-64 |
| | | Daily | 012 - Total Precipitation | 06-May-04 |
| 3062905 | Grande Lookout | Daily | 001 - Daily Maximum Temperature | 05-Aug-65 |
| | | Daily | 002 - Daily Minimum Temperature | 05-Aug-65 |
| | | Daily | 010 - Total Rainfall | 04-Aug-65 |
| | | Daily | 011 - Total Snowfall | 01-Aug-65 |
| | | Daily | 012 - Total Precipitation | 04-Aug-65 |
| 3063120 | Heart Lake Lookout | Daily | 001 - Daily Maximum Temperature | 14-Apr-05 |
| | | Daily | 002 - Daily Minimum Temperature | 15-Apr-05 |
| | | Daily | 003 - Daily Mean Temperature | 17-Apr-05 |
| | | Daily | 010 - Total Rainfall | 14-Apr-05 |
| 3063563 | Johnson Lake LO | Daily | 001 - Daily Maximum Temperature | 01-May-65 |
| | | Daily | 002 - Daily Minimum Temperature | 01-May-65 |
| | | Daily | 003 - Daily Mean Temperature | 01-May-65 |
| | | Daily | 010 - Total Rainfall | 01-May-65 |
| | | Daily | 012 - Total Precipitation | 14-May-04 |
| 3064528 | Mildred Lake | Daily | 001 - Daily Maximum Temperature | 01-Jan-94 |
| | | Daily | 002 - Daily Minimum Temperature | 01-Jan-94 |
| | | Daily | 003 - Daily Mean Temperature | 01-Jan-94 |
| | | Daily | 010 - Total Rainfall | 01-Jan-94 |
| | | Daily | 011 - Total Snowfall | 01-Jan-94 |
| | | Daily | 012 - Total Precipitation | 01-Jan-94 |
| 3064531 | Mildred Lake | Daily | 001 - Daily Maximum Temperature | 04-Jul-73 |
| | | Daily | 002 - Daily Minimum Temperature | 05-Jul-73 |
| | | Daily | 003 - Daily Mean Temperature | 05-Jul-73 |
| | | Daily | 010 - Total Rainfall | 01-Jul-73 |
| | | Daily | 011 - Total Snowfall | 01-Jul-73 |
| | | Daily | 012 - Total Precipitation | 01-Jul-73 |
| 3064740 | Muskeg LO | Daily | 001 - Daily Maximum Temperature | 01-Aug-65 |
| | | Daily | 002 - Daily Minimum Temperature | 01-Aug-65 |
| | | Daily | 003 - Daily Mean Temperature | 01-Aug-65 |
| | | Daily | 010 - Total Rainfall | 27-Apr-65 |
| | | Daily | 012 - Total Precipitation | 07-May-04 |
| 3065492 | Richardson LO | Daily | 001 - Daily Maximum Temperature | 03-Jun-64 |
| | | Daily | 002 - Daily Minimum Temperature | 01-Jun-64 |
| | | Daily | 003 - Daily Mean Temperature | 03-Jun-64 |
| | | Daily | 010 - Total Rainfall | 25-Apr-60 |
| | | Daily | 012 - Total Precipitation | 07-May-04 |

Table C.2-4 (Cont'd., 4 of 7)

| <i>Station</i> | <i>Name</i> | <i>Time Step</i> | <i>Data Type</i> | <i>From Date</i> |
|----------------|-----------------------------------|---------------------------------|------------------|------------------|
| 3065560 | Round Hill LO | | | |
| | Daily | 001 - Daily Maximum Temperature | | 06-Jul-51 |
| | Daily | 002 - Daily Minimum Temperature | | 06-Jul-51 |
| | Daily | 003 - Daily Mean Temperature | | 06-Jul-51 |
| | Daily | 010 - Total Rainfall | | 28-Apr-52 |
| | Daily | 012 - Total Precipitation | | 01-May-04 |
| 3066160 | Stoney Mountain LO | | | |
| | Daily | 001 - Daily Maximum Temperature | | 01-May-64 |
| | Daily | 002 - Daily Minimum Temperature | | 01-May-64 |
| | Daily | 003 - Daily Mean Temperature | | 01-May-64 |
| | Daily | 010 - Total Rainfall | | 01-May-54 |
| | Daily | 012 - Total Precipitation | | 19-Apr-04 |
| 3066364 | Tar Island | | | |
| | Daily | 001 - Daily Maximum Temperature | | 01-Apr-70 |
| | Daily | 002 - Daily Minimum Temperature | | 01-Apr-70 |
| | Daily | 003 - Daily Mean Temperature | | 01-Apr-70 |
| | Daily | 010 - Total Rainfall | | 01-Jun-70 |
| 3066380 | Thickwood LO | | | |
| | Daily | 001 - Daily Maximum Temperature | | 02-Aug-57 |
| | Daily | 002 - Daily Minimum Temperature | | 02-Aug-57 |
| | Daily | 003 - Daily Mean Temperature | | 02-Aug-57 |
| | Daily | 010 - Total Rainfall | | 08-Apr-57 |
| | Daily | 011 - Total Snowfall | | 08-Apr-57 |
| | Daily | 012 - Total Precipitation | | 08-Apr-57 |
| 3067590 | Winefred LO | | | |
| | Daily | 001 - Daily Maximum Temperature | | 01-May-65 |
| | Daily | 002 - Daily Minimum Temperature | | 01-May-65 |
| | Daily | 003 - Daily Mean Temperature | | 01-May-65 |
| | Daily | 010 - Total Rainfall | | 01-May-57 |
| | Daily | 012 - Total Precipitation | | 03-May-04 |
| 3073792 | Legend LO | | | |
| | Daily | 001 - Daily Maximum Temperature | | 06-May-62 |
| | Daily | 002 - Daily Minimum Temperature | | 06-May-62 |
| | Daily | 003 - Daily Mean Temperature | | 06-May-62 |
| | Daily | 010 - Total Rainfall | | 06-May-62 |
| | Daily | 012 - Total Precipitation | | 12-May-04 |
| ALBATH | Albian Athabasca River Withdrawal | | | |
| | Daily | 1 - Discharge | | 01-Jan-04 |
| AUCWD | Aurora Clean Water Diversion | | | |
| | Daily | 1 - Discharge | | 18-May-03 |
| CR1 | Calumet River | | | |
| | Daily | 1 - Discharge | | 04-May-05 |
| JC1 | Joslyn Creek | | | |
| | Daily | 1 - Discharge | | 04-May-05 |

Table C.2-4 (Cont'd., 5 of 7)

| <i>Station</i> | <i>Name</i> | <i>Time Step</i> | <i>Data Type</i> | <i>From Date</i> |
|----------------|---|-------------------------|------------------|------------------|
| L1 | McClelland Lake | | | |
| | Daily | 010 - Total Rainfall | | 26-Apr-04 |
| | Daily | 1 - Discharge | | 30-Apr-99 |
| | Daily | 8 - Water Level | | 22-Jun-97 |
| L2 | Kearl Lake | | | |
| | Daily | 8 - Water Level | | 19-Jan-89 |
| L3 | Isadore's Lake | | | |
| | Daily | 8 - Water Level | | 22-Feb-00 |
| POPCKSP | Poplar Creek Spillway Release | | | |
| | Daily | 1 - Discharge | | 23-Mar-04 |
| RCHRISLK | Christina Lake near Winefred Lake | | | |
| | Daily | 010 - Total Rainfall | | 28-Sep-01 |
| S01 | Alsands Drain | | | |
| | Daily | 1 - Discharge | | 10-Aug-95 |
| | Daily | 8 - Water Level | | 16-Apr-97 |
| S02 | Jackpine Creek at Canterra Road | | | |
| | Daily | 1 - Discharge | | 06-May-95 |
| | Daily | 8 - Water Level | | 17-Apr-97 |
| S03 | Iyininim Creek above Kearl Lake | | | |
| | Daily | 010 - Total Rainfall | | 16-May-04 |
| | Daily | 1 - Discharge | | 18-Jan-89 |
| | Daily | 8 - Water Level | | 20-Apr-89 |
| S04 | Blackfly Creek near the Mouth | | | |
| | Daily | 8 - Water Level | | 15-Feb-89 |
| S05 | Muskeg River above Stanley Creek | | | |
| | Daily | 1 - Discharge | | 04-May-03 |
| | Daily | 8 - Water Level | | 04-May-03 |
| S05A | Muskeg River above Muskeg Creek | | | |
| | Daily | 1 - Discharge | | 11-Aug-95 |
| | Daily | 8 - Water Level | | 17-Apr-97 |
| | Daily | 998 - Water Temperature | | 27-Apr-05 |
| S06 | Mills Creek at Highway 63 | | | |
| | Daily | 1 - Discharge | | 16-Apr-97 |
| | Daily | 8 - Water Level | | 16-Apr-97 |
| S07 | Muskeg River near Fort MacKay (07DA008) | | | |
| | Daily | 1 - Discharge | | 01-Jan-74 |
| | Daily | 8 - Water Level | | 01-Jan-00 |
| S08 | Stanley Creek near the Mouth | | | |
| | Daily | 1 - Discharge | | 03-May-03 |
| | Daily | 8 - Water Level | | 14-Sep-99 |
| S09 | Kearl Lake Outlet | | | |
| | Daily | 1 - Discharge | | 18-Jan-89 |
| | Daily | 8 - Water Level | | 18-Jan-89 |
| S10 | Wapasu Creek at Canterra Road | | | |
| | Daily | 1 - Discharge | | 08-May-97 |
| | Daily | 8 - Water Level | | 08-May-97 |

Table C.2-4 (Cont'd., 6 of 7)

| <i>Station</i> | <i>Name</i> | <i>Time Step</i> | <i>Data Type</i> | <i>From Date</i> |
|----------------|--|------------------|------------------------------|------------------|
| S11 | Poplar Creek at Highway 63 (07DA007) | Daily | 1 - Discharge | 16-Mar-72 |
| | | Daily | 8 - Water Level | 05-May-95 |
| S12 | Fort Creek at Highway 63 | Daily | 8 - Water Level | 02-Apr-00 |
| | | | | |
| S13 | Albian Pond 3 Outlet | Daily | 8 - Water Level | 02-Mar-00 |
| | | | | |
| S14 | Ells River above Joslyn Creek | Daily | 1 - Discharge | 28-Jul-75 |
| | | Daily | 8 - Water Level | 13-May-01 |
| S14A | Ells River at CNRL Bridge | Daily | 1 - Discharge | 30-Oct-04 |
| | | Daily | 8 - Water Level | 30-Oct-04 |
| | | Daily | 998 - Water Temperature | 14-Jul-05 |
| S15 | Tar River near the Mouth (07DA015) | Daily | 1 - Discharge | 24-Aug-75 |
| | | Daily | 8 - Water Level | 09-May-01 |
| S16 | Calumet River near the Mouth | Daily | 003 - Daily Mean Temperature | 01-Jan-04 |
| | | Daily | 010 - Total Rainfall | 11-Apr-04 |
| | | Daily | 011 - Total Snowfall | 01-Jan-04 |
| | | Daily | 1 - Discharge | 12-May-01 |
| | | Daily | 8 - Water Level | 12-May-01 |
| | | Daily | 998 - Water Temperature | 27-Jun-04 |
| S17 | Tar River Upland Tributary | Daily | 1 - Discharge | 12-May-01 |
| | | Daily | 8 - Water Level | 12-May-01 |
| S18A | Calumet River Upland Tributary | Daily | 1 - Discharge | 10-Jun-02 |
| | | Daily | 8 - Water Level | 10-Jun-02 |
| S19 | Tar River Lowland Tributary near the Mouth | Daily | 010 - Total Rainfall | 27-Apr-04 |
| | | Daily | 1 - Discharge | 09-May-01 |
| | | Daily | 8 - Water Level | 09-May-01 |
| S20 | Muskeg River Upland | Daily | 1 - Discharge | 09-May-01 |
| | | Daily | 8 - Water Level | 09-May-01 |
| S21 | Shelley Creek near the Mouth | Daily | 1 - Discharge | 04-May-03 |
| | | Daily | 8 - Water Level | 14-May-01 |
| S22 | Muskeg Creek near the Mouth | Daily | 1 - Discharge | 17-Jan-89 |
| | | Daily | 8 - Water Level | 17-Jan-89 |
| S23 | Aurora Boundary Weir | Daily | 8 - Water Level | 01-Jan-01 |
| | | | | |

Table C.2-4 (Cont'd., 7 of 7)

| <i>Station</i> | <i>Name</i> | <i>Time Step</i> | <i>Data Type</i> | <i>From Date</i> |
|----------------|--|------------------|------------------|------------------|
| S24 | Athabasca River below Eymundson Creek | Daily | 1 - Discharge | 21-Jun-01 |
| | | Daily | 8 - Water Level | 21-Jun-01 |
| S26 | Mackay River near Fort McKay (07DB001) | Daily | 1 - Discharge | 15-Mar-72 |
| | | Daily | 8 - Water Level | 31-Oct-01 |
| S27 | Firebag River near the Mouth (07DC001) | Daily | 1 - Discharge | 06-May-71 |
| | | Daily | 8 - Water Level | 01-Jan-02 |
| S28 | Khahago Creek below Black Fly Creek | Daily | 1 - Discharge | 19-Jan-89 |
| | | Daily | 8 - Water Level | 19-Jan-89 |
| S29 | Christina River near Chard (07CE002) | Daily | 1 - Discharge | 20-May-82 |
| | | Daily | 8 - Water Level | 13-Jan-02 |
| S31 | Hangingstone Creek at North Star Road | Daily | 1 - Discharge | 10-Apr-02 |
| | | Daily | 8 - Water Level | 10-Apr-02 |
| S32 | Surmont Creek at Highway 881 | Daily | 1 - Discharge | 18-May-02 |
| | | Daily | 8 - Water Level | 18-May-02 |
| S33 | Muskeg River at the Aurora / Albian Boundary | Daily | 1 - Discharge | 01-May-03 |
| | | Daily | 8 - Water Level | 01-May-03 |
| S34 | Tar River above CNRL Lake | Daily | 1 - Discharge | 26-Apr-05 |
| | | Daily | 8 - Water Level | 26-Apr-05 |
| SUNATH | Suncor Athabasca River Withdrawal | Daily | 1 - Discharge | 01-Jan-02 |
| TR1 | Tar River | Daily | 1 - Discharge | 03-May-05 |

C.2.5 Hydrometric Details

C.2.5.1 2005 Hydrographs in Historical Context

Discharge and water level hydrographs for 2005 for each RAMP station are presented in Figure C.2-2 through Figure C.2-29 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.

C.2.5.2 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.2-30 through Figure C.2-55 below. The figures are organized by station, and the stations are presented in numerical order.

Figure C.2-2 2005 discharge hydrograph and historical context for Station S3, Iyininmin Creek above Kearl Lake.

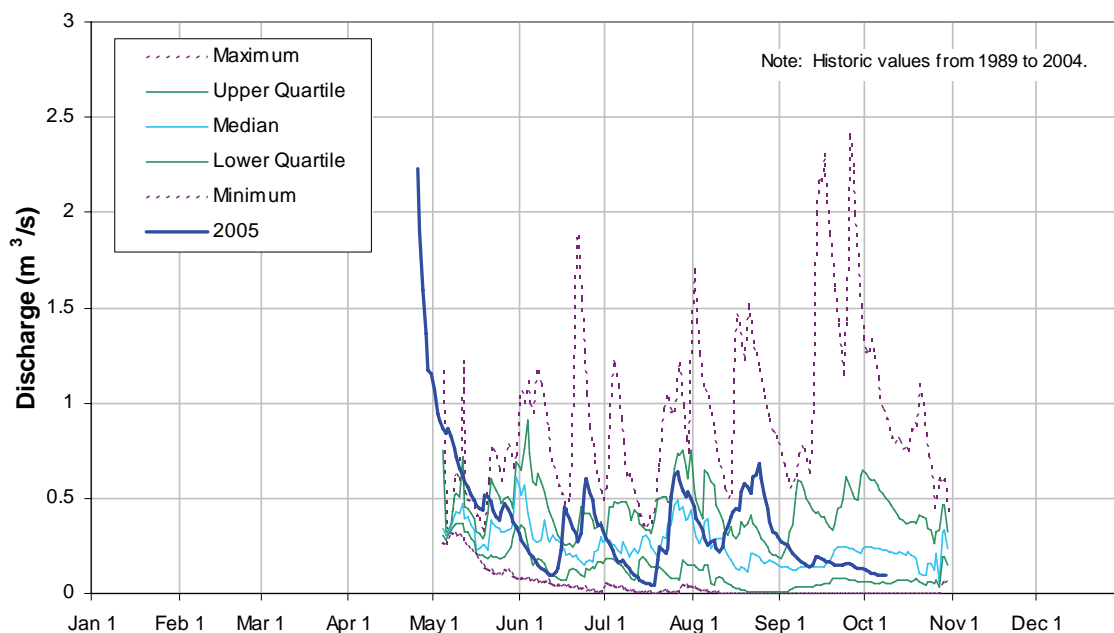


Figure C.2-3 2005 water level hydrograph and historical context for Station L1, McClelland Lake.

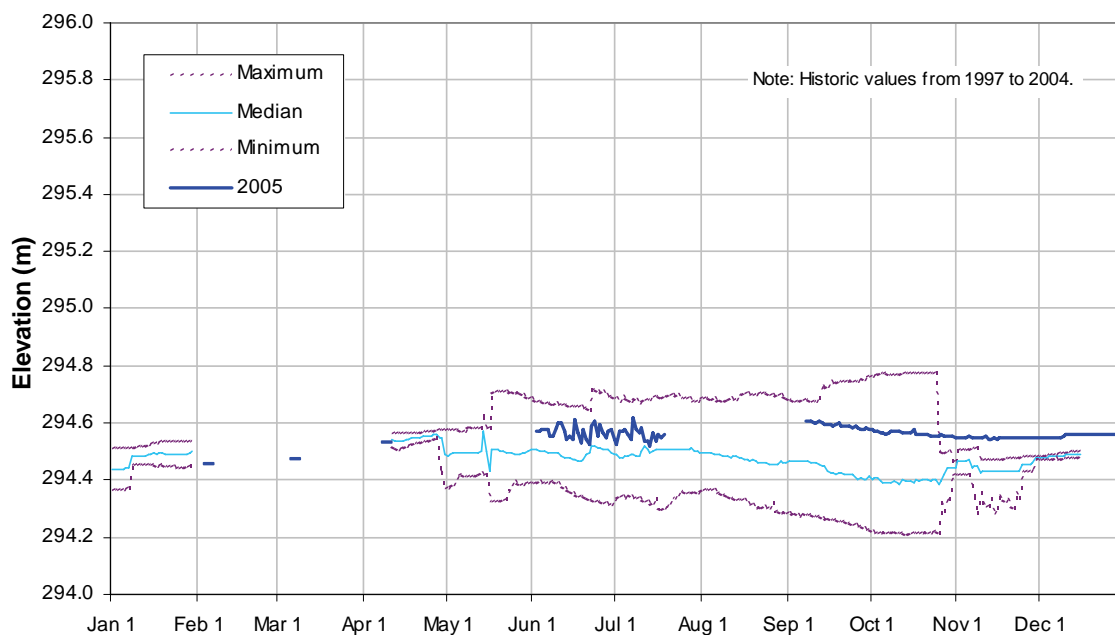


Figure C.2-4 2005 water level hydrograph and historical context for Station L2, Kearl Lake.

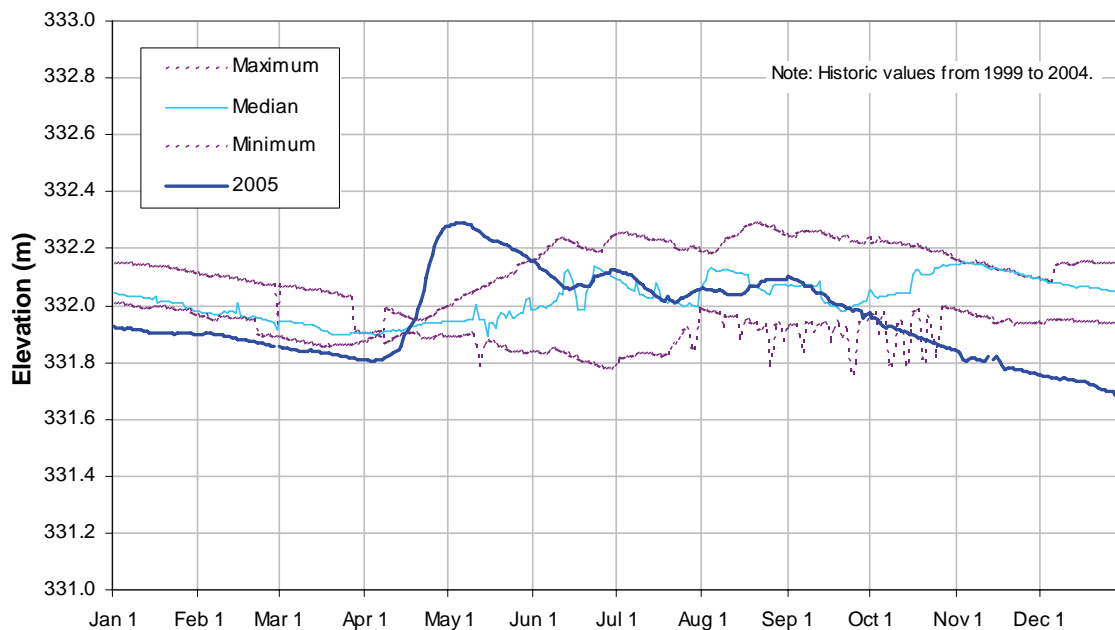


Figure C.2-5 2005 water level hydrograph and historical context for Station L3, Isadore's Lake.

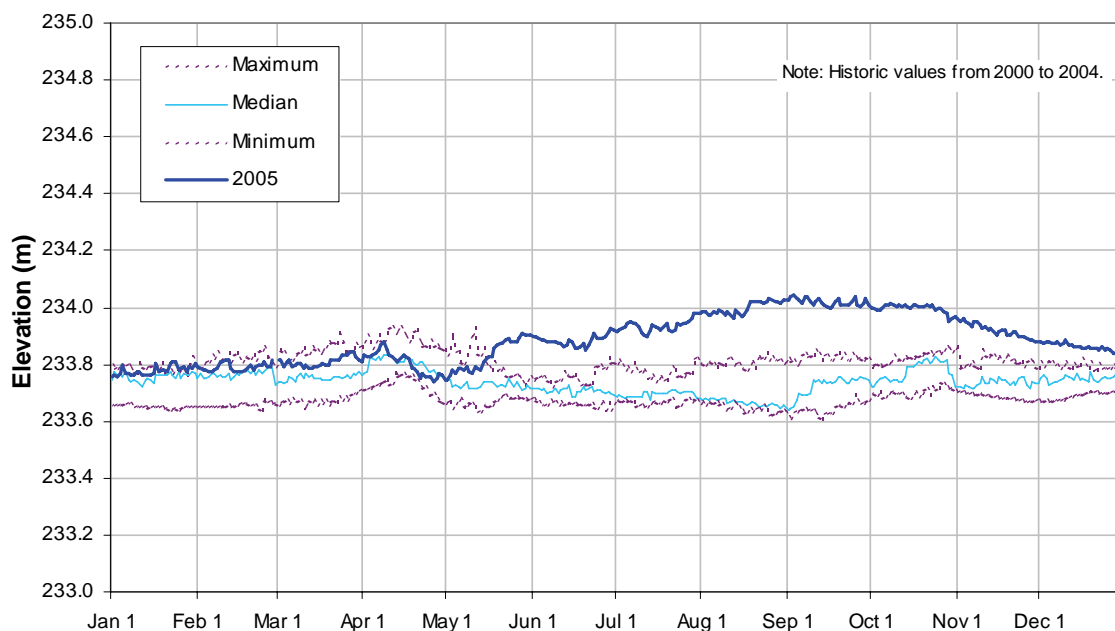


Figure C.2-6 2005 discharge hydrograph and historical context for Station S2, Jackpine Creek at Canterra Road.

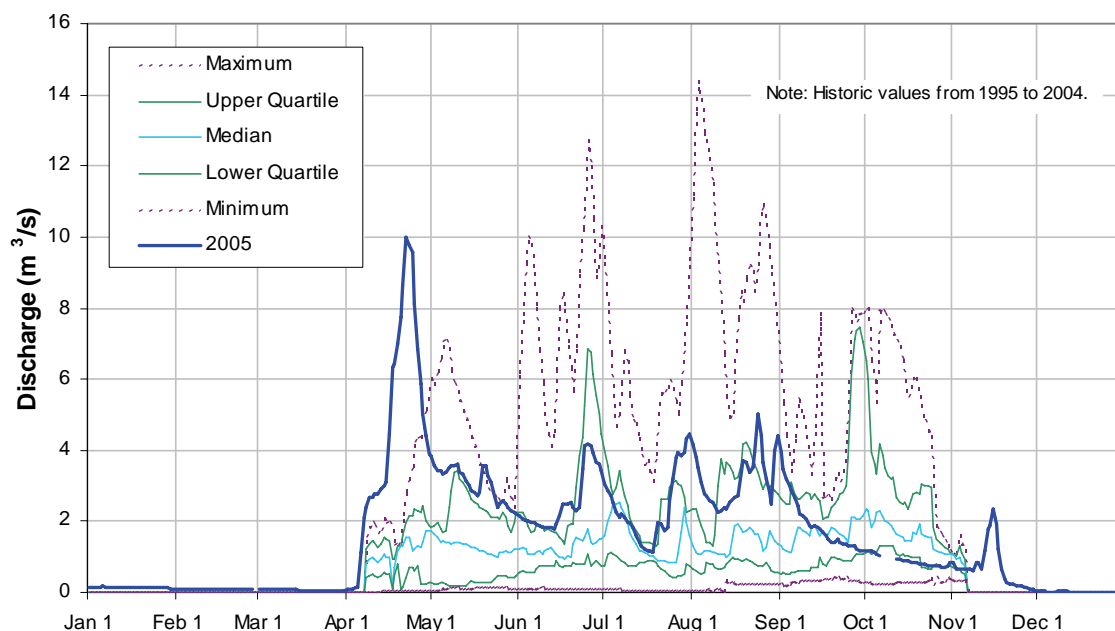


Figure C.2-7 2005 discharge hydrograph and historical context for Station S5, Muskeg River above Stanley Creek.

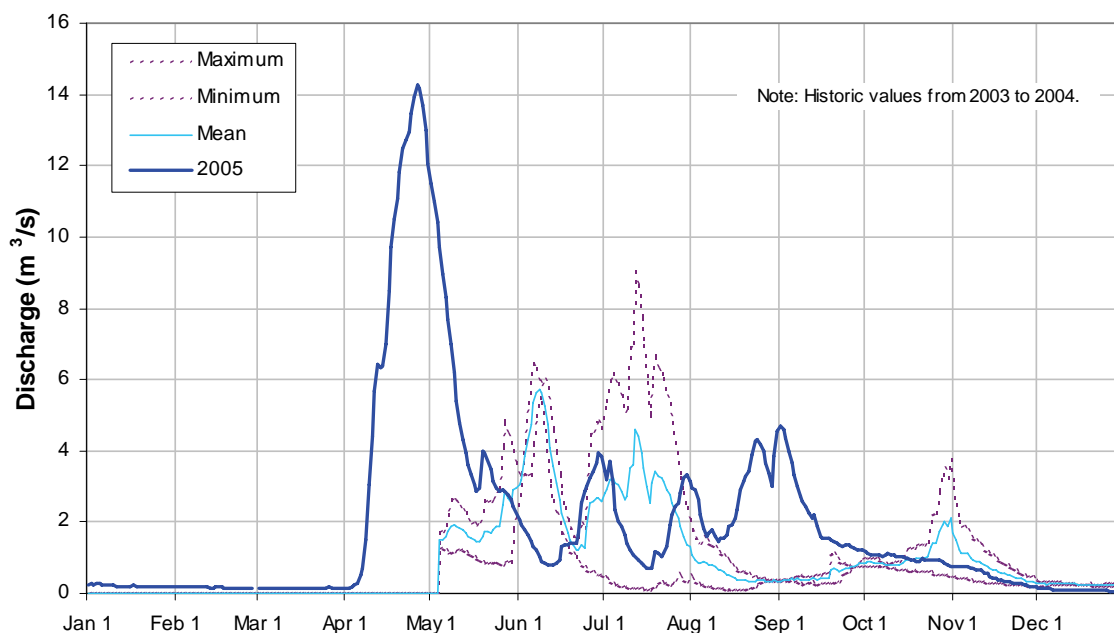


Figure C.2-8 2005 discharge hydrograph and historical context for Station S5A, Muskeg River above Muskeg Creek.

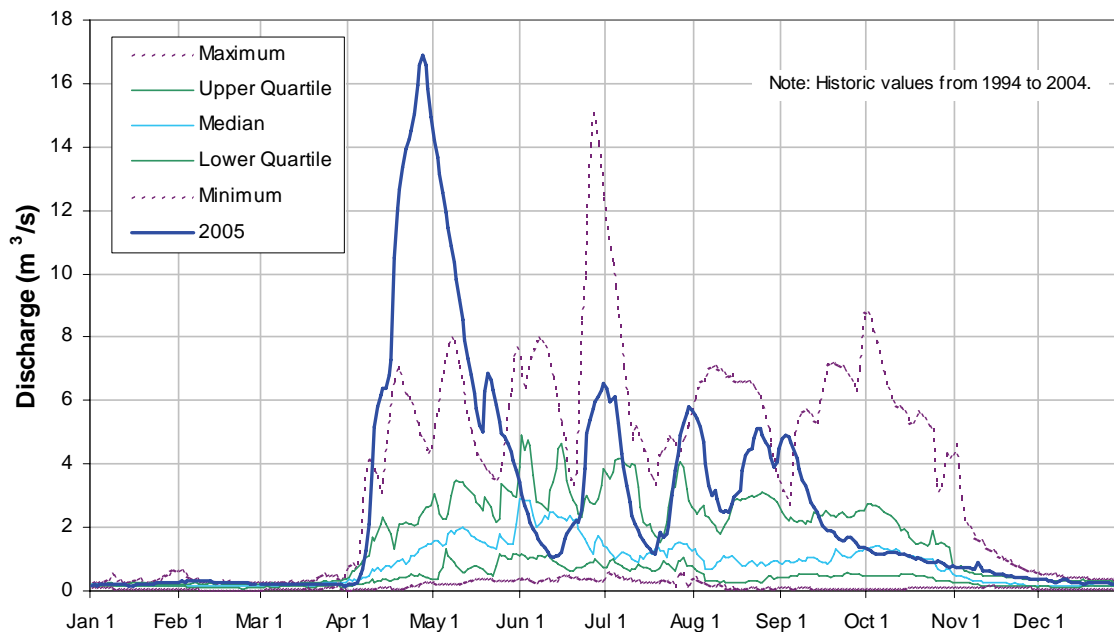


Figure C.2-9 2005 discharge hydrograph and historical context for Station S6, Mills Creek at Highway 63.

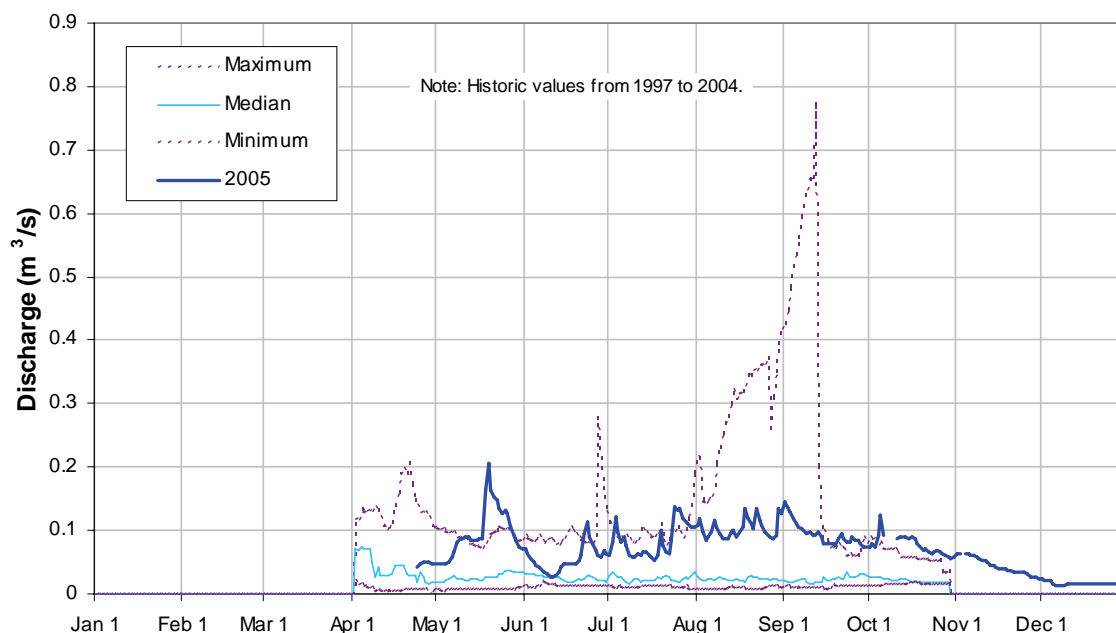


Figure C.2-10 2005 discharge hydrograph and historical context for Station S7, Muskeg River near Fort McKay (07DA008).

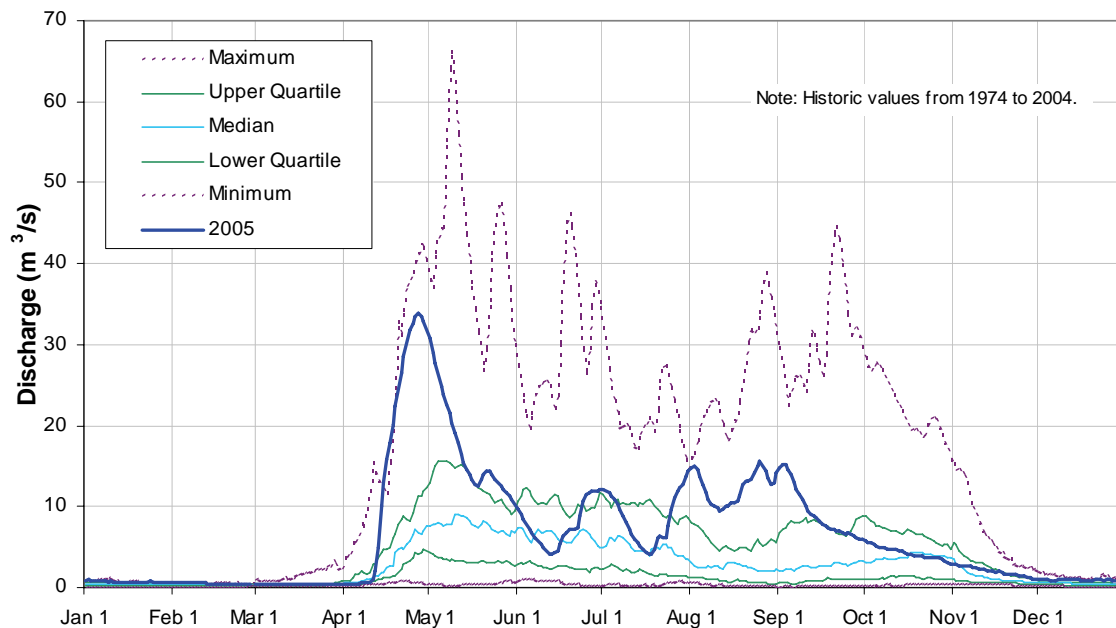


Figure C.2-11 2005 discharge hydrograph and historical context for Station S9, Kears Lake outlet.

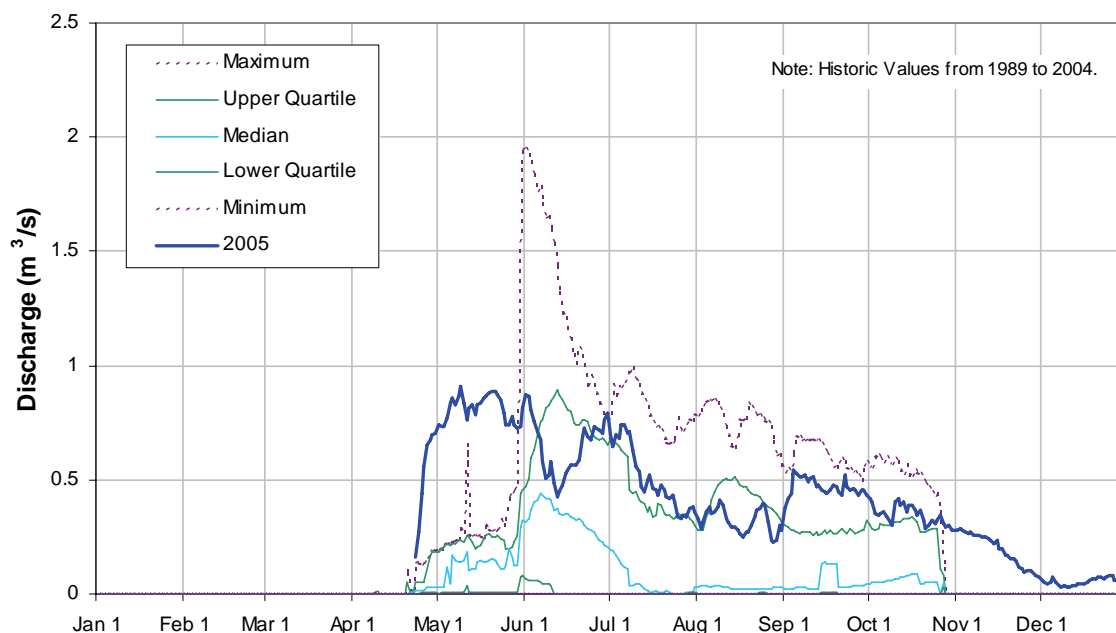


Figure C.2-12 2005 discharge hydrograph and historical context for Station S10, Wapasu Creek at Canterra Road.

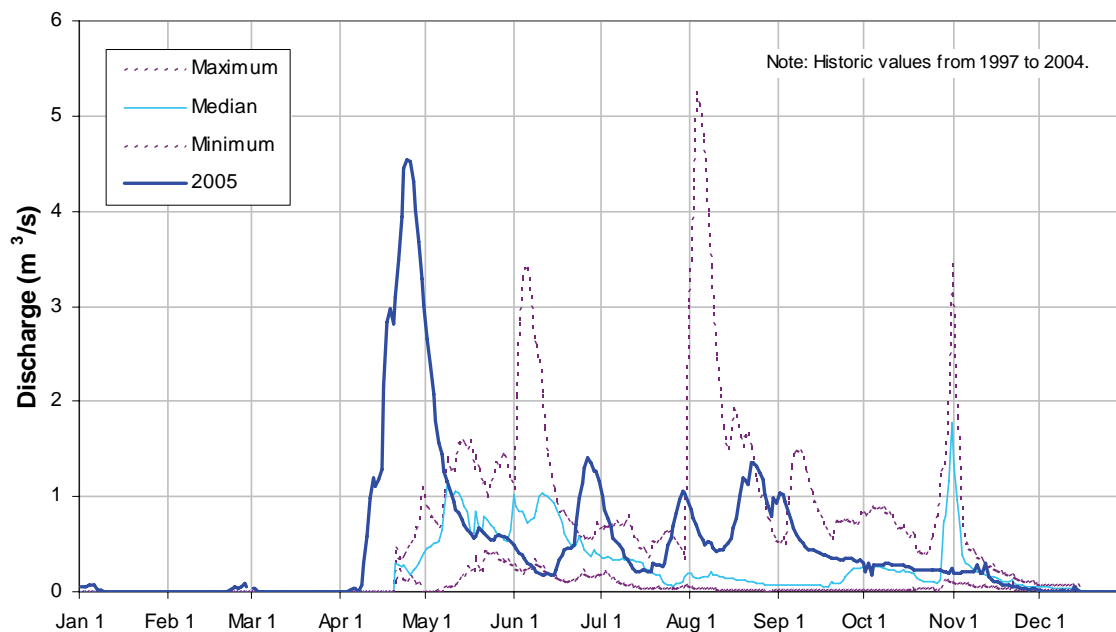


Figure C.2-13 2005 discharge hydrograph and historical context for Station S11, Poplar Creek at Highway 61 (07DA007).

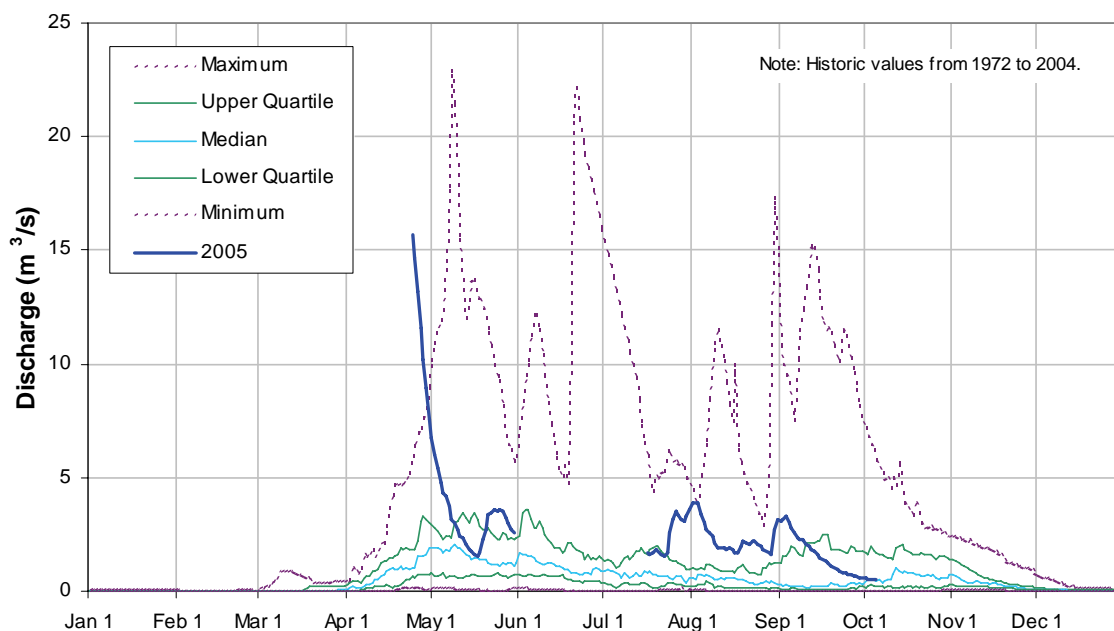


Figure C.2-14 2005 discharge hydrograph and historical context for Station S14, Ells River above Joslyn Creek.

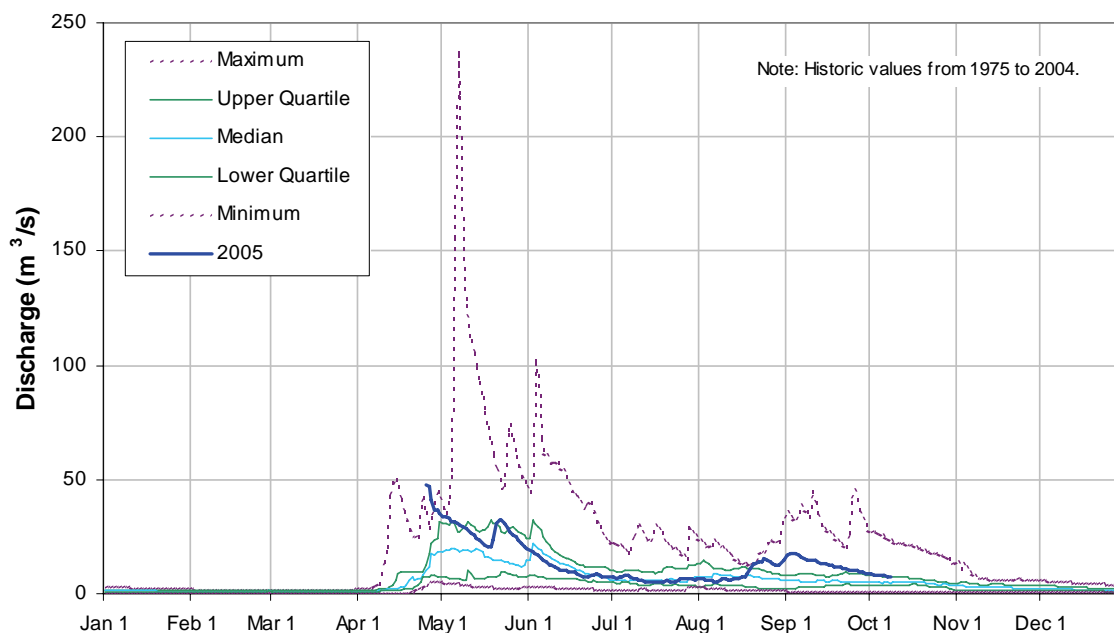


Figure C.2-15 2005 discharge hydrograph and historical context for Station S14A, Ells River at the CNRL Bridge.

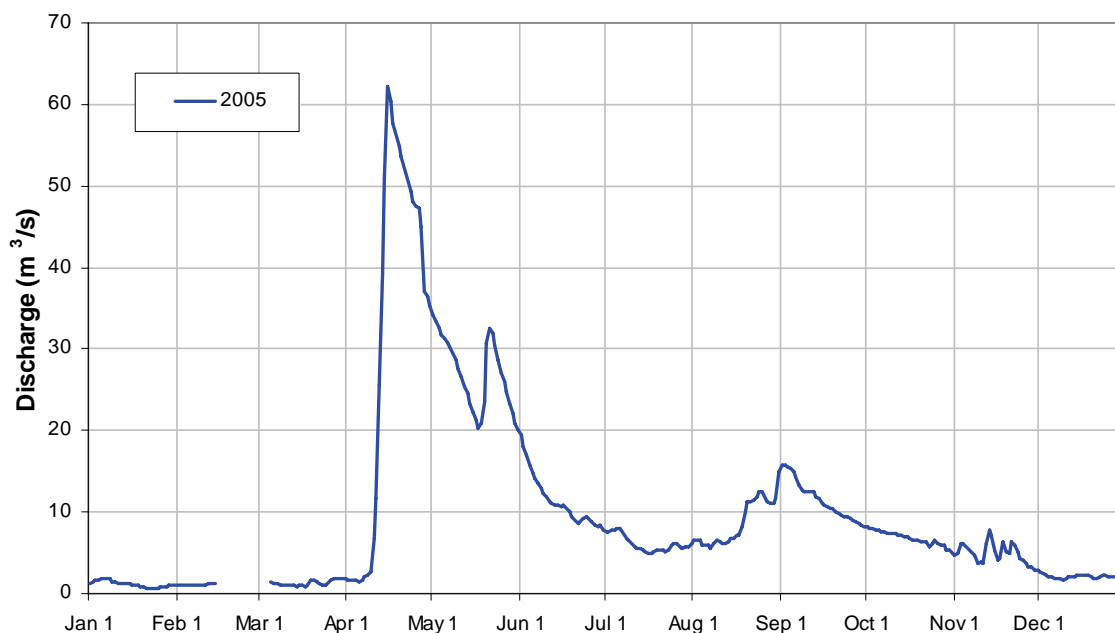


Figure C.2-16 2005 discharge hydrograph and historical context for Station S15, Tar River near the mouth.

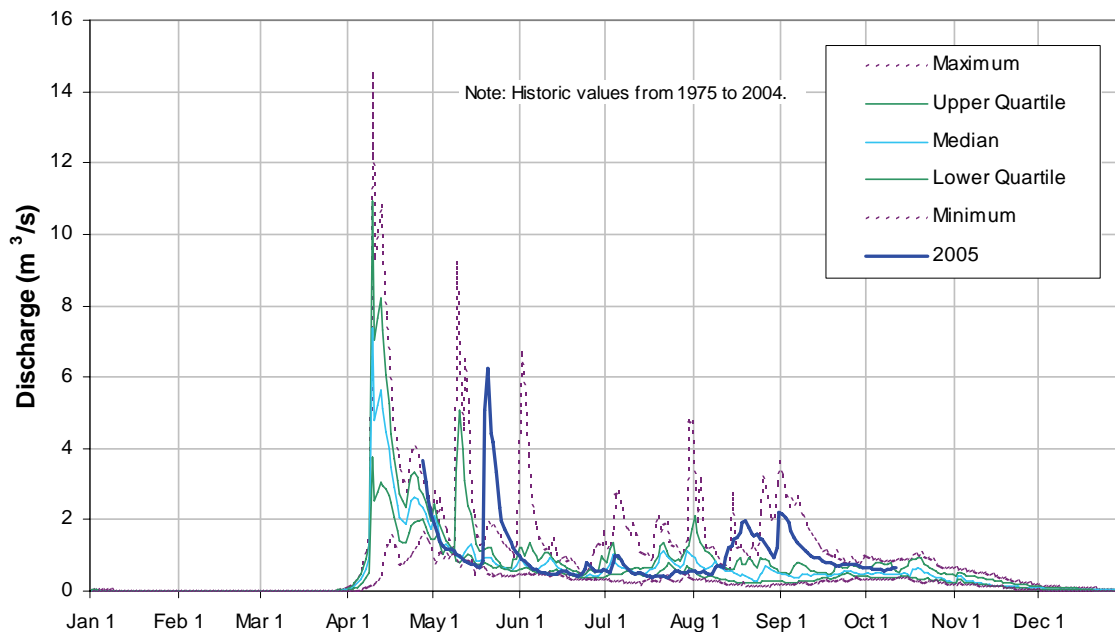


Figure C.2-17 2005 discharge hydrograph and historical context for Station S18A, Calumet River upland tributary.

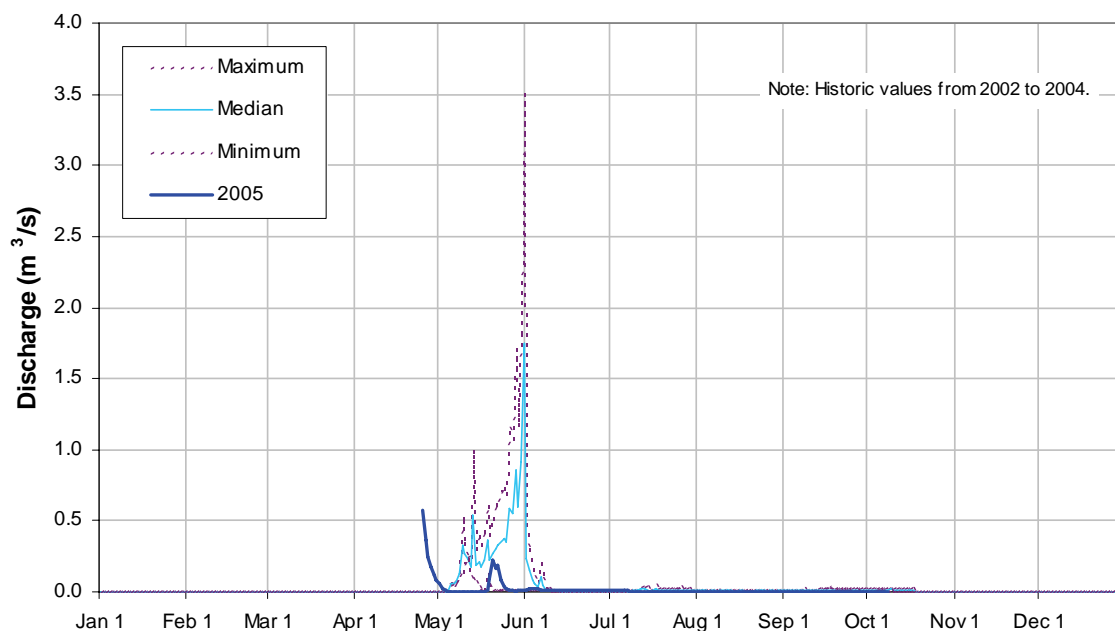


Figure C.2-18 2005 discharge hydrograph and historical context for Station S19, Tar River Lowland Tributary near the mouth.

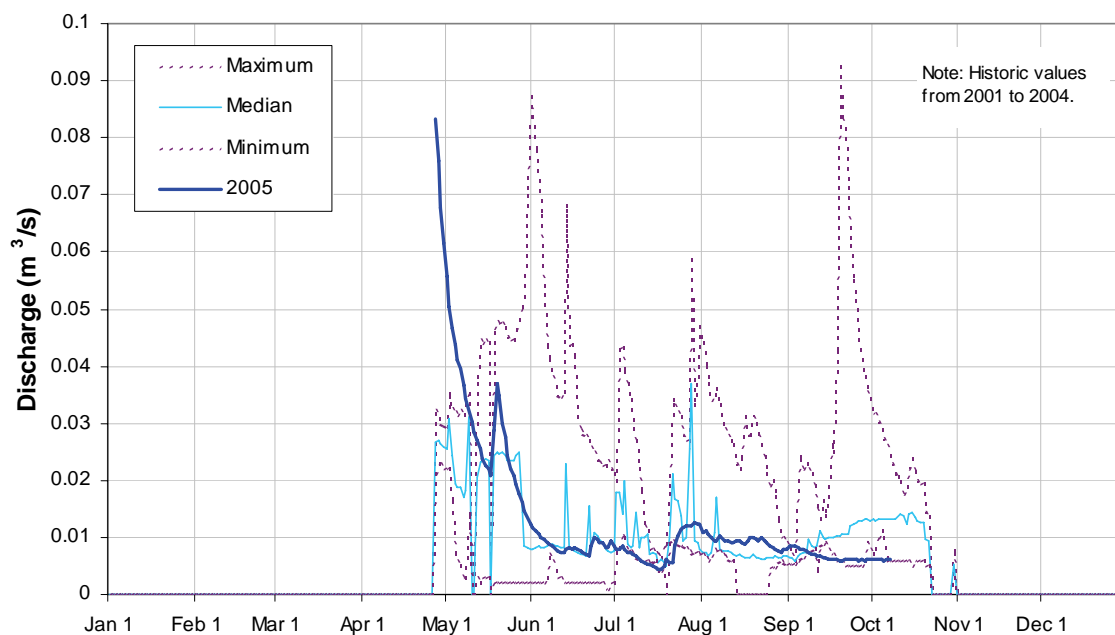


Figure C.2-19 2005 discharge hydrograph and historical context for Station S20, Muskeg River Upland.

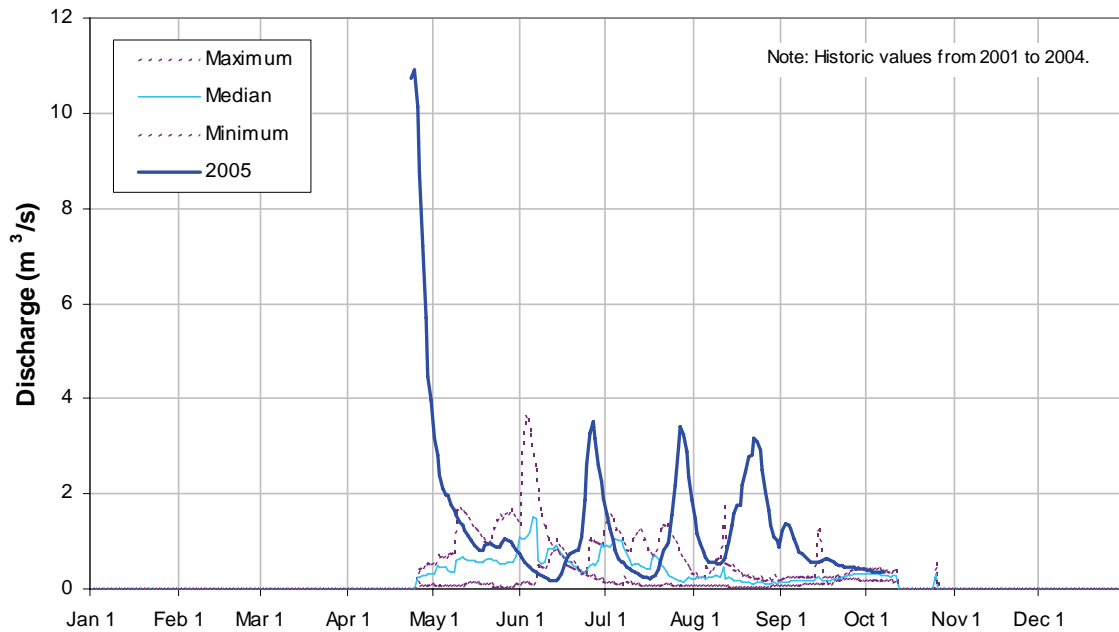


Figure C.2-20 2005 discharge hydrograph and historical context for Station S22, Muskeg Creek near the mouth.

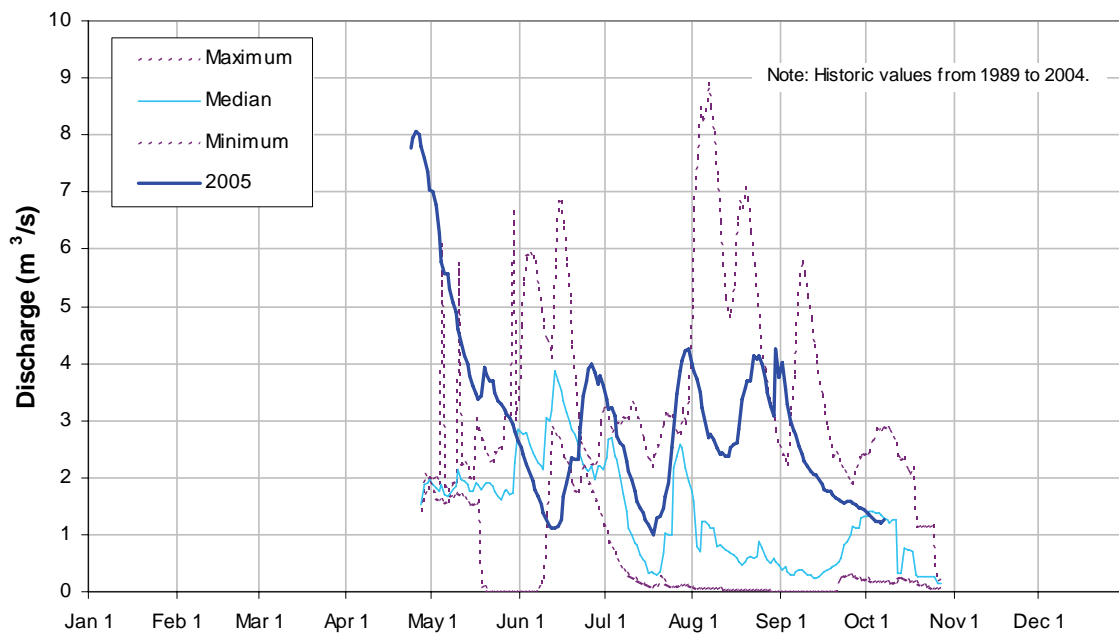


Figure C.2-21 2005 discharge hydrograph and historical context for Station S24, Athabasca River below Eymundson Creek.

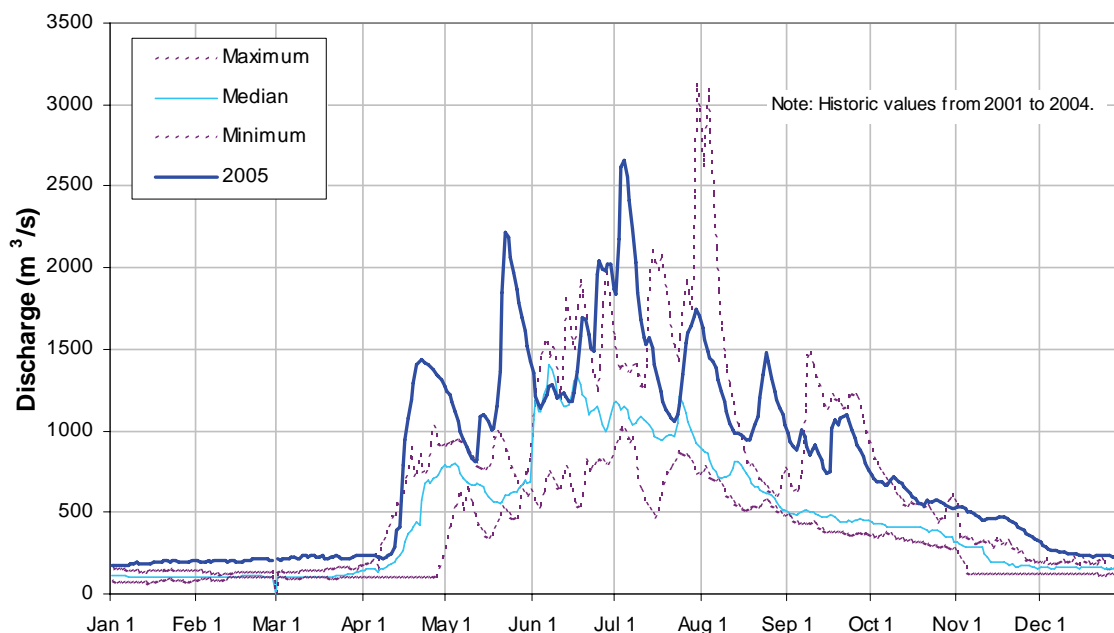


Figure C.2-22 2005 discharge hydrograph and historical context for Station S26, MacKay River near Fort McKay (07DB001).

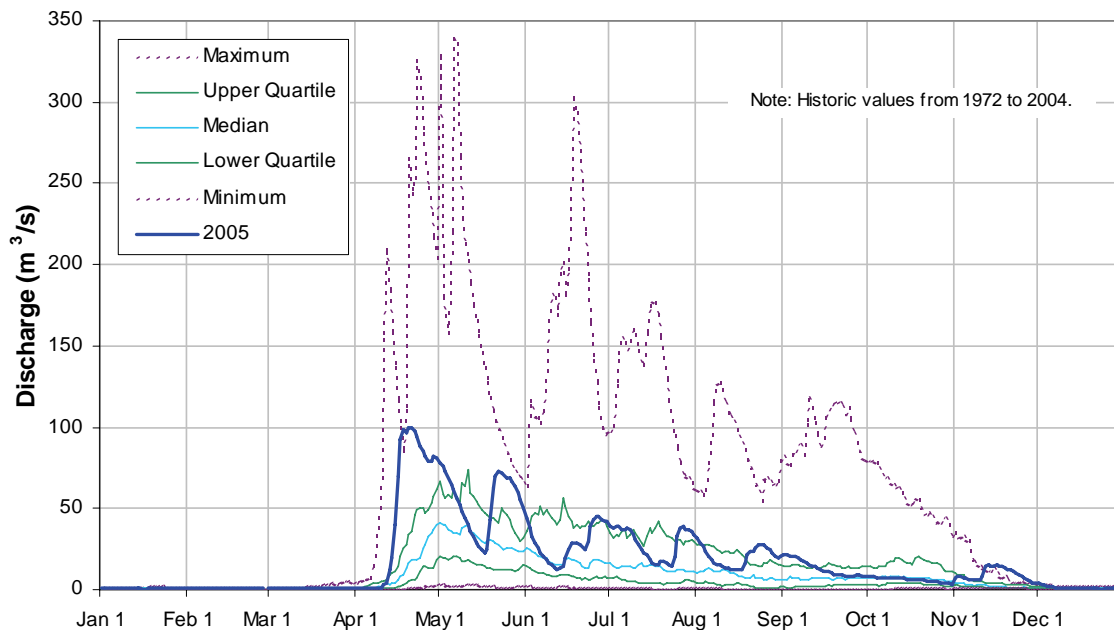


Figure C.2-23 2005 discharge hydrograph and historical context for Station S27, Firebag River near the mouth.

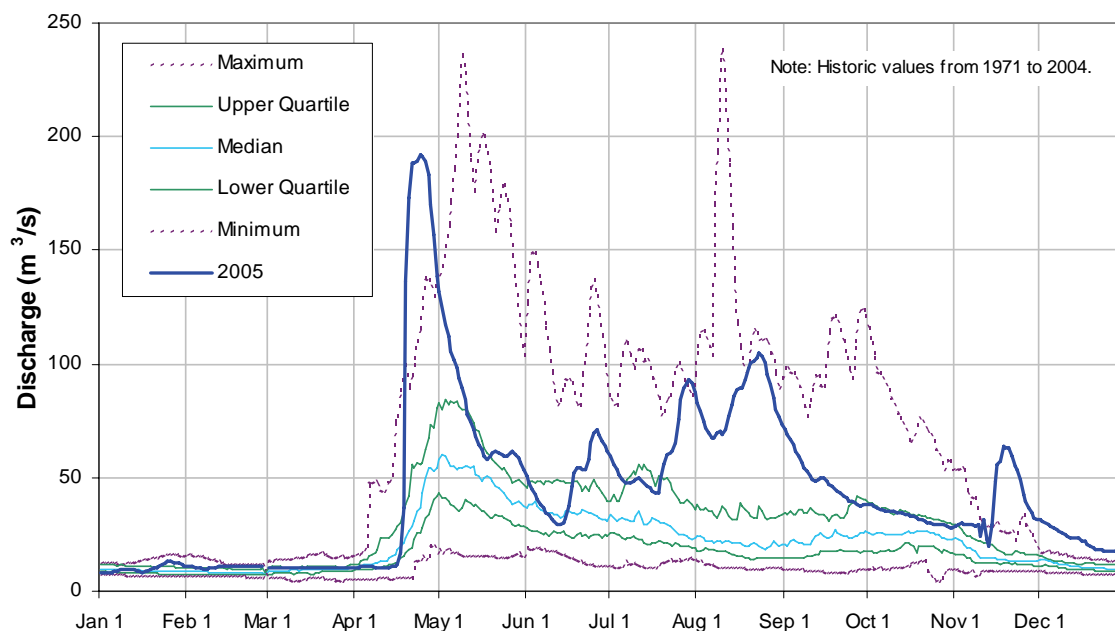


Figure C.2-24 2005 discharge hydrograph and historical context for Station S28, Khahago Creek below Black Fly Creek.

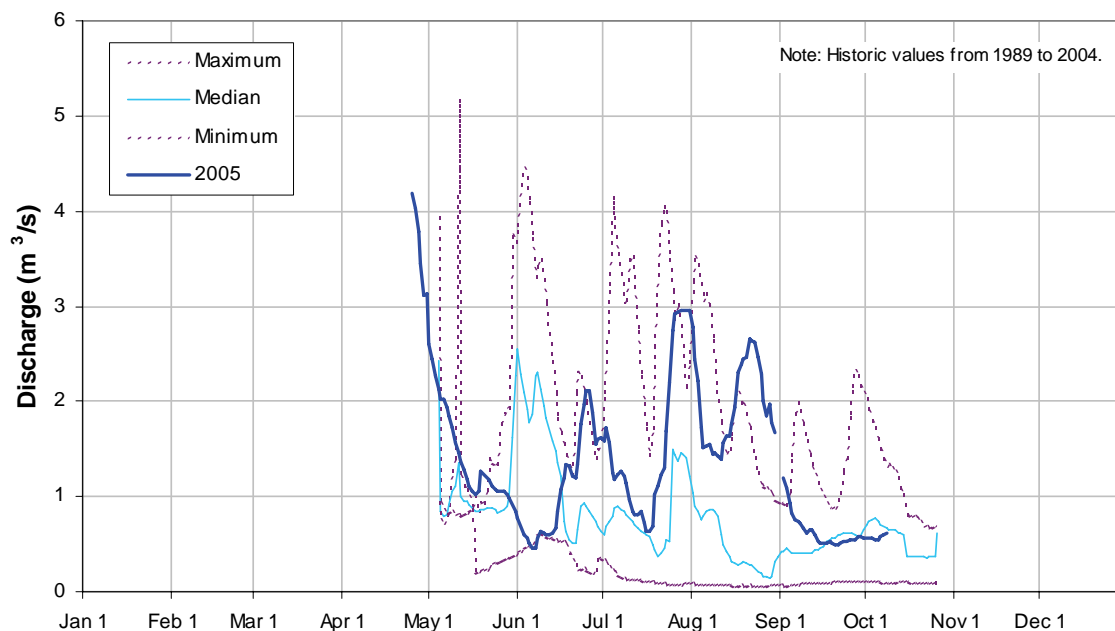


Figure C.2-25 2005 discharge hydrograph and historical context for Station S29, Christina River near Chard (07CE002).

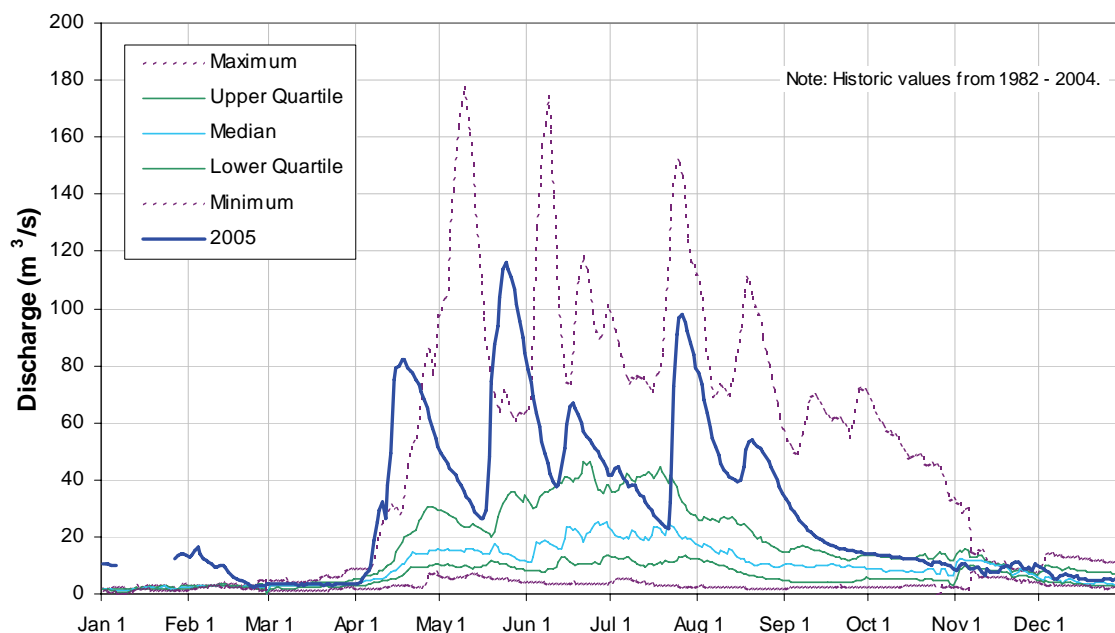


Figure C.2-26 2005 discharge hydrograph and historical context for Station S31, Hangingstone Creek near the mouth.

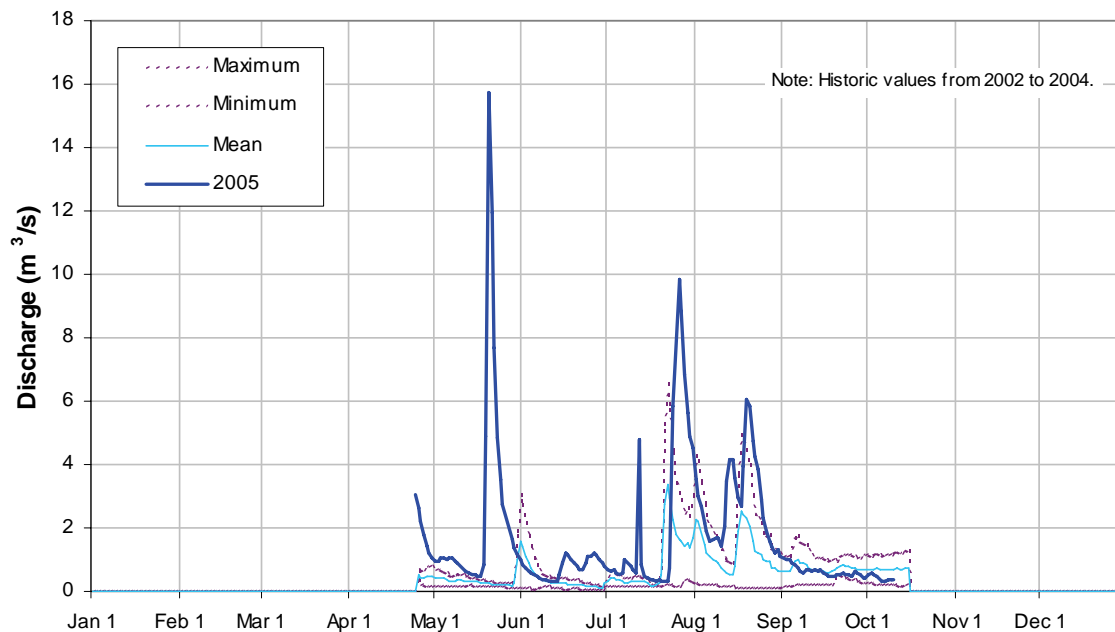


Figure C.2-27 2005 discharge hydrograph and historical context for Station S32, Surmont Creek at Highway 31.

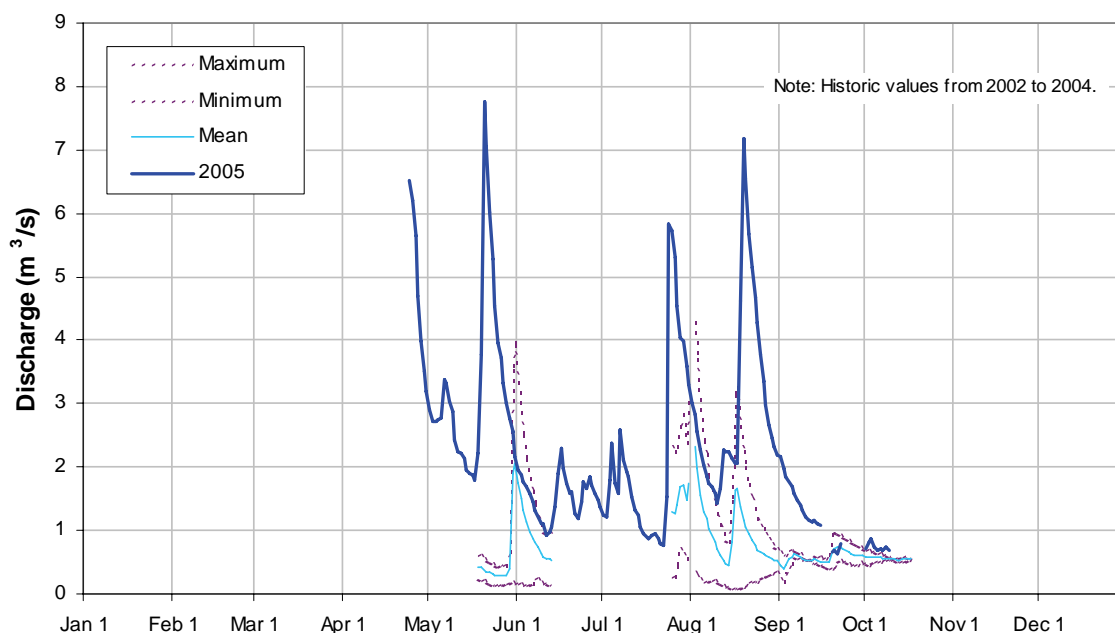


Figure C.2-28 2005 discharge hydrograph and historical context for Station S33, Muskeg River at the Aurora/Albian Boundary.

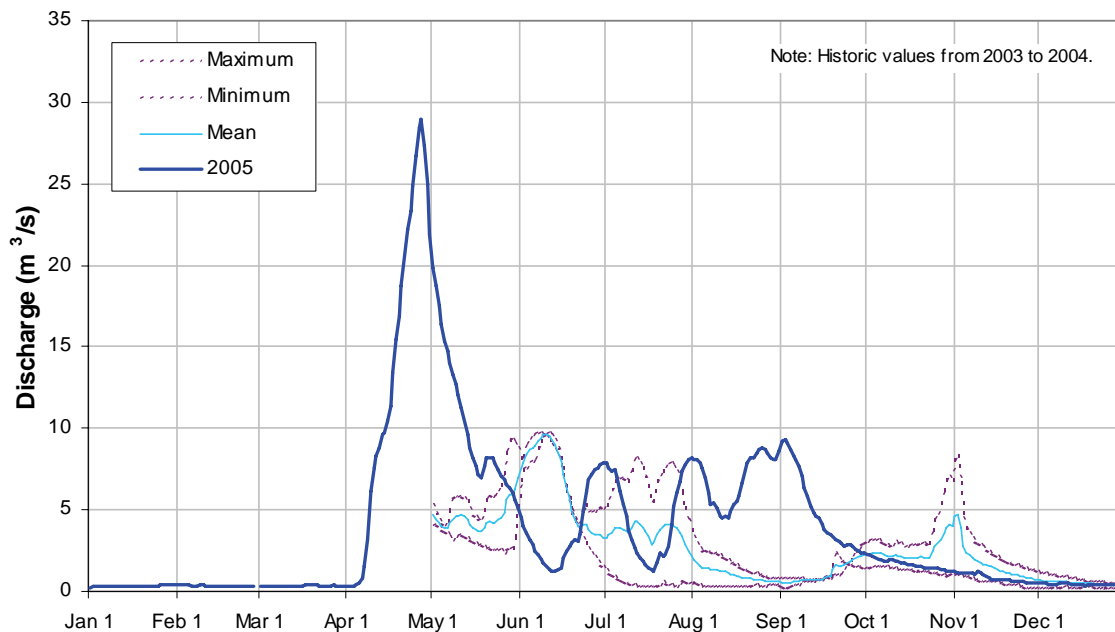


Figure C.2-29 2005 discharge hydrograph and historical context for Station S34, Tar River above CNRL Lake.

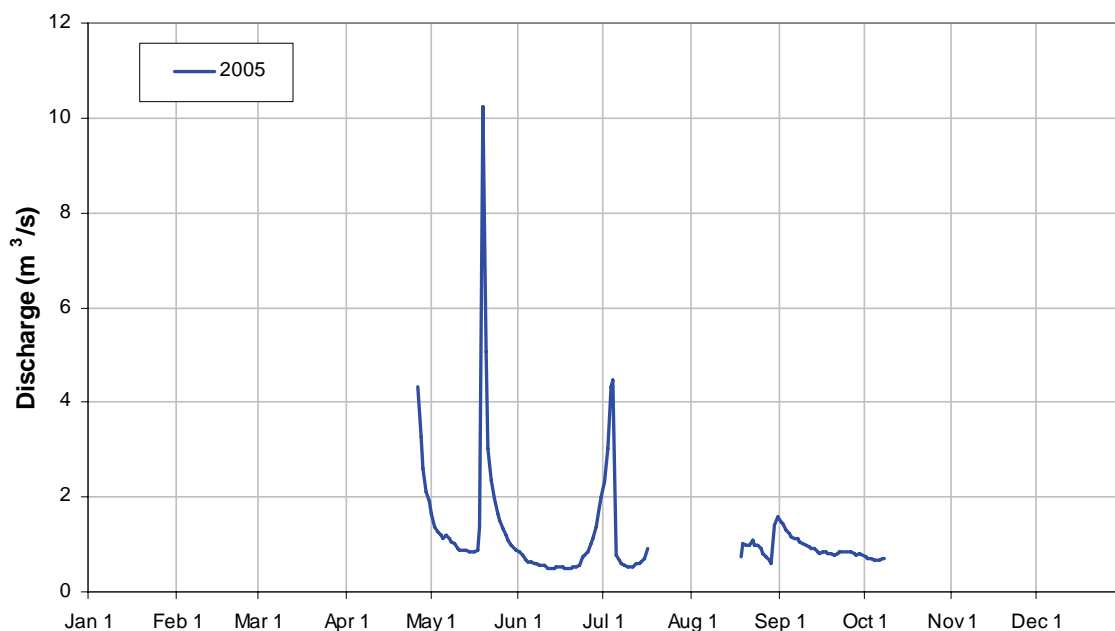


Figure C.2-30 Stage-discharge rating curve for Station L1, McClelland Lake.

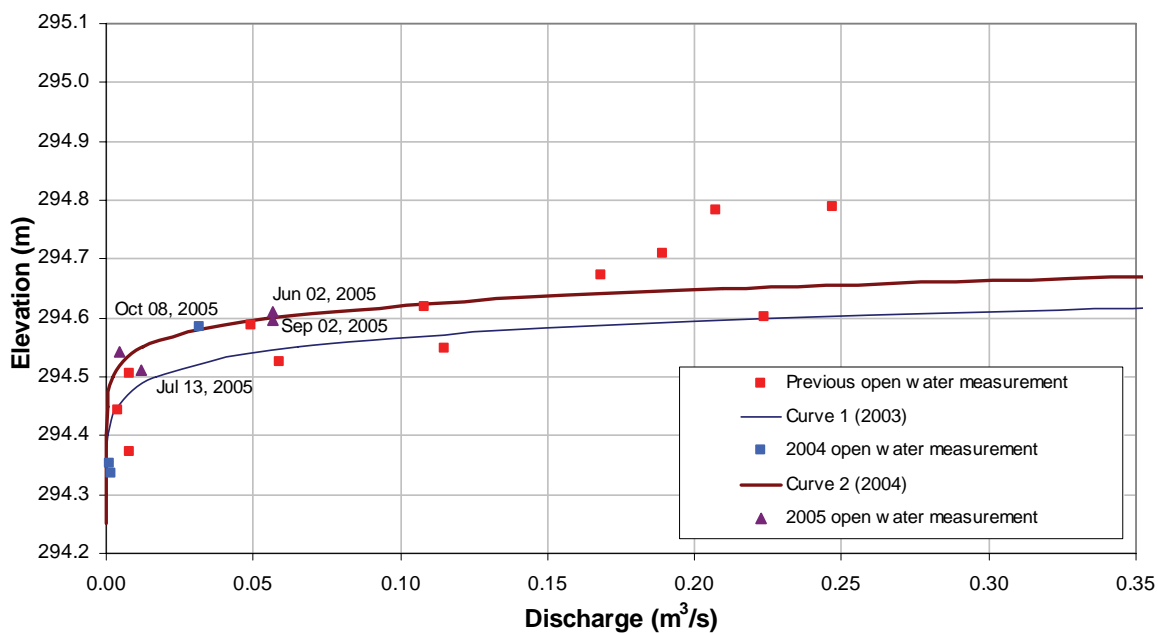


Figure C.2-31 Stage-discharge rating curve for Station S2, Jackpine Creek at Canterra Road.

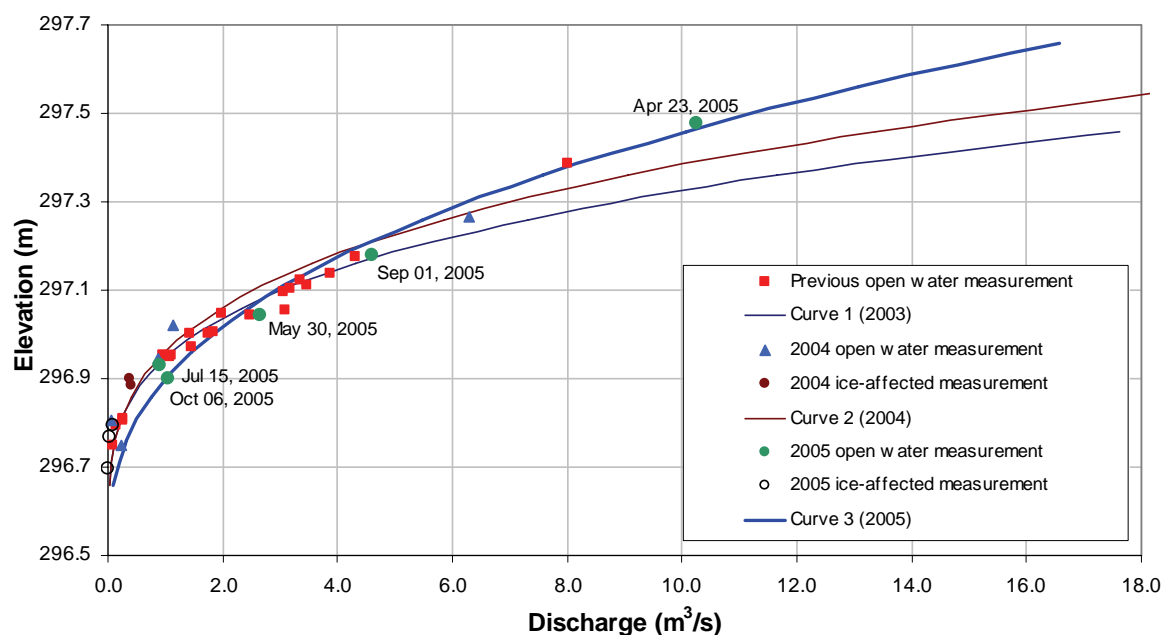


Figure C.2-32 Stage-discharge rating curve for Station S3, Iyininim Creek above Kearn Lake.

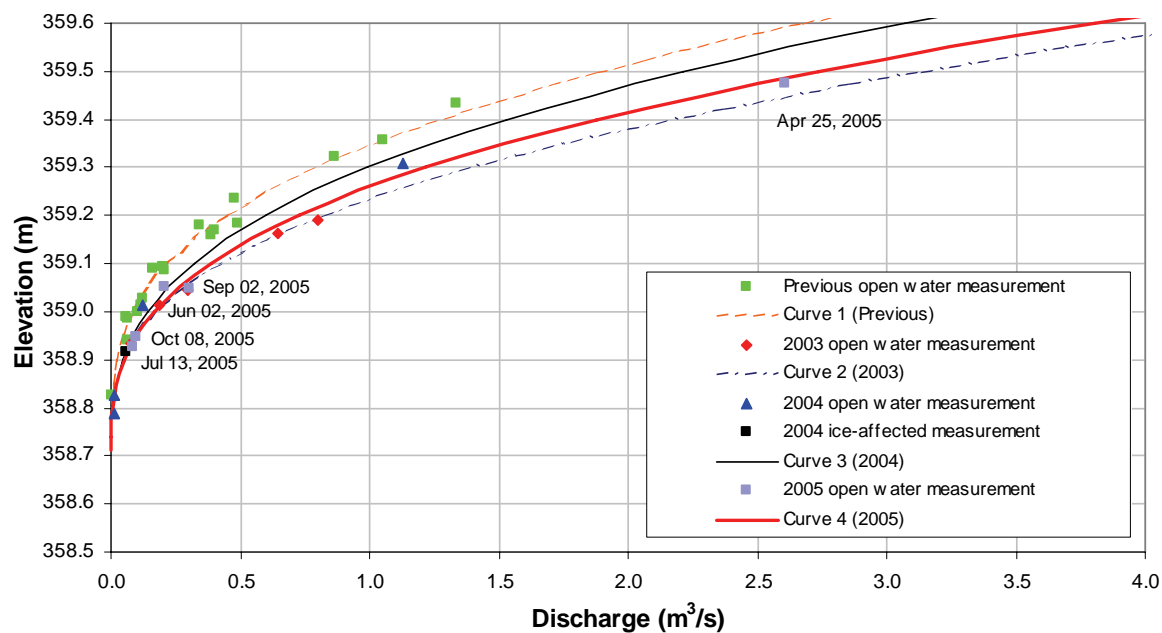


Figure C.2-33 Stage-discharge rating curve for Station S5, Muskeg River above Stanley Creek.

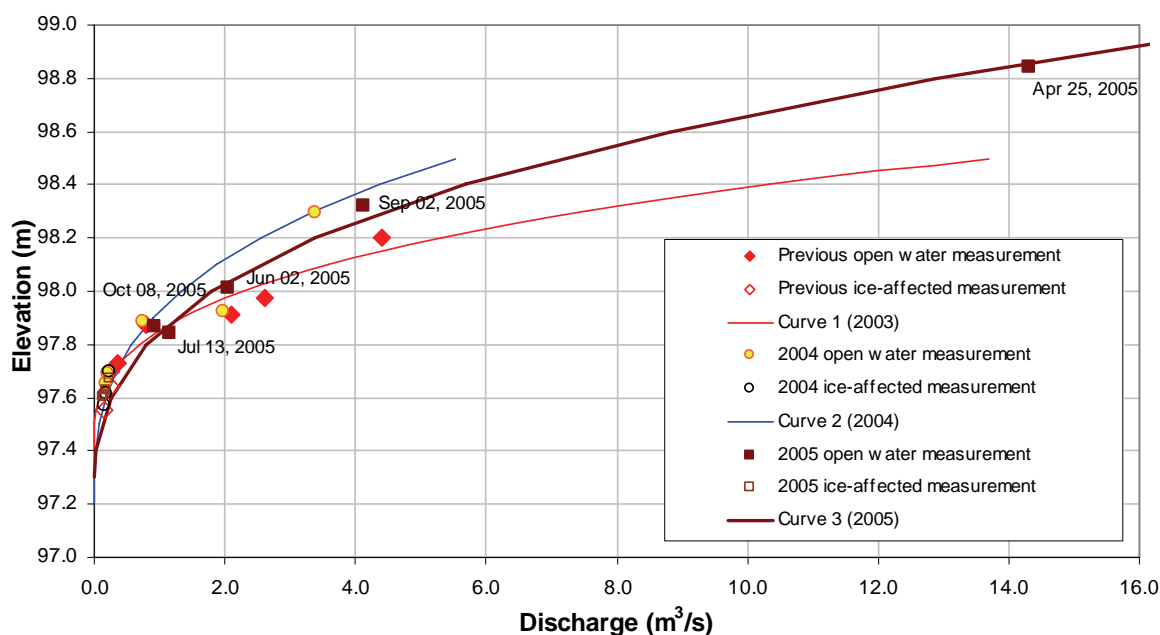


Figure C.2-34 Stage-discharge rating curve for Station S5A, Muskeg River above Muskeg Creek.

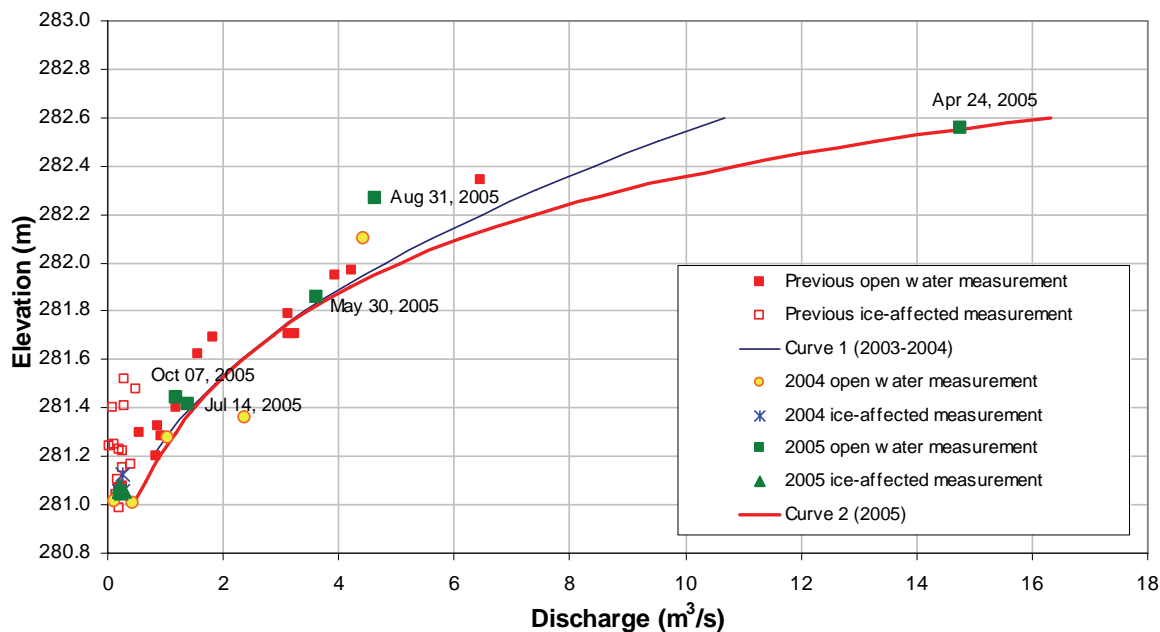


Figure C.2-35 Stage-discharge rating curve for Station S6, Mills Creek at Highway 63.

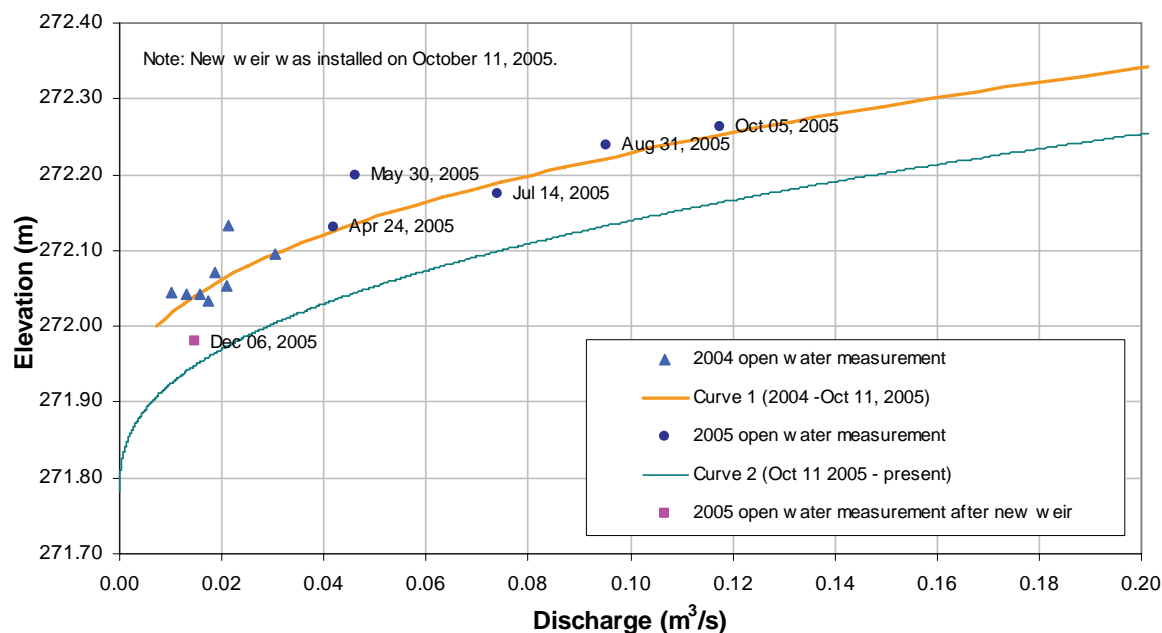


Figure C.2-36 Stage-discharge rating curve for Station S7, Muskeg River near Fort McKay (07DA008).

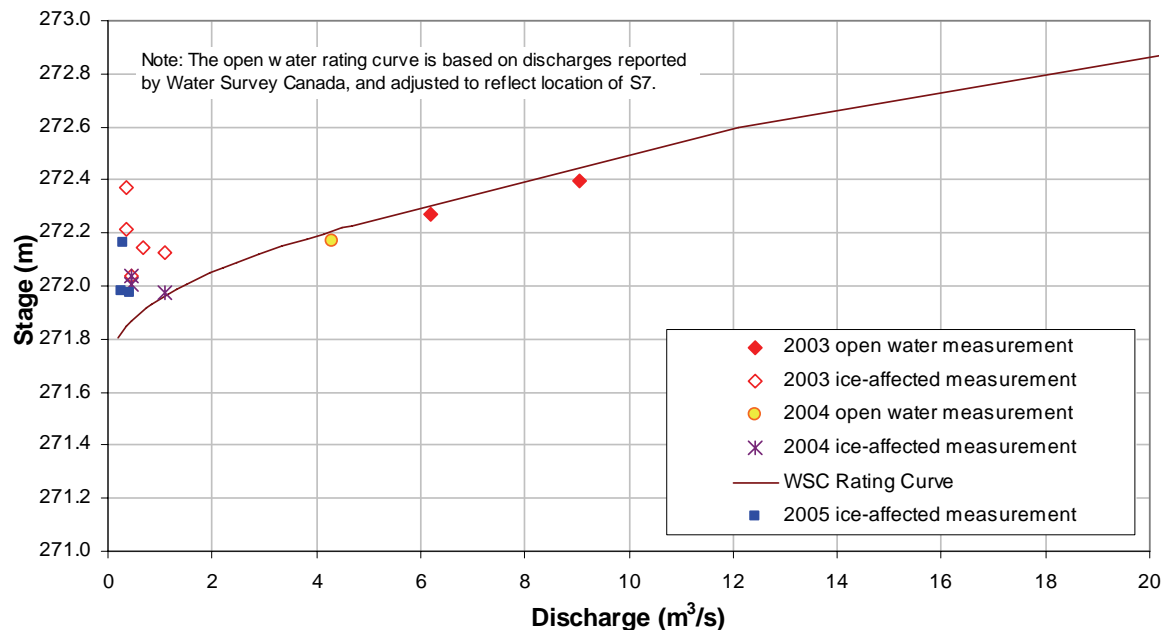


Figure C.2-37 Stage-discharge rating curve for Station S9, Kearl Lake outlet.

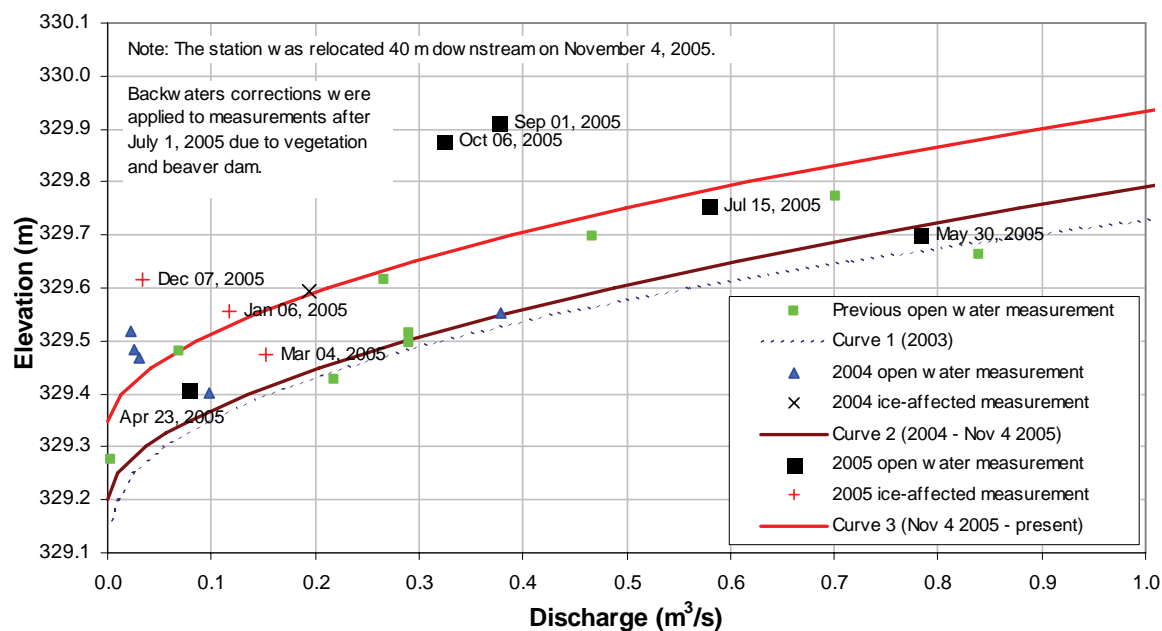


Figure C.2-38 Stage-discharge rating curve for Station S10, Wapasu Creek at Canterra Road.

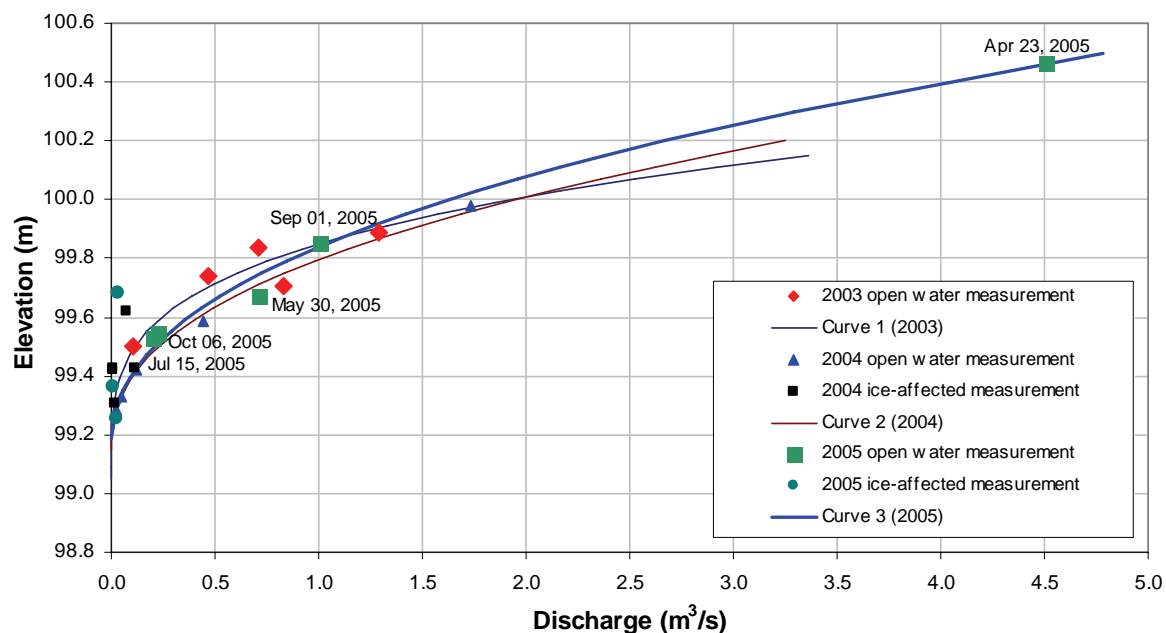


Figure C.2-39 Stage-discharge rating curve for Station S11, Poplar Creek at Highway 61 (07DA007).

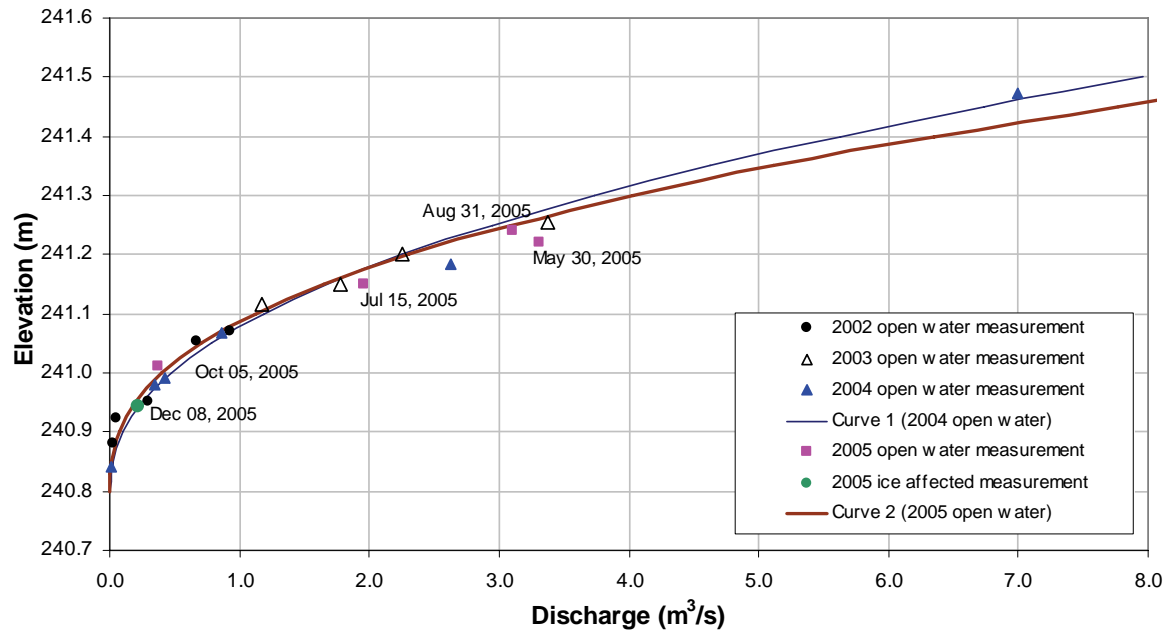


Figure C.2-40 Stage-discharge rating curve for Station S14, Ells River above Joslyn Creek.

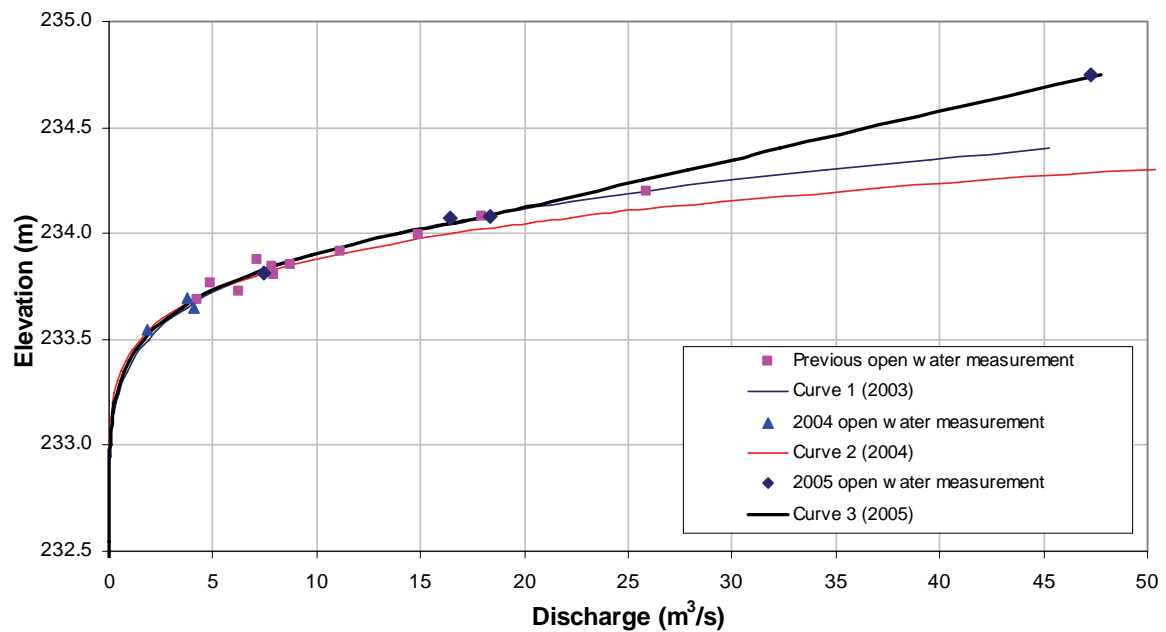


Figure C.2-41 Stage-discharge rating curve for Station S14A, Ells River at the CNRL Bridge.

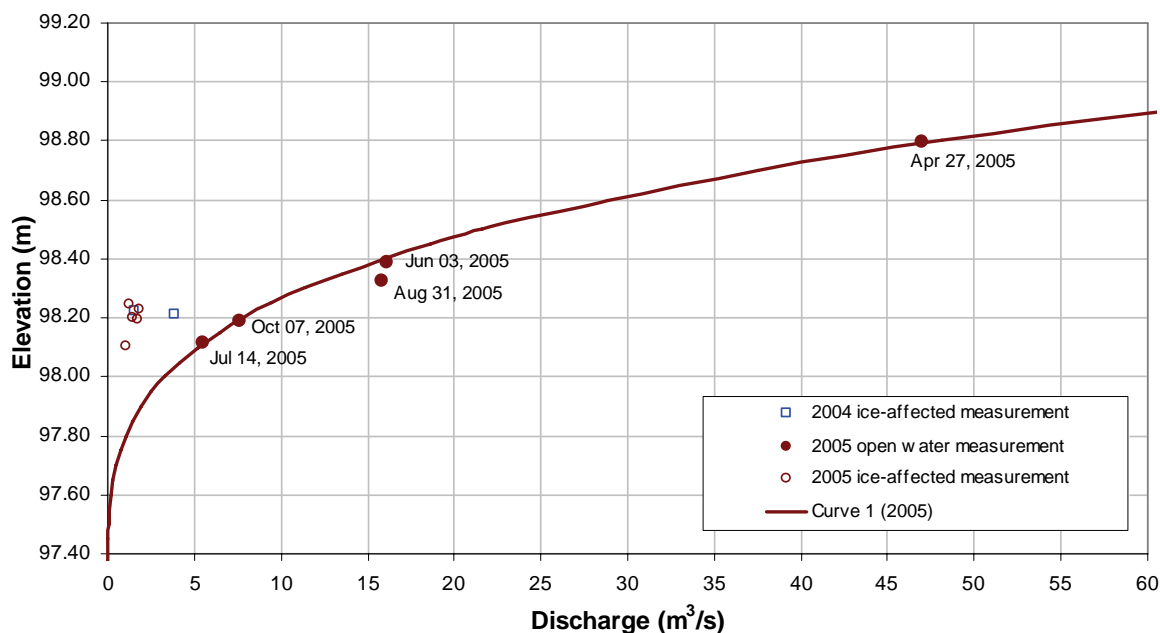


Figure C.2-42 Stage-discharge rating curve for Station S15, Tar River near the mouth.

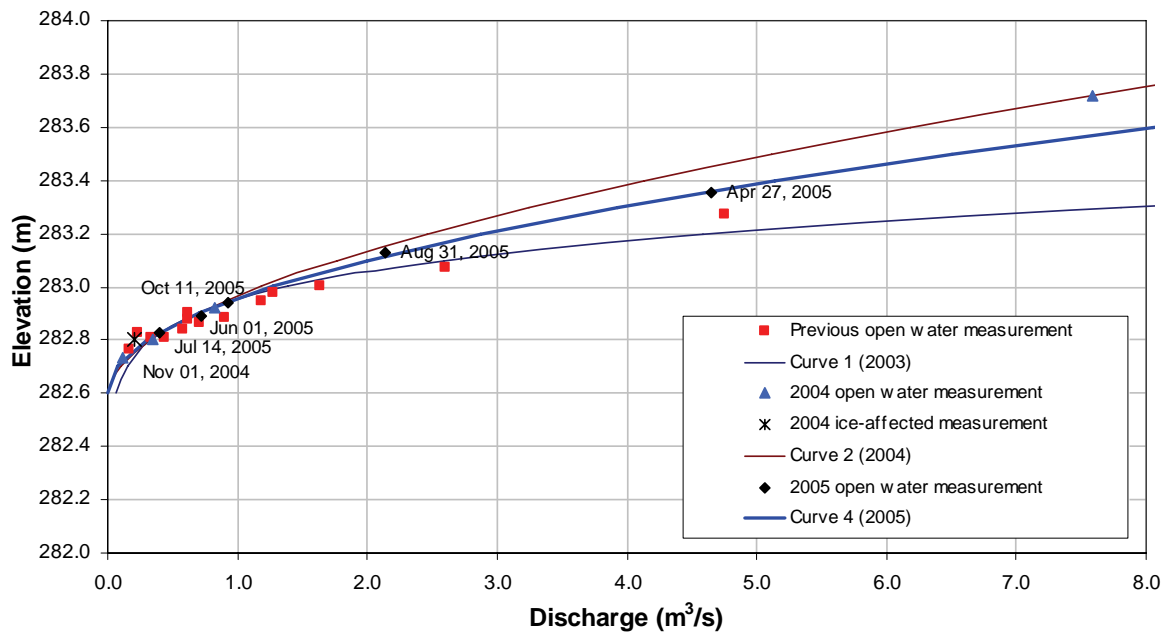


Figure C.2-43 Stage-discharge rating curve for Station S18A, Calumet River Upland Tributary.

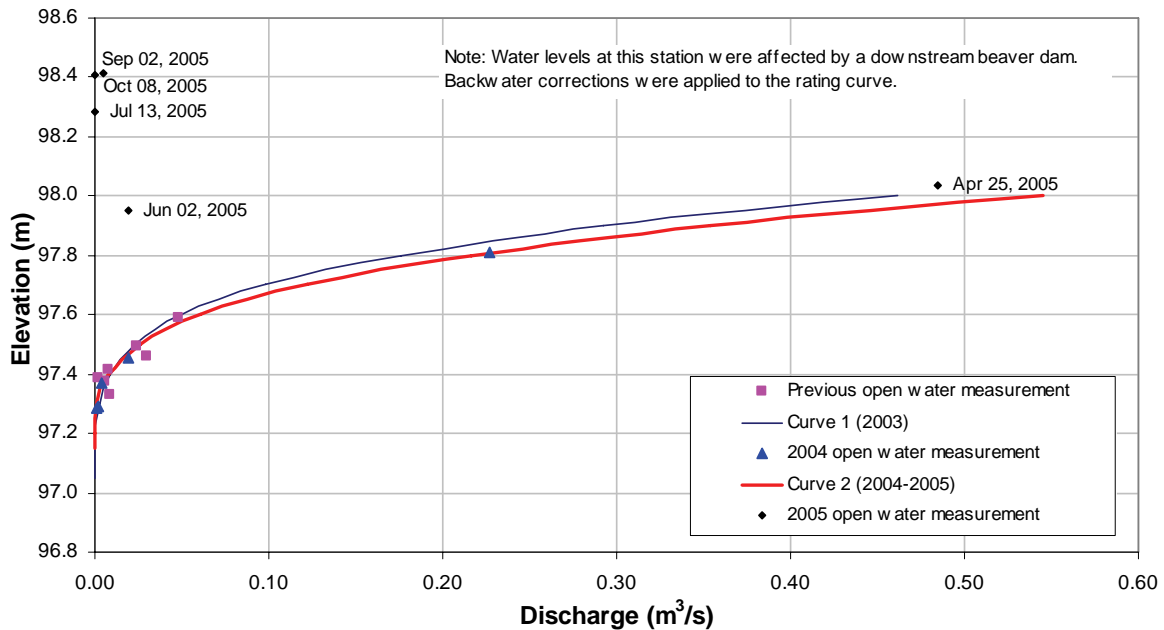


Figure C.2-44 Stage-discharge rating curve for Station S19, Tar River Lowland Tributary near the mouth.

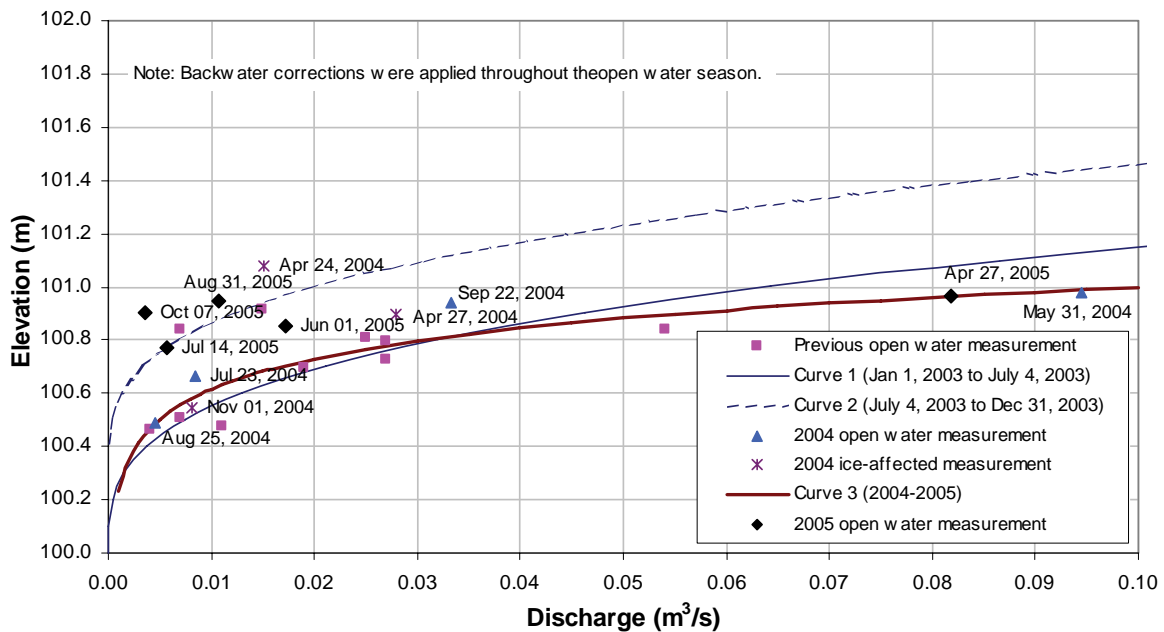


Figure C.2-45 Stage-discharge rating curve for Station S20, Muskeg River Upland.

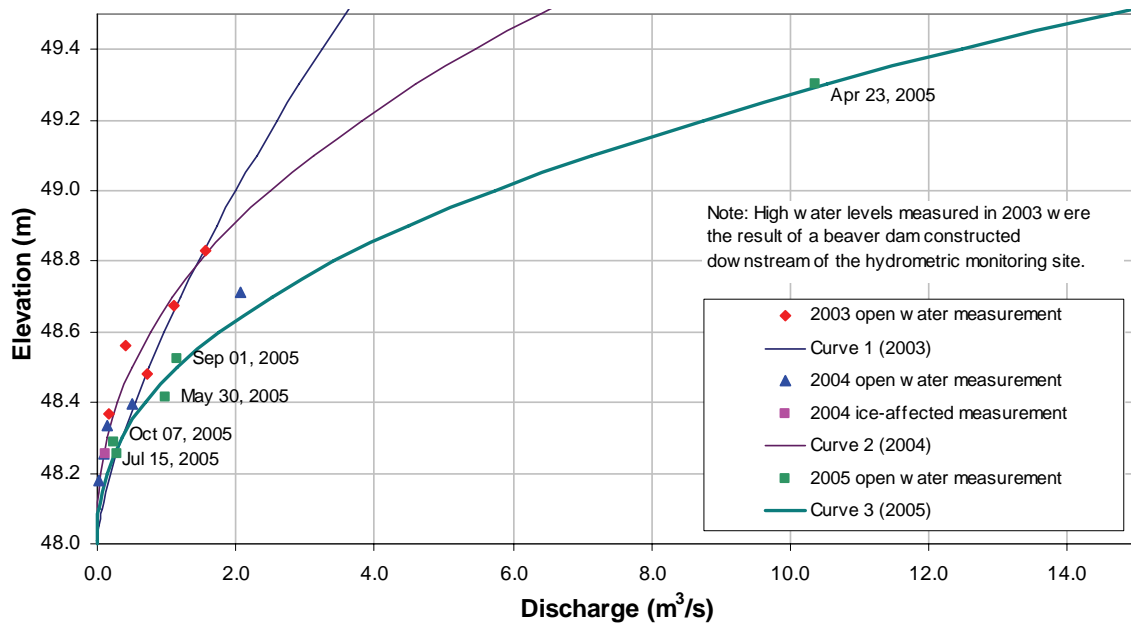


Figure C.2-46 Stage-discharge rating curve for Station S22, Muskeg Creek near the mouth.

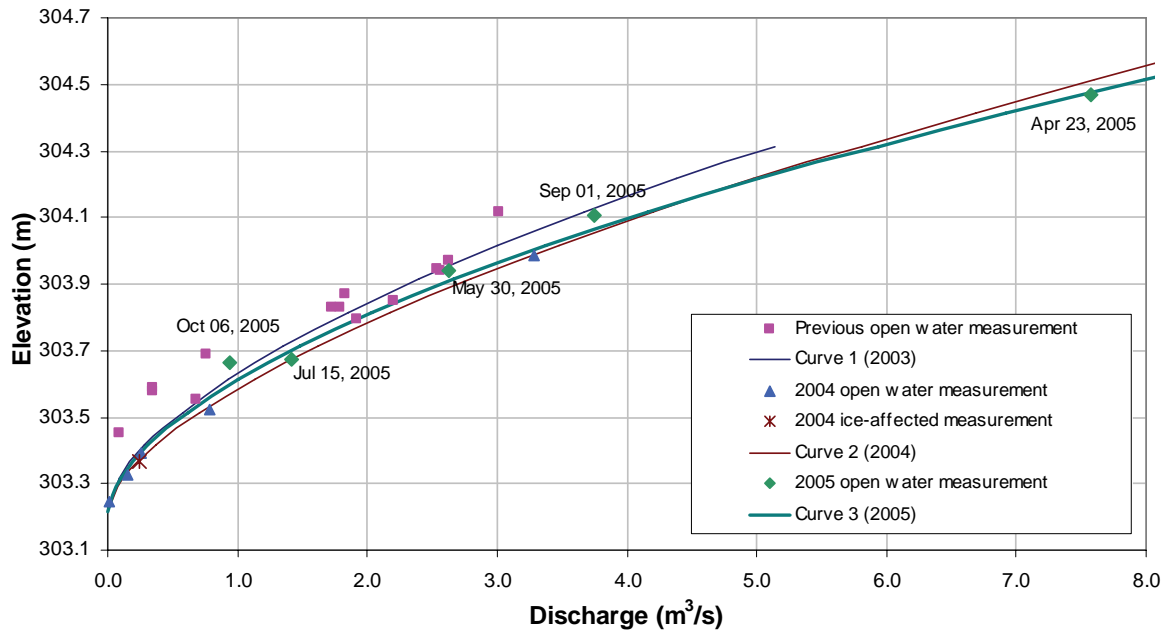


Figure C.2-47 Stage-discharge rating curve for Station S24, Athabasca River below Eymundson Creek.

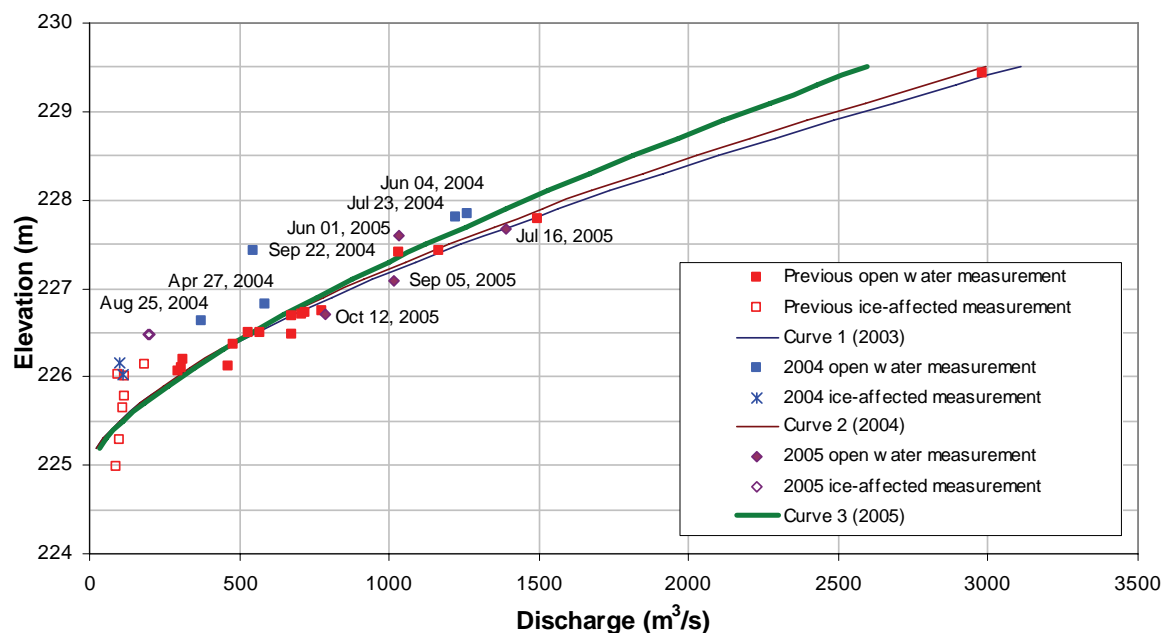


Figure C.2-48 Stage-discharge rating curve for Station S26, MacKay River near Fort McKay (07DB001).

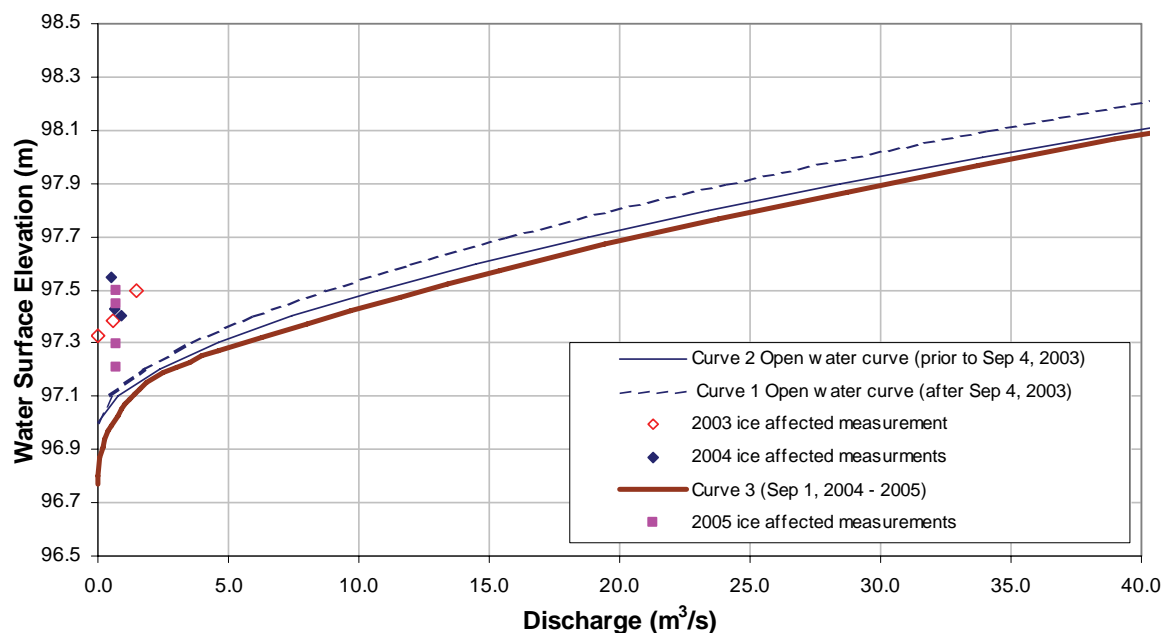


Figure C.2-49 Stage-discharge rating curve for Station S27, Firebag River near the mouth.

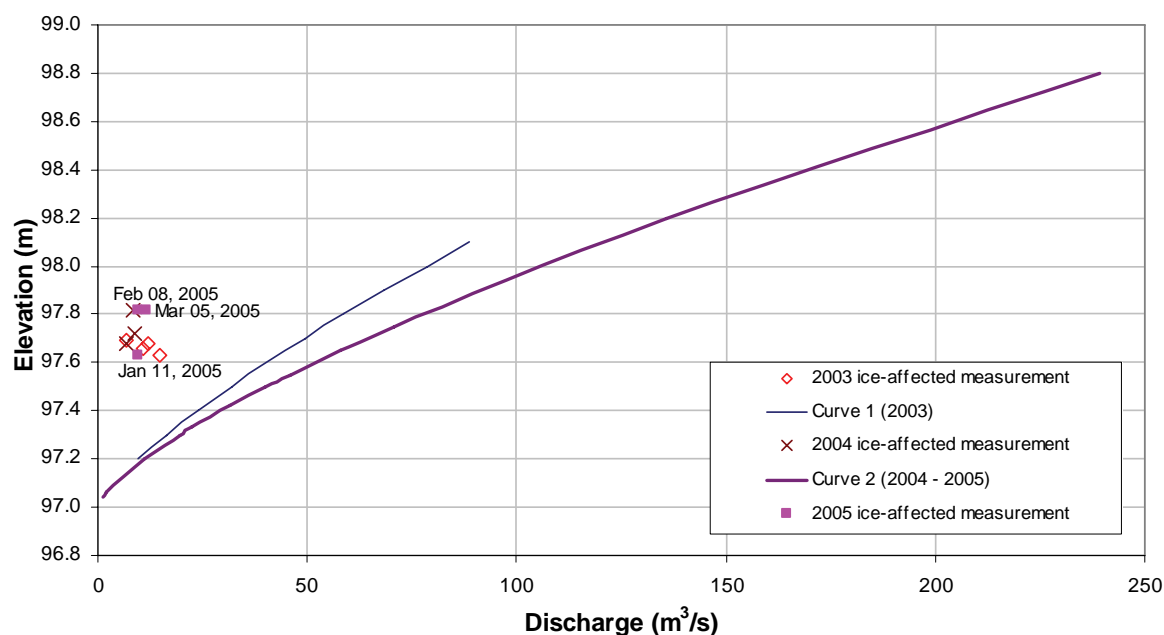


Figure C.2-50 Stage-discharge rating curve for Station S28, Khahago Creek below Black Fly Creek.

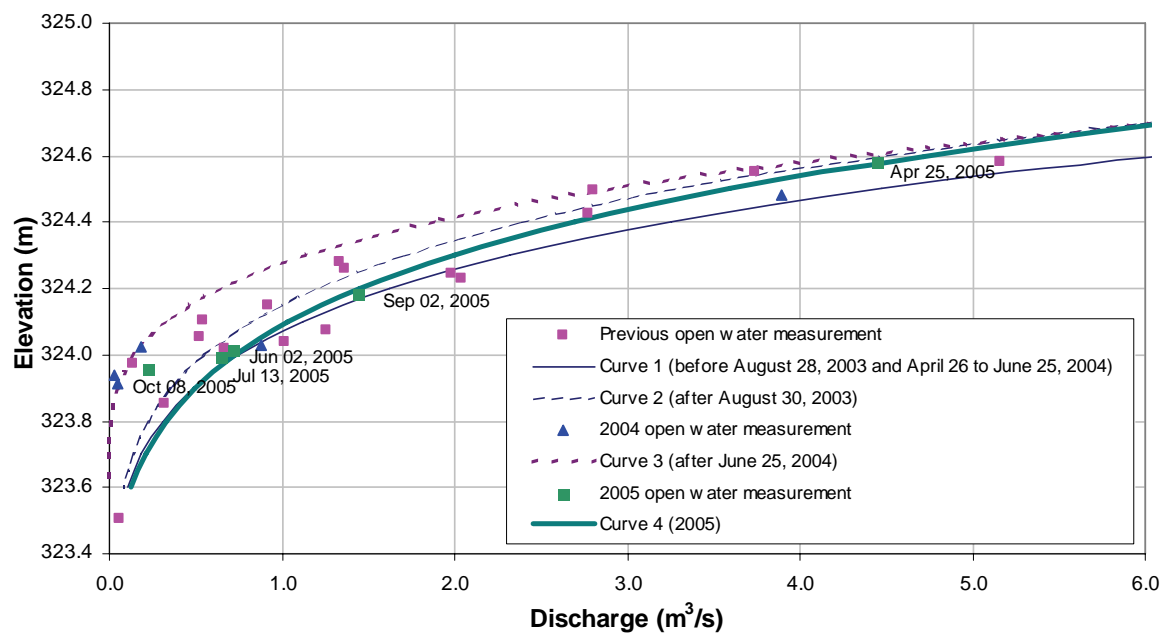


Figure C.2-51 Stage-discharge rating curve for Station S29, Christina River near Chard (07CE002).

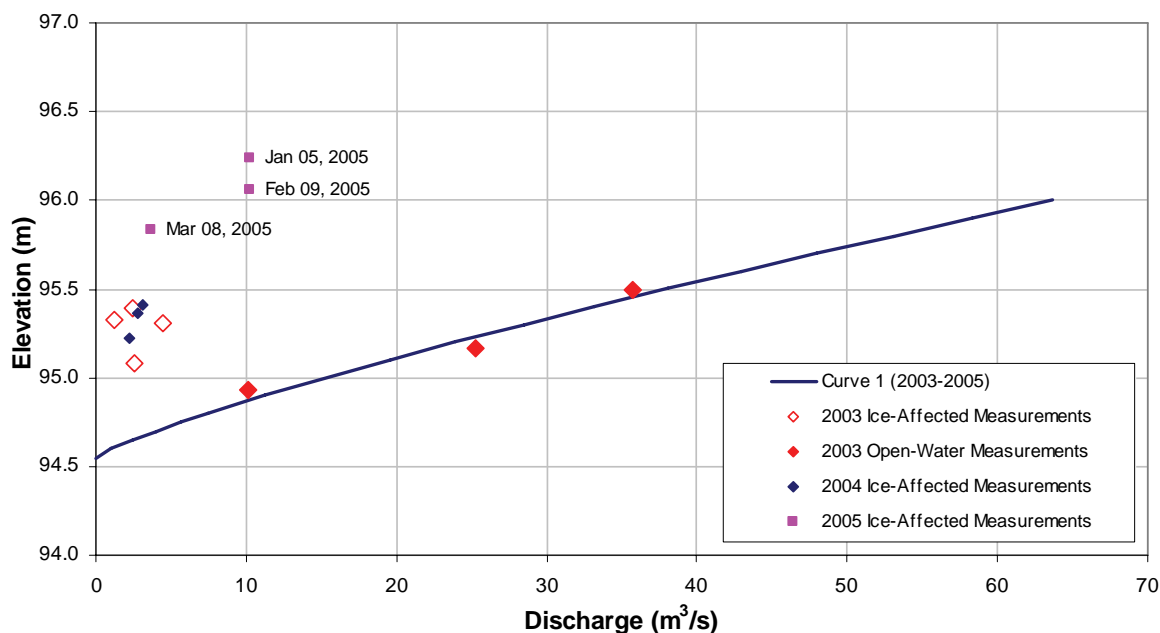


Figure C.2-52 Stage-discharge rating curve for Station S31, Hangingstone Creek near the mouth.

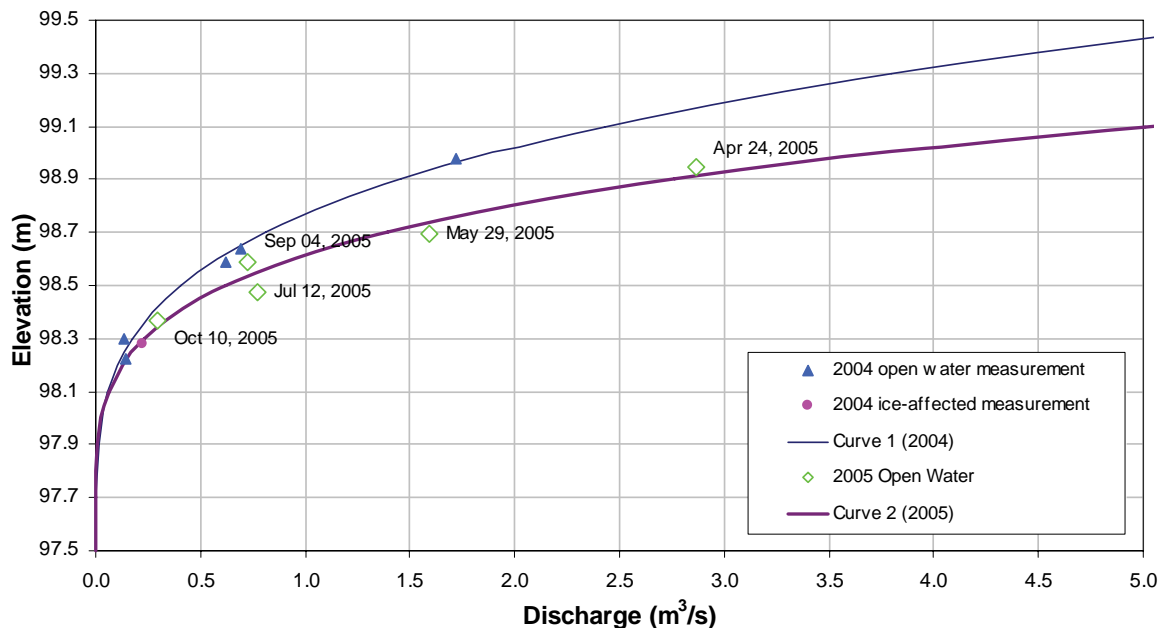


Figure C.2-53 Stage-discharge rating curve for Station S31, Surmont Creek at Highway 31.

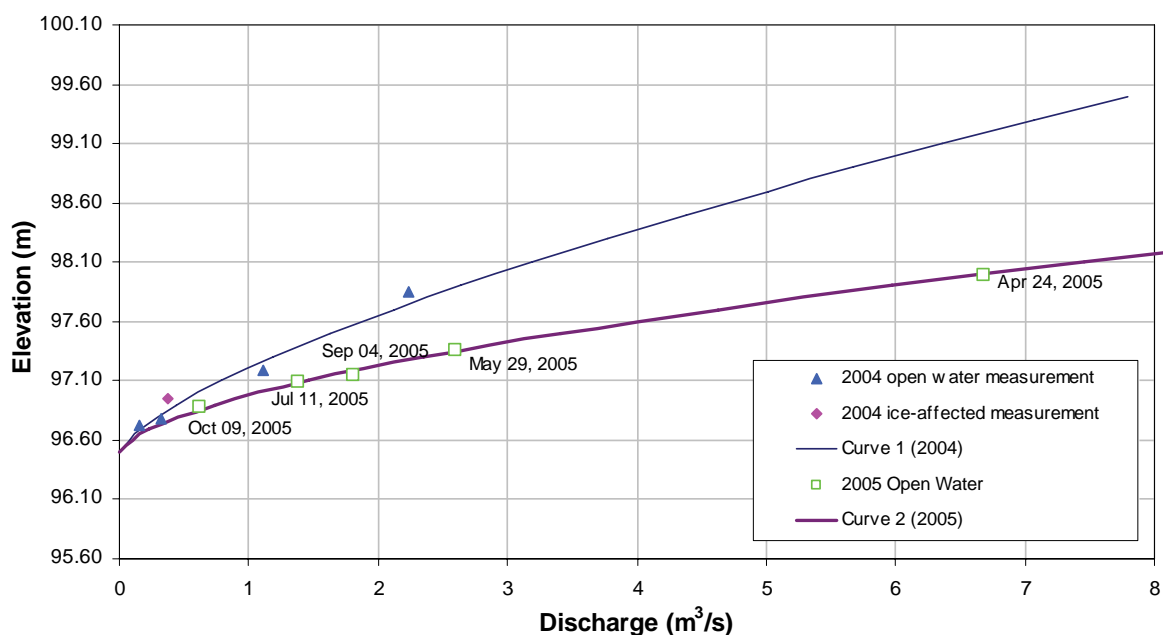


Figure C.2-54 Stage-discharge rating curve for Station S33, Muskeg River at the Aurora/Albian Boundary.

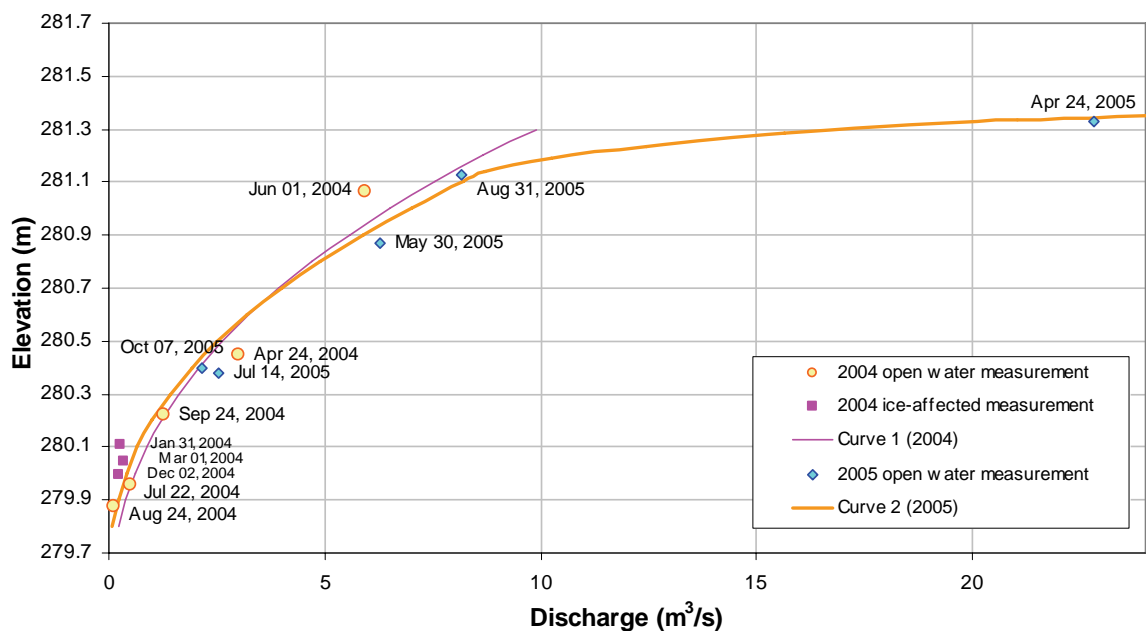
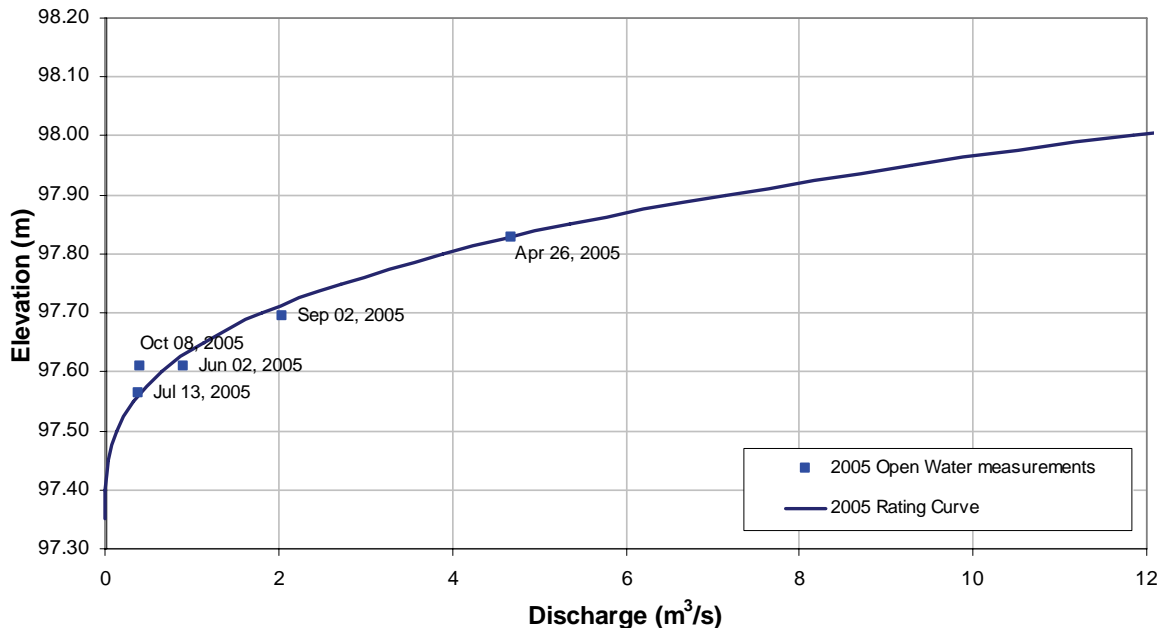


Figure C.2-55 Stage-discharge rating curve for Station S34, Tar River above CNRL Lake.



C.2.5.3 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. For most of 2005, the assessment was made according to the following qualitative scale:

Excellent: Straight reach, prismatic section, no weeds, no boulders, no ice cover, no slush, no trash or brush affecting the flow, negligible wind, no equipment problems, no more than 10% of the discharge in any single panel.

Good: Possible minimal reduction of measurement precision due to slightly irregular hydraulic conditions caused by a curved reach at or upstream of the measurement section, non-prismatic channel, weeds, trash, brush, boulders, irregular bed, or upstream or downstream wind. No more than 15% of the discharge in any single panel.

Fair: Minor reduction of measurement precision due to irregular hydraulic conditions caused by one or more of the factors listed in the “Good” classification, or by ice cover. No more than 15% of the discharge in any single panel.

Poor: Significant reduction of measurement precision due to one or more of the factors listed above; or velocities near the lower detection limit of the current meter.

Late in 2005, the quality assessment was made more systematic and quantitative, as discussed in Section C5.

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 | | Personnel & Equipment Measurement Made B ND/RM Data Entry By: ND Checked PM Meter Type and No.: N/A | | | | | | | | | | | |
|--|-----------|--|--|---|---|-------|---------|-------|--------|----------|-----------|-------|---------|
| Time of Measurement Date of Measurement: February 5, 2005 Start Time: 11:35 AM MST End Time: MST | | Level Readings and Measurements Bench Mark Reading: Rod in PVC Water Level Reading: 4.0315 Top of Ice Level Reading: 4.0205 Transducer Reading: 0.156805 Other: Rod on upper bank | | | | | | | | | | | |
| Weather Conditions: -20 °C, Cloudy, snowing River Conditions: Frozen | | EI: 295.84 Full of snow EI: 294.452 EI: 291.89 EI: 294.295 EI: 296.814 | | | | | | | | | | | |
| Notes: | | <table border="1"> <thead> <tr> <th>1</th> <th>2</th> </tr> </thead> <tbody> <tr> <td>3.961</td> <td>291.879</td> </tr> <tr> <td>3.95</td> <td>291.89</td> </tr> <tr> <td>0.156805</td> <td>291.7222</td> </tr> <tr> <td>1.598</td> <td>294.242</td> </tr> </tbody> </table> | | 1 | 2 | 3.961 | 291.879 | 3.95 | 291.89 | 0.156805 | 291.7222 | 1.598 | 294.242 |
| 1 | 2 | | | | | | | | | | | | |
| 3.961 | 291.879 | | | | | | | | | | | | |
| 3.95 | 291.89 | | | | | | | | | | | | |
| 0.156805 | 291.7222 | | | | | | | | | | | | |
| 1.598 | 294.242 | | | | | | | | | | | | |
| Datalogger Notes: Datalogger Internal Power: 4.58V Datalogger External Power: 12.84V Datalogger Memory Used: 18% used Datalogger Clock: Feb 05, 2005 11:22 MST Laptop Clock: Feb 05, 2005 11:35 MST Dessicant: 15% used Datalogger: 204100607 PT: 730130-5 Power: | | Database 607 | | | | | | | | | | | |
| Measurement Location River/Stream: McClelland Lake Location: McClelland Lake Site Name: L1 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4 | | Personnel & Equipment Measurement Made B ND/RM Data Entry By: ND Checked PM Meter Type and No.: N/A | | | | | | | | | | | |
| Time of Measurement Date of Measurement: March 7, 2005 Start Time: 11:25 AM MST End Time: MST | | Level Readings and Measurements Bench Mark Reading: Rod in PVC Water Level Reading: 3.6675 Top of Ice Level Reading: 3.6735 Transducer Reading: 0.108154 Other: Rod on upper bank | | | | | | | | | | | |
| Weather Conditions: -12 °C, Clear River Conditions: Frozen | | EI: 295.84 Full of snow EI: 584.674 EI: -3.602 EI: 294.362 EI: 296.814 | | | | | | | | | | | |
| Notes: | | <table border="1"> <thead> <tr> <th>1</th> <th>2</th> </tr> </thead> <tbody> <tr> <td>3.595</td> <td>-3.595</td> </tr> <tr> <td>3.602</td> <td>-3.602</td> </tr> <tr> <td>0.108154</td> <td>-3.703154</td> </tr> <tr> <td>1.252</td> <td>-1.252</td> </tr> </tbody> </table> | | 1 | 2 | 3.595 | -3.595 | 3.602 | -3.602 | 0.108154 | -3.703154 | 1.252 | -1.252 |
| 1 | 2 | | | | | | | | | | | | |
| 3.595 | -3.595 | | | | | | | | | | | | |
| 3.602 | -3.602 | | | | | | | | | | | | |
| 0.108154 | -3.703154 | | | | | | | | | | | | |
| 1.252 | -1.252 | | | | | | | | | | | | |
| Datalogger Notes: Datalogger Internal Power: 4.641V Datalogger External Power: 14.97V Datalogger Memory Used: 21% used Datalogger Clock: Mar 07, 2005 11:13 MST Laptop Clock: Mar 07, 2005 11:27 MST Dessicant: 20% used Datalogger: 204100607 PT: 730130-5 Power: | | Database 607 | | | | | | | | | | | |
| Measurement Location River/Stream: McClelland Lake Location: McClelland Lake Site Name: L1 Coordinates & Legal: 483430 E, 6371950 N NW-12-98-9-W4 | | Personnel & Equipment Measurement Made B ND/RM Data Entry By: ND Checked PM Meter Type and No.: N/A | | | | | | | | | | | |
| Time of Measurement Date of Measurement: April 9, 2005 Start Time: 10:05 AM MDT End Time: MDT | | Level Readings and Measurements Bench Mark Reading: Rod in PVC Water Level Reading: 3.4375 Top of Ice Level Reading: 3.424 Transducer Reading: 0.01422 Other: Rod on upper bank | | | | | | | | | | | |
| Weather Conditions: +7 °C, Cloudy River Conditions: Ice cover | | EI: 295.84 Full of snow EI: 584.904 EI: -3.355 EI: 294.518 EI: 296.814 | | | | | | | | | | | |
| Notes: | | <table border="1"> <thead> <tr> <th>1</th> <th>2</th> </tr> </thead> <tbody> <tr> <td>3.37</td> <td>-3.37</td> </tr> <tr> <td>3.355</td> <td>-3.355</td> </tr> <tr> <td>0.01422</td> <td>-3.38422</td> </tr> <tr> <td>1.086</td> <td>-1.086</td> </tr> </tbody> </table> | | 1 | 2 | 3.37 | -3.37 | 3.355 | -3.355 | 0.01422 | -3.38422 | 1.086 | -1.086 |
| 1 | 2 | | | | | | | | | | | | |
| 3.37 | -3.37 | | | | | | | | | | | | |
| 3.355 | -3.355 | | | | | | | | | | | | |
| 0.01422 | -3.38422 | | | | | | | | | | | | |
| 1.086 | -1.086 | | | | | | | | | | | | |
| Datalogger Notes: Datalogger Internal Power: 4.645V Datalogger External Power: 14.82V Datalogger Memory Used: 24% used Datalogger Clock: Apr 09, 2005 09:31 MST Laptop Clock: Apr 09, 2005 09:45 MST Dessicant: 20% used Datalogger: 204100607 PT: 730130-5 Power: | | Database 607 | | | | | | | | | | | |

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, 2005
Start Time: MDT
End Time: MDT

Weather Conditions: +8 °C, Cloudy

River Conditions: Partial Ice cover

Notes: Could not visit the site, lot of overflow and water level very high, not possible to land

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: ND Checked PM
Meter Type and No.: N/A

Level Readings and Measurements

| | | | |
|---------------------------|-------------------|-----|---------|
| Bench Mark Reading: | Rod in PVC | El: | 295.84 |
| Water Level Reading: | #DIV/0! | El: | #DIV/0! |
| Top of Ice Level Reading: | #DIV/0! | El: | 295.84 |
| Transducer Reading: | #DIV/0! | El: | #DIV/0! |
| Other: | Rod on upper bank | El: | 296.814 |

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: June 2, 2005
Start Time: 12:55 PM MDT
End Time: 1:07 PM MDT

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Rod in PV 2.551
Water Level Reading: 3.779
Bench Mark Rod Near PVC 1.577
Transducer Reading & Calc'd El. 1.176
Other: Rod near DL 3.520

Setup No. 1

El: 295.840
El: 294.612
El: 296.814
El: 293.436
El: 294.871

Setup No. 2

2.537 El: 295.840
3.769 El: 294.608
1.565 El: 296.812
1.176 El: 293.432
3.510 El: 294.867

Weather Conditions: +20 C, Clear, Light wind

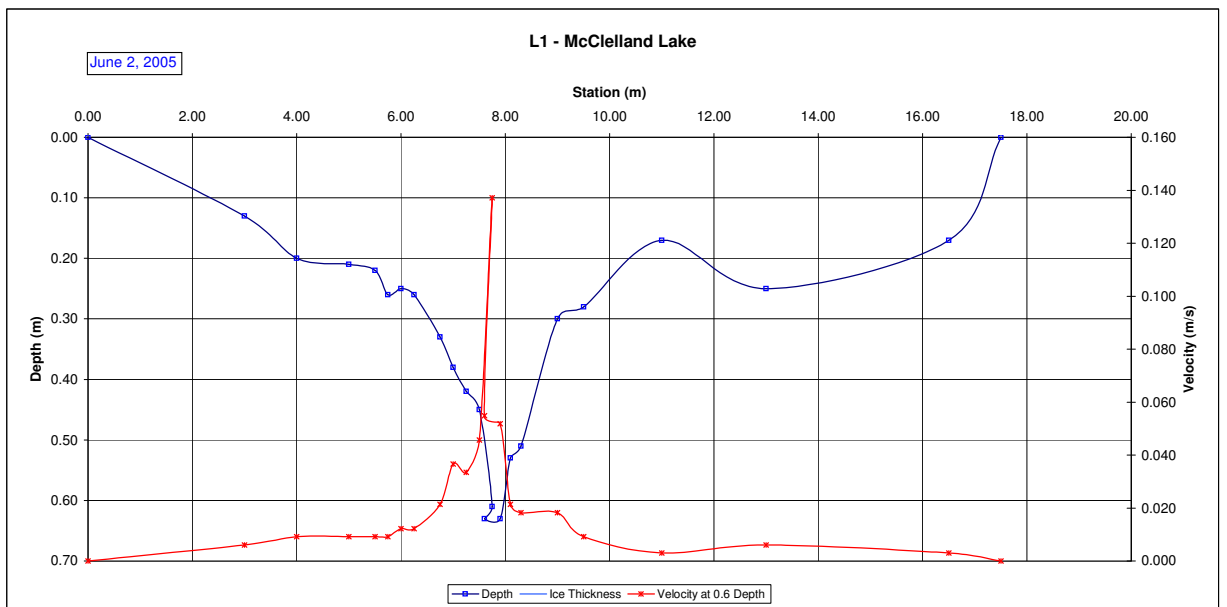
River Conditions: Open, High stage, Outlet is flowing

| 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) | (m²) | (m³/s) | | | | | |
| 0.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.00 | 1.50 | 0.002 | 0.002 | 0.03 | 0.05 | 0.000 | | | | | |
| 3.00 | 0.13 | | | | 0.006 | 1.00 | 2 | 1.50 | 3.50 | 0.006 | 0.006 | 0.13 | 0.26 | 0.002 | | | | | |
| 4.00 | 0.20 | | | | 0.009 | 1.00 | 3 | 3.50 | 4.50 | 0.009 | 0.009 | 0.20 | 0.20 | 0.002 | | | | | |
| 5.00 | 0.21 | | | | 0.009 | 1.00 | 4 | 4.50 | 5.25 | 0.009 | 0.009 | 0.21 | 0.16 | 0.001 | | | | | |
| 5.50 | 0.22 | | | | 0.009 | 1.00 | 5 | 5.25 | 5.63 | 0.009 | 0.009 | 0.22 | 0.08 | 0.001 | | | | | |
| 5.75 | 0.26 | | | | 0.009 | 1.00 | 6 | 5.63 | 5.88 | 0.009 | 0.009 | 0.26 | 0.07 | 0.001 | | | | | |
| 6.00 | 0.25 | | | | 0.012 | 1.00 | 7 | 5.88 | 6.13 | 0.012 | 0.012 | 0.25 | 0.06 | 0.001 | | | | | |
| 6.25 | 0.26 | | | | 0.012 | 1.00 | 8 | 6.13 | 6.50 | 0.012 | 0.012 | 0.26 | 0.10 | 0.001 | | | | | |
| 6.75 | 0.33 | | | | 0.021 | 1.00 | 9 | 6.50 | 6.88 | 0.021 | 0.021 | 0.33 | 0.12 | 0.003 | | | | | |
| 7.00 | 0.38 | | | | 0.037 | 1.00 | 10 | 6.88 | 7.13 | 0.037 | 0.037 | 0.38 | 0.10 | 0.003 | | | | | |
| 7.25 | 0.42 | | | | 0.034 | 1.00 | 11 | 7.13 | 7.38 | 0.034 | 0.034 | 0.42 | 0.11 | 0.004 | | | | | |
| 7.50 | 0.45 | | | | 0.046 | 1.00 | 12 | 7.38 | 7.63 | 0.046 | 0.046 | 0.45 | 0.11 | 0.005 | | | | | |
| 7.75 | 0.61 | | | | 0.137 | 1.00 | 13 | 7.63 | 7.68 | 0.137 | 0.137 | 0.61 | 0.03 | 0.004 | | | | | |
| 7.60 | 0.63 | | | | 0.055 | 1.00 | 14 | 7.68 | 7.75 | 0.055 | 0.055 | 0.63 | 0.05 | 0.003 | | | | | |
| 7.90 | 0.63 | | | | 0.052 | 1.00 | 15 | 7.75 | 8.00 | 0.052 | 0.052 | 0.63 | 0.16 | 0.008 | | | | | |
| 8.10 | 0.53 | | | | 0.021 | 1.00 | 16 | 8.00 | 8.20 | 0.021 | 0.021 | 0.53 | 0.11 | 0.002 | | | | | |
| 8.30 | 0.51 | | | | 0.018 | 1.00 | 17 | 8.20 | 8.65 | 0.018 | 0.018 | 0.51 | 0.23 | 0.004 | | | | | |
| 9.00 | 0.30 | | | | 0.018 | 1.00 | 18 | 8.65 | 9.25 | 0.018 | 0.018 | 0.30 | 0.18 | 0.003 | | | | | |
| 9.50 | 0.28 | | | | 0.009 | 1.00 | 19 | 9.25 | 10.25 | 0.009 | 0.009 | 0.28 | 0.28 | 0.003 | | | | | |
| 11.00 | 0.17 | | | | 0.003 | 1.00 | 20 | 10.25 | 12.00 | 0.003 | 0.003 | 0.17 | 0.30 | 0.001 | | | | | |
| 13.00 | 0.25 | | | | 0.006 | 1.00 | 21 | 12.00 | 14.75 | 0.006 | 0.006 | 0.25 | 0.69 | 0.004 | | | | | |
| 16.50 | 0.17 | | | | 0.003 | 1.00 | 22 | 14.75 | 17.00 | 0.003 | 0.003 | 0.17 | 0.38 | 0.001 | | | | | |
| 17.50 | 0.00 | | | | 0.000 | 1.00 | 23 | 17.00 | 17.50 | 0.001 | 0.001 | 0.04 | 0.02 | 0.000 | | | | | |
| | | | | | | | | | | | | | Total Flow: | | 0.057 | | | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.057 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 3.83 | (m ²) |
| Top Width: | 17.50 | (m) |
| Hydraulic Depth: | 0.219 | (m) |
| Mean Velocity: | 0.015 | (m/s) |
| Froude Number | 0.010 | |
| Photographs taken looking at: | | |
| Upstream, downstream, left bank, right bank, bench mark, datalogger/battery | | |

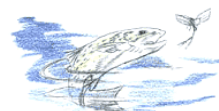
| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 607 |
| Datalogger Internal Power: | 4.7V | |
| Datalogger External Power: | 14.2V | |
| Datalogger Memory Used: | 30% | |
| Datalogger Clock: | Jun 02, 2005 10:43 | MST |
| Laptop Clock: | Jun 02, 2005 10:50 | MST |
| Dessicant: | 50% used | |
| Datalogger: | Optimum DD128, # 0105010607 | |
| PT: | Keller 730-130-5 psi #0205464 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: The chewed cable fixed, data now looks OK.
Tipping bucket rain gauge installed. Ignore tips up to 11:41 AM, RG counts 3289.
TSS sample collected at the outlet.



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

Personnel & Equipment

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

Time of Measurement

Date of Measurement: July 13, 2005
Start Time: 2:15 PM MDT
End Time: 2:31 PM MDT

Level Readings

| | Setup No. 1 | Setup No. 2 |
|---------------------------------|-------------|-------------|
| Bench Mark Reading: Rod in PV | 2.352 | 2.278 |
| Water Level Reading: | 3.685 | 3.602 |
| Bench Mark Rod Near PVC | 1.380 | 1.305 |
| Transducer Reading & Calc'd El. | 1.125 | 1.125 |
| Other: | | |

Weather Conditions:

+25°C, Clear

River Conditions:

Open, Outlet is flowing

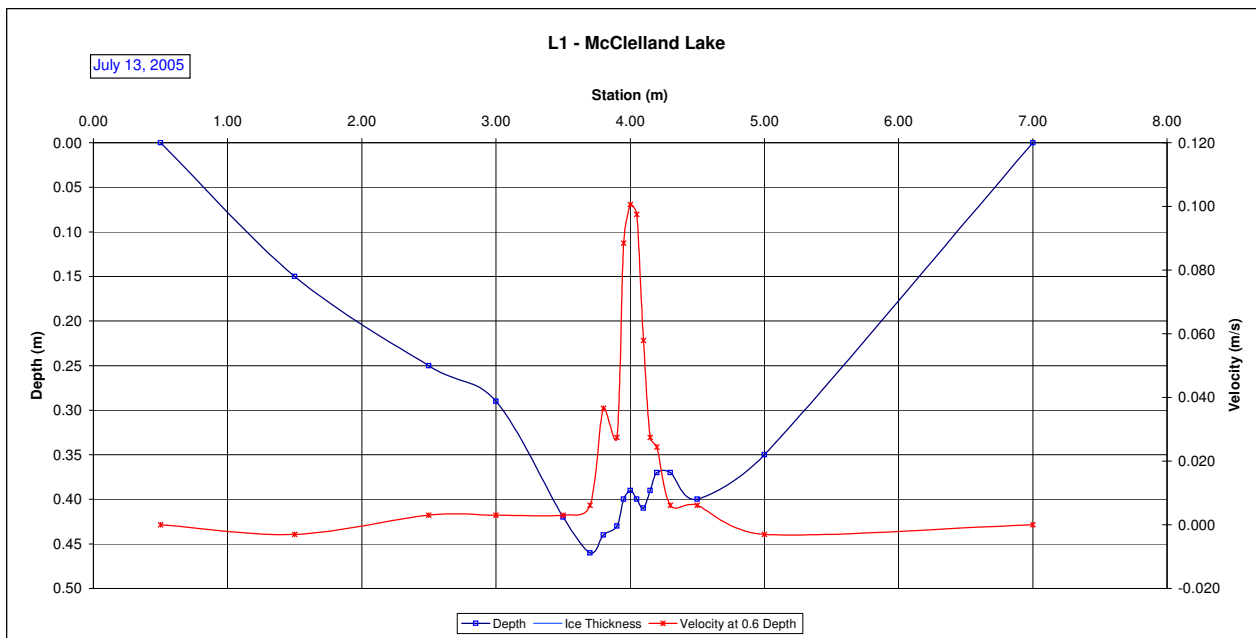
Measurement Data

| 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) |
| 0.50 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.50 | 1.00 | -0.001 | -0.001 | 0.04 | 0.02 | 0.000 |
| 1.50 | 0.15 | | | | -0.003 | 1.00 | 2 | 1.00 | 2.00 | -0.003 | -0.003 | 0.15 | 0.15 | 0.000 |
| 2.50 | 0.25 | | | | 0.003 | 1.00 | 3 | 2.00 | 2.75 | 0.003 | 0.003 | 0.25 | 0.19 | 0.001 |
| 3.00 | 0.29 | | | | 0.003 | 1.00 | 4 | 2.75 | 3.25 | 0.003 | 0.003 | 0.29 | 0.15 | 0.000 |
| 3.50 | 0.42 | | | | 0.003 | 1.00 | 5 | 3.25 | 3.60 | 0.003 | 0.003 | 0.42 | 0.15 | 0.000 |
| 3.70 | 0.46 | | | | 0.006 | 1.00 | 6 | 3.60 | 3.75 | 0.006 | 0.006 | 0.46 | 0.07 | 0.000 |
| 3.80 | 0.44 | | | | 0.037 | 1.00 | 7 | 3.75 | 3.85 | 0.037 | 0.037 | 0.44 | 0.04 | 0.002 |
| 3.90 | 0.43 | | | | 0.027 | 1.00 | 8 | 3.85 | 3.93 | 0.027 | 0.027 | 0.43 | 0.03 | 0.001 |
| 3.95 | 0.40 | | | | 0.088 | 1.00 | 9 | 3.93 | 3.98 | 0.088 | 0.088 | 0.40 | 0.02 | 0.002 |
| 4.00 | 0.39 | | | | 0.101 | 1.00 | 10 | 3.98 | 4.03 | 0.101 | 0.101 | 0.39 | 0.02 | 0.002 |
| 4.05 | 0.40 | | | | 0.098 | 1.00 | 11 | 4.03 | 4.08 | 0.098 | 0.098 | 0.40 | 0.02 | 0.002 |
| 4.10 | 0.41 | | | | 0.058 | 1.00 | 12 | 4.08 | 4.13 | 0.058 | 0.058 | 0.41 | 0.02 | 0.001 |
| 4.15 | 0.39 | | | | 0.027 | 1.00 | 13 | 4.13 | 4.18 | 0.027 | 0.027 | 0.39 | 0.02 | 0.001 |
| 4.20 | 0.37 | | | | 0.024 | 1.00 | 14 | 4.18 | 4.25 | 0.024 | 0.024 | 0.37 | 0.03 | 0.001 |
| 4.30 | 0.37 | | | | 0.006 | 1.00 | 15 | 4.25 | 4.40 | 0.006 | 0.006 | 0.37 | 0.06 | 0.000 |
| 4.50 | 0.40 | | | | 0.006 | 1.00 | 16 | 4.40 | 4.75 | 0.006 | 0.006 | 0.40 | 0.14 | 0.001 |
| 5.00 | 0.35 | | | | -0.003 | 1.00 | 17 | 4.75 | 6.00 | -0.003 | -0.003 | 0.35 | 0.44 | -0.001 |
| 7.00 | 0.00 | | | | 0.000 | 1.00 | 18 | 6.00 | 7.00 | -0.001 | -0.001 | 0.09 | 0.09 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.012 |

| | | |
|---|-------|--------|
| Total Flow: | 0.012 | (m³/s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1.64 | (m²) |
| Top Width: | 6.50 | (m) |
| Hydraulic Depth: | 0.253 | (m) |
| Mean Velocity: | 0.007 | (m/s) |
| Froude Number | 0.005 | |
| Photographs taken looking at: | | |
| Upstream, downstream, left bank, right bank, bench mark, datalogger/battery | | |

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 607 |
| Datalogger Internal Power: | 4.711V | |
| Datalogger External Power: | 14.04V | |
| Datalogger Memory Used: | 35% | |
| Datalogger Clock: | Jul 13, 2005 12:43 | MST |
| Laptop Clock: | Jul 13, 2005 12:57 | MST |
| Dessicant: | 60% used | |
| Datalogger: | Optimum DD128, # 0105010607 | |
| PT: | Keller 730-130-5 psi #0205464 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes:



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: September 2, 2005
Date of Measurement: 2:45 PM MDT
Start Time: 2:58 PM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Rod in PV 2.064
Water Level Reading: 3.311
Bench Mark Rod Near PVC 1.091
Transducer Reading & Calc'd El. 0.669
Other: Rod near DL

Setup No. 1

El: 295.840
El: 294.593
El: 296.813
El: 293.924
El: 297.904

Setup No. 2

El: 295.840
El: 294.598
El: 296.813
El: 293.929
El: 298.023

Weather Conditions: +15 C, overcast, calm

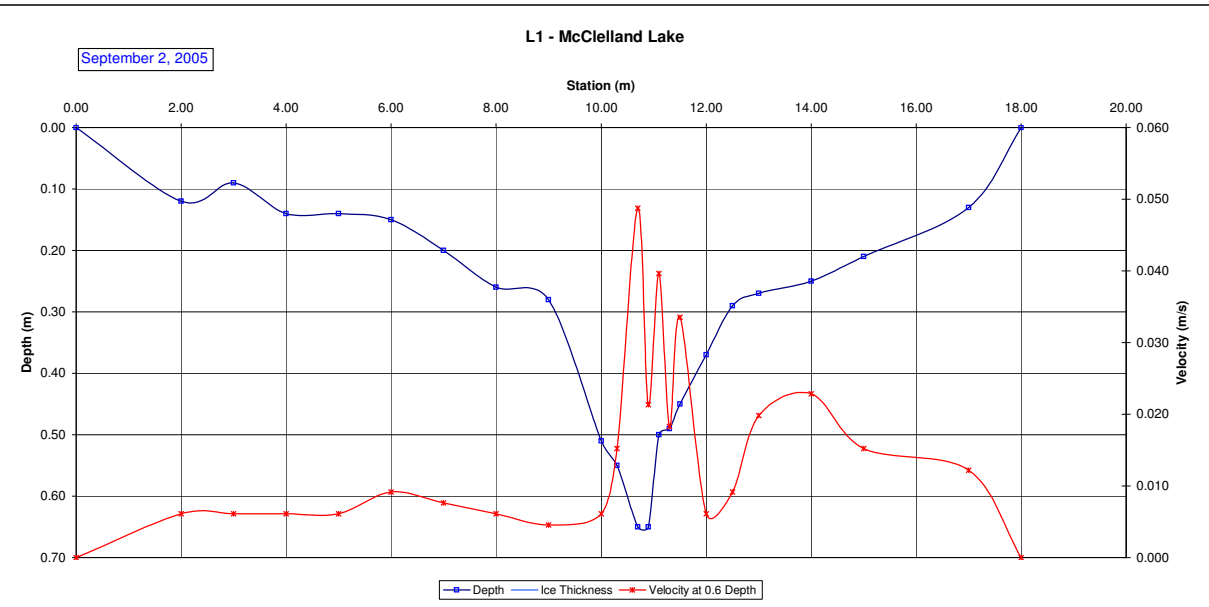
River Conditions: Open, Moderately High stage, Outlet is flowing

| 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) |
| 0.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.00 | 1.00 | 0.002 | 0.002 | 0.03 | 0.03 | 0.000 |
| 2.00 | 0.12 | | | | 0.006 | 1.00 | 2 | 1.00 | 2.50 | 0.006 | 0.006 | 0.12 | 0.18 | 0.001 |
| 3.00 | 0.09 | | | | 0.006 | 1.00 | 3 | 2.50 | 3.50 | 0.006 | 0.006 | 0.09 | 0.09 | 0.001 |
| 4.00 | 0.14 | | | | 0.006 | 1.00 | 4 | 3.50 | 4.50 | 0.006 | 0.006 | 0.14 | 0.14 | 0.001 |
| 5.00 | 0.14 | | | | 0.006 | 1.00 | 5 | 4.50 | 5.50 | 0.006 | 0.006 | 0.14 | 0.14 | 0.001 |
| 6.00 | 0.15 | | | | 0.009 | 1.00 | 6 | 5.50 | 6.50 | 0.009 | 0.009 | 0.15 | 0.15 | 0.001 |
| 7.00 | 0.20 | | | | 0.008 | 1.00 | 7 | 6.50 | 7.50 | 0.008 | 0.008 | 0.20 | 0.20 | 0.002 |
| 8.00 | 0.26 | | | | 0.006 | 1.00 | 8 | 7.50 | 8.50 | 0.006 | 0.006 | 0.26 | 0.26 | 0.002 |
| 9.00 | 0.28 | | | | 0.005 | 1.00 | 9 | 8.50 | 9.50 | 0.005 | 0.005 | 0.28 | 0.28 | 0.001 |
| 10.00 | 0.51 | | | | 0.006 | 1.00 | 10 | 9.50 | 10.15 | 0.006 | 0.006 | 0.51 | 0.33 | 0.002 |
| 10.30 | 0.55 | | | | 0.015 | 1.00 | 11 | 10.15 | 10.50 | 0.015 | 0.015 | 0.55 | 0.19 | 0.003 |
| 10.70 | 0.65 | | | | 0.049 | 1.00 | 12 | 10.50 | 10.80 | 0.049 | 0.049 | 0.65 | 0.20 | 0.010 |
| 10.90 | 0.65 | | | | 0.021 | 1.00 | 13 | 10.80 | 11.00 | 0.021 | 0.021 | 0.65 | 0.13 | 0.003 |
| 11.10 | 0.50 | | | | 0.040 | 1.00 | 14 | 11.00 | 11.20 | 0.040 | 0.040 | 0.50 | 0.10 | 0.004 |
| 11.30 | 0.49 | | | | 0.018 | 1.00 | 15 | 11.20 | 11.40 | 0.018 | 0.018 | 0.49 | 0.10 | 0.002 |
| 11.50 | 0.45 | | | | 0.034 | 1.00 | 16 | 11.40 | 11.75 | 0.034 | 0.034 | 0.45 | 0.16 | 0.005 |
| 12.00 | 0.37 | | | | 0.006 | 1.00 | 17 | 11.75 | 12.25 | 0.006 | 0.006 | 0.37 | 0.19 | 0.001 |
| 12.50 | 0.29 | | | | 0.009 | 1.00 | 18 | 12.25 | 12.75 | 0.009 | 0.009 | 0.29 | 0.15 | 0.001 |
| 13.00 | 0.27 | | | | 0.020 | 1.00 | 19 | 12.75 | 13.50 | 0.020 | 0.020 | 0.27 | 0.20 | 0.004 |
| 14.00 | 0.25 | | | | 0.023 | 1.00 | 20 | 13.50 | 14.50 | 0.023 | 0.023 | 0.25 | 0.25 | 0.006 |
| 15.00 | 0.21 | | | | 0.015 | 1.00 | 21 | 14.50 | 16.00 | 0.015 | 0.015 | 0.21 | 0.32 | 0.005 |
| 17.00 | 0.13 | | | | 0.012 | 1.00 | 22 | 16.00 | 17.50 | 0.012 | 0.012 | 0.13 | 0.20 | 0.002 |
| 18.00 | 0.00 | | | | 0.000 | 1.00 | 23 | 17.50 | 18.00 | 0.003 | 0.003 | 0.03 | 0.02 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.057 |

| | | |
|--|-------|---------------------|
| Total Flow: | 0.057 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 3.98 | (m ²) |
| Top Width: | 18.00 | (m) |
| Hydraulic Depth: | 0.221 | (m) |
| Mean Velocity: | 0.014 | (m/s) |
| Froude Number | 0.010 | |
| Photographs taken looking at: Upstream, downstream, left bank, right bank, bench mark, datalogger/battery | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 607 |
| Datalogger Internal Power: | 4.46V | |
| Datalogger External Power: | 12.9V | |
| Datalogger Memory Used: | 41% | |
| Datalogger Clock: | Sep 02, 2005 12:01 | MST |
| Laptop Clock: | Sep 02, 2005 12:17 | MST |
| Dessicant: | 100% used-replaced | |
| Datalogger: | Optimum DD128, # 0105010607 | |
| PT: | Keller 730-130-5 psi #0205464 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: RG at 3946 tips. Ignore tips to 3950. RG repaired.
TSS sample collected at the outlet.
Transducer malfunctioning-reading depth too low. Transducer destroyed during attempt to troubleshoot.



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 7, 2005
 Start Time: 10:28 AM MDT
 End Time:

Weather Conditions:

+15° C, Clear, strong wind from south west, 8 to 15 cm waves.

River Conditions:

Open, Outlet is flowing

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Rod in PV 2.094
 Water Level Reading: 3.348
 Bench Mark Rod Near PVC 1.122
 Transducer Reading & Calc'd El: 1.200

Setup No. 1

El: 295.840
 El: 294.586
 El: 296.812
 El: 293.386

Setup No. 2

El: 295.840
 El: 294.590
 El: 296.814
 El: 293.390

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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | |

| | |
|---|---------------------|
| Total Flow: | (m ³ /s) |
| Perceived Measurement Quality: | |
| Total Area: | (m ²) |
| Top Width: | (m) |
| Hydraulic Depth: | (m) |
| Mean Velocity: | (m/s) |
| Froude Number | |
| Photographs taken looking at: | |
| Upstream, downstream, left bank, right bank, bench mark, datalogger/battery | |

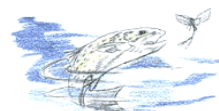
| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 607 |
| Datalogger Internal Power: | 4.711V | |
| Datalogger External Power: | 14.35V | |
| Datalogger Memory Used: | 41% | |
| Datalogger Clock: | Sep 07, 2005 09:28 | MST |
| Laptop Clock: | Sep 07, 2005 09:45 | MST |
| Dessicant: | 100% Good | |
| Datalogger: | Optimum DD128, # 0105010607 | |
| PT: | Keller 730-130-5 psi #503448 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes:

Rain guage at 3952 counts. Rain gauge repaired by reafixing wire to logger.
 New transducer installed with security cable around base of equipment mast.
 Clock set to match laptop at 11:13 MST. Memory cleared. Multiple transducer readings averaged to account for waves on lake.

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

Personnel & Equipment

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

Time of Measurement

Date of Measurement: October 8, 2005
Start Time: 12:18 PM MDT
End Time: 12:20 PM MDT

Level Readings

| | Setup No. 1 | Setup No. 2 |
|---------------------------------|-------------|-------------|
| Bench Mark Reading: Rod in PV | 1.790 | 1.808 |
| Water Level Reading: | 3.088 | 3.105 |
| Bench Mark Rod Near PVC | 0.812 | 0.834 |
| Transducer Reading & Calc'd El. | 1.156 | 1.156 |
| Other: Rod near DL | 297.630 | 297.648 |

Weather Conditions: +10 C, overcast, raining

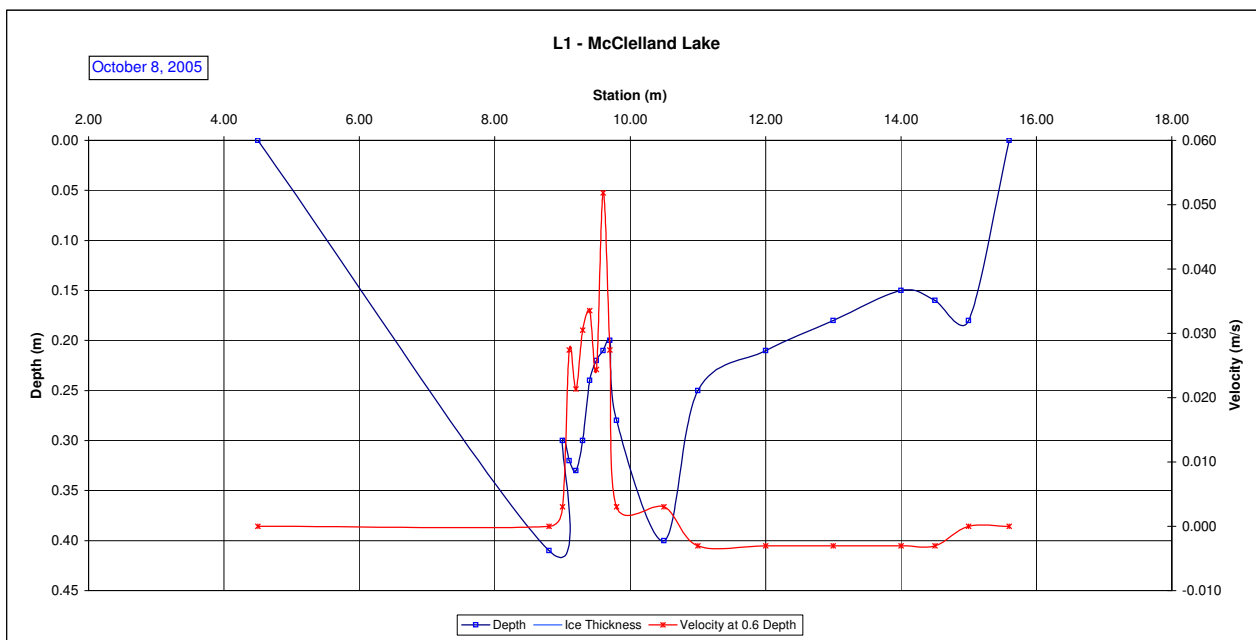
River Conditions: Open, High stage

| 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) |
| 4.50 | 0.00 | | | | 0.000 | 1.00 | 1 | 4.50 | 6.65 | 0.000 | 0.000 | 0.10 | 0.22 | 0.000 |
| 8.80 | 0.41 | | | | 0.000 | 1.00 | 2 | 6.65 | 8.90 | 0.000 | 0.000 | 0.41 | 0.92 | 0.000 |
| 9.00 | 0.30 | | | | 0.003 | 1.00 | 3 | 8.90 | 9.05 | 0.003 | 0.003 | 0.30 | 0.05 | 0.000 |
| 9.10 | 0.32 | | | | 0.027 | 1.00 | 4 | 9.05 | 9.15 | 0.027 | 0.027 | 0.32 | 0.03 | 0.001 |
| 9.20 | 0.33 | | | | 0.021 | 1.00 | 5 | 9.15 | 9.25 | 0.021 | 0.021 | 0.33 | 0.03 | 0.001 |
| 9.30 | 0.30 | | | | 0.030 | 1.00 | 6 | 9.25 | 9.35 | 0.030 | 0.030 | 0.30 | 0.03 | 0.001 |
| 9.40 | 0.24 | | | | 0.034 | 1.00 | 7 | 9.35 | 9.45 | 0.034 | 0.034 | 0.24 | 0.02 | 0.001 |
| 9.50 | 0.22 | | | | 0.024 | 1.00 | 8 | 9.45 | 9.55 | 0.024 | 0.024 | 0.22 | 0.02 | 0.001 |
| 9.60 | 0.21 | | | | 0.052 | 1.00 | 9 | 9.55 | 9.65 | 0.052 | 0.052 | 0.21 | 0.02 | 0.001 |
| 9.70 | 0.20 | | | | 0.027 | 1.00 | 10 | 9.65 | 9.75 | 0.027 | 0.027 | 0.20 | 0.02 | 0.001 |
| 9.80 | 0.28 | | | | 0.003 | 1.00 | 11 | 9.75 | 10.15 | 0.003 | 0.003 | 0.28 | 0.11 | 0.000 |
| 10.50 | 0.40 | | | | 0.003 | 1.00 | 12 | 10.15 | 10.75 | 0.003 | 0.003 | 0.40 | 0.24 | 0.001 |
| 11.00 | 0.25 | | | | -0.003 | 1.00 | 13 | 10.75 | 11.50 | -0.003 | -0.003 | 0.25 | 0.19 | -0.001 |
| 12.00 | 0.21 | | | | -0.003 | 1.00 | 14 | 11.50 | 12.50 | -0.003 | -0.003 | 0.21 | 0.21 | -0.001 |
| 13.00 | 0.18 | | | | -0.003 | 1.00 | 15 | 12.50 | 13.50 | -0.003 | -0.003 | 0.18 | 0.18 | -0.001 |
| 14.00 | 0.15 | | | | -0.003 | 1.00 | 16 | 13.50 | 14.25 | -0.003 | -0.003 | 0.15 | 0.11 | 0.000 |
| 14.50 | 0.16 | | | | -0.003 | 1.00 | 17 | 14.25 | 14.75 | -0.003 | -0.003 | 0.16 | 0.08 | 0.000 |
| 15.00 | 0.18 | | | | 0.000 | 1.00 | 18 | 14.75 | 15.30 | 0.000 | 0.000 | 0.18 | 0.10 | 0.000 |
| 15.60 | 0.00 | | | | 0.000 | 1.00 | 19 | 15.30 | 15.60 | 0.000 | 0.000 | 0.05 | 0.01 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.004 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.004 | (m ³ /s) |
| Perceived Measurement Quality: | Poor | |
| Total Area: | 2.60 | (m ²) |
| Top Width: | 11.10 | (m) |
| Hydraulic Depth: | 0.235 | (m) |
| Mean Velocity: | 0.002 | (m/s) |
| Froude Number | 0.001 | |
| Photographs taken looking at: | | |
| Upstream, downstream, left bank, right bank, bench mark, datalogger/battery | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 607 |
| Datalogger Internal Power: | 4.465 V | |
| Datalogger External Power: | 12.86V | |
| Datalogger Memory Used: | 41% | |
| Datalogger Clock: | Oct 08, 2005 12:18 | MST |
| Laptop Clock: | Oct 08, 2005 12:20 | MST |
| Dessicant: | good | |
| Datalogger: | Optimum DD128, # 0105010607 | |
| PT: | Keller 730-130-5 psi #0205464 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| | PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes:



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 9, 2005
Start Time: 1:05 PM MST
End Time: MST

Weather Conditions: +2 °C, Partly cloudy, Calm

River Conditions: Complete ice cover

Notes:

Notes:

Personnel & Equipment

Measurement Made By: ND/PM
Data Entry By: ND Checked PM
Meter Type and No.: N/A

Level Readings and Measurements

| | | | | |
|---------------------------|-------------------|----------|-----|---------|
| Bench Mark Reading: | Rod in PVC | 1.1055 | El: | 295.84 |
| Water Level Reading: | | 2.3775 | El: | 294.568 |
| Top of Ice Level Reading: | | 2.371 | El: | 294.571 |
| Transducer Reading: | | 1.141868 | El: | 293.426 |
| Other: | Rod on upper bank | 0.131 | El: | 296.815 |

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 607 |
| Datalogger Internal Power: | 4.637V | |
| Datalogger External Power: | 12.08V | |
| Datalogger Memory Used: | 10% | |
| Datalogger Clock: | Dec 09, 2005 13:01 | MST |
| Laptop Clock: | Dec 09, 2005 13:05 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD128, # 0105010607 | |
| 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

L2 - Kearl Lake



Regional Aquatics Monitoring Program

| Measurement Location | | Personnel & Equipment | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----------------------------------|--|---------------|-------------|--|-------------|--|----------------------------------|-------------------|-------------------|--|----------------------|-------------------|-------------------|--|---------------------------|-----------|-----------|--|----------------------------------|-------------------|-------------------|--|--------|-----|-----|--|
| River/Stream: | Kearl Lake | Measurement Made By: | DB/ND/CT | | | | | | | | | | | | | | | | | | | | | | | | |
| Location: | Kearl Lake | Data Entry By: | DB Checked PM | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Name: | L2 | Meter Type and No.: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Time of Measurement | | Level Readings | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date of Measurement: | January 6, 2005 | <table border="1"> <thead> <tr> <th colspan="2">Setup No. 1</th> <th colspan="2">Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: nail in tree</td> <td>1.855 El: 100.000</td> <td>1.940 El: 100.000</td> <td></td> </tr> <tr> <td>Water Level Reading:</td> <td>2.987 El: 331.931</td> <td>3.070 El: 331.933</td> <td></td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td>2.986 El:</td> <td>3.065 El:</td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>0.622 El: 331.309</td> <td>0.622 El: 331.311</td> <td></td> </tr> <tr> <td>Other:</td> <td>El:</td> <td>El:</td> <td></td> </tr> </tbody> </table> | | Setup No. 1 | | Setup No. 2 | | Bench Mark Reading: nail in tree | 1.855 El: 100.000 | 1.940 El: 100.000 | | Water Level Reading: | 2.987 El: 331.931 | 3.070 El: 331.933 | | Top of Ice Level Reading: | 2.986 El: | 3.065 El: | | Transducer Reading & Calc'd El.: | 0.622 El: 331.309 | 0.622 El: 331.311 | | Other: | El: | El: | |
| Setup No. 1 | | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: nail in tree | 1.855 El: 100.000 | 1.940 El: 100.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 2.987 El: 331.931 | 3.070 El: 331.933 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | 2.986 El: | 3.065 El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 0.622 El: 331.309 | 0.622 El: 331.311 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other: | El: | El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Start Time: | 1:50 PM MST | | | | | | | | | | | | | | | | | | | | | | | | | | |
| End Time: | MST | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: -10 °C, overcast, light snow | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| River Conditions: Complete ice cover | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Notes: Logger clock synchronized with laptop after download | | Datalogger Notes: Database # 657 Datalogger Internal Power: 4.374 V Datalogger External Power: 12.54 V Datalogger Memory Used: 65% Datalogger Clock: Jan 06, 2005 13:43 MST Laptop Clock: Jan 06, 2005 13:51 MST Dessicant: 25% used Datalogger: PT: 101344 Power: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement Location | | Personnel & Equipment | | | | | | | | | | | | | | | | | | | | | | | | | |
| River/Stream: | Kearl Lake | Measurement Made By: | RM/ND/CT | | | | | | | | | | | | | | | | | | | | | | | | |
| Location: | Kearl Lake | Data Entry By: | ND Checked PM | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Name: | L2 | Meter Type and No.: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Time of Measurement | | Level Readings | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date of Measurement: | February 4, 2005 | <table border="1"> <thead> <tr> <th colspan="2">Setup No. 1</th> <th colspan="2">Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: nail in tree</td> <td>1.946 El: 100.000</td> <td>1.995 El: 100.000</td> <td></td> </tr> <tr> <td>Water Level Reading:</td> <td>3.114 El: 331.895</td> <td>3.161 El: 331.897</td> <td></td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td>3.120 El:</td> <td>3.167 El:</td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>0.607 El: 331.288</td> <td>0.607 El: 331.290</td> <td></td> </tr> <tr> <td>Other:</td> <td>El:</td> <td>El:</td> <td></td> </tr> </tbody> </table> | | Setup No. 1 | | Setup No. 2 | | Bench Mark Reading: nail in tree | 1.946 El: 100.000 | 1.995 El: 100.000 | | Water Level Reading: | 3.114 El: 331.895 | 3.161 El: 331.897 | | Top of Ice Level Reading: | 3.120 El: | 3.167 El: | | Transducer Reading & Calc'd El.: | 0.607 El: 331.288 | 0.607 El: 331.290 | | Other: | El: | El: | |
| Setup No. 1 | | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: nail in tree | 1.946 El: 100.000 | 1.995 El: 100.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 3.114 El: 331.895 | 3.161 El: 331.897 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | 3.120 El: | 3.167 El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 0.607 El: 331.288 | 0.607 El: 331.290 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other: | El: | El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Start Time: | 1:30 PM MST | | | | | | | | | | | | | | | | | | | | | | | | | | |
| End Time: | MST | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: -20 °C, overcast | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| River Conditions: Complete ice cover | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Notes: Logger clock synchronized with laptop after download | | Datalogger Notes: Database # 657 Datalogger Internal Power: 4.35 V Datalogger External Power: 14.96 V Datalogger Memory Used: 67% Datalogger Clock: Feb 04, 2005 13:27 MST Laptop Clock: Feb 04, 2005 13:31 MST Dessicant: 25% used, good Datalogger: #0209170657 PT: 101344 Power: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement Location | | Personnel & Equipment | | | | | | | | | | | | | | | | | | | | | | | | | |
| River/Stream: | Kearl Lake | Measurement Made By: | RM/ND/CT | | | | | | | | | | | | | | | | | | | | | | | | |
| Location: | Kearl Lake | Data Entry By: | ND Checked PM | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Name: | L2 | Meter Type and No.: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Time of Measurement | | Level Readings | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date of Measurement: | March 4, 2005 | <table border="1"> <thead> <tr> <th colspan="2">Setup No. 1</th> <th colspan="2">Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: nail in tree</td> <td>2.028 El: 100.000</td> <td>1.935 El: 100.000</td> <td></td> </tr> <tr> <td>Water Level Reading:</td> <td>3.240 El: 331.851</td> <td>3.151 El: 331.847</td> <td></td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td>3.200 El:</td> <td>3.110 El:</td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>0.553 El: 331.298</td> <td>0.553 El: 331.294</td> <td></td> </tr> <tr> <td>Other:</td> <td>El:</td> <td>El:</td> <td></td> </tr> </tbody> </table> | | Setup No. 1 | | Setup No. 2 | | Bench Mark Reading: nail in tree | 2.028 El: 100.000 | 1.935 El: 100.000 | | Water Level Reading: | 3.240 El: 331.851 | 3.151 El: 331.847 | | Top of Ice Level Reading: | 3.200 El: | 3.110 El: | | Transducer Reading & Calc'd El.: | 0.553 El: 331.298 | 0.553 El: 331.294 | | Other: | El: | El: | |
| Setup No. 1 | | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: nail in tree | 2.028 El: 100.000 | 1.935 El: 100.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 3.240 El: 331.851 | 3.151 El: 331.847 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | 3.200 El: | 3.110 El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 0.553 El: 331.298 | 0.553 El: 331.294 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other: | El: | El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Start Time: | 11:25 AM MST | | | | | | | | | | | | | | | | | | | | | | | | | | |
| End Time: | MST | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: -1 °C, Clear | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| River Conditions: Complete ice cover | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Notes: | | Datalogger Notes: Database # 657 Datalogger Internal Power: 4.403 V Datalogger External Power: 14.37 V Datalogger Memory Used: 70% Datalogger Clock: Mar 04, 2005 11:22 MST Laptop Clock: Mar 04, 2005 11:26 MST Dessicant: 25% used, good Datalogger: #0209170657 PT: 101344 Power: | | | | | | | | | | | | | | | | | | | | | | | | | |

Hydrometric Measurement / Site Visit Record

L2 - Kearn Lake



Regional Aquatics Monitoring Program

| Measurement Location | | Personnel & Equipment | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------------------------------|--|---------------|-------------|--|-------------|--|----------------------------------|-------------------|-------------------|--|----------------------|-------------------|-------------------|--|---------------------------|-----------|-----------|--|----------------------------------|-------------------|-------------------|--|--------|-----|-----|--|
| River/Stream: | Kearl Lake | Measurement Made By: | ND/CT | | | | | | | | | | | | | | | | | | | | | | | | |
| Location: | Kearl Lake | Data Entry By: | ND | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Name: | L2 | Meter Type and No.: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Time of Measurement | | Level Readings | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date of Measurement: | April 5, 2005 | <table border="1"> <thead> <tr> <th colspan="2">Setup No. 1</th> <th colspan="2">Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: nail in tree</td> <td>1.961 El: 100.000</td> <td>2.010 El: 100.000</td> <td></td> </tr> <tr> <td>Water Level Reading:</td> <td>3.215 El: 331.806</td> <td>3.269 El: 331.801</td> <td></td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td>3.176 El:</td> <td>3.226 El:</td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>0.514 El: 331.292</td> <td>0.514 El: 331.287</td> <td></td> </tr> <tr> <td>Other:</td> <td>El:</td> <td>El:</td> <td></td> </tr> </tbody> </table> | | Setup No. 1 | | Setup No. 2 | | Bench Mark Reading: nail in tree | 1.961 El: 100.000 | 2.010 El: 100.000 | | Water Level Reading: | 3.215 El: 331.806 | 3.269 El: 331.801 | | Top of Ice Level Reading: | 3.176 El: | 3.226 El: | | Transducer Reading & Calc'd El.: | 0.514 El: 331.292 | 0.514 El: 331.287 | | Other: | El: | El: | |
| Setup No. 1 | | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: nail in tree | 1.961 El: 100.000 | 2.010 El: 100.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 3.215 El: 331.806 | 3.269 El: 331.801 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | 3.176 El: | 3.226 El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 0.514 El: 331.292 | 0.514 El: 331.287 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other: | El: | El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Start Time: | 12:15 PM MDT | | | | | | | | | | | | | | | | | | | | | | | | | | |
| End Time: | MDT | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: +8 C, Clear | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| River Conditions: Complete ice cover | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Notes: | | Datalogger Notes: Database # 657 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Internal Power: 4.45 V | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger External Power: 13.94 V | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Memory Used: 72% | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Clock: Apr 05, 2005 11:15 MST | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Laptop Clock: Apr 05, 2005 11:18 MST | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Dessicant: 25% used, Good | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger: #0209170657 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | PT: 101344 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Power: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement Location | | Personnel & Equipment | | | | | | | | | | | | | | | | | | | | | | | | | |
| River/Stream: | Kearl Lake | Measurement Made By: | ND/FF | | | | | | | | | | | | | | | | | | | | | | | | |
| Location: | Kearl Lake | Data Entry By: | ND Checked PM | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Name: | L2 | Meter Type and No.: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Time of Measurement | | Level Readings | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date of Measurement: | April 23, 2005 | <table border="1"> <thead> <tr> <th colspan="2">Setup No. 1</th> <th colspan="2">Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: nail in tree</td> <td>1.868 El: 100.000</td> <td>1.562 El: 100.000</td> <td></td> </tr> <tr> <td>Water Level Reading:</td> <td>2.818 El: 332.110</td> <td>2.528 El: 332.094</td> <td></td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td>El:</td> <td>El:</td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>0.809 El: 331.301</td> <td>0.809 El: 331.285</td> <td></td> </tr> <tr> <td>Other:</td> <td>El:</td> <td>El:</td> <td></td> </tr> </tbody> </table> | | Setup No. 1 | | Setup No. 2 | | Bench Mark Reading: nail in tree | 1.868 El: 100.000 | 1.562 El: 100.000 | | Water Level Reading: | 2.818 El: 332.110 | 2.528 El: 332.094 | | Top of Ice Level Reading: | El: | El: | | Transducer Reading & Calc'd El.: | 0.809 El: 331.301 | 0.809 El: 331.285 | | Other: | El: | El: | |
| Setup No. 1 | | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: nail in tree | 1.868 El: 100.000 | 1.562 El: 100.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 2.818 El: 332.110 | 2.528 El: 332.094 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | El: | El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 0.809 El: 331.301 | 0.809 El: 331.285 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other: | El: | El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Start Time: | 12:37 PM MDT | | | | | | | | | | | | | | | | | | | | | | | | | | |
| End Time: | MDT | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: +17 C, Clear, Calm | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| River Conditions: Ice cover except at the shore | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Notes: Level high and increasing. | | Datalogger Notes: Database # 657 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Internal Power: 4.45 V | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger External Power: 13.89 V | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Memory Used: 74% | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Clock: Apr 23, 2005 11:29 MST | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Laptop Clock: Apr 23, 2005 11:32 MST | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Dessicant: 25% used, Good | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger: #0209170657 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | PT: 101344 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Power: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Measurement Location | | Personnel & Equipment | | | | | | | | | | | | | | | | | | | | | | | | | |
| River/Stream: | Kearl Lake | Measurement Made By: | RM/FF | | | | | | | | | | | | | | | | | | | | | | | | |
| Location: | Kearl Lake | Data Entry By: | ND Checked PM | | | | | | | | | | | | | | | | | | | | | | | | |
| Site Name: | L2 | Meter Type and No.: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Time of Measurement | | Level Readings | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date of Measurement: | May 30, 2005 | <table border="1"> <thead> <tr> <th colspan="2">Setup No. 1</th> <th colspan="2">Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: nail in tree</td> <td>1.997 El: 100.000</td> <td>1.931 El: 100.000</td> <td></td> </tr> <tr> <td>Water Level Reading:</td> <td>2.891 El: 332.166</td> <td>2.827 El: 332.164</td> <td></td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td>El:</td> <td>El:</td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>0.878 El: 331.288</td> <td>0.878 El: 331.286</td> <td></td> </tr> <tr> <td>Other:</td> <td>El:</td> <td>El:</td> <td></td> </tr> </tbody> </table> | | Setup No. 1 | | Setup No. 2 | | Bench Mark Reading: nail in tree | 1.997 El: 100.000 | 1.931 El: 100.000 | | Water Level Reading: | 2.891 El: 332.166 | 2.827 El: 332.164 | | Top of Ice Level Reading: | El: | El: | | Transducer Reading & Calc'd El.: | 0.878 El: 331.288 | 0.878 El: 331.286 | | Other: | El: | El: | |
| Setup No. 1 | | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: nail in tree | 1.997 El: 100.000 | 1.931 El: 100.000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 2.891 El: 332.166 | 2.827 El: 332.164 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | El: | El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 0.878 El: 331.288 | 0.878 El: 331.286 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Other: | El: | El: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Start Time: | 9:15 AM MDT | | | | | | | | | | | | | | | | | | | | | | | | | | |
| End Time: | MDT | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: +18 C, Clear, Calm | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| River Conditions: Open water conditions, Stage falling | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Notes: | | Datalogger Notes: Database # 657 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Internal Power: 4.46 V | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger External Power: 13.76 V | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Memory Used: 77% | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger Clock: May 30, 2005 09:08 MST | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Laptop Clock: May 30, 2005 09:12 MST | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Dessicant: 100% Good | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Datalogger: #0209170657 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | PT: 101344 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Power: | | | | | | | | | | | | | | | | | | | | | | | | | |

Hydrometric Measurement / Site Visit Record

L2 - Kearn Lake



Regional Aquatics Monitoring Program

| Measurement Location | | Personnel & Equipment | |
|---|----------------------------------|--|---------------|
| River/Stream: | Kearl Lake | Measurement Made By: | RM/ND |
| Location: | Kearl Lake | Data Entry By: | ND Checked PM |
| Site Name: | L2 | Meter Type and No.: | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | |
| Time of Measurement | | Level Readings | |
| Date of Measurement: | July 15, 2005 | | |
| Start Time: | 4:15 PM MDT | | |
| End Time: | MDT | | |
| Weather Conditions: +25 C, Overcast | | | |
| River Conditions: Open water conditions | | | |
| Notes: | | Datalogger Notes: Database # 657 Datalogger Internal Power: 4.482 V Datalogger External Power: 13.59 V Datalogger Memory Used: 80% Datalogger Clock: Jul 15, 2005 15:09 MST Laptop Clock: Jul 15, 2005 15:13 MST Dessicant: 100% Good Datalogger: #0209170657 PT: 101344 Power: | |
| | | | |
| | | | |
| | | | |
| | | | |
| Measurement Location | | Personnel & Equipment | |
| River/Stream: | Kearl Lake | Measurement Made By: | ND/FF |
| Location: | Kearl Lake | Data Entry By: | FF Checked PM |
| Site Name: | L2 | Meter Type and No.: | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | |
| Time of Measurement | | Level Readings | |
| Date of Measurement: | September 1, 2005 | | |
| Start Time: | 1:09 AM MDT | | |
| End Time: | MDT | | |
| Weather Conditions: +16 C, Clear, calm | | | |
| River Conditions: Open water conditions, moderately high stage | | | |
| Notes: | | Datalogger Notes: Database # 657 Datalogger Internal Power: 4.46 V Datalogger External Power: 13.97 V Datalogger Memory Used: 84% cleared Datalogger Clock: Sep 01, 2005 12:07 MST Laptop Clock: Sep 01, 2005 12:11 MST Dessicant: 100% used-replaced Datalogger: #0209170657 PT: 101344 Power: | |
| | | | |
| | | | |
| | | | |
| | | | |
| Measurement Location | | Personnel & Equipment | |
| River/Stream: | Kearl Lake | Measurement Made By: | ND/PM |
| Location: | Kearl Lake | Data Entry By: | PM Checked PM |
| Site Name: | L2 | Meter Type and No.: | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | |
| Time of Measurement | | Level Readings | |
| Date of Measurement: | October 6, 2005 | | |
| Start Time: | 1:27 PM MDT | | |
| End Time: | MDT | | |
| Weather Conditions: +15 C, Moderate wind from SW | | | |
| River Conditions: Open water conditions, high stage | | | |
| Notes: Spikes in data from sep 1 | | Datalogger Notes: Database # 657 Datalogger Internal Power: 4.44 V Datalogger External Power: 14.04 V Datalogger Memory Used: 3% Datalogger Clock: Oct 06, 2005 12:25 MST Laptop Clock: Oct 06, 2005 12:29 MST Dessicant: 5% used Datalogger: #0209170657 PT: 101344 Power: | |
| | | | |
| | | | |
| | | | |
| | | | |

Hydrometric Measurement / Site Visit Record

L2 - Kearn Lake



Regional Aquatics Monitoring Program

| Measurement Location | | Personnel & Equipment | |
|--|----------------------------------|---|-------------------|
| River/Stream: | Kearl Lake | Measurement Made By: | ND/RM |
| Location: | Kearl Lake | Data Entry By: | ND Checked PM |
| Site Name: | L2 | Meter Type and No.: | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | |
| Time of Measurement | | Level Readings | |
| Date of Measurement: | November 3, 2005 | Bench Mark Reading: nail in tree | 1.875 El: 100.000 |
| Start Time: | 10:10 AM MST | Water Level Reading: | 3.095 El: 331.840 |
| End Time: | MST | Top of Ice Level Reading: | El: El: |
| | | Transducer Reading & Calc'd El.: | 0.554 El: 331.286 |
| | | Other: TD s/n 0303326 | 0.413 El: 331.427 |
| Weather Conditions: +1° C, Overcast, Windy | | | |
| River Conditions: Open water conditions, moderate stage | | | |
| Notes: Transducer s/n 0101344 removed for recalibration. Data downloaded. Transducer s/n 0303326 installed, clamped to a concrete block and placed in the flow. | | Datalogger Notes: Database # 657 Datalogger Internal Power: 4.401 V Datalogger External Power: 12.84 V Datalogger Memory Used: 5% Datalogger Clock: Nov 03, 2005 10:06 MST Laptop Clock: Nov 03, 2005 10:10 MST Dessicant: 10% used Datalogger: Optimum Datalogger DD-128 #0209170657 PT: Keller 730-130 s/n 0303326 3 psi Power: Magnacharge 20V 10A DC Battery and Solar Panel | |
| Measurement Location | | Personnel & Equipment | |
| River/Stream: | Kearl Lake | Measurement Made By: | ND/PM/RM |
| Location: | Kearl Lake | Data Entry By: | ND Checked PM |
| Site Name: | L2 | Meter Type and No.: | |
| Coordinates & Legal: | 484935 E, 6349023 N SE-32-95-8-4 | | |
| Time of Measurement | | Level Readings | |
| Date of Measurement: | December 7, 2005 | Bench Mark Reading: nail in tree | 1.819 El: 100.000 |
| Start Time: | 10:25 AM MST | Water Level Reading: | 3.145 El: 331.734 |
| End Time: | MST | Top of Ice Level Reading: | 3.186 El: El: |
| | | Transducer Reading & Calc'd El.: | 0.356 El: 331.378 |
| | | Other: | El: El: |
| Weather Conditions: -20° C, Clear, Light wind from SE | | | |
| River Conditions: Complete ice cover | | | |
| Notes: Data downloaded. | | Datalogger Notes: Database # 657 Datalogger Internal Power: 4.355 V Datalogger External Power: 12.32 V Datalogger Memory Used: 8% Datalogger Clock: Dec 07, 2005 10:25 MST Laptop Clock: Dec 07, 2005 10:27 MST Dessicant: 10% used Datalogger: Optimum Datalogger DD-128 #0209170657 PT: Keller 730-130 s/n 0303326 3 psi Power: Magnacharge 20V 10A DC Battery and Solar Panel | |

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

| Measurement Location | | Personnel & Equipment | | | |
|--|-----------------------------------|--|-----------------------------|--------------------|--------------------|
| River/Stream: | Isadore's Lake | Measurement Made By: | ND/DB/CT | | |
| Location: | Isadore's Lake | Data Entry By: | DB | Checked PM | |
| Site Name: | L3 | Meter Type and No.: | Marsh McBirney FloMate 2000 | | |
| Coordinates & Legal: | 6343250 N, 463400 E 16-7-95-10-W4 | | s/n 2004521 | | |
| Time of Measurement | | Level Readings | | Setup No. 1 | Setup No. 2 |
| Date of Measurement: | January 8, 2005 | Bench Mark Reading: bar in PVC | 1.525 | El: 234.506 | El: 234.506 |
| Start Time: | 4:45 PM MST | Water Level Reading: | 2.260 | El: 233.771 | El: 233.771 |
| End Time: | MST | Top of Ice Level Reading: | 2.235 | El: 233.796 | El: 233.796 |
| | | Transducer Reading & Calc'd El.: | 0.962 | El: 232.809 | El: 232.809 |
| | | Other: | | El: | El: |
| Weather Conditions: -25 C, clear, calm | | | | | |
| River Conditions: Complete ice cover ~ 4" | | | | | |
| Notes: | | Datalogger Notes: | | | |
| Battery replaced with new battery - new voltage readings - Aux: 12.29V 79% | | Datalogger Internal Power: 11.34 V 100% | | | |
| Could only do one setup for survey due to bad light. | | Datalogger External Power: 11.68 V 75% Fair | | | |
| | | Datalogger Memory Used: 26571 KB free | | | |
| | | Datalogger Clock: Jan 08, 2005 16:40 MST | | | |
| | | Laptop Clock: Jan 08, 2005 16:49 MST | | | |
| | | Dessicant: Good | | | |
| | | Datalogger: 94834-08 | | | |
| | | PT: 996022-5 | | | |
| | | Power: | | | |
| Measurement Location | | Personnel & Equipment | | | |
| River/Stream: | Isadore's Lake | Measurement Made By: | ND/RM | | |
| Location: | Isadore's Lake | Data Entry By: | ND | Checked PM | |
| Site Name: | L3 | Meter Type and No.: | Marsh McBirney FloMate 2000 | | |
| Coordinates & Legal: | 6343250 N, 463400 E 16-7-95-10-W4 | | s/n 2004521 | | |
| Time of Measurement | | Level Readings | | Setup No. 1 | Setup No. 2 |
| Date of Measurement: | February 6, 2005 | Bench Mark Reading: bar in PVC | 1.480 | El: 234.506 | 1.513 El: 234.506 |
| Start Time: | 3:10 PM MST | Water Level Reading: | 2.240 | El: 233.746 | 2.291 El: 233.728 |
| End Time: | MST | Top of Ice Level Reading: | 2.345 | El: 233.641 | 2.400 El: 233.619 |
| | | Transducer Reading & Calc'd El.: | 0.979 | El: 232.768 | 0.979 El: 232.750 |
| | | Other: Nail in tree | 0.119 | El: | 0.175 El: |
| Weather Conditions: -20 C, partly cloudy | | | | | |
| River Conditions: Complete ice cover ~ 4" | | | | | |
| Notes: | | Datalogger Notes: | | | |
| Battery replaced with new battery - new voltage readings - Aux: 12.29V 79% | | Datalogger Internal Power: 11.34 V 100% | | | |
| | | Datalogger External Power: 12.17 V 78% | | | |
| | | Datalogger Memory Used: 25094 KB free 20% used | | | |
| | | Datalogger Clock: Feb 06, 2005 15:07 MST | | | |
| | | Laptop Clock: Feb 06, 2005 15:18 MST | | | |
| | | Dessicant: Good | | | |
| | | Datalogger: 94834-08 | | | |
| | | PT: 996022-5 | | | |
| | | Power: | | | |
| Measurement Location | | Personnel & Equipment | | | |
| River/Stream: | Isadore's Lake | Measurement Made By: | ND/RM | | |
| Location: | Isadore's Lake | Data Entry By: | ND | Checked PM | |
| Site Name: | L3 | Meter Type and No.: | Marsh McBirney FloMate 2000 | | |
| Coordinates & Legal: | 6343250 N, 463400 E 16-7-95-10-W4 | | s/n 2004521 | | |
| Time of Measurement | | Level Readings | | Setup No. 1 | Setup No. 2 |
| Date of Measurement: | March 7, 2005 | Bench Mark Reading: bar in PVC | 1.556 | El: 234.506 | 1.619 El: 234.506 |
| Start Time: | 1:25 PM MST | Water Level Reading: | 2.261 | El: 233.801 | 2.319 El: 233.806 |
| End Time: | MST | Top of Ice Level Reading: | 2.220 | El: 233.842 | 2.289 El: 233.836 |
| | | Transducer Reading & Calc'd El.: | 1.008 | El: 232.793 | 1.008 El: 232.798 |
| | | Other: Nail in tree | 0.160 | El: | 0.220 El: |
| Weather Conditions: -2 C, partly cloudy | | | | | |
| River Conditions: Complete ice cover ~ 4" | | | | | |
| Notes: | | Datalogger Notes: | | | |
| Battery replaced with new battery - new voltage readings - Aux: 12.29V 79% | | Datalogger Internal Power: 11.34 V 100% | | | |
| | | Datalogger External Power: 12.04 V 77% | | | |
| | | Datalogger Memory Used: 23619 KB free 30% used | | | |
| | | Datalogger Clock: Mar 07, 2005 13:13 MST | | | |
| | | Laptop Clock: Mar 07, 2005 13:27 MST | | | |
| | | Dessicant: Good | | | |
| | | Datalogger: 94834-08 | | | |
| | | PT: 996022-5 | | | |
| | | Power: | | | |

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

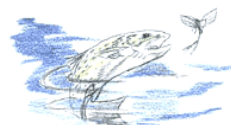
| | | | |
|--|--|--|--|
| Measurement Location River/Stream: Isadore's Lake Location: Isadore's Lake Site Name: L3 Coordinates & Legal: 6343250 N, 463400 E 16-7-95-10-W4 | | Personnel & Equipment Measurement Made By: ND/RM Data Entry By: ND Checked PM Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521 | |
| Time of Measurement Date of Measurement: April 7, 2005 Start Time: 1:15 PM MDT End Time: MDT | | Level Readings Bench Mark Reading: bar in PVC 1.508 El: 234.506 Water Level Reading: 2.111 El: 233.903 Top of Ice Level Reading: 2.079 El: 233.935 Transducer Reading & Calc'd El.: 1.070 El: 232.833 Other: Nail in tree 0.095 El: | |
| Weather Conditions: +15 C, Clear River Conditions: Ice cover | | Setup No. 1 1.543 El: 234.506 2.155 El: 233.894 2.120 El: 233.929 1.070 El: 232.824 0.140 El: | |
| Notes: | | Datalogger Notes: Datalogger Internal Power: 11.34 V 100% Datalogger External Power: 12.29 V 79% Datalogger Memory Used: 22040 KB free 30% used Datalogger Clock: Apr 07, 2005 12:10 MST Laptop Clock: Apr 07, 2005 12:24 MST Dessicant: Good Datalogger: 94834-08 PT: 996022-5 Power: | |

| | | | |
|--|--|---|--|
| 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 | | Personnel & Equipment Measurement Made By: ND/FF Data Entry By: ND Checked PM Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521 | |
| Time of Measurement Date of Measurement: April 28, 2005 Start Time: 5:30 PM MDT End Time: MDT | | Level Readings Bench Mark Reading: bar in PVC 1.892 El: 234.506 Water Level Reading: 2.625 El: 233.773 Top of Ice Level Reading: El: Transducer Reading & Calc'd El.: 0.970 El: 232.803 Other: Nail in tree 0.487 El: | |
| Weather Conditions: +5 C, Overcast, windy River Conditions: Open - no ice | | Setup No. 1 1.947 El: 234.506 2.681 El: 233.772 El: 0.970 El: 232.802 0.546 El: | |
| Notes: | | Datalogger Notes: Datalogger Internal Power: 11.34 V 100% Datalogger External Power: 12.17 V 78% Datalogger Memory Used: 35% used Datalogger Clock: Apr 28, 2005 16:14 MST Laptop Clock: Apr 28, 2005 16:29 MST Dessicant: Good - 20% used Datalogger: 94834-08 PT: 996022-5 Power: | |

| | | | |
|--|--|---|--|
| 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 | | Personnel & Equipment Measurement Made By: CT/FF Data Entry By: ND Checked PM Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521 | |
| Time of Measurement Date of Measurement: June 2, 2005 Start Time: 6:50 PM MDT End Time: MDT | | Level Readings Bench Mark Reading: bar in PVC 1.701 El: 234.506 Water Level Reading: 2.316 El: 233.891 Top of Ice Level Reading: El: Transducer Reading & Calc'd El.: 1.100 El: 232.791 Other: Nail in tree 0.302 El: | |
| Weather Conditions: +25 C, Light wind, Clear River Conditions: Open, very high stage | | Setup No. 1 1.723 El: 234.506 2.341 El: 233.888 El: 1.100 El: 232.788 0.324 El: | |
| Notes: | | Datalogger Notes: Datalogger Internal Power: 11.34 V 100% Datalogger External Power: 12.41 V 80% Datalogger Memory Used: 40% used Datalogger Clock: Jun 02, 2005 17:35 MST Laptop Clock: Jun 02, 2005 17:50 MST Dessicant: Good - 20% used Datalogger: 94834-08 PT: 996022-5 Power: | |

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 | | Personnel & Equipment Measurement Made By: ND/RM Data Entry By: ND Checked PM Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521 | | | | | | | | | | | | | | | | | | | | | | |
|--|-------------------|---|--|--|-------------|-------------|--------------------------------|-------------------|-------------------|----------------------|-------------------|-------------------|---------------------------|--|--|----------------------------------|-------------------|-------------------|---------------------|-----------|-----------|---------------|-------------------|-------------------|
| Time of Measurement Date of Measurement: July 16, 2005 Start Time: 11:45 AM MDT End Time: MDT | | Level Readings <table border="1"> <thead> <tr> <th></th> <th>Setup No. 1</th> <th>Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: bar in PVC</td> <td>1.531 El: 234.506</td> <td>1.474 El: 234.506</td> </tr> <tr> <td>Water Level Reading:</td> <td>2.109 El: 233.928</td> <td>2.057 El: 233.923</td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td></td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>1.132 El: 232.796</td> <td>1.132 El: 232.791</td> </tr> <tr> <td>Other: Nail in tree</td> <td>0.121 El:</td> <td>0.074 El:</td> </tr> </tbody> </table> | | | Setup No. 1 | Setup No. 2 | Bench Mark Reading: bar in PVC | 1.531 El: 234.506 | 1.474 El: 234.506 | Water Level Reading: | 2.109 El: 233.928 | 2.057 El: 233.923 | Top of Ice Level Reading: | | | Transducer Reading & Calc'd El.: | 1.132 El: 232.796 | 1.132 El: 232.791 | Other: Nail in tree | 0.121 El: | 0.074 El: | | | |
| | Setup No. 1 | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: bar in PVC | 1.531 El: 234.506 | 1.474 El: 234.506 | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 2.109 El: 233.928 | 2.057 El: 233.923 | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 1.132 El: 232.796 | 1.132 El: 232.791 | | | | | | | | | | | | | | | | | | | | | | |
| Other: Nail in tree | 0.121 El: | 0.074 El: | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: +23 C, Overcast River Conditions: Open, very high stage | | Datalogger Notes: Datalogger Internal Power: 11.34 V 100% Datalogger External Power: 12.17 V 78% Datalogger Memory Used: 40% used Datalogger Clock: Jul 16, 2005 10:44 MST Laptop Clock: Jul 16, 2005 11:00 MST Dessicant: Good - 25% used Datalogger: 94834-08 PT: 996022-5 Power: | | | | | | | | | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | Personnel & Equipment Measurement Made By: ND/FF Data Entry By: FF Checked PM Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521 | | | | | | | | | | | | | | | | | | | | | | |
| Time of Measurement Date of Measurement: September 5, 2005 Start Time: 2:05 PM MDT End Time: MDT | | Level Readings <table border="1"> <thead> <tr> <th></th> <th>Setup No. 1</th> <th>Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: bar in PVC</td> <td>1.608 El: 234.506</td> <td>1.743 El: 234.506</td> </tr> <tr> <td>Water Level Reading:</td> <td>2.076 El: 234.038</td> <td>2.214 El: 234.035</td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td></td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>1.232 El: 232.806</td> <td>1.232 El: 232.803</td> </tr> <tr> <td>Other: Nail in tree</td> <td>0.207 El:</td> <td>0.344 El:</td> </tr> </tbody> </table> | | | Setup No. 1 | Setup No. 2 | Bench Mark Reading: bar in PVC | 1.608 El: 234.506 | 1.743 El: 234.506 | Water Level Reading: | 2.076 El: 234.038 | 2.214 El: 234.035 | Top of Ice Level Reading: | | | Transducer Reading & Calc'd El.: | 1.232 El: 232.806 | 1.232 El: 232.803 | Other: Nail in tree | 0.207 El: | 0.344 El: | | | |
| | Setup No. 1 | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: bar in PVC | 1.608 El: 234.506 | 1.743 El: 234.506 | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 2.076 El: 234.038 | 2.214 El: 234.035 | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 1.232 El: 232.806 | 1.232 El: 232.803 | | | | | | | | | | | | | | | | | | | | | | |
| Other: Nail in tree | 0.207 El: | 0.344 El: | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: +15 C, Scattered cloud, light wind from SW River Conditions: Open, very high stage | | Datalogger Notes: Datalogger Internal Power: 11.34 V 100% Datalogger External Power: 11.92 V 77% Datalogger Memory Used: 58% used Datalogger Clock: Sep 02, 2005 12:55 MST Laptop Clock: Sep 02, 2005 13:12 MST Dessicant: 100% used-replaced Datalogger: 94834-08 PT: 996022-5 Power: | | | | | | | | | | | | | | | | | | | | | | |
| Notes: Battery replaced. | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | Personnel & Equipment Measurement Made By: ND/FF/PM Data Entry By: PM Checked PM Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521 | | | | | | | | | | | | | | | | | | | | | | |
| Time of Measurement Date of Measurement: October 5, 2005 Start Time: 3:25 PM MDT End Time: MDT | | Level Readings <table border="1"> <thead> <tr> <th></th> <th>Setup No. 1</th> <th>Setup No. 2</th> </tr> </thead> <tbody> <tr> <td>Bench Mark Reading: bar in PVC</td> <td>1.753 El: 234.506</td> <td>1.827 El: 234.506</td> </tr> <tr> <td>Water Level Reading:</td> <td>2.254 El: 234.005</td> <td>2.331 El: 234.002</td> </tr> <tr> <td>Top of Ice Level Reading:</td> <td></td> <td></td> </tr> <tr> <td>Transducer Reading & Calc'd El.:</td> <td>1.192 El: 232.813</td> <td>1.192 El: 232.810</td> </tr> <tr> <td>Other: Nail in tree</td> <td>0.355 El:</td> <td>0.430 El:</td> </tr> <tr> <td>Other: New TD</td> <td>1.220 El: 232.785</td> <td>1.220 El: 232.782</td> </tr> </tbody> </table> | | | Setup No. 1 | Setup No. 2 | Bench Mark Reading: bar in PVC | 1.753 El: 234.506 | 1.827 El: 234.506 | Water Level Reading: | 2.254 El: 234.005 | 2.331 El: 234.002 | Top of Ice Level Reading: | | | Transducer Reading & Calc'd El.: | 1.192 El: 232.813 | 1.192 El: 232.810 | Other: Nail in tree | 0.355 El: | 0.430 El: | Other: New TD | 1.220 El: 232.785 | 1.220 El: 232.782 |
| | Setup No. 1 | Setup No. 2 | | | | | | | | | | | | | | | | | | | | | | |
| Bench Mark Reading: bar in PVC | 1.753 El: 234.506 | 1.827 El: 234.506 | | | | | | | | | | | | | | | | | | | | | | |
| Water Level Reading: | 2.254 El: 234.005 | 2.331 El: 234.002 | | | | | | | | | | | | | | | | | | | | | | |
| Top of Ice Level Reading: | | | | | | | | | | | | | | | | | | | | | | | | |
| Transducer Reading & Calc'd El.: | 1.192 El: 232.813 | 1.192 El: 232.810 | | | | | | | | | | | | | | | | | | | | | | |
| Other: Nail in tree | 0.355 El: | 0.430 El: | | | | | | | | | | | | | | | | | | | | | | |
| Other: New TD | 1.220 El: 232.785 | 1.220 El: 232.782 | | | | | | | | | | | | | | | | | | | | | | |
| Weather Conditions: +10 C, light wind from NE River Conditions: Open, high stage | | Datalogger Notes: Datalogger Internal Power: 11.34 V 100% Datalogger External Power: 11.29 V 79% Datalogger Memory Used: 60% used Datalogger Clock: Oct 05, 2005 14:10 MST Laptop Clock: Oct 05, 2005 14:29 MST Dessicant: Datalogger: 94834-08 PT: 996022-5 Power: | | | | | | | | | | | | | | | | | | | | | | |
| Notes: Transducer removed for recalibration s/n 509001-288 4-20mA 8-28V DC 0-5 PSI 25m cable New TD reading 1.22m 0.81 ms warmup | | | | | | | | | | | | | | | | | | | | | | | | |

Hydrometric Measurement / Site Visit Record

L3 - Isadore's Lake



Regional Aquatics Monitoring Program

| | | | |
|--|-----------------------------------|---|-----------------------------|
| Measurement Location | | Personnel & Equipment | |
| River/Stream: | Isadore's Lake | Measurement Made By: | ND/PM |
| Location: | Isadore's Lake | Data Entry By: | ND Checked PM |
| Site Name: | L3 | Meter Type and No.: | Marsh McBirney FloMate 2000 |
| Coordinates & Legal: | 6343250 N, 463400 E 16-7-95-10-W4 | | s/n 2004521 |
| Time of Measurement | | Level Readings | |
| Date of Measurement: | December 8, 2005 | | |
| Start Time: | 10:55 AM MST | | |
| End Time: | MST | | |
| Weather Conditions: -10 C, Overcast, Calm | | | |
| River Conditions: Complete ice Cover | | | |
| Notes: Battery replaced, 11.8 V, 78% Lots of spikes in data | | | |
| | | Datalogger Notes: | |
| | | Datalogger Internal Power: 11.34 V 100% | |
| | | Datalogger External Power: 11.80 76% Fair | |
| | | Datalogger Memory Used: 10% | |
| | | Datalogger Clock: Dec 08, 2005 10:52 MST | |
| | | Laptop Clock: Dec 08, 2005 10:56 MST | |
| | | Dessicant: 25% used | |
| | | Datalogger: 94834-08 | |
| | | PT: 509001-288 | |
| | | Power: | |

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: January 6, 2005
Start Time: 11:00 AM MST
End Time: MST

Weather Conditions: -10 °C, overcast, windy, light snow

River Conditions: ice cover, frozen to depth within < 10 mm, 3 sections tested

Personnel & Equipment

Measurement Made By: ND/CT/DB
Data Entry By: DB
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2001521

Level Readings

Bench Mark Reading: Pin on RB 0.755
Water Level Reading: 1.960
Top of Ice Level Reading: 1.826
Transducer Reading & Calc'd El. 0.558
Other:

Setup No. 1

El: 297.990
El: 296.785
El: 296.919
El: 296.227
El:

Setup No. 2

El: 297.990
El: 296.790
El: 296.232
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 ²) | (m ³ /s) |
| | | | | | - | | | | | - | - | - | - | - |
| Total Flow: | | | | | | | | | | | | | | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (m) |
| Mean Velocity: | - | (m/s) |
| Froude Number | - | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

Replaced battery with new battery, power now at main - 100%, 11.34V, aux - 83%, 12.90 V
Tried at 3 cross sections to get to bottom - at transducer, US of transducer, at bridge

Datalogger Notes:

Datalogger Internal Power: 11.34 V 100%
Datalogger External Power: 12.04 V 77%
Datalogger Memory Used:
Datalogger Clock: Jan 06, 2005 11:11 MST
Laptop Clock: Jan 06, 2005 11:18 MST
Dessicant: Good
Datalogger: 207085
PT:
Power:

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 4, 2005
Start Time: 11:15 AM MST
End Time: MST

Weather Conditions: -18 °C, overcast

River Conditions: ice cover, frozen to depth within < 10 mm, 3 sections tested

Personnel & Equipment

Measurement Made By: ND/CT/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2001521

Level Readings

Bench Mark Reading: Pin on RB 0.891
Water Level Reading: 2.075
Top of Ice Level Reading: 2.012
Transducer Reading & Calc'd El. 0.548
Other:

Setup No. 1

El: 297.990
El: 296.806
El: 296.869
El: 296.259
El:

Setup No. 2

El: 297.990
El: 296.800
El: 296.253
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 ²) | (m ³ /s) |
| | | | | | - | | | | | - | - | - | - | - |
| Total Flow: | | | | | | | | | | | | | | - |

| | | |
|--------------------------------|------------------------------|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (m) |
| Mean Velocity: | - | (m/s) |
| Froude Number | - | |
| Photographs taken looking at: | Upstream, downstream, across | |

Notes:

Tried at 3 cross sections to get to bottom - at transducer, US of transducer, at bridge

Datalogger Notes:

Datalogger Internal Power: 11.34 V 100%
Datalogger External Power: 12.41 V 80%
Datalogger Memory Used:
Datalogger Clock: Feb 04, 2005 11:14 MST
Laptop Clock: Feb 04, 2005 11:26 MST
Dessicant: Good
Datalogger: 207085
PT:
Power:

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 4, 2005
Start Time: 9:45 AM MST
End Time: MST

Weather Conditions: -2 °C, Clear

River Conditions: Ice cover, frozen to depth within < 10 mm, 3 sections tested, there is flow under the ice

Personnel & Equipment

Measurement Made By: ND/CT/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2001521

Level Readings

Bench Mark Reading: Pin on RB 1.013
Water Level Reading: 2.234
Top of Ice Level Reading: 2.136
Transducer Reading & Calc'd El. 0.548
Other:

Setup No. 1

El: 297.990
El: 296.769
El: 296.867
El: 296.222
El:

Setup No. 2

El: 297.990
El: 296.766
El: 2.044
El: 296.219
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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| | | | | | - | | | | | - | - | - | - | - |
| | | | | | | | | | | | | | Total Flow: | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (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: | 12.77 V | 82% |
| Datalogger Memory Used: | | |
| Datalogger Clock: | Mar 04, 2005 09:31 | MST |
| Laptop Clock: | Mar 04, 2005 09:45 | MST |
| Dessicant: | Good | |
| Datalogger: | 207085 | |
| PT: | | |
| Power: | | |

Notes:

Tried at 3 cross sections to get to bottom - at transducer, US of transducer, at bridge. Insufficient flow depth under the ice to facilitate manual MMT.

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: ND/CT
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2001521

Time of Measurement

Date of Measurement: April 5, 2005
Start Time: 9:35 AM MDT
End Time: 9:57 AM MDT

Level Readings

Bench Mark Reading: Pin on RB 0.743
Water Level Reading: 1.943
Top of Ice Level Reading: 1.906
Transducer Reading & Calc'd El.: 0.595

Setup No. 1

El.: 297.990
El.: 296.790
El.: 1.955
El.: 296.195

Setup No. 2

El.: 297.990
El.: 296.796
El.: 1.955
El.: 296.201

Weather Conditions:

+1 °C, clear, calm

River Conditions:

Partial ice cover (about 80%), ice broken out through MMT section.

| 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) | |
| 0.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.00 | 1.31 | 0.002 | 0.002 | 0.01 | 0.01 | 0.000 | 0% |
| 2.62 | 0.03 | 0.00 | | | 0.006 | 1.00 | 2 | 1.31 | 2.69 | 0.006 | 0.006 | 0.03 | 0.04 | 0.000 | 0% |
| 2.75 | 0.03 | 0.00 | | | 0.015 | 1.00 | 3 | 2.69 | 2.95 | 0.015 | 0.015 | 0.03 | 0.01 | 0.000 | 0% |
| 3.15 | 0.08 | 0.00 | | | 0.046 | 1.00 | 4 | 2.95 | 3.25 | 0.046 | 0.046 | 0.08 | 0.02 | 0.001 | 1% |
| 3.34 | 0.12 | 0.00 | | | 0.027 | 1.00 | 5 | 3.25 | 3.42 | 0.027 | 0.027 | 0.12 | 0.02 | 0.001 | 1% |
| 3.50 | 0.09 | 0.00 | | | 0.067 | 1.00 | 6 | 3.42 | 3.60 | 0.067 | 0.067 | 0.09 | 0.02 | 0.001 | 1% |
| 3.70 | 0.12 | 0.00 | | | 0.116 | 1.00 | 7 | 3.60 | 3.80 | 0.116 | 0.116 | 0.12 | 0.02 | 0.003 | 3% |
| 3.90 | 0.10 | 0.00 | | | 0.040 | 1.00 | 8 | 3.80 | 3.95 | 0.040 | 0.040 | 0.10 | 0.02 | 0.001 | 1% |
| 4.00 | 0.10 | 0.00 | | | 0.064 | 1.00 | 9 | 3.95 | 4.55 | 0.064 | 0.064 | 0.10 | 0.06 | 0.004 | 4% |
| 5.10 | 0.13 | 0.00 | | | 0.034 | 1.00 | 10 | 4.55 | 5.15 | 0.034 | 0.034 | 0.13 | 0.08 | 0.003 | 3% |
| 5.20 | 0.13 | 0.00 | | | 0.091 | 1.00 | 11 | 5.15 | 5.25 | 0.091 | 0.091 | 0.13 | 0.01 | 0.001 | 1% |
| 5.30 | 0.11 | 0.00 | | | 0.122 | 1.00 | 12 | 5.25 | 5.45 | 0.122 | 0.122 | 0.11 | 0.02 | 0.003 | 3% |
| 5.60 | 0.10 | 0.00 | | | 0.247 | 1.00 | 13 | 5.45 | 5.65 | 0.247 | 0.247 | 0.10 | 0.02 | 0.005 | 6% |
| 5.70 | 0.09 | 0.00 | | | 0.146 | 1.00 | 14 | 5.65 | 5.79 | 0.146 | 0.146 | 0.09 | 0.01 | 0.002 | 2% |
| 5.88 | 0.10 | 0.00 | | | 0.162 | 1.00 | 15 | 5.79 | 5.94 | 0.162 | 0.162 | 0.10 | 0.01 | 0.002 | 3% |
| 6.00 | 0.10 | 0.00 | | | 0.006 | 1.00 | 16 | 5.94 | 6.08 | 0.006 | 0.006 | 0.10 | 0.01 | 0.000 | 0% |
| 6.15 | 0.09 | 0.00 | | | 0.122 | 1.00 | 17 | 6.08 | 6.23 | 0.122 | 0.122 | 0.09 | 0.01 | 0.002 | 2% |
| 6.30 | 0.10 | 0.00 | | | 0.311 | 1.00 | 18 | 6.23 | 6.35 | 0.311 | 0.311 | 0.10 | 0.01 | 0.004 | 4% |
| 6.40 | 0.09 | 0.00 | | | 0.479 | 1.00 | 19 | 6.35 | 6.45 | 0.479 | 0.479 | 0.09 | 0.01 | 0.004 | 5% |
| 6.50 | 0.10 | 0.00 | | | 0.229 | 1.00 | 20 | 6.45 | 6.58 | 0.229 | 0.229 | 0.10 | 0.01 | 0.003 | 3% |
| 6.65 | 0.08 | 0.00 | | | 0.427 | 1.00 | 21 | 6.58 | 6.70 | 0.427 | 0.427 | 0.08 | 0.01 | 0.004 | 5% |
| 6.75 | 0.10 | 0.00 | | | 0.445 | 1.00 | 22 | 6.70 | 6.83 | 0.445 | 0.445 | 0.10 | 0.01 | 0.006 | 6% |
| 6.90 | 0.11 | 0.00 | | | 0.265 | 1.00 | 23 | 6.83 | 6.98 | 0.265 | 0.265 | 0.11 | 0.02 | 0.004 | 5% |
| 7.05 | 0.10 | 0.00 | | | 0.262 | 1.00 | 24 | 6.98 | 7.13 | 0.262 | 0.262 | 0.10 | 0.02 | 0.004 | 4% |
| 7.20 | 0.11 | 0.00 | | | 0.189 | 1.00 | 25 | 7.13 | 7.30 | 0.189 | 0.189 | 0.11 | 0.02 | 0.004 | 4% |
| 7.40 | 0.11 | 0.00 | | | 0.186 | 1.00 | 26 | 7.30 | 7.50 | 0.186 | 0.186 | 0.11 | 0.02 | 0.004 | 5% |
| 7.60 | 0.10 | 0.00 | | | 0.122 | 1.00 | 27 | 7.50 | 7.70 | 0.122 | 0.122 | 0.10 | 0.02 | 0.002 | 3% |
| 7.80 | 0.08 | 0.00 | | | 0.198 | 1.00 | 28 | 7.70 | 7.90 | 0.198 | 0.198 | 0.08 | 0.02 | 0.003 | 4% |
| 8.00 | 0.07 | 0.00 | | | 0.229 | 1.00 | 29 | 7.90 | 9.00 | 0.229 | 0.229 | 0.07 | 0.08 | 0.018 | 20% |
| 10.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 30 | 9.00 | 10.00 | 0.057 | 0.057 | 0.02 | 0.02 | 0.001 | 1% |
| Total Flow: | | | | | | | | | | | | | | 0.089 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.089 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.67 | (m ²) |
| Top Width: | 10.00 | (m) |
| Hydraulic Depth: | 0.067 | (m) |
| Mean Velocity: | 0.133 | (m/s) |
| Froude Number | 0.165 | |
| Photographs taken looking at: Upstream, downstream, across | | |

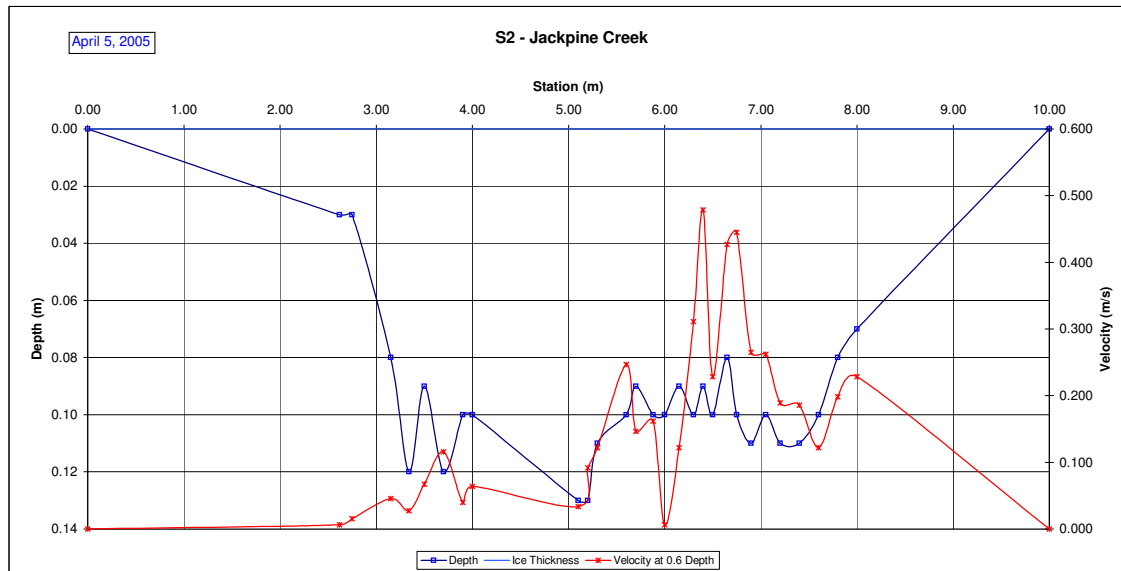
Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.77V 82%
Datalogger Memory Used:
Datalogger Clock: Apr 05, 2005 07:54 MST
Laptop Clock: Apr 05, 2005 08:08 MST
Dessicant: Good

Datalogger: 207085
PT: 984631
Power:

Notes:

Ice broken out through most of the measurement section to facilitate manual MMT.



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: ND/FF
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2001521

Time of Measurement

Date of Measurement: April 23, 2005
Start Time: 8:43 AM MDT
End Time: 9:00 AM MDT

Level Readings

Bench Mark Reading: Pin on RB 0.920
Water Level Reading: 1.434
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.926
Other: Transducer 1.347

Setup No. 1

El: 297.990
El: 297.476
El: 296.550
El: 296.129

Setup No. 2

El: 297.990
El: 297.474
El: 296.548 After moving in stilling w
El: 296.127 Before moving

Weather Conditions:

+8 °C, clear, calm

River Conditions:

Open, higher than bankfull, very high stage, swift current

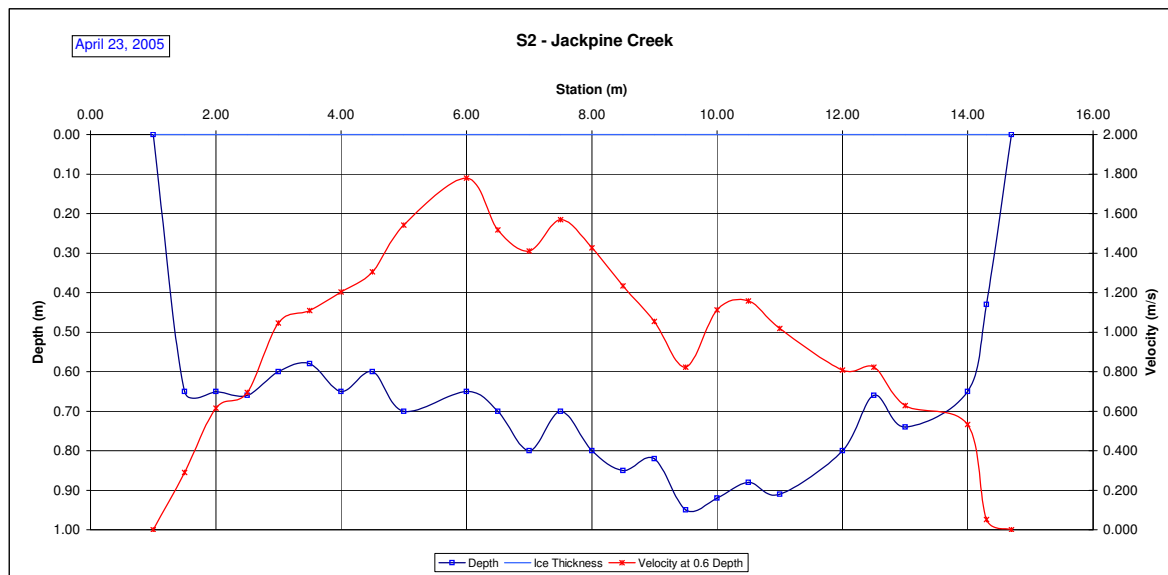
Measurement Data

| 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) | |
| 1.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 1.00 | 1.25 | 0.072 | 0.072 | 0.16 | 0.04 | 0.003 | 0% |
| 1.50 | 0.65 | 0.00 | | | 0.290 | 1.00 | 2 | 1.25 | 1.75 | 0.290 | 0.290 | 0.65 | 0.33 | 0.094 | 1% |
| 2.00 | 0.65 | 0.00 | | | 0.616 | 1.00 | 3 | 1.75 | 2.25 | 0.616 | 0.616 | 0.65 | 0.33 | 0.200 | 2% |
| 2.50 | 0.66 | 0.00 | | | 0.695 | 1.00 | 4 | 2.25 | 2.75 | 0.695 | 0.695 | 0.66 | 0.33 | 0.229 | 2% |
| 3.00 | 0.60 | 0.00 | | | 1.045 | 1.00 | 5 | 2.75 | 3.25 | 1.045 | 1.045 | 0.60 | 0.30 | 0.314 | 3% |
| 3.50 | 0.58 | 0.00 | | | 1.109 | 1.00 | 6 | 3.25 | 3.75 | 1.109 | 1.109 | 0.58 | 0.29 | 0.322 | 3% |
| 4.00 | 0.65 | 0.00 | | | 1.204 | 1.00 | 7 | 3.75 | 4.25 | 1.204 | 1.204 | 0.65 | 0.33 | 0.391 | 4% |
| 4.50 | 0.60 | 0.00 | | | 1.305 | 1.00 | 8 | 4.25 | 4.75 | 1.305 | 1.305 | 0.60 | 0.30 | 0.391 | 4% |
| 5.00 | 0.70 | 0.00 | | | 1.542 | 1.00 | 9 | 4.75 | 5.50 | 1.542 | 1.542 | 0.70 | 0.53 | 0.810 | 8% |
| 6.00 | 0.65 | 0.00 | | | 1.780 | 1.00 | 10 | 5.50 | 6.25 | 1.780 | 1.780 | 0.65 | 0.49 | 0.868 | 8% |
| 6.50 | 0.70 | 0.00 | | | 1.518 | 1.00 | 11 | 6.25 | 6.75 | 1.518 | 1.518 | 0.70 | 0.35 | 0.531 | 5% |
| 7.00 | 0.80 | 0.00 | | | 1.411 | 1.00 | 12 | 6.75 | 7.25 | 1.411 | 1.411 | 0.80 | 0.40 | 0.564 | 6% |
| 7.50 | 0.70 | 0.00 | | | 1.570 | 1.00 | 13 | 7.25 | 7.75 | 1.570 | 1.570 | 0.70 | 0.35 | 0.549 | 5% |
| 8.00 | 0.80 | 0.00 | | | 1.426 | 1.00 | 14 | 7.75 | 8.25 | 1.426 | 1.426 | 0.80 | 0.40 | 0.571 | 6% |
| 8.50 | 0.85 | 0.00 | | | 1.234 | 1.00 | 15 | 8.25 | 8.75 | 1.234 | 1.234 | 0.85 | 0.43 | 0.525 | 5% |
| 9.00 | 0.82 | 0.00 | | | 1.055 | 1.00 | 16 | 8.75 | 9.25 | 1.055 | 1.055 | 0.82 | 0.41 | 0.432 | 4% |
| 9.50 | 0.95 | 0.00 | | | 0.823 | 1.00 | 17 | 9.25 | 9.75 | 0.823 | 0.823 | 0.95 | 0.48 | 0.391 | 4% |
| 10.00 | 0.92 | 0.00 | | | 1.113 | 1.00 | 18 | 9.75 | 10.25 | 1.113 | 1.113 | 0.92 | 0.46 | 0.512 | 5% |
| 10.50 | 0.88 | 0.00 | | | 1.158 | 1.00 | 19 | 10.25 | 10.75 | 1.158 | 1.158 | 0.88 | 0.44 | 0.510 | 5% |
| 11.00 | 0.91 | 0.00 | | | 1.018 | 1.00 | 20 | 10.75 | 11.50 | 1.018 | 1.018 | 0.91 | 0.68 | 0.695 | 7% |
| 12.00 | 0.80 | 0.00 | | | 0.808 | 1.00 | 21 | 11.50 | 12.25 | 0.808 | 0.808 | 0.80 | 0.60 | 0.485 | 5% |
| 12.50 | 0.66 | 0.00 | | | 0.823 | 1.00 | 22 | 12.25 | 12.75 | 0.823 | 0.823 | 0.66 | 0.33 | 0.272 | 3% |
| 13.00 | 0.74 | 0.00 | | | 0.628 | 1.00 | 23 | 12.75 | 13.50 | 0.628 | 0.628 | 0.74 | 0.56 | 0.348 | 3% |
| 14.00 | 0.65 | 0.00 | | | 0.533 | 1.00 | 24 | 13.50 | 14.15 | 0.533 | 0.533 | 0.65 | 0.42 | 0.225 | 2% |
| 14.30 | 0.43 | 0.00 | | | 0.052 | 1.00 | 25 | 14.15 | 14.50 | 0.052 | 0.052 | 0.43 | 0.15 | 0.008 | 0% |
| 14.70 | 0.00 | 0.00 | | | 0.000 | 1.00 | 26 | 14.50 | 14.70 | 0.013 | 0.013 | 0.11 | 0.02 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 10.240 | 1.0 |

| | | |
|---|--------|--------|
| Total Flow: | 10.240 | (m³/s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 9.72 | (m²) |
| Top Width: | 13.70 | (m) |
| Hydraulic Depth: | 0.709 | (m) |
| Mean Velocity: | 1.053 | (m/s) |
| Froude Number | 0.399 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.7V | 82% |
| Datalogger Memory Used: | 0% | |
| Datalogger Clock: | Apr 23, 2005 07:16 | MST |
| Laptop Clock: | Apr 23, 2005 07:31 | MST |
| Dessicant: | Good | |
| Datalogger: | 207085 | |
| PT: | 984631- 2 psi | |
| Power: | | |

Notes: Transducer may have gone over range. Transducer appears to have moved. The Transducer was moved back into its stilling well. Data sampling interval set to 15 mins. Undulating water surface. TSS sample taken.



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: May 30, 2005
Start Time: 8:00 AM MDT
End Time: 8:15 AM MDT

Weather Conditions:

+18 °C, clear, calm

River Conditions:

Open water, stage below bankfull, stage falling

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Pin on RB 1.653
Water Level Reading: 2.605
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.204
Other:

Setup No. 1

El: 297.990
El: 297.038
El:
El: 296.834
El:

Setup No. 2

El: 297.990
El: 297.041
El:
El: 296.837
El:

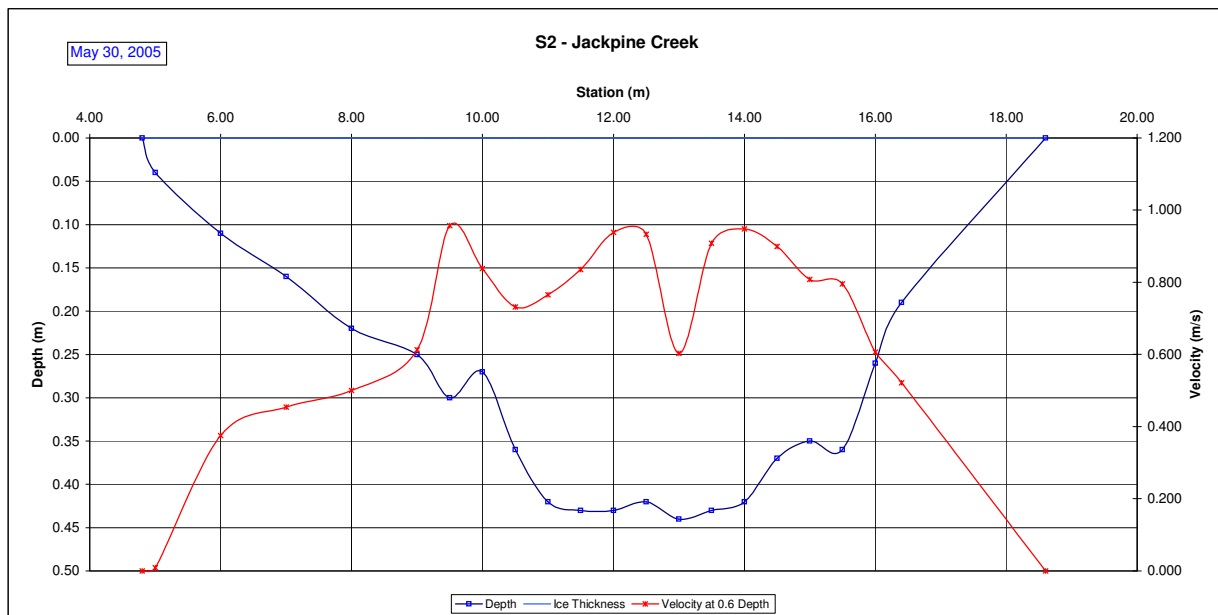
Measurement Data

| 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 ²) | (m ³ /s) | |
| 4.80 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 4.80 | 4.90 | 0.002 | 0.002 | 0.01 | 0.00 | 0.000 | 0% |
| 5.00 | 0.04 | 0.00 | | | 0.009 | 1.00 | 2 | 4.90 | 5.50 | 0.009 | 0.009 | 0.04 | 0.02 | 0.000 | 0% |
| 6.00 | 0.11 | 0.00 | | | 0.375 | 1.00 | 3 | 5.50 | 6.50 | 0.375 | 0.375 | 0.11 | 0.11 | 0.041 | 2% |
| 7.00 | 0.16 | 0.00 | | | 0.454 | 1.00 | 4 | 6.50 | 7.50 | 0.454 | 0.454 | 0.16 | 0.16 | 0.073 | 3% |
| 8.00 | 0.22 | 0.00 | | | 0.500 | 1.00 | 5 | 7.50 | 8.50 | 0.500 | 0.500 | 0.22 | 0.22 | 0.110 | 4% |
| 9.00 | 0.25 | 0.00 | | | 0.613 | 1.00 | 6 | 8.50 | 9.25 | 0.613 | 0.613 | 0.25 | 0.19 | 0.115 | 4% |
| 9.50 | 0.30 | 0.00 | | | 0.957 | 1.00 | 7 | 9.25 | 9.75 | 0.957 | 0.957 | 0.30 | 0.15 | 0.144 | 5% |
| 10.00 | 0.27 | 0.00 | | | 0.838 | 1.00 | 8 | 9.75 | 10.25 | 0.838 | 0.838 | 0.27 | 0.14 | 0.113 | 4% |
| 10.50 | 0.36 | 0.00 | | | 0.732 | 1.00 | 9 | 10.25 | 10.75 | 0.732 | 0.732 | 0.36 | 0.18 | 0.132 | 5% |
| 11.00 | 0.42 | 0.00 | | | 0.765 | 1.00 | 10 | 10.75 | 11.25 | 0.765 | 0.765 | 0.42 | 0.21 | 0.161 | 6% |
| 11.50 | 0.43 | 0.00 | | | 0.835 | 1.00 | 11 | 11.25 | 11.75 | 0.835 | 0.835 | 0.43 | 0.22 | 0.180 | 7% |
| 12.00 | 0.43 | 0.00 | | | 0.939 | 1.00 | 12 | 11.75 | 12.25 | 0.939 | 0.939 | 0.43 | 0.22 | 0.202 | 8% |
| 12.50 | 0.42 | 0.00 | | | 0.933 | 1.00 | 13 | 12.25 | 12.75 | 0.933 | 0.933 | 0.42 | 0.21 | 0.196 | 7% |
| 13.00 | 0.44 | 0.00 | | | 0.604 | 1.00 | 14 | 12.75 | 13.25 | 0.604 | 0.604 | 0.44 | 0.22 | 0.133 | 5% |
| 13.50 | 0.43 | 0.00 | | | 0.908 | 1.00 | 15 | 13.25 | 13.75 | 0.908 | 0.908 | 0.43 | 0.22 | 0.195 | 7% |
| 14.00 | 0.42 | 0.00 | | | 0.948 | 1.00 | 16 | 13.75 | 14.25 | 0.948 | 0.948 | 0.42 | 0.21 | 0.199 | 8% |
| 14.50 | 0.37 | 0.00 | | | 0.899 | 1.00 | 17 | 14.25 | 14.75 | 0.899 | 0.899 | 0.37 | 0.19 | 0.166 | 6% |
| 15.00 | 0.35 | 0.00 | | | 0.808 | 1.00 | 18 | 14.75 | 15.25 | 0.808 | 0.808 | 0.35 | 0.18 | 0.141 | 5% |
| 15.50 | 0.36 | 0.00 | | | 0.796 | 1.00 | 19 | 15.25 | 15.75 | 0.796 | 0.796 | 0.36 | 0.18 | 0.143 | 5% |
| 16.00 | 0.26 | 0.00 | | | 0.607 | 1.00 | 20 | 15.75 | 16.20 | 0.607 | 0.607 | 0.26 | 0.12 | 0.071 | 3% |
| 16.40 | 0.19 | 0.00 | | | 0.521 | 1.00 | 21 | 16.20 | 17.50 | 0.521 | 0.521 | 0.19 | 0.25 | 0.129 | 5% |
| 18.60 | 0.00 | 0.00 | | | 0.000 | 1.00 | 22 | 17.50 | 18.60 | 0.130 | 0.130 | 0.05 | 0.05 | 0.007 | 0% |
| Total Flow: | | | | | | | | | | | | | | 2.650 | 1.0 |

| | | |
|---|-------|---------------------|
| Total Flow: | 2.650 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.62 | (m ²) |
| Top Width: | 13.80 | (m) |
| Hydraulic Depth: | 0.262 | (m) |
| Mean Velocity: | 0.732 | (m/s) |
| Froude Number | 0.457 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.65V | 81% |
| Datalogger Memory Used: | 10% | |
| Datalogger Clock: | May 30, 2005 06:48 | MST |
| Laptop Clock: | May 30, 2005 07:04 | MST |
| Dessicant: | 80% Good | |
| Datalogger: | 207085 | |
| PT: | 984631 | |
| Power: | | |

Notes: TSS sample taken.



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: July 15, 2005
Start Time: 12:50 PM MDT
End Time: 1:15 PM MDT

Weather Conditions:

+25 °C, clear, calm

River Conditions:

Open water

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Pin on RB 0.789
Water Level Reading: 1.851
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.190
Other:

Setup No. 1

El: 297.990
El: 296.928
El:
El: 296.738
El:

Setup No. 2

El: 297.990
El: 296.930
El:
El: 296.740
El:

RB

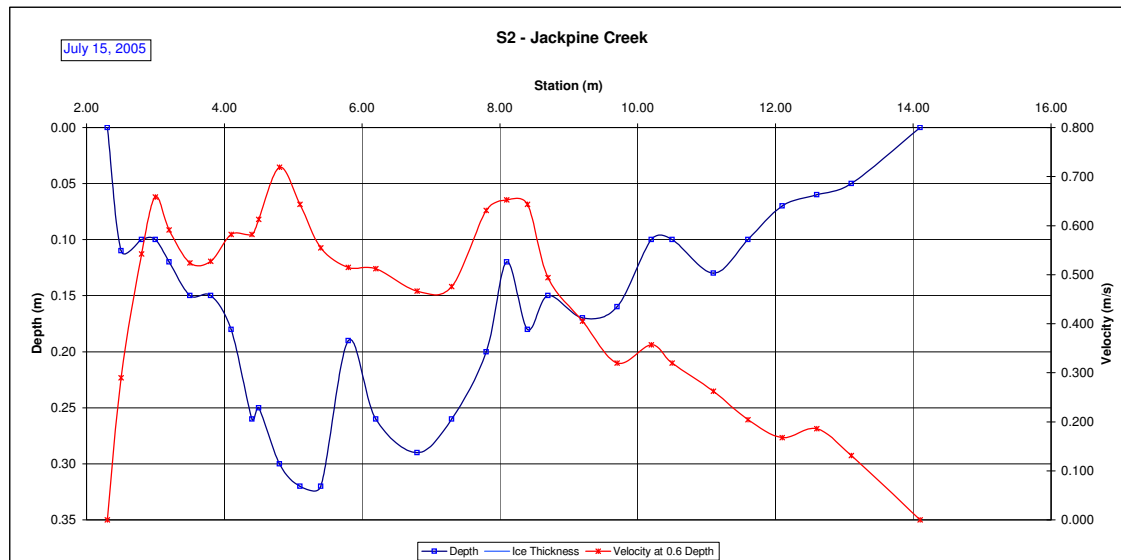
LB

| 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 ²) | (m ³ /s) | | | | | |
| 2.30 | 0.00 | | | | 0.000 | 1.00 | 1 | 2.30 | 2.40 | 0.072 | 0.072 | 0.03 | 0.00 | 0.000 | 0% | | | | |
| 2.50 | 0.11 | | | | 0.290 | 1.00 | 2 | 2.40 | 2.65 | 0.290 | 0.290 | 0.11 | 0.03 | 0.008 | 1% | | | | |
| 2.80 | 0.10 | | | | 0.543 | 1.00 | 3 | 2.65 | 2.90 | 0.543 | 0.543 | 0.10 | 0.03 | 0.014 | 2% | | | | |
| 3.00 | 0.10 | | | | 0.658 | 1.00 | 4 | 2.90 | 3.10 | 0.658 | 0.658 | 0.10 | 0.02 | 0.013 | 1% | | | | |
| 3.20 | 0.12 | | | | 0.591 | 1.00 | 5 | 3.10 | 3.35 | 0.591 | 0.591 | 0.12 | 0.03 | 0.018 | 2% | | | | |
| 3.50 | 0.15 | | | | 0.524 | 1.00 | 6 | 3.35 | 3.65 | 0.524 | 0.524 | 0.15 | 0.05 | 0.024 | 3% | | | | |
| 3.80 | 0.15 | | | | 0.527 | 1.00 | 7 | 3.65 | 3.95 | 0.527 | 0.527 | 0.15 | 0.05 | 0.024 | 3% | | | | |
| 4.10 | 0.18 | | | | 0.582 | 1.00 | 8 | 3.95 | 4.25 | 0.582 | 0.582 | 0.18 | 0.05 | 0.031 | 4% | | | | |
| 4.40 | 0.26 | | | | 0.582 | 1.00 | 9 | 4.25 | 4.45 | 0.582 | 0.582 | 0.26 | 0.05 | 0.030 | 3% | | | | |
| 4.50 | 0.25 | | | | 0.613 | 1.00 | 10 | 4.45 | 4.65 | 0.613 | 0.613 | 0.25 | 0.05 | 0.031 | 3% | | | | |
| 4.80 | 0.30 | | | | 0.719 | 1.00 | 11 | 4.65 | 4.95 | 0.719 | 0.719 | 0.30 | 0.09 | 0.065 | 7% | | | | |
| 5.10 | 0.32 | | | | 0.643 | 1.00 | 12 | 4.95 | 5.25 | 0.643 | 0.643 | 0.32 | 0.10 | 0.062 | 7% | | | | |
| 5.40 | 0.32 | | | | 0.555 | 1.00 | 13 | 5.25 | 5.60 | 0.555 | 0.555 | 0.32 | 0.11 | 0.062 | 7% | | | | |
| 5.80 | 0.19 | | | | 0.515 | 1.00 | 14 | 5.60 | 6.00 | 0.515 | 0.515 | 0.19 | 0.08 | 0.039 | 4% | | | | |
| 6.20 | 0.26 | | | | 0.512 | 1.00 | 15 | 6.00 | 6.50 | 0.512 | 0.512 | 0.26 | 0.13 | 0.067 | 7% | | | | |
| 6.80 | 0.29 | | | | 0.466 | 1.00 | 16 | 6.50 | 7.05 | 0.466 | 0.466 | 0.29 | 0.16 | 0.074 | 8% | | | | |
| 7.30 | 0.26 | | | | 0.475 | 1.00 | 17 | 7.05 | 7.55 | 0.475 | 0.475 | 0.26 | 0.13 | 0.062 | 7% | | | | |
| 7.80 | 0.20 | | | | 0.631 | 1.00 | 18 | 7.55 | 7.95 | 0.631 | 0.631 | 0.20 | 0.08 | 0.050 | 6% | | | | |
| 8.10 | 0.12 | | | | 0.652 | 1.00 | 19 | 7.95 | 8.25 | 0.652 | 0.652 | 0.12 | 0.04 | 0.023 | 3% | | | | |
| 8.40 | 0.18 | | | | 0.643 | 1.00 | 20 | 8.25 | 8.55 | 0.643 | 0.643 | 0.18 | 0.05 | 0.035 | 4% | | | | |
| 8.70 | 0.15 | | | | 0.494 | 1.00 | 21 | 8.55 | 8.95 | 0.494 | 0.494 | 0.15 | 0.06 | 0.030 | 3% | | | | |
| 9.20 | 0.17 | | | | 0.405 | 1.00 | 22 | 8.95 | 9.45 | 0.405 | 0.405 | 0.17 | 0.09 | 0.034 | 4% | | | | |
| 9.70 | 0.16 | | | | 0.320 | 1.00 | 23 | 9.45 | 9.95 | 0.320 | 0.320 | 0.16 | 0.08 | 0.026 | 3% | | | | |
| 10.20 | 0.10 | | | | 0.357 | 1.00 | 24 | 9.95 | 10.35 | 0.357 | 0.357 | 0.10 | 0.04 | 0.014 | 2% | | | | |
| 10.50 | 0.10 | | | | 0.320 | 1.00 | 25 | 10.35 | 10.80 | 0.320 | 0.320 | 0.10 | 0.05 | 0.014 | 2% | | | | |
| 11.10 | 0.13 | | | | 0.262 | 1.00 | 26 | 10.80 | 11.35 | 0.262 | 0.262 | 0.13 | 0.07 | 0.019 | 2% | | | | |
| 11.60 | 0.10 | | | | 0.204 | 1.00 | 27 | 11.35 | 11.85 | 0.204 | 0.204 | 0.10 | 0.05 | 0.010 | 1% | | | | |
| 12.10 | 0.07 | | | | 0.168 | 1.00 | 28 | 11.85 | 12.35 | 0.168 | 0.168 | 0.07 | 0.04 | 0.006 | 1% | | | | |
| 12.60 | 0.06 | | | | 0.186 | 1.00 | 29 | 12.35 | 12.85 | 0.186 | 0.186 | 0.06 | 0.03 | 0.006 | 1% | | | | |
| 13.10 | 0.05 | | | | 0.131 | 1.00 | 30 | 12.85 | 13.60 | 0.131 | 0.131 | 0.05 | 0.04 | 0.005 | 1% | | | | |
| 14.10 | 0.00 | | | | 0.000 | 1.00 | 31 | 13.60 | 14.10 | 0.033 | 0.033 | 0.01 | 0.01 | 0.000 | 0% | | | | |
| | | | | | | | | | | | | | | Total Flow: | 0.895 | | | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.895 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.86 | (m ²) |
| Top Width: | 11.80 | (m) |
| Hydraulic Depth: | 0.157 | (m) |
| Mean Velocity: | 0.483 | (m/s) |
| Froude Number | 0.389 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.34V | 81% |
| Datalogger Memory Used: | 25% | |
| Datalogger Clock: | Jul 15, 2005 11:25 | MST |
| Laptop Clock: | Jul 15, 2005 11:42 | MST |
| Dessicant: | 80% Good | |
| Datalogger: | 207085 | |
| PT: | 984631 | |
| Power: | | |

Notes: TSS sample taken.



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 1, 2005
Start Time: 9:19 AM MDT
End Time: 9:27 AM MDT

Weather Conditions:

+7 °C, overcast, fog

River Conditions:

Open water, approaching bankfull stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Pin on RB 0.732
Water Level Reading: 1.546
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.476
Other:

Setup No. 1

El: 297.990
El: 297.176
El: 296.700
El:

Setup No. 2

El: 297.990
El: 297.177
El: 296.701
El:

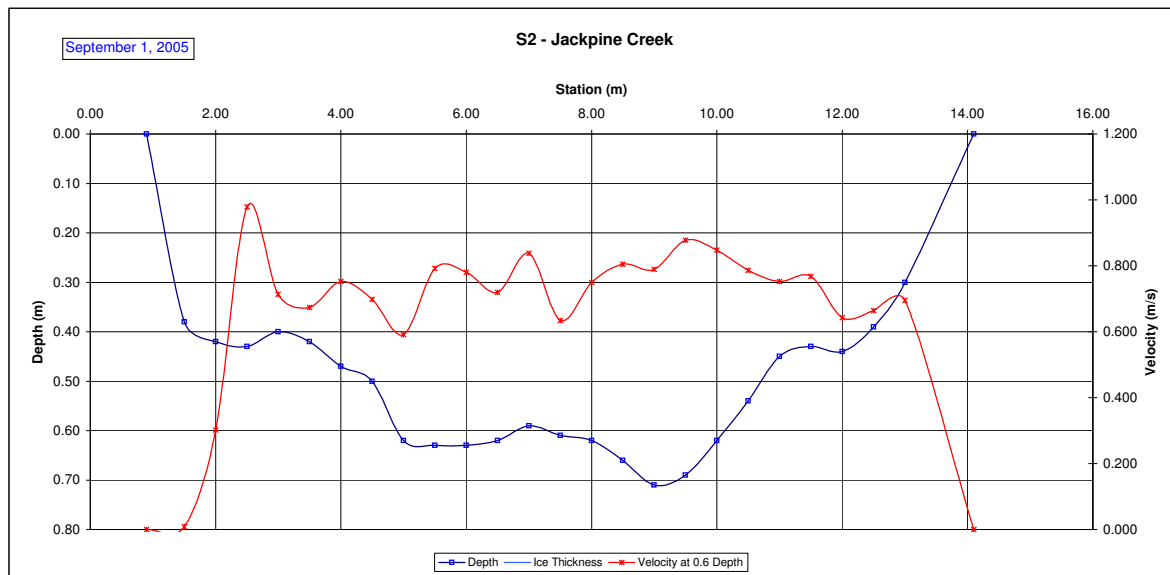
Measurement Data

| 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 ²) | (m ³ /s) | |
| RB | 0.90 | 0.00 | | | 0.000 | 1.00 | 1 | 0.90 | 1.20 | 0.002 | 0.002 | 0.10 | 0.03 | 0.000 | 0% |
| | 1.50 | 0.38 | | | 0.009 | 1.00 | 2 | 1.20 | 1.75 | 0.009 | 0.009 | 0.38 | 0.21 | 0.002 | 0% |
| | 2.00 | 0.42 | | | 0.302 | 1.00 | 3 | 1.75 | 2.25 | 0.302 | 0.302 | 0.42 | 0.21 | 0.063 | 1% |
| | 2.50 | 0.43 | | | 0.978 | 1.00 | 4 | 2.25 | 2.75 | 0.978 | 0.978 | 0.43 | 0.22 | 0.210 | 5% |
| | 3.00 | 0.40 | | | 0.713 | 1.00 | 5 | 2.75 | 3.25 | 0.713 | 0.713 | 0.40 | 0.20 | 0.143 | 3% |
| | 3.50 | 0.42 | | | 0.674 | 1.00 | 6 | 3.25 | 3.75 | 0.674 | 0.674 | 0.42 | 0.21 | 0.141 | 3% |
| | 4.00 | 0.47 | | | 0.753 | 1.00 | 7 | 3.75 | 4.25 | 0.753 | 0.753 | 0.47 | 0.24 | 0.177 | 4% |
| | 4.50 | 0.50 | | | 0.698 | 1.00 | 8 | 4.25 | 4.75 | 0.698 | 0.698 | 0.50 | 0.25 | 0.174 | 4% |
| | 5.00 | 0.62 | | | 0.591 | 1.00 | 9 | 4.75 | 5.25 | 0.591 | 0.591 | 0.62 | 0.31 | 0.183 | 4% |
| | 5.50 | 0.63 | | | 0.792 | 1.00 | 10 | 5.25 | 5.75 | 0.792 | 0.792 | 0.63 | 0.32 | 0.250 | 5% |
| | 6.00 | 0.63 | | | 0.780 | 1.00 | 11 | 5.75 | 6.25 | 0.780 | 0.780 | 0.63 | 0.32 | 0.246 | 5% |
| | 6.50 | 0.62 | | | 0.719 | 1.00 | 12 | 6.25 | 6.75 | 0.719 | 0.719 | 0.62 | 0.31 | 0.223 | 5% |
| | 7.00 | 0.59 | | | 0.838 | 1.00 | 13 | 6.75 | 7.25 | 0.838 | 0.838 | 0.59 | 0.30 | 0.247 | 5% |
| | 7.50 | 0.61 | | | 0.634 | 1.00 | 14 | 7.25 | 7.75 | 0.634 | 0.634 | 0.61 | 0.31 | 0.193 | 4% |
| | 8.00 | 0.62 | | | 0.750 | 1.00 | 15 | 7.75 | 8.25 | 0.750 | 0.750 | 0.62 | 0.31 | 0.232 | 5% |
| | 8.50 | 0.66 | | | 0.805 | 1.00 | 16 | 8.25 | 8.75 | 0.805 | 0.805 | 0.66 | 0.33 | 0.266 | 6% |
| | 9.00 | 0.71 | | | 0.789 | 1.00 | 17 | 8.75 | 9.25 | 0.789 | 0.789 | 0.71 | 0.36 | 0.280 | 6% |
| | 9.50 | 0.69 | | | 0.878 | 1.00 | 18 | 9.25 | 9.75 | 0.878 | 0.878 | 0.69 | 0.35 | 0.303 | 7% |
| | 10.00 | 0.62 | | | 0.847 | 1.00 | 19 | 9.75 | 10.25 | 0.847 | 0.847 | 0.62 | 0.31 | 0.263 | 6% |
| | 10.50 | 0.54 | | | 0.786 | 1.00 | 20 | 10.25 | 10.75 | 0.786 | 0.786 | 0.54 | 0.27 | 0.212 | 5% |
| | 11.00 | 0.45 | | | 0.753 | 1.00 | 21 | 10.75 | 11.25 | 0.753 | 0.753 | 0.45 | 0.23 | 0.169 | 4% |
| | 11.50 | 0.43 | | | 0.768 | 1.00 | 22 | 11.25 | 11.75 | 0.768 | 0.768 | 0.43 | 0.22 | 0.165 | 4% |
| | 12.00 | 0.44 | | | 0.643 | 1.00 | 23 | 11.75 | 12.25 | 0.643 | 0.643 | 0.44 | 0.22 | 0.141 | 3% |
| | 12.50 | 0.39 | | | 0.664 | 1.00 | 24 | 12.25 | 12.75 | 0.664 | 0.664 | 0.39 | 0.20 | 0.130 | 3% |
| | 13.00 | 0.30 | | | 0.695 | 1.00 | 25 | 12.75 | 13.55 | 0.695 | 0.695 | 0.30 | 0.24 | 0.167 | 4% |
| LB | 14.10 | 0.00 | | | 0.000 | 1.00 | 26 | 13.55 | 14.10 | 0.174 | 0.174 | 0.08 | 0.04 | 0.007 | 0% |
| Total Flow: | | | | | | | | | | | | | | 4.589 | 1 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 4.589 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 6.46 | (m ²) |
| Top Width: | 13.20 | (m) |
| Hydraulic Depth: | 0.490 | (m) |
| Mean Velocity: | 0.710 | (m/s) |
| Froude Number | 0.324 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

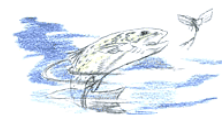
| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.17V | 78% |
| Datalogger Memory Used: | 40% | |
| Datalogger Clock: | Sep 01, 2005 07:44 | MST |
| Laptop Clock: | Sep 01, 2005 08:02 | MST |
| Dessicant: | 100% Used-Replaced | |
| Datalogger: | 207085 | |
| PT: | 984631 | |
| Power: | | |

Notes: TSS sample taken.



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 6, 2005
Start Time: 3:20 PM MDT
End Time: MDT

Weather Conditions:

+18 °C, Partly cloudy

River Conditions:

Open water, stage falling

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Pin on RB 0.677
Water Level Reading: 1.592
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.369
Other:

Setup No. 1

El: 297.990
El: 297.075
El: 296.706

Setup No. 2

El: 297.990
El: 297.074
El: 296.705

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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: Transducer does not appear to have moved.

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.41V | 80% |
| Datalogger Memory Used: | 45% | |
| Datalogger Clock: | Sep 06, 2005 14:02 | MST |
| Laptop Clock: | Sep 06, 2005 14:20 | MST |
| Dessicant: | Good | |
| Datalogger: | 207085 | |
| PT: | 984631 | |
| Power: | | |

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: ND/FF/PM
Data Entry By: PM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Time of Measurement

Date of Measurement: October 6, 2005
Start Time: 10:07 AM MDT
End Time: 10:29 AM MDT

Level Readings

Bench Mark Reading: Pin on RB 0.762
Water Level Reading: 1.817
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.287
Other:

Setup No. 1

El: 297.990
El: 296.935
El: 296.648
El:

Setup No. 2

El: 0.709 297.990
El: 1.758 296.864
El: 0.287 296.577
El:

Weather Conditions:

Pt cloudy, light wind

River Conditions:

Open, moderate stage

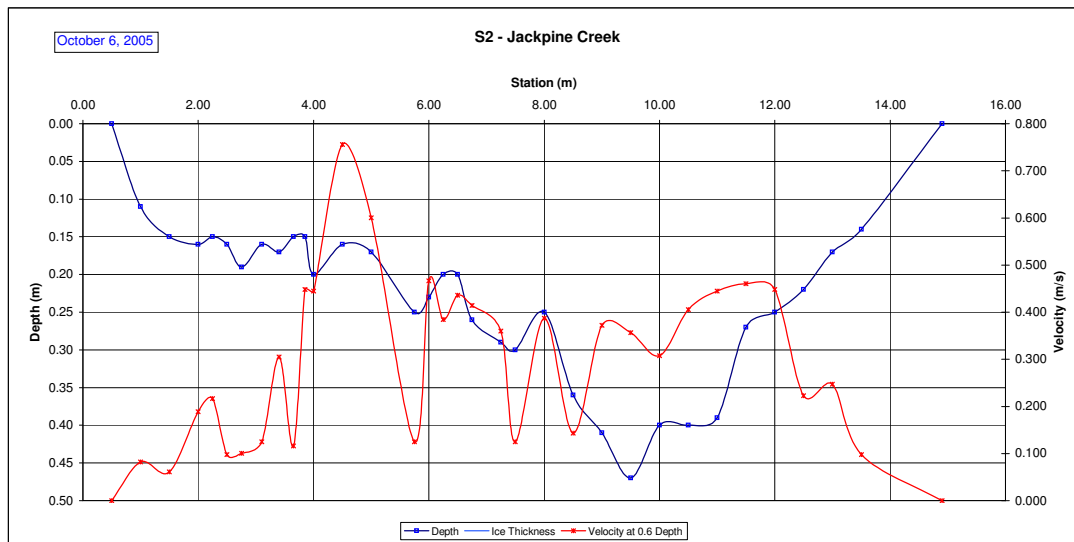
Measurement Data

| 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) | (m ²) | (m ³ /s) | |
| 0.50 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.50 | 0.75 | 0.021 | 0.021 | 0.03 | 0.01 | 0.000 | 0% |
| 1.00 | 0.11 | | | | 0.082 | 1.00 | 2 | 0.75 | 1.25 | 0.082 | 0.082 | 0.11 | 0.06 | 0.005 | 0% |
| 1.50 | 0.15 | | | | 0.061 | 1.00 | 3 | 1.25 | 1.75 | 0.061 | 0.061 | 0.15 | 0.08 | 0.005 | 0% |
| 2.00 | 0.16 | | | | 0.189 | 1.00 | 4 | 1.75 | 2.13 | 0.189 | 0.189 | 0.16 | 0.06 | 0.011 | 1% |
| 2.25 | 0.15 | | | | 0.216 | 1.00 | 5 | 2.13 | 2.38 | 0.216 | 0.216 | 0.15 | 0.04 | 0.008 | 1% |
| 2.50 | 0.16 | | | | 0.098 | 1.00 | 6 | 2.38 | 2.63 | 0.098 | 0.098 | 0.16 | 0.04 | 0.004 | 0% |
| 2.75 | 0.19 | | | | 0.101 | 1.00 | 7 | 2.63 | 2.93 | 0.101 | 0.101 | 0.19 | 0.06 | 0.006 | 1% |
| 3.10 | 0.16 | | | | 0.125 | 1.00 | 8 | 2.93 | 3.25 | 0.125 | 0.125 | 0.16 | 0.05 | 0.006 | 1% |
| 3.40 | 0.17 | | | | 0.305 | 1.00 | 9 | 3.25 | 3.53 | 0.305 | 0.305 | 0.17 | 0.05 | 0.014 | 1% |
| 3.65 | 0.15 | | | | 0.116 | 1.00 | 10 | 3.53 | 3.75 | 0.116 | 0.116 | 0.15 | 0.03 | 0.004 | 0% |
| 3.85 | 0.15 | | | | 0.448 | 1.00 | 11 | 3.75 | 3.93 | 0.448 | 0.448 | 0.15 | 0.03 | 0.012 | 1% |
| 4.00 | 0.20 | | | | 0.445 | 1.00 | 12 | 3.93 | 4.25 | 0.445 | 0.445 | 0.20 | 0.07 | 0.029 | 3% |
| 4.50 | 0.16 | | | | 0.756 | 1.00 | 13 | 4.25 | 4.75 | 0.756 | 0.756 | 0.16 | 0.08 | 0.060 | 6% |
| 5.00 | 0.17 | | | | 0.600 | 1.00 | 14 | 4.75 | 5.38 | 0.600 | 0.600 | 0.17 | 0.11 | 0.064 | 6% |
| 5.75 | 0.25 | | | | 0.125 | 1.00 | 15 | 5.38 | 5.88 | 0.125 | 0.125 | 0.25 | 0.13 | 0.016 | 1% |
| 6.00 | 0.23 | | | | 0.466 | 1.00 | 16 | 5.88 | 6.13 | 0.466 | 0.466 | 0.23 | 0.06 | 0.027 | 3% |
| 6.25 | 0.20 | | | | 0.384 | 1.00 | 17 | 6.13 | 6.38 | 0.384 | 0.384 | 0.20 | 0.05 | 0.019 | 2% |
| 6.50 | 0.20 | | | | 0.436 | 1.00 | 18 | 6.38 | 6.63 | 0.436 | 0.436 | 0.20 | 0.05 | 0.022 | 2% |
| 6.75 | 0.26 | | | | 0.415 | 1.00 | 19 | 6.63 | 7.00 | 0.415 | 0.415 | 0.26 | 0.10 | 0.040 | 4% |
| 7.25 | 0.29 | | | | 0.360 | 1.00 | 20 | 7.00 | 7.38 | 0.360 | 0.360 | 0.29 | 0.11 | 0.039 | 4% |
| 7.50 | 0.30 | | | | 0.125 | 1.00 | 21 | 7.38 | 7.75 | 0.125 | 0.125 | 0.30 | 0.11 | 0.014 | 1% |
| 8.00 | 0.25 | | | | 0.387 | 1.00 | 22 | 7.75 | 8.25 | 0.387 | 0.387 | 0.25 | 0.13 | 0.048 | 5% |
| 8.50 | 0.36 | | | | 0.143 | 1.00 | 23 | 8.25 | 8.75 | 0.143 | 0.143 | 0.36 | 0.18 | 0.026 | 2% |
| 9.00 | 0.41 | | | | 0.372 | 1.00 | 24 | 8.75 | 9.25 | 0.372 | 0.372 | 0.41 | 0.21 | 0.076 | 7% |
| 9.50 | 0.47 | | | | 0.357 | 1.00 | 25 | 9.25 | 9.75 | 0.357 | 0.357 | 0.47 | 0.24 | 0.084 | 8% |
| 10.00 | 0.40 | | | | 0.308 | 1.00 | 26 | 9.75 | 10.25 | 0.308 | 0.308 | 0.40 | 0.20 | 0.062 | 6% |
| 10.50 | 0.40 | | | | 0.405 | 1.00 | 27 | 10.25 | 10.75 | 0.405 | 0.405 | 0.40 | 0.20 | 0.081 | 8% |
| 11.00 | 0.39 | | | | 0.445 | 1.00 | 28 | 10.75 | 11.25 | 0.445 | 0.445 | 0.39 | 0.20 | 0.087 | 8% |
| 11.50 | 0.27 | | | | 0.460 | 1.00 | 29 | 11.25 | 11.75 | 0.460 | 0.460 | 0.27 | 0.14 | 0.062 | 6% |
| 12.00 | 0.25 | | | | 0.448 | 1.00 | 30 | 11.75 | 12.25 | 0.448 | 0.448 | 0.25 | 0.13 | 0.056 | 5% |
| 12.50 | 0.22 | | | | 0.223 | 1.00 | 31 | 12.25 | 12.75 | 0.223 | 0.223 | 0.22 | 0.11 | 0.024 | 2% |
| 13.00 | 0.17 | | | | 0.247 | 1.00 | 32 | 12.75 | 13.25 | 0.247 | 0.247 | 0.17 | 0.09 | 0.021 | 2% |
| 13.50 | 0.14 | | | | 0.098 | 1.00 | 33 | 13.25 | 14.20 | 0.098 | 0.098 | 0.14 | 0.13 | 0.013 | 1% |
| 14.90 | 0.00 | | | | 0.000 | 1.00 | 34 | 14.20 | 14.90 | 0.024 | 0.024 | 0.04 | 0.02 | 0.001 | 0% |
| Total Flow: | | | | | | | | | | | | | | 1.046 | 1 |

| | | |
|---|-------|---------------------|
| Total Flow: | 1.046 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.30 | (m ²) |
| Top Width: | 14.40 | (m) |
| Hydraulic Depth: | 0.229 | (m) |
| Mean Velocity: | 0.317 | (m/s) |
| Froude Number | 0.212 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|--------------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.04V | 77% replaced |
| Datalogger Memory Used: | 50% | |
| Datalogger Clock: | Oct 06, 2005 08:40 | MST |
| Laptop Clock: | Oct 06, 2005 08:59 | MST |
| Dessicant: | 5% Used | |
| Datalogger: | 207085 | |
| PT: | 984631 | |
| Power: | | |

Notes: TSS sample taken.
Battery changed. New battery reading 13.26 V 85%.
Transducer removed from stilling tube for winter installation, but was removed from site since it was malfunctioning.



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: October 9, 2005
Start Time: 1:01 PM MDT
End Time: MDT

Weather Conditions: +12 °C, clear, calm
River Conditions: Open water, stage falling

Personnel & Equipment

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

Level Readings

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

Setup No. 1

El: 297.990
El: 297.990
El:
El: 297.990
El:

Setup No. 2

El: 297.990
El: 297.990
El:
El: 297.990
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 | 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: Station visit to replace malfunctioning PT
PT s/n 000871 formerly installed in S3 was installed
PT affixed to concrete block & placed in deep pool d/s of logger box on RB
No computer available to check/reconfig logger
use S3.FMT to process data or create a new S2.FMT using S3 constants
Winter mmmts should be attempted under bridge, depth is relatively high under bridge

| |
|----------------------------|
| Datalogger Notes: |
| Datalogger Internal Power: |
| Datalogger External Power: |
| Datalogger Memory Used: |
| Datalogger Clock: |
| Laptop Clock: |
| Dessicant: Good |
| Datalogger: 207085 |
| PT: 984631 |
| Power: |

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: October 12, 2005
 Start Time: 9:15 AM MDT
 End Time: MDT

Weather Conditions:

River Conditions:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Pin on RB 0.687
 Water Level Reading: 1.786
 Top of Ice Level Reading:
 Transducer Reading & Calc'd El.: 0.562
 Other:

Setup No. 1

El: 297.990
 El: 296.891
 El:
 El: 296.329
 El:

Setup No. 2

0.743 0.709 297.990
 1.863 El: 296.870
 El:
 0.562 El: 296.308
 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - |

LB

| | | |
|--------------------------------|--|---------------------|
| Total Flow: | | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

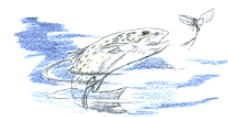
Notes: Downloaded Data, Memory cleared, clock synched
 Water level unstable for elevation shot

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
 Datalogger External Power: 12.90 83%
 Datalogger Memory Used: 50%
 Datalogger Clock: Oct 12, 2005 08:04 MST
 Laptop Clock: Oct 12, 2005 08:23 MST
 Dessicant: Good
 Datalogger: 207085
 PT: 0871
 Power:

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: ND/PMRM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Time of Measurement

Date of Measurement: December 7, 2005
Start Time: 9:03 AM MST
End Time: 9:30 AM MST

Level Readings

Bench Mark Reading: Pin on RB 1.210
Water Level Reading: 2.432
Top of Ice Level Reading: 2.400
Transducer Reading & Calc'd El. 0.419
Other:

Setup No. 1

El: 297.990
El: 296.768
El: 296.349
El:

Setup No. 2

0.709 297.990
El: 296.769
El: 2.319
El: 296.350
El:

Weather Conditions:

-20 °C, Clear, Calm

River Conditions:

Complete ice cover

Measurement Data

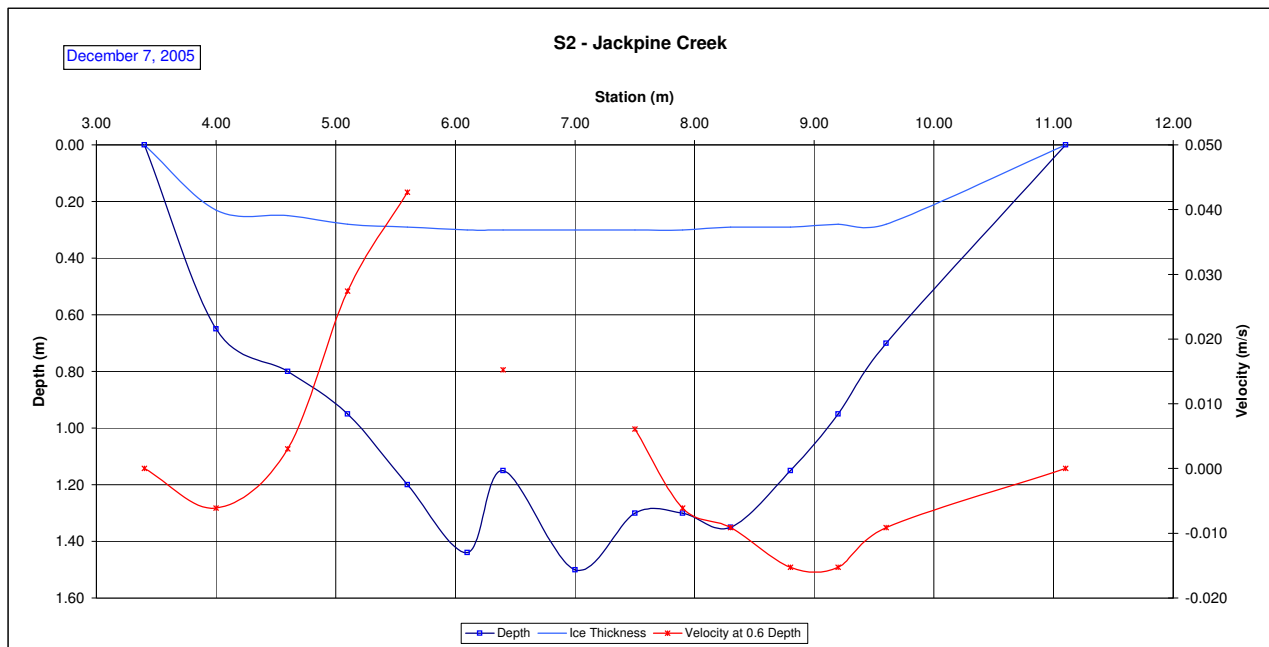
| Measured Data | | | | | | Calculated Data | | | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|
| 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 ²) | (m ³ /s) | |
| 3.40 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 3.40 | 3.70 | -0.002 | -0.001 | 0.11 | 0.03 | 0.000 | 0% |
| 4.00 | 0.65 | 0.23 | | | -0.006 | 0.90 | 2 | 3.70 | 4.30 | -0.006 | -0.005 | 0.42 | 0.25 | -0.001 | -5% |
| 4.60 | 0.80 | 0.25 | | | 0.003 | 0.90 | 3 | 4.30 | 4.85 | 0.003 | 0.003 | 0.55 | 0.30 | 0.001 | 3% |
| 5.10 | 0.95 | 0.28 | | | 0.027 | 0.90 | 4 | 4.85 | 5.35 | 0.027 | 0.025 | 0.67 | 0.34 | 0.008 | 28% |
| 5.60 | 1.20 | 0.29 | | | 0.043 | 0.90 | 5 | 5.35 | 5.85 | 0.043 | 0.038 | 0.91 | 0.46 | 0.017 | 59% |
| 6.10 | 1.44 | 0.30 | 0.040 | 0.012 | | 0.90 | 6 | 5.85 | 6.25 | 0.026 | 0.023 | 1.14 | 0.46 | 0.011 | 36% |
| 6.40 | 1.15 | 0.30 | | | 0.015 | 0.90 | 7 | 6.25 | 6.70 | 0.015 | 0.014 | 0.85 | 0.38 | 0.005 | 18% |
| 7.00 | 1.50 | 0.30 | 0.006 | 0.009 | | 0.90 | 8 | 6.70 | 7.25 | 0.008 | 0.007 | 1.20 | 0.66 | 0.005 | 15% |
| 7.50 | 1.30 | 0.30 | | | 0.006 | 0.90 | 9 | 7.25 | 7.70 | 0.006 | 0.005 | 1.00 | 0.45 | 0.002 | 8% |
| 7.90 | 1.30 | 0.30 | | | -0.006 | 0.90 | 10 | 7.70 | 8.10 | -0.006 | -0.005 | 1.00 | 0.40 | -0.002 | -7% |
| 8.30 | 1.35 | 0.29 | | | -0.009 | 0.90 | 11 | 8.10 | 8.55 | -0.009 | -0.008 | 1.06 | 0.48 | -0.004 | -13% |
| 8.80 | 1.15 | 0.29 | | | -0.015 | 0.90 | 12 | 8.55 | 9.00 | -0.015 | -0.014 | 0.86 | 0.39 | -0.005 | -18% |
| 9.20 | 0.95 | 0.28 | | | -0.015 | 0.90 | 13 | 9.00 | 9.40 | -0.015 | -0.014 | 0.67 | 0.27 | -0.004 | -12% |
| 9.60 | 0.70 | 0.28 | | | -0.009 | 0.90 | 14 | 9.40 | 10.35 | -0.009 | -0.008 | 0.42 | 0.40 | -0.003 | -11% |
| 11.10 | 0.00 | 0.00 | | | 0.000 | 0.90 | 15 | 10.35 | 11.10 | -0.002 | -0.002 | 0.11 | 0.08 | 0.000 | -1% |
| Total Flow: | | | | | | | | | | | | | | 0.029 | 1 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.029 | (m ³ /s) |
| Perceived Measurement Quality: | Poor | |
| Total Area: | 5.33 | (m ²) |
| Top Width: | 7.70 | (m) |
| Hydraulic Depth: | 0.693 | (m) |
| Mean Velocity: | 0.006 | (m/s) |
| Froude Number | 0.002 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.53V 81%
Datalogger Memory Used: 15%
Datalogger Clock: Dec 07, 2005 08:37 MST
Laptop Clock: Dec 07, 2005 08:40 MST
Dessicant: 30% used
Datalogger: 207085
PT: 0871
Power:

Notes: MMT done under the bridge.



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: April 25, 2005
Start Time: 8:37 AM MDT
End Time: 8:48 AM MDT

Weather Conditions:

+8 C, Partly cloudy, Calm

River Conditions:

Open, high stage and high velocity

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Bar in PVC 1.842
Water Level Reading: 2.963
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 0.840
Other:

Setup No. 1

El: 360.610
El: 359.489
El:
El: 358.649
El:

Setup No. 2

El: 360.610
El: 359.479
El:
El: 358.639
El:

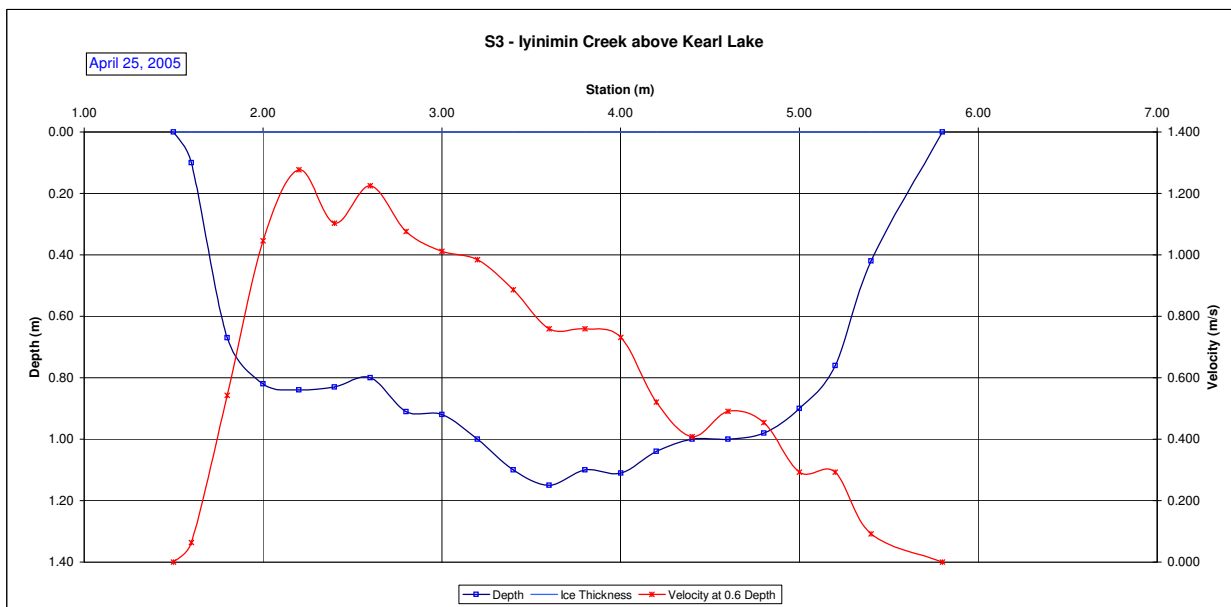
| Measured Data | | | | | | Measurement Data | | | | | | | | | | Calculated Data | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------|-----------------|--|-----------------|--|--|--|--|
| 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 | | | | | | |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) | | | | | | |
| 1.50 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 1.50 | 1.55 | 0.016 | 0.016 | 0.03 | 0.00 | 0.000 | | | | | | |
| 1.60 | 0.10 | 0.00 | | | 0.064 | 1.00 | 2 | 1.55 | 1.70 | 0.064 | 0.064 | 0.10 | 0.02 | 0.001 | | | | | | |
| 1.80 | 0.67 | 0.00 | | | 0.543 | 1.00 | 3 | 1.70 | 1.90 | 0.543 | 0.543 | 0.67 | 0.13 | 0.073 | | | | | | |
| 2.00 | 0.82 | 0.00 | | | 1.045 | 1.00 | 4 | 1.90 | 2.10 | 1.045 | 1.045 | 0.82 | 0.16 | 0.171 | | | | | | |
| 2.20 | 0.84 | 0.00 | | | 1.277 | 1.00 | 5 | 2.10 | 2.30 | 1.277 | 1.277 | 0.84 | 0.17 | 0.215 | | | | | | |
| 2.40 | 0.83 | 0.00 | | | 1.103 | 1.00 | 6 | 2.30 | 2.50 | 1.103 | 1.103 | 0.83 | 0.17 | 0.183 | | | | | | |
| 2.60 | 0.80 | 0.00 | | | 1.225 | 1.00 | 7 | 2.50 | 2.70 | 1.225 | 1.225 | 0.80 | 0.16 | 0.196 | | | | | | |
| 2.80 | 0.91 | 0.00 | | | 1.076 | 1.00 | 8 | 2.70 | 2.90 | 1.076 | 1.076 | 0.91 | 0.18 | 0.196 | | | | | | |
| 3.00 | 0.92 | 0.00 | | | 1.012 | 1.00 | 9 | 2.90 | 3.10 | 1.012 | 1.012 | 0.92 | 0.18 | 0.186 | | | | | | |
| 3.20 | 1.00 | 0.00 | | | 0.985 | 1.00 | 10 | 3.10 | 3.30 | 0.985 | 0.985 | 1.00 | 0.20 | 0.197 | | | | | | |
| 3.40 | 1.10 | 0.00 | | | 0.887 | 1.00 | 11 | 3.30 | 3.50 | 0.887 | 0.887 | 1.10 | 0.22 | 0.195 | | | | | | |
| 3.60 | 1.15 | 0.00 | | | 0.759 | 1.00 | 12 | 3.50 | 3.70 | 0.759 | 0.759 | 1.15 | 0.23 | 0.175 | | | | | | |
| 3.80 | 1.10 | 0.00 | | | 0.759 | 1.00 | 13 | 3.70 | 3.90 | 0.759 | 0.759 | 1.10 | 0.22 | 0.167 | | | | | | |
| 4.00 | 1.11 | 0.00 | | | 0.732 | 1.00 | 14 | 3.90 | 4.10 | 0.732 | 0.732 | 1.11 | 0.22 | 0.162 | | | | | | |
| 4.20 | 1.04 | 0.00 | | | 0.521 | 1.00 | 15 | 4.10 | 4.30 | 0.521 | 0.521 | 1.04 | 0.21 | 0.108 | | | | | | |
| 4.40 | 1.00 | 0.00 | | | 0.408 | 1.00 | 16 | 4.30 | 4.50 | 0.408 | 0.408 | 1.00 | 0.20 | 0.082 | | | | | | |
| 4.60 | 1.00 | 0.00 | | | 0.491 | 1.00 | 17 | 4.50 | 4.70 | 0.491 | 0.491 | 1.00 | 0.20 | 0.098 | | | | | | |
| 4.80 | 0.98 | 0.00 | | | 0.454 | 1.00 | 18 | 4.70 | 4.90 | 0.454 | 0.454 | 0.98 | 0.20 | 0.089 | | | | | | |
| 5.00 | 0.90 | 0.00 | | | 0.293 | 1.00 | 19 | 4.90 | 5.10 | 0.293 | 0.293 | 0.90 | 0.18 | 0.053 | | | | | | |
| 5.20 | 0.76 | 0.00 | | | 0.293 | 1.00 | 20 | 5.10 | 5.30 | 0.293 | 0.293 | 0.76 | 0.15 | 0.044 | | | | | | |
| 5.40 | 0.42 | 0.00 | | | 0.091 | 1.00 | 21 | 5.30 | 5.60 | 0.091 | 0.091 | 0.42 | 0.13 | 0.012 | | | | | | |
| 5.80 | 0.00 | 0.00 | | | 0.000 | 1.00 | 22 | 5.60 | 5.80 | 0.023 | 0.023 | 0.11 | 0.02 | 0.000 | | | | | | |
| | | | | | | | | | | | | | Total Flow: | 2.603 | | | | | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 2.603 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.55 | (m ²) |
| Top Width: | 4.30 | (m) |
| Hydraulic Depth: | 0.825 | (m) |
| Mean Velocity: | 0.733 | (m/s) |
| Froude Number | 0.258 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.65 V 81%
Datalogger Memory Used: 0%
Datalogger Clock: April 25, 2005 MST
Laptop Clock: April 25, 2005 MST
Dessicant: Good
Datalogger: Lakewood UltraLogger RX-2 #41174-08
PT: Keller Pressure Transducer LE8363K 2 psi #871
Power: Lakewood battery

Notes: TSS sample collected.
Transducer installed, clamped on to a rock and placed at a deep spot in the flow.
Rain gauge installed, ignore tips 1373 to 1378 since they were test tips.



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

Personnel & Equipment

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

Time of Measurement

Date of Measurement: June 2, 2005
Start Time: 8:30 AM MDT
End Time: 8:37 AM MDT

Level Readings

Bench Mark Reading: Bar in PVC 1.801
Water Level Reading: 3.361
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.439
Other:

Setup No. 1

El: 360.610
El: 359.050
El: 358.611
El:

Setup No. 2

El: 360.610
El: 359.050
El: 358.611
El:

Weather Conditions:

+20 C, light wind, partly cloudy

River Conditions:

Open water, stage below bankfull, stage falling

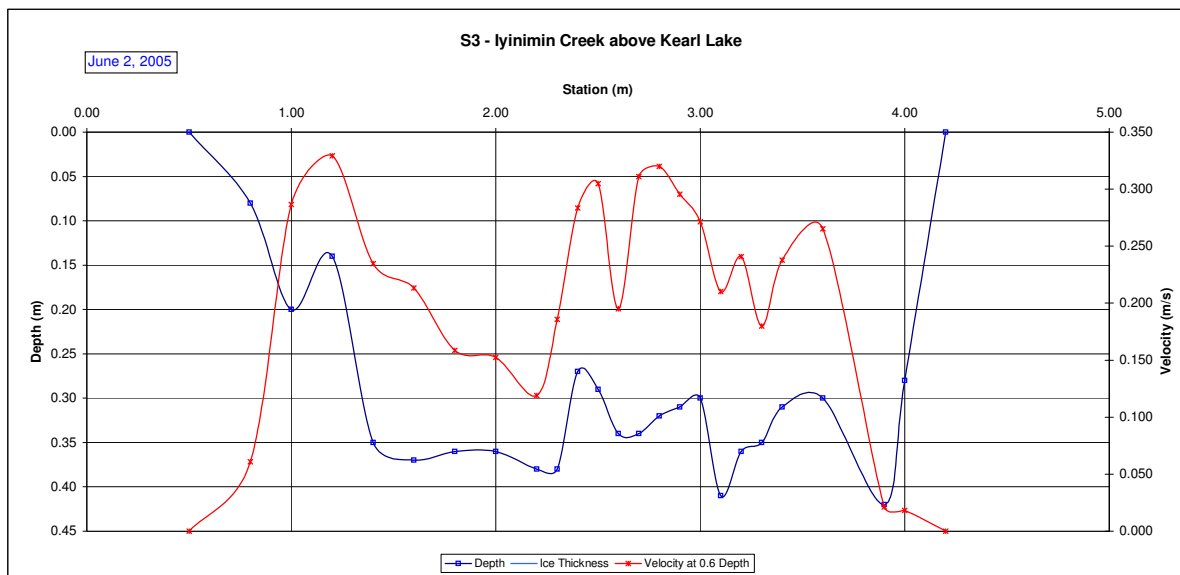
Measurement Data

| 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 ²) | (m ³ /s) |
| 0.50 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.50 | 0.65 | 0.015 | 0.015 | 0.02 | 0.00 | 0.000 |
| 0.80 | 0.08 | | | | 0.061 | 1.00 | 2 | 0.65 | 0.90 | 0.061 | 0.061 | 0.08 | 0.02 | 0.001 |
| 1.00 | 0.20 | | | | 0.287 | 1.00 | 3 | 0.90 | 1.10 | 0.287 | 0.287 | 0.20 | 0.04 | 0.011 |
| 1.20 | 0.14 | | | | 0.329 | 1.00 | 4 | 1.10 | 1.30 | 0.329 | 0.329 | 0.14 | 0.03 | 0.009 |
| 1.40 | 0.35 | | | | 0.235 | 1.00 | 5 | 1.30 | 1.50 | 0.235 | 0.235 | 0.35 | 0.07 | 0.016 |
| 1.60 | 0.37 | | | | 0.213 | 1.00 | 6 | 1.50 | 1.70 | 0.213 | 0.213 | 0.37 | 0.07 | 0.016 |
| 1.80 | 0.36 | | | | 0.158 | 1.00 | 7 | 1.70 | 1.90 | 0.158 | 0.158 | 0.36 | 0.07 | 0.011 |
| 2.00 | 0.36 | | | | 0.152 | 1.00 | 8 | 1.90 | 2.10 | 0.152 | 0.152 | 0.36 | 0.07 | 0.011 |
| 2.20 | 0.38 | | | | 0.119 | 1.00 | 9 | 2.10 | 2.25 | 0.119 | 0.119 | 0.38 | 0.06 | 0.007 |
| 2.30 | 0.38 | | | | 0.186 | 1.00 | 10 | 2.25 | 2.35 | 0.186 | 0.186 | 0.38 | 0.04 | 0.007 |
| 2.40 | 0.27 | | | | 0.283 | 1.00 | 11 | 2.35 | 2.45 | 0.283 | 0.283 | 0.27 | 0.03 | 0.008 |
| 2.50 | 0.29 | | | | 0.305 | 1.00 | 12 | 2.45 | 2.55 | 0.305 | 0.305 | 0.29 | 0.03 | 0.009 |
| 2.60 | 0.34 | | | | 0.195 | 1.00 | 13 | 2.55 | 2.65 | 0.195 | 0.195 | 0.34 | 0.03 | 0.007 |
| 2.70 | 0.34 | | | | 0.311 | 1.00 | 14 | 2.65 | 2.75 | 0.311 | 0.311 | 0.34 | 0.03 | 0.011 |
| 2.80 | 0.32 | | | | 0.320 | 1.00 | 15 | 2.75 | 2.85 | 0.320 | 0.320 | 0.32 | 0.03 | 0.010 |
| 2.90 | 0.31 | | | | 0.296 | 1.00 | 16 | 2.85 | 2.95 | 0.296 | 0.296 | 0.31 | 0.03 | 0.009 |
| 3.00 | 0.30 | | | | 0.271 | 1.00 | 17 | 2.95 | 3.05 | 0.271 | 0.271 | 0.30 | 0.03 | 0.008 |
| 3.10 | 0.41 | | | | 0.210 | 1.00 | 18 | 3.05 | 3.15 | 0.210 | 0.210 | 0.41 | 0.04 | 0.009 |
| 3.20 | 0.36 | | | | 0.241 | 1.00 | 19 | 3.15 | 3.25 | 0.241 | 0.241 | 0.36 | 0.04 | 0.009 |
| 3.30 | 0.35 | | | | 0.180 | 1.00 | 20 | 3.25 | 3.35 | 0.180 | 0.180 | 0.35 | 0.03 | 0.006 |
| 3.40 | 0.31 | | | | 0.238 | 1.00 | 21 | 3.35 | 3.50 | 0.238 | 0.238 | 0.31 | 0.05 | 0.011 |
| 3.60 | 0.30 | | | | 0.265 | 1.00 | 22 | 3.50 | 3.75 | 0.265 | 0.265 | 0.30 | 0.08 | 0.020 |
| 3.90 | 0.42 | | | | 0.021 | 1.00 | 23 | 3.75 | 3.95 | 0.021 | 0.021 | 0.42 | 0.08 | 0.002 |
| 4.00 | 0.28 | | | | 0.018 | 1.00 | 24 | 3.95 | 4.10 | 0.018 | 0.018 | 0.28 | 0.04 | 0.001 |
| 4.20 | 0.00 | | | | 0.000 | 1.00 | 25 | 4.10 | 4.20 | 0.005 | 0.005 | 0.07 | 0.01 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.209 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.209 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.06 | (m ²) |
| Top Width: | 3.70 | (m) |
| Hydraulic Depth: | 0.286 | (m) |
| Mean Velocity: | 0.197 | (m/s) |
| Froude Number | 0.118 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V 100% | |
| Datalogger External Power: | 12.4 V 80% | |
| Datalogger Memory Used: | 40% | |
| Datalogger Clock: | June 2, 2005 07:17 AM | MST |
| Laptop Clock: | June 2, 2005 07:18 AM | MST |
| Dessicant: | 90% Good | |
| Datalogger: | Lakewood UltraLogger RX-2 #41174-08 | |
| PT: | Keller Pressure Transducer LE8363K 2 psi #871 | |
| Power: | Lakewood battery | |

Notes: TSS sample collected.
Stage high. Some debris in channel. Flow much lower than during April installation visit. Some woody debris near station removed.
Rain gauge working - 1476 counts.



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

Personnel & Equipment

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

Time of Measurement

Date of Measurement: July 13, 2005
Start Time: 9:22 AM MDT
End Time: 9:42 AM MDT

Level Readings

Bench Mark Reading: Bar in PVC 1.800
Water Level Reading: 3.490
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.336
Other:

Setup No. 1

El: 360.610 1.762
El: 358.920 3.450
El: 358.584 0.336
El:

Setup No. 2

El: 360.610
El: 358.922
El:
El: 358.586
El:

Weather Conditions:

+18 C, Clear

River Conditions:

Open water, low stage

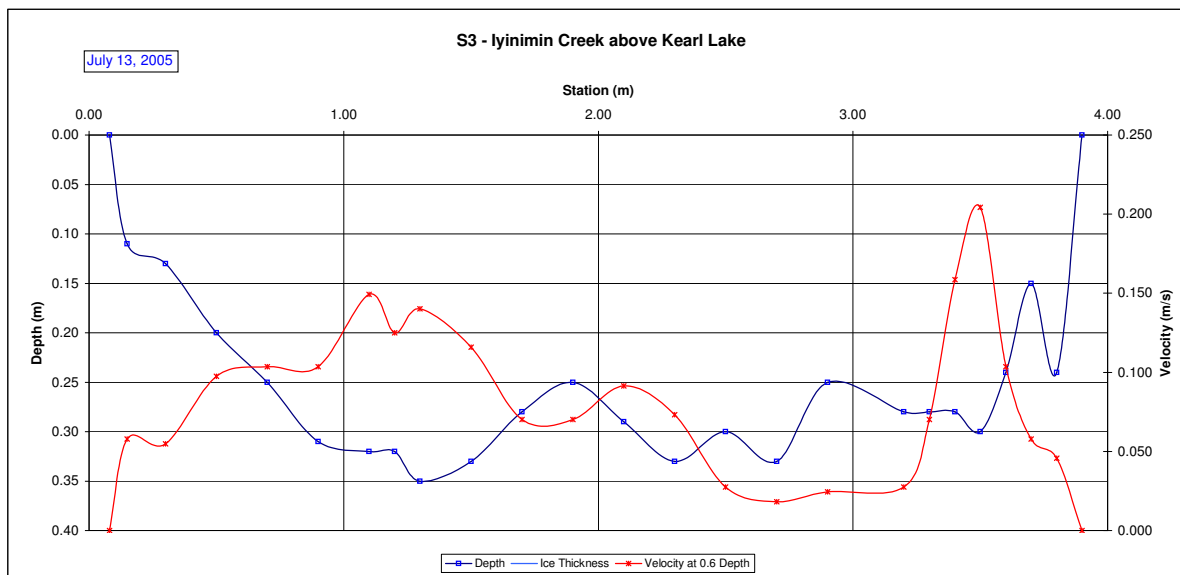
Measurement Data

| 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 ²) | (m ³ /s) |
| 0.08 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.08 | 0.12 | 0.014 | 0.014 | 0.03 | 0.00 | 0.000 |
| 0.15 | 0.11 | | | | 0.058 | 1.00 | 2 | 0.12 | 0.23 | 0.058 | 0.058 | 0.11 | 0.01 | 0.001 |
| 0.30 | 0.13 | | | | 0.055 | 1.00 | 3 | 0.23 | 0.40 | 0.055 | 0.055 | 0.13 | 0.02 | 0.001 |
| 0.50 | 0.20 | | | | 0.098 | 1.00 | 4 | 0.40 | 0.60 | 0.098 | 0.098 | 0.20 | 0.04 | 0.004 |
| 0.70 | 0.25 | | | | 0.104 | 1.00 | 5 | 0.60 | 0.80 | 0.104 | 0.104 | 0.25 | 0.05 | 0.005 |
| 0.90 | 0.31 | | | | 0.104 | 1.00 | 6 | 0.80 | 1.00 | 0.104 | 0.104 | 0.31 | 0.06 | 0.006 |
| 1.10 | 0.32 | | | | 0.149 | 1.00 | 7 | 1.00 | 1.15 | 0.149 | 0.149 | 0.32 | 0.05 | 0.007 |
| 1.20 | 0.32 | | | | 0.125 | 1.00 | 8 | 1.15 | 1.25 | 0.125 | 0.125 | 0.32 | 0.03 | 0.004 |
| 1.30 | 0.35 | | | | 0.140 | 1.00 | 9 | 1.25 | 1.40 | 0.140 | 0.140 | 0.35 | 0.05 | 0.007 |
| 1.50 | 0.33 | | | | 0.116 | 1.00 | 10 | 1.40 | 1.60 | 0.116 | 0.116 | 0.33 | 0.07 | 0.008 |
| 1.70 | 0.28 | | | | 0.070 | 1.00 | 11 | 1.60 | 1.80 | 0.070 | 0.070 | 0.28 | 0.06 | 0.004 |
| 1.90 | 0.25 | | | | 0.070 | 1.00 | 12 | 1.80 | 2.00 | 0.070 | 0.070 | 0.25 | 0.05 | 0.004 |
| 2.10 | 0.29 | | | | 0.091 | 1.00 | 13 | 2.00 | 2.20 | 0.091 | 0.091 | 0.29 | 0.06 | 0.005 |
| 2.30 | 0.33 | | | | 0.073 | 1.00 | 14 | 2.20 | 2.40 | 0.073 | 0.073 | 0.33 | 0.07 | 0.005 |
| 2.50 | 0.30 | | | | 0.027 | 1.00 | 15 | 2.40 | 2.60 | 0.027 | 0.027 | 0.30 | 0.06 | 0.002 |
| 2.70 | 0.33 | | | | 0.018 | 1.00 | 16 | 2.60 | 2.80 | 0.018 | 0.018 | 0.33 | 0.07 | 0.001 |
| 2.90 | 0.25 | | | | 0.024 | 1.00 | 17 | 2.80 | 3.05 | 0.024 | 0.024 | 0.25 | 0.06 | 0.002 |
| 3.20 | 0.28 | | | | 0.027 | 1.00 | 18 | 3.05 | 3.25 | 0.027 | 0.027 | 0.28 | 0.06 | 0.002 |
| 3.30 | 0.28 | | | | 0.070 | 1.00 | 19 | 3.25 | 3.35 | 0.070 | 0.070 | 0.28 | 0.03 | 0.002 |
| 3.40 | 0.28 | | | | 0.158 | 1.00 | 20 | 3.35 | 3.45 | 0.158 | 0.158 | 0.28 | 0.03 | 0.004 |
| 3.50 | 0.30 | | | | 0.204 | 1.00 | 21 | 3.45 | 3.55 | 0.204 | 0.204 | 0.30 | 0.03 | 0.006 |
| 3.60 | 0.24 | | | | 0.104 | 1.00 | 22 | 3.55 | 3.65 | 0.104 | 0.104 | 0.24 | 0.02 | 0.002 |
| 3.70 | 0.15 | | | | 0.058 | 1.00 | 23 | 3.65 | 3.75 | 0.058 | 0.058 | 0.15 | 0.01 | 0.001 |
| 3.80 | 0.24 | | | | 0.046 | 1.00 | 24 | 3.75 | 3.85 | 0.046 | 0.046 | 0.24 | 0.02 | 0.001 |
| 3.90 | 0.00 | | | | 0.000 | 1.00 | 25 | 3.85 | 3.90 | 0.011 | 0.011 | 0.06 | 0.00 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.084 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.084 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.01 | (m ²) |
| Top Width: | 3.82 | (m) |
| Hydraulic Depth: | 0.265 | (m) |
| Mean Velocity: | 0.083 | (m/s) |
| Froude Number | 0.052 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V 100% | |
| Datalogger External Power: | 12.41 V 80% | |
| Datalogger Memory Used: | 90% | |
| Datalogger Clock: | July 13, 2005 08:06 AM | MST |
| Laptop Clock: | July 13, 2005 08:09 AM | MST |
| Dessicant: | 50% Good | |
| Datalogger: | Lakewood UltraLogger RX-2 #41174-08 | |
| PT: | Keller Pressure Transducer LE8363K 2 psi #871 | |
| Power: | Lakewood battery | |

Notes: TSS sample collected.
Rain gauge working - 1851 counts.



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 2, 2005
Start Time: 8:45 AM MDT
End Time: 9:00 AM MDT

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Bar in PVC 1.749
Water Level Reading: 3.316
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 0.456
Other:

Setup No. 1

El: 360.610
El: 359.043
El:
El: 358.587
El:

Setup No. 2

El: 360.610
El: 359.044
El:
El: 358.588
El:

Weather Conditions: +8 C, overcast, light rain

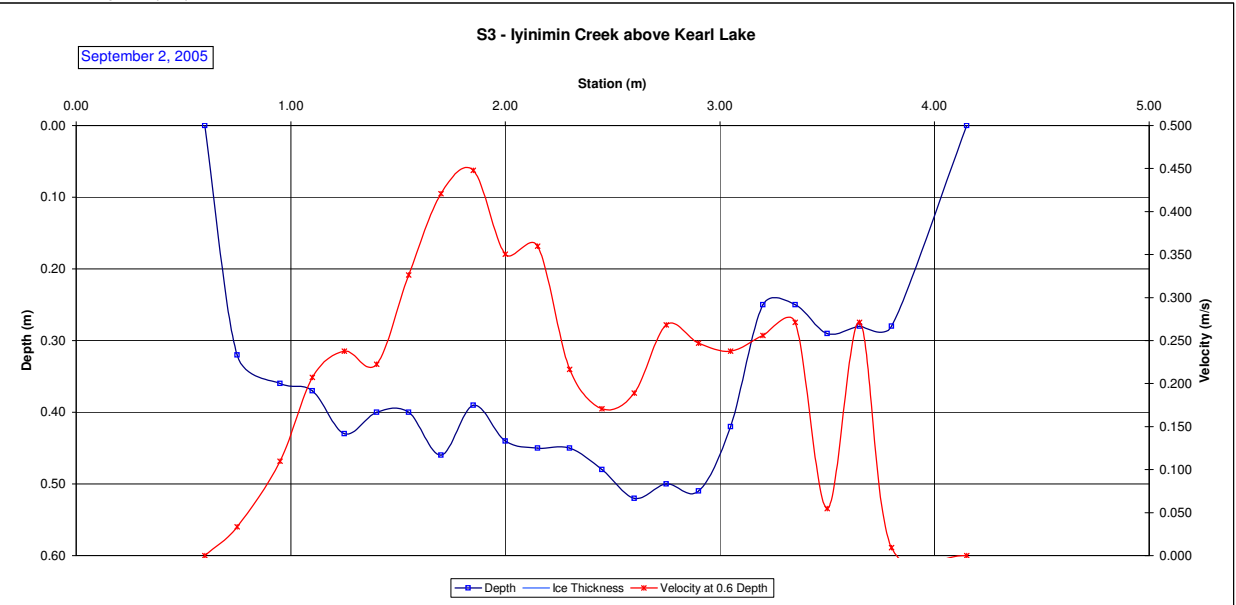
River Conditions: Open water, stage high but below bankfull.

| 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) |
| 0.60 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.60 | 0.68 | 0.008 | 0.008 | 0.08 | 0.01 | 0.000 |
| 0.75 | 0.32 | | | | 0.034 | 1.00 | 2 | 0.68 | 0.85 | 0.034 | 0.034 | 0.32 | 0.06 | 0.002 |
| 0.95 | 0.36 | | | | 0.110 | 1.00 | 3 | 0.85 | 1.03 | 0.110 | 0.110 | 0.36 | 0.06 | 0.007 |
| 1.10 | 0.37 | | | | 0.207 | 1.00 | 4 | 1.03 | 1.18 | 0.207 | 0.207 | 0.37 | 0.06 | 0.012 |
| 1.25 | 0.43 | | | | 0.238 | 1.00 | 5 | 1.18 | 1.33 | 0.238 | 0.238 | 0.43 | 0.06 | 0.015 |
| 1.40 | 0.40 | | | | 0.223 | 1.00 | 6 | 1.33 | 1.48 | 0.223 | 0.223 | 0.40 | 0.06 | 0.013 |
| 1.55 | 0.40 | | | | 0.326 | 1.00 | 7 | 1.48 | 1.63 | 0.326 | 0.326 | 0.40 | 0.06 | 0.020 |
| 1.70 | 0.46 | | | | 0.421 | 1.00 | 8 | 1.63 | 1.78 | 0.421 | 0.421 | 0.46 | 0.07 | 0.029 |
| 1.85 | 0.39 | | | | 0.448 | 1.00 | 9 | 1.78 | 1.93 | 0.448 | 0.448 | 0.39 | 0.06 | 0.026 |
| 2.00 | 0.44 | | | | 0.351 | 1.00 | 10 | 1.93 | 2.08 | 0.351 | 0.351 | 0.44 | 0.07 | 0.023 |
| 2.15 | 0.45 | | | | 0.360 | 1.00 | 11 | 2.08 | 2.23 | 0.360 | 0.360 | 0.45 | 0.07 | 0.024 |
| 2.30 | 0.45 | | | | 0.216 | 1.00 | 12 | 2.23 | 2.38 | 0.216 | 0.216 | 0.45 | 0.07 | 0.015 |
| 2.45 | 0.48 | | | | 0.171 | 1.00 | 13 | 2.38 | 2.53 | 0.171 | 0.171 | 0.48 | 0.07 | 0.012 |
| 2.60 | 0.52 | | | | 0.189 | 1.00 | 14 | 2.53 | 2.68 | 0.189 | 0.189 | 0.52 | 0.08 | 0.015 |
| 2.75 | 0.50 | | | | 0.268 | 1.00 | 15 | 2.68 | 2.83 | 0.268 | 0.268 | 0.50 | 0.08 | 0.020 |
| 2.90 | 0.51 | | | | 0.247 | 1.00 | 16 | 2.83 | 2.98 | 0.247 | 0.247 | 0.51 | 0.08 | 0.019 |
| 3.05 | 0.42 | | | | 0.238 | 1.00 | 17 | 2.98 | 3.13 | 0.238 | 0.238 | 0.42 | 0.06 | 0.015 |
| 3.20 | 0.25 | | | | 0.256 | 1.00 | 18 | 3.13 | 3.28 | 0.256 | 0.256 | 0.25 | 0.04 | 0.010 |
| 3.35 | 0.25 | | | | 0.271 | 1.00 | 19 | 3.28 | 3.43 | 0.271 | 0.271 | 0.25 | 0.04 | 0.010 |
| 3.50 | 0.29 | | | | 0.055 | 1.00 | 20 | 3.43 | 3.58 | 0.055 | 0.055 | 0.29 | 0.04 | 0.002 |
| 3.65 | 0.28 | | | | 0.271 | 1.00 | 21 | 3.58 | 3.73 | 0.271 | 0.271 | 0.28 | 0.04 | 0.011 |
| 3.80 | 0.28 | | | | 0.009 | 1.00 | 22 | 3.73 | 3.98 | 0.009 | 0.009 | 0.28 | 0.07 | 0.001 |
| 4.15 | 0.00 | | | | 0.000 | 1.00 | 23 | 3.98 | 4.15 | 0.002 | 0.002 | 0.07 | 0.01 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.301 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.301 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.30 | (m ²) |
| Top Width: | 3.55 | (m) |
| Hydraulic Depth: | 0.366 | (m) |
| Mean Velocity: | 0.231 | (m/s) |
| Froude Number | 0.122 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|---|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.04 V | 77% |
| Datalogger Memory Used: | 100% | |
| Datalogger Clock: | September 2, 2005 07:10 AM | MST |
| Laptop Clock: | September 2, 2005 07:13 AM | MST |
| Dessicant: | 100% used-replaced | |
| Datalogger: | Lakewood UltraLogger RX-2 #41174-08 | |
| PT: | Keller Pressure Transducer LE8363K 2 psi #871 | |
| Power: | Lakewood battery | |

Notes: TSS sample collected.
Memory cleared, clock synchronized to laptop.
Rain guage cable broken by wildlife - 2052 counts. Cable repaired. Wire rain gauge to ports 1 & 2 on input plug.
Ignore tips up to 2063 - test.



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

Personnel & Equipment

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

Time of Measurement

Date of Measurement: October 8, 2005
Start Time: 9:10 AM MDT
End Time: 9:23 AM MDT

Level Readings

Bench Mark Reading: Bar in PVC 1.599
Water Level Reading: 3.255
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.361
Other:

Setup No. 1

El: 360.610
El: 358.954
El:
El: 358.593
El:

Setup No. 2

El: 360.610
El: 358.949
El:
El: 358.588
El:

Weather Conditions:

+5°C, overcast, light rain

River Conditions:

Open water, low stage

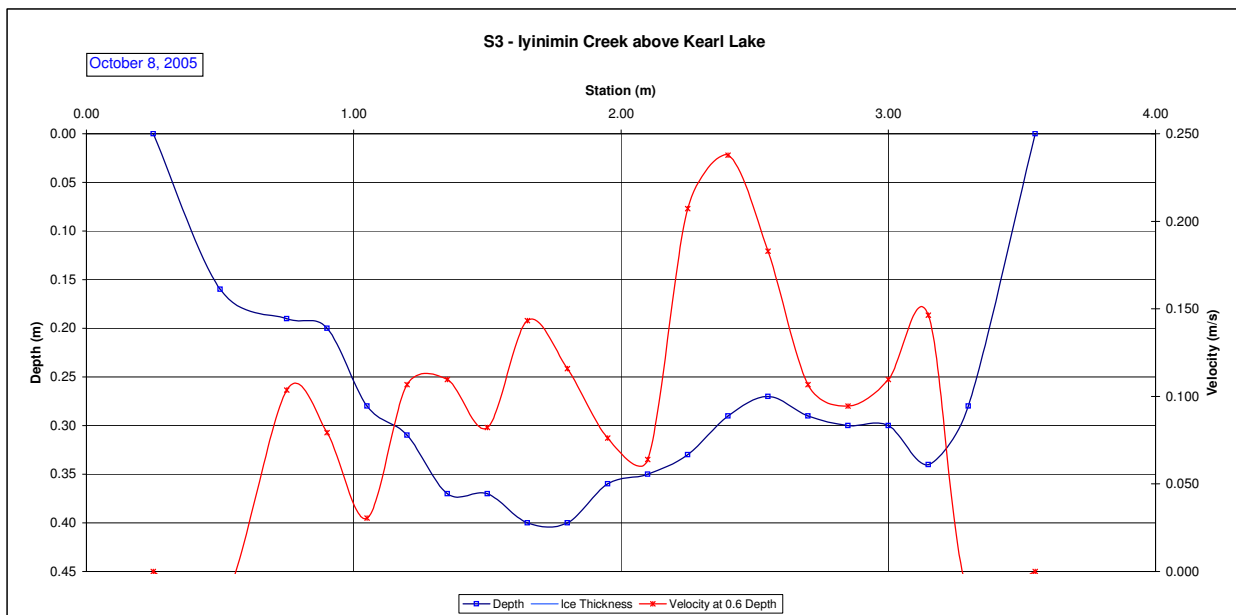
Measurement Data

| 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 ²) | (m ³ /s) |
| 0.25 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.25 | 0.38 | -0.005 | -0.005 | 0.04 | 0.01 | 0.000 |
| 0.50 | 0.16 | | | | -0.021 | 1.00 | 2 | 0.38 | 0.63 | -0.021 | -0.021 | 0.16 | 0.04 | -0.001 |
| 0.75 | 0.19 | | | | 0.104 | 1.00 | 3 | 0.63 | 0.83 | 0.104 | 0.104 | 0.19 | 0.04 | 0.004 |
| 0.90 | 0.20 | | | | 0.079 | 1.00 | 4 | 0.83 | 0.98 | 0.079 | 0.079 | 0.20 | 0.03 | 0.002 |
| 1.05 | 0.28 | | | | 0.030 | 1.00 | 5 | 0.98 | 1.13 | 0.030 | 0.030 | 0.28 | 0.04 | 0.001 |
| 1.20 | 0.31 | | | | 0.107 | 1.00 | 6 | 1.13 | 1.28 | 0.107 | 0.107 | 0.31 | 0.05 | 0.005 |
| 1.35 | 0.37 | | | | 0.110 | 1.00 | 7 | 1.28 | 1.43 | 0.110 | 0.110 | 0.37 | 0.06 | 0.006 |
| 1.50 | 0.37 | | | | 0.082 | 1.00 | 8 | 1.43 | 1.58 | 0.082 | 0.082 | 0.37 | 0.06 | 0.005 |
| 1.65 | 0.40 | | | | 0.143 | 1.00 | 9 | 1.58 | 1.73 | 0.143 | 0.143 | 0.40 | 0.06 | 0.009 |
| 1.80 | 0.40 | | | | 0.116 | 1.00 | 10 | 1.73 | 1.88 | 0.116 | 0.116 | 0.40 | 0.06 | 0.007 |
| 1.95 | 0.36 | | | | 0.076 | 1.00 | 11 | 1.88 | 2.03 | 0.076 | 0.076 | 0.36 | 0.05 | 0.004 |
| 2.10 | 0.35 | | | | 0.064 | 1.00 | 12 | 2.03 | 2.18 | 0.064 | 0.064 | 0.35 | 0.05 | 0.003 |
| 2.25 | 0.33 | | | | 0.207 | 1.00 | 13 | 2.18 | 2.33 | 0.207 | 0.207 | 0.33 | 0.05 | 0.010 |
| 2.40 | 0.29 | | | | 0.238 | 1.00 | 14 | 2.33 | 2.48 | 0.238 | 0.238 | 0.29 | 0.04 | 0.010 |
| 2.55 | 0.27 | | | | 0.183 | 1.00 | 15 | 2.48 | 2.63 | 0.183 | 0.183 | 0.27 | 0.04 | 0.007 |
| 2.70 | 0.29 | | | | 0.107 | 1.00 | 16 | 2.63 | 2.78 | 0.107 | 0.107 | 0.29 | 0.04 | 0.005 |
| 2.85 | 0.30 | | | | 0.094 | 1.00 | 17 | 2.78 | 2.93 | 0.094 | 0.094 | 0.30 | 0.04 | 0.004 |
| 3.00 | 0.30 | | | | 0.110 | 1.00 | 18 | 2.93 | 3.08 | 0.110 | 0.110 | 0.30 | 0.05 | 0.005 |
| 3.15 | 0.34 | | | | 0.146 | 1.00 | 19 | 3.08 | 3.23 | 0.146 | 0.146 | 0.34 | 0.05 | 0.007 |
| 3.30 | 0.28 | | | | -0.012 | 1.00 | 20 | 3.23 | 3.43 | -0.012 | -0.012 | 0.28 | 0.06 | -0.001 |
| 3.55 | 0.00 | | | | 0.000 | 1.00 | 21 | 3.43 | 3.55 | -0.003 | -0.003 | 0.07 | 0.01 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.094 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.094 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 0.92 | (m ²) |
| Top Width: | 3.30 | (m) |
| Hydraulic Depth: | 0.279 | (m) |
| Mean Velocity: | 0.102 | (m/s) |
| Froude Number | 0.062 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V 100% | |
| Datalogger External Power: | 12.65 V 81% | |
| Datalogger Memory Used: | 100% | |
| Datalogger Clock: | October 8, 2005 07:46 AM | MST |
| Laptop Clock: | October 8, 2005 07:48 AM | MST |
| Dessicant: | 20% used | |
| Datalogger: | Lakewood UltraLogger RX-2 #41174-08 | |
| PT: | Keller Pressure Transducer LE8363K 2 psi #871 | |
| Power: | Lakewood battery | |

Notes: TSS sample collected.
Rain gauge 2158 counts
Transducer & rain gauge removed for winter



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: DB/ND
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: January 9, 2005
Start Time: 10:30 AM MST
End Time: 11:00 AM MST

Level Readings

Bench Mark Reading: 1.0 m placed on btm of DL box -0.130
Water Level Reading: 2.215
Top of Ice Level Reading: 2.104
Transducer Reading & El.: 1.350
Other:

Setup No. 1

El: 100.000
El: 97.655
El: 2.180
El: 96.305
El:

Setup No. 2

El: 100.000
El: 97.658
El: 2.180
El: 96.308
El:

Weather Conditions: -35 C, calm, clear

River Conditions: Frozen

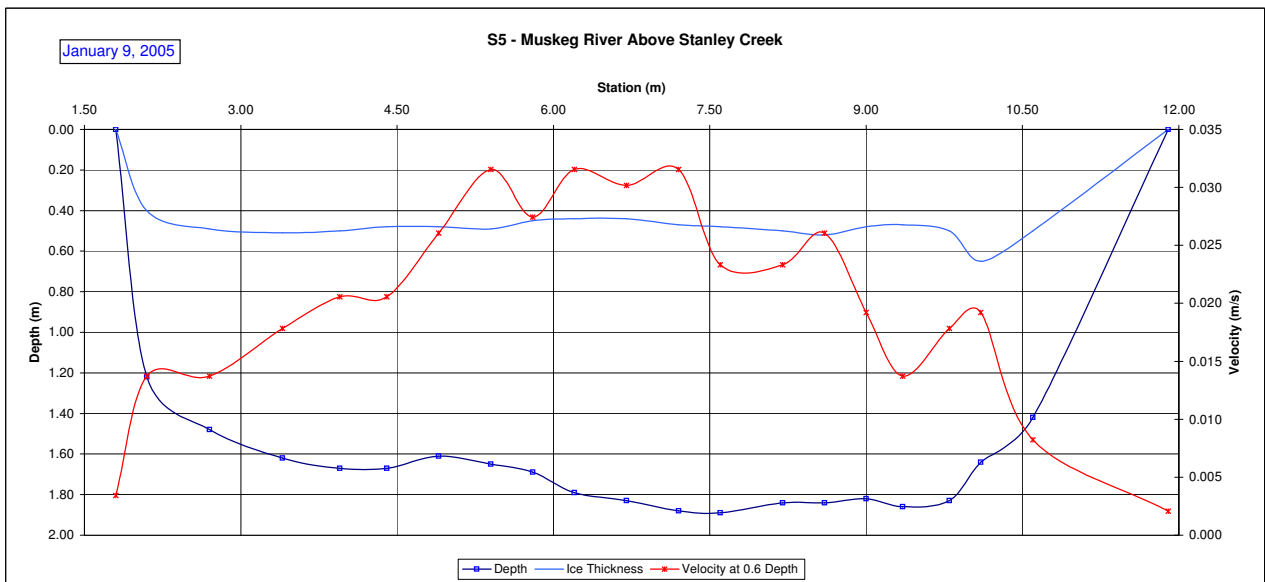
Measurement Data

| 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) | |
| 11.90 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 11.90 | 11.25 | 0.002 | 0.002 | 0.23 | 0.15 | 0.000 | 0% |
| 10.60 | 1.42 | 0.50 | | | 0.009 | 0.90 | 2 | 11.25 | 10.35 | 0.009 | 0.008 | 0.92 | 0.83 | 0.007 | 3% |
| 10.10 | 1.64 | 0.65 | | | 0.021 | 0.90 | 3 | 10.35 | 9.95 | 0.021 | 0.019 | 0.99 | 0.40 | 0.008 | 3% |
| 9.80 | 1.83 | 0.50 | 0.02 | 0.02 | | 0.90 | 4 | 9.95 | 9.58 | 0.020 | 0.018 | 1.33 | 0.50 | 0.009 | 4% |
| 9.35 | 1.86 | 0.47 | 0.02 | 0.02 | | 0.90 | 5 | 9.58 | 9.18 | 0.015 | 0.014 | 1.39 | 0.56 | 0.008 | 3% |
| 9.00 | 1.82 | 0.48 | 0.03 | 0.02 | | 0.90 | 6 | 9.18 | 8.80 | 0.021 | 0.019 | 1.34 | 0.50 | 0.010 | 4% |
| 8.60 | 1.84 | 0.52 | 0.03 | 0.02 | | 0.90 | 7 | 8.80 | 8.40 | 0.029 | 0.026 | 1.32 | 0.53 | 0.014 | 6% |
| 8.20 | 1.84 | 0.50 | 0.03 | 0.02 | | 0.90 | 8 | 8.40 | 7.90 | 0.026 | 0.023 | 1.34 | 0.67 | 0.016 | 6% |
| 7.60 | 1.89 | 0.48 | 0.03 | 0.02 | | 0.90 | 9 | 7.90 | 7.40 | 0.026 | 0.023 | 1.41 | 0.70 | 0.016 | 7% |
| 7.20 | 1.88 | 0.47 | 0.04 | 0.03 | | 0.90 | 10 | 7.40 | 6.95 | 0.035 | 0.032 | 1.41 | 0.63 | 0.020 | 8% |
| 6.70 | 1.83 | 0.44 | 0.04 | 0.03 | | 0.90 | 11 | 6.95 | 6.45 | 0.034 | 0.030 | 1.39 | 0.70 | 0.021 | 9% |
| 6.20 | 1.79 | 0.44 | 0.03 | 0.04 | | 0.90 | 12 | 6.45 | 6.00 | 0.035 | 0.032 | 1.35 | 0.61 | 0.019 | 8% |
| 5.80 | 1.69 | 0.45 | 0.03 | 0.03 | | 0.90 | 13 | 6.00 | 5.60 | 0.030 | 0.027 | 1.24 | 0.50 | 0.014 | 6% |
| 5.40 | 1.65 | 0.49 | 0.04 | 0.03 | | 0.90 | 14 | 5.60 | 5.15 | 0.035 | 0.032 | 1.16 | 0.52 | 0.016 | 7% |
| 4.90 | 1.61 | 0.48 | 0.03 | 0.03 | | 0.90 | 15 | 5.15 | 4.65 | 0.029 | 0.026 | 1.13 | 0.57 | 0.015 | 6% |
| 4.40 | 1.67 | 0.48 | 0.02 | 0.02 | | 0.90 | 16 | 4.65 | 4.18 | 0.023 | 0.021 | 1.19 | 0.57 | 0.012 | 5% |
| 3.95 | 1.67 | 0.50 | 0.03 | 0.02 | | 0.90 | 17 | 4.18 | 3.68 | 0.023 | 0.021 | 1.17 | 0.59 | 0.012 | 5% |
| 3.40 | 1.62 | 0.51 | 0.02 | 0.02 | | 0.90 | 18 | 3.68 | 3.05 | 0.020 | 0.018 | 1.11 | 0.69 | 0.012 | 5% |
| 2.70 | 1.48 | 0.49 | | | 0.015 | 0.90 | 19 | 3.05 | 2.40 | 0.015 | 0.014 | 0.99 | 0.64 | 0.009 | 4% |
| 2.10 | 1.22 | 0.40 | | | 0.015 | 0.90 | 20 | 2.40 | 1.95 | 0.015 | 0.014 | 0.82 | 0.37 | 0.005 | 2% |
| 1.80 | 0.00 | 0.00 | | | 0.000 | 0.90 | 21 | 1.95 | 1.80 | 0.004 | 0.003 | 0.21 | 0.03 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 0.242 | 1 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.242 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 11.24 | (m ²) |
| Top Width: | 10.10 | (m) |
| Hydraulic Depth: | 1.113 | (m) |
| Mean Velocity: | 0.022 | (m/s) |
| Froude Number | 0.007 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.169V | |
| Datalogger External Power: | 12.49V | |
| Datalogger Memory Used: | 37% | |
| Datalogger Clock: | Jan 09, 2005 09:28 | MST |
| Laptop Clock: | Jan 09, 2005 09:33 | MST |
| Dessicant: | Good | |
| 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 5, 2005
 Start Time: MST
 End Time: MST

Weather Conditions: -20° C, cloudy

River Conditions: Frozen

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.0 m placed on
 btm of DL box
 Water Level Reading: 2.312
 Top of Ice Level Reading: 2.261
 Transducer Reading & El.: 1.333
 Other:

Setup No. 1

El: 100.000
 El: 97.637
 El: 96.304
 El:

Setup No. 2

El: 100.000
 El: 97.633
 El: 96.300
 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Not taken | | |

Notes: Manual MMT could not be completed since the ice auger stopped working

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.217V | |
| Datalogger External Power: | 13.27V | |
| Datalogger Memory Used: | 39% | |
| Datalogger Clock: | Feb 05, 2005 09:27 | MST |
| Laptop Clock: | Feb 05, 2005 09:32 | MST |
| Dessicant: | Good | |
| 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 | |

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 10, 2005
Start Time: 2:51 PM MST
End Time: 3:24 PM MST

Weather Conditions: -2 C, overcast

River Conditions: Frozen

Personnel & Equipment

Measurement Made By: NDRM/CT
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: 1.0 m placed on top of DL box 0.060
Water Level Reading: 2.437
Top of Ice Level Reading: 2.153
Transducer Reading & El.: 1.332
Other:

Setup No. 1

El: 100.000
El: 97.623
El: 2.055
El: 96.291
El:

Setup No. 2

El: 100.000
El: 97.632
El: 2.055
El: 96.300
El:

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 | | | | | | | | | | | | | | | | |
| | 6.00 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 6.00 | 6.30 | 0.005 | 0.004 | 0.21 | 0.06 | 0.000 | 0% |
| | 6.60 | 1.30 | 0.48 | | | 0.018 | 0.90 | 2 | 6.30 | 6.80 | 0.018 | 0.016 | 0.82 | 0.41 | 0.007 | 4% |
| | 7.00 | 1.64 | 0.49 | 0.02 | 0.02 | | 0.90 | 3 | 6.80 | 7.25 | 0.018 | 0.016 | 1.15 | 0.52 | 0.009 | 5% |
| | 7.50 | 1.73 | 0.49 | 0.02 | 0.02 | | 0.90 | 4 | 7.25 | 7.80 | 0.017 | 0.015 | 1.24 | 0.68 | 0.010 | 6% |
| | 8.10 | 1.76 | 0.49 | 0.02 | 0.01 | | 0.90 | 5 | 7.80 | 8.35 | 0.015 | 0.014 | 1.27 | 0.70 | 0.010 | 6% |
| | 8.60 | 1.73 | 0.50 | 0.03 | 0.02 | | 0.90 | 6 | 8.35 | 8.85 | 0.021 | 0.019 | 1.23 | 0.62 | 0.012 | 7% |
| | 9.10 | 1.78 | 0.51 | 0.03 | 0.02 | | 0.90 | 7 | 8.85 | 9.40 | 0.026 | 0.023 | 1.27 | 0.70 | 0.016 | 9% |
| | 9.70 | 1.80 | 0.53 | 0.02 | 0.02 | | 0.90 | 8 | 9.40 | 9.90 | 0.024 | 0.022 | 1.27 | 0.64 | 0.014 | 8% |
| | 10.10 | 1.75 | 0.50 | 0.03 | 0.02 | | 0.90 | 9 | 9.90 | 10.35 | 0.027 | 0.025 | 1.25 | 0.56 | 0.014 | 8% |
| | 10.60 | 1.72 | 0.50 | 0.03 | 0.02 | | 0.90 | 10 | 10.35 | 10.90 | 0.026 | 0.023 | 1.22 | 0.67 | 0.016 | 9% |
| | 11.20 | 1.61 | 0.48 | 0.03 | 0.03 | | 0.90 | 11 | 10.90 | 11.45 | 0.027 | 0.025 | 1.13 | 0.62 | 0.015 | 9% |
| | 11.70 | 1.55 | 0.48 | 0.03 | 0.02 | | 0.90 | 12 | 11.45 | 11.95 | 0.026 | 0.023 | 1.07 | 0.54 | 0.012 | 7% |
| | 12.20 | 1.54 | 0.50 | 0.02 | 0.02 | | 0.90 | 13 | 11.95 | 12.53 | 0.020 | 0.018 | 1.04 | 0.60 | 0.011 | 6% |
| | 12.85 | 1.55 | 0.51 | 0.02 | 0.02 | | 0.90 | 14 | 12.53 | 13.18 | 0.017 | 0.015 | 1.04 | 0.68 | 0.010 | 6% |
| | 13.50 | 1.51 | 0.51 | | | 0.015 | 0.90 | 15 | 13.18 | 13.75 | 0.015 | 0.014 | 1.00 | 0.57 | 0.008 | 5% |
| | 14.00 | 1.40 | 0.50 | | | 0.009 | 0.90 | 16 | 13.75 | 14.20 | 0.009 | 0.008 | 0.90 | 0.40 | 0.003 | 2% |
| RB | 14.40 | 1.20 | 0.45 | | | 0.012 | 0.90 | 17 | 14.20 | 14.85 | 0.012 | 0.011 | 0.75 | 0.49 | 0.005 | 3% |
| | 15.30 | 0.00 | 0.00 | | | 0.000 | 0.90 | 18 | 14.85 | 15.30 | 0.003 | 0.003 | 0.19 | 0.08 | 0.000 | 0% |
| | | | | | | | | | | | | | Total Flow: | | 0.172 | 1 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.172 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 9.53 | (m ²) |
| Top Width: | 9.30 | (m) |
| Hydraulic Depth: | 1.025 | (m) |
| Mean Velocity: | 0.018 | (m/s) |
| Froude Number | 0.006 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.285V | |
| Datalogger External Power: | 14.34V | |
| Datalogger Memory Used: | 39% | |
| Datalogger Clock: | Feb 10, 2005 14:23 | MST |
| Laptop Clock: | Feb 10, 2005 14:29 | MST |
| Dessicant: | Good | |
| 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: March 7, 2005
Start Time: 9:45 AM MST
End Time: 10:15 AM MST

Weather Conditions: -15 C, overcast

River Conditions: Frozen

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.0 m placed on top of DL box
Water Level Reading: 0.042
Top of Ice Level Reading: 2.417
Transducer Reading & El.: 2.421
Other: 1.335

Setup No. 1

El: 100.000
El: 97.625
El: 2.469
El: 2.463
El: 96.290
El:

Setup No. 2

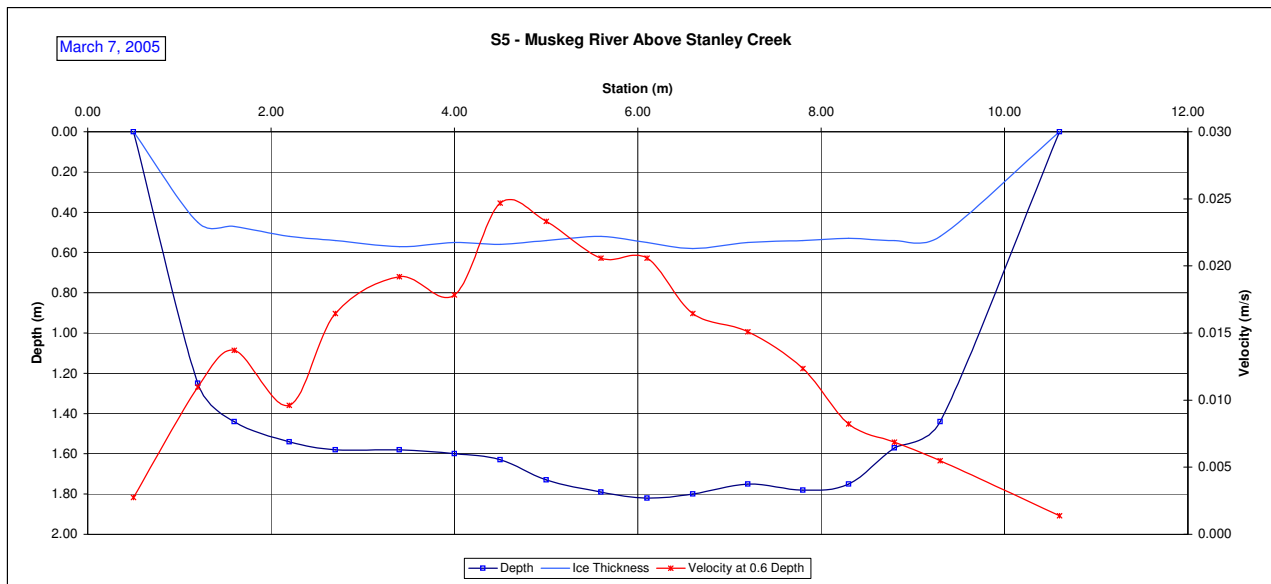
El: 100.000
El: 97.622
El: 2.469
El: 2.463
El: 96.287
El:

| 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) | (m²) | (m³/s) | | | | | |
| 0.50 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 0.50 | 0.85 | 0.003 | 0.003 | 0.20 | 0.07 | 0.000 | 0% | | | | |
| 1.20 | 1.25 | 0.45 | | | 0.012 | 0.90 | 2 | 0.85 | 1.40 | 0.012 | 0.011 | 0.80 | 0.44 | 0.005 | 3% | | | | |
| 1.60 | 1.44 | 0.47 | | | 0.015 | 0.90 | 3 | 1.40 | 1.90 | 0.015 | 0.014 | 0.97 | 0.49 | 0.007 | 4% | | | | |
| 2.20 | 1.54 | 0.52 | 0.01 | 0.01 | | 0.90 | 4 | 1.90 | 2.45 | 0.011 | 0.010 | 1.02 | 0.56 | 0.005 | 4% | | | | |
| 2.70 | 1.58 | 0.54 | 0.02 | 0.02 | | 0.90 | 5 | 2.45 | 3.05 | 0.018 | 0.016 | 1.04 | 0.62 | 0.010 | 7% | | | | |
| 3.40 | 1.58 | 0.57 | 0.02 | 0.02 | | 0.90 | 6 | 3.05 | 3.70 | 0.021 | 0.019 | 1.01 | 0.66 | 0.013 | 8% | | | | |
| 4.00 | 1.60 | 0.55 | 0.02 | 0.02 | | 0.90 | 7 | 3.70 | 4.25 | 0.020 | 0.018 | 1.05 | 0.58 | 0.010 | 7% | | | | |
| 4.50 | 1.63 | 0.56 | 0.02 | 0.03 | | 0.90 | 8 | 4.25 | 4.75 | 0.027 | 0.025 | 1.07 | 0.54 | 0.013 | 9% | | | | |
| 5.00 | 1.73 | 0.54 | 0.02 | 0.03 | | 0.90 | 9 | 4.75 | 5.30 | 0.026 | 0.023 | 1.19 | 0.65 | 0.015 | 10% | | | | |
| 5.60 | 1.79 | 0.52 | 0.02 | 0.02 | | 0.90 | 10 | 5.30 | 5.85 | 0.023 | 0.021 | 1.27 | 0.70 | 0.014 | 10% | | | | |
| 6.10 | 1.82 | 0.55 | 0.02 | 0.02 | | 0.90 | 11 | 5.85 | 6.35 | 0.023 | 0.021 | 1.27 | 0.64 | 0.013 | 9% | | | | |
| 6.60 | 1.80 | 0.58 | 0.02 | 0.02 | | 0.90 | 12 | 6.35 | 6.90 | 0.018 | 0.016 | 1.22 | 0.67 | 0.011 | 7% | | | | |
| 7.20 | 1.75 | 0.55 | 0.02 | 0.01 | | 0.90 | 13 | 6.90 | 7.50 | 0.017 | 0.015 | 1.20 | 0.72 | 0.011 | 7% | | | | |
| 7.80 | 1.78 | 0.54 | 0.02 | 0.01 | | 0.90 | 14 | 7.50 | 8.05 | 0.014 | 0.012 | 1.24 | 0.68 | 0.008 | 6% | | | | |
| 8.30 | 1.75 | 0.53 | 0.01 | 0.01 | | 0.90 | 15 | 8.05 | 8.55 | 0.009 | 0.008 | 1.22 | 0.61 | 0.005 | 3% | | | | |
| 8.80 | 1.57 | 0.54 | 0.00 | 0.01 | | 0.90 | 16 | 8.55 | 9.05 | 0.008 | 0.007 | 1.03 | 0.52 | 0.004 | 2% | | | | |
| 9.30 | 1.44 | 0.52 | | | 0.006 | 0.90 | 17 | 9.05 | 9.95 | 0.006 | 0.005 | 0.92 | 0.83 | 0.005 | 3% | | | | |
| 10.60 | 0.00 | 0.00 | | | 0.000 | 0.90 | 18 | 9.95 | 10.60 | 0.002 | 0.001 | 0.23 | 0.15 | 0.000 | 0% | | | | |
| Total Flow: | | | | | | | | | | | | | | 0.150 | 1 | | | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.150 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 10.11 | (m ²) |
| Top Width: | 10.10 | (m) |
| Hydraulic Depth: | 1.001 | (m) |
| Mean Velocity: | 0.015 | (m/s) |
| Froude Number | 0.005 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.239V | |
| Datalogger External Power: | 15.21V | |
| Datalogger Memory Used: | 41% | |
| Datalogger Clock: | Mar 07, 2005 09:16 | MST |
| Laptop Clock: | Mar 07, 2005 09:23 | MST |
| Dessicant: | Good | |
| 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: April 9, 2005
 Start Time: 9:15 AM MDT
 End Time: MDT

Weather Conditions: +7 C, overcast

River Conditions: Water flowing over ice, 90% ice covered, open holes.

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.0 m placed on
 btm of DL box -0.090
 Water Level Reading: 1.752
 Top of Ice Level Reading:
 Transducer Reading & El.: 1.903
 Other:

Setup No. 1

El: 100.000
 El: 98.158
 El:
 El: 96.255
 El:

Setup No. 2

El: 100.000
 El: 98.158
 El:
 El: 96.255
 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: Conditions unsafe for manual flow measurement.

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.289V | |
| Datalogger External Power: | 14.49V | |
| Datalogger Memory Used: | 44% | |
| Datalogger Clock: | Apr 09, 2005 08:08 | MST |
| Laptop Clock: | Apr 09, 2005 08:13 | MST |
| Dessicant: | Good - 15% 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 | |

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: April 25, 2005
Start Time: 5:00 PM MDT
End Time: MDT

Weather Conditions: +8 C, Partly cloudy

River Conditions: Open, high flood stage, stage > bankfull

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.0 m placed on
btm of DL box
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & El.:
Other:

Setup No. 1

El: 100.000
El: 100.000
El:
El: 100.000
El:

Setup No. 2

El: 100.000
El: 100.000
El:
El: 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | - | |

| | | | |
|--------------------------------|---|--------|---------------------|
| Total Flow: | - | 14.300 | (m ³ /s) |
| Perceived Measurement Quality: | | | |
| Total Area: | | | (m ²) |
| Top Width: | | | (m) |
| Hydraulic Depth: | | | (m) |
| Mean Velocity: | | | (m/s) |
| Froude Number | | | |
| Photographs taken looking at: | | | |

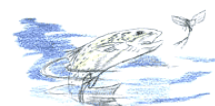
| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | | |
| Datalogger External Power: | | |
| Datalogger Memory Used: | | |
| Datalogger Clock: | | MST |
| Laptop Clock: | | MST |
| Dessicant: | | |
| Datalogger: | Optimum datalogger s/n# 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: Could not land helicopter due to very high stage. No dry land without trees nearby.

DISCHARGE ESTIMATED AT 14.3 CMS BASED ON MEASUREMENT OF DISCHARGES AT OTHER LOCAL STATIONS AND TRIBUTARIES.

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: June 2, 2005
Start Time: 10:55 AM MDT
End Time: 11:10 PM MDT

Weather Conditions:

+22 C, light wind, partly cloudy

River Conditions:

Open water, stage below bankfull, stage falling

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.8 m placed on beam of DL box
Water Level Reading: 1.600
Top of Ice Level Reading:
Transducer Reading & El.: 1.770
Other: Rod in PVC 2.350

Setup No. 1

El: 100.000
El: 97.944
El: 96.174
El: 97.194

Setup No. 2

El: -0.405
El: 1.659
El: 1.770
El: 2.404

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 | Panel | Measured | Average | Panel | Panel | Panel | | |
| | | | | | | | | Starts at Station (m) | Ends at Station (m) | Panel Velocity (m/s) | Panel Velocity (m/s) | Effective Depth (m) | Area (m²) | Discharge (m³/s) | | |
| 0.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.40 | 0.95 | 0.008 | 0.008 | 0.31 | 0.17 | 0.001 | 0% | |
| 1.50 | 1.24 | | | | 0.034 | 1.00 | 2 | 0.95 | 1.75 | 0.034 | 0.034 | 1.24 | 0.99 | 0.033 | 2% | |
| 2.00 | 1.44 | | 0.05 | 0.03 | | 1.00 | 3 | 1.75 | 2.25 | 0.041 | 0.041 | 1.44 | 0.72 | 0.030 | 1% | |
| 2.50 | 1.90 | | 0.10 | 0.09 | | 1.00 | 4 | 2.25 | 2.75 | 0.098 | 0.098 | 1.90 | 0.95 | 0.093 | 5% | |
| 3.00 | 1.93 | | 0.11 | 0.12 | | 1.00 | 5 | 2.75 | 3.25 | 0.113 | 0.113 | 1.93 | 0.97 | 0.109 | 5% | |
| 3.50 | 1.96 | | 0.14 | 0.08 | | 1.00 | 6 | 3.25 | 3.75 | 0.107 | 0.107 | 1.96 | 0.98 | 0.105 | 5% | |
| 4.00 | 2.00 | | 0.15 | 0.13 | | 1.00 | 7 | 3.75 | 4.25 | 0.142 | 0.142 | 2.00 | 1.00 | 0.142 | 7% | |
| 4.50 | 1.93 | | 0.18 | 0.12 | | 1.00 | 8 | 4.25 | 4.75 | 0.151 | 0.151 | 1.93 | 0.97 | 0.146 | 7% | |
| 5.00 | 1.96 | | 0.19 | 0.16 | | 1.00 | 9 | 4.75 | 5.13 | 0.174 | 0.174 | 1.96 | 0.74 | 0.128 | 6% | |
| 5.25 | 1.97 | | 0.17 | 0.15 | | 1.00 | 10 | 5.13 | 5.38 | 0.157 | 0.157 | 1.97 | 0.49 | 0.077 | 4% | |
| 5.50 | 1.97 | | 0.20 | 0.16 | | 1.00 | 11 | 5.38 | 5.63 | 0.181 | 0.181 | 1.97 | 0.49 | 0.089 | 4% | |
| 5.75 | 1.95 | | 0.15 | 0.17 | | 1.00 | 12 | 5.63 | 5.88 | 0.158 | 0.158 | 1.95 | 0.49 | 0.077 | 4% | |
| 6.00 | 1.95 | | 0.17 | 0.18 | | 1.00 | 13 | 5.88 | 6.25 | 0.177 | 0.177 | 1.95 | 0.73 | 0.129 | 6% | |
| 6.50 | 1.93 | | 0.18 | 0.14 | | 1.00 | 14 | 6.25 | 6.75 | 0.162 | 0.162 | 1.93 | 0.97 | 0.156 | 8% | |
| 7.00 | 1.96 | | 0.16 | 0.13 | | 1.00 | 15 | 6.75 | 7.25 | 0.142 | 0.142 | 1.96 | 0.98 | 0.139 | 7% | |
| 7.50 | 2.00 | | 0.16 | 0.16 | | 1.00 | 16 | 7.25 | 7.75 | 0.160 | 0.160 | 2.00 | 1.00 | 0.160 | 8% | |
| 8.00 | 1.98 | | 0.15 | 0.14 | | 1.00 | 17 | 7.75 | 8.25 | 0.146 | 0.146 | 1.98 | 0.99 | 0.145 | 7% | |
| 8.50 | 1.92 | | 0.12 | 0.13 | | 1.00 | 18 | 8.25 | 8.75 | 0.123 | 0.123 | 1.92 | 0.96 | 0.119 | 6% | |
| 9.00 | 1.77 | | 0.10 | 0.10 | | 1.00 | 19 | 8.75 | 9.25 | 0.102 | 0.102 | 1.77 | 0.89 | 0.090 | 4% | |
| 9.50 | 1.70 | | 0.08 | 0.03 | | 1.00 | 20 | 9.25 | 9.75 | 0.058 | 0.058 | 1.70 | 0.85 | 0.049 | 2% | |
| 10.00 | 1.45 | | 0.05 | 0.02 | | 1.00 | 21 | 9.75 | 10.25 | 0.030 | 0.030 | 1.45 | 0.73 | 0.022 | 1% | |
| 10.50 | 1.14 | | | | 0.018 | 1.00 | 22 | 10.25 | 11.00 | 0.018 | 0.018 | 1.14 | 0.86 | 0.016 | 1% | |
| 11.50 | 0.00 | | | | 0.000 | 1.00 | 23 | 11.00 | 11.50 | 0.005 | 0.005 | 0.29 | 0.14 | 0.001 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 2.055 | 1 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 2.055 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 18.03 | (m ²) |
| Top Width: | 11.10 | (m) |
| Hydraulic Depth: | 1.625 | (m) |
| Mean Velocity: | 0.114 | (m/s) |
| Froude Number | 0.029 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.300V | |
| Datalogger External Power: | 14.24V | |
| Datalogger Memory Used: | 49% | |
| Datalogger Clock: | Jun 02, 2005 09:29 | MST |
| Laptop Clock: | Jun 02, 2005 09:31 | MST |
| Dessicant: | 50% Good | |
| 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: TSS sample collected.



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: July 13, 2005
Start Time: 12:35 PM MDT
End Time: 1:05 PM MDT

Weather Conditions: +25 C, Clear

River Conditions: Open water

Personnel & Equipment

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

Level Readings

Bench Mark Reading: -0.121
Water Level Reading: 2.045
Top of Ice Level Reading:
Transducer Reading & El.: 1.591
Other:

Setup No. 1

El: 100.000
El: 97.834
El: 96.243
El:

Setup No. 2

El: 100.000
El: 97.826
El: 96.235
El:

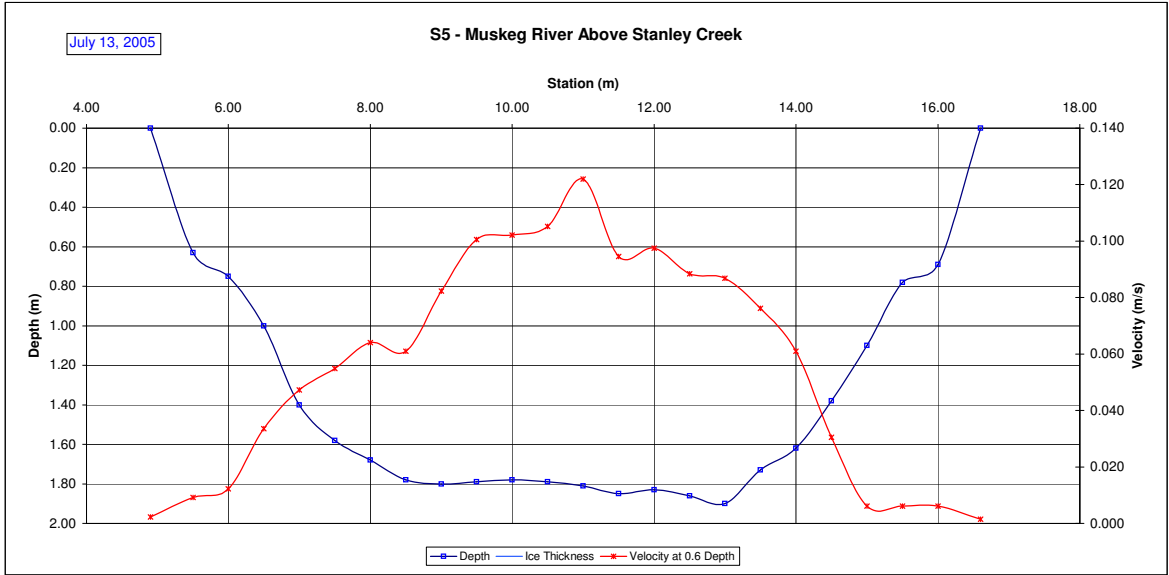
Measurement Data

| 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) | |
| 4.90 | 0.00 | | | | 0.000 | 1.00 | 1 | 4.90 | 5.20 | 0.002 | 0.002 | 0.16 | 0.05 | 0.000 | 0% |
| 5.50 | 0.63 | | | | 0.009 | 1.00 | 2 | 5.20 | 5.75 | 0.009 | 0.009 | 0.63 | 0.35 | 0.003 | 0% |
| 6.00 | 0.75 | | | | 0.012 | 1.00 | 3 | 5.75 | 6.25 | 0.012 | 0.012 | 0.75 | 0.38 | 0.005 | 0% |
| 6.50 | 1.00 | | | | 0.034 | 1.00 | 4 | 6.25 | 6.75 | 0.034 | 0.034 | 1.00 | 0.50 | 0.017 | 1% |
| 7.00 | 1.40 | 0.06 | 0.04 | | 1.00 | 1.00 | 5 | 6.75 | 7.25 | 0.047 | 0.047 | 1.40 | 0.70 | 0.033 | 3% |
| 7.50 | 1.58 | 0.07 | 0.04 | | 1.00 | 1.00 | 6 | 7.25 | 7.75 | 0.055 | 0.055 | 1.58 | 0.79 | 0.043 | 4% |
| 8.00 | 1.68 | 0.06 | 0.07 | | 1.00 | 1.00 | 7 | 7.75 | 8.25 | 0.064 | 0.064 | 1.68 | 0.84 | 0.054 | 5% |
| 8.50 | 1.78 | 0.07 | 0.05 | | 1.00 | 1.00 | 8 | 8.25 | 8.75 | 0.061 | 0.061 | 1.78 | 0.89 | 0.054 | 5% |
| 9.00 | 1.80 | 0.08 | 0.08 | | 1.00 | 1.00 | 9 | 8.75 | 9.25 | 0.082 | 0.082 | 1.80 | 0.90 | 0.074 | 6% |
| 9.50 | 1.79 | 0.13 | 0.07 | | 1.00 | 1.00 | 10 | 9.25 | 9.75 | 0.101 | 0.101 | 1.79 | 0.90 | 0.090 | 8% |
| 10.00 | 1.78 | 0.10 | 0.11 | | 1.00 | 1.00 | 11 | 9.75 | 10.25 | 0.102 | 0.102 | 1.78 | 0.89 | 0.091 | 8% |
| 10.50 | 1.79 | 0.11 | 0.10 | | 1.00 | 1.00 | 12 | 10.25 | 10.75 | 0.105 | 0.105 | 1.79 | 0.90 | 0.094 | 8% |
| 11.00 | 1.81 | 0.13 | 0.11 | | 1.00 | 1.00 | 13 | 10.75 | 11.25 | 0.122 | 0.122 | 1.81 | 0.91 | 0.110 | 10% |
| 11.50 | 1.85 | 0.12 | 0.07 | | 1.00 | 1.00 | 14 | 11.25 | 11.75 | 0.094 | 0.094 | 1.85 | 0.93 | 0.087 | 8% |
| 12.00 | 1.83 | 0.12 | 0.07 | | 1.00 | 1.00 | 15 | 11.75 | 12.25 | 0.098 | 0.098 | 1.83 | 0.92 | 0.089 | 8% |
| 12.50 | 1.86 | 0.11 | 0.07 | | 1.00 | 1.00 | 16 | 12.25 | 12.75 | 0.088 | 0.088 | 1.86 | 0.93 | 0.082 | 7% |
| 13.00 | 1.90 | 0.09 | 0.08 | | 1.00 | 1.00 | 17 | 12.75 | 13.25 | 0.087 | 0.087 | 1.90 | 0.95 | 0.083 | 7% |
| 13.50 | 1.73 | 0.08 | 0.07 | | 1.00 | 1.00 | 18 | 13.25 | 13.75 | 0.076 | 0.076 | 1.73 | 0.87 | 0.066 | 6% |
| 14.00 | 1.62 | 0.05 | 0.07 | | 1.00 | 1.00 | 19 | 13.75 | 14.25 | 0.061 | 0.061 | 1.62 | 0.81 | 0.049 | 4% |
| 14.50 | 1.38 | 0.05 | 0.02 | | 1.00 | 1.00 | 20 | 14.25 | 14.75 | 0.030 | 0.030 | 1.38 | 0.69 | 0.021 | 2% |
| 15.00 | 1.10 | | | | 0.006 | 1.00 | 21 | 14.75 | 15.25 | 0.006 | 0.006 | 1.10 | 0.55 | 0.003 | 0% |
| 15.50 | 0.78 | | | | 0.006 | 1.00 | 22 | 15.25 | 15.75 | 0.006 | 0.006 | 0.78 | 0.39 | 0.002 | 0% |
| 16.00 | 0.69 | | | | 0.006 | 1.00 | 23 | 15.75 | 16.30 | 0.006 | 0.006 | 0.69 | 0.38 | 0.002 | 0% |
| 16.60 | 0.00 | | | | 0.000 | 1.00 | 24 | 16.30 | 16.60 | 0.002 | 0.002 | 0.17 | 0.05 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 1.154 | 1 |

| | | |
|---|-------|--------|
| Total Flow: | 1.154 | (m³/s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 16.43 | (m²) |
| Top Width: | 11.70 | (m) |
| Hydraulic Depth: | 1.404 | (m) |
| Mean Velocity: | 0.070 | (m/s) |
| Froude Number | 0.019 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.358V | |
| Datalogger External Power: | 14.02V | |
| Datalogger Memory Used: | 52% | |
| Datalogger Clock: | Jul 13, 2005 10:59 | MST |
| Laptop Clock: | Jul 13, 2005 11:05 | MST |
| Dessicant: | 60% Good | |
| 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: TSS sample collected.



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: ND/FF
Data Entry By: FF
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: September 2, 2005
Start Time: 11:37 AM MDT
End Time: 12:01 PM MDT

Level Readings

Bench Mark Reading: 1.0 m placed on base of S5 box
Water Level Reading: 1.494
Top of Ice Level Reading:
Transducer Reading & El.: 2.047
Other:

Setup No. 1

El: 100.000
El: 98.296
El: 96.249
El:

Setup No. 2

El: 100.000
El: 98.287
El: 96.240
El:

Weather Conditions:

+15 C, Light showers

River Conditions:

Open water, stage slightly greater than bankfull.

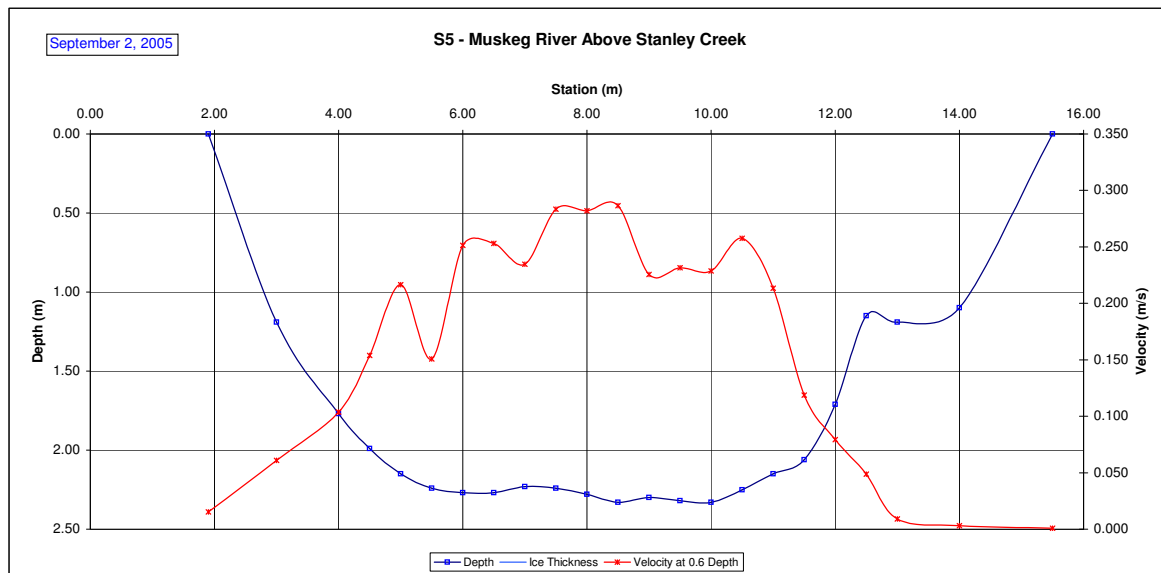
Measurement Data

| 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) | | |
| 1.90 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.90 | 2.45 | 0.015 | 0.015 | 0.30 | 0.16 | 0.002 | 0% | |
| 3.00 | 1.19 | | 0.04 | 0.08 | | 1.00 | 2 | 2.45 | 3.50 | 0.061 | 0.061 | 1.19 | 1.25 | 0.076 | 2% | |
| 4.00 | 1.77 | | 0.14 | 0.07 | | 1.00 | 3 | 3.50 | 4.25 | 0.104 | 0.104 | 1.77 | 1.33 | 0.138 | 3% | |
| 4.50 | 1.99 | | 0.21 | 0.10 | | 1.00 | 4 | 4.25 | 4.75 | 0.154 | 0.154 | 1.99 | 1.00 | 0.153 | 4% | |
| 5.00 | 2.15 | | 0.24 | 0.19 | | 1.00 | 5 | 4.75 | 5.25 | 0.216 | 0.216 | 2.15 | 1.08 | 0.233 | 6% | |
| 5.50 | 2.24 | | 0.22 | 0.09 | | 1.00 | 6 | 5.25 | 5.75 | 0.151 | 0.151 | 2.24 | 1.12 | 0.169 | 4% | |
| 6.00 | 2.27 | | 0.26 | 0.25 | | 1.00 | 7 | 5.75 | 6.25 | 0.251 | 0.251 | 2.27 | 1.14 | 0.285 | 7% | |
| 6.50 | 2.27 | | 0.27 | 0.24 | | 1.00 | 8 | 6.25 | 6.75 | 0.253 | 0.253 | 2.27 | 1.14 | 0.287 | 7% | |
| 7.00 | 2.23 | | 0.22 | 0.25 | | 1.00 | 9 | 6.75 | 7.25 | 0.235 | 0.235 | 2.23 | 1.12 | 0.262 | 6% | |
| 7.50 | 2.24 | | 0.27 | 0.30 | | 1.00 | 10 | 7.25 | 7.75 | 0.283 | 0.283 | 2.24 | 1.12 | 0.317 | 8% | |
| 8.00 | 2.28 | | 0.30 | 0.26 | | 1.00 | 11 | 7.75 | 8.25 | 0.282 | 0.282 | 2.28 | 1.14 | 0.321 | 8% | |
| 8.50 | 2.33 | | 0.31 | 0.26 | | 1.00 | 12 | 8.25 | 8.75 | 0.287 | 0.287 | 2.33 | 1.17 | 0.334 | 8% | |
| 9.00 | 2.30 | | 0.30 | 0.15 | | 1.00 | 13 | 8.75 | 9.25 | 0.226 | 0.226 | 2.30 | 1.15 | 0.259 | 6% | |
| 9.50 | 2.32 | | 0.23 | 0.23 | | 1.00 | 14 | 9.25 | 9.75 | 0.232 | 0.232 | 2.32 | 1.16 | 0.269 | 7% | |
| 10.00 | 2.33 | | 0.26 | 0.20 | | 1.00 | 15 | 9.75 | 10.25 | 0.229 | 0.229 | 2.33 | 1.17 | 0.266 | 6% | |
| 10.50 | 2.25 | | 0.25 | 0.26 | | 1.00 | 16 | 10.25 | 10.75 | 0.258 | 0.258 | 2.25 | 1.13 | 0.290 | 7% | |
| 11.00 | 2.15 | | 0.21 | 0.22 | | 1.00 | 17 | 10.75 | 11.25 | 0.213 | 0.213 | 2.15 | 1.08 | 0.229 | 6% | |
| 11.50 | 2.06 | | 0.17 | 0.06 | | 1.00 | 18 | 11.25 | 11.75 | 0.119 | 0.119 | 2.06 | 1.03 | 0.122 | 3% | |
| 12.00 | 1.71 | | 0.15 | 0.01 | | 1.00 | 19 | 11.75 | 12.25 | 0.079 | 0.079 | 1.71 | 0.86 | 0.068 | 2% | |
| 12.50 | 1.15 | | 0.09 | 0.01 | | 1.00 | 20 | 12.25 | 12.75 | 0.049 | 0.049 | 1.15 | 0.58 | 0.028 | 1% | |
| 13.00 | 1.19 | | 0.01 | 0.01 | | 1.00 | 21 | 12.75 | 13.50 | 0.009 | 0.009 | 1.19 | 0.89 | 0.008 | 0% | |
| 14.00 | 1.10 | | | | 0.003 | 1.00 | 22 | 13.50 | 14.75 | 0.003 | 0.003 | 1.10 | 1.38 | 0.004 | 0% | |
| 15.50 | 0.00 | | | | 0.000 | 1.00 | 23 | 14.75 | 15.50 | 0.001 | 0.001 | 0.28 | 0.21 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 4.122 | 1 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 4.122 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 23.35 | (m ²) |
| Top Width: | 13.60 | (m) |
| Hydraulic Depth: | 1.717 | (m) |
| Mean Velocity: | 0.177 | (m/s) |
| Froude Number | 0.043 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.30V | |
| Datalogger External Power: | 13.69V | |
| Datalogger Memory Used: | 56% | |
| Datalogger Clock: | Sep 02, 2005 09:57 | MST |
| Laptop Clock: | Sep 02, 2005 10:05 | MST |
| Dessicant: | 100% Used-replaced | |
| 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: TSS sample collected.
Stage high, due to high flow.
Water quality datasonde removed at 11:23 am MST.



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: October 8, 2005
Start Time: 12:00 PM MDT
End Time: 12:35 PM MDT

Weather Conditions: +8 C, overcast, raining

River Conditions: Open water, low stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.0 m placed on base of S5 box -0.256 El: 100.000
Water Level Reading: 1.863 El: 97.881
Top of Ice Level Reading: El: 97.866
Transducer Reading & El.: 1.617 El: 96.264
Other: El: 96.249

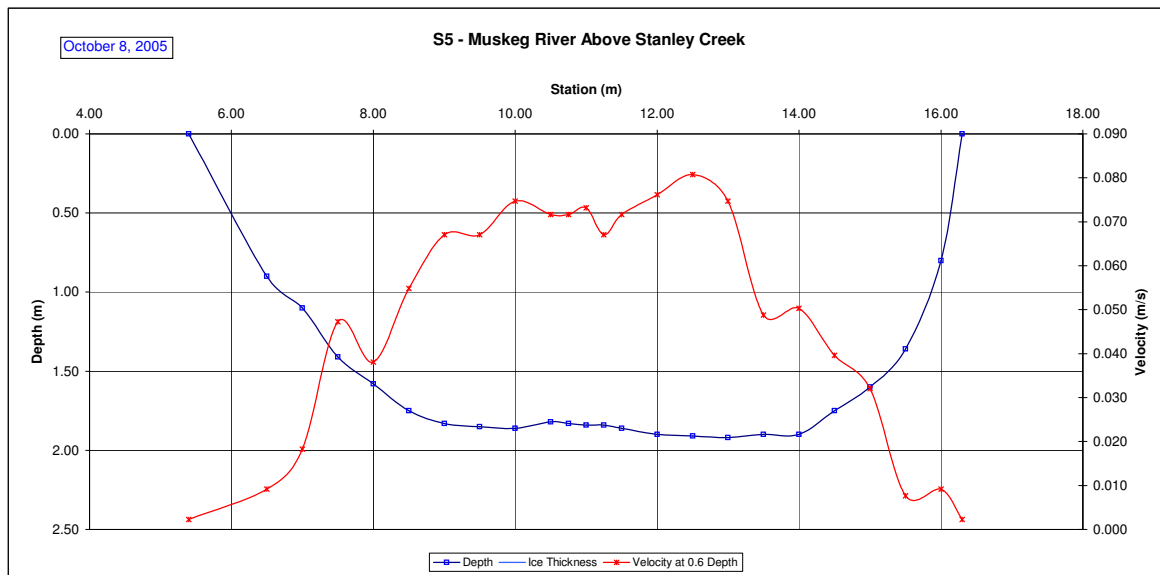
Measurement Data

| 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) | | |
| 5.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 5.40 | 5.95 | 0.002 | 0.002 | 0.23 | 0.12 | 0.000 | 0% | |
| 6.50 | 0.90 | | | | 0.009 | 1.00 | 2 | 5.95 | 6.75 | 0.009 | 0.009 | 0.90 | 0.72 | 0.007 | 1% | |
| 7.00 | 1.10 | | | 0.01 | 0.027 | 1.00 | 3 | 6.75 | 7.25 | 0.018 | 0.018 | 1.10 | 0.55 | 0.010 | 1% | |
| 7.50 | 1.41 | | 0.06 | 0.04 | | 1.00 | 4 | 7.25 | 7.75 | 0.047 | 0.047 | 1.41 | 0.71 | 0.033 | 4% | |
| 8.00 | 1.58 | | 0.04 | 0.03 | | 1.00 | 5 | 7.75 | 8.25 | 0.038 | 0.038 | 1.58 | 0.79 | 0.030 | 3% | |
| 8.50 | 1.75 | | 0.07 | 0.04 | | 1.00 | 6 | 8.25 | 8.75 | 0.055 | 0.055 | 1.75 | 0.88 | 0.048 | 5% | |
| 9.00 | 1.83 | | 0.08 | 0.05 | | 1.00 | 7 | 8.75 | 9.25 | 0.067 | 0.067 | 1.83 | 0.92 | 0.061 | 7% | |
| 9.50 | 1.85 | | 0.08 | 0.05 | | 1.00 | 8 | 9.25 | 9.75 | 0.067 | 0.067 | 1.85 | 0.93 | 0.062 | 7% | |
| 10.00 | 1.86 | | 0.08 | 0.07 | | 1.00 | 9 | 9.75 | 10.25 | 0.075 | 0.075 | 1.86 | 0.93 | 0.069 | 8% | |
| 10.50 | 1.82 | | 0.09 | 0.06 | | 1.00 | 10 | 10.25 | 10.63 | 0.072 | 0.072 | 1.82 | 0.68 | 0.049 | 5% | |
| 10.75 | 1.83 | | 0.07 | 0.07 | | 1.00 | 11 | 10.63 | 10.88 | 0.072 | 0.072 | 1.83 | 0.46 | 0.033 | 4% | |
| 11.00 | 1.84 | | 0.07 | 0.07 | | 1.00 | 12 | 10.88 | 11.13 | 0.073 | 0.073 | 1.84 | 0.46 | 0.034 | 4% | |
| 11.25 | 1.84 | | 0.07 | 0.06 | | 1.00 | 13 | 11.13 | 11.38 | 0.067 | 0.067 | 1.84 | 0.46 | 0.031 | 3% | |
| 11.50 | 1.86 | | 0.07 | 0.07 | | 1.00 | 14 | 11.38 | 11.75 | 0.072 | 0.072 | 1.86 | 0.70 | 0.050 | 5% | |
| 12.00 | 1.90 | | 0.09 | 0.06 | | 1.00 | 15 | 11.75 | 12.25 | 0.076 | 0.076 | 1.90 | 0.95 | 0.072 | 8% | |
| 12.50 | 1.91 | | 0.08 | 0.08 | | 1.00 | 16 | 12.25 | 12.75 | 0.081 | 0.081 | 1.91 | 0.96 | 0.077 | 8% | |
| 13.00 | 1.92 | | 0.08 | 0.07 | | 1.00 | 17 | 12.75 | 13.50 | 0.075 | 0.075 | 1.92 | 1.44 | 0.108 | 12% | |
| 13.50 | 1.90 | | 0.07 | 0.03 | | 1.00 | 18 | 13.50 | 14.00 | 0.049 | 0.049 | 1.90 | 0.95 | 0.046 | 5% | |
| 14.00 | 1.90 | | 0.07 | 0.03 | | 1.00 | 19 | 14.00 | 14.25 | 0.050 | 0.050 | 1.90 | 0.48 | 0.024 | 3% | |
| 14.50 | 1.75 | | 0.06 | 0.02 | | 1.00 | 20 | 14.25 | 14.75 | 0.040 | 0.040 | 1.75 | 0.88 | 0.035 | 4% | |
| 15.00 | 1.60 | | 0.04 | 0.03 | | 1.00 | 21 | 14.75 | 15.25 | 0.032 | 0.032 | 1.60 | 0.80 | 0.026 | 3% | |
| 15.50 | 1.36 | | 0.01 | 0.00 | | 1.00 | 22 | 15.25 | 15.75 | 0.008 | 0.008 | 1.36 | 0.68 | 0.005 | 1% | |
| 16.00 | 0.80 | | | | 0.009 | 1.00 | 23 | 15.75 | 16.15 | 0.009 | 0.009 | 0.80 | 0.32 | 0.003 | 0% | |
| 16.30 | 0.00 | | | | 0.000 | 1.00 | 24 | 16.15 | 16.30 | 0.002 | 0.002 | 0.20 | 0.03 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.913 | 1 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.913 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 16.77 | (m ²) |
| Top Width: | 10.90 | (m) |
| Hydraulic Depth: | 1.538 | (m) |
| Mean Velocity: | 0.054 | (m/s) |
| Froude Number | 0.014 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.292V | |
| Datalogger External Power: | 13.51V | |
| Datalogger Memory Used: | 56% | |
| Datalogger Clock: | Oct 08, 2005 10:23 | MST |
| Laptop Clock: | Oct 08, 2005 10:32 | MST |
| Dessicant: | 10% Used-good | |
| 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: TSS sample collected.



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: December 9, 2005
Start Time: 12:07 PM MST
End Time: 12:25 PM MST

Weather Conditions:

+2 C, overcast, calm
River Conditions: Complete ice cover, snow over ice melting

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.0 m placed on stem of DC box -0.229
Water Level Reading: 2.160
Top of Ice Level Reading: 2.171
Transducer Reading & El.: 1.376
Other:

Setup No. 1

El: 100.000
El: 97.611
El: 2.255
El: 2.264
El: 96.235
El:

Setup No. 2

El: 100.000
El: 97.607
El: 2.255
El: 2.264
El: 96.231
El:

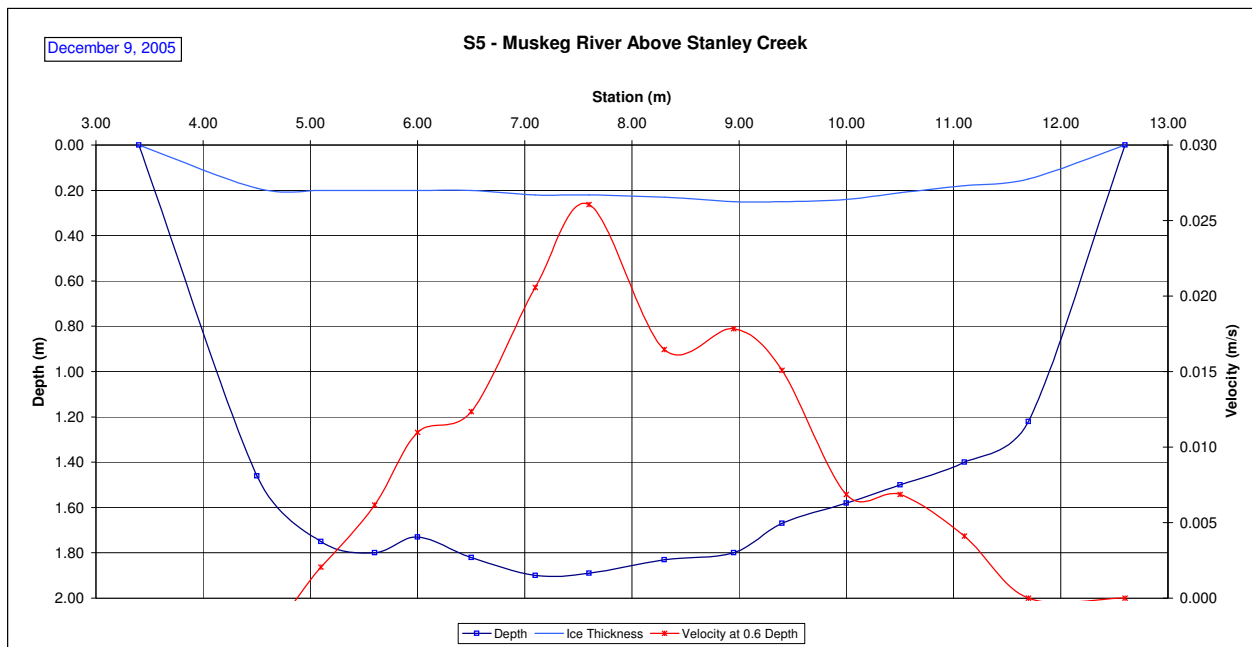
Measurement Data

| 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) | | |
| | | | | | | | | | | | | | | | | |
| 3.40 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.90 | 1 | 3.40 | 3.95 | -0.001 | -0.001 | 0.32 | 0.17 | 0.000 | 0% | |
| 4.50 | 1.46 | 0.19 | -0.01 | 0.00 | | 0.90 | 2 | 3.95 | 4.80 | -0.002 | -0.002 | 1.27 | 1.08 | -0.002 | -2% | |
| 5.10 | 1.75 | 0.20 | 0.00 | 0.00 | | 0.90 | 3 | 4.80 | 5.35 | 0.002 | 0.002 | 1.55 | 0.85 | 0.002 | 1% | |
| 5.60 | 1.80 | 0.20 | 0.01 | 0.01 | | 0.90 | 4 | 5.35 | 5.80 | 0.007 | 0.006 | 1.60 | 0.72 | 0.004 | 4% | |
| 6.00 | 1.73 | 0.20 | 0.02 | 0.00 | | 0.90 | 5 | 5.80 | 6.25 | 0.012 | 0.011 | 1.53 | 0.69 | 0.008 | 6% | |
| 6.50 | 1.82 | 0.20 | 0.02 | 0.00 | | 0.90 | 6 | 6.25 | 6.80 | 0.014 | 0.012 | 1.62 | 0.89 | 0.011 | 9% | |
| 7.10 | 1.90 | 0.22 | 0.03 | 0.02 | | 0.90 | 7 | 6.80 | 7.35 | 0.023 | 0.021 | 1.68 | 0.92 | 0.019 | 15% | |
| 7.60 | 1.89 | 0.22 | 0.03 | 0.03 | | 0.90 | 8 | 7.35 | 7.95 | 0.029 | 0.026 | 1.67 | 1.00 | 0.026 | 21% | |
| 8.30 | 1.83 | 0.23 | 0.02 | 0.02 | | 0.90 | 9 | 7.95 | 8.63 | 0.018 | 0.016 | 1.60 | 1.08 | 0.018 | 14% | |
| 8.95 | 1.80 | 0.25 | 0.02 | 0.02 | | 0.90 | 10 | 8.63 | 9.18 | 0.020 | 0.018 | 1.55 | 0.85 | 0.015 | 12% | |
| 9.40 | 1.67 | 0.25 | 0.02 | 0.02 | | 0.90 | 11 | 9.18 | 9.70 | 0.017 | 0.015 | 1.42 | 0.75 | 0.011 | 9% | |
| 10.00 | 1.58 | 0.24 | 0.01 | 0.01 | | 0.90 | 12 | 9.70 | 10.25 | 0.008 | 0.007 | 1.34 | 0.74 | 0.005 | 4% | |
| 10.50 | 1.50 | 0.21 | 0.01 | 0.01 | | 0.90 | 13 | 10.25 | 10.80 | 0.008 | 0.007 | 1.29 | 0.71 | 0.005 | 4% | |
| 11.10 | 1.40 | 0.18 | 0.01 | 0.00 | | 0.90 | 14 | 10.80 | 11.40 | 0.005 | 0.004 | 1.22 | 0.73 | 0.003 | 2% | |
| 11.70 | 1.22 | 0.15 | 0.00 | 0.00 | | 0.90 | 15 | 11.40 | 12.15 | 0.000 | 0.000 | 1.07 | 0.80 | 0.000 | 0% | |
| 12.60 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.90 | 16 | 12.15 | 12.60 | 0.000 | 0.000 | 0.27 | 0.12 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.125 | 1 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.125 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 12.11 | (m ²) |
| Top Width: | 9.20 | (m) |
| Hydraulic Depth: | 1.316 | (m) |
| Mean Velocity: | 0.010 | (m/s) |
| Froude Number | 0.003 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|---|------------------------------------|-----|
| Datalogger Notes: | Database | 845 |
| Datalogger Internal Power: | 4.283 V | |
| Datalogger External Power: | 11.51 V | |
| Datalogger Memory Used: | 64% | |
| Datalogger Clock: | Dec 09, 2005 11:12 | MST |
| Laptop Clock: | Dec 09, 2005 11:22 | MST |
| Dessicant: | 25% Used - replaced | |
| 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: Beaver dam about 30 m downstream of the station visible.



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: January 9, 2006
Start Time: 9:58 AM MST
End Time: 10:27 AM MST

Weather Conditions:

-10 C, overcast, flurries

River Conditions:

Complete ice cover

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.0 m placed on
Water Level Reading: 2.348
Top of Ice Level Reading: 2.273
Transducer Reading & El.: Error
Other:

Setup No. 1

El.: 100.000
El.: 97.556
El.: 2.346
El.: Error
El.:

Setup No. 2

El.: 100.000
El.: 97.551
El.:
El.:
El.:

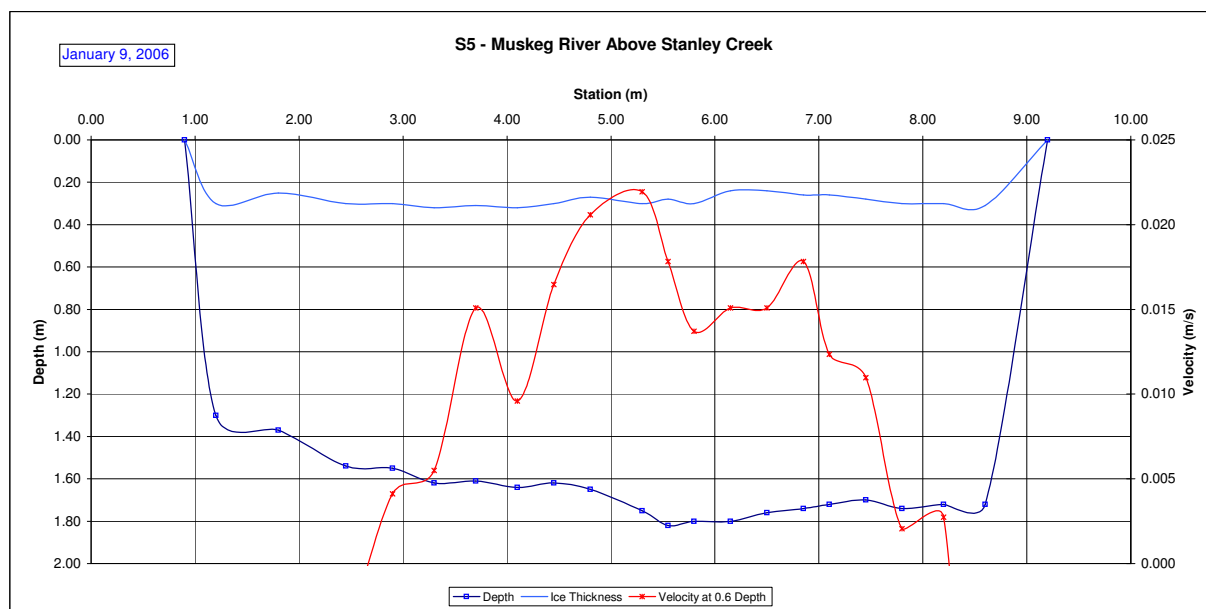
Measurement Data

| 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 (m ²) | Panel Discharge (m ³ /s) | |
| 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.90 | 1 | 0.90 | 1.05 | -0.005 | -0.004 | 0.25 | 0.04 | 0.000 | 0% |
| 1.20 | 1.30 | 0.30 | -0.02 | -0.02 | | 0.90 | 2 | 1.05 | 1.50 | -0.020 | -0.018 | 1.00 | 0.45 | -0.008 | -13% |
| 1.80 | 1.37 | 0.25 | -0.01 | -0.02 | | 0.90 | 3 | 1.50 | 2.13 | -0.015 | -0.014 | 1.12 | 0.70 | -0.010 | -16% |
| 2.45 | 1.54 | 0.30 | 0.00 | -0.01 | | 0.90 | 4 | 2.13 | 2.68 | -0.005 | -0.004 | 1.24 | 0.68 | -0.003 | -5% |
| 2.90 | 1.55 | 0.30 | 0.01 | 0.00 | | 0.90 | 5 | 2.68 | 3.10 | 0.005 | 0.004 | 1.25 | 0.53 | 0.002 | 4% |
| 3.30 | 1.62 | 0.32 | 0.01 | 0.00 | | 0.90 | 6 | 3.10 | 3.50 | 0.006 | 0.005 | 1.30 | 0.52 | 0.003 | 5% |
| 3.70 | 1.61 | 0.31 | 0.01 | 0.02 | | 0.90 | 7 | 3.50 | 3.90 | 0.017 | 0.015 | 1.30 | 0.52 | 0.008 | 13% |
| 4.10 | 1.64 | 0.32 | 0.02 | 0.01 | | 0.90 | 8 | 3.90 | 4.28 | 0.011 | 0.010 | 1.32 | 0.50 | 0.005 | 8% |
| 4.45 | 1.62 | 0.30 | 0.02 | 0.02 | | 0.90 | 9 | 4.28 | 4.63 | 0.018 | 0.016 | 1.32 | 0.46 | 0.008 | 13% |
| 4.80 | 1.65 | 0.27 | 0.02 | 0.02 | | 0.90 | 10 | 4.63 | 5.05 | 0.023 | 0.021 | 1.38 | 0.59 | 0.012 | 20% |
| 5.30 | 1.75 | 0.30 | 0.02 | 0.03 | | 0.90 | 11 | 5.05 | 5.43 | 0.024 | 0.022 | 1.45 | 0.54 | 0.012 | 20% |
| 5.55 | 1.82 | 0.28 | 0.02 | 0.02 | | 0.90 | 12 | 5.43 | 5.68 | 0.020 | 0.018 | 1.54 | 0.39 | 0.007 | 11% |
| 5.80 | 1.80 | 0.30 | 0.02 | 0.01 | | 0.90 | 13 | 5.68 | 5.98 | 0.015 | 0.014 | 1.50 | 0.45 | 0.006 | 10% |
| 6.15 | 1.80 | 0.24 | 0.02 | 0.02 | | 0.90 | 14 | 5.98 | 6.33 | 0.017 | 0.015 | 1.56 | 0.55 | 0.008 | 14% |
| 6.50 | 1.76 | 0.24 | 0.02 | 0.01 | | 0.90 | 15 | 6.33 | 6.68 | 0.017 | 0.015 | 1.52 | 0.53 | 0.008 | 13% |
| 6.85 | 1.74 | 0.26 | 0.02 | 0.02 | | 0.90 | 16 | 6.68 | 6.98 | 0.020 | 0.018 | 1.48 | 0.44 | 0.008 | 13% |
| 7.10 | 1.72 | 0.26 | 0.02 | 0.00 | | 0.90 | 17 | 6.98 | 7.28 | 0.014 | 0.012 | 1.46 | 0.44 | 0.005 | 9% |
| 7.45 | 1.70 | 0.28 | 0.02 | 0.01 | | 0.90 | 18 | 7.28 | 7.63 | 0.012 | 0.011 | 1.42 | 0.50 | 0.005 | 9% |
| 7.80 | 1.74 | 0.30 | 0.00 | 0.00 | | 0.90 | 19 | 7.63 | 8.00 | 0.002 | 0.002 | 1.44 | 0.54 | 0.001 | 2% |
| 8.20 | 1.72 | 0.30 | 0.00 | 0.00 | | 0.90 | 20 | 8.00 | 8.40 | 0.003 | 0.003 | 1.42 | 0.57 | 0.002 | 3% |
| 8.60 | 1.72 | 0.31 | -0.03 | -0.03 | | 0.90 | 21 | 8.40 | 8.90 | -0.029 | -0.026 | 1.41 | 0.71 | -0.018 | -30% |
| 9.20 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.90 | 22 | 8.90 | 9.20 | -0.007 | -0.007 | 0.35 | 0.11 | -0.001 | -1% |
| Total Flow: | | | | | | | | | | | | | | 0.060 | 1 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.060 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 10.74 | (m ²) |
| Top Width: | 8.30 | (m) |
| Hydraulic Depth: | 1.294 | (m) |
| Mean Velocity: | 0.006 | (m/s) |
| Froude Number | 0.002 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|--|
| Datalogger Notes: | Database 845 |
| Datalogger Internal Power: | 4.245 V |
| Datalogger External Power: | 5.57 V needs to be replaced |
| Datalogger Memory Used: | 67% |
| Datalogger Clock: | Jan 09, 2006 09:19 MST |
| Laptop Clock: | Jan 09, 2006 09:30 MST |
| Dessicant: | Good |
| 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: Battery voltage is bad resulting in bad data after Jan 5.
Will visit again to replace the battery.



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Personnel & Equipment

Measurement Made By: ND/DB/CT
Data Entry By: DB
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: January 7, 2005
Start Time: 9:30 AM MST
End Time: 10:10 AM MST

Level Readings

Bench Mark Reading: Rod in PV 1.274
Water Level Reading: 2.601
Top of Ice Level Reading: 2.504
Transducer Reading & Calc'd El: 0.833
Other:

Setup No. 1

El: 282.380
El: 281.053
El: 2.589
El: 280.220
El:

Setup No. 2

El: 282.380
El: 281.051
El:
El: 280.218
El:

Weather Conditions:

-12 C, cloudy

River Conditions:

ice cover

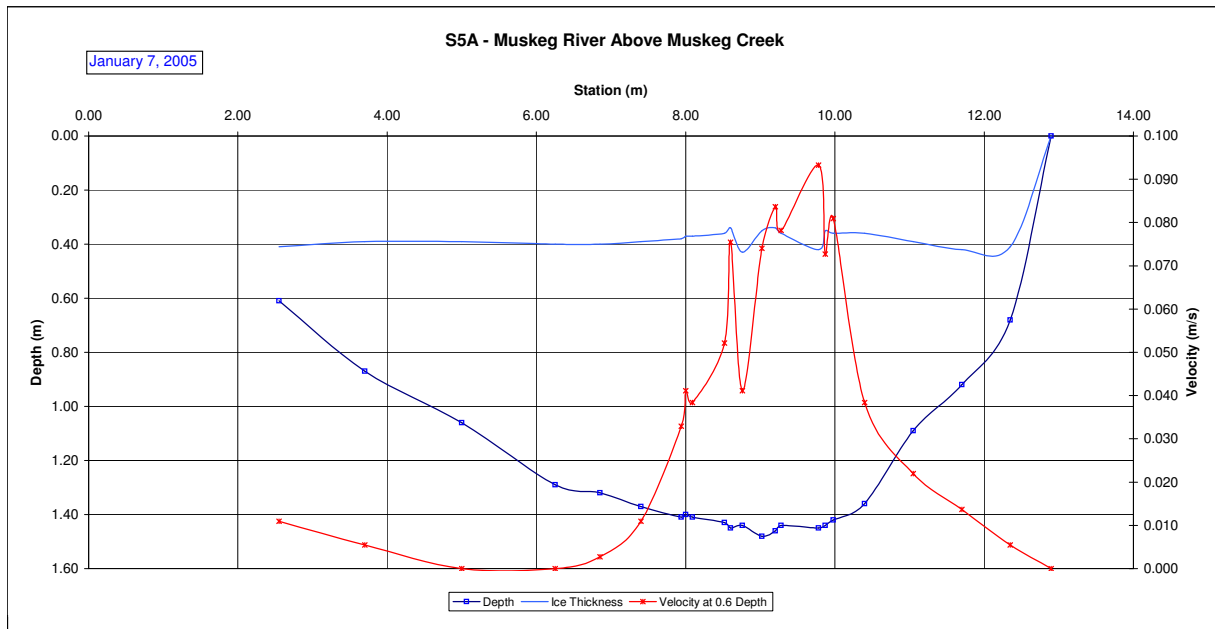
Measurement Data

| 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) | |
| 12.90 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 12.90 | 12.63 | 0.000 | 0.000 | 0.07 | 0.02 | 0.000 | 0% |
| 12.35 | 0.68 | 0.41 | | | 0.006 | 0.90 | 2 | 12.63 | 12.03 | 0.006 | 0.005 | 0.27 | 0.16 | 0.001 | 0% |
| 11.70 | 0.92 | 0.42 | | | 0.015 | 0.90 | 3 | 12.03 | 11.38 | 0.015 | 0.014 | 0.50 | 0.32 | 0.004 | 2% |
| 11.05 | 1.09 | 0.39 | | | 0.024 | 0.90 | 4 | 11.38 | 10.73 | 0.024 | 0.022 | 0.70 | 0.45 | 0.010 | 5% |
| 10.40 | 1.36 | 0.36 | | | 0.043 | 0.90 | 5 | 10.73 | 10.19 | 0.043 | 0.038 | 1.00 | 0.54 | 0.021 | 9% |
| 9.98 | 1.42 | 0.36 | 0.10 | 0.08 | | 0.90 | 6 | 10.19 | 9.93 | 0.090 | 0.081 | 1.06 | 0.28 | 0.023 | 10% |
| 9.87 | 1.44 | 0.35 | 0.09 | 0.07 | | 0.90 | 7 | 9.93 | 9.83 | 0.081 | 0.073 | 1.09 | 0.11 | 0.008 | 4% |
| 9.78 | 1.45 | 0.42 | 0.10 | 0.11 | | 0.90 | 8 | 9.83 | 9.53 | 0.104 | 0.093 | 1.03 | 0.30 | 0.028 | 13% |
| 9.28 | 1.44 | 0.36 | 0.08 | 0.09 | | 0.90 | 9 | 9.53 | 9.24 | 0.087 | 0.078 | 1.08 | 0.31 | 0.024 | 11% |
| 9.20 | 1.46 | 0.34 | 0.09 | 0.10 | | 0.90 | 10 | 9.24 | 9.11 | 0.093 | 0.084 | 1.12 | 0.15 | 0.012 | 6% |
| 9.02 | 1.48 | 0.35 | 0.08 | 0.09 | | 0.90 | 11 | 9.11 | 8.89 | 0.082 | 0.074 | 1.13 | 0.25 | 0.018 | 8% |
| 8.76 | 1.44 | 0.43 | 0.05 | 0.04 | | 0.90 | 12 | 8.89 | 8.68 | 0.046 | 0.041 | 1.01 | 0.21 | 0.009 | 4% |
| 8.60 | 1.45 | 0.34 | 0.08 | 0.09 | | 0.90 | 13 | 8.68 | 8.56 | 0.084 | 0.075 | 1.11 | 0.13 | 0.010 | 5% |
| 8.52 | 1.43 | 0.36 | 0.03 | 0.08 | | 0.90 | 14 | 8.56 | 8.31 | 0.058 | 0.052 | 1.07 | 0.27 | 0.014 | 6% |
| 8.09 | 1.41 | 0.37 | 0.01 | 0.07 | | 0.90 | 15 | 8.31 | 8.05 | 0.043 | 0.038 | 1.04 | 0.27 | 0.010 | 5% |
| 8.00 | 1.40 | 0.37 | 0.03 | 0.06 | | 0.90 | 16 | 8.05 | 7.97 | 0.046 | 0.041 | 1.03 | 0.08 | 0.003 | 1% |
| 7.94 | 1.41 | 0.38 | 0.03 | 0.05 | | 0.90 | 17 | 7.97 | 7.67 | 0.037 | 0.033 | 1.03 | 0.31 | 0.010 | 5% |
| 7.40 | 1.37 | 0.39 | | | 0.012 | 0.90 | 18 | 7.67 | 7.13 | 0.012 | 0.011 | 0.98 | 0.53 | 0.006 | 3% |
| 6.85 | 1.32 | 0.40 | | | 0.003 | 0.90 | 19 | 7.13 | 6.55 | 0.003 | 0.003 | 0.92 | 0.53 | 0.001 | 1% |
| 6.25 | 1.29 | 0.40 | | | 0.000 | 0.90 | 20 | 6.55 | 5.63 | 0.000 | 0.000 | 0.89 | 0.82 | 0.000 | 0% |
| 5.00 | 1.06 | 0.39 | | | 0.000 | 0.90 | 21 | 5.63 | 5.00 | 0.000 | 0.000 | 0.67 | 0.42 | 0.000 | 0% |
| 3.70 | 0.87 | 0.39 | | | 0.006 | 0.90 | 22 | 5.00 | 3.70 | 0.006 | 0.005 | 0.48 | 0.62 | 0.003 | 2% |
| 2.55 | 0.61 | 0.41 | | | 0.012 | 0.90 | 23 | 3.70 | 2.55 | 0.012 | 0.011 | 0.12 | 0.14 | 0.002 | 1% |
| Total Flow: | | | | | | | | | | | | | | 0.219 | 1 |

| | | |
|--|-------|---------------------|
| Total Flow: | 0.219 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 7.24 | (m ²) |
| Top Width: | 10.35 | (m) |
| Hydraulic Depth: | 0.699 | (m) |
| Mean Velocity: | 0.030 | (m/s) |
| Froude Number | 0.012 | |
| Photographs taken looking at: Upstream, downstream and across | | |

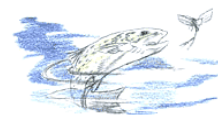
| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 407 |
| Datalogger Internal Power: | 4.774V | |
| Datalogger External Power: | 12.57V | |
| Datalogger Memory Used: | 16% used | |
| Datalogger Clock: | Jan 07, 2004 08:57 | MST |
| Laptop Clock: | Jan 07, 2004 09:03 | MST |
| Dessicant: | 25% used | |
| Datalogger: | Optimum datalogger s/n#03110220407 | |
| PT: | Keller s/n 0101356 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: Barometric Pressure 983.26580 hPa
Water temp 1.371663 C



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: February 9, 2005
Start Time: 2:58 PM MST
End Time: 3:15 PM MST

Weather Conditions:

-15 C, cloudy

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: ND/RM/CT
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

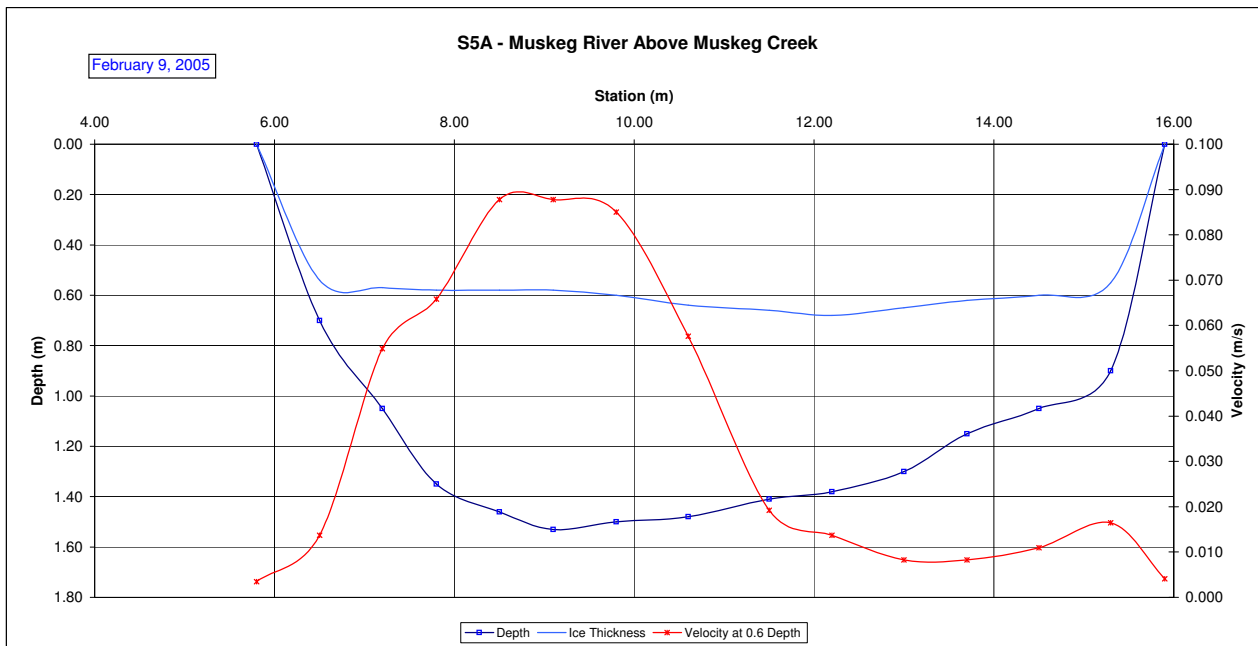
| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: Rod in PV | 1.152 | El: 282.380 |
| Water Level Reading: | 2.478 | El: 281.054 |
| Top of Ice Level Reading: | 2.440 | El: 2.599 |
| Transducer Reading & Calc'd El | 0.868 | El: 280.186 |
| Other: | | El: 280.192 |

| 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 ²) | (m ³ /s) | |
| 15.90 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 15.90 | 15.60 | 0.005 | 0.004 | 0.09 | 0.03 | 0.000 | 0% |
| 15.30 | 0.90 | 0.55 | | | 0.018 | 0.90 | 2 | 15.60 | 14.90 | 0.018 | 0.016 | 0.35 | 0.25 | 0.004 | 1% |
| 14.50 | 1.05 | 0.60 | | | 0.012 | 0.90 | 3 | 14.90 | 14.10 | 0.012 | 0.011 | 0.45 | 0.36 | 0.004 | 1% |
| 13.70 | 1.15 | 0.62 | | | 0.009 | 0.90 | 4 | 14.10 | 13.35 | 0.009 | 0.008 | 0.53 | 0.40 | 0.003 | 1% |
| 13.00 | 1.30 | 0.65 | | | 0.009 | 0.90 | 5 | 13.35 | 12.60 | 0.009 | 0.008 | 0.65 | 0.49 | 0.004 | 1% |
| 12.20 | 1.38 | 0.68 | | | 0.015 | 0.90 | 6 | 12.60 | 11.85 | 0.015 | 0.014 | 0.70 | 0.53 | 0.007 | 2% |
| 11.50 | 1.41 | 0.66 | | | 0.021 | 0.90 | 7 | 11.85 | 11.05 | 0.021 | 0.019 | 0.75 | 0.60 | 0.012 | 4% |
| 10.80 | 1.48 | 0.64 | | | 0.064 | 0.90 | 8 | 11.05 | 10.20 | 0.064 | 0.058 | 0.84 | 0.71 | 0.041 | 14% |
| 9.80 | 1.50 | 0.60 | | | 0.094 | 0.90 | 9 | 10.20 | 9.45 | 0.094 | 0.085 | 0.90 | 0.68 | 0.057 | 20% |
| 9.10 | 1.53 | 0.58 | | | 0.098 | 0.90 | 10 | 9.45 | 8.80 | 0.098 | 0.088 | 0.95 | 0.62 | 0.054 | 19% |
| 8.50 | 1.46 | 0.58 | | | 0.098 | 0.90 | 11 | 8.80 | 8.15 | 0.098 | 0.088 | 0.88 | 0.57 | 0.050 | 17% |
| 7.80 | 1.35 | 0.58 | | | 0.073 | 0.90 | 12 | 8.15 | 7.50 | 0.073 | 0.066 | 0.77 | 0.50 | 0.033 | 11% |
| 7.20 | 1.05 | 0.57 | | | 0.061 | 0.90 | 13 | 7.50 | 6.85 | 0.061 | 0.055 | 0.48 | 0.31 | 0.017 | 6% |
| 6.50 | 0.70 | 0.54 | | | 0.015 | 0.90 | 14 | 6.85 | 6.15 | 0.015 | 0.014 | 0.16 | 0.11 | 0.002 | 1% |
| 5.80 | 0.00 | 0.00 | | | 0.000 | 0.90 | 15 | 6.15 | 5.80 | 0.004 | 0.003 | 0.04 | 0.01 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 0.289 | 1 |

| | | |
|--|-------|---------------------|
| Total Flow: | 0.289 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 6.16 | (m ²) |
| Top Width: | 10.10 | (m) |
| Hydraulic Depth: | 0.610 | (m) |
| Mean Velocity: | 0.047 | (m/s) |
| Froude Number | 0.019 | |
| Photographs taken looking at: Upstream, downstream and across | | |

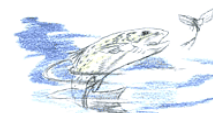
| | | |
|---|------------------------------------|-----|
| Datalogger Notes: | Database | 407 |
| Datalogger Internal Power: | 4.828V | |
| Datalogger External Power: | 14.39V | |
| Datalogger Memory Used: | 22% used | |
| Datalogger Clock: | Feb 09, 2004 14:21 | MST |
| Laptop Clock: | Feb 09, 2004 14:27 | MST |
| Dessicant: | Good-25% used | |
| Datalogger: | Optimum datalogger s/n#03110220407 | |
| PT: | Keller s/n 0101356 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | |

Notes: Barometric Pressure 969.16542 hPa
Water temp 1.642389 C



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: March 3, 2005
Start Time: 2:01 PM MST
End Time: 2:28 PM MST

Weather Conditions:

+3 C, Clear

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: ND/RM/CT
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: Rod in PV 1.427
Water Level Reading: 2.725
Top of Ice Level Reading: 2.714
Transducer Reading & Calc'd El. 0.863
Other:

Setup No. 1

El: 282.380
El: 281.082
El: 280.219

Setup No. 2

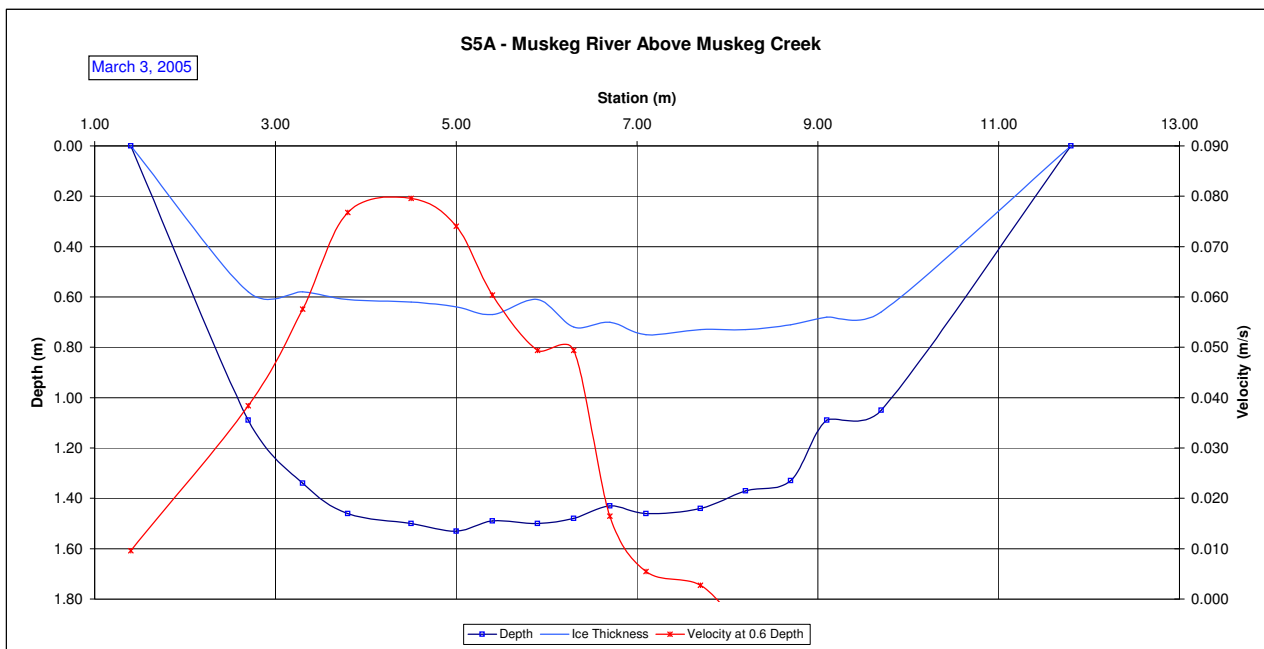
El: 282.380
El: 281.076
El: 280.213

| 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 ²) | (m ³ /s) | | |
| 1.40 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 1.40 | 2.05 | 0.011 | 0.010 | 0.13 | 0.08 | 0.001 | 0% | |
| 2.70 | 1.09 | 0.58 | | | 0.043 | 0.90 | 2 | 2.05 | 3.00 | 0.043 | 0.038 | 0.51 | 0.48 | 0.019 | 9% | |
| 3.30 | 1.34 | 0.58 | | | 0.064 | 0.90 | 3 | 3.00 | 3.55 | 0.064 | 0.058 | 0.76 | 0.42 | 0.024 | 11% | |
| 3.80 | 1.46 | 0.61 | | | 0.085 | 0.90 | 4 | 3.55 | 4.15 | 0.085 | 0.077 | 0.85 | 0.51 | 0.039 | 18% | |
| 4.50 | 1.50 | 0.62 | | | 0.088 | 0.90 | 5 | 4.15 | 4.75 | 0.088 | 0.080 | 0.88 | 0.53 | 0.042 | 20% | |
| 5.00 | 1.53 | 0.64 | | | 0.082 | 0.90 | 6 | 4.75 | 5.20 | 0.082 | 0.074 | 0.89 | 0.40 | 0.030 | 14% | |
| 5.40 | 1.49 | 0.67 | | | 0.067 | 0.90 | 7 | 5.20 | 5.65 | 0.067 | 0.060 | 0.82 | 0.37 | 0.022 | 10% | |
| 5.90 | 1.50 | 0.61 | | | 0.055 | 0.90 | 8 | 5.65 | 6.10 | 0.055 | 0.049 | 0.89 | 0.40 | 0.020 | 9% | |
| 6.30 | 1.48 | 0.72 | | | 0.055 | 0.90 | 9 | 6.10 | 6.50 | 0.055 | 0.049 | 0.76 | 0.30 | 0.015 | 7% | |
| 6.70 | 1.43 | 0.70 | | | 0.018 | 0.90 | 10 | 6.50 | 6.90 | 0.018 | 0.016 | 0.73 | 0.29 | 0.005 | 2% | |
| 7.10 | 1.46 | 0.75 | | | 0.006 | 0.90 | 11 | 6.90 | 7.40 | 0.006 | 0.005 | 0.71 | 0.36 | 0.002 | 1% | |
| 7.70 | 1.44 | 0.73 | | | 0.003 | 0.90 | 12 | 7.40 | 7.95 | 0.003 | 0.003 | 0.71 | 0.39 | 0.001 | 1% | |
| 8.20 | 1.37 | 0.73 | | | -0.006 | 0.90 | 13 | 7.95 | 8.45 | -0.006 | -0.005 | 0.64 | 0.32 | -0.002 | -1% | |
| 8.70 | 1.33 | 0.71 | | | -0.006 | 0.90 | 14 | 8.45 | 8.90 | -0.006 | -0.005 | 0.62 | 0.28 | -0.002 | -1% | |
| 9.10 | 1.09 | 0.68 | | | -0.006 | 0.90 | 15 | 8.90 | 9.40 | -0.006 | -0.005 | 0.41 | 0.21 | -0.001 | -1% | |
| 9.70 | 1.05 | 0.66 | | | -0.003 | 0.90 | 16 | 9.40 | 10.75 | -0.003 | -0.003 | 0.39 | 0.53 | -0.001 | -1% | |
| 11.80 | 0.00 | 0.00 | | | 0.000 | 0.90 | 17 | 10.75 | 11.80 | -0.001 | -0.001 | 0.10 | 0.10 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.213 | 1 | |

| | | |
|---------------------------------|-------|---------------------|
| Total Flow: | 0.213 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 5.97 | (m ²) |
| Top Width: | 10.40 | (m) |
| Hydraulic Depth: | 0.574 | (m) |
| Mean Velocity: | 0.036 | (m/s) |
| Froude Number | 0.015 | |
| Photographs taken looking at: | | |
| Upstream, downstream and across | | |

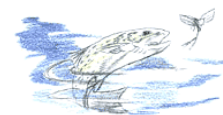
Notes: Barometric Pressure 980.82168 hPa
Water temp 1.864366 C
Data looks OK

| | |
|----------------------------|--|
| Datalogger Notes: | Database 407 |
| Datalogger Internal Power: | 4.861V |
| Datalogger External Power: | 14.54V |
| Datalogger Memory Used: | 26% used |
| Datalogger Clock: | Mar 03, 2004 13:19 MST |
| Laptop Clock: | Mar 03, 2004 13:28 MST |
| Dessicant: | Good-25% used |
| Datalogger: | Optimum datalogger s/n#03110220407 |
| PT: | Keller s/n 0101356 |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller |



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Aurora



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Aurora
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: April 6, 2005
Start Time: 2:30 PM MDT
End Time: MDT

Level Readings and Measurements

| | Setup No. 1 | Setup No. 2 |
|---------------------------------|-------------------|-------------------|
| Bench Mark Reading: Tbar in PVC | 1.266 El: 282.380 | 1.205 El: 282.380 |
| Water Level Reading: | 2.308 El: 281.338 | 2.251 El: 281.334 |
| Top of Ice Level Reading: | | |
| Transducer Reading: | 1.097 El: 280.241 | 1.097 El: 280.237 |
| Other: | | |

Weather Conditions: +10° C, Clear, Light Wind

River Conditions: Water flowing over ice, 80% 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 | Panel Ends at | Panel | 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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

Total Flow: -

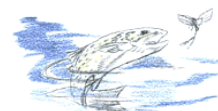
| | | | | | | | |
|--------------------------------|--|--|--|--|---|--|---------------------|
| Total Flow: | | | | | - | | (m ³ /s) |
| Perceived Measurement Quality: | | | | | | | |
| Total Area: | | | | | | | (m ²) |
| Top Width: | | | | | | | (m) |
| Hydraulic Depth: | | | | | | | (m) |
| Mean Velocity: | | | | | | | (m/s) |
| Froude Number | | | | | | | |
| Photographs taken looking at: | | | | | | | |
| Upstream, downstream, across | | | | | | | |

| | |
|----------------------------|---|
| Datalogger Notes: | |
| Datalogger Internal Power: | 4.906V |
| Datalogger External Power: | 13.87V |
| Datalogger Memory Used: | 31% used |
| Datalogger Clock: | Apr 06, 2005 13:27 MST |
| Laptop Clock: | Apr 06, 2005 13:35 MST |
| Dessicant: | Good |
| Datalogger: | Optimum DD128, # 0110220407 |
| PT: | Keller 730-130-5 psi #0104640 |
| Power: | Magnacharge 20V 10A DC Battery and |
| | PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller |

Notes: Barometer: 980.56483 hPa Water Temp: 2.215197 C
DB 407
Unsafe for flow measurement.

Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: April 24, 2005
Start Time: 2:05 PM MDT
End Time: 2:22 PM MDT

Weather Conditions:

+10°C, Clear, Calm

River Conditions:

No ice cover. Very high stage. Stage above bankfull. Stage above BM.

Personnel & Equipment

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

Level Readings

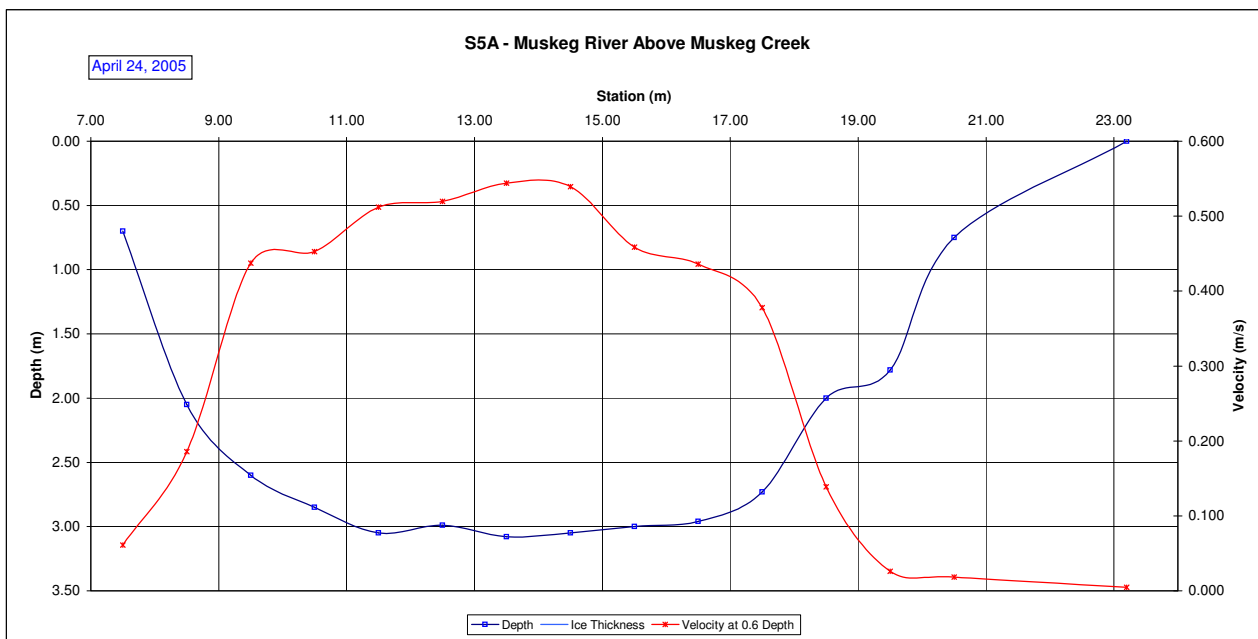
| | Setup No. 1 | Setup No. 2 |
|---------------------------------|-------------|-------------|
| Bench Mark Reading: Rod in PV | 0.174 | 0.174 |
| Water Level Reading: | 0.000 | 0.000 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El. | 2.343 | 2.343 |
| Other: | | |

| 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) | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| 7.50 | 0.70 | | | | 0.061 | 1.00 | 1 | 7.50 | 8.00 | 0.061 | 0.061 | 0.51 | 0.26 | 0.016 | 0% | | | | | | |
| 8.50 | 2.05 | | 0.24 | 0.13 | | 1.00 | 2 | 8.00 | 9.00 | 0.186 | 0.186 | 2.05 | 2.05 | 0.381 | 3% | | | | | | |
| 9.50 | 2.60 | | 0.49 | 0.39 | | 1.00 | 3 | 9.00 | 10.00 | 0.437 | 0.437 | 2.60 | 2.60 | 1.137 | 9% | | | | | | |
| 10.50 | 2.85 | | 0.58 | 0.33 | | 1.00 | 4 | 10.00 | 11.00 | 0.453 | 0.453 | 2.85 | 2.85 | 1.290 | 10% | | | | | | |
| 11.50 | 3.05 | | 0.65 | 0.37 | | 1.00 | 5 | 11.00 | 12.00 | 0.512 | 0.512 | 3.05 | 3.05 | 1.562 | 12% | | | | | | |
| 12.50 | 2.99 | | 0.59 | 0.45 | | 1.00 | 6 | 12.00 | 13.00 | 0.520 | 0.520 | 2.99 | 2.99 | 1.554 | 12% | | | | | | |
| 13.50 | 3.08 | | 0.67 | 0.41 | | 1.00 | 7 | 13.00 | 14.00 | 0.544 | 0.544 | 3.08 | 3.08 | 1.676 | 13% | | | | | | |
| 14.50 | 3.05 | | 0.60 | 0.48 | | 1.00 | 8 | 14.00 | 15.00 | 0.539 | 0.539 | 3.05 | 3.05 | 1.645 | 12% | | | | | | |
| 15.50 | 3.00 | | 0.58 | 0.34 | | 1.00 | 9 | 15.00 | 16.00 | 0.459 | 0.459 | 3.00 | 3.00 | 1.376 | 10% | | | | | | |
| 16.50 | 2.96 | | 0.48 | 0.39 | | 1.00 | 10 | 16.00 | 17.00 | 0.436 | 0.436 | 2.96 | 2.96 | 1.290 | 10% | | | | | | |
| 17.50 | 2.73 | | 0.45 | 0.31 | | 1.00 | 11 | 17.00 | 18.00 | 0.378 | 0.378 | 2.73 | 2.73 | 1.032 | 8% | | | | | | |
| 18.50 | 2.00 | | 0.15 | 0.13 | | 1.00 | 12 | 18.00 | 19.00 | 0.139 | 0.139 | 2.00 | 2.00 | 0.277 | 2% | | | | | | |
| 19.50 | 1.78 | | 0.03 | 0.02 | | 1.00 | 13 | 19.00 | 20.00 | 0.026 | 0.026 | 1.78 | 1.78 | 0.046 | 0% | | | | | | |
| 20.50 | 0.75 | | | | 0.018 | 1.00 | 14 | 20.00 | 20.50 | 0.018 | 0.018 | 0.75 | 0.38 | 0.007 | 0% | | | | | | |
| 23.20 | 0.00 | | | | 0.000 | 1.00 | 15 | 20.50 | 23.20 | 0.005 | 0.005 | 0.19 | 0.51 | 0.002 | 0% | | | | | | |
| | | | | | | | | | | | | | Total Flow: | 13.292 | | | | | | | |

| | | |
|--|--------|---------------------|
| Measured Flow: | 13.292 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Estimated unmeasured flow: | 10% | of measured flow |
| Total Flow: | 14.768 | (m ³ /s) |
| Total Area: | 33.28 | (m ²) |
| Top Width: | 15.70 | (m) |
| Hydraulic Depth: | 2.120 | (m) |
| Mean Velocity: | 0.444 | (m/s) |
| Froude Number | 0.097 | |
| Photographs taken looking at: Upstream, downstream and across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 407 |
| Datalogger Internal Power: | 4.873V | |
| Datalogger External Power: | 14.22V | |
| Datalogger Memory Used: | 34% used | |
| Datalogger Clock: | Apr 24, 2004 11:44 | MST |
| Laptop Clock: | Apr 24, 2004 11:50 | MST |
| Dessicant: | Good-25% used | |
| Datalogger: | Optimum datalogger s/n#03110220407 | |
| PT: | Keller s/n 0104640 ?? | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: Barometric Pressure 988.45 hPa
Water temp 9.5 C - Temp sensor may not be working properly.
Data looks OK. Water level still rising. Flow measurement made between active banks.
Unmeasured overbank flow estimated at 10% of the total. TSS sample taken.
Water levels read on the rod directly without using the spirit level since the top of bench mark is below the water surface.



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: April 27, 2005
Start Time: 6:40 PM MDT
End Time: MDT

Weather Conditions:

+4 C, Partly cloudy, windy

River Conditions:

No ice cover. Very high stage. Stage above bankfull. Stage above BM.

Personnel & Equipment

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

Level Readings

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: Rod in P\ | 0.240 | 0.240 |
| Water Level Reading: | 0.000 | 0.000 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El | 2.320 | 2.320 |
| Other: | | |

| 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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - | |

| | | |
|---------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream and across | | |

| | |
|----------------------------|--|
| Datalogger Notes: | Database 407 |
| Datalogger Internal Power: | 4.84V |
| Datalogger External Power: | 14.27V |
| Datalogger Memory Used: | 34% used |
| Datalogger Clock: | Apr 27, 2004 17:39 MST |
| Laptop Clock: | Apr 27, 2004 17:47 MST |
| Dessicant: | Good-25% used |
| Datalogger: | Optimum datalogger s/n#03110220407 |
| PT: | Keller s/n 0104640 ?? |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller |

Notes:

Barometric Pressure 994.467 hPa
Water temp 6.65 C - Temp sensor is not working properly. Counterchecked using a thermometer, and it gave a reading of 4.1°C.
Transducer appears to have moved up by about 4 cms just after the visit on Apr 24.
Water levels read on the rod directly without using the spirit level since the top of bench mark is below the water surface.

Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: May 30, 2005
Start Time: 2:05 PM MDT
End Time: 2:25 PM MDT

Level Readings

Bench Mark Reading: Rebar 1.175
Water Level Reading: 1.698
Top of Ice Level Reading:
Transducer Reading & Calc'd El 1.638
Other:

Setup No. 1

El: 282.380
El: 281.857
El: 280.219
El:

Setup No. 2

El: 282.380
El: 281.860
El:
El: 280.222
El:

Weather Conditions:

+20° C, light wind, clear

River Conditions:

Open water, stage below bankfull and falling, beaver dam downstream may be lower following high flows

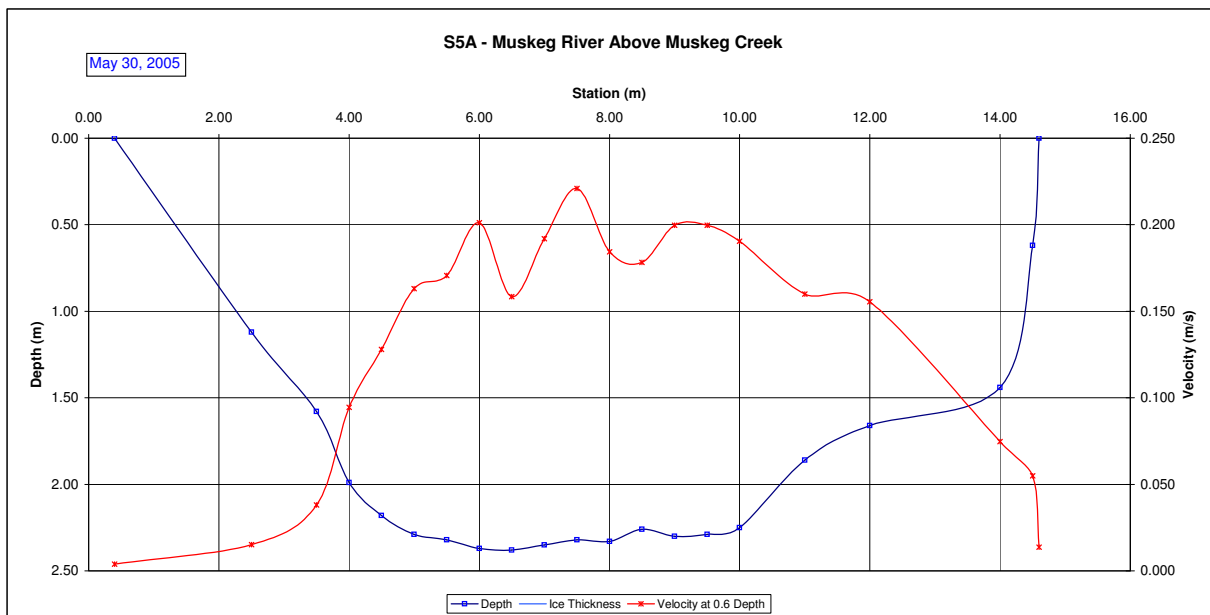
Measurement Data

| | 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 | | | | | | | | | | | | | | | | |
| | 0.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.40 | 1.45 | 0.004 | 0.004 | 0.28 | 0.29 | 0.001 | 0% |
| | 2.50 | 1.12 | | | | 0.015 | 1.00 | 2 | 1.45 | 3.00 | 0.015 | 0.015 | 1.12 | 1.74 | 0.026 | 1% |
| | 3.50 | 1.58 | | 0.05 | 0.03 | | 1.00 | 3 | 3.00 | 3.75 | 0.038 | 0.038 | 1.58 | 1.19 | 0.045 | 1% |
| | 4.00 | 1.99 | | 0.12 | 0.07 | | 1.00 | 4 | 3.75 | 4.25 | 0.094 | 0.094 | 1.99 | 1.00 | 0.094 | 3% |
| | 4.50 | 2.18 | | 0.14 | 0.11 | | 1.00 | 5 | 4.25 | 4.75 | 0.128 | 0.128 | 2.18 | 1.09 | 0.140 | 4% |
| | 5.00 | 2.29 | | 0.20 | 0.13 | | 1.00 | 6 | 4.75 | 5.25 | 0.163 | 0.163 | 2.29 | 1.15 | 0.187 | 5% |
| | 5.50 | 2.32 | | 0.21 | 0.13 | | 1.00 | 7 | 5.25 | 5.75 | 0.171 | 0.171 | 2.32 | 1.16 | 0.198 | 5% |
| | 6.00 | 2.37 | | 0.21 | 0.19 | | 1.00 | 8 | 5.75 | 6.25 | 0.201 | 0.201 | 2.37 | 1.19 | 0.238 | 7% |
| | 6.50 | 2.38 | | 0.19 | 0.13 | | 1.00 | 9 | 6.25 | 6.75 | 0.158 | 0.158 | 2.38 | 1.19 | 0.189 | 5% |
| | 7.00 | 2.35 | | 0.22 | 0.17 | | 1.00 | 10 | 6.75 | 7.25 | 0.192 | 0.192 | 2.35 | 1.18 | 0.226 | 6% |
| | 7.50 | 2.32 | | 0.24 | 0.20 | | 1.00 | 11 | 7.25 | 7.75 | 0.221 | 0.221 | 2.32 | 1.16 | 0.256 | 7% |
| | 8.00 | 2.33 | | 0.21 | 0.16 | | 1.00 | 12 | 7.75 | 8.25 | 0.184 | 0.184 | 2.33 | 1.17 | 0.215 | 6% |
| | 8.50 | 2.26 | | 0.20 | 0.16 | | 1.00 | 13 | 8.25 | 8.75 | 0.178 | 0.178 | 2.26 | 1.13 | 0.201 | 6% |
| | 9.00 | 2.30 | | 0.19 | 0.21 | | 1.00 | 14 | 8.75 | 9.25 | 0.200 | 0.200 | 2.30 | 1.15 | 0.230 | 6% |
| | 9.50 | 2.29 | | 0.24 | 0.16 | | 1.00 | 15 | 9.25 | 9.75 | 0.200 | 0.200 | 2.29 | 1.15 | 0.229 | 6% |
| | 10.00 | 2.25 | | 0.19 | 0.20 | | 1.00 | 16 | 9.75 | 10.50 | 0.191 | 0.191 | 2.25 | 1.69 | 0.321 | 9% |
| | 11.00 | 1.86 | | 0.17 | 0.15 | | 1.00 | 17 | 10.50 | 11.50 | 0.160 | 0.160 | 1.86 | 1.86 | 0.298 | 8% |
| | 12.00 | 1.66 | | 0.17 | 0.14 | | 1.00 | 18 | 11.50 | 13.00 | 0.155 | 0.155 | 1.66 | 2.49 | 0.387 | 11% |
| | 14.00 | 1.44 | | 0.06 | 0.09 | | 1.00 | 19 | 13.00 | 14.25 | 0.075 | 0.075 | 1.44 | 1.80 | 0.134 | 4% |
| RB | 14.50 | 0.62 | | | | 0.055 | 1.00 | 20 | 14.25 | 14.55 | 0.055 | 0.055 | 0.62 | 0.19 | 0.010 | 0% |
| | 14.60 | 0.00 | | | | 0.000 | 1.00 | 21 | 14.55 | 14.60 | 0.014 | 0.014 | 0.16 | 0.01 | 0.000 | 0% |
| | Total Flow: | | | | | | | | | | | | | | 3.625 | 1 |

| | | |
|--------------------------------|-------|--------|
| Total Flow: | 3.625 | (m³/s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 24.94 | (m²) |
| Top Width: | 14.20 | (m) |
| Hydraulic Depth: | 1.756 | (m) |
| Mean Velocity: | 0.145 | (m/s) |
| Froude Number | 0.035 | |
| Photographs taken looking at: | yes | |

| | | |
|---|------------------------------------|-----|
| Datalogger Notes: | Database | 407 |
| Datalogger Internal Power: | 4.9V | |
| Datalogger External Power: | 13.7V | |
| Datalogger Memory Used: | 39% | |
| Datalogger Clock: | May 30, 2005 12:33 | MST |
| Laptop Clock: | May 30, 2005 12:25 | MST |
| Dessicant: | Replaced - 100% | |
| Datalogger: | Optimum datalogger s/n#110220407 | |
| PT: | Keller s/n 0104640 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | |

Notes: TSS sample collected.
Air Pressure 987.2, Water Temp (old thermistor) 16.93 C.
Installed new thermistor to Alg 16 - Port named "New Therm". Water Temp reading 18.1 C.



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: July 14, 2005
Start Time: 3:37 PM MDT
End Time: 4:00 PM MDT

Level Readings

Bench Mark Reading: Rebar 1.310
Water Level Reading: 2.274
Top of Ice Level Reading:
Transducer Reading & Calc'd El 1.201
Other:

Setup No. 1

El: 282.380
El: 281.416
El:
El: 280.215
El:

Setup No. 2

El: 282.380
El: 281.412
El:
El: 280.211
El:

Weather Conditions:

+25 C, Partly cloudy

River Conditions:

Open water

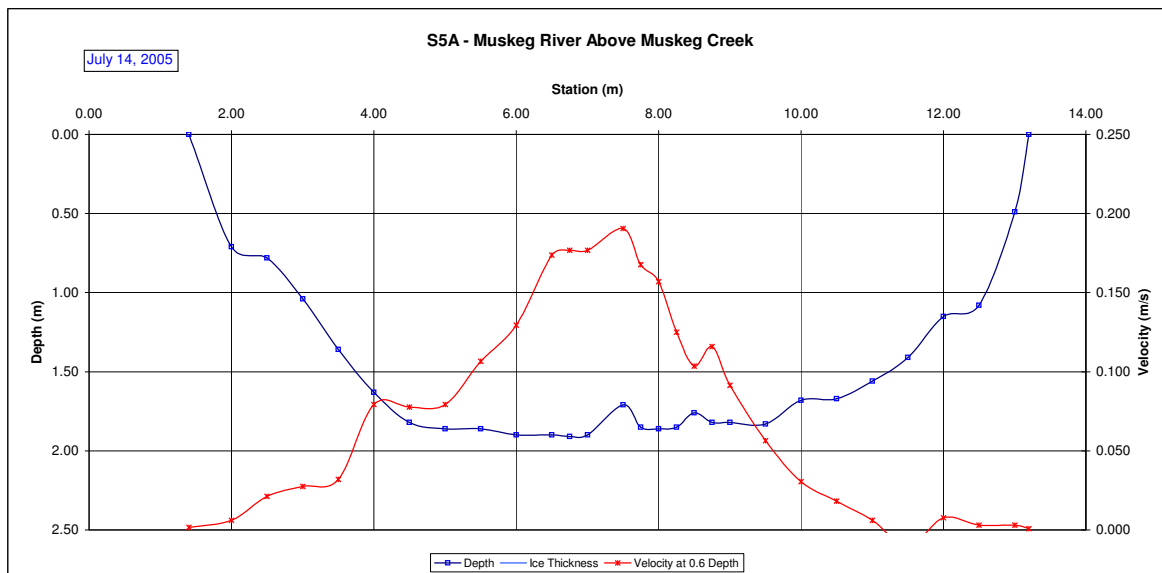
Measurement Data

| 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) | |
| 1.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.40 | 1.70 | 0.002 | 0.002 | 0.18 | 0.05 | 0.000 | 0% |
| 2.00 | 0.71 | | | | 0.006 | 1.00 | 2 | 1.70 | 2.25 | 0.006 | 0.006 | 0.71 | 0.39 | 0.002 | 0% |
| 2.50 | 0.78 | | | | 0.021 | 1.00 | 3 | 2.25 | 2.75 | 0.021 | 0.021 | 0.78 | 0.39 | 0.008 | 1% |
| 3.00 | 1.04 | | | | 0.027 | 1.00 | 4 | 2.75 | 3.25 | 0.027 | 0.027 | 1.04 | 0.52 | 0.014 | 1% |
| 3.50 | 1.36 | | 0.04 | 0.02 | | 1.00 | 5 | 3.25 | 3.75 | 0.032 | 0.032 | 1.36 | 0.68 | 0.022 | 2% |
| 4.00 | 1.63 | | 0.11 | 0.05 | | 1.00 | 6 | 3.75 | 4.25 | 0.079 | 0.079 | 1.63 | 0.82 | 0.065 | 5% |
| 4.50 | 1.82 | | 0.09 | 0.07 | | 1.00 | 7 | 4.25 | 4.75 | 0.078 | 0.078 | 1.82 | 0.91 | 0.071 | 5% |
| 5.00 | 1.86 | | 0.12 | 0.04 | | 1.00 | 8 | 4.75 | 5.25 | 0.079 | 0.079 | 1.86 | 0.93 | 0.074 | 5% |
| 5.50 | 1.86 | | 0.13 | 0.09 | | 1.00 | 9 | 5.25 | 5.75 | 0.107 | 0.107 | 1.86 | 0.93 | 0.099 | 7% |
| 6.00 | 1.90 | | 0.13 | 0.12 | | 1.00 | 10 | 5.75 | 6.25 | 0.130 | 0.130 | 1.90 | 0.95 | 0.123 | 9% |
| 6.50 | 1.90 | | 0.21 | 0.14 | | 1.00 | 11 | 6.25 | 6.63 | 0.174 | 0.174 | 1.90 | 0.71 | 0.124 | 9% |
| 6.75 | 1.91 | | 0.19 | 0.16 | | 1.00 | 12 | 6.63 | 6.88 | 0.177 | 0.177 | 1.91 | 0.48 | 0.084 | 6% |
| 7.00 | 1.90 | | 0.21 | 0.15 | | 1.00 | 13 | 6.88 | 7.25 | 0.177 | 0.177 | 1.90 | 0.71 | 0.126 | 9% |
| 7.50 | 1.71 | | 0.20 | 0.18 | | 1.00 | 14 | 7.25 | 7.63 | 0.191 | 0.191 | 1.71 | 0.64 | 0.122 | 9% |
| 7.75 | 1.85 | | 0.17 | 0.17 | | 1.00 | 15 | 7.63 | 7.88 | 0.168 | 0.168 | 1.85 | 0.46 | 0.078 | 6% |
| 8.00 | 1.86 | | 0.16 | 0.15 | | 1.00 | 16 | 7.88 | 8.13 | 0.157 | 0.157 | 1.86 | 0.47 | 0.073 | 5% |
| 8.25 | 1.85 | | 0.09 | 0.16 | | 1.00 | 17 | 8.13 | 8.38 | 0.125 | 0.125 | 1.85 | 0.46 | 0.058 | 4% |
| 8.50 | 1.76 | | 0.09 | 0.12 | | 1.00 | 18 | 8.38 | 8.63 | 0.104 | 0.104 | 1.76 | 0.44 | 0.046 | 3% |
| 8.75 | 1.82 | | 0.09 | 0.14 | | 1.00 | 19 | 8.63 | 8.88 | 0.116 | 0.116 | 1.82 | 0.46 | 0.053 | 4% |
| 9.00 | 1.82 | | 0.06 | 0.12 | | 1.00 | 20 | 8.88 | 9.25 | 0.091 | 0.091 | 1.82 | 0.68 | 0.062 | 4% |
| 9.50 | 1.83 | | 0.06 | 0.05 | | 1.00 | 21 | 9.25 | 9.75 | 0.056 | 0.056 | 1.83 | 0.92 | 0.052 | 4% |
| 10.00 | 1.68 | | 0.04 | 0.02 | | 1.00 | 22 | 9.75 | 10.25 | 0.030 | 0.030 | 1.68 | 0.84 | 0.026 | 2% |
| 10.50 | 1.67 | | 0.03 | 0.01 | | 1.00 | 23 | 10.25 | 10.75 | 0.018 | 0.018 | 1.67 | 0.84 | 0.015 | 1% |
| 11.00 | 1.56 | | 0.01 | 0.01 | | 1.00 | 24 | 10.75 | 11.25 | 0.006 | 0.006 | 1.56 | 0.78 | 0.005 | 0% |
| 11.50 | 1.41 | | -0.01 | -0.01 | | 1.00 | 25 | 11.25 | 11.75 | -0.011 | -0.011 | 1.41 | 0.71 | -0.008 | -1% |
| 12.00 | 1.15 | | 0.01 | 0.00 | | 1.00 | 26 | 11.75 | 12.25 | 0.008 | 0.008 | 1.15 | 0.58 | 0.004 | 0% |
| 12.50 | 1.08 | | | | 0.003 | 1.00 | 27 | 12.25 | 12.75 | 0.003 | 0.003 | 1.08 | 0.54 | 0.002 | 0% |
| 13.00 | 0.49 | | | | 0.003 | 1.00 | 28 | 12.75 | 13.10 | 0.003 | 0.003 | 0.49 | 0.17 | 0.001 | 0% |
| 13.20 | 0.00 | | | | 0.000 | 1.00 | 29 | 13.10 | 13.20 | 0.001 | 0.001 | 0.12 | 0.01 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 1.400 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 1.400 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 17.45 | (m ²) |
| Top Width: | 11.80 | (m) |
| Hydraulic Depth: | 1.479 | (m) |
| Mean Velocity: | 0.080 | (m/s) |
| Froude Number | 0.021 | |
| Photographs taken looking at: | yes | |

| | | |
|---|------------------------------------|-----|
| Datalogger Notes: | Database | 407 |
| Datalogger Internal Power: | 4.915V | |
| Datalogger External Power: | 13.61V | |
| Datalogger Memory Used: | 48% | |
| Datalogger Clock: | Jul 16, 2005 14:17 | MST |
| Laptop Clock: | Jul 16, 2005 14:26 | MST |
| Dessicant: | Good - 10% used | |
| Datalogger: | Optimum datalogger s/n#110220407 | |
| PT: | Keller s/n 0104640 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | |

Notes: TSS sample collected.
Air Pressure 973.86427, Water Temp (old thermistor) 19.950683 C.
Water Temp (new thermistor) 21.767543 C



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: August 31, 2005
Start Time: 1:34 PM MDT
End Time: 2:03 PM MDT

Level Readings

Bench Mark Reading: Rebar 0.000
Water Level Reading: 0.113
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 2.031
Other:

Setup No. 1

El: 282.380
El: 282.267
El:
El: 280.236
El:

Setup No. 2

0.000 El: 282.380
0.113 El: 282.267
El:
2.031 El: 280.236
El:

Weather Conditions:

+18 C, Overcast

River Conditions:

Open water, very high stage with overbank flow.

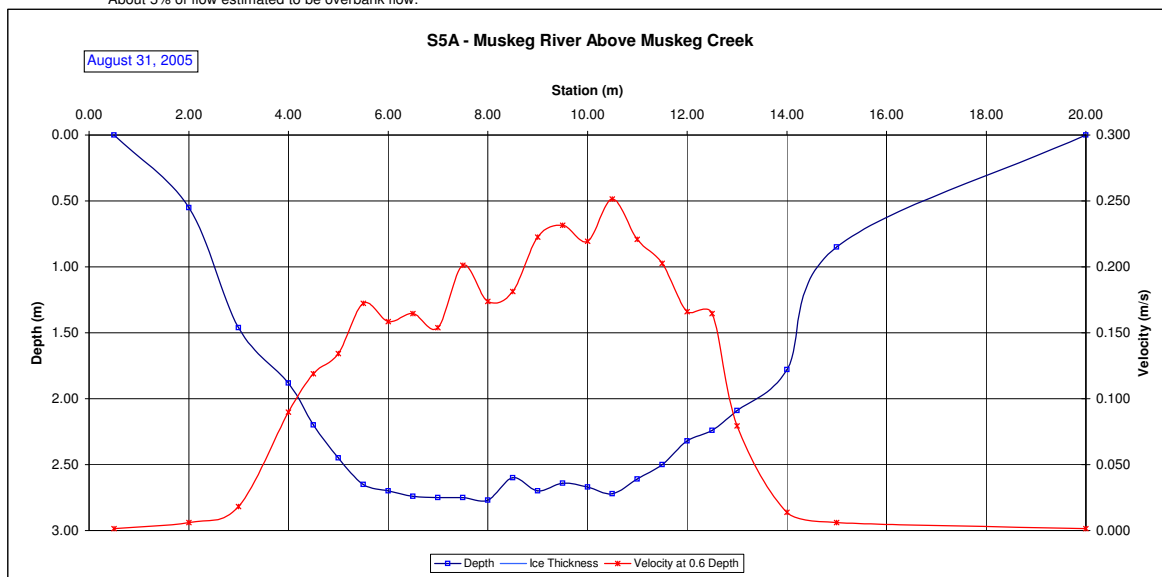
Measurement Data

| 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) | |
| | | | | | | | | | | | | | | | |
| 0.50 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.50 | 1.25 | 0.002 | 0.002 | 0.14 | 0.10 | 0.000 | 0% |
| 2.00 | 0.55 | | | | 0.006 | 1.00 | 2 | 1.25 | 2.50 | 0.006 | 0.006 | 0.55 | 0.69 | 0.004 | 0% |
| 3.00 | 1.46 | | 0.02 | 0.01 | | 1.00 | 3 | 2.50 | 3.50 | 0.018 | 0.018 | 1.46 | 1.46 | 0.027 | 1% |
| 4.00 | 1.88 | | 0.13 | 0.05 | | 1.00 | 4 | 3.50 | 4.25 | 0.090 | 0.090 | 1.88 | 1.41 | 0.127 | 3% |
| 4.50 | 2.20 | | 0.17 | 0.06 | | 1.00 | 5 | 4.25 | 4.75 | 0.119 | 0.119 | 2.20 | 1.10 | 0.131 | 3% |
| 5.00 | 2.45 | | 0.17 | 0.10 | | 1.00 | 6 | 4.75 | 5.25 | 0.134 | 0.134 | 2.45 | 1.23 | 0.164 | 4% |
| 5.50 | 2.65 | | 0.20 | 0.15 | | 1.00 | 7 | 5.25 | 5.75 | 0.172 | 0.172 | 2.65 | 1.33 | 0.228 | 5% |
| 6.00 | 2.70 | | 0.17 | 0.15 | | 1.00 | 8 | 5.75 | 6.25 | 0.158 | 0.158 | 2.70 | 1.35 | 0.214 | 5% |
| 6.50 | 2.74 | | 0.17 | 0.16 | | 1.00 | 9 | 6.25 | 6.75 | 0.165 | 0.165 | 2.74 | 1.37 | 0.225 | 5% |
| 7.00 | 2.75 | | 0.18 | 0.13 | | 1.00 | 10 | 6.75 | 7.25 | 0.154 | 0.154 | 2.75 | 1.38 | 0.212 | 5% |
| 7.50 | 2.75 | | 0.21 | 0.20 | | 1.00 | 11 | 7.25 | 7.75 | 0.201 | 0.201 | 2.75 | 1.38 | 0.277 | 6% |
| 8.00 | 2.77 | | 0.19 | 0.16 | | 1.00 | 12 | 7.75 | 8.25 | 0.174 | 0.174 | 2.77 | 1.39 | 0.241 | 5% |
| 8.50 | 2.60 | | 0.17 | 0.20 | | 1.00 | 13 | 8.25 | 8.75 | 0.181 | 0.181 | 2.60 | 1.30 | 0.236 | 5% |
| 9.00 | 2.70 | | 0.22 | 0.22 | | 1.00 | 14 | 8.75 | 9.25 | 0.223 | 0.223 | 2.70 | 1.35 | 0.300 | 7% |
| 9.50 | 2.64 | | 0.25 | 0.21 | | 1.00 | 15 | 9.25 | 9.75 | 0.232 | 0.232 | 2.64 | 1.32 | 0.306 | 7% |
| 10.00 | 2.67 | | 0.22 | 0.22 | | 1.00 | 16 | 9.75 | 10.25 | 0.219 | 0.219 | 2.67 | 1.34 | 0.293 | 7% |
| 10.50 | 2.72 | | 0.28 | 0.22 | | 1.00 | 17 | 10.25 | 10.75 | 0.251 | 0.251 | 2.72 | 1.36 | 0.342 | 8% |
| 11.00 | 2.61 | | 0.27 | 0.17 | | 1.00 | 18 | 10.75 | 11.25 | 0.221 | 0.221 | 2.61 | 1.31 | 0.288 | 7% |
| 11.50 | 2.50 | | 0.27 | 0.13 | | 1.00 | 19 | 11.25 | 11.75 | 0.203 | 0.203 | 2.50 | 1.25 | 0.253 | 6% |
| 12.00 | 2.32 | | 0.25 | 0.08 | | 1.00 | 20 | 11.75 | 12.25 | 0.166 | 0.166 | 2.32 | 1.16 | 0.193 | 4% |
| 12.50 | 2.24 | | 0.25 | 0.08 | | 1.00 | 21 | 12.25 | 12.75 | 0.165 | 0.165 | 2.24 | 1.12 | 0.184 | 4% |
| 13.00 | 2.09 | | 0.14 | 0.02 | | 1.00 | 22 | 12.75 | 13.50 | 0.079 | 0.079 | 2.09 | 1.57 | 0.124 | 3% |
| 14.00 | 1.78 | | 0.02 | 0.01 | | 1.00 | 23 | 13.50 | 14.50 | 0.014 | 0.014 | 1.78 | 1.78 | 0.024 | 1% |
| 15.00 | 0.85 | | | | 0.006 | 1.00 | 24 | 14.50 | 17.50 | 0.006 | 0.006 | 0.85 | 2.55 | 0.016 | 0% |
| 20.00 | 0.00 | | | | 0.000 | 1.00 | 25 | 17.50 | 20.00 | 0.002 | 0.002 | 0.21 | 0.53 | 0.001 | 0% |
| Total Flow: | | | | | | | | | | | | | | 4.410 | |

| | | | |
|--------------------------------|-------|-------|---------------------|
| Total Flow: | 4.410 | 4.631 | (m ³ /s) |
| Perceived Measurement Quality: | Good | | |
| Total Area: | 32.09 | | (m ²) |
| Top Width: | 19.50 | | (m) |
| Hydraulic Depth: | 1.646 | | (m) |
| Mean Velocity: | 0.137 | | (m/s) |
| Froude Number | 0.034 | | |
| Photographs taken looking at: | | | |
| yes | | | |

| | | |
|---|------------------------------------|-----|
| Datalogger Notes: | Database | 407 |
| Datalogger Internal Power: | 4.89V | |
| Datalogger External Power: | 13.9V | |
| Datalogger Memory Used: | 57% | |
| Datalogger Clock: | Aug 31, 2005 12:09 | MST |
| Laptop Clock: | Aug 31, 2005 12:19 | MST |
| Dessicant: | Good - 25% used | |
| Datalogger: | Optimum datalogger s/n#110220407 | |
| PT: | Keller s/n 0104640 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | |

Notes: TSS sample collected.
Air Pressure 979.1 hPa, Water Temp (old thermistor) 13 C.
Water Temp (new thermistor) 12.5 C
About 5% of flow estimated to be overbank flow.



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: October 7, 2005
Start Time: 12:55 PM MDT
End Time: 1:30 PM MDT

Level Readings

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: Rebar | 1.167 | El: 282.380 |
| Water Level Reading: | 2.107 | El: 281.440 |
| Top of Ice Level Reading: | | El: 281.444 |
| Transducer Reading & Calc'd El | 1.244 | El: 280.196 |
| Other: | | El: 280.200 |

Weather Conditions:

+8 C, Overcast, very light wind

River Conditions:

Open water, low stage

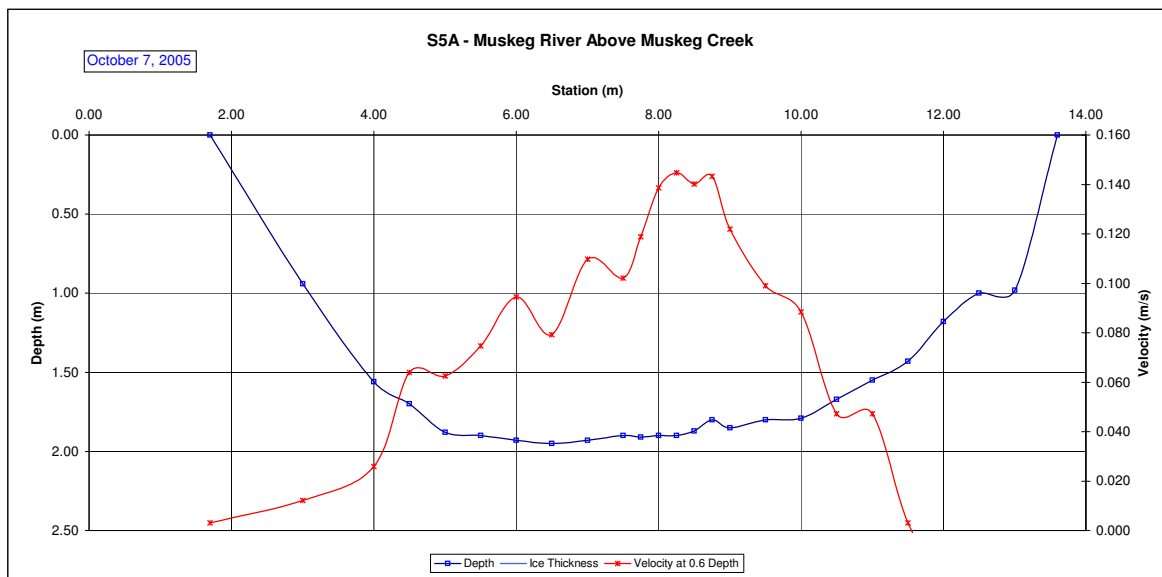
Measurement Data

| 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 ²) | (m ³ /s) | |
| 1.70 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.70 | 2.35 | 0.003 | 0.003 | 0.24 | 0.15 | 0.000 | 0% |
| 3.00 | 0.94 | | | | 0.012 | 1.00 | 2 | 2.35 | 3.50 | 0.012 | 0.012 | 0.94 | 1.08 | 0.013 | 1% |
| 4.00 | 1.56 | | 0.04 | 0.01 | | 1.00 | 3 | 3.50 | 4.25 | 0.026 | 0.026 | 1.56 | 1.17 | 0.030 | 3% |
| 4.50 | 1.70 | | 0.11 | 0.02 | | 1.00 | 4 | 4.25 | 4.75 | 0.064 | 0.064 | 1.70 | 0.85 | 0.054 | 5% |
| 5.00 | 1.88 | | 0.11 | 0.02 | | 1.00 | 5 | 4.75 | 5.25 | 0.062 | 0.062 | 1.88 | 0.94 | 0.059 | 5% |
| 5.50 | 1.90 | | 0.11 | 0.04 | | 1.00 | 6 | 5.25 | 5.75 | 0.075 | 0.075 | 1.90 | 0.95 | 0.071 | 6% |
| 6.00 | 1.93 | | 0.13 | 0.06 | | 1.00 | 7 | 5.75 | 6.25 | 0.094 | 0.094 | 1.93 | 0.97 | 0.091 | 8% |
| 6.50 | 1.95 | | 0.12 | 0.04 | | 1.00 | 8 | 6.25 | 6.75 | 0.079 | 0.079 | 1.95 | 0.98 | 0.077 | 6% |
| 7.00 | 1.93 | | 0.16 | 0.06 | | 1.00 | 9 | 6.75 | 7.25 | 0.110 | 0.110 | 1.93 | 0.97 | 0.106 | 9% |
| 7.50 | 1.90 | | 0.13 | 0.08 | | 1.00 | 10 | 7.25 | 7.63 | 0.102 | 0.102 | 1.90 | 0.71 | 0.073 | 6% |
| 7.75 | 1.91 | | 0.15 | 0.09 | | 1.00 | 11 | 7.63 | 7.88 | 0.119 | 0.119 | 1.91 | 0.48 | 0.057 | 5% |
| 8.00 | 1.90 | | 0.16 | 0.11 | | 1.00 | 12 | 7.88 | 8.13 | 0.139 | 0.139 | 1.90 | 0.48 | 0.066 | 5% |
| 8.25 | 1.90 | | 0.19 | 0.10 | | 1.00 | 13 | 8.13 | 8.38 | 0.145 | 0.145 | 1.90 | 0.48 | 0.069 | 6% |
| 8.50 | 1.87 | | 0.16 | 0.12 | | 1.00 | 14 | 8.38 | 8.63 | 0.140 | 0.140 | 1.87 | 0.47 | 0.066 | 5% |
| 8.75 | 1.80 | | 0.17 | 0.12 | | 1.00 | 15 | 8.63 | 8.88 | 0.143 | 0.143 | 1.80 | 0.45 | 0.064 | 5% |
| 9.00 | 1.85 | | 0.12 | 0.12 | | 1.00 | 16 | 8.88 | 9.25 | 0.122 | 0.122 | 1.85 | 0.69 | 0.085 | 7% |
| 9.50 | 1.80 | | 0.10 | 0.10 | | 1.00 | 17 | 9.25 | 9.75 | 0.099 | 0.099 | 1.80 | 0.90 | 0.089 | 7% |
| 10.00 | 1.79 | | 0.09 | 0.09 | | 1.00 | 18 | 9.75 | 10.25 | 0.088 | 0.088 | 1.79 | 0.90 | 0.079 | 7% |
| 10.50 | 1.67 | | 0.07 | 0.02 | | 1.00 | 19 | 10.25 | 10.75 | 0.047 | 0.047 | 1.67 | 0.84 | 0.039 | 3% |
| 11.00 | 1.55 | | 0.07 | 0.02 | | 1.00 | 20 | 10.75 | 11.25 | 0.047 | 0.047 | 1.55 | 0.78 | 0.037 | 3% |
| 11.50 | 1.43 | | 0.00 | 0.00 | | 1.00 | 21 | 11.25 | 11.75 | 0.003 | 0.003 | 1.43 | 0.72 | 0.002 | 0% |
| 12.00 | 1.18 | | -0.02 | -0.02 | | 1.00 | 22 | 11.75 | 12.25 | -0.018 | -0.018 | 1.18 | 0.59 | -0.011 | -1% |
| 12.50 | 1.00 | | | | -0.018 | 1.00 | 23 | 12.25 | 12.75 | -0.018 | -0.018 | 1.00 | 0.50 | -0.009 | -1% |
| 13.00 | 0.98 | | | | -0.012 | 1.00 | 24 | 12.75 | 13.30 | -0.012 | -0.012 | 0.98 | 0.54 | -0.007 | -1% |
| 13.60 | 0.00 | | | | 0.000 | 1.00 | 25 | 13.30 | 13.60 | -0.003 | -0.003 | 0.25 | 0.07 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 1.201 | 1 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 1.201 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 17.62 | (m ²) |
| Top Width: | 11.90 | (m) |
| Hydraulic Depth: | 1.481 | (m) |
| Mean Velocity: | 0.068 | (m/s) |
| Froude Number | 0.018 | |
| Photographs taken looking at: | | |
| yes | | |

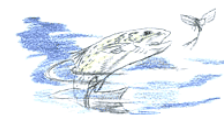
| | | |
|---|------------------------------------|-----|
| Datalogger Notes: | Database | 407 |
| Datalogger Internal Power: | 4.848V | |
| Datalogger External Power: | 14.14V | |
| Datalogger Memory Used: | 69% | |
| Datalogger Clock: | Oct 07, 2005 11:17 | MST |
| Laptop Clock: | Oct 07, 2005 23:27 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum datalogger s/n#110220407 | |
| PT: | Keller s/n 0104640 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | |

Notes: TSS sample collected.
Air Pressure 965.72743 hPa, Water Temp (old thermistor) 4.873952 °C, (new) 5.488429 °C.
Some spikes in data, probably due to backwater from obstruction downstream.



Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: November 2, 2005
Start Time: 3:00 PM MST
End Time: MST

Weather Conditions: +2 C, Partly cloudy, very light wind

River Conditions: Mostly Open, border ice forming

Personnel & Equipment

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

Level Readings

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: Rebar | 1.321 | El: 282.380 |
| Water Level Reading: | 2.426 | El: 281.275 |
| Top of Ice Level Reading: | | El: 281.278 |
| Transducer Reading & Calc'd El | 1.073 | El: 280.202 |
| Other: TD reading | 1.307 | El: 279.968 |

Before Move
After Move

| 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 | Panel Ends at | Panel | 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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | | - | |

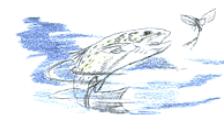
| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: |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

| | |
|----------------------------|--|
| Datalogger Notes: | Database 407 |
| Datalogger Internal Power: | 4.835V |
| Datalogger External Power: | 13.72V |
| Datalogger Memory Used: | 69% |
| Datalogger Clock: | Nov 02, 2005 14:33 MST |
| Laptop Clock: | Nov 02, 2005 14:44 MST |
| Dessicant: | Good |
| Datalogger: | Optimum datalogger s/n#110220407 |
| PT: | Keller s/n 0104640 |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller |

Notes: Transducer was removed and then placed deeper in the flow.
Air Pressure 966.842 hPa, Water Temp (old thermistor) 1.844 °C, (new) 3.288 °C.
Spikes in data
Old thermistor removed

Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Time of Measurement

Date of Measurement: November 17, 2005
Start Time: 11:40 AM MST
End Time: MST

Weather Conditions:

-8 C, Overcast

River Conditions:

Complete ice cover ~ 3-4 cm thick

Personnel & Equipment

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

Level Readings

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: Rebar | 1.145 | El: 282.380 |
| Water Level Reading: | 2.341 | El: 281.184 |
| Top of Ice Level Reading: | 2.265 | El: 281.260 |
| Transducer Reading & Calc'd El | 1.234 | El: 279.950 |
| Other: | | El: |

| 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) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow: | - | |

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

| | |
|----------------------------|--|
| Datalogger Notes: | Database 407 |
| Datalogger Internal Power: | 4.81V |
| Datalogger External Power: | 13.29V |
| Datalogger Memory Used: | 71% |
| Datalogger Clock: | Nov 17, 2005 11:44 MST |
| Laptop Clock: | Nov 17, 2005 11:39 MST |
| Dessicant: | Good |
| Datalogger: | Optimum datalogger s/n#110220407 |
| PT: | Keller s/n 0104640 |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller |

Notes: Air Pressure 979.3199 hPa, Water Temp (new thermistor) 2.808201 °C.

Hydrometric Measurement / Site Visit Record

S5A - Muskeg River Above Muskeg Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Muskeg River
Location: Muskeg River Above Muskeg Creek
Site Name: S5A
Coordinates & Legal: 6351600 N, 476100 E SE-9-96-9-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: December 6, 2005
Start Time: 11:11 AM MST
End Time: 12:56 PM MST

Level Readings

Bench Mark Reading: Rebar 1.241
Water Level Reading: 2.562
Top of Ice Level Reading: 2.485
Transducer Reading & Calc'd El: 1.127
Other:

Setup No. 1

El: 282.380
El: 281.059
El: 279.932
El:

Setup No. 2

El: 282.380
El: 281.029
El: 279.902
El:

Weather Conditions:

-25, Clear, Calm

River Conditions:

Complete ice cover

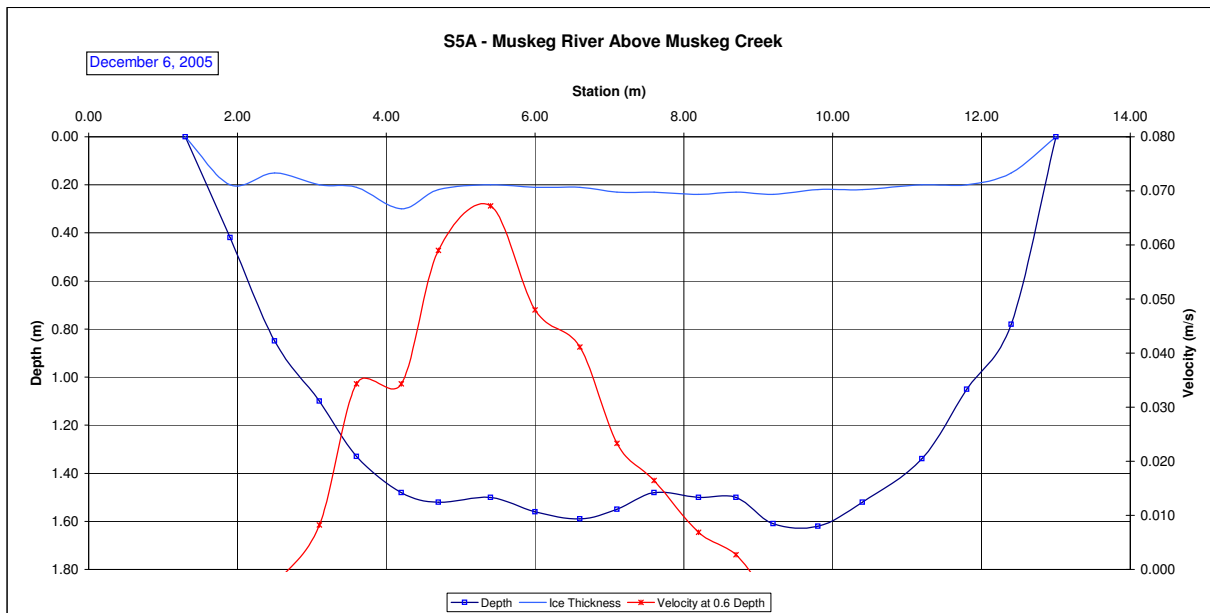
Measurement Data

| 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) | | |
| 1.30 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 1.30 | 1.60 | -0.003 | -0.003 | 0.06 | 0.02 | 0.000 | 0% | |
| 1.90 | 0.42 | 0.20 | | | -0.012 | 0.90 | 2 | 1.60 | 2.20 | -0.012 | -0.011 | 0.22 | 0.13 | -0.001 | -1% | |
| 2.50 | 0.85 | 0.15 | | | -0.003 | 0.90 | 3 | 2.20 | 2.80 | -0.003 | -0.003 | 0.70 | 0.42 | -0.001 | -1% | |
| 3.10 | 1.10 | 0.20 | | | 0.009 | 0.90 | 4 | 2.80 | 3.35 | 0.009 | 0.008 | 0.90 | 0.50 | 0.004 | 2% | |
| 3.60 | 1.33 | 0.21 | 0.04 | 0.04 | | 0.90 | 5 | 3.35 | 3.90 | 0.038 | 0.034 | 1.12 | 0.62 | 0.021 | 10% | |
| 4.20 | 1.48 | 0.30 | 0.04 | 0.04 | | 0.90 | 6 | 3.90 | 4.45 | 0.038 | 0.034 | 1.18 | 0.65 | 0.022 | 11% | |
| 4.70 | 1.52 | 0.22 | 0.06 | 0.07 | | 0.90 | 7 | 4.45 | 5.05 | 0.066 | 0.059 | 1.30 | 0.78 | 0.046 | 22% | |
| 5.40 | 1.50 | 0.20 | 0.07 | 0.08 | | 0.90 | 8 | 5.05 | 5.70 | 0.075 | 0.067 | 1.30 | 0.84 | 0.057 | 27% | |
| 6.00 | 1.56 | 0.21 | 0.05 | 0.06 | | 0.90 | 9 | 5.70 | 6.30 | 0.053 | 0.048 | 1.35 | 0.81 | 0.039 | 18% | |
| 6.60 | 1.59 | 0.21 | 0.05 | 0.05 | | 0.90 | 10 | 6.30 | 6.85 | 0.046 | 0.041 | 1.38 | 0.76 | 0.031 | 15% | |
| 7.10 | 1.55 | 0.23 | 0.02 | 0.03 | | 0.90 | 11 | 6.85 | 7.35 | 0.026 | 0.023 | 1.32 | 0.66 | 0.015 | 7% | |
| 7.60 | 1.48 | 0.23 | 0.01 | 0.03 | | 0.90 | 12 | 7.35 | 7.90 | 0.018 | 0.016 | 1.25 | 0.69 | 0.011 | 5% | |
| 8.20 | 1.50 | 0.24 | 0.01 | 0.01 | | 0.90 | 13 | 7.90 | 8.45 | 0.008 | 0.007 | 1.26 | 0.69 | 0.005 | 2% | |
| 8.70 | 1.50 | 0.23 | 0.00 | 0.00 | | 0.90 | 14 | 8.45 | 8.95 | 0.003 | 0.003 | 1.27 | 0.64 | 0.002 | 1% | |
| 9.20 | 1.61 | 0.24 | -0.01 | -0.01 | | 0.90 | 15 | 8.95 | 9.50 | -0.006 | -0.005 | 1.37 | 0.75 | -0.004 | -2% | |
| 9.80 | 1.62 | 0.22 | -0.01 | -0.01 | | 0.90 | 16 | 9.50 | 10.10 | -0.009 | -0.008 | 1.40 | 0.84 | -0.007 | -3% | |
| 10.40 | 1.52 | 0.22 | -0.01 | -0.01 | | 0.90 | 17 | 10.10 | 10.80 | -0.009 | -0.008 | 1.30 | 0.91 | -0.007 | -4% | |
| 11.20 | 1.34 | 0.20 | -0.01 | -0.01 | | 0.90 | 18 | 10.80 | 11.50 | -0.012 | -0.011 | 1.14 | 0.80 | -0.009 | -4% | |
| 11.80 | 1.05 | 0.20 | | | -0.015 | 0.90 | 19 | 11.50 | 12.10 | -0.015 | -0.014 | 0.85 | 0.51 | -0.007 | -3% | |
| 12.40 | 0.78 | 0.15 | | | -0.015 | 0.90 | 20 | 12.10 | 12.70 | -0.015 | -0.014 | 0.63 | 0.38 | -0.005 | -2% | |
| 13.00 | 0.00 | 0.00 | | | 0.000 | 0.90 | 21 | 12.70 | 13.00 | -0.004 | -0.003 | 0.16 | 0.05 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.211 | 1 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.211 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 12.43 | (m ²) |
| Top Width: | 11.70 | (m) |
| Hydraulic Depth: | 1.063 | (m) |
| Mean Velocity: | 0.017 | (m/s) |
| Froude Number | 0.005 | |
| Photographs taken looking at: | | |
| yes | | |

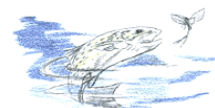
| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 407 |
| Datalogger Internal Power: | 4.737V | |
| Datalogger External Power: | 15.18V | |
| Datalogger Memory Used: | 74% | |
| Datalogger Clock: | Dec 06, 2005 10:13 | MST |
| Laptop Clock: | Dec 06, 2005 10:22 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum datalogger s/n#110220407 | |
| PT: | Keller s/n 0104640 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| | PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: Air Pressure 1001.6132 hPa, Water Temp (new) 19.88 ° C.
Water thermistor certainly not reading correct, malfunctioning.
Error in Setup#2 for level readings, hence not included.



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Personnel & Equipment

Measurement Made By: DB/ND/CT
Data Entry By: DB Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: January 8, 2005
Start Time: 3:32 PM MST
End Time: 3:41 PM MST

Level Readings and Measurement

Bench Mark Reading: bar in PV 2.011 El: 273.600
Water Level Reading: 3.605 El: 272.006
V-notch El: 275.611
Transducer Reading & Est. El.: El:
Other: ice level 3.580 El: 272.031

Weather Conditions:

Clear, calm, -22°C

River Conditions:

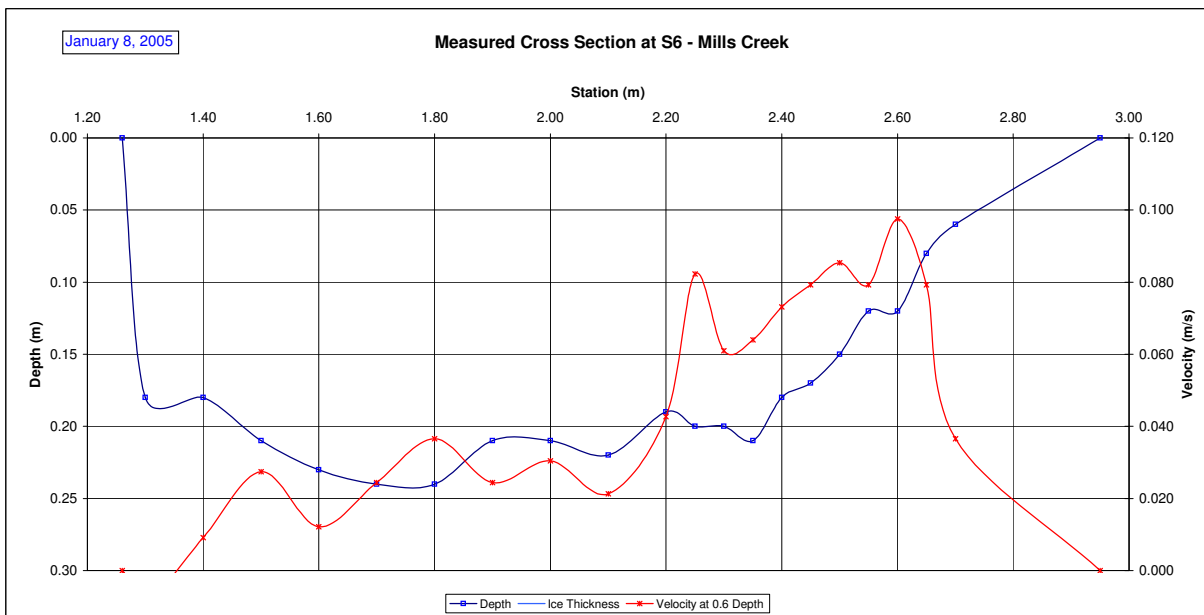
Partial ice cover, section cut through for measurement

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 | 1.26 | 0.00 | | | 0.000 | 1.00 | 1 | 1.26 | 1.28 | -0.002 | -0.002 | 0.05 | 0.00 | 0.000 | 0% | |
| | 1.30 | 0.18 | | | -0.009 | 1.00 | 2 | 1.28 | 1.35 | -0.009 | -0.009 | 0.18 | 0.01 | 0.000 | -1% | |
| | 1.40 | 0.18 | | | 0.009 | 1.00 | 3 | 1.35 | 1.45 | 0.009 | 0.009 | 0.18 | 0.02 | 0.000 | 1% | |
| | 1.50 | 0.21 | | | 0.027 | 1.00 | 4 | 1.45 | 1.55 | 0.027 | 0.027 | 0.21 | 0.02 | 0.001 | 5% | |
| | 1.60 | 0.23 | | | 0.012 | 1.00 | 5 | 1.55 | 1.65 | 0.012 | 0.012 | 0.23 | 0.02 | 0.000 | 2% | |
| | 1.70 | 0.24 | | | 0.024 | 1.00 | 6 | 1.65 | 1.75 | 0.024 | 0.024 | 0.24 | 0.02 | 0.001 | 5% | |
| | 1.80 | 0.24 | | | 0.037 | 1.00 | 7 | 1.75 | 1.85 | 0.037 | 0.037 | 0.24 | 0.02 | 0.001 | 8% | |
| | 1.90 | 0.21 | | | 0.024 | 1.00 | 8 | 1.85 | 1.95 | 0.024 | 0.024 | 0.21 | 0.02 | 0.001 | 4% | |
| | 2.00 | 0.21 | | | 0.030 | 1.00 | 9 | 1.95 | 2.05 | 0.030 | 0.030 | 0.21 | 0.02 | 0.001 | 6% | |
| | 2.10 | 0.22 | | | 0.021 | 1.00 | 10 | 2.05 | 2.15 | 0.021 | 0.021 | 0.22 | 0.02 | 0.000 | 4% | |
| | 2.20 | 0.19 | | | 0.043 | 1.00 | 11 | 2.15 | 2.23 | 0.043 | 0.043 | 0.19 | 0.01 | 0.001 | 5% | |
| | 2.25 | 0.20 | | | 0.082 | 1.00 | 12 | 2.23 | 2.28 | 0.082 | 0.082 | 0.20 | 0.01 | 0.001 | 7% | |
| | 2.30 | 0.20 | | | 0.061 | 1.00 | 13 | 2.28 | 2.33 | 0.061 | 0.061 | 0.20 | 0.01 | 0.001 | 5% | |
| | 2.35 | 0.21 | | | 0.064 | 1.00 | 14 | 2.33 | 2.38 | 0.064 | 0.064 | 0.21 | 0.01 | 0.001 | 6% | |
| | 2.40 | 0.18 | | | 0.073 | 1.00 | 15 | 2.38 | 2.43 | 0.073 | 0.073 | 0.18 | 0.01 | 0.001 | 6% | |
| | 2.45 | 0.17 | | | 0.079 | 1.00 | 16 | 2.43 | 2.48 | 0.079 | 0.079 | 0.17 | 0.01 | 0.001 | 6% | |
| | 2.50 | 0.15 | | | 0.085 | 1.00 | 17 | 2.48 | 2.53 | 0.085 | 0.085 | 0.15 | 0.01 | 0.001 | 6% | |
| | 2.55 | 0.12 | | | 0.079 | 1.00 | 18 | 2.53 | 2.63 | 0.079 | 0.079 | 0.12 | 0.01 | 0.001 | 8% | |
| | 2.60 | 0.12 | | | 0.098 | 1.00 | 19 | 2.63 | 2.73 | 0.098 | 0.098 | 0.12 | 0.01 | 0.001 | 10% | |
| | 2.65 | 0.08 | | | 0.079 | 1.00 | 20 | 2.73 | 2.77 | 0.079 | 0.079 | 0.08 | 0.00 | 0.000 | 2% | |
| | 2.70 | 0.06 | | | 0.037 | 1.00 | 21 | 2.63 | 2.83 | 0.037 | 0.037 | 0.06 | 0.01 | 0.000 | 4% | |
| | 2.95 | 0.00 | | | 0.000 | 1.00 | 22 | 2.83 | 2.95 | 0.009 | 0.009 | 0.02 | 0.00 | 0.000 | 0% | |
| | | | | | | | | | | | | | | | 100% | |

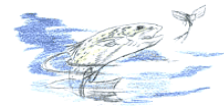
| | | |
|--------------------------------|-------|--------|
| Total Flow: | 0.012 | (m³/s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 0.30 | (m²) |
| Top Width: | 1.69 | (m) |
| Hydraulic Depth: | 0.177 | (m) |
| Mean Velocity: | 0.039 | (m/s) |
| Froude Number | 0.029 | |
| Photographs 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: | |



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Personnel & Equipment

Measurement Made By: RM/ND/CT
Data Entry By: ND Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: February 4, 2005
Start Time: 5:42 PM MST
End Time: 6:08 PM MST

Level Readings and Measurement

Bench Mark Reading: bar in PVC 2.779
Water Level Reading: 4.393
V-notch
Transducer Reading & Est. El.:
Other: ice level 4.364

Setup No. 1

El: 273.600
El: 271.986
El: 276.379
El: 272.015

Setup No. 2

El: 273.600
El: 271.978
El:
El:

Weather Conditions:

Cloudy, -20°C

River Conditions:

Partial ice cover, section cut through for measurement

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) | | |
| 2.20 | 0.00 | | | | 0.000 | 1.00 | 1 | 2.20 | 2.30 | 0.011 | 0.011 | 0.05 | 0.00 | 0.000 | 0% | |
| 2.40 | 0.20 | | | | 0.043 | 1.00 | 2 | 2.30 | 2.45 | 0.043 | 0.043 | 0.20 | 0.03 | 0.001 | 7% | |
| 2.50 | 0.20 | | | | 0.046 | 1.00 | 3 | 2.45 | 2.55 | 0.046 | 0.046 | 0.20 | 0.02 | 0.001 | 5% | |
| 2.60 | 0.21 | | | | 0.015 | 1.00 | 4 | 2.55 | 2.65 | 0.015 | 0.015 | 0.21 | 0.02 | 0.000 | 2% | |
| 2.70 | 0.21 | | | | 0.012 | 1.00 | 5 | 2.65 | 2.75 | 0.012 | 0.012 | 0.21 | 0.02 | 0.000 | 1% | |
| 2.80 | 0.20 | | | | 0.018 | 1.00 | 6 | 2.75 | 2.85 | 0.018 | 0.018 | 0.20 | 0.02 | 0.000 | 2% | |
| 2.90 | 0.19 | | | | 0.015 | 1.00 | 7 | 2.85 | 2.95 | 0.015 | 0.015 | 0.19 | 0.02 | 0.000 | 2% | |
| 3.00 | 0.20 | | | | 0.012 | 1.00 | 8 | 2.95 | 3.05 | 0.012 | 0.012 | 0.20 | 0.02 | 0.000 | 1% | |
| 3.10 | 0.21 | | | | 0.003 | 1.00 | 9 | 3.05 | 3.15 | 0.003 | 0.003 | 0.21 | 0.02 | 0.000 | 0% | |
| 3.20 | 0.22 | | | | 0.021 | 1.00 | 10 | 3.15 | 3.25 | 0.021 | 0.021 | 0.22 | 0.02 | 0.000 | 2% | |
| 3.30 | 0.24 | | | | 0.037 | 1.00 | 11 | 3.25 | 3.35 | 0.037 | 0.037 | 0.24 | 0.02 | 0.001 | 5% | |
| 3.40 | 0.25 | | | | 0.064 | 1.00 | 12 | 3.35 | 3.45 | 0.064 | 0.064 | 0.25 | 0.03 | 0.002 | 8% | |
| 3.50 | 0.30 | | | | 0.055 | 1.00 | 13 | 3.45 | 3.55 | 0.055 | 0.055 | 0.30 | 0.03 | 0.002 | 9% | |
| 3.60 | 0.22 | | | | 0.061 | 1.00 | 14 | 3.55 | 3.65 | 0.061 | 0.061 | 0.22 | 0.02 | 0.001 | 7% | |
| 3.70 | 0.25 | | | | 0.055 | 1.00 | 15 | 3.65 | 3.75 | 0.055 | 0.055 | 0.25 | 0.02 | 0.001 | 7% | |
| 3.80 | 0.28 | | | | 0.046 | 1.00 | 16 | 3.75 | 3.90 | 0.046 | 0.046 | 0.28 | 0.04 | 0.002 | 10% | |
| 4.00 | 0.27 | | | | 0.052 | 1.00 | 17 | 3.90 | 4.08 | 0.052 | 0.052 | 0.27 | 0.05 | 0.002 | 13% | |
| 4.15 | 0.22 | | | | 0.018 | 1.00 | 18 | 4.08 | 4.23 | 0.018 | 0.018 | 0.22 | 0.03 | 0.001 | 3% | |
| 4.30 | 0.20 | | | | 0.024 | 1.00 | 19 | 4.23 | 4.38 | 0.024 | 0.024 | 0.20 | 0.03 | 0.001 | 4% | |
| 4.45 | 0.21 | | | | 0.021 | 1.00 | 20 | 4.38 | 4.53 | 0.021 | 0.021 | 0.21 | 0.03 | 0.001 | 4% | |
| 4.60 | 0.15 | | | | 0.021 | 1.00 | 21 | 4.53 | 4.68 | 0.021 | 0.021 | 0.15 | 0.02 | 0.000 | 3% | |
| 4.75 | 0.17 | | | | 0.021 | 1.00 | 22 | 4.68 | 4.78 | 0.021 | 0.021 | 0.17 | 0.02 | 0.000 | 2% | |
| 4.80 | 0.10 | | | | 0.046 | 1.00 | 23 | 4.78 | 4.85 | 0.046 | 0.046 | 0.10 | 0.01 | 0.000 | 2% | |
| 4.90 | 0.06 | | | | 0.070 | 1.00 | 24 | 4.85 | 4.95 | 0.070 | 0.070 | 0.06 | 0.01 | 0.000 | 2% | |
| 5.00 | 0.00 | | | | 0.000 | 1.00 | 25 | 4.95 | 5.00 | 0.018 | 0.018 | 0.02 | 0.00 | 0.000 | 0% | |
| | | | | | | | | | | | | | | | 100% | |

| | | |
|--------------------------------|------------------------------|---------------------|
| Total Flow: | 0.019 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 0.56 | (m ²) |
| Top Width: | 2.80 | (m) |
| Hydraulic Depth: | 0.201 | (m) |
| Mean Velocity: | 0.034 | (m/s) |
| Froude Number | 0.024 | |
| 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:

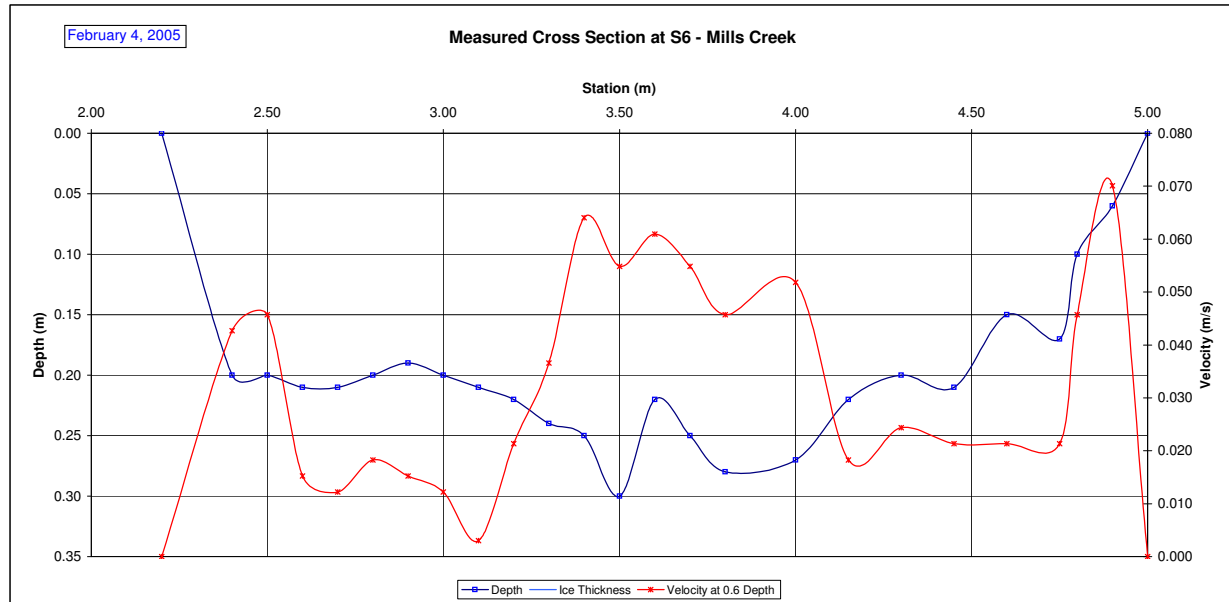
Power:

MST
MST

Notes:

No Transducer in place - removed for the winter

Ice was broken away from edges on section in order to take wading measurement



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
 Location: Mills Creek
 Site Name: S6
 Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4
Time of Measurement
 Date of Measurement: March 3, 2005
 Start Time: 4:02 PM MST
 End Time: 4:21 PM MST

Weather Conditions: Clear, +5°C
River Conditions: Open

Personnel & Equipment

Measurement Made By: RM/ND/CT
 Data Entry By: ND Checked: PM
 Meter Type and No.: March Mc Birney Flo-Mate 2000
 s/n 2004521

Level Readings and Measurement

Bench Mark Reading: bar in PVI 1.677 El: 273.600
 Water Level Reading: 3.274 El: 272.003
 V-notch 275.277 El:
 Transducer Reading & Est. El.: El:
 Other: ice level 3.242 El: 272.035

Setup No. 1

Setup No. 2

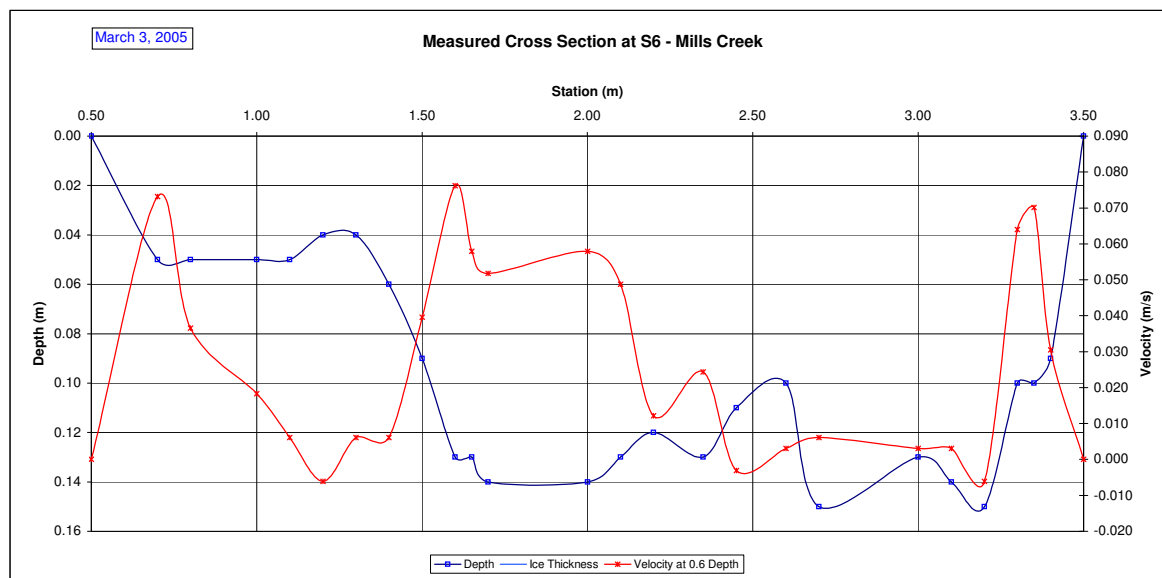
LB

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) | |
| 0.50 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.50 | 0.60 | 0.018 | 0.018 | 0.01 | 0.00 | 0.000 | 0% |
| 0.70 | 0.05 | | | | 0.073 | 1.00 | 2 | 0.60 | 0.75 | 0.073 | 0.073 | 0.05 | 0.01 | 0.001 | 7% |
| 0.80 | 0.05 | | | | 0.037 | 1.00 | 3 | 0.75 | 0.90 | 0.037 | 0.037 | 0.05 | 0.01 | 0.000 | 3% |
| 1.00 | 0.05 | | | | 0.018 | 1.00 | 4 | 0.90 | 1.05 | 0.018 | 0.018 | 0.05 | 0.01 | 0.000 | 2% |
| 1.10 | 0.05 | | | | 0.006 | 1.00 | 5 | 1.05 | 1.15 | 0.006 | 0.006 | 0.05 | 0.00 | 0.000 | 0% |
| 1.20 | 0.04 | | | | -0.006 | 1.00 | 6 | 1.15 | 1.25 | -0.006 | -0.006 | 0.04 | 0.00 | 0.000 | 0% |
| 1.30 | 0.04 | | | | 0.006 | 1.00 | 7 | 1.25 | 1.35 | 0.006 | 0.006 | 0.04 | 0.00 | 0.000 | 0% |
| 1.40 | 0.06 | | | | 0.006 | 1.00 | 8 | 1.35 | 1.45 | 0.006 | 0.006 | 0.06 | 0.01 | 0.000 | 0% |
| 1.50 | 0.09 | | | | 0.040 | 1.00 | 9 | 1.45 | 1.55 | 0.040 | 0.040 | 0.09 | 0.01 | 0.000 | 5% |
| 1.60 | 0.13 | | | | 0.076 | 1.00 | 10 | 1.55 | 1.63 | 0.076 | 0.076 | 0.13 | 0.01 | 0.001 | 9% |
| 1.65 | 0.13 | | | | 0.058 | 1.00 | 11 | 1.63 | 1.68 | 0.058 | 0.058 | 0.13 | 0.01 | 0.000 | 5% |
| 1.70 | 0.14 | | | | 0.052 | 1.00 | 12 | 1.68 | 1.85 | 0.052 | 0.052 | 0.14 | 0.02 | 0.001 | 16% |
| 2.00 | 0.14 | | | | 0.058 | 1.00 | 13 | 1.85 | 2.05 | 0.058 | 0.058 | 0.14 | 0.03 | 0.002 | 21% |
| 2.10 | 0.13 | | | | 0.049 | 1.00 | 14 | 2.05 | 2.15 | 0.049 | 0.049 | 0.13 | 0.01 | 0.001 | 8% |
| 2.20 | 0.12 | | | | 0.012 | 1.00 | 15 | 2.15 | 2.28 | 0.012 | 0.012 | 0.12 | 0.02 | 0.000 | 2% |
| 2.35 | 0.13 | | | | 0.024 | 1.00 | 16 | 2.28 | 2.40 | 0.024 | 0.024 | 0.13 | 0.02 | 0.000 | 5% |
| 2.45 | 0.11 | | | | -0.003 | 1.00 | 17 | 2.40 | 2.53 | -0.003 | -0.003 | 0.11 | 0.01 | 0.000 | -1% |
| 2.60 | 0.10 | | | | 0.003 | 1.00 | 18 | 2.53 | 2.65 | 0.003 | 0.003 | 0.10 | 0.01 | 0.000 | 0% |
| 2.70 | 0.15 | | | | 0.006 | 1.00 | 19 | 2.65 | 2.85 | 0.006 | 0.006 | 0.15 | 0.03 | 0.000 | 2% |
| 3.00 | 0.13 | | | | 0.003 | 1.00 | 20 | 2.85 | 3.05 | 0.003 | 0.003 | 0.13 | 0.03 | 0.000 | 1% |
| 3.10 | 0.14 | | | | 0.003 | 1.00 | 21 | 3.05 | 3.15 | 0.003 | 0.003 | 0.14 | 0.01 | 0.000 | 1% |
| 3.20 | 0.15 | | | | -0.006 | 1.00 | 22 | 3.15 | 3.25 | -0.006 | -0.006 | 0.15 | 0.01 | 0.000 | -1% |
| 3.30 | 0.10 | | | | 0.064 | 1.00 | 23 | 3.25 | 3.33 | 0.064 | 0.064 | 0.10 | 0.01 | 0.000 | 6% |
| 3.35 | 0.10 | | | | 0.070 | 1.00 | 24 | 3.33 | 3.38 | 0.070 | 0.070 | 0.10 | 0.00 | 0.000 | 4% |
| 3.40 | 0.09 | | | | 0.030 | 1.00 | 25 | 3.38 | 3.45 | 0.030 | 0.030 | 0.09 | 0.01 | 0.000 | 3% |
| 3.50 | 0.00 | | | | 0.000 | 1.00 | 26 | 3.45 | 3.50 | 0.008 | 0.008 | 0.02 | 0.00 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | | 0.008 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.008 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.30 | (m ²) |
| Top Width: | 3.00 | (m) |
| Hydraulic Depth: | 0.099 | (m) |
| Mean Velocity: | 0.027 | (m/s) |
| Froude Number | 0.027 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |
| Notes: | | |
| No Transducer in place - removed for the winter | | |

| | |
|----------------------------|-----|
| Datalogger Notes: | |
| Datalogger Internal Power: | |
| Datalogger External Power: | |
| Datalogger Memory Used: | |
| Datalogger Clock: | MST |
| Laptop Clock: | MST |
| Dessicant: | |
| Datalogger: | |
| PT: | |
| Power: | |



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4
Time of Measurement: April 5, 2005
Date of Measurement: 2:25 PM MDT
Start Time: 2:46 PM MDT
End Time:

Personnel & Equipment

Measurement Made By: ND/CT
Data Entry By: ND Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measurem

Bench Mark Reading: bar in PVI 2.047
Water Level Reading: 3.569
V-notch
Transducer Reading & Est. El.:
Other: ice level

Setup No. 1

El: 273.600
El: 272.078
El: 275.647
El:
El: 275.647

Setup No. 2

El: 273.600
El: 272.083
El:
El:
El:

Weather Conditions: Clear, +10°C
River Conditions: Open

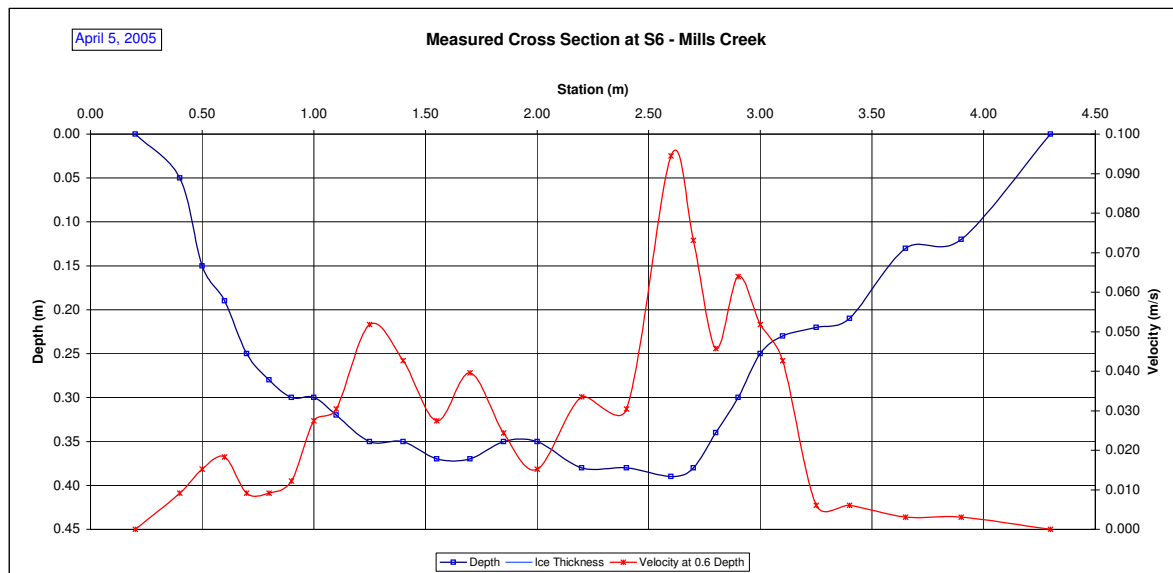
Measurement Data

| 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) | | |
| 0.20 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.20 | 0.30 | 0.002 | 0.002 | 0.01 | 0.00 | 0.000 | 0% | |
| 0.40 | 0.05 | | | | 0.009 | 1.00 | 2 | 0.30 | 0.45 | 0.009 | 0.009 | 0.05 | 0.01 | 0.000 | 0% | |
| 0.50 | 0.15 | | | | 0.015 | 1.00 | 3 | 0.45 | 0.55 | 0.015 | 0.015 | 0.15 | 0.02 | 0.000 | 1% | |
| 0.60 | 0.19 | | | | 0.018 | 1.00 | 4 | 0.55 | 0.65 | 0.018 | 0.018 | 0.19 | 0.02 | 0.000 | 1% | |
| 0.70 | 0.25 | | | | 0.009 | 1.00 | 5 | 0.65 | 0.75 | 0.009 | 0.009 | 0.25 | 0.03 | 0.000 | 1% | |
| 0.80 | 0.28 | | | | 0.009 | 1.00 | 6 | 0.75 | 0.85 | 0.009 | 0.009 | 0.28 | 0.03 | 0.000 | 1% | |
| 0.90 | 0.30 | | | | 0.012 | 1.00 | 7 | 0.85 | 0.95 | 0.012 | 0.012 | 0.30 | 0.03 | 0.000 | 1% | |
| 1.00 | 0.30 | | | | 0.027 | 1.00 | 8 | 0.95 | 1.05 | 0.027 | 0.027 | 0.30 | 0.03 | 0.001 | 2% | |
| 1.10 | 0.32 | | | | 0.030 | 1.00 | 9 | 1.05 | 1.18 | 0.030 | 0.030 | 0.32 | 0.04 | 0.001 | 4% | |
| 1.25 | 0.35 | | | | 0.052 | 1.00 | 10 | 1.18 | 1.33 | 0.052 | 0.052 | 0.35 | 0.05 | 0.003 | 8% | |
| 1.40 | 0.35 | | | | 0.043 | 1.00 | 11 | 1.33 | 1.48 | 0.043 | 0.043 | 0.35 | 0.05 | 0.002 | 7% | |
| 1.55 | 0.37 | | | | 0.027 | 1.00 | 12 | 1.48 | 1.63 | 0.027 | 0.027 | 0.37 | 0.06 | 0.002 | 4% | |
| 1.70 | 0.37 | | | | 0.040 | 1.00 | 13 | 1.63 | 1.78 | 0.040 | 0.040 | 0.37 | 0.06 | 0.002 | 6% | |
| 1.85 | 0.35 | | | | 0.024 | 1.00 | 14 | 1.78 | 1.93 | 0.024 | 0.024 | 0.35 | 0.05 | 0.001 | 4% | |
| 2.00 | 0.35 | | | | 0.015 | 1.00 | 15 | 1.93 | 2.10 | 0.015 | 0.015 | 0.35 | 0.06 | 0.001 | 3% | |
| 2.20 | 0.38 | | | | 0.034 | 1.00 | 16 | 2.10 | 2.30 | 0.034 | 0.034 | 0.38 | 0.08 | 0.003 | 7% | |
| 2.40 | 0.38 | | | | 0.030 | 1.00 | 17 | 2.30 | 2.50 | 0.030 | 0.030 | 0.38 | 0.08 | 0.002 | 7% | |
| 2.60 | 0.39 | | | | 0.094 | 1.00 | 18 | 2.50 | 2.65 | 0.094 | 0.094 | 0.39 | 0.06 | 0.006 | 16% | |
| 2.70 | 0.38 | | | | 0.073 | 1.00 | 19 | 2.65 | 2.75 | 0.073 | 0.073 | 0.38 | 0.04 | 0.003 | 8% | |
| 2.80 | 0.34 | | | | 0.046 | 1.00 | 20 | 2.75 | 2.85 | 0.046 | 0.046 | 0.34 | 0.03 | 0.002 | 5% | |
| 2.90 | 0.30 | | | | 0.064 | 1.00 | 21 | 2.85 | 2.95 | 0.064 | 0.064 | 0.30 | 0.03 | 0.002 | 6% | |
| 3.00 | 0.25 | | | | 0.052 | 1.00 | 22 | 2.95 | 3.05 | 0.052 | 0.052 | 0.25 | 0.02 | 0.001 | 4% | |
| 3.10 | 0.23 | | | | 0.043 | 1.00 | 23 | 3.05 | 3.18 | 0.043 | 0.043 | 0.23 | 0.03 | 0.001 | 4% | |
| 3.25 | 0.22 | | | | 0.006 | 1.00 | 24 | 3.18 | 3.33 | 0.006 | 0.006 | 0.22 | 0.03 | 0.000 | 1% | |
| 3.40 | 0.21 | | | | 0.006 | 1.00 | 25 | 3.33 | 3.53 | 0.006 | 0.006 | 0.21 | 0.04 | 0.000 | 1% | |
| 3.65 | 0.13 | | | | 0.003 | 1.00 | 26 | 3.53 | 3.78 | 0.003 | 0.003 | 0.13 | 0.03 | 0.000 | 0% | |
| 3.90 | 0.12 | | | | 0.003 | 1.00 | 27 | 3.78 | 4.10 | 0.003 | 0.003 | 0.12 | 0.04 | 0.000 | 0% | |
| 4.30 | 0.00 | | | | 0.000 | 1.00 | 28 | 4.10 | 4.30 | 0.001 | 0.001 | 0.03 | 0.01 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | | 0.034 | 100% |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.034 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.04 | (m ²) |
| Top Width: | 4.10 | (m) |
| Hydraulic Depth: | 0.255 | (m) |
| Mean Velocity: | 0.033 | (m/s) |
| Froude Number | 0.021 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|----------------------------|-------------------------|
| Datalogger Notes: | No transducer installed |
| Datalogger Internal Power: | |
| Datalogger External Power: | |
| Datalogger Memory Used: | |
| Datalogger Clock: | MST |
| Laptop Clock: | MST |
| Dessicant: | |
| Datalogger: | |
| PT: | |
| Power: | |

Notes:
No Transducer in place - removed for the winter



Hydrometric Measurement / Site Visit Record

S6 - Mills Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Mills Creek
Location: Mills Creek
Site Name: S6
Coordinates & Legal: 6344743 N, 463829 E NW-17-95-10-W4

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: ND Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: April 24, 2005
Start Time: 4:45 PM MDT
End Time: 5:03 PM MDT

Level Readings and Measurement

| Setup No. 1 | | Setup No. 2 | |
|--------------------------------|-------|-------------|---------|
| Bench Mark Reading: bar in PV | 1.689 | El: | 273.600 |
| Water Level Reading: | 3.154 | El: | 272.135 |
| V-notch | | El: | 275.289 |
| Transducer Reading & Est. El.: | 0.589 | El: | 271.547 |
| Other: ice level | | El: | 271.538 |

Weather Conditions: Clear, Calm +15°C

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 | Percentage of Total | |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) | | |
| LB | 0.40 | 0.00 | | | 0.000 | 1.00 | 1 | 0.40 | 0.50 | 0.002 | 0.002 | 0.01 | 0.00 | 0.000 | 0% | |
| | 0.60 | 0.04 | | | 0.006 | 1.00 | 2 | 0.50 | 0.70 | 0.006 | 0.006 | 0.04 | 0.01 | 0.000 | 0% | |
| | 0.80 | 0.10 | | | 0.037 | 1.00 | 3 | 0.70 | 0.90 | 0.037 | 0.037 | 0.10 | 0.02 | 0.001 | 2% | |
| | 1.00 | 0.27 | | | 0.018 | 1.00 | 4 | 0.90 | 1.10 | 0.018 | 0.018 | 0.27 | 0.05 | 0.001 | 2% | |
| | 1.20 | 0.30 | | | 0.058 | 1.00 | 5 | 1.10 | 1.30 | 0.058 | 0.058 | 0.30 | 0.06 | 0.003 | 8% | |
| | 1.40 | 0.31 | | | 0.046 | 1.00 | 6 | 1.30 | 1.50 | 0.046 | 0.046 | 0.31 | 0.06 | 0.003 | 7% | |
| | 1.60 | 0.29 | | | 0.088 | 1.00 | 7 | 1.50 | 1.70 | 0.088 | 0.088 | 0.29 | 0.06 | 0.005 | 12% | |
| | 1.80 | 0.29 | | | 0.088 | 1.00 | 8 | 1.70 | 1.90 | 0.088 | 0.088 | 0.29 | 0.06 | 0.005 | 12% | |
| | 2.00 | 0.30 | | | 0.027 | 1.00 | 9 | 1.90 | 2.10 | 0.027 | 0.027 | 0.30 | 0.06 | 0.002 | 4% | |
| | 2.20 | 0.32 | | | 0.015 | 1.00 | 10 | 2.10 | 2.30 | 0.015 | 0.015 | 0.32 | 0.06 | 0.001 | 2% | |
| | 2.40 | 0.31 | | | 0.030 | 1.00 | 11 | 2.30 | 2.50 | 0.030 | 0.030 | 0.31 | 0.06 | 0.002 | 5% | |
| | 2.60 | 0.28 | | | 0.024 | 1.00 | 12 | 2.50 | 2.65 | 0.024 | 0.024 | 0.28 | 0.04 | 0.001 | 2% | |
| | 2.70 | 0.30 | | | 0.070 | 1.00 | 13 | 2.65 | 2.75 | 0.070 | 0.070 | 0.30 | 0.03 | 0.002 | 5% | |
| | 2.80 | 0.32 | | | 0.110 | 1.00 | 14 | 2.75 | 2.85 | 0.110 | 0.110 | 0.32 | 0.03 | 0.004 | 8% | |
| | 2.90 | 0.29 | | | 0.122 | 1.00 | 15 | 2.85 | 2.95 | 0.122 | 0.122 | 0.29 | 0.03 | 0.004 | 8% | |
| | 3.00 | 0.29 | | | 0.055 | 1.00 | 16 | 2.95 | 3.10 | 0.055 | 0.055 | 0.29 | 0.04 | 0.002 | 6% | |
| | 3.20 | 0.24 | | | 0.012 | 1.00 | 17 | 3.10 | 3.40 | 0.012 | 0.012 | 0.24 | 0.07 | 0.001 | 2% | |
| | 3.60 | 0.23 | | | 0.015 | 1.00 | 18 | 3.40 | 3.65 | 0.015 | 0.015 | 0.23 | 0.06 | 0.001 | 2% | |
| | 3.70 | 0.22 | | | 0.030 | 1.00 | 19 | 3.65 | 3.75 | 0.030 | 0.030 | 0.22 | 0.02 | 0.001 | 2% | |
| | 3.80 | 0.19 | | | 0.088 | 1.00 | 20 | 3.75 | 3.85 | 0.088 | 0.088 | 0.19 | 0.02 | 0.002 | 4% | |
| RB | 3.90 | 0.12 | | | 0.162 | 1.00 | 21 | 3.85 | 3.95 | 0.162 | 0.162 | 0.12 | 0.01 | 0.002 | 5% | |
| | 4.00 | 0.12 | | | 0.009 | 1.00 | 22 | 3.95 | 4.30 | 0.009 | 0.009 | 0.12 | 0.04 | 0.000 | 1% | |
| | 4.60 | 0.00 | | | 0.000 | 1.00 | 23 | 4.30 | 4.60 | 0.002 | 0.002 | 0.03 | 0.01 | 0.000 | 0% | |
| | | | | | | | | | | | | | | | 100% | |

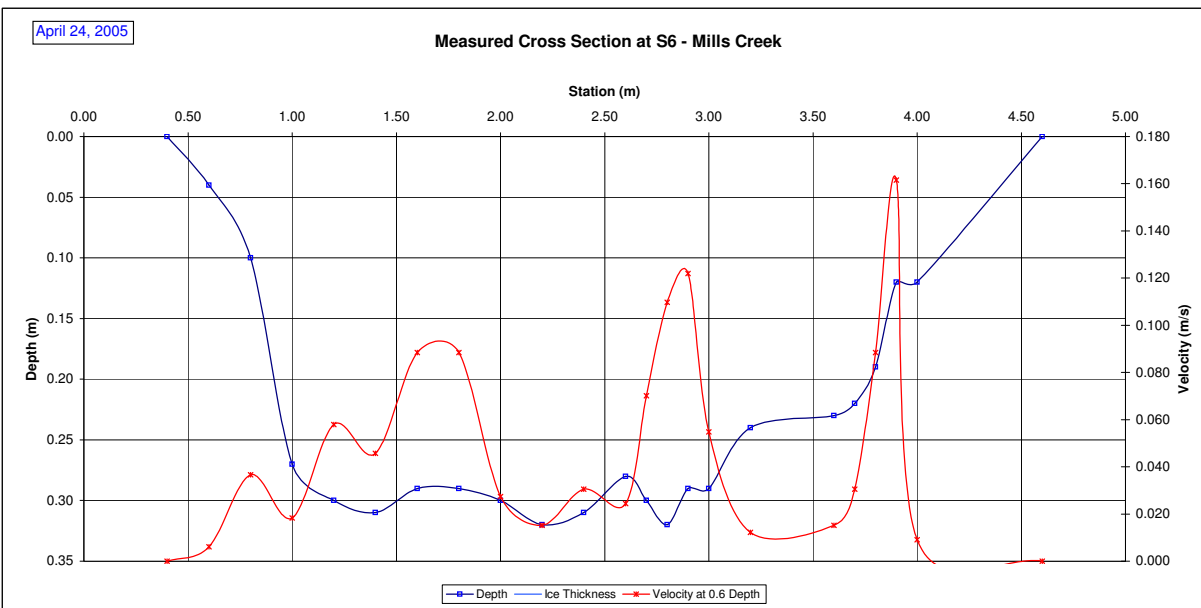
| | | |
|--------------------------------|-------|--------|
| Total Flow: | 0.042 | (m³/s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 0.92 | (m²) |
| Top Width: | 4.20 | (m) |
| Hydraulic Depth: | 0.218 | (m) |
| Mean Velocity: | 0.046 | (m/s) |
| Froude Number | 0.031 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

TSS Sample Taken
Equipment installed. Transducer clamped to a concrete block and placed in the flow.
Sample rate set to 15 mins.

Datalogger Notes:

Datalogger Internal Power: 11.34 V 100%
Datalogger External Power: 13.47 V 84%
Datalogger Memory Used: 0%
Datalogger Clock: Apr 24, 2005 15:37 MST
Laptop Clock: Apr 24, 2005 15:37 MST
Dessicant: Good
Datalogger: Lakewood UL RX 2 HC #207110
PT: Keller LE8363K 5psi #1747
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

Personnel & Equipment

Measurement Made By: FF/RM
Data Entry By: FF Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: May 30, 2005
Start Time: 12:30 PM MDT
End Time: 12:45 PM MDT

Level Readings and Measurement

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: bar in PV | 1.601 | 1.511 |
| Water Level Reading: | 3.006 | 2.91 |
| V-notch | | |
| Transducer Reading & Est. El.: | 0.639 | 0.639 |
| Other: ice level | | |

Weather Conditions: Clear, Light Wind, +22°C

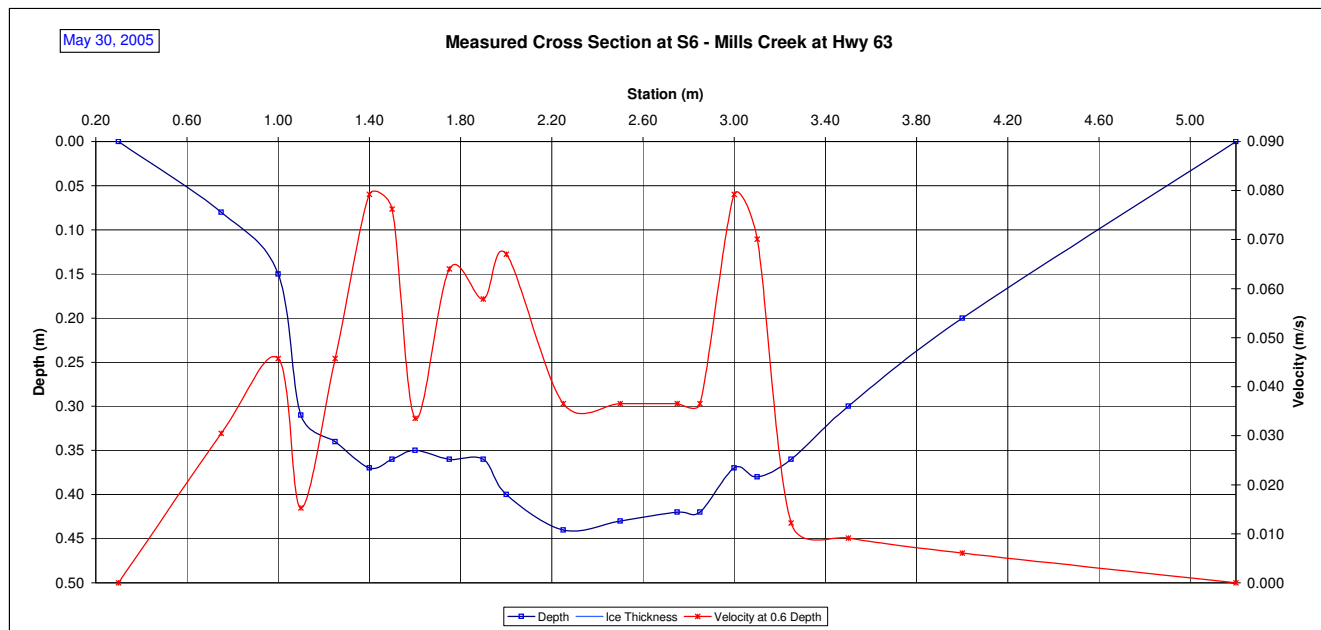
River Conditions: Open water

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 | 0.30 | 0.00 | | | 0.000 | 1.00 | 1 | 0.30 | 0.53 | 0.008 | 0.008 | 0.02 | 0.00 | 0.000 | 0% | | | | | | | | | | | |
| | 0.75 | 0.08 | | | 0.030 | 1.00 | 2 | 0.53 | 0.88 | 0.030 | 0.030 | 0.08 | 0.03 | 0.001 | 2% | | | | | | | | | | | |
| | 1.00 | 0.15 | | | 0.046 | 1.00 | 3 | 0.88 | 1.05 | 0.046 | 0.046 | 0.15 | 0.03 | 0.001 | 3% | | | | | | | | | | | |
| | 1.10 | 0.31 | | | 0.015 | 1.00 | 4 | 1.05 | 1.18 | 0.015 | 0.015 | 0.31 | 0.04 | 0.001 | 1% | | | | | | | | | | | |
| | 1.25 | 0.34 | | | 0.046 | 1.00 | 5 | 1.18 | 1.33 | 0.046 | 0.046 | 0.34 | 0.05 | 0.002 | 5% | | | | | | | | | | | |
| | 1.40 | 0.37 | | | 0.079 | 1.00 | 6 | 1.33 | 1.45 | 0.079 | 0.079 | 0.37 | 0.05 | 0.004 | 8% | | | | | | | | | | | |
| | 1.50 | 0.36 | | | 0.076 | 1.00 | 7 | 1.45 | 1.55 | 0.076 | 0.076 | 0.36 | 0.04 | 0.003 | 6% | | | | | | | | | | | |
| | 1.60 | 0.35 | | | 0.034 | 1.00 | 8 | 1.55 | 1.68 | 0.034 | 0.034 | 0.35 | 0.04 | 0.001 | 3% | | | | | | | | | | | |
| | 1.75 | 0.36 | | | 0.064 | 1.00 | 9 | 1.68 | 1.83 | 0.064 | 0.064 | 0.36 | 0.05 | 0.003 | 7% | | | | | | | | | | | |
| | 1.90 | 0.36 | | | 0.058 | 1.00 | 10 | 1.83 | 1.95 | 0.058 | 0.058 | 0.36 | 0.05 | 0.003 | 6% | | | | | | | | | | | |
| | 2.00 | 0.40 | | | 0.067 | 1.00 | 11 | 1.95 | 2.13 | 0.067 | 0.067 | 0.40 | 0.07 | 0.005 | 10% | | | | | | | | | | | |
| | 2.25 | 0.44 | | | 0.037 | 1.00 | 12 | 2.13 | 2.38 | 0.037 | 0.037 | 0.44 | 0.11 | 0.004 | 9% | | | | | | | | | | | |
| | 2.50 | 0.43 | | | 0.037 | 1.00 | 13 | 2.38 | 2.63 | 0.037 | 0.037 | 0.43 | 0.11 | 0.004 | 9% | | | | | | | | | | | |
| | 2.75 | 0.42 | | | 0.037 | 1.00 | 14 | 2.63 | 2.80 | 0.037 | 0.037 | 0.42 | 0.07 | 0.003 | 6% | | | | | | | | | | | |
| | 2.85 | 0.42 | | | 0.037 | 1.00 | 15 | 2.80 | 2.93 | 0.037 | 0.037 | 0.42 | 0.05 | 0.002 | 4% | | | | | | | | | | | |
| | 3.00 | 0.37 | | | 0.079 | 1.00 | 16 | 2.93 | 3.05 | 0.079 | 0.079 | 0.37 | 0.05 | 0.004 | 8% | | | | | | | | | | | |
| | 3.10 | 0.38 | | | 0.070 | 1.00 | 17 | 3.05 | 3.18 | 0.070 | 0.070 | 0.38 | 0.05 | 0.003 | 7% | | | | | | | | | | | |
| | 3.25 | 0.36 | | | 0.012 | 1.00 | 18 | 3.18 | 3.38 | 0.012 | 0.012 | 0.36 | 0.07 | 0.001 | 2% | | | | | | | | | | | |
| | 3.50 | 0.30 | | | 0.009 | 1.00 | 19 | 3.38 | 3.75 | 0.009 | 0.009 | 0.30 | 0.11 | 0.001 | 2% | | | | | | | | | | | |
| | RB | 4.00 | 0.20 | | | 0.006 | 1.00 | 20 | 3.75 | 4.60 | 0.006 | 0.006 | 0.20 | 0.17 | 0.001 | 2% | | | | | | | | | | |
| 5.20 | | 0.00 | | | 0.000 | 1.00 | 21 | 4.60 | 5.20 | 0.002 | 0.002 | 0.05 | 0.03 | 0.000 | 0% | | | | | | | | | | | |
| | | | | | | | | | | | | | | | 100% | | | | | | | | | | | |

| | | |
|--|-------|--------|
| Total Flow: | 0.046 | (m³/s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.27 | (m²) |
| Top Width: | 4.90 | (m) |
| Hydraulic Depth: | 0.258 | (m) |
| Mean Velocity: | 0.037 | (m/s) |
| Froude Number | 0.023 | |
| Photographs taken looking at: Upstream, downstream, across | | |
| Notes: Data looks good. Stage was very high; check that notch was not exceeded. | | |

| | | |
|----------------------------|-----------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 13.02V | 84% |
| Datalogger Memory Used: | 15% | |
| Datalogger Clock: | May 30, 2005 11:27 AM | MST |
| Laptop Clock: | May 30, 2005 11:28 AM | MST |
| Dessicant: | 95% Good | |
| Datalogger: | s/n 207110 | |
| PT: | s/n 001747 | |
| 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: July 14, 2005
Start Time: 2:31 PM MDT
End Time: 2:48 PM MDT

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measurement

Bench Mark Reading: bar in PVI 1.811
Water Level Reading: 3.235
V-notch
Transducer Reading & Est. El.: 0.623
Other: ice level

Setup No. 1

El: 273.600
El: 272.176
El:
El: 271.553

Setup No. 2

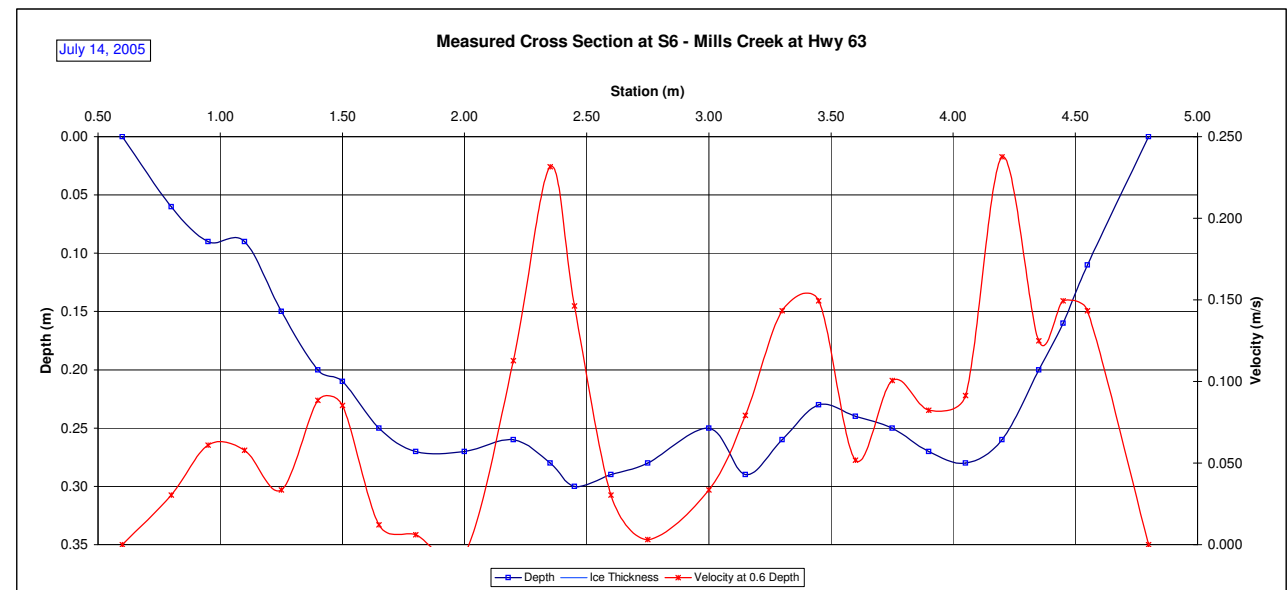
El: 273.600
El: 272.172
El:
El: 271.549

Weather Conditions: Clear, +25°C
River Conditions: Open water

| 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 | 0.70 | 0.008 | 0.008 | 0.02 | 0.00 | 0.000 | 0% |
| 0.80 | 0.06 | | | | 0.030 | 1.00 | 2 | 0.70 | 0.88 | 0.030 | 0.030 | 0.06 | 0.01 | 0.000 | 0% |
| 0.95 | 0.09 | | | | 0.061 | 1.00 | 3 | 0.88 | 1.03 | 0.061 | 0.061 | 0.09 | 0.01 | 0.001 | 1% |
| 1.10 | 0.09 | | | | 0.058 | 1.00 | 4 | 1.03 | 1.18 | 0.058 | 0.058 | 0.09 | 0.01 | 0.001 | 1% |
| 1.25 | 0.15 | | | | 0.034 | 1.00 | 5 | 1.18 | 1.33 | 0.034 | 0.034 | 0.15 | 0.02 | 0.001 | 1% |
| 1.40 | 0.20 | | | | 0.088 | 1.00 | 6 | 1.33 | 1.45 | 0.088 | 0.088 | 0.20 | 0.03 | 0.002 | 3% |
| 1.50 | 0.21 | | | | 0.085 | 1.00 | 7 | 1.45 | 1.58 | 0.085 | 0.085 | 0.21 | 0.03 | 0.002 | 3% |
| 1.65 | 0.25 | | | | 0.012 | 1.00 | 8 | 1.58 | 1.73 | 0.012 | 0.012 | 0.25 | 0.04 | 0.000 | 1% |
| 1.80 | 0.27 | | | | 0.006 | 1.00 | 9 | 1.73 | 1.90 | 0.006 | 0.006 | 0.27 | 0.05 | 0.000 | 0% |
| 2.00 | 0.27 | | | | -0.006 | 1.00 | 10 | 1.90 | 2.10 | -0.006 | -0.006 | 0.27 | 0.05 | 0.000 | 0% |
| 2.20 | 0.26 | | | | 0.113 | 1.00 | 11 | 2.10 | 2.28 | 0.113 | 0.113 | 0.26 | 0.05 | 0.005 | 7% |
| 2.35 | 0.28 | | | | 0.232 | 1.00 | 12 | 2.28 | 2.40 | 0.232 | 0.232 | 0.28 | 0.04 | 0.008 | 11% |
| 2.45 | 0.30 | | | | 0.146 | 1.00 | 13 | 2.40 | 2.53 | 0.146 | 0.146 | 0.30 | 0.04 | 0.005 | 7% |
| 2.60 | 0.29 | | | | 0.030 | 1.00 | 14 | 2.53 | 2.68 | 0.030 | 0.030 | 0.29 | 0.04 | 0.001 | 2% |
| 2.75 | 0.28 | | | | 0.003 | 1.00 | 15 | 2.68 | 2.88 | 0.003 | 0.003 | 0.28 | 0.06 | 0.000 | 0% |
| 3.00 | 0.25 | | | | 0.034 | 1.00 | 16 | 2.88 | 3.08 | 0.034 | 0.034 | 0.25 | 0.05 | 0.002 | 2% |
| 3.15 | 0.29 | | | | 0.079 | 1.00 | 17 | 3.08 | 3.23 | 0.079 | 0.079 | 0.29 | 0.04 | 0.003 | 5% |
| 3.30 | 0.26 | | | | 0.143 | 1.00 | 18 | 3.23 | 3.38 | 0.143 | 0.143 | 0.26 | 0.04 | 0.006 | 8% |
| 3.45 | 0.23 | | | | 0.149 | 1.00 | 19 | 3.38 | 3.53 | 0.149 | 0.149 | 0.23 | 0.03 | 0.005 | 7% |
| 3.60 | 0.24 | | | | 0.052 | 1.00 | 20 | 3.53 | 3.68 | 0.052 | 0.052 | 0.24 | 0.04 | 0.002 | 3% |
| 3.75 | 0.25 | | | | 0.101 | 1.00 | 21 | 3.68 | 3.83 | 0.101 | 0.101 | 0.25 | 0.04 | 0.004 | 5% |
| 3.90 | 0.27 | | | | 0.082 | 1.00 | 22 | 3.83 | 3.98 | 0.082 | 0.082 | 0.27 | 0.04 | 0.003 | 4% |
| 4.05 | 0.28 | | | | 0.091 | 1.00 | 23 | 3.98 | 4.13 | 0.091 | 0.091 | 0.28 | 0.04 | 0.004 | 5% |
| 4.20 | 0.26 | | | | 0.238 | 1.00 | 24 | 4.13 | 4.28 | 0.238 | 0.238 | 0.26 | 0.04 | 0.009 | 13% |
| 4.35 | 0.20 | | | | 0.125 | 1.00 | 25 | 4.28 | 4.40 | 0.125 | 0.125 | 0.20 | 0.03 | 0.003 | 4% |
| 4.45 | 0.16 | | | | 0.149 | 1.00 | 26 | 4.40 | 4.50 | 0.149 | 0.149 | 0.16 | 0.02 | 0.002 | 3% |
| 4.55 | 0.11 | | | | 0.143 | 1.00 | 27 | 4.50 | 4.68 | 0.143 | 0.143 | 0.11 | 0.02 | 0.003 | 4% |
| 4.80 | 0.00 | | | | 0.000 | 1.00 | 28 | 4.68 | 4.80 | 0.036 | 0.036 | 0.03 | 0.00 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | | 0.074 |

| | | |
|---|-------|--------|
| Total Flow: | 0.074 | (m³/s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 0.89 | (m²) |
| Top Width: | 4.20 | (m) |
| Hydraulic Depth: | 0.213 | (m) |
| Mean Velocity: | 0.083 | (m/s) |
| Froude Number | 0.057 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.9V | 83% |
| Datalogger Memory Used: | 22% | |
| Datalogger Clock: | July 14, 2005 01:20 PM | MST |
| Laptop Clock: | July 14, 2005 01:21 PM | MST |
| Dessicant: | 50% Good | |
| Datalogger: | s/n 207110 | |
| PT: | s/n 001747 | |
| 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

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: FF Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: August 31, 2005
Start Time: 4:09 AM MDT
End Time: 4:31 AM MDT

Level Readings and Measurement

Bench Mark Reading: bar in PV 1.542
Water Level Reading: 2.906
V-notch
Transducer Reading & Est. El.: 0.691
Other: ice level

Setup No. 1

El: 273.600
El: 272.236
El: 271.545
El:

Setup No. 2

El: 273.600
El: 272.243
El: 271.552
El:

Weather Conditions:

Partly Cloudy, Calm, +18°C

River Conditions:

Open water, high stage, left weir panel leaking slightly.

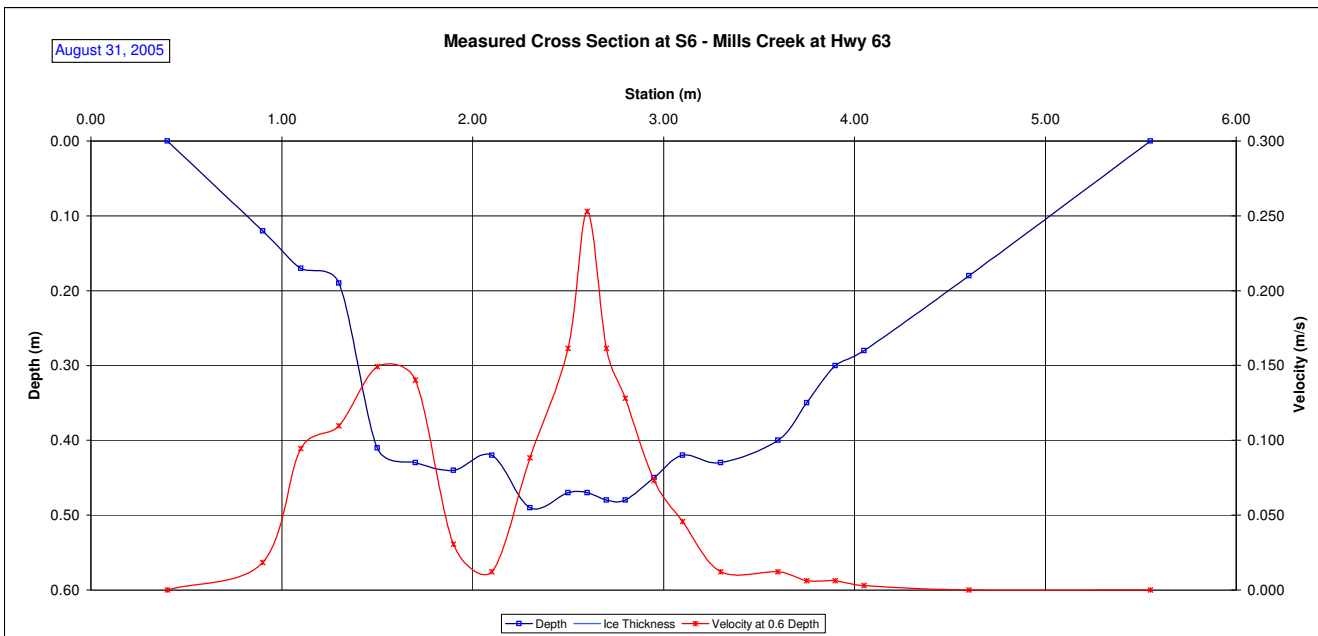
Measurement Data

| 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) | |
| 0.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.40 | 0.65 | 0.005 | 0.005 | 0.03 | 0.01 | 0.000 | 0% |
| 0.90 | 0.12 | | | | 0.018 | 1.00 | 2 | 0.65 | 1.00 | 0.018 | 0.018 | 0.12 | 0.04 | 0.001 | 1% |
| 1.10 | 0.17 | | | | 0.094 | 1.00 | 3 | 1.00 | 1.20 | 0.094 | 0.094 | 0.17 | 0.03 | 0.003 | 3% |
| 1.30 | 0.19 | | | | 0.110 | 1.00 | 4 | 1.20 | 1.40 | 0.110 | 0.110 | 0.19 | 0.04 | 0.004 | 4% |
| 1.50 | 0.41 | | | | 0.149 | 1.00 | 5 | 1.40 | 1.60 | 0.149 | 0.149 | 0.41 | 0.08 | 0.012 | 13% |
| 1.70 | 0.43 | | | | 0.140 | 1.00 | 6 | 1.60 | 1.80 | 0.140 | 0.140 | 0.43 | 0.09 | 0.012 | 13% |
| 1.90 | 0.44 | | | | 0.030 | 1.00 | 7 | 1.80 | 2.00 | 0.030 | 0.030 | 0.44 | 0.09 | 0.003 | 3% |
| 2.10 | 0.42 | | | | 0.012 | 1.00 | 8 | 2.00 | 2.20 | 0.012 | 0.012 | 0.42 | 0.08 | 0.001 | 1% |
| 2.30 | 0.49 | | | | 0.088 | 1.00 | 9 | 2.20 | 2.40 | 0.088 | 0.088 | 0.49 | 0.10 | 0.009 | 9% |
| 2.50 | 0.47 | | | | 0.162 | 1.00 | 10 | 2.40 | 2.55 | 0.162 | 0.162 | 0.47 | 0.07 | 0.011 | 12% |
| 2.60 | 0.47 | | | | 0.253 | 1.00 | 11 | 2.55 | 2.65 | 0.253 | 0.253 | 0.47 | 0.05 | 0.012 | 12% |
| 2.70 | 0.48 | | | | 0.162 | 1.00 | 12 | 2.65 | 2.75 | 0.162 | 0.162 | 0.48 | 0.05 | 0.008 | 8% |
| 2.80 | 0.48 | | | | 0.128 | 1.00 | 13 | 2.75 | 2.88 | 0.128 | 0.128 | 0.48 | 0.06 | 0.008 | 8% |
| 2.95 | 0.45 | | | | 0.073 | 1.00 | 14 | 2.88 | 3.03 | 0.073 | 0.073 | 0.45 | 0.07 | 0.005 | 5% |
| 3.10 | 0.42 | | | | 0.046 | 1.00 | 15 | 3.03 | 3.20 | 0.046 | 0.046 | 0.42 | 0.07 | 0.003 | 4% |
| 3.30 | 0.43 | | | | 0.012 | 1.00 | 16 | 3.20 | 3.45 | 0.012 | 0.012 | 0.43 | 0.11 | 0.001 | 1% |
| 3.60 | 0.40 | | | | 0.012 | 1.00 | 17 | 3.45 | 3.68 | 0.012 | 0.012 | 0.40 | 0.09 | 0.001 | 1% |
| 3.75 | 0.35 | | | | 0.006 | 1.00 | 18 | 3.68 | 3.83 | 0.006 | 0.006 | 0.35 | 0.05 | 0.000 | 0% |
| 3.90 | 0.30 | | | | 0.006 | 1.00 | 19 | 3.83 | 3.98 | 0.006 | 0.006 | 0.30 | 0.04 | 0.000 | 0% |
| 4.05 | 0.28 | | | | 0.003 | 1.00 | 20 | 3.98 | 4.33 | 0.003 | 0.003 | 0.28 | 0.10 | 0.000 | 0% |
| 4.60 | 0.18 | | | | 0.000 | 1.00 | 21 | 4.33 | 5.08 | 0.000 | 0.000 | 0.18 | 0.14 | 0.000 | 0% |
| 5.55 | 0.00 | | | | 0.000 | 1.00 | 22 | 5.08 | 5.55 | 0.000 | 0.000 | 0.05 | 0.02 | 0.000 | 0% |
| | | | | | | | | | | | | | | | 100% |

| | | |
|---|-------|--------|
| Total Flow: | 0.095 | (m³/s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1.48 | (m²) |
| Top Width: | 5.15 | (m) |
| Hydraulic Depth: | 0.286 | (m) |
| Mean Velocity: | 0.065 | (m/s) |
| Froude Number | 0.038 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.65V | 81% |
| Datalogger Memory Used: | 15% | |
| Datalogger Clock: | August 31, 2005 02:57 PM | MST |
| Laptop Clock: | August 31, 2005 03:00 PM | MST |
| Dessicant: | 100% used - replaced | |
| Datalogger: | s/n 207110 | |
| PT: | s/n 001747 | |
| Power: | Lakewood battery | |

Notes:
Data looks good. Stage was very high. TSS sample taken.



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 5, 2005
Start Time: 2:29 PM MDT
End Time: 2:43 PM MDT

Weather Conditions:

+10 C wind from NE
River Conditions: Open water, stage high but falling

Personnel & Equipment

Measurement Made By: ND/FF/PM
Data Entry By: PM Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measure

Bench Mark Reading: bar in PV 1.390
Water Level Reading: 2.731
V-notch
Transducer Reading & Est. El.: 0.715
Other: ice level

Setup No. 1

El: 273.600
El: 272.259
El:
El: 271.544
El:

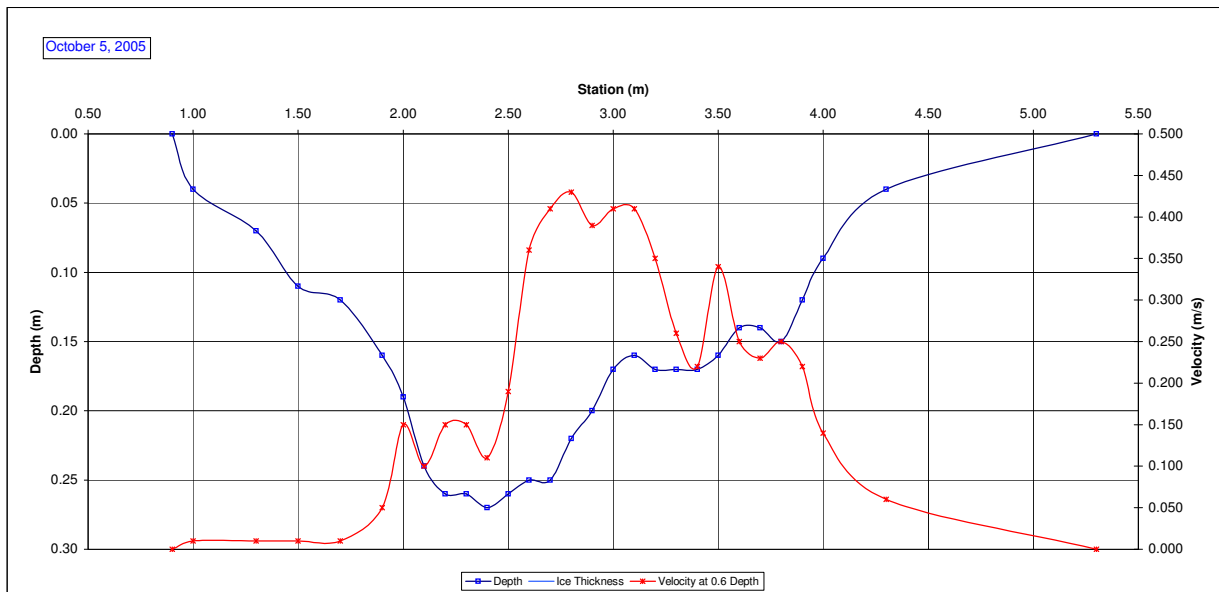
Setup No. 2

El: 273.600
El: 272.269
El:
El: 271.554
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) | (m²) | (m³/s) | | | | | | | |
| 0.90 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.90 | 0.95 | 0.003 | 0.003 | 0.01 | 0.00 | 0.000 | 0% | | | | | | |
| 1.00 | 0.04 | | | | 0.010 | 1.00 | 2 | 0.95 | 1.15 | 0.010 | 0.010 | 0.04 | 0.01 | 0.000 | 0% | | | | | | |
| 1.30 | 0.07 | | | | 0.010 | 1.00 | 3 | 1.15 | 1.40 | 0.010 | 0.010 | 0.07 | 0.02 | 0.000 | 0% | | | | | | |
| 1.50 | 0.11 | | | | 0.010 | 1.00 | 4 | 1.40 | 1.60 | 0.010 | 0.010 | 0.11 | 0.02 | 0.000 | 0% | | | | | | |
| 1.70 | 0.12 | | | | 0.010 | 1.00 | 5 | 1.60 | 1.80 | 0.010 | 0.010 | 0.12 | 0.02 | 0.000 | 0% | | | | | | |
| 1.90 | 0.16 | | | | 0.050 | 1.00 | 6 | 1.80 | 1.95 | 0.050 | 0.050 | 0.16 | 0.02 | 0.001 | 1% | | | | | | |
| 2.00 | 0.19 | | | | 0.150 | 1.00 | 7 | 1.95 | 2.05 | 0.150 | 0.150 | 0.19 | 0.02 | 0.003 | 2% | | | | | | |
| 2.10 | 0.24 | | | | 0.100 | 1.00 | 8 | 2.05 | 2.15 | 0.100 | 0.100 | 0.24 | 0.02 | 0.002 | 2% | | | | | | |
| 2.20 | 0.26 | | | | 0.150 | 1.00 | 9 | 2.15 | 2.25 | 0.150 | 0.150 | 0.26 | 0.03 | 0.004 | 3% | | | | | | |
| 2.30 | 0.26 | | | | 0.150 | 1.00 | 10 | 2.25 | 2.35 | 0.150 | 0.150 | 0.26 | 0.03 | 0.004 | 3% | | | | | | |
| 2.40 | 0.27 | | | | 0.110 | 1.00 | 11 | 2.35 | 2.45 | 0.110 | 0.110 | 0.27 | 0.03 | 0.003 | 3% | | | | | | |
| 2.50 | 0.26 | | | | 0.190 | 1.00 | 12 | 2.45 | 2.55 | 0.190 | 0.190 | 0.26 | 0.03 | 0.005 | 4% | | | | | | |
| 2.60 | 0.25 | | | | 0.360 | 1.00 | 13 | 2.55 | 2.65 | 0.360 | 0.360 | 0.25 | 0.03 | 0.009 | 8% | | | | | | |
| 2.70 | 0.25 | | | | 0.410 | 1.00 | 14 | 2.65 | 2.75 | 0.410 | 0.410 | 0.25 | 0.02 | 0.010 | 9% | | | | | | |
| 2.80 | 0.22 | | | | 0.430 | 1.00 | 15 | 2.75 | 2.85 | 0.430 | 0.430 | 0.22 | 0.02 | 0.009 | 8% | | | | | | |
| 2.90 | 0.20 | | | | 0.390 | 1.00 | 16 | 2.85 | 2.95 | 0.390 | 0.390 | 0.20 | 0.02 | 0.008 | 7% | | | | | | |
| 3.00 | 0.17 | | | | 0.410 | 1.00 | 17 | 2.95 | 3.05 | 0.410 | 0.410 | 0.17 | 0.02 | 0.007 | 6% | | | | | | |
| 3.10 | 0.16 | | | | 0.410 | 1.00 | 18 | 3.05 | 3.15 | 0.410 | 0.410 | 0.16 | 0.02 | 0.007 | 6% | | | | | | |
| 3.20 | 0.17 | | | | 0.350 | 1.00 | 19 | 3.15 | 3.25 | 0.350 | 0.350 | 0.17 | 0.02 | 0.006 | 5% | | | | | | |
| 3.30 | 0.17 | | | | 0.260 | 1.00 | 20 | 3.25 | 3.40 | 0.260 | 0.260 | 0.17 | 0.03 | 0.007 | 6% | | | | | | |
| 3.40 | 0.17 | | | | 0.220 | 1.00 | 21 | 3.40 | 3.50 | 0.220 | 0.220 | 0.17 | 0.02 | 0.004 | 3% | | | | | | |
| 3.50 | 0.16 | | | | 0.340 | 1.00 | 22 | 3.50 | 3.60 | 0.340 | 0.340 | 0.16 | 0.02 | 0.005 | 5% | | | | | | |
| 3.60 | 0.14 | | | | 0.250 | 1.00 | 23 | 3.60 | 3.70 | 0.250 | 0.250 | 0.14 | 0.01 | 0.004 | 3% | | | | | | |
| 3.70 | 0.14 | | | | 0.230 | 1.00 | 24 | 3.70 | 3.80 | 0.230 | 0.230 | 0.14 | 0.01 | 0.003 | 3% | | | | | | |
| 3.80 | 0.15 | | | | 0.250 | 1.00 | 25 | 3.80 | 3.90 | 0.250 | 0.250 | 0.15 | 0.01 | 0.004 | 3% | | | | | | |
| 3.90 | 0.12 | | | | 0.220 | 1.00 | 26 | 3.90 | 4.07 | 0.220 | 0.220 | 0.12 | 0.02 | 0.004 | 4% | | | | | | |
| 4.00 | 0.09 | | | | 0.140 | 1.00 | 27 | 4.07 | 4.53 | 0.140 | 0.140 | 0.09 | 0.04 | 0.006 | 5% | | | | | | |
| 4.30 | 0.04 | | | | 0.060 | 1.00 | 28 | 4.53 | 4.80 | 0.060 | 0.060 | 0.04 | 0.01 | 0.001 | 1% | | | | | | |
| 5.30 | 0.00 | | | | 0.000 | 1.00 | 23 | 3.60 | 5.30 | 0.085 | 0.085 | 0.01 | 0.02 | 0.001 | 1% | | | | | | |
| 100% | | | | | | | | | | | | | | | | | | | | | |

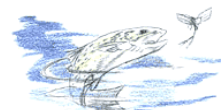
| | | |
|------------------------------------|-------|---------------------|
| Total Flow: | 0.118 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.58 | (m ²) |
| Top Width: | 4.40 | (m) |
| Hydraulic Depth: | 0.131 | (m) |
| Mean Velocity: | 0.204 | (m/s) |
| Froude Number | 0.179 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |
| Notes: | | |
| Data looks fine. TSS sample taken. | | |

| | | |
|----------------------------|--------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.41V | 80% |
| Datalogger Memory Used: | 50% | |
| Datalogger Clock: | October 5, 2005 01:12 PM | MST |
| Laptop Clock: | October 5, 2005 01:17 PM | MST |
| Dessicant: | 5% used - good | |
| Datalogger: | s/n 207110 | |
| PT: | s/n 001747 | |
| 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 11, 2005
Start Time: 11:00 AM MDT
End Time:

Weather Conditions:

+15 °C, clear, light wind

River Conditions:

Open water, stage about 1/2 up the v notch

Personnel & Equipment

Measurement Made By: ND/PM
Data Entry By: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measurer

Bench Mark Reading: bar in PVC pipe
Water Level Reading:
V-notch
Transducer Reading & Est. El.:
Other: ice level

Setup No. 1

El: 273.600
El: 273.600
El:
El: 273.600
El:

Setup No. 2

El: 273.600
El: 273.600
El:
El: 273.600
El:

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 ²) | (m ³ /s) | |
| Total Flow: | | | | | | | | | | | | | | | - |

| | |
|--------------------------------|---------------------|
| Total Flow: | (m ³ /s) |
| Perceived Measurement Quality: | |
| Total Area: | (m ²) |
| Top Width: | (m) |
| Hydraulic Depth: | (m) |
| Mean Velocity: | (m/s) |
| Froude Number | |
| Photographs taken looking at: | |
| Upstream, downstream, across | |

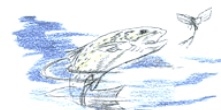
| |
|----------------------------|
| Datalogger Notes: |
| Datalogger Internal Power: |
| Datalogger External Power: |
| Datalogger Memory Used: |
| Datalogger Clock: |
| Laptop Clock: |
| Dessicant: |
| Datalogger: s/n 207110 |
| PT: s/n 001747 |
| Power: Lakewood battery |

Notes:

Transducer removed and placed in new housing upstream of new weir
Stilling well consists of 4" diameter PCV perforated and wrapped in filter cloth. New stilling well is significantly deeper than prior transducer placement
Level sensor has 5PSI range ~ 5 x 0.7 = 3.5m so transducer should be fine

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 12, 2005
Start Time: 9:00 AM MDT
End Time:

Weather Conditions:

+5 °C

River Conditions:

Open water, stage high but falling

Personnel & Equipment

Measurement Made By: ND/PM
Data Entry By: PM Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measurer

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: bar in PV/ | 0.939 | 0.946 |
| Water Level Reading: | 2.407 | 2.419 |
| V-notch | | |
| Transducer Reading & Est. El.: | 0.701 | 0.701 |
| Other: ice level | | |

| 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) | (m ²) | (m ³ /s) | |
| Total Flow: - | | | | | | | | | | | | | | | |

| | |
|--------------------------------|---------------------|
| Total Flow: | (m ³ /s) |
| Perceived Measurement Quality: | |
| Total Area: | (m ²) |
| Top Width: | (m) |
| Hydraulic Depth: | (m) |
| Mean Velocity: | (m/s) |
| Froude Number | |
| Photographs taken looking at: | |
| Upstream, downstream, across | |

Notes:

New enclosure installed
Battery replaced Aux: 12.77V 82%
Memory cleared, Clock synched

| | | |
|----------------------------|---------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.29V | 79% |
| Datalogger Memory Used: | 50% | |
| Datalogger Clock: | October 12, 2005 08:50 AM | MST |
| Laptop Clock: | October 12, 2005 08:55 AM | MST |
| Dessicant: | 10% used - good | |
| Datalogger: | s/n 207110 | |
| PT: | s/n 001747 | |
| 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 2, 2005
Start Time: 1:00 PM MST
End Time:

Weather Conditions:

+2 °C, Partly cloudy

River Conditions:

Open, border ice upstream of weir

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measurer

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: bar in PV/ | 1.363 | 1.313 |
| Water Level Reading: | 2.888 | 2.834 |
| V-notch | | |
| Transducer Reading & Est. El.: | 0.657 | 0.657 |
| Other: invert of culvert | | 3.664 |

| 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) | (m ²) | (m ³ /s) | | |
| Total Flow: | | | | | | | | | | | | | | - | | |

| | | |
|--------------------------------|--|---------------------|
| Total Flow: | | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

Transducer s/n 001747 removed for recalibration
Transducer s/n 0101356 installed but seems to be reading incorrectly. Will stop by later to install a different transducer.

| | | |
|----------------------------|---------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.53V | 81% |
| Datalogger Memory Used: | 10% | |
| Datalogger Clock: | November 2, 2005 01:02 PM | MST |
| Laptop Clock: | November 2, 2005 01:03 PM | MST |
| Dessicant: | 15% used - Good | |
| Datalogger: | s/n 207110 | |
| PT: | s/n 001747 | |
| 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 4, 2005
Start Time: 2:25 PM MST
End Time:

Weather Conditions:

+2 °C, Overcast, Light wind

River Conditions:

Open, border ice upstream of weir

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measurer

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: bar in PV/ | 1.501 | 273.600 |
| Water Level Reading: | 3.014 | 272.087 |
| V-notch | | |
| Transducer Reading & Est. El.: | 0.582 | 271.505 |
| Other: | | |

| 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) | (m ²) | (m ³ /s) | |
| Total Flow: | | | | | | | | | | | | | | - | |

| | |
|--------------------------------|---------------------|
| Total Flow: | (m ³ /s) |
| Perceived Measurement Quality: | |
| Total Area: | (m ²) |
| Top Width: | (m) |
| Hydraulic Depth: | (m) |
| Mean Velocity: | (m/s) |
| Froude Number | |
| Photographs taken looking at: | |
| Upstream, downstream, across | |

Notes:

Transducer s/n 0101356 removed because it reads incorrectly
Transducer s/n 0507001-5910 installed in the stilling tube.
Memory cleared, clocks synchronized.

| | |
|----------------------------|-------------------------------|
| Datalogger Notes: | |
| Datalogger Internal Power: | 11.34V 100% |
| Datalogger External Power: | 12.53V 81% |
| Datalogger Memory Used: | 0% |
| Datalogger Clock: | November 4, 2005 02:23 PM MST |
| Laptop Clock: | November 4, 2005 02:23 PM MST |
| Dessicant: | 15% used - Good |
| Datalogger: | s/n 207110 |
| PT: | s/n 0507001-5910 8.53 psi |
| 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

Personnel & Equipment

Measurement Made By: ND/PM/JE
Data Entry By: ND Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Time of Measurement

Date of Measurement: December 6, 2005
Start Time: 9:50 AM MST
End Time: 9:59 AM MST

Level Readings and Measurer

Bench Mark Reading: bar in PV/ 0.704 El: 273.600
Water Level Reading: 2.325 El: 271.979
V-notch El: 2.401 El: 271.981
Transducer Reading & Est. El.: 0.492 El: 271.487
Other: ice level El: 271.489

Weather Conditions:

-25 C, Clear, Calm

River Conditions:

Complete ice cover, ice broken out for measurement

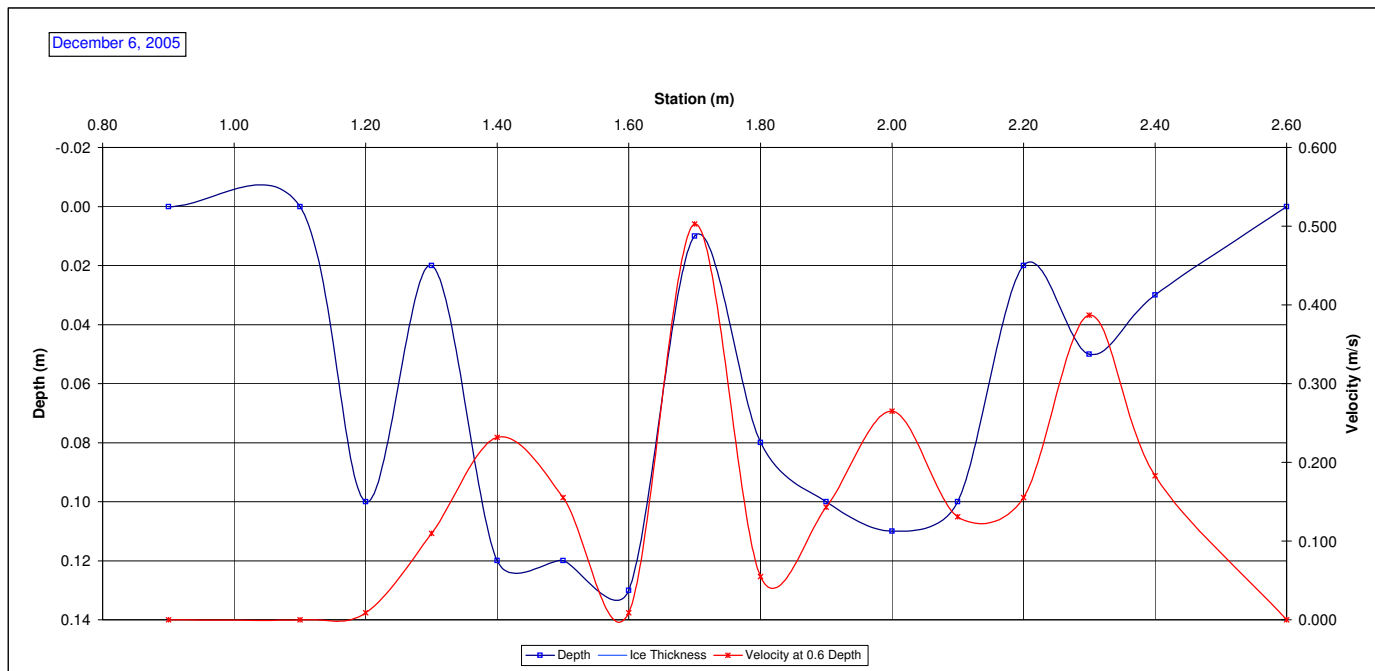
Measurement Data

| | 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 ²) | (m ³ /s) | |
| LB | | | | | | | | | | | | | | | | |
| | 0.90 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.90 | 1.00 | 0.000 | 0.000 | 0.00 | 0.00 | 0.000 | 0% |
| | 1.10 | 0.00 | | | | 0.000 | 1.00 | 2 | 1.00 | 1.15 | 0.000 | 0.000 | 0.00 | 0.00 | 0.000 | 0% |
| | 1.20 | 0.10 | | | | 0.009 | 1.00 | 3 | 1.15 | 1.25 | 0.009 | 0.009 | 0.10 | 0.01 | 0.000 | 1% |
| | 1.30 | 0.02 | | | | 0.110 | 1.00 | 4 | 1.25 | 1.35 | 0.110 | 0.110 | 0.02 | 0.00 | 0.000 | 1% |
| | 1.40 | 0.12 | | | | 0.232 | 1.00 | 5 | 1.35 | 1.45 | 0.232 | 0.232 | 0.12 | 0.01 | 0.003 | 19% |
| | 1.50 | 0.12 | | | | 0.155 | 1.00 | 6 | 1.45 | 1.55 | 0.155 | 0.155 | 0.12 | 0.01 | 0.002 | 13% |
| | 1.60 | 0.13 | | | | 0.009 | 1.00 | 7 | 1.55 | 1.65 | 0.009 | 0.009 | 0.13 | 0.01 | 0.000 | 1% |
| | 1.70 | 0.01 | | | | 0.503 | 1.00 | 8 | 1.65 | 1.75 | 0.503 | 0.503 | 0.01 | 0.00 | 0.001 | 3% |
| | 1.80 | 0.08 | | | | 0.055 | 1.00 | 9 | 1.75 | 1.85 | 0.055 | 0.055 | 0.08 | 0.01 | 0.000 | 3% |
| | 1.90 | 0.10 | | | | 0.143 | 1.00 | 10 | 1.85 | 1.95 | 0.143 | 0.143 | 0.10 | 0.01 | 0.001 | 10% |
| | 2.00 | 0.11 | | | | 0.265 | 1.00 | 11 | 1.95 | 2.05 | 0.265 | 0.265 | 0.11 | 0.01 | 0.003 | 20% |
| | 2.10 | 0.10 | | | | 0.131 | 1.00 | 12 | 2.05 | 2.15 | 0.131 | 0.131 | 0.10 | 0.01 | 0.001 | 9% |
| | 2.20 | 0.02 | | | | 0.155 | 1.00 | 13 | 2.15 | 2.25 | 0.155 | 0.155 | 0.02 | 0.00 | 0.000 | 2% |
| | 2.30 | 0.05 | | | | 0.387 | 1.00 | 14 | 2.25 | 2.35 | 0.387 | 0.387 | 0.05 | 0.00 | 0.002 | 13% |
| | 2.40 | 0.03 | | | | 0.183 | 1.00 | 15 | 2.35 | 2.50 | 0.183 | 0.183 | 0.03 | 0.00 | 0.001 | 6% |
| RB | 2.60 | 0.00 | | | | 0.000 | 1.00 | 16 | 2.50 | 2.60 | 0.046 | 0.046 | 0.01 | 0.00 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | | 0.015 | 100% |

| | | |
|--|-------|---------------------|
| Total Flow: | 0.015 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.10 | (m ²) |
| Top Width: | 1.70 | (m) |
| Hydraulic Depth: | 0.060 | (m) |
| Mean Velocity: | 0.146 | (m/s) |
| Froude Number | 0.191 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |
| Notes: | | |
| Data looks OK. | | |
| Battery replaced, new reading is 12.65 V 81% | | |
| COM port on logger damaged, should replace logger at next visit. | | |

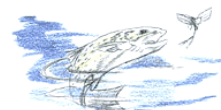
Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 11.68V 75% Fair
Datalogger Memory Used: 10%
Datalogger Clock: December 6, 2005 08:42 AM MST
Laptop Clock: December 6, 2005 08:44 AM MST
Dessicant: Bad-replaced
Datalogger: s/n 207110
PT: s/n 0507001-5910 8.53 psi
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: December 8, 2005
Start Time: 9:30 AM MST
End Time: MST

Weather Conditions:

-10 C, Overcast, Calm

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: ND/PM/RM
Data Entry By: ND Checked: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measur

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: bar in PV/ | 1.051 | 1.041 |
| Water Level Reading: | 2.700 | 2.689 |
| V-notch | | |
| Transducer Reading & Est. El.: | 0.438 | 0.438 |
| Other: ice level | 2.585 | 2.578 |

| 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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

Data downloaded of Logger #207110
Replaced logger with s/n 203149, memory cleared, clocks synched, sample rate set to 15 min.

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.77V 82% Fair
Datalogger Memory Used: 15%
Datalogger Clock: December 8, 2005 09:25 AM MST
Laptop Clock: December 8, 2005 09:28 AM MST
Dessicant: Good
Datalogger: s/n 203149
PT: s/n 0507001-5910 8.53 psi
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: ND/CT/DB
Data Entry By: DB
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: January 6, 2005
Start Time: 9:17 AM MST
End Time: 9:57 AM MST

Level Readings

Bench Mark Reading: pin in tree 0.909
Water Level Reading: 4.314
Top of Ice Level Reading: 4.315
Transducer Reading & Calc'd El. 0.960
Other:

Setup No. 1

El: 275.565
El: 272.160
El: 271.250
El: 271.200
El:

Setup No. 2

El: 275.565
El: 272.164
El: 271.163
El: 271.204
El:

Weather Conditions: -10 C, cloudy, windy, light snow

River Conditions: ice cover

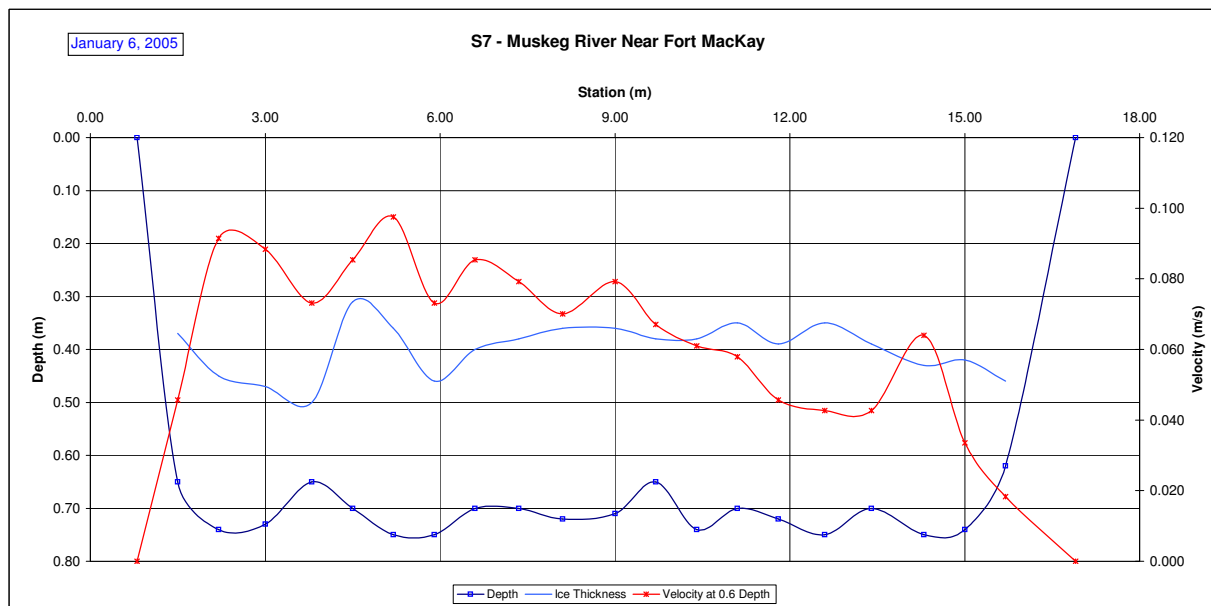
Measurement Data

| 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) | | |
| 16.90 | 0.00 | | | | 0.000 | 0.90 | 1 | 16.90 | 16.30 | 0.005 | 0.004 | 0.04 | 0.02 | 0.000 | 0% | |
| 15.70 | 0.62 | 0.46 | | | 0.018 | 0.90 | 2 | 16.30 | 15.35 | 0.018 | 0.016 | 0.16 | 0.15 | 0.003 | 1% | |
| 15.00 | 0.74 | 0.42 | | | 0.034 | 0.90 | 3 | 15.35 | 14.65 | 0.034 | 0.030 | 0.32 | 0.22 | 0.007 | 2% | |
| 14.30 | 0.75 | 0.43 | | | 0.064 | 0.90 | 4 | 14.65 | 13.85 | 0.064 | 0.058 | 0.32 | 0.26 | 0.015 | 5% | |
| 13.40 | 0.70 | 0.39 | | | 0.043 | 0.90 | 5 | 13.85 | 13.00 | 0.043 | 0.038 | 0.31 | 0.26 | 0.010 | 4% | |
| 12.60 | 0.75 | 0.35 | | | 0.043 | 0.90 | 6 | 13.00 | 12.20 | 0.043 | 0.038 | 0.40 | 0.32 | 0.012 | 4% | |
| 11.80 | 0.72 | 0.39 | | | 0.046 | 0.90 | 7 | 12.20 | 11.45 | 0.046 | 0.041 | 0.33 | 0.25 | 0.010 | 4% | |
| 11.10 | 0.70 | 0.35 | | | 0.058 | 0.90 | 8 | 11.45 | 10.75 | 0.058 | 0.052 | 0.35 | 0.25 | 0.013 | 5% | |
| 10.40 | 0.74 | 0.38 | | | 0.061 | 0.90 | 9 | 10.75 | 10.05 | 0.061 | 0.055 | 0.36 | 0.25 | 0.014 | 5% | |
| 9.70 | 0.65 | 0.38 | | | 0.067 | 0.90 | 10 | 10.05 | 9.35 | 0.067 | 0.060 | 0.27 | 0.19 | 0.011 | 4% | |
| 9.00 | 0.71 | 0.36 | | | 0.079 | 0.90 | 11 | 9.35 | 8.55 | 0.079 | 0.071 | 0.35 | 0.28 | 0.020 | 7% | |
| 8.10 | 0.72 | 0.36 | | | 0.070 | 0.90 | 12 | 8.55 | 7.73 | 0.070 | 0.063 | 0.36 | 0.30 | 0.019 | 7% | |
| 7.35 | 0.70 | 0.38 | | | 0.079 | 0.90 | 13 | 7.73 | 6.98 | 0.079 | 0.071 | 0.32 | 0.24 | 0.017 | 6% | |
| 6.60 | 0.70 | 0.40 | | | 0.085 | 0.90 | 14 | 6.98 | 6.25 | 0.085 | 0.077 | 0.30 | 0.22 | 0.017 | 6% | |
| 5.90 | 0.75 | 0.46 | | | 0.073 | 0.90 | 15 | 6.25 | 5.55 | 0.073 | 0.066 | 0.29 | 0.20 | 0.013 | 5% | |
| 5.20 | 0.75 | 0.36 | | | 0.098 | 0.90 | 16 | 5.55 | 4.85 | 0.098 | 0.088 | 0.39 | 0.27 | 0.024 | 9% | |
| 4.50 | 0.70 | 0.31 | | | 0.085 | 0.90 | 17 | 4.85 | 4.15 | 0.085 | 0.077 | 0.39 | 0.27 | 0.021 | 8% | |
| 3.80 | 0.65 | 0.50 | | | 0.073 | 0.90 | 18 | 4.15 | 3.40 | 0.073 | 0.066 | 0.15 | 0.11 | 0.007 | 3% | |
| 3.00 | 0.73 | 0.47 | | | 0.088 | 0.90 | 19 | 3.40 | 1.88 | 0.088 | 0.080 | 0.26 | 0.40 | 0.032 | 11% | |
| 2.20 | 0.74 | 0.45 | | | 0.091 | 0.90 | 20 | 1.88 | 1.50 | 0.091 | 0.082 | 0.29 | 0.11 | 0.009 | 3% | |
| 1.50 | 0.65 | 0.37 | | | 0.046 | 0.90 | 21 | 1.50 | 1.15 | 0.046 | 0.041 | 0.28 | 0.10 | 0.004 | 1% | |
| 0.80 | 0.00 | | | | 0.000 | 0.90 | 22 | 1.15 | 0.80 | 0.011 | 0.010 | 0.07 | 0.02 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.278 | 100% | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.278 | (m ³ /s) |
| Percieved Measurement Quality: | Good | |
| Total Area: | 4.70 | (m ²) |
| Top Width: | 16.10 | (m) |
| Hydraulic Depth: | 0.292 | (m) |
| Mean Velocity: | 0.059 | (m/s) |
| Froude Number | 0.035 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 269 |
| Datalogger Internal Power: | 4.604V | |
| Datalogger External Power: | 12.67V | |
| Datalogger Memory Used: | 13% | |
| Datalogger Clock: | Jan 06, 2004 08:38 | MST |
| Laptop Clock: | Jan 06, 2004 08:47 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD128, # 0105010269 | |
| PT: | Keller 730-130-3 psi #0101346 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

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

Personnel & Equipment

Measurement Made By: ND/CT/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: February 4, 2005
Start Time: 10:34 AM MST
End Time: 10:56 AM MST

Level Readings

Bench Mark Reading: pin in tree 0.881
Water Level Reading: 4.471
Top of Ice Level Reading: 4.442
Transducer Reading & Calc'd El. 0.874
Other:

Setup No. 1

El: 275.565
El: 271.975
El: 271.123
El: 271.101
El:

Setup No. 2

El: 275.565
El: 4.514
El: 4.491
El: 0.874
El:

Weather Conditions:

-24 C, cloudy

River Conditions:

Frozen

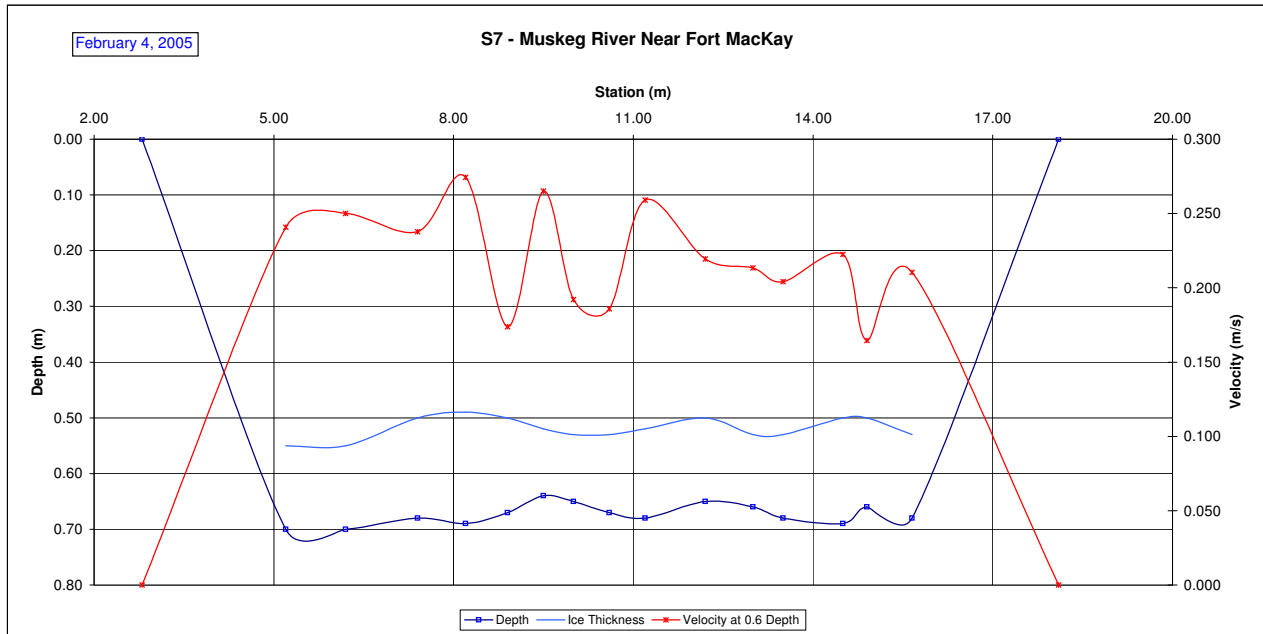
Measurement Data

| 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) | | |
| 2.80 | 0.00 | | | | 0.000 | 0.90 | 1 | 2.80 | 4.00 | 0.060 | 0.054 | 0.04 | 0.05 | 0.002 | 1% | |
| 5.20 | 0.70 | 0.55 | | | 0.241 | 0.90 | 2 | 4.00 | 5.70 | 0.241 | 0.217 | 0.15 | 0.26 | 0.055 | 13% | |
| 6.20 | 0.70 | 0.55 | | | 0.250 | 0.90 | 3 | 5.70 | 6.80 | 0.250 | 0.225 | 0.15 | 0.17 | 0.037 | 9% | |
| 7.40 | 0.68 | 0.50 | | | 0.238 | 0.90 | 4 | 6.80 | 7.80 | 0.238 | 0.214 | 0.18 | 0.18 | 0.039 | 9% | |
| 8.20 | 0.69 | 0.49 | | | 0.274 | 0.90 | 5 | 7.80 | 8.55 | 0.274 | 0.247 | 0.20 | 0.15 | 0.037 | 9% | |
| 8.90 | 0.67 | 0.50 | | | 0.174 | 0.90 | 6 | 8.55 | 9.20 | 0.174 | 0.156 | 0.17 | 0.11 | 0.017 | 4% | |
| 9.50 | 0.64 | 0.52 | | | 0.265 | 0.90 | 7 | 9.20 | 9.75 | 0.265 | 0.239 | 0.12 | 0.07 | 0.016 | 4% | |
| 10.00 | 0.65 | 0.53 | | | 0.192 | 0.90 | 8 | 9.75 | 10.30 | 0.192 | 0.173 | 0.12 | 0.07 | 0.011 | 3% | |
| 10.60 | 0.67 | 0.53 | | | 0.186 | 0.90 | 9 | 10.30 | 10.90 | 0.186 | 0.167 | 0.14 | 0.08 | 0.014 | 3% | |
| 11.20 | 0.68 | 0.52 | | | 0.259 | 0.90 | 10 | 10.90 | 11.70 | 0.259 | 0.233 | 0.16 | 0.13 | 0.030 | 7% | |
| 12.20 | 0.65 | 0.50 | | | 0.219 | 0.90 | 11 | 11.70 | 12.60 | 0.219 | 0.198 | 0.15 | 0.14 | 0.027 | 7% | |
| 13.00 | 0.66 | 0.53 | | | 0.213 | 0.90 | 12 | 12.60 | 13.25 | 0.213 | 0.192 | 0.13 | 0.08 | 0.016 | 4% | |
| 13.50 | 0.68 | 0.53 | | | 0.204 | 0.90 | 13 | 13.25 | 14.00 | 0.204 | 0.184 | 0.15 | 0.11 | 0.021 | 5% | |
| 14.50 | 0.69 | 0.50 | | | 0.223 | 0.90 | 14 | 14.00 | 14.70 | 0.223 | 0.200 | 0.19 | 0.13 | 0.027 | 6% | |
| 14.90 | 0.66 | 0.50 | | | 0.165 | 0.90 | 15 | 14.70 | 15.28 | 0.165 | 0.148 | 0.16 | 0.09 | 0.014 | 3% | |
| 15.65 | 0.68 | 0.53 | | | 0.210 | 0.90 | 16 | 15.28 | 16.88 | 0.210 | 0.189 | 0.15 | 0.24 | 0.045 | 11% | |
| 18.10 | 0.00 | | | | 0.000 | 0.90 | 17 | 16.88 | 18.10 | 0.053 | 0.047 | 0.04 | 0.05 | 0.002 | 1% | |
| | | | | | | | | | | | | | Total Flow: | 0.410 | 100% | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.410 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.09 | (m ²) |
| Top Width: | 15.30 | (m) |
| Hydraulic Depth: | 0.137 | (m) |
| Mean Velocity: | 0.196 | (m/s) |
| Froude Number | 0.169 | |
| Photographs taken looking at: Upstream, downstream, across | | |

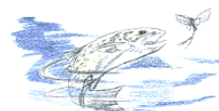
| | | |
|---|------------------------------------|-----|
| Datalogger Notes: | Database | 269 |
| Datalogger Internal Power: | 4.552V | |
| Datalogger External Power: | 12.36V | |
| Datalogger Memory Used: | 16% | |
| Datalogger Clock: | Feb 04, 2005 08:08 | MST |
| Laptop Clock: | Feb 04, 2005 08:19 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD128, # 0104170269 | |
| PT: | Keller 730-130-3 psi #0101346 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | |

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: March 4, 2005
Start Time: 8:55 AM MST
End Time: 9:12 AM MST

Weather Conditions:

-7 C, Clear

River Conditions:

Frozen

Personnel & Equipment

Measurement Made By: ND/CT/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Bench Mark Reading: pin in tree 1.025
Water Level Reading: 4.612
Top of Ice Level Reading: 4.606
Transducer Reading & Calc'd El. 0.856
Other:

Setup No. 1

El: 275.565
El: 271.978
El: 270.959
El: 271.122

Setup No. 2

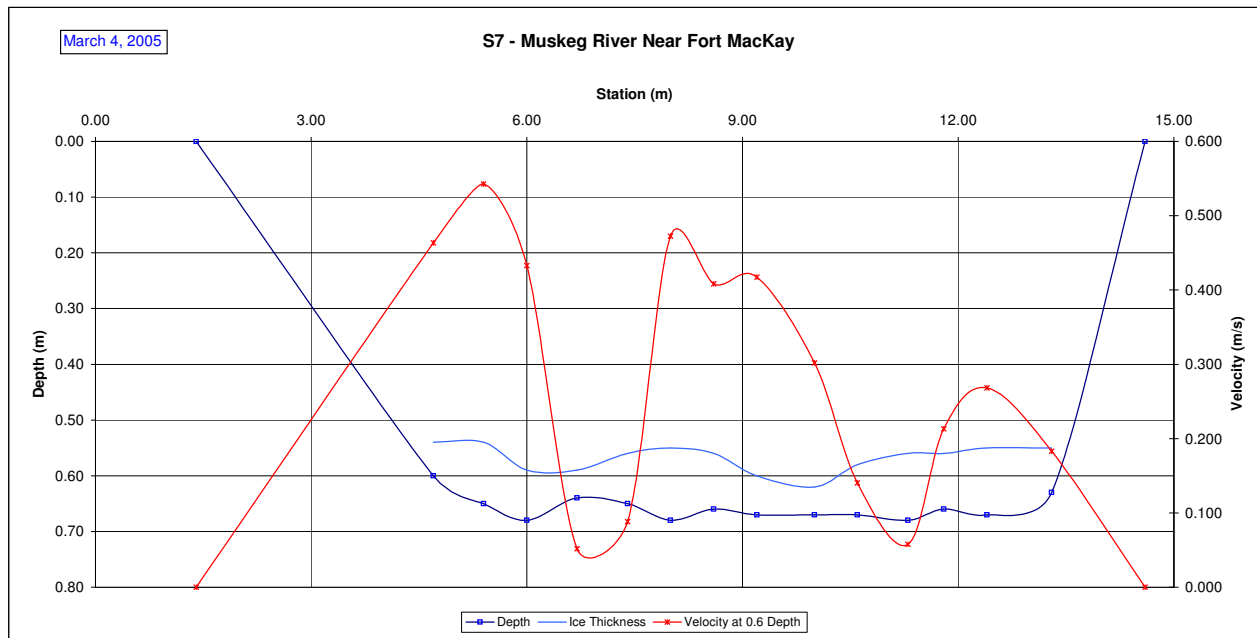
El: 275.565
El: 271.984
El: 271.047
El: 271.128

| 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 | 1.40 | 0.00 | | | 0.000 | 0.90 | 1 | 1.40 | 3.05 | 0.116 | 0.104 | 0.02 | 0.02 | 0.003 | 1% | |
| | 4.70 | 0.60 | 0.54 | | 0.463 | 0.90 | 2 | 3.05 | 5.05 | 0.463 | 0.417 | 0.06 | 0.12 | 0.050 | 19% | |
| | 5.40 | 0.65 | 0.54 | | 0.543 | 0.90 | 3 | 5.05 | 5.70 | 0.543 | 0.488 | 0.11 | 0.07 | 0.035 | 14% | |
| | 6.00 | 0.68 | 0.59 | | 0.433 | 0.90 | 4 | 5.70 | 6.35 | 0.433 | 0.390 | 0.09 | 0.06 | 0.023 | 9% | |
| | 6.70 | 0.64 | 0.59 | | 0.052 | 0.90 | 5 | 6.35 | 7.05 | 0.052 | 0.047 | 0.05 | 0.04 | 0.002 | 1% | |
| | 7.40 | 0.65 | 0.56 | | 0.088 | 0.90 | 6 | 7.05 | 7.70 | 0.088 | 0.080 | 0.09 | 0.06 | 0.005 | 2% | |
| | 8.00 | 0.68 | 0.55 | | 0.472 | 0.90 | 7 | 7.70 | 8.30 | 0.472 | 0.425 | 0.13 | 0.08 | 0.033 | 13% | |
| | 8.60 | 0.66 | 0.56 | | 0.408 | 0.90 | 8 | 8.30 | 8.90 | 0.408 | 0.368 | 0.10 | 0.06 | 0.022 | 9% | |
| | 9.20 | 0.67 | 0.60 | | 0.418 | 0.90 | 9 | 8.90 | 9.60 | 0.418 | 0.376 | 0.07 | 0.05 | 0.018 | 7% | |
| | 10.00 | 0.67 | 0.62 | | 0.302 | 0.90 | 10 | 9.60 | 10.30 | 0.302 | 0.272 | 0.05 | 0.04 | 0.010 | 4% | |
| | 10.60 | 0.67 | 0.58 | | 0.140 | 0.90 | 11 | 10.30 | 10.95 | 0.140 | 0.126 | 0.09 | 0.06 | 0.007 | 3% | |
| | 11.30 | 0.68 | 0.56 | | 0.058 | 0.90 | 12 | 10.95 | 11.55 | 0.058 | 0.052 | 0.12 | 0.07 | 0.004 | 1% | |
| | 11.80 | 0.66 | 0.56 | | 0.213 | 0.90 | 13 | 11.55 | 12.10 | 0.213 | 0.192 | 0.10 | 0.06 | 0.011 | 4% | |
| | 12.40 | 0.67 | 0.55 | | 0.268 | 0.90 | 14 | 12.10 | 12.85 | 0.268 | 0.241 | 0.12 | 0.09 | 0.022 | 8% | |
| | 13.30 | 0.63 | 0.55 | | 0.183 | 0.90 | 15 | 12.85 | 13.95 | 0.183 | 0.165 | 0.08 | 0.09 | 0.014 | 6% | |
| | 14.60 | 0.00 | | | 0.000 | 0.90 | 16 | 13.95 | 14.60 | 0.046 | 0.041 | 0.02 | 0.01 | 0.001 | 0% | |
| RB | | | | | | | | | | | | | Total Flow: | 0.258 | 100% | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.258 | (m ³ /s) |
| Percieved Measurement Quality: | Fair | |
| Total Area: | 0.97 | (m ²) |
| Top Width: | 13.20 | (m) |
| Hydraulic Depth: | 0.073 | (m) |
| Mean Velocity: | 0.267 | (m/s) |
| Froude Number | 0.315 | |
| Photographs taken looking at: Upstream, downstream, across | | |

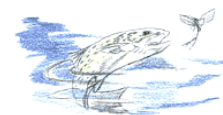
| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 269 |
| Datalogger Internal Power: | 4.6V | |
| Datalogger External Power: | 14.21V | |
| Datalogger Memory Used: | 18% | |
| Datalogger Clock: | Mar 04, 2005 08:03 | MST |
| Laptop Clock: | Mar 04, 2005 08:16 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD128, # 0104170269 | |
| PT: | Keller 730-130-3 psi #0101346 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

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 5, 2005
Start Time: 8:20 AM MDT
End Time: MDT

Weather Conditions:

-1° C, Partly cloudy

River Conditions:

Partial ice cover, ice breaking up, open spots downstream

Personnel & Equipment

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

Level Readings

Bench Mark Reading: pin in tree 0.630
Water Level Reading: 4.112
Top of Ice Level Reading: 4.086
Transducer Reading & Calc'd El 0.963
Other:

Setup No. 1

El: 275.565
El: 272.083
El: 271.479
El: 271.120

Setup No. 2

El: 275.565
El: 272.089
El: 271.389
El: 271.126

| 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 | Calculated Data | | | | | | |
| | | | | | | | | | | 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: | | | | | | | | | | | | | | - | | |

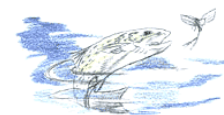
| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 269 |
| Datalogger Internal Power: | 4.632V | |
| Datalogger External Power: | 14.12V | |
| Datalogger Memory Used: | 21% | |
| Datalogger Clock: | Apr 05, 2005 07:03 | MST |
| Laptop Clock: | Apr 05, 2005 07:15 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD128, # 0104170269 | |
| PT: | Keller 730-130-3 psi #0101346 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: Water bubbling up at the centre of channel, open spots downstream.
Conditions unsafe for manual flow measurement.

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 23, 2005
Start Time: 7:05 AM MDT
End Time: MDT

Weather Conditions:

+7 C, Partly cloudy, Calm

River Conditions:

Open water conditions, very high stage greater than bankfull, high velocity.

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: ND
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 | 1.018 | 0.970 |
| Water Level Reading: | 3.635 | 3.585 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El | 1.849 | 1.849 |
| Other: | | |

| 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) | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow: | - | | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| 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: | 4.63V | |
| Datalogger External Power: | 14.56V | |
| Datalogger Memory Used: | 22% | |
| Datalogger Clock: | Apr 23, 2005 06:04 | MST |
| Laptop Clock: | Apr 23, 2005 06:10 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD128, # 0104170269 | |
| PT: | Keller 730-130-3 psi #0101346 | |
| Power: | Magnacharge 20V 10A DC Battery and | |
| | PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: Data looks good. Water level very high and flowing at a high velocity making it not possible to carry out wading measurement. Stage greater than bankfull and rising. TSS sample taken.

Hydrometric Measurement / Site Visit Record

S7 - Muskeg River Near Fort MacKay



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: May 30, 2005
Start Time: 7:35 AM MDT
End Time: MDT

Weather Conditions:

+18 C, Clear, Calm Wind

River Conditions:

Open water, Stage below bankfull, stage falling.

Personnel & Equipment

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

Level Readings

Bench Mark Reading: pin in tree 0.709
Water Level Reading: 3.889
Top of Ice Level Reading:
Transducer Reading & Calc'd El 1.264
Other:

Setup No. 1

El: 275.565
El: 272.385
El:
El: 271.122
El:

Setup No. 2

El: 275.565
El: 272.377
El:
El: 271.114
El:

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 ²) | (m ³ /s) | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow: | - | | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

TSS sample taken
Transducer serial number should be checked from records-101346 is installed elsewhere.

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 269 |
| Datalogger Internal Power: | 4.85V | |
| Datalogger External Power: | 14.32V | |
| Datalogger Memory Used: | 25% | |
| Datalogger Clock: | May 30, 2005 06:22 | MST |
| Laptop Clock: | May 30, 2005 06:34 | MST |
| Dessicant: | 100 % Good | |
| Datalogger: | Optimum DD128, # 0104170269 | |
| PT: | Keller 730-130-3 psi #?????? | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

S7 - Muskeg River Near Fort MacKay



S7 - Muskeg River Near Fort MacKay



S7 - Muskeg River Near Fort MacKay



River Conditions: Open water, stage high but falling

| | | | | | | |
|---------------------------------|-------|-----|---------|-------|-----|---------|
| Bench Mark Reading: pin in tree | 0.716 | El: | 275.565 | 0.886 | El: | 275.565 |
| Water Level Reading: | 3.821 | El: | 272.460 | 3.992 | El: | 272.459 |
| Top of Ice Level Reading: | | El: | | | El: | |
| Transducer Reading & Calcd El | 1.249 | El: | 271.211 | 1.249 | El: | 271.210 |
| Other: | | El: | | | El: | |

| 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow: | - |

| | | |
|---|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Percieved Measurement Quality: | | |
| Total Area: | | (m ²) |
| 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: | 4.62V | |
| Datalogger External Power: | 12.46V | |
| Datalogger Memory Used: | 1% | |
| Datalogger Clock: | Sep 06, 2005 14:55 | MST |
| Laptop Clock: | Sep 06, 2005 14:55 | MST |
| Dessicant: | 100 % Good | |
| Datalogger: | Optimum DD128, # 0104170269 | |
| PT: | Keller 730-130-3 psi #101345 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

S7 - Muskeg River Near Fort MacKay



S7 - Muskeg River Near Fort MacKay



S7 - Muskeg River Near Fort MacKay



River Conditions: About 6 cm thick ice cover at station, open downstream

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

Bench Mark Reading: pin in tree
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & Calc'd El
Other:

| | |
|-----|---------|
| El: | 275.565 |
| El: | 271.653 |
| El: | |
| El: | 270.916 |
| El: | |

| | | |
|-------|-----|---------|
| 0.585 | El: | 275.565 |
| 4.488 | El: | 271.662 |
| 4.435 | El: | |
| 0.737 | El: | 270.925 |
| | 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow: | - |

| | | |
|---|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: Upstream, downstream, across | | |

Notes: Ice thickness about 6 cms, open water at a section downstream, unsafe for flow MMT.
Data downloaded, looks fine

| | | |
|-----------------------------------|---|------------|
| Datalogger Notes: | Database | 269 |
| Datalogger Internal Power: | 4.565V | |
| Datalogger External Power: | 12.80V | |
| Datalogger Memory Used: | 8% | |
| Datalogger Clock: | Dec 06, 2005 15:13 | MST |
| Laptop Clock: | Dec 06, 2005 15:13 | MST |
| Dessicant: | 10% Used | |
| Datalogger: | Optimum DD128, # 0104170269 | |
| PT: | Keller 730-130-3 psi #101345 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

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:

Time of Measurement

Date of Measurement: January 6, 2005
Start Time: 12:35 PM MST
End Time: 12:52 PM MST

Weather Conditions:

-12°C, partly cloudy

River Conditions:

Ice cover

Personnel & Equipment

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

Level Readings

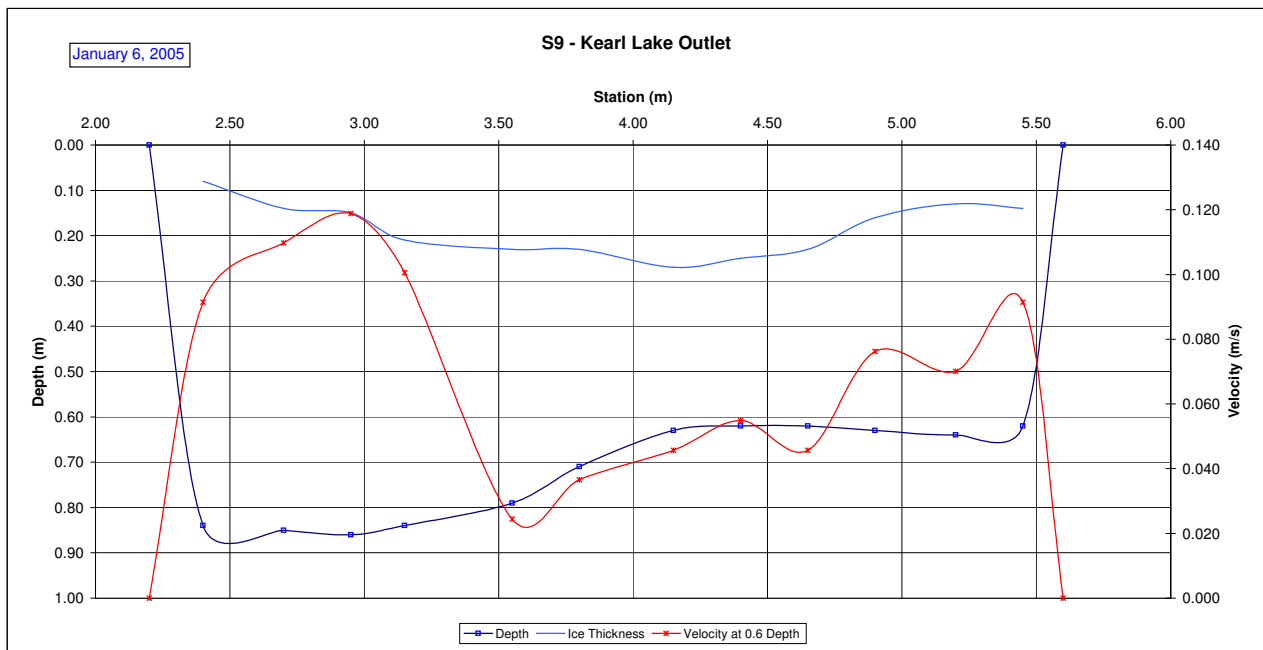
| | Setup No. 1 | Setup No. 2 |
|--------------------------------------|-------------|-------------|
| Bench Mark Reading: post in P\ | 2.355 | 2.446 |
| Water Level Reading: | 3.202 | 3.288 |
| Top of Ice Level Reading: | 3.194 | 3.276 |
| Transducer Reading & Calc'd El | n/a | n/a |
| Other: Crown of culvert on river rig | | 2.440 |

| 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) | | |
| | | | | | | | | | | | | | | | | |
| 2.20 | 0.00 | | | | 0.000 | 0.90 | 1 | 2.20 | 2.30 | 0.023 | 0.021 | 0.19 | 0.02 | 0.000 | 0% | |
| 2.40 | 0.84 | 0.08 | | | 0.091 | 0.90 | 2 | 2.30 | 2.55 | 0.091 | 0.082 | 0.76 | 0.19 | 0.016 | 13% | |
| 2.70 | 0.85 | 0.14 | | | 0.110 | 0.90 | 3 | 2.55 | 2.83 | 0.110 | 0.099 | 0.71 | 0.20 | 0.019 | 16% | |
| 2.95 | 0.86 | 0.15 | | | 0.119 | 0.90 | 4 | 2.83 | 3.05 | 0.119 | 0.107 | 0.71 | 0.16 | 0.017 | 15% | |
| 3.15 | 0.84 | 0.21 | | | 0.101 | 0.90 | 5 | 3.05 | 3.35 | 0.101 | 0.091 | 0.63 | 0.19 | 0.017 | 15% | |
| 3.55 | 0.79 | 0.23 | | | 0.024 | 0.90 | 6 | 3.35 | 3.68 | 0.024 | 0.022 | 0.56 | 0.18 | 0.004 | 3% | |
| 3.80 | 0.71 | 0.23 | | | 0.037 | 0.90 | 7 | 3.68 | 3.98 | 0.037 | 0.033 | 0.48 | 0.14 | 0.005 | 4% | |
| 4.15 | 0.63 | 0.27 | | | 0.046 | 0.90 | 8 | 3.98 | 4.28 | 0.046 | 0.041 | 0.36 | 0.11 | 0.004 | 4% | |
| 4.40 | 0.62 | 0.25 | | | 0.055 | 0.90 | 9 | 4.28 | 4.53 | 0.055 | 0.049 | 0.37 | 0.09 | 0.005 | 4% | |
| 4.65 | 0.62 | 0.23 | | | 0.046 | 0.90 | 10 | 4.53 | 4.78 | 0.046 | 0.041 | 0.39 | 0.10 | 0.004 | 3% | |
| 4.90 | 0.63 | 0.16 | | | 0.076 | 0.90 | 11 | 4.78 | 5.05 | 0.076 | 0.069 | 0.47 | 0.13 | 0.009 | 8% | |
| 5.20 | 0.64 | 0.13 | | | 0.070 | 0.90 | 12 | 5.05 | 5.33 | 0.070 | 0.063 | 0.51 | 0.14 | 0.009 | 8% | |
| 5.45 | 0.62 | 0.14 | | | 0.091 | 0.90 | 13 | 5.33 | 5.53 | 0.091 | 0.082 | 0.48 | 0.10 | 0.008 | 7% | |
| 5.60 | 0.00 | | | | 0.000 | 0.90 | 14 | 5.53 | 5.60 | 0.023 | 0.021 | 0.12 | 0.01 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.117 | | |

| | | |
|--------------------------------|------------------------------|---------------------|
| Total Flow: | 0.117 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1.75 | (m ²) |
| Top Width: | 3.40 | (m) |
| Hydraulic Depth: | 0.515 | (m) |
| Mean Velocity: | 0.067 | (m/s) |
| Froude Number | 0.030 | |
| Photographs taken looking at: | Upstream, downstream, across | |

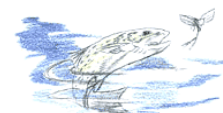
| | |
|----------------------------|---------------------|
| Datalogger Notes: | |
| Datalogger Internal Power: | no logger installed |
| Datalogger External Power: | |
| Datalogger Memory Used: | |
| Datalogger Clock: | |
| Laptop Clock: | |
| Dessicant: | |
| Datalogger: | |
| PT: | |
| Power: | |

Notes: Ice was thin so auger holes were spaced > 1x auger diameter apart



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:

Time of Measurement

Date of Measurement: [February 4, 2005](#)
 Start Time: [2:30 PM](#) [MST](#)
 End Time: [MST](#)

Weather Conditions: [-22°C, partly cloudy](#)

River Conditions: [Ice cover-just about 6 cms of ice](#)

Personnel & Equipment

Measurement Made By: [RM/ND/CT](#)
 Data Entry By: [ND](#) Checked: [PM](#)
 Meter Type and No.: [Marsh McBirney FloMate 2000](#)
[s/n 2004521](#)

Level Readings

Bench Mark Reading: post in P\ [2.463](#)
 Water Level Reading: [3.342](#)
 Top of Ice Level Reading: [3.334](#)
 Transducer Reading & Calc'd El [n/a](#)
 Other:

Setup No. 1

El: [330.400](#)
 El: [329.521](#)
 El: [329.529](#)
 El:

Setup No. 2

El: [330.400](#)
 El: [329.518](#)
 El: [329.527](#)
 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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: [Ice was very thin to drill holes by ice auger](#)
[Wading MMT not possible due to cold weather](#)

Datalogger Notes:
 Datalogger Internal Power: [no logger installed](#)
 Datalogger External Power:
 Datalogger Memory Used:
 Datalogger Clock:
 Laptop Clock:
 Dessicant:
 Datalogger:
 PT:
 Power:

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:

Time of Measurement

Date of Measurement: **March 4, 2005**
Start Time: **12:27 PM MST**
End Time: **12:53 PM MST**

Weather Conditions:

+2°C, Clear

River Conditions:

Open

Personnel & Equipment

Measurement Made By: **RM/ND/CT**
Data Entry By: **ND** Checked: **PM**
Meter Type and No.: **Marsh McBirney FloMate 2000**
s/n 2004521

Level Readings

Bench Mark Reading: post in PVI **2.337**
Water Level Reading: **3.262**
Top of Ice Level Reading:
Transducer Reading & Calc'd El n/a
Other: **Crown of culvert on river rig**

Setup No. 1

El: **330.400**
El: **329.475**
El: **332.737**
El: **n/a**
El:

Setup No. 2

El: **330.400**
El: **329.474**
El: **329.435**
El:
El: **2.440**
El:

Measurement Data

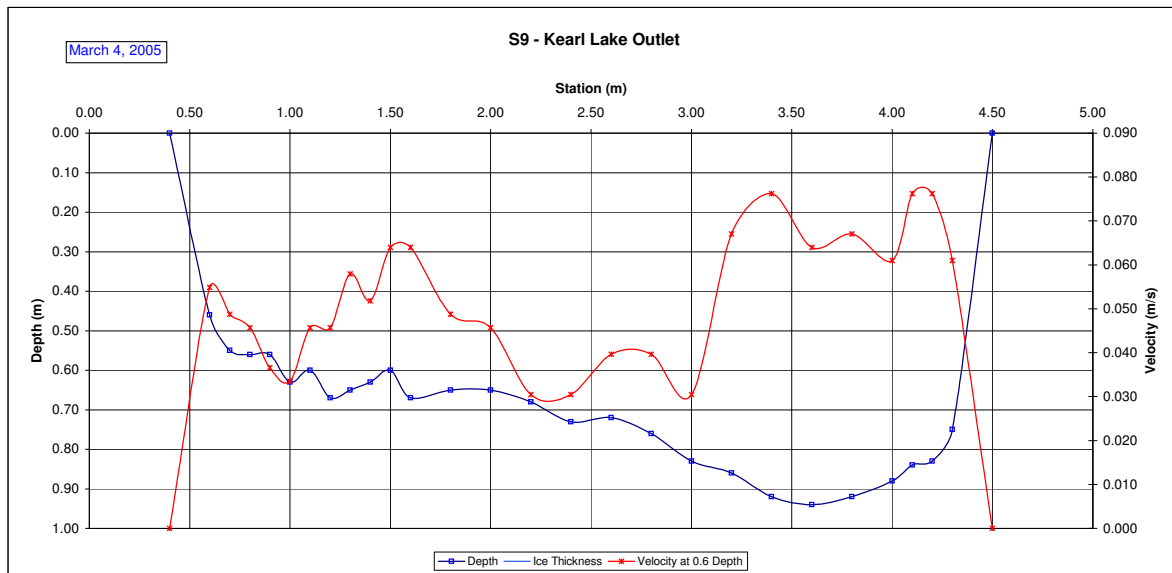
| Measured Data | | | | | | Calculated Data | | | | | | | | | Percentage of Total |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|------------------------|-----------------------|------------|-----------------|---------------------|
| 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 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) | |
| 0.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.40 | 0.50 | 0.014 | 0.014 | 0.12 | 0.01 | 0.000 | 0% |
| 0.60 | 0.46 | | | | 0.055 | 1.00 | 2 | 0.50 | 0.65 | 0.055 | 0.055 | 0.46 | 0.07 | 0.004 | 2% |
| 0.70 | 0.55 | | | | 0.049 | 1.00 | 3 | 0.65 | 0.75 | 0.049 | 0.049 | 0.55 | 0.06 | 0.003 | 2% |
| 0.80 | 0.56 | | | | 0.046 | 1.00 | 4 | 0.75 | 0.85 | 0.046 | 0.046 | 0.56 | 0.06 | 0.003 | 2% |
| 0.90 | 0.56 | | | | 0.037 | 1.00 | 5 | 0.85 | 0.95 | 0.037 | 0.037 | 0.56 | 0.06 | 0.002 | 1% |
| 1.00 | 0.63 | | | | 0.034 | 1.00 | 6 | 0.95 | 1.05 | 0.034 | 0.034 | 0.63 | 0.06 | 0.002 | 1% |
| 1.10 | 0.60 | | | | 0.046 | 1.00 | 7 | 1.05 | 1.15 | 0.046 | 0.046 | 0.60 | 0.06 | 0.003 | 2% |
| 1.20 | 0.67 | | | | 0.046 | 1.00 | 8 | 1.15 | 1.25 | 0.046 | 0.046 | 0.67 | 0.07 | 0.003 | 2% |
| 1.30 | 0.65 | | | | 0.058 | 1.00 | 9 | 1.25 | 1.35 | 0.058 | 0.058 | 0.65 | 0.07 | 0.004 | 2% |
| 1.40 | 0.63 | | | | 0.052 | 1.00 | 10 | 1.35 | 1.45 | 0.052 | 0.052 | 0.63 | 0.06 | 0.003 | 2% |
| 1.50 | 0.60 | | | | 0.064 | 1.00 | 11 | 1.45 | 1.55 | 0.064 | 0.064 | 0.60 | 0.06 | 0.004 | 3% |
| 1.60 | 0.67 | | | | 0.064 | 1.00 | 12 | 1.55 | 1.70 | 0.064 | 0.064 | 0.67 | 0.10 | 0.006 | 4% |
| 1.80 | 0.65 | | | | 0.049 | 1.00 | 13 | 1.70 | 1.90 | 0.049 | 0.049 | 0.65 | 0.13 | 0.006 | 4% |
| 2.00 | 0.65 | | | | 0.046 | 1.00 | 14 | 1.90 | 2.10 | 0.046 | 0.046 | 0.65 | 0.13 | 0.006 | 4% |
| 2.20 | 0.68 | | | | 0.030 | 1.00 | 15 | 2.10 | 2.30 | 0.030 | 0.030 | 0.68 | 0.14 | 0.004 | 3% |
| 2.40 | 0.73 | | | | 0.030 | 1.00 | 16 | 2.30 | 2.50 | 0.030 | 0.030 | 0.73 | 0.15 | 0.004 | 3% |
| 2.60 | 0.72 | | | | 0.040 | 1.00 | 17 | 2.50 | 2.70 | 0.040 | 0.040 | 0.72 | 0.14 | 0.006 | 4% |
| 2.80 | 0.76 | | | | 0.040 | 1.00 | 18 | 2.70 | 2.90 | 0.040 | 0.040 | 0.76 | 0.15 | 0.006 | 4% |
| 3.00 | 0.83 | | | | 0.030 | 1.00 | 19 | 2.90 | 3.10 | 0.030 | 0.030 | 0.83 | 0.17 | 0.005 | 3% |
| 3.20 | 0.86 | | | | 0.067 | 1.00 | 20 | 3.10 | 3.30 | 0.067 | 0.067 | 0.86 | 0.17 | 0.012 | 8% |
| 3.40 | 0.92 | | | | 0.076 | 1.00 | 21 | 3.30 | 3.50 | 0.076 | 0.076 | 0.92 | 0.18 | 0.014 | 9% |
| 3.60 | 0.94 | | | | 0.064 | 1.00 | 22 | 3.50 | 3.70 | 0.064 | 0.064 | 0.94 | 0.19 | 0.012 | 8% |
| 3.80 | 0.92 | | | | 0.067 | 1.00 | 23 | 3.70 | 3.90 | 0.067 | 0.067 | 0.92 | 0.18 | 0.012 | 8% |
| 4.00 | 0.88 | | | | 0.061 | 1.00 | 24 | 3.90 | 4.05 | 0.061 | 0.061 | 0.88 | 0.13 | 0.008 | 5% |
| 4.10 | 0.84 | | | | 0.076 | 1.00 | 25 | 4.05 | 4.15 | 0.076 | 0.076 | 0.84 | 0.08 | 0.006 | 4% |
| 4.20 | 0.83 | | | | 0.076 | 1.00 | 26 | 4.15 | 4.25 | 0.076 | 0.076 | 0.83 | 0.08 | 0.006 | 4% |
| 4.30 | 0.75 | | | | 0.061 | 1.00 | 27 | 4.25 | 4.40 | 0.061 | 0.061 | 0.75 | 0.11 | 0.007 | 5% |
| 4.50 | 0.00 | | | | 0.000 | 1.00 | 28 | 4.40 | 4.50 | 0.015 | 0.015 | 0.19 | 0.02 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 0.152 | 1 |

| | | |
|--------------------------------|------------------------------|--------|
| Total Flow: | 0.152 | (m³/s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.89 | (m²) |
| Top Width: | 4.10 | (m) |
| Hydraulic Depth: | 0.704 | (m) |
| Mean Velocity: | 0.053 | (m/s) |
| Froude Number | 0.020 | |
| Photographs taken looking at: | Upstream, downstream, across | |

Datalogger Notes:

Datalogger Internal Power: **no logger installed**
Datalogger External Power:
Datalogger Memory Used:
Datalogger Clock:
Laptop Clock:
Dessicant:
Datalogger:
PT:
Power:

Notes: Manual MMT done by wading through the river.



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:
Time of Measurement: April 5, 2005
Date of Measurement: 1:19 PM MDT
Start Time: 1:39 PM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: post in PV 2.348
Water Level Reading: 3.405
Top of Ice Level Reading:
Transducer Reading & Calc'd El. n/a
Other: Crown of culvert on river rig

Setup No. 1

El: 330.400
El: 329.343
El:
El: n/a
El:

Setup No. 2

El: 330.400
El: 329.345
El:
El:
El:

Weather Conditions:

+10°C, Clear

River Conditions:

Open

| 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) | | | | | | |
| | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.00 | 0.25 | 0.001 | 0.001 | 0.08 | 0.02 | 0.000 | 0% | | | | | |
| | 0.50 | 0.30 | | | 0.003 | 1.00 | 2 | 0.25 | 0.75 | 0.003 | 0.003 | 0.30 | 0.15 | 0.000 | 3% | | | | | |
| | 1.00 | 0.35 | | | 0.003 | 1.00 | 3 | 0.75 | 1.13 | 0.003 | 0.003 | 0.35 | 0.13 | 0.000 | 2% | | | | | |
| | 1.25 | 0.38 | | | 0.003 | 1.00 | 4 | 1.13 | 1.38 | 0.003 | 0.003 | 0.38 | 0.10 | 0.000 | 2% | | | | | |
| | 1.50 | 0.53 | | | 0.009 | 1.00 | 5 | 1.38 | 1.75 | 0.009 | 0.009 | 0.53 | 0.20 | 0.002 | 11% | | | | | |
| | 2.00 | 0.62 | | | 0.012 | 1.00 | 6 | 1.75 | 2.13 | 0.012 | 0.012 | 0.62 | 0.23 | 0.003 | 18% | | | | | |
| | 2.25 | 0.62 | | | 0.009 | 1.00 | 7 | 2.13 | 2.38 | 0.009 | 0.009 | 0.62 | 0.16 | 0.001 | 9% | | | | | |
| | 2.50 | 0.69 | | | 0.006 | 1.00 | 8 | 2.38 | 2.63 | 0.006 | 0.006 | 0.69 | 0.17 | 0.001 | 7% | | | | | |
| | 2.75 | 0.58 | | | 0.003 | 1.00 | 9 | 2.63 | 2.88 | 0.003 | 0.003 | 0.58 | 0.15 | 0.000 | 3% | | | | | |
| | 3.00 | 0.53 | | | 0.009 | 1.00 | 10 | 2.88 | 3.13 | 0.009 | 0.009 | 0.53 | 0.13 | 0.001 | 8% | | | | | |
| | 3.25 | 0.48 | | | 0.003 | 1.00 | 11 | 3.13 | 3.38 | 0.003 | 0.003 | 0.48 | 0.12 | 0.000 | 2% | | | | | |
| | 3.50 | 0.42 | | | 0.006 | 1.00 | 12 | 3.38 | 3.60 | 0.006 | 0.006 | 0.42 | 0.09 | 0.001 | 4% | | | | | |
| | 3.70 | 0.50 | | | 0.006 | 1.00 | 13 | 3.60 | 3.80 | 0.006 | 0.006 | 0.50 | 0.10 | 0.001 | 4% | | | | | |
| | 3.90 | 0.47 | | | 0.006 | 1.00 | 14 | 3.80 | 4.00 | 0.006 | 0.006 | 0.47 | 0.09 | 0.001 | 4% | | | | | |
| | 4.10 | 0.40 | | | 0.006 | 1.00 | 15 | 4.00 | 4.20 | 0.006 | 0.006 | 0.40 | 0.08 | 0.000 | 3% | | | | | |
| | 4.30 | 0.42 | | | 0.009 | 1.00 | 16 | 4.20 | 4.40 | 0.009 | 0.009 | 0.42 | 0.08 | 0.001 | 5% | | | | | |
| | 4.50 | 0.41 | | | 0.009 | 1.00 | 17 | 4.40 | 4.55 | 0.009 | 0.009 | 0.41 | 0.06 | 0.001 | 3% | | | | | |
| | 4.60 | 0.40 | | | 0.012 | 1.00 | 18 | 4.55 | 4.65 | 0.012 | 0.012 | 0.40 | 0.04 | 0.000 | 3% | | | | | |
| | 4.70 | 0.38 | | | 0.012 | 1.00 | 19 | 4.65 | 4.75 | 0.012 | 0.012 | 0.38 | 0.04 | 0.000 | 3% | | | | | |
| | 4.80 | 0.36 | | | 0.009 | 1.00 | 20 | 4.75 | 4.85 | 0.009 | 0.009 | 0.36 | 0.04 | 0.000 | 2% | | | | | |
| | 4.90 | 0.32 | | | 0.009 | 1.00 | 21 | 4.85 | 4.95 | 0.009 | 0.009 | 0.32 | 0.03 | 0.000 | 2% | | | | | |
| | 5.00 | 0.32 | | | 0.009 | 1.00 | 22 | 4.95 | 5.10 | 0.009 | 0.009 | 0.32 | 0.05 | 0.000 | 3% | | | | | |
| | 5.20 | 0.30 | | | 0.003 | 1.00 | 23 | 5.10 | 5.35 | 0.003 | 0.003 | 0.30 | 0.08 | 0.000 | 1% | | | | | |
| | 5.50 | 0.00 | | | 0.000 | 1.00 | 24 | 5.35 | 5.50 | 0.001 | 0.001 | 0.08 | 0.01 | 0.000 | 0% | | | | | |
| Total Flow: | | | | | | | | | | | | | | 0.016 | | | | | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.016 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.35 | (m ²) |
| Top Width: | 5.50 | (m) |
| Hydraulic Depth: | 0.426 | (m) |
| Mean Velocity: | 0.007 | (m/s) |
| Froude Number | 0.003 | |

Photographs taken looking at:

Upstream, downstream, across

Datalogger Notes:

Datalogger Internal Power: no logger installed

Datalogger External Power:

Datalogger Memory Used:

Datalogger Clock:

Laptop Clock:

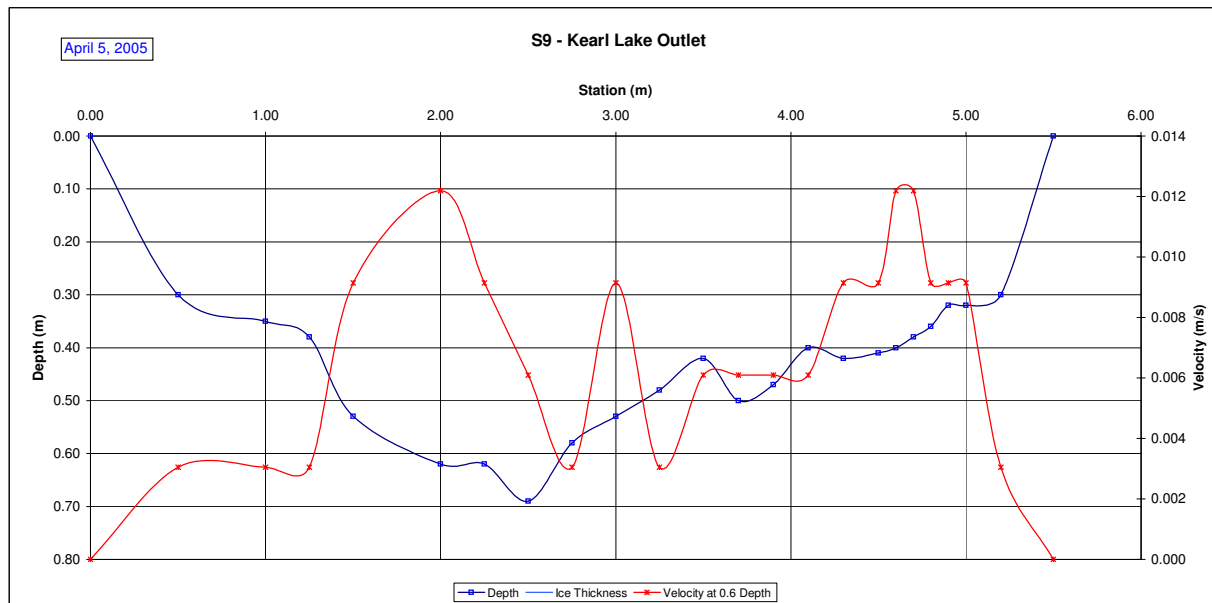
Dessicant:

Datalogger:

PT:

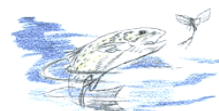
Power:

Notes: Manual MMT done by wading through the river.



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:

Time of Measurement

Date of Measurement: **April 23, 2005**
Start Time: **1:38 PM MDT**
End Time: **1:48 PM MDT**

Weather Conditions:

+15°C, Clear, Calm

River Conditions:

Open, water over banks

Personnel & Equipment

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

Level Readings

Bench Mark Reading: post in PV **2.297**
Water Level Reading: **3.164**
Top of Ice Level Reading:
Transducer Reading & Calc'd El. **0.858**
Other:

Setup No. 1

El: **330.400**
El: **329.533**
El:
El: **328.675**
El:

Setup No. 2

El: **330.400**
El: **329.527**
El:
El: **328.669**
El:

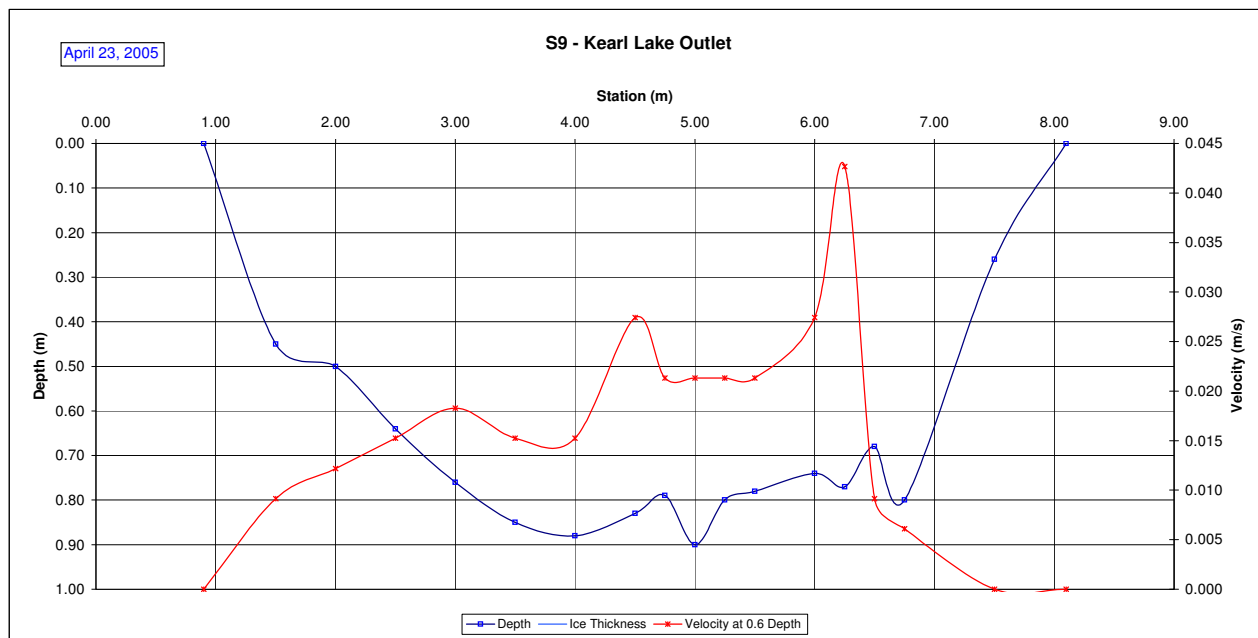
Measurement Data

| 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 ²) | (m ³ /s) | | |
| 0.90 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.90 | 1.20 | 0.002 | 0.002 | 0.11 | 0.03 | 0.000 | 0% | |
| 1.50 | 0.45 | | | | 0.009 | 1.00 | 2 | 1.20 | 1.75 | 0.009 | 0.009 | 0.45 | 0.25 | 0.002 | 3% | |
| 2.00 | 0.50 | | | | 0.012 | 1.00 | 3 | 1.75 | 2.25 | 0.012 | 0.012 | 0.50 | 0.25 | 0.003 | 4% | |
| 2.50 | 0.64 | | | | 0.015 | 1.00 | 4 | 2.25 | 2.75 | 0.015 | 0.015 | 0.64 | 0.32 | 0.005 | 6% | |
| 3.00 | 0.76 | | | | 0.018 | 1.00 | 5 | 2.75 | 3.25 | 0.018 | 0.018 | 0.76 | 0.38 | 0.007 | 9% | |
| 3.50 | 0.85 | | | | 0.015 | 1.00 | 6 | 3.25 | 3.75 | 0.015 | 0.015 | 0.85 | 0.43 | 0.006 | 8% | |
| 4.00 | 0.88 | | | | 0.015 | 1.00 | 7 | 3.75 | 4.25 | 0.015 | 0.015 | 0.88 | 0.44 | 0.007 | 9% | |
| 4.50 | 0.83 | | | | 0.027 | 1.00 | 8 | 4.25 | 4.63 | 0.027 | 0.027 | 0.83 | 0.31 | 0.009 | 11% | |
| 4.75 | 0.79 | | | | 0.021 | 1.00 | 9 | 4.63 | 4.88 | 0.021 | 0.021 | 0.79 | 0.20 | 0.004 | 5% | |
| 5.00 | 0.90 | | | | 0.021 | 1.00 | 10 | 4.88 | 5.13 | 0.021 | 0.021 | 0.90 | 0.23 | 0.005 | 6% | |
| 5.25 | 0.80 | | | | 0.021 | 1.00 | 11 | 5.13 | 5.38 | 0.021 | 0.021 | 0.80 | 0.20 | 0.004 | 5% | |
| 5.50 | 0.78 | | | | 0.021 | 1.00 | 12 | 5.38 | 5.75 | 0.021 | 0.021 | 0.78 | 0.29 | 0.006 | 8% | |
| 6.00 | 0.74 | | | | 0.027 | 1.00 | 13 | 5.75 | 6.13 | 0.027 | 0.027 | 0.74 | 0.28 | 0.008 | 10% | |
| 6.25 | 0.77 | | | | 0.043 | 1.00 | 14 | 6.13 | 6.38 | 0.043 | 0.043 | 0.77 | 0.19 | 0.008 | 10% | |
| 6.50 | 0.68 | | | | 0.009 | 1.00 | 15 | 6.38 | 6.63 | 0.009 | 0.009 | 0.68 | 0.17 | 0.002 | 2% | |
| 6.75 | 0.80 | | | | 0.006 | 1.00 | 16 | 6.63 | 7.13 | 0.006 | 0.006 | 0.80 | 0.40 | 0.002 | 3% | |
| 7.50 | 0.26 | | | | 0.000 | 1.00 | 17 | 7.13 | 7.80 | 0.000 | 0.000 | 0.26 | 0.18 | 0.000 | 0% | |
| 8.10 | 0.00 | | | | 0.000 | 1.00 | 18 | 7.80 | 8.10 | 0.000 | 0.000 | 0.07 | 0.02 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.078 | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.078 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 4.56 | (m ²) |
| Top Width: | 7.20 | (m) |
| Hydraulic Depth: | 0.633 | (m) |
| Mean Velocity: | 0.017 | (m/s) |
| Froude Number | 0.007 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|------------------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34 V | 100% |
| Datalogger External Power: | 12.41 V | 80% |
| Datalogger Memory Used: | 0% | |
| Datalogger Clock: | Apr 23, 2005 12:29 | MST |
| Laptop Clock: | Apr 23, 2005 12:29 | MST |
| Dessicant: | Good | |
| Datalogger: | Lakewood UltraLogger RX-GC #203058 | |
| PT: | Keller LE8363K #971022 | |
| Power: | Lakewood battery | |

Notes: TSS Sample taken.
Equipment installed. Transducer clamped to a concrete block and placed in the flow.



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: FF/RM
Data Entry By: FF Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: May 30, 2005
Start Time: 9:38 AM MDT
End Time: 9:45 AM MDT

Level Readings

Bench Mark Reading: post in P\ 1.822
Water Level Reading: 2.519
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 1.152
Other: Crown of culvert on river rig

Setup No. 1

El: 330.400
El: 329.703
El:
El: 328.551
El:

Setup No. 2

El: 330.400
El: 329.698
El:
El: 328.546
El:

Weather Conditions:

+18°C, Clear, Calm wind

River Conditions:

Open water, stage below bankfull, stage falling

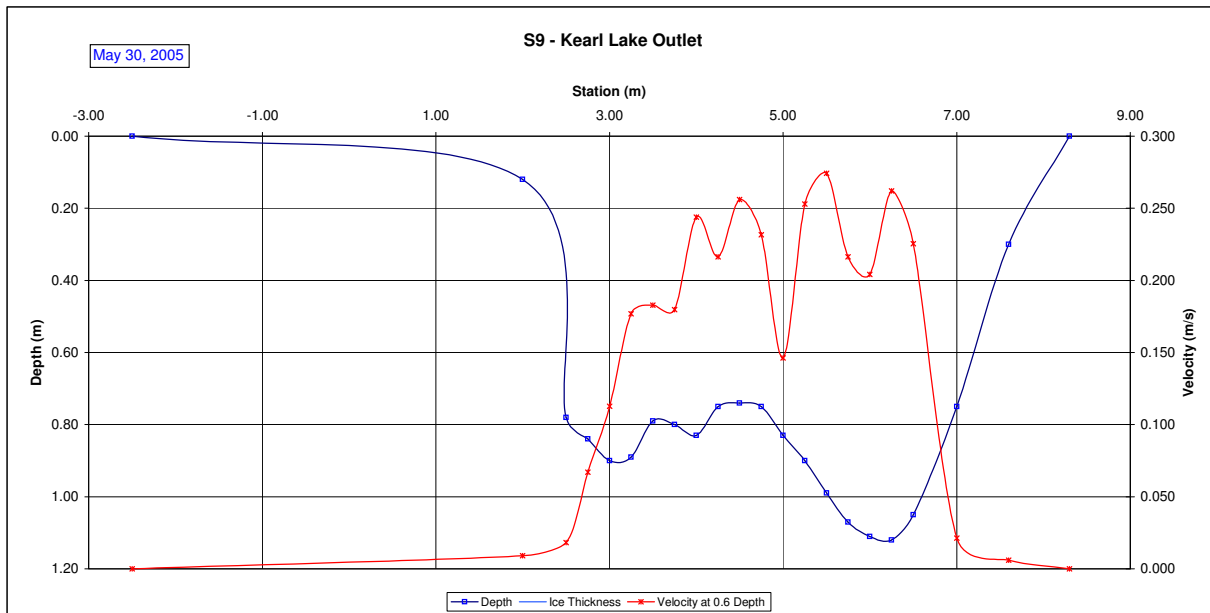
Measurement Data

| 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) | | |
| -2.50 | 0.00 | | | | 0.000 | 1.00 | 1 | -2.50 | -0.25 | 0.002 | 0.002 | 0.03 | 0.07 | 0.000 | 0% | |
| 2.00 | 0.12 | | | | 0.009 | 1.00 | 2 | -0.25 | 2.25 | 0.009 | 0.009 | 0.12 | 0.30 | 0.003 | 0% | |
| 2.50 | 0.78 | | | | 0.018 | 1.00 | 3 | 2.25 | 2.63 | 0.018 | 0.018 | 0.78 | 0.29 | 0.005 | 1% | |
| 2.75 | 0.84 | | | | 0.067 | 1.00 | 4 | 2.63 | 2.88 | 0.067 | 0.067 | 0.84 | 0.21 | 0.014 | 2% | |
| 3.00 | 0.90 | | | | 0.113 | 1.00 | 5 | 2.88 | 3.13 | 0.113 | 0.113 | 0.90 | 0.23 | 0.025 | 3% | |
| 3.25 | 0.89 | | | | 0.177 | 1.00 | 6 | 3.13 | 3.38 | 0.177 | 0.177 | 0.89 | 0.22 | 0.039 | 5% | |
| 3.50 | 0.79 | | | | 0.183 | 1.00 | 7 | 3.38 | 3.63 | 0.183 | 0.183 | 0.79 | 0.20 | 0.036 | 5% | |
| 3.75 | 0.80 | | | | 0.180 | 1.00 | 8 | 3.63 | 3.88 | 0.180 | 0.180 | 0.80 | 0.20 | 0.036 | 5% | |
| 4.00 | 0.83 | | | | 0.244 | 1.00 | 9 | 3.88 | 4.13 | 0.244 | 0.244 | 0.83 | 0.21 | 0.051 | 6% | |
| 4.25 | 0.75 | | | | 0.216 | 1.00 | 10 | 4.13 | 4.38 | 0.216 | 0.216 | 0.75 | 0.19 | 0.041 | 5% | |
| 4.50 | 0.74 | | | | 0.256 | 1.00 | 11 | 4.38 | 4.63 | 0.256 | 0.256 | 0.74 | 0.19 | 0.047 | 6% | |
| 4.75 | 0.75 | | | | 0.232 | 1.00 | 12 | 4.63 | 4.88 | 0.232 | 0.232 | 0.75 | 0.19 | 0.043 | 6% | |
| 5.00 | 0.83 | | | | 0.146 | 1.00 | 13 | 4.88 | 5.13 | 0.146 | 0.146 | 0.83 | 0.21 | 0.030 | 4% | |
| 5.25 | 0.90 | | | | 0.253 | 1.00 | 14 | 5.13 | 5.38 | 0.253 | 0.253 | 0.90 | 0.23 | 0.057 | 7% | |
| 5.50 | 0.99 | | | | 0.274 | 1.00 | 15 | 5.38 | 5.63 | 0.274 | 0.274 | 0.99 | 0.25 | 0.068 | 9% | |
| 5.75 | 1.07 | | | | 0.216 | 1.00 | 16 | 5.63 | 5.88 | 0.216 | 0.216 | 1.07 | 0.27 | 0.058 | 7% | |
| 6.00 | 1.11 | | | | 0.204 | 1.00 | 17 | 5.88 | 6.13 | 0.204 | 0.204 | 1.11 | 0.28 | 0.057 | 7% | |
| 6.25 | 1.12 | | | | 0.262 | 1.00 | 18 | 6.13 | 6.38 | 0.262 | 0.262 | 1.12 | 0.28 | 0.073 | 9% | |
| 6.50 | 1.05 | | | | 0.226 | 1.00 | 19 | 6.38 | 6.75 | 0.226 | 0.226 | 1.05 | 0.39 | 0.089 | 11% | |
| 7.00 | 0.75 | | | | 0.021 | 1.00 | 20 | 6.75 | 7.30 | 0.021 | 0.021 | 0.75 | 0.41 | 0.009 | 1% | |
| 7.60 | 0.30 | | | | 0.006 | 1.00 | 21 | 7.30 | 7.95 | 0.006 | 0.006 | 0.30 | 0.20 | 0.001 | 0% | |
| 8.30 | 0.00 | | | | 0.000 | 1.00 | 22 | 7.95 | 8.30 | 0.002 | 0.002 | 0.08 | 0.03 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.783 | 1 | |

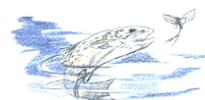
| | | |
|---|-------|---------------------|
| Total Flow: | 0.783 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 5.02 | (m ²) |
| Top Width: | 10.80 | (m) |
| Hydraulic Depth: | 0.464 | (m) |
| Mean Velocity: | 0.156 | (m/s) |
| Froude Number | 0.073 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|------------------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.29V | 79% |
| Datalogger Memory Used: | 25% used | |
| Datalogger Clock: | May 30, 2005 08:26 | MST |
| Laptop Clock: | May 30, 2005 08:28 | MST |
| Dessicant: | 95% Good | |
| Datalogger: | Lakewood UltraLogger 203058 | |
| PT: | Keller Pressure Transducer #971022 | |
| Power: | | |

Notes: Data looks good - check water level spikes in May.
Blockage or uplift may be affecting backwater from culverts - verify rating curve.
TSS sample taken.



S9 - Kearl 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

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

Date of Measurement: July 15, 2005
Start Time: 3:24 PM MDT
End Time: 3:50 PM MDT

| | |
|--------------------------------------|-------|
| Bench Mark Reading: post in P\ | 2.384 |
| Water Level Reading: | 3.034 |
| Top of Ice Level Reading: | |
| Transducer Reading & Calc'd EI | 1.360 |
| Other: Crown of culvert on river ric | |

| <u>Setup No. 1</u> | | <u>Setup No. 2</u> | |
|--------------------|---------|--------------------|-------------|
| El: | 330.400 | 2.410 | El: 330.400 |
| El: | 329.750 | 3.050 | El: 329.760 |
| El: | | | El: |
| El: | 328.390 | 1.360 | El: 328.400 |
| El: | | | El: |

River Conditions: Open water, high stage > bankfull

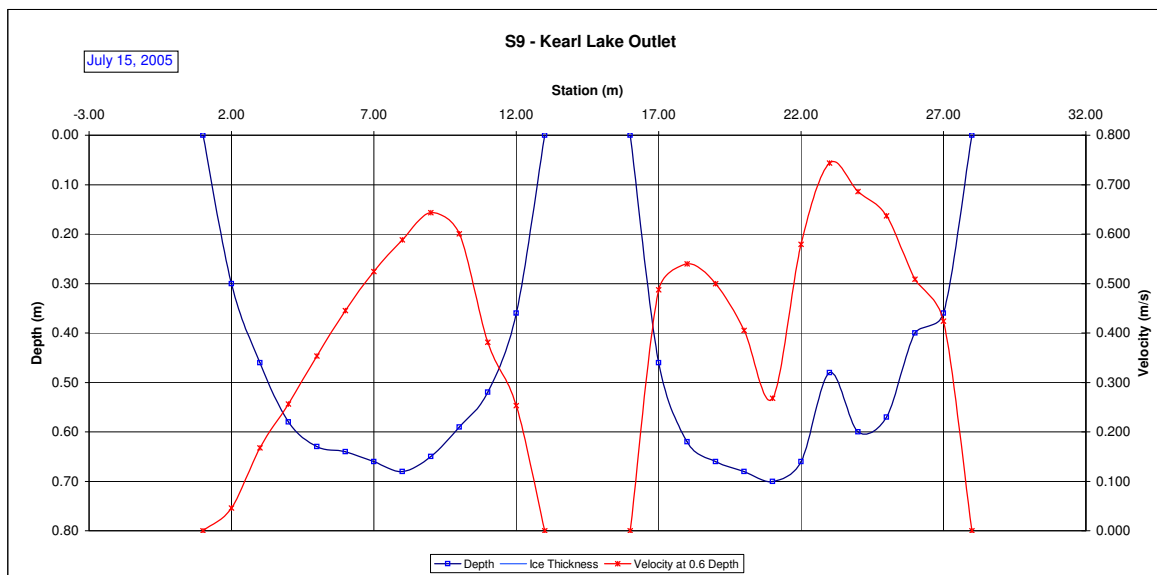
Measurement Data

| | 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 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) | | |
| RB | Right Culvert | | | | | | | | | | | | | | | |
| | 3.60 | 0.00 | | | | 0.000 | 1.00 | 1 | 3.60 | 3.65 | 0.011 | 0.011 | 0.08 | 0.00 | 0.000 | 0% |
| | 3.70 | 0.30 | | | | 0.046 | 1.00 | 2 | 3.65 | 3.75 | 0.046 | 0.046 | 0.30 | 0.03 | 0.001 | 1% |
| | 3.80 | 0.46 | | | | 0.168 | 1.00 | 3 | 3.75 | 3.85 | 0.168 | 0.168 | 0.46 | 0.05 | 0.008 | 3% |
| | 3.90 | 0.58 | | | | 0.256 | 1.00 | 4 | 3.85 | 3.95 | 0.256 | 0.256 | 0.58 | 0.06 | 0.015 | 6% |
| | 4.00 | 0.63 | | | | 0.354 | 1.00 | 5 | 3.95 | 4.05 | 0.354 | 0.354 | 0.63 | 0.06 | 0.022 | 9% |
| | 4.10 | 0.64 | | | | 0.445 | 1.00 | 6 | 4.05 | 4.15 | 0.445 | 0.445 | 0.64 | 0.06 | 0.028 | 11% |
| | 4.20 | 0.66 | | | | 0.524 | 1.00 | 7 | 4.15 | 4.25 | 0.524 | 0.524 | 0.66 | 0.07 | 0.035 | 14% |
| | 4.30 | 0.68 | | | | 0.588 | 1.00 | 8 | 4.25 | 4.35 | 0.588 | 0.588 | 0.68 | 0.07 | 0.040 | 16% |
| | 4.40 | 0.65 | | | | 0.643 | 1.00 | 9 | 4.35 | 4.45 | 0.643 | 0.643 | 0.65 | 0.07 | 0.042 | 16% |
| | 4.50 | 0.59 | | | | 0.600 | 1.00 | 10 | 4.45 | 4.55 | 0.600 | 0.600 | 0.59 | 0.06 | 0.035 | 14% |
| | 4.60 | 0.52 | | | | 0.381 | 1.00 | 11 | 4.55 | 4.65 | 0.381 | 0.381 | 0.52 | 0.05 | 0.020 | 8% |
| | 4.70 | 0.36 | | | | 0.253 | 1.00 | 12 | 4.65 | 4.75 | 0.253 | 0.253 | 0.36 | 0.04 | 0.009 | 4% |
| 4.80 | 0.00 | | | | 0.000 | 1.00 | 13 | 4.75 | 4.80 | 0.063 | 0.063 | 0.09 | 0.00 | 0.000 | 0% | |
| RB | Left Culvert | | | | | | | | | | | | | | | |
| | 9.60 | 0.00 | | | | 0.000 | 1.00 | 1 | 9.60 | 9.65 | 0.122 | 0.122 | 0.12 | 0.01 | 0.001 | 0% |
| | 9.70 | 0.46 | | | | 0.488 | 1.00 | 2 | 9.65 | 9.75 | 0.488 | 0.488 | 0.46 | 0.05 | 0.022 | 7% |
| | 9.80 | 0.62 | | | | 0.539 | 1.00 | 3 | 9.75 | 9.85 | 0.539 | 0.539 | 0.62 | 0.06 | 0.033 | 10% |
| | 9.90 | 0.66 | | | | 0.500 | 1.00 | 4 | 9.85 | 9.95 | 0.500 | 0.500 | 0.66 | 0.07 | 0.033 | 10% |
| | 10.00 | 0.68 | | | | 0.405 | 1.00 | 5 | 9.95 | 10.05 | 0.405 | 0.405 | 0.68 | 0.07 | 0.028 | 9% |
| | 10.10 | 0.70 | | | | 0.268 | 1.00 | 6 | 10.05 | 10.15 | 0.268 | 0.268 | 0.70 | 0.07 | 0.019 | 6% |
| | 10.20 | 0.66 | | | | 0.579 | 1.00 | 7 | 10.15 | 10.25 | 0.579 | 0.579 | 0.66 | 0.07 | 0.038 | 12% |
| | 10.30 | 0.48 | | | | 0.744 | 1.00 | 8 | 10.25 | 10.35 | 0.744 | 0.744 | 0.48 | 0.05 | 0.036 | 11% |
| | 10.40 | 0.60 | | | | 0.686 | 1.00 | 9 | 10.35 | 10.45 | 0.686 | 0.686 | 0.60 | 0.06 | 0.041 | 13% |
| | 10.50 | 0.57 | | | | 0.637 | 1.00 | 10 | 10.45 | 10.55 | 0.637 | 0.637 | 0.57 | 0.06 | 0.036 | 11% |
| | 10.60 | 0.40 | | | | 0.509 | 1.00 | 11 | 10.55 | 10.65 | 0.509 | 0.509 | 0.40 | 0.04 | 0.020 | 6% |
| | 10.70 | 0.36 | | | | 0.424 | 1.00 | 12 | 10.65 | 10.75 | 0.424 | 0.424 | 0.36 | 0.04 | 0.015 | 5% |
| 10.80 | 0.00 | | | | 0.000 | 1.00 | 13 | 10.75 | 10.80 | 0.106 | 0.106 | 0.09 | 0.00 | 0.000 | 0% | |
| | | | | | | | | | | | | | | Total Flow: | 0.323 | 100% |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.579 | (m ³ /s) |
| Perceived Measurement Quality: | Poor | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (m) |
| Mean Velocity: | - | (m/s) |
| Froude Number | - | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | | |
|-----------------------------------|------------------------------------|------|-----|
| Datalogger Notes: | | | |
| Datalogger Internal Power: | 11.34V | 100% | |
| Datalogger External Power: | 12.17V | 78% | |
| Datalogger Memory Used: | 50% | | |
| Datalogger Clock: | Jul 15, 2005 13:57 | | MST |
| Laptop Clock: | Jul 15, 2005 14:00 | | MST |
| Dessicant: | 15% used | | |
| Datalogger: | Lakewood UltraLogger 203058 | | |
| PT: | Keller Pressure Transducer #971022 | | |
| Power: | | | |

| | | |
|--------|--|--------|
| Notes: | Very high stage greater than bankfull, too deep to wade. Strong vegetation and beaver dam activity downstream in the channel affecting stage. Measurements taken at both the culvert inlets. TSS sample taken. | Power: |
|--------|--|--------|



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: ND/FF
Data Entry By: FF Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Time of Measurement

Date of Measurement: September 1, 2005
Start Time: 12:04 PM MDT
End Time: 12:25 PM MDT

Level Readings

Bench Mark Reading: post in PVI 2.262
Water Level Reading: 2.752
Top of Ice Level Reading:
Transducer Reading & Calc'd El 1.466
Other: TD reading 1.339

Setup No. 1

El: 330.400
El: 329.910
El: 328.444
El: 328.572

Setup No. 2

El: 2.356
El: 2.844
El: 1.466
El: 1.339

Before battery change
After battery change

Weather Conditions:

+10°C, Overcast, Calm wind

River Conditions:

Open water, stage at site very high due to new beaver dams upstream of road culverts.

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 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.00 | 1.00 | -0.002 | -0.002 | 0.11 | 0.11 | 0.000 | 0% |
| | 2.00 | 0.45 | | | -0.009 | 1.00 | 2 | 1.00 | 2.38 | -0.009 | -0.009 | 0.45 | 0.62 | -0.006 | -1% |
| | 2.75 | 0.85 | | | 0.110 | 1.00 | 3 | 2.38 | 2.88 | 0.110 | 0.110 | 0.85 | 0.43 | 0.047 | 12% |
| | 3.00 | 0.91 | | | 0.186 | 1.00 | 4 | 2.88 | 3.13 | 0.186 | 0.186 | 0.91 | 0.23 | 0.042 | 11% |
| | 3.25 | 0.99 | | | 0.198 | 1.00 | 5 | 3.13 | 3.38 | 0.198 | 0.198 | 0.99 | 0.25 | 0.049 | 13% |
| | 3.50 | 0.83 | | | 0.290 | 1.00 | 6 | 3.38 | 3.63 | 0.290 | 0.290 | 0.83 | 0.21 | 0.060 | 16% |
| | 3.75 | 0.94 | | | 0.128 | 1.00 | 7 | 3.63 | 3.88 | 0.128 | 0.128 | 0.94 | 0.24 | 0.030 | 8% |
| | 4.00 | 1.18 | 0.31 | 0.09 | | 1.00 | 8 | 3.88 | 4.13 | 0.000 | 0.000 | 1.18 | 0.30 | 0.000 | 0% |
| | 4.25 | 1.00 | | | 0.198 | 1.00 | 9 | 4.13 | 4.38 | 0.198 | 0.198 | 1.00 | 0.25 | 0.050 | 13% |
| | 4.50 | 1.45 | 0.25 | 0.02 | | 1.00 | 10 | 4.38 | 4.63 | 0.000 | 0.000 | 1.45 | 0.36 | 0.000 | 0% |
| | 4.75 | 1.44 | 0.25 | 0.03 | | 1.00 | 11 | 4.63 | 4.88 | 0.000 | 0.000 | 1.44 | 0.36 | 0.000 | 0% |
| | 5.00 | 1.43 | 0.12 | 0.01 | | 1.00 | 12 | 4.88 | 5.25 | 0.000 | 0.000 | 1.43 | 0.54 | 0.000 | 0% |
| | 5.50 | 1.22 | 0.07 | 0.01 | | 1.00 | 13 | 5.25 | 5.75 | 0.000 | 0.000 | 1.22 | 0.61 | 0.000 | 0% |
| | 6.00 | 1.00 | | | 0.005 | 1.00 | 14 | 5.75 | 6.50 | 0.005 | 0.005 | 1.00 | 0.75 | 0.003 | 1% |
| | 7.00 | 0.80 | | | 0.009 | 1.00 | 15 | 6.50 | 7.50 | 0.009 | 0.009 | 0.80 | 0.80 | 0.007 | 2% |
| | 8.00 | 0.82 | | | 0.012 | 1.00 | 16 | 7.50 | 8.25 | 0.012 | 0.012 | 0.82 | 0.62 | 0.007 | 2% |
| | 8.50 | 1.03 | | | 0.064 | 1.00 | 17 | 8.25 | 8.75 | 0.064 | 0.064 | 1.03 | 0.52 | 0.033 | 9% |
| | 9.00 | 1.25 | 0.24 | 0.02 | | 1.00 | 18 | 8.75 | 9.25 | 0.000 | 0.000 | 1.25 | 0.63 | 0.000 | 0% |
| | 9.50 | 1.28 | 0.21 | 0.03 | | 1.00 | 19 | 9.25 | 9.75 | 0.000 | 0.000 | 1.28 | 0.64 | 0.000 | 0% |
| | 10.00 | 0.77 | | | 0.085 | 1.00 | 20 | 9.75 | 10.25 | 0.085 | 0.085 | 0.77 | 0.39 | 0.033 | 9% |
| | 10.50 | 0.85 | | | 0.030 | 1.00 | 21 | 10.25 | 10.75 | 0.030 | 0.030 | 0.85 | 0.43 | 0.013 | 3% |
| | 11.00 | 0.57 | | | 0.009 | 1.00 | 22 | 10.75 | 11.25 | 0.009 | 0.009 | 0.57 | 0.29 | 0.003 | 1% |
| | 11.50 | 0.50 | | | 0.009 | 1.00 | 23 | 11.25 | 12.25 | 0.009 | 0.009 | 0.50 | 0.50 | 0.005 | 1% |
| | 13.00 | 0.25 | | | 0.003 | 1.00 | 24 | 12.25 | 14.50 | 0.003 | 0.003 | 0.25 | 0.56 | 0.002 | 0% |
| RB | 16.00 | 0.00 | | | 0.000 | 1.00 | 25 | 14.50 | 16.00 | 0.001 | 0.001 | 0.06 | 0.09 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 0.378 | 1 |

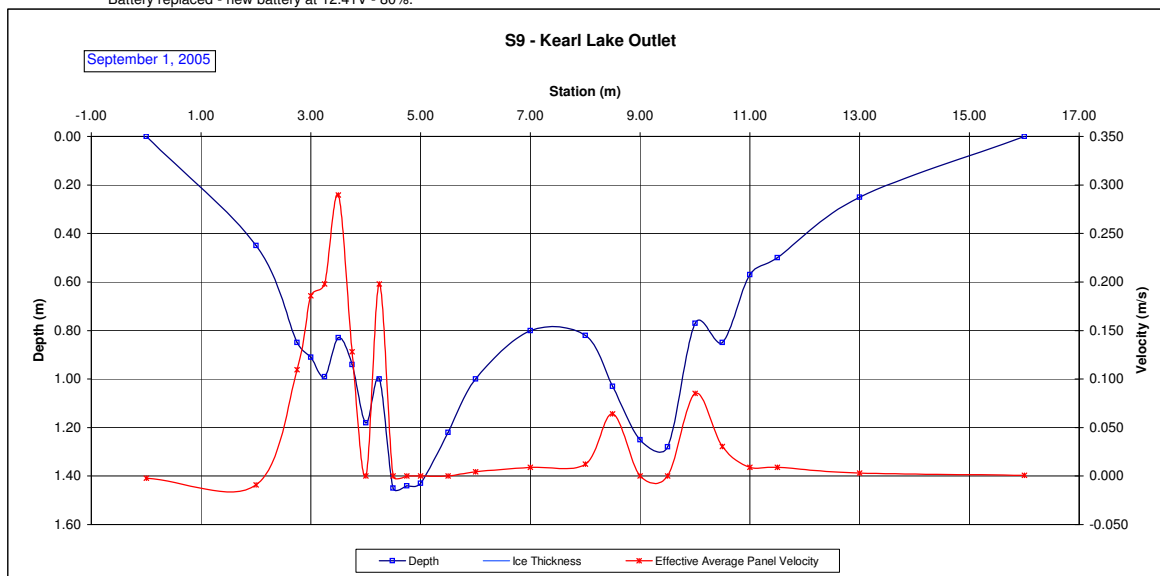
| | | |
|--------------------------------|-------|--------|
| Total Flow: | 0.378 | (m³/s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 10.68 | (m²) |
| Top Width: | 16.00 | (m) |
| Hydraulic Depth: | 0.668 | (m) |
| Mean Velocity: | 0.035 | (m/s) |
| Froude Number | 0.014 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 11.8V 76%
Datalogger Memory Used: 80%
Datalogger Clock: Sep 01, 2005 10:06 MST
Laptop Clock: Sep 01, 2005 10:10 MST
Dessicant: 100% used-replaced
Datalogger: Lakewood UltraLogger 203058
PT: Keller Pressure Transducer #971022
Power:

Notes:

Beaver dam built 25 m downstream of the logger site. Data reflects increases in water level due to beaver dam construction. Flow measurement taken downstream of culverts. New beaverdam built downstream of culverts affecting tailwater.
TSS sample taken.
Battery replaced - new battery at 12.41V - 80%.



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: October 6, 2005
Date of Measurement: October 6, 2005
Start Time: 12:44 PM MDT
End Time: 1:06 PM MDT

Personnel & Equipment

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

Level Readings

Bench Mark Reading: post in P
Water Level Reading: 2.621
Water Level Reading (D/S):
Transducer Reading & Calc'd El: 1.360
Other: TD reading 1.277

Setup No. 1

El: 330.400
El: 329.878
El: 2.876
El: 328.518
El: 328.602

Setup No. 2

El: 330.400
El: 329.874
El: 329.658
El: 328.514
El: 328.598

Weather Conditions:

+2°C, Partly cloudy

River Conditions:

Open water, high stage, backwater from beaver dam 25m ds of station

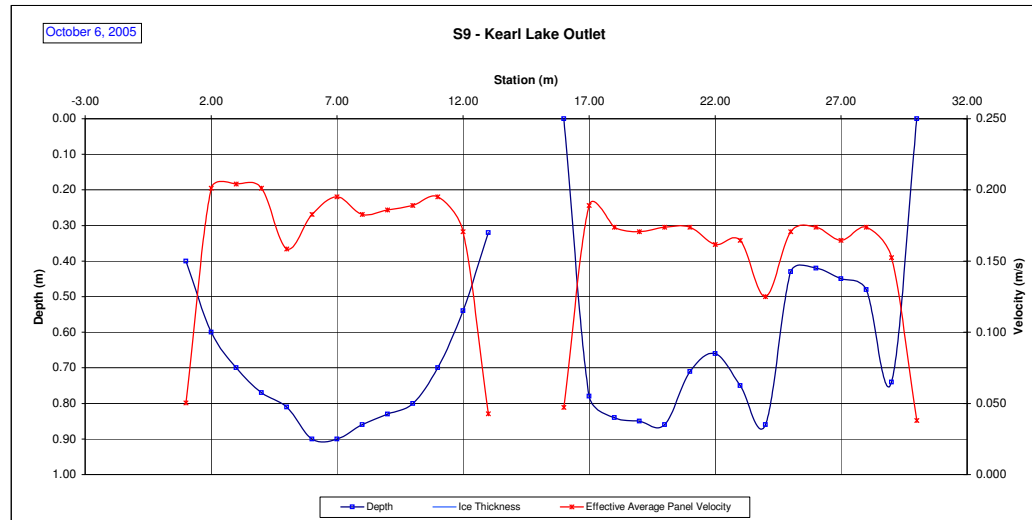
| | | Measured Data | | | | | | Calculated Data | | | | | | | |
|-----------------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|--------------------------|-----------------------|-------------------|---------------------|---------------------|
| 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 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 ²) | (m ³ /s) | |
| Left Culvert: | | | | | | | | | | | | | | | |
| 0.50 | 0.40 | | | | 0.171 | 1.00 | 1 | 0.50 | 0.55 | 0.050 | 0.050 | 0.15 | 0.01 | 0.000 | 0% |
| 0.60 | 0.60 | | | | 0.201 | 1.00 | 2 | 0.55 | 0.65 | 0.201 | 0.201 | 0.60 | 0.06 | 0.012 | 4% |
| 0.70 | 0.70 | | | | 0.204 | 1.00 | 3 | 0.65 | 0.75 | 0.204 | 0.204 | 0.70 | 0.07 | 0.014 | 4% |
| 0.80 | 0.77 | | | | 0.201 | 1.00 | 4 | 0.75 | 0.85 | 0.201 | 0.201 | 0.77 | 0.08 | 0.015 | 5% |
| 0.90 | 0.81 | | | | 0.158 | 1.00 | 5 | 0.85 | 1.00 | 0.158 | 0.158 | 0.81 | 0.12 | 0.019 | 6% |
| 1.10 | 0.90 | | | | 0.183 | 1.00 | 6 | 1.00 | 1.15 | 0.183 | 0.183 | 0.90 | 0.14 | 0.025 | 8% |
| 1.20 | 0.90 | | | | 0.195 | 1.00 | 7 | 1.15 | 1.25 | 0.195 | 0.195 | 0.90 | 0.09 | 0.018 | 5% |
| 1.30 | 0.86 | | | | 0.183 | 1.00 | 8 | 1.25 | 1.35 | 0.183 | 0.183 | 0.86 | 0.09 | 0.016 | 5% |
| 1.40 | 0.83 | | | | 0.186 | 1.00 | 9 | 1.35 | 1.45 | 0.186 | 0.186 | 0.83 | 0.08 | 0.015 | 5% |
| 1.50 | 0.80 | | | | 0.189 | 1.00 | 10 | 1.45 | 1.55 | 0.189 | 0.189 | 0.80 | 0.08 | 0.015 | 5% |
| 1.60 | 0.70 | | | | 0.195 | 1.00 | 11 | 1.55 | 1.65 | 0.195 | 0.195 | 0.70 | 0.07 | 0.014 | 4% |
| 1.70 | 0.54 | | | | 0.171 | 1.00 | 12 | 1.65 | 1.75 | 0.171 | 0.171 | 0.54 | 0.05 | 0.009 | 3% |
| 1.80 | 0.32 | | | | 0.000 | 1.00 | 13 | 1.75 | 1.80 | 0.043 | 0.043 | 0.14 | 0.01 | 0.000 | 0% |
| | | | | | | | | | | | | | | Total Flow: | 0.173 |
| Right Culvert: | | | | | | | | | | | | | | | |
| 1.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.00 | 1.05 | 0.047 | 0.047 | 0.20 | 0.01 | 0.000 | 0% |
| 1.10 | 0.78 | | | | 0.189 | 1.00 | 2 | 1.05 | 1.15 | 0.189 | 0.189 | 0.78 | 0.08 | 0.015 | 5% |
| 1.20 | 0.84 | | | | 0.174 | 1.00 | 3 | 1.15 | 1.25 | 0.174 | 0.174 | 0.84 | 0.08 | 0.015 | 4% |
| 1.30 | 0.85 | | | | 0.171 | 1.00 | 4 | 1.25 | 1.35 | 0.171 | 0.171 | 0.85 | 0.09 | 0.015 | 4% |
| 1.40 | 0.86 | | | | 0.174 | 1.00 | 5 | 1.35 | 1.45 | 0.174 | 0.174 | 0.86 | 0.09 | 0.015 | 5% |
| 1.50 | 0.71 | | | | 0.174 | 1.00 | 6 | 1.45 | 1.55 | 0.174 | 0.174 | 0.71 | 0.07 | 0.012 | 4% |
| 1.60 | 0.66 | | | | 0.162 | 1.00 | 7 | 1.55 | 1.65 | 0.162 | 0.162 | 0.66 | 0.07 | 0.011 | 3% |
| 1.70 | 0.75 | | | | 0.165 | 1.00 | 8 | 1.65 | 1.75 | 0.165 | 0.165 | 0.75 | 0.08 | 0.012 | 4% |
| 1.80 | 0.86 | | | | 0.125 | 1.00 | 9 | 1.75 | 2.05 | 0.125 | 0.125 | 0.86 | 0.26 | 0.032 | 10% |
| 1.90 | 0.43 | | | | 0.171 | 1.00 | 10 | 2.05 | 2.15 | 0.171 | 0.171 | 0.43 | 0.04 | 0.007 | 2% |
| 2.00 | 0.42 | | | | 0.174 | 1.00 | 11 | 2.15 | 2.20 | 0.174 | 0.174 | 0.42 | 0.02 | 0.004 | 1% |
| 2.10 | 0.45 | | | | 0.165 | 1.00 | 12 | 2.20 | 2.25 | 0.165 | 0.165 | 0.45 | 0.02 | 0.004 | 1% |
| 2.20 | 0.48 | | | | 0.174 | 1.00 | 13 | 2.25 | 2.30 | 0.174 | 0.174 | 0.48 | 0.02 | 0.004 | 1% |
| 2.30 | 0.74 | | | | 0.152 | 1.00 | 14 | 2.30 | 2.35 | 0.152 | 0.152 | 0.74 | 0.04 | 0.006 | 2% |
| 2.40 | 0.00 | | | | 0.000 | 1.00 | 15 | 2.35 | 2.40 | 0.038 | 0.038 | 0.19 | 0.01 | 0.000 | 0% |
| | | | | | | | | | | | | | | Total Flow: | 0.152 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.325 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (m) |
| Mean Velocity: | - | (m/s) |
| Froude Number | - | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|------------------------------------|--------------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.04V | 77% replaced |
| Datalogger Memory Used: | 20% | |
| Datalogger Clock: | Oct 06, 2005 10:59 | MST |
| Laptop Clock: | Oct 06, 2005 11:04 | MST |
| Dessicant: | 10% used | |
| Datalogger: | Lakewood UltraLogger 203058 | |
| PT: | Keller Pressure Transducer #971022 | |
| Power: | | |

Notes: Beaver dam built 25 m downstream of the logger site. Data reflects increases in water level due to beaver dam construction. Flow measurement taken at culvert outlet. New beaverdam built downstream of culverts affecting tailwater.
TSS sample taken.
Battery replaced - new battery at 12.41V - 80%.

| US Culvert Elevations: | Right Culvert | Left Culvert | DS Culvert Elevations: | Right Culvert | Left Culvert | | |
|------------------------|---------------|--------------|------------------------|---------------|--------------|-------|-------|
| Crown | 2.167 m | 2.227 m | Crown | 2.55 m | 2.375 m | 7.833 | 7.45 |
| Invert | 3.602 m | 3.584 m | Invert | 3.845 m | 3.815 m | 6.398 | 6.155 |
| Water level | 2.875 m | 2.876 m | Water level | 2.876 m | 2.879 m | 7.125 | 7.124 |



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: **November 4, 2005**
 Start Time: **4:00 PM MST**
 End Time: **MST**

Weather Conditions:

+1°C, Overcast, Calm

River Conditions:

Open water, backwater from beaver dam 25m d/s of station

Personnel & Equipment

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

Level Readings

| | Setup No. 1 | Setup No. 2 | |
|------------------------------------|-------------|-------------|-------------------|
| Bench Mark Reading: post in PVC | 2.400 | El: 330.400 | 2.390 El: 330.400 |
| Water Level Reading (Old TD locn): | 2.950 | El: 329.850 | 2.939 El: 329.851 |
| Water Level Reading (New TD locn): | 3.162 | El: 329.638 | 3.136 El: 329.654 |
| Transducer Reading & Calc'd El.: | 1.289 | El: 328.561 | 1.289 El: 328.562 |
| Transducer Reading (New locn): | 0.729 | El: 328.909 | 0.729 El: 328.925 |
| Other: New BM (T-Post): | 1.823 | El: 330.977 | 1.810 El: 330.980 |

Before move
After move

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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow: | | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

Data downloaded. Station removed from existing location and relocated approximately 20 m downstream of the culverts.
 Installed a new bench mark (T-Post in ground) approximately 15 m upstream of new location. New station location marked in GPS as S9A.
 Memory cleared and clocks synchronized.

| | | |
|----------------------------|------------------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.29V | 79% |
| Datalogger Memory Used: | 40% | |
| Datalogger Clock: | Nov 04, 2005 15:46 | MST |
| Laptop Clock: | Nov 04, 2005 15:53 | MST |
| Dessicant: | 50% used - replaced | |
| Datalogger: | Lakewood UltraLogger 203058 | |
| PT: | Keller Pressure Transducer #971022 | |
| Power: | Lakewood battery | |

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

Time of Measurement

Date of Measurement: December 7, 2005
Start Time: 11:20 AM MST
End Time: 11:50 AM MST

Weather Conditions:

-20°C, Partly cloudy, windy

River Conditions:

Complete Ice Cover

Personnel & Equipment

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

Level Readings

Bench Mark Reading: T-post 1.784
Water Level Reading: 3.150
Top of Ice Level Reading: 3.124
Transducer Reading & Calc'd El. 0.772
Other: TD reading 0.706

Setup No. 1

El: 330.979
El: 329.613
El: 329.639
El: 328.841
El: 328.907

Setup No. 2

El: 330.979
El: 329.617
El: 329.636
El: 328.845
El: 328.911

Before battery change

After battery change

| 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) | |
| 8.90 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 8.90 | 9.10 | -0.007 | -0.006 | 0.22 | 0.04 | 0.000 | -1% |
| 9.30 | 0.95 | 0.09 | | | -0.027 | 0.90 | 2 | 9.10 | 9.45 | -0.027 | -0.025 | 0.86 | 0.30 | -0.007 | -22% |
| 9.60 | 1.00 | 0.12 | | | -0.046 | 0.90 | 3 | 9.45 | 9.73 | -0.046 | -0.041 | 0.88 | 0.24 | -0.010 | -29% |
| 9.85 | 1.11 | 0.12 | | | -0.040 | 0.90 | 4 | 9.73 | 10.03 | -0.040 | -0.036 | 0.99 | 0.30 | -0.011 | -31% |
| 10.20 | 1.08 | 0.13 | | | -0.046 | 0.90 | 5 | 10.03 | 10.35 | -0.046 | -0.041 | 0.95 | 0.31 | -0.013 | -37% |
| 10.50 | 1.08 | 0.13 | | | 0.061 | 0.90 | 6 | 10.35 | 10.65 | 0.061 | 0.055 | 0.95 | 0.29 | 0.016 | 46% |
| 10.80 | 1.04 | 0.13 | | | 0.040 | 0.90 | 7 | 10.65 | 10.95 | 0.040 | 0.036 | 0.91 | 0.27 | 0.010 | 29% |
| 11.10 | 0.96 | 0.11 | | | 0.034 | 0.90 | 8 | 10.95 | 11.30 | 0.034 | 0.030 | 0.85 | 0.30 | 0.009 | 26% |
| 11.50 | 0.82 | 0.11 | | | 0.021 | 0.90 | 9 | 11.30 | 11.63 | 0.021 | 0.019 | 0.71 | 0.23 | 0.004 | 13% |
| 11.75 | 0.74 | 0.12 | | | 0.027 | 0.90 | 10 | 11.63 | 11.88 | 0.027 | 0.025 | 0.62 | 0.16 | 0.004 | 11% |
| 12.00 | 0.75 | 0.12 | | | 0.015 | 0.90 | 11 | 11.88 | 12.18 | 0.015 | 0.014 | 0.63 | 0.19 | 0.003 | 8% |
| 12.35 | 0.78 | 0.10 | | | 0.021 | 0.90 | 12 | 12.18 | 12.58 | 0.021 | 0.019 | 0.68 | 0.27 | 0.005 | 15% |
| 12.80 | 0.80 | 0.14 | | | 0.015 | 0.90 | 13 | 12.58 | 13.00 | 0.015 | 0.014 | 0.66 | 0.28 | 0.004 | 11% |
| 13.20 | 0.80 | 0.16 | | | 0.003 | 0.90 | 14 | 13.00 | 13.38 | 0.003 | 0.003 | 0.64 | 0.24 | 0.001 | 2% |
| 13.55 | 0.77 | 0.16 | | | 0.006 | 0.90 | 15 | 13.38 | 13.70 | 0.006 | 0.005 | 0.61 | 0.20 | 0.001 | 3% |
| 13.85 | 0.70 | 0.15 | | | 0.012 | 0.90 | 16 | 13.70 | 14.08 | 0.012 | 0.011 | 0.55 | 0.21 | 0.002 | 7% |
| 14.30 | 0.79 | 0.14 | | | 0.021 | 0.90 | 17 | 14.08 | 14.45 | 0.021 | 0.019 | 0.65 | 0.24 | 0.005 | 14% |
| 14.60 | 0.79 | 0.14 | | | 0.024 | 0.90 | 18 | 14.45 | 14.75 | 0.024 | 0.022 | 0.65 | 0.20 | 0.004 | 13% |
| 14.90 | 0.73 | 0.15 | | | 0.027 | 0.90 | 19 | 14.75 | 15.05 | 0.027 | 0.025 | 0.58 | 0.17 | 0.004 | 13% |
| 15.20 | 0.75 | 0.14 | | | 0.003 | 0.90 | 20 | 15.05 | 15.35 | 0.003 | 0.003 | 0.61 | 0.18 | 0.001 | 1% |
| 15.50 | 0.78 | 0.12 | | | 0.003 | 0.90 | 21 | 15.35 | 15.70 | 0.003 | 0.003 | 0.66 | 0.23 | 0.001 | 2% |
| 15.90 | 0.85 | 0.10 | | | 0.012 | 0.90 | 22 | 15.70 | 16.15 | 0.012 | 0.011 | 0.75 | 0.34 | 0.004 | 11% |
| 16.40 | 0.40 | 0.08 | | | -0.009 | 0.90 | 23 | 16.15 | 16.65 | -0.009 | -0.008 | 0.32 | 0.16 | -0.001 | -4% |
| 16.90 | 0.00 | 0.00 | | | 0.000 | 0.90 | 24 | 16.65 | 16.90 | -0.002 | -0.002 | 0.08 | 0.02 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | 0.034 | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.034 | (m ³ /s) |
| Perceived Measurement Quality: | Poor | |
| Total Area: | 5.36 | (m ²) |
| Top Width: | 8.00 | (m) |
| Hydraulic Depth: | 0.670 | (m) |
| Mean Velocity: | 0.006 | (m/s) |
| Froude Number | 0.002 | |

Photographs taken looking at:

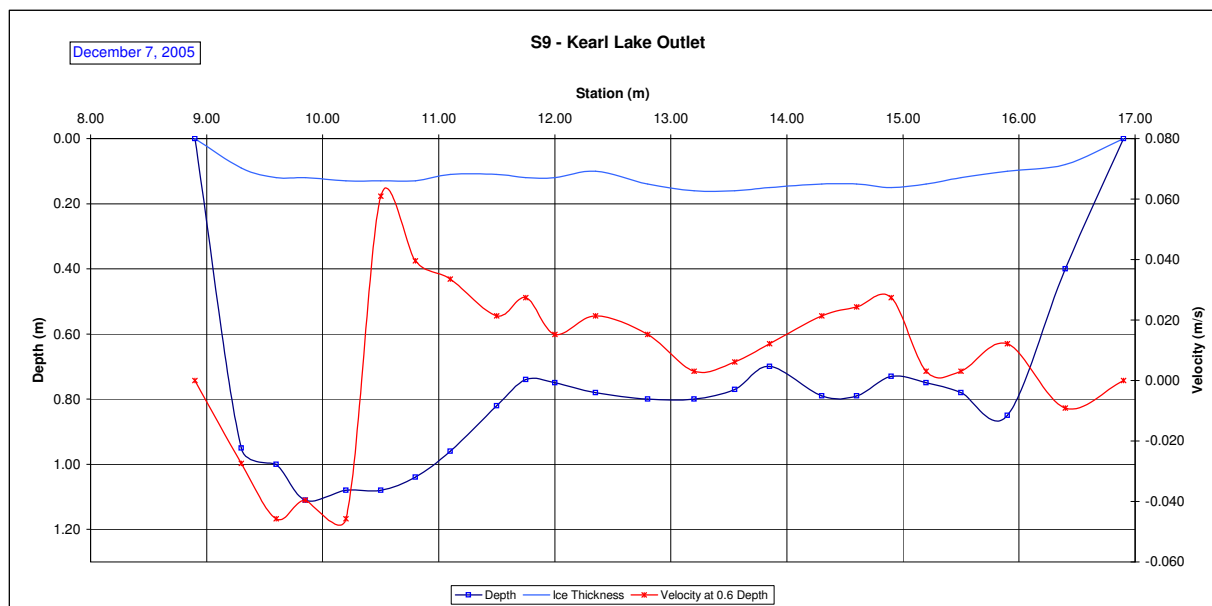
Upstream, downstream, across

Datalogger Notes:

Datalogger Internal Power: 11.34 V 100%
Datalogger External Power: 11.92 V 77%
Datalogger Memory Used: 20%
Datalogger Clock: 11:08:00 AM
Laptop Clock: 11:11:00 AM
Dessicant: 10 % Used

Datalogger: Lakewood UltraLogger 203058
PT: Keller Pressure Transducer #971022
Power: Lakewood battery

Notes: Battery Replaced New: 12.29 V 79%



Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: Wapasu Creek
Site Name: S10
Coordinates & Legal:

Time of Measurement

Date of Measurement: January 6, 2005
Start Time: 3:33 PM MST
End Time: 3:50 PM MST

Weather Conditions:

overcast, -10°C, flurries

River Conditions:

ice cover

Personnel & Equipment

Measurement Made By: ND/CT/DB
Data Entry By: DB
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

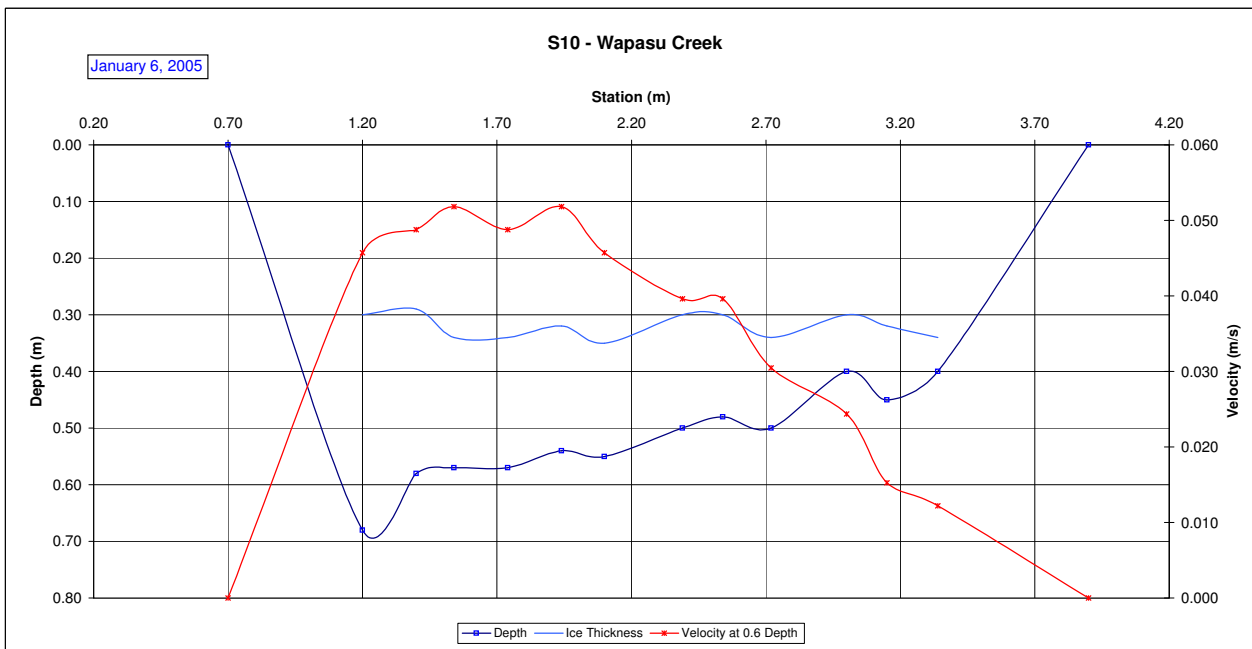
| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: rebar acrr | 0.893 | 1.001 |
| Water Level Reading: | 2.545 | 2.651 |
| Top of Ice Level Reading: | 2.354 | 2.459 |
| Transducer Reading & Calc'd El | 0.303 | 0.303 |
| Other: | | |

| 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 | Percentage of Total |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) | |
| | | | | | 0.000 | 0.90 | 1 | 0.70 | 0.95 | 0.011 | 0.010 | 0.10 | 0.02 | 0.000 | 1% |
| 0.70 | 0.00 | | | | 0.046 | 0.90 | 2 | 0.95 | 1.30 | 0.046 | 0.041 | 0.38 | 0.13 | 0.005 | 25% |
| 1.20 | 0.68 | 0.30 | | | 0.049 | 0.90 | 3 | 1.30 | 1.47 | 0.049 | 0.044 | 0.29 | 0.05 | 0.002 | 10% |
| 1.40 | 0.58 | 0.29 | | | 0.052 | 0.90 | 4 | 1.47 | 1.64 | 0.052 | 0.047 | 0.23 | 0.04 | 0.002 | 8% |
| 1.54 | 0.57 | 0.34 | | | 0.049 | 0.90 | 5 | 1.64 | 1.84 | 0.049 | 0.044 | 0.23 | 0.05 | 0.002 | 9% |
| 1.74 | 0.57 | 0.34 | | | 0.052 | 0.90 | 6 | 1.84 | 2.02 | 0.052 | 0.047 | 0.22 | 0.04 | 0.002 | 8% |
| 1.94 | 0.54 | 0.32 | | | 0.046 | 0.90 | 7 | 2.02 | 2.25 | 0.046 | 0.041 | 0.20 | 0.05 | 0.002 | 8% |
| 2.10 | 0.55 | 0.35 | | | 0.040 | 0.90 | 8 | 2.25 | 2.47 | 0.040 | 0.036 | 0.20 | 0.04 | 0.002 | 7% |
| 2.39 | 0.50 | 0.30 | | | 0.040 | 0.90 | 9 | 2.47 | 2.95 | 0.040 | 0.036 | 0.18 | 0.09 | 0.003 | 14% |
| 2.54 | 0.48 | 0.30 | | | 0.030 | 0.90 | 10 | 2.95 | 3.22 | 0.030 | 0.027 | 0.16 | 0.04 | 0.001 | 5% |
| 2.72 | 0.50 | 0.34 | | | 0.024 | 0.90 | 11 | 3.22 | 3.35 | 0.024 | 0.022 | 0.10 | 0.01 | 0.000 | 1% |
| 3.00 | 0.40 | 0.30 | | | 0.015 | 0.90 | 12 | 3.35 | 3.46 | 0.015 | 0.014 | 0.13 | 0.02 | 0.000 | 1% |
| 3.15 | 0.45 | 0.32 | | | 0.012 | 0.90 | 13 | 3.46 | 3.62 | 0.012 | 0.011 | 0.06 | 0.01 | 0.000 | 0% |
| 3.34 | 0.40 | 0.34 | | | 0.000 | 0.90 | 14 | 3.62 | 3.90 | 0.003 | 0.003 | 0.02 | 0.00 | 0.000 | 0% |
| 3.90 | 0.00 | | | | | | | | | | | Total Flow: | | 0.022 | 1 |

| | | |
|--------------------------------|------------------------------|---------------------|
| Total Flow: | 0.022 | (m ³ /s) |
| Perceived Measurement Quality: | Poor | |
| Total Area: | 0.59 | (m ²) |
| Top Width: | 3.20 | (m) |
| Hydraulic Depth: | 0.185 | (m) |
| Mean Velocity: | 0.037 | (m/s) |
| Froude Number | 0.027 | |
| Photographs taken looking at: | Upstream, downstream, across | |

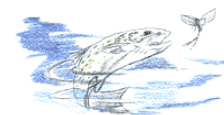
| | |
|----------------------------|------------------------|
| Datalogger Notes: | |
| Datalogger Internal Power: | 11.34V 100% |
| Datalogger External Power: | 12.29 V 79% |
| Datalogger Memory Used: | |
| Datalogger Clock: | Jan 06, 2005 15:06 MST |
| Laptop Clock: | Jan 06, 2005 15:18 MST |
| Dessicant: | Good |
| Datalogger: | |
| PT: | 971024 |
| Power: | |

Notes: Battery was replaced, readings on fully charged battery were the same as old one



Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: Wapasu Creek
Site Name: S10
Coordinates & Legal:

Time of Measurement

Date of Measurement: February 4, 2005
Start Time: 3:45 PM MST
End Time: MST

Weather Conditions:

overcast, -22°C

River Conditions:

ice cover, river frozen to < 10 cms of depth

Personnel & Equipment

Measurement Made By: ND/CT/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar across
Water Level Reading: 2.900
Top of Ice Level Reading: 2.689
Transducer Reading & Calc'd El: 0.286
Other: Top of stilling well 0.385

Setup No. 1

El: 100.908
El: 99.251
El: 98.219
El: 98.965
El: 101.766

Setup No. 2

El: 100.908
El: 99.251
El: 98.008
El: 98.965
El: 101.766

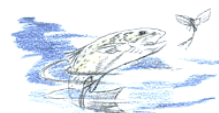
| Measurement Data | | | | | | | | | | | | | | | Percentage of Total |
|------------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|
| 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) | (m ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | - | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| US, D/ S and across | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | |
| Datalogger Internal Power: | 11.34V 100% |
| Datalogger External Power: | 12.04 V 77% |
| Datalogger Memory Used: | |
| Datalogger Clock: | Feb 04, 2005 15:35 MST |
| Laptop Clock: | Feb 04, 2005 15:50 MST |
| Dessicant: | Good-10% used |
| Datalogger: | |
| PT: | 971024 |
| Power: | |

Notes: Battery was replaced, Aux. 12.17V 78%
BM-rebar on LB could not be found as it was buried in the snow, top of stilling well measured instead.
Frozen to about 5-10 cms of depth, hit rock on 2 occasions, not enough room between the bottom of ice and channel bed for flow meter.

S10 - Wapasu Creek



Measurement Location

Measurement Location:
River/Stream: Wapasu Creek
Location: Wapasu Creek
Site Name: S10
Coordinates & Legal:

Personnel & Equipment

Measurement Made By: ND/CT/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Time of Measurement

Date of Measurement: March 4, 2005
Start Time: 10:30 AM MST
End Time: MST

Level Readings

| Bench Reading: | | Setup No. 1 | Setup No. 2 |
|------------------------------------|-------|-------------|-------------------|
| Bench Mark Reading: rebar across o | 1.302 | El: 100.908 | 1.239 El: 100.908 |
| Water Level Reading: | 2.941 | El: 99.269 | 2.880 El: 99.267 |
| Top of Ice Level Reading: | 2.728 | El: 99.482 | 2.659 El: 99.488 |
| Transducer Reading & Calc'd El | 0.435 | El: 98.834 | 0.435 El: 98.832 |
| Other: Top of stilling well | 0.445 | El: 101.765 | 0.380 El: 101.767 |

Weather Conditions:

River Conditions: Complete ice cover, river frozen to < 10 cms of depth

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 ²) | Panel Discharge (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow: | - | - |

| | | | |
|--|---|--|---------------------|
| Total Flow: | - | | (m ³ /s) |
| Perceived Measurement Quality: | | | |
| Total Area: | | | (m ²) |
| Top Width: | | | (m) |
| Hydraulic Depth: | | | (m) |
| Mean Velocity: | | | (m/s) |
| Froude Number | | | |
| Photographs taken looking at: U.S. D/S and across | | | |

Datalogger Notes:

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.04 V | 77% |
| Datalogger Memory Used: | | |
| Datalogger Clock: | Mar 04, 2005 10:15 | MST |
| Laptop Clock: | Mar 04, 2005 10:32 | MST |
| Dessicant: | Good-10% used | |
| Datalogger: | 203095 | |
| PT: | 971024 | |
| Power: | | |

Notes:

Battery was replaced, Aux. 12.29V 79%
Some spikes in data.
Frozen to about 5-10 cms of depth, hit rock on 2 occasions, not enough room between the bottom of ice and channel bed for flow meter. Very little flow in river.

Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: Wapasu Creek
Site Name: S10
Coordinates & Legal:
Time of Measurement: April 5, 2005
Start Time: 10:20 AM MDT
End Time: 10:34 AM MDT

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar across 1.140
Water Level Reading: 2.365
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.717
Other:

Setup No. 1

El: 100.908
El: 99.683
El:
El: 98.966
El:

Setup No. 2

El: 100.908
El: 99.680
El:
El: 98.963
El:

Weather Conditions:

Clear, +5°C

River Conditions:

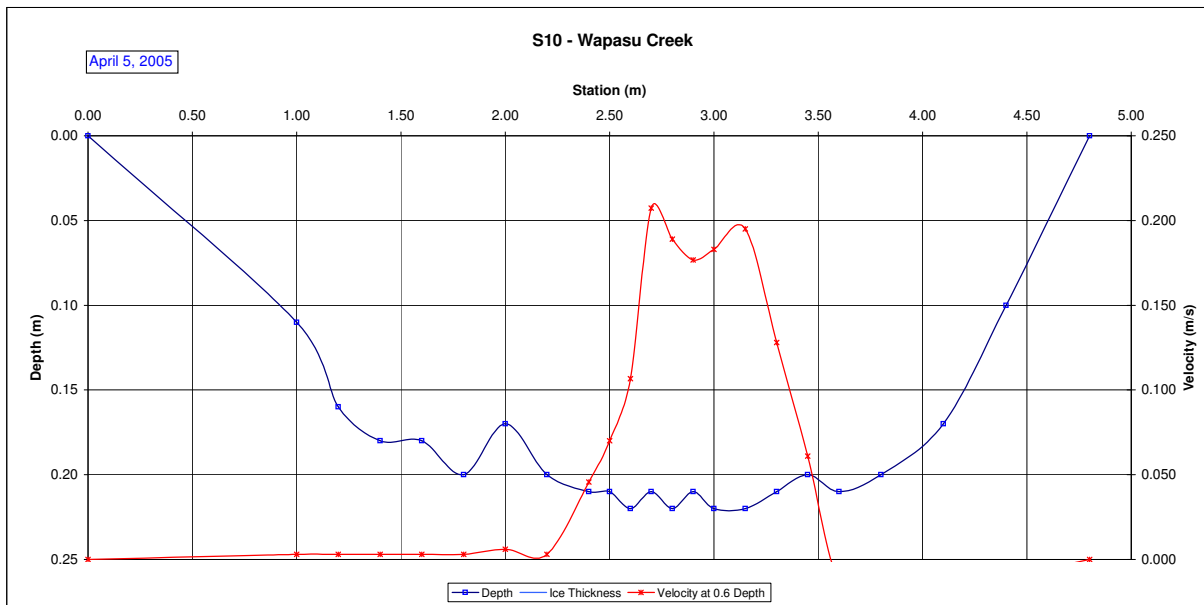
Ice begun to break up, 80% open

| 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) | (m²) | (m³/s) | |
| 0.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.00 | 0.50 | 0.001 | 0.001 | 0.03 | 0.01 | 0.000 | 0% |
| 1.00 | 0.11 | | | | 0.003 | 1.00 | 2 | 0.50 | 1.10 | 0.003 | 0.003 | 0.11 | 0.07 | 0.000 | 1% |
| 1.20 | 0.16 | | | | 0.003 | 1.00 | 3 | 1.10 | 1.30 | 0.003 | 0.003 | 0.16 | 0.03 | 0.000 | 0% |
| 1.40 | 0.18 | | | | 0.003 | 1.00 | 4 | 1.30 | 1.50 | 0.003 | 0.003 | 0.18 | 0.04 | 0.000 | 0% |
| 1.60 | 0.18 | | | | 0.003 | 1.00 | 5 | 1.50 | 1.70 | 0.003 | 0.003 | 0.18 | 0.04 | 0.000 | 0% |
| 1.80 | 0.20 | | | | 0.003 | 1.00 | 6 | 1.70 | 1.90 | 0.003 | 0.003 | 0.20 | 0.04 | 0.000 | 0% |
| 2.00 | 0.17 | | | | 0.006 | 1.00 | 7 | 1.90 | 2.10 | 0.006 | 0.006 | 0.17 | 0.03 | 0.000 | 1% |
| 2.20 | 0.20 | | | | 0.003 | 1.00 | 8 | 2.10 | 2.30 | 0.003 | 0.003 | 0.20 | 0.04 | 0.000 | 0% |
| 2.40 | 0.21 | | | | 0.046 | 1.00 | 9 | 2.30 | 2.45 | 0.046 | 0.046 | 0.21 | 0.03 | 0.001 | 4% |
| 2.50 | 0.21 | | | | 0.070 | 1.00 | 10 | 2.45 | 2.55 | 0.070 | 0.070 | 0.21 | 0.02 | 0.001 | 4% |
| 2.60 | 0.22 | | | | 0.107 | 1.00 | 11 | 2.55 | 2.65 | 0.107 | 0.107 | 0.22 | 0.02 | 0.002 | 7% |
| 2.70 | 0.21 | | | | 0.207 | 1.00 | 12 | 2.65 | 2.75 | 0.207 | 0.207 | 0.21 | 0.02 | 0.004 | 13% |
| 2.80 | 0.22 | | | | 0.189 | 1.00 | 13 | 2.75 | 2.85 | 0.189 | 0.189 | 0.22 | 0.02 | 0.004 | 12% |
| 2.90 | 0.21 | | | | 0.177 | 1.00 | 14 | 2.85 | 2.95 | 0.177 | 0.177 | 0.21 | 0.02 | 0.004 | 11% |
| 3.00 | 0.22 | | | | 0.183 | 1.00 | 15 | 2.95 | 3.08 | 0.183 | 0.183 | 0.22 | 0.03 | 0.005 | 15% |
| 3.15 | 0.22 | | | | 0.195 | 1.00 | 16 | 3.08 | 3.23 | 0.195 | 0.195 | 0.22 | 0.03 | 0.006 | 19% |
| 3.30 | 0.21 | | | | 0.128 | 1.00 | 17 | 3.23 | 3.38 | 0.128 | 0.128 | 0.21 | 0.03 | 0.004 | 12% |
| 3.45 | 0.20 | | | | 0.061 | 1.00 | 18 | 3.38 | 3.53 | 0.061 | 0.061 | 0.20 | 0.03 | 0.002 | 5% |
| 3.60 | 0.21 | | | | -0.012 | 1.00 | 19 | 3.53 | 3.70 | -0.012 | -0.012 | 0.21 | 0.04 | 0.000 | -1% |
| 3.80 | 0.20 | | | | -0.006 | 1.00 | 20 | 3.70 | 3.95 | -0.006 | -0.006 | 0.20 | 0.05 | 0.000 | -1% |
| 4.10 | 0.17 | | | | -0.003 | 1.00 | 21 | 3.95 | 4.25 | -0.003 | -0.003 | 0.17 | 0.05 | 0.000 | 0% |
| 4.40 | 0.10 | | | | -0.009 | 1.00 | 22 | 4.25 | 4.60 | -0.009 | -0.009 | 0.10 | 0.04 | 0.000 | -1% |
| 4.80 | 0.00 | | | | 0.000 | 1.00 | 23 | 4.60 | 4.80 | -0.002 | -0.002 | 0.03 | 0.01 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 0.035 | 1 |

| | | |
|---|-------|--------|
| Total Flow: | 0.035 | (m³/s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.74 | (m²) |
| Top Width: | 4.80 | (m) |
| Hydraulic Depth: | 0.153 | (m) |
| Mean Velocity: | 0.047 | (m/s) |
| Froude Number | 0.038 | |
| Photographs taken looking at: Upstream, downstream, across | | |

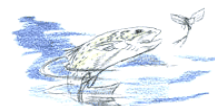
| | | |
|----------------------------|--------------------|----------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.17 V | 78% |
| Datalogger Memory Used: | 16377 K free | 45% used |
| Datalogger Clock: | Apr 05, 2005 09:42 | MST |
| Laptop Clock: | Apr 05, 2005 09:59 | MST |
| Dessicant: | Good | |
| Datalogger: | 203095 | |
| PT: | 971024 | |
| Power: | | |

Notes: Ice broken out at mesurement section.
Data has lots of spikes. The transducer probably has got affected due to freezeup



Hydrometric Measurement / Site Visit Record

S10 - Wapasu Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Wapasu Creek
Location: Wapasu Creek
Site Name: S10
Coordinates & Legal:

Time of Measurement

Date of Measurement: April 23, 2005
Start Time: 3:10 PM MDT
End Time: 3:40 PM MDT

Weather Conditions:

Clear, Calm, +15°C

River Conditions:

Open water conditions, high stage, stage rising, stage above bankfull

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar across 1.225
Water Level Reading: 1.656
Top of Ice Level Reading:
Transducer Reading & Calc'd El 1.480
Other:

Setup No. 1

El: 100.908
El: 100.477
El: 98.997
El:

Setup No. 2

El: 100.908
El: 100.478
El: 98.998
El:

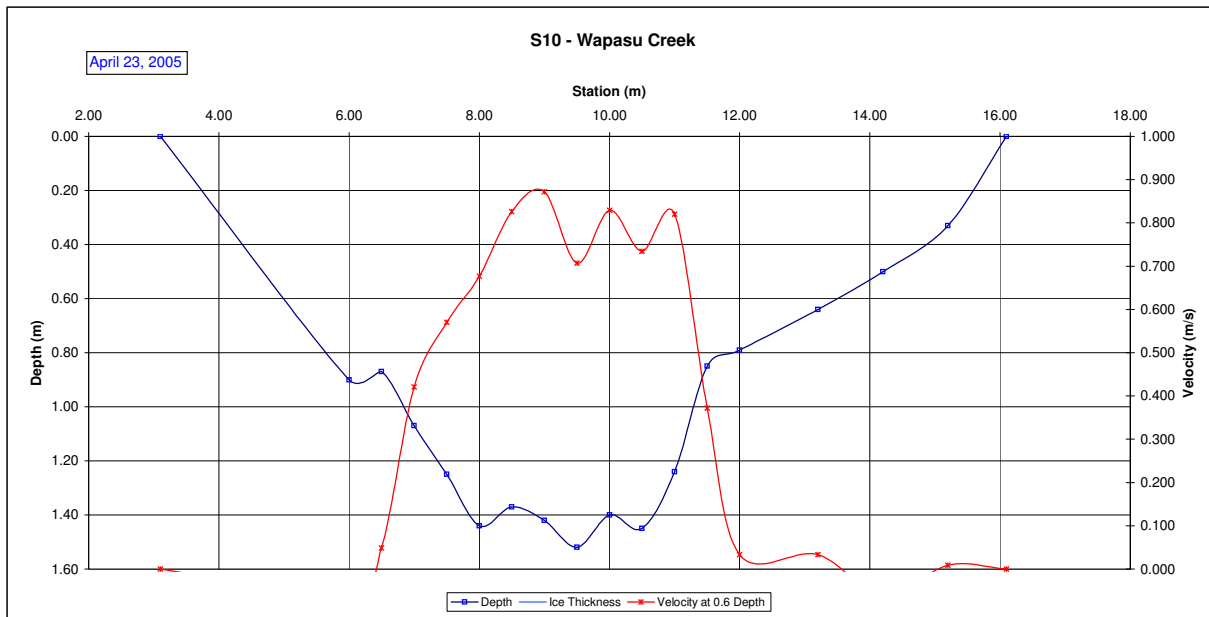
| Measurement Data | | | | | | | | | | | | | | | | |
|------------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|------------|-----------------|---------------------|---|
| 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) | | |
| 3.10 | 0.00 | | | | 0.000 | 1.00 | 1 | 3.10 | 4.55 | -0.016 | -0.016 | 0.23 | 0.33 | -0.005 | 0% | |
| 6.00 | 0.90 | | | | -0.064 | 1.00 | 2 | 4.55 | 6.25 | -0.064 | -0.064 | 0.90 | 1.53 | -0.098 | -2% | |
| 6.50 | 0.87 | | | | 0.049 | 1.00 | 3 | 6.25 | 6.75 | 0.049 | 0.049 | 0.87 | 0.44 | 0.021 | 0% | |
| 7.00 | 1.07 | | | | 0.421 | 1.00 | 4 | 6.75 | 7.25 | 0.421 | 0.421 | 1.07 | 0.54 | 0.225 | 5% | |
| 7.50 | 1.25 | | | | 0.570 | 1.00 | 5 | 7.25 | 7.75 | 0.570 | 0.570 | 1.25 | 0.63 | 0.356 | 8% | |
| 8.00 | 1.44 | | | | 0.677 | 1.00 | 6 | 7.75 | 8.25 | 0.677 | 0.677 | 1.44 | 0.72 | 0.487 | 11% | |
| 8.50 | 1.37 | | | | 0.826 | 1.00 | 7 | 8.25 | 8.75 | 0.826 | 0.826 | 1.37 | 0.69 | 0.566 | 13% | |
| 9.00 | 1.42 | | | | 0.872 | 1.00 | 8 | 8.75 | 9.25 | 0.872 | 0.872 | 1.42 | 0.71 | 0.619 | 14% | |
| 9.50 | 1.52 | | | | 0.707 | 1.00 | 9 | 9.25 | 9.75 | 0.707 | 0.707 | 1.52 | 0.76 | 0.537 | 12% | |
| 10.00 | 1.40 | | | | 0.829 | 1.00 | 10 | 9.75 | 10.25 | 0.829 | 0.829 | 1.40 | 0.70 | 0.580 | 13% | |
| 10.50 | 1.45 | | | | 0.735 | 1.00 | 11 | 10.25 | 10.75 | 0.735 | 0.735 | 1.45 | 0.73 | 0.533 | 12% | |
| 11.00 | 1.24 | | | | 0.820 | 1.00 | 12 | 10.75 | 11.25 | 0.820 | 0.820 | 1.24 | 0.62 | 0.508 | 11% | |
| 11.50 | 0.85 | | | | 0.372 | 1.00 | 13 | 11.25 | 11.75 | 0.372 | 0.372 | 0.85 | 0.43 | 0.158 | 4% | |
| 12.00 | 0.79 | | | | 0.034 | 1.00 | 14 | 11.75 | 12.60 | 0.034 | 0.034 | 0.79 | 0.67 | 0.023 | 0% | |
| 13.20 | 0.64 | | | | 0.034 | 1.00 | 15 | 12.60 | 13.70 | 0.034 | 0.034 | 0.64 | 0.70 | 0.024 | 1% | |
| 14.20 | 0.50 | | | | -0.064 | 1.00 | 16 | 13.70 | 14.70 | -0.064 | -0.064 | 0.50 | 0.50 | -0.032 | -1% | |
| 15.20 | 0.33 | | | | 0.009 | 1.00 | 17 | 14.70 | 15.65 | 0.009 | 0.009 | 0.33 | 0.31 | 0.003 | 0% | |
| 16.10 | 0.00 | | | | 0.000 | 1.00 | 18 | 15.65 | 16.10 | 0.002 | 0.002 | 0.08 | 0.04 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | 4.505 | | | 1 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 4.505 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 11.02 | (m ²) |
| Top Width: | 13.00 | (m) |
| Hydraulic Depth: | 0.848 | (m) |
| Mean Velocity: | 0.409 | (m/s) |
| Froude Number | 0.142 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.29 V | 79% |
| Datalogger Memory Used: | 50% | |
| Datalogger Clock: | Apr 23, 2005 13:11 | MST |
| Laptop Clock: | Apr 23, 2005 13:28 | MST |
| Dessicant: | Good - 90% | |
| Datalogger: | 203095 | |
| PT: | 971024 | |
| Power: | | |

Notes:

TSS sample taken. Clock synchronized with laptop. Record rate set to 15 min. Transducer rating looks reasonable. Memory downloaded and cleared.



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: May 30, 2005
Start Time: 10:40 AM MDT
End Time: 11:03 AM MDT

Weather Conditions:

Clear, Calm, +20°C

River Conditions:

Open water, stage below bankfull, stage falling

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar across 1.092
Water Level Reading: 2.300
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 0.700
Other: Old BM on RB 2.031

Setup No. 1

El: 100.908
El: 99.700
El: 99.000
El: 99.969

Setup No. 2

El: 100.908
El: 2.216
El: 99.700
El: 0.700
El: 1.942

Measurement Data

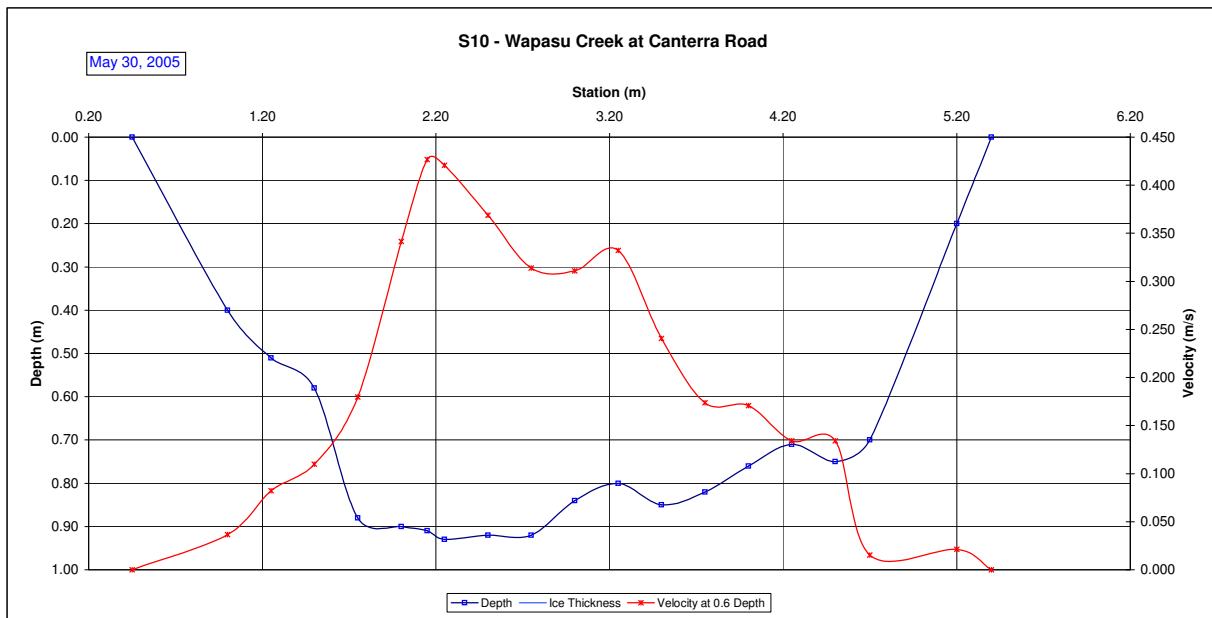
| Measured Data | | | | | | Calculated Data | | | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|
| 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 ²) | (m ³ /s) | |
| RB 0.45 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.45 | 0.73 | 0.009 | 0.009 | 0.10 | 0.03 | 0.000 | 0% |
| 1.00 | 0.40 | | | | 0.037 | 1.00 | 2 | 0.73 | 1.13 | 0.037 | 0.037 | 0.40 | 0.16 | 0.006 | 1% |
| 1.25 | 0.51 | | | | 0.082 | 1.00 | 3 | 1.13 | 1.38 | 0.082 | 0.082 | 0.51 | 0.13 | 0.010 | 1% |
| 1.50 | 0.58 | | | | 0.110 | 1.00 | 4 | 1.38 | 1.63 | 0.110 | 0.110 | 0.58 | 0.15 | 0.016 | 2% |
| 1.75 | 0.88 | | | | 0.180 | 1.00 | 5 | 1.63 | 1.88 | 0.180 | 0.180 | 0.88 | 0.22 | 0.040 | 6% |
| 2.00 | 0.90 | | | | 0.341 | 1.00 | 6 | 1.88 | 2.08 | 0.341 | 0.341 | 0.90 | 0.18 | 0.061 | 9% |
| 2.15 | 0.91 | | | | 0.427 | 1.00 | 7 | 2.08 | 2.20 | 0.427 | 0.427 | 0.91 | 0.11 | 0.049 | 7% |
| 2.25 | 0.93 | | | | 0.421 | 1.00 | 8 | 2.20 | 2.38 | 0.421 | 0.421 | 0.93 | 0.16 | 0.068 | 10% |
| 2.50 | 0.92 | | | | 0.369 | 1.00 | 9 | 2.38 | 2.63 | 0.369 | 0.369 | 0.92 | 0.23 | 0.085 | 12% |
| 2.75 | 0.92 | | | | 0.314 | 1.00 | 10 | 2.63 | 2.88 | 0.314 | 0.314 | 0.92 | 0.23 | 0.072 | 10% |
| 3.00 | 0.84 | | | | 0.311 | 1.00 | 11 | 2.88 | 3.13 | 0.311 | 0.311 | 0.84 | 0.21 | 0.065 | 9% |
| 3.25 | 0.80 | | | | 0.332 | 1.00 | 12 | 3.13 | 3.38 | 0.332 | 0.332 | 0.80 | 0.20 | 0.066 | 9% |
| 3.50 | 0.85 | | | | 0.241 | 1.00 | 13 | 3.38 | 3.63 | 0.241 | 0.241 | 0.85 | 0.21 | 0.051 | 7% |
| 3.75 | 0.82 | | | | 0.174 | 1.00 | 14 | 3.63 | 3.88 | 0.174 | 0.174 | 0.82 | 0.21 | 0.036 | 5% |
| 4.00 | 0.76 | | | | 0.171 | 1.00 | 15 | 3.88 | 4.13 | 0.171 | 0.171 | 0.76 | 0.19 | 0.032 | 5% |
| 4.25 | 0.71 | | | | 0.134 | 1.00 | 16 | 4.13 | 4.38 | 0.134 | 0.134 | 0.71 | 0.18 | 0.024 | 3% |
| 4.50 | 0.75 | | | | 0.134 | 1.00 | 17 | 4.38 | 4.60 | 0.134 | 0.134 | 0.75 | 0.17 | 0.023 | 3% |
| 4.70 | 0.70 | | | | 0.015 | 1.00 | 18 | 4.60 | 4.95 | 0.015 | 0.015 | 0.70 | 0.25 | 0.004 | 1% |
| 5.20 | 0.20 | | | | 0.021 | 1.00 | 19 | 4.95 | 5.30 | 0.021 | 0.021 | 0.20 | 0.07 | 0.001 | 0% |
| LB 5.40 | 0.00 | | | | 0.000 | 1.00 | 20 | 5.30 | 5.40 | 0.005 | 0.005 | 0.05 | 0.00 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 0.710 | 1 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.710 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.28 | (m ²) |
| Top Width: | 4.95 | (m) |
| Hydraulic Depth: | 0.663 | (m) |
| Mean Velocity: | 0.217 | (m/s) |
| Froude Number | 0.085 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.29 V | 79% |
| Datalogger Memory Used: | 23% | |
| Datalogger Clock: | May 30, 2005 09:43 | MST |
| Laptop Clock: | May 30, 2005 09:44 | MST |
| Dessicant: | Good - 95% | |
| Datalogger: | 203095 | |
| PT: | 971024 | |
| Power: | | |

Notes:

TSS sample taken. Transducer reading looks reasonable.
Stage has fallen 700 mm from peak.



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: ND/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: July 15, 2005
Start Time: 6:10 PM MDT
End Time: 6:22 PM MDT

Level Readings

Bench Mark Reading: rebar across 0.815
Water Level Reading: 2.198
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.529
Other:

Setup No. 1

El: 100.908
El: 99.525
El: 98.996
El:

Setup No. 2

El: 100.908
El: 99.509
El: 98.980
El:

Weather Conditions: Overcast, +23°C

River Conditions: Open water

Measurement Data

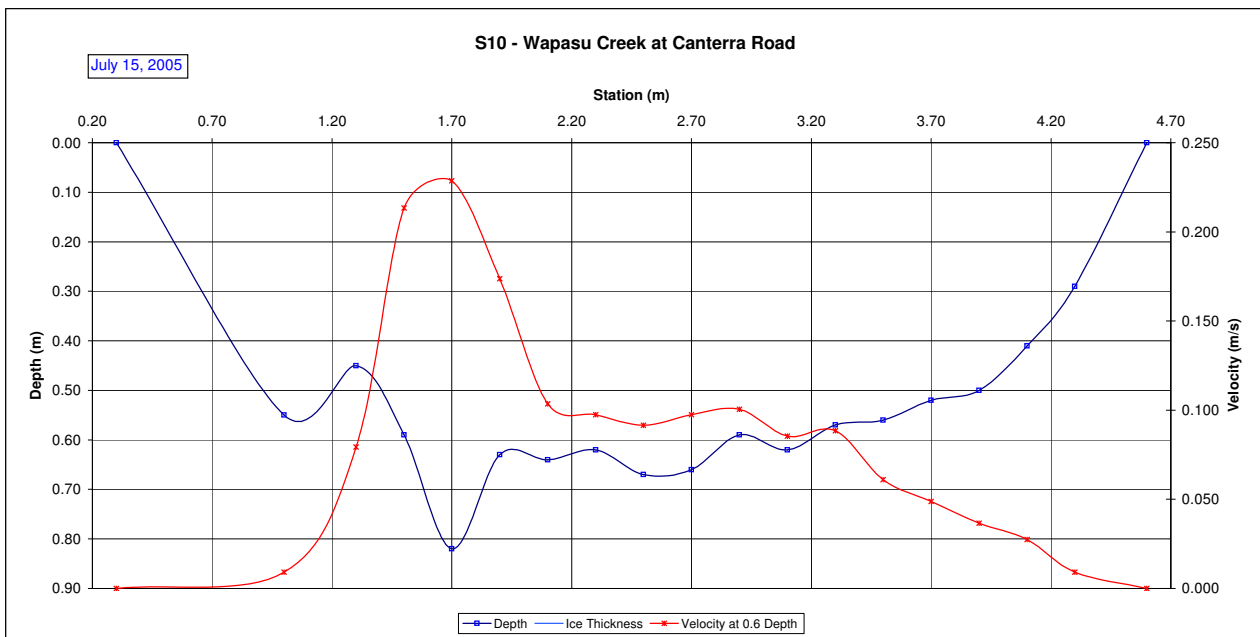
| | Measured Data | | | | | | Calculated Data | | | | | | | | | |
|----|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|
| | 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 ²) | (m ³ /s) | |
| RB | 0.30 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.30 | 0.65 | 0.002 | 0.002 | 0.14 | 0.05 | 0.000 | 0% |
| | 1.00 | 0.55 | | | | 0.009 | 1.00 | 2 | 0.65 | 1.15 | 0.009 | 0.009 | 0.55 | 0.28 | 0.003 | 1% |
| | 1.30 | 0.45 | | | | 0.079 | 1.00 | 3 | 1.15 | 1.40 | 0.079 | 0.079 | 0.45 | 0.11 | 0.009 | 5% |
| | 1.50 | 0.59 | | | | 0.213 | 1.00 | 4 | 1.40 | 1.60 | 0.213 | 0.213 | 0.59 | 0.12 | 0.025 | 13% |
| | 1.70 | 0.82 | | | | 0.229 | 1.00 | 5 | 1.60 | 1.80 | 0.229 | 0.229 | 0.82 | 0.16 | 0.037 | 19% |
| | 1.90 | 0.63 | | | | 0.174 | 1.00 | 6 | 1.80 | 2.00 | 0.174 | 0.174 | 0.63 | 0.13 | 0.022 | 11% |
| | 2.10 | 0.64 | | | | 0.104 | 1.00 | 7 | 2.00 | 2.20 | 0.104 | 0.104 | 0.64 | 0.13 | 0.013 | 7% |
| | 2.30 | 0.62 | | | | 0.098 | 1.00 | 8 | 2.20 | 2.40 | 0.098 | 0.098 | 0.62 | 0.12 | 0.012 | 6% |
| | 2.50 | 0.67 | | | | 0.091 | 1.00 | 9 | 2.40 | 2.60 | 0.091 | 0.091 | 0.67 | 0.13 | 0.012 | 6% |
| | 2.70 | 0.66 | | | | 0.098 | 1.00 | 10 | 2.60 | 2.80 | 0.098 | 0.098 | 0.66 | 0.13 | 0.013 | 7% |
| | 2.90 | 0.59 | | | | 0.101 | 1.00 | 11 | 2.80 | 3.00 | 0.101 | 0.101 | 0.59 | 0.12 | 0.012 | 6% |
| | 3.10 | 0.62 | | | | 0.085 | 1.00 | 12 | 3.00 | 3.20 | 0.085 | 0.085 | 0.62 | 0.12 | 0.011 | 5% |
| | 3.30 | 0.57 | | | | 0.088 | 1.00 | 13 | 3.20 | 3.40 | 0.088 | 0.088 | 0.57 | 0.11 | 0.010 | 5% |
| | 3.50 | 0.56 | | | | 0.061 | 1.00 | 14 | 3.40 | 3.60 | 0.061 | 0.061 | 0.56 | 0.11 | 0.007 | 3% |
| | 3.70 | 0.52 | | | | 0.049 | 1.00 | 15 | 3.60 | 3.80 | 0.049 | 0.049 | 0.52 | 0.10 | 0.005 | 3% |
| | 3.90 | 0.50 | | | | 0.037 | 1.00 | 16 | 3.80 | 4.00 | 0.037 | 0.037 | 0.50 | 0.10 | 0.004 | 2% |
| | 4.10 | 0.41 | | | | 0.027 | 1.00 | 17 | 4.00 | 4.20 | 0.027 | 0.027 | 0.41 | 0.08 | 0.002 | 1% |
| | 4.30 | 0.29 | | | | 0.009 | 1.00 | 18 | 4.20 | 4.45 | 0.009 | 0.009 | 0.29 | 0.07 | 0.001 | 0% |
| LB | 4.60 | 0.00 | | | | 0.000 | 1.00 | 19 | 4.45 | 4.60 | 0.002 | 0.002 | 0.07 | 0.01 | 0.000 | 0% |
| | | | | | | | | | | | | | | | Total Flow: | 0.198 |
| | | | | | | | | | | | | | | | | 1 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.198 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 2.20 | (m ²) |
| Top Width: | 4.30 | (m) |
| Hydraulic Depth: | 0.511 | (m) |
| Mean Velocity: | 0.090 | (m/s) |
| Froude Number | 0.040 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.17 V | 78% |
| Datalogger Memory Used: | 50% | |
| Datalogger Clock: | Jul 15, 2005 16:55 | MST |
| Laptop Clock: | Jul 15, 2005 16:57 | MST |
| Dessicant: | Good - 50% | |
| Datalogger: | 203095 | |
| PT: | 971024 | |
| Power: | | |

Notes:

TSS sample 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/ND
Data Entry By: FF
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: September 1, 2005
Start Time: 2:21 PM MDT
End Time: 2:31 PM MDT

Level Readings

Bench Mark Reading: rebar across 1.392
Water Level Reading: 2.452
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.886
Other:

Setup No. 1

El: 100.908
El: 99.848
El:
El: 98.962
El:

Setup No. 2

El: 100.908
El: 99.854
El:
El: 98.968
El:

Weather Conditions:

+23°C Clear, Calm

River Conditions:

Open water, moderately high stage, below bankfull

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) | |
| 1.30 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.30 | 1.40 | 0.012 | 0.012 | 0.10 | 0.01 | 0.000 | 0% |
| 1.50 | 0.40 | | | | 0.049 | 1.00 | 2 | 1.40 | 1.63 | 0.049 | 0.049 | 0.40 | 0.09 | 0.004 | 0% |
| 1.75 | 0.60 | | | | 0.146 | 1.00 | 3 | 1.63 | 1.88 | 0.146 | 0.146 | 0.60 | 0.15 | 0.022 | 2% |
| 2.00 | 0.62 | | | | 0.091 | 1.00 | 4 | 1.88 | 2.13 | 0.091 | 0.091 | 0.62 | 0.16 | 0.014 | 1% |
| 2.25 | 0.64 | | | | 0.110 | 1.00 | 5 | 2.13 | 2.38 | 0.110 | 0.110 | 0.64 | 0.16 | 0.018 | 2% |
| 2.50 | 0.70 | | | | 0.421 | 1.00 | 6 | 2.38 | 2.63 | 0.421 | 0.421 | 0.70 | 0.18 | 0.074 | 7% |
| 2.75 | 0.70 | | | | 0.637 | 1.00 | 7 | 2.63 | 2.88 | 0.637 | 0.637 | 0.70 | 0.18 | 0.111 | 11% |
| 3.00 | 0.77 | | | | 0.591 | 1.00 | 8 | 2.88 | 3.13 | 0.591 | 0.591 | 0.77 | 0.19 | 0.114 | 11% |
| 3.25 | 0.76 | | | | 0.585 | 1.00 | 9 | 3.13 | 3.38 | 0.585 | 0.585 | 0.76 | 0.19 | 0.111 | 11% |
| 3.50 | 0.80 | | | | 0.469 | 1.00 | 10 | 3.38 | 3.63 | 0.469 | 0.469 | 0.80 | 0.20 | 0.094 | 9% |
| 3.75 | 0.76 | | | | 0.497 | 1.00 | 11 | 3.63 | 3.88 | 0.497 | 0.497 | 0.76 | 0.19 | 0.094 | 9% |
| 4.00 | 0.78 | | | | 0.430 | 1.00 | 12 | 3.88 | 4.13 | 0.430 | 0.430 | 0.78 | 0.20 | 0.084 | 8% |
| 4.25 | 0.76 | | | | 0.408 | 1.00 | 13 | 4.13 | 4.38 | 0.408 | 0.408 | 0.76 | 0.19 | 0.078 | 8% |
| 4.50 | 0.70 | | | | 0.369 | 1.00 | 14 | 4.38 | 4.63 | 0.369 | 0.369 | 0.70 | 0.18 | 0.065 | 6% |
| 4.75 | 0.63 | | | | 0.338 | 1.00 | 15 | 4.63 | 4.88 | 0.338 | 0.338 | 0.63 | 0.16 | 0.053 | 5% |
| 5.00 | 0.55 | | | | 0.296 | 1.00 | 16 | 4.88 | 5.13 | 0.296 | 0.296 | 0.55 | 0.14 | 0.041 | 4% |
| 5.25 | 0.34 | | | | 0.171 | 1.00 | 17 | 5.13 | 5.38 | 0.171 | 0.171 | 0.34 | 0.09 | 0.015 | 1% |
| 5.50 | 0.27 | | | | 0.162 | 1.00 | 18 | 5.38 | 5.70 | 0.162 | 0.162 | 0.27 | 0.09 | 0.014 | 1% |
| 5.90 | 0.00 | | | | 0.000 | 1.00 | 19 | 5.70 | 5.90 | 0.040 | 0.040 | 0.07 | 0.01 | 0.001 | 0% |
| Total Flow: | | | | | | | | | | | | | | 1.006 | 1 |

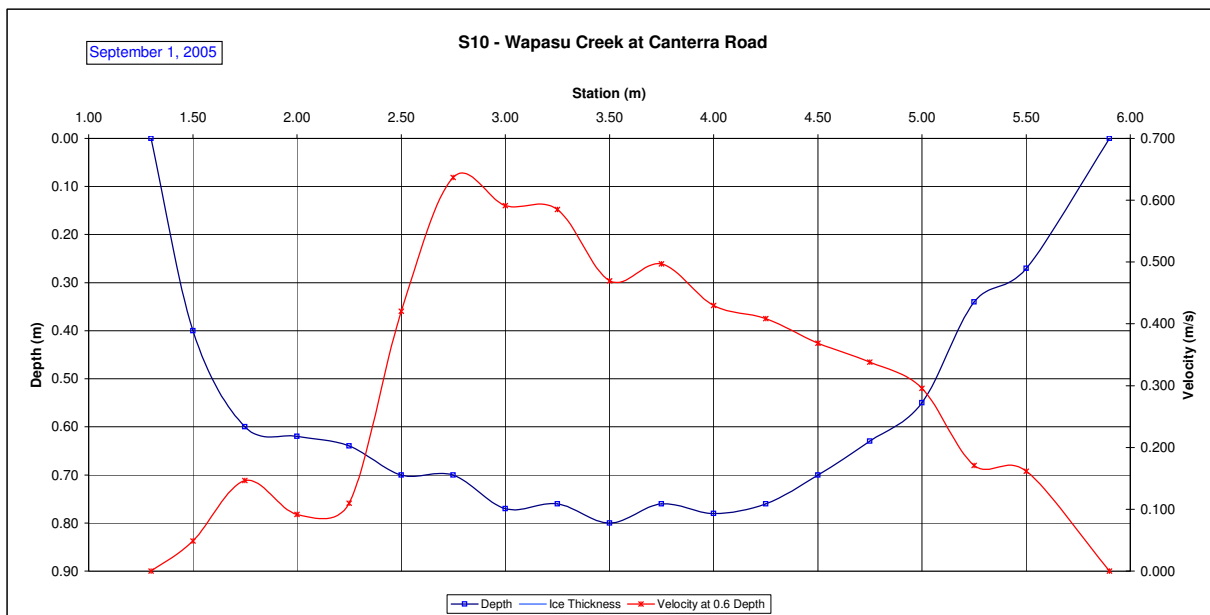
| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 1.006 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.73 | (m ²) |
| Top Width: | 4.60 | (m) |
| Hydraulic Depth: | 0.593 | (m) |
| Mean Velocity: | 0.369 | (m/s) |
| Froude Number | 0.153 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 11.8 V 78%
Datalogger Memory Used: 80%
Datalogger Clock: Sep 01, 2005 12:56 MST
Laptop Clock: Sep 01, 2005 12:58 MST
Dessicant: 100% used-replaced
Datalogger: 203095
PT: 971024
Power:

Notes:

TSS sample taken.
Memory cleared.
Battery to be replaced. Sensor reading appears to be correct.



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: September 5, 2005
Start Time: 8:08 AM MDT
End Time:

Weather Conditions: Scattered cloud, +13°C
River Conditions: Open water, stage falling

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: FF
Meter Type and No.:

Level Readings

| | Setup No. 1 | Setup No. 2 |
|----------------------------------|-------------|-------------|
| Bench Mark Reading: rebar across | 1.059 | 1.193 |
| Water Level Reading: | 2.214 | 2.354 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El: | 0.799 | 0.799 |
| 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 | 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | |

| | |
|--------------------------------|---------------------|
| Total Flow: | (m ³ /s) |
| Perceived Measurement Quality: | |
| Total Area: | (m ²) |
| Top Width: | (m) |
| Hydraulic Depth: | (m) |
| Mean Velocity: | (m/s) |
| Froude Number | |
| Photographs taken looking at: | |
| Upstream, downstream, across | |

Notes:

Battery replaced - new battery at 12.04V, 77%.

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 11.68V 78%
Datalogger Memory Used: 2%
Datalogger Clock: Sep 05, 2005 07:08 MST
Laptop Clock: Sep 05, 2005 07:08 MST
Dessicant: Good - 100%
Datalogger: 203095
PT: 971024
Power:

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: October 6, 2005
Start Time: 5:45 PM MDT
End Time: 6:03 PM MDT

Weather Conditions:

+10°C Clear, Calm

River Conditions:

Open water, moderate stage, below bankfull

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar across 0.896
Water Level Reading: 2.244
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.586
Other:

Setup No. 1

El: 100.908
El: 99.560
El: 98.974
El:

Setup No. 2

El: 100.908
El: 99.558
El: 98.972
El:

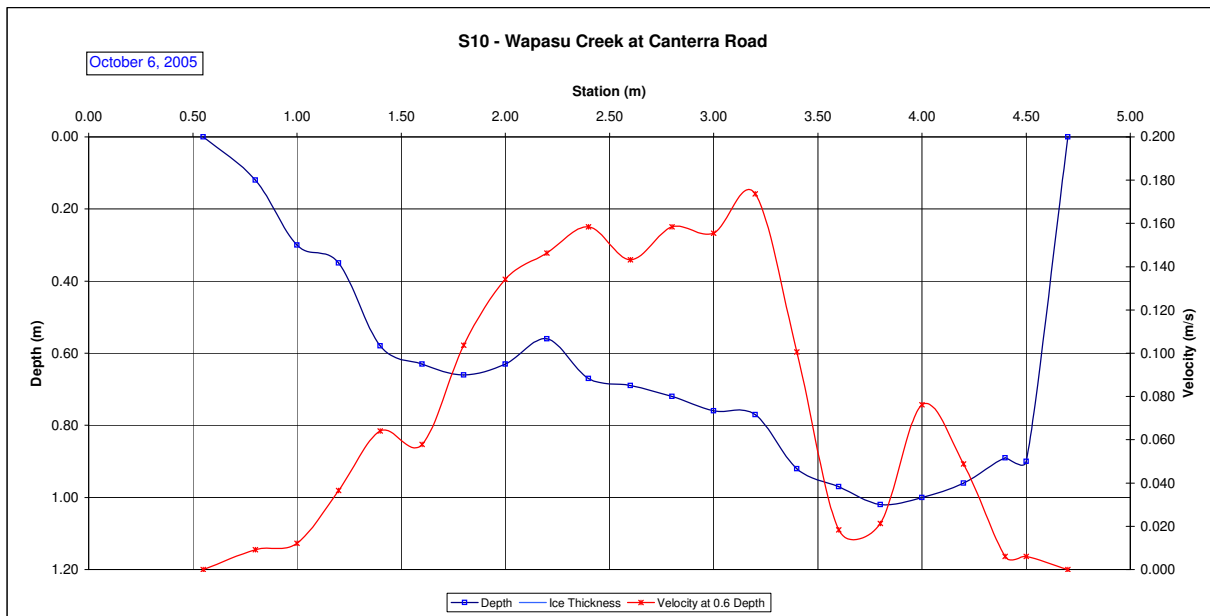
| Measured Data | | | | | | Measurement Data | | | | | | | | | | Percentage of Total |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|------------|-----------------|-----|---------------------|
| 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) | | |
| 0.55 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.55 | 0.68 | 0.002 | 0.002 | 0.03 | 0.00 | 0.000 | 0% | |
| 0.80 | 0.12 | | | | 0.009 | 1.00 | 2 | 0.68 | 0.90 | 0.009 | 0.009 | 0.12 | 0.03 | 0.000 | 0% | |
| 1.00 | 0.30 | | | | 0.012 | 1.00 | 3 | 0.90 | 1.10 | 0.012 | 0.012 | 0.30 | 0.06 | 0.001 | 0% | |
| 1.20 | 0.35 | | | | 0.037 | 1.00 | 4 | 1.10 | 1.30 | 0.037 | 0.037 | 0.35 | 0.07 | 0.003 | 1% | |
| 1.40 | 0.58 | | | | 0.064 | 1.00 | 5 | 1.30 | 1.50 | 0.064 | 0.064 | 0.58 | 0.12 | 0.007 | 3% | |
| 1.60 | 0.63 | | | | 0.058 | 1.00 | 6 | 1.50 | 1.70 | 0.058 | 0.058 | 0.63 | 0.13 | 0.007 | 3% | |
| 1.80 | 0.66 | | | | 0.104 | 1.00 | 7 | 1.70 | 1.90 | 0.104 | 0.104 | 0.66 | 0.13 | 0.014 | 6% | |
| 2.00 | 0.63 | | | | 0.134 | 1.00 | 8 | 1.90 | 2.10 | 0.134 | 0.134 | 0.63 | 0.13 | 0.017 | 7% | |
| 2.20 | 0.56 | | | | 0.146 | 1.00 | 9 | 2.10 | 2.30 | 0.146 | 0.146 | 0.56 | 0.11 | 0.016 | 7% | |
| 2.40 | 0.67 | | | | 0.158 | 1.00 | 10 | 2.30 | 2.50 | 0.158 | 0.158 | 0.67 | 0.13 | 0.021 | 9% | |
| 2.60 | 0.69 | | | | 0.143 | 1.00 | 11 | 2.50 | 2.70 | 0.143 | 0.143 | 0.69 | 0.14 | 0.020 | 9% | |
| 2.80 | 0.72 | | | | 0.158 | 1.00 | 12 | 2.70 | 2.90 | 0.158 | 0.158 | 0.72 | 0.14 | 0.023 | 10% | |
| 3.00 | 0.76 | | | | 0.155 | 1.00 | 13 | 2.90 | 3.10 | 0.155 | 0.155 | 0.76 | 0.15 | 0.024 | 10% | |
| 3.20 | 0.77 | | | | 0.174 | 1.00 | 14 | 3.10 | 3.30 | 0.174 | 0.174 | 0.77 | 0.15 | 0.027 | 12% | |
| 3.40 | 0.92 | | | | 0.101 | 1.00 | 15 | 3.30 | 3.50 | 0.101 | 0.101 | 0.92 | 0.18 | 0.019 | 8% | |
| 3.60 | 0.97 | | | | 0.018 | 1.00 | 16 | 3.50 | 4.00 | 0.018 | 0.018 | 0.97 | 0.49 | 0.009 | 4% | |
| 3.80 | 1.02 | | | | 0.021 | 1.00 | 17 | 4.00 | 4.18 | 0.021 | 0.021 | 1.02 | 0.18 | 0.004 | 2% | |
| 4.00 | 1.00 | | | | 0.076 | 1.00 | 18 | 4.18 | 4.36 | 0.076 | 0.076 | 1.00 | 0.18 | 0.014 | 6% | |
| 4.20 | 0.96 | | | | 0.049 | 1.00 | 19 | 4.36 | 4.45 | 0.049 | 0.049 | 0.96 | 0.09 | 0.004 | 2% | |
| 4.40 | 0.89 | | | | 0.006 | 1.00 | 20 | 4.45 | 4.53 | 0.006 | 0.006 | 0.89 | 0.07 | 0.000 | 0% | |
| 4.50 | 0.90 | | | | 0.006 | 1.00 | 21 | 4.53 | 4.60 | 0.006 | 0.006 | 0.90 | 0.06 | 0.000 | 0% | |
| 4.70 | 0.00 | | | | 0.000 | 1.00 | 22 | 4.60 | 4.70 | 0.002 | 0.002 | 0.23 | 0.02 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 0.230 | 1 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.230 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.77 | (m ²) |
| Top Width: | 4.15 | (m) |
| Hydraulic Depth: | 0.668 | (m) |
| Mean Velocity: | 0.083 | (m/s) |
| Froude Number | 0.032 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 11.92 V | 77% |
| Datalogger Memory Used: | 20% | |
| Datalogger Clock: | Oct 06, 2005 16:33 | MST |
| Laptop Clock: | Oct 06, 2005 16:34 | MST |
| Dessicant: | 5% used | |
| Datalogger: | 203095 | |
| PT: | 971024 | |
| Power: | | |

Notes:

TSS sample taken.
Battery replaced. New battery reading 12.65V 81%. Sensor reading appears to be correct.



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: November 3, 2005
Start Time: 9:01 AM MST
End Time: MST

Weather Conditions: +1°C Partly cloudy, Calm

River Conditions: Mostly Open water, border ice forming, low stage

Personnel & Equipment

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

Level Readings

| Level Readings | | Setup No. 1 | | Setup No. 2 | |
|----------------------------------|-------|-------------|---------|-------------|-------------|
| Bench Mark Reading: rebar across | 1.162 | El: | 100.908 | 1.210 | El: 100.908 |
| Water Level Reading: | 2.581 | El: | 99.489 | 2.620 | El: 99.498 |
| Top of Ice Level Reading: | | El: | | | El: |
| Transducer Reading & Calc'd El | 0.526 | El: | 98.963 | 0.526 | El: 98.972 |
| Other: TD s/n 996022-5 | 0.523 | El: | 98.966 | 0.523 | El: 98.975 |

| 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 | 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

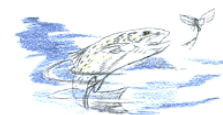
Notes:

Transducer s/n 971024 removed for recalibration.
Transducer s/n 996022-5 installed in the stilling tube.
Memory cleared, clocks synchronized.

| | | |
|----------------------------|---------------------|-------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 11.17 V | 78% |
| Datalogger Memory Used: | 30% | |
| Datalogger Clock: | Nov 03, 2005 08:53 | MST |
| Laptop Clock: | Nov 03, 2005 08:55 | MST |
| Dessicant: | 15% used | |
| Datalogger: | ULRX s/n 203095 | |
| PT: | Keller s/n 996022-5 | 5 psi |
| Power: | Lakewood battery | |

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 7, 2005
Start Time: 1:02 PM MST
End Time: 1:16 PM MST

Weather Conditions:

-20°C Clear, Calm

River Conditions:

Complete ice cover

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar across 1.409
Water Level Reading: 2.951
Top of Ice Level Reading: 2.930
Transducer Reading & Calc'd El: 0.389
Other:

Setup No. 1

El: 100.908
El: 99.366
El: 98.977
El:

Setup No. 2

El: 100.908
El: 99.362
El: 98.973
El:

Measurement Data

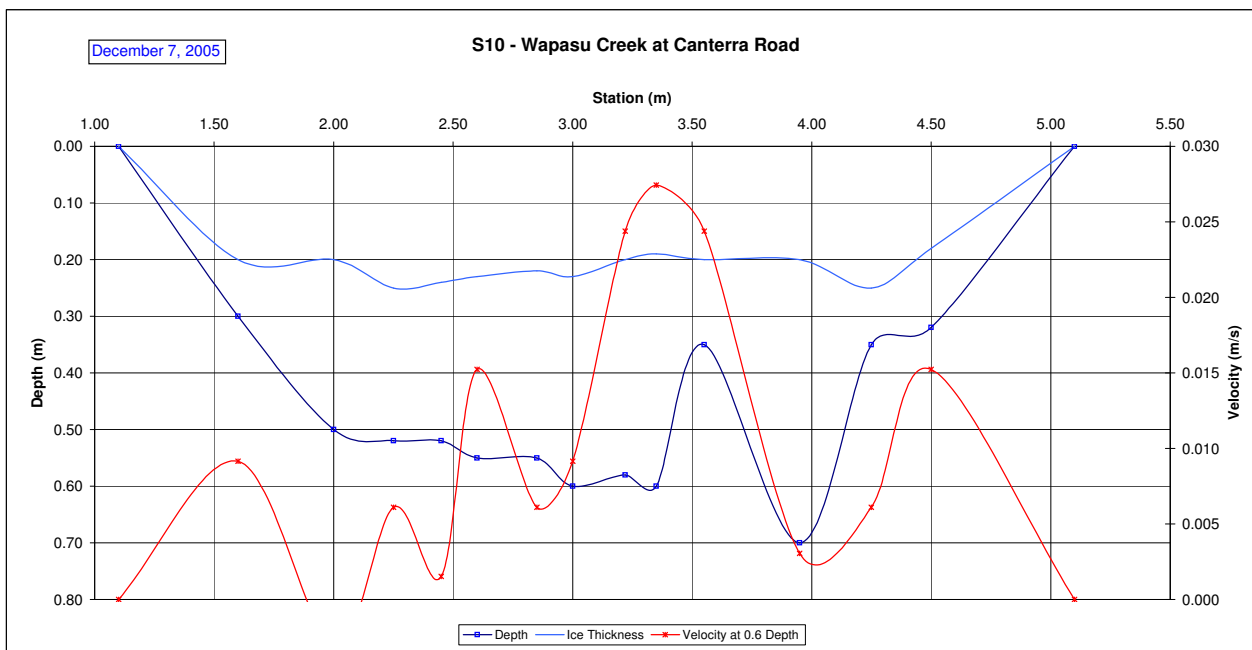
| Measured Data | | | | | | | Calculated Data | | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|
| 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 ²) | (m ³ /s) | |
| 1.10 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 1.10 | 1.35 | 0.002 | 0.002 | 0.03 | 0.01 | 0.000 | 0% |
| 1.60 | 0.30 | 0.20 | | | 0.009 | 0.90 | 2 | 1.35 | 1.80 | 0.009 | 0.008 | 0.10 | 0.05 | 0.000 | 5% |
| 2.00 | 0.50 | 0.20 | | | -0.003 | 0.90 | 3 | 1.80 | 2.13 | -0.003 | -0.003 | 0.30 | 0.10 | 0.000 | -3% |
| 2.25 | 0.52 | 0.25 | | | 0.006 | 0.90 | 4 | 2.13 | 2.35 | 0.006 | 0.005 | 0.27 | 0.06 | 0.000 | 4% |
| 2.45 | 0.52 | 0.24 | | | 0.002 | 0.90 | 5 | 2.35 | 2.53 | 0.002 | 0.001 | 0.28 | 0.05 | 0.000 | 1% |
| 2.60 | 0.55 | 0.23 | | | 0.015 | 0.90 | 6 | 2.53 | 2.73 | 0.015 | 0.014 | 0.32 | 0.06 | 0.001 | 11% |
| 2.85 | 0.55 | 0.22 | | | 0.006 | 0.90 | 7 | 2.73 | 2.93 | 0.006 | 0.005 | 0.33 | 0.07 | 0.000 | 5% |
| 3.00 | 0.60 | 0.23 | | | 0.009 | 0.90 | 8 | 2.93 | 3.11 | 0.009 | 0.008 | 0.37 | 0.07 | 0.001 | 7% |
| 3.22 | 0.58 | 0.20 | | | 0.024 | 0.90 | 9 | 3.11 | 3.29 | 0.024 | 0.022 | 0.38 | 0.07 | 0.001 | 18% |
| 3.35 | 0.60 | 0.19 | | | 0.027 | 0.90 | 10 | 3.29 | 3.45 | 0.027 | 0.025 | 0.41 | 0.07 | 0.002 | 21% |
| 3.55 | 0.35 | 0.20 | | | 0.024 | 0.90 | 11 | 3.45 | 3.75 | 0.024 | 0.022 | 0.15 | 0.05 | 0.001 | 12% |
| 3.95 | 0.70 | 0.20 | | | 0.003 | 0.90 | 12 | 3.75 | 4.10 | 0.003 | 0.003 | 0.50 | 0.18 | 0.000 | 6% |
| 4.25 | 0.35 | 0.25 | | | 0.006 | 0.90 | 13 | 4.10 | 4.38 | 0.006 | 0.005 | 0.10 | 0.03 | 0.000 | 2% |
| 4.50 | 0.32 | 0.18 | | | 0.015 | 0.90 | 14 | 4.38 | 4.80 | 0.015 | 0.014 | 0.14 | 0.06 | 0.001 | 10% |
| 5.10 | 0.00 | 0.00 | | | 0.000 | 0.90 | 15 | 4.80 | 5.10 | 0.004 | 0.003 | 0.04 | 0.01 | 0.000 | 0% |
| Total Flow: | | | | | | | | | | | | | | 0.008 | 1 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.008 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.91 | (m ²) |
| Top Width: | 4.00 | (m) |
| Hydraulic Depth: | 0.227 | (m) |
| Mean Velocity: | 0.009 | (m/s) |
| Froude Number | 0.006 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 11.92 V 77% replaced
Datalogger Memory Used: 25%
Datalogger Clock: Dec 07, 2005 12:31 MST
Laptop Clock: Dec 07, 2005 12:33 MST
Dessicant: 10% used
Datalogger: ULRX s/n 203095
PT: Keller s/n 996022-5 5 psi
Power: Lakewood battery

Notes: Battery replaced, 12.17 V, 78%.



0

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:

Time of Measurement

Date of Measurement: January 5, 2005
Start Time: 11:00 AM MST
End Time: MST

Weather Conditions: Windy, overcast, -11 C

River Conditions: Complete ice cover

Personnel & Equipment

Measurement Made By: ND/DB/CT
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

| | | | | | | |
|-----------------------------------|-------|-----|---------|-------|-----|---------|
| Bench Mark Reading: cap on bridge | 1.017 | El: | 245.550 | 0.792 | El: | 245.550 |
| Water Level Reading: | 5.645 | El: | 240.922 | 5.421 | El: | 240.921 |
| Top of Ice Level Reading: | 5.535 | El: | | 5.297 | El: | |
| Transducer Reading & Est. El.: | | El: | 240.922 | | El: | 240.921 |
| Other: orange post | 3.492 | El: | | 3.263 | 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 ²) | (m ³ /s) |
| - | - | | | | - | - | - | - | - | - | - | - | - | - |
| Total Flow: | | | | | | | | | | | | | | - |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.000 | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (m) |
| Mean Velocity: | - | (m/s) |
| Froude Number | - | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

Not able to get more than one hole through the ice, others are frozen to the bottom.

Datalogger Notes:

Datalogger Internal Power:

Datalogger External Power:

Datalogger Memory Used:

Datalogger Clock:

Laptop Clock:

Dessicant:

Datalogger: 41157-08

PT: 101183

Power:

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:

Time of Measurement

Date of Measurement: February 6, 2005
Start Time: 8:20 AM MST
End Time: MST

Weather Conditions: Windy, overcast, -25 C

River Conditions: Frozen to depth

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: cap on bridge El: 245.550 El: 245.550
Water Level Reading: Bottom of bed El: 242.081 El: 242.081
Top of Ice Level Reading: El: El:
Transducer Reading & Est. El.: El: 242.081 El: 242.081
Other: orange post El: 242.081 El: 242.081

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 ²) | (m ³ /s) |
| - | - | | | | - | - | - | - | - | - | - | - | - | - |
| Total Flow: | | | | | | | | | | | | | | - |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.000 | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | - | (m ²) |
| 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: | |
| Datalogger External Power: | |
| Datalogger Memory Used: | |
| Datalogger Clock: | |
| Laptop Clock: | |
| Dessicant: | |
| Datalogger: | 41157-08 |
| PT: | 101183 |
| Power: | |

Tried at 3 sections. Hit rock on all occasions, frozen to depth, hardly any water came out of the hole on hitting the bottom, so no level survey done.

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:

Time of Measurement

Date of Measurement: March 5, 2005
Start Time: 1:25 PM MST
End Time: MST

Weather Conditions:

Clear, +8 C

River Conditions:

Frozen to depth

Personnel & Equipment

Measurement Made By: ND/RM/CT
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: cap on bridge El: 245.550 El: 245.550
Water Level Reading: Bottom of bed El: 0.000 El: 0.000
Top of Ice Level Reading: El: El:
Transducer Reading & Est. El.: El: 0.000 El: 0.000
Other: orange post El: 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 ²) | (m ³ /s) |
| - | - | | | | - | - | - | - | - | - | - | - | - | - |
| Total Flow: | | | | | | | | | | | | | | - |

| | | | |
|--|-------|--|--------|
| Total Flow: | 0.000 | | (m³/s) |
| Perceived Measurement Quality: | | | |
| Total Area: | - | | (m²) |
| Top Width: | - | | (m) |
| Hydraulic Depth: | - | | (m) |
| | - | | |
| Mean Velocity: | - | | (m/s) |
| Froude Number | - | | |
| Photographs taken looking at: | | | |
| Upstream, downstream, across, drilled holes. | | | |

Notes:

Tried at 3 sections. Hit rock on all occasions, frozen to depth, hardly any water came out of the hole on hitting the bottom
Thus can say that no flow.

Datalogger Notes:

Datalogger Internal Power:
Datalogger External Power:
Datalogger Memory Used:
Datalogger Clock:
Laptop Clock:
Dessicant:
Datalogger: 41157-08
PT: 101183
Power:

Hydrometric Measurement / Site Visit Record
S11 - Poplar Creek



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Poplar Creek
Location: Poplar Creek
Site Name: S11

Time of Measurement

Date of Measurement: April 6, 2005
Start Time: 4:56 PM MDT
End Time: 5:35 PM MDT

Weather Conditions:

River Conditions: Clear, 15 C
Open, marginal ice at the banks.

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

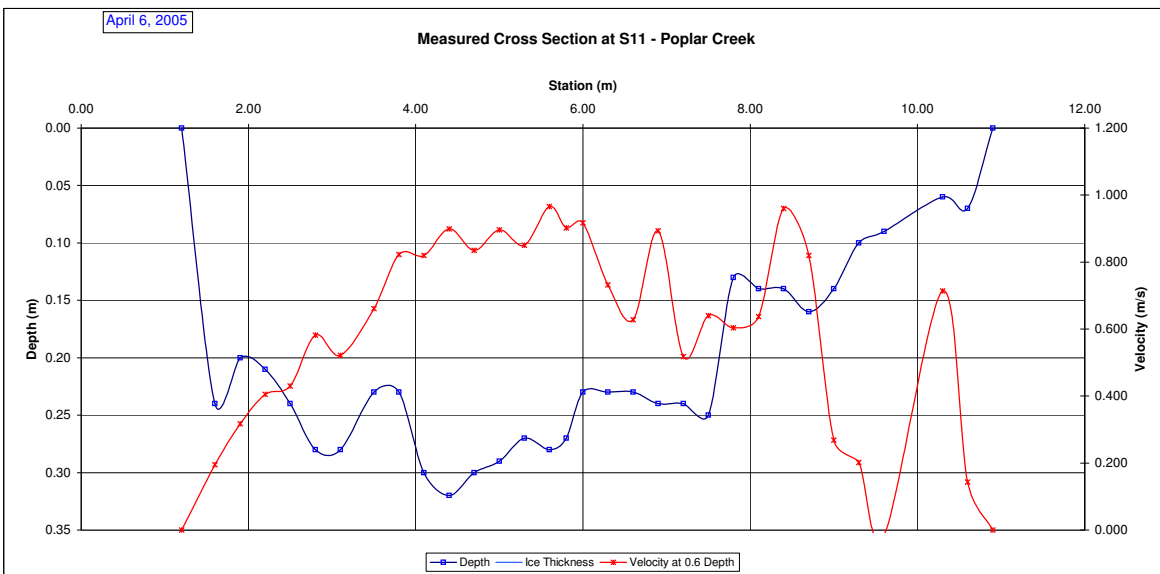
Level Readings and Measurements

Bench Mark Reading: cap on Bridge A 1.039 El: 245.550 0.961 El: 245.550
Water Level Reading: 5.335 El: 241.254 5.25 El: 241.261
Top of Ice Level Reading: El:
Transducer Reading & Est. El.: El:
Other: ASM Marker 4.493 El: 4.412 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 | | | | | |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) | | | | | |
| 1.20 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.20 | 1.40 | 0.049 | 0.049 | 0.06 | 0.01 | 0.001 | | | | | |
| 1.60 | 0.24 | | | | 0.195 | 1.00 | 2 | 1.40 | 1.75 | 0.195 | 0.195 | 0.24 | 0.08 | 0.016 | | | | | |
| 1.90 | 0.20 | | | | 0.317 | 1.00 | 3 | 1.75 | 2.05 | 0.317 | 0.317 | 0.20 | 0.06 | 0.019 | | | | | |
| 2.20 | 0.21 | | | | 0.405 | 1.00 | 4 | 2.05 | 2.35 | 0.405 | 0.405 | 0.21 | 0.06 | 0.026 | | | | | |
| 2.50 | 0.24 | | | | 0.430 | 1.00 | 5 | 2.35 | 2.65 | 0.430 | 0.430 | 0.24 | 0.07 | 0.031 | | | | | |
| 2.80 | 0.28 | | | | 0.582 | 1.00 | 6 | 2.65 | 2.95 | 0.582 | 0.582 | 0.28 | 0.08 | 0.049 | | | | | |
| 3.10 | 0.28 | | | | 0.521 | 1.00 | 7 | 2.95 | 3.30 | 0.521 | 0.521 | 0.28 | 0.10 | 0.051 | | | | | |
| 3.50 | 0.23 | | | | 0.661 | 1.00 | 8 | 3.30 | 3.65 | 0.661 | 0.661 | 0.23 | 0.08 | 0.053 | | | | | |
| 3.80 | 0.23 | | | | 0.823 | 1.00 | 9 | 3.65 | 3.95 | 0.823 | 0.823 | 0.23 | 0.07 | 0.057 | | | | | |
| 4.10 | 0.30 | | | | 0.820 | 1.00 | 10 | 3.95 | 4.25 | 0.820 | 0.820 | 0.30 | 0.09 | 0.074 | | | | | |
| 4.40 | 0.32 | | | | 0.899 | 1.00 | 11 | 4.25 | 4.55 | 0.899 | 0.899 | 0.32 | 0.10 | 0.086 | | | | | |
| 4.70 | 0.30 | | | | 0.835 | 1.00 | 12 | 4.55 | 4.85 | 0.835 | 0.835 | 0.30 | 0.09 | 0.075 | | | | | |
| 5.00 | 0.29 | | | | 0.896 | 1.00 | 13 | 4.85 | 5.15 | 0.896 | 0.896 | 0.29 | 0.09 | 0.078 | | | | | |
| 5.30 | 0.27 | | | | 0.850 | 1.00 | 14 | 5.15 | 5.45 | 0.850 | 0.850 | 0.27 | 0.08 | 0.069 | | | | | |
| 5.60 | 0.28 | | | | 0.966 | 1.00 | 15 | 5.45 | 5.70 | 0.966 | 0.966 | 0.28 | 0.07 | 0.068 | | | | | |
| 5.80 | 0.27 | | | | 0.902 | 1.00 | 16 | 5.70 | 5.90 | 0.902 | 0.902 | 0.27 | 0.05 | 0.049 | | | | | |
| 6.00 | 0.23 | | | | 0.917 | 1.00 | 17 | 5.90 | 6.15 | 0.917 | 0.917 | 0.23 | 0.06 | 0.053 | | | | | |
| 6.30 | 0.23 | | | | 0.732 | 1.00 | 18 | 6.15 | 6.45 | 0.732 | 0.732 | 0.23 | 0.07 | 0.050 | | | | | |
| 6.60 | 0.23 | | | | 0.628 | 1.00 | 19 | 6.45 | 6.75 | 0.628 | 0.628 | 0.23 | 0.07 | 0.043 | | | | | |
| 6.90 | 0.24 | | | | 0.893 | 1.00 | 20 | 6.75 | 7.05 | 0.893 | 0.893 | 0.24 | 0.07 | 0.064 | | | | | |
| 7.20 | 0.24 | | | | 0.518 | 1.00 | 21 | 7.05 | 7.35 | 0.518 | 0.518 | 0.24 | 0.07 | 0.037 | | | | | |
| 7.50 | 0.25 | | | | 0.640 | 1.00 | 22 | 7.35 | 7.65 | 0.640 | 0.640 | 0.25 | 0.08 | 0.048 | | | | | |
| 7.80 | 0.13 | | | | 0.604 | 1.00 | 23 | 7.65 | 7.95 | 0.604 | 0.604 | 0.13 | 0.04 | 0.024 | | | | | |
| 8.10 | 0.14 | | | | 0.637 | 1.00 | 24 | 7.95 | 8.25 | 0.637 | 0.637 | 0.14 | 0.04 | 0.027 | | | | | |
| 8.40 | 0.14 | | | | 0.960 | 1.00 | 25 | 8.25 | 8.55 | 0.960 | 0.960 | 0.14 | 0.04 | 0.040 | | | | | |
| 8.70 | 0.16 | | | | 0.820 | 1.00 | 26 | 8.55 | 8.85 | 0.820 | 0.820 | 0.16 | 0.05 | 0.039 | | | | | |
| 9.00 | 0.14 | | | | 0.268 | 1.00 | 27 | 8.85 | 9.15 | 0.268 | 0.268 | 0.14 | 0.04 | 0.011 | | | | | |
| 9.30 | 0.10 | | | | 0.201 | 1.00 | 28 | 9.15 | 9.45 | 0.201 | 0.201 | 0.10 | 0.03 | 0.006 | | | | | |
| 9.60 | 0.09 | | | | -0.015 | 1.00 | 29 | 9.45 | 9.95 | -0.015 | -0.015 | 0.09 | 0.05 | -0.001 | | | | | |
| 10.30 | 0.06 | | | | 0.713 | 1.00 | 30 | 9.95 | 10.45 | 0.713 | 0.713 | 0.06 | 0.03 | 0.021 | | | | | |
| 10.60 | 0.07 | | | | 0.143 | 1.00 | 31 | 10.45 | 10.75 | 0.143 | 0.143 | 0.07 | 0.02 | 0.003 | | | | | |
| 10.90 | 0.00 | | | | 0.000 | 1.00 | 32 | 10.75 | 10.90 | 0.036 | 0.036 | 0.02 | 0.00 | 0.000 | | | | | |
| Total Flow: | | | | | | | | | | | | | | 1.268 | | | | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 1.268 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.95 | (m ²) |
| Top Width: | 9.70 | (m) |
| Hydraulic Depth: | 0.201 | (m) |
| Mean Velocity: | 0.651 | (m/s) |
| Froude Number | 0.464 | |
| Photographs taken looking at: Upstream, downstream, across | | |
| Notes: | | |

| | |
|----------------------------|-------------------------|
| Datalogger Notes: | |
| Datalogger Internal Power: | No transducer installed |
| Datalogger External Power: | |
| Datalogger Memory Used: | |
| Datalogger Clock: | |
| Laptop Clock: | |
| Dessicant: | |
| Datalogger: | |
| PT: | |
| Power: | |



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:

Time of Measurement

Date of Measurement: April 24, 2005
Start Time: 6:30 PM MDT
End Time: MDT

Weather Conditions:

Clear, Light wind, 17 C

River Conditions:

Open, no ice, very high stage, stage > bankfull, very high velocity

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

Bench Mark Reading: Cap on Bridge A 0.998 El: 245.550 1.023 El: 245.550
Water Level Reading: 4.886 El: 241.662 4.914 El: 241.659
Top of Ice Level Reading: El:
Transducer Reading & Est. El.: 0.933 El: 240.729 0.933 El: 240.726
Other: ASM Marker 4.461 El: 4.491 El:

| 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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | - |
| Total Flow: | | | | | | | | | | | | | | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

TSS Sample taken. Equipment installed. Transducer clamped to a concrete block and placed in the flow.
Wading measurement not possible due to very high stage and very high velocity.

Datalogger Notes:

Datalogger Internal Power: 11.34 V 100%
Datalogger External Power: 12.65 V 81%
Datalogger Memory Used: 0%
Datalogger Clock: Apr 24, 2005 17:22 MST
Laptop Clock: Apr 24, 2005 17:22 MST
Dessicant: Good - 100%
Datalogger: Lakewood UltraLogger RX #41157-08
PT: Keller LE8363K #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: FF/RM
Data Entry By: FF
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: May 30, 2005
Start Time: 4:55 PM MDT
End Time: 5:40 PM MDT

Level Readings and Measurements

Bench Mark Reading: Cap on Bridge Abutment 2.039 El: 245.550 1.971 El: 245.550
Water Level Reading: 6.380 El: 241.209 6.29 El: 241.231
Top of Ice Level Reading: El: 240.539 0.670 El: 240.561
Transducer Reading & Est. El.: 0.670 El: 242.076
Other: ASM Marker 5.509 El: 241.096 0.113 El: 241.118

Weather Conditions:

+25 C, light wind, clear

River Conditions:

Open water, stage below bankfull, stage falling

Measurement Data

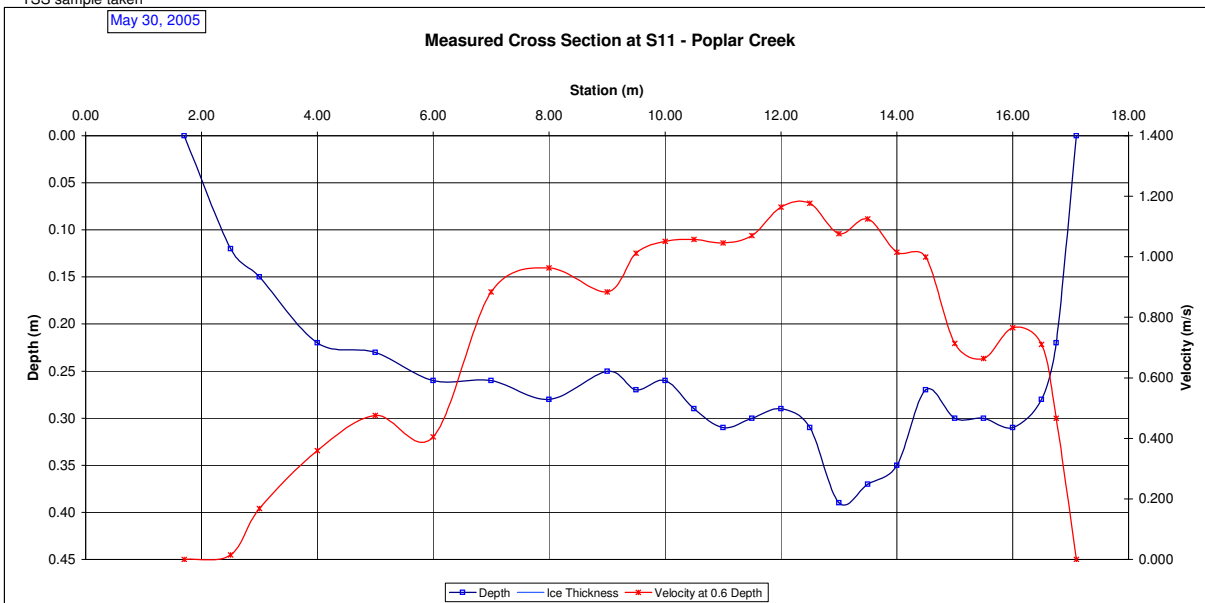
| | Measured Data | | | | | Calculated Data | | | | | | | | | |
|----|---------------|-----------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|------------|-----------------|
| | | | 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 (m) | Depth (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) |
| RB | 1.70 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.70 | 2.10 | 0.004 | 0.004 | 0.03 | 0.01 | 0.000 |
| | 2.50 | 0.12 | | | | 0.015 | 1.00 | 2 | 2.10 | 2.75 | 0.015 | 0.015 | 0.12 | 0.08 | 0.001 |
| | 3.00 | 0.15 | | | | 0.168 | 1.00 | 3 | 2.75 | 3.00 | 0.168 | 0.168 | 0.15 | 0.04 | 0.006 |
| | 4.00 | 0.22 | | | | 0.360 | 1.00 | 4 | 3.00 | 4.00 | 0.360 | 0.360 | 0.22 | 0.22 | 0.079 |
| | 5.00 | 0.23 | | | | 0.475 | 1.00 | 5 | 4.00 | 5.00 | 0.475 | 0.475 | 0.23 | 0.23 | 0.109 |
| | 6.00 | 0.26 | | | | 0.405 | 1.00 | 6 | 5.00 | 6.00 | 0.405 | 0.405 | 0.26 | 0.26 | 0.105 |
| | 7.00 | 0.26 | | | | 0.884 | 1.00 | 7 | 6.00 | 7.00 | 0.884 | 0.884 | 0.26 | 0.26 | 0.230 |
| | 8.00 | 0.28 | | | | 0.963 | 1.00 | 8 | 7.00 | 8.00 | 0.963 | 0.963 | 0.28 | 0.28 | 0.270 |
| | 9.00 | 0.25 | | | | 0.884 | 1.00 | 9 | 8.00 | 9.00 | 0.884 | 0.884 | 0.25 | 0.25 | 0.221 |
| | 9.50 | 0.27 | | | | 1.012 | 1.00 | 10 | 9.00 | 9.50 | 1.012 | 1.012 | 0.27 | 0.14 | 0.137 |
| | 10.00 | 0.26 | | | | 1.052 | 1.00 | 11 | 9.50 | 10.00 | 1.052 | 1.052 | 0.26 | 0.13 | 0.137 |
| | 10.50 | 0.29 | | | | 1.058 | 1.00 | 12 | 10.00 | 10.50 | 1.058 | 1.058 | 0.29 | 0.15 | 0.153 |
| | 11.00 | 0.31 | | | | 1.045 | 1.00 | 13 | 10.50 | 11.00 | 1.045 | 1.045 | 0.31 | 0.16 | 0.162 |
| | 11.50 | 0.30 | | | | 1.070 | 1.00 | 14 | 11.00 | 11.50 | 1.070 | 1.070 | 0.30 | 0.15 | 0.160 |
| | 12.00 | 0.29 | | | | 1.164 | 1.00 | 15 | 11.50 | 12.00 | 1.164 | 1.164 | 0.29 | 0.15 | 0.169 |
| | 12.50 | 0.31 | | | | 1.177 | 1.00 | 16 | 12.00 | 12.50 | 1.177 | 1.177 | 0.31 | 0.16 | 0.182 |
| | 13.00 | 0.39 | | | | 1.076 | 1.00 | 17 | 12.50 | 13.00 | 1.076 | 1.076 | 0.39 | 0.20 | 0.210 |
| | 13.50 | 0.37 | | | | 1.125 | 1.00 | 18 | 13.00 | 13.50 | 1.125 | 1.125 | 0.37 | 0.19 | 0.208 |
| | 14.00 | 0.35 | | | | 1.015 | 1.00 | 19 | 13.50 | 14.00 | 1.015 | 1.015 | 0.35 | 0.18 | 0.178 |
| | 14.50 | 0.27 | | | | 1.000 | 1.00 | 20 | 14.00 | 14.50 | 1.000 | 1.000 | 0.27 | 0.14 | 0.135 |
| | 15.00 | 0.30 | | | | 0.713 | 1.00 | 21 | 14.50 | 15.00 | 0.713 | 0.713 | 0.30 | 0.15 | 0.107 |
| | 15.50 | 0.30 | | | | 0.664 | 1.00 | 22 | 15.00 | 15.50 | 0.664 | 0.664 | 0.30 | 0.15 | 0.100 |
| | 16.00 | 0.31 | | | | 0.765 | 1.00 | 23 | 15.50 | 16.00 | 0.765 | 0.765 | 0.31 | 0.16 | 0.119 |
| | 16.50 | 0.28 | | | | 0.710 | 1.00 | 24 | 16.00 | 16.50 | 0.710 | 0.710 | 0.28 | 0.14 | 0.099 |
| | 16.75 | 0.22 | | | | 0.466 | 1.00 | 25 | 16.50 | 16.75 | 0.466 | 0.466 | 0.22 | 0.06 | 0.026 |
| | LB | 17.10 | 0.00 | | | | 0.000 | 1.00 | 26 | 16.75 | 17.10 | 0.117 | 0.117 | 0.06 | 0.02 |
| | | | | | | | | | | | | | | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 3.305 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 4.00 | (m ²) |
| Top Width: | 15.40 | (m) |
| Hydraulic Depth: | 0.260 | (m) |
| Mean Velocity: | 0.826 | (m/s) |
| Froude Number | 0.517 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|--------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.77V | 82% |
| Datalogger Memory Used: | 22% | |
| Datalogger Clock: | May 30, 2005 15:49 | MST |
| Laptop Clock: | May 30, 2005 15:50 | MST |
| Dessicant: | 95% Good | |
| Datalogger: | 41157-08 | |
| PT: | 101183 | |
| Power: | Lakewood battery | |

Notes:

Transducer was tampered with and appears to have been raised 0.419 m on May 7 at 16:00. Account for this shift in the transducer history
Transducer re-set deeper in the flow by 0.557 m at 4 pm MST on May 30, 2005 (transducer reading changed from 0.112 to 0.670).
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: July 15, 2005
Start Time: 10:45 AM MDT
End Time: 11:05 AM MDT

Weather Conditions:

+25 C, Clear

River Conditions:

Open water

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings and Measurements

| | | | | | | |
|-------------------------------------|-------|-----|---------|-------|-----|---------|
| Bench Mark Reading: Cap on Bridge # | 1.084 | El: | 245.550 | 1.131 | El: | 245.550 |
| Water Level Reading: at TD | 5.488 | El: | 241.146 | 5.528 | El: | 241.153 |
| Water Level Reading: at bridge | 5.263 | El: | 241.371 | 5.306 | El: | 241.375 |
| Transducer Reading & Est. El.: | | El: | | | El: | |
| Other: ASM Marker | 4.578 | El: | 242.056 | 4.62 | El: | 242.061 |
| | | El: | | | El: | |

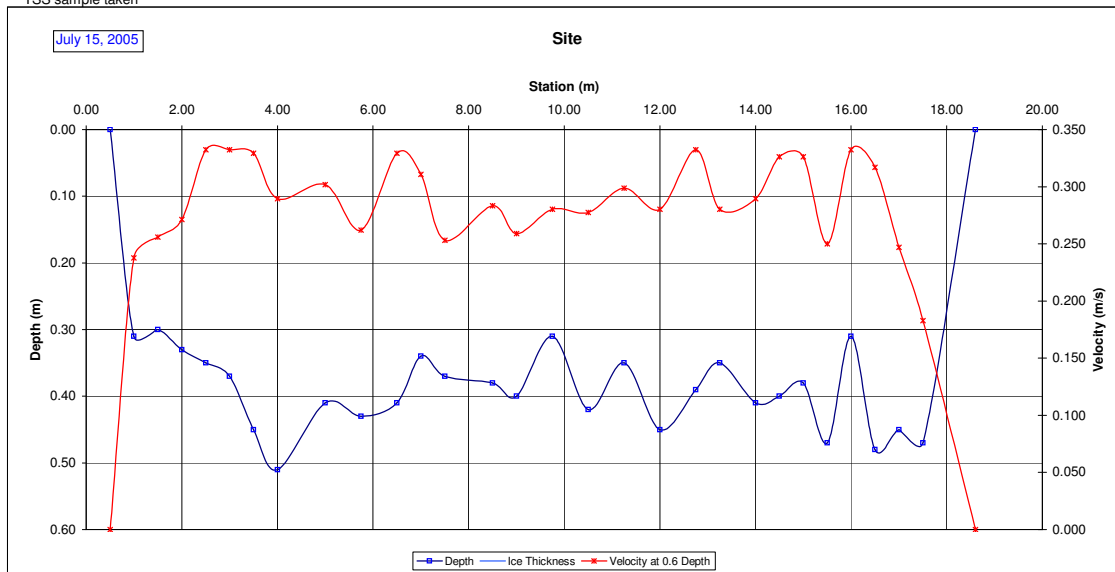
| Measured Data | | | | | | Calculated Data | | | | | | | | |
|---------------|-----------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|------------|-----------------|
| | | 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 (m) | Depth (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 | 0.75 | 0.059 | 0.059 | 0.08 | 0.02 | 0.001 |
| | 1.00 | 0.31 | | | 0.238 | 1.00 | 2 | 0.75 | 1.25 | 0.238 | 0.238 | 0.31 | 0.16 | 0.037 |
| | 1.50 | 0.30 | | | 0.256 | 1.00 | 3 | 1.25 | 1.75 | 0.256 | 0.256 | 0.30 | 0.15 | 0.038 |
| | 2.00 | 0.33 | | | 0.271 | 1.00 | 4 | 1.75 | 2.25 | 0.271 | 0.271 | 0.33 | 0.17 | 0.045 |
| | 2.50 | 0.35 | | | 0.332 | 1.00 | 5 | 2.25 | 2.75 | 0.332 | 0.332 | 0.35 | 0.18 | 0.058 |
| | 3.00 | 0.37 | | | 0.332 | 1.00 | 6 | 2.75 | 3.25 | 0.332 | 0.332 | 0.37 | 0.19 | 0.061 |
| | 3.50 | 0.45 | | | 0.329 | 1.00 | 7 | 3.25 | 3.75 | 0.329 | 0.329 | 0.45 | 0.23 | 0.074 |
| | 4.00 | 0.51 | | | 0.290 | 1.00 | 8 | 3.75 | 4.50 | 0.290 | 0.290 | 0.51 | 0.38 | 0.111 |
| | 5.00 | 0.41 | | | 0.302 | 1.00 | 9 | 4.50 | 5.38 | 0.302 | 0.302 | 0.41 | 0.36 | 0.108 |
| | 5.75 | 0.43 | | | 0.262 | 1.00 | 10 | 5.38 | 6.13 | 0.262 | 0.262 | 0.43 | 0.32 | 0.085 |
| | 6.50 | 0.41 | | | 0.329 | 1.00 | 11 | 6.13 | 6.75 | 0.329 | 0.329 | 0.41 | 0.26 | 0.084 |
| | 7.00 | 0.34 | | | 0.311 | 1.00 | 12 | 6.75 | 7.25 | 0.311 | 0.311 | 0.34 | 0.17 | 0.053 |
| | 7.50 | 0.37 | | | 0.253 | 1.00 | 13 | 7.25 | 8.00 | 0.253 | 0.253 | 0.37 | 0.28 | 0.070 |
| | 8.50 | 0.38 | | | 0.283 | 1.00 | 14 | 8.00 | 8.75 | 0.283 | 0.283 | 0.38 | 0.29 | 0.081 |
| | 9.00 | 0.40 | | | 0.259 | 1.00 | 15 | 8.75 | 9.38 | 0.259 | 0.259 | 0.40 | 0.25 | 0.065 |
| | 9.75 | 0.31 | | | 0.280 | 1.00 | 16 | 9.38 | 10.13 | 0.280 | 0.280 | 0.31 | 0.23 | 0.065 |
| | 10.50 | 0.42 | | | 0.277 | 1.00 | 17 | 10.13 | 10.88 | 0.277 | 0.277 | 0.42 | 0.32 | 0.087 |
| | 11.25 | 0.35 | | | 0.299 | 1.00 | 18 | 10.88 | 11.63 | 0.299 | 0.299 | 0.35 | 0.26 | 0.078 |
| | 12.00 | 0.45 | | | 0.280 | 1.00 | 19 | 11.63 | 12.38 | 0.280 | 0.280 | 0.45 | 0.34 | 0.095 |
| | 12.75 | 0.39 | | | 0.332 | 1.00 | 20 | 12.38 | 13.00 | 0.332 | 0.332 | 0.39 | 0.24 | 0.081 |
| | 13.25 | 0.35 | | | 0.280 | 1.00 | 21 | 13.00 | 13.63 | 0.280 | 0.280 | 0.35 | 0.22 | 0.061 |
| | 14.00 | 0.41 | | | 0.290 | 1.00 | 22 | 13.63 | 14.25 | 0.290 | 0.290 | 0.41 | 0.26 | 0.074 |
| | 14.50 | 0.40 | | | 0.326 | 1.00 | 23 | 14.25 | 14.75 | 0.326 | 0.326 | 0.40 | 0.20 | 0.065 |
| | 15.00 | 0.38 | | | 0.326 | 1.00 | 24 | 14.75 | 15.25 | 0.326 | 0.326 | 0.38 | 0.19 | 0.062 |
| | 15.50 | 0.47 | | | 0.250 | 1.00 | 25 | 15.25 | 15.75 | 0.250 | 0.250 | 0.47 | 0.24 | 0.059 |
| | 16.00 | 0.31 | | | 0.332 | 1.00 | 26 | 15.75 | 16.25 | 0.332 | 0.332 | 0.31 | 0.16 | 0.051 |
| | 16.50 | 0.48 | | | 0.317 | 1.00 | 27 | 16.25 | 16.75 | 0.317 | 0.317 | 0.48 | 0.24 | 0.076 |
| | 17.00 | 0.45 | | | 0.247 | 1.00 | 28 | 16.75 | 17.25 | 0.247 | 0.247 | 0.45 | 0.23 | 0.056 |
| | 17.50 | 0.47 | | | 0.183 | 1.00 | 29 | 17.25 | 18.05 | 0.183 | 0.183 | 0.47 | 0.38 | 0.069 |
| 18.60 | 0.00 | | | | 0.000 | 1.00 | 30 | 18.05 | 18.60 | 0.046 | 0.046 | 0.12 | 0.06 | 0.003 |
| Total Flow: | | | | | | | | | | | | | | 1.954 |

| | | |
|---|-------|---------------------|
| Total Flow: | 1.954 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 6.93 | (m ²) |
| Top Width: | 18.10 | (m) |
| Hydraulic Depth: | 0.383 | (m) |
| Mean Velocity: | 0.282 | (m/s) |
| Froude Number | 0.146 | |
| 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: 41157-08
PT: 101183
Power: Lakewood battery

Notes:
Site vandalized. The logger (s/n 41157-08) was stolen, no data download possible.
Installed logger ULRX s/n 703013 but still not recording any data. Will stop by later and install a new transducer.
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:

Time of Measurement

Date of Measurement: July 16, 2005
Start Time: 10:00 AM MDT
End Time: MDT

Weather Conditions: Overcast, 17 C

River Conditions: Open

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings and Measurements

| | | | | | |
|--------------------------------------|-----|---------|-------|---------|---------|
| Bench Mark Reading: Cap on Bridge AB | El: | 245.550 | El: | 245.550 | |
| Water Level Reading: 5.277 | El: | 241.169 | 5.336 | El: | 241.171 |
| Top of Ice Level Reading: | El: | | | El: | |
| Transducer Reading & Est. El.: 0.619 | El: | 240.550 | 0.619 | El: | 240.552 |
| Other: ASM Marker 4.365 | El: | 242.081 | 4.426 | El: | 242.081 |

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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | - |

Total Flow:

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes:

New transducer and logger installed.
Set to record voltages since calibration constants unknown.

Datalogger Notes:

Datalogger Internal Power: 11.34 V 100%
Datalogger External Power: 12.29 V 79%
Datalogger Memory Used: 0%
Datalogger Clock: Jul 16, 2005 09:11 MST
Laptop Clock: Jul 16, 2005 09:11 MST
Dessicant: Good - 100%
Datalogger: Lakewood UltraLogger RX 2 #203149
PT: Keller LE8363KP 5psi #0507001-5110
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: FF/RM
Data Entry By: FF
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: August 31, 2005
Start Time: 5:41 PM MDT
End Time: 5:51 PM MDT

Level Readings and Measurements

Bench Mark Reading: Cap on Bridge Abutment El: 245.550 0.897 El: 245.550
Water Level Reading: El: 241.238 5.209 El: 241.243
Top of Ice Level Reading: El: 240.525 0.713 El: 240.530
Transducer Reading & Est. El: 0.713 El: 240.530
Other: ASM Marker El: 240.530

Weather Conditions: +20 C, overcast, calm

River Conditions: Open water, stage below bankfull, stage moderately high.

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 ²) | (m ³ /s) |
| RB 2.30 | 0.00 | | | | 0.000 | 1.00 | 1 | 2.30 | 2.65 | 0.133 | 0.133 | 0.10 | 0.04 | 0.005 |
| 3.00 | 0.40 | | | | 0.530 | 1.00 | 2 | 2.65 | 3.50 | 0.530 | 0.530 | 0.40 | 0.34 | 0.180 |
| 4.00 | 0.44 | | | | 0.631 | 1.00 | 3 | 3.50 | 4.50 | 0.631 | 0.631 | 0.44 | 0.44 | 0.278 |
| 5.00 | 0.46 | | | | 1.073 | 1.00 | 4 | 4.50 | 5.25 | 1.073 | 1.073 | 0.46 | 0.35 | 0.370 |
| 5.50 | 0.49 | | | | 0.997 | 1.00 | 5 | 5.25 | 5.75 | 0.997 | 0.997 | 0.49 | 0.25 | 0.244 |
| 6.00 | 0.48 | | | | 0.881 | 1.00 | 6 | 5.75 | 6.25 | 0.881 | 0.881 | 0.48 | 0.24 | 0.211 |
| 6.50 | 0.47 | | | | 0.814 | 1.00 | 7 | 6.25 | 6.75 | 0.814 | 0.814 | 0.47 | 0.24 | 0.191 |
| 7.00 | 0.44 | | | | 0.881 | 1.00 | 8 | 6.75 | 7.25 | 0.881 | 0.881 | 0.44 | 0.22 | 0.194 |
| 7.50 | 0.38 | | | | 0.686 | 1.00 | 9 | 7.25 | 7.75 | 0.686 | 0.686 | 0.38 | 0.19 | 0.130 |
| 8.00 | 0.35 | | | | 0.668 | 1.00 | 10 | 7.75 | 8.25 | 0.668 | 0.668 | 0.35 | 0.18 | 0.117 |
| 8.50 | 0.40 | | | | 0.680 | 1.00 | 11 | 8.25 | 8.75 | 0.680 | 0.680 | 0.40 | 0.20 | 0.136 |
| 9.00 | 0.38 | | | | 0.643 | 1.00 | 12 | 8.75 | 9.25 | 0.643 | 0.643 | 0.38 | 0.19 | 0.122 |
| 9.50 | 0.36 | | | | 0.457 | 1.00 | 13 | 9.25 | 9.75 | 0.457 | 0.457 | 0.36 | 0.18 | 0.082 |
| 10.00 | 0.35 | | | | 0.744 | 1.00 | 14 | 9.75 | 10.25 | 0.744 | 0.744 | 0.35 | 0.18 | 0.130 |
| 10.50 | 0.36 | | | | 0.664 | 1.00 | 15 | 10.25 | 10.75 | 0.664 | 0.664 | 0.36 | 0.18 | 0.120 |
| 11.00 | 0.34 | | | | 0.488 | 1.00 | 16 | 10.75 | 11.25 | 0.488 | 0.488 | 0.34 | 0.17 | 0.083 |
| 11.50 | 0.35 | | | | 0.396 | 1.00 | 17 | 11.25 | 11.75 | 0.396 | 0.396 | 0.35 | 0.18 | 0.069 |
| 12.00 | 0.34 | | | | 0.494 | 1.00 | 18 | 11.75 | 12.25 | 0.494 | 0.494 | 0.34 | 0.17 | 0.084 |
| 12.50 | 0.36 | | | | 0.515 | 1.00 | 19 | 12.25 | 12.75 | 0.515 | 0.515 | 0.36 | 0.18 | 0.093 |
| 13.00 | 0.35 | | | | 0.466 | 1.00 | 20 | 12.75 | 13.25 | 0.466 | 0.466 | 0.35 | 0.18 | 0.082 |
| 13.50 | 0.34 | | | | 0.558 | 1.00 | 21 | 13.25 | 13.75 | 0.558 | 0.558 | 0.34 | 0.17 | 0.095 |
| 14.00 | 0.31 | | | | 0.311 | 1.00 | 22 | 13.75 | 14.25 | 0.311 | 0.311 | 0.31 | 0.16 | 0.048 |
| 14.50 | 0.28 | | | | 0.192 | 1.00 | 23 | 14.25 | 14.75 | 0.192 | 0.192 | 0.28 | 0.14 | 0.027 |
| 15.00 | 0.22 | | | | 0.079 | 1.00 | 24 | 14.75 | 15.35 | 0.079 | 0.079 | 0.22 | 0.13 | 0.010 |
| LB 15.70 | 0.00 | | | | 0.000 | 1.00 | 25 | 15.35 | 15.70 | 0.020 | 0.020 | 0.06 | 0.02 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 3.102 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 3.102 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 4.88 | (m ²) |
| Top Width: | 13.40 | (m) |
| Hydraulic Depth: | 0.364 | (m) |
| Mean Velocity: | 0.636 | (m/s) |
| Froude Number | 0.337 | |

Photographs taken looking at:

Upstream, downstream, across

Notes:

Calibration constants acquired and appropriate format file used.

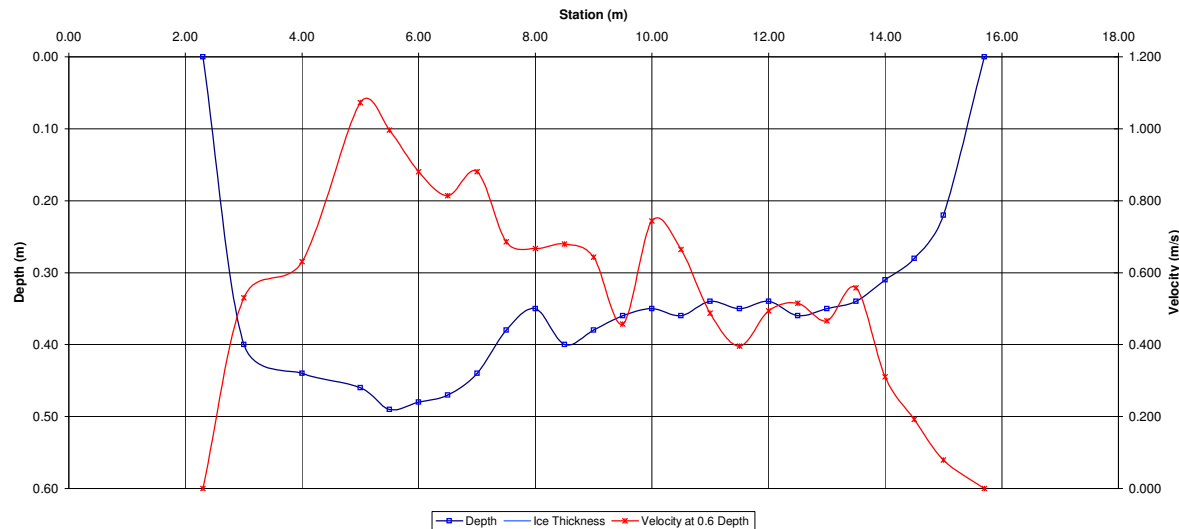
TSS sample taken

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.17V 78%
Datalogger Memory Used: 22%
Datalogger Clock: Aug 31, 2005 16:22 MST
Laptop Clock: Aug 31, 2005 16:23 MST
Dessicant: 100% used - replaced
Datalogger: 203149
PT: 0507001-5110
Power: Lakewood battery

August 31, 2005

Measured Cross Section at S11 - Poplar Creek



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: FF/RM/PM
Data Entry By: PM
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: October 5, 2005
Start Time: 4:55 PM MDT
End Time: 4:58 PM MDT

Level Readings and Measurements

Bench Mark Reading: Cap on Bridge At: 1.082 El: 245.550 0.968 El: 245.550
Water Level Reading: 5.621 El: 241.011 5.508 El: 241.010
Top of Ice Level Reading: El: El: El: El:
Transducer Reading & Est. El.: 0.480 El: 240.531 0.480 El: 240.530
Other: ASM Marker 4.579 El: 4.472 El:

Weather Conditions: +5 °C, Clear, Light wind

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 ²) | (m ³ /s) |
| LB | 1.90 | 0.00 | | | 0.000 | 1.00 | 1 | 1.90 | 2.05 | 0.002 | 0.002 | 0.10 | 0.02 | 0.000 |
| | 2.20 | 0.40 | | | 0.006 | 1.00 | 2 | 2.05 | 2.60 | 0.006 | 0.006 | 0.40 | 0.22 | 0.001 |
| | 3.00 | 0.44 | | | 0.043 | 1.00 | 3 | 2.60 | 3.25 | 0.043 | 0.043 | 0.44 | 0.29 | 0.012 |
| | 3.50 | 0.46 | | | 0.037 | 1.00 | 4 | 3.25 | 3.75 | 0.037 | 0.037 | 0.46 | 0.23 | 0.008 |
| | 4.00 | 0.49 | | | 0.076 | 1.00 | 5 | 3.75 | 4.25 | 0.076 | 0.076 | 0.49 | 0.25 | 0.019 |
| | 4.50 | 0.48 | | | 0.110 | 1.00 | 6 | 4.25 | 4.63 | 0.110 | 0.110 | 0.48 | 0.18 | 0.020 |
| | 4.75 | 0.47 | | | 0.125 | 1.00 | 7 | 4.63 | 4.88 | 0.125 | 0.125 | 0.47 | 0.12 | 0.015 |
| | 5.00 | 0.44 | | | 0.308 | 1.00 | 8 | 4.88 | 5.13 | 0.308 | 0.308 | 0.44 | 0.11 | 0.034 |
| | 5.25 | 0.38 | | | 0.408 | 1.00 | 9 | 5.13 | 5.38 | 0.408 | 0.408 | 0.38 | 0.10 | 0.039 |
| | 5.50 | 0.35 | | | 0.351 | 1.00 | 10 | 5.38 | 5.63 | 0.351 | 0.351 | 0.35 | 0.09 | 0.031 |
| | 5.75 | 0.40 | | | 0.250 | 1.00 | 11 | 5.63 | 5.88 | 0.250 | 0.250 | 0.40 | 0.10 | 0.025 |
| | 6.00 | 0.38 | | | 0.344 | 1.00 | 12 | 5.88 | 6.13 | 0.344 | 0.344 | 0.38 | 0.10 | 0.033 |
| | 6.25 | 0.36 | | | 0.213 | 1.00 | 13 | 6.13 | 6.38 | 0.213 | 0.213 | 0.36 | 0.09 | 0.019 |
| | 6.50 | 0.35 | | | 0.085 | 1.00 | 14 | 6.38 | 6.75 | 0.085 | 0.085 | 0.35 | 0.13 | 0.011 |
| | 7.00 | 0.36 | | | 0.046 | 1.00 | 15 | 6.75 | 7.25 | 0.046 | 0.046 | 0.36 | 0.18 | 0.008 |
| | 7.50 | 0.34 | | | 0.034 | 1.00 | 16 | 7.25 | 7.75 | 0.034 | 0.034 | 0.34 | 0.17 | 0.006 |
| | 8.00 | 0.35 | | | 0.134 | 1.00 | 17 | 7.75 | 8.25 | 0.134 | 0.134 | 0.35 | 0.18 | 0.023 |
| | 8.50 | 0.34 | | | 0.049 | 1.00 | 18 | 8.25 | 8.75 | 0.049 | 0.049 | 0.34 | 0.17 | 0.008 |
| | 9.00 | 0.36 | | | 0.064 | 1.00 | 19 | 8.75 | 9.25 | 0.064 | 0.064 | 0.36 | 0.18 | 0.012 |
| | 9.50 | 0.35 | | | 0.119 | 1.00 | 20 | 9.25 | 9.75 | 0.119 | 0.119 | 0.35 | 0.18 | 0.021 |
| | 10.00 | 0.34 | | | 0.131 | 1.00 | 21 | 9.75 | 10.25 | 0.131 | 0.131 | 0.34 | 0.17 | 0.022 |
| RB | 10.50 | 0.31 | | | 0.037 | 1.00 | 22 | 10.25 | 10.50 | 0.037 | 0.037 | 0.31 | 0.08 | 0.003 |
| | 11.70 | 0.00 | | | 0.000 | 1.00 | 23 | 10.50 | 11.70 | 0.009 | 0.009 | 0.08 | 0.09 | 0.001 |
| Total Flow: | | | | | | | | | | | | | | 0.371 |

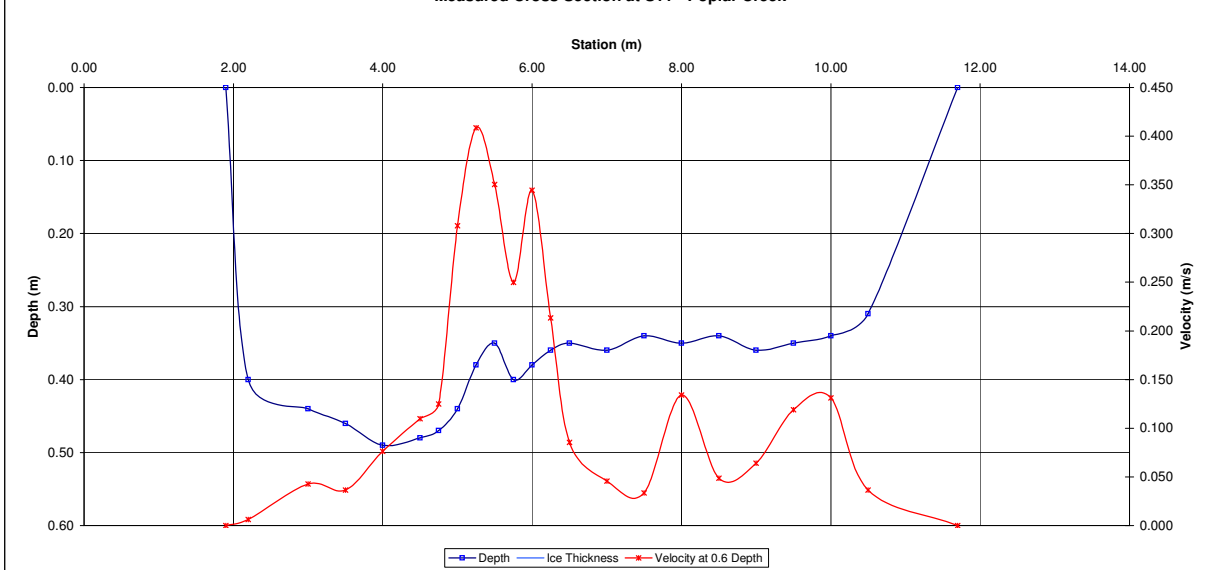
| | | |
|---|-------|---------------------|
| Total Flow: | 0.371 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.39 | (m ²) |
| Top Width: | 9.80 | (m) |
| Hydraulic Depth: | 0.346 | (m) |
| Mean Velocity: | 0.109 | (m/s) |
| Froude Number | 0.059 | |
| Photographs taken looking at: Upstream, downstream, across | | |
| Notes: Battery replaced, Aux 12.65V 81% | | |

| | | |
|----------------------------|---------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 11.92V | 77% |
| Datalogger Memory Used: | 48% | |
| Datalogger Clock: | Aug 31, 2005 16:22 | MST |
| Laptop Clock: | Aug 31, 2005 16:23 | MST |
| Dessicant: | 80% used - replaced | |
| Datalogger: | 203149 | |
| PT: | 0507001-5110 | |
| Power: | Lakewood battery | |

TSS sample taken

October 5, 2005

Measured Cross Section at S11 - Poplar Creek



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: ND/RM/PM
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: December 8, 2005
Start Time: 1:05 PM MST
End Time: 1:18 PM MST

Level Readings and Measurements

Bench Mark Reading: Cap on Bridge At 2.565 El: 245.550 1.61 El: 245.550
Water Level Reading: 7.170 El: 240.945 6.22 El: 240.940
Top of Ice Level Reading: 7.095 El: 6.124
Transducer Reading & Est. El.: El:
Other: ASM Marker 6.052 El: 5.105 El:

Weather Conditions:

-10 °C, Overcast

River Conditions:

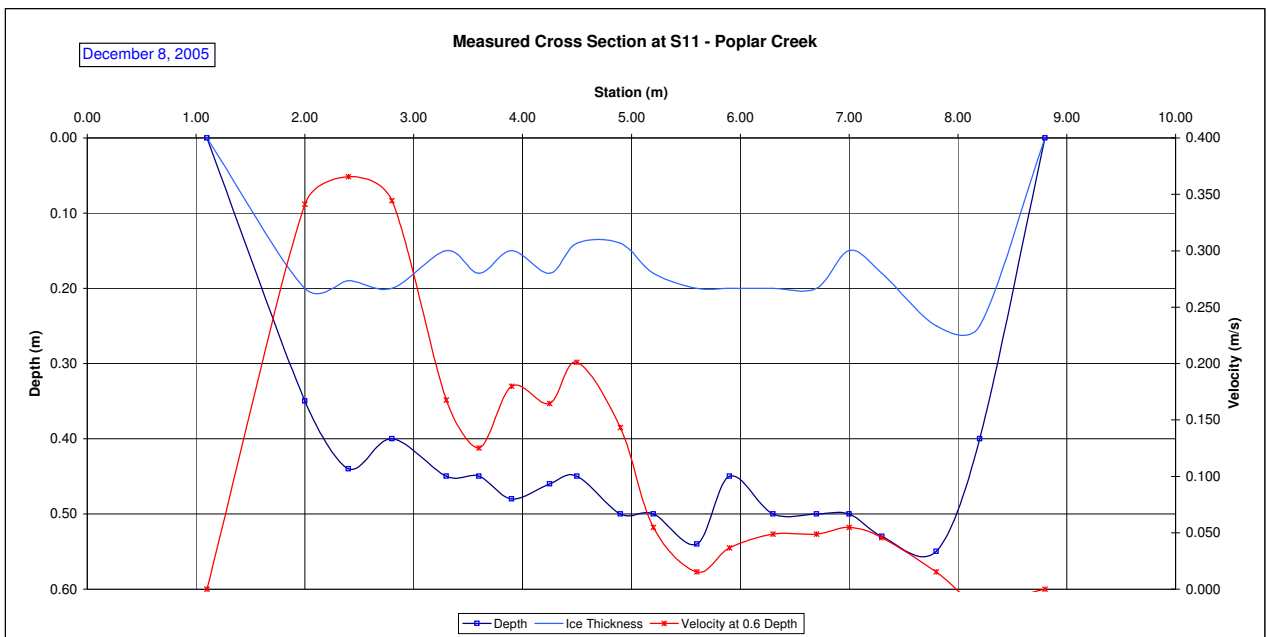
Open at few spots upstream and downstream

| 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) | (m²) | (m³/s) | | | | |
| 1.10 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 1.10 | 1.55 | 0.085 | 0.077 | 0.04 | 0.02 | 0.001 | | | | |
| 2.00 | 0.35 | 0.20 | | | 0.341 | 0.90 | 2 | 1.55 | 2.20 | 0.341 | 0.307 | 0.15 | 0.10 | 0.030 | | | | |
| 2.40 | 0.44 | 0.19 | | | 0.366 | 0.90 | 3 | 2.20 | 2.60 | 0.366 | 0.329 | 0.25 | 0.10 | 0.033 | | | | |
| 2.80 | 0.40 | 0.20 | | | 0.344 | 0.90 | 4 | 2.60 | 3.05 | 0.344 | 0.310 | 0.20 | 0.09 | 0.028 | | | | |
| 3.30 | 0.45 | 0.15 | | | 0.168 | 0.90 | 5 | 3.05 | 3.45 | 0.168 | 0.151 | 0.30 | 0.12 | 0.018 | | | | |
| 3.60 | 0.45 | 0.18 | | | 0.125 | 0.90 | 6 | 3.45 | 3.75 | 0.125 | 0.112 | 0.27 | 0.08 | 0.009 | | | | |
| 3.90 | 0.48 | 0.15 | | | 0.180 | 0.90 | 7 | 3.75 | 4.08 | 0.180 | 0.162 | 0.33 | 0.11 | 0.017 | | | | |
| 4.25 | 0.46 | 0.18 | | | 0.165 | 0.90 | 8 | 4.08 | 4.38 | 0.165 | 0.148 | 0.28 | 0.08 | 0.012 | | | | |
| 4.50 | 0.45 | 0.14 | | | 0.201 | 0.90 | 9 | 4.38 | 4.70 | 0.201 | 0.181 | 0.31 | 0.10 | 0.018 | | | | |
| 4.90 | 0.50 | 0.14 | | | 0.143 | 0.90 | 10 | 4.70 | 5.05 | 0.143 | 0.129 | 0.36 | 0.13 | 0.016 | | | | |
| 5.20 | 0.50 | 0.18 | | | 0.055 | 0.90 | 11 | 5.05 | 5.40 | 0.055 | 0.049 | 0.32 | 0.11 | 0.006 | | | | |
| 5.60 | 0.54 | 0.20 | | | 0.015 | 0.90 | 12 | 5.40 | 5.75 | 0.015 | 0.014 | 0.34 | 0.12 | 0.002 | | | | |
| 5.90 | 0.45 | 0.20 | | | 0.037 | 0.90 | 13 | 5.75 | 6.10 | 0.037 | 0.033 | 0.25 | 0.09 | 0.003 | | | | |
| 6.30 | 0.50 | 0.20 | | | 0.049 | 0.90 | 14 | 6.10 | 6.50 | 0.049 | 0.044 | 0.30 | 0.12 | 0.005 | | | | |
| 6.70 | 0.50 | 0.20 | | | 0.049 | 0.90 | 15 | 6.50 | 6.85 | 0.049 | 0.044 | 0.30 | 0.11 | 0.005 | | | | |
| 7.00 | 0.50 | 0.15 | | | 0.055 | 0.90 | 16 | 6.85 | 7.15 | 0.055 | 0.049 | 0.35 | 0.11 | 0.005 | | | | |
| 7.30 | 0.53 | 0.18 | | | 0.046 | 0.90 | 17 | 7.15 | 7.55 | 0.046 | 0.041 | 0.35 | 0.14 | 0.006 | | | | |
| 7.80 | 0.55 | 0.25 | | | 0.015 | 0.90 | 18 | 7.55 | 8.00 | 0.015 | 0.014 | 0.30 | 0.14 | 0.002 | | | | |
| 8.20 | 0.40 | 0.25 | | | -0.012 | 0.90 | 19 | 8.00 | 8.50 | -0.012 | -0.011 | 0.15 | 0.08 | -0.001 | | | | |
| 8.80 | 0.00 | 0.00 | | | 0.000 | 0.90 | 20 | 8.50 | 8.80 | -0.003 | -0.003 | 0.04 | 0.01 | 0.000 | | | | |
| Total Flow: | | | | | | | | | | | | | 0.215 | | | | | |

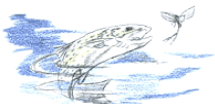
| | | |
|---|-------|---------------------|
| Total Flow: | 0.215 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1.93 | (m ²) |
| Top Width: | 7.70 | (m) |
| Hydraulic Depth: | 0.251 | (m) |
| Mean Velocity: | 0.111 | (m/s) |
| Froude Number | 0.071 | |
| Photographs taken looking at: Upstream, downstream, across | | |
| Notes: | | |

Datalogger Notes:

Datalogger Internal Power:
Datalogger External Power:
Datalogger Memory Used:
Datalogger Clock:
Laptop Clock:
Dessicant:
Datalogger: Equipment removed for winter
PT:
Power:



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: April 27, 2005
Date of Measurement: 2:15 PM MDT
Start Time: 3:22 PM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.259
Water Level Reading: 2.928
Top of Ice Level Reading:
Transducer Reading & El.: 1.188
Other:

Setup No. 1

El: 236.416
El: 234.747
El: 233.559

Setup No. 2

El: 1.309
El: 234.751
El: 233.563

Weather Conditions: +15 C, partly cloudy, windy
River Conditions: Open, very high stage, high velocity

Table with 14 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. Rows include data for stations 13.60 to 53.70.

Summary table with 4 columns: Parameter, Value, Unit, Notes. Includes Total Flow (49.848 m³/s), Perceived Measurement Quality (Good), Total Area (75.94 m²), Top Width (40.10 m), Hydraulic Depth (1.894 m), Mean Velocity (0.656 m/s), Froude Number (0.152), and Photographs taken looking at (no - camera broken).

Table with 2 columns: Parameter, Value. Includes Datalogger Notes, Database (771), Datalogger Internal Power (4.63V), Datalogger External Power (14.42V), Datalogger Memory Used (14%), Datalogger Clock (Apr 25, 2005 16:41 MST), Laptop Clock (Apr 25, 2005 16:41 MST), Dessicant (Good - 100%), Datalogger (Optimum DD128, # 030430771), PT (Keller 730-130-5 psi #0303326), Power (Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller).

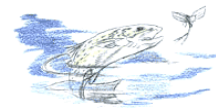
Notes: TSS sample collected. Database # 771.
Equipment installed. Transducer clamped to a concrete block and placed in the flow.
Stilling well tube could not be found due to very high stage.
Wading measurement not possible due to very high stage and velocity. Hence manual flow measurement was done from the bridge over the Ells River at the mouth on April 27.

DISCHARGE ESTIMATED AT 47.26 CMS BASED ON THIS MEASUREMENT DONE ABOVE THE BRIDGE AT ELLS RIVER AT THE MOUTH.



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: June 2, 2005
Date of Measurement: 4:15 PM MDT
Start Time: 4:30 PM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1.187
Water Level Reading: 3.521
Top of Ice Level Reading:
Transducer Reading & El.: 0.528
Other:

| Setup No. 1 | Setup No. 2 |
|-------------|-------------|
| El: 236.416 | El: 236.416 |
| El: 234.082 | El: 234.086 |
| El: 233.554 | El: 233.558 |

Weather Conditions: +25 C, clear, light wind from N

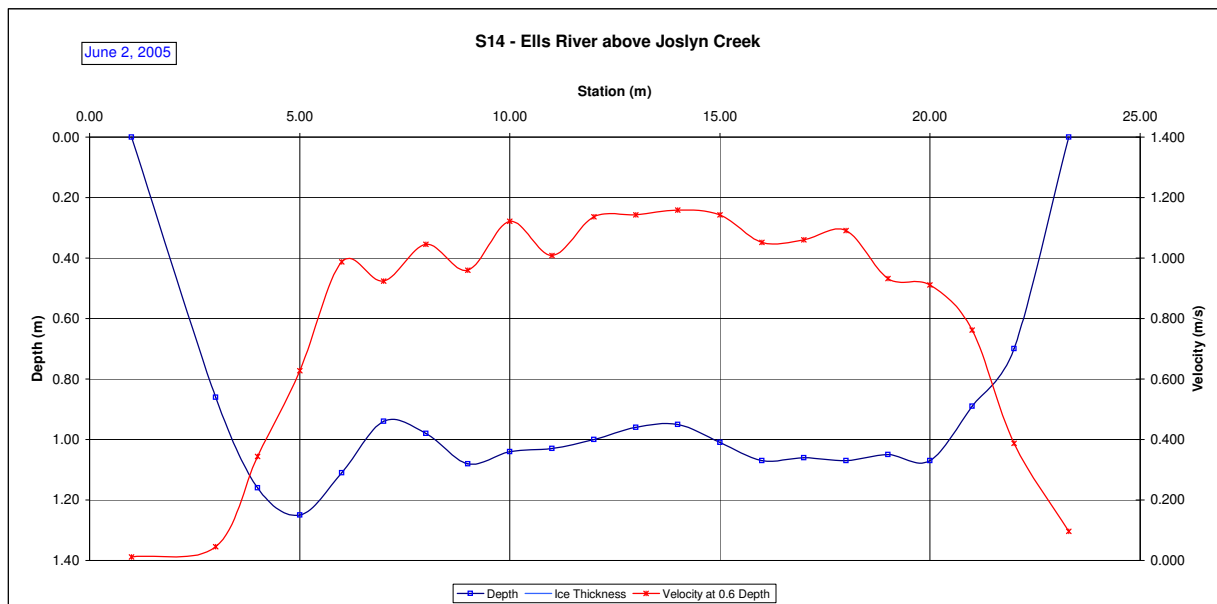
River Conditions: Open, high stage, stage falling

| | 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) |
| LB | | | | | | | | | | | | | | | |
| | 1.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.00 | 2.00 | 0.011 | 0.011 | 0.22 | 0.22 | 0.002 |
| | 3.00 | 0.86 | | | | 0.046 | 1.00 | 2 | 2.00 | 3.50 | 0.046 | 0.046 | 0.86 | 1.29 | 0.059 |
| | 4.00 | 1.16 | | | | 0.344 | 1.00 | 3 | 3.50 | 4.50 | 0.344 | 0.344 | 1.16 | 1.16 | 0.400 |
| | 5.00 | 1.25 | | | | 0.628 | 1.00 | 4 | 4.50 | 5.50 | 0.628 | 0.628 | 1.25 | 1.25 | 0.785 |
| | 6.00 | 1.11 | | | | 0.988 | 1.00 | 5 | 5.50 | 6.50 | 0.988 | 0.988 | 1.11 | 1.11 | 1.096 |
| | 7.00 | 0.94 | | | | 0.924 | 1.00 | 6 | 6.50 | 7.50 | 0.924 | 0.924 | 0.94 | 0.94 | 0.868 |
| | 8.00 | 0.98 | | | | 1.045 | 1.00 | 7 | 7.50 | 8.50 | 1.045 | 1.045 | 0.98 | 0.98 | 1.025 |
| | 9.00 | 1.08 | | | | 0.960 | 1.00 | 8 | 8.50 | 9.50 | 0.960 | 0.960 | 1.08 | 1.08 | 1.037 |
| | 10.00 | 1.04 | | | | 1.122 | 1.00 | 9 | 9.50 | 10.50 | 1.122 | 1.122 | 1.04 | 1.04 | 1.167 |
| | 11.00 | 1.03 | | | | 1.009 | 1.00 | 10 | 10.50 | 11.50 | 1.009 | 1.009 | 1.03 | 1.03 | 1.039 |
| | 12.00 | 1.00 | | | | 1.137 | 1.00 | 11 | 11.50 | 12.50 | 1.137 | 1.137 | 1.00 | 1.00 | 1.137 |
| | 13.00 | 0.96 | | | | 1.143 | 1.00 | 12 | 12.50 | 13.50 | 1.143 | 1.143 | 0.96 | 0.96 | 1.097 |
| | 14.00 | 0.95 | | | | 1.158 | 1.00 | 13 | 13.50 | 14.50 | 1.158 | 1.158 | 0.95 | 0.95 | 1.100 |
| | 15.00 | 1.01 | | | | 1.143 | 1.00 | 14 | 14.50 | 15.50 | 1.143 | 1.143 | 1.01 | 1.01 | 1.154 |
| | 16.00 | 1.07 | | | | 1.052 | 1.00 | 15 | 15.50 | 16.50 | 1.052 | 1.052 | 1.07 | 1.07 | 1.125 |
| | 17.00 | 1.06 | | | | 1.061 | 1.00 | 16 | 16.50 | 17.50 | 1.061 | 1.061 | 1.06 | 1.06 | 1.124 |
| | 18.00 | 1.07 | | | | 1.091 | 1.00 | 17 | 17.50 | 18.50 | 1.091 | 1.091 | 1.07 | 1.07 | 1.168 |
| | 19.00 | 1.05 | | | | 0.933 | 1.00 | 18 | 18.50 | 19.50 | 0.933 | 0.933 | 1.05 | 1.05 | 0.979 |
| | 20.00 | 1.07 | | | | 0.911 | 1.00 | 19 | 19.50 | 20.50 | 0.911 | 0.911 | 1.07 | 1.07 | 0.975 |
| RB | 21.00 | 0.89 | | | | 0.762 | 1.00 | 20 | 20.50 | 21.50 | 0.762 | 0.762 | 0.89 | 0.89 | 0.678 |
| | 22.00 | 0.70 | | | | 0.387 | 1.00 | 21 | 21.50 | 22.65 | 0.387 | 0.387 | 0.70 | 0.80 | 0.312 |
| | 23.30 | 0.00 | | | | 0.000 | 1.00 | 22 | 22.65 | 23.30 | 0.097 | 0.097 | 0.18 | 0.11 | 0.011 |
| | | | | | | | | | | | | | Total Flow: | | 18.339 |

| | | |
|--------------------------------|--------------------|---------------------|
| Total Flow: | 18.339 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 21.14 | (m ²) |
| Top Width: | 22.30 | (m) |
| Hydraulic Depth: | 0.948 | (m) |
| Mean Velocity: | 0.867 | (m/s) |
| Froude Number | 0.380 | |
| Photographs taken looking at: | no - camera broken | |

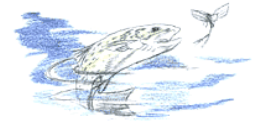
| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 771 |
| Datalogger Internal Power: | 4.7V | |
| Datalogger External Power: | 14.1V | |
| Datalogger Memory Used: | 17% | |
| Datalogger Clock: | Jun 02, 2005 14:47 | MST |
| Laptop Clock: | Jun 02, 2005 14:49 | MST |
| Dessicant: | Good - 95% | |
| Datalogger: | Optimum DD128, # 030430771 | |
| PT: | Keller 730-130-5 psi #0303326 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: TSS sample collected. Database # 771. Transducer may have been dragged downstream in the flow. Stilling well tube could not be found due to very high stage. Wading measurement barely possible due to high stage and velocity.



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: July 13, 2005
Start Time: 6:40 PM MDT
End Time: MDT

Weather Conditions: +25° C, Clear

River Conditions: Open

Personnel & Equipment

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

Level Readings

Bench Mark Reading: nail in tree 1.209
Water Level Reading: 3.885
Top of Ice Level Reading:
Transducer Reading & El.: 0.281
Other:

Setup No. 1

El: 236.416
El: 233.740
El:
El: 233.459
El:

Setup No. 2

El: 236.416
El: 233.744
El:
El: 233.463
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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| U/S, D/S, across | | |

Notes: TSS sample collected.
Wading measurement not possible due to high velocity and depth.

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 771 |
| Datalogger Internal Power: | 4.665V | |
| Datalogger External Power: | 14.17V | |
| Datalogger Memory Used: | 20% | |
| Datalogger Clock: | Jul 13, 2005 17:39 | MST |
| Laptop Clock: | Jul 13, 2005 17:41 | MST |
| Dessicant: | 60% used | |
| Datalogger: | Optimum DD128, # 030430771 | |
| PT: | Keller 730-130-5 psi #0303326 | |
| 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

Personnel & Equipment

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

Time of Measurement

Date of Measurement: September 2, 2005
Start Time: 6:50 AM MDT
End Time: 7:05 AM MDT

Level Readings

Bench Mark Reading: nail in tree 1.241
Water Level Reading: 3.589
Top of Ice Level Reading:
Transducer Reading & El.: 0.638
Other:

Setup No. 1

El: 236.416
El: 234.068
El: 233.430
El:

Setup No. 2

1.303 El: 236.416
3.640 El: 234.079
0.638 El: 233.441
El:

Weather Conditions:

+17 C, partly cloudy

River Conditions:

Open, moderately high stage, stage falling

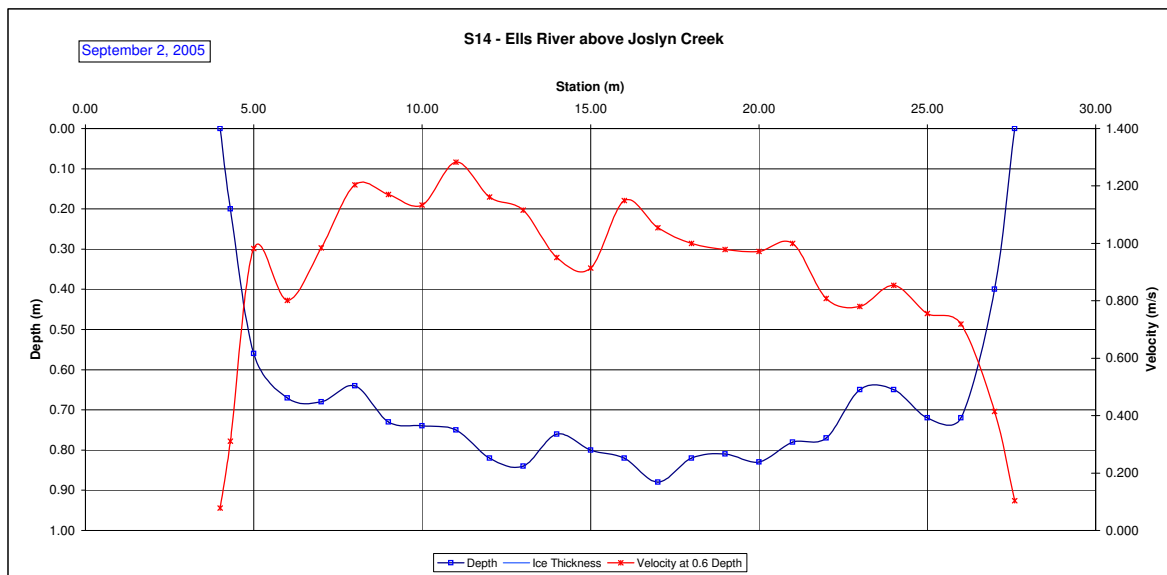
Measurement Data

| 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 ²) | (m ³ /s) |
| LB 4.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 4.00 | 4.15 | 0.078 | 0.078 | 0.05 | 0.01 | 0.001 |
| 4.30 | 0.20 | | | | 0.311 | 1.00 | 2 | 4.15 | 4.65 | 0.311 | 0.311 | 0.20 | 0.10 | 0.031 |
| 5.00 | 0.56 | | | | 0.981 | 1.00 | 3 | 4.65 | 5.50 | 0.981 | 0.981 | 0.56 | 0.48 | 0.467 |
| 6.00 | 0.67 | | | | 0.802 | 1.00 | 4 | 5.50 | 6.50 | 0.802 | 0.802 | 0.67 | 0.67 | 0.537 |
| 7.00 | 0.68 | | | | 0.985 | 1.00 | 5 | 6.50 | 7.50 | 0.985 | 0.985 | 0.68 | 0.68 | 0.669 |
| 8.00 | 0.64 | | | | 1.204 | 1.00 | 6 | 7.50 | 8.50 | 1.204 | 1.204 | 0.64 | 0.64 | 0.771 |
| 9.00 | 0.73 | | | | 1.170 | 1.00 | 7 | 8.50 | 9.50 | 1.170 | 1.170 | 0.73 | 0.73 | 0.854 |
| 10.00 | 0.74 | | | | 1.134 | 1.00 | 8 | 9.50 | 10.50 | 1.134 | 1.134 | 0.74 | 0.74 | 0.839 |
| 11.00 | 0.75 | | | | 1.283 | 1.00 | 9 | 10.50 | 11.50 | 1.283 | 1.283 | 0.75 | 0.75 | 0.962 |
| 12.00 | 0.82 | | | | 1.161 | 1.00 | 10 | 11.50 | 12.50 | 1.161 | 1.161 | 0.82 | 0.82 | 0.952 |
| 13.00 | 0.84 | | | | 1.116 | 1.00 | 11 | 12.50 | 13.50 | 1.116 | 1.116 | 0.84 | 0.84 | 0.937 |
| 14.00 | 0.76 | | | | 0.951 | 1.00 | 12 | 13.50 | 14.50 | 0.951 | 0.951 | 0.76 | 0.76 | 0.723 |
| 15.00 | 0.80 | | | | 0.914 | 1.00 | 13 | 14.50 | 15.50 | 0.914 | 0.914 | 0.80 | 0.80 | 0.732 |
| 16.00 | 0.82 | | | | 1.149 | 1.00 | 14 | 15.50 | 16.50 | 1.149 | 1.149 | 0.82 | 0.82 | 0.942 |
| 17.00 | 0.88 | | | | 1.055 | 1.00 | 15 | 16.50 | 17.50 | 1.055 | 1.055 | 0.88 | 0.88 | 0.928 |
| 18.00 | 0.82 | | | | 1.000 | 1.00 | 16 | 17.50 | 18.50 | 1.000 | 1.000 | 0.82 | 0.82 | 0.820 |
| 19.00 | 0.81 | | | | 0.978 | 1.00 | 17 | 18.50 | 19.50 | 0.978 | 0.978 | 0.81 | 0.81 | 0.793 |
| 20.00 | 0.83 | | | | 0.972 | 1.00 | 18 | 19.50 | 20.50 | 0.972 | 0.972 | 0.83 | 0.83 | 0.807 |
| 21.00 | 0.78 | | | | 1.000 | 1.00 | 19 | 20.50 | 21.50 | 1.000 | 1.000 | 0.78 | 0.78 | 0.780 |
| 22.00 | 0.77 | | | | 0.808 | 1.00 | 20 | 21.50 | 22.50 | 0.808 | 0.808 | 0.77 | 0.77 | 0.622 |
| 23.00 | 0.65 | | | | 0.780 | 1.00 | 21 | 22.50 | 23.50 | 0.780 | 0.780 | 0.65 | 0.65 | 0.507 |
| 24.00 | 0.65 | | | | 0.853 | 1.00 | 22 | 23.50 | 24.50 | 0.853 | 0.853 | 0.65 | 0.65 | 0.555 |
| 25.00 | 0.72 | | | | 0.756 | 1.00 | 23 | 24.50 | 25.50 | 0.756 | 0.756 | 0.72 | 0.72 | 0.544 |
| 26.00 | 0.72 | | | | 0.719 | 1.00 | 24 | 25.50 | 26.50 | 0.719 | 0.719 | 0.72 | 0.72 | 0.518 |
| 27.00 | 0.40 | | | | 0.415 | 1.00 | 25 | 26.50 | 27.30 | 0.415 | 0.415 | 0.40 | 0.32 | 0.133 |
| RB 27.60 | 0.00 | | | | 0.000 | 1.00 | 26 | 27.30 | 27.60 | 0.104 | 0.104 | 0.10 | 0.03 | 0.003 |
| Total Flow: | | | | | | | | | | | | | | 16.427 |

| | | |
|--------------------------------|--------------------|---------------------|
| Total Flow: | 16.427 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 16.81 | (m ²) |
| Top Width: | 23.60 | (m) |
| Hydraulic Depth: | 0.712 | (m) |
| Mean Velocity: | 0.977 | (m/s) |
| Froude Number | 0.485 | |
| Photographs taken looking at: | no - camera broken | |

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 771 |
| Datalogger Internal Power: | 4.7V | |
| Datalogger External Power: | 14.1V | |
| Datalogger Memory Used: | 17% | |
| Datalogger Clock: | Jun 02, 2005 14:47 | MST |
| Laptop Clock: | Jun 02, 2005 14:49 | MST |
| Dessicant: | Good - 95% | |
| Datalogger: | Optimum DD128, # 030430771 | |
| PT: | Keller 730-130-5 psi #0303326 | |
| Power: | Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | |

Notes: TSS sample collected. Database # 771. Transducer may have been dragged downstream in the flow. Stilling well tube could not be found due to very high stage. Wading measurement barely possible due to high stage and velocity.



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

Personnel & Equipment

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

Time of Measurement

Date of Measurement: October 8, 2005
Start Time: 6:20 PM MDT
End Time: 6:39 PM MDT

Level Readings

Bench Mark Reading: nail in tree 1.207
Water Level Reading: 3.807
Top of Ice Level Reading:
Transducer Reading & El.: 0.393
Other:

Setup No. 1

El: 236.416
El: 233.816
El: 233.423
El:

Setup No. 2

El: 236.416
El: 233.816
El: 233.423
El:

Weather Conditions: +15 C, partly cloudy, calm

River Conditions: Open, low stage

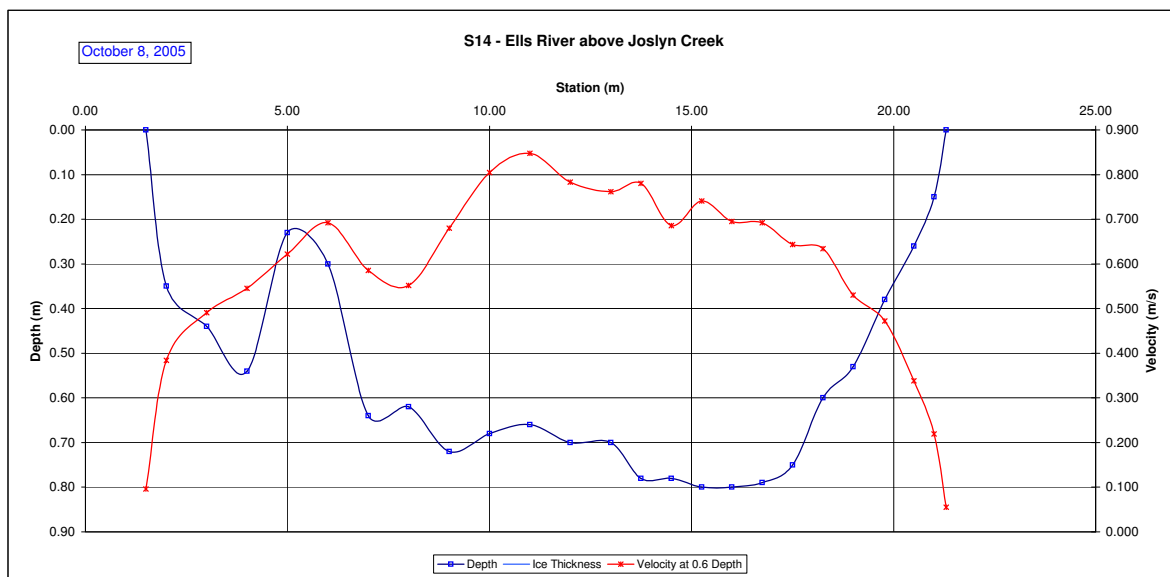
Measurement Data

| 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 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 ²) | (m ³ /s) |
| 1.50 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.50 | 1.75 | 0.096 | 0.096 | 0.09 | 0.02 | 0.002 |
| 2.00 | 0.35 | | | | 0.384 | 1.00 | 2 | 1.75 | 2.50 | 0.384 | 0.384 | 0.35 | 0.26 | 0.101 |
| 3.00 | 0.44 | | | | 0.491 | 1.00 | 3 | 2.50 | 3.50 | 0.491 | 0.491 | 0.44 | 0.44 | 0.216 |
| 4.00 | 0.54 | | | | 0.546 | 1.00 | 4 | 3.50 | 4.50 | 0.546 | 0.546 | 0.54 | 0.54 | 0.295 |
| 5.00 | 0.23 | | | | 0.622 | 1.00 | 5 | 4.50 | 5.50 | 0.622 | 0.622 | 0.23 | 0.23 | 0.143 |
| 6.00 | 0.30 | | | | 0.692 | 1.00 | 6 | 5.50 | 6.50 | 0.692 | 0.692 | 0.30 | 0.30 | 0.208 |
| 7.00 | 0.64 | | | | 0.585 | 1.00 | 7 | 6.50 | 7.50 | 0.585 | 0.585 | 0.64 | 0.64 | 0.375 |
| 8.00 | 0.62 | | | | 0.552 | 1.00 | 8 | 7.50 | 8.50 | 0.552 | 0.552 | 0.62 | 0.62 | 0.342 |
| 9.00 | 0.72 | | | | 0.680 | 1.00 | 9 | 8.50 | 9.50 | 0.680 | 0.680 | 0.72 | 0.72 | 0.489 |
| 10.00 | 0.68 | | | | 0.805 | 1.00 | 10 | 9.50 | 10.50 | 0.805 | 0.805 | 0.68 | 0.68 | 0.547 |
| 11.00 | 0.66 | | | | 0.847 | 1.00 | 11 | 10.50 | 11.50 | 0.847 | 0.847 | 0.66 | 0.66 | 0.559 |
| 12.00 | 0.70 | | | | 0.783 | 1.00 | 12 | 11.50 | 12.50 | 0.783 | 0.783 | 0.70 | 0.70 | 0.548 |
| 13.00 | 0.70 | | | | 0.762 | 1.00 | 13 | 12.50 | 13.38 | 0.762 | 0.762 | 0.70 | 0.61 | 0.467 |
| 13.75 | 0.78 | | | | 0.780 | 1.00 | 14 | 13.38 | 14.13 | 0.780 | 0.780 | 0.78 | 0.59 | 0.456 |
| 14.50 | 0.78 | | | | 0.686 | 1.00 | 15 | 14.13 | 14.88 | 0.686 | 0.686 | 0.78 | 0.59 | 0.401 |
| 15.25 | 0.80 | | | | 0.741 | 1.00 | 16 | 14.88 | 15.63 | 0.741 | 0.741 | 0.80 | 0.60 | 0.444 |
| 16.00 | 0.80 | | | | 0.695 | 1.00 | 17 | 15.63 | 16.38 | 0.695 | 0.695 | 0.80 | 0.60 | 0.417 |
| 16.75 | 0.79 | | | | 0.692 | 1.00 | 18 | 16.38 | 17.13 | 0.692 | 0.692 | 0.79 | 0.59 | 0.410 |
| 17.50 | 0.75 | | | | 0.643 | 1.00 | 19 | 17.13 | 17.88 | 0.643 | 0.643 | 0.75 | 0.56 | 0.362 |
| 18.25 | 0.60 | | | | 0.634 | 1.00 | 20 | 17.88 | 18.63 | 0.634 | 0.634 | 0.60 | 0.45 | 0.285 |
| 19.00 | 0.53 | | | | 0.530 | 1.00 | 21 | 18.63 | 19.39 | 0.530 | 0.530 | 0.53 | 0.41 | 0.215 |
| 19.78 | 0.38 | | | | 0.472 | 1.00 | 22 | 19.39 | 20.14 | 0.472 | 0.472 | 0.38 | 0.29 | 0.135 |
| 20.50 | 0.26 | | | | 0.338 | 1.00 | 23 | 20.14 | 20.75 | 0.338 | 0.338 | 0.26 | 0.16 | 0.054 |
| 21.00 | 0.15 | | | | 0.219 | 1.00 | 24 | 20.75 | 21.15 | 0.219 | 0.219 | 0.15 | 0.06 | 0.013 |
| 21.30 | 0.00 | | | | 0.000 | 1.00 | 25 | 21.15 | 21.30 | 0.055 | 0.055 | 0.04 | 0.01 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 7.484 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 7.484 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 11.32 | (m ²) |
| Top Width: | 19.80 | (m) |
| Hydraulic Depth: | 0.572 | (m) |
| Mean Velocity: | 0.661 | (m/s) |
| Froude Number | 0.358 | |
| Photographs taken looking at: no - camera broken | | |

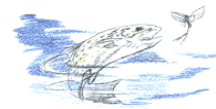
| | | |
|----------------------------|---|-----|
| Datalogger Notes: | Database | 771 |
| Datalogger Internal Power: | 4.608V | |
| Datalogger External Power: | 14.22V | |
| Datalogger Memory Used: | 28% | |
| Datalogger Clock: | Oct 08, 2005 16:59 | MST |
| Laptop Clock: | Oct 08, 2005 17:03 | MST |
| Dessicant: | 100% used | |
| Datalogger: | Optimum DD128, # 030430771 | |
| PT: | Keller 730-130-5 psi #0303326 | |
| 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

S15 - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15
Coordinates & Legal: 6356983 N, 454453 E SW-29-96-11-W4
Time of Measurement: April 27, 2005
Date of Measurement: 10:46 AM MDT
Start Time: 11:05 AM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1 post on RB 0.859 El: 285.908
Water Level Reading: 3.418 El: 283.349
Top of Ice Level Reading: El: 283.354
Transducer Reading & Calc'd El: 0.875 El: 282.474
Other: nail in tree 1.440 El: 285.327

Setup No. 1

El: 285.908
El: 283.349
El: 283.354
El: 282.474
El: 285.327

Setup No. 2

El: 285.908
El: 283.354
El: 283.354
El: 282.479
El: 285.324

Weather Conditions: +2 C, Overcast, Flurries, Gusty

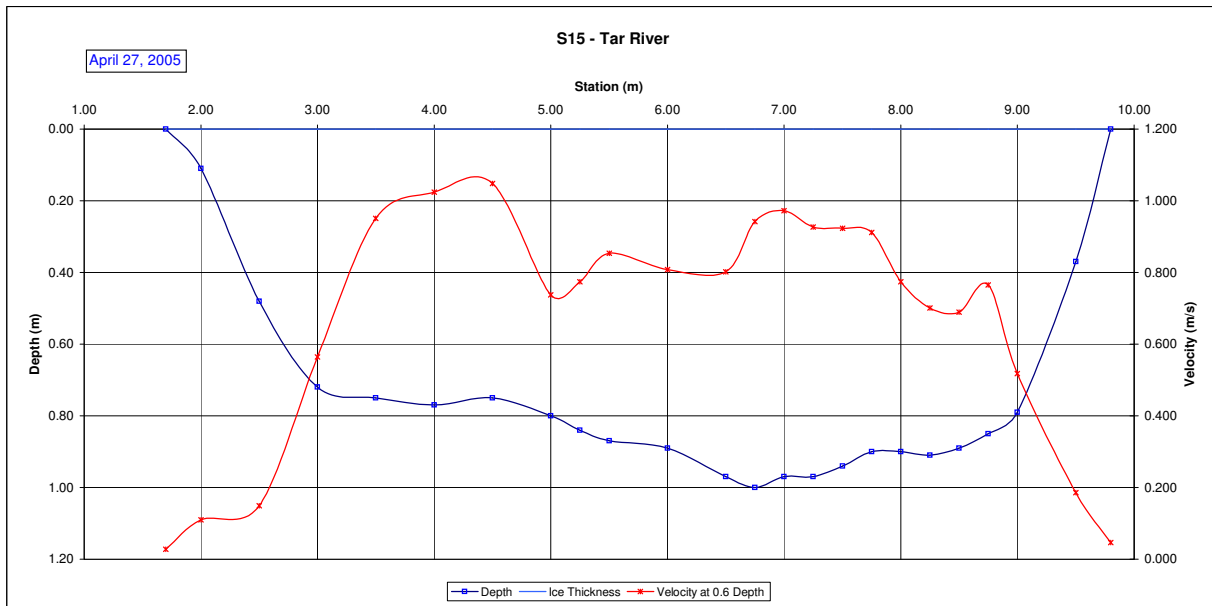
River Conditions: Open, high stage, turbid

| 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) | (m²) | (m³/s) | | | | | |
| 1.70 | 0.00 | 0.00 | | | 0.00 | 1.00 | 1 | 1.70 | 1.85 | 0.027 | 0.027 | 0.03 | 0.00 | 0.000 | | | | | |
| 2.00 | 0.11 | 0.00 | | | 0.11 | 1.00 | 2 | 1.85 | 2.25 | 0.110 | 0.110 | 0.11 | 0.04 | 0.005 | | | | | |
| 2.50 | 0.48 | 0.00 | | | 0.15 | 1.00 | 3 | 2.25 | 2.75 | 0.149 | 0.149 | 0.48 | 0.24 | 0.036 | | | | | |
| 3.00 | 0.72 | 0.00 | | | 0.56 | 1.00 | 4 | 2.75 | 3.25 | 0.564 | 0.564 | 0.72 | 0.36 | 0.203 | | | | | |
| 3.50 | 0.75 | 0.00 | | | 0.95 | 1.00 | 5 | 3.25 | 3.75 | 0.951 | 0.951 | 0.75 | 0.38 | 0.357 | | | | | |
| 4.00 | 0.77 | 0.00 | | | 1.02 | 1.00 | 6 | 3.75 | 4.25 | 1.024 | 1.024 | 0.77 | 0.39 | 0.394 | | | | | |
| 4.50 | 0.75 | 0.00 | | | 1.05 | 1.00 | 7 | 4.25 | 4.75 | 1.049 | 1.049 | 0.75 | 0.38 | 0.393 | | | | | |
| 5.00 | 0.80 | 0.00 | | | 0.74 | 1.00 | 8 | 4.75 | 5.13 | 0.738 | 0.738 | 0.80 | 0.30 | 0.221 | | | | | |
| 5.25 | 0.84 | 0.00 | | | 0.77 | 1.00 | 9 | 5.13 | 5.38 | 0.774 | 0.774 | 0.84 | 0.21 | 0.163 | | | | | |
| 5.50 | 0.87 | 0.00 | | | 0.85 | 1.00 | 10 | 5.38 | 5.75 | 0.853 | 0.853 | 0.87 | 0.33 | 0.278 | | | | | |
| 6.00 | 0.89 | 0.00 | | | 0.81 | 1.00 | 11 | 5.75 | 6.25 | 0.808 | 0.808 | 0.89 | 0.45 | 0.359 | | | | | |
| 6.50 | 0.97 | 0.00 | | | 0.80 | 1.00 | 12 | 6.25 | 6.63 | 0.802 | 0.802 | 0.97 | 0.36 | 0.292 | | | | | |
| 6.75 | 1.00 | 0.00 | | | 0.94 | 1.00 | 13 | 6.63 | 6.88 | 0.942 | 0.942 | 1.00 | 0.25 | 0.235 | | | | | |
| 7.00 | 0.97 | 0.00 | | | 0.97 | 1.00 | 14 | 6.88 | 7.13 | 0.972 | 0.972 | 0.97 | 0.24 | 0.236 | | | | | |
| 7.25 | 0.97 | 0.00 | | | 0.93 | 1.00 | 15 | 7.13 | 7.38 | 0.927 | 0.927 | 0.97 | 0.24 | 0.225 | | | | | |
| 7.50 | 0.94 | 0.00 | | | 0.92 | 1.00 | 16 | 7.38 | 7.63 | 0.924 | 0.924 | 0.94 | 0.24 | 0.217 | | | | | |
| 7.75 | 0.90 | 0.00 | | | 0.91 | 1.00 | 17 | 7.63 | 7.88 | 0.911 | 0.911 | 0.90 | 0.23 | 0.205 | | | | | |
| 8.00 | 0.90 | 0.00 | | | 0.77 | 1.00 | 18 | 7.88 | 8.13 | 0.774 | 0.774 | 0.90 | 0.23 | 0.174 | | | | | |
| 8.25 | 0.91 | 0.00 | | | 0.70 | 1.00 | 19 | 8.13 | 8.38 | 0.701 | 0.701 | 0.91 | 0.23 | 0.159 | | | | | |
| 8.50 | 0.89 | 0.00 | | | 0.69 | 1.00 | 20 | 8.38 | 8.63 | 0.689 | 0.689 | 0.89 | 0.22 | 0.153 | | | | | |
| 8.75 | 0.85 | 0.00 | | | 0.77 | 1.00 | 21 | 8.63 | 8.88 | 0.765 | 0.765 | 0.85 | 0.21 | 0.163 | | | | | |
| 9.00 | 0.79 | 0.00 | | | 0.52 | 1.00 | 22 | 8.88 | 9.25 | 0.518 | 0.518 | 0.79 | 0.30 | 0.154 | | | | | |
| 9.50 | 0.37 | 0.00 | | | 0.19 | 1.00 | 23 | 9.25 | 9.65 | 0.186 | 0.186 | 0.37 | 0.15 | 0.028 | | | | | |
| 9.80 | 0.00 | 0.00 | | | 0.00 | 1.00 | 24 | 9.65 | 9.80 | 0.046 | 0.046 | 0.09 | 0.01 | 0.001 | | | | | |
| Total Flow: | | | | | | | | | | | | | 4.650 | | | | | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 4.650 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 5.97 | (m ²) |
| Top Width: | 8.10 | (m) |
| Hydraulic Depth: | 0.737 | (m) |
| Mean Velocity: | 0.779 | (m/s) |
| Froude Number | 0.290 | |
| Photographs taken looking at: Upstream, downstream, across | | |

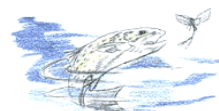
| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database # 608 |
| Datalogger Internal Power: | 4.67V |
| Datalogger External Power: | 13.49V |
| Datalogger Memory Used: | 14% |
| Datalogger Clock: | Apr 27, 2005 09:27 MST |
| Laptop Clock: | Apr 27, 2005 09:27 MST |
| Dessicant: | Good - 100% |
| Datalogger: | Optimum DD-128 #0204100608 |
| PT: | Keller 3psi #0101356 |
| Power: | Solar panel and internal battery |

Notes: TSS taken
Equipment installed. Transducer installed in the stilling well on site.



Hydrometric Measurement / Site Visit Record

S15 - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15
Coordinates & Legal: 6356983 N, 454453 E SW-29-96-11-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: June 1, 2005
Start Time: 9:55 AM MDT
End Time: 10:11 AM MDT

Level Readings

Bench Mark Reading: 1 post on RB 0.756 El: 285.908 0.673 El: 285.908
Water Level Reading: 3.722 El: 282.942 3.636 El: 282.945
Top of Ice Level Reading: El: El: El: El:
Transducer Reading & Calc'd El. 0.469 El: 282.473 0.469 El: 282.476
Other: nail in tree 1.338 El: 285.326 1.255 El: 285.326

Weather Conditions:

+20° C, Scattered cloud, light wind from N

River Conditions:

Open, high stage but well below bankfull, turbid

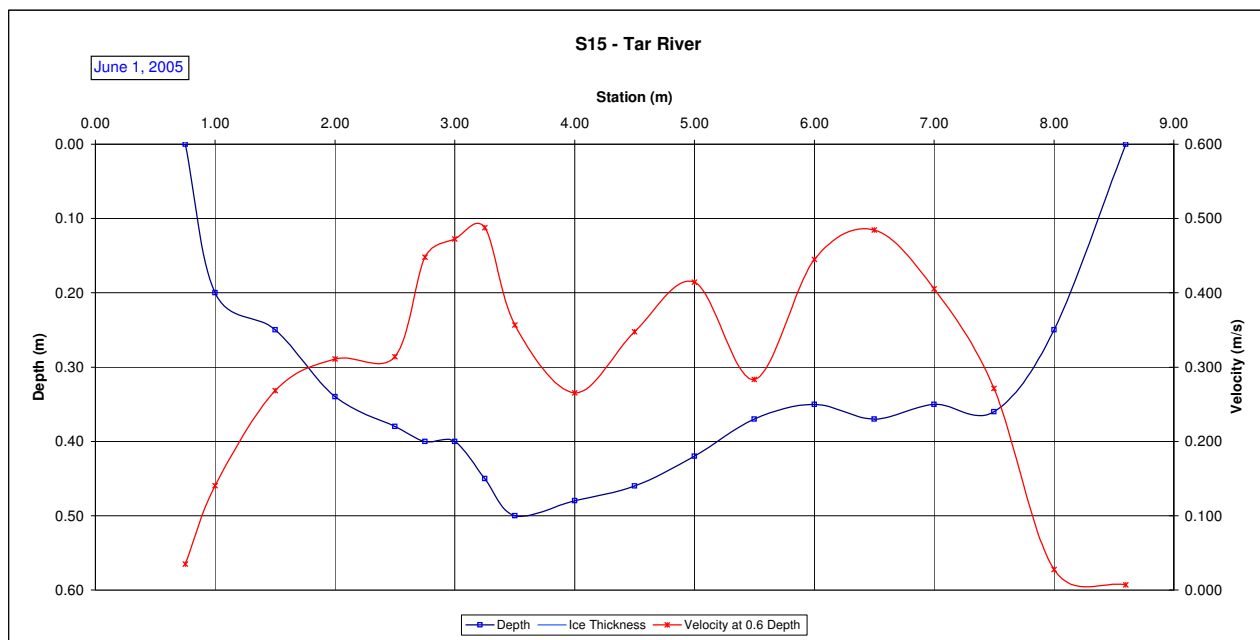
Measurement Data

| 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) |
| 0.75 | 0.00 | | | | 0.00 | 1.00 | 1 | 0.75 | 0.88 | 0.035 | 0.035 | 0.05 | 0.01 | 0.000 |
| 1.00 | 0.20 | | | | 0.14 | 1.00 | 2 | 0.88 | 1.25 | 0.140 | 0.140 | 0.20 | 0.08 | 0.011 |
| 1.50 | 0.25 | | | | 0.27 | 1.00 | 3 | 1.25 | 1.75 | 0.268 | 0.268 | 0.25 | 0.13 | 0.034 |
| 2.00 | 0.34 | | | | 0.31 | 1.00 | 4 | 1.75 | 2.25 | 0.311 | 0.311 | 0.34 | 0.17 | 0.053 |
| 2.50 | 0.38 | | | | 0.31 | 1.00 | 5 | 2.25 | 2.63 | 0.314 | 0.314 | 0.38 | 0.14 | 0.045 |
| 2.75 | 0.40 | | | | 0.45 | 1.00 | 6 | 2.63 | 2.88 | 0.448 | 0.448 | 0.40 | 0.10 | 0.045 |
| 3.00 | 0.40 | | | | 0.47 | 1.00 | 7 | 2.88 | 3.13 | 0.472 | 0.472 | 0.40 | 0.10 | 0.047 |
| 3.25 | 0.45 | | | | 0.49 | 1.00 | 8 | 3.13 | 3.38 | 0.488 | 0.488 | 0.45 | 0.11 | 0.055 |
| 3.50 | 0.50 | | | | 0.36 | 1.00 | 9 | 3.38 | 3.75 | 0.357 | 0.357 | 0.50 | 0.19 | 0.067 |
| 4.00 | 0.48 | | | | 0.27 | 1.00 | 10 | 3.75 | 4.25 | 0.265 | 0.265 | 0.48 | 0.24 | 0.064 |
| 4.50 | 0.46 | | | | 0.35 | 1.00 | 11 | 4.25 | 4.75 | 0.347 | 0.347 | 0.46 | 0.23 | 0.080 |
| 5.00 | 0.42 | | | | 0.41 | 1.00 | 12 | 4.75 | 5.25 | 0.415 | 0.415 | 0.42 | 0.21 | 0.087 |
| 5.50 | 0.37 | | | | 0.28 | 1.00 | 13 | 5.25 | 5.75 | 0.283 | 0.283 | 0.37 | 0.19 | 0.052 |
| 6.00 | 0.35 | | | | 0.45 | 1.00 | 14 | 5.75 | 6.25 | 0.445 | 0.445 | 0.35 | 0.18 | 0.078 |
| 6.50 | 0.37 | | | | 0.48 | 1.00 | 15 | 6.25 | 6.75 | 0.485 | 0.485 | 0.37 | 0.19 | 0.090 |
| 7.00 | 0.35 | | | | 0.41 | 1.00 | 16 | 6.75 | 7.25 | 0.405 | 0.405 | 0.35 | 0.18 | 0.071 |
| 7.50 | 0.36 | | | | 0.27 | 1.00 | 17 | 7.25 | 7.75 | 0.271 | 0.271 | 0.36 | 0.18 | 0.049 |
| 8.00 | 0.25 | | | | 0.03 | 1.00 | 18 | 7.75 | 8.30 | 0.027 | 0.027 | 0.25 | 0.14 | 0.004 |
| 8.60 | 0.00 | | | | 0.00 | 1.00 | 19 | 8.30 | 8.60 | 0.007 | 0.007 | 0.06 | 0.02 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 0.930 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.930 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.76 | (m ²) |
| Top Width: | 7.85 | (m) |
| Hydraulic Depth: | 0.351 | (m) |
| Mean Velocity: | 0.338 | (m/s) |
| Froude Number | 0.182 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database # 608 |
| Datalogger Internal Power: | 4.7V |
| Datalogger External Power: | 15.03V |
| Datalogger Memory Used: | 17% |
| Datalogger Clock: | Jun 01, 2005 08:41 MST |
| Laptop Clock: | Jun 01, 2005 08:43 MST |
| Dessicant: | Good - 95% |
| Datalogger: | Optimum DD-128 #0204100608 |
| PT: | Keller 3psi #0101356 |
| Power: | Solar panel and internal battery |

Notes: TSS taken



Hydrometric Measurement / Site Visit Record

S15 - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15
Coordinates & Legal: 6356983 N, 454453 E SW-29-96-11-W4

Time of Measurement

Date of Measurement: July 14, 2005
Start Time: 10:00 AM MDT
End Time: 10:25 AM MDT

Weather Conditions:

+20 C, Clear

River Conditions:

Open, lower stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1 post on RB 0.927
Water Level Reading: 4.001
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 0.373
Other: nail in tree 1.511

Setup No. 1

El: 285.908
El: 282.834
El: 282.461
El: 285.324

Setup No. 2

0.864 El: 285.908
3.957 El: 282.815
0.373 El: 282.442
1.450 El: 285.322

LB

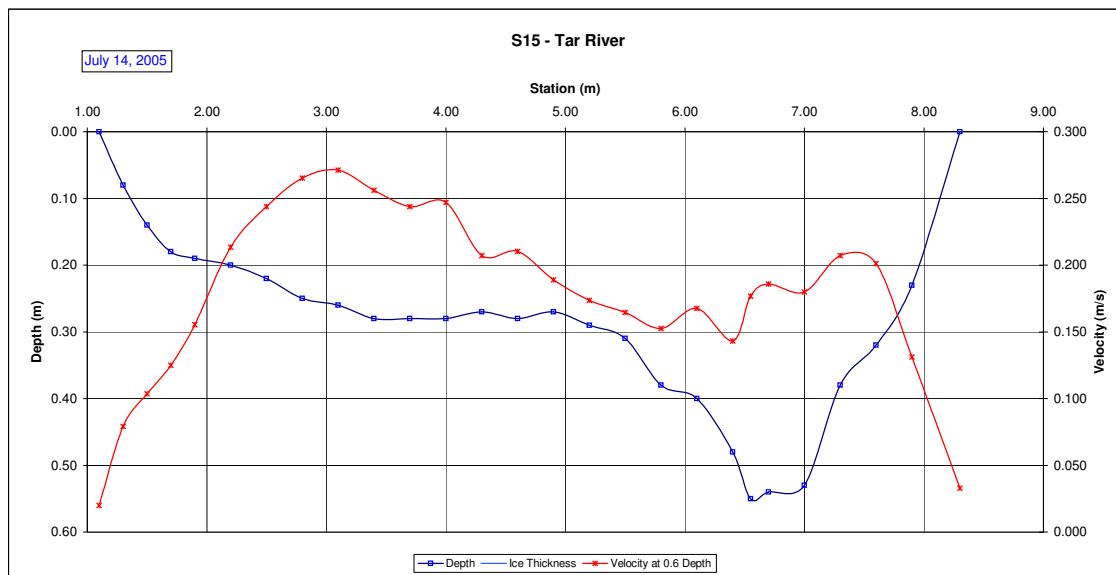
RB

| 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 | 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 ²) | (m ³ /s) |
| 1.10 | 0.00 | | | | 0.00 | 1.00 | 1 | 1.10 | 1.20 | 0.020 | 0.020 | 0.02 | 0.00 | 0.000 |
| 1.30 | 0.08 | | | | 0.08 | 1.00 | 2 | 1.20 | 1.40 | 0.079 | 0.079 | 0.08 | 0.02 | 0.001 |
| 1.50 | 0.14 | | | | 0.10 | 1.00 | 3 | 1.40 | 1.60 | 0.104 | 0.104 | 0.14 | 0.03 | 0.003 |
| 1.70 | 0.18 | | | | 0.12 | 1.00 | 4 | 1.60 | 1.80 | 0.125 | 0.125 | 0.18 | 0.04 | 0.004 |
| 1.90 | 0.19 | | | | 0.16 | 1.00 | 5 | 1.80 | 2.05 | 0.155 | 0.155 | 0.19 | 0.05 | 0.007 |
| 2.20 | 0.20 | | | | 0.21 | 1.00 | 6 | 2.05 | 2.35 | 0.213 | 0.213 | 0.20 | 0.06 | 0.013 |
| 2.50 | 0.22 | | | | 0.24 | 1.00 | 7 | 2.35 | 2.65 | 0.244 | 0.244 | 0.22 | 0.07 | 0.016 |
| 2.80 | 0.25 | | | | 0.27 | 1.00 | 8 | 2.65 | 2.95 | 0.265 | 0.265 | 0.25 | 0.08 | 0.020 |
| 3.10 | 0.26 | | | | 0.27 | 1.00 | 9 | 2.95 | 3.25 | 0.271 | 0.271 | 0.26 | 0.08 | 0.021 |
| 3.40 | 0.28 | | | | 0.26 | 1.00 | 10 | 3.25 | 3.55 | 0.256 | 0.256 | 0.28 | 0.08 | 0.022 |
| 3.70 | 0.28 | | | | 0.24 | 1.00 | 11 | 3.55 | 3.85 | 0.244 | 0.244 | 0.28 | 0.08 | 0.020 |
| 4.00 | 0.28 | | | | 0.25 | 1.00 | 12 | 3.85 | 4.15 | 0.247 | 0.247 | 0.28 | 0.08 | 0.021 |
| 4.30 | 0.27 | | | | 0.21 | 1.00 | 13 | 4.15 | 4.45 | 0.207 | 0.207 | 0.27 | 0.08 | 0.017 |
| 4.60 | 0.28 | | | | 0.21 | 1.00 | 14 | 4.45 | 4.75 | 0.210 | 0.210 | 0.28 | 0.08 | 0.018 |
| 4.90 | 0.27 | | | | 0.19 | 1.00 | 15 | 4.75 | 5.05 | 0.189 | 0.189 | 0.27 | 0.08 | 0.015 |
| 5.20 | 0.29 | | | | 0.17 | 1.00 | 16 | 5.05 | 5.35 | 0.174 | 0.174 | 0.29 | 0.09 | 0.015 |
| 5.50 | 0.31 | | | | 0.16 | 1.00 | 17 | 5.35 | 5.65 | 0.165 | 0.165 | 0.31 | 0.09 | 0.015 |
| 5.80 | 0.38 | | | | 0.15 | 1.00 | 18 | 5.65 | 5.95 | 0.152 | 0.152 | 0.38 | 0.11 | 0.017 |
| 6.10 | 0.40 | | | | 0.17 | 1.00 | 19 | 5.95 | 6.25 | 0.168 | 0.168 | 0.40 | 0.12 | 0.020 |
| 6.40 | 0.48 | | | | 0.14 | 1.00 | 20 | 6.25 | 6.48 | 0.143 | 0.143 | 0.48 | 0.11 | 0.015 |
| 6.55 | 0.55 | | | | 0.18 | 1.00 | 21 | 6.48 | 6.63 | 0.177 | 0.177 | 0.55 | 0.08 | 0.015 |
| 6.70 | 0.54 | | | | 0.19 | 1.00 | 22 | 6.63 | 6.85 | 0.186 | 0.186 | 0.54 | 0.12 | 0.023 |
| 7.00 | 0.53 | | | | 0.18 | 1.00 | 23 | 6.85 | 7.15 | 0.180 | 0.180 | 0.53 | 0.16 | 0.029 |
| 7.30 | 0.38 | | | | 0.21 | 1.00 | 24 | 7.15 | 7.45 | 0.207 | 0.207 | 0.38 | 0.11 | 0.024 |
| 7.60 | 0.32 | | | | 0.20 | 1.00 | 25 | 7.45 | 7.75 | 0.201 | 0.201 | 0.32 | 0.10 | 0.019 |
| 7.90 | 0.23 | | | | 0.13 | 1.00 | 26 | 7.75 | 8.10 | 0.131 | 0.131 | 0.23 | 0.08 | 0.011 |
| 8.30 | 0.00 | | | | 0.00 | 1.00 | 27 | 8.10 | 8.30 | 0.033 | 0.033 | 0.06 | 0.01 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 0.402 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.402 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.09 | (m ²) |
| Top Width: | 7.20 | (m) |
| Hydraulic Depth: | 0.291 | (m) |
| Mean Velocity: | 0.192 | (m/s) |
| Froude Number | 0.114 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: TSS taken

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database # 608 |
| Datalogger Internal Power: | 4.768V |
| Datalogger External Power: | 14.62V |
| Datalogger Memory Used: | 20% |
| Datalogger Clock: | Jul 14, 2005 08:46 MST |
| Laptop Clock: | Jul 14, 2005 08:47 MST |
| Dessicant: | 40% used |
| Datalogger: | Optimum DD-128 #0204100608 |
| PT: | Keller 3psi #0101356 |
| Power: | Solar panel and internal battery |



Hydrometric Measurement / Site Visit Record

S15 - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15
Coordinates & Legal: 6356983 N, 454453 E SW-29-96-11-W4

Time of Measurement

Date of Measurement: August 31, 2005
Start Time: 11:27 AM MDT
End Time: 11:36 AM MDT

Weather Conditions:

+18 C, Clear

River Conditions:

Open, high stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1 post on RB 0.997
Water Level Reading: 3.774
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 0.657
Other: nail in tree 1.580

Setup No. 1

El: 285.908
El: 283.131
El: 282.474
El: 285.325

Setup No. 2

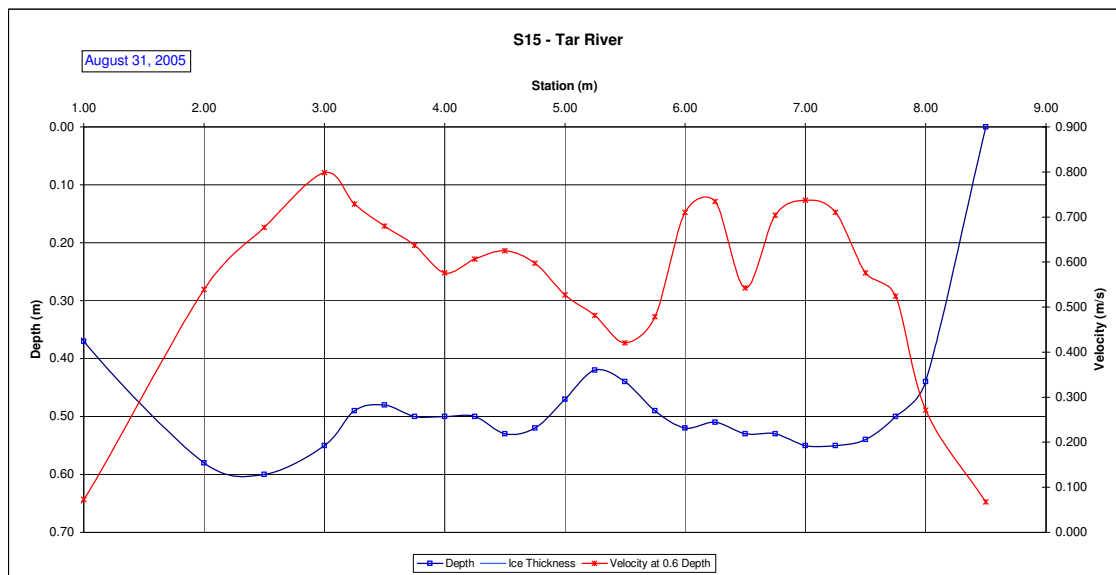
0.913 El: 285.908
3.693 El: 283.128
0.657 El: 282.471
1.495 El: 285.326

| 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 ²) | (m ³ /s) |
| 0.50 | 0.00 | | | | 0.00 | 1.00 | 1 | 0.50 | 0.60 | 0.002 | 0.002 | 0.06 | 0.01 | 0.000 |
| 0.70 | 0.25 | | | | 0.01 | 1.00 | 2 | 0.60 | 0.85 | 0.009 | 0.009 | 0.25 | 0.06 | 0.001 |
| 1.00 | 0.37 | | | | 0.07 | 1.00 | 3 | 0.85 | 1.50 | 0.073 | 0.073 | 0.37 | 0.24 | 0.018 |
| 2.00 | 0.58 | | | | 0.54 | 1.00 | 4 | 1.50 | 2.25 | 0.539 | 0.539 | 0.58 | 0.44 | 0.235 |
| 2.50 | 0.60 | | | | 0.68 | 1.00 | 5 | 2.25 | 2.75 | 0.677 | 0.677 | 0.60 | 0.30 | 0.203 |
| 3.00 | 0.55 | | | | 0.80 | 1.00 | 6 | 2.75 | 3.13 | 0.799 | 0.799 | 0.55 | 0.21 | 0.165 |
| 3.25 | 0.49 | | | | 0.73 | 1.00 | 7 | 3.13 | 3.38 | 0.728 | 0.728 | 0.49 | 0.12 | 0.089 |
| 3.50 | 0.48 | | | | 0.68 | 1.00 | 8 | 3.38 | 3.63 | 0.680 | 0.680 | 0.48 | 0.12 | 0.082 |
| 3.75 | 0.50 | | | | 0.64 | 1.00 | 9 | 3.63 | 3.88 | 0.637 | 0.637 | 0.50 | 0.13 | 0.080 |
| 4.00 | 0.50 | | | | 0.58 | 1.00 | 10 | 3.88 | 4.13 | 0.576 | 0.576 | 0.50 | 0.13 | 0.072 |
| 4.25 | 0.50 | | | | 0.61 | 1.00 | 11 | 4.13 | 4.38 | 0.607 | 0.607 | 0.50 | 0.13 | 0.076 |
| 4.50 | 0.53 | | | | 0.62 | 1.00 | 12 | 4.38 | 4.63 | 0.625 | 0.625 | 0.53 | 0.13 | 0.083 |
| 4.75 | 0.52 | | | | 0.60 | 1.00 | 13 | 4.63 | 4.88 | 0.597 | 0.597 | 0.52 | 0.13 | 0.078 |
| 5.00 | 0.47 | | | | 0.53 | 1.00 | 14 | 4.88 | 5.13 | 0.527 | 0.527 | 0.47 | 0.12 | 0.062 |
| 5.25 | 0.42 | | | | 0.48 | 1.00 | 15 | 5.13 | 5.38 | 0.482 | 0.482 | 0.42 | 0.11 | 0.051 |
| 5.50 | 0.44 | | | | 0.42 | 1.00 | 16 | 5.38 | 5.63 | 0.421 | 0.421 | 0.44 | 0.11 | 0.046 |
| 5.75 | 0.49 | | | | 0.48 | 1.00 | 17 | 5.63 | 5.88 | 0.479 | 0.479 | 0.49 | 0.12 | 0.059 |
| 6.00 | 0.52 | | | | 0.71 | 1.00 | 18 | 5.88 | 6.13 | 0.710 | 0.710 | 0.52 | 0.13 | 0.092 |
| 6.25 | 0.51 | | | | 0.73 | 1.00 | 19 | 6.13 | 6.38 | 0.735 | 0.735 | 0.51 | 0.13 | 0.094 |
| 6.50 | 0.53 | | | | 0.54 | 1.00 | 20 | 6.38 | 6.63 | 0.543 | 0.543 | 0.53 | 0.13 | 0.072 |
| 6.75 | 0.53 | | | | 0.70 | 1.00 | 21 | 6.63 | 6.88 | 0.704 | 0.704 | 0.53 | 0.13 | 0.093 |
| 7.00 | 0.55 | | | | 0.74 | 1.00 | 22 | 6.88 | 7.13 | 0.738 | 0.738 | 0.55 | 0.14 | 0.101 |
| 7.25 | 0.55 | | | | 0.71 | 1.00 | 23 | 7.13 | 7.38 | 0.710 | 0.710 | 0.55 | 0.14 | 0.098 |
| 7.50 | 0.54 | | | | 0.58 | 1.00 | 24 | 7.38 | 7.63 | 0.576 | 0.576 | 0.54 | 0.14 | 0.078 |
| 7.75 | 0.50 | | | | 0.52 | 1.00 | 25 | 7.63 | 7.88 | 0.524 | 0.524 | 0.50 | 0.13 | 0.066 |
| 8.00 | 0.44 | | | | 0.27 | 1.00 | 26 | 7.88 | 8.25 | 0.271 | 0.271 | 0.44 | 0.17 | 0.045 |
| 8.50 | 0.00 | | | | 0.00 | 1.00 | 27 | 8.25 | 8.50 | 0.068 | 0.068 | 0.11 | 0.03 | 0.002 |
| Total Flow: | | | | | | | | | | | | | | 2.137 |

| | | |
|---|-------|---------------------|
| Total Flow: | 2.137 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.84 | (m ²) |
| Top Width: | 8.00 | (m) |
| Hydraulic Depth: | 0.479 | (m) |
| Mean Velocity: | 0.557 | (m/s) |
| Froude Number | 0.257 | |
| Photographs taken looking at: Upstream, downstream, across | | |

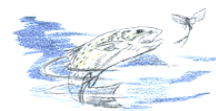
| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database # 608 |
| Datalogger Internal Power: | 4.7V |
| Datalogger External Power: | 15.2V |
| Datalogger Memory Used: | 24% |
| Datalogger Clock: | Aug 31, 2005 10:10 MST |
| Laptop Clock: | Aug 31, 2005 10:10 MST |
| Dessicant: | 100% used - replaced |
| Datalogger: | Optimum DD-128 #0204100608 |
| PT: | Keller 3psi #0101356 |
| Power: | Solar panel and internal battery |

Notes: TSS taken



Hydrometric Measurement / Site Visit Record

S15 - Tar River



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River
Site Name: S15
Coordinates & Legal: 6356983 N, 454453 E SW-29-96-11-W4

Time of Measurement

Date of Measurement: October 11, 2005
Start Time: 3:02 PM MDT
End Time: 3:18 PM MDT

Weather Conditions:

+16° C, Clear, Light wind

River Conditions:

Open, low stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1 post on RB 0.868
Water Level Reading: 3.884
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.415
Other: nail in tree 1.456

Setup No. 1

El: 285.908
El: 282.892
El: 282.477
El: 285.320

Setup No. 2

El: 285.908
El: 282.892
El: 282.477
El: 285.321

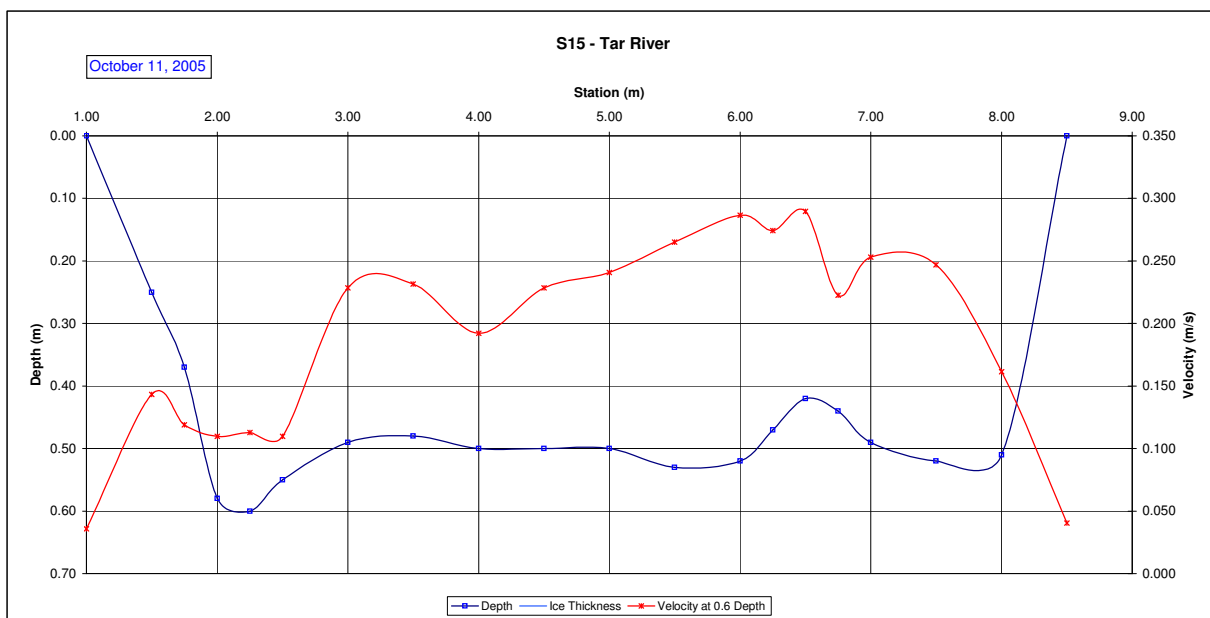
Measurement Data

| 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 ²) | (m ³ /s) |
| 1.00 | 0.00 | | | | 0.00 | 1.00 | 1 | 1.00 | 1.25 | 0.036 | 0.036 | 0.06 | 0.02 | 0.001 |
| 1.50 | 0.25 | | | | 0.14 | 1.00 | 2 | 1.25 | 1.63 | 0.143 | 0.143 | 0.25 | 0.09 | 0.013 |
| 1.75 | 0.37 | | | | 0.12 | 1.00 | 3 | 1.63 | 1.88 | 0.119 | 0.119 | 0.37 | 0.09 | 0.011 |
| 2.00 | 0.58 | | | | 0.11 | 1.00 | 4 | 1.88 | 2.13 | 0.110 | 0.110 | 0.58 | 0.15 | 0.016 |
| 2.25 | 0.60 | | | | 0.11 | 1.00 | 5 | 2.13 | 2.38 | 0.113 | 0.113 | 0.60 | 0.15 | 0.017 |
| 2.50 | 0.55 | | | | 0.11 | 1.00 | 6 | 2.38 | 2.75 | 0.110 | 0.110 | 0.55 | 0.21 | 0.023 |
| 3.00 | 0.49 | | | | 0.23 | 1.00 | 7 | 2.75 | 3.25 | 0.229 | 0.229 | 0.49 | 0.25 | 0.056 |
| 3.50 | 0.48 | | | | 0.23 | 1.00 | 8 | 3.25 | 3.75 | 0.232 | 0.232 | 0.48 | 0.24 | 0.056 |
| 4.00 | 0.50 | | | | 0.19 | 1.00 | 9 | 3.75 | 4.25 | 0.192 | 0.192 | 0.50 | 0.25 | 0.048 |
| 4.50 | 0.50 | | | | 0.23 | 1.00 | 10 | 4.25 | 4.75 | 0.229 | 0.229 | 0.50 | 0.25 | 0.057 |
| 5.00 | 0.50 | | | | 0.24 | 1.00 | 11 | 4.75 | 5.25 | 0.241 | 0.241 | 0.50 | 0.25 | 0.060 |
| 5.50 | 0.53 | | | | 0.27 | 1.00 | 12 | 5.25 | 5.75 | 0.265 | 0.265 | 0.53 | 0.27 | 0.070 |
| 6.00 | 0.52 | | | | 0.29 | 1.00 | 13 | 5.75 | 6.13 | 0.287 | 0.287 | 0.52 | 0.20 | 0.056 |
| 6.25 | 0.47 | | | | 0.27 | 1.00 | 14 | 6.13 | 6.38 | 0.274 | 0.274 | 0.47 | 0.12 | 0.032 |
| 6.50 | 0.42 | | | | 0.29 | 1.00 | 15 | 6.38 | 6.63 | 0.290 | 0.290 | 0.42 | 0.11 | 0.030 |
| 6.75 | 0.44 | | | | 0.22 | 1.00 | 16 | 6.63 | 6.88 | 0.223 | 0.223 | 0.44 | 0.11 | 0.024 |
| 7.00 | 0.49 | | | | 0.25 | 1.00 | 17 | 6.88 | 7.25 | 0.253 | 0.253 | 0.49 | 0.18 | 0.046 |
| 7.50 | 0.52 | | | | 0.25 | 1.00 | 18 | 7.25 | 7.75 | 0.247 | 0.247 | 0.52 | 0.26 | 0.064 |
| 8.00 | 0.51 | | | | 0.16 | 1.00 | 19 | 7.75 | 8.25 | 0.162 | 0.162 | 0.51 | 0.26 | 0.041 |
| 8.50 | 0.00 | | | | 0.00 | 1.00 | 20 | 8.25 | 8.50 | 0.040 | 0.040 | 0.13 | 0.03 | 0.001 |
| Total Flow: | | | | | | | | | | | | | | 0.724 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.724 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.46 | (m ²) |
| Top Width: | 7.50 | (m) |
| Hydraulic Depth: | 0.462 | (m) |
| Mean Velocity: | 0.209 | (m/s) |
| Froude Number | 0.098 | |
| Photographs taken looking at: Upstream, downstream, across | | |

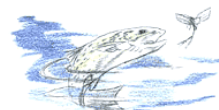
| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database # 608 |
| Datalogger Internal Power: | 4.735 V |
| Datalogger External Power: | 14.32 V |
| Datalogger Memory Used: | 28% |
| Datalogger Clock: | Oct 11, 2005 13:54 MST |
| Laptop Clock: | Oct 11, 2005 13:58 MST |
| Dessicant: | 10% used |
| Datalogger: | Optimum DD-128 #0204100608 |
| PT: | Keller 3psi #0101356 |
| Power: | Solar panel and internal battery |

Notes: Data downloaded, looks fine
Transducer removed for winter



Hydrometric Measurement / Site Visit Record

S16 - Calumet River near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River near the Mouth
Site Name: S16
Coordinates & Legal: 6361693 N, 458152 E NE-10-97-11-W4

Time of Measurement

Date of Measurement: January 9, 2005
Start Time: MST
End Time:

Weather Conditions:

-30 °C, Clear, windy

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: ND/DB
Data Entry By: ND
Meter Type and No.: n/a

Level Readings and Measurements

Bench Mark Reading: T-bar El: 266.300
Water Level Reading: D/S Dam El: 266.300
Water Level Reading: U/S Dam El: 266.300
Transducer Reading: El: 266.300
Other: Nail in Tree: El: 266.300
Water Level @ MMT El: 266.300

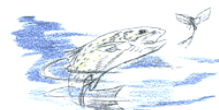
Measurement Data

| 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) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | 0.000 | | (m3/s) | Datalogger Notes: | | | | | | | |
| Perceived MMT Quality | | | | | - | | | Datalogger Internal Power: | | | | 4.633V | | | |
| Total Area: | | | | | 0.000 | | (m2) | Datalogger External Power: | | | | 12.61V | | | |
| Top Width: | | | | | - | | (m) | Datalogger Memory Used: | | | | 26% | | | |
| Hydraulic Depth: | | | | | - | | (m) | Datalogger Clock: | | | | Jan 9, 2005 12:45 PM | | MST | |
| Mean Velocity: | | | | | - | | (m/s) | Laptop Clock: | | | | Jan 9, 2005 12:53 PM | | MST | |
| Froude Number | | | | | - | | | Dessicant: | | | | | | | Not there |
| Photographs taken looking at: | | | | | | | | Datalogger: | | | | | | | Optimum DD128 #0104170274 |
| Rain gauge | | | | | | | | PT: | | | | | | | |
| | | | | | | | | Power: | | | | | | | Magnacharge 20V 10A DC Battery and |
| | | | | | | | | PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | | | | | | |
| Measured Cross Section at S16-Calumet River near the Mouth | | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| PR525USW: 253 tips, PR525M: 927 tips, Air temp -29.97102 C. | | | | | | | | | | | | | | | |
| Database No #274 | | | | | | | | | | | | | | | |

PT: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Hydrometric Measurement / Site Visit Record

S16 - Calumet River near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River near the Mouth
Site Name: S16
Coordinates & Legal: 6361693 N, 458152 E NE-10-97-11-W4

Time of Measurement

Date of Measurement: February 5, 2005
Start Time: MST
End Time:

Weather Conditions:

-15 °C, Cloudy, snowing

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: n/a

Level Readings and Measurements

Bench Mark Reading: T-bar El: 266.300
Water Level Reading: D/S Dam El: 266.300
Water Level Reading: U/S Dam El: 266.300
Transducer Reading: El: 266.300
Other: Nail in Tree: El: 266.300
Water Level @ MMT El: 266.300

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) |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | 0.000 | | (m3/s) | Datalogger Notes: | | | | | | |
| Perceived MMT Quality | | | | | - | | | Datalogger Internal Power: | | | | | | |
| Total Area: | | | | | 0.000 | | (m2) | Datalogger External Power: | | | | | | |
| Top Width: | | | | | - | | (m) | Datalogger Memory Used: | | | | | | |
| Hydraulic Depth: | | | | | - | | (m) | Datalogger Clock: | | | | | | |
| Mean Velocity: | | | | | - | | (m/s) | Laptop Clock: | | | | | | |
| Froude Number | | | | | - | | | Dessicant: | | | | | | |
| Photographs taken looking at: | | | | | | | | Not there | | | | | | |
| Rain gauge | | | | | | | | Datalogger: Optimum DD128 #0104170274 | | | | | | |
| | | | | | | | | PT: | | | | | | |
| | | | | | | | | Power: Magnacharge 20V 10A DC Battery and | | | | | | |
| | | | | | | | | PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | | | | | |
| Measured Cross Section at S16-Calumet River near the Mouth | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | | |
| PR525USW: 506 tips, PR525M: 933 tips, Air temp -18.69121 C. | | | | | | | | | | | | | | |
| Added Antifreeze that caused 30-40 tips | | | | | | | | | | | | | | |
| Database No #274 | | | | | | | | | | | | | | |

Hydrometric Measurement / Site Visit Record

S16 - Calumet River near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River near the Mouth
Site Name: S16
Coordinates & Legal: 6361693 N, 458152 E NE-10-97-11-W4

Time of Measurement

Date of Measurement: March 7, 2005
Start Time: MST
End Time:

Weather Conditions:

-2 °C, Clear
River Conditions: Complete ice cover

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: n/a

Level Readings and Measurements

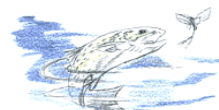
Bench Mark Reading: T-bar El: 266.300
Water Level Reading: D/S Dam El: 266.300
Water Level Reading: U/S Dam El: 266.300
Transducer Reading: El: 266.300
Other: Nail in Tree: El: 266.300
Water Level @ MMT El: 266.300

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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m2) | (m3/s) |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | 0.000 | | (m3/s) | Datalogger Notes: | | | | | | |
| Perceived MMT Quality | | | | | - | | | Datalogger Internal Power: | | | | | | |
| Total Area: | | | | | 0.000 | | (m2) | Datalogger External Power: | | | | | | |
| Top Width: | | | | | - | | (m) | Datalogger Memory Used: | | | | | | |
| Hydraulic Depth: | | | | | - | | (m) | Datalogger Clock: | | | | | | |
| Mean Velocity: | | | | | - | | (m/s) | Laptop Clock: | | | | | | |
| Froude Number | | | | | - | | | Dessicant: | | | | | | |
| Photographs taken looking at: | | | | | | | | Not there | | | | | | |
| Rain gauge | | | | | | | | Datalogger: Optimum DD128 #0104170274 | | | | | | |
| | | | | | | | | PT: | | | | | | |
| | | | | | | | | Power: Magnacharge 20V 10A DC Battery and | | | | | | |
| | | | | | | | | PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | | | | | |
| Measured Cross Section at S16-Calumet River near the Mouth | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | | |
| PR525USW: 627 tips, PR525M: 1121 tips, Air temp -1.873323 C. | | | | | | | | | | | | | | |
| Added new Antifreeze and babyoil that caused 65+ tips | | | | | | | | | | | | | | |
| Database No #274 | | | | | | | | | | | | | | |

Hydrometric Measurement / Site Visit Record

S16 - Calumet River near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River near the Mouth
Site Name: S16
Coordinates & Legal: 6361693 N, 458152 E NE-10-97-11-W4

Time of Measurement

Date of Measurement: April 9, 2005
Start Time: MDT
End Time:

Weather Conditions:

+9 °C, Partly Cloudy
River Conditions: Open, ice along the banks.

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: n/a

Level Readings and Measurements

Bench Mark Reading: T-bar El: 266.300
Water Level Reading: D/S Dam El: 266.300
Water Level Reading: U/S Dam El: 266.300
Transducer Reading: El: 266.300
Other: Nail in Tree: El: 266.300
Water Level @ MMT El: 266.300

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) |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | 0.000 | | (m3/s) | Datalogger Notes: | | | | | | |
| Perceived MMT Quality | | | | | - | | | Datalogger Internal Power: | | | | 4.791V | | |
| Total Area: | | | | | 0.000 | | (m2) | Datalogger External Power: | | | | 14.67V | | |
| Top Width: | | | | | - | | (m) | Datalogger Memory Used: | | | | 39% | | |
| Hydraulic Depth: | | | | | - | | (m) | Datalogger Clock: | | | | Apr 9, 2005 10:38 AM | | MST |
| Mean Velocity: | | | | | - | | (m/s) | Laptop Clock: | | | | Apr 9, 2005 10:49 AM | | MST |
| Froude Number | | | | | - | | | Dessicant: Not there Datalogger: Optimum DD128 #0104170274 PT: Power: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | | | | | |
| Photographs taken looking at: | | | | | | | | | | | | | | |
| Rain gauge | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Measured Cross Section at S16-Calumet River near the Mouth | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| PR525USW: 709 tips, PR525M: 1241 tips, Air temp +8.585793 C. | | | | | | | | | | | | | | |
| Database No #274 | | | | | | | | | | | | | | |

PT: Magnacharge 20V 10A DC Battery and PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller

Hydrometric Measurement / Site Visit Record

S16 - Calumet River near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River near the Mouth
Site Name: S16
Coordinates & Legal: 6361693 N, 458152 E NE-10-97-11-W4
Time of Measurement: April 25, 2005
Date of Measurement: 2:22 PM MDT
Start Time: 2:40 PM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Rod on LB 0.694
Water Level Reading: 2.526
Water Level Abv Beaver Dam
Transducer Reading & Calc'd El. 0.554
Other: Nail in Tree LB 1.373

Setup No. 1

El: 266.300
El: 264.468
El:
El: 263.914
El: 265.621

Setup No. 2

El: 266.300
El: 264.469
El:
El: 263.915
El: 265.633

Weather Conditions: +18 C, Clear, clam

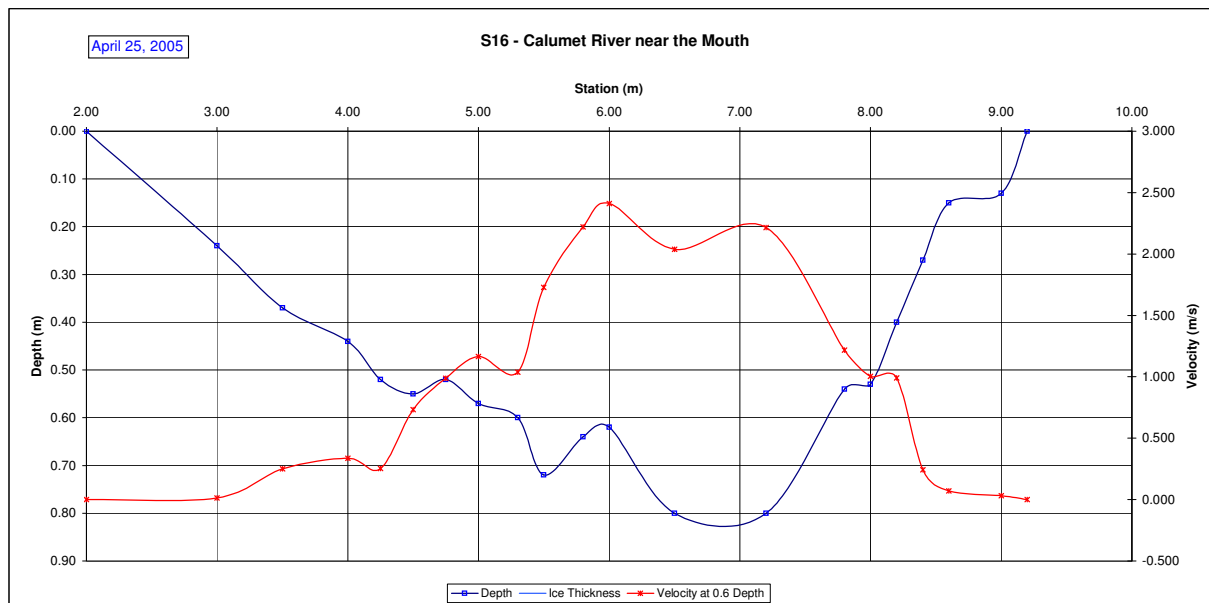
River Conditions: No ice cover. River at very high stage. Stage approaching bankfull. Beaver dam u/s of site overtopped.

| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) |
| 2.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 2.00 | 2.50 | 0.003 | 0.003 | 0.06 | 0.03 | 0.000 |
| 3.00 | 0.24 | | | | 0.012 | 1.00 | 2 | 2.50 | 3.25 | 0.012 | 0.012 | 0.24 | 0.18 | 0.002 |
| 3.50 | 0.37 | | | | 0.250 | 1.00 | 3 | 3.25 | 3.75 | 0.250 | 0.250 | 0.37 | 0.19 | 0.046 |
| 4.00 | 0.44 | | | | 0.335 | 1.00 | 4 | 3.75 | 4.13 | 0.335 | 0.335 | 0.44 | 0.17 | 0.055 |
| 4.25 | 0.52 | | | | 0.253 | 1.00 | 5 | 4.13 | 4.38 | 0.253 | 0.253 | 0.52 | 0.13 | 0.033 |
| 4.50 | 0.55 | | | | 0.732 | 1.00 | 6 | 4.38 | 4.63 | 0.732 | 0.732 | 0.55 | 0.14 | 0.101 |
| 4.75 | 0.52 | | | | 0.988 | 1.00 | 7 | 4.63 | 4.88 | 0.988 | 0.988 | 0.52 | 0.13 | 0.128 |
| 5.00 | 0.57 | | | | 1.164 | 1.00 | 8 | 4.88 | 5.15 | 1.164 | 1.164 | 0.57 | 0.16 | 0.183 |
| 5.30 | 0.60 | | | | 1.036 | 1.00 | 9 | 5.15 | 5.40 | 1.036 | 1.036 | 0.60 | 0.15 | 0.155 |
| 5.50 | 0.72 | | | | 1.728 | 1.00 | 10 | 5.40 | 5.65 | 1.728 | 1.728 | 0.72 | 0.18 | 0.311 |
| 5.80 | 0.64 | | | | 2.222 | 1.00 | 11 | 5.65 | 5.90 | 2.222 | 2.222 | 0.64 | 0.16 | 0.356 |
| 6.00 | 0.62 | | | | 2.411 | 1.00 | 12 | 5.90 | 6.25 | 2.411 | 2.411 | 0.62 | 0.22 | 0.523 |
| 6.50 | 0.80 | | | | 2.039 | 1.00 | 13 | 6.25 | 6.85 | 2.039 | 2.039 | 0.80 | 0.48 | 0.979 |
| 7.20 | 0.80 | | | | 2.216 | 1.00 | 14 | 6.85 | 7.50 | 2.216 | 2.216 | 0.80 | 0.52 | 1.152 |
| 7.80 | 0.54 | | | | 1.216 | 1.00 | 15 | 7.50 | 7.90 | 1.216 | 1.216 | 0.54 | 0.22 | 0.263 |
| 8.00 | 0.53 | | | | 1.003 | 1.00 | 16 | 7.90 | 8.10 | 1.003 | 1.003 | 0.53 | 0.11 | 0.106 |
| 8.20 | 0.40 | | | | 0.991 | 1.00 | 17 | 8.10 | 8.30 | 0.991 | 0.991 | 0.40 | 0.08 | 0.079 |
| 8.40 | 0.27 | | | | 0.244 | 1.00 | 18 | 8.30 | 8.50 | 0.244 | 0.244 | 0.27 | 0.05 | 0.013 |
| 8.60 | 0.15 | | | | 0.070 | 1.00 | 19 | 8.50 | 8.80 | 0.070 | 0.070 | 0.15 | 0.05 | 0.003 |
| 9.00 | 0.13 | | | | 0.030 | 1.00 | 20 | 8.80 | 9.10 | 0.030 | 0.030 | 0.13 | 0.04 | 0.001 |
| 9.20 | 0.00 | | | | 0.000 | 1.00 | 21 | 9.10 | 9.20 | 0.008 | 0.008 | 0.03 | 0.00 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 4.490 | |

| | | |
|--|-------|---------------------|
| Total Flow: | 4.490 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 3.36 | (m ²) |
| Top Width: | 7.20 | (m) |
| Hydraulic Depth: | 0.467 | (m) |
| Mean Velocity: | 1.335 | (m/s) |
| Froude Number | 0.623 | |
| Photographs taken looking at: Upstream, downstream and across | | |

| | | |
|----------------------------|----------------------------------|--------------|
| Datalogger Notes: | Database | 274 |
| Datalogger Internal Power: | 4.83V | dolphin 100% |
| Datalogger External Power: | 14.27V | dolphin 80% |
| Datalogger Memory Used: | 41% | |
| Datalogger Clock: | Apr 25, 2005 12:32 | MST |
| Laptop Clock: | Apr 25, 2005 12:45 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD-128 #0104170274 | |
| PT: | Keller 730-130 3 psi #0101347 | |
| Power: | Solar panel and internal battery | |

Notes: TSS sample taken Transducer installed. Water temp thermistor not installed.
Transducer clamped to a concrete block and placed in the flow.
Snow guage is at 770 counts. Tipping bucket rain guage No. 2 is 1517 counts.
Ignore counts for 1517 to 1526 for rain guage
Wading conditions marginal due to high velocity.
Air temperature 18 C



Hydrometric Measurement / Site Visit Record

S16 - Calumet River near the Mouth



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Calumet River
Location: Calumet River near the Mouth
Site Name: S16
Coordinates & Legal: 6361693 N, 458152 E NE-10-97-11-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: October 11, 2005
Start Time: 1:29 PM MDT
End Time: 1:39 PM MDT

Level Readings

Bench Mark Reading: T-bar 0.535
Water Level Reading: 2.914
Transducer Reading & Calc'd El. 0.000
Other:

Setup No. 1

El: 266.300
El: 263.921
El: 263.921
El:

Setup No. 2

El: 266.300
El: 263.920
El: 263.920
El:

Weather Conditions: +12 C, clear, calm

River Conditions: open, low stage

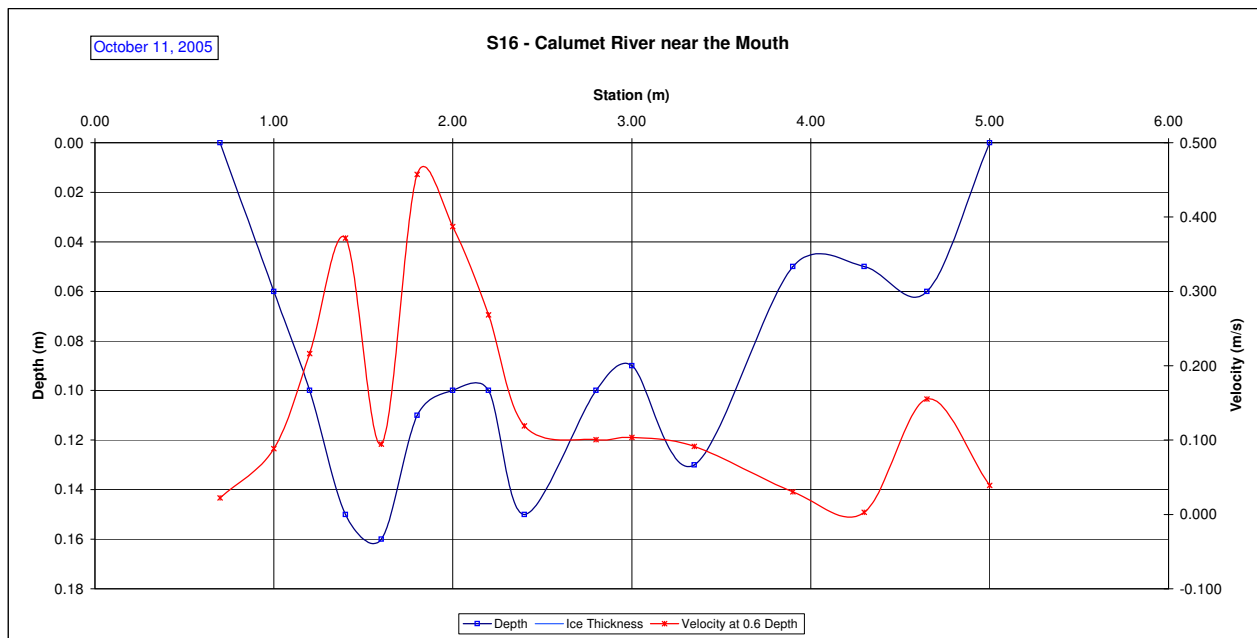
Measurement Data

| 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 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 | 0.85 | 0.022 | 0.022 | 0.02 | 0.00 | 0.000 |
| 1.00 | 0.06 | | | | 0.088 | 1.00 | 2 | 0.85 | 1.10 | 0.088 | 0.088 | 0.06 | 0.02 | 0.001 |
| 1.20 | 0.10 | | | | 0.216 | 1.00 | 3 | 1.10 | 1.30 | 0.216 | 0.216 | 0.10 | 0.02 | 0.004 |
| 1.40 | 0.15 | | | | 0.372 | 1.00 | 4 | 1.30 | 1.50 | 0.372 | 0.372 | 0.15 | 0.03 | 0.011 |
| 1.60 | 0.16 | | | | 0.094 | 1.00 | 5 | 1.50 | 1.70 | 0.094 | 0.094 | 0.16 | 0.03 | 0.003 |
| 1.80 | 0.11 | | | | 0.457 | 1.00 | 6 | 1.70 | 1.90 | 0.457 | 0.457 | 0.11 | 0.02 | 0.010 |
| 2.00 | 0.10 | | | | 0.387 | 1.00 | 7 | 1.90 | 2.10 | 0.387 | 0.387 | 0.10 | 0.02 | 0.008 |
| 2.20 | 0.10 | | | | 0.268 | 1.00 | 8 | 2.10 | 2.30 | 0.268 | 0.268 | 0.10 | 0.02 | 0.005 |
| 2.40 | 0.15 | | | | 0.119 | 1.00 | 9 | 2.30 | 2.60 | 0.119 | 0.119 | 0.15 | 0.05 | 0.005 |
| 2.80 | 0.10 | | | | 0.101 | 1.00 | 10 | 2.60 | 2.90 | 0.101 | 0.101 | 0.10 | 0.03 | 0.003 |
| 3.00 | 0.09 | | | | 0.104 | 1.00 | 11 | 2.90 | 3.18 | 0.104 | 0.104 | 0.09 | 0.02 | 0.003 |
| 3.35 | 0.13 | | | | 0.091 | 1.00 | 12 | 3.18 | 3.63 | 0.091 | 0.091 | 0.13 | 0.06 | 0.005 |
| 3.90 | 0.05 | | | | 0.030 | 1.00 | 13 | 3.63 | 4.10 | 0.030 | 0.030 | 0.05 | 0.02 | 0.001 |
| 4.30 | 0.05 | | | | 0.003 | 1.00 | 14 | 4.10 | 4.48 | 0.003 | 0.003 | 0.05 | 0.02 | 0.000 |
| 4.65 | 0.06 | | | | 0.155 | 1.00 | 15 | 4.48 | 4.83 | 0.155 | 0.155 | 0.06 | 0.02 | 0.003 |
| 5.00 | 0.00 | | | | 0.000 | 1.00 | 16 | 4.83 | 5.00 | 0.039 | 0.039 | 0.02 | 0.00 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 0.063 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.063 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.39 | (m ²) |
| Top Width: | 4.30 | (m) |
| Hydraulic Depth: | 0.090 | (m) |
| Mean Velocity: | 0.165 | (m/s) |
| Froude Number | 0.175 | |
| Photographs taken looking at: | yes | |

| | | |
|---|----------------------------------|-----|
| Datalogger Notes: | Database | 277 |
| Datalogger Internal Power: | 4.829 V | |
| Datalogger External Power: | 14.47 V | |
| Datalogger Memory Used: | 71% | |
| Datalogger Clock: | Oct 11, 2005 11:23 | MST |
| Laptop Clock: | Oct 11, 2005 11:36 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD-128 #0104170274 | |
| PT: | Keller 730-130 3 psi #0101347 | |
| Power: | Solar panel and internal battery | |
| PhotoWatt Int. PWX 200 Solar panel with SunSaver Controller | | |

Notes: Air Temp 15.289 °C
PR 525 USW 874 counts
PR 525 19 1544 counts
All equipment removed



Hydrometric Measurement / Site Visit Record

S17 - Tar River Upland Tributary



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Tar River
Location: Tar River Upland Tributary
Site Name: S17
Coordinates & Legal: 6357804 N, 444486 E NW-29-96-12-W4

Time of Measurement

Date of Measurement: April 26, 2005
Start Time: MDT
End Time: MDT

Weather Conditions: +1°C, Overcast, Light snow

River Conditions: Open

Personnel & Equipment

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

Level Readings

Bench Mark Reading:
Water Level Reading:
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Other:

Setup No. 1

El: 366.546
El:
El:
El:
El:

Setup No. 2

El: 366.546
El:
El:
El:
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 ²) | (m ³ /s) |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Total Flow: | | | | | | | | | | | | | - | - |

| | | |
|--|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | - | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (m) |
| Mean Velocity: | - | (m/s) |
| Froude Number | - | |
| Photographs taken looking at: Upstream, downstream and across | | |

Notes: Station discontinued. Removed the data logger and solar panel from site.
This equipment to be installed at a new station S34.

| |
|----------------------------|
| Datalogger Notes: |
| Datalogger Internal Power: |
| Datalogger External Power: |
| Datalogger Memory Used: |
| Datalogger Clock: |
| Laptop Clock: |
| Dessicant: |
| Datalogger: |
| PT: |
| Power: |

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: 450662 E, 6363488 N SE-14-97-12-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: April 25, 2005
Start Time: 3:40 PM MDT
End Time: 4:10 PM MDT

Level Readings

Bench Mark Reading: Nail in Tree I 0.061
Water Level Reading: 2.021
Top of Ice Level Reading:
Transducer Reading & Calc'd El 1.177
Other:

Setup No. 1

El: 100.000
El: 98.040
El: 96.863
El:

Setup No. 2

El: 100.000
El: 98.036
El:
El: 96.859
El:

Weather Conditions: +18 C, partly cloudy, light wind

River Conditions: Open, very high stage

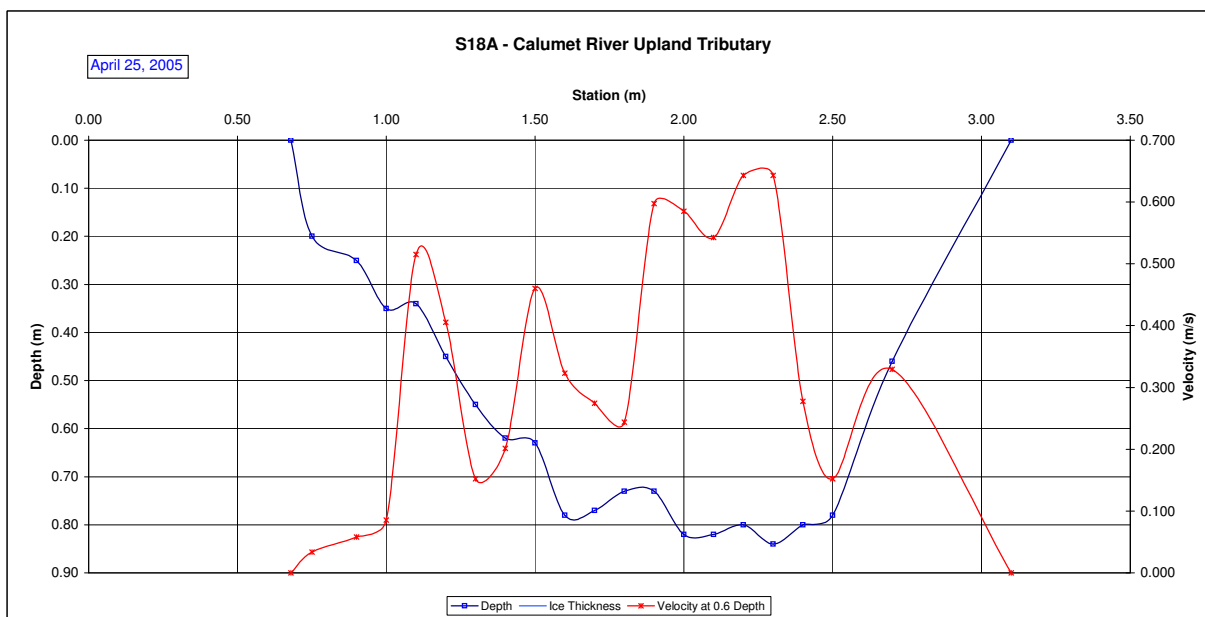
Measurement Data

| 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 ²) | (m ³ /s) |
| LB 0.68 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.68 | 0.72 | 0.008 | 0.008 | 0.05 | 0.00 | 0.000 |
| 0.75 | 0.20 | | | | 0.034 | 1.00 | 2 | 0.72 | 0.83 | 0.034 | 0.034 | 0.20 | 0.02 | 0.001 |
| 0.90 | 0.25 | | | | 0.058 | 1.00 | 3 | 0.83 | 0.95 | 0.058 | 0.058 | 0.25 | 0.03 | 0.002 |
| 1.00 | 0.35 | | | | 0.085 | 1.00 | 4 | 0.95 | 1.05 | 0.085 | 0.085 | 0.35 | 0.04 | 0.003 |
| 1.10 | 0.34 | | | | 0.515 | 1.00 | 5 | 1.05 | 1.15 | 0.515 | 0.515 | 0.34 | 0.03 | 0.018 |
| 1.20 | 0.45 | | | | 0.405 | 1.00 | 6 | 1.15 | 1.25 | 0.405 | 0.405 | 0.45 | 0.05 | 0.018 |
| 1.30 | 0.55 | | | | 0.152 | 1.00 | 7 | 1.25 | 1.35 | 0.152 | 0.152 | 0.55 | 0.06 | 0.008 |
| 1.40 | 0.62 | | | | 0.201 | 1.00 | 8 | 1.35 | 1.45 | 0.201 | 0.201 | 0.62 | 0.06 | 0.012 |
| 1.50 | 0.63 | | | | 0.460 | 1.00 | 9 | 1.45 | 1.55 | 0.460 | 0.460 | 0.63 | 0.06 | 0.029 |
| 1.60 | 0.78 | | | | 0.323 | 1.00 | 10 | 1.55 | 1.65 | 0.323 | 0.323 | 0.78 | 0.08 | 0.025 |
| 1.70 | 0.77 | | | | 0.274 | 1.00 | 11 | 1.65 | 1.75 | 0.274 | 0.274 | 0.77 | 0.08 | 0.021 |
| 1.80 | 0.73 | | | | 0.244 | 1.00 | 12 | 1.75 | 1.85 | 0.244 | 0.244 | 0.73 | 0.07 | 0.018 |
| 1.90 | 0.73 | | | | 0.597 | 1.00 | 13 | 1.85 | 1.95 | 0.597 | 0.597 | 0.73 | 0.07 | 0.044 |
| 2.00 | 0.82 | | | | 0.585 | 1.00 | 14 | 1.95 | 2.05 | 0.585 | 0.585 | 0.82 | 0.08 | 0.048 |
| 2.10 | 0.82 | | | | 0.543 | 1.00 | 15 | 2.05 | 2.15 | 0.543 | 0.543 | 0.82 | 0.08 | 0.044 |
| 2.20 | 0.80 | | | | 0.643 | 1.00 | 16 | 2.15 | 2.25 | 0.643 | 0.643 | 0.80 | 0.08 | 0.051 |
| 2.30 | 0.84 | | | | 0.643 | 1.00 | 17 | 2.25 | 2.35 | 0.643 | 0.643 | 0.84 | 0.08 | 0.054 |
| 2.40 | 0.80 | | | | 0.277 | 1.00 | 18 | 2.35 | 2.45 | 0.277 | 0.277 | 0.80 | 0.08 | 0.022 |
| 2.50 | 0.78 | | | | 0.152 | 1.00 | 19 | 2.45 | 2.60 | 0.152 | 0.152 | 0.78 | 0.12 | 0.018 |
| 2.70 | 0.46 | | | | 0.329 | 1.00 | 20 | 2.60 | 2.90 | 0.329 | 0.329 | 0.46 | 0.14 | 0.045 |
| RB 3.10 | 0.00 | | | | 0.000 | 1.00 | 21 | 2.90 | 3.10 | 0.082 | 0.082 | 0.12 | 0.02 | 0.002 |
| Total Flow: | | | | | | | | | | | | | | 0.484 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.484 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.34 | (m ²) |
| Top Width: | 2.42 | (m) |
| Hydraulic Depth: | 0.552 | (m) |
| Mean Velocity: | 0.362 | (m/s) |
| Froude Number | 0.156 | |
| Photographs taken looking at: upstream, downstream, across | | |

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 404 |
| Datalogger Internal Power: | 4.79V | |
| Datalogger External Power: | 12.38V | |
| Datalogger Memory Used: | 0% | |
| Datalogger Clock: | Apr 25, 2005 14:42 | MST |
| Laptop Clock: | Apr 25, 2005 14:42 | MST |
| Dessicant: | Good - 100% | |
| Datalogger: | Optimum datalogger DD-128 # 0109050404 | |
| PT: | Keller # 0101346 3 psi | |
| Power: | Optimum battery | |

Notes: TSS sample collected.
Equipment installed. Transducer wired to a rebar and placed in the flow.



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: 450662 E, 6363488 N SE-14-97-12-W4
Time of Measurement: June 2, 2005
Date of Measurement: 3:00 PM MDT
Start Time: 3:08 PM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Nail in Tree I -0.033
Water Level Reading: 2.018
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 1.097
Other:

Setup No. 1

El: 100.000
El: 97.949
El:
El: 96.852
El:

Setup No. 2

El: 100.000
El: 97.952
El:
El: 96.855
El:

Weather Conditions:

+25 C, clear, light wind from N

River Conditions:

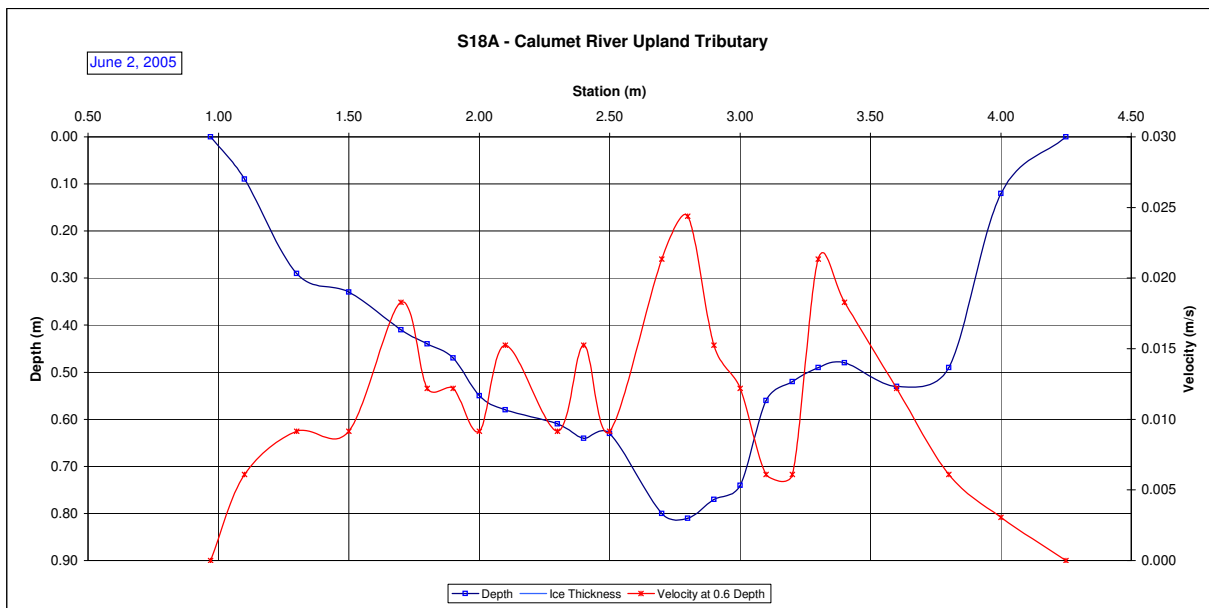
Open, high stage, backwater from downstream beaver dam.

| 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) |
| 0.97 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.97 | 1.04 | 0.002 | 0.002 | 0.02 | 0.00 | 0.000 |
| 1.10 | 0.09 | | | | 0.006 | 1.00 | 2 | 1.04 | 1.20 | 0.006 | 0.006 | 0.09 | 0.01 | 0.000 |
| 1.30 | 0.29 | | | | 0.009 | 1.00 | 3 | 1.20 | 1.40 | 0.009 | 0.009 | 0.29 | 0.06 | 0.001 |
| 1.50 | 0.33 | | | | 0.009 | 1.00 | 4 | 1.40 | 1.60 | 0.009 | 0.009 | 0.33 | 0.07 | 0.001 |
| 1.70 | 0.41 | | | | 0.018 | 1.00 | 5 | 1.60 | 1.75 | 0.018 | 0.018 | 0.41 | 0.06 | 0.001 |
| 1.80 | 0.44 | | | | 0.012 | 1.00 | 6 | 1.75 | 1.85 | 0.012 | 0.012 | 0.44 | 0.04 | 0.001 |
| 1.90 | 0.47 | | | | 0.012 | 1.00 | 7 | 1.85 | 1.95 | 0.012 | 0.012 | 0.47 | 0.05 | 0.001 |
| 2.00 | 0.55 | | | | 0.009 | 1.00 | 8 | 1.95 | 2.05 | 0.009 | 0.009 | 0.55 | 0.05 | 0.001 |
| 2.10 | 0.58 | | | | 0.015 | 1.00 | 9 | 2.05 | 2.20 | 0.015 | 0.015 | 0.58 | 0.09 | 0.001 |
| 2.30 | 0.61 | | | | 0.009 | 1.00 | 10 | 2.20 | 2.35 | 0.009 | 0.009 | 0.61 | 0.09 | 0.001 |
| 2.40 | 0.64 | | | | 0.015 | 1.00 | 11 | 2.35 | 2.45 | 0.015 | 0.015 | 0.64 | 0.06 | 0.001 |
| 2.50 | 0.63 | | | | 0.009 | 1.00 | 12 | 2.45 | 2.60 | 0.009 | 0.009 | 0.63 | 0.09 | 0.001 |
| 2.70 | 0.80 | | | | 0.021 | 1.00 | 13 | 2.60 | 2.75 | 0.021 | 0.021 | 0.80 | 0.12 | 0.003 |
| 2.80 | 0.81 | | | | 0.024 | 1.00 | 14 | 2.75 | 2.85 | 0.024 | 0.024 | 0.81 | 0.08 | 0.002 |
| 2.90 | 0.77 | | | | 0.015 | 1.00 | 15 | 2.85 | 2.95 | 0.015 | 0.015 | 0.77 | 0.08 | 0.001 |
| 3.00 | 0.74 | | | | 0.012 | 1.00 | 16 | 2.95 | 3.05 | 0.012 | 0.012 | 0.74 | 0.07 | 0.001 |
| 3.10 | 0.56 | | | | 0.006 | 1.00 | 17 | 3.05 | 3.15 | 0.006 | 0.006 | 0.56 | 0.06 | 0.000 |
| 3.20 | 0.52 | | | | 0.006 | 1.00 | 18 | 3.15 | 3.25 | 0.006 | 0.006 | 0.52 | 0.05 | 0.000 |
| 3.30 | 0.49 | | | | 0.021 | 1.00 | 19 | 3.25 | 3.35 | 0.021 | 0.021 | 0.49 | 0.05 | 0.001 |
| 3.40 | 0.48 | | | | 0.018 | 1.00 | 20 | 3.35 | 3.50 | 0.018 | 0.018 | 0.48 | 0.07 | 0.001 |
| 3.60 | 0.53 | | | | 0.012 | 1.00 | 21 | 3.50 | 3.70 | 0.012 | 0.012 | 0.53 | 0.11 | 0.001 |
| 3.80 | 0.49 | | | | 0.006 | 1.00 | 22 | 3.70 | 3.90 | 0.006 | 0.006 | 0.49 | 0.10 | 0.001 |
| 4.00 | 0.12 | | | | 0.003 | 1.00 | 23 | 3.90 | 4.13 | 0.003 | 0.003 | 0.12 | 0.03 | 0.000 |
| 4.25 | 0.00 | | | | 0.000 | 1.00 | 24 | 4.13 | 4.25 | 0.001 | 0.001 | 0.03 | 0.00 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.020 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.020 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.50 | (m ²) |
| Top Width: | 3.28 | (m) |
| Hydraulic Depth: | 0.457 | (m) |
| Mean Velocity: | 0.013 | (m/s) |
| Froude Number | 0.006 | |
| Photographs taken looking at: upstream, downstream, across | | |

| | | |
|----------------------------|--|-----|
| Datalogger Notes: | Database | 404 |
| Datalogger Internal Power: | 4.79V | |
| Datalogger External Power: | 12.38V | |
| Datalogger Memory Used: | 4% | |
| Datalogger Clock: | Jun 02, 2005 12:43 | MST |
| Laptop Clock: | Jun 02, 2005 12:43 | MST |
| Dessicant: | Good - 100% | |
| Datalogger: | Optimum datalogger DD-128 # 0109050404 | |
| PT: | Keller # 0101346 3 psi | |
| Power: | Optimum battery | |

Notes: TSS sample collected.
Backwater due to beaverdam is impacting stage.



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: 450662 E, 6363488 N SE-14-97-12-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: July 13, 2005
Start Time: 3:37 PM MDT
End Time: 3:58 PM MDT

Level Readings

| | Setup No. 1 | Setup No. 2 |
|----------------------------------|-------------|-------------|
| Bench Mark Reading: Nail in Tree | 0.779 | 0.729 |
| Water Level Reading: | 2.495 | 2.449 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El | 1.419 | 1.419 |
| Other: | | |

Weather Conditions: +22 C, Overcast

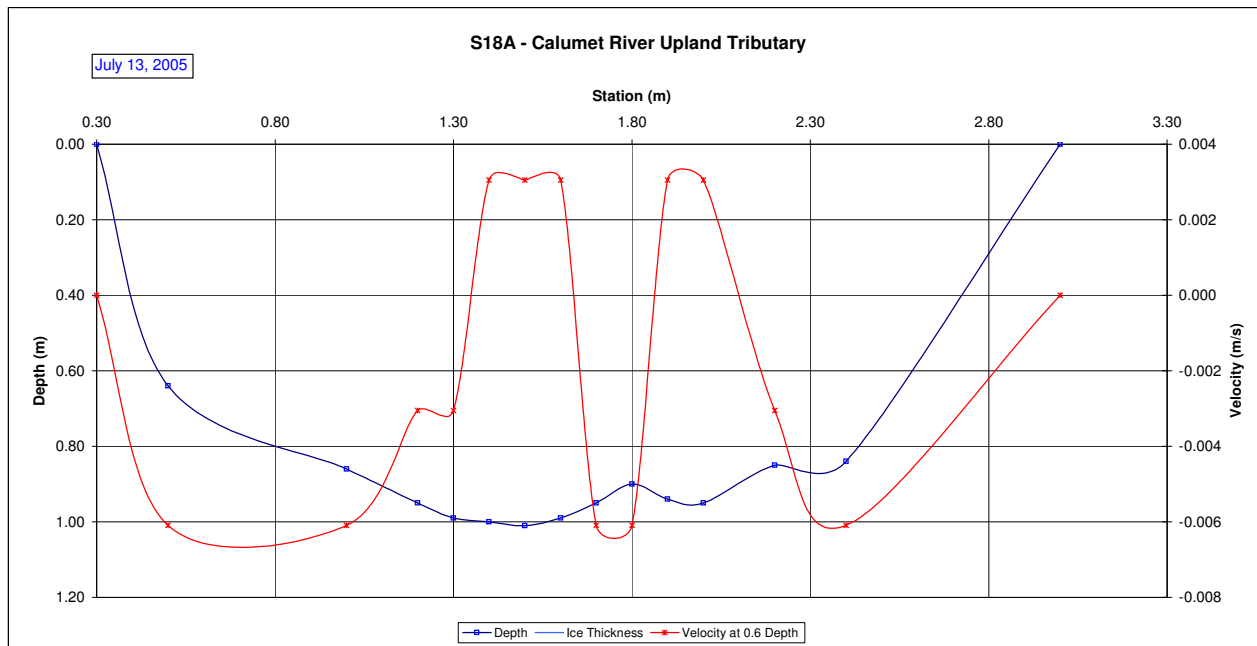
River Conditions: Open, high stage, backwater from downstream beaver dam.

| 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) |
| | | | | | | | | | | | | | | |
| 0.30 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.30 | 0.40 | -0.002 | -0.002 | 0.16 | 0.02 | 0.000 |
| 0.50 | 0.64 | | | | -0.006 | 1.00 | 2 | 0.40 | 0.75 | -0.006 | -0.006 | 0.64 | 0.22 | -0.001 |
| 1.00 | 0.86 | | | | -0.006 | 1.00 | 3 | 0.75 | 1.10 | -0.006 | -0.006 | 0.86 | 0.30 | -0.002 |
| 1.20 | 0.95 | | | | -0.003 | 1.00 | 4 | 1.10 | 1.25 | -0.003 | -0.003 | 0.95 | 0.14 | 0.000 |
| 1.30 | 0.99 | | | | -0.003 | 1.00 | 5 | 1.25 | 1.35 | -0.003 | -0.003 | 0.99 | 0.10 | 0.000 |
| 1.40 | 1.00 | | | | 0.003 | 1.00 | 6 | 1.35 | 1.45 | 0.003 | 0.003 | 1.00 | 0.10 | 0.000 |
| 1.50 | 1.01 | | | | 0.003 | 1.00 | 7 | 1.45 | 1.55 | 0.003 | 0.003 | 1.01 | 0.10 | 0.000 |
| 1.60 | 0.99 | | | | 0.003 | 1.00 | 8 | 1.55 | 1.65 | 0.003 | 0.003 | 0.99 | 0.10 | 0.000 |
| 1.70 | 0.95 | | | | -0.006 | 1.00 | 9 | 1.65 | 1.75 | -0.006 | -0.006 | 0.95 | 0.10 | -0.001 |
| 1.80 | 0.90 | | | | -0.006 | 1.00 | 10 | 1.75 | 1.85 | -0.006 | -0.006 | 0.90 | 0.09 | -0.001 |
| 1.90 | 0.94 | | | | 0.003 | 1.00 | 11 | 1.85 | 1.95 | 0.003 | 0.003 | 0.94 | 0.09 | 0.000 |
| 2.00 | 0.95 | | | | 0.003 | 1.00 | 12 | 1.95 | 2.10 | 0.003 | 0.003 | 0.95 | 0.14 | 0.000 |
| 2.20 | 0.85 | | | | -0.003 | 1.00 | 13 | 2.10 | 2.30 | -0.003 | -0.003 | 0.85 | 0.17 | -0.001 |
| 2.40 | 0.84 | | | | -0.006 | 1.00 | 14 | 2.30 | 2.70 | -0.006 | -0.006 | 0.84 | 0.34 | -0.002 |
| 3.00 | 0.00 | | | | 0.000 | 1.00 | 15 | 2.70 | 3.00 | -0.002 | -0.002 | 0.21 | 0.06 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | -0.006 |

| | | | |
|---|--------|-------|---------------------|
| Total Flow: | -0.006 | 0.000 | (m ³ /s) |
| Perceived Measurement Quality: | Poor | | |
| Total Area: | 2.07 | | (m ²) |
| Top Width: | 2.70 | | (m) |
| Hydraulic Depth: | 0.768 | | (m) |
| Mean Velocity: | -0.003 | | (m/s) |
| Froude Number | -0.001 | | |
| Photographs taken looking at: upstream, downstream, across | | | |

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|----------------------------|--|-----|
| Datalogger Notes: | Database | 404 |
| Datalogger Internal Power: | 4.826V | |
| Datalogger External Power: | 12.31V | |
| Datalogger Memory Used: | 7% | |
| Datalogger Clock: | Jul 13, 2005 14:14 | MST |
| Laptop Clock: | Jul 13, 2005 14:16 | MST |
| Dessicant: | 50% used | |
| Datalogger: | Optimum datalogger DD-128 # 0109050404 | |
| PT: | Keller # 0101346 3 psi | |
| Power: | Optimum battery | |

Notes: TSS sample collected.
Looks like stagnant water. Backwater due to beaverdam is impacting stage.



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: 450662 E, 6363488 N SE-14-97-12-W4

Personnel & Equipment

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

Time of Measurement

Date of Measurement: September 2, 2005
Start Time: 4:35 PM MDT
End Time: 4:47 PM MDT

Level Readings

| | Setup No. 1 | Setup No. 2 |
|----------------------------------|-------------|-------------|
| Bench Mark Reading: Nail in Tree | 0.398 | 0.468 |
| Water Level Reading: | 1.984 | 2.058 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El. | 1.558 | 1.558 |
| Other: | | |

Weather Conditions: +16 C, Overcast, LT wind

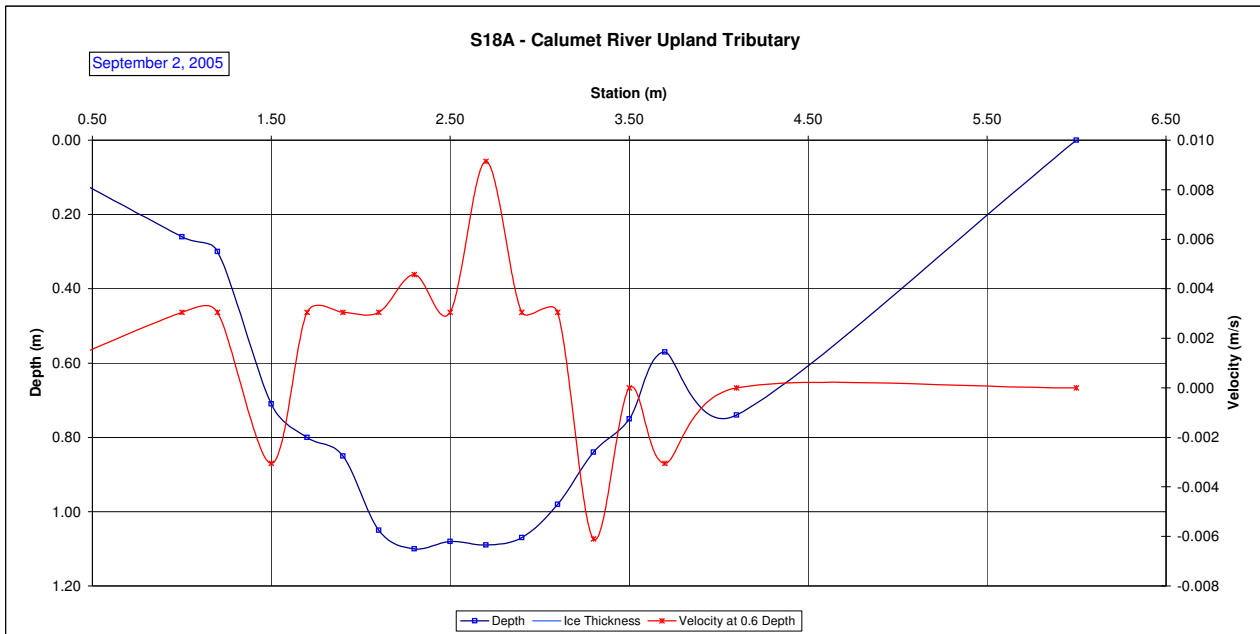
River Conditions: Open, high stage

| Measurement Data | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|-----------------|--|----|--|--|--|--|--|--|
| Measured Data | | | | | | Calculated Data | | | | | | | | |
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| Total Flow: | 0.005 | (m ³ /s) |
| Perceived Measurement Quality: | Poor | |
| Total Area: | 3.56 | (m ²) |
| Top Width: | 6.00 | (m) |
| Hydraulic Depth: | 0.593 | (m) |
| Mean Velocity: | 0.001 | (m/s) |
| Froude Number | 0.001 | |
| Photographs taken looking at: upstream, downstream, across | | |

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|----------------------------|--|-----|
| Datalogger Notes: | Database | 404 |
| Datalogger Internal Power: | 4.79V | |
| Datalogger External Power: | 12.38V | |
| Datalogger Memory Used: | 4% | |
| Datalogger Clock: | Jun 02, 2005 12:43 | MST |
| Laptop Clock: | Jun 02, 2005 12:43 | MST |
| Dessicant: | Good - 100% | |
| Datalogger: | Optimum datalogger DD-128 # 0109050404 | |
| PT: | Keller # 0101346 3 psi | |
| Power: | Optimum battery | |

Notes: TSS sample collected.
Backwater due to beaverdam is impacting stage.



S18A - Calumet River Upland Tributary



P:\Projects\MSA 2002\200217 RAMP\Site Data\S18A Calumet River Upland Tributary\S18A MMT and Rating Curve

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 27, 2005
Start Time: 12:35 PM MDT
End Time: 12:47 PM MDT

Weather Conditions:

-2 C, snow flurries, gusty

River Conditions:

Open

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Nail in tree 2.104
Water Level Reading: 2.616
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.577
Other:

Setup No. 1

El: 101.478
El: 100.966
El:
El: 100.390
El:

Setup No. 2

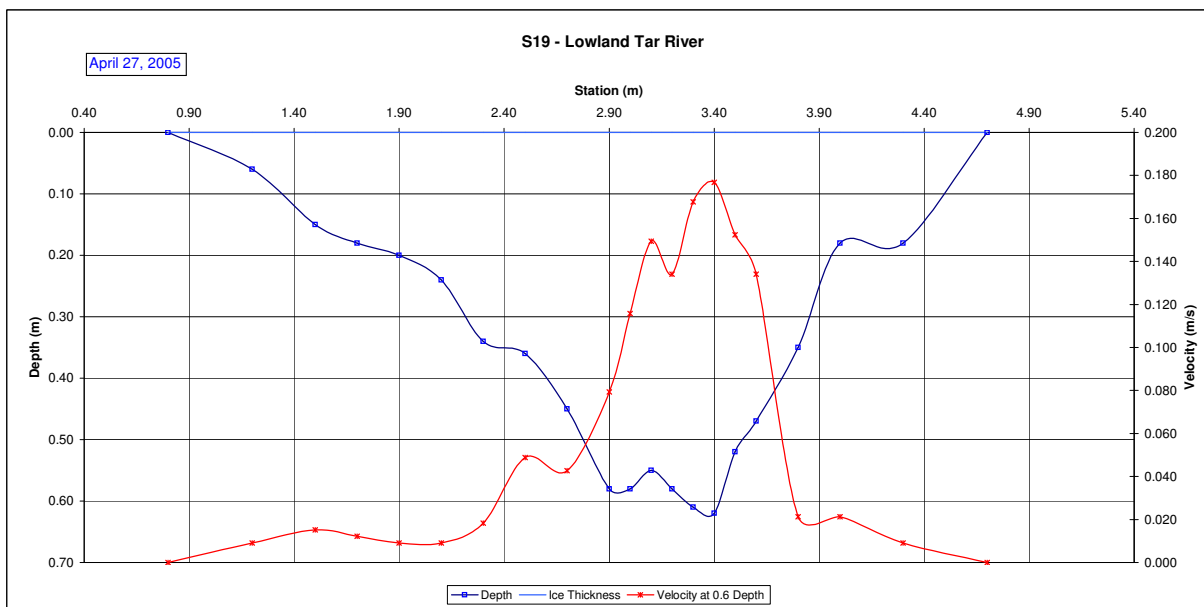
El: 101.478
El: 100.967
El:
El: 100.391
El:

| 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 | | | | | | |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) | | | | | | |
| 0.80 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.80 | 1.00 | 0.002 | 0.002 | 0.02 | 0.00 | 0.000 | | | | | | |
| 1.20 | 0.06 | 0.00 | | | 0.009 | 1.00 | 2 | 1.00 | 1.35 | 0.009 | 0.009 | 0.06 | 0.02 | 0.000 | | | | | | |
| 1.50 | 0.15 | 0.00 | | | 0.015 | 1.00 | 3 | 1.35 | 1.60 | 0.015 | 0.015 | 0.15 | 0.04 | 0.001 | | | | | | |
| 1.70 | 0.18 | 0.00 | | | 0.012 | 1.00 | 4 | 1.60 | 1.80 | 0.012 | 0.012 | 0.18 | 0.04 | 0.000 | | | | | | |
| 1.90 | 0.20 | 0.00 | | | 0.009 | 1.00 | 5 | 1.80 | 2.00 | 0.009 | 0.009 | 0.20 | 0.04 | 0.000 | | | | | | |
| 2.10 | 0.24 | 0.00 | | | 0.009 | 1.00 | 6 | 2.00 | 2.20 | 0.009 | 0.009 | 0.24 | 0.05 | 0.000 | | | | | | |
| 2.30 | 0.34 | 0.00 | | | 0.018 | 1.00 | 7 | 2.20 | 2.40 | 0.018 | 0.018 | 0.34 | 0.07 | 0.001 | | | | | | |
| 2.50 | 0.36 | 0.00 | | | 0.049 | 1.00 | 8 | 2.40 | 2.60 | 0.049 | 0.049 | 0.36 | 0.07 | 0.004 | | | | | | |
| 2.70 | 0.45 | 0.00 | | | 0.043 | 1.00 | 9 | 2.60 | 2.80 | 0.043 | 0.043 | 0.45 | 0.09 | 0.004 | | | | | | |
| 2.90 | 0.58 | 0.00 | | | 0.079 | 1.00 | 10 | 2.80 | 2.95 | 0.079 | 0.079 | 0.58 | 0.09 | 0.007 | | | | | | |
| 3.00 | 0.58 | 0.00 | | | 0.116 | 1.00 | 11 | 2.95 | 3.05 | 0.116 | 0.116 | 0.58 | 0.06 | 0.007 | | | | | | |
| 3.10 | 0.55 | 0.00 | | | 0.149 | 1.00 | 12 | 3.05 | 3.15 | 0.149 | 0.149 | 0.55 | 0.06 | 0.008 | | | | | | |
| 3.20 | 0.58 | 0.00 | | | 0.134 | 1.00 | 13 | 3.15 | 3.25 | 0.134 | 0.134 | 0.58 | 0.06 | 0.008 | | | | | | |
| 3.30 | 0.61 | 0.00 | | | 0.168 | 1.00 | 14 | 3.25 | 3.35 | 0.168 | 0.168 | 0.61 | 0.06 | 0.010 | | | | | | |
| 3.40 | 0.62 | 0.00 | | | 0.177 | 1.00 | 15 | 3.35 | 3.45 | 0.177 | 0.177 | 0.62 | 0.06 | 0.011 | | | | | | |
| 3.50 | 0.52 | 0.00 | | | 0.152 | 1.00 | 16 | 3.45 | 3.55 | 0.152 | 0.152 | 0.52 | 0.05 | 0.008 | | | | | | |
| 3.60 | 0.47 | 0.00 | | | 0.134 | 1.00 | 17 | 3.55 | 3.70 | 0.134 | 0.134 | 0.47 | 0.07 | 0.009 | | | | | | |
| 3.80 | 0.35 | 0.00 | | | 0.021 | 1.00 | 18 | 3.70 | 3.90 | 0.021 | 0.021 | 0.35 | 0.07 | 0.001 | | | | | | |
| 4.00 | 0.18 | 0.00 | | | 0.021 | 1.00 | 19 | 3.90 | 4.15 | 0.021 | 0.021 | 0.18 | 0.05 | 0.001 | | | | | | |
| 4.30 | 0.18 | 0.00 | | | 0.009 | 1.00 | 20 | 4.15 | 4.50 | 0.009 | 0.009 | 0.18 | 0.06 | 0.001 | | | | | | |
| 4.70 | 0.00 | 0.00 | | | 0.000 | 1.00 | 21 | 4.50 | 4.70 | 0.002 | 0.002 | 0.05 | 0.01 | 0.000 | | | | | | |
| | | | | | | | | | | | | | | Total Flow: | 0.082 | | | | | |

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|--------------------------------|------------------------------|---------------------|
| Total Flow: | 0.082 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1.11 | (m ²) |
| Top Width: | 3.90 | (m) |
| Hydraulic Depth: | 0.284 | (m) |
| Mean Velocity: | 0.074 | (m/s) |
| Froude Number | 0.044 | |
| Photographs taken looking at: | Upstream, downstream, across | |

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| Datalogger Notes: | Database # 271 |
| Datalogger Internal Power: | 4.6V |
| Datalogger External Power: | 14.73V |
| Datalogger Memory Used: | 23% |
| Datalogger Clock: | Apr 27, 2005 11:22 MST |
| Laptop Clock: | Apr 27, 2005 11:22 MST |
| Dessicant: | Good - 100% |
| Datalogger: | Optimum DD-128 with modem #0104170271 |
| PT: | Keller 730-130-0003 psi Pressure Transducer #101352 |
| Power: | 12V 20A battery and solar panel |

Notes: TSS sample taken.
Equipment installed. Transducer clamped to a rock and placed in the flow.
Rain Guage installed, ignore tips from 2223 to 2227 as they were test tips.



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: June 1, 2005
Date of Measurement: June 1, 2005
Start Time: 10:55 AM MDT
End Time: 11:06 AM MDT

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Nail in tree 1.582
Water Level Reading: 2.206
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.451
Other:

Setup No. 1

El: 101.478
El: 100.854
El:
El: 100.403
El:

Setup No. 2

El: 101.478
El: 100.852
El:
El: 100.401
El:

Weather Conditions: +20 C, Scattered cloud, light wind from N

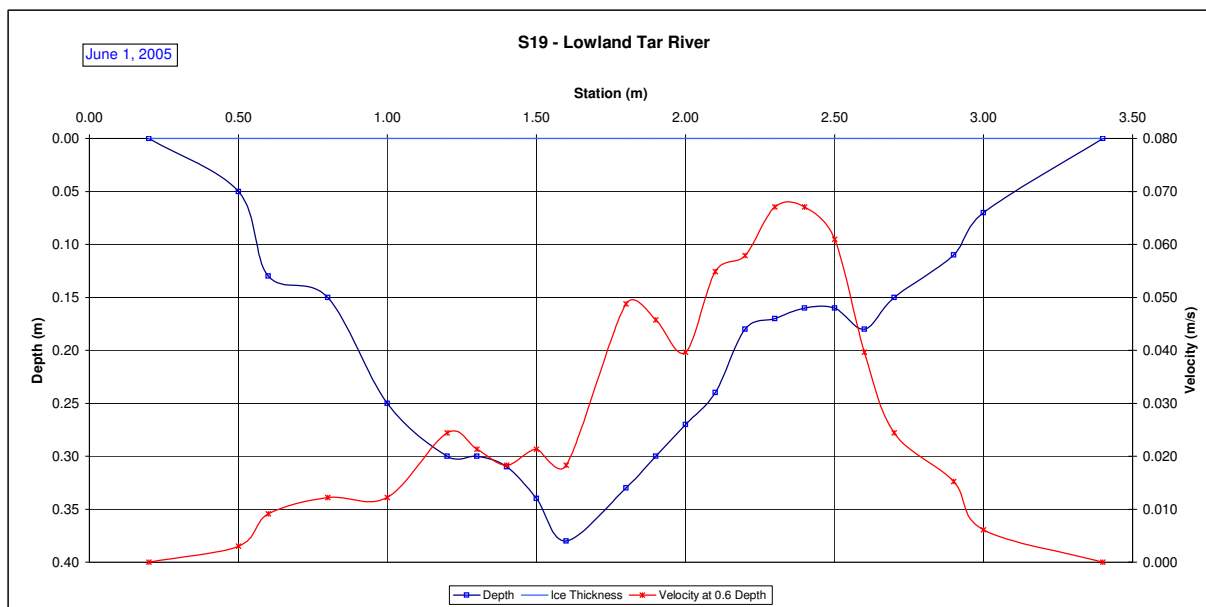
River Conditions: Open

| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) |
| | | | | | | | | | | | | | | |
| 0.20 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.20 | 0.35 | 0.001 | 0.001 | 0.01 | 0.00 | 0.000 |
| 0.50 | 0.05 | 0.00 | | | 0.003 | 1.00 | 2 | 0.35 | 0.55 | 0.003 | 0.003 | 0.05 | 0.01 | 0.000 |
| 0.60 | 0.13 | 0.00 | | | 0.009 | 1.00 | 3 | 0.55 | 0.70 | 0.009 | 0.009 | 0.13 | 0.02 | 0.000 |
| 0.80 | 0.15 | 0.00 | | | 0.012 | 1.00 | 4 | 0.70 | 0.90 | 0.012 | 0.012 | 0.15 | 0.03 | 0.000 |
| 1.00 | 0.25 | 0.00 | | | 0.012 | 1.00 | 5 | 0.90 | 1.10 | 0.012 | 0.012 | 0.25 | 0.05 | 0.001 |
| 1.20 | 0.30 | 0.00 | | | 0.024 | 1.00 | 6 | 1.10 | 1.25 | 0.024 | 0.024 | 0.30 | 0.05 | 0.001 |
| 1.30 | 0.30 | 0.00 | | | 0.021 | 1.00 | 7 | 1.25 | 1.35 | 0.021 | 0.021 | 0.30 | 0.03 | 0.001 |
| 1.40 | 0.31 | 0.00 | | | 0.018 | 1.00 | 8 | 1.35 | 1.45 | 0.018 | 0.018 | 0.31 | 0.03 | 0.001 |
| 1.50 | 0.34 | 0.00 | | | 0.021 | 1.00 | 9 | 1.45 | 1.55 | 0.021 | 0.021 | 0.34 | 0.03 | 0.001 |
| 1.60 | 0.38 | 0.00 | | | 0.018 | 1.00 | 10 | 1.55 | 1.70 | 0.018 | 0.018 | 0.38 | 0.06 | 0.001 |
| 1.80 | 0.33 | 0.00 | | | 0.049 | 1.00 | 11 | 1.70 | 1.85 | 0.049 | 0.049 | 0.33 | 0.05 | 0.002 |
| 1.90 | 0.30 | 0.00 | | | 0.046 | 1.00 | 12 | 1.85 | 1.95 | 0.046 | 0.046 | 0.30 | 0.03 | 0.001 |
| 2.00 | 0.27 | 0.00 | | | 0.040 | 1.00 | 13 | 1.95 | 2.05 | 0.040 | 0.040 | 0.27 | 0.03 | 0.001 |
| 2.10 | 0.24 | 0.00 | | | 0.055 | 1.00 | 14 | 2.05 | 2.15 | 0.055 | 0.055 | 0.24 | 0.02 | 0.001 |
| 2.20 | 0.18 | 0.00 | | | 0.058 | 1.00 | 15 | 2.15 | 2.25 | 0.058 | 0.058 | 0.18 | 0.02 | 0.001 |
| 2.30 | 0.17 | 0.00 | | | 0.067 | 1.00 | 16 | 2.25 | 2.35 | 0.067 | 0.067 | 0.17 | 0.02 | 0.001 |
| 2.40 | 0.16 | 0.00 | | | 0.067 | 1.00 | 17 | 2.35 | 2.45 | 0.067 | 0.067 | 0.16 | 0.02 | 0.001 |
| 2.50 | 0.16 | 0.00 | | | 0.061 | 1.00 | 18 | 2.45 | 2.55 | 0.061 | 0.061 | 0.16 | 0.02 | 0.001 |
| 2.60 | 0.18 | 0.00 | | | 0.040 | 1.00 | 19 | 2.55 | 2.65 | 0.040 | 0.040 | 0.18 | 0.02 | 0.001 |
| 2.70 | 0.15 | 0.00 | | | 0.024 | 1.00 | 20 | 2.65 | 2.80 | 0.024 | 0.024 | 0.15 | 0.02 | 0.001 |
| 2.90 | 0.11 | 0.00 | | | 0.015 | 1.00 | 21 | 2.80 | 2.95 | 0.015 | 0.015 | 0.11 | 0.02 | 0.000 |
| 3.00 | 0.07 | 0.00 | | | 0.006 | 1.00 | 22 | 2.95 | 3.20 | 0.006 | 0.006 | 0.07 | 0.02 | 0.000 |
| 3.40 | 0.00 | 0.00 | | | 0.000 | 1.00 | 23 | 3.20 | 3.40 | 0.002 | 0.002 | 0.02 | 0.00 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 0.017 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.017 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.58 | (m ²) |
| Top Width: | 3.20 | (m) |
| Hydraulic Depth: | 0.182 | (m) |
| Mean Velocity: | 0.030 | (m/s) |
| Froude Number | 0.022 | |
| Photographs taken looking at: Upstream, downstream, across | | |

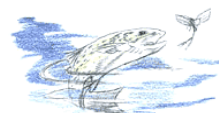
| | |
|----------------------------|---|
| Datalogger Notes: | Database # 271 |
| Datalogger Internal Power: | 4.6V |
| Datalogger External Power: | 14.1V |
| Datalogger Memory Used: | 16% |
| Datalogger Clock: | Jun 01, 2005 09:51 MST |
| Laptop Clock: | Jun 01, 2005 09:52 MST |
| Dessicant: | Good - 95% |
| Datalogger: | Optimum DD-128 with modem #0104170271 |
| PT: | Keller 730-130-0003 psi Pressure Transducer #101352 |
| Power: | 12V 20A battery and solar panel |

Notes: TSS sample taken.
Ignore any tips on the date of visit. RG at 2596 counts.



Hydrometric Measurement / Site Visit Record

S19 - Lowland Tar River



Regional Aquatics Monitoring Program

Measurement Location

Lowland Tar River
Lowland Tar River
S19
Coordinates & Legal: 6352849 N, 457329 E SE-10-96-11-W4

Personnel & Equipment

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

Date of Measurement:

11:29 AM MDT
11:43 AM MDT

Level Readings

| | | | | | | |
|----------------------------------|-------|-----|---------|-------|-----|---------|
| Bench Mark Reading: Nail in tree | 2.495 | El: | 101.478 | 2.440 | El: | 101.478 |
| Water Level Reading: | 3.203 | El: | 100.770 | 3.142 | El: | 100.776 |
| Top of Ice Level Reading: | | El: | | | El: | |
| Transducer Reading & Calc'd El | 0.379 | El: | 100.391 | 0.379 | El: | 100.397 |
| Other: | | El: | | | El: | |

Weather Conditions:

+22 C, Clear

River Conditions:

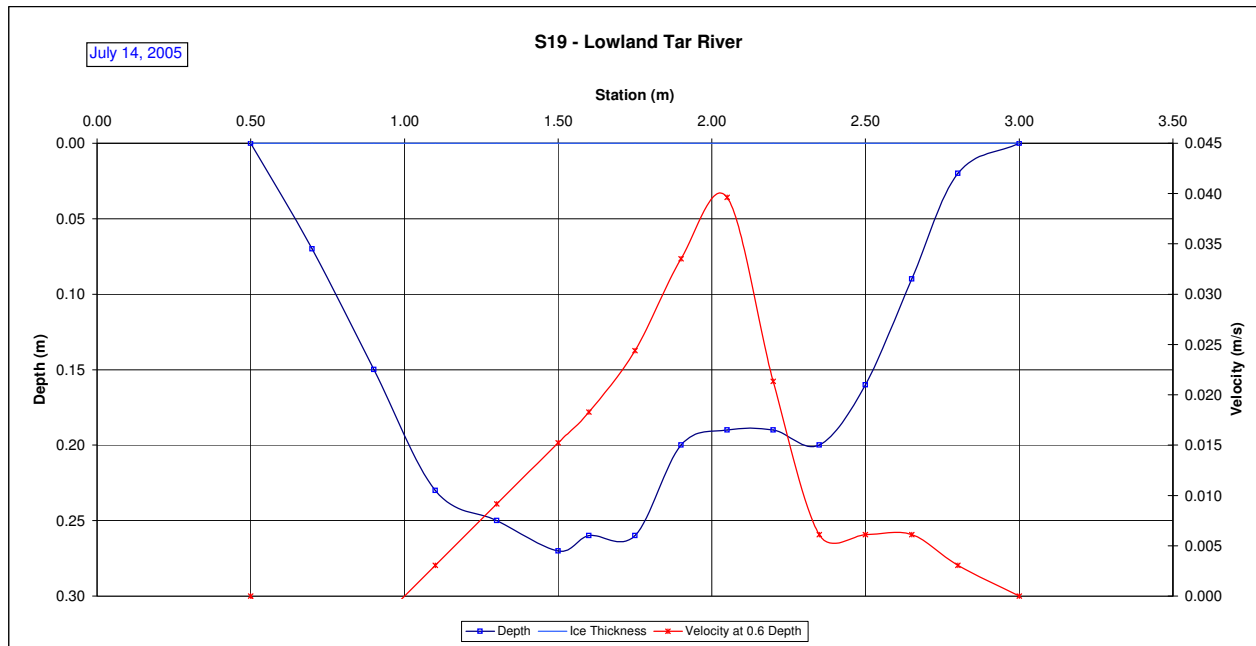
Open

| 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 ²) | (m ³ /s) |
| 0.50 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.50 | 0.60 | -0.002 | -0.002 | 0.02 | 0.00 | 0.000 |
| 0.70 | 0.07 | 0.00 | | | -0.009 | 1.00 | 2 | 0.60 | 0.80 | -0.009 | -0.009 | 0.07 | 0.01 | 0.000 |
| 0.90 | 0.15 | 0.00 | | | -0.003 | 1.00 | 3 | 0.80 | 1.00 | -0.003 | -0.003 | 0.15 | 0.03 | 0.000 |
| 1.10 | 0.23 | 0.00 | | | 0.003 | 1.00 | 4 | 1.00 | 1.20 | 0.003 | 0.003 | 0.23 | 0.05 | 0.000 |
| 1.30 | 0.25 | 0.00 | | | 0.009 | 1.00 | 5 | 1.20 | 1.40 | 0.009 | 0.009 | 0.25 | 0.05 | 0.000 |
| 1.50 | 0.27 | 0.00 | | | 0.015 | 1.00 | 6 | 1.40 | 1.55 | 0.015 | 0.015 | 0.27 | 0.04 | 0.001 |
| 1.60 | 0.26 | 0.00 | | | 0.018 | 1.00 | 7 | 1.55 | 1.68 | 0.018 | 0.018 | 0.26 | 0.03 | 0.001 |
| 1.75 | 0.26 | 0.00 | | | 0.024 | 1.00 | 8 | 1.68 | 1.83 | 0.024 | 0.024 | 0.26 | 0.04 | 0.001 |
| 1.90 | 0.20 | 0.00 | | | 0.034 | 1.00 | 9 | 1.83 | 1.98 | 0.034 | 0.034 | 0.20 | 0.03 | 0.001 |
| 2.05 | 0.19 | 0.00 | | | 0.040 | 1.00 | 10 | 1.98 | 2.13 | 0.040 | 0.040 | 0.19 | 0.03 | 0.001 |
| 2.20 | 0.19 | 0.00 | | | 0.021 | 1.00 | 11 | 2.13 | 2.28 | 0.021 | 0.021 | 0.19 | 0.03 | 0.001 |
| 2.35 | 0.20 | 0.00 | | | 0.006 | 1.00 | 12 | 2.28 | 2.43 | 0.006 | 0.006 | 0.20 | 0.03 | 0.000 |
| 2.50 | 0.16 | 0.00 | | | 0.006 | 1.00 | 13 | 2.43 | 2.58 | 0.006 | 0.006 | 0.16 | 0.02 | 0.000 |
| 2.65 | 0.09 | 0.00 | | | 0.006 | 1.00 | 14 | 2.58 | 2.73 | 0.006 | 0.006 | 0.09 | 0.01 | 0.000 |
| 2.80 | 0.02 | 0.00 | | | 0.003 | 1.00 | 15 | 2.73 | 2.90 | 0.003 | 0.003 | 0.02 | 0.00 | 0.000 |
| 3.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 16 | 2.90 | 3.00 | 0.001 | 0.001 | 0.01 | 0.00 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 0.006 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.006 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.41 | (m ²) |
| Top Width: | 2.50 | (m) |
| Hydraulic Depth: | 0.165 | (m) |
| | 0.014 | (m/s) |
| Froude Number | 0.011 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|---|----------|
| Database # 271 | |
| Datalogger Internal Power: | 4.652V |
| Datalogger External Power: | 14.09V |
| Datalogger Memory Used: | 32% |
| | 40% used |
| Datalogger: Optimum DD-128 with modem #0104170271 | |
| PT: Keller 730-130-0003 psi Pressure Transducer #101352 | |
| Power: 12V 20A battery and solar panel | |

Notes: TSS sample taken.
RG at 3255 counts. Ignore counts 3256 and 3257 as test.



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: August 31, 2005
Date of Measurement: 9:09 AM MDT
Start Time: 9:24 AM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Nail in tree 2.335
Water Level Reading: 2.865
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.543
Other:

Setup No. 1

El: 101.478
El: 100.948
El:
El: 100.405
El:

Setup No. 2

El: 101.478
El: 100.945
El:
El: 100.402
El:

Weather Conditions: +10° C, Partly cloudy

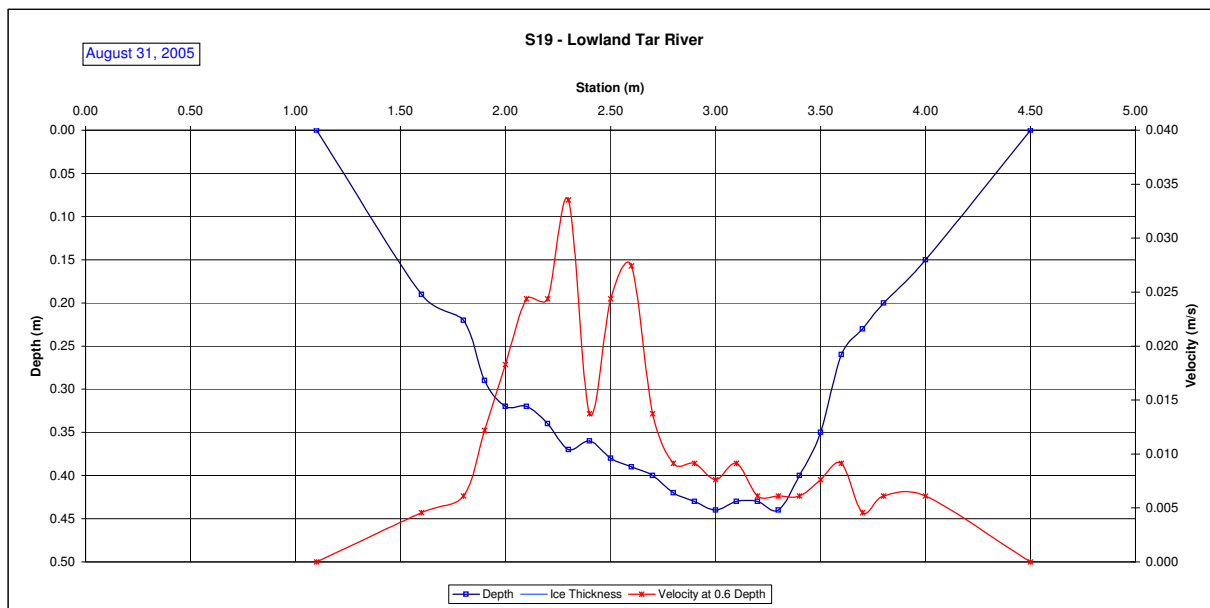
River Conditions: Open, high stage, road ditches running off.

| 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) | (m²) | (m³/s) | | | | | | |
| 1.10 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.10 | 1.35 | 0.001 | 0.001 | 0.05 | 0.01 | 0.000 | | | | | | |
| 1.60 | 0.19 | | | | 0.005 | 1.00 | 2 | 1.35 | 1.70 | 0.005 | 0.005 | 0.19 | 0.07 | 0.000 | | | | | | |
| 1.80 | 0.22 | | | | 0.006 | 1.00 | 3 | 1.70 | 1.85 | 0.006 | 0.006 | 0.22 | 0.03 | 0.000 | | | | | | |
| 1.90 | 0.29 | | | | 0.012 | 1.00 | 4 | 1.85 | 1.95 | 0.012 | 0.012 | 0.29 | 0.03 | 0.000 | | | | | | |
| 2.00 | 0.32 | | | | 0.018 | 1.00 | 5 | 1.95 | 2.05 | 0.018 | 0.018 | 0.32 | 0.03 | 0.001 | | | | | | |
| 2.10 | 0.32 | | | | 0.024 | 1.00 | 6 | 2.05 | 2.15 | 0.024 | 0.024 | 0.32 | 0.03 | 0.001 | | | | | | |
| 2.20 | 0.34 | | | | 0.024 | 1.00 | 7 | 2.15 | 2.25 | 0.024 | 0.024 | 0.34 | 0.03 | 0.001 | | | | | | |
| 2.30 | 0.37 | | | | 0.034 | 1.00 | 8 | 2.25 | 2.35 | 0.034 | 0.034 | 0.37 | 0.04 | 0.001 | | | | | | |
| 2.40 | 0.36 | | | | 0.014 | 1.00 | 9 | 2.35 | 2.45 | 0.014 | 0.014 | 0.36 | 0.04 | 0.000 | | | | | | |
| 2.50 | 0.38 | | | | 0.024 | 1.00 | 10 | 2.45 | 2.55 | 0.024 | 0.024 | 0.38 | 0.04 | 0.001 | | | | | | |
| 2.60 | 0.39 | | | | 0.027 | 1.00 | 11 | 2.55 | 2.65 | 0.027 | 0.027 | 0.39 | 0.04 | 0.001 | | | | | | |
| 2.70 | 0.40 | | | | 0.014 | 1.00 | 12 | 2.65 | 2.75 | 0.014 | 0.014 | 0.40 | 0.04 | 0.001 | | | | | | |
| 2.80 | 0.42 | | | | 0.009 | 1.00 | 13 | 2.75 | 2.85 | 0.009 | 0.009 | 0.42 | 0.04 | 0.000 | | | | | | |
| 2.90 | 0.43 | | | | 0.009 | 1.00 | 14 | 2.85 | 2.95 | 0.009 | 0.009 | 0.43 | 0.04 | 0.000 | | | | | | |
| 3.00 | 0.44 | | | | 0.008 | 1.00 | 15 | 2.95 | 3.05 | 0.008 | 0.008 | 0.44 | 0.04 | 0.000 | | | | | | |
| 3.10 | 0.43 | | | | 0.009 | 1.00 | 16 | 3.05 | 3.15 | 0.009 | 0.009 | 0.43 | 0.04 | 0.000 | | | | | | |
| 3.20 | 0.43 | | | | 0.006 | 1.00 | 17 | 3.15 | 3.25 | 0.006 | 0.006 | 0.43 | 0.04 | 0.000 | | | | | | |
| 3.30 | 0.44 | | | | 0.006 | 1.00 | 18 | 3.25 | 3.35 | 0.006 | 0.006 | 0.44 | 0.04 | 0.000 | | | | | | |
| 3.40 | 0.40 | | | | 0.006 | 1.00 | 19 | 3.35 | 3.45 | 0.006 | 0.006 | 0.40 | 0.04 | 0.000 | | | | | | |
| 3.50 | 0.35 | | | | 0.008 | 1.00 | 20 | 3.45 | 3.55 | 0.008 | 0.008 | 0.35 | 0.03 | 0.000 | | | | | | |
| 3.60 | 0.26 | | | | 0.009 | 1.00 | 21 | 3.55 | 3.65 | 0.009 | 0.009 | 0.26 | 0.03 | 0.000 | | | | | | |
| 3.70 | 0.23 | | | | 0.005 | 1.00 | 22 | 3.65 | 3.75 | 0.005 | 0.005 | 0.23 | 0.02 | 0.000 | | | | | | |
| 3.80 | 0.20 | | | | 0.006 | 1.00 | 23 | 3.75 | 3.90 | 0.006 | 0.006 | 0.20 | 0.03 | 0.000 | | | | | | |
| 4.00 | 0.15 | | | | 0.006 | 1.00 | 24 | 3.90 | 4.25 | 0.006 | 0.006 | 0.15 | 0.05 | 0.000 | | | | | | |
| 4.50 | 0.00 | | | | 0.000 | 1.00 | 25 | 4.25 | 4.50 | 0.002 | 0.002 | 0.04 | 0.01 | 0.000 | | | | | | |
| | | | | | | | | | | | | | Total Flow: | 0.011 | | | | | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.011 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.90 | (m ²) |
| Top Width: | 3.40 | (m) |
| Hydraulic Depth: | 0.266 | (m) |
| Mean Velocity: | 0.012 | (m/s) |
| Froude Number | 0.007 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

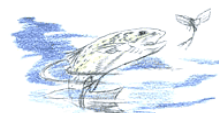
| | |
|----------------------------|---|
| Datalogger Notes: | Database # 271 |
| Datalogger Internal Power: | 4.6V |
| Datalogger External Power: | 13.12V |
| Datalogger Memory Used: | 38% |
| Datalogger Clock: | Aug 31, 2005 08:01 MST |
| Laptop Clock: | Aug 31, 2005 08:02 MST |
| Dessicant: | 100% used - changed |
| Datalogger: | Optimum DD-128 with modem #0104170271 |
| PT: | Keller 730-130-0003 psi Pressure Transducer #101352 |
| Power: | 12V 20A battery and solar panel |

Notes: TSS sample taken.
RG at 4380 counts.



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

Personnel & Equipment

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

Time of Measurement

Date of Measurement: October 7, 2005
Start Time: 6:12 PM MDT
End Time: 6:15 PM MDT

Level Readings

| | Setup No. 1 | Setup No. 2 |
|----------------------------------|-------------|-------------|
| Bench Mark Reading: Nail in tree | 2.242 | 2.271 |
| Water Level Reading: | 2.821 | 2.844 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El | 0.506 | 0.506 |
| Other: | | |

Weather Conditions: +15 C, Partly cloudy, calm

River Conditions: Open, high stage blockage D/S

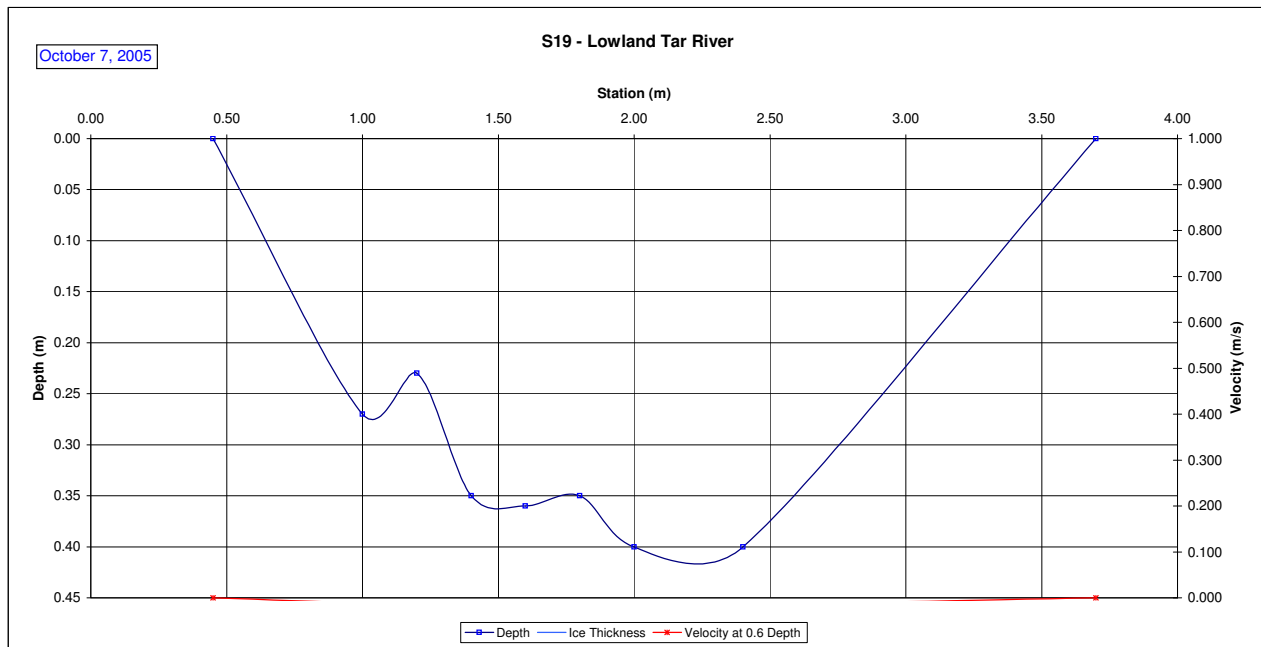
| Measured Data | | | | | | Measurement Data | | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|
| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| 0.45 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.45 | 0.73 | -0.003 | -0.003 | 0.07 | 0.02 | 0.000 |
| 1.00 | 0.27 | | | | -0.012 | 1.00 | 2 | 0.73 | 1.10 | -0.012 | -0.012 | 0.27 | 0.10 | -0.001 |
| 1.20 | 0.23 | | | | -0.018 | 1.00 | 3 | 1.10 | 1.30 | -0.018 | -0.018 | 0.23 | 0.05 | -0.001 |
| 1.40 | 0.35 | | | | -0.018 | 1.00 | 4 | 1.30 | 1.50 | -0.018 | -0.018 | 0.35 | 0.07 | -0.001 |
| 1.60 | 0.36 | | | | -0.015 | 1.00 | 5 | 1.50 | 1.70 | -0.015 | -0.015 | 0.36 | 0.07 | -0.001 |
| 1.80 | 0.35 | | | | -0.015 | 1.00 | 6 | 1.70 | 1.90 | -0.015 | -0.015 | 0.35 | 0.07 | -0.001 |
| 2.00 | 0.40 | | | | -0.015 | 1.00 | 7 | 1.90 | 2.20 | -0.015 | -0.015 | 0.40 | 0.12 | -0.002 |
| 2.40 | 0.40 | | | | -0.015 | 1.00 | 8 | 2.20 | 3.05 | -0.015 | -0.015 | 0.40 | 0.34 | -0.005 |
| 3.70 | 0.00 | | | | 0.000 | 1.00 | 9 | 3.05 | 3.70 | -0.004 | -0.004 | 0.10 | 0.07 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | -0.013 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.004 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 0.90 | (m ²) |
| Top Width: | 3.25 | (m) |
| Hydraulic Depth: | 0.278 | (m) |
| Mean Velocity: | 0.004 | (m/s) |
| Froude Number | 0.002 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|---|
| Datalogger Notes: | Database # 271 |
| Datalogger Internal Power: | 4.6V |
| Datalogger External Power: | 13.49V |
| Datalogger Memory Used: | 43% |
| Datalogger Clock: | Oct 07, 2005 16:54 MST |
| Laptop Clock: | Oct 07, 2005 16:56 MST |
| Dessicant: | 100% used - changed |
| Datalogger: | Optimum DD-128 with modem #0104170271 |
| PT: | Keller 730-130-0003 psi Pressure Transducer #101352 |
| Power: | 12V 20A battery and solar panel |

Notes: TSS sample taken.
Tranducer and TBRG removed for winter. RG on input 3, TD on input 11.
negative flow using panel area method, time volume method used at culvert using a rectangular box (tapered 61x33cm @ bottom, 66x38cm @top, depth 25cm)
time to fill t₁ = 16 sec, t₂ = 16 sec, t₃ = 15 sec

| | | | | | |
|-------------|--------------------------|----------------|-----------|------|----------------------------|
| bottom area | 0.2013 m ² | t ₁ | 16 sec | Flow | 0.0036 m ³ /sec |
| top area | 0.2508 m ² | t ₂ | 16 sec | | |
| average | 0.22605 m ² | t ₃ | 15 sec | | |
| volume | 0.0565125 m ³ | ave | 15.67 sec | | |



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 11, 2005
Start Time:
End Time:

Weather Conditions: +15° C, Clear, Windy

River Conditions:

Personnel & Equipment

Measurement Made By: ND/PM
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:

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:

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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - |

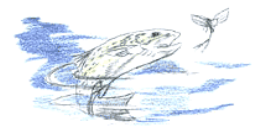
| | |
|--------------------------------|---------------------|
| Total Flow: | (m ³ /s) |
| Perceived Measurement Quality: | |
| Total Area: | (m ²) |
| Top Width: | (m) |
| Hydraulic Depth: | (m) |
| Mean Velocity: | (m/s) |
| Froude Number | |
| Photographs taken looking at: | |

Notes: Snow gauge installed for winter (TR525M-R2, s/n 28107-101)
Initial reading at 4566, ignore tips upto 4732 as test during install.

| | |
|----------------------------|---|
| Datalogger Notes: | Database # 271 |
| Datalogger Internal Power: | 4.658V |
| Datalogger External Power: | 13.64V |
| Datalogger Memory Used: | 43% |
| Datalogger Clock: | |
| Laptop Clock: | |
| Dessicant: | |
| Datalogger: | Optimum DD-128 with modem #0104170271 |
| PT: | Keller 730-130-0003 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: December 7, 2005
 Start Time:
 End Time:

Weather Conditions: -12°C, Partly cloudy

River Conditions:

Personnel & Equipment

Measurement Made By: ND/PM/RM
 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:

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:

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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow: | - |

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

Notes: Snow Guage at 4802 Counts
 Data Downloaded, Looks fine
 Ignore tips on date of visit, Added Antifreeze ignore all tips today.

| | |
|----------------------------|---------------------------------------|
| Datalogger Notes: | Database # 271 |
| Datalogger Internal Power: | 4.578V |
| Datalogger External Power: | 13V |
| Datalogger Memory Used: | 43% |
| Datalogger Clock: | |
| Laptop Clock: | |
| Dessicant: | |
| Datalogger: | Optimum DD-128 with modem #0104170271 |
| PT: | Removed for winter |
| Power: | 12V 20A battery and solar panel |

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: April 23, 2005
Start Time: 5:40 PM MDT
End Time: 6:23 PM MDT

Weather Conditions:

Partly cloudy, calm, +7°C

River Conditions:

Open, high stage, above bankfull

Personnel & Equipment

Measurement Made By: ND/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: t post | 0.724 | 0.650 |
| Water Level Reading: | 1.418 | 1.351 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El | 1.143 | 1.143 |
| Other: | | |

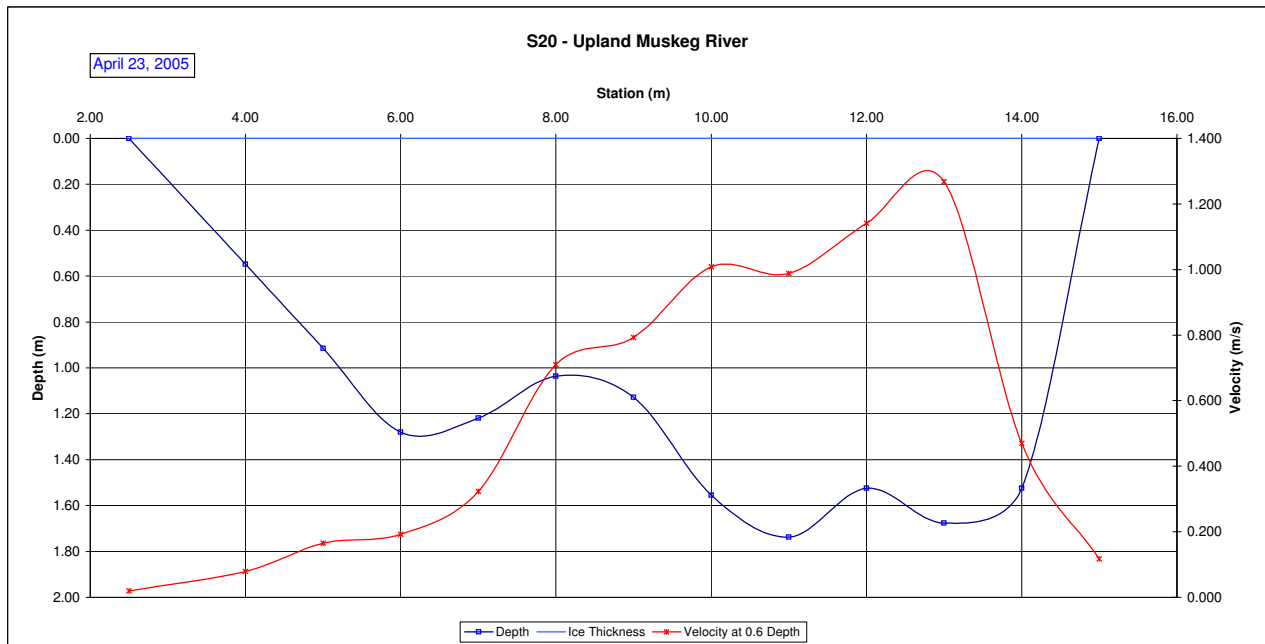
| Measured Data | | | | | | | Measurement Data | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|------------------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|
| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| LB 2.50 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 2.50 | 3.25 | 0.020 | 0.020 | 0.14 | 0.10 | 0.002 |
| 4.00 | 0.55 | 0.00 | | | 0.079 | 1.00 | 2 | 3.25 | 4.50 | 0.079 | 0.079 | 0.55 | 0.69 | 0.054 |
| 5.00 | 0.91 | 0.00 | | | 0.165 | 1.00 | 3 | 4.50 | 5.50 | 0.165 | 0.165 | 0.91 | 0.91 | 0.151 |
| 6.00 | 1.28 | 0.00 | | | 0.192 | 1.00 | 4 | 5.50 | 6.50 | 0.192 | 0.192 | 1.28 | 1.28 | 0.246 |
| 7.00 | 1.22 | 0.00 | | | 0.323 | 1.00 | 5 | 6.50 | 7.50 | 0.323 | 0.323 | 1.22 | 1.22 | 0.394 |
| 8.00 | 1.04 | 0.00 | | | 0.710 | 1.00 | 6 | 7.50 | 8.50 | 0.710 | 0.710 | 1.04 | 1.04 | 0.736 |
| 9.00 | 1.13 | 0.00 | | | 0.792 | 1.00 | 7 | 8.50 | 9.50 | 0.792 | 0.792 | 1.13 | 1.13 | 0.894 |
| 10.00 | 1.55 | 0.00 | | | 1.009 | 1.00 | 8 | 9.50 | 10.50 | 1.009 | 1.009 | 1.55 | 1.55 | 1.568 |
| 11.00 | 1.74 | 0.00 | 0.93 | 1.04 | | 1.00 | 9 | 10.50 | 11.50 | 0.988 | 0.988 | 1.74 | 1.74 | 1.716 |
| 12.00 | 1.52 | 0.00 | 1.24 | 1.04 | | 1.00 | 10 | 11.50 | 12.50 | 1.141 | 1.141 | 1.52 | 1.52 | 1.740 |
| 13.00 | 1.68 | 0.00 | 1.33 | 1.21 | | 1.00 | 11 | 12.50 | 13.50 | 1.268 | 1.268 | 1.68 | 1.68 | 2.126 |
| 14.00 | 1.52 | 0.00 | 0.18 | 0.76 | | 1.00 | 12 | 13.50 | 14.50 | 0.469 | 0.469 | 1.52 | 1.52 | 0.715 |
| RB 15.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 13 | 14.50 | 15.00 | 0.117 | 0.117 | 0.38 | 0.19 | 0.022 |
| Total Flow: | | | | | | | | | | | | | | 10.363 |

| | | |
|---|--------|---------------------|
| Total Flow: | 10.363 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 14.57 | (m ²) |
| Top Width: | 12.50 | (m) |
| Hydraulic Depth: | 1.166 | (m) |
| Mean Velocity: | 0.711 | (m/s) |
| Froude Number | 0.210 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database # 277 |
| Datalogger Internal Power: | 4.489V |
| Datalogger External Power: | 12.56V |
| Datalogger Memory Used: | 0% |
| Datalogger Clock: | Apr 23, 2005 15:42 MST |
| Laptop Clock: | Apr 23, 2005 15:42 MST |
| Dessicant: | Good - 100% |
| Datalogger: | Optimum DD-128 #109050402 |
| PT: | Keller 5 psi #104638 |
| Power: | Solar panel and internal battery |

Notes:

TSS sample taken
Equipment installed. Transducer clamped to a rock and placed in the flow. Installed here the old S16 data logger that was sent for repair. The calibration constants are m = 1.4121481 & b = -0.063028.
Gate to the access road is locked, a new bridge in place.
Manual MMT done using bomb from the bridge.



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: May 30, 2005
Start Time: 11:25 AM MDT
End Time: 11:35 AM MDT

Weather Conditions:

clear, calm, +20°C
River Conditions: Open water, stage below bankfull, stage falling

Personnel & Equipment

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

Level Readings

Bench Mark Reading: t post 0.642
Water Level Reading: 2.230
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.275
Other:

Setup No. 1

El: 50.000
El: 48.412
El: 48.137
El:

Setup No. 2

0.573 El: 50.000
2.155 El: 48.418
0.275 El: 48.143
El:

Measurement Data

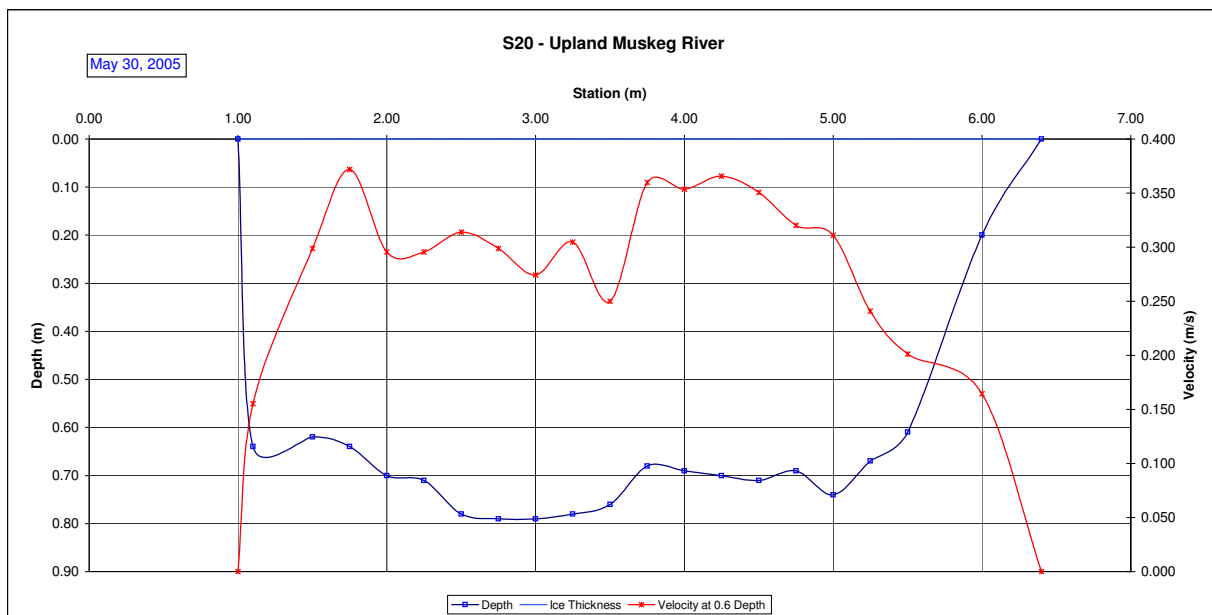
| Measured Data | | | | | | Calculated Data | | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|
| 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 ²) | (m ³ /s) |
| LB 1.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 1.00 | 1.05 | 0.039 | 0.039 | 0.16 | 0.01 | 0.000 |
| 1.10 | 0.64 | 0.00 | | | 0.155 | 1.00 | 2 | 1.05 | 1.30 | 0.155 | 0.155 | 0.64 | 0.16 | 0.025 |
| 1.50 | 0.62 | 0.00 | | | 0.299 | 1.00 | 3 | 1.30 | 1.63 | 0.299 | 0.299 | 0.62 | 0.20 | 0.060 |
| 1.75 | 0.64 | 0.00 | | | 0.372 | 1.00 | 4 | 1.63 | 1.88 | 0.372 | 0.372 | 0.64 | 0.16 | 0.059 |
| 2.00 | 0.70 | 0.00 | | | 0.296 | 1.00 | 5 | 1.88 | 2.13 | 0.296 | 0.296 | 0.70 | 0.18 | 0.052 |
| 2.25 | 0.71 | 0.00 | | | 0.296 | 1.00 | 6 | 2.13 | 2.38 | 0.296 | 0.296 | 0.71 | 0.18 | 0.052 |
| 2.50 | 0.78 | 0.00 | | | 0.314 | 1.00 | 7 | 2.38 | 2.63 | 0.314 | 0.314 | 0.78 | 0.20 | 0.061 |
| 2.75 | 0.79 | 0.00 | | | 0.299 | 1.00 | 8 | 2.63 | 2.88 | 0.299 | 0.299 | 0.79 | 0.20 | 0.059 |
| 3.00 | 0.79 | 0.00 | | | 0.274 | 1.00 | 9 | 2.88 | 3.13 | 0.274 | 0.274 | 0.79 | 0.20 | 0.054 |
| 3.25 | 0.78 | 0.00 | | | 0.305 | 1.00 | 10 | 3.13 | 3.38 | 0.305 | 0.305 | 0.78 | 0.20 | 0.059 |
| 3.50 | 0.76 | 0.00 | | | 0.250 | 1.00 | 11 | 3.38 | 3.63 | 0.250 | 0.250 | 0.76 | 0.19 | 0.047 |
| 3.75 | 0.68 | 0.00 | | | 0.360 | 1.00 | 12 | 3.63 | 3.88 | 0.360 | 0.360 | 0.68 | 0.17 | 0.061 |
| 4.00 | 0.69 | 0.00 | | | 0.354 | 1.00 | 13 | 3.88 | 4.13 | 0.354 | 0.354 | 0.69 | 0.17 | 0.061 |
| 4.25 | 0.70 | 0.00 | | | 0.366 | 1.00 | 14 | 4.13 | 4.38 | 0.366 | 0.366 | 0.70 | 0.18 | 0.064 |
| 4.50 | 0.71 | 0.00 | | | 0.351 | 1.00 | 15 | 4.38 | 4.63 | 0.351 | 0.351 | 0.71 | 0.18 | 0.062 |
| 4.75 | 0.69 | 0.00 | | | 0.320 | 1.00 | 16 | 4.63 | 4.88 | 0.320 | 0.320 | 0.69 | 0.17 | 0.055 |
| 5.00 | 0.74 | 0.00 | | | 0.311 | 1.00 | 17 | 4.88 | 5.13 | 0.311 | 0.311 | 0.74 | 0.19 | 0.058 |
| 5.25 | 0.67 | 0.00 | | | 0.241 | 1.00 | 18 | 5.13 | 5.38 | 0.241 | 0.241 | 0.67 | 0.17 | 0.040 |
| 5.50 | 0.61 | 0.00 | | | 0.201 | 1.00 | 19 | 5.38 | 5.75 | 0.201 | 0.201 | 0.61 | 0.23 | 0.046 |
| 6.00 | 0.20 | 0.00 | | | 0.165 | 1.00 | 20 | 5.75 | 6.20 | 0.165 | 0.165 | 0.20 | 0.09 | 0.015 |
| RB 6.40 | 0.00 | 0.00 | | | 0.000 | 1.00 | 21 | 6.20 | 6.40 | 0.041 | 0.041 | 0.05 | 0.01 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 0.993 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.993 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.41 | (m ²) |
| Top Width: | 5.40 | (m) |
| Hydraulic Depth: | 0.631 | (m) |
| Mean Velocity: | 0.292 | (m/s) |
| Froude Number | 0.117 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 277 |
| Datalogger Internal Power: | 4.57V |
| Datalogger External Power: | 13.84V |
| Datalogger Memory Used: | 3% |
| Datalogger Clock: | May 30, 2005 10:22 MST |
| Laptop Clock: | May 30, 2005 10:23 MST |
| Dessicant: | 100% Good |
| Datalogger: | 109050402 |
| PT: | 104638 |
| Power: | |

Notes:

TSS sample taken
Transducer level verified with survey rod depth reading with good agreement.



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: July 15, 2005
Start Time: 5:15 PM MDT
End Time: 5:33 PM MDT

Weather Conditions:

Overcast, +23°C
River Conditions: Open water, low stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: t post 0.950
Water Level Reading: 2.701
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.095
Other:

Setup No. 1

El: 50.000
El: 48.249
El: 48.154
El:

Setup No. 2

1.009 El: 50.000
2.752 El: 48.257
0.095 El: 48.162
El:

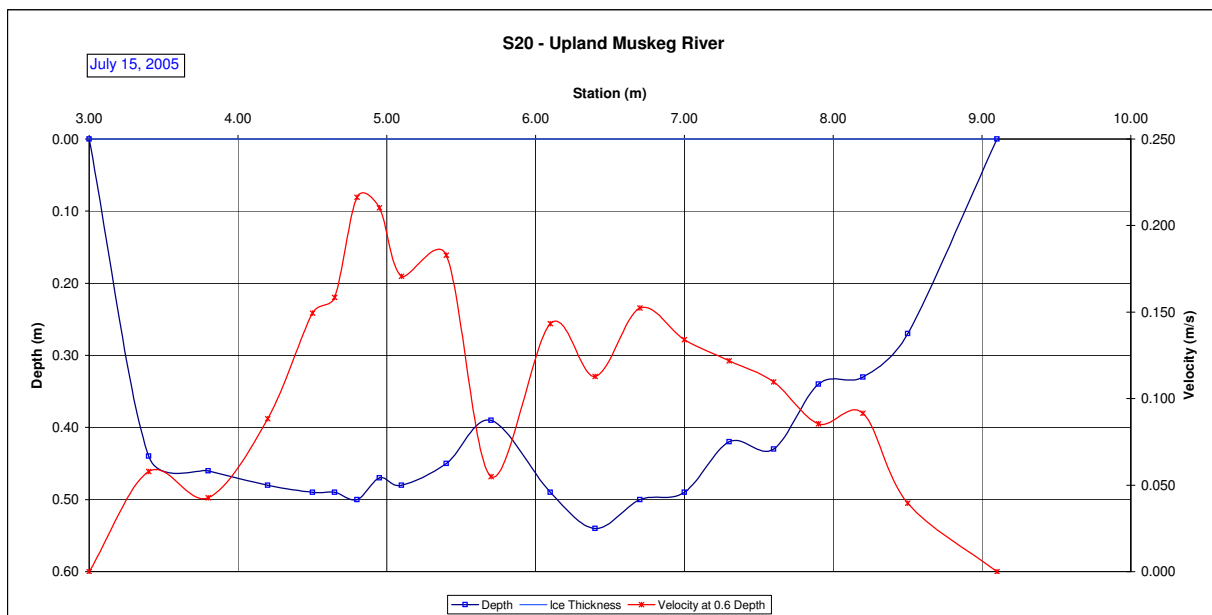
| Measurement Data | | | | | | | | | | | | | | |
|------------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|------------|-----------------|
| 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) | (m²) | (m³/s) |
| 3.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 3.00 | 3.20 | 0.014 | 0.014 | 0.11 | 0.02 | 0.000 |
| 3.40 | 0.44 | 0.00 | | | 0.058 | 1.00 | 2 | 3.20 | 3.60 | 0.058 | 0.058 | 0.44 | 0.18 | 0.010 |
| 3.80 | 0.46 | 0.00 | | | 0.043 | 1.00 | 3 | 3.60 | 4.00 | 0.043 | 0.043 | 0.46 | 0.18 | 0.008 |
| 4.20 | 0.48 | 0.00 | | | 0.088 | 1.00 | 4 | 4.00 | 4.35 | 0.088 | 0.088 | 0.48 | 0.17 | 0.015 |
| 4.50 | 0.49 | 0.00 | | | 0.149 | 1.00 | 5 | 4.35 | 4.58 | 0.149 | 0.149 | 0.49 | 0.11 | 0.016 |
| 4.65 | 0.49 | 0.00 | | | 0.158 | 1.00 | 6 | 4.58 | 4.73 | 0.158 | 0.158 | 0.49 | 0.07 | 0.012 |
| 4.80 | 0.50 | 0.00 | | | 0.216 | 1.00 | 7 | 4.73 | 4.88 | 0.216 | 0.216 | 0.50 | 0.08 | 0.016 |
| 4.95 | 0.47 | 0.00 | | | 0.210 | 1.00 | 8 | 4.88 | 5.03 | 0.210 | 0.210 | 0.47 | 0.07 | 0.015 |
| 5.10 | 0.48 | 0.00 | | | 0.171 | 1.00 | 9 | 5.03 | 5.25 | 0.171 | 0.171 | 0.48 | 0.11 | 0.018 |
| 5.40 | 0.45 | 0.00 | | | 0.183 | 1.00 | 10 | 5.25 | 5.55 | 0.183 | 0.183 | 0.45 | 0.14 | 0.025 |
| 5.70 | 0.39 | 0.00 | | | 0.055 | 1.00 | 11 | 5.55 | 5.90 | 0.055 | 0.055 | 0.39 | 0.14 | 0.007 |
| 6.10 | 0.49 | 0.00 | | | 0.143 | 1.00 | 12 | 5.90 | 6.25 | 0.143 | 0.143 | 0.49 | 0.17 | 0.025 |
| 6.40 | 0.54 | 0.00 | | | 0.113 | 1.00 | 13 | 6.25 | 6.55 | 0.113 | 0.113 | 0.54 | 0.16 | 0.018 |
| 6.70 | 0.50 | 0.00 | | | 0.152 | 1.00 | 14 | 6.55 | 6.85 | 0.152 | 0.152 | 0.50 | 0.15 | 0.023 |
| 7.00 | 0.49 | 0.00 | | | 0.134 | 1.00 | 15 | 6.85 | 7.15 | 0.134 | 0.134 | 0.49 | 0.15 | 0.020 |
| 7.30 | 0.42 | 0.00 | | | 0.122 | 1.00 | 16 | 7.15 | 7.45 | 0.122 | 0.122 | 0.42 | 0.13 | 0.015 |
| 7.60 | 0.43 | 0.00 | | | 0.110 | 1.00 | 17 | 7.45 | 7.75 | 0.110 | 0.110 | 0.43 | 0.13 | 0.014 |
| 7.90 | 0.34 | 0.00 | | | 0.085 | 1.00 | 18 | 7.75 | 8.05 | 0.085 | 0.085 | 0.34 | 0.10 | 0.009 |
| 8.20 | 0.33 | 0.00 | | | 0.091 | 1.00 | 19 | 8.05 | 8.35 | 0.091 | 0.091 | 0.33 | 0.10 | 0.009 |
| 8.50 | 0.27 | 0.00 | | | 0.040 | 1.00 | 20 | 8.35 | 8.80 | 0.040 | 0.040 | 0.27 | 0.12 | 0.005 |
| 9.10 | 0.00 | 0.00 | | | 0.000 | 1.00 | 21 | 8.80 | 9.10 | 0.010 | 0.010 | 0.07 | 0.02 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 0.281 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.281 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.49 | (m ²) |
| Top Width: | 6.10 | (m) |
| Hydraulic Depth: | 0.408 | (m) |
| Mean Velocity: | 0.113 | (m/s) |
| Froude Number | 0.056 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 277 |
| Datalogger Internal Power: | 4.589V |
| Datalogger External Power: | 13.71V |
| Datalogger Memory Used: | 7% |
| Datalogger Clock: | Jul 15, 2005 16:03 MST |
| Laptop Clock: | Jul 15, 2005 16:04 MST |
| Dessicant: | 50% used |
| Datalogger: | 109050402 |
| PT: | 104638 |
| Power: | |

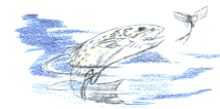
Notes:

TSS sample taken



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: September 1, 2005
Date of Measurement: 3:05 PM MDT
Start Time: 3:15 PM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: t post 0.834
Water Level Reading: 2.307
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 0.351
Other:

Setup No. 1

El: 50.000
El: 48.527
El:
El: 48.176
El:

Setup No. 2

0.738 El: 50.000
2.214 El: 48.524
El:
El:
El: 48.173
El:

Weather Conditions:

clear, calm, +20°C

River Conditions:

Open water, stage below bankfull, stage falling

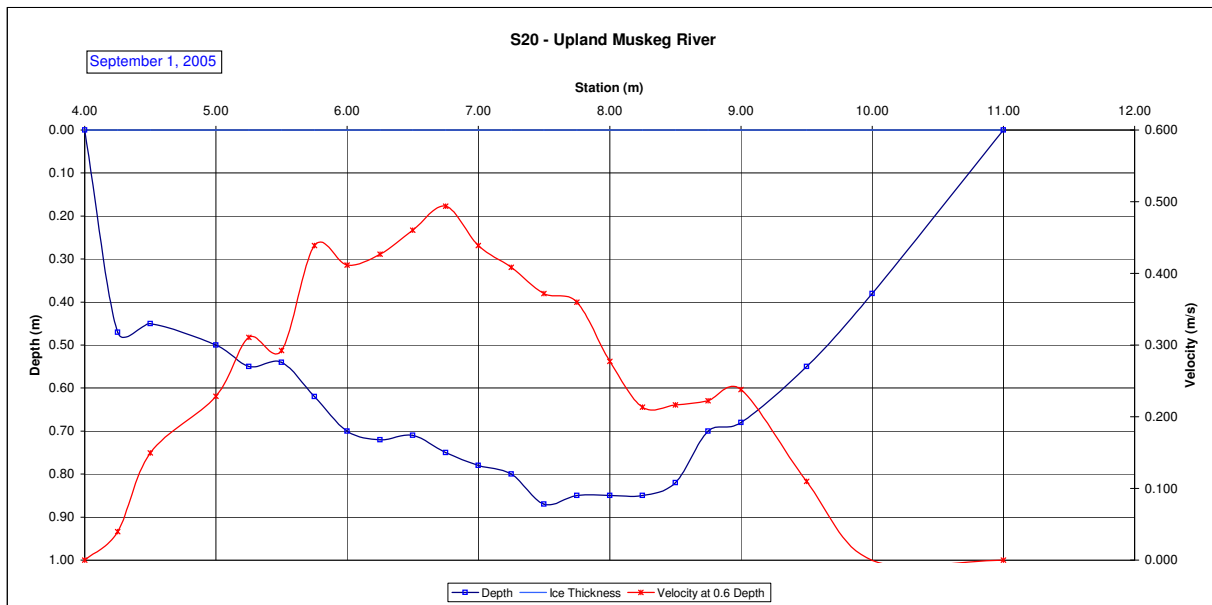
| Measured Data | | | | | | Measurement Data | | | | | | | | | Calculated Data | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------|-----------------|-----------------|--|--|--|--|
| 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) | (m²) | (m³/s) | | | | | |
| 4.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 4.00 | 4.13 | 0.010 | 0.010 | 0.12 | 0.01 | 0.000 | | | | | |
| 4.25 | 0.47 | 0.00 | | | 0.040 | 1.00 | 2 | 4.13 | 4.38 | 0.040 | 0.040 | 0.47 | 0.12 | 0.005 | | | | | |
| 4.50 | 0.45 | 0.00 | | | 0.149 | 1.00 | 3 | 4.38 | 4.75 | 0.149 | 0.149 | 0.45 | 0.17 | 0.025 | | | | | |
| 5.00 | 0.50 | 0.00 | | | 0.229 | 1.00 | 4 | 4.75 | 5.13 | 0.229 | 0.229 | 0.50 | 0.19 | 0.043 | | | | | |
| 5.25 | 0.55 | 0.00 | | | 0.311 | 1.00 | 5 | 5.13 | 5.38 | 0.311 | 0.311 | 0.55 | 0.14 | 0.043 | | | | | |
| 5.50 | 0.54 | 0.00 | | | 0.293 | 1.00 | 6 | 5.38 | 5.63 | 0.293 | 0.293 | 0.54 | 0.14 | 0.040 | | | | | |
| 5.75 | 0.62 | 0.00 | | | 0.439 | 1.00 | 7 | 5.63 | 5.88 | 0.439 | 0.439 | 0.62 | 0.16 | 0.068 | | | | | |
| 6.00 | 0.70 | 0.00 | | | 0.411 | 1.00 | 8 | 5.88 | 6.13 | 0.411 | 0.411 | 0.70 | 0.18 | 0.072 | | | | | |
| 6.25 | 0.72 | 0.00 | | | 0.427 | 1.00 | 9 | 6.13 | 6.38 | 0.427 | 0.427 | 0.72 | 0.18 | 0.077 | | | | | |
| 6.50 | 0.71 | 0.00 | | | 0.460 | 1.00 | 10 | 6.38 | 6.63 | 0.460 | 0.460 | 0.71 | 0.18 | 0.082 | | | | | |
| 6.75 | 0.75 | 0.00 | | | 0.494 | 1.00 | 11 | 6.63 | 6.88 | 0.494 | 0.494 | 0.75 | 0.19 | 0.093 | | | | | |
| 7.00 | 0.78 | 0.00 | | | 0.439 | 1.00 | 12 | 6.88 | 7.13 | 0.439 | 0.439 | 0.78 | 0.20 | 0.086 | | | | | |
| 7.25 | 0.80 | 0.00 | | | 0.408 | 1.00 | 13 | 7.13 | 7.38 | 0.408 | 0.408 | 0.80 | 0.20 | 0.082 | | | | | |
| 7.50 | 0.87 | 0.00 | | | 0.372 | 1.00 | 14 | 7.38 | 7.63 | 0.372 | 0.372 | 0.87 | 0.22 | 0.081 | | | | | |
| 7.75 | 0.85 | 0.00 | | | 0.360 | 1.00 | 15 | 7.63 | 7.88 | 0.360 | 0.360 | 0.85 | 0.21 | 0.076 | | | | | |
| 8.00 | 0.85 | 0.00 | | | 0.277 | 1.00 | 16 | 7.88 | 8.13 | 0.277 | 0.277 | 0.85 | 0.21 | 0.059 | | | | | |
| 8.25 | 0.85 | 0.00 | | | 0.213 | 1.00 | 17 | 8.13 | 8.38 | 0.213 | 0.213 | 0.85 | 0.21 | 0.045 | | | | | |
| 8.50 | 0.82 | 0.00 | | | 0.216 | 1.00 | 18 | 8.38 | 8.63 | 0.216 | 0.216 | 0.82 | 0.21 | 0.044 | | | | | |
| 8.75 | 0.70 | 0.00 | | | 0.223 | 1.00 | 19 | 8.63 | 8.88 | 0.223 | 0.223 | 0.70 | 0.18 | 0.039 | | | | | |
| 9.00 | 0.68 | 0.00 | | | 0.238 | 1.00 | 20 | 8.88 | 9.25 | 0.238 | 0.238 | 0.68 | 0.26 | 0.061 | | | | | |
| 9.50 | 0.55 | 0.00 | | | 0.110 | 1.00 | 21 | 9.25 | 9.75 | 0.110 | 0.110 | 0.55 | 0.28 | 0.030 | | | | | |
| 10.00 | 0.38 | 0.00 | | | -0.001 | 1.00 | 22 | 9.75 | 10.50 | -0.001 | -0.001 | 0.38 | 0.29 | 0.000 | | | | | |
| 11.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 23 | 10.50 | 11.00 | 0.000 | 0.000 | 0.10 | 0.05 | 0.000 | | | | | |
| | | | | | | | | | | | | | Total Flow: | | 1.149 | | | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 1.149 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 4.13 | (m ²) |
| Top Width: | 7.00 | (m) |
| Hydraulic Depth: | 0.590 | (m) |
| Mean Velocity: | 0.278 | (m/s) |
| Froude Number | 0.116 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 277 |
| Datalogger Internal Power: | 4.57V |
| Datalogger External Power: | 13.54V |
| Datalogger Memory Used: | 11% |
| Datalogger Clock: | Sep 01, 2005 13:47 MST |
| Laptop Clock: | Sep 01, 2005 13:49 MST |
| Dessicant: | 100 used-replaced |
| Datalogger: | 109050402 |
| PT: | 104638 |
| Power: | |

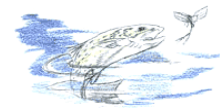
Notes:

TSS sample taken
Transducer level verified with survey rod depth reading with good agreement.



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: October 7, 2005
Date of Measurement: 7:48 AM MDT
Start Time: 8:05 AM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: t post 0.802
Water Level Reading: 2.512
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 0.136
Other:

Setup No. 1

El: 50.000
El: 48.290
El:
El: 48.154
El:

Setup No. 2

El: 50.000
El: 48.288
El:
El: 48.152
El:

Weather Conditions:

partly cloudy, calm, +5°C

River Conditions:

Open water, low stage, stage falling

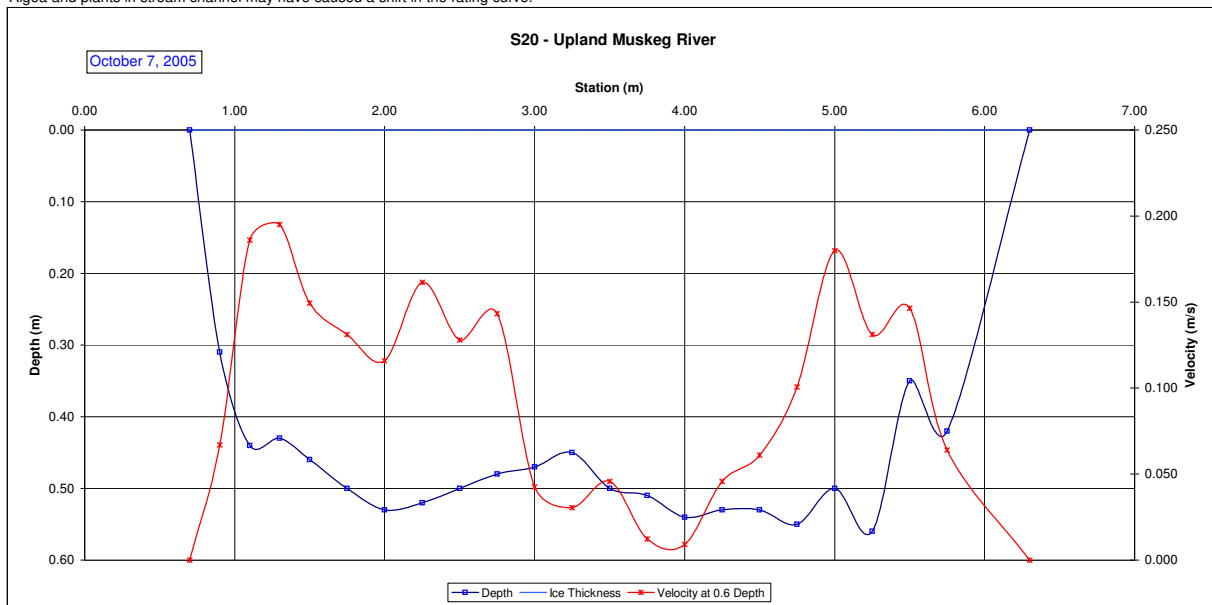
| | Measured Data | | | | | | Calculated Data | | | | | | | | |
|-------------|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|
| | | | | | | | | | | | | | | | |
| | 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 ²) | (m ³ /s) |
| LB | 0.70 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.70 | 0.80 | 0.017 | 0.017 | 0.08 | 0.01 | 0.000 |
| | 0.90 | 0.31 | 0.00 | | | 0.067 | 1.00 | 2 | 0.80 | 1.00 | 0.067 | 0.067 | 0.31 | 0.06 | 0.004 |
| | 1.10 | 0.44 | 0.00 | | | 0.186 | 1.00 | 3 | 1.00 | 1.20 | 0.186 | 0.186 | 0.44 | 0.09 | 0.016 |
| | 1.30 | 0.43 | 0.00 | | | 0.195 | 1.00 | 4 | 1.20 | 1.40 | 0.195 | 0.195 | 0.43 | 0.09 | 0.017 |
| | 1.50 | 0.46 | 0.00 | | | 0.149 | 1.00 | 5 | 1.40 | 1.63 | 0.149 | 0.149 | 0.46 | 0.10 | 0.015 |
| | 1.75 | 0.50 | 0.00 | | | 0.131 | 1.00 | 6 | 1.63 | 1.88 | 0.131 | 0.131 | 0.50 | 0.13 | 0.016 |
| | 2.00 | 0.53 | 0.00 | | | 0.116 | 1.00 | 7 | 1.88 | 2.13 | 0.116 | 0.116 | 0.53 | 0.13 | 0.015 |
| | 2.25 | 0.52 | 0.00 | | | 0.162 | 1.00 | 8 | 2.13 | 2.38 | 0.162 | 0.162 | 0.52 | 0.13 | 0.021 |
| | 2.50 | 0.50 | 0.00 | | | 0.128 | 1.00 | 9 | 2.38 | 2.63 | 0.128 | 0.128 | 0.50 | 0.13 | 0.016 |
| | 2.75 | 0.48 | 0.00 | | | 0.143 | 1.00 | 10 | 2.63 | 2.88 | 0.143 | 0.143 | 0.48 | 0.12 | 0.017 |
| | 3.00 | 0.47 | 0.00 | | | 0.043 | 1.00 | 11 | 2.88 | 3.13 | 0.043 | 0.043 | 0.47 | 0.12 | 0.005 |
| | 3.25 | 0.45 | 0.00 | | | 0.030 | 1.00 | 12 | 3.13 | 3.38 | 0.030 | 0.030 | 0.45 | 0.11 | 0.003 |
| | 3.50 | 0.50 | 0.00 | | | 0.046 | 1.00 | 13 | 3.38 | 3.63 | 0.046 | 0.046 | 0.50 | 0.13 | 0.006 |
| | 3.75 | 0.51 | 0.00 | | | 0.012 | 1.00 | 14 | 3.63 | 3.88 | 0.012 | 0.012 | 0.51 | 0.13 | 0.002 |
| | 4.00 | 0.54 | 0.00 | | | 0.009 | 1.00 | 15 | 3.88 | 4.13 | 0.009 | 0.009 | 0.54 | 0.14 | 0.001 |
| | 4.25 | 0.53 | 0.00 | | | 0.046 | 1.00 | 16 | 4.13 | 4.38 | 0.046 | 0.046 | 0.53 | 0.13 | 0.006 |
| | 4.50 | 0.53 | 0.00 | | | 0.061 | 1.00 | 17 | 4.38 | 4.63 | 0.061 | 0.061 | 0.53 | 0.13 | 0.008 |
| | 4.75 | 0.55 | 0.00 | | | 0.101 | 1.00 | 18 | 4.63 | 4.88 | 0.101 | 0.101 | 0.55 | 0.14 | 0.014 |
| | 5.00 | 0.50 | 0.00 | | | 0.180 | 1.00 | 19 | 4.88 | 5.13 | 0.180 | 0.180 | 0.50 | 0.13 | 0.022 |
| | 5.25 | 0.56 | 0.00 | | | 0.131 | 1.00 | 20 | 5.13 | 5.38 | 0.131 | 0.131 | 0.56 | 0.14 | 0.018 |
| | 5.50 | 0.35 | 0.00 | | | 0.146 | 1.00 | 21 | 5.38 | 5.63 | 0.146 | 0.146 | 0.35 | 0.09 | 0.013 |
| | 5.75 | 0.42 | 0.00 | | | 0.064 | 1.00 | 22 | 5.63 | 6.03 | 0.064 | 0.064 | 0.42 | 0.17 | 0.011 |
| | RB | 6.30 | 0.00 | 0.00 | | | 0.000 | 1.00 | 23 | 6.03 | 6.30 | 0.016 | 0.016 | 0.11 | 0.03 |
| Total Flow: | | | | | | | | | | | | | | 0.249 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.249 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.55 | (m ²) |
| Top Width: | 5.60 | (m) |
| Hydraulic Depth: | 0.455 | (m) |
| Mean Velocity: | 0.098 | (m/s) |
| Froude Number | 0.046 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 277 |
| Datalogger Internal Power: | 4.52V |
| Datalogger External Power: | 12.39V |
| Datalogger Memory Used: | 14% |
| Datalogger Clock: | Oct 07, 2005 06:42 MST |
| Laptop Clock: | Oct 07, 2005 06:45 MST |
| Dessicant: | 5% used |
| Datalogger: | 109050402 |
| PT: | 104638 |
| Power: | |

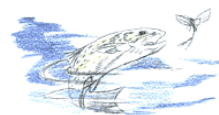
Notes:

TSS sample taken
Equipment removed for the winter.
Algae and plants in stream channel may have caused a shift in the rating curve.



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:

Personnel & Equipment

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

Time of Measurement

Date of Measurement: April 23, 2005
Start Time: 11:22 AM MDT
End Time: 11:40 AM MDT

Level Readings

| | Setup No. 1 | Setup No. 2 |
|--------------------------------|-------------|-------------|
| Bench Mark Reading: t post | 1.241 | El: 306.476 |
| Water Level Reading: | 3.245 | El: 304.472 |
| Top of Ice Level Reading: | | El: 304.465 |
| Transducer Reading & Calc'd El | 1.155 | El: 303.317 |
| Other: | | El: 303.310 |

Weather Conditions: +15 C clear, calm.

River Conditions: Open, very high stage and velocity, flowing over banks

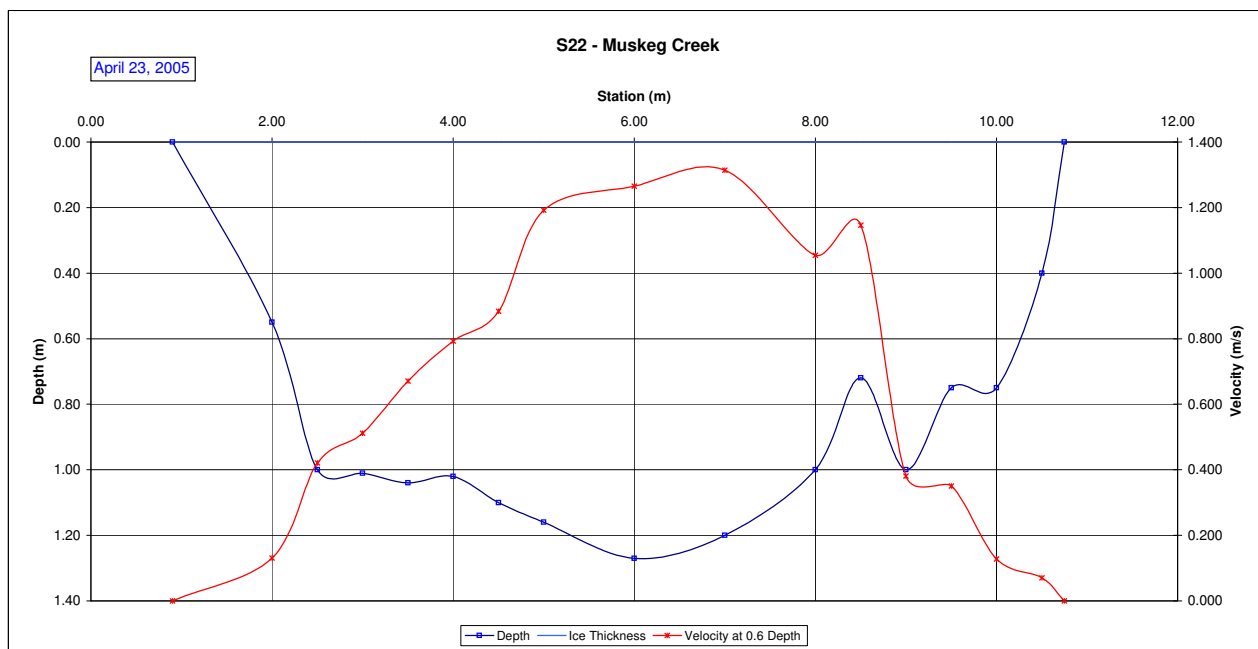
| Measured Data | | | | | | | Measurement Data | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|------------------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|
| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| 0.90 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.90 | 1.45 | 0.033 | 0.033 | 0.14 | 0.08 | 0.002 |
| 2.00 | 0.55 | 0.00 | | | 0.131 | 1.00 | 2 | 1.45 | 2.25 | 0.131 | 0.131 | 0.55 | 0.44 | 0.058 |
| 2.50 | 1.00 | 0.00 | | | 0.421 | 1.00 | 3 | 2.25 | 2.75 | 0.421 | 0.421 | 1.00 | 0.50 | 0.210 |
| 3.00 | 1.01 | 0.00 | | | 0.512 | 1.00 | 4 | 2.75 | 3.25 | 0.512 | 0.512 | 1.01 | 0.51 | 0.259 |
| 3.50 | 1.04 | 0.00 | | | 0.671 | 1.00 | 5 | 3.25 | 3.75 | 0.671 | 0.671 | 1.04 | 0.52 | 0.349 |
| 4.00 | 1.02 | 0.00 | | | 0.792 | 1.00 | 6 | 3.75 | 4.25 | 0.792 | 0.792 | 1.02 | 0.51 | 0.404 |
| 4.50 | 1.10 | 0.00 | | | 0.884 | 1.00 | 7 | 4.25 | 4.75 | 0.884 | 0.884 | 1.10 | 0.55 | 0.486 |
| 5.00 | 1.16 | 0.00 | | | 1.192 | 1.00 | 8 | 4.75 | 5.50 | 1.192 | 1.192 | 1.16 | 0.87 | 1.037 |
| 6.00 | 1.27 | 0.00 | | | 1.265 | 1.00 | 9 | 5.50 | 6.50 | 1.265 | 1.265 | 1.27 | 1.27 | 1.606 |
| 7.00 | 1.20 | 0.00 | | | 1.314 | 1.00 | 10 | 6.50 | 7.50 | 1.314 | 1.314 | 1.20 | 1.20 | 1.576 |
| 8.00 | 1.00 | 0.00 | | | 1.055 | 1.00 | 11 | 7.50 | 8.25 | 1.055 | 1.055 | 1.00 | 0.75 | 0.791 |
| 8.50 | 0.72 | 0.00 | | | 1.146 | 1.00 | 12 | 8.25 | 8.75 | 1.146 | 1.146 | 0.72 | 0.36 | 0.413 |
| 9.00 | 1.00 | 0.00 | | | 0.381 | 1.00 | 13 | 8.75 | 9.25 | 0.381 | 0.381 | 1.00 | 0.50 | 0.191 |
| 9.50 | 0.75 | 0.00 | | | 0.351 | 1.00 | 14 | 9.25 | 9.75 | 0.351 | 0.351 | 0.75 | 0.38 | 0.131 |
| 10.00 | 0.75 | 0.00 | | | 0.128 | 1.00 | 15 | 9.75 | 10.25 | 0.128 | 0.128 | 0.75 | 0.38 | 0.048 |
| 10.50 | 0.40 | 0.00 | | | 0.070 | 1.00 | 16 | 10.25 | 10.63 | 0.070 | 0.070 | 0.40 | 0.15 | 0.011 |
| 10.75 | 0.00 | 0.00 | | | 0.000 | 1.00 | 17 | 10.63 | 10.75 | 0.018 | 0.018 | 0.10 | 0.01 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 7.572 |

| | | |
|---|-------|---------------------|
| Total Flow: | 7.572 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 8.96 | (m ²) |
| Top Width: | 9.85 | (m) |
| Hydraulic Depth: | 0.910 | (m) |
| Mean Velocity: | 0.845 | (m/s) |
| Froude Number | 0.283 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across (may have been lost with camera) | | |

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database # 602 |
| Datalogger Internal Power: | 4.74 V |
| Datalogger External Power: | 13.74 V |
| Datalogger Memory Used: | 16% |
| Datalogger Clock: | Apr 23, 2005 09:36 MST |
| Laptop Clock: | Apr 23, 2005 09:36 MST |
| Dessicant: | Good - 100% |
| Datalogger: | Optimum DD-128 #0204100602 |
| PT: | Keller 3 psi #101353 |
| Power: | Solar panel and internal battery |

Notes:

TSS Sample Taken
Equipment installed. Transducer installed in the stilling tube on site.



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: May 30, 2005
Start Time: 8:58 AM MDT
End Time: 9:09 AM MDT

Weather Conditions:

+18 C clear, calm.

River Conditions:

Open water, stage below bankfull, stage falling

Personnel & Equipment

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

Level Readings

Bench Mark Reading: t post 1.447
Water Level Reading: 3.982
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.624
Other:

Setup No. 1

El: 306.476
El: 303.941
El: 307.923
El: 303.317

Setup No. 2

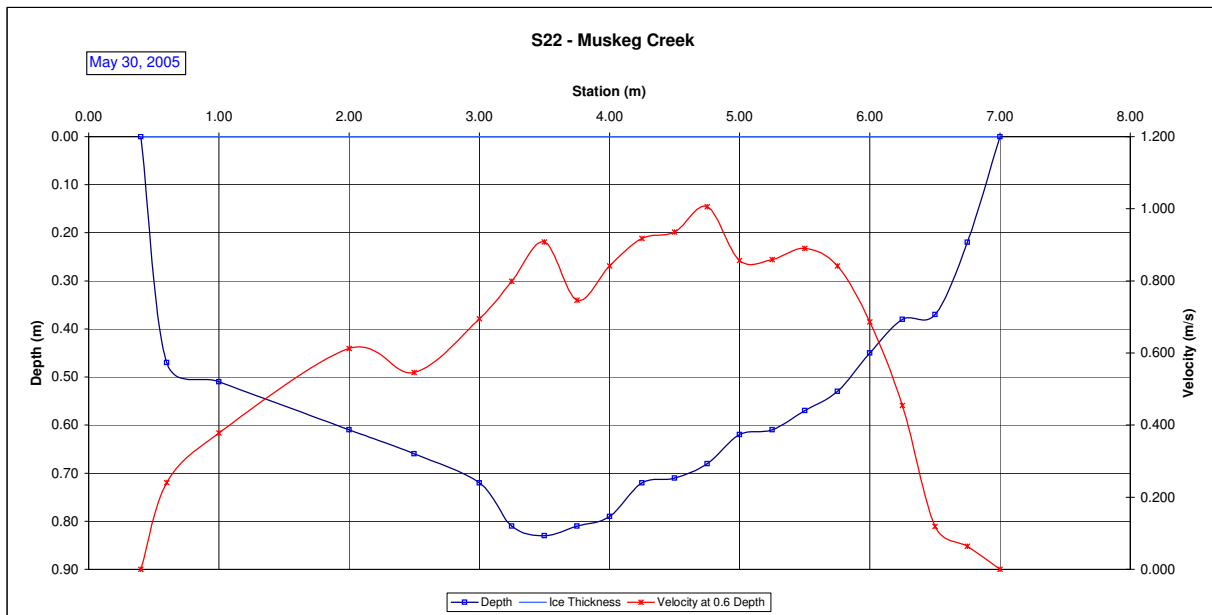
El: 306.476
El: 303.935
El: 307.954
El: 303.311

| 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) | (m²) | (m³/s) | | | | |
| 0.40 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.40 | 0.50 | 0.060 | 0.060 | 0.12 | 0.01 | 0.001 | | | | |
| 0.60 | 0.47 | 0.00 | | | 0.241 | 1.00 | 2 | 0.50 | 0.80 | 0.241 | 0.241 | 0.47 | 0.14 | 0.034 | | | | |
| 1.00 | 0.51 | 0.00 | | | 0.378 | 1.00 | 3 | 0.80 | 1.50 | 0.378 | 0.378 | 0.51 | 0.36 | 0.135 | | | | |
| 2.00 | 0.61 | 0.00 | | | 0.613 | 1.00 | 4 | 1.50 | 2.25 | 0.613 | 0.613 | 0.61 | 0.46 | 0.280 | | | | |
| 2.50 | 0.66 | 0.00 | | | 0.546 | 1.00 | 5 | 2.25 | 2.75 | 0.546 | 0.546 | 0.66 | 0.33 | 0.180 | | | | |
| 3.00 | 0.72 | 0.00 | | | 0.695 | 1.00 | 6 | 2.75 | 3.13 | 0.695 | 0.695 | 0.72 | 0.27 | 0.188 | | | | |
| 3.25 | 0.81 | 0.00 | | | 0.799 | 1.00 | 7 | 3.13 | 3.38 | 0.799 | 0.799 | 0.81 | 0.20 | 0.162 | | | | |
| 3.50 | 0.83 | 0.00 | | | 0.908 | 1.00 | 8 | 3.38 | 3.63 | 0.908 | 0.908 | 0.83 | 0.21 | 0.188 | | | | |
| 3.75 | 0.81 | 0.00 | | | 0.747 | 1.00 | 9 | 3.63 | 3.88 | 0.747 | 0.747 | 0.81 | 0.20 | 0.151 | | | | |
| 4.00 | 0.79 | 0.00 | | | 0.841 | 1.00 | 10 | 3.88 | 4.13 | 0.841 | 0.841 | 0.79 | 0.20 | 0.166 | | | | |
| 4.25 | 0.72 | 0.00 | | | 0.917 | 1.00 | 11 | 4.13 | 4.38 | 0.917 | 0.917 | 0.72 | 0.18 | 0.165 | | | | |
| 4.50 | 0.71 | 0.00 | | | 0.936 | 1.00 | 12 | 4.38 | 4.63 | 0.936 | 0.936 | 0.71 | 0.18 | 0.166 | | | | |
| 4.75 | 0.68 | 0.00 | | | 1.006 | 1.00 | 13 | 4.63 | 4.88 | 1.006 | 1.006 | 0.68 | 0.17 | 0.171 | | | | |
| 5.00 | 0.62 | 0.00 | | | 0.856 | 1.00 | 14 | 4.88 | 5.13 | 0.856 | 0.856 | 0.62 | 0.16 | 0.133 | | | | |
| 5.25 | 0.61 | 0.00 | | | 0.860 | 1.00 | 15 | 5.13 | 5.38 | 0.860 | 0.860 | 0.61 | 0.15 | 0.131 | | | | |
| 5.50 | 0.57 | 0.00 | | | 0.890 | 1.00 | 16 | 5.38 | 5.63 | 0.890 | 0.890 | 0.57 | 0.14 | 0.127 | | | | |
| 5.75 | 0.53 | 0.00 | | | 0.841 | 1.00 | 17 | 5.63 | 5.88 | 0.841 | 0.841 | 0.53 | 0.13 | 0.111 | | | | |
| 6.00 | 0.45 | 0.00 | | | 0.686 | 1.00 | 18 | 5.88 | 6.13 | 0.686 | 0.686 | 0.45 | 0.11 | 0.077 | | | | |
| 6.25 | 0.38 | 0.00 | | | 0.454 | 1.00 | 19 | 6.13 | 6.38 | 0.454 | 0.454 | 0.38 | 0.10 | 0.043 | | | | |
| 6.50 | 0.37 | 0.00 | | | 0.119 | 1.00 | 20 | 6.38 | 6.63 | 0.119 | 0.119 | 0.37 | 0.09 | 0.011 | | | | |
| 6.75 | 0.22 | 0.00 | | | 0.064 | 1.00 | 21 | 6.63 | 6.88 | 0.064 | 0.064 | 0.22 | 0.06 | 0.004 | | | | |
| 7.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 22 | 6.88 | 7.00 | 0.016 | 0.016 | 0.06 | 0.01 | 0.000 | | | | |
| Total Flow: | | | | | | | | | | | | | | 2.624 | | | | |

| | | |
|--|-------|---------------------|
| Total Flow: | 2.624 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.85 | (m ²) |
| Top Width: | 6.60 | (m) |
| Hydraulic Depth: | 0.583 | (m) |
| Mean Velocity: | 0.682 | (m/s) |
| Froude Number | 0.285 | |
| Photographs taken looking at: Upstream, downstream, across. | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 602 |
| Datalogger Internal Power: | 4.76 V |
| Datalogger External Power: | 13.56 V |
| Datalogger Memory Used: | 19% |
| Datalogger Clock: | May 30, 2005 07:47 MST |
| Laptop Clock: | May 30, 2005 07:49 MST |
| Dessicant: | Good - 95% |
| Datalogger: | 105801602 |
| PT: | 101353 |
| Power: | |

Notes:
TSS Sample Taken



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: July 15, 2005
Start Time: 2:00 PM MDT
End Time: 2:20 PM MDT

Weather Conditions:

+26 C clear, calm.

River Conditions:

Open water

Personnel & Equipment

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

Level Readings

Bench Mark Reading: t post 2.310
Water Level Reading: 5.117
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.353
Other:

Setup No. 1

El: 306.476
El: 303.669
El: 308.786
El: 303.316

Setup No. 2

El: 306.476
El: 303.676
El: 308.836
El: 303.323

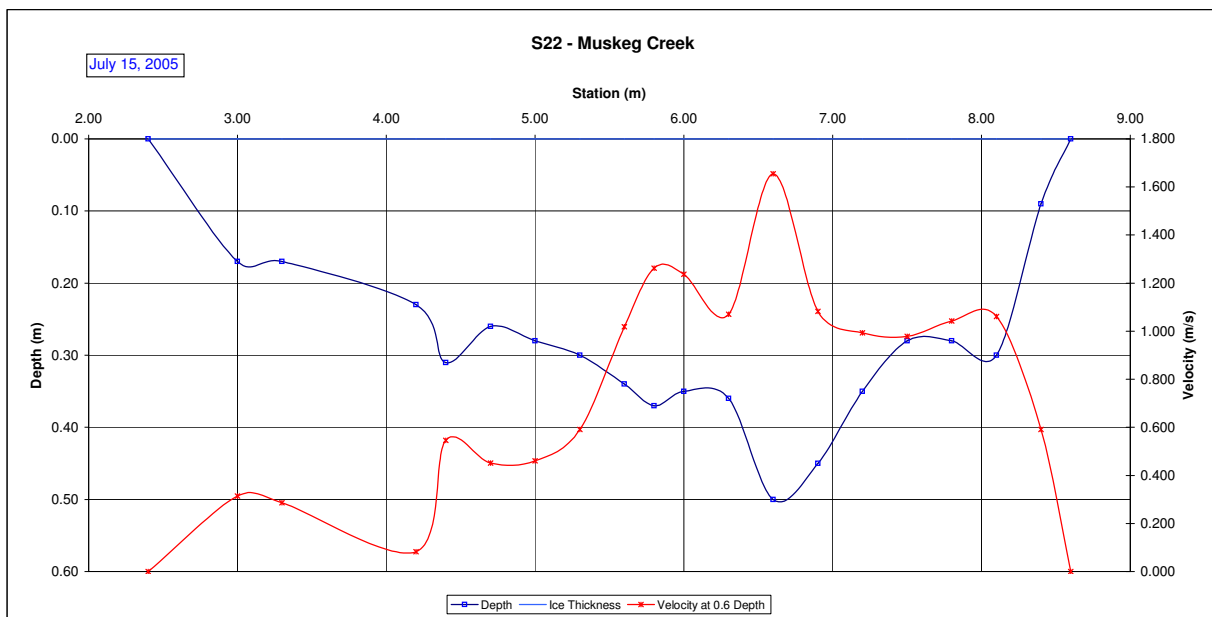
| Measured Data | | | | | | Measurement Data | | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------|-----------------|
| | | | | | | | | | | | | | | |
| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) |
| 2.40 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 2.40 | 2.70 | 0.078 | 0.078 | 0.04 | 0.01 | 0.001 |
| 3.00 | 0.17 | 0.00 | | | 0.314 | 1.00 | 2 | 2.70 | 3.15 | 0.314 | 0.314 | 0.17 | 0.08 | 0.024 |
| 3.30 | 0.17 | 0.00 | | | 0.287 | 1.00 | 3 | 3.15 | 3.75 | 0.287 | 0.287 | 0.17 | 0.10 | 0.029 |
| 4.20 | 0.23 | 0.00 | | | 0.082 | 1.00 | 4 | 3.75 | 4.30 | 0.082 | 0.082 | 0.23 | 0.13 | 0.010 |
| 4.40 | 0.31 | 0.00 | | | 0.546 | 1.00 | 5 | 4.30 | 4.55 | 0.546 | 0.546 | 0.31 | 0.08 | 0.042 |
| 4.70 | 0.26 | 0.00 | | | 0.451 | 1.00 | 6 | 4.55 | 4.85 | 0.451 | 0.451 | 0.26 | 0.08 | 0.035 |
| 5.00 | 0.28 | 0.00 | | | 0.460 | 1.00 | 7 | 4.85 | 5.15 | 0.460 | 0.460 | 0.28 | 0.08 | 0.039 |
| 5.30 | 0.30 | 0.00 | | | 0.591 | 1.00 | 8 | 5.15 | 5.45 | 0.591 | 0.591 | 0.30 | 0.09 | 0.053 |
| 5.60 | 0.34 | 0.00 | | | 1.018 | 1.00 | 9 | 5.45 | 5.70 | 1.018 | 1.018 | 0.34 | 0.09 | 0.087 |
| 5.80 | 0.37 | 0.00 | | | 1.262 | 1.00 | 10 | 5.70 | 5.90 | 1.262 | 1.262 | 0.37 | 0.07 | 0.093 |
| 6.00 | 0.35 | 0.00 | | | 1.237 | 1.00 | 11 | 5.90 | 6.15 | 1.237 | 1.237 | 0.35 | 0.09 | 0.108 |
| 6.30 | 0.36 | 0.00 | | | 1.070 | 1.00 | 12 | 6.15 | 6.45 | 1.070 | 1.070 | 0.36 | 0.11 | 0.116 |
| 6.60 | 0.50 | 0.00 | | | 1.655 | 1.00 | 13 | 6.45 | 6.75 | 1.655 | 1.655 | 0.50 | 0.15 | 0.248 |
| 6.90 | 0.45 | 0.00 | | | 1.082 | 1.00 | 14 | 6.75 | 7.05 | 1.082 | 1.082 | 0.45 | 0.14 | 0.146 |
| 7.20 | 0.35 | 0.00 | | | 0.994 | 1.00 | 15 | 7.05 | 7.35 | 0.994 | 0.994 | 0.35 | 0.11 | 0.104 |
| 7.50 | 0.28 | 0.00 | | | 0.978 | 1.00 | 16 | 7.35 | 7.65 | 0.978 | 0.978 | 0.28 | 0.08 | 0.082 |
| 7.80 | 0.28 | 0.00 | | | 1.042 | 1.00 | 17 | 7.65 | 7.95 | 1.042 | 1.042 | 0.28 | 0.08 | 0.088 |
| 8.10 | 0.30 | 0.00 | | | 1.061 | 1.00 | 18 | 7.95 | 8.25 | 1.061 | 1.061 | 0.30 | 0.09 | 0.095 |
| 8.40 | 0.09 | 0.00 | | | 0.591 | 1.00 | 19 | 8.25 | 8.50 | 0.591 | 0.591 | 0.09 | 0.02 | 0.013 |
| 8.60 | 0.00 | 0.00 | | | 0.000 | 1.00 | 20 | 8.50 | 8.60 | 0.148 | 0.148 | 0.02 | 0.00 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 1.415 |

| | | |
|--|-------|---------------------|
| Total Flow: | 1.415 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.67 | (m ²) |
| Top Width: | 6.20 | (m) |
| Hydraulic Depth: | 0.270 | (m) |
| Mean Velocity: | 0.845 | (m/s) |
| Froude Number | 0.519 | |
| Photographs taken looking at: Upstream, downstream, across. | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 602 |
| Datalogger Internal Power: | 4.777 V |
| Datalogger External Power: | 13.29 V |
| Datalogger Memory Used: | 22% |
| Datalogger Clock: | Jul 15, 2005 12:50 MST |
| Laptop Clock: | Jul 15, 2005 12:52 MST |
| Dessicant: | 30% used |
| Datalogger: | 105801602 |
| PT: | 101353 |
| Power: | |

Notes:

TSS Sample Taken



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: September 1, 2005
Start Time: 10:35 AM MDT
End Time: 10:46 AM MDT

Weather Conditions:

+9 C overcast, calm.

River Conditions:

Open water, stage approaching bankfull

Personnel & Equipment

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

Level Readings

Bench Mark Reading: t post 1.916
Water Level Reading: 4.280
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.794
Other:

Setup No. 1

El: 306.476
El: 304.112
El: 308.392
El: 303.318

Setup No. 2

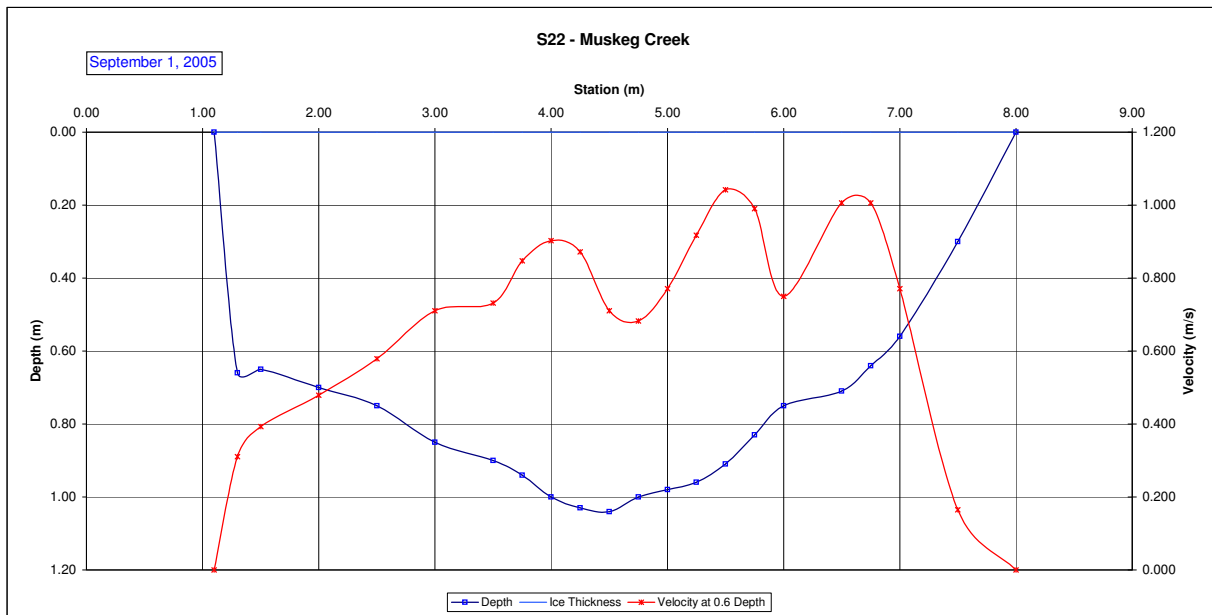
El: 306.476
El: 304.105
El: 308.456
El: 303.311

| 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) | (m²) | (m³/s) | | | | |
| 1.10 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 1.10 | 1.20 | 0.078 | 0.078 | 0.17 | 0.02 | 0.001 | | | | |
| 1.30 | 0.66 | 0.00 | | | 0.311 | 1.00 | 2 | 1.20 | 1.40 | 0.311 | 0.311 | 0.66 | 0.13 | 0.041 | | | | |
| 1.50 | 0.65 | 0.00 | | | 0.393 | 1.00 | 3 | 1.40 | 1.75 | 0.393 | 0.393 | 0.65 | 0.23 | 0.089 | | | | |
| 2.00 | 0.70 | 0.00 | | | 0.479 | 1.00 | 4 | 1.75 | 2.25 | 0.479 | 0.479 | 0.70 | 0.35 | 0.167 | | | | |
| 2.50 | 0.75 | 0.00 | | | 0.579 | 1.00 | 5 | 2.25 | 2.75 | 0.579 | 0.579 | 0.75 | 0.38 | 0.217 | | | | |
| 3.00 | 0.85 | 0.00 | | | 0.710 | 1.00 | 6 | 2.75 | 3.25 | 0.710 | 0.710 | 0.85 | 0.43 | 0.302 | | | | |
| 3.50 | 0.90 | 0.00 | | | 0.732 | 1.00 | 7 | 3.25 | 3.63 | 0.732 | 0.732 | 0.90 | 0.34 | 0.247 | | | | |
| 3.75 | 0.94 | 0.00 | | | 0.847 | 1.00 | 8 | 3.63 | 3.88 | 0.847 | 0.847 | 0.94 | 0.24 | 0.199 | | | | |
| 4.00 | 1.00 | 0.00 | | | 0.902 | 1.00 | 9 | 3.88 | 4.13 | 0.902 | 0.902 | 1.00 | 0.25 | 0.226 | | | | |
| 4.25 | 1.03 | 0.00 | | | 0.872 | 1.00 | 10 | 4.13 | 4.38 | 0.872 | 0.872 | 1.03 | 0.26 | 0.224 | | | | |
| 4.50 | 1.04 | 0.00 | | | 0.710 | 1.00 | 11 | 4.38 | 4.63 | 0.710 | 0.710 | 1.04 | 0.26 | 0.185 | | | | |
| 4.75 | 1.00 | 0.00 | | | 0.683 | 1.00 | 12 | 4.63 | 4.88 | 0.683 | 0.683 | 1.00 | 0.25 | 0.171 | | | | |
| 5.00 | 0.98 | 0.00 | | | 0.771 | 1.00 | 13 | 4.88 | 5.13 | 0.771 | 0.771 | 0.98 | 0.25 | 0.189 | | | | |
| 5.25 | 0.96 | 0.00 | | | 0.917 | 1.00 | 14 | 5.13 | 5.38 | 0.917 | 0.917 | 0.96 | 0.24 | 0.220 | | | | |
| 5.50 | 0.91 | 0.00 | | | 1.042 | 1.00 | 15 | 5.38 | 5.63 | 1.042 | 1.042 | 0.91 | 0.23 | 0.237 | | | | |
| 5.75 | 0.83 | 0.00 | | | 0.991 | 1.00 | 16 | 5.63 | 5.88 | 0.991 | 0.991 | 0.83 | 0.21 | 0.206 | | | | |
| 6.00 | 0.75 | 0.00 | | | 0.750 | 1.00 | 17 | 5.88 | 6.25 | 0.750 | 0.750 | 0.75 | 0.28 | 0.211 | | | | |
| 6.50 | 0.71 | 0.00 | | | 1.006 | 1.00 | 18 | 6.25 | 6.63 | 1.006 | 1.006 | 0.71 | 0.27 | 0.268 | | | | |
| 6.75 | 0.64 | 0.00 | | | 1.006 | 1.00 | 19 | 6.63 | 6.88 | 1.006 | 1.006 | 0.64 | 0.16 | 0.161 | | | | |
| 7.00 | 0.56 | 0.00 | | | 0.771 | 1.00 | 20 | 6.88 | 7.25 | 0.771 | 0.771 | 0.56 | 0.21 | 0.162 | | | | |
| 7.50 | 0.30 | 0.00 | | | 0.165 | 1.00 | 21 | 7.25 | 7.75 | 0.165 | 0.165 | 0.30 | 0.15 | 0.025 | | | | |
| 8.00 | 0.00 | 0.00 | | | 0.000 | 1.00 | 22 | 7.75 | 8.00 | 0.041 | 0.041 | 0.08 | 0.02 | 0.001 | | | | |
| Total Flow: | | | | | | | | | | | | | | 3.748 | | | | |

| | | |
|--|-------|---------------------|
| Total Flow: | 3.748 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 5.12 | (m ²) |
| Top Width: | 6.90 | (m) |
| Hydraulic Depth: | 0.742 | (m) |
| Mean Velocity: | 0.732 | (m/s) |
| Froude Number | 0.271 | |
| Photographs taken looking at: Upstream, downstream, across. | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 602 |
| Datalogger Internal Power: | 4.71 V |
| Datalogger External Power: | 13.84 V |
| Datalogger Memory Used: | 26% |
| Datalogger Clock: | Sep 01, 2005 09:18 MST |
| Laptop Clock: | Sep 01, 2005 09:20 MST |
| Dessicant: | 75% used-replaced |
| Datalogger: | 0204100602 |
| PT: | 101353 |
| Power: | |

Notes:
TSS Sample Taken



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: October 6, 2005
Start Time: 11:23 AM MDT
End Time: 11:44 AM MDT

Weather Conditions:

+8 C clear, wind from west.

River Conditions:

Open water, low stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: 1 post 0.913
Water Level Reading: 3.726
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.333
Other:

Setup No. 1

El: 306.476
El: 303.663
El: 307.389
El: 303.330

Setup No. 2

El: 306.476
El: 303.662
El: 307.281
El: 303.329

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 ²) | (m ³ /s) |
| 0.50 | 0.00 | 0.00 | | | 0.000 | 1.00 | 1 | 0.50 | 0.75 | -0.006 | -0.006 | 0.06 | 0.01 | 0.000 |
| 1.00 | 0.23 | 0.00 | | | -0.026 | 1.00 | 2 | 0.75 | 1.25 | -0.026 | -0.026 | 0.23 | 0.12 | -0.003 |
| 1.50 | 0.23 | 0.00 | | | 0.076 | 1.00 | 3 | 1.25 | 1.63 | 0.076 | 0.076 | 0.23 | 0.09 | 0.007 |
| 1.75 | 0.25 | 0.00 | | | 0.235 | 1.00 | 4 | 1.63 | 1.88 | 0.235 | 0.235 | 0.25 | 0.06 | 0.015 |
| 2.00 | 0.24 | 0.00 | | | 0.226 | 1.00 | 5 | 1.88 | 2.10 | 0.226 | 0.226 | 0.24 | 0.05 | 0.012 |
| 2.20 | 0.26 | 0.00 | | | 0.332 | 1.00 | 6 | 2.10 | 2.30 | 0.332 | 0.332 | 0.26 | 0.05 | 0.017 |
| 2.40 | 0.31 | 0.00 | | | 0.460 | 1.00 | 7 | 2.30 | 2.45 | 0.460 | 0.460 | 0.31 | 0.05 | 0.021 |
| 2.50 | 0.33 | 0.00 | | | 0.482 | 1.00 | 8 | 2.45 | 2.55 | 0.482 | 0.482 | 0.33 | 0.03 | 0.016 |
| 2.60 | 0.39 | 0.00 | | | 0.506 | 1.00 | 9 | 2.55 | 2.65 | 0.506 | 0.506 | 0.39 | 0.04 | 0.020 |
| 2.70 | 0.40 | 0.00 | | | 0.494 | 1.00 | 10 | 2.65 | 2.75 | 0.494 | 0.494 | 0.40 | 0.04 | 0.020 |
| 2.80 | 0.40 | 0.00 | | | 0.521 | 1.00 | 11 | 2.75 | 2.85 | 0.521 | 0.521 | 0.40 | 0.04 | 0.021 |
| 2.90 | 0.40 | 0.00 | | | 0.573 | 1.00 | 12 | 2.85 | 3.00 | 0.573 | 0.573 | 0.40 | 0.06 | 0.034 |
| 3.10 | 0.47 | 0.00 | | | 0.564 | 1.00 | 13 | 3.00 | 3.20 | 0.564 | 0.564 | 0.47 | 0.09 | 0.053 |
| 3.30 | 0.50 | 0.00 | | | 0.658 | 1.00 | 14 | 3.20 | 3.40 | 0.658 | 0.658 | 0.50 | 0.10 | 0.066 |
| 3.50 | 0.57 | 0.00 | | | 0.597 | 1.00 | 15 | 3.40 | 3.60 | 0.597 | 0.597 | 0.57 | 0.11 | 0.068 |
| 3.70 | 0.54 | 0.00 | | | 0.518 | 1.00 | 16 | 3.60 | 3.80 | 0.518 | 0.518 | 0.54 | 0.11 | 0.056 |
| 3.90 | 0.53 | 0.00 | | | 0.302 | 1.00 | 17 | 3.80 | 4.00 | 0.302 | 0.302 | 0.53 | 0.11 | 0.032 |
| 4.10 | 0.44 | 0.00 | | | 0.582 | 1.00 | 18 | 4.00 | 4.20 | 0.582 | 0.582 | 0.44 | 0.09 | 0.051 |
| 4.30 | 0.50 | 0.00 | | | 0.384 | 1.00 | 19 | 4.20 | 4.40 | 0.384 | 0.384 | 0.50 | 0.10 | 0.038 |
| 4.50 | 0.44 | 0.00 | | | 0.856 | 1.00 | 20 | 4.40 | 4.60 | 0.856 | 0.856 | 0.44 | 0.09 | 0.075 |
| 4.70 | 0.51 | 0.00 | | | 0.823 | 1.00 | 21 | 4.60 | 4.80 | 0.823 | 0.823 | 0.51 | 0.10 | 0.084 |
| 4.90 | 0.40 | 0.00 | | | 0.759 | 1.00 | 22 | 4.80 | 5.00 | 0.759 | 0.759 | 0.40 | 0.08 | 0.061 |
| 5.10 | 0.31 | 0.00 | | | 0.649 | 1.00 | 23 | 5.00 | 5.20 | 0.649 | 0.649 | 0.31 | 0.06 | 0.040 |
| 5.30 | 0.25 | 0.00 | | | 0.716 | 1.00 | 24 | 5.20 | 5.40 | 0.716 | 0.716 | 0.25 | 0.05 | 0.036 |
| 5.50 | 0.23 | 0.00 | | | 0.835 | 1.00 | 25 | 5.40 | 5.60 | 0.835 | 0.835 | 0.23 | 0.05 | 0.038 |
| 5.70 | 0.20 | 0.00 | | | 0.594 | 1.00 | 26 | 5.60 | 5.85 | 0.594 | 0.594 | 0.20 | 0.05 | 0.030 |
| 6.00 | 0.15 | 0.00 | | | 0.735 | 1.00 | 27 | 5.85 | 6.13 | 0.735 | 0.735 | 0.15 | 0.04 | 0.030 |
| 6.25 | 0.11 | 0.00 | | | 0.058 | 1.00 | 28 | 6.13 | 6.43 | 0.058 | 0.058 | 0.11 | 0.03 | 0.002 |
| 6.60 | 0.00 | 0.00 | | | 0.000 | 1.00 | 29 | 6.43 | 6.60 | 0.014 | 0.014 | 0.03 | 0.00 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 0.941 | |

| | | |
|--|-------|---------------------|
| Total Flow: | 0.941 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.91 | (m ²) |
| Top Width: | 6.10 | (m) |
| Hydraulic Depth: | 0.313 | (m) |
| Mean Velocity: | 0.493 | (m/s) |
| Froude Number | 0.281 | |
| Photographs taken looking at: Upstream, downstream, across. | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 602 |
| Datalogger Internal Power: | 4.73 V |
| Datalogger External Power: | 13.82 V |
| Datalogger Memory Used: | 29% |
| Datalogger Clock: | Oct 06, 2005 10:16 MST |
| Laptop Clock: | Oct 06, 2005 10:20 MST |
| Dessicant: | 5% used |
| Datalogger: | 0204100602 |
| PT: | 101353 |
| Power: | |

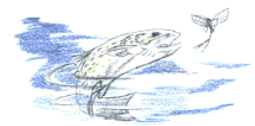
Notes:

TSS Sample Taken



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: October 7, 2005
 Start Time: 8:32 AM MDT
 End Time: MDT

Weather Conditions: +8 °C partly cloudy, light wind.

River Conditions: Open water, stage falling

Personnel & Equipment

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

Level Readings

Bench Mark Reading: t post 0.726
 Water Level Reading: 3.541
 Top of Ice Level Reading:
 Transducer Reading & Calc'd El: 0.354
 Other:

Setup No. 1

El: 306.476
 El: 303.661
 El: 307.202
 El: 303.307

Setup No. 2

El: 306.476
 El: 303.661
 El: 307.275
 El: 303.307

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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | Total Flow: | - |

| | | |
|--------------------------------|--|---------------------|
| Total Flow: | | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across. | | |

Notes: Transducer removed for winter

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database # 602 |
| Datalogger Internal Power: | 4.692 V |
| Datalogger External Power: | 12.32 V |
| Datalogger Memory Used: | 29% |
| Datalogger Clock: | Oct 07, 2005 07:32 MST |
| Laptop Clock: | Oct 07, 2005 07:36 MST |
| Dessicant: | Good |
| Datalogger: | 0204100602 |
| PT: | 101353 |
| Power: | |

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: March 9, 2005
Date of Measurement: 10:15 AM MST
Start Time: 12:24 PM MST
End Time:

Personnel & Equipment

Measurement Made By: ND/CT/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Level Readings

Table with 3 columns: Reading Type, Setup No. 1, Setup No. 2. Rows include Bench Mark Reading, Water Level Reading, Top of Ice Level Reading, Transducer Reading & Calc'd El., and Other.

Weather Conditions: 0 C, Overcast, windy

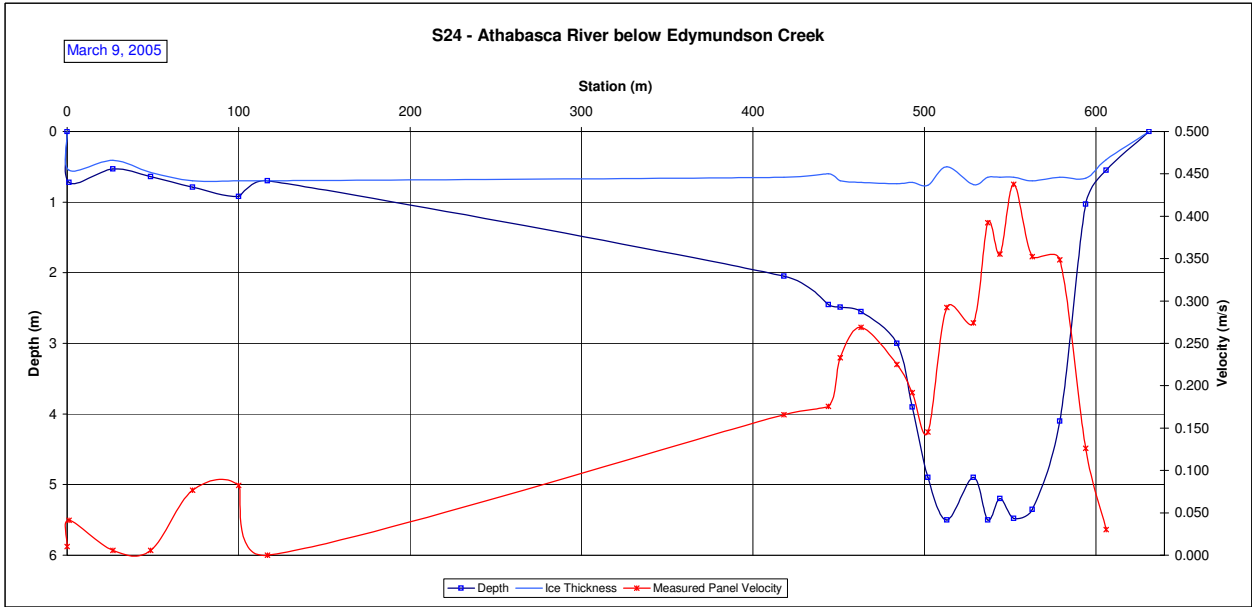
River Conditions: Ice Cover

Main data table with 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 rows: Total Flow, Pervel Measurement Quality, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number, Photographs taken looking at.

Datalogger Notes table with rows: Datalogger Internal Power, Datalogger External Power, Datalogger Memory Used, Datalogger Clock, Laptop Clock, Dessicant, Datalogger, PT, Power.

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: April 11, 2005
 Start Time: MDT
 End Time: MDT

Weather Conditions:

River Conditions:

Personnel & Equipment

Measurement Made By:
 Data Entry By: ND
 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.: 1.390
 Other: T-post

Setup No. 1

El: 231.096
 El:
 El:
 El:
 El:

Setup No. 2

El: 231.096
 El:
 El:
 El:
 El:

| 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) | (m ²) | (m ³ /s) | | |
| | | | | | | | | | | | | | | - | | |

| | | |
|-------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Pereived Measurement Quality: | - | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (m) |
| Mean Velocity: | - | (m/s) |
| Froude Number | - | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database #278 |
| Datalogger Internal Power: | 4.648 V |
| Datalogger External Power: | 13.87 V |
| Datalogger Memory Used: | 19% |
| Datalogger Clock: | Apr 11, 2005 10:50 MST |
| Laptop Clock: | Apr 11, 2005 10:59 MST |
| Dessicant: | |
| Datalogger: | 104170278 |
| PT: | 101353 |
| Power: | |

Notes: Could not visit the site due to unsafe ice conditions.
 Hence remotely downloaded the data from office on April 11.

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: April 28, 2005
Start Time: 1:45 PM MDT
End Time: MDT

Weather Conditions: 0 °C, Partly cloudy, gusty
River Conditions: Open, very wavy water surface

Personnel & Equipment

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

Level Readings

Bench Mark Reading: nail in tree 0.308
Water Level Reading: 3.565
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Other: T-post 0.054
Approx. High water mark 0.445

Setup No. 1

El: 231.096
El: 227.839
El:
El:
El: 230.959

Setup No. 2

El: 231.096
El: 227.830
El:
El:
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 | Percentage of Total | |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) | | |
| | | | | | | | | | | | | | | - | | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | - | |
| Total Area: | - | (m ²) |
| Top Width: | - | (m) |
| Hydraulic Depth: | - | (m) |
| Mean Velocity: | - | (m/s) |
| Froude Number | - | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database #278 |
| Datalogger Internal Power: | 4.69 V |
| Datalogger External Power: | 14.49 V |
| Datalogger Memory Used: | 20% |
| Datalogger Clock: | Apr 28, 2005 12:43 MST |
| Laptop Clock: | Apr 28, 2005 12:59 MST |
| Dessicant: | Good |
| Datalogger: | 104170278 |
| PT: | 101879 |
| Power: | |

Notes: Transducer found completely destroyed on arrival at site. Apparently destroyed during ice break-up.
TSS sample taken.
Manual measurement not possible due to bad weather and extremely choppy water surface.

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 1, 2005
Start Time: 2:20 PM MDT
End Time: 3:25 PM MDT

Weather Conditions:

25 C, Partly cloudy, light wind

River Conditions:

Open, stage dropping

Personnel & Equipment

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

Level Readings

Bench Mark Reading: nail in tree 0.268
Water Level Reading: 3.514
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 2.911
Other: T-post 0.013

Setup No. 1

El: 231.096
El: 227.850
El: 224.939
El: 231.351

Setup No. 2

0.294 El: 231.096
3.563 El: 227.827
El:
2.911 El: 224.916
0.042 El: 231.348

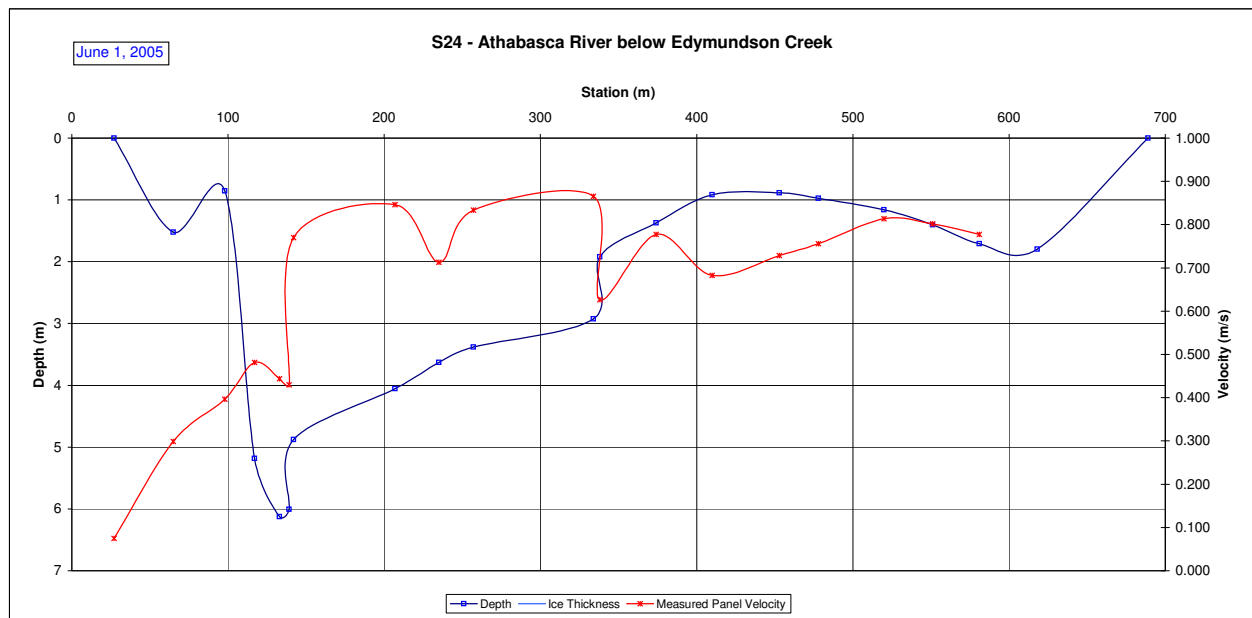
Measurement Data

| 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) | | |
| 27 | 0 | | 0 | 0 | | 1.0 | 1 | 27 | 46 | 0.075 | 0.075 | 0.381 | 7.239 | 0.541 | 0% | |
| 65 | 1.52 | | 0.2835 | 0.3139 | | 1.0 | 2 | 46 | 81.5 | 0.299 | 0.299 | 1.524 | 54.102 | 16.160 | 2% | |
| 98 | 0.85 | | | | 0.396 | 1.0 | 3 | 81.5 | 107.5 | 0.396 | 0.396 | 0.853 | 22.189 | 8.792 | 1% | |
| 117 | 5.18 | | 0.4755 | 0.4877 | | 1.0 | 4 | 107.5 | 125 | 0.482 | 0.482 | 5.182 | 90.678 | 43.669 | 4% | |
| 133 | 6.13 | | 0.6126 | 0.2743 | | 1.0 | 5 | 125 | 136 | 0.443 | 0.443 | 6.126 | 67.391 | 29.887 | 3% | |
| 139 | 6.00 | | 0.5456 | 0.3139 | | 1.0 | 6 | 136 | 140.5 | 0.430 | 0.430 | 6.005 | 27.021 | 11.613 | 1% | |
| 142 | 4.88 | | 1.0363 | 0.5029 | | 1.0 | 7 | 140.5 | 174.5 | 0.770 | 0.770 | 4.877 | 165.811 | 127.612 | 12% | |
| 207 | 4.05 | | 1.0363 | 0.6553 | | 1.0 | 8 | 174.5 | 221 | 0.846 | 0.846 | 4.054 | 188.504 | 159.440 | 15% | |
| 235 | 3.63 | | 1.0119 | 0.4145 | | 1.0 | 9 | 221 | 246 | 0.713 | 0.713 | 3.627 | 90.678 | 64.674 | 6% | |
| 257 | 3.38 | | 0.9510 | 0.7163 | | 1.0 | 10 | 246 | 295.5 | 0.834 | 0.834 | 3.383 | 167.472 | 139.610 | 14% | |
| 334 | 2.93 | | 0.9083 | 0.8230 | | 1.0 | 11 | 295.5 | 336 | 0.866 | 0.866 | 2.926 | 118.506 | 102.583 | 10% | |
| 338 | 1.92 | | 0.7132 | 0.5395 | | 1.0 | 12 | 336 | 356 | 0.626 | 0.626 | 1.920 | 38.405 | 24.055 | 2% | |
| 374 | 1.37 | | 0.8687 | 0.6858 | | 1.0 | 13 | 356 | 392 | 0.777 | 0.777 | 1.372 | 49.378 | 38.378 | 4% | |
| 410 | 0.91 | | | | 0.683 | 1.0 | 14 | 392 | 431.5 | 0.683 | 0.683 | 0.914 | 36.119 | 24.660 | 2% | |
| 453 | 0.88 | | | | 0.728 | 1.0 | 15 | 431.5 | 465.5 | 0.728 | 0.728 | 0.884 | 30.053 | 21.893 | 2% | |
| 478 | 0.98 | | | | 0.756 | 1.0 | 16 | 465.5 | 499 | 0.756 | 0.756 | 0.975 | 32.675 | 24.699 | 2% | |
| 520 | 1.16 | | | | 0.814 | 1.0 | 17 | 499 | 535.5 | 0.814 | 0.814 | 1.158 | 42.276 | 34.405 | 3% | |
| 551 | 1.40 | | 0.914 | 0.689 | | 1.0 | 18 | 535.5 | 566 | 0.802 | 0.802 | 1.402 | 42.763 | 34.280 | 3% | |
| 581 | 1.71 | | 0.823 | 0.732 | | 1.0 | 19 | 566 | 599.5 | 0.777 | 0.777 | 1.707 | 57.180 | 44.443 | 4% | |
| 618 | 1.80 | | 0.853 | 0.710 | | 1.0 | 20 | 599.5 | 653.5 | 0.782 | 0.782 | 1.798 | 97.109 | 75.921 | 7% | |
| 689 | 0 | | 0.000 | 0.000 | | 1.0 | 21 | 653.5 | 689 | 0.195 | 0.195 | 0.450 | 15.960 | 3.119 | 0% | |
| | | | | | | | | | | | | | Total Flow | 1030.435 | | |

| | | |
|---|----------|---------------------|
| Total Flow: | 1030.435 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1441.51 | (m ²) |
| Top Width: | 662.00 | (m) |
| Hydraulic Depth: | 2.178 | (m) |
| Mean Velocity: | 0.715 | (m/s) |
| Froude Number | 0.155 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|----------------------------|---------------------------|
| Datalogger Notes: | Database #278 |
| Datalogger Internal Power: | 4.7 V |
| Datalogger External Power: | 13.87 V |
| Datalogger Memory Used: | 23% |
| Datalogger Clock: | Jun 01, 2005 11:49 MST |
| Laptop Clock: | Jun 01, 2005 12:05 MST |
| Dessicant: | Good |
| Datalogger: | Optimum DD-128 #104170278 |
| PT: | Keller 10 psi #503363 |
| Power: | Battery and Solar Panel |

Notes: New transducer installed - No download. Calibration constants are m = 2.84681, and b = -0.105901
TSS sample taken.



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: July 16, 2005
Start Time: 2:00 PM MDT
End Time: 3:20 PM MDT

Weather Conditions:

20 C, Overcast, raining, wind from N

River Conditions:

Open, high stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: nail in tree 0.817
Water Level Reading: 4.256
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 2.964
Other: T-post 0.593

Setup No. 1

El: 231.096
El: 227.657
El: 224.693
El: 231.320

Setup No. 2

El: 231.096
El: 227.683
El: 224.719
El: 231.350

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 ²) | (m ³ /s) | | |
| 0 | 0 | | 0 | 0 | | 1.0 | 1 | 0 | 12.85 | 0.182 | 0.182 | 0.411 | 5.288 | 0.965 | 0% | |
| 25.7 | 1.65 | | 0.811 | 0.649 | | 1.0 | 2 | 12.85 | 53.9 | 0.730 | 0.730 | 1.646 | 67.565 | 49.322 | 4% | |
| 82.1 | 1.58 | | 0.978 | 0.716 | | 1.0 | 3 | 53.9 | 106.05 | 0.847 | 0.847 | 1.585 | 82.656 | 70.038 | 5% | |
| 130 | 1.71 | | 1.000 | 0.457 | | 1.0 | 4 | 106.05 | 156.5 | 0.728 | 0.728 | 1.707 | 86.112 | 62.730 | 5% | |
| 183 | 1.40 | | 0.725 | 0.628 | | 1.0 | 5 | 156.5 | 216.5 | 0.677 | 0.677 | 1.402 | 84.125 | 56.924 | 4% | |
| 250 | 1.92 | | 0.796 | 0.613 | | 1.0 | 6 | 216.5 | 279.5 | 0.704 | 0.704 | 1.920 | 120.975 | 85.177 | 6% | |
| 309 | 2.13 | | 1.131 | 0.942 | | 1.0 | 7 | 279.5 | 329.5 | 1.036 | 1.036 | 2.134 | 106.680 | 110.555 | 8% | |
| 350 | 2.87 | | 0.945 | 0.576 | | 1.0 | 8 | 329.5 | 370 | 0.760 | 0.760 | 2.865 | 116.037 | 88.244 | 6% | |
| 390 | 3.11 | | 1.173 | 0.704 | | 1.0 | 9 | 370 | 411.5 | 0.939 | 0.939 | 3.109 | 129.022 | 121.124 | 9% | |
| 433 | 3.69 | | 1.103 | 0.850 | | 1.0 | 10 | 411.5 | 451 | 0.977 | 0.977 | 3.688 | 145.679 | 142.312 | 10% | |
| 469 | 4.85 | | 1.000 | 0.223 | | 1.0 | 11 | 451 | 482 | 0.611 | 0.611 | 4.846 | 150.236 | 91.813 | 7% | |
| 495 | 4.97 | | 0.872 | 0.539 | | 1.0 | 12 | 482 | 518 | 0.706 | 0.706 | 4.968 | 178.857 | 126.203 | 9% | |
| 541 | 6.00 | | 1.027 | 0.756 | | 1.0 | 13 | 518 | 549.5 | 0.892 | 0.892 | 6.005 | 189.144 | 168.629 | 12% | |
| 558 | 5.82 | | 1.024 | 0.796 | | 1.0 | 14 | 549.5 | 569 | 0.910 | 0.910 | 5.822 | 113.523 | 103.286 | 7% | |
| 580 | 5.49 | | 0.799 | 0.802 | | 1.0 | 15 | 569 | 590 | 0.800 | 0.800 | 5.486 | 115.214 | 92.183 | 7% | |
| 600 | 1.25 | | | | 0.415 | 1.0 | 16 | 590 | 624 | 0.415 | 0.415 | 1.250 | 42.489 | 17.613 | 1% | |
| 648 | 0 | | | | 0 | 1.0 | 17 | 624 | 648 | 0.104 | 0.104 | 0.312 | 7.498 | 0.777 | 0% | |
| | | | | | | | | | | | | | Total Flow | 1387.894 | | |

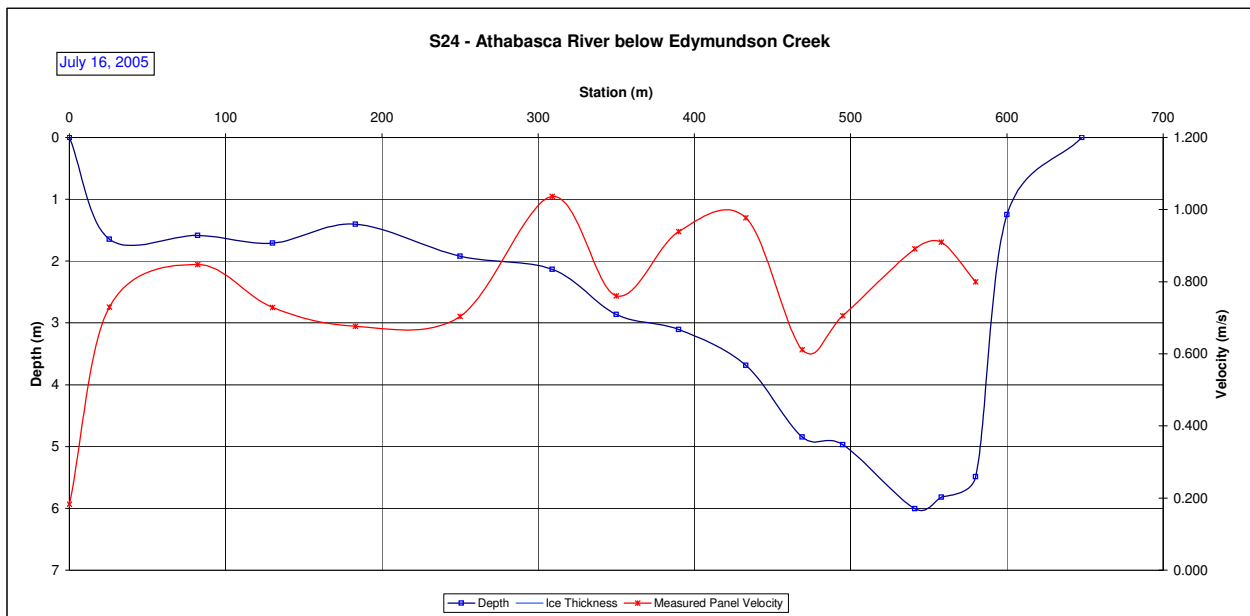
| | | |
|--------------------------------|---------|---------------------|
| Total Flow: | 1387.89 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1741.10 | (m ²) |
| Top Width: | 648.00 | (m) |
| Hydraulic Depth: | 2.687 | (m) |
| Mean Velocity: | 0.797 | (m/s) |
| Froude Number | 0.155 | |

Photographs taken looking at:

Upstream, downstream, across

| | |
|----------------------------|---------------------------|
| Datalogger Notes: | Database #278 |
| Datalogger Internal Power: | 4.728 V |
| Datalogger External Power: | 13.67 V |
| Datalogger Memory Used: | 26% |
| Datalogger Clock: | Jul 16, 2005 11:55 MST |
| Laptop Clock: | Jul 16, 2005 12:13 MST |
| Dessicant: | Good |
| Datalogger: | Optimum DD-128 #104170278 |
| PT: | Keller 10 psi #503363 |
| Power: | Battery and Solar Panel |

Notes: TSS sample taken.



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: Sep 5 2005
Start Time: 10:30 AM MDT
End Time: 12:12 PM MDT

Personnel & Equipment

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

Level Readings

Bench Mark Reading: nail in tree 0.214
Water Level Reading: 4.221
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 2.391
Other: T-post -0.038

Setup No. 1

El: 231.096
El: 227.089
El:
El: 224.698
El: 231.348

Setup No. 2

El: 231.096
El: 227.082
El:
El: 224.691
El: 230.352

Weather Conditions: 13 C, Partly cloudy, light wind

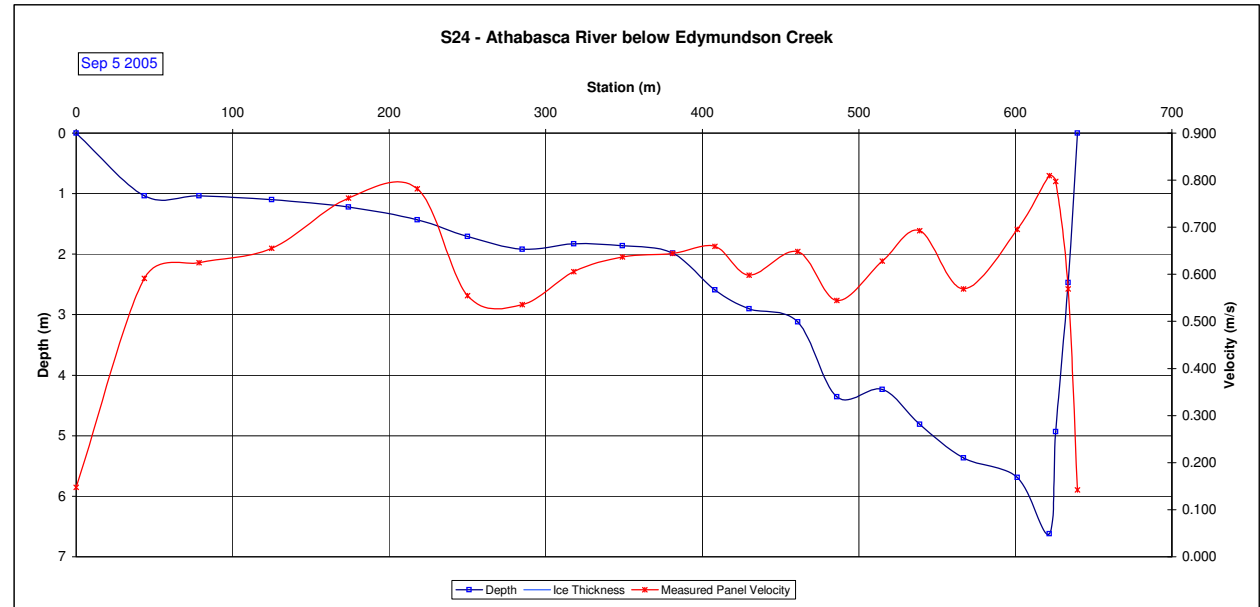
River Conditions: Open, stage low and dropping

| 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 ²) | (m ³ /s) | | | |
| 0 | 0 | | | | 0.000 | 1.0 | 1 | 0 | 21.8 | 0.148 | 0.148 | 0.259 | 5.648 | 0.835 | | | |
| 43.6 | 1.04 | | | | 0.591 | 1.0 | 2 | 22 | 61 | 0.591 | 0.591 | 1.036 | 40.727 | 24.083 | | | |
| 78.6 | 1.04 | | | | 0.625 | 1.0 | 3 | 61 | 102 | 0.625 | 0.625 | 1.036 | 42.178 | 26.355 | | | |
| 125 | 1.10 | | | | 0.655 | 1.0 | 4 | 102 | 150 | 0.655 | 0.655 | 1.097 | 52.340 | 34.300 | | | |
| 174 | 1.22 | | 0.811 | 0.713 | | 1.0 | 5 | 150 | 196 | 0.762 | 0.762 | 1.219 | 56.693 | 43.200 | | | |
| 218 | 1.43 | | 0.838 | 0.725 | | 1.0 | 6 | 196 | 234 | 0.782 | 0.782 | 1.433 | 54.437 | 42.560 | | | |
| 250 | 1.71 | | 0.614 | 0.496 | | 1.0 | 7 | 234 | 268 | 0.555 | 0.555 | 1.707 | 57.180 | 31.734 | | | |
| 285 | 1.92 | | 0.619 | 0.453 | | 1.0 | 8 | 268 | 302 | 0.536 | 0.536 | 1.920 | 65.288 | 34.967 | | | |
| 318 | 1.83 | | 0.640 | 0.571 | | 1.0 | 9 | 302 | 334 | 0.606 | 0.606 | 1.829 | 58.522 | 35.442 | | | |
| 349 | 1.86 | | 0.692 | 0.582 | | 1.0 | 10 | 334 | 365 | 0.637 | 0.637 | 1.859 | 58.567 | 37.300 | | | |
| 381 | 1.98 | | 0.660 | 0.629 | | 1.0 | 11 | 365 | 395 | 0.644 | 0.644 | 1.981 | 58.445 | 37.664 | | | |
| 408 | 2.59 | | 0.759 | 0.560 | | 1.0 | 12 | 395 | 419 | 0.660 | 0.660 | 2.591 | 63.475 | 41.862 | | | |
| 430 | 2.90 | | 0.662 | 0.535 | | 1.0 | 13 | 419 | 446 | 0.598 | 0.598 | 2.905 | 76.976 | 46.038 | | | |
| 461 | 3.12 | | 0.707 | 0.591 | | 1.0 | 14 | 446 | 474 | 0.649 | 0.649 | 3.118 | 87.307 | 56.639 | | | |
| 486 | 4.36 | | 0.670 | 0.418 | | 1.0 | 15 | 474 | 501 | 0.544 | 0.544 | 4.356 | 117.601 | 63.999 | | | |
| 515 | 4.23 | | 0.765 | 0.491 | | 1.0 | 16 | 501 | 527 | 0.628 | 0.628 | 4.234 | 112.192 | 70.486 | | | |
| 539 | 4.81 | | 0.800 | 0.586 | | 1.0 | 17 | 527 | 553 | 0.693 | 0.693 | 4.813 | 125.133 | 86.706 | | | |
| 567 | 5.36 | | 0.694 | 0.444 | | 1.0 | 18 | 553 | 584 | 0.569 | 0.569 | 5.364 | 167.157 | 95.111 | | | |
| 601 | 5.69 | | 0.767 | 0.623 | | 1.0 | 19 | 584 | 612 | 0.695 | 0.695 | 5.688 | 155.782 | 108.280 | | | |
| 622 | 6.62 | | 0.907 | 0.711 | | 1.0 | 20 | 612 | 624 | 0.809 | 0.809 | 6.617 | 80.796 | 65.388 | | | |
| 626 | 4.93 | | 0.832 | 0.763 | | 1.0 | 21 | 624 | 630 | 0.797 | 0.797 | 4.935 | 29.312 | 23.375 | | | |
| 634 | 2.47 | | 0.711 | 0.427 | | 1.0 | 22 | 630 | 637 | 0.569 | 0.569 | 2.469 | 17.109 | 9.735 | | | |
| 640 | 0 | | 0.000 | 0.000 | | 1.0 | 23 | 637 | 640 | 0.142 | 0.142 | 0.617 | 1.833 | 0.261 | | | |
| | | | | | | | | | | | | | Total Flow | 1016 | | | |

| | | |
|--------------------------------|---------|---------------------|
| Total Flow: | 1016 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1584.70 | (m ²) |
| Top Width: | 639.60 | (m) |
| Hydraulic Depth: | 2.478 | (m) |
| Mean Velocity: | 0.641 | (m/s) |
| Froude Number | 0.130 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

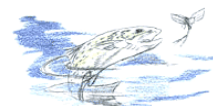
Notes: TSS sample taken.

| | |
|----------------------------|---------------------------|
| Datalogger Notes: | Database #278 |
| Datalogger Internal Power: | 4.7 V |
| Datalogger External Power: | 14.02 V |
| Datalogger Memory Used: | 30% |
| Datalogger Clock: | Sep 05, 2005 11:08 MST |
| Laptop Clock: | Sep 05, 2005 11:26 MST |
| Dessicant: | Good |
| Datalogger: | Optimum DD-128 #104170278 |
| PT: | Keller 10 psi #503363 |
| Power: | Battery and Solar Panel |



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: Oct 12 2005
Start Time: 11:36 AM MDT
End Time: 1:05 PM MDT

Weather Conditions:

2 C, overcast, calm

River Conditions:

Open, low stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: nail in tree 0.551
Water Level Reading: 4.930
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 2.021
Other: T-post 0.291

Setup No. 1

El: 231.096
El: 226.717
El:
El: 224.696
El: 231.356

Setup No. 2

El: 231.096
El: 226.714
El:
El: 224.693
El: 231.356

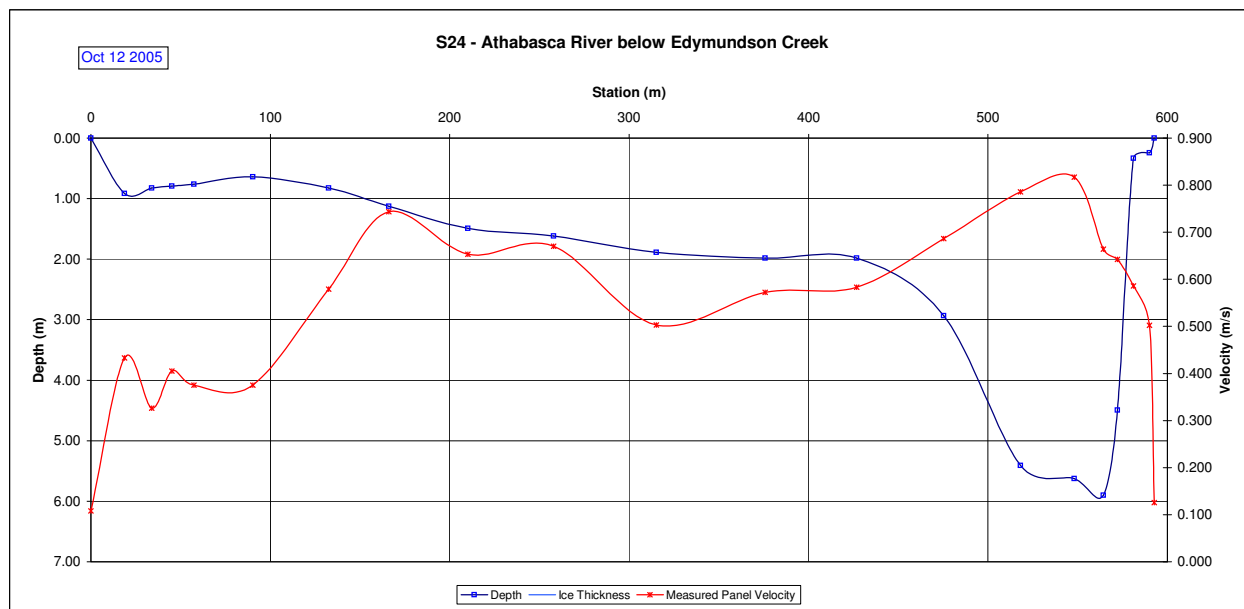
LB

| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| 0 | 0.00 | | | | 0.000 | 1.0 | 1 | 0 | 9.4 | 0.108 | 0.108 | 0.229 | 2.144 | 0.232 |
| 18.8 | 0.91 | | | | 0.433 | 1.0 | 2 | 9.4 | 26.3 | 0.433 | 0.433 | 0.914 | 15.502 | 6.709 |
| 33.9 | 0.82 | | | | 0.326 | 1.0 | 3 | 26.3 | 39.5 | 0.326 | 0.326 | 0.823 | 10.864 | 3.543 |
| 45.2 | 0.79 | | | | 0.405 | 1.0 | 4 | 39.5 | 51.3 | 0.405 | 0.405 | 0.792 | 9.298 | 3.769 |
| 57.4 | 0.76 | | | | 0.375 | 1.0 | 5 | 51.3 | 73.8 | 0.375 | 0.375 | 0.762 | 17.152 | 6.431 |
| 90.2 | 0.64 | | | | 0.375 | 1.0 | 6 | 73.8 | 111.3 | 0.375 | 0.375 | 0.640 | 24.049 | 9.016 |
| 132.5 | 0.82 | | | | 0.579 | 1.0 | 7 | 111.3 | 149.2 | 0.579 | 0.579 | 0.823 | 31.187 | 18.061 |
| 166.0 | 1.13 | | 0.814 | 0.674 | | 1.0 | 8 | 149.2 | 188.0 | 0.744 | 0.744 | 1.128 | 43.737 | 32.528 |
| 210.1 | 1.49 | | 0.705 | 0.601 | | 1.0 | 9 | 188.0 | 234.0 | 0.653 | 0.653 | 1.494 | 68.701 | 44.865 |
| 258.0 | 1.62 | | 0.692 | 0.649 | | 1.0 | 10 | 234.0 | 286.6 | 0.670 | 0.670 | 1.615 | 84.857 | 56.879 |
| 315.1 | 1.89 | | 0.623 | 0.384 | | 1.0 | 11 | 286.6 | 345.5 | 0.503 | 0.503 | 1.890 | 111.371 | 56.048 |
| 375.8 | 1.98 | | 0.657 | 0.487 | | 1.0 | 12 | 345.5 | 401.3 | 0.572 | 0.572 | 1.981 | 110.655 | 63.319 |
| 426.8 | 1.98 | | 0.666 | 0.500 | | 1.0 | 13 | 401.3 | 451.1 | 0.583 | 0.583 | 1.981 | 98.578 | 57.471 |
| 475.4 | 2.94 | | 0.752 | 0.621 | | 1.0 | 14 | 451.1 | 496.8 | 0.686 | 0.686 | 2.935 | 134.067 | 92.030 |
| 518.2 | 5.41 | | 0.858 | 0.713 | | 1.0 | 15 | 496.8 | 533.2 | 0.786 | 0.786 | 5.410 | 196.853 | 154.646 |
| 548.1 | 5.63 | | 0.821 | 0.813 | | 1.0 | 16 | 533.2 | 556.3 | 0.817 | 0.817 | 5.627 | 130.008 | 106.196 |
| 564.4 | 5.90 | | 0.780 | 0.547 | | 1.0 | 17 | 556.3 | 568.3 | 0.664 | 0.664 | 5.901 | 70.812 | 47.006 |
| 572.1 | 4.49 | | 0.707 | 0.578 | | 1.0 | 18 | 568.3 | 576.6 | 0.642 | 0.642 | 4.493 | 37.582 | 24.138 |
| 581.1 | 0.34 | | 0.627 | 0.545 | | 1.0 | 19 | 576.6 | 585.6 | 0.586 | 0.586 | 0.335 | 3.013 | 1.766 |
| 590.1 | 0.24 | | | | 0.502 | 1.0 | 20 | 585.6 | 591.4 | 0.502 | 0.502 | 0.244 | 1.407 | 0.706 |
| 592.7 | 0.00 | | | | 0.000 | 1.0 | 21 | 591.4 | 592.7 | 0.126 | 0.126 | 0.061 | 0.078 | 0.010 |
| | | | | | | | | | | | | | Total Flow | 785 |

| | | |
|--------------------------------|---------|---------------------|
| Total Flow: | 785 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1201.91 | (m ²) |
| Top Width: | 592.67 | (m) |
| Hydraulic Depth: | 2.028 | (m) |
| Mean Velocity: | 0.653 | (m/s) |
| Froude Number | 0.146 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|---------------------------|---------------|
| Datalogger Notes: | | Database #278 |
| Datalogger Internal Power: | 4.7 V | |
| Datalogger External Power: | 13.34 V | |
| Datalogger Memory Used: | 33% | |
| Datalogger Clock: | Oct 12, 2005 12:00 | MST |
| Laptop Clock: | Oct 12, 2005 12:19 | MST |
| Dessicant: | Good | |
| Datalogger: | Optimum DD-128 #104170278 | |
| PT: | Keller 10 psi #503363 | |
| Power: | Battery and Solar Panel | |

Notes: TSS sample taken.



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: November 3, 2005
Start Time: 2:30 PM MST
End Time: MST

Weather Conditions:

0 C, overcast, calm

River Conditions:

Open, low stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: nail in tree 0.399
Water Level Reading: 5.095
Top of Ice Level Reading:
Transducer Reading & Calc'd El.: 1.681
Other: T-post 0.143

Setup No. 1

El: 231.096
El: 226.400
El: 224.719
El: 231.352

Setup No. 2

El: 231.096
El: 226.394
El: 224.713
El: 231.353

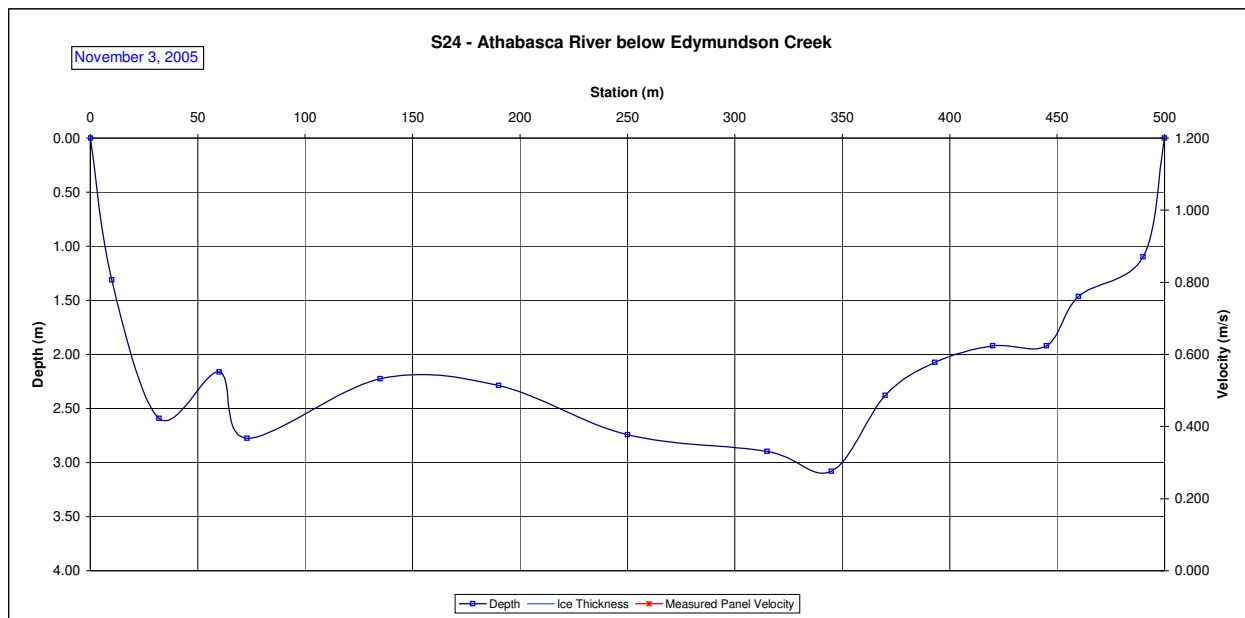
Measurement Data

| | 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 | |
| LB | (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) | |
| | 0 | 0.00 | | | | | | | | | | | | | | |
| | 10.0 | 1.31 | | | | | | | | | | | | | | |
| | 32.0 | 2.59 | | | | | | | | | | | | | | |
| | 60.0 | 2.16 | | | | | | | | | | | | | | |
| | 73.0 | 2.77 | | | | | | | | | | | | | | |
| | 135.0 | 2.23 | | | | | | | | | | | | | | |
| | 190.0 | 2.29 | | | | | | | | | | | | | | |
| | 250.0 | 2.74 | | | | | | | | | | | | | | |
| | 315.0 | 2.90 | | | | | | | | | | | | | | |
| | 345.0 | 3.08 | | | | | | | | | | | | | | |
| | 370.0 | 2.38 | | | | | | | | | | | | | | |
| | 393.0 | 2.07 | | | | | | | | | | | | | | |
| | 420.0 | 1.92 | | | | | | | | | | | | | | |
| | 445.0 | 1.92 | | | | | | | | | | | | | | |
| | 460.0 | 1.46 | | | | | | | | | | | | | | |
| RB | 490.0 | 1.10 | | | | | | | | | | | | | | |
| | 500.0 | 0.00 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | Total Flow | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|---------------------------|
| Datalogger Notes: | Database #278 |
| Datalogger Internal Power: | 4.679 V |
| Datalogger External Power: | 12.57 V |
| Datalogger Memory Used: | 35% |
| Datalogger Clock: | Nov 03, 2005 14:09 MST |
| Laptop Clock: | Nov 03, 2005 14:29 MST |
| Dessicant: | Good |
| Datalogger: | Optimum DD-128 #104170278 |
| PT: | Keller 10 psi #503363 |
| Power: | Battery and Solar Panel |

Notes: Site reconnaissance carried out to determine a new flow measurement section across the river. New left bank for flow measurement is about 2.5 kms downstream of station location, new left bank flagged and marked in GPS as S24NLB. Depth profile measured at new measurement section.



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: December 9, 2005
 Start Time: 1:30 PM MST
 End Time: MST

Weather Conditions: +2 C, overcast, calm

River Conditions: Partial ice cover, open in places

Personnel & Equipment

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

Level Readings

Bench Mark Reading: nail in tree 0.498
 Water Level Reading: 5.665
 Top of Ice Level Reading: 5.674
 Transducer Reading & Calc'd El.: 1.191
 Other: T-post 0.242

Setup No. 1

El: 231.096
 El: 225.929
 El: 224.738
 El: 231.352

Setup No. 2

El: 231.096
 El: 225.926
 El: 224.735
 El: 231.352

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 ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | Total Flow | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: Open spots in ice, unsafe for manual flow measurement.

| | |
|----------------------------|---------------------------|
| Datalogger Notes: | Database #278 |
| Datalogger Internal Power: | 4.699 V |
| Datalogger External Power: | 13.24 V |
| Datalogger Memory Used: | 38% |
| Datalogger Clock: | Dec 09, 2005 13:30 MST |
| Laptop Clock: | Dec 09, 2005 13:53 MST |
| Dessicant: | Good |
| Datalogger: | Optimum DD-128 #104170278 |
| PT: | Keller 10 psi #503363 |
| Power: | Battery and Solar Panel |

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: January 10, 2005
Start Time: 12:05 PM MST
End Time: 12:30 PM MST

Weather Conditions:

-25 C, clear, calm

River Conditions:

Ice cover

Personnel & Equipment

Measurement Made By: ND/DB
Data Entry By: DB
Meter Type and No.: Marsh Mc Birney FloMate 2000

Level Readings and Measurements

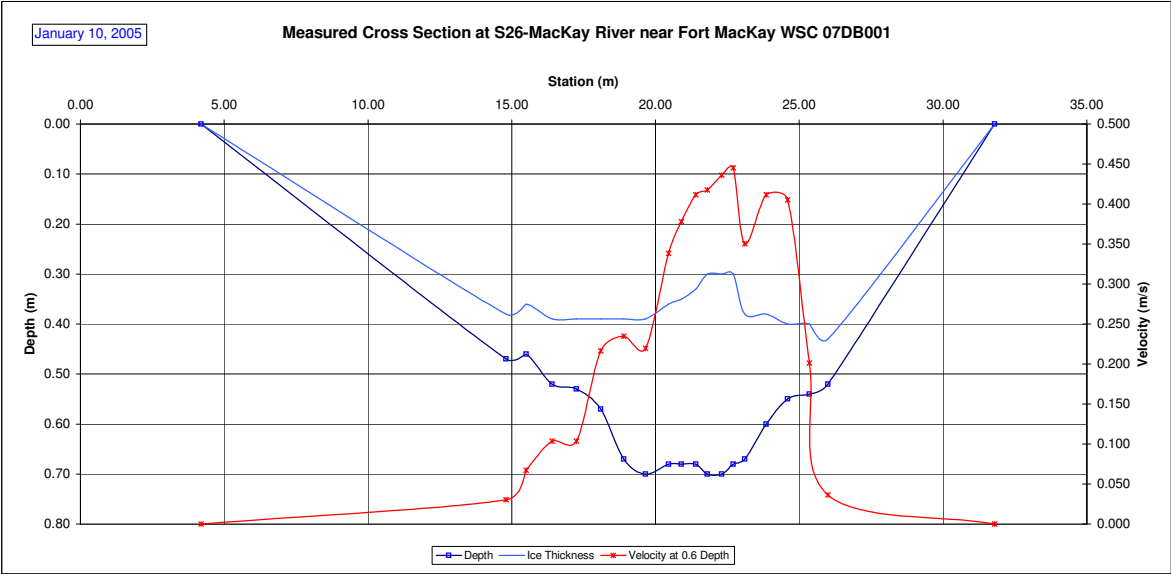
Bench Mark Reading: Yellow mark 0.473 El: 100.000
Water Level Reading: 3.014 El: 97.459
Top of Ice Level Reading: 2.998 El: 97.475
Transducer Reading: El:
Other: El:

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. It contains two main sections of data labeled LB and RB, representing different parts of the river cross-section.

Summary table with 4 columns: Parameter, Value, Unit, and a blank column. Rows include Total Flow (0.694 m³/s), Perceived Quality of Measurement (Good), Total Area (3.32 m²), Top Width (27.60 m), Hydraulic Depth (0.120 m), Mean Velocity (0.209 m/s), Froude Number (0.192), and Photographs taken looking at (Upstream, downstream, across).

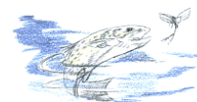
Datalogger Notes section with fields for Datalogger Internal Power, Datalogger External Power, Datalogger Memory Used, Datalogger Clock, Laptop Clock, Dessicant, Datalogger, PT, and Power. Includes a note: 'no transducer using WSC Levels'.

Notes: Manual MMT done at same station as 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: February 11, 2005
Start Time: 10:20 AM MST
End Time: 11:05 AM MST

Weather Conditions:

+2 C, clear

River Conditions:

Ice cover, frozen

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: Marsh Mc Birney FloMate 2000

Level Readings and Measurements

| | Set Up #1 | Set Up #2 |
|---------------------------------|-----------|-----------|
| Bench Mark Reading: Yellow mark | 0.445 | 0.509 |
| Water Level Reading: | 3.120 | 3.183 |
| Top of Ice Level Reading: | 3.112 | 3.179 |
| Transducer Reading: | 97.325 | 97.326 |
| Other: WL at old TD | 2.995 | 3.051 |

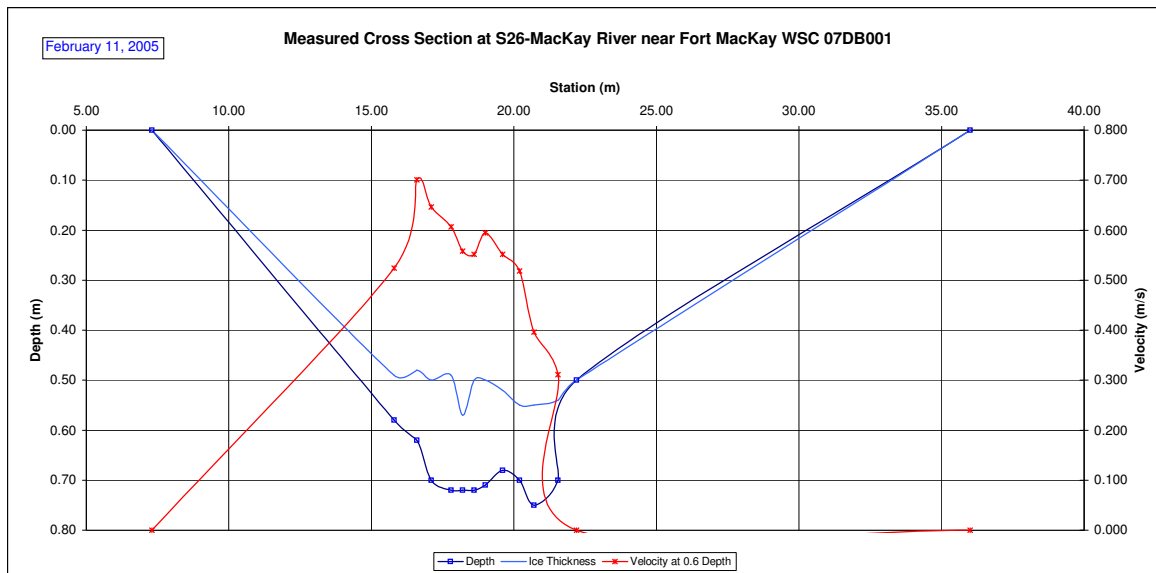
| | | Measurement Data | | | | | | | | | | | | | | | |
|---------|-------|------------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|--|--|
| | | 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 ²) | (m ³ /s) | | | |
| LB | 7.30 | 0.00 | 0.00 | | 0.000 | 0.90 | 1 | 7.30 | 11.55 | 0.131 | 0.118 | 0.02 | 0.10 | 0.011 | 2% | | |
| | 15.80 | 0.58 | 0.49 | | 0.524 | 0.90 | 2 | 11.55 | 16.20 | 0.524 | 0.472 | 0.09 | 0.42 | 0.197 | 28% | | |
| | 16.60 | 0.62 | 0.48 | | 0.701 | 0.90 | 3 | 16.20 | 16.85 | 0.701 | 0.631 | 0.14 | 0.09 | 0.057 | 8% | | |
| | 17.10 | 0.70 | 0.50 | | 0.646 | 0.90 | 4 | 16.85 | 17.45 | 0.646 | 0.582 | 0.20 | 0.12 | 0.070 | 10% | | |
| | 17.80 | 0.72 | 0.49 | | 0.607 | 0.90 | 5 | 17.45 | 18.00 | 0.607 | 0.546 | 0.23 | 0.13 | 0.069 | 10% | | |
| | 18.20 | 0.72 | 0.57 | | 0.558 | 0.90 | 6 | 18.00 | 18.40 | 0.558 | 0.502 | 0.15 | 0.06 | 0.030 | 4% | | |
| | 18.60 | 0.72 | 0.50 | | 0.552 | 0.90 | 7 | 18.40 | 18.80 | 0.552 | 0.497 | 0.22 | 0.09 | 0.044 | 6% | | |
| | 19.00 | 0.71 | 0.50 | | 0.594 | 0.90 | 8 | 18.80 | 19.30 | 0.594 | 0.535 | 0.21 | 0.11 | 0.056 | 8% | | |
| | 19.60 | 0.68 | 0.52 | | 0.552 | 0.90 | 9 | 19.30 | 19.90 | 0.552 | 0.497 | 0.16 | 0.10 | 0.048 | 7% | | |
| | 20.20 | 0.70 | 0.55 | | 0.518 | 0.90 | 10 | 19.90 | 20.45 | 0.518 | 0.466 | 0.15 | 0.08 | 0.038 | 5% | | |
| | 20.70 | 0.75 | 0.55 | | 0.396 | 0.90 | 11 | 20.45 | 21.13 | 0.396 | 0.357 | 0.20 | 0.14 | 0.048 | 7% | | |
| | 21.55 | 0.70 | 0.54 | | 0.311 | 0.90 | 12 | 21.13 | 21.88 | 0.311 | 0.280 | 0.16 | 0.12 | 0.034 | 5% | | |
| | 22.20 | 0.50 | 0.50 | | 0.000 | 0.90 | 13 | 21.88 | 29.10 | 0.000 | 0.000 | 0.00 | 0.00 | 0.000 | 0% | | |
| RB | 36.00 | 0.00 | 0.00 | | 0.000 | 0.90 | 14 | 29.10 | 36.00 | 0.000 | 0.000 | 0.00 | 0.00 | 0.000 | 0% | | |
| | | | | | | | | | | | | | | Total Flow: | 0.703 | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.703 | (m ³ /s) |
| Perceived Quality of Measurement: | Fair | |
| Total Area: | 1.54 | (m ²) |
| Top Width: | 28.70 | (m) |
| Hydraulic Depth: | 0.054 | (m) |
| Mean Velocity: | 0.457 | (m/s) |
| Froude Number | 0.630 | |
| 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 at same station as 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 7, 2005
Start Time: 3:20 PM MST
End Time: 3:50 PM MST

Weather Conditions:

0 C, Overcast

River Conditions:

Ice cover, frozen

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: Marsh Mc Birney FloMate 2000

Level Readings and Measurements

| | Set Up #1 | Set Up #2 |
|-----------------------------------|-----------|-----------|
| Bench Mark Reading: Yellow mark | 0.571 | 0.655 |
| Water Level Reading: at WSC shack | 3.074 | 3.153 |
| Top of Ice Level Reading: | 3.125 | 3.212 |
| Transducer Reading: | | 97.446 |
| Other: WL at old TD | 2.978 | 3.059 |

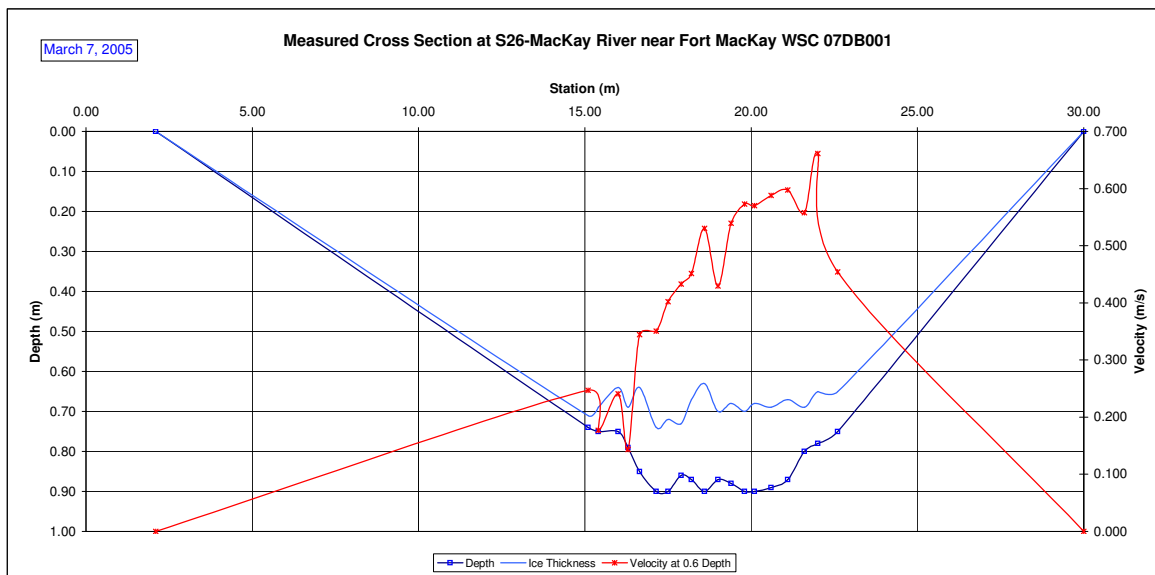
| | | Measurement Data | | | | | | | | | | | | | | | | |
|-------------|--|------------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|--|
| | | 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 ²) | (m ³ /s) | | |
| RB | | 2.10 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 2.10 | 8.60 | 0.062 | 0.056 | 0.01 | 0.05 | 0.003 | 0% | |
| | | 15.10 | 0.74 | 0.71 | | | 0.247 | 0.90 | 2 | 8.60 | 15.25 | 0.247 | 0.222 | 0.03 | 0.20 | 0.044 | 6% | |
| | | 15.40 | 0.75 | 0.69 | | | 0.177 | 0.90 | 3 | 15.25 | 15.70 | 0.177 | 0.159 | 0.06 | 0.03 | 0.004 | 1% | |
| | | 16.00 | 0.75 | 0.64 | | | 0.241 | 0.90 | 4 | 15.70 | 16.15 | 0.241 | 0.217 | 0.11 | 0.05 | 0.011 | 1% | |
| | | 16.30 | 0.79 | 0.69 | | | 0.143 | 0.90 | 5 | 16.15 | 16.48 | 0.143 | 0.129 | 0.10 | 0.03 | 0.004 | 1% | |
| | | 16.65 | 0.85 | 0.64 | | | 0.344 | 0.90 | 6 | 16.48 | 16.90 | 0.344 | 0.310 | 0.21 | 0.09 | 0.028 | 4% | |
| | | 17.15 | 0.90 | 0.74 | | | 0.351 | 0.90 | 7 | 16.90 | 17.33 | 0.351 | 0.315 | 0.16 | 0.07 | 0.021 | 3% | |
| | | 17.50 | 0.90 | 0.72 | | | 0.402 | 0.90 | 8 | 17.33 | 17.70 | 0.402 | 0.362 | 0.18 | 0.07 | 0.024 | 3% | |
| | | 17.90 | 0.86 | 0.73 | | | 0.433 | 0.90 | 9 | 17.70 | 18.05 | 0.433 | 0.390 | 0.13 | 0.05 | 0.018 | 2% | |
| | | 18.20 | 0.87 | 0.67 | | | 0.451 | 0.90 | 10 | 18.05 | 18.40 | 0.451 | 0.406 | 0.20 | 0.07 | 0.028 | 4% | |
| | | 18.60 | 0.90 | 0.63 | | | 0.530 | 0.90 | 11 | 18.40 | 18.80 | 0.530 | 0.477 | 0.27 | 0.11 | 0.052 | 7% | |
| | | 19.00 | 0.87 | 0.70 | | | 0.430 | 0.90 | 12 | 18.80 | 19.20 | 0.430 | 0.387 | 0.17 | 0.07 | 0.026 | 4% | |
| | | 19.40 | 0.88 | 0.68 | | | 0.539 | 0.90 | 13 | 19.20 | 19.60 | 0.539 | 0.486 | 0.20 | 0.08 | 0.039 | 5% | |
| | | 19.80 | 0.90 | 0.70 | | | 0.573 | 0.90 | 14 | 19.60 | 19.95 | 0.573 | 0.516 | 0.20 | 0.07 | 0.036 | 5% | |
| | | 20.10 | 0.90 | 0.68 | | | 0.570 | 0.90 | 15 | 19.95 | 20.35 | 0.570 | 0.513 | 0.22 | 0.09 | 0.045 | 6% | |
| | | 20.60 | 0.89 | 0.69 | | | 0.588 | 0.90 | 16 | 20.35 | 20.85 | 0.588 | 0.529 | 0.20 | 0.10 | 0.053 | 7% | |
| | | 21.10 | 0.87 | 0.67 | | | 0.597 | 0.90 | 17 | 20.85 | 21.35 | 0.597 | 0.538 | 0.20 | 0.10 | 0.054 | 7% | |
| | | 21.60 | 0.80 | 0.69 | | | 0.558 | 0.90 | 18 | 21.35 | 21.80 | 0.558 | 0.502 | 0.11 | 0.05 | 0.025 | 3% | |
| LB | | 22.00 | 0.78 | 0.65 | | | 0.661 | 0.90 | 19 | 21.80 | 22.30 | 0.661 | 0.595 | 0.13 | 0.07 | 0.039 | 5% | |
| | | 22.60 | 0.75 | 0.65 | | | 0.454 | 0.90 | 20 | 22.30 | 26.30 | 0.454 | 0.409 | 0.10 | 0.40 | 0.163 | 22% | |
| | | 30.00 | 0.00 | 0.00 | | | 0.000 | 0.90 | 21 | 26.30 | 30.00 | 0.114 | 0.102 | 0.03 | 0.09 | 0.009 | 1% | |
| | | | | | | | | | | | | | | | | | 100% | |
| Total Flow: | | | | | | | | | | | | | | | | 0.727 | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.727 | (m ³ /s) |
| Perceived Quality of Measurement: | Fair | |
| Total Area: | 1.92 | (m ²) |
| Top Width: | 27.90 | (m) |
| Hydraulic Depth: | 0.069 | (m) |
| Mean Velocity: | 0.379 | (m/s) |
| Froude Number | 0.461 | |
| 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 at same station as 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: April 9, 2005
Start Time: 2:00 PM MDT
End Time: MDT

Weather Conditions:

+11 C, Partly cloudy

River Conditions:

Water flowing over ice, ice beginning to breakup.

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: Marsh Mc Birney FloMate 2000

Level Readings and Measurements

| Set Up #1 | | Set Up #2 | |
|---------------------------|--------------------|-----------|---------|
| Bench Mark Reading: | Yellow mark 0.734 | El: | 100.000 |
| Water Level Reading: | at WSC shack 2.418 | El: | 98.316 |
| Top of Ice Level Reading: | | El: | |
| Transducer Reading: | | El: | |
| Other: | WL at old TD | 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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - | |

| | | |
|-----------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Quality of Measurement: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| 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: Water level taken at WSC shack only.
Conditions unsafe for manual flow measurement.

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: December 10, 2005
Start Time: 2:10 PM MST
End Time: 2:32 PM MST

Weather Conditions: 0 C, overcast, calm

River Conditions: Complete Ice cover

Personnel & Equipment

Measurement Made By: ND/PM
Data Entry By: ND
Meter Type and No.: Marsh Mc Birney FloMate 2000

Level Readings and Measurements

| | Set Up #1 | Set Up #2 | |
|-----------------------------------|-----------|-----------|-------------|
| Bench Mark Reading: Yellow mark | 0.916 | 0.975 | El: 100.000 |
| Water Level Reading: at WSC Shack | 3.710 | 3.763 | El: 97.206 |
| Top of Ice Level Reading: | 3.676 | 3.731 | El: 97.240 |
| Transducer Reading: | | | El: |
| Other: | | | El: |

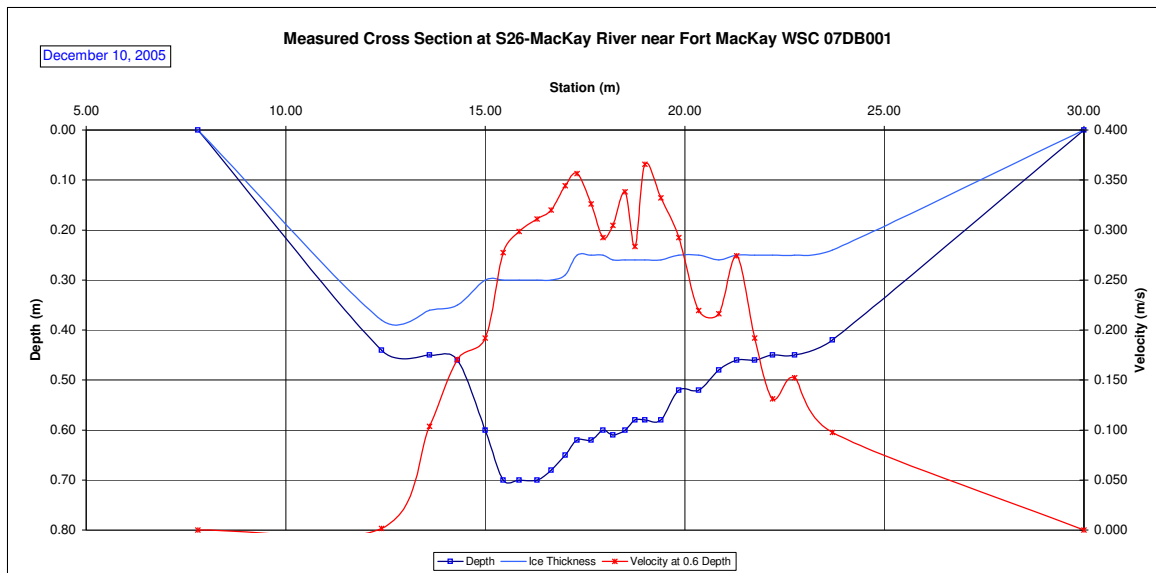
| Measurement Data | | | | | | | | | | | | | | | |
|------------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|
| 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 ²) | (m ³ /s) | |
| LB | 7.80 | 0.00 | 0.00 | | 0.000 | 0.90 | 1 | 7.80 | 10.10 | 0.000 | 0.000 | 0.02 | 0.03 | 0.000 | 0% |
| | 12.40 | 0.44 | 0.38 | | 0.002 | 0.90 | 2 | 10.10 | 13.00 | 0.002 | 0.001 | 0.06 | 0.17 | 0.000 | 0% |
| | 13.60 | 0.45 | 0.36 | | 0.104 | 0.90 | 3 | 13.00 | 13.95 | 0.104 | 0.093 | 0.09 | 0.09 | 0.008 | 1% |
| | 14.30 | 0.46 | 0.35 | | 0.171 | 0.90 | 4 | 13.95 | 14.65 | 0.171 | 0.154 | 0.11 | 0.08 | 0.012 | 2% |
| | 15.00 | 0.60 | 0.30 | | 0.192 | 0.90 | 5 | 14.65 | 15.23 | 0.192 | 0.173 | 0.30 | 0.17 | 0.030 | 4% |
| | 15.45 | 0.70 | 0.30 | | 0.277 | 0.90 | 6 | 15.23 | 15.65 | 0.277 | 0.250 | 0.40 | 0.17 | 0.042 | 6% |
| | 15.85 | 0.70 | 0.30 | | 0.299 | 0.90 | 7 | 15.65 | 16.08 | 0.299 | 0.269 | 0.40 | 0.17 | 0.046 | 6% |
| | 16.30 | 0.70 | 0.30 | | 0.311 | 0.90 | 8 | 16.08 | 16.48 | 0.311 | 0.280 | 0.40 | 0.16 | 0.045 | 6% |
| | 16.65 | 0.68 | 0.30 | | 0.320 | 0.90 | 9 | 16.48 | 16.83 | 0.320 | 0.288 | 0.38 | 0.13 | 0.038 | 5% |
| | 17.00 | 0.65 | 0.29 | | 0.344 | 0.90 | 10 | 16.83 | 17.15 | 0.344 | 0.310 | 0.36 | 0.12 | 0.036 | 5% |
| | 17.30 | 0.62 | 0.25 | | 0.357 | 0.90 | 11 | 17.15 | 17.48 | 0.357 | 0.321 | 0.37 | 0.12 | 0.039 | 5% |
| | 17.65 | 0.62 | 0.25 | | 0.326 | 0.90 | 12 | 17.48 | 17.80 | 0.326 | 0.294 | 0.37 | 0.12 | 0.035 | 5% |
| | 17.95 | 0.60 | 0.25 | | 0.293 | 0.90 | 13 | 17.80 | 18.08 | 0.293 | 0.263 | 0.35 | 0.10 | 0.025 | 4% |
| | 18.20 | 0.61 | 0.26 | | 0.305 | 0.90 | 14 | 18.08 | 18.35 | 0.305 | 0.274 | 0.35 | 0.10 | 0.026 | 4% |
| | 18.50 | 0.60 | 0.26 | | 0.338 | 0.90 | 15 | 18.35 | 18.63 | 0.338 | 0.304 | 0.34 | 0.09 | 0.028 | 4% |
| | 18.75 | 0.58 | 0.26 | | 0.283 | 0.90 | 16 | 18.63 | 18.88 | 0.283 | 0.255 | 0.32 | 0.08 | 0.020 | 3% |
| | 19.00 | 0.58 | 0.26 | | 0.366 | 0.90 | 17 | 18.88 | 19.20 | 0.366 | 0.329 | 0.32 | 0.10 | 0.034 | 5% |
| | 19.40 | 0.58 | 0.26 | | 0.332 | 0.90 | 18 | 19.20 | 19.63 | 0.332 | 0.299 | 0.32 | 0.14 | 0.041 | 6% |
| | 19.85 | 0.52 | 0.25 | | 0.293 | 0.90 | 19 | 19.63 | 20.10 | 0.293 | 0.263 | 0.27 | 0.13 | 0.034 | 5% |
| | 20.35 | 0.52 | 0.25 | | 0.219 | 0.90 | 20 | 20.10 | 20.60 | 0.219 | 0.198 | 0.27 | 0.14 | 0.027 | 4% |
| | 20.85 | 0.48 | 0.26 | | 0.216 | 0.90 | 21 | 20.60 | 21.08 | 0.216 | 0.195 | 0.22 | 0.10 | 0.020 | 3% |
| | 21.30 | 0.46 | 0.25 | | 0.274 | 0.90 | 22 | 21.08 | 21.53 | 0.274 | 0.247 | 0.21 | 0.09 | 0.023 | 3% |
| | 21.75 | 0.46 | 0.25 | | 0.192 | 0.90 | 23 | 21.53 | 21.98 | 0.192 | 0.173 | 0.21 | 0.09 | 0.016 | 2% |
| | 22.20 | 0.45 | 0.25 | | 0.131 | 0.90 | 24 | 21.98 | 22.48 | 0.131 | 0.118 | 0.20 | 0.10 | 0.012 | 2% |
| | 22.75 | 0.45 | 0.25 | | 0.152 | 0.90 | 25 | 22.48 | 23.23 | 0.152 | 0.137 | 0.20 | 0.15 | 0.021 | 3% |
| | 23.70 | 0.42 | 0.24 | | 0.098 | 0.90 | 26 | 23.23 | 26.85 | 0.098 | 0.088 | 0.18 | 0.65 | 0.057 | 8% |
| RB | 30.00 | 0.00 | 0.00 | | 0.000 | 0.90 | 27 | 26.85 | 30.00 | 0.024 | 0.022 | 0.05 | 0.14 | 0.003 | 0% |
| Total Flow: | | | | | | | | | | | | | | 0.720 | 100% |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.720 | (m ³ /s) |
| Perceived Quality of Measurement: | Good | |
| Total Area: | 3.74 | (m ²) |
| Top Width: | 22.20 | (m) |
| Hydraulic Depth: | 0.169 | (m) |
| Mean Velocity: | 0.192 | (m/s) |
| Froude Number | 0.150 | |
| 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 at same station as WSC cableway.



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: January 11, 2005
Start Time: 10:22 AM MST
End Time: 10:46 AM MST

Weather Conditions:

-30, cloudy, light snow

River Conditions:

Ice cover

Personnel & Equipment

Measurement Made By: DB/ND/CT
Data Entry By: DB Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000

Level Readings and Measurements

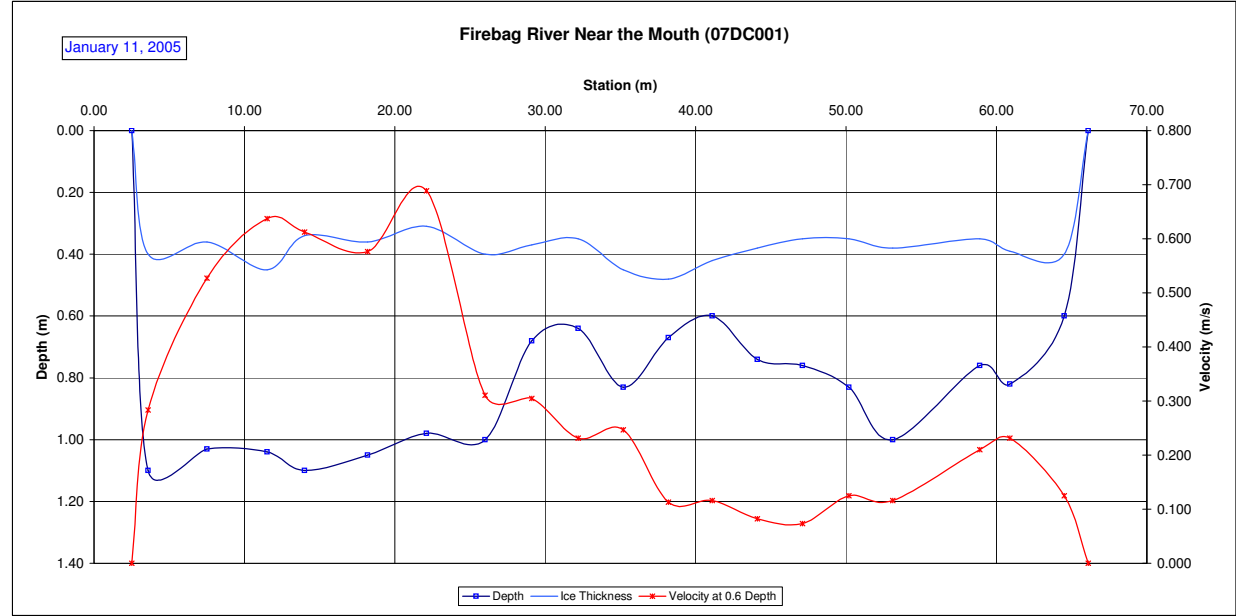
Bench Mark Reading: Rod in P 1.498
Water Level Reading: 3.641
Top of Ice Level Reading: 3.655
Transducer Reading & Calc'd El 1.126
Other:
Set up #1
El: 99.773 1.432
El: 97.630 3.572
El: 97.616 3.583
El: 96.504 1.126
Set up #2
El: 99.773
El: 97.633
El: 97.622
El: 96.507

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 2.50 to 66.10, categorized by LB and RB.

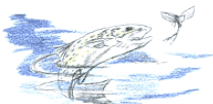
Summary table with 4 columns: Parameter, Value, Unit. Rows include Total Flow (9.780 m³/s), Pervious Measurement Quality (Fair), Total Area (29.96 m²), Top Width (63.60 m), Hydraulic Depth (0.471 m), Mean Velocity (0.326 m/s), Froude Number (0.152).

Datalogger Notes table with 2 columns: Parameter, Value. Rows include Database #333, Datalogger Internal Power (4.663 V), Datalogger External Power (12.19 V), Datalogger Memory Used (66%), Datalogger Clock (Jan 11, 2005 09:07 MST), Laptop Clock (Jan 11, 2005 09:12 MST), Dessicant (good), Datalogger (Optimum DD128, # 0106040333), PT (Keller 730-130-3 psi #0101348), Power (Magnacharge 20V 10A DC Battery).

Notes:



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: February 8, 2005
Date of Measurement: 2:45 PM MST
Start Time: 3:15 PM MST
End Time:

Personnel & Equipment

Measurement Made By: RM/ND/CT
Data Entry By: ND Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000

Level Readings and Measurements

Bench Mark Reading: Rod in PV 1.481
Water Level Reading: 3.436
Top of Ice Level Reading: 3.429
Transducer Reading & Calc'd El. 1.278
Other:

Set up #1
El: 99.773 1.670
El: 97.818 3.624
El: 97.825 3.619
El: 96.540 1.278
El:

Weather Conditions: -10, clear
River Conditions: Ice cover

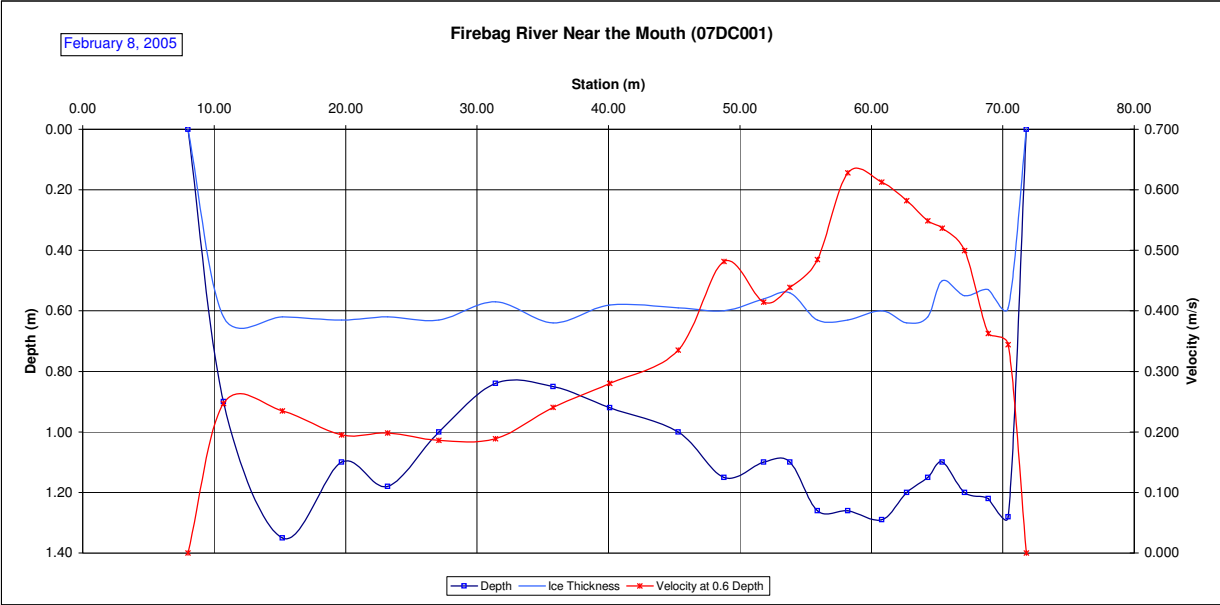
Table with 17 columns: Station, Depth, Ice Thickness, Velocity at 0.2 Depth, Velocity at 0.8 Depth, Velocity at 0.6 Depth, Velocity Correction Factor, Panel No., Panel Starts at Station, Panel Ends at Station, Measured Panel Velocity, Effective Average Panel Velocity, Panel Effective Depth, Panel Area, Panel Discharge, Percentage of Total. Rows include data for stations 8.00 to 71.80.

Notes: Total: 9.760

Summary table with 3 columns: Metric, Value, Unit. Rows include Total Flow (9.760 m³/s), Perceived Measurement Quality (Good), Total Area (30.04 m²), Top Width (63.80 m), Hydraulic Depth (0.471 m), Mean Velocity (0.325 m/s), Froude Number (0.151).

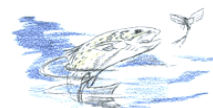
Datalogger Notes table with 2 columns: Metric, Value. Rows include Datalogger Internal Power (4.777 V), Datalogger External Power (12.37 V), Datalogger Memory Used (68%), Datalogger Clock (Feb 08, 2005 14:08 MST), Laptop Clock (Feb 08, 2005 14:16 MST), Dessicant (Good), Datalogger (Optimum DD128, # 0106040333), PT (Keller 730-130-3 psi #0101348), Power (Magnacharge 20V 10A DC Battery).

Notes:



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: March 5, 2005
Start Time: 10:34 AM MST
End Time: 11:00 AM MST

Weather Conditions:

-5, overcast

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: RM/ND/CT
Data Entry By: ND Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000

Level Readings and Measurements

| | Set up #1 | Set up #2 |
|---------------------------------|------------|-----------|
| Bench Mark Reading: Rod in P.V. | El: 99.773 | 1.615 |
| Water Level Reading: | El: 97.823 | 3.571 |
| Top of Ice Level Reading: | El: 97.809 | 3.591 |
| Transducer Reading & Calc'd El | El: 96.554 | 1.269 |
| Other: | El: | El: |

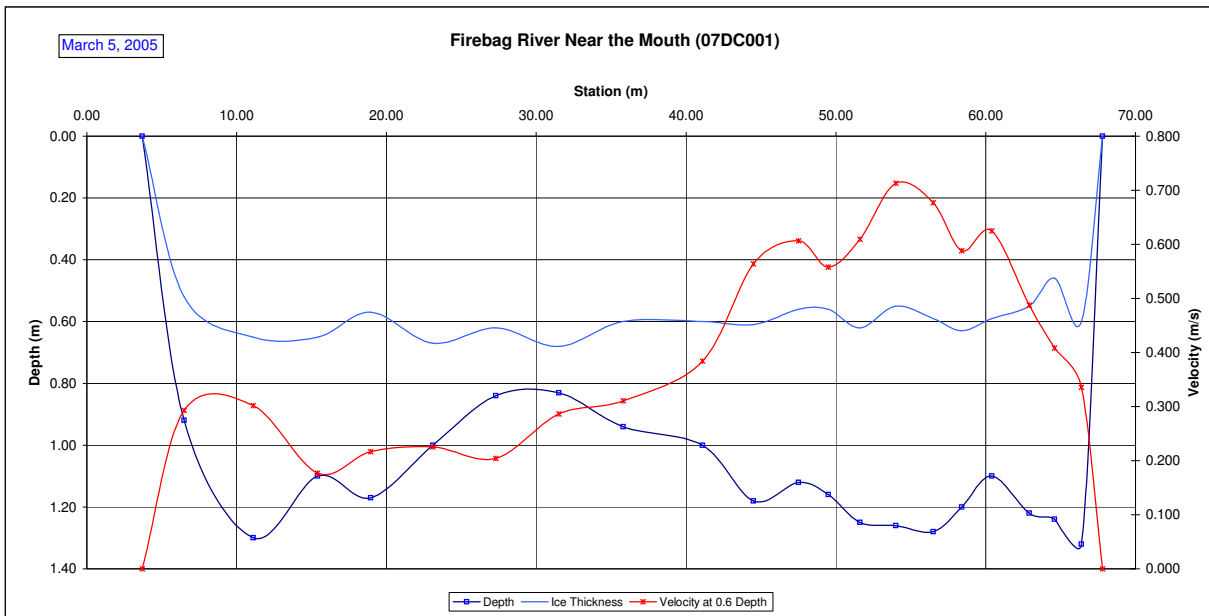
| Measurement Data | | | | | | | | | | | | | | | | Percentage of Total |
|------------------|-------|------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------------|--------------|-------------------------------|-----------------------------|-------------------------------|---|-----------------------------|---------------|--------------------|--------|------------------------|
| 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) | | |
| 3.70 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 3.70 | 5.10 | 0.073 | 0.066 | 0.10 | 0.14 | 0.009 | 0% | |
| 6.50 | 0.92 | 0.52 | | | 0.293 | 0.90 | 2 | 5.10 | 8.80 | 0.293 | 0.263 | 0.40 | 1.48 | 0.390 | 3% | |
| 11.10 | 1.30 | 0.65 | | | 0.302 | 0.90 | 3 | 8.80 | 13.25 | 0.302 | 0.272 | 0.65 | 2.89 | 0.786 | 7% | |
| 15.40 | 1.10 | 0.65 | | | 0.177 | 0.90 | 4 | 13.25 | 17.18 | 0.177 | 0.159 | 0.45 | 1.77 | 0.281 | 2% | |
| 18.95 | 1.17 | 0.57 | | | 0.216 | 0.90 | 5 | 17.18 | 21.03 | 0.216 | 0.195 | 0.60 | 2.31 | 0.450 | 4% | |
| 23.10 | 1.00 | 0.67 | | | 0.226 | 0.90 | 6 | 21.03 | 25.20 | 0.226 | 0.203 | 0.33 | 1.38 | 0.280 | 2% | |
| 27.30 | 0.84 | 0.62 | | | 0.204 | 0.90 | 7 | 25.20 | 29.40 | 0.204 | 0.184 | 0.22 | 0.92 | 0.170 | 1% | |
| 31.50 | 0.83 | 0.68 | | | 0.287 | 0.90 | 8 | 29.40 | 33.65 | 0.287 | 0.258 | 0.15 | 0.64 | 0.164 | 1% | |
| 35.80 | 0.94 | 0.60 | | | 0.311 | 0.90 | 9 | 33.65 | 38.45 | 0.311 | 0.280 | 0.34 | 1.63 | 0.457 | 4% | |
| 41.10 | 1.00 | 0.60 | | | 0.384 | 0.90 | 10 | 38.45 | 42.80 | 0.384 | 0.346 | 0.40 | 1.74 | 0.601 | 5% | |
| 44.50 | 1.18 | 0.61 | | | 0.564 | 0.90 | 11 | 42.80 | 46.00 | 0.564 | 0.507 | 0.57 | 1.82 | 0.926 | 8% | |
| 47.50 | 1.12 | 0.56 | | | 0.607 | 0.90 | 12 | 46.00 | 48.50 | 0.607 | 0.546 | 0.56 | 1.40 | 0.764 | 7% | |
| 49.50 | 1.16 | 0.56 | | | 0.558 | 0.90 | 13 | 48.50 | 50.55 | 0.558 | 0.502 | 0.60 | 1.23 | 0.617 | 5% | |
| 51.60 | 1.25 | 0.62 | | | 0.610 | 0.90 | 14 | 50.55 | 52.80 | 0.610 | 0.549 | 0.63 | 1.42 | 0.778 | 7% | |
| 54.00 | 1.26 | 0.55 | | | 0.713 | 0.90 | 15 | 52.80 | 55.25 | 0.713 | 0.642 | 0.71 | 1.74 | 1.117 | 10% | |
| 56.50 | 1.28 | 0.59 | | | 0.677 | 0.90 | 16 | 55.25 | 57.45 | 0.677 | 0.609 | 0.69 | 1.52 | 0.924 | 8% | |
| 58.40 | 1.20 | 0.63 | | | 0.588 | 0.90 | 17 | 57.45 | 59.40 | 0.588 | 0.529 | 0.57 | 1.11 | 0.588 | 5% | |
| 60.40 | 1.10 | 0.59 | | | 0.625 | 0.90 | 18 | 59.40 | 61.65 | 0.625 | 0.562 | 0.51 | 1.15 | 0.645 | 6% | |
| 62.90 | 1.22 | 0.55 | | | 0.488 | 0.90 | 19 | 61.65 | 63.75 | 0.488 | 0.439 | 0.67 | 1.41 | 0.618 | 5% | |
| 64.60 | 1.24 | 0.46 | | | 0.408 | 0.90 | 20 | 63.75 | 65.50 | 0.408 | 0.368 | 0.78 | 1.37 | 0.502 | 4% | |
| 66.40 | 1.32 | 0.60 | | | 0.335 | 0.90 | 21 | 65.50 | 67.10 | 0.335 | 0.302 | 0.72 | 1.15 | 0.348 | 3% | |
| 67.80 | 0.00 | 0.00 | | | 0.000 | 0.90 | 22 | 67.10 | 67.80 | 0.084 | 0.075 | 0.18 | 0.13 | 0.010 | 0% | |
| Notes: | | | | | | | | | | | | | | Total: | 11.424 | |

Notes:

| | | |
|---|--------|---------------------|
| Total Flow: | 11.424 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 30.34 | (m ²) |
| Top Width: | 64.10 | (m) |
| Hydraulic Depth: | 0.473 | (m) |
| Mean Velocity: | 0.377 | (m/s) |
| Froude Number | 0.175 | |
| Photographs taken looking at: Upstream, downstream, across | | |

Notes:

| | |
|----------------------------|--------------------------------|
| Datalogger Notes: | Database #333 |
| Datalogger Internal Power: | 4.752 V |
| Datalogger External Power: | 12.4 V |
| Datalogger Memory Used: | 70% |
| Datalogger Clock: | Mar 05, 2005 10:00 MST |
| Laptop Clock: | Mar 05, 2005 10:08 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

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 9, 2005
Start Time: 1:00 PM MDT
End Time: MDT

Weather Conditions:

+10 C, Clear

River Conditions:

Water flowing over ice, 60% ice cover.

Personnel & Equipment

Measurement Made By: RM/ND
Data Entry By: ND Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000

Level Readings and Measurements

| | Set up #1 | Set up #2 |
|--------------------------------|-----------|-----------|
| Bench Mark Reading: Rod in P\ | 1.474 | 1.345 |
| Water Level Reading: | 3.206 | 3.074 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El | 1.484 | 1.484 |
| 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 | Percentage of Total |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | Total: | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: Conditions unsafe for manual flow measurement.

| | |
|----------------------------|--------------------------------|
| Datalogger Notes: | Database #333 |
| Datalogger Internal Power: | 4.806 V |
| Datalogger External Power: | 12.44 V |
| Datalogger Memory Used: | 73% |
| Datalogger Clock: | Apr 09, 2005 11:55 MST |
| Laptop Clock: | Apr 09, 2005 12:03 MST |
| Dessicant: | Good - 10% 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

Time of Measurement

Date of Measurement: September 2, 2005
Start Time: 3:13 PM MDT
End Time: MDT

Weather Conditions:

+20 C, Clear, calm

River Conditions:

Open water, moderately high stage.

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: FF Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000

Level Readings and Measurements

| | Set up #1 | Set up #2 |
|--------------------------------|-----------|-----------|
| Bench Mark Reading: Rod in P\ | 1.242 | 1.337 |
| Water Level Reading: | 3.134 | 3.216 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El | 1.369 | 1.369 |
| Other: | | |

| 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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | | Total: | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: Transducer removed for recalibration. Data downloaded - looks fine.

| | |
|----------------------------|--------------------------------|
| Datalogger Notes: | Database #333 |
| Datalogger Internal Power: | 4.823 V |
| Datalogger External Power: | 12.26 V |
| Datalogger Memory Used: | 85% |
| Datalogger Clock: | Sep 02, 2005 14:13 MST |
| Laptop Clock: | Sep 02, 2005 14:24 MST |
| Dessicant: | 100% used-replaced |
| 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: October 8, 2005
Start Time: 2:30 PM MDT
End Time: MDT

Weather Conditions:

+12° C, Overcast

River Conditions:

Open water, moderate stage.

Personnel & Equipment

Measurement Made By: ND/PM
Data Entry By: PM Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000

Level Readings and Measurements

| | Set up #1 | Set up #2 |
|--------------------------------|-----------|-----------|
| Bench Mark Reading: Rod in P\ | 1.318 | 1.362 |
| Water Level Reading: | 3.568 | 3.609 |
| Top of Ice Level Reading: | | |
| Transducer Reading & Calc'd El | 1.003 | 1.003 |
| 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 | Percentage of Total | |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) | | |
| | | | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | | Total: | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: Transducer re-installed after recalibration.

| | |
|----------------------------|--------------------------------|
| Datalogger Notes: | Database #333 |
| Datalogger Internal Power: | 4.781 V |
| Datalogger External Power: | 12.12 V |
| Datalogger Memory Used: | 85% |
| Datalogger Clock: | Oct 08, 2005 13:57 MST |
| Laptop Clock: | Oct 08, 2005 13:57 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

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: December 10, 2005
Start Time: 10:00 AM MST
End Time: MST

Weather Conditions:

-2° C, Scattered cloud, Calm

River Conditions:

85% Ice cover, open spots near the left bank

Personnel & Equipment

Measurement Made By: ND/PM
Data Entry By: ND Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000

Level Readings and Measurements

| | Set up #1 | Set up #2 |
|--------------------------------|-----------|-----------|
| Bench Mark Reading: Rod in P\ | 1.405 | 1.352 |
| Water Level Reading: | 3.598 | 3.545 |
| Top of Ice Level Reading: | 3.566 | 3.513 |
| Transducer Reading & Calc'd El | 1.004 | 1.004 |
| Other: | 96.576 | 96.576 |

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 ²) | (m ³ /s) | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Notes: | | | | | | | | | | | | | | Total: | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

Notes: Open spots in ice, unsafe for manual flow measurement.

| | |
|----------------------------|--------------------------------|
| Datalogger Notes: | Database #333 |
| Datalogger Internal Power: | 4.732 V |
| Datalogger External Power: | 12.02 V |
| Datalogger Memory Used: | 93% |
| Datalogger Clock: | Dec 10, 2005 09:48 MST |
| Laptop Clock: | Dec 10, 2005 09:51 MST |
| Dessicant: | 10% used - replaced |
| Datalogger: | Optimum DD128, # 0106040333 |
| PT: | Keller 730-130-3 psi #0101348 |
| Power: | Magnacharge 20V 10A DC Battery |

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: April 25, 2005
Start Time: 11:10 AM MDT
End Time: 11:45 AM MDT

Weather Conditions:

+2 C, calm, clear

River Conditions:

Open, very high stage > bankfull

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Rebar 0.000
Water Level Reading: 0.592
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 1.227
Other:

Setup No. 1

El: 325.175
El: 324.583
El:
El: 323.356
El:

Setup No. 2

El: 325.175
El: 324.583
El:
El: 323.356
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 ²) | (m ³ /s) |
| LB | 9.50 | 0.00 | | | 0.000 | 1.00 | 1 | 9.50 | 9.00 | 0.002 | 0.002 | 0.17 | 0.08 | 0.000 |
| | 8.50 | 0.66 | | | 0.009 | 1.00 | 2 | 9.00 | 8.25 | 0.009 | 0.009 | 0.66 | 0.50 | 0.005 |
| | 8.00 | 1.30 | | | 0.009 | 1.00 | 3 | 8.25 | 7.75 | 0.009 | 0.009 | 1.30 | 0.65 | 0.006 |
| | 7.50 | 1.43 | 0.01 | 0.03 | | 1.00 | 4 | 7.75 | 7.25 | 0.020 | 0.020 | 1.43 | 0.72 | 0.014 |
| | 7.00 | 1.70 | 0.01 | 0.10 | | 1.00 | 5 | 7.25 | 6.75 | 0.058 | 0.058 | 1.70 | 0.85 | 0.049 |
| | 6.50 | 1.68 | 0.06 | 0.17 | | 1.00 | 6 | 6.75 | 6.25 | 0.117 | 0.117 | 1.68 | 0.84 | 0.099 |
| | 6.00 | 1.98 | 0.20 | 0.27 | | 1.00 | 7 | 6.25 | 5.75 | 0.236 | 0.236 | 1.98 | 0.99 | 0.234 |
| | 5.50 | 2.22 | 0.30 | 0.32 | | 1.00 | 8 | 5.75 | 5.25 | 0.308 | 0.308 | 2.22 | 1.11 | 0.342 |
| | 5.00 | 2.68 | 0.45 | 0.32 | | 1.00 | 9 | 5.25 | 4.75 | 0.384 | 0.384 | 2.68 | 1.34 | 0.515 |
| | 4.50 | 2.76 | 0.43 | 0.36 | | 1.00 | 10 | 4.75 | 4.25 | 0.396 | 0.396 | 2.76 | 1.38 | 0.547 |
| | 4.00 | 2.86 | 0.45 | 0.38 | | 1.00 | 11 | 4.25 | 3.75 | 0.411 | 0.411 | 2.86 | 1.43 | 0.588 |
| | 3.50 | 2.80 | 0.46 | 0.36 | | 1.00 | 12 | 3.75 | 3.25 | 0.411 | 0.411 | 2.80 | 1.40 | 0.576 |
| | 3.00 | 2.77 | 0.34 | 0.42 | | 1.00 | 13 | 3.25 | 2.75 | 0.378 | 0.378 | 2.77 | 1.39 | 0.523 |
| | 2.50 | 2.67 | 0.40 | 0.21 | | 1.00 | 14 | 2.75 | 2.25 | 0.305 | 0.305 | 2.67 | 1.34 | 0.407 |
| | 2.00 | 2.52 | 0.31 | 0.11 | | 1.00 | 15 | 2.25 | 1.75 | 0.213 | 0.213 | 2.52 | 1.26 | 0.269 |
| RB | 1.50 | 1.60 | | | 0.235 | 1.00 | 16 | 1.75 | 1.05 | 0.235 | 0.235 | 1.60 | 1.12 | 0.263 |
| | 0.60 | 0.00 | | | 0.000 | 1.00 | 17 | 1.05 | 0.60 | 0.059 | 0.059 | 0.40 | 0.18 | 0.011 |
| Total Flow: | | | | | | | | | | | | | 4.447 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 4.447 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 16.56 | (m ²) |
| Top Width: | 8.90 | (m) |
| Hydraulic Depth: | 1.861 | (m) |
| Mean Velocity: | 0.268 | (m/s) |
| Froude Number | 0.063 | |
| Photographs taken looking at: Upstream, downstream, across | | |

Notes: TSS sample collected.
Equipment installed. Transducer clamped to a rebar and placed in the flow.

| | | |
|----------------------------|-------------------------------|-----|
| Datalogger Notes: | Database | 414 |
| Datalogger Internal Power: | 4.77V | |
| Datalogger External Power: | 13.89 V | |
| Datalogger Memory Used: | 30% | |
| Datalogger Clock: | Apr 25, 2005 09:05 | MST |
| Laptop Clock: | Apr 25, 2005 09:18 | MST |
| Dessicant: | Good - 100% | |
| Datalogger: | Optimum DD-128 s/n#0110220414 | |
| PT: | Keller s/n 0101354 3 psi | |
| Power: | Car Battery | |

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: RM/FF
Data Entry By: FF
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: June 2, 2005
Start Time: 9:30 AM MDT
End Time: 9:51 AM MDT

Level Readings

Bench Mark Reading: Rebar 0.615
Water Level Reading: 1.773
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.661
Other:

Setup No. 1

El: 325.175
El: 324.017
El:
El: 323.356
El:

Setup No. 2

El: 325.175
El: 324.007
El:
El: 323.346
El:

Weather Conditions:

+20° C, partly cloudy, light wind from N

River Conditions:

Open water, high stage

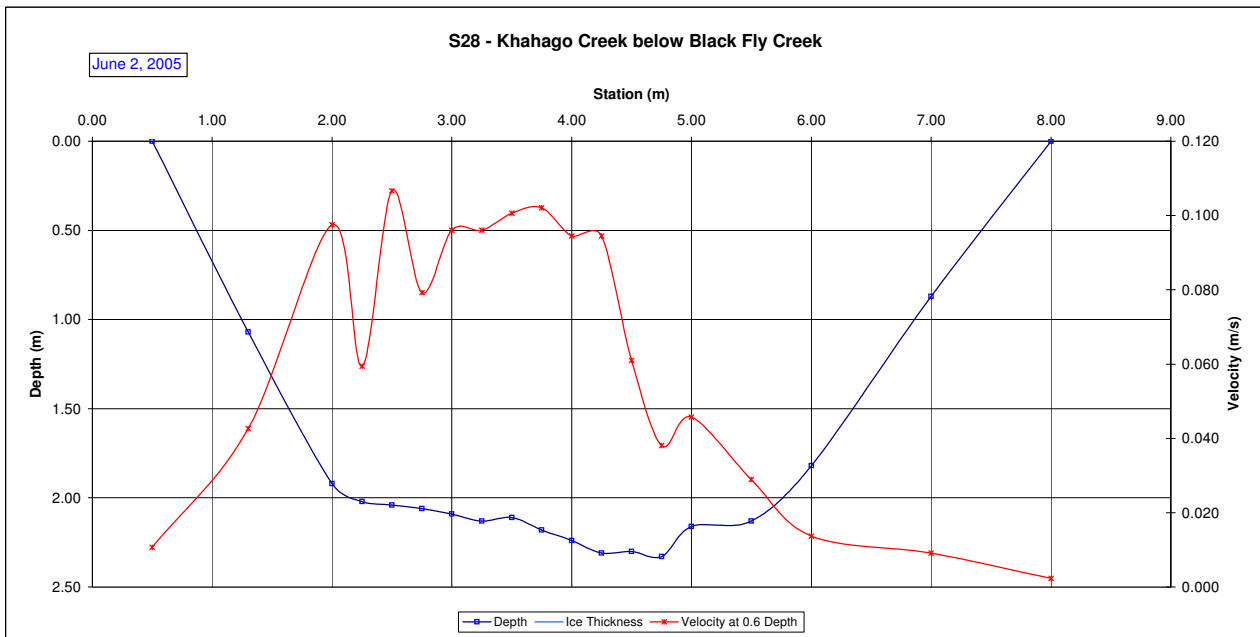
Measurement Data

| 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) |
| RB | 0.50 | 0.00 | | | 0.000 | 1.00 | 1 | 0.50 | 0.90 | 0.011 | 0.011 | 0.27 | 0.11 | 0.001 |
| | 1.30 | 1.07 | | | 0.043 | 1.00 | 2 | 0.90 | 1.65 | 0.043 | 0.043 | 1.07 | 0.80 | 0.034 |
| | 2.00 | 1.92 | 0.09 | 0.11 | | 1.00 | 3 | 1.65 | 2.13 | 0.098 | 0.098 | 1.92 | 0.91 | 0.089 |
| | 2.25 | 2.02 | 0.06 | 0.06 | | 1.00 | 4 | 2.13 | 2.38 | 0.059 | 0.059 | 2.02 | 0.51 | 0.030 |
| | 2.50 | 2.04 | 0.09 | 0.12 | | 1.00 | 5 | 2.38 | 2.63 | 0.107 | 0.107 | 2.04 | 0.51 | 0.054 |
| | 2.75 | 2.06 | 0.08 | 0.08 | | 1.00 | 6 | 2.63 | 2.88 | 0.079 | 0.079 | 2.06 | 0.52 | 0.041 |
| | 3.00 | 2.09 | 0.09 | 0.10 | | 1.00 | 7 | 2.88 | 3.13 | 0.096 | 0.096 | 2.09 | 0.52 | 0.050 |
| | 3.25 | 2.13 | 0.11 | 0.09 | | 1.00 | 8 | 3.13 | 3.38 | 0.096 | 0.096 | 2.13 | 0.53 | 0.051 |
| | 3.50 | 2.11 | 0.09 | 0.11 | | 1.00 | 9 | 3.38 | 3.63 | 0.101 | 0.101 | 2.11 | 0.53 | 0.053 |
| | 3.75 | 2.18 | 0.10 | 0.10 | | 1.00 | 10 | 3.63 | 3.88 | 0.102 | 0.102 | 2.18 | 0.55 | 0.056 |
| | 4.00 | 2.24 | 0.09 | 0.10 | | 1.00 | 11 | 3.88 | 4.13 | 0.094 | 0.094 | 2.24 | 0.56 | 0.053 |
| | 4.25 | 2.31 | 0.13 | 0.06 | | 1.00 | 12 | 4.13 | 4.38 | 0.094 | 0.094 | 2.31 | 0.58 | 0.055 |
| | 4.50 | 2.30 | 0.08 | 0.04 | | 1.00 | 13 | 4.38 | 4.63 | 0.061 | 0.061 | 2.30 | 0.58 | 0.035 |
| | 4.75 | 2.33 | 0.05 | 0.02 | | 1.00 | 14 | 4.63 | 4.88 | 0.038 | 0.038 | 2.33 | 0.58 | 0.022 |
| | 5.00 | 2.16 | 0.06 | 0.03 | | 1.00 | 15 | 4.88 | 5.25 | 0.046 | 0.046 | 2.16 | 0.81 | 0.037 |
| | 5.50 | 2.13 | 0.03 | 0.03 | | 1.00 | 16 | 5.25 | 5.75 | 0.029 | 0.029 | 2.13 | 1.07 | 0.031 |
| | 6.00 | 1.82 | 0.02 | 0.01 | | 1.00 | 17 | 5.75 | 6.50 | 0.014 | 0.014 | 1.82 | 1.37 | 0.019 |
| | 7.00 | 0.87 | | | 0.009 | 1.00 | 18 | 6.50 | 7.50 | 0.009 | 0.009 | 0.87 | 0.87 | 0.008 |
| | 8.00 | 0.00 | | | 0.000 | 1.00 | 19 | 7.50 | 8.00 | 0.002 | 0.002 | 0.22 | 0.11 | 0.000 |
| LB | | | | | | | | | | | | | Total Flow: | 0.719 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.719 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 11.99 | (m ²) |
| Top Width: | 7.50 | (m) |
| Hydraulic Depth: | 1.599 | (m) |
| Mean Velocity: | 0.060 | (m/s) |
| Froude Number | 0.015 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | | |
|----------------------------|-------------------------------|-----|
| Datalogger Notes: | Database | 414 |
| Datalogger Internal Power: | 4.9V | |
| Datalogger External Power: | 13.6 V | |
| Datalogger Memory Used: | 33% | |
| Datalogger Clock: | Jun 02, 2005 07:50 | MST |
| Laptop Clock: | Jun 02, 2005 08:05 | MST |
| Dessicant: | Good - 80% | |
| Datalogger: | Optimum DD-128 s/n#0110220414 | |
| PT: | Keller s/n 0101354 3 psi | |
| Power: | Car Battery | |

Notes: TSS sample collected.
Check records and verify transducer serial number.



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: July 13, 2005
Date of Measurement: 10:36 AM MDT
Start Time: 11:08 AM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Rebar 0.730
Water Level Reading: 1.912
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.697
Other:

Setup No. 1

El: 325.175
El: 323.993
El:
El: 323.296
El:

Setup No. 2

El: 325.175
El: 323.997
El:
El: 323.300
El:

Weather Conditions:

+20 C, Clear

River Conditions:

Open water, high stage

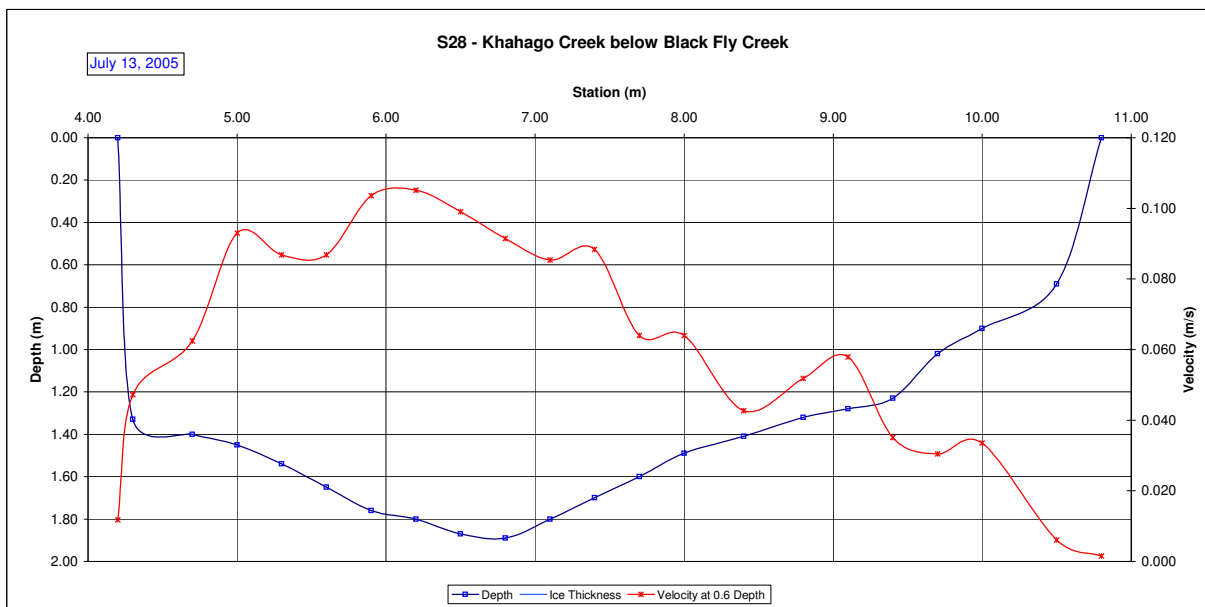
Measurement Data

| 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) |
| 4.20 | 0.00 | | 0.00 | 0.00 | | 1.00 | 1 | 4.20 | 4.25 | 0.012 | 0.012 | 0.33 | 0.02 | 0.000 |
| 4.30 | 1.33 | | 0.05 | 0.05 | | 1.00 | 2 | 4.25 | 4.50 | 0.047 | 0.047 | 1.33 | 0.33 | 0.016 |
| 4.70 | 1.40 | | 0.09 | 0.04 | | 1.00 | 3 | 4.50 | 4.85 | 0.062 | 0.062 | 1.40 | 0.49 | 0.031 |
| 5.00 | 1.45 | | 0.10 | 0.09 | | 1.00 | 4 | 4.85 | 5.15 | 0.093 | 0.093 | 1.45 | 0.44 | 0.040 |
| 5.30 | 1.54 | | 0.10 | 0.07 | | 1.00 | 5 | 5.15 | 5.45 | 0.087 | 0.087 | 1.54 | 0.46 | 0.040 |
| 5.60 | 1.65 | | 0.10 | 0.07 | | 1.00 | 6 | 5.45 | 5.75 | 0.087 | 0.087 | 1.65 | 0.50 | 0.043 |
| 5.90 | 1.76 | | 0.11 | 0.10 | | 1.00 | 7 | 5.75 | 6.05 | 0.104 | 0.104 | 1.76 | 0.53 | 0.055 |
| 6.20 | 1.80 | | 0.10 | 0.11 | | 1.00 | 8 | 6.05 | 6.35 | 0.105 | 0.105 | 1.80 | 0.54 | 0.057 |
| 6.50 | 1.87 | | 0.10 | 0.10 | | 1.00 | 9 | 6.35 | 6.65 | 0.099 | 0.099 | 1.87 | 0.56 | 0.056 |
| 6.80 | 1.89 | | 0.08 | 0.10 | | 1.00 | 10 | 6.65 | 6.95 | 0.091 | 0.091 | 1.89 | 0.57 | 0.052 |
| 7.10 | 1.80 | | 0.08 | 0.09 | | 1.00 | 11 | 6.95 | 7.25 | 0.085 | 0.085 | 1.80 | 0.54 | 0.046 |
| 7.40 | 1.70 | | 0.09 | 0.09 | | 1.00 | 12 | 7.25 | 7.55 | 0.088 | 0.088 | 1.70 | 0.51 | 0.045 |
| 7.70 | 1.60 | | 0.06 | 0.06 | | 1.00 | 13 | 7.55 | 7.85 | 0.064 | 0.064 | 1.60 | 0.48 | 0.031 |
| 8.00 | 1.49 | | 0.07 | 0.06 | | 1.00 | 14 | 7.85 | 8.20 | 0.064 | 0.064 | 1.49 | 0.52 | 0.033 |
| 8.40 | 1.41 | | 0.05 | 0.04 | | 1.00 | 15 | 8.20 | 8.60 | 0.043 | 0.043 | 1.41 | 0.56 | 0.024 |
| 8.80 | 1.32 | | 0.05 | 0.05 | | 1.00 | 16 | 8.60 | 8.95 | 0.052 | 0.052 | 1.32 | 0.46 | 0.024 |
| 9.10 | 1.28 | | 0.06 | 0.06 | | 1.00 | 17 | 8.95 | 9.25 | 0.058 | 0.058 | 1.28 | 0.38 | 0.022 |
| 9.40 | 1.23 | | 0.06 | 0.01 | | 1.00 | 18 | 9.25 | 9.55 | 0.035 | 0.035 | 1.23 | 0.37 | 0.013 |
| 9.70 | 1.02 | | | | 0.030 | 1.00 | 19 | 9.55 | 9.85 | 0.030 | 0.030 | 1.02 | 0.31 | 0.009 |
| 10.00 | 0.90 | | | | 0.034 | 1.00 | 20 | 9.85 | 10.25 | 0.034 | 0.034 | 0.90 | 0.36 | 0.012 |
| 10.50 | 0.69 | | | | 0.006 | 1.00 | 21 | 10.25 | 10.65 | 0.006 | 0.006 | 0.69 | 0.28 | 0.002 |
| 10.80 | 0.00 | | | | 0.000 | 1.00 | 22 | 10.65 | 10.80 | 0.002 | 0.002 | 0.17 | 0.03 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 0.651 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.651 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 9.23 | (m ²) |
| Top Width: | 6.60 | (m) |
| Hydraulic Depth: | 1.398 | (m) |
| Mean Velocity: | 0.071 | (m/s) |
| Froude Number | 0.019 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

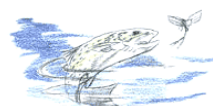
| | | |
|----------------------------|-------------------------------|-----|
| Datalogger Notes: | Database | 414 |
| Datalogger Internal Power: | 4.808V | |
| Datalogger External Power: | 13.49 V | |
| Datalogger Memory Used: | 36% | |
| Datalogger Clock: | Jul 13, 2005 08:58 | MST |
| Laptop Clock: | Jul 13, 2005 09:14 | MST |
| Dessicant: | 55% used | |
| Datalogger: | Optimum DD-128 s/n#0110220414 | |
| PT: | Keller s/n 0101354 3 psi | |
| Power: | Car Battery | |

Notes: TSS sample collected.
Check records and verify transducer serial number.



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 2, 2005
Date of Measurement: 10:10 AM MDT
Start Time: 10:33 AM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Rebar 0.635
Water Level Reading: 1.628
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 1.053
Other:

Setup No. 1

El: 325.175
El: 324.182
El:
El: 323.129
El:

Setup No. 2

El: 325.175
El: 324.185
El:
El: 323.132
El:

Weather Conditions:

+10 C, overcast, calm

River Conditions:

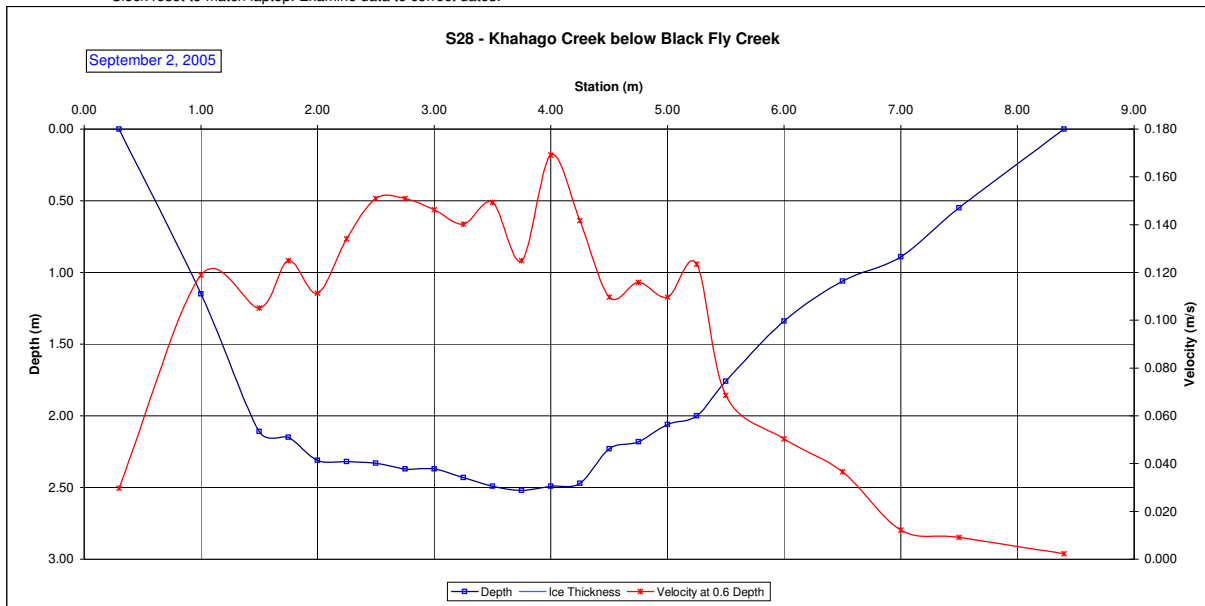
Open water, moderately high stage

| 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 | | | | | |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) | | | | | |
| | 0.30 | | | | 0.000 | 1.00 | 1 | 0.30 | 0.65 | 0.030 | 0.030 | 0.29 | 0.10 | 0.003 | | | | | |
| | 1.00 | | | | 0.119 | 1.00 | 2 | 0.65 | 1.25 | 0.119 | 0.119 | 1.15 | 0.69 | 0.082 | | | | | |
| | 1.50 | | 0.11 | 0.10 | | 1.00 | 3 | 1.25 | 1.63 | 0.105 | 0.105 | 2.11 | 0.79 | 0.083 | | | | | |
| | 1.75 | | 0.12 | 0.13 | | 1.00 | 4 | 1.63 | 1.88 | 0.125 | 0.125 | 2.15 | 0.54 | 0.067 | | | | | |
| | 2.00 | | 0.12 | 0.11 | | 1.00 | 5 | 1.88 | 2.13 | 0.111 | 0.111 | 2.31 | 0.58 | 0.064 | | | | | |
| | 2.25 | | 0.13 | 0.14 | | 1.00 | 6 | 2.13 | 2.38 | 0.134 | 0.134 | 2.32 | 0.58 | 0.078 | | | | | |
| | 2.50 | | 0.19 | 0.12 | | 1.00 | 7 | 2.38 | 2.63 | 0.151 | 0.151 | 2.33 | 0.58 | 0.088 | | | | | |
| | 2.75 | | 0.18 | 0.12 | | 1.00 | 8 | 2.63 | 2.88 | 0.151 | 0.151 | 2.37 | 0.59 | 0.089 | | | | | |
| | 3.00 | | 0.16 | 0.13 | | 1.00 | 9 | 2.88 | 3.13 | 0.146 | 0.146 | 2.37 | 0.59 | 0.087 | | | | | |
| | 3.25 | | 0.17 | 0.11 | | 1.00 | 10 | 3.13 | 3.38 | 0.140 | 0.140 | 2.43 | 0.61 | 0.085 | | | | | |
| | 3.50 | | 0.17 | 0.13 | | 1.00 | 11 | 3.38 | 3.63 | 0.149 | 0.149 | 2.49 | 0.62 | 0.093 | | | | | |
| | 3.75 | | 0.16 | 0.09 | | 1.00 | 12 | 3.63 | 3.88 | 0.125 | 0.125 | 2.52 | 0.63 | 0.079 | | | | | |
| | 4.00 | | 0.17 | 0.16 | | 1.00 | 13 | 3.88 | 4.13 | 0.169 | 0.169 | 2.49 | 0.62 | 0.105 | | | | | |
| | 4.25 | | 0.15 | 0.13 | | 1.00 | 14 | 4.13 | 4.38 | 0.142 | 0.142 | 2.47 | 0.62 | 0.088 | | | | | |
| | 4.50 | | 0.12 | 0.10 | | 1.00 | 15 | 4.38 | 4.63 | 0.110 | 0.110 | 2.23 | 0.56 | 0.061 | | | | | |
| | 4.75 | | 0.14 | 0.09 | | 1.00 | 16 | 4.63 | 4.88 | 0.116 | 0.116 | 2.18 | 0.55 | 0.063 | | | | | |
| | 5.00 | | 0.12 | 0.10 | | 1.00 | 17 | 4.88 | 5.13 | 0.110 | 0.110 | 2.06 | 0.52 | 0.057 | | | | | |
| | 5.25 | | 0.13 | 0.12 | | 1.00 | 18 | 5.13 | 5.38 | 0.123 | 0.123 | 2.00 | 0.50 | 0.062 | | | | | |
| | 5.50 | | 0.08 | 0.06 | | 1.00 | 19 | 5.38 | 5.75 | 0.069 | 0.069 | 1.76 | 0.66 | 0.045 | | | | | |
| | 6.00 | | 0.05 | 0.05 | | 1.00 | 20 | 5.75 | 6.25 | 0.050 | 0.050 | 1.34 | 0.67 | 0.034 | | | | | |
| | 6.50 | | | | 0.037 | 1.00 | 21 | 6.25 | 6.75 | 0.037 | 0.037 | 1.06 | 0.53 | 0.019 | | | | | |
| | 7.00 | | | | 0.012 | 1.00 | 22 | 6.75 | 7.25 | 0.012 | 0.012 | 0.89 | 0.45 | 0.005 | | | | | |
| | 7.50 | | | | 0.009 | 1.00 | 23 | 7.25 | 7.95 | 0.009 | 0.009 | 0.55 | 0.39 | 0.004 | | | | | |
| | 8.40 | | | | 0.000 | 1.00 | 24 | 7.95 | 8.40 | 0.002 | 0.002 | 0.14 | 0.06 | 0.000 | | | | | |
| Total Flow: | | | | | | | | | | | | | 1.441 | | | | | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 1.441 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 13.01 | (m ²) |
| Top Width: | 8.10 | (m) |
| Hydraulic Depth: | 1.607 | (m) |
| Mean Velocity: | 0.111 | (m/s) |
| Froude Number | 0.028 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|-------------------------------|-----|
| Datalogger Notes: | Database | 414 |
| Datalogger Internal Power: | 4.725V | |
| Datalogger External Power: | 13.06 V | |
| Datalogger Memory Used: | 40% | |
| Datalogger Clock: | Aug 30, 2005 08:48 | MST |
| Laptop Clock: | Sep 02, 2005 08:31 | MST |
| Dessicant: | 100% used-replaced | |
| Datalogger: | Optimum DD-128 s/n#0110220414 | |
| PT: | Keller s/n 0101354 3 psi | |
| Power: | Car Battery | |

Notes: TSS sample collected.
Check records and verify transducer serial number.
Transducer reading verified by water depth measurement.
Clock reset to match laptop. Examine data to correct dates.



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 8, 2005
Date of Measurement: 10:15 AM MDT
Start Time: 10:45 AM MDT
End Time:

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Rebar 0.610
Water Level Reading: 1.833
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.636
Other:

Setup No. 1

El: 325.175
El: 323.952
El:
El: 323.316
El:

Setup No. 2

El: 325.175
El: 323.963
El:
El: 323.327
El:

Weather Conditions: +8 C, overcast, light rain

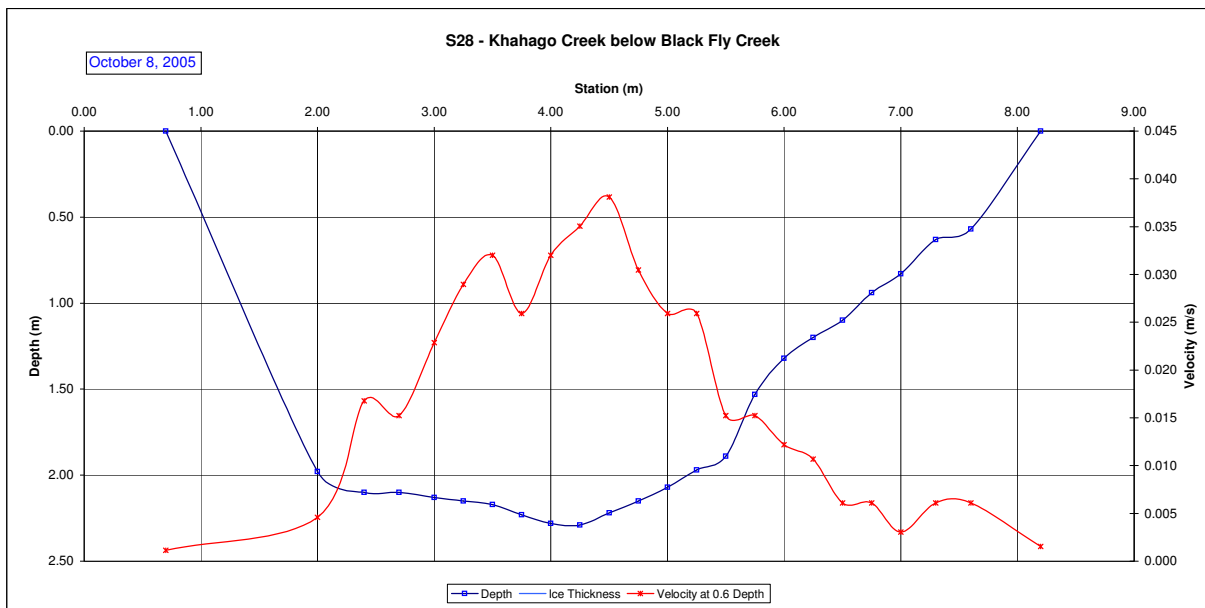
River Conditions: Open water, low stage

| 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) | (m²) | (m³/s) |
| 0.70 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.70 | 1.35 | 0.001 | 0.001 | 0.50 | 0.32 | 0.000 |
| 2.00 | 1.98 | | 0.01 | 0.00 | | 1.00 | 2 | 1.35 | 2.20 | 0.005 | 0.005 | 1.98 | 1.68 | 0.008 |
| 2.40 | 2.10 | | 0.03 | 0.01 | | 1.00 | 3 | 2.20 | 2.55 | 0.017 | 0.017 | 2.10 | 0.73 | 0.012 |
| 2.70 | 2.10 | | 0.02 | 0.01 | | 1.00 | 4 | 2.55 | 2.85 | 0.015 | 0.015 | 2.10 | 0.63 | 0.010 |
| 3.00 | 2.13 | | 0.02 | 0.02 | | 1.00 | 5 | 2.85 | 3.13 | 0.023 | 0.023 | 2.13 | 0.59 | 0.013 |
| 3.25 | 2.15 | | 0.03 | 0.02 | | 1.00 | 6 | 3.13 | 3.38 | 0.029 | 0.029 | 2.15 | 0.54 | 0.016 |
| 3.50 | 2.17 | | 0.04 | 0.02 | | 1.00 | 7 | 3.38 | 3.63 | 0.032 | 0.032 | 2.17 | 0.54 | 0.017 |
| 3.75 | 2.23 | | 0.03 | 0.02 | | 1.00 | 8 | 3.63 | 3.88 | 0.026 | 0.026 | 2.23 | 0.56 | 0.014 |
| 4.00 | 2.28 | | 0.04 | 0.03 | | 1.00 | 9 | 3.88 | 4.13 | 0.032 | 0.032 | 2.28 | 0.57 | 0.018 |
| 4.25 | 2.29 | | 0.04 | 0.03 | | 1.00 | 10 | 4.13 | 4.38 | 0.035 | 0.035 | 2.29 | 0.57 | 0.020 |
| 4.50 | 2.22 | | 0.05 | 0.03 | | 1.00 | 11 | 4.38 | 4.63 | 0.038 | 0.038 | 2.22 | 0.56 | 0.021 |
| 4.75 | 2.15 | | 0.04 | 0.02 | | 1.00 | 12 | 4.63 | 4.88 | 0.030 | 0.030 | 2.15 | 0.54 | 0.016 |
| 5.00 | 2.07 | | 0.03 | 0.02 | | 1.00 | 13 | 4.88 | 5.13 | 0.026 | 0.026 | 2.07 | 0.52 | 0.013 |
| 5.25 | 1.97 | | 0.03 | 0.02 | | 1.00 | 14 | 5.13 | 5.38 | 0.026 | 0.026 | 1.97 | 0.49 | 0.013 |
| 5.50 | 1.89 | | 0.02 | 0.02 | | 1.00 | 15 | 5.38 | 5.63 | 0.015 | 0.015 | 1.89 | 0.47 | 0.007 |
| 5.75 | 1.53 | | 0.02 | 0.01 | | 1.00 | 16 | 5.63 | 5.88 | 0.015 | 0.015 | 1.53 | 0.38 | 0.006 |
| 6.00 | 1.32 | | 0.02 | 0.01 | | 1.00 | 17 | 5.88 | 6.13 | 0.012 | 0.012 | 1.32 | 0.33 | 0.004 |
| 6.25 | 1.20 | | 0.02 | 0.01 | | 1.00 | 18 | 6.13 | 6.38 | 0.011 | 0.011 | 1.20 | 0.30 | 0.003 |
| 6.50 | 1.10 | | | | 0.006 | 1.00 | 19 | 6.38 | 6.63 | 0.006 | 0.006 | 1.10 | 0.28 | 0.002 |
| 6.75 | 0.94 | | | | 0.006 | 1.00 | 20 | 6.63 | 6.88 | 0.006 | 0.006 | 0.94 | 0.24 | 0.001 |
| 7.00 | 0.83 | | | | 0.003 | 1.00 | 21 | 6.88 | 7.15 | 0.003 | 0.003 | 0.83 | 0.23 | 0.001 |
| 7.30 | 0.63 | | | | 0.006 | 1.00 | 22 | 7.15 | 7.45 | 0.006 | 0.006 | 0.63 | 0.19 | 0.001 |
| 7.60 | 0.57 | | | | 0.006 | 1.00 | 23 | 7.45 | 7.90 | 0.006 | 0.006 | 0.57 | 0.26 | 0.002 |
| 8.20 | 0.00 | | | | 0.000 | 1.00 | 24 | 7.90 | 8.20 | 0.002 | 0.002 | 0.14 | 0.04 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 0.220 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.220 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 11.55 | (m ²) |
| Top Width: | 7.50 | (m) |
| Hydraulic Depth: | 1.540 | (m) |
| Mean Velocity: | 0.019 | (m/s) |
| Froude Number | 0.005 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | | |
|----------------------------|-------------------------------|-----|
| Datalogger Notes: | Database | 414 |
| Datalogger Internal Power: | 4.668V | |
| Datalogger External Power: | 13.06 V | |
| Datalogger Memory Used: | 3% | |
| Datalogger Clock: | Oct 08, 2005 08:45 | MST |
| Laptop Clock: | Oct 08, 2005 08:46 | MST |
| Dessicant: | 20% used | |
| Datalogger: | Optimum DD-128 s/n#0110220414 | |
| PT: | Keller s/n 0101354 3 psi | |
| Power: | Car Battery | |

Notes: TSS sample collected.
Transducer removed 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: ND/CT/DB
Data Entry By: ND Checked: PM
Meter Type and No.:

Time of Measurement

Date of Measurement: January 5, 2005
Start Time: 5:52 PM MST
End Time: 6:45 PM MST

Level Readings

Bench Mark Reading: T-bar 1.584
Water Level Reading: 4.421
Top of Ice Level Reading: 4.081
Transducer Reading & Calc'd El.:
Nail in Tree on LB 1.068

Setup No. 1

El: 99.076
El: 96.239
El: 96.239
El: 99.592

Setup No. 2

El: 99.076
El: 96.233
El: 96.233
El: 99.617

Weather Conditions:

-10 C, partially cloudy

River Conditions:

Complete ice cover

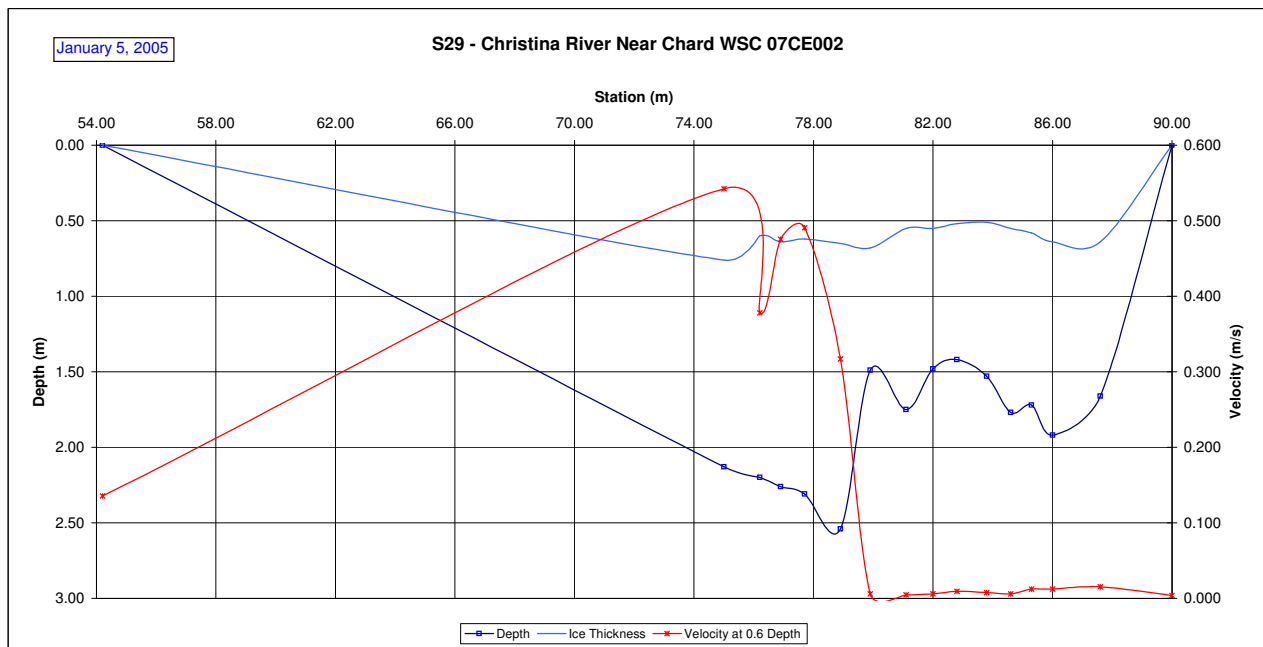
Measurement Data

| 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) | | |
| 54.20 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.90 | 1 | 54.20 | 64.60 | 0.136 | 0.122 | 0.34 | 3.56 | 0.435 | 4% | |
| 75.00 | 2.13 | 0.76 | 0.57 | 0.52 | | 0.90 | 2 | 64.60 | 75.60 | 0.543 | 0.488 | 1.37 | 15.07 | 7.359 | 72% | |
| 76.20 | 2.20 | 0.60 | 0.46 | 0.30 | | 0.90 | 3 | 75.60 | 76.55 | 0.378 | 0.340 | 1.60 | 1.52 | 0.517 | 5% | |
| 76.90 | 2.26 | 0.64 | 0.55 | 0.40 | | 0.90 | 4 | 76.55 | 77.30 | 0.475 | 0.428 | 1.62 | 1.22 | 0.520 | 5% | |
| 77.70 | 2.31 | 0.62 | 0.53 | 0.45 | | 0.90 | 5 | 77.30 | 78.30 | 0.491 | 0.442 | 1.69 | 1.69 | 0.746 | 7% | |
| 78.90 | 2.54 | 0.65 | 0.40 | 0.24 | | 0.90 | 6 | 78.30 | 79.40 | 0.317 | 0.285 | 1.89 | 2.08 | 0.593 | 6% | |
| 79.90 | 1.49 | 0.68 | | | 0.006 | 0.90 | 7 | 79.40 | 80.50 | 0.006 | 0.005 | 0.81 | 0.89 | 0.005 | 0% | |
| 81.10 | 1.75 | 0.55 | 0.01 | 0.00 | | 0.90 | 8 | 80.50 | 81.55 | 0.005 | 0.004 | 1.20 | 1.26 | 0.005 | 0% | |
| 82.00 | 1.48 | 0.55 | | | 0.006 | 0.90 | 9 | 81.55 | 82.40 | 0.006 | 0.005 | 0.93 | 0.79 | 0.004 | 0% | |
| 82.80 | 1.42 | 0.52 | | | 0.009 | 0.90 | 10 | 82.40 | 83.30 | 0.009 | 0.008 | 0.90 | 0.81 | 0.007 | 0% | |
| 83.80 | 1.53 | 0.51 | 0.01 | 0.01 | | 0.90 | 11 | 83.30 | 84.20 | 0.008 | 0.007 | 1.02 | 0.92 | 0.006 | 0% | |
| 84.60 | 1.77 | 0.55 | 0.01 | 0.00 | | 0.90 | 12 | 84.20 | 84.95 | 0.006 | 0.005 | 1.22 | 0.92 | 0.005 | 0% | |
| 85.30 | 1.72 | 0.58 | 0.01 | 0.02 | | 0.90 | 13 | 84.95 | 85.65 | 0.012 | 0.011 | 1.14 | 0.80 | 0.009 | 0% | |
| 86.00 | 1.92 | 0.64 | 0.01 | 0.02 | | 0.90 | 14 | 85.65 | 86.80 | 0.012 | 0.011 | 1.28 | 1.47 | 0.016 | 0% | |
| 87.60 | 1.66 | 0.64 | | | 0.015 | 0.90 | 15 | 86.80 | 88.80 | 0.015 | 0.014 | 1.02 | 2.04 | 0.028 | 0% | |
| 90.00 | 0.00 | 0.00 | | | 0.000 | 0.90 | 16 | 88.80 | 90.00 | 0.004 | 0.003 | 0.26 | 0.31 | 0.001 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 10.256 | - | |

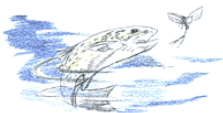
| | | |
|--|--------|---------------------|
| Total Flow: | 10.256 | (m ³ /s) |
| Pereived Measurement Quality: | Poor | |
| Total Area: | 35.34 | (m ²) |
| Top Width: | 35.80 | (m) |
| Hydraulic Depth: | 0.987 | (m) |
| Mean Velocity: | 0.290 | (m/s) |
| Froude Number | 0.093 | |
| Photographs taken 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: ND/CT/RM
Data Entry By: ND Checked: PM
Meter Type and No.:

Time of Measurement

Date of Measurement: February 9, 2005
Start Time: 10:37 AM MST
End Time: 11:02 AM MST

Level Readings

Bench Mark Reading: T-bar
Water Level Reading: 4.422
Top of Ice Level Reading: 3.901
Transducer Reading & Calc'd El.: Nail in Tree on LB 0.839

Setup No. 1

El: 99.076
El: 96.007
El: 96.007
El: 99.590

Setup No. 2

El: 99.076 could not be fo
El: 96.121
El: 96.121
El: 99.590

Weather Conditions: -10 C, partially cloudy

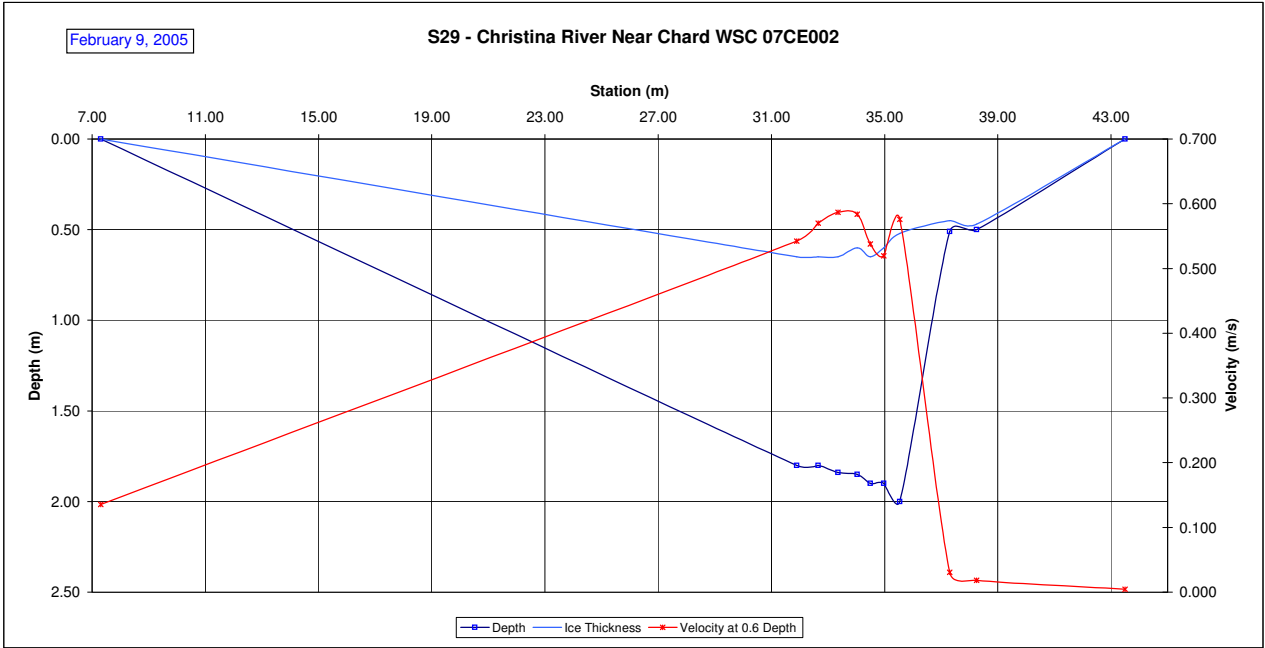
River Conditions: Complete ice cover

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 7.30 to 43.50.

Summary table with 2 columns: Metric (Total Flow, Pervied Measurement Quality, Total Area, Top Width, Hydraulic Depth, Mean Velocity, Froude Number) and Value (10.286, Poor, 23.67, 36.20, 0.654, 0.435, 0.172).

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

Notes: The BM, t-bar in PVC could not be found



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: ND/RM
Data Entry By: ND Checked: PM
Meter Type and No.:

Time of Measurement

Date of Measurement: March 8, 2005
Start Time: 10:35 AM MST
End Time: 11:44 AM MST

AT WSC

Level Readings

Bench Mark Reading: T-bar
Water Level Reading: 4.511
Top of Ice Level Reading: 4.323
Transducer Reading & Calc'd El.:
Nail in Tree on LB 0.757

Setup No. 1

El: 99.076
El: 95.836
El: 4.399
El: 95.836
El: 99.590

Setup No. 2

El: 99.076
El: 95.829
El: 4.592
El: 95.829
El: 99.590

could not be for

Weather Conditions:

+2 C, clear, calm

River Conditions:

Complete ice cover

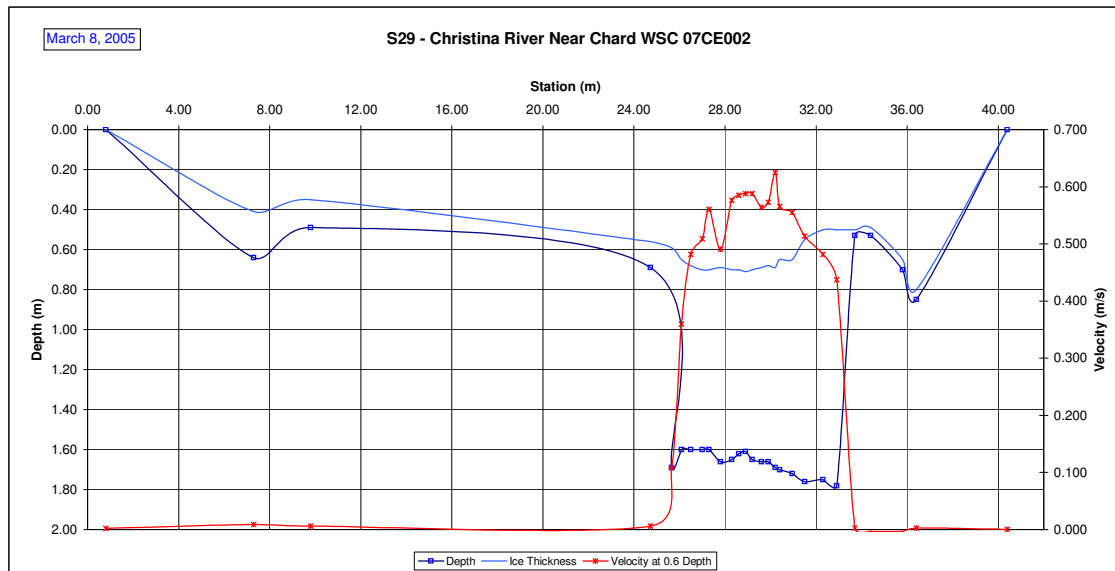
Measurement Data

| 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 ²) | (m ³ /s) | | |
| | | | | | | | | | | | | | | | | |
| 0.80 | 0.00 | 0.00 | | | 0.000 | 0.90 | 1 | 0.80 | 4.05 | 0.002 | 0.002 | 0.06 | 0.19 | 0.000 | 0% | |
| 7.30 | 0.64 | 0.41 | | | 0.009 | 0.90 | 2 | 4.05 | 8.55 | 0.009 | 0.008 | 0.23 | 1.04 | 0.009 | 0% | |
| 9.80 | 0.49 | 0.35 | | | 0.006 | 0.90 | 3 | 8.55 | 17.27 | 0.006 | 0.005 | 0.14 | 1.22 | 0.007 | 0% | |
| 24.73 | 0.69 | 0.56 | | | 0.006 | 0.90 | 4 | 17.27 | 25.19 | 0.006 | 0.005 | 0.13 | 1.03 | 0.006 | 0% | |
| 25.65 | 1.69 | 0.59 | 0.01 | 0.21 | | 0.90 | 5 | 25.19 | 25.87 | 0.108 | 0.097 | 1.10 | 0.75 | 0.073 | 2% | |
| 26.09 | 1.60 | 0.65 | | | 0.360 | 0.90 | 6 | 25.87 | 26.30 | 0.360 | 0.324 | 0.95 | 0.40 | 0.131 | 4% | |
| 26.50 | 1.60 | 0.68 | | | 0.482 | 0.90 | 7 | 26.30 | 26.75 | 0.482 | 0.433 | 0.92 | 0.42 | 0.181 | 5% | |
| 27.00 | 1.60 | 0.70 | | | 0.509 | 0.90 | 8 | 26.75 | 27.15 | 0.509 | 0.458 | 0.90 | 0.36 | 0.165 | 4% | |
| 27.30 | 1.60 | 0.70 | | | 0.561 | 0.90 | 9 | 27.15 | 27.55 | 0.561 | 0.505 | 0.90 | 0.36 | 0.182 | 5% | |
| 27.80 | 1.66 | 0.69 | | | 0.491 | 0.90 | 10 | 27.55 | 28.05 | 0.491 | 0.442 | 0.97 | 0.49 | 0.214 | 6% | |
| 28.30 | 1.65 | 0.70 | | | 0.576 | 0.90 | 11 | 28.05 | 28.45 | 0.576 | 0.518 | 0.95 | 0.38 | 0.197 | 5% | |
| 28.60 | 1.62 | 0.70 | | | 0.585 | 0.90 | 12 | 28.45 | 28.75 | 0.585 | 0.527 | 0.92 | 0.28 | 0.145 | 4% | |
| 28.90 | 1.61 | 0.71 | | | 0.588 | 0.90 | 13 | 28.75 | 29.05 | 0.588 | 0.529 | 0.90 | 0.27 | 0.143 | 4% | |
| 29.20 | 1.65 | 0.70 | | | 0.588 | 0.90 | 14 | 29.05 | 29.40 | 0.588 | 0.529 | 0.95 | 0.33 | 0.176 | 5% | |
| 29.60 | 1.66 | 0.69 | | | 0.564 | 0.90 | 15 | 29.40 | 29.75 | 0.564 | 0.507 | 0.97 | 0.34 | 0.172 | 5% | |
| 29.90 | 1.66 | 0.68 | | | 0.573 | 0.90 | 16 | 29.75 | 30.05 | 0.573 | 0.516 | 0.98 | 0.29 | 0.152 | 4% | |
| 30.20 | 1.69 | 0.69 | | | 0.625 | 0.90 | 17 | 30.05 | 30.30 | 0.625 | 0.562 | 1.00 | 0.25 | 0.141 | 4% | |
| 30.40 | 1.70 | 0.65 | 0.62 | 0.51 | | 0.90 | 18 | 30.30 | 30.68 | 0.565 | 0.509 | 1.05 | 0.39 | 0.200 | 5% | |
| 30.95 | 1.72 | 0.65 | 0.60 | 0.51 | | 0.90 | 19 | 30.68 | 31.23 | 0.555 | 0.499 | 1.07 | 0.59 | 0.294 | 8% | |
| 31.50 | 1.76 | 0.55 | 0.54 | 0.48 | | 0.90 | 20 | 31.23 | 31.90 | 0.514 | 0.462 | 1.21 | 0.82 | 0.378 | 10% | |
| 32.30 | 1.75 | 0.50 | 0.52 | 0.44 | | 0.90 | 21 | 31.90 | 32.60 | 0.482 | 0.433 | 1.25 | 0.87 | 0.379 | 10% | |
| 32.90 | 1.78 | 0.50 | 0.48 | 0.39 | | 0.90 | 22 | 32.60 | 33.30 | 0.437 | 0.394 | 1.28 | 0.90 | 0.353 | 10% | |
| 33.70 | 0.53 | 0.50 | | | 0.003 | 0.90 | 23 | 33.30 | 34.05 | 0.003 | 0.003 | 0.03 | 0.02 | 0.000 | 0% | |
| 34.40 | 0.53 | 0.49 | | | -0.003 | 0.90 | 24 | 34.05 | 35.10 | -0.003 | -0.003 | 0.04 | 0.04 | 0.000 | 0% | |
| 35.80 | 0.70 | 0.65 | | | -0.003 | 0.90 | 25 | 35.10 | 36.10 | -0.003 | -0.003 | 0.05 | 0.05 | 0.000 | 0% | |
| 36.40 | 0.85 | 0.80 | | | 0.003 | 0.90 | 26 | 36.10 | 38.40 | 0.003 | 0.003 | 0.05 | 0.12 | 0.000 | 0% | |
| 40.40 | 0.00 | 0.00 | | | 0.000 | 0.90 | 27 | 38.40 | 40.40 | 0.001 | 0.001 | 0.01 | 0.03 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 3.697 | 100% | |

| | | |
|--------------------------------|-------------------|---------------------|
| Total Flow: | 3.697 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 12.21 | (m ²) |
| Top Width: | 39.60 | (m) |
| Hydraulic Depth: | 0.308 | (m) |
| Mean Velocity: | 0.303 | (m/s) |
| Froude Number | 0.174 | |
| 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: The BM, t-bar in PVC could not be found
WSC also did a manual MMT downstream of the bridge and they got discharge of about 3.45 m³/s



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: ND/RM
Data Entry By: ND Checked: PM
Meter Type and No.:

Time of Measurement

Date of Measurement: April 7, 2005
Start Time: 11:00 AM MDT
End Time: MDT

Level Readings

Bench Mark Reading: T-bar 1.578
Water Level Reading: 3.900
Top of Ice Level Reading:
Transducer Reading & Calc'd El.:
Nail in Tree on LB 1.058

Setup No. 1

El: 99.076
El: 96.754
El: 96.754
El: 99.596

Setup No. 2

El: 99.076
El: 96.762
El: 96.762
El: 99.546

Weather Conditions:

+5 C, Clear

River Conditions:

Ice cover melting. Lots of overflow, several open spots.

| 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) | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - | - |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| 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:

Water level taken at both WSC shack and old transducer location. Ice conditions unsafe for manual flow measurement.

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: ND/PM
Data Entry By: ND Checked: PM
Meter Type and No.:

Time of Measurement

Date of Measurement: December 11, 2005
Start Time: 2:15 AM MST
End Time: MST

Level Readings

Bench Mark Reading: T-bar

Water Level Reading:

Top of Ice Level Reading:

Transducer Reading & Calc'd El.:

Nail in Tree on LB

Setup No. 1

El: 99.076

El: 95.382

El: 95.382

El: 99.598

Setup No. 2

El: 99.076

El: 95.380

El: 5.080

El: 95.380

Weather Conditions:

+5 C, Clear, Calm

River Conditions:

Thin ice cover, open spot upstream

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: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| 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:

Water level taken at both WSC shack and old transducer location. Ice conditions unsafe for manual flow measurement.

Hydrometric Measurement / Site Visit Record

S31 - Hanginstone Creek Above at North Star Road



Regional Aquatics Monitoring Program

Measurement Location

River/Stream: Hanginstone Creek
Location: Hanginstone Creek Above at North Star Road
Site Name: S31
Coordinates & Legal: 6236084 N, 469784 E NW 10-84-10 W4M

Personnel & Equipment

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

Time of Measurement

Date of Measurement: April 24, 2005
Start Time: 7:55 AM MDT
End Time: 8:10 AM MDT

Level Readings

Bench Mark Reading: Nail on LB 0.616
Water Level Reading: 1.669
Top of Ice Level Reading:
Transducer Reading & Calc'd El 1.020
Other:

Setup No. 1

El: 100.000 0.657
El: 98.947 1.715
El: 97.927 1.020
El:

Setup No. 2

El: 100.000
El: 98.942
El:
El: 97.922
El:

Weather Conditions:

+7 °C, Clear, Calm

River Conditions:

Open water conditions. High stage. Stage above bankfull stage. Flow turbid.

Measurement Data

| Measured Data | | | | | | Calculated Data | | | | | | | | |
|---------------|-------|-----------|----------|----------|----------|-----------------|-------|-----------|---------|----------|-----------|-----------|-------|-----------|
| | | | | | | | | | | | | | | |
| | | Ice | Velocity | Velocity | Velocity | Velocity | Panel | Panel | Panel | Measured | Effective | Panel | Panel | Panel |
| Station | Depth | Thickness | at 0.2 | at 0.8 | at 0.6 | Correction | No. | Starts at | Ends at | Panel | Average | Effective | Area | Discharge |
| (m) | (m) | (m) | Depth | Depth | Depth | Factor | | (m) | (m) | Velocity | Panel | Depth | (m²) | (m³/s) |
| | | | | | | | | | | | | | | |
| 1.70 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.70 | 1.80 | 0.014 | 0.014 | 0.13 | 0.01 | 0.000 |
| 1.90 | 0.51 | | | | 0.055 | 1.00 | 2 | 1.80 | 2.08 | 0.055 | 0.055 | 0.51 | 0.14 | 0.008 |
| 2.25 | 0.63 | | | | 0.308 | 1.00 | 3 | 2.08 | 2.50 | 0.308 | 0.308 | 0.63 | 0.27 | 0.082 |
| 2.75 | 0.66 | | | | 0.500 | 1.00 | 4 | 2.50 | 2.88 | 0.500 | 0.500 | 0.66 | 0.25 | 0.124 |
| 3.00 | 0.64 | | | | 0.482 | 1.00 | 5 | 2.88 | 3.13 | 0.482 | 0.482 | 0.64 | 0.16 | 0.077 |
| 3.25 | 0.56 | | | | 0.494 | 1.00 | 6 | 3.13 | 3.38 | 0.494 | 0.494 | 0.56 | 0.14 | 0.069 |
| 3.50 | 0.62 | | | | 0.549 | 1.00 | 7 | 3.38 | 3.63 | 0.549 | 0.549 | 0.62 | 0.16 | 0.085 |
| 3.75 | 0.72 | | | | 0.533 | 1.00 | 8 | 3.63 | 3.88 | 0.533 | 0.533 | 0.72 | 0.18 | 0.096 |
| 4.00 | 0.74 | | | | 0.546 | 1.00 | 9 | 3.88 | 4.25 | 0.546 | 0.546 | 0.74 | 0.28 | 0.151 |
| 4.50 | 0.87 | | | | 0.604 | 1.00 | 10 | 4.25 | 4.75 | 0.604 | 0.604 | 0.87 | 0.44 | 0.263 |
| 5.00 | 0.92 | | | | 0.524 | 1.00 | 11 | 4.75 | 5.25 | 0.524 | 0.524 | 0.92 | 0.46 | 0.241 |
| 5.50 | 0.92 | | | | 0.561 | 1.00 | 12 | 5.25 | 5.75 | 0.561 | 0.561 | 0.92 | 0.46 | 0.258 |
| 6.00 | 0.96 | | | | 0.619 | 1.00 | 13 | 5.75 | 6.13 | 0.619 | 0.619 | 0.96 | 0.36 | 0.223 |
| 6.25 | 0.92 | | | | 0.546 | 1.00 | 14 | 6.13 | 6.38 | 0.546 | 0.546 | 0.92 | 0.23 | 0.125 |
| 6.50 | 0.98 | | | | 0.552 | 1.00 | 15 | 6.38 | 6.63 | 0.552 | 0.552 | 0.98 | 0.25 | 0.135 |
| 6.75 | 0.97 | | | | 0.579 | 1.00 | 16 | 6.63 | 6.88 | 0.579 | 0.579 | 0.97 | 0.24 | 0.140 |
| 7.00 | 0.98 | | | | 0.546 | 1.00 | 17 | 6.88 | 7.13 | 0.546 | 0.546 | 0.98 | 0.25 | 0.134 |
| 7.25 | 1.09 | | | | 0.527 | 1.00 | 18 | 7.13 | 7.38 | 0.527 | 0.527 | 1.09 | 0.27 | 0.144 |
| 7.50 | 1.06 | | | | 0.482 | 1.00 | 19 | 7.38 | 7.63 | 0.482 | 0.482 | 1.06 | 0.27 | 0.128 |
| 7.75 | 0.94 | | | | 0.408 | 1.00 | 20 | 7.63 | 7.88 | 0.408 | 0.408 | 0.94 | 0.24 | 0.096 |
| 8.00 | 0.94 | | | | 0.463 | 1.00 | 21 | 7.88 | 8.13 | 0.463 | 0.463 | 0.94 | 0.24 | 0.109 |
| 8.25 | 0.95 | | | | 0.317 | 1.00 | 22 | 8.13 | 8.38 | 0.317 | 0.317 | 0.95 | 0.24 | 0.075 |
| 8.50 | 0.83 | | | | 0.271 | 1.00 | 23 | 8.38 | 8.63 | 0.271 | 0.271 | 0.83 | 0.21 | 0.056 |
| 8.75 | 0.73 | | | | 0.168 | 1.00 | 24 | 8.63 | 8.98 | 0.168 | 0.168 | 0.73 | 0.26 | 0.043 |
| 9.20 | 0.00 | | | | 0.000 | 1.00 | 25 | 8.98 | 9.20 | 0.042 | 0.042 | 0.18 | 0.04 | 0.002 |
| Total Flow: | | | | | | | | | | | | | 2.864 | |

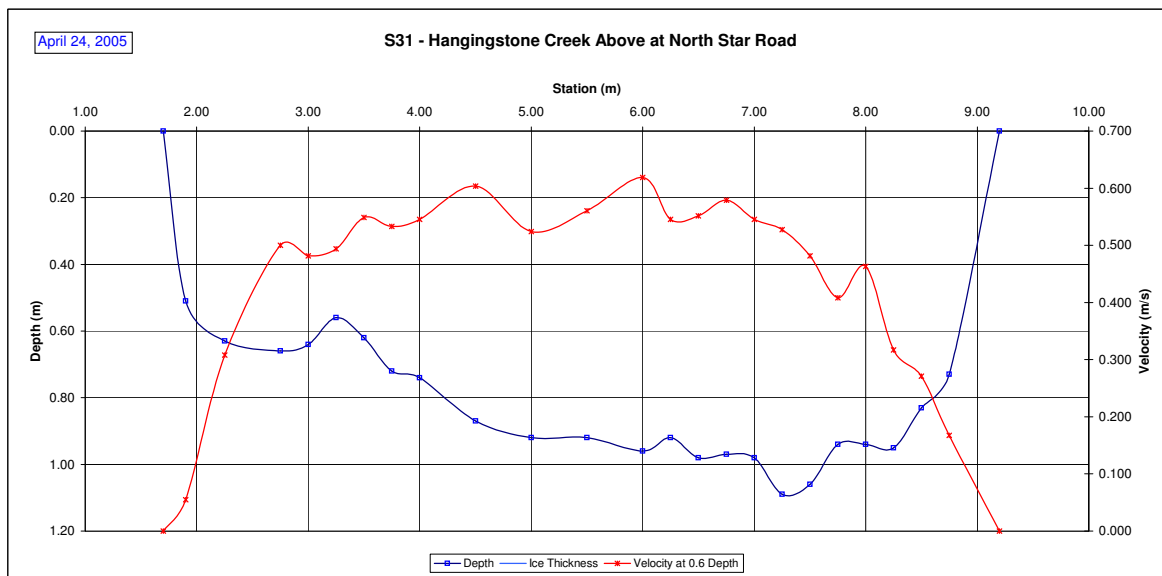
| | | |
|---|-------|---------------------|
| Total Flow: | 2.864 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 6.01 | (m ²) |
| Top Width: | 7.50 | (m) |
| Hydraulic Depth: | 0.801 | (m) |
| Mean Velocity: | 0.477 | (m/s) |
| Froude Number | 0.170 | |
| Photographs taken looking at: | | |
| Upstream, downstream, left bank, right bank, bench mark, datalogger/battery | | |

Datalogger Notes:

Datalogger Internal Power: 11.34V (100%)
Datalogger External Power: 12.17 V (78%)
Datalogger Memory Used: 0% used
Datalogger Clock: Apr 24, 2005 06:28 MST
Laptop Clock: Apr 24, 2005 06:28 MST
Dessicant: 100 % Good
Datalogger: Lakewood UltraLogger RX 1A #95185-05
PT: Keller Pressure Transducer 3 psi #3499
Power: Lakewood battery

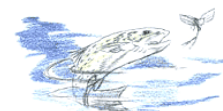
Notes:

TSS sample collected.
Stage above bankfull. Flow turbid. Equipment installed. TD fixed to concrete block and placed in flow.
Check Jul 25, 2004 MMT - Error in panel width equation.



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: FF/DM
Data Entry By: FF
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: May 29, 2005
Start Time: 3:28 PM MDT
End Time: 3:51 PM MDT

Level Readings

Bench Mark Reading: Nail on LB 1.037
Water Level Reading: 2.341
Top of Ice Level Reading:
Transducer Reading & Calc'd El. 0.775
Other:

Setup No. 1

El: 100.000
El: 98.696
El: 97.921
El:

Setup No. 2

El: 100.000
El: 98.693
El: 97.918
El:

Weather Conditions:

+20 °C, Clear, Calm

River Conditions:

Open water conditions. High stage, but falling. Stage below bankfull 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) |
| 1.30 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.30 | 1.40 | 0.046 | 0.046 | 0.10 | 0.01 | 0.000 |
| 1.50 | 0.38 | | | | 0.186 | 1.00 | 2 | 1.40 | 1.75 | 0.186 | 0.186 | 0.38 | 0.13 | 0.025 |
| 2.00 | 0.37 | | | | 0.332 | 1.00 | 3 | 1.75 | 2.25 | 0.332 | 0.332 | 0.37 | 0.19 | 0.061 |
| 2.50 | 0.38 | | | | 0.332 | 1.00 | 4 | 2.25 | 2.75 | 0.332 | 0.332 | 0.38 | 0.19 | 0.063 |
| 3.00 | 0.46 | | | | 0.405 | 1.00 | 5 | 2.75 | 3.25 | 0.405 | 0.405 | 0.46 | 0.23 | 0.093 |
| 3.50 | 0.48 | | | | 0.405 | 1.00 | 6 | 3.25 | 3.75 | 0.405 | 0.405 | 0.48 | 0.24 | 0.097 |
| 4.00 | 0.58 | | | | 0.491 | 1.00 | 7 | 3.75 | 4.25 | 0.491 | 0.491 | 0.58 | 0.29 | 0.142 |
| 4.50 | 0.60 | | | | 0.494 | 1.00 | 8 | 4.25 | 4.75 | 0.494 | 0.494 | 0.60 | 0.30 | 0.148 |
| 5.00 | 0.66 | | | | 0.521 | 1.00 | 9 | 4.75 | 5.13 | 0.521 | 0.521 | 0.66 | 0.25 | 0.129 |
| 5.25 | 0.70 | | | | 0.451 | 1.00 | 10 | 5.13 | 5.38 | 0.451 | 0.451 | 0.70 | 0.18 | 0.079 |
| 5.50 | 0.70 | | | | 0.503 | 1.00 | 11 | 5.38 | 5.75 | 0.503 | 0.503 | 0.70 | 0.26 | 0.132 |
| 6.00 | 0.68 | | | | 0.436 | 1.00 | 12 | 5.75 | 6.25 | 0.436 | 0.436 | 0.68 | 0.34 | 0.148 |
| 6.50 | 0.70 | | | | 0.427 | 1.00 | 13 | 6.25 | 6.75 | 0.427 | 0.427 | 0.70 | 0.35 | 0.149 |
| 7.00 | 0.71 | | | | 0.369 | 1.00 | 14 | 6.75 | 7.25 | 0.369 | 0.369 | 0.71 | 0.36 | 0.131 |
| 7.50 | 0.65 | | | | 0.439 | 1.00 | 15 | 7.25 | 7.75 | 0.439 | 0.439 | 0.65 | 0.33 | 0.143 |
| 8.00 | 0.60 | | | | 0.149 | 1.00 | 16 | 7.75 | 8.25 | 0.149 | 0.149 | 0.60 | 0.30 | 0.045 |
| 8.50 | 0.44 | | | | 0.024 | 1.00 | 17 | 8.25 | 8.70 | 0.024 | 0.024 | 0.44 | 0.20 | 0.005 |
| 8.90 | 0.00 | | | | 0.000 | 1.00 | 18 | 8.70 | 8.90 | 0.006 | 0.006 | 0.11 | 0.02 | 0.000 |
| | | | | | | | | | | | | | Total Flow: | 1.592 |

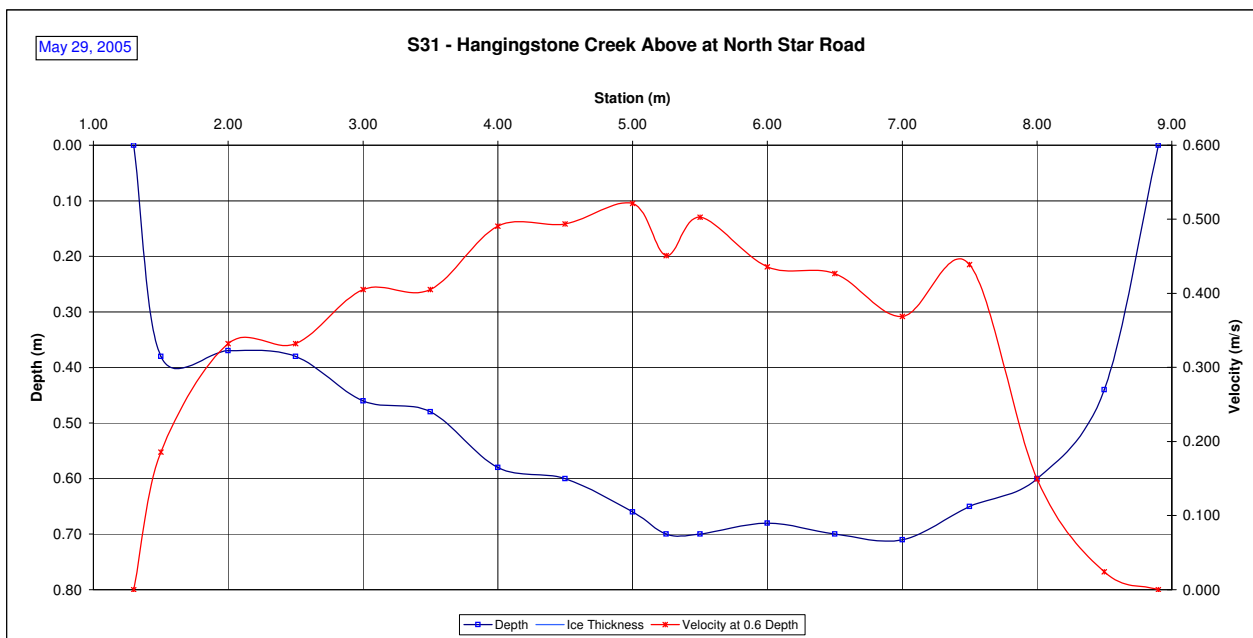
| | | |
|---|-------|---------------------|
| Total Flow: | 1.592 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 4.15 | (m ²) |
| Top Width: | 7.60 | (m) |
| Hydraulic Depth: | 0.546 | (m) |
| Mean Velocity: | 0.383 | (m/s) |
| Froude Number | 0.166 | |
| Photographs taken looking at: | | |
| Upstream, downstream, left bank, right bank, bench mark, datalogger/battery | | |

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.29 V 79%
Datalogger Memory Used: 20% used
Datalogger Clock: May 29, 2005 14:17 MST
Laptop Clock: May 29, 2005 14:18 MST
Dessicant: 95 % Good
Datalogger: Lakewood UltraLogger RX 1A #95185-05
PT: Keller Pressure Transducer 3 psi #3499
Power: Lakewood battery

Notes:

TSS sample collected.
Very high levels recently present - beaver dam upstream may have failed.



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: ND/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney FloMate 2000 s/n 2004521

Time of Measurement

Date of Measurement: July 12, 2005
Start Time: 9:13 AM MDT
End Time: 9:27 AM MDT

Level Readings

Bench Mark Reading: Nail on LB 0.648
Water Level Reading: 2.171
Top of Ice Level Reading:
Transducer Reading & Calc'd El: 0.574
Other:

Setup No. 1

El: 100.000 0.617 El: 100.000
El: 98.477 2.142 El: 98.475
El:
El: 97.903 0.574 El: 97.901
El:

Setup No. 2

Weather Conditions:

+15 °C, Clear, Calm

River Conditions:

Open water conditions.

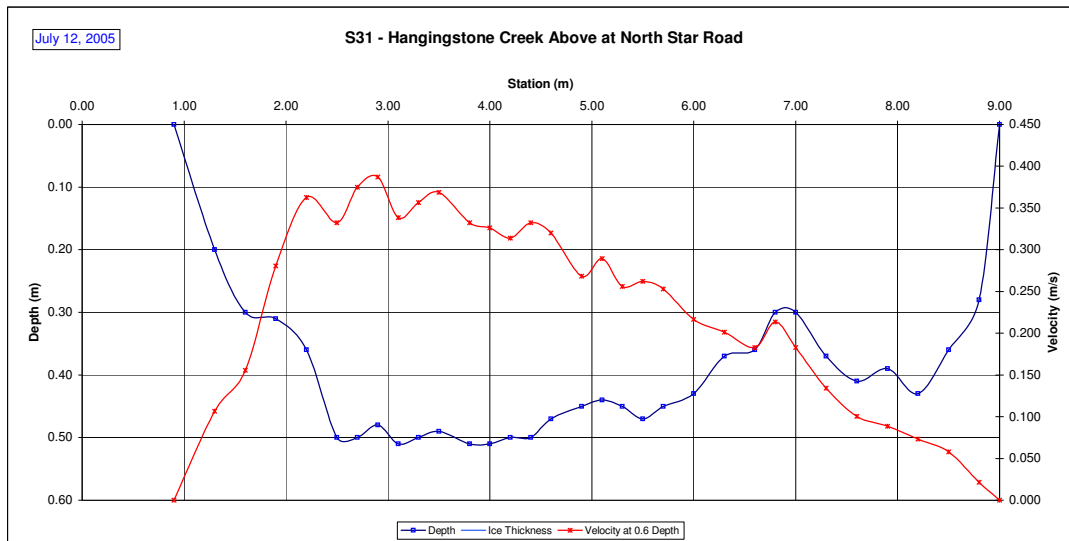
Measurement Data

| 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) | (m²) | (m³/s) |
| 0.90 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.90 | 1.10 | 0.027 | 0.027 | 0.05 | 0.01 | 0.006 |
| 1.30 | 0.20 | | | | 0.107 | 1.00 | 2 | 1.10 | 1.45 | 0.107 | 0.107 | 0.20 | 0.07 | 0.007 |
| 1.60 | 0.30 | | | | 0.155 | 1.00 | 3 | 1.45 | 1.75 | 0.155 | 0.155 | 0.30 | 0.09 | 0.014 |
| 1.90 | 0.31 | | | | 0.280 | 1.00 | 4 | 1.75 | 2.05 | 0.280 | 0.280 | 0.31 | 0.09 | 0.026 |
| 2.20 | 0.36 | | | | 0.363 | 1.00 | 5 | 2.05 | 2.35 | 0.363 | 0.363 | 0.36 | 0.11 | 0.039 |
| 2.50 | 0.50 | | | | 0.332 | 1.00 | 6 | 2.35 | 2.60 | 0.332 | 0.332 | 0.50 | 0.13 | 0.042 |
| 2.70 | 0.50 | | | | 0.375 | 1.00 | 7 | 2.60 | 2.80 | 0.375 | 0.375 | 0.50 | 0.10 | 0.037 |
| 2.90 | 0.48 | | | | 0.387 | 1.00 | 8 | 2.80 | 3.00 | 0.387 | 0.387 | 0.48 | 0.10 | 0.037 |
| 3.10 | 0.51 | | | | 0.338 | 1.00 | 9 | 3.00 | 3.20 | 0.338 | 0.338 | 0.51 | 0.10 | 0.035 |
| 3.30 | 0.50 | | | | 0.357 | 1.00 | 10 | 3.20 | 3.40 | 0.357 | 0.357 | 0.50 | 0.10 | 0.036 |
| 3.50 | 0.49 | | | | 0.369 | 1.00 | 11 | 3.40 | 3.65 | 0.369 | 0.369 | 0.49 | 0.12 | 0.045 |
| 3.80 | 0.51 | | | | 0.332 | 1.00 | 12 | 3.65 | 3.90 | 0.332 | 0.332 | 0.51 | 0.13 | 0.042 |
| 4.00 | 0.51 | | | | 0.326 | 1.00 | 13 | 3.90 | 4.10 | 0.326 | 0.326 | 0.51 | 0.10 | 0.033 |
| 4.20 | 0.50 | | | | 0.314 | 1.00 | 14 | 4.10 | 4.30 | 0.314 | 0.314 | 0.50 | 0.10 | 0.031 |
| 4.40 | 0.50 | | | | 0.332 | 1.00 | 15 | 4.30 | 4.50 | 0.332 | 0.332 | 0.50 | 0.10 | 0.033 |
| 4.60 | 0.47 | | | | 0.320 | 1.00 | 16 | 4.50 | 4.75 | 0.320 | 0.320 | 0.47 | 0.12 | 0.038 |
| 4.90 | 0.45 | | | | 0.268 | 1.00 | 17 | 4.75 | 5.00 | 0.268 | 0.268 | 0.45 | 0.11 | 0.030 |
| 5.10 | 0.44 | | | | 0.290 | 1.00 | 18 | 5.00 | 5.20 | 0.290 | 0.290 | 0.44 | 0.09 | 0.025 |
| 5.30 | 0.45 | | | | 0.256 | 1.00 | 19 | 5.20 | 5.40 | 0.256 | 0.256 | 0.45 | 0.09 | 0.023 |
| 5.50 | 0.47 | | | | 0.262 | 1.00 | 20 | 5.40 | 5.60 | 0.262 | 0.262 | 0.47 | 0.09 | 0.025 |
| 5.70 | 0.45 | | | | 0.253 | 1.00 | 21 | 5.60 | 5.85 | 0.253 | 0.253 | 0.45 | 0.11 | 0.028 |
| 6.00 | 0.43 | | | | 0.216 | 1.00 | 22 | 5.85 | 6.15 | 0.216 | 0.216 | 0.43 | 0.13 | 0.028 |
| 6.30 | 0.37 | | | | 0.201 | 1.00 | 23 | 6.15 | 6.45 | 0.201 | 0.201 | 0.37 | 0.11 | 0.022 |
| 6.60 | 0.36 | | | | 0.183 | 1.00 | 24 | 6.45 | 6.70 | 0.183 | 0.183 | 0.36 | 0.09 | 0.016 |
| 6.80 | 0.30 | | | | 0.213 | 1.00 | 25 | 6.70 | 6.90 | 0.213 | 0.213 | 0.30 | 0.06 | 0.013 |
| 7.00 | 0.30 | | | | 0.183 | 1.00 | 26 | 6.90 | 7.15 | 0.183 | 0.183 | 0.30 | 0.08 | 0.014 |
| 7.30 | 0.37 | | | | 0.134 | 1.00 | 27 | 7.15 | 7.45 | 0.134 | 0.134 | 0.37 | 0.11 | 0.015 |
| 7.60 | 0.41 | | | | 0.101 | 1.00 | 28 | 7.45 | 7.75 | 0.101 | 0.101 | 0.41 | 0.12 | 0.012 |
| 7.90 | 0.39 | | | | 0.088 | 1.00 | 29 | 7.75 | 8.05 | 0.088 | 0.088 | 0.39 | 0.12 | 0.010 |
| 8.20 | 0.43 | | | | 0.073 | 1.00 | 30 | 8.05 | 8.35 | 0.073 | 0.073 | 0.43 | 0.13 | 0.009 |
| 8.50 | 0.36 | | | | 0.058 | 1.00 | 31 | 8.35 | 8.65 | 0.058 | 0.058 | 0.36 | 0.11 | 0.006 |
| 8.80 | 0.28 | | | | 0.021 | 1.00 | 32 | 8.65 | 8.90 | 0.021 | 0.021 | 0.28 | 0.07 | 0.001 |
| 9.00 | 0.00 | | | | 0.000 | 1.00 | 33 | 8.90 | 9.00 | 0.005 | 0.005 | 0.07 | 0.01 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 0.776 | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.776 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.19 | (m ²) |
| Top Width: | 8.10 | (m) |
| Hydraulic Depth: | 0.394 | (m) |
| Mean Velocity: | 0.243 | (m/s) |
| Froude Number | 0.124 | |
| Photographs taken looking at: Upstream, downstream | | |

| | | |
|----------------------------|--|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 11.92 V | 77% |
| Datalogger Memory Used: | 47% | |
| Datalogger Clock: | Jul 12, 2005 07:46 | MST |
| Laptop Clock: | Jul 12, 2005 07:48 | MST |
| Dessicant: | 35 % Used | |
| Datalogger: | Lakewood UltraLogger RX 1A #95185-05 | |
| PT: | Keller Pressure Transducer 3 psi #3499 | |
| Power: | Lakewood battery | |

Notes: TSS sample collected.
Battery replaced - 12.41V 80%



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: September 4, 2005
Start Time: 8:25 AM MDT
End Time: 8:37 AM MDT

Weather Conditions:

+10 °C, Clear, Calm, light wind

River Conditions:

Open water conditions.

Personnel & Equipment

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

Level Readings

Bench Mark Reading: Nail on LB 1.655
Water Level Reading: 3.066
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.749
Other:

Setup No. 1

El: 100.000
El: 98.589
El: 97.840
El:

Setup No. 2

El: 100.000
El: 98.590
El: 97.841
El:

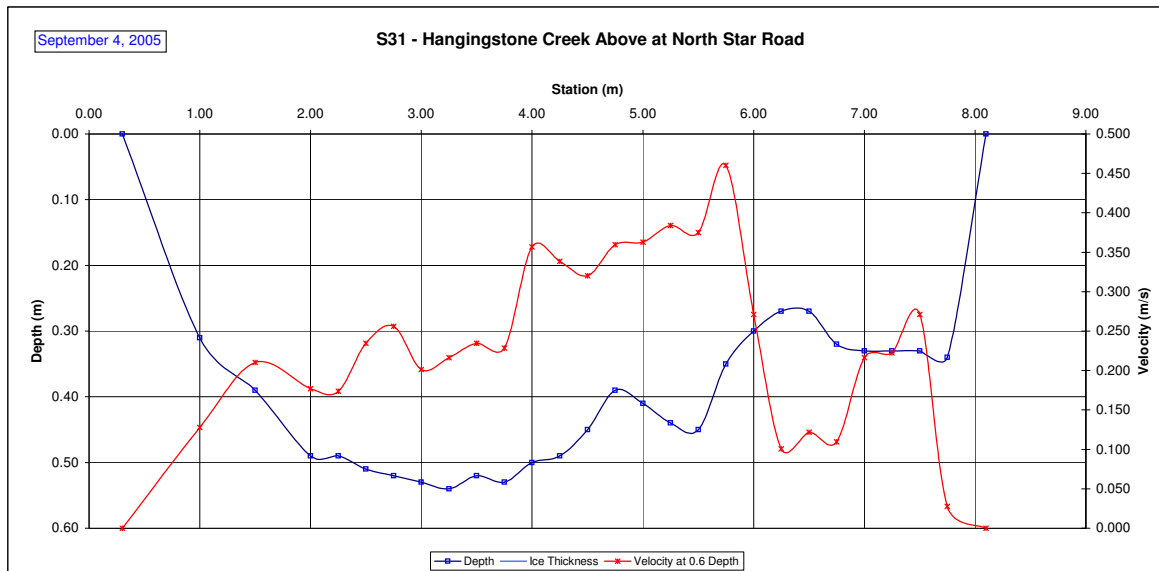
Measurement Data

| 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) | (m²) | (m³/s) |
| 0.30 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.30 | 0.65 | 0.032 | 0.032 | 0.08 | 0.03 | 0.001 |
| 1.00 | 0.31 | | | | 0.128 | 1.00 | 2 | 0.65 | 1.25 | 0.128 | 0.128 | 0.31 | 0.19 | 0.024 |
| 1.50 | 0.39 | | | | 0.210 | 1.00 | 3 | 1.25 | 1.75 | 0.210 | 0.210 | 0.39 | 0.20 | 0.041 |
| 2.00 | 0.49 | | | | 0.177 | 1.00 | 4 | 1.75 | 2.13 | 0.177 | 0.177 | 0.49 | 0.18 | 0.032 |
| 2.25 | 0.49 | | | | 0.174 | 1.00 | 5 | 2.13 | 2.38 | 0.174 | 0.174 | 0.49 | 0.12 | 0.021 |
| 2.50 | 0.51 | | | | 0.235 | 1.00 | 6 | 2.38 | 2.63 | 0.235 | 0.235 | 0.51 | 0.13 | 0.030 |
| 2.75 | 0.52 | | | | 0.256 | 1.00 | 7 | 2.63 | 2.88 | 0.256 | 0.256 | 0.52 | 0.13 | 0.033 |
| 3.00 | 0.53 | | | | 0.201 | 1.00 | 8 | 2.88 | 3.13 | 0.201 | 0.201 | 0.53 | 0.13 | 0.027 |
| 3.25 | 0.54 | | | | 0.216 | 1.00 | 9 | 3.13 | 3.38 | 0.216 | 0.216 | 0.54 | 0.14 | 0.029 |
| 3.50 | 0.52 | | | | 0.235 | 1.00 | 10 | 3.38 | 3.63 | 0.235 | 0.235 | 0.52 | 0.13 | 0.031 |
| 3.75 | 0.53 | | | | 0.229 | 1.00 | 11 | 3.63 | 3.88 | 0.229 | 0.229 | 0.53 | 0.13 | 0.030 |
| 4.00 | 0.50 | | | | 0.357 | 1.00 | 12 | 3.88 | 4.13 | 0.357 | 0.357 | 0.50 | 0.13 | 0.045 |
| 4.25 | 0.49 | | | | 0.338 | 1.00 | 13 | 4.13 | 4.38 | 0.338 | 0.338 | 0.49 | 0.12 | 0.041 |
| 4.50 | 0.45 | | | | 0.320 | 1.00 | 14 | 4.38 | 4.63 | 0.320 | 0.320 | 0.45 | 0.11 | 0.036 |
| 4.75 | 0.39 | | | | 0.360 | 1.00 | 15 | 4.63 | 4.88 | 0.360 | 0.360 | 0.39 | 0.10 | 0.035 |
| 5.00 | 0.41 | | | | 0.363 | 1.00 | 16 | 4.88 | 5.13 | 0.363 | 0.363 | 0.41 | 0.10 | 0.037 |
| 5.25 | 0.44 | | | | 0.384 | 1.00 | 17 | 5.13 | 5.38 | 0.384 | 0.384 | 0.44 | 0.11 | 0.042 |
| 5.50 | 0.45 | | | | 0.375 | 1.00 | 18 | 5.38 | 5.63 | 0.375 | 0.375 | 0.45 | 0.11 | 0.042 |
| 5.75 | 0.35 | | | | 0.460 | 1.00 | 19 | 5.63 | 5.88 | 0.460 | 0.460 | 0.35 | 0.09 | 0.040 |
| 6.00 | 0.30 | | | | 0.271 | 1.00 | 20 | 5.88 | 6.13 | 0.271 | 0.271 | 0.30 | 0.08 | 0.020 |
| 6.25 | 0.27 | | | | 0.101 | 1.00 | 21 | 6.13 | 6.38 | 0.101 | 0.101 | 0.27 | 0.07 | 0.007 |
| 6.50 | 0.27 | | | | 0.122 | 1.00 | 22 | 6.38 | 6.63 | 0.122 | 0.122 | 0.27 | 0.07 | 0.008 |
| 6.75 | 0.32 | | | | 0.110 | 1.00 | 23 | 6.63 | 6.88 | 0.110 | 0.110 | 0.32 | 0.08 | 0.009 |
| 7.00 | 0.33 | | | | 0.216 | 1.00 | 24 | 6.88 | 7.13 | 0.216 | 0.216 | 0.33 | 0.08 | 0.018 |
| 7.25 | 0.33 | | | | 0.223 | 1.00 | 25 | 7.13 | 7.38 | 0.223 | 0.223 | 0.33 | 0.08 | 0.018 |
| 7.50 | 0.33 | | | | 0.271 | 1.00 | 26 | 7.38 | 7.63 | 0.271 | 0.271 | 0.33 | 0.08 | 0.022 |
| 7.75 | 0.34 | | | | 0.027 | 1.00 | 27 | 7.63 | 7.93 | 0.027 | 0.027 | 0.34 | 0.10 | 0.003 |
| 8.10 | 0.00 | | | | 0.000 | 1.00 | 28 | 7.93 | 8.10 | 0.007 | 0.007 | 0.09 | 0.01 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 0.724 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.724 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.03 | (m ²) |
| Top Width: | 7.80 | (m) |
| Hydraulic Depth: | 0.388 | (m) |
| Mean Velocity: | 0.239 | (m/s) |
| Froude Number | 0.123 | |
| Photographs taken looking at: | | |
| Upstream, downstream | | |

| | | |
|----------------------------|--|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 11.92 V | 77% |
| Datalogger Memory Used: | 80% | |
| Datalogger Clock: | Sep 04, 2005 07:09 | MST |
| Laptop Clock: | Sep 04, 2005 07:14 | MST |
| Dessicant: | 100% Used-replaced | |
| Datalogger: | Lakewood UltraLogger RX 1A #95185-05 | |
| PT: | Keller Pressure Transducer 3 psi #3499 | |
| Power: | Lakewood battery | |

Notes: TSS sample collected.
Battery replaced - 12.41V 80%
Memory cleared. Clock reset to match laptop.



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: PM/ND/DM
Data Entry By: PM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Time of Measurement

Date of Measurement: October 10, 2005
Start Time: 5:07 PM MDT
End Time: 5:24 PM MDT

Level Readings

Bench Mark Reading: Nail on LB 1.087
Water Level Reading: 2.712
Top of Ice Level Reading:
Transducer Reading & Calc'd El 0.532
Other:

Setup No. 1

El: 100.000
El: 98.375
El: 97.843
El:

Setup No. 2

El: 100.000
El: 98.367
El: 97.835
El:

Weather Conditions:

+13 °C, Clear, windy

River Conditions:

Open water conditions, low stage

Measurement Data

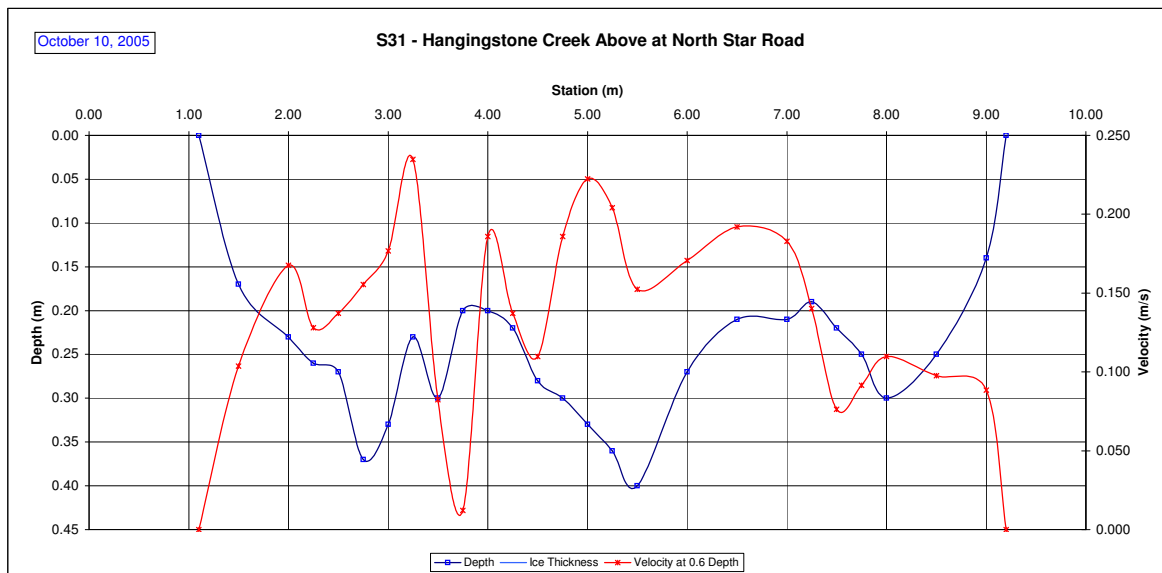
| Measured Data | | | | | | Calculated Data | | | | | | | | |
|---------------|-----------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|------------|-----------------|
| | | 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 (m) | Depth (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m²) | (m³/s) |
| | | | | | 0.000 | 1.00 | 1 | 1.10 | 1.30 | 0.026 | 0.026 | 0.04 | 0.01 | 0.000 |
| 1.10 | 0.00 | | | | 0.104 | 1.00 | 2 | 1.30 | 1.75 | 0.104 | 0.104 | 0.17 | 0.08 | 0.008 |
| 1.50 | 0.17 | | | | 0.168 | 1.00 | 3 | 1.75 | 2.13 | 0.168 | 0.168 | 0.23 | 0.09 | 0.014 |
| 2.00 | 0.23 | | | | 0.128 | 1.00 | 4 | 2.13 | 2.38 | 0.128 | 0.128 | 0.26 | 0.07 | 0.008 |
| 2.25 | 0.26 | | | | 0.137 | 1.00 | 5 | 2.38 | 2.63 | 0.137 | 0.137 | 0.27 | 0.07 | 0.009 |
| 2.50 | 0.27 | | | | 0.155 | 1.00 | 6 | 2.63 | 2.88 | 0.155 | 0.155 | 0.37 | 0.09 | 0.014 |
| 2.75 | 0.37 | | | | 0.177 | 1.00 | 7 | 2.88 | 3.13 | 0.177 | 0.177 | 0.33 | 0.08 | 0.015 |
| 3.00 | 0.33 | | | | 0.235 | 1.00 | 8 | 3.13 | 3.38 | 0.235 | 0.235 | 0.23 | 0.06 | 0.013 |
| 3.25 | 0.23 | | | | 0.082 | 1.00 | 9 | 3.38 | 3.63 | 0.082 | 0.082 | 0.30 | 0.08 | 0.006 |
| 3.50 | 0.30 | | | | 0.012 | 1.00 | 10 | 3.63 | 3.88 | 0.012 | 0.012 | 0.20 | 0.05 | 0.001 |
| 3.75 | 0.20 | | | | 0.186 | 1.00 | 11 | 3.88 | 4.13 | 0.186 | 0.186 | 0.20 | 0.05 | 0.009 |
| 4.00 | 0.20 | | | | 0.137 | 1.00 | 12 | 4.13 | 4.38 | 0.137 | 0.137 | 0.22 | 0.06 | 0.008 |
| 4.25 | 0.22 | | | | 0.110 | 1.00 | 13 | 4.38 | 4.63 | 0.110 | 0.110 | 0.28 | 0.07 | 0.008 |
| 4.50 | 0.28 | | | | 0.186 | 1.00 | 14 | 4.63 | 4.88 | 0.186 | 0.186 | 0.30 | 0.08 | 0.014 |
| 4.75 | 0.30 | | | | 0.223 | 1.00 | 15 | 4.88 | 5.13 | 0.223 | 0.223 | 0.33 | 0.08 | 0.018 |
| 5.00 | 0.33 | | | | 0.204 | 1.00 | 16 | 5.13 | 5.38 | 0.204 | 0.204 | 0.36 | 0.09 | 0.018 |
| 5.25 | 0.36 | | | | 0.152 | 1.00 | 17 | 5.38 | 5.75 | 0.152 | 0.152 | 0.40 | 0.15 | 0.023 |
| 5.50 | 0.40 | | | | 0.171 | 1.00 | 18 | 5.75 | 6.25 | 0.171 | 0.171 | 0.27 | 0.14 | 0.023 |
| 6.00 | 0.27 | | | | 0.192 | 1.00 | 19 | 6.25 | 6.75 | 0.192 | 0.192 | 0.21 | 0.11 | 0.020 |
| 6.50 | 0.21 | | | | 0.183 | 1.00 | 20 | 6.75 | 7.13 | 0.183 | 0.183 | 0.21 | 0.08 | 0.014 |
| 7.00 | 0.21 | | | | 0.140 | 1.00 | 21 | 7.13 | 7.38 | 0.140 | 0.140 | 0.19 | 0.05 | 0.007 |
| 7.25 | 0.19 | | | | 0.076 | 1.00 | 22 | 7.38 | 7.63 | 0.076 | 0.076 | 0.22 | 0.06 | 0.004 |
| 7.50 | 0.22 | | | | 0.091 | 1.00 | 23 | 7.63 | 7.88 | 0.091 | 0.091 | 0.25 | 0.06 | 0.006 |
| 7.75 | 0.25 | | | | 0.110 | 1.00 | 24 | 7.88 | 8.25 | 0.110 | 0.110 | 0.30 | 0.11 | 0.012 |
| 8.00 | 0.30 | | | | 0.098 | 1.00 | 25 | 8.25 | 8.75 | 0.098 | 0.098 | 0.25 | 0.13 | 0.012 |
| 8.50 | 0.25 | | | | 0.088 | 1.00 | 26 | 8.75 | 9.10 | 0.088 | 0.088 | 0.14 | 0.05 | 0.004 |
| 9.00 | 0.14 | | | | 0.000 | 1.00 | 27 | 9.10 | 9.20 | 0.022 | 0.022 | 0.04 | 0.00 | 0.000 |
| 9.20 | 0.00 | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | 0.291 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.291 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.01 | (m ²) |
| Top Width: | 8.10 | (m) |
| Hydraulic Depth: | 0.248 | (m) |
| Mean Velocity: | 0.145 | (m/s) |
| Froude Number | 0.093 | |
| Photographs taken looking at: | | |
| Upstream, downstream | | |

Datalogger Notes:

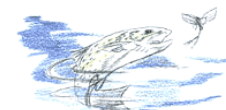
Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.17 V 78%
Datalogger Memory Used: 20%
Datalogger Clock: Oct 10, 2005 16:07 MST
Laptop Clock: Oct 10, 2005 16:08 MST
Dessicant: 10% Used
Datalogger: Lakewood UltraLogger RX 1A #95185-05
PT: Keller Pressure Transducer 3 psi #3499
Power: Lakewood battery

Notes: TSS sample collected.



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

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: ND
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Time of Measurement

Date of Measurement: April 24, 2005
Start Time: 10:15 AM MDT
End Time: 10:30 AM MDT

Level Readings

Bench Mark Reading: nail in bridge 1.796 El: 97.942 1.879 El: 97.942
Water Level Reading: 1.744 El: 97.994 1.823 El: 97.998
Top of Ice Level Reading: El: El: El: El:
Transducer Reading & Est. El.: 1.491 El: 96.503 1.491 El: 96.507
Other: El: El:

Weather Conditions:

Clear, Calm +10 °C

River Conditions:

Open, high 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) |
| RB | 0.75 | 0.00 | | | 0.000 | 1.00 | 1 | 0.75 | 1.13 | 0.023 | 0.023 | 0.07 | 0.03 | 0.001 |
| | 1.50 | 0.28 | | | 0.091 | 1.00 | 2 | 1.13 | 1.75 | 0.091 | 0.091 | 0.28 | 0.18 | 0.016 |
| | 2.00 | 0.88 | | | 0.366 | 1.00 | 3 | 1.75 | 2.50 | 0.366 | 0.366 | 0.88 | 0.66 | 0.241 |
| | 3.00 | 1.15 | | | 0.360 | 1.00 | 4 | 2.50 | 3.50 | 0.360 | 0.360 | 1.15 | 1.15 | 0.414 |
| | 4.00 | 1.33 | 0.604 | 0.555 | | 1.00 | 5 | 3.50 | 4.50 | 0.579 | 0.579 | 1.33 | 1.33 | 0.770 |
| | 5.00 | 1.38 | 0.789 | 0.741 | | 1.00 | 6 | 4.50 | 5.25 | 0.765 | 0.765 | 1.38 | 1.04 | 0.792 |
| | 5.50 | 1.35 | 0.783 | 0.756 | | 1.00 | 7 | 5.25 | 5.75 | 0.770 | 0.770 | 1.35 | 0.68 | 0.519 |
| | 6.00 | 1.55 | 0.927 | 0.482 | | 1.00 | 8 | 5.75 | 6.25 | 0.704 | 0.704 | 1.55 | 0.78 | 0.546 |
| | 6.50 | 1.45 | 0.783 | 0.628 | | 1.00 | 9 | 6.25 | 6.75 | 0.706 | 0.706 | 1.45 | 0.73 | 0.512 |
| | 7.00 | 1.60 | 0.838 | 0.744 | | 1.00 | 10 | 6.75 | 7.25 | 0.791 | 0.791 | 1.60 | 0.80 | 0.633 |
| | 7.50 | 1.45 | 0.741 | 0.625 | | 1.00 | 11 | 7.25 | 7.75 | 0.683 | 0.683 | 1.45 | 0.73 | 0.495 |
| | 8.00 | 1.50 | 0.716 | 0.680 | | 1.00 | 12 | 7.75 | 8.50 | 0.698 | 0.698 | 1.50 | 1.13 | 0.785 |
| | 9.00 | 1.39 | 0.677 | 0.485 | | 1.00 | 13 | 8.50 | 9.25 | 0.581 | 0.581 | 1.39 | 1.04 | 0.605 |
| | 9.50 | 1.22 | | | 0.421 | 1.00 | 14 | 9.25 | 9.75 | 0.421 | 0.421 | 1.22 | 0.61 | 0.257 |
| | 10.00 | 0.60 | | | 0.308 | 1.00 | 15 | 9.75 | 10.25 | 0.308 | 0.308 | 0.60 | 0.30 | 0.092 |
| | 10.50 | 0.26 | | | 0.067 | 1.00 | 16 | 10.25 | 10.75 | 0.067 | 0.067 | 0.26 | 0.13 | 0.009 |
| LB | 11.00 | 0.00 | | | 0.000 | 1.00 | 17 | 10.75 | 11.00 | 0.017 | 0.017 | 0.07 | 0.02 | 0.000 |
| Total Flow: | | | | | | | | | | | | | 6.687 | |

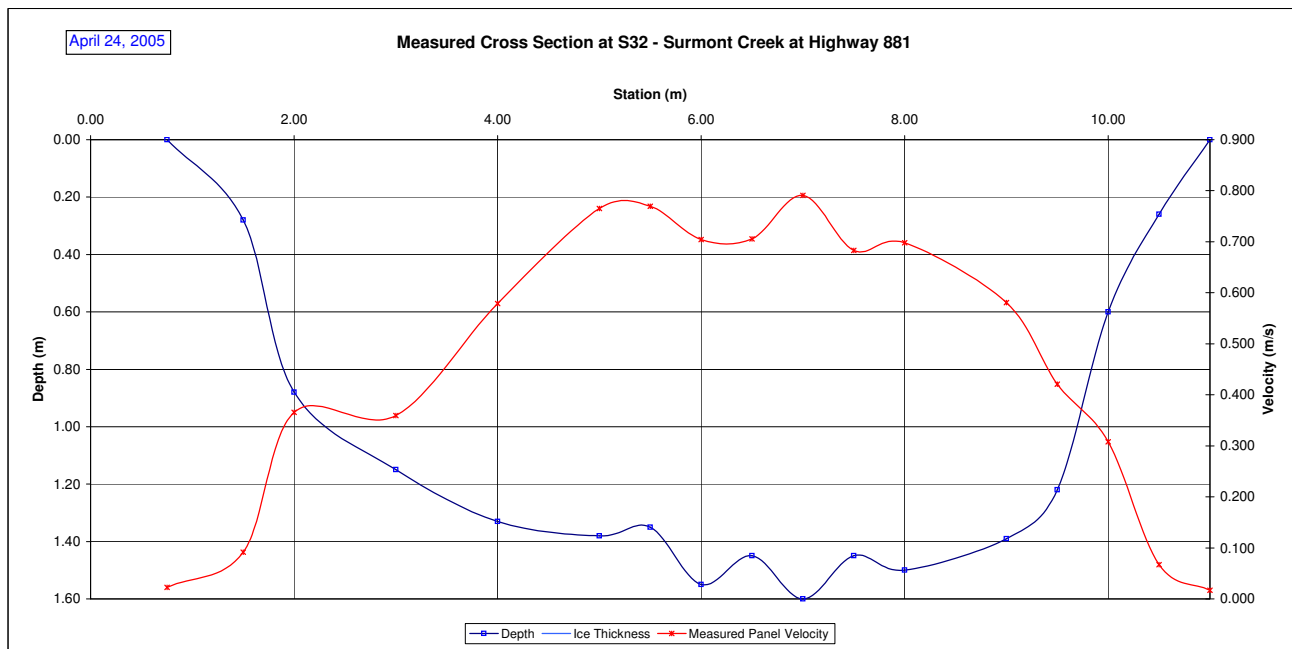
| | | |
|---|-------|---------------------|
| Total Flow: | 6.687 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 11.30 | (m ²) |
| Top Width: | 10.25 | (m) |
| Hydraulic Depth: | 1.102 | (m) |
| Mean Velocity: | 0.592 | (m/s) |
| Froude Number | 0.180 | |
| Photographs taken looking at: Upstream, downstream, across | | |

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.65 V 81%
Datalogger Memory Used: 0%
Datalogger Clock: Apr 24 2005 8:48:00 AM MST
Laptop Clock: Apr 24 2005 8:48:00 AM MST
Dessicant: Good - 100%
Datalogger: Lakewood UL RX #206095
PT: Keller LE8363K 10 psi #971332
Power: Lakewood battery

Notes:

TSS sample taken
Equipment installed. Transducer wired and clamped to a concrete block and placed in the flow.



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

Personnel & Equipment

Measurement Made By: FF/DM
Data Entry By: FF
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Time of Measurement

Date of Measurement: May 29, 2005
Start Time: 2:10 PM MDT
End Time: 2:32 PM MDT

Level Readings

Bench Mark Reading: nail in bridge 2.417
Water Level Reading: 2.996
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.867
Other:

Setup No. 1

El: 97.942
El: 97.363
El: 96.496
El:

Setup No. 2

El: 2.312
El: 2.894
El: 0.867
El: 96.493
El:

Weather Conditions:

Clear, Calm +20 °C

River Conditions:

Open, high stage, stage falling, flow turbid

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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| RB | 1.60 | 0.00 | | | 0.000 | 1.00 | 1 | 1.60 | 1.80 | 0.002 | 0.002 | 0.03 | 0.01 | 0.000 |
| | 2.00 | 0.11 | | | 0.009 | 1.00 | 2 | 1.80 | 2.13 | 0.009 | 0.009 | 0.11 | 0.04 | 0.000 |
| | 2.25 | 0.44 | | | 0.018 | 1.00 | 3 | 2.13 | 2.38 | 0.018 | 0.018 | 0.44 | 0.11 | 0.002 |
| | 2.50 | 0.50 | | | 0.146 | 1.00 | 4 | 2.38 | 2.75 | 0.146 | 0.146 | 0.50 | 0.19 | 0.027 |
| | 3.00 | 0.61 | | | 0.192 | 1.00 | 5 | 2.75 | 3.25 | 0.192 | 0.192 | 0.61 | 0.31 | 0.059 |
| | 3.50 | 0.75 | | | 0.207 | 1.00 | 6 | 3.25 | 3.75 | 0.207 | 0.207 | 0.75 | 0.38 | 0.078 |
| | 4.00 | 0.90 | | | 0.241 | 1.00 | 7 | 3.75 | 4.25 | 0.241 | 0.241 | 0.90 | 0.45 | 0.108 |
| | 4.50 | 0.92 | | | 0.390 | 1.00 | 8 | 4.25 | 4.75 | 0.390 | 0.390 | 0.92 | 0.46 | 0.179 |
| | 5.00 | 0.90 | | | 0.536 | 1.00 | 9 | 4.75 | 5.13 | 0.536 | 0.536 | 0.90 | 0.34 | 0.181 |
| | 5.25 | 0.91 | | | 0.680 | 1.00 | 10 | 5.13 | 5.38 | 0.680 | 0.680 | 0.91 | 0.23 | 0.155 |
| | 5.50 | 0.92 | | | 0.649 | 1.00 | 11 | 5.38 | 5.63 | 0.649 | 0.649 | 0.92 | 0.23 | 0.149 |
| | 5.75 | 0.94 | | | 0.704 | 1.00 | 12 | 5.63 | 5.88 | 0.704 | 0.704 | 0.94 | 0.24 | 0.165 |
| | 6.00 | 0.95 | | | 0.725 | 1.00 | 13 | 5.88 | 6.13 | 0.725 | 0.725 | 0.95 | 0.24 | 0.172 |
| | 6.25 | 0.94 | | | 0.692 | 1.00 | 14 | 6.13 | 6.38 | 0.692 | 0.692 | 0.94 | 0.24 | 0.163 |
| | 6.50 | 0.96 | | | 0.661 | 1.00 | 15 | 6.38 | 6.75 | 0.661 | 0.661 | 0.96 | 0.36 | 0.238 |
| | 7.00 | 0.98 | | | 0.509 | 1.00 | 16 | 6.75 | 7.25 | 0.509 | 0.509 | 0.98 | 0.49 | 0.249 |
| | 7.50 | 0.94 | | | 0.494 | 1.00 | 17 | 7.25 | 7.75 | 0.494 | 0.494 | 0.94 | 0.47 | 0.232 |
| | 8.00 | 0.91 | | | 0.451 | 1.00 | 18 | 7.75 | 8.25 | 0.451 | 0.451 | 0.91 | 0.46 | 0.205 |
| | 8.50 | 0.80 | | | 0.308 | 1.00 | 19 | 8.25 | 8.75 | 0.308 | 0.308 | 0.80 | 0.40 | 0.123 |
| | 9.00 | 0.67 | | | 0.268 | 1.00 | 20 | 8.75 | 9.25 | 0.268 | 0.268 | 0.67 | 0.34 | 0.090 |
| | 9.50 | 0.65 | | | 0.091 | 1.00 | 21 | 9.25 | 9.65 | 0.091 | 0.091 | 0.65 | 0.26 | 0.024 |
| | 9.80 | 0.16 | | | 0.055 | 1.00 | 22 | 9.65 | 9.90 | 0.055 | 0.055 | 0.16 | 0.04 | 0.002 |
| | 10.00 | 0.00 | | | 0.000 | 1.00 | 23 | 9.90 | 10.00 | 0.014 | 0.014 | 0.04 | 0.00 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 2.603 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 2.603 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 6.25 | (m ²) |
| Top Width: | 8.40 | (m) |
| Hydraulic Depth: | 0.743 | (m) |
| Mean Velocity: | 0.417 | (m/s) |
| Froude Number | 0.154 | |

Photographs taken looking at:

Upstream, downstream, across

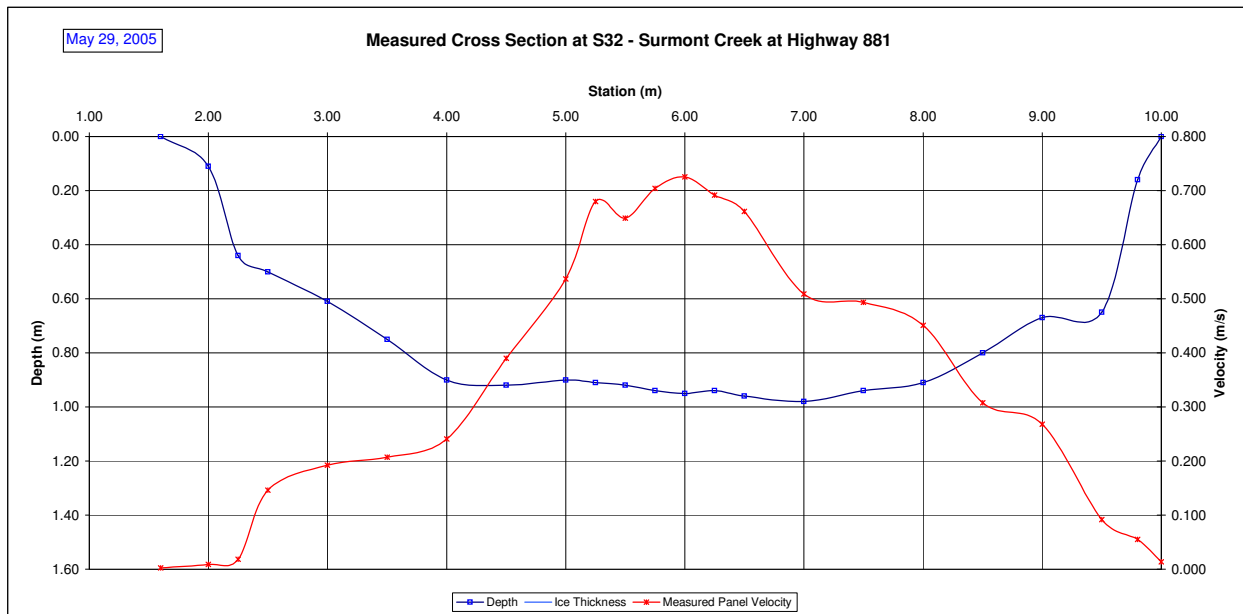
Notes:

TSS sample taken

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.77 V 82%
Datalogger Memory Used: 10%
Datalogger Clock: May 29, 2005 13:02 MST
Laptop Clock: May 29, 2005 13:03 MST
Dessicant: Good - 100%

Datalogger: Lakewood UL RX #206095
PT: Keller LE8363K 10 psi #971332
Power: Lakewood battery



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: July 11, 2005
Start Time: 6:28 PM MDT
End Time: 6:52 PM MDT

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Level Readings

Bench Mark Reading: nail in bridge 2.014
Water Level Reading: 2.865
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.546
Other:

Setup No. 1

Setup No. 2

El: 97.942 2.065 El: 97.942
El: 97.091 2.912 El: 97.095
El: 0.299 0.47 El: 0.47
El: 96.545 0.546 El: 96.549
El:

Weather Conditions:

Overcast +16 °C

River Conditions:

Open, stage falling, flow turbid

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 ²) | (m ³ /s) |
| 2.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 2.00 | 2.20 | 0.035 | 0.035 | 0.09 | 0.02 | 0.001 |
| 2.40 | 0.35 | | | | 0.140 | 1.00 | 2 | 2.20 | 2.60 | 0.140 | 0.140 | 0.35 | 0.14 | 0.020 |
| 2.80 | 0.42 | | | | 0.165 | 1.00 | 3 | 2.60 | 2.95 | 0.165 | 0.165 | 0.42 | 0.15 | 0.024 |
| 3.10 | 0.47 | | | | 0.259 | 1.00 | 4 | 2.95 | 3.25 | 0.259 | 0.259 | 0.47 | 0.14 | 0.037 |
| 3.40 | 0.47 | | | | 0.299 | 1.00 | 5 | 3.25 | 3.55 | 0.299 | 0.299 | 0.47 | 0.14 | 0.042 |
| 3.70 | 0.47 | | | | 0.384 | 1.00 | 6 | 3.55 | 3.85 | 0.384 | 0.384 | 0.47 | 0.14 | 0.054 |
| 4.00 | 0.51 | | | | 0.411 | 1.00 | 7 | 3.85 | 4.15 | 0.411 | 0.411 | 0.51 | 0.15 | 0.063 |
| 4.30 | 0.58 | | | | 0.421 | 1.00 | 8 | 4.15 | 4.45 | 0.421 | 0.421 | 0.58 | 0.17 | 0.073 |
| 4.60 | 0.52 | | | | 0.427 | 1.00 | 9 | 4.45 | 4.75 | 0.427 | 0.427 | 0.52 | 0.16 | 0.067 |
| 4.90 | 0.52 | | | | 0.436 | 1.00 | 10 | 4.75 | 5.05 | 0.436 | 0.436 | 0.52 | 0.16 | 0.068 |
| 5.20 | 0.50 | | | | 0.408 | 1.00 | 11 | 5.05 | 5.35 | 0.408 | 0.408 | 0.50 | 0.15 | 0.061 |
| 5.50 | 0.51 | | | | 0.463 | 1.00 | 12 | 5.35 | 5.65 | 0.463 | 0.463 | 0.51 | 0.15 | 0.071 |
| 5.80 | 0.56 | | | | 0.512 | 1.00 | 13 | 5.65 | 5.95 | 0.512 | 0.512 | 0.56 | 0.17 | 0.086 |
| 6.10 | 0.55 | | | | 0.488 | 1.00 | 14 | 5.95 | 6.20 | 0.488 | 0.488 | 0.55 | 0.14 | 0.067 |
| 6.30 | 0.58 | | | | 0.457 | 1.00 | 15 | 6.20 | 6.40 | 0.457 | 0.457 | 0.58 | 0.12 | 0.053 |
| 6.50 | 0.61 | | | | 0.448 | 1.00 | 16 | 6.40 | 6.60 | 0.448 | 0.448 | 0.61 | 0.12 | 0.055 |
| 6.70 | 0.60 | | | | 0.466 | 1.00 | 17 | 6.60 | 6.80 | 0.466 | 0.466 | 0.60 | 0.12 | 0.056 |
| 6.90 | 0.58 | | | | 0.482 | 1.00 | 18 | 6.80 | 7.00 | 0.482 | 0.482 | 0.58 | 0.12 | 0.056 |
| 7.10 | 0.60 | | | | 0.405 | 1.00 | 19 | 7.00 | 7.20 | 0.405 | 0.405 | 0.60 | 0.12 | 0.049 |
| 7.30 | 0.58 | | | | 0.418 | 1.00 | 20 | 7.20 | 7.45 | 0.418 | 0.418 | 0.58 | 0.15 | 0.061 |
| 7.60 | 0.60 | | | | 0.363 | 1.00 | 21 | 7.45 | 7.75 | 0.363 | 0.363 | 0.60 | 0.18 | 0.065 |
| 7.90 | 0.59 | | | | 0.369 | 1.00 | 22 | 7.75 | 8.00 | 0.369 | 0.369 | 0.59 | 0.15 | 0.054 |
| 8.10 | 0.58 | | | | 0.360 | 1.00 | 23 | 8.00 | 8.25 | 0.360 | 0.360 | 0.58 | 0.15 | 0.052 |
| 8.40 | 0.58 | | | | 0.326 | 1.00 | 24 | 8.25 | 8.50 | 0.326 | 0.326 | 0.58 | 0.15 | 0.047 |
| 8.60 | 0.53 | | | | 0.283 | 1.00 | 25 | 8.50 | 8.70 | 0.283 | 0.283 | 0.53 | 0.11 | 0.030 |
| 8.80 | 0.48 | | | | 0.250 | 1.00 | 26 | 8.70 | 8.90 | 0.250 | 0.250 | 0.48 | 0.10 | 0.024 |
| 9.00 | 0.45 | | | | 0.241 | 1.00 | 27 | 8.90 | 9.10 | 0.241 | 0.241 | 0.45 | 0.09 | 0.022 |
| 9.20 | 0.38 | | | | 0.198 | 1.00 | 28 | 9.10 | 9.30 | 0.198 | 0.198 | 0.38 | 0.08 | 0.015 |
| 9.40 | 0.32 | | | | 0.128 | 1.00 | 29 | 9.30 | 9.50 | 0.128 | 0.128 | 0.32 | 0.06 | 0.008 |
| 9.60 | 0.24 | | | | 0.061 | 1.00 | 30 | 9.50 | 9.70 | 0.061 | 0.061 | 0.24 | 0.05 | 0.003 |
| 9.80 | 0.00 | | | | 0.000 | 1.00 | 31 | 9.70 | 9.80 | 0.015 | 0.015 | 0.06 | 0.01 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 1.383 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 1.383 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.82 | (m ²) |
| Top Width: | 7.80 | (m) |
| Hydraulic Depth: | 0.489 | (m) |
| Mean Velocity: | 0.362 | (m/s) |
| Froude Number | 0.165 | |

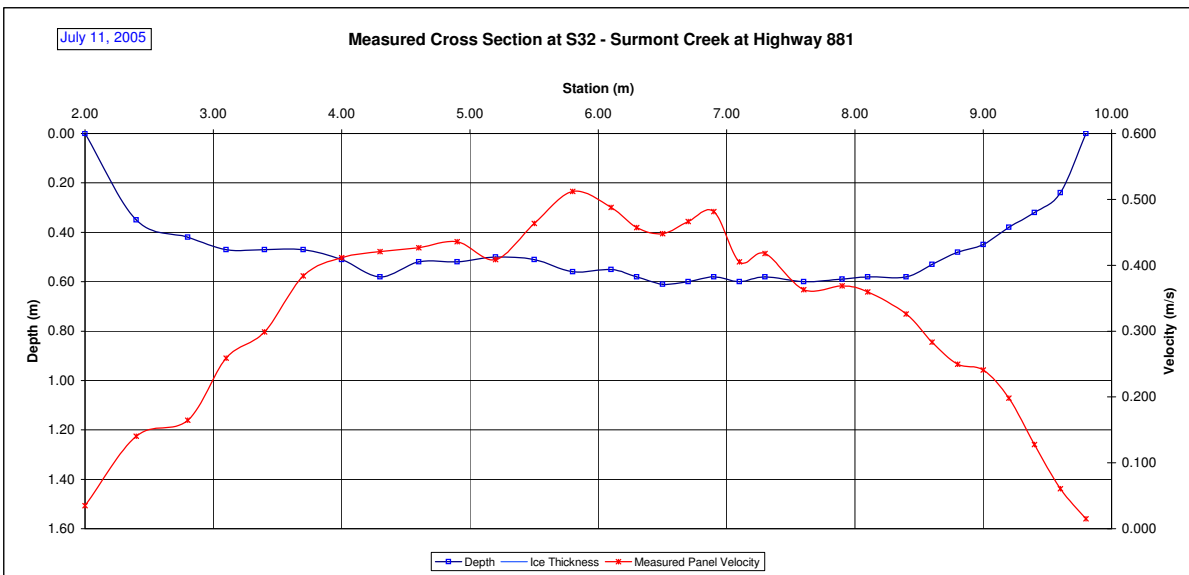
Photographs taken looking at:
Upstream, downstream, across

Notes:

TSS sample taken

Datalogger Notes:

Datalogger Internal Power: 11.34V 100%
Datalogger External Power: 12.53 V 81%
Datalogger Memory Used: 23%
Datalogger Clock: Jul 11, 2005 17:11 MST
Laptop Clock: Jul 11, 2005 17:13 MST
Dessicant: Good - 95%
Datalogger: Lakewood UL RX #206095
PT: Keller LE8363K 10 psi #971332
Power: Lakewood battery



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: September 4, 2005
Start Time: 10:00 AM MDT
End Time: 10:10 AM MDT

Weather Conditions:

+10 °C, windy, clear
Open, stage relatively low

River Conditions:

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: FF
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Level Readings

Bench Mark Reading: nail in bridge 1.915
Water Level Reading: 2.712
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.621
Other:

Setup No. 1

El: 97.942
El: 97.145
El:
El: 96.524
El:

Setup No. 2

El: 97.942
El: 97.148
El:
El: 96.527
El:

Measurement Data

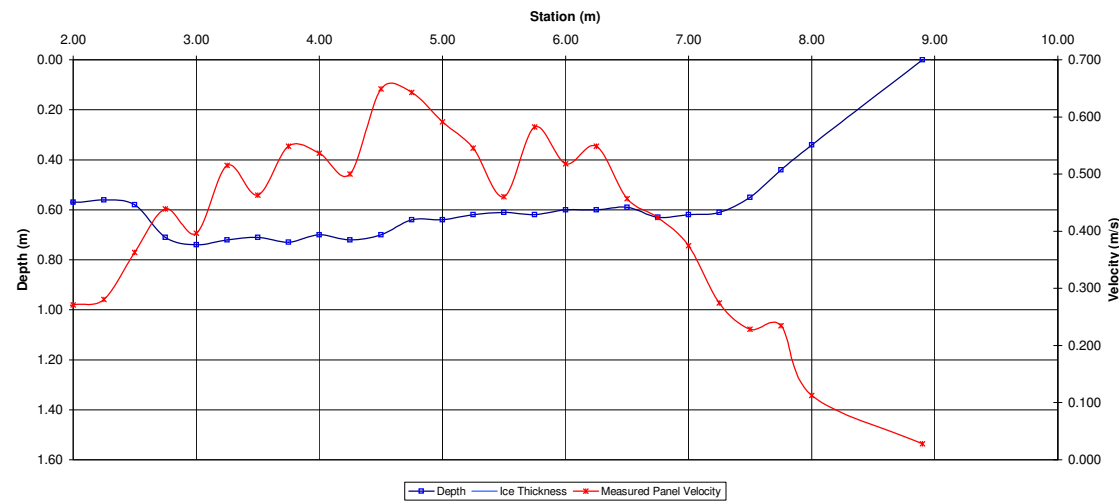
| Measured Data | | | | | | Calculated Data | | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|
| 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 ²) | (m ³ /s) |
| 0.90 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.90 | 1.20 | 0.006 | 0.006 | 0.10 | 0.03 | 0.000 |
| 1.50 | 0.41 | | | | 0.024 | 1.00 | 2 | 1.20 | 1.63 | 0.024 | 0.024 | 0.41 | 0.17 | 0.004 |
| 1.75 | 0.54 | | | | 0.253 | 1.00 | 3 | 1.63 | 1.88 | 0.253 | 0.253 | 0.54 | 0.14 | 0.034 |
| 2.00 | 0.57 | | | | 0.271 | 1.00 | 4 | 1.88 | 2.13 | 0.271 | 0.271 | 0.57 | 0.14 | 0.039 |
| 2.25 | 0.56 | | | | 0.280 | 1.00 | 5 | 2.13 | 2.38 | 0.280 | 0.280 | 0.56 | 0.14 | 0.039 |
| 2.50 | 0.58 | | | | 0.363 | 1.00 | 6 | 2.38 | 2.63 | 0.363 | 0.363 | 0.58 | 0.15 | 0.053 |
| 2.75 | 0.71 | | | | 0.439 | 1.00 | 7 | 2.63 | 2.88 | 0.439 | 0.439 | 0.71 | 0.18 | 0.078 |
| 3.00 | 0.74 | | | | 0.396 | 1.00 | 8 | 2.88 | 3.13 | 0.396 | 0.396 | 0.74 | 0.19 | 0.073 |
| 3.25 | 0.72 | | | | 0.515 | 1.00 | 9 | 3.13 | 3.38 | 0.515 | 0.515 | 0.72 | 0.18 | 0.093 |
| 3.50 | 0.71 | | | | 0.463 | 1.00 | 10 | 3.38 | 3.63 | 0.463 | 0.463 | 0.71 | 0.18 | 0.082 |
| 3.75 | 0.73 | | | | 0.549 | 1.00 | 11 | 3.63 | 3.88 | 0.549 | 0.549 | 0.73 | 0.18 | 0.100 |
| 4.00 | 0.70 | | | | 0.536 | 1.00 | 12 | 3.88 | 4.13 | 0.536 | 0.536 | 0.70 | 0.18 | 0.094 |
| 4.25 | 0.72 | | | | 0.500 | 1.00 | 13 | 4.13 | 4.38 | 0.500 | 0.500 | 0.72 | 0.18 | 0.090 |
| 4.50 | 0.70 | | | | 0.649 | 1.00 | 14 | 4.38 | 4.63 | 0.649 | 0.649 | 0.70 | 0.18 | 0.114 |
| 4.75 | 0.64 | | | | 0.643 | 1.00 | 15 | 4.63 | 4.88 | 0.643 | 0.643 | 0.64 | 0.16 | 0.103 |
| 5.00 | 0.64 | | | | 0.591 | 1.00 | 16 | 4.88 | 5.13 | 0.591 | 0.591 | 0.64 | 0.16 | 0.095 |
| 5.25 | 0.62 | | | | 0.546 | 1.00 | 17 | 5.13 | 5.38 | 0.546 | 0.546 | 0.62 | 0.16 | 0.085 |
| 5.50 | 0.61 | | | | 0.460 | 1.00 | 18 | 5.38 | 5.63 | 0.460 | 0.460 | 0.61 | 0.15 | 0.070 |
| 5.75 | 0.62 | | | | 0.582 | 1.00 | 19 | 5.63 | 5.88 | 0.582 | 0.582 | 0.62 | 0.16 | 0.090 |
| 6.00 | 0.60 | | | | 0.518 | 1.00 | 20 | 5.88 | 6.13 | 0.518 | 0.518 | 0.60 | 0.15 | 0.078 |
| 6.25 | 0.60 | | | | 0.549 | 1.00 | 21 | 6.13 | 6.38 | 0.549 | 0.549 | 0.60 | 0.15 | 0.082 |
| 6.50 | 0.59 | | | | 0.457 | 1.00 | 22 | 6.38 | 6.63 | 0.457 | 0.457 | 0.59 | 0.15 | 0.067 |
| 6.75 | 0.63 | | | | 0.424 | 1.00 | 23 | 6.63 | 6.88 | 0.424 | 0.424 | 0.63 | 0.16 | 0.067 |
| 7.00 | 0.62 | | | | 0.375 | 1.00 | 24 | 6.88 | 7.13 | 0.375 | 0.375 | 0.62 | 0.16 | 0.058 |
| 7.25 | 0.61 | | | | 0.274 | 1.00 | 25 | 7.13 | 7.38 | 0.274 | 0.274 | 0.61 | 0.15 | 0.042 |
| 7.50 | 0.55 | | | | 0.229 | 1.00 | 26 | 7.38 | 7.63 | 0.229 | 0.229 | 0.55 | 0.14 | 0.031 |
| 7.75 | 0.44 | | | | 0.235 | 1.00 | 27 | 7.63 | 7.88 | 0.235 | 0.235 | 0.44 | 0.11 | 0.026 |
| 8.00 | 0.34 | | | | 0.113 | 1.00 | 28 | 7.88 | 8.45 | 0.113 | 0.113 | 0.34 | 0.20 | 0.022 |
| 8.90 | 0.00 | | | | 0.000 | 1.00 | 29 | 8.45 | 8.90 | 0.028 | 0.028 | 0.09 | 0.04 | 0.001 |
| Total Flow: | | | | | | | | | | | | | | 1.810 |

| | | |
|--|-------|---------------------|
| Total Flow: | 1.810 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 4.38 | (m ²) |
| Top Width: | 8.00 | (m) |
| Hydraulic Depth: | 0.547 | (m) |
| Mean Velocity: | 0.414 | (m/s) |
| Froude Number | 0.179 | |
| Photographs taken looking at: Upstream, downstream, across | | |
| Notes: TSS sample taken Battery replaced, new reading 13.02 V 84%. | | |

| | | |
|----------------------------|-------------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.29 V | 79% |
| Datalogger Memory Used: | 40% | |
| Datalogger Clock: | Sep 04, 2005 08:39 | MST |
| Laptop Clock: | Sep 04, 2005 08:42 | MST |
| Dessicant: | Good - 90% | |
| Datalogger: | Lakewood UL RX #206095 | |
| PT: | Keller LE8363K 10 psi #971332 | |
| Power: | Lakewood battery | |

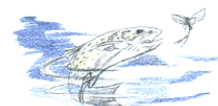
September 4, 2005

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
Coordinates & Legal: 6254511 N, 490252 E NE 3-86-8 W4M

Personnel & Equipment

Measurement Made By: ND/PM
Data Entry By: PM
Meter Type and No.: Marsh McBirney 2000 SN#2004521

Time of Measurement

Date of Measurement: October 9, 2005
Start Time: 6:14 PM MDT
End Time: 6:32 AM MDT

Level Readings

Bench Mark Reading: nail in bridge 1.958
Water Level Reading: 3.031
Top of Ice Level Reading:
Transducer Reading & Est. El.: 0.305
Other:

Setup No. 1

El: 97.942 1.979 El: 97.942
El: 96.869 3.04 El: 96.881
El: 96.564 0.305 El: 96.576
El:

Setup No. 2

Weather Conditions: +15 °C, calm, clear
River Conditions: Open

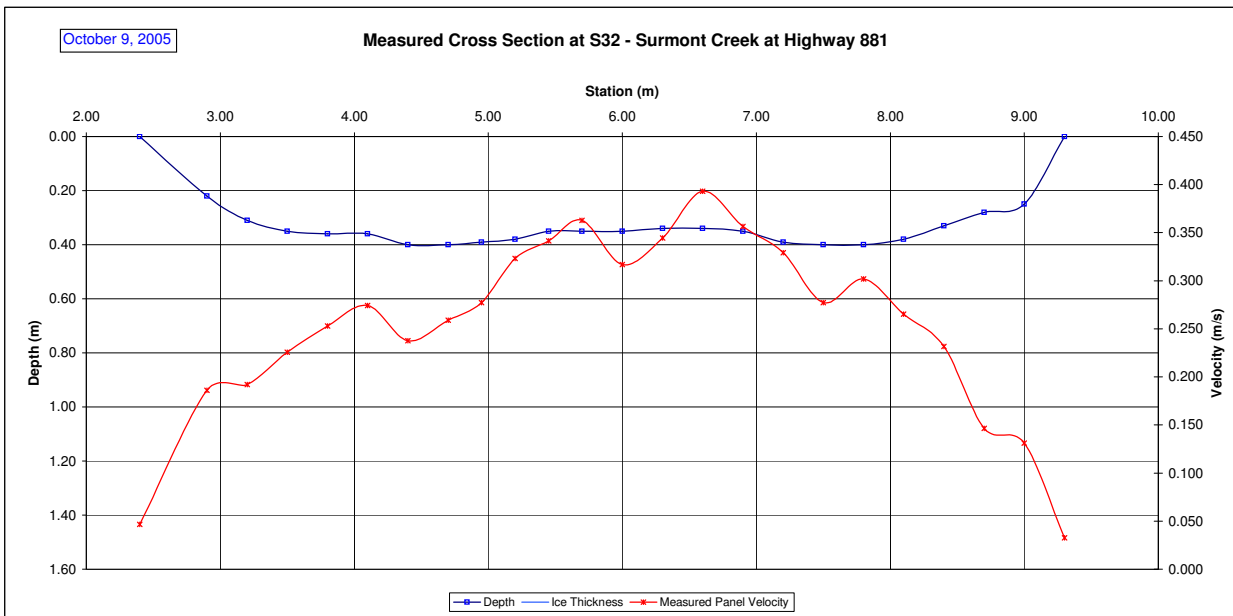
Measurement Data

| 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 | 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 ²) | (m ³ /s) |
| 2.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 2.40 | 2.65 | 0.046 | 0.046 | 0.06 | 0.01 | 0.001 |
| 2.90 | 0.22 | | | | 0.186 | 1.00 | 2 | 2.65 | 3.05 | 0.186 | 0.186 | 0.22 | 0.09 | 0.016 |
| 3.20 | 0.31 | | | | 0.192 | 1.00 | 3 | 3.05 | 3.35 | 0.192 | 0.192 | 0.31 | 0.09 | 0.018 |
| 3.50 | 0.35 | | | | 0.226 | 1.00 | 4 | 3.35 | 3.65 | 0.226 | 0.226 | 0.35 | 0.11 | 0.024 |
| 3.80 | 0.36 | | | | 0.253 | 1.00 | 5 | 3.65 | 3.95 | 0.253 | 0.253 | 0.36 | 0.11 | 0.027 |
| 4.10 | 0.36 | | | | 0.274 | 1.00 | 6 | 3.95 | 4.25 | 0.274 | 0.274 | 0.36 | 0.11 | 0.030 |
| 4.40 | 0.40 | | | | 0.238 | 1.00 | 7 | 4.25 | 4.55 | 0.238 | 0.238 | 0.40 | 0.12 | 0.029 |
| 4.70 | 0.40 | | | | 0.259 | 1.00 | 8 | 4.55 | 4.83 | 0.259 | 0.259 | 0.40 | 0.11 | 0.028 |
| 4.95 | 0.39 | | | | 0.277 | 1.00 | 9 | 4.83 | 5.08 | 0.277 | 0.277 | 0.39 | 0.10 | 0.027 |
| 5.20 | 0.38 | | | | 0.323 | 1.00 | 10 | 5.08 | 5.33 | 0.323 | 0.323 | 0.38 | 0.10 | 0.031 |
| 5.45 | 0.35 | | | | 0.341 | 1.00 | 11 | 5.33 | 5.58 | 0.341 | 0.341 | 0.35 | 0.09 | 0.030 |
| 5.70 | 0.35 | | | | 0.363 | 1.00 | 12 | 5.58 | 5.85 | 0.363 | 0.363 | 0.35 | 0.10 | 0.035 |
| 6.00 | 0.35 | | | | 0.317 | 1.00 | 13 | 5.85 | 6.15 | 0.317 | 0.317 | 0.35 | 0.11 | 0.033 |
| 6.30 | 0.34 | | | | 0.344 | 1.00 | 14 | 6.15 | 6.45 | 0.344 | 0.344 | 0.34 | 0.10 | 0.035 |
| 6.60 | 0.34 | | | | 0.393 | 1.00 | 15 | 6.45 | 6.75 | 0.393 | 0.393 | 0.34 | 0.10 | 0.040 |
| 6.90 | 0.35 | | | | 0.357 | 1.00 | 16 | 6.75 | 7.05 | 0.357 | 0.357 | 0.35 | 0.11 | 0.037 |
| 7.20 | 0.39 | | | | 0.329 | 1.00 | 17 | 7.05 | 7.35 | 0.329 | 0.329 | 0.39 | 0.12 | 0.039 |
| 7.50 | 0.40 | | | | 0.277 | 1.00 | 18 | 7.35 | 7.65 | 0.277 | 0.277 | 0.40 | 0.12 | 0.033 |
| 7.80 | 0.40 | | | | 0.302 | 1.00 | 19 | 7.65 | 7.95 | 0.302 | 0.302 | 0.40 | 0.12 | 0.036 |
| 8.10 | 0.38 | | | | 0.265 | 1.00 | 20 | 7.95 | 8.25 | 0.265 | 0.265 | 0.38 | 0.11 | 0.030 |
| 8.40 | 0.33 | | | | 0.232 | 1.00 | 21 | 8.25 | 8.55 | 0.232 | 0.232 | 0.33 | 0.10 | 0.023 |
| 8.70 | 0.28 | | | | 0.146 | 1.00 | 22 | 8.55 | 8.85 | 0.146 | 0.146 | 0.28 | 0.08 | 0.012 |
| 9.00 | 0.25 | | | | 0.131 | 1.00 | 23 | 8.85 | 9.15 | 0.131 | 0.131 | 0.25 | 0.08 | 0.010 |
| 9.30 | 0.00 | | | | 0.000 | 1.00 | 24 | 9.15 | 9.30 | 0.033 | 0.033 | 0.06 | 0.01 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 0.625 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.625 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 2.27 | (m ²) |
| Top Width: | 6.90 | (m) |
| Hydraulic Depth: | 0.330 | (m) |
| Mean Velocity: | 0.275 | (m/s) |
| Froude Number | 0.153 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |
| Notes: | | |

Transducer removed from winter - block, toolbox & safety line all left at site

| | | |
|----------------------------|-------------------------------|------|
| Datalogger Notes: | | |
| Datalogger Internal Power: | 11.34V | 100% |
| Datalogger External Power: | 12.77 V | 82% |
| Datalogger Memory Used: | 50% | |
| Datalogger Clock: | Oct 09, 2005 17:01 | MST |
| Laptop Clock: | Oct 09, 2005 17:05 | MST |
| Dessicant: | Good | |
| Datalogger: | Lakewood UL RX #206095 | |
| PT: | Keller LE8363K 10 psi #971332 | |
| Power: | Lakewood battery | |



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: January 7, 2005
Start Time: 11:30 AM MST
End Time: MST

Weather Conditions:

Overcast, light wind, -10°C

River Conditions:

ice cover

Personnel & Equipment

Measurement Made By: ND/DB/CT
Data Entry By: DB
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: t-bar 0.791
Water Level Reading: 2.464
Top of Ice Level Reading: 2.452
Transducer Reading & Est. El.: 1.068
Other:

Setup No. 1

El: 281.740
El: 280.067
El: 280.079
El: 278.999
El:

Setup No. 2

El: 281.740
El: 280.069
El: 280.080
El: 279.001
El:

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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| US, DS, across | | |

Notes: Could not do manual flow measurement as all augers broke down

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database #290 |
| Datalogger Internal Power: | 4.711 V |
| Datalogger External Power: | 14.59 V |
| Datalogger Memory Used: | 37% |
| Datalogger Clock: | Jan 07, 2005 10:48 MST |
| Laptop Clock: | Jan 07, 2005 10:59 MST |
| Dessicant: | |
| Datalogger: | |
| PT: | |
| 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: January 8, 2005
Start Time: 1:50 PM MST
End Time: 2:21 PM MST

Weather Conditions:

Clear, calm, -23°C

River Conditions:

ice cover

Personnel & Equipment

Measurement Made By: ND/DB/CT
Data Entry By: DB
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: t-bar 0.846
Water Level Reading: 2.527
Top of Ice Level Reading: 2.495
Transducer Reading & Est. El.: 0.000
Other:

Setup No. 1

El: 281.740 0.788
El: 280.059 2.476
El: 280.091 2.443
El: 0.000
El:

Setup No. 2

El: 281.740
El: 280.052
El: 280.085
El:
El:

Measurement Data

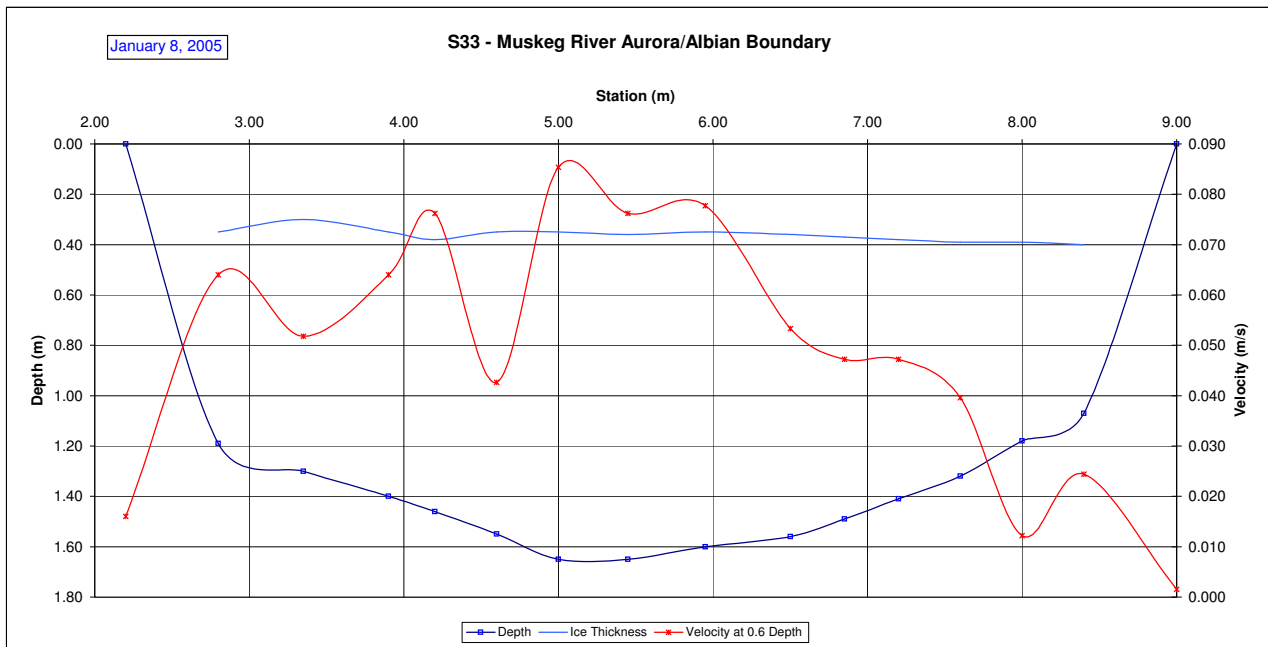
| Measured Data | | | | | | Calculated Data | | | | | | | | | Percentage of Total |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|-------------------|---------------------|---------------------|
| 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 ²) | (m ³ /s) | |
| | | | | | 0.000 | 0.90 | 1 | 2.20 | 2.50 | 0.016 | 0.014 | 0.21 | 0.06 | 0.001 | 0% |
| 2.80 | 1.19 | 0.35 | | | 0.064 | 0.90 | 2 | 2.50 | 3.08 | 0.064 | 0.058 | 0.84 | 0.48 | 0.028 | 8% |
| 3.35 | 1.30 | 0.30 | | | 0.052 | 0.90 | 3 | 3.08 | 3.63 | 0.052 | 0.047 | 1.00 | 0.55 | 0.026 | 8% |
| 3.90 | 1.40 | 0.35 | 0.05 | 0.08 | | 0.90 | 4 | 3.63 | 4.05 | 0.064 | 0.058 | 1.05 | 0.45 | 0.026 | 8% |
| 4.20 | 1.46 | 0.38 | 0.06 | 0.09 | | 0.90 | 5 | 4.05 | 4.40 | 0.076 | 0.069 | 1.08 | 0.38 | 0.026 | 8% |
| 4.60 | 1.55 | 0.35 | 0.02 | 0.07 | | 0.90 | 6 | 4.40 | 4.80 | 0.043 | 0.038 | 1.20 | 0.48 | 0.018 | 5% |
| 5.00 | 1.65 | 0.35 | 0.09 | 0.08 | | 0.90 | 7 | 4.80 | 5.23 | 0.085 | 0.077 | 1.30 | 0.55 | 0.042 | 13% |
| 5.45 | 1.65 | 0.36 | 0.09 | 0.07 | | 0.90 | 8 | 5.23 | 5.70 | 0.076 | 0.069 | 1.29 | 0.61 | 0.042 | 12% |
| 5.95 | 1.60 | 0.35 | 0.08 | 0.07 | | 0.90 | 9 | 5.70 | 6.23 | 0.078 | 0.070 | 1.25 | 0.66 | 0.046 | 14% |
| 6.50 | 1.56 | 0.36 | 0.07 | 0.04 | | 0.90 | 10 | 6.23 | 6.68 | 0.053 | 0.048 | 1.20 | 0.54 | 0.026 | 8% |
| 6.85 | 1.49 | 0.37 | 0.05 | 0.04 | | 0.90 | 11 | 6.68 | 7.03 | 0.047 | 0.043 | 1.12 | 0.39 | 0.017 | 5% |
| 7.20 | 1.41 | 0.38 | 0.04 | 0.06 | | 0.90 | 12 | 7.03 | 7.40 | 0.047 | 0.043 | 1.03 | 0.39 | 0.016 | 5% |
| 7.60 | 1.32 | 0.39 | | | 0.040 | 0.90 | 13 | 7.40 | 7.80 | 0.040 | 0.036 | 0.93 | 0.37 | 0.013 | 4% |
| 8.00 | 1.18 | 0.39 | | | 0.012 | 0.90 | 14 | 7.80 | 8.20 | 0.012 | 0.011 | 0.79 | 0.32 | 0.003 | 1% |
| 8.40 | 1.07 | 0.40 | | | 0.024 | 0.90 | 15 | 8.20 | 8.70 | 0.024 | 0.022 | 0.67 | 0.34 | 0.007 | 2% |
| 9.00 | 0.00 | | | | 0.000 | 0.90 | 16 | 8.70 | 9.00 | 0.002 | 0.001 | 0.17 | 0.05 | 0.000 | 0% |

Total Flow: 0.338

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.338 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 6.61 | (m ²) |
| Top Width: | 6.80 | (m) |
| Hydraulic Depth: | 0.973 | (m) |
| Mean Velocity: | 0.051 | (m/s) |
| Froude Number | 0.017 | |
| Photographs taken looking at: | | |
| US, DS, across | | |

Notes: Will remote download data from office, logger looked good on Jan 7

| | |
|----------------------------|---------------|
| Datalogger Notes: | Database #290 |
| Datalogger Internal Power: | |
| Datalogger External Power: | |
| Datalogger Memory Used: | |
| Datalogger Clock: | MST |
| Laptop Clock: | MST |
| Dessicant: | |
| Datalogger: | |
| PT: | |
| 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: February 9, 2005
Start Time: 4:20 PM MST
End Time: 4:37 PM MST

Weather Conditions:

Partly cloudy, -10°C

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: ND/RM/CT
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: t-bar
Water Level Reading: 2.649
Top of Ice Level Reading: 2.588
Transducer Reading & Est. El.: 1.040
Other: BM, top of logger box 0.348

Setup No. 1

El: 281.740
El: 280.029 2.71
El: 280.090 2.669
El: 278.989 1.040
El: 282.330 0.401

Setup No. 2

El: 281.740 could not be fo
El: 280.021
El: 280.062
El: 278.981
El: 282.330

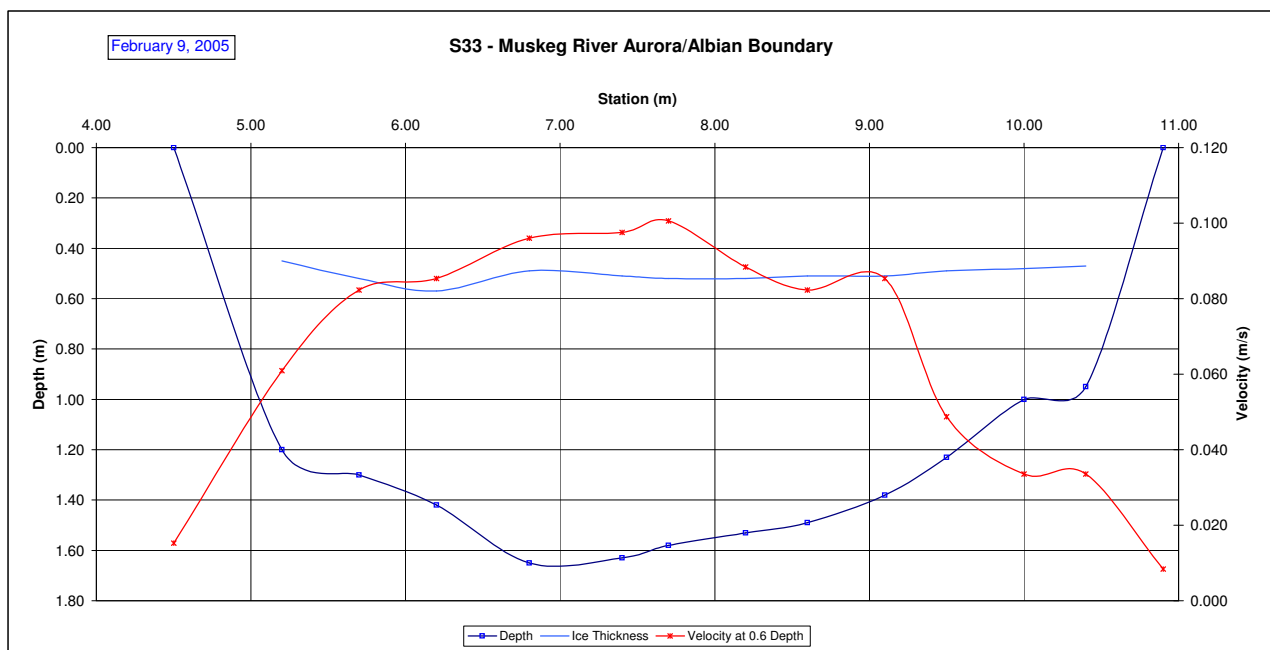
Measurement Data

| | 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 | 4.50 | 0.00 | | | | 0.000 | 0.90 | 1 | 4.50 | 4.85 | 0.015 | 0.014 | 0.19 | 0.07 | 0.001 | 0% |
| | 5.20 | 1.20 | 0.45 | | | 0.061 | 0.90 | 2 | 4.85 | 5.45 | 0.061 | 0.055 | 0.75 | 0.45 | 0.025 | 7% |
| | 5.70 | 1.30 | 0.52 | | | 0.082 | 0.90 | 3 | 5.45 | 5.95 | 0.082 | 0.074 | 0.78 | 0.39 | 0.029 | 8% |
| | 6.20 | 1.42 | 0.57 | | | 0.085 | 0.90 | 4 | 5.95 | 6.50 | 0.085 | 0.077 | 0.85 | 0.47 | 0.036 | 10% |
| | 6.80 | 1.65 | 0.49 | 0.09 | 0.10 | | 0.90 | 5 | 6.50 | 7.10 | 0.096 | 0.086 | 1.16 | 0.70 | 0.060 | 17% |
| | 7.40 | 1.63 | 0.51 | 0.10 | 0.09 | | 0.90 | 6 | 7.10 | 7.55 | 0.098 | 0.088 | 1.12 | 0.50 | 0.044 | 12% |
| | 7.70 | 1.58 | 0.52 | 0.11 | 0.09 | | 0.90 | 7 | 7.55 | 7.95 | 0.101 | 0.091 | 1.06 | 0.42 | 0.038 | 11% |
| | 8.20 | 1.53 | 0.52 | | | 0.088 | 0.90 | 8 | 7.95 | 8.40 | 0.088 | 0.080 | 1.01 | 0.45 | 0.036 | 10% |
| | 8.60 | 1.49 | 0.51 | | | 0.082 | 0.90 | 9 | 8.40 | 8.85 | 0.082 | 0.074 | 0.98 | 0.44 | 0.033 | 9% |
| | 9.10 | 1.38 | 0.51 | | | 0.085 | 0.90 | 10 | 8.85 | 9.30 | 0.085 | 0.077 | 0.87 | 0.39 | 0.030 | 8% |
| | 9.50 | 1.23 | 0.49 | | | 0.049 | 0.90 | 11 | 9.30 | 9.75 | 0.049 | 0.044 | 0.74 | 0.33 | 0.015 | 4% |
| | 10.00 | 1.00 | 0.48 | | | 0.034 | 0.90 | 12 | 9.75 | 10.20 | 0.034 | 0.030 | 0.52 | 0.23 | 0.007 | 2% |
| | 10.40 | 0.95 | 0.47 | | | 0.034 | 0.90 | 13 | 10.20 | 10.65 | 0.034 | 0.030 | 0.48 | 0.22 | 0.007 | 2% |
| | 10.90 | 0.00 | | | | 0.000 | 0.90 | 14 | 10.65 | 10.90 | 0.008 | 0.008 | 0.12 | 0.03 | 0.000 | 0% |
| | | | | | | | | | | | | | | | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.360 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 5.10 | (m ²) |
| Top Width: | 6.40 | (m) |
| Hydraulic Depth: | 0.796 | (m) |
| Mean Velocity: | 0.071 | (m/s) |
| Froude Number | 0.025 | |
| Photographs taken looking at: US, DS, across | | |

Notes: The BM could not be found, was buried in the snow, all efforts to find it failed.
Shot the top of the logger box as a reference bench mark.

| | |
|----------------------------|------------------------|
| Datalogger Notes: | DB 290 |
| Datalogger Internal Power: | 4.756 V |
| Datalogger External Power: | 14.74 V |
| Datalogger Memory Used: | 40% |
| Datalogger Clock: | Feb 09, 2005 15:44 MST |
| Laptop Clock: | Feb 09, 2005 15:48 MST |
| Dessicant: | Good - 10% used |
| Datalogger: | |
| PT: | |
| 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: March 3, 2005
Start Time: 3:07 PM MST
End Time: 3:33 PM MST

Weather Conditions:

Clear, +4°C

River Conditions:

Complete ice cover

Personnel & Equipment

Measurement Made By: ND/RM/CT
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: 1-bar
Water Level Reading: 2.681
Top of Ice Level Reading: 2.611
Transducer Reading & Est. El.: 1.050
Other: BM, top of logger box 0.385

Setup No. 1

0.975
2.681
2.611
1.050
0.385

Setup No. 2

1.032
2.739
2.626
1.050
0.443

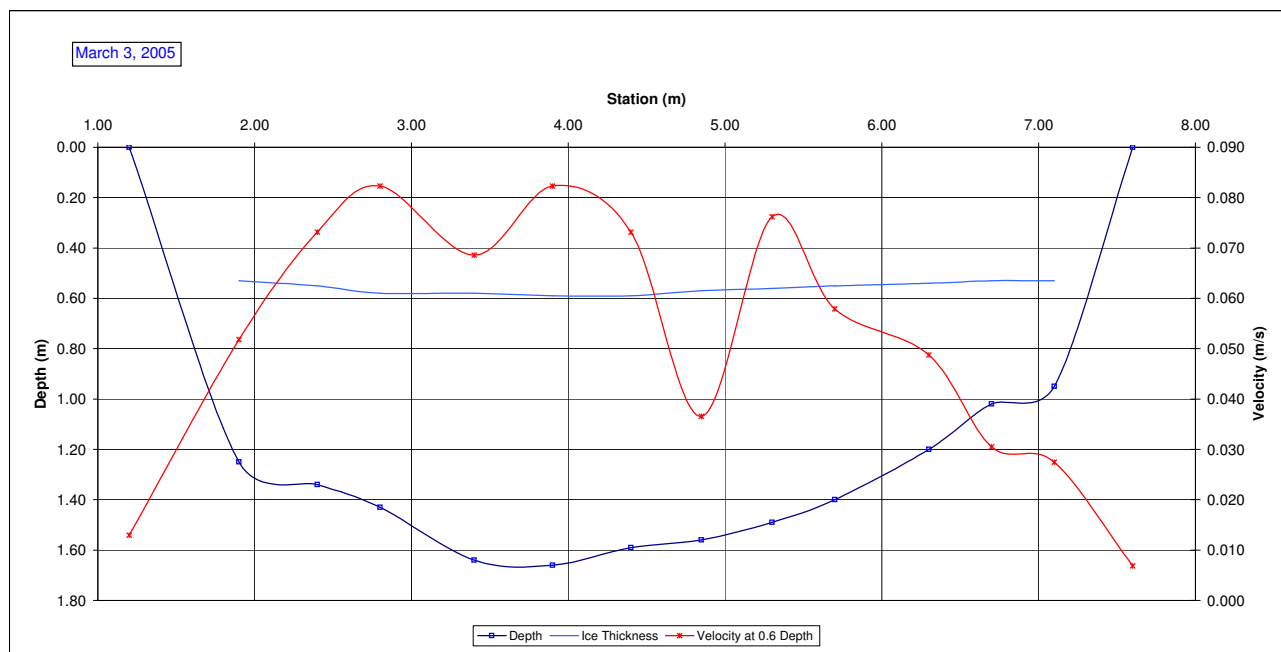
Measurement Data

| 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 | 1.20 | 0.00 | | | 0.000 | 0.90 | 1 | 1.20 | 1.55 | 0.013 | 0.012 | 0.18 | 0.06 | 0.001 | 0% | | | | | | | | | | | | | | | | | |
| | 1.90 | 1.25 | 0.53 | | 0.052 | 0.90 | 2 | 1.55 | 2.15 | 0.052 | 0.047 | 0.72 | 0.43 | 0.020 | 7% | | | | | | | | | | | | | | | | | |
| | 2.40 | 1.34 | 0.55 | | 0.073 | 0.90 | 3 | 2.15 | 2.60 | 0.073 | 0.066 | 0.79 | 0.36 | 0.023 | 9% | | | | | | | | | | | | | | | | | |
| | 2.80 | 1.43 | 0.58 | | 0.082 | 0.90 | 4 | 2.60 | 3.10 | 0.082 | 0.074 | 0.85 | 0.43 | 0.031 | 12% | | | | | | | | | | | | | | | | | |
| | 3.40 | 1.64 | 0.58 | 0.07 | 0.07 | 0.90 | 5 | 3.10 | 3.65 | 0.069 | 0.062 | 1.06 | 0.58 | 0.036 | 13% | | | | | | | | | | | | | | | | | |
| | 3.90 | 1.66 | 0.59 | 0.09 | 0.07 | 0.90 | 6 | 3.65 | 4.15 | 0.082 | 0.074 | 1.07 | 0.54 | 0.040 | 15% | | | | | | | | | | | | | | | | | |
| | 4.40 | 1.59 | 0.59 | | 0.073 | 0.90 | 7 | 4.15 | 4.63 | 0.073 | 0.066 | 1.00 | 0.48 | 0.031 | 12% | | | | | | | | | | | | | | | | | |
| | 4.85 | 1.56 | 0.57 | | 0.037 | 0.90 | 8 | 4.63 | 5.08 | 0.037 | 0.033 | 0.99 | 0.45 | 0.015 | 5% | | | | | | | | | | | | | | | | | |
| | 5.30 | 1.49 | 0.56 | | 0.076 | 0.90 | 9 | 5.08 | 5.50 | 0.076 | 0.069 | 0.93 | 0.40 | 0.027 | 10% | | | | | | | | | | | | | | | | | |
| | 5.70 | 1.40 | 0.55 | | 0.058 | 0.90 | 10 | 5.50 | 6.00 | 0.058 | 0.052 | 0.85 | 0.43 | 0.022 | 8% | | | | | | | | | | | | | | | | | |
| | 6.30 | 1.20 | 0.54 | | 0.049 | 0.90 | 11 | 6.00 | 6.50 | 0.049 | 0.044 | 0.66 | 0.33 | 0.014 | 5% | | | | | | | | | | | | | | | | | |
| | 6.70 | 1.02 | 0.53 | | 0.030 | 0.90 | 12 | 6.50 | 6.90 | 0.030 | 0.027 | 0.49 | 0.20 | 0.005 | 2% | | | | | | | | | | | | | | | | | |
| | 7.10 | 0.95 | 0.53 | | 0.027 | 0.90 | 13 | 6.90 | 7.35 | 0.027 | 0.025 | 0.42 | 0.19 | 0.005 | 2% | | | | | | | | | | | | | | | | | |
| RB | 7.60 | 0.00 | | | 0.000 | 0.90 | 14 | 7.35 | 7.60 | 0.007 | 0.006 | 0.11 | 0.03 | 0.000 | 0% | | | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | 0.271 | | | | | | | | | | | | | | | | | | |

| | | |
|--------------------------------|----------------|---------------------|
| Total Flow: | 0.271 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 4.88 | (m ²) |
| Top Width: | 6.40 | (m) |
| Hydraulic Depth: | 0.762 | (m) |
| Mean Velocity: | 0.056 | (m/s) |
| Froude Number | 0.020 | |
| Photographs taken looking at: | US, DS, across | |

Notes:

| | |
|----------------------------|------------------------|
| Datalogger Notes: | DB 290 |
| Datalogger Internal Power: | 4.705 V |
| Datalogger External Power: | 14.54 V |
| Datalogger Memory Used: | 41% |
| Datalogger Clock: | Mar 03, 2005 14:45 MST |
| Laptop Clock: | Mar 03, 2005 14:50 MST |
| Dessicant: | Good - 15% used |
| Datalogger: | 105010290 |
| PT: | |
| 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: April 6, 2005
Start Time: 3:15 PM MDT
End Time: MDT

Weather Conditions:

Clear, +12°C

River Conditions:

Water flowing over ice, holes in ice visible

Personnel & Equipment

Measurement Made By: ND/RM
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: t-bar 0.950
Water Level Reading: 2.490
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.221
Other:

Setup No. 1

El: 281.740
El: 280.200
El: 282.690
El: 278.979
El:

Setup No. 2

El: 281.740
El: 280.205
El: 282.650
El: 278.984
El:

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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | - | |

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| US, DS, across | | |
| Notes: | | |

Conditions unsafe for manual flow measurement.

| | |
|----------------------------|------------------------|
| Datalogger Notes: | DB 290 |
| Datalogger Internal Power: | 4.822 V |
| Datalogger External Power: | 14.19 V |
| Datalogger Memory Used: | 44% |
| Datalogger Clock: | Apr 06, 2005 14:12 MST |
| Laptop Clock: | Apr 06, 2005 14:18 MST |
| Dessicant: | Good - 25% used |
| Datalogger: | 105010290 |
| PT: | |
| 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: April 24, 2005
Start Time: 3:30 PM MDT
End Time: MDT

Weather Conditions:

Clear, Calm +15°C

River Conditions:

Very high stage, flow over banks.

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: t-bar 0.000
Water Level Reading: 0.370
Top of Ice Level Reading:
Transducer Reading & Est. El.: 2.428
Other:

Setup No. 1

El: 281.740
El: 281.370
El: 281.370
El: 278.942
El:

Setup No. 2

El: 281.740
El: 281.370
El: 281.370
El: 278.942
El:

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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | | - |

| | | | |
|-------------------------------|---|--------|---------------------|
| Total Flow: | - | 22.800 | (m ³ /s) |
| Pereived Measurement Quality: | | | |
| Total Area: | | | (m ²) |
| Top Width: | | | (m) |
| Hydraulic Depth: | | | (m) |
| Mean Velocity: | | | (m/s) |
| Froude Number | | | |
| Photographs taken looking at: | | | |
| US_DS_across | | | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | DB 290 |
| Datalogger Internal Power: | 4.82 V |
| Datalogger External Power: | 14.19 V |
| Datalogger Memory Used: | 46% |
| Datalogger Clock: | Apr 24, 2005 14:32 MST |
| Laptop Clock: | Apr 24, 2005 14:37 MST |
| Dessicant: | Good - 25% used |
| Datalogger: | 105010290 |
| PT: | 304988 |
| Power: | |

Notes:

Conditions unsafe and not ideal for manual flow measurement due to very high stage and velocity.
Water levels read on the rod directly without using the spirit level since the top of bench mark is above the water surface.
A PVC tube installed on the bench mark to enhance visibility.
TSS sample taken.

DISCHARGE ESTIMATED AT 22.8 CMS BASED ON MEASUREMENT OF DISCHARGES AT OTHER LOCAL STATIONS AND TRIBUTARIES.

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: FF/RM
Data Entry By: FF
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: May 30, 2005
Start Time: 3:15 PM MDT
End Time: 3:30 PM MDT

Level Readings

Bench Mark Reading: rebar on 0.891 El: 281.740 0.782 El: 281.740
Water Level Reading: 1.720 El: 280.911 1.610 El: 280.912
Top of Ice Level Reading: El: El:
Transducer Reading & Est. El.: 1.953 El: 278.958 1.953 El: 278.959
Other: El: El:

Weather Conditions:

+20 C, light wind, clear

River Conditions:

Open water, stage below bankfull, stage falling

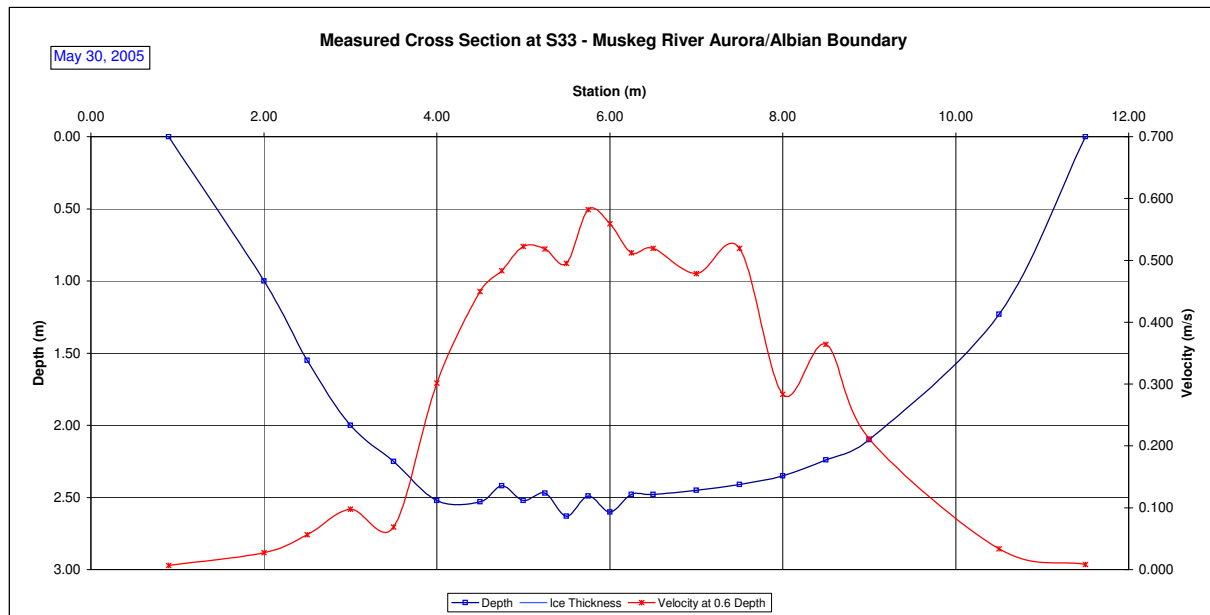
Measurement Data

| | 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 | 0.90 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.90 | 1.45 | 0.007 | 0.007 | 0.25 | 0.14 | 0.001 | 0% | |
| | 2.00 | 1.00 | | | | 0.027 | 1.00 | 2 | 1.45 | 2.25 | 0.027 | 0.027 | 1.00 | 0.80 | 0.022 | 0% | |
| | 2.50 | 1.55 | | 0.08 | 0.03 | | 1.00 | 3 | 2.25 | 2.75 | 0.056 | 0.056 | 1.55 | 0.78 | 0.044 | 1% | |
| | 3.00 | 2.00 | | 0.16 | 0.04 | | 1.00 | 4 | 2.75 | 3.25 | 0.098 | 0.098 | 2.00 | 1.00 | 0.098 | 2% | |
| | 3.50 | 2.25 | | 0.08 | 0.06 | | 1.00 | 5 | 3.25 | 3.75 | 0.069 | 0.069 | 2.25 | 1.13 | 0.077 | 1% | |
| | 4.00 | 2.52 | | 0.33 | 0.28 | | 1.00 | 6 | 3.75 | 4.25 | 0.302 | 0.302 | 2.52 | 1.26 | 0.380 | 6% | |
| | 4.50 | 2.53 | | 0.37 | 0.53 | | 1.00 | 7 | 4.25 | 4.63 | 0.450 | 0.450 | 2.53 | 0.95 | 0.427 | 7% | |
| | 4.75 | 2.42 | | 0.46 | 0.50 | | 1.00 | 8 | 4.63 | 4.88 | 0.483 | 0.483 | 2.42 | 0.61 | 0.292 | 5% | |
| | 5.00 | 2.52 | | 0.46 | 0.58 | | 1.00 | 9 | 4.88 | 5.13 | 0.523 | 0.523 | 2.52 | 0.63 | 0.329 | 5% | |
| | 5.25 | 2.47 | | 0.52 | 0.52 | | 1.00 | 10 | 5.13 | 5.38 | 0.518 | 0.518 | 2.47 | 0.62 | 0.320 | 5% | |
| | 5.50 | 2.63 | | 0.51 | 0.48 | | 1.00 | 11 | 5.38 | 5.63 | 0.495 | 0.495 | 2.63 | 0.66 | 0.326 | 5% | |
| | 5.75 | 2.49 | | 0.55 | 0.62 | | 1.00 | 12 | 5.63 | 5.88 | 0.582 | 0.582 | 2.49 | 0.62 | 0.362 | 6% | |
| | 6.00 | 2.60 | | 0.60 | 0.52 | | 1.00 | 13 | 5.88 | 6.13 | 0.559 | 0.559 | 2.60 | 0.65 | 0.364 | 6% | |
| | 6.25 | 2.48 | | 0.48 | 0.54 | | 1.00 | 14 | 6.13 | 6.38 | 0.512 | 0.512 | 2.48 | 0.62 | 0.317 | 5% | |
| | 6.50 | 2.48 | | 0.54 | 0.50 | | 1.00 | 15 | 6.38 | 6.75 | 0.520 | 0.520 | 2.48 | 0.93 | 0.483 | 8% | |
| | 7.00 | 2.45 | | 0.48 | 0.48 | | 1.00 | 16 | 6.75 | 7.25 | 0.479 | 0.479 | 2.45 | 1.23 | 0.586 | 9% | |
| | 7.50 | 2.41 | | 0.45 | 0.59 | | 1.00 | 17 | 7.25 | 7.75 | 0.520 | 0.520 | 2.41 | 1.21 | 0.626 | 10% | |
| | 8.00 | 2.35 | | 0.30 | 0.27 | | 1.00 | 18 | 7.75 | 8.25 | 0.283 | 0.283 | 2.35 | 1.18 | 0.333 | 5% | |
| | 8.50 | 2.24 | | 0.32 | 0.41 | | 1.00 | 19 | 8.25 | 8.75 | 0.364 | 0.364 | 2.24 | 1.12 | 0.408 | 6% | |
| | 9.00 | 2.10 | | 0.17 | 0.26 | | 1.00 | 20 | 8.75 | 9.75 | 0.212 | 0.212 | 2.10 | 2.10 | 0.445 | 7% | |
| | RB | 10.50 | 1.23 | | | | 0.034 | 1.00 | 21 | 9.75 | 11.00 | 0.034 | 0.034 | 1.23 | 1.54 | 0.052 | 1% |
| | | 11.50 | 0.00 | | | | 0.000 | 1.00 | 22 | 11.00 | 11.50 | 0.008 | 0.008 | 0.31 | 0.15 | 0.001 | 0% |
| | | | | | | | | | | | | | | | | | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 6.293 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 19.90 | (m ²) |
| Top Width: | 10.60 | (m) |
| Hydraulic Depth: | 1.877 | (m) |
| Mean Velocity: | 0.316 | (m/s) |
| Froude Number | 0.074 | |
| Photographs taken looking at: | | |
| U/S, D/S, across | | |

Notes:
TSS Sample Taken

Datalogger Notes: Database #290
Datalogger Internal Power: 4.83 V
Datalogger External Power: 13.97 V
Datalogger Memory Used: 49%
Datalogger Clock: May 30, 2005 13:49 P MST
Laptop Clock: May 30, 2005 13:55 P MST
Dessicant: 40% Used
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: ND/RM
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: July 14, 2005
Start Time: 5:22 PM MDT
End Time: 5:55 PM MDT

Level Readings

Bench Mark Reading: rebar on 0.722 EI: 281.740 0.767 EI: 281.740
Water Level Reading: 2.043 EI: 280.419 2.087 EI: 280.420
Top of Ice Level Reading: EI: EI: EI: EI:
Transducer Reading & Est. EI.: 1.459 EI: 278.960 1.459 EI: 278.961
Other: EI: EI: EI: EI:

Weather Conditions: +25 C, Partly cloudy

River Conditions: Open water

Measurement Data

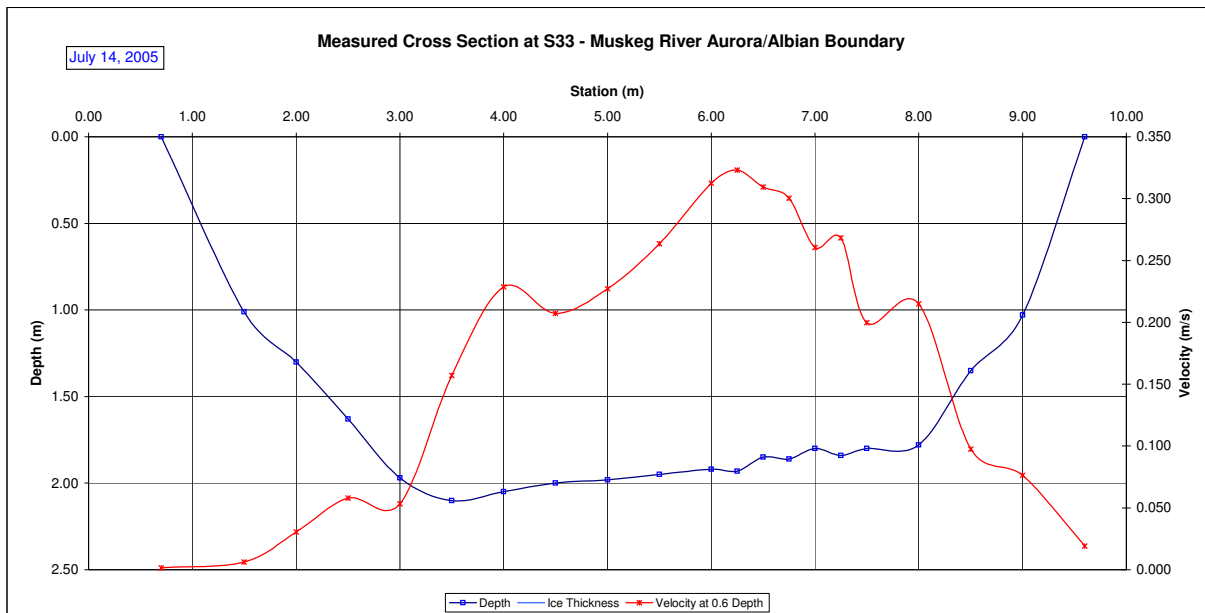
| Measured Data | | | | | | Calculated Data | | | | | | | | | | |
|---------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|------------|-----------------|---------------------|--|
| 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 | 0.70 | 0.00 | | | 0.000 | 1.00 | 1 | 0.70 | 1.10 | 0.002 | 0.002 | 0.25 | 0.10 | 0.000 | 0% | |
| | 1.50 | 1.01 | | | 0.006 | 1.00 | 2 | 1.10 | 1.75 | 0.006 | 0.006 | 1.01 | 0.66 | 0.004 | 0% | |
| | 2.00 | 1.30 | 0.01 | 0.05 | | 1.00 | 3 | 1.75 | 2.25 | 0.030 | 0.030 | 1.30 | 0.65 | 0.020 | 1% | |
| | 2.50 | 1.63 | 0.02 | 0.10 | | 1.00 | 4 | 2.25 | 2.75 | 0.058 | 0.058 | 1.63 | 0.82 | 0.047 | 2% | |
| | 3.00 | 1.97 | 0.02 | 0.09 | | 1.00 | 5 | 2.75 | 3.25 | 0.053 | 0.053 | 1.97 | 0.99 | 0.053 | 2% | |
| | 3.50 | 2.10 | 0.06 | 0.25 | | 1.00 | 6 | 3.25 | 3.75 | 0.157 | 0.157 | 2.10 | 1.05 | 0.165 | 6% | |
| | 4.00 | 2.05 | 0.13 | 0.32 | | 1.00 | 7 | 3.75 | 4.25 | 0.229 | 0.229 | 2.05 | 1.03 | 0.234 | 9% | |
| | 4.50 | 2.00 | 0.10 | 0.32 | | 1.00 | 8 | 4.25 | 4.75 | 0.207 | 0.207 | 2.00 | 1.00 | 0.207 | 8% | |
| | 5.00 | 1.98 | 0.16 | 0.29 | | 1.00 | 9 | 4.75 | 5.25 | 0.227 | 0.227 | 1.98 | 0.99 | 0.225 | 9% | |
| | 5.50 | 1.95 | 0.23 | 0.30 | | 1.00 | 10 | 5.25 | 5.75 | 0.264 | 0.264 | 1.95 | 0.98 | 0.257 | 10% | |
| | 6.00 | 1.92 | 0.31 | 0.31 | | 1.00 | 11 | 5.75 | 6.13 | 0.312 | 0.312 | 1.92 | 0.72 | 0.225 | 9% | |
| | 6.25 | 1.93 | 0.31 | 0.33 | | 1.00 | 12 | 6.13 | 6.38 | 0.323 | 0.323 | 1.93 | 0.48 | 0.156 | 6% | |
| | 6.50 | 1.85 | 0.30 | 0.32 | | 1.00 | 13 | 6.38 | 6.63 | 0.309 | 0.309 | 1.85 | 0.46 | 0.143 | 6% | |
| | 6.75 | 1.86 | 0.27 | 0.33 | | 1.00 | 14 | 6.63 | 6.88 | 0.300 | 0.300 | 1.86 | 0.47 | 0.140 | 5% | |
| | 7.00 | 1.80 | 0.23 | 0.30 | | 1.00 | 15 | 6.88 | 7.13 | 0.261 | 0.261 | 1.80 | 0.45 | 0.117 | 5% | |
| | 7.25 | 1.84 | 0.24 | 0.30 | | 1.00 | 16 | 7.13 | 7.38 | 0.268 | 0.268 | 1.84 | 0.46 | 0.123 | 5% | |
| | 7.50 | 1.80 | 0.18 | 0.22 | | 1.00 | 17 | 7.38 | 7.75 | 0.200 | 0.200 | 1.80 | 0.68 | 0.135 | 5% | |
| | 8.00 | 1.78 | 0.19 | 0.24 | | 1.00 | 18 | 7.75 | 8.25 | 0.215 | 0.215 | 1.78 | 0.89 | 0.191 | 7% | |
| 8.50 | 1.35 | 0.03 | 0.17 | | 1.00 | 19 | 8.25 | 8.75 | 0.098 | 0.098 | 1.35 | 0.68 | 0.066 | 3% | | |
| RB | 9.00 | 1.03 | | | 0.076 | 1.00 | 20 | 8.75 | 9.30 | 0.076 | 0.076 | 1.03 | 0.57 | 0.043 | 2% | |
| | 9.60 | 0.00 | | | 0.000 | 1.00 | 21 | 9.30 | 9.60 | 0.019 | 0.019 | 0.26 | 0.08 | 0.001 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 2.553 | | |

| | | |
|---|-------|---------------------|
| Total Flow: | 2.553 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 14.17 | (m ²) |
| Top Width: | 8.90 | (m) |
| Hydraulic Depth: | 1.592 | (m) |
| Mean Velocity: | 0.180 | (m/s) |
| Froude Number | 0.046 | |
| Photographs taken looking at: U/S, D/S, across | | |

Notes:

TSS Sample Taken

Datalogger Notes: Database #290
Datalogger Internal Power: 4.838 V
Datalogger External Power: 13.97 V
Datalogger Memory Used: 52%
Datalogger Clock: Jul 14, 2005 15:51 MST
Laptop Clock: Jul 14, 2005 15:58 MST
Dessicant: 50% Used
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: August 31, 2005
Start Time: 2:54 PM MDT
End Time: 3:16 PM MDT

Weather Conditions:

+20 C, Partly cloudy

River Conditions:

Open water, high stage, approaching bankfull but lower than S5A

Personnel & Equipment

Measurement Made By: ND/FF
Data Entry By: FF
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Level Readings

Bench Mark Reading: rebar on c 0.784 El: 281.740 0.855 El: 281.740
Water Level Reading: 1.355 El: 281.169 1.424 El: 281.171
Top of Ice Level Reading:
Transducer Reading & Est. El.: 2.218 El: 278.951 2.218 El: 278.953
Other: El:

Setup No. 1

Setup No. 2

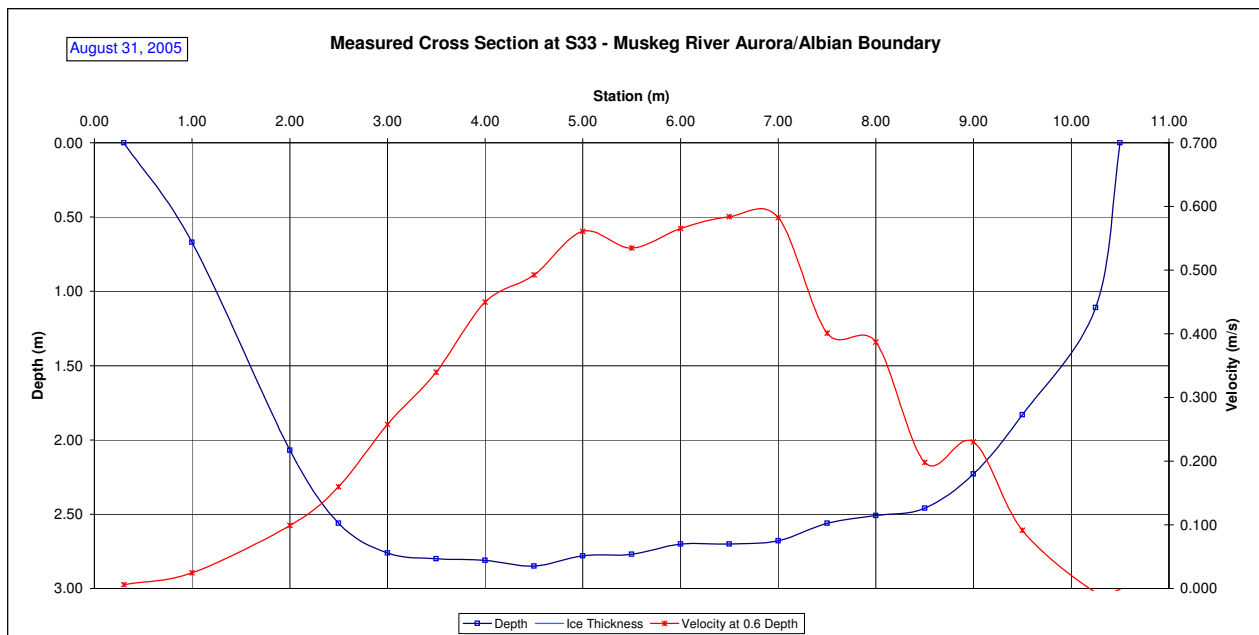
| Measurement Data | | | | | | | | | | | | | | | | |
|------------------|-------|---------------|-----------------------|-----------------------|-----------------------|----------------------------|-----------|-------------------------|-----------------------|-------------------------|----------------------------------|-----------------------|------------|-----------------|-------|---------------------|
| 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) | | |
| 0.30 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.30 | 0.65 | 0.006 | 0.006 | 0.17 | 0.06 | 0.000 | 0% | |
| 1.00 | 0.67 | | | | 0.024 | 1.00 | 2 | 0.65 | 1.50 | 0.024 | 0.024 | 0.67 | 0.57 | 0.014 | 0% | |
| 2.00 | 2.07 | | 0.06 | 0.14 | | 1.00 | 3 | 1.50 | 2.25 | 0.099 | 0.099 | 2.07 | 1.55 | 0.154 | 2% | |
| 2.50 | 2.56 | | 0.02 | 0.30 | | 1.00 | 4 | 2.25 | 2.75 | 0.160 | 0.160 | 2.56 | 1.28 | 0.205 | 3% | |
| 3.00 | 2.76 | | 0.21 | 0.31 | | 1.00 | 5 | 2.75 | 3.25 | 0.258 | 0.258 | 2.76 | 1.38 | 0.355 | 4% | |
| 3.50 | 2.80 | | 0.19 | 0.49 | | 1.00 | 6 | 3.25 | 3.75 | 0.340 | 0.340 | 2.80 | 1.40 | 0.476 | 6% | |
| 4.00 | 2.81 | | 0.32 | 0.58 | | 1.00 | 7 | 3.75 | 4.25 | 0.450 | 0.450 | 2.81 | 1.41 | 0.632 | 8% | |
| 4.50 | 2.85 | | 0.40 | 0.59 | | 1.00 | 8 | 4.25 | 4.75 | 0.492 | 0.492 | 2.85 | 1.43 | 0.701 | 9% | |
| 5.00 | 2.78 | | 0.54 | 0.58 | | 1.00 | 9 | 4.75 | 5.25 | 0.561 | 0.561 | 2.78 | 1.39 | 0.780 | 10% | |
| 5.50 | 2.77 | | 0.58 | 0.49 | | 1.00 | 10 | 5.25 | 5.75 | 0.535 | 0.535 | 2.77 | 1.39 | 0.741 | 9% | |
| 6.00 | 2.70 | | 0.59 | 0.54 | | 1.00 | 11 | 5.75 | 6.25 | 0.565 | 0.565 | 2.70 | 1.35 | 0.763 | 10% | |
| 6.50 | 2.70 | | 0.55 | 0.62 | | 1.00 | 12 | 6.25 | 6.75 | 0.584 | 0.584 | 2.70 | 1.35 | 0.788 | 10% | |
| 7.00 | 2.68 | | 0.59 | 0.57 | | 1.00 | 13 | 6.75 | 7.25 | 0.582 | 0.582 | 2.68 | 1.34 | 0.780 | 10% | |
| 7.50 | 2.56 | | 0.32 | 0.48 | | 1.00 | 14 | 7.25 | 7.75 | 0.401 | 0.401 | 2.56 | 1.28 | 0.513 | 6% | |
| 8.00 | 2.51 | | 0.41 | 0.37 | | 1.00 | 15 | 7.75 | 8.25 | 0.387 | 0.387 | 2.51 | 1.26 | 0.486 | 6% | |
| 8.50 | 2.46 | | 0.13 | 0.27 | | 1.00 | 16 | 8.25 | 8.75 | 0.198 | 0.198 | 2.46 | 1.23 | 0.244 | 3% | |
| 9.00 | 2.23 | | 0.16 | 0.30 | | 1.00 | 17 | 8.75 | 9.25 | 0.230 | 0.230 | 2.23 | 1.12 | 0.257 | 3% | |
| 9.50 | 1.83 | | 0.03 | 0.15 | | 1.00 | 18 | 9.25 | 9.88 | 0.091 | 0.091 | 1.83 | 1.14 | 0.105 | 1% | |
| 10.25 | 1.11 | | | | -0.006 | 1.00 | 19 | 9.88 | 10.38 | -0.006 | -0.006 | 1.11 | 0.56 | -0.003 | 0% | |
| 10.50 | 0.00 | | | | 0.000 | 1.00 | 20 | 10.38 | 10.50 | -0.002 | -0.002 | 0.28 | 0.03 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | | 7.989 | |

| | | | |
|-------------------------------|-------|-------|---------------------|
| Total Flow: | 7.989 | 8.149 | (m ³ /s) |
| Pereived Measurement Quality: | Good | | |
| Total Area: | 22.50 | | (m ²) |
| Top Width: | 10.20 | | (m) |
| Hydraulic Depth: | 2.206 | | (m) |
| Mean Velocity: | 0.355 | | (m/s) |
| Froude Number | 0.076 | | |
| Photographs taken looking at: | | | |
| U/S, D/S, across | | | |

Notes:

TSS Sample Taken
About 2% of flow in overbank flow. Bankfull strage exceeded.

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database #290 |
| Datalogger Internal Power: | 4.81 V |
| Datalogger External Power: | 14.12 V |
| Datalogger Memory Used: | 56% |
| Datalogger Clock: | Aug 31, 2005 13:26 MST |
| Laptop Clock: | Aug 31, 2005 13:33 MST |
| Dessicant: | 100% used - replaced |
| 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: October 7, 2005
Start Time: 2:30 PM MDT
End Time: 3:13 PM MDT

Personnel & Equipment

Measurement Made By: ND/PM
Data Entry By: FF
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521
Level Readings: Setup No. 1
Bench Mark Reading: rebar on 0.775
Water Level Reading: 2.085
Top of Ice Level Reading:
Transducer Reading & Est. El.: 1.477
Other:

Setup No. 2

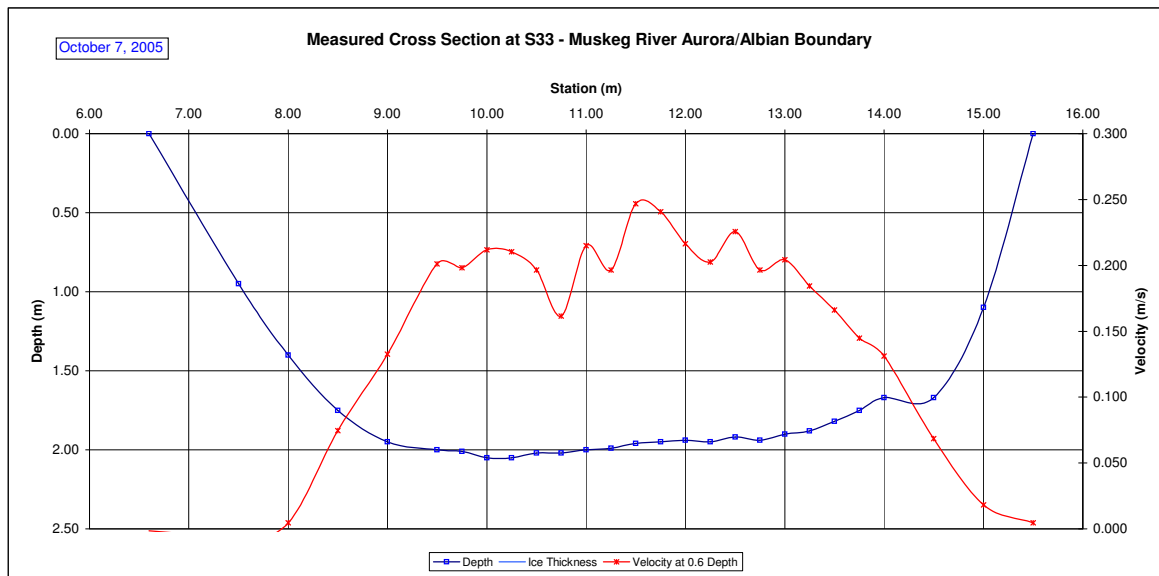
El: 281.740
El: 280.430
El:
El: 278.953
El:

Weather Conditions: +11 C, Overcast, light wind
River Conditions: Open water, low stage and falling

| 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) | | |
| 6.60 | 0.00 | | | | 0.000 | 1.00 | 1 | 6.60 | 7.05 | -0.002 | -0.002 | 0.24 | 0.11 | 0.000 | 0% | |
| 7.50 | 0.95 | | | | -0.006 | 1.00 | 2 | 7.05 | 7.75 | -0.006 | -0.006 | 0.95 | 0.67 | -0.004 | 0% | |
| 8.00 | 1.40 | | -0.02 | 0.03 | | 1.00 | 3 | 7.75 | 8.25 | 0.005 | 0.005 | 1.40 | 0.70 | 0.003 | 0% | |
| 8.50 | 1.75 | | 0.06 | 0.09 | | 1.00 | 4 | 8.25 | 8.75 | 0.075 | 0.075 | 1.75 | 0.88 | 0.065 | 3% | |
| 9.00 | 1.95 | | 0.12 | 0.15 | | 1.00 | 5 | 8.75 | 9.25 | 0.133 | 0.133 | 1.95 | 0.98 | 0.129 | 6% | |
| 9.50 | 2.00 | | 0.16 | 0.25 | | 1.00 | 6 | 9.25 | 9.63 | 0.201 | 0.201 | 2.00 | 0.75 | 0.151 | 7% | |
| 9.75 | 2.01 | | 0.12 | 0.27 | | 1.00 | 7 | 9.63 | 9.88 | 0.198 | 0.198 | 2.01 | 0.50 | 0.100 | 5% | |
| 10.00 | 2.05 | | 0.16 | 0.27 | | 1.00 | 8 | 9.88 | 10.13 | 0.212 | 0.212 | 2.05 | 0.51 | 0.109 | 5% | |
| 10.25 | 2.05 | | 0.14 | 0.28 | | 1.00 | 9 | 10.13 | 10.38 | 0.210 | 0.210 | 2.05 | 0.51 | 0.108 | 5% | |
| 10.50 | 2.02 | | 0.12 | 0.28 | | 1.00 | 10 | 10.38 | 10.63 | 0.197 | 0.197 | 2.02 | 0.51 | 0.099 | 5% | |
| 10.75 | 2.02 | | 0.10 | 0.23 | | 1.00 | 11 | 10.63 | 10.88 | 0.162 | 0.162 | 2.02 | 0.51 | 0.082 | 4% | |
| 11.00 | 2.00 | | 0.21 | 0.22 | | 1.00 | 12 | 10.88 | 11.13 | 0.215 | 0.215 | 2.00 | 0.50 | 0.107 | 5% | |
| 11.25 | 1.99 | | 0.17 | 0.22 | | 1.00 | 13 | 11.13 | 11.38 | 0.197 | 0.197 | 1.99 | 0.50 | 0.098 | 5% | |
| 11.50 | 1.96 | | 0.24 | 0.25 | | 1.00 | 14 | 11.38 | 11.63 | 0.247 | 0.247 | 1.96 | 0.49 | 0.121 | 6% | |
| 11.75 | 1.95 | | 0.27 | 0.22 | | 1.00 | 15 | 11.63 | 11.88 | 0.241 | 0.241 | 1.95 | 0.49 | 0.117 | 5% | |
| 12.00 | 1.94 | | 0.21 | 0.22 | | 1.00 | 16 | 11.88 | 12.13 | 0.216 | 0.216 | 1.94 | 0.49 | 0.105 | 5% | |
| 12.25 | 1.95 | | 0.19 | 0.22 | | 1.00 | 17 | 12.13 | 12.38 | 0.203 | 0.203 | 1.95 | 0.49 | 0.099 | 5% | |
| 12.50 | 1.92 | | 0.24 | 0.21 | | 1.00 | 18 | 12.38 | 12.63 | 0.226 | 0.226 | 1.92 | 0.48 | 0.108 | 5% | |
| 12.75 | 1.94 | | 0.17 | 0.22 | | 1.00 | 19 | 12.63 | 12.88 | 0.197 | 0.197 | 1.94 | 0.49 | 0.095 | 4% | |
| 13.00 | 1.90 | | 0.17 | 0.24 | | 1.00 | 20 | 12.88 | 13.13 | 0.204 | 0.204 | 1.90 | 0.48 | 0.097 | 4% | |
| 13.25 | 1.88 | | 0.21 | 0.16 | | 1.00 | 21 | 13.13 | 13.38 | 0.184 | 0.184 | 1.88 | 0.47 | 0.087 | 4% | |
| 13.50 | 1.82 | | 0.16 | 0.18 | | 1.00 | 22 | 13.38 | 13.63 | 0.166 | 0.166 | 1.82 | 0.46 | 0.076 | 3% | |
| 13.75 | 1.75 | | 0.11 | 0.18 | | 1.00 | 23 | 13.63 | 13.88 | 0.145 | 0.145 | 1.75 | 0.44 | 0.063 | 3% | |
| 14.00 | 1.67 | | 0.11 | 0.16 | | 1.00 | 24 | 13.88 | 14.25 | 0.131 | 0.131 | 1.67 | 0.63 | 0.082 | 4% | |
| 14.50 | 1.67 | | 0.04 | 0.09 | | 1.00 | 25 | 14.25 | 14.75 | 0.069 | 0.069 | 1.67 | 0.84 | 0.057 | 3% | |
| 15.00 | 1.10 | | | | 0.018 | 1.00 | 26 | 14.75 | 15.25 | 0.018 | 0.018 | 1.10 | 0.55 | 0.010 | 0% | |
| 15.50 | 0.00 | | | | 0.000 | 1.00 | 27 | 15.25 | 15.50 | 0.005 | 0.005 | 0.28 | 0.07 | 0.000 | 0% | |
| Total Flow: | | | | | | | | | | | | | | 2.165 | | |

| | | |
|--------------------------------|------------------|---------------------|
| Total Flow: | 2.165 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 14.44 | (m ²) |
| Top Width: | 8.90 | (m) |
| Hydraulic Depth: | 1.622 | (m) |
| Mean Velocity: | 0.150 | (m/s) |
| Froude Number | 0.038 | |
| Photographs taken looking at: | U/S, D/S, across | |
| Notes: | TSS Sample Taken | |

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database #290 |
| Datalogger Internal Power: | 4.79 V |
| Datalogger External Power: | 14.49 V |
| Datalogger Memory Used: | 59% |
| Datalogger Clock: | Oct 07, 2005 12:53 MST |
| Laptop Clock: | Oct 07, 2005 13:02 MST |
| Dessicant: | 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: November 17, 2005
Start Time: 12:15 PM MST
End Time: MST

Weather Conditions:

-8° C, Overcast, light wind

River Conditions:

Complete ice cover ~ 3-4 cm thick

Personnel & Equipment

Measurement Made By: RM/JE
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000
s/n 2004521

Level Readings

Bench Mark Reading: rebar on 0.710
Water Level Reading: 2.285
Top of Ice Level Reading: 2.201
Transducer Reading & Est. El.: 1.210
Other:

Setup No. 1

El: 281.740
El: 280.165
El: 280.249
El: 278.955

Setup No. 2

El: 281.740
El: 280.165
El: 280.255
El: 278.955

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 ²) | (m ³ /s) | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Total Flow: -

| | | |
|--------------------------------|---|---------------------|
| Total Flow: | - | (m ³ /s) |
| Perceived Measurement Quality: | | |
| Total Area: | | (m ²) |
| Top Width: | | (m) |
| Hydraulic Depth: | | (m) |
| Mean Velocity: | | (m/s) |
| Froude Number | | |
| Photographs taken looking at: | | |
| U/S, D/S, across | | |

Notes:

| | |
|----------------------------|------------------------|
| Datalogger Notes: | Database #290 |
| Datalogger Internal Power: | 4.74 V |
| Datalogger External Power: | 13.67 V |
| Datalogger Memory Used: | 62% |
| Datalogger Clock: | Nov 17, 2005 12:10 MST |
| Laptop Clock: | Nov 17, 2005 12:12 MST |
| Dessicant: | 30% used |
| 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: ND/PM/JE
Data Entry By: ND
Meter Type and No.: March Mc Birney Flo-Mate 2000 s/n 2004521

Time of Measurement

Date of Measurement: December 6, 2005
Start Time: 1:50 PM MST
End Time: 2:17 PM MST

Level Readings

Bench Mark Reading: rebar on 0.821
Water Level Reading: 2.526
Top of Ice Level Reading: 2.466
Transducer Reading & Est. El.: 1.084
Other:

Setup No. 1

El: 281.740 0.892
El: 280.035 2.593
El: 280.039 2.547
El: 278.951 1.084
El:

Setup No. 2

El: 281.740
El: 280.039
El:
El: 278.955
El:

Weather Conditions:

-25 C, Clear, Calm

River Conditions:

Complete ice cover

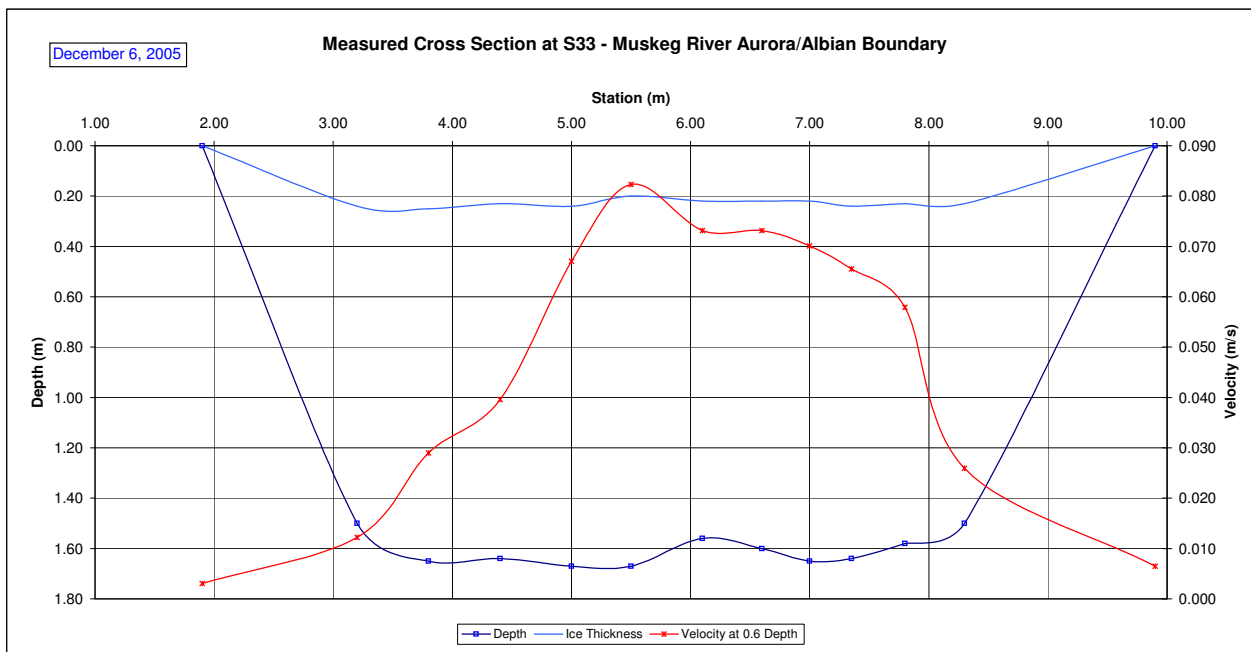
Measurement Data

| | 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 ²) | (m ³ /s) | |
| LB | 1.90 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.90 | 1 | 1.90 | 2.55 | 0.003 | 0.003 | 0.32 | 0.20 | 0.001 | 0% |
| | 3.20 | 1.50 | 0.24 | 0.02 | 0.01 | | 0.90 | 2 | 2.55 | 3.50 | 0.012 | 0.011 | 1.26 | 1.20 | 0.013 | 3% |
| | 3.80 | 1.65 | 0.25 | 0.02 | 0.04 | | 0.90 | 3 | 3.50 | 4.10 | 0.029 | 0.026 | 1.40 | 0.84 | 0.022 | 6% |
| | 4.40 | 1.64 | 0.23 | 0.04 | 0.04 | | 0.90 | 4 | 4.10 | 4.70 | 0.040 | 0.036 | 1.41 | 0.85 | 0.030 | 8% |
| | 5.00 | 1.67 | 0.24 | 0.07 | 0.07 | | 0.90 | 5 | 4.70 | 5.25 | 0.067 | 0.060 | 1.43 | 0.79 | 0.047 | 12% |
| | 5.50 | 1.67 | 0.20 | 0.08 | 0.08 | | 0.90 | 6 | 5.25 | 5.80 | 0.082 | 0.074 | 1.47 | 0.81 | 0.060 | 15% |
| | 6.10 | 1.56 | 0.22 | 0.09 | 0.06 | | 0.90 | 7 | 5.80 | 6.35 | 0.073 | 0.066 | 1.34 | 0.74 | 0.049 | 12% |
| | 6.60 | 1.60 | 0.22 | 0.10 | 0.04 | | 0.90 | 8 | 6.35 | 6.80 | 0.073 | 0.066 | 1.38 | 0.62 | 0.041 | 10% |
| | 7.00 | 1.65 | 0.22 | 0.09 | 0.05 | | 0.90 | 9 | 6.80 | 7.18 | 0.070 | 0.063 | 1.43 | 0.54 | 0.034 | 9% |
| | 7.35 | 1.64 | 0.24 | 0.08 | 0.05 | | 0.90 | 10 | 7.18 | 7.58 | 0.066 | 0.059 | 1.40 | 0.56 | 0.033 | 8% |
| | 7.80 | 1.58 | 0.23 | 0.07 | 0.05 | | 0.90 | 11 | 7.58 | 8.05 | 0.058 | 0.052 | 1.35 | 0.64 | 0.033 | 8% |
| | 8.30 | 1.50 | 0.23 | 0.01 | 0.05 | | 0.90 | 12 | 8.05 | 9.10 | 0.026 | 0.023 | 1.27 | 1.33 | 0.031 | 8% |
| RB | 9.90 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.90 | 13 | 9.10 | 9.90 | 0.006 | 0.006 | 0.32 | 0.25 | 0.001 | 0% |

Total Flow: 0.395

| | | |
|---|-------|---------------------|
| Total Flow: | 0.395 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 9.37 | (m ²) |
| Top Width: | 8.00 | (m) |
| Hydraulic Depth: | 1.171 | (m) |
| Mean Velocity: | 0.042 | (m/s) |
| Froude Number | 0.012 | |
| Photographs taken looking at: U/S, D/S, across | | |
| Notes: | | |

| | |
|---------------------------------|------------------------|
| Datalogger Notes: Database #290 | |
| Datalogger Internal Power: | 4.683 V |
| Datalogger External Power: | 15.28 V |
| Datalogger Memory Used: | 64% |
| Datalogger Clock: | Dec 06, 2005 13:16 MST |
| Laptop Clock: | Dec 06, 2005 13:31 MST |
| Dessicant: | 50% used - replaced |
| Datalogger: | 105010290 |
| PT: | 304988 |
| Power: | |



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 26, 2005
Start Time: 12:46 PM MDT
End Time: 12:58 PM MDT

Weather Conditions:

+3 C, Overcast, very light snow

River Conditions:

Open, stage almost bankfull, high velocity

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar on LB 1.289
Water Level Reading: 3.461
Top of Ice Level Reading:
Transducer Reading & El.: 0.340
Other: Nail in tree 2.475

Setup No. 1

El: 100.000
El: 97.828
El: 97.488
El: 98.814

Setup No. 2

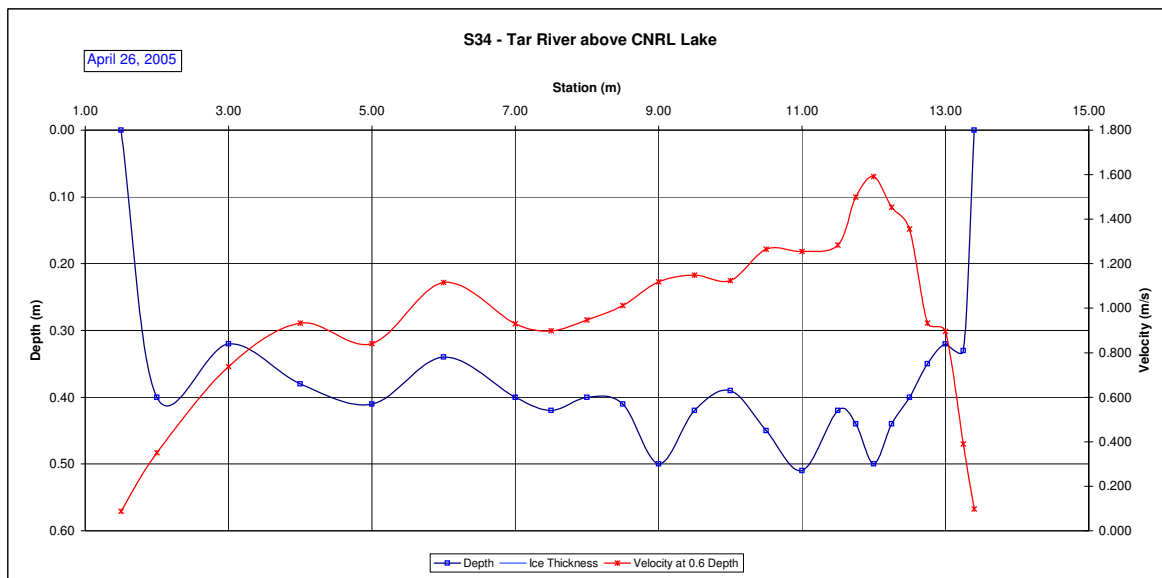
El: 100.000
El: 97.828
El: 97.488
El: 98.817

| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| 1.50 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.50 | 1.75 | 0.088 | 0.088 | 0.10 | 0.03 | 0.002 |
| 2.00 | 0.40 | | | | 0.351 | 1.00 | 2 | 1.75 | 2.50 | 0.351 | 0.351 | 0.40 | 0.30 | 0.105 |
| 3.00 | 0.32 | | | | 0.738 | 1.00 | 3 | 2.50 | 3.50 | 0.738 | 0.738 | 0.32 | 0.32 | 0.236 |
| 4.00 | 0.38 | | | | 0.933 | 1.00 | 4 | 3.50 | 4.50 | 0.933 | 0.933 | 0.38 | 0.38 | 0.354 |
| 5.00 | 0.41 | | | | 0.841 | 1.00 | 5 | 4.50 | 5.50 | 0.841 | 0.841 | 0.41 | 0.41 | 0.345 |
| 6.00 | 0.34 | | | | 1.116 | 1.00 | 6 | 5.50 | 6.50 | 1.116 | 1.116 | 0.34 | 0.34 | 0.379 |
| 7.00 | 0.40 | | | | 0.930 | 1.00 | 7 | 6.50 | 7.25 | 0.930 | 0.930 | 0.40 | 0.30 | 0.279 |
| 7.50 | 0.42 | | | | 0.899 | 1.00 | 8 | 7.25 | 7.75 | 0.899 | 0.899 | 0.42 | 0.21 | 0.189 |
| 8.00 | 0.40 | | | | 0.948 | 1.00 | 9 | 7.75 | 8.25 | 0.948 | 0.948 | 0.40 | 0.20 | 0.190 |
| 8.50 | 0.41 | | | | 1.012 | 1.00 | 10 | 8.25 | 8.75 | 1.012 | 1.012 | 0.41 | 0.21 | 0.207 |
| 9.00 | 0.50 | | | | 1.119 | 1.00 | 11 | 8.75 | 9.25 | 1.119 | 1.119 | 0.50 | 0.25 | 0.280 |
| 9.50 | 0.42 | | | | 1.149 | 1.00 | 12 | 9.25 | 9.75 | 1.149 | 1.149 | 0.42 | 0.21 | 0.241 |
| 10.00 | 0.39 | | | | 1.125 | 1.00 | 13 | 9.75 | 10.25 | 1.125 | 1.125 | 0.39 | 0.20 | 0.219 |
| 10.50 | 0.45 | | | | 1.265 | 1.00 | 14 | 10.25 | 10.75 | 1.265 | 1.265 | 0.45 | 0.23 | 0.285 |
| 11.00 | 0.51 | | | | 1.256 | 1.00 | 15 | 10.75 | 11.25 | 1.256 | 1.256 | 0.51 | 0.26 | 0.320 |
| 11.50 | 0.42 | | | | 1.283 | 1.00 | 16 | 11.25 | 11.63 | 1.283 | 1.283 | 0.42 | 0.16 | 0.202 |
| 11.75 | 0.44 | | | | 1.500 | 1.00 | 17 | 11.63 | 11.88 | 1.500 | 1.500 | 0.44 | 0.11 | 0.165 |
| 12.00 | 0.50 | | | | 1.591 | 1.00 | 18 | 11.88 | 12.13 | 1.591 | 1.591 | 0.50 | 0.13 | 0.199 |
| 12.25 | 0.44 | | | | 1.454 | 1.00 | 19 | 12.13 | 12.38 | 1.454 | 1.454 | 0.44 | 0.11 | 0.160 |
| 12.50 | 0.40 | | | | 1.356 | 1.00 | 20 | 12.38 | 12.63 | 1.356 | 1.356 | 0.40 | 0.10 | 0.136 |
| 12.75 | 0.35 | | | | 0.933 | 1.00 | 21 | 12.63 | 12.88 | 0.933 | 0.933 | 0.35 | 0.09 | 0.082 |
| 13.00 | 0.32 | | | | 0.896 | 1.00 | 22 | 12.88 | 13.13 | 0.896 | 0.896 | 0.32 | 0.08 | 0.072 |
| 13.25 | 0.33 | | | | 0.390 | 1.00 | 23 | 13.13 | 13.33 | 0.390 | 0.390 | 0.33 | 0.07 | 0.026 |
| 13.40 | 0.00 | | | | 0.000 | 1.00 | 24 | 13.33 | 13.40 | 0.098 | 0.098 | 0.08 | 0.01 | 0.001 |
| Total Flow: | | | | | | | | | | | | | 4.673 | |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 4.673 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 4.67 | (m ²) |
| Top Width: | 11.90 | (m) |
| Hydraulic Depth: | 0.392 | (m) |
| Mean Velocity: | 1.001 | (m/s) |
| Froude Number | 0.510 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database #272 |
| Datalogger Internal Power: | 4.44 V |
| Datalogger External Power: | 12.82 V |
| Datalogger Memory Used: | 28% |
| Datalogger Clock: | Apr 26, 2005 11:33 MST |
| Laptop Clock: | Apr 26, 2005 11:33 MST |
| Dessicant: | Good - 100% |
| Datalogger: | Optimum DD-128 #0104170272 |
| PT: | Keller 3 psi #0101878 |
| Power: | Solar panel and internal battery |

Notes: TSS Sample taken.
New station installation. Equipment from discontinued station S17 installed here as S34.
Transducer wired and clamped to a rock and placed in the flow.



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: FF/RM
Data Entry By: FF Checked: PM
Meter Type and No.: Marsh McBirney FloMate 2000
s/n 2004521

Time of Measurement

Date of Measurement: June 2, 2005
Start Time: 2:50 PM MDT
End Time: 3:00 PM MDT

Level Readings

Bench Mark Reading: rebar on LB 1.307
Water Level Reading: 3.699
Transducer Rdg before shift: 0.144
Transducer Reading & El.: 0.304
Other: Nail in tree 2.500

Setup No. 1

El: 100.000
El: 97.608
El: 97.464
El: 97.304
El: 98.807

Setup No. 2

El: 100.000
El: 97.610
El: 97.466
El: 97.306
El: 98.811

Weather Conditions:

+25 C, clear, light wind from N

River Conditions:

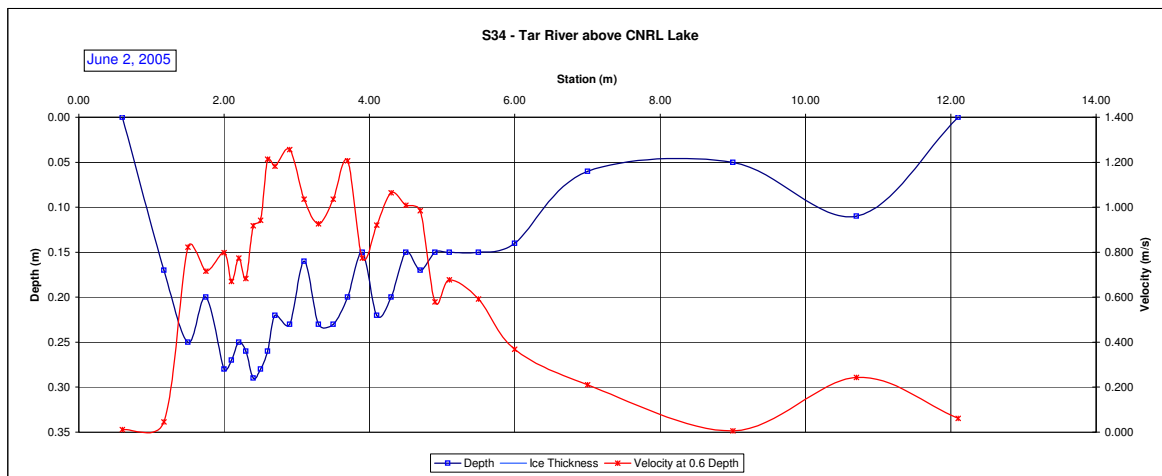
Open, stage below bankfull, stage falling

| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| 0.60 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.60 | 0.89 | 0.011 | 0.011 | 0.04 | 0.01 | 0.000 |
| 1.17 | 0.17 | | | | 0.046 | 1.00 | 2 | 0.89 | 1.34 | 0.046 | 0.046 | 0.17 | 0.08 | 0.003 |
| 1.50 | 0.25 | | | | 0.823 | 1.00 | 3 | 1.34 | 1.63 | 0.823 | 0.823 | 0.25 | 0.07 | 0.060 |
| 1.75 | 0.20 | | | | 0.716 | 1.00 | 4 | 1.63 | 1.88 | 0.716 | 0.716 | 0.20 | 0.05 | 0.036 |
| 2.00 | 0.28 | | | | 0.799 | 1.00 | 5 | 1.88 | 2.05 | 0.799 | 0.799 | 0.28 | 0.05 | 0.039 |
| 2.10 | 0.27 | | | | 0.671 | 1.00 | 6 | 2.05 | 2.15 | 0.671 | 0.671 | 0.27 | 0.03 | 0.018 |
| 2.20 | 0.25 | | | | 0.774 | 1.00 | 7 | 2.15 | 2.25 | 0.774 | 0.774 | 0.25 | 0.02 | 0.019 |
| 2.30 | 0.26 | | | | 0.683 | 1.00 | 8 | 2.25 | 2.35 | 0.683 | 0.683 | 0.26 | 0.03 | 0.018 |
| 2.40 | 0.29 | | | | 0.917 | 1.00 | 9 | 2.35 | 2.45 | 0.917 | 0.917 | 0.29 | 0.03 | 0.027 |
| 2.50 | 0.28 | | | | 0.942 | 1.00 | 10 | 2.45 | 2.55 | 0.942 | 0.942 | 0.28 | 0.03 | 0.026 |
| 2.60 | 0.26 | | | | 1.213 | 1.00 | 11 | 2.55 | 2.65 | 1.213 | 1.213 | 0.26 | 0.03 | 0.032 |
| 2.70 | 0.22 | | | | 1.183 | 1.00 | 12 | 2.65 | 2.80 | 1.183 | 1.183 | 0.22 | 0.03 | 0.039 |
| 2.90 | 0.23 | | | | 1.256 | 1.00 | 13 | 2.80 | 3.00 | 1.256 | 1.256 | 0.23 | 0.05 | 0.058 |
| 3.10 | 0.16 | | | | 1.036 | 1.00 | 14 | 3.00 | 3.20 | 1.036 | 1.036 | 0.16 | 0.03 | 0.033 |
| 3.30 | 0.23 | | | | 0.927 | 1.00 | 15 | 3.20 | 3.40 | 0.927 | 0.927 | 0.23 | 0.05 | 0.043 |
| 3.50 | 0.23 | | | | 1.036 | 1.00 | 16 | 3.40 | 3.60 | 1.036 | 1.036 | 0.23 | 0.05 | 0.048 |
| 3.70 | 0.20 | | | | 1.207 | 1.00 | 17 | 3.60 | 3.80 | 1.207 | 1.207 | 0.20 | 0.04 | 0.048 |
| 3.90 | 0.15 | | | | 0.774 | 1.00 | 18 | 3.80 | 4.00 | 0.774 | 0.774 | 0.15 | 0.03 | 0.023 |
| 4.10 | 0.22 | | | | 0.920 | 1.00 | 19 | 4.00 | 4.20 | 0.920 | 0.920 | 0.22 | 0.04 | 0.041 |
| 4.30 | 0.20 | | | | 1.064 | 1.00 | 20 | 4.20 | 4.40 | 1.064 | 1.064 | 0.20 | 0.04 | 0.043 |
| 4.50 | 0.15 | | | | 1.009 | 1.00 | 21 | 4.40 | 4.60 | 1.009 | 1.009 | 0.15 | 0.03 | 0.030 |
| 4.70 | 0.17 | | | | 0.985 | 1.00 | 22 | 4.60 | 4.80 | 0.985 | 0.985 | 0.17 | 0.03 | 0.033 |
| 4.90 | 0.15 | | | | 0.579 | 1.00 | 23 | 4.80 | 5.00 | 0.579 | 0.579 | 0.15 | 0.03 | 0.017 |
| 5.10 | 0.15 | | | | 0.677 | 1.00 | 24 | 5.00 | 5.30 | 0.677 | 0.677 | 0.15 | 0.04 | 0.030 |
| 5.50 | 0.15 | | | | 0.591 | 1.00 | 25 | 5.30 | 5.75 | 0.591 | 0.591 | 0.15 | 0.07 | 0.040 |
| 6.00 | 0.14 | | | | 0.369 | 1.00 | 26 | 5.75 | 6.50 | 0.369 | 0.369 | 0.14 | 0.11 | 0.039 |
| 7.00 | 0.06 | | | | 0.210 | 1.00 | 27 | 6.50 | 8.00 | 0.210 | 0.210 | 0.06 | 0.09 | 0.019 |
| 9.00 | 0.05 | | | | 0.006 | 1.00 | 28 | 8.00 | 9.85 | 0.006 | 0.006 | 0.05 | 0.09 | 0.001 |
| 10.70 | 0.11 | | | | 0.244 | 1.00 | 29 | 9.85 | 11.40 | 0.244 | 0.244 | 0.11 | 0.17 | 0.042 |
| 12.10 | 0.00 | | | | 0.000 | 1.00 | 30 | 11.40 | 12.10 | 0.061 | 0.061 | 0.03 | 0.02 | 0.001 |
| Total Flow: | | | | | | | | | | | | | | 0.905 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.905 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.46 | (m ²) |
| Top Width: | 11.50 | (m) |
| Hydraulic Depth: | 0.127 | (m) |
| Mean Velocity: | 0.619 | (m/s) |
| Froude Number | 0.555 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database #272 |
| Datalogger Internal Power: | 4.5 V |
| Datalogger External Power: | 13.7 V |
| Datalogger Memory Used: | 31% |
| Datalogger Clock: | Jun 02, 2005 13:40 MST |
| Laptop Clock: | Jun 02, 2005 13:40 MST |
| Dessicant: | Good - 95% |
| Datalogger: | Optimum DD-128 #0104170272 |
| PT: | Keller 3 psi #0101878 |
| Power: | Solar panel and internal battery |

Notes: TSS Sample taken.
Transducer replaced deeper in the bed to try to ensure depth at lower discharges.



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: July 13, 2005
Start Time: 5:30 PM MDT
End Time: 5:44 PM MDT

Weather Conditions:

+25 C, Partly cloudy

River Conditions:

Open

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar on LB 1.335
Water Level Reading: 3.770

Transducer Reading & El.: 0.290
Other: Nail in tree 2.525

Setup No. 1

El: 100.000
El: 97.565
El: 97.275
El: 98.810

Setup No. 2

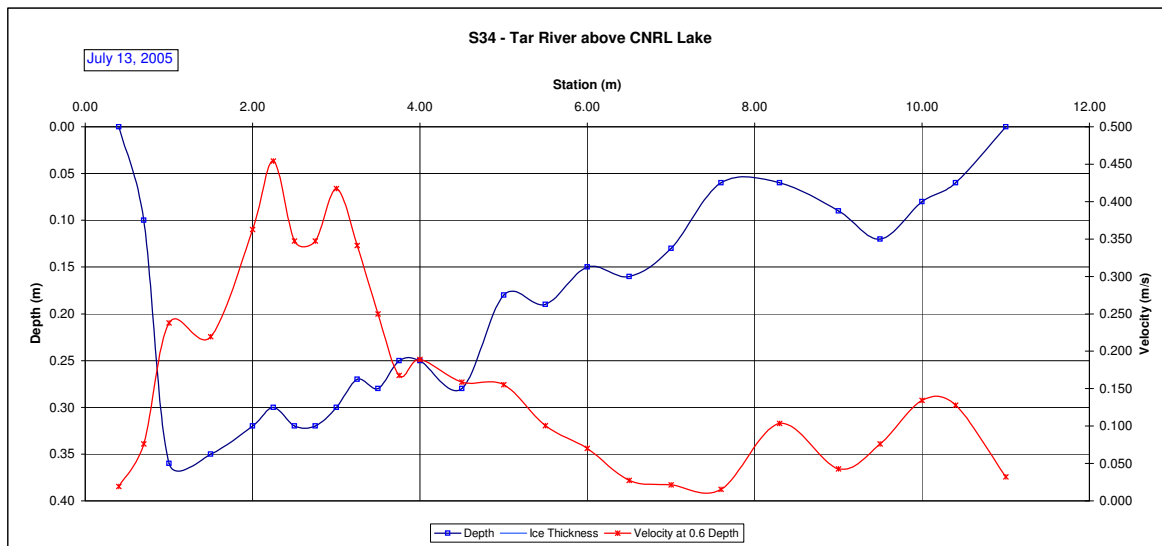
El: 100.000
El: 97.561
El: 97.271
El: 98.809

| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| 0.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.40 | 0.55 | 0.019 | 0.019 | 0.03 | 0.00 | 0.000 |
| 0.70 | 0.10 | | | | 0.076 | 1.00 | 2 | 0.55 | 0.85 | 0.076 | 0.076 | 0.10 | 0.03 | 0.002 |
| 1.00 | 0.36 | | | | 0.238 | 1.00 | 3 | 0.85 | 1.25 | 0.238 | 0.238 | 0.36 | 0.14 | 0.034 |
| 1.50 | 0.35 | | | | 0.219 | 1.00 | 4 | 1.25 | 1.75 | 0.219 | 0.219 | 0.35 | 0.18 | 0.038 |
| 2.00 | 0.32 | | | | 0.363 | 1.00 | 5 | 1.75 | 2.13 | 0.363 | 0.363 | 0.32 | 0.12 | 0.044 |
| 2.25 | 0.30 | | | | 0.454 | 1.00 | 6 | 2.13 | 2.38 | 0.454 | 0.454 | 0.30 | 0.08 | 0.034 |
| 2.50 | 0.32 | | | | 0.347 | 1.00 | 7 | 2.38 | 2.63 | 0.347 | 0.347 | 0.32 | 0.08 | 0.028 |
| 2.75 | 0.32 | | | | 0.347 | 1.00 | 8 | 2.63 | 2.88 | 0.347 | 0.347 | 0.32 | 0.08 | 0.028 |
| 3.00 | 0.30 | | | | 0.418 | 1.00 | 9 | 2.88 | 3.13 | 0.418 | 0.418 | 0.30 | 0.08 | 0.031 |
| 3.25 | 0.27 | | | | 0.341 | 1.00 | 10 | 3.13 | 3.38 | 0.341 | 0.341 | 0.27 | 0.07 | 0.023 |
| 3.50 | 0.28 | | | | 0.250 | 1.00 | 11 | 3.38 | 3.63 | 0.250 | 0.250 | 0.28 | 0.07 | 0.017 |
| 3.75 | 0.25 | | | | 0.168 | 1.00 | 12 | 3.63 | 3.88 | 0.168 | 0.168 | 0.25 | 0.06 | 0.010 |
| 4.00 | 0.25 | | | | 0.189 | 1.00 | 13 | 3.88 | 4.25 | 0.189 | 0.189 | 0.25 | 0.09 | 0.018 |
| 4.50 | 0.28 | | | | 0.158 | 1.00 | 14 | 4.25 | 4.75 | 0.158 | 0.158 | 0.28 | 0.14 | 0.022 |
| 5.00 | 0.18 | | | | 0.155 | 1.00 | 15 | 4.75 | 5.25 | 0.155 | 0.155 | 0.18 | 0.09 | 0.014 |
| 5.50 | 0.19 | | | | 0.101 | 1.00 | 16 | 5.25 | 5.75 | 0.101 | 0.101 | 0.19 | 0.10 | 0.010 |
| 6.00 | 0.15 | | | | 0.070 | 1.00 | 17 | 5.75 | 6.25 | 0.070 | 0.070 | 0.15 | 0.08 | 0.005 |
| 6.50 | 0.16 | | | | 0.027 | 1.00 | 18 | 6.25 | 6.75 | 0.027 | 0.027 | 0.16 | 0.08 | 0.002 |
| 7.00 | 0.13 | | | | 0.021 | 1.00 | 19 | 6.75 | 7.30 | 0.021 | 0.021 | 0.13 | 0.07 | 0.002 |
| 7.60 | 0.06 | | | | 0.015 | 1.00 | 20 | 7.30 | 7.95 | 0.015 | 0.015 | 0.06 | 0.04 | 0.001 |
| 8.30 | 0.06 | | | | 0.104 | 1.00 | 21 | 7.95 | 8.65 | 0.104 | 0.104 | 0.06 | 0.04 | 0.004 |
| 9.00 | 0.09 | | | | 0.043 | 1.00 | 22 | 8.65 | 9.25 | 0.043 | 0.043 | 0.09 | 0.05 | 0.002 |
| 9.50 | 0.12 | | | | 0.076 | 1.00 | 23 | 9.25 | 9.75 | 0.076 | 0.076 | 0.12 | 0.06 | 0.005 |
| 10.00 | 0.08 | | | | 0.134 | 1.00 | 24 | 9.75 | 10.20 | 0.134 | 0.134 | 0.08 | 0.04 | 0.005 |
| 10.40 | 0.06 | | | | 0.128 | 1.00 | 25 | 10.20 | 10.70 | 0.128 | 0.128 | 0.06 | 0.03 | 0.004 |
| 11.00 | 0.00 | | | | 0.000 | 1.00 | 26 | 10.70 | 11.00 | 0.032 | 0.032 | 0.02 | 0.00 | 0.000 |
| Total Flow: | | | | | | | | | | | | | | 0.384 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 0.384 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 1.89 | (m ²) |
| Top Width: | 10.60 | (m) |
| Hydraulic Depth: | 0.179 | (m) |
| Mean Velocity: | 0.203 | (m/s) |
| Froude Number | 0.153 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database #272 |
| Datalogger Internal Power: | 4.497V |
| Datalogger External Power: | 11.01 V |
| Datalogger Memory Used: | 34% |
| Datalogger Clock: | Jul 13, 2005 16:14 MST |
| Laptop Clock: | Jul 13, 2005 16:15 MST |
| Dessicant: | 50% used |
| 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

Time of Measurement

Date of Measurement: September 2, 2005
Start Time: 5:41 PM MDT
End Time: 5:51 PM MDT

Weather Conditions:

+16 C, overcast, calm

River Conditions:

Open, high stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar on LB 1.264
Water Level Reading: 3.575

Transducer Reading & El.: 0.396
Other: Nail in tree 2.449

Setup No. 1

El: 100.000
El: 97.689
El: 97.293
El: 98.815

Setup No. 2

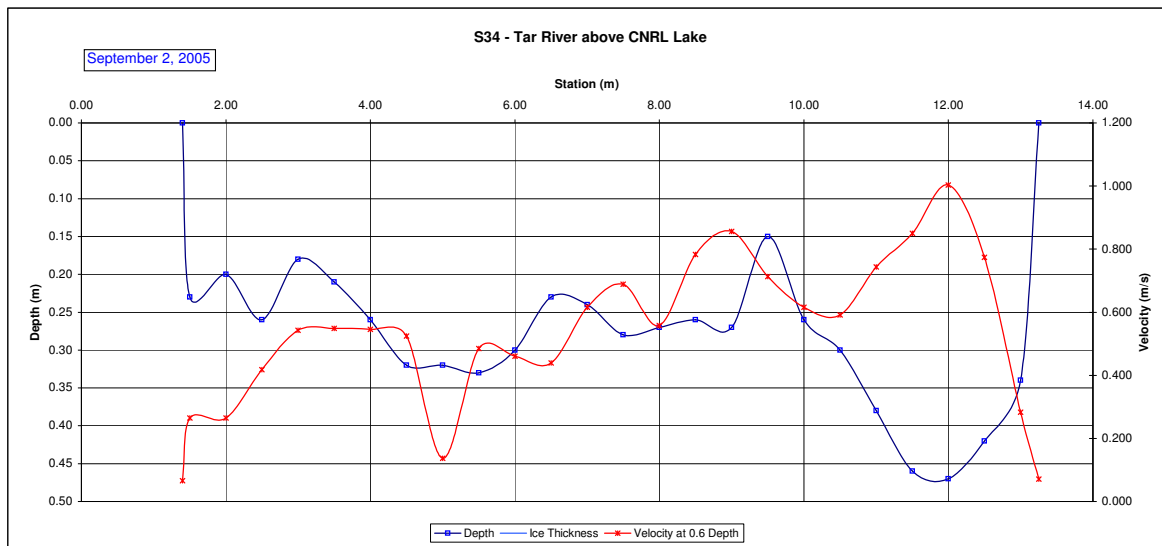
El: 100.000
El: 97.699
El: 97.303
El: 98.811

| 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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| 1.40 | 0.00 | | | | 0.000 | 1.00 | 1 | 1.40 | 1.45 | 0.066 | 0.066 | 0.06 | 0.00 | 0.000 |
| 1.50 | 0.23 | | | | 0.265 | 1.00 | 2 | 1.45 | 1.75 | 0.265 | 0.265 | 0.23 | 0.07 | 0.018 |
| 2.00 | 0.20 | | | | 0.265 | 1.00 | 3 | 1.75 | 2.25 | 0.265 | 0.265 | 0.20 | 0.10 | 0.027 |
| 2.50 | 0.26 | | | | 0.418 | 1.00 | 4 | 2.25 | 2.75 | 0.418 | 0.418 | 0.26 | 0.13 | 0.054 |
| 3.00 | 0.18 | | | | 0.543 | 1.00 | 5 | 2.75 | 3.25 | 0.543 | 0.543 | 0.18 | 0.09 | 0.049 |
| 3.50 | 0.21 | | | | 0.549 | 1.00 | 6 | 3.25 | 3.75 | 0.549 | 0.549 | 0.21 | 0.11 | 0.058 |
| 4.00 | 0.26 | | | | 0.546 | 1.00 | 7 | 3.75 | 4.25 | 0.546 | 0.546 | 0.26 | 0.13 | 0.071 |
| 4.50 | 0.32 | | | | 0.524 | 1.00 | 8 | 4.25 | 4.75 | 0.524 | 0.524 | 0.32 | 0.16 | 0.084 |
| 5.00 | 0.32 | | | | 0.137 | 1.00 | 9 | 4.75 | 5.25 | 0.137 | 0.137 | 0.32 | 0.16 | 0.022 |
| 5.50 | 0.33 | | | | 0.485 | 1.00 | 10 | 5.25 | 5.75 | 0.485 | 0.485 | 0.33 | 0.17 | 0.080 |
| 6.00 | 0.30 | | | | 0.460 | 1.00 | 11 | 5.75 | 6.25 | 0.460 | 0.460 | 0.30 | 0.15 | 0.069 |
| 6.50 | 0.23 | | | | 0.439 | 1.00 | 12 | 6.25 | 6.75 | 0.439 | 0.439 | 0.23 | 0.12 | 0.050 |
| 7.00 | 0.24 | | | | 0.616 | 1.00 | 13 | 6.75 | 7.25 | 0.616 | 0.616 | 0.24 | 0.12 | 0.074 |
| 7.50 | 0.28 | | | | 0.689 | 1.00 | 14 | 7.25 | 7.75 | 0.689 | 0.689 | 0.28 | 0.14 | 0.096 |
| 8.00 | 0.27 | | | | 0.558 | 1.00 | 15 | 7.75 | 8.25 | 0.558 | 0.558 | 0.27 | 0.14 | 0.075 |
| 8.50 | 0.26 | | | | 0.783 | 1.00 | 16 | 8.25 | 8.75 | 0.783 | 0.783 | 0.26 | 0.13 | 0.102 |
| 9.00 | 0.27 | | | | 0.856 | 1.00 | 17 | 8.75 | 9.25 | 0.856 | 0.856 | 0.27 | 0.14 | 0.116 |
| 9.50 | 0.15 | | | | 0.713 | 1.00 | 18 | 9.25 | 9.75 | 0.713 | 0.713 | 0.15 | 0.08 | 0.053 |
| 10.00 | 0.26 | | | | 0.616 | 1.00 | 19 | 9.75 | 10.25 | 0.616 | 0.616 | 0.26 | 0.13 | 0.080 |
| 10.50 | 0.30 | | | | 0.591 | 1.00 | 20 | 10.25 | 10.75 | 0.591 | 0.591 | 0.30 | 0.15 | 0.089 |
| 11.00 | 0.38 | | | | 0.744 | 1.00 | 21 | 10.75 | 11.25 | 0.744 | 0.744 | 0.38 | 0.19 | 0.141 |
| 11.50 | 0.46 | | | | 0.850 | 1.00 | 22 | 11.25 | 11.75 | 0.850 | 0.850 | 0.46 | 0.23 | 0.196 |
| 12.00 | 0.47 | | | | 1.003 | 1.00 | 23 | 11.75 | 12.25 | 1.003 | 1.003 | 0.47 | 0.24 | 0.236 |
| 12.50 | 0.42 | | | | 0.774 | 1.00 | 24 | 12.25 | 12.75 | 0.774 | 0.774 | 0.42 | 0.21 | 0.163 |
| 13.00 | 0.34 | | | | 0.283 | 1.00 | 25 | 12.75 | 13.13 | 0.283 | 0.283 | 0.34 | 0.13 | 0.036 |
| 13.25 | 0.00 | | | | 0.000 | 1.00 | 26 | 13.13 | 13.25 | 0.071 | 0.071 | 0.09 | 0.01 | 0.001 |
| Total Flow: | | | | | | | | | | | | | | 2.039 |

| | | |
|--------------------------------|-------|---------------------|
| Total Flow: | 2.039 | (m ³ /s) |
| Perceived Measurement Quality: | Good | |
| Total Area: | 3.40 | (m ²) |
| Top Width: | 11.85 | (m) |
| Hydraulic Depth: | 0.286 | (m) |
| Mean Velocity: | 0.601 | (m/s) |
| Froude Number | 0.358 | |
| Photographs taken looking at: | | |
| Upstream, downstream, across | | |

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database #272 |
| Datalogger Internal Power: | 4.4V |
| Datalogger External Power: | 9.7 V |
| Datalogger Memory Used: | 38% |
| Datalogger Clock: | Sep 02, 2005 16:21 MST |
| Laptop Clock: | Sep 02, 2005 16:23 MST |
| Dessicant: | 10% used-replaced |
| Datalogger: | Optimum DD-128 #0104170272 |
| PT: | Keller 3 psi #0101878 |
| Power: | Solar panel and internal battery |

Notes: TSS Sample taken.
Data bad due to low battery power. Battery needs to be replaced.



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 7, 2005
Start Time: 9:04 AM MDT
End Time:

Weather Conditions: +10° C, Clear, calm

River Conditions: Open, moderate stage, stage falling

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar on LB 1.218
Water Level Reading: 3.570

Transducer Reading & El.: 0.313
Other: Nail in tree 2.409

Setup No. 1

El: 100.000
El: 97.648
El: 97.335
El: 98.809

Setup No. 2

El: 100.000
El: 97.649
El: 97.336
El: 98.810

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 |
| (m) | (m) | (m) | (m/s) | (m/s) | (m/s) | | | (m) | (m) | (m/s) | (m/s) | (m) | (m ²) | (m ³ /s) |
| | | | | | | | | | | | | | | |
| Total Flow: | | | | | | | | | | | | | | |

| | |
|--------------------------------|---------------------|
| Total Flow: | (m ³ /s) |
| Percieved Measurement Quality: | |
| Total Area: | (m ²) |
| Top Width: | (m) |
| Hydraulic Depth: | (m) |
| Mean Velocity: | (m/s) |
| Froude Number | |
| Photographs taken looking at: | |
| Upstream, downstream, across | |

Notes: Battery changed - new battery reading 13.02V
Transducer reading verified after battery change.

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database #272 |
| Datalogger Internal Power: | 4.497V |
| Datalogger External Power: | 9.32 V |
| Datalogger Memory Used: | 39% |
| Datalogger Clock: | Sep 07, 2005 08:04 MST |
| Laptop Clock: | Sep 07, 2005 08:04 MST |
| Dessicant: | 10% used |
| Datalogger: | Optimum DD-128 #0104170272 |
| PT: | Keller 3 psi #0101878 |
| Power: | Solar panel and internal battery |

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: October 8, 2005
Start Time: 5:12 PM MDT
End Time: 5:31 PM MDT

Weather Conditions:

+10 C, overcast

River Conditions:

Open, low stage

Personnel & Equipment

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

Level Readings

Bench Mark Reading: rebar on LB
Water Level Reading:

Setup No. 1

El: 100.000
El: 97.607

Setup No. 2

El: 1.252
El: 3.639
El: 0.237
El: 97.370
El: 2.458
El: 100.000
El: 97.613
El: 97.376
El: 98.794

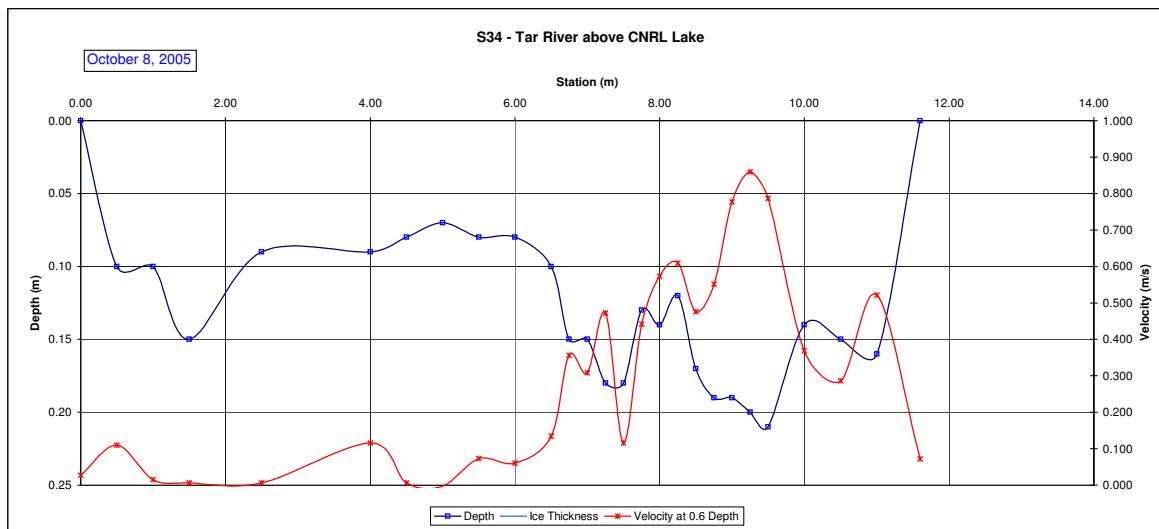
Measurement Data

| 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 ²) | (m ³ /s) |
| 0.00 | 0.00 | | | | 0.000 | 1.00 | 1 | 0.00 | 0.25 | 0.027 | 0.027 | 0.03 | 0.01 | 0.000 |
| 0.50 | 0.10 | | | | 0.110 | 1.00 | 2 | 0.25 | 0.75 | 0.110 | 0.110 | 0.10 | 0.05 | 0.005 |
| 1.00 | 0.10 | | | | 0.015 | 1.00 | 3 | 0.75 | 1.25 | 0.015 | 0.015 | 0.10 | 0.05 | 0.001 |
| 1.50 | 0.15 | | | | 0.006 | 1.00 | 4 | 1.25 | 2.00 | 0.006 | 0.006 | 0.15 | 0.11 | 0.001 |
| 2.50 | 0.09 | | | | 0.006 | 1.00 | 5 | 2.00 | 3.25 | 0.006 | 0.006 | 0.09 | 0.11 | 0.001 |
| 4.00 | 0.09 | | | | 0.116 | 1.00 | 6 | 3.25 | 4.25 | 0.116 | 0.116 | 0.09 | 0.09 | 0.010 |
| 4.50 | 0.08 | | | | 0.006 | 1.00 | 7 | 4.25 | 4.75 | 0.006 | 0.006 | 0.08 | 0.04 | 0.000 |
| 5.00 | 0.07 | | | | -0.003 | 1.00 | 8 | 4.75 | 5.25 | -0.003 | -0.003 | 0.07 | 0.04 | 0.000 |
| 5.50 | 0.08 | | | | 0.073 | 1.00 | 9 | 5.25 | 5.75 | 0.073 | 0.073 | 0.08 | 0.04 | 0.003 |
| 6.00 | 0.08 | | | | 0.061 | 1.00 | 10 | 5.75 | 6.25 | 0.061 | 0.061 | 0.08 | 0.04 | 0.002 |
| 6.50 | 0.10 | | | | 0.134 | 1.00 | 11 | 6.25 | 6.63 | 0.134 | 0.134 | 0.10 | 0.04 | 0.005 |
| 6.75 | 0.15 | | | | 0.357 | 1.00 | 12 | 6.63 | 6.88 | 0.357 | 0.357 | 0.15 | 0.04 | 0.013 |
| 7.00 | 0.15 | | | | 0.308 | 1.00 | 13 | 6.88 | 7.13 | 0.308 | 0.308 | 0.15 | 0.04 | 0.012 |
| 7.25 | 0.18 | | | | 0.472 | 1.00 | 14 | 7.13 | 7.38 | 0.472 | 0.472 | 0.18 | 0.05 | 0.021 |
| 7.50 | 0.18 | | | | 0.116 | 1.00 | 15 | 7.38 | 7.63 | 0.116 | 0.116 | 0.18 | 0.05 | 0.005 |
| 7.75 | 0.13 | | | | 0.442 | 1.00 | 16 | 7.63 | 7.88 | 0.442 | 0.442 | 0.13 | 0.03 | 0.014 |
| 8.00 | 0.14 | | | | 0.573 | 1.00 | 17 | 7.88 | 8.13 | 0.573 | 0.573 | 0.14 | 0.04 | 0.020 |
| 8.25 | 0.12 | | | | 0.610 | 1.00 | 18 | 8.13 | 8.38 | 0.610 | 0.610 | 0.12 | 0.03 | 0.018 |
| 8.50 | 0.17 | | | | 0.475 | 1.00 | 19 | 8.38 | 8.63 | 0.475 | 0.475 | 0.17 | 0.04 | 0.020 |
| 8.75 | 0.19 | | | | 0.552 | 1.00 | 20 | 8.63 | 8.88 | 0.552 | 0.552 | 0.19 | 0.05 | 0.026 |
| 9.00 | 0.19 | | | | 0.777 | 1.00 | 21 | 8.88 | 9.13 | 0.777 | 0.777 | 0.19 | 0.05 | 0.037 |
| 9.25 | 0.20 | | | | 0.860 | 1.00 | 22 | 9.13 | 9.38 | 0.860 | 0.860 | 0.20 | 0.05 | 0.043 |
| 9.50 | 0.21 | | | | 0.786 | 1.00 | 23 | 9.38 | 9.75 | 0.786 | 0.786 | 0.21 | 0.08 | 0.062 |
| 10.00 | 0.14 | | | | 0.369 | 1.00 | 24 | 9.75 | 10.25 | 0.369 | 0.369 | 0.14 | 0.07 | 0.026 |
| 10.50 | 0.15 | | | | 0.287 | 1.00 | 25 | 10.25 | 11.03 | 0.287 | 0.287 | 0.15 | 0.12 | 0.034 |
| 11.00 | 0.16 | | | | 0.521 | 1.00 | 26 | 11.03 | 11.30 | 0.521 | 0.521 | 0.16 | 0.04 | 0.022 |
| 11.60 | 0.00 | | | | 0.000 | 1.00 | 26 | 11.03 | 11.60 | 0.072 | 0.072 | 0.04 | 0.02 | 0.002 |
| Total Flow: | | | | | | | | | | | | | | 0.404 |

| | | |
|---|-------|---------------------|
| Total Flow: | 0.404 | (m ³ /s) |
| Perceived Measurement Quality: | Fair | |
| Total Area: | 1.39 | (m ²) |
| Top Width: | 11.60 | (m) |
| Hydraulic Depth: | 0.120 | (m) |
| Mean Velocity: | 0.290 | (m/s) |
| Froude Number | 0.267 | |
| Photographs taken looking at: Upstream, downstream, across | | |

| | |
|----------------------------|----------------------------------|
| Datalogger Notes: | Database #272 |
| Datalogger Internal Power: | 4.473V |
| Datalogger External Power: | 13.24 V |
| Datalogger Memory Used: | 48% |
| Datalogger Clock: | Oct 08, 2005 15:48 MST |
| Laptop Clock: | Oct 08, 2005 15:50 MST |
| Dessicant: | 50% used |
| Datalogger: | Optimum DD-128 #0104170272 |
| PT: | Keller 3 psi #0101878 |
| Power: | Solar panel and internal battery |

Notes: TSS Sample taken.
Transducer removed for winter.



C.3 REGULATORY APPROVALS

Copies of regulatory approvals for the installation of station S14A, Ells River at the CNRL Bridge are provided on the following pages.

August 15, 2005

File: 00222996

Niranjan Deshpande
Mack, Slack & Associates Inc.
#204, 1212 1st Street SE
Calgary, Alberta
T2G 2H8

**RE: Application under the *Water Act* for an Approval – Deer Creek Energy Ltd.
Hydrometric Monitoring Station – Ells River – NW ¼ 16-095-11-W4**

Enclosed is the approval authorizing the above activity.

The *Water Act* provides a right to appeal this decision. Notice of appeal must be submitted not later than 7 days after receipt of this notice to:

Steve E. Hrudehy, Chair
Environmental Appeals Board
3rd Floor, Peace Hills Trust Tower
10011 – 109 Street
Edmonton, Alberta
T5J 3S8

Telephone: (780) 427-6207 Fax: (780) 427-4693

Also enclosed is the "Certificate of Completion" to be submitted upon completion of the operation.

Please ensure that a copy of this approval is available at the site of the activity.

Under the *Water Act*, the Director will provide a public notice of this decision. The notice will be posted in the Edmonton Regional office of Alberta Environment.

In order to reduce the potential of the spread of the Whirling Disease in fish we ask that all equipment and machinery that has been used in the United States be washed clean of all mud and dirt before being used again in any activities in or near streams in Alberta.

This approval should not be taken to mean that you have an authority under federal legislation.
You should contact the

Fisheries and Oceans Canada
Whitemud Business Park
4253 - 97 Street
Edmonton, Alberta T6E 5Y7
(telephone: [780]- 495- 4220)
(fax: [780]- 495- 8606)

regarding the application of federal laws relating to the *Fisheries Act (Canada)*

Please note that authorization may be required under Alberta's *Public Lands Act*.

Please call Dale Adams at (780) 427-7556 if you have any questions.

Sincerely,



Park Powell, P.Eng.
Designated Director under the Act

Enclosure

APPROVAL

PURSUANT TO THE PROVISIONS
OF THE WATER ACT

APPROVAL No. 00222996-00-00

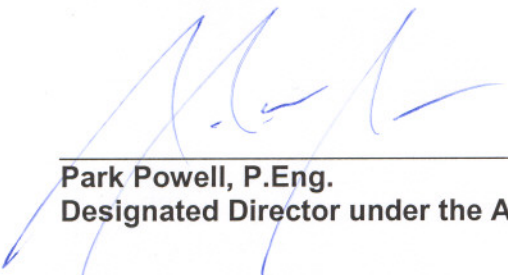
FILE No. 00222996

Deer Creek Energy Limited
Suite 2600, 205 – 5th Avenue SW
Calgary, Alberta
T2P 2V7

is authorized to construct a hydrometric monitoring station on the bank of Ells River, subject to the attached conditions.

2006 08 14

Expiry Date (Y/M/D)



Park Powell, P.Eng.
Designated Director under the Act

2005 08 15

Dated (Y/M/D)

CONDITIONS

ACTIVITY

1. This approval is appurtenant to the following:

NW ¼ 16-095-11-W4 (Bed and bank of Ells River)
2. The approval holder shall undertake the activity in accordance with the plans and/or reports filed in the following Departmental records:

| NUMBER | TITLE |
|---------------|----------------------------|
| 00222996-P001 | Location Plan |
| 00222996-P002 | Typical Section and Detail |

3. The approval holder shall confine the activity to the work area designated on the plans or to areas as prescribed in the approval.
4. The approval holder shall reclaim any disturbed bed and banks of Ells River and areas associated with the activity to the original contours that existed prior to the commencement of the activity.
5. The approval holder shall not deposit or cause to be deposited any substance in, on or around Ells River that has the potential to adversely affect the water body.
6. The approval holder shall immediately report to the Director by telephone (1-780-422-4505) the release of any deleterious materials to Ells River.
7. The approval holder shall not conduct activities directly in the waters of Ells River during the period of September 16 to July 15.
8. The approval holder shall prevent erosion and siltation of Ells River resulting from the activity.
9. The approval holder shall maintain a continuous flow of water in Ells River for the duration of the activity.

GENERAL

10. The construction activity authorized under this approval shall be completed by August 14, 2006.

CONDITIONS

11. The approval holder shall hold harmless the Minister of Environment or any other agent of the Government of Alberta for damage or damage claims arising out of the activity.
12. The terms and conditions of this approval are severable. If any term or condition of this approval is held invalid, the application of such term or condition to other circumstances and the remainder of this approval shall not be affected thereby.
13. The approval holder shall retain a copy of this approval at the site of the activity.
14. The approval holder shall immediately report to the Director by telephone (1-780-422-4505) any contraventions of the terms and conditions of this approval.
15. On completion, partial completion of the activity, or when requested by the Director, the approval holder shall submit to the Director a certificate of completion which includes:
 - (a) a statement that the activity or that part of the activity has been completed in accordance with the approval, and
 - (b) any other information required by the Director.



Park Powell, P.Eng.
Designated Director under the Act

2005 08 15
Dated (Y/M/D)

January 24, 2006

Deer Creek Energy Limited
Suite 2600, 205 – 5th Avenue SW
Calgary, Alberta
T2P 2V7

Attention: Land Department

Dear Sir/Madam:

Re: License of Occupation Application No. LOC 051907
NW 16-95-11-W4M (and part bed & shore Ells River) (±0.12 acres)
Hydrometric Monitoring Site
Joslyn
LETTER OF AUTHORITY

Further to your application submitted August 2005 and as amended to January 4, 2006, this is to advise that the department has completed its review of your request.

Pursuant to Section 20 of the *Public Lands Act*, authority is hereby granted to enter upon those portions of vacant or other public lands for which you have obtained the occupant's consent, the approximate location of which is shown on the attached plan, for the purpose of a hydrometric monitoring site, subject to the conditions in Schedule A, attached.

Based on the information supplied with your application, first year's charges for this authority are indicated below. Please remit this amount within 30 days. This account will be subject to a 12% interest charge if payment is not received within the time specified.

.../2

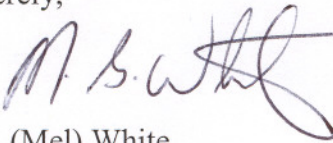
These charges are subject to review and amendment when your final plan is received and/or formal lease documents are prepared.

| | |
|---------------------------|--------------------------------|
| Application/Amendment fee | <u>\$50.00</u> (\$3.50 GST) |
| First Year's Rental | <u>\$50.00</u> (\$3.50 GST) |
| Plans/Amendment fee | <u>\$125.00</u> |
| Total | <u>\$232.00</u> (includes GST) |
| Amount Received | <u>\$178.50</u> |
| Balance Owning | <u>\$53.50</u> (includes GST) |

The holder will be invoiced annually for the subsequent annual rental. For the first five years of the term of this authority, unless an amendment is approved during this period, the amount will be \$50.00 (plus GST).

If you have any questions or concerns, please do not hesitate to contact the undersigned.

Sincerely,



M.G. (Mel) White
Land Use Operations Branch

Cc: Northeast Region
Waterways Area
Fort McMurray office
Attn: Chase Bendick

Mack Slack & Associates Inc.
#204, 1212 - 1st Street SE
Calgary, AB T2G 2H8
Attn: West Dick



UNSURVEYED TERRITORY

SW-21-95-11-4

NW-16-95-11-4

NE-16-95-11-4

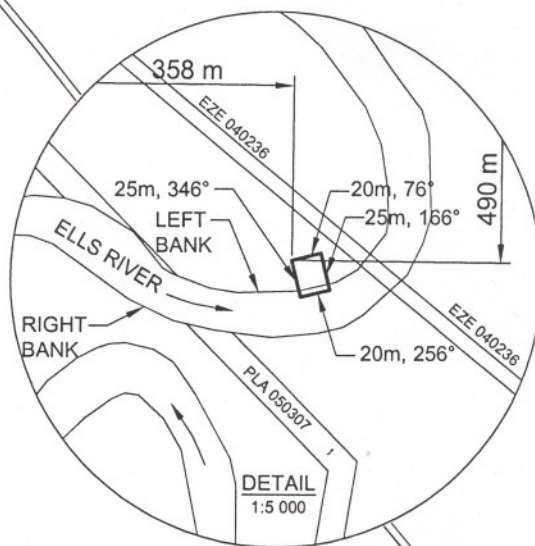
PROPOSED HYDROMETRIC
STATION S14A LOCATION

DIMENSIONS OF SITE 25m x 20m
(ON THE LEFT BANK OF RIVER)
AREA = 0.050 ha
LOCATION OF BANK DETERMINED FROM
NTS MAP No. 74E/4

SEE DETAIL

16

SE-16-95-11-4



PLAN
1:10 000

| | | |
|--------------------|------------|----|
| Plan #: | 24580TL | |
| Version: | 2006-1-5 | |
| File: | LOC 05/907 | |
| TECHNICAL SERVICES | SKT | TC |

LOCATION: NW1/4 16 T9S R11 W4M

COORDINATES OF NW CORNER OF SITE:

EASTING: 455727 ; NORTHING: 6344954 (UTM NAD83)

LONGITUDE: 111°44'18" ; LATITUDE: 57°14'27"

Scale:

1:10,000
0 100 200 m

1:5,000
0 50 100 m

CLIENT:

Deer Creek
Energy Limited



PROJECT:

REGIONAL AQUATICS MONITORING PROGRAM

TITLE:

HYDROMETRIC MONITORING STATION S14A
LOCATION PLAN

DATE:

NOV. 2005

JOB No.:

MSA 200217

CAD FILE:

200217S02.dwg

FIGURE No.:

Figure 1

REV.

A



Fisheries and Oceans
Canada

Pêches et Océans
Canada

4253 - 97 Street
Edmonton, Alberta
T6E 5Y7

August 18, 2005

Your file Votre référence

200217.S14A

Our file Notre référence

05-HCAA-CA1-000-002164

Deer Creek Energy Ltd.
C/O Mr. Wes Dick
Senior Water Resources Engineer
Mack, Slack & Associates Incorporated
Suite 204 Victoria Square
1212 First Street Se
Calgary, Alberta
T2G2H8

Dear Mr. Dick:

Subject: Proposed works or undertakings will likely avoid negative effects to fish habitat.

Fisheries and Oceans Canada (DFO) received your proposal to install a hydrometric monitoring station on Ells River on August 4, 2005. To expedite future correspondence or inquiries, please refer to your referral title and file numbers when you contact us.

Referral File No.: **05-HCAA-CA1-000-002164**
Habitat File No.: **ED-05-2164**
Referral Title: **Hydrometric monitoring station on Ells River in NW 16-095-11 W4M**

We have concluded that a harmful alteration, disruption or destruction (HADD) of fish habitat is not likely to occur if you implement your plans as proposed. A subsection 35(2) *Fisheries Act* Authorization is not necessary. However, failure to properly implement the measures outlined in your plans may result in contravention of subsection 35(1) of the *Fisheries Act*, which states: "no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat."

This letter of advice does not allow the deposit of deleterious substance (section 36 of the *Fisheries Act*) into waters frequented by fish nor does it release you from the responsibility to obtain any federal (for example, the *Navigable Waters Protection Act*), provincial or municipal approvals that may be needed.

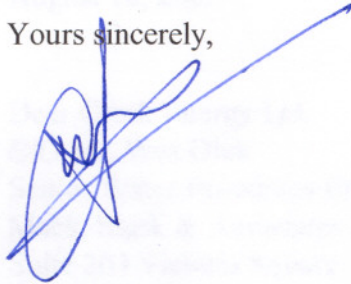
We request that you notify us at least 10 working days before starting the work and that a copy of this letter be kept on site while works are in progress. If you have any questions

.../2

Canada

concerning the above, or if my understanding of the proposal is either incorrect, incomplete, or if there are changes to the proposed work, please contact myself directly by telephone at (780) 495-8469, by fax at (780) 495-8606, or by e-mail at StefanovI@dfo-mpo.gc.ca.

Yours sincerely,



Ivan Stefanov
Fish Habitat Biologist

c.c.: M. Janowicz, DFO Edmonton.

Referral File No.: 05-HCAA-CAT-000-002164
Habitat File No.: ED-05-2164
Referral Title: Hydroelectric monitoring station on the River in NW
10-495-11 W241

We have concluded that a harmful alteration, disruption or destruction (HADD) of fish habitat is not likely to occur if you implement your plan as proposed. A subsection 35(2) Fisheries Act authorization is not necessary. However, failure to properly implement the measures outlined in your plan may result in contravention of subsection 35(1) of the Fisheries Act, which states: "no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat."

This letter of advice does not allow the deposit of deleterious substance (section 36 of the Fisheries Act) into waters frequented by fish nor does it release you from the responsibility to obtain any federal (for example, the Navigable Waters Protection Act), provincial or municipal approvals that may be needed.

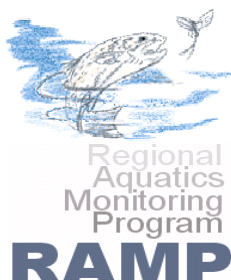
We request that you notify us at least 10 working days before starting the work and that a copy of this letter be kept on site while work is in progress. If you have any questions

C.4 NEW OR REVISED STATION DESCRIPTION SHEETS

Factsheets for hydrometric stations at Mills Creek (S6), Kearl Lake outlet (S9), and the Ells River at the CNRL Bridge (S14A) are provided on the following pages.

[illegible]

[illegible]



ELLS RIVER AT THE CNRL BRIDGE HYDROMETRIC STATION

S14A

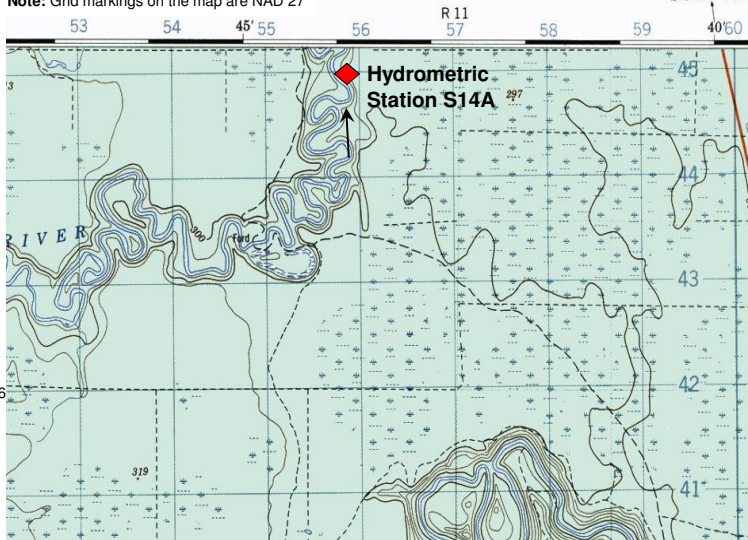
FACTSHEET

LOCATION AND PURPOSE

Established in October 2004 to monitor discharge on the Ells River. This station is intended to replace station S14 after three years of concurrent operation.

Period of Record: October 2004 to present
 Access: Truck
 Benchmark: 100.000 m (assumed datum)
 A 2 m long 15 mm dia rebar, which is about 400 mm above the ground and located at about 10 m upstream of the pressure transducer on the left bank
 Drainage Area: 2430 km²
 Coordinates: UTM: 6344947 N, 455748 E (NAD 83, ZONE 12) Lat/Long: 57°14'27" N, 111°44'18" W
 LSD: NW-16-95-11-W4 NTS Map: 74E/4

Note: Grid markings on the map are NAD 27



EQUIPMENT

| Component | Function | Serial No. |
|---------------------------------------|--------------------------|-------------|
| Lakewood UltraLogger RX-2 | Record and Store Data | 703126 |
| Keller Pressure Transducer | Measure Water Levels | 505006-5872 |
| Water Thermistor | Record Water Temperature | |
| Bubbler System, Hydrological Systems: | | |
| Compressed Nitrogen Tank | Gas Source | |
| Bubble Unit HS23 | Regulates Bubble Rate | |
| Pressure Transducer | Measure Water Levels | WL3100 |
| Lakewood UltraLogger RX-2 | Record and Store Data | 41199-08 |
| | | |

C.5 CHANGES TO STANDARD OPERATING PROCEDURES IN 2005

In 2005, it was recognized that the quality assessment process for individual manual measurements and for the entire station was highly valuable for interpreting the data and for evaluating station records, but was somewhat subjective. Therefore a more systematic and reproducible assessment matrix system was developed. Two matrices used starting late in 2005 are presented in Table C.5-1 and Table C.5-2. The matrices are considered preliminary and are subject to revision.

Table C.5-1 Hydrometric measurement quality assessment.

| Factor | | Condition | | |
|--------------------------------------|---|--|---|--|
| Channel alignment | | Tight bend | Moderate bend | Straight or minor bends |
| Channel prism | | Significant expansion or contraction or bars | Moderate expansion or contraction or bars | Prismatic (No or minor expansion or contraction) |
| Vegetation or debris | Vegetation or debris significantly affects the flow pattern | Vegetation or debris moderately affects the flow pattern | Vegetation or debris has a minor effect on the flow pattern | No or minimal instream vegetation and debris |
| Boulders | Boulders up to half the flow depth | Boulders up to one quarter of the flow depth | Smaller boulders or cobbles | Plane bed |
| Wind (parallel to the channel) | | Strong Wind | Moderate Wind | Calm or breeze |
| Waves | Significant waves | Moderate waves | Minor waves | Ripples |
| Flow velocities | Near lower detection limit of the meter | Reading precision generally within 10% | Reading precision generally within 5% | Three significant digits for most of the cross section |
| Ice | Severely broken and irregular ice | Partial or full ice cover; no velocity profile | Partial or full ice cover and a velocity profile taken | No ice |
| Maximum panel discharge (% of total) | > 20% | 15% - 20% | 10% - 15% | < 10% |
| Resulting quality assessment | Poor | Fair | Good | Excellent |

Select and circle one condition for each factor. The worst condition governs the overall quality assessment.

Table C.5-2 Hydrometric data quality assessment.

| Factor | Current Year | Assessment | | | |
|---|--|---------------------------|--|--|---|
| | | Two or fewer measurements | At least three measurements, or two fair or good measurements | At least three fair or good measurements | At least three good measurements |
| Ice-affected discharge measurements ¹ (omit for open-water stations) | | | | | |
| Open-water discharge measurements ¹ | Not as good as → | | At least four measurements; or at least three good or excellent measurements | At least four good or excellent measurements | At least five good or excellent measurements over a range of discharges |
| Rating curve consistency (R ² on log-log scale) ² | < 0.80 | | 0.80 – 0.90 | 0.90 – 0.95 | >0.95 |
| Rating curve extrapolation (ratio of maximum computed discharge to maximum current year measured discharge) | >2.0 | | 2.0 – 1.25 | 1.25 – 1.1 | <1.1 |
| Rating curve coverage (how well do the measurements define the curve over the range needed for this years' data?) | Poor | | Fair | Good | Excellent |
| Transducer / survey performance | Little confidence in the transducer readings | | Unexplained shifts or jumps in the apparent transducer elevation | All apparent transducer elevations are within ±2 cm of a trendline | All apparent transducer elevations are within ±1 cm of a linear trendline |
| Record completeness (percent of data recorded within the monitored period) ^{1, 3} | < 80% | | 80% - 90% | 90% - 95% | 95% - 100% |
| Other (explain) ⁴ | | | | | |
| Resulting quality assessment: - Open-water - Winter | Poor Poor | | Fair Fair | Good Good | Excellent Excellent |

¹ Considering the current calendar year and January of the following year.

² Considering all of the points used to derive the curve.

³ After removal of suspect data.

⁴ Could adjust the assessment up or down based on other factors: Rating curve consistency with previous years; known events or hydraulic conditions, etc.

Select and circle one condition for each factor. The worst condition governs the overall quality assessment.

Appendix D
Water Quality Component

D.0 WATER QUALITY COMPONENT

D.1 PCA AND CLUSTER ANALYSIS OF WATER QUALITY DATA

D.1.1 Introduction

RAMP water quality data from 1997 to 2005 for the Athabasca River, Athabasca River Delta (ARD), tributaries of the Athabasca River within the RAMP FSA, and 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 (Jones and Boyer 2002). More information on this approach is provided in Appendix E of RAMP RAMP (2005a).

D.1.1.1 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 1 to 9 years (data for other seasons were excluded) from 1997 to 2005, for a total of 244 observations (i.e., station/year combinations).

Table D.1-1 RAMP water quality stations included in the historical dataset, 1997 to 2005.

| Region | Station | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----------------|-------------|------|------|------|------|------|------|------|------|------|
| 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 | | | | | | √ | √ | √ | √ |
| | ATR-MR-E | | | | √ | √ | √ | √ | √ | √ |
| | ATR-MR-E-D | | √ | | | | | | | |
| | ATR-MR-M | | | | √ | | | | | |
| | ATR-MR-W | | | | √ | √ | √ | √ | √ | √ |
| | ATR-MR-W-D | | √ | | | | | | | |
| | ATR-SR-E | | | | √ | √ | √ | √ | √ | √ |
| | ATR-SR-M | | | | √ | | | | | |

Table D.1-1 (Cont'd.)

| Region | Station | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|--------------------------|----------|------|------|------|------|------|------|------|------|------|
| Athabasca River, cont'd. | ATR-SR-W | | | | √ | √ | √ | √ | √ | √ |
| | EMR-1 | | | | | | | √ | | |
| 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 | | | | | | | | √ | √ |
| Southern Tributaries | CHR-1 | | | | | | √ | √ | √ | √ |
| | CHR-2 | | | | | | √ | √ | √ | √ |
| | 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.1.2 Methods

D.1.2.1 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), which conducted the analyses from 1997-2001, and Alberta Research Council (ARC), which conducted analyses from 2002 to 2004. In general, detection limits for metals were higher (i.e., analytical methods were less sensitive) at ETL. As a result, the analytical detection limits reported by ARC were revised to be consistent with results reported by 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.

D.1.2.2 Cluster Analysis

Cluster analysis was conducted in two steps. First, hierarchical clustering was conducted using Ward's linkage methods and Euclidean distance measures (SPSS 1999). Second, k-means cluster analysis (Guler *et al.* 2002) 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 (SPSS 2000).

D.1.2.3 Correlation Analyses

Rank correlations were used to evaluate the relationships between conventional variables, nutrients, and PCs.

D.1.3 Results

D.1.3.1 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:**
 - **Metals** - dissolved beryllium, cadmium, mercury, selenium, silver, and tin, and total, beryllium, cadmium, mercury, selenium, silver, and tin;
 - **Ions** - carbonate and hydroxide; and
 - **Organic compounds** - all PAHs, naphthenic acids, total recoverable hydrocarbons, and volatile organics.
- **Missing values:**
 - **Metals** - dissolved bismuth, calcium, chlorine, chromium, silicon, sulphur, tin, and thorium, and total chlorine, chromium, magnesium, mercury, potassium, silicon, sodium, sulphur, tin, and thorium.
 - **Ions** - hydroxide; and
 - **Organic compounds** - all PAHs, total recoverable hydrocarbons, and volatile organics.

Data Reduction

Dissolved Metals

The dissolved metals PCA produced a total of four PCs. The first three principal components, which accounted for a total of 61% (28%, 20%, and 13%, respectively) of the variance in the dataset, were used in subsequent analyses. A fourth PC accounted for little of the variance in the dataset and was therefore excluded from subsequent analyses. Table D.1-2 contains the correlations among the input variables and the PCs for dissolved metals:

- DISMET PC1, the first summary variable that explained a majority of the variance in the dataset, was moderately or strongly positively correlated with 7 of the 15 input variables: dissolved strontium, uranium, nickel, barium, molybdenum, copper, and cobalt;

- DISMET PC2 was strongly and moderately positively correlated with: dissolved lithium, manganese, boron, and iron. Elevated concentrations of iron, manganese, and boron are often associated with the weathering of rock; and
- DISMET PC3 was moderately and negatively correlated with: dissolved vanadium, titanium, and arsenic.

Table D.1-2 Pearson correlations 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 |
| Strontium | 0.81 | -0.15 | 0.12 |
| Uranium | 0.80 | -0.40 | -0.18 |
| Nickel | 0.73 | 0.05 | 0.11 |
| Barium | 0.68 | -0.21 | 0.35 |
| Molybdenum | 0.67 | -0.39 | -0.34 |
| Copper | 0.66 | -0.28 | 0.12 |
| Cobalt | 0.59 | 0.45 | 0.19 |
| Arsenic | 0.43 | 0.30 | -0.56 |
| Lithium | 0.32 | 0.72 | 0.30 |
| Vanadium | 0.32 | 0.13 | -0.66 |
| Zinc | 0.29 | -0.27 | 0.44 |
| Manganese | 0.26 | 0.66 | 0.34 |
| Boron | 0.23 | 0.70 | 0.17 |
| Titanium | 0.23 | 0.36 | -0.59 |
| Iron | -0.01 | 0.77 | -0.18 |

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) exists between the input variable and summary variable (i.e., PC).

Total Metals

The total metals PCA produced a total of four PCs. Three of the four PCs accounted for a total of 67% (45%, 15%, and 7%, respectively) of the variance 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. Table D.1-3 contains the correlations among the input variables and the PCs for total metals:

- TOTMET PC1 was moderately and strongly positively correlated with most of the metals in the dataset;

- TOTMET PC2 was strongly positively correlated with lithium and boron, and moderately correlated with manganese; and
- TOTMET PC4 showed moderate and negative correlation with zinc.

Table D.1-3 Pearson correlations 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 PC4 |
| Aluminum | 0.88 | -0.18 | 0.22 |
| Vanadium | 0.87 | -0.16 | 0.22 |
| Titanium | 0.86 | -0.16 | 0.20 |
| Lead | 0.84 | -0.17 | -0.07 |
| Cobalt | 0.82 | 0.16 | -0.17 |
| Uranium | 0.75 | -0.13 | 0.28 |
| Nickel | 0.69 | 0.19 | -0.19 |
| Molybdenum | 0.67 | -0.28 | 0.32 |
| Iron | 0.64 | 0.38 | -0.09 |
| Barium | 0.60 | 0.18 | -0.29 |
| Strontium | 0.57 | 0.23 | 0.04 |
| Manganese | 0.50 | 0.52 | -0.21 |
| Zinc | 0.48 | -0.13 | -0.65 |
| Lithium | -0.02 | 0.90 | 0.18 |
| Boron | -0.08 | 0.83 | 0.27 |

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) exists between the input variable and summary variable (i.e., PC).

Ions

The ion PCA generated three PCs, which accounted for a total of 82% (47%, 22%, and 13%, respectively) of the variance in the dataset; all three PCs were used in subsequent analyses. Table D.1-4 contains the correlations among the input variables and the PCs for ions:

- ION PC1 was moderately and strongly correlated with: magnesium; calcium; bicarbonate; potassium; sodium; and sulphate. ION PC1 was used to represent all of these ions, except sodium, which was more strongly correlated with PC2;

- ION PC2 was strongly and moderately correlated with chloride and sodium, respectively; and
- ION PC3 was strongly correlated with sulphide. The separation of sulphide from the other ions indicates that this ion behaves differently from the other ions over time and/or space.

Table D.1-4 Pearson correlations 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 | 0.88 | -0.41 | -0.08 |
| Calcium | 0.87 | -0.36 | -0.08 |
| Bicarbonate | 0.86 | -0.44 | 0.03 |
| Potassium | 0.75 | 0.14 | -0.01 |
| Sodium | 0.56 | 0.69 | 0.28 |
| Sulphate | 0.51 | 0.46 | -0.35 |
| Chloride | 0.45 | 0.78 | 0.13 |
| Sulphide | 0.10 | -0.20 | 0.91 |

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) exists between the 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 PCs (Table D.1-5). The strongest correlations were observed between DISMET PC2 and TOTMET PC2 ($r_s = 0.82$) and DISMET PC1 and TOTMET PC1 ($r_s = 0.70$). DISMET PC3 and TOTMET PC4 were negatively correlated. Moderate positive correlations were also observed for ions and metals including ION PC1 and DISMET PC1, TOTMET PC2 and 3, and ION PC2 and TOTMET PC1.

Although a number of statistically significant relationships were observed among PCs, many of the observed correlations were not particularly meaningful, given that an r-value as low as $|0.13|$ was significant, due to the large sample size of the dataset.

D.1.3.2 Cluster Analysis

Cluster Membership

Based on results of hierarchical cluster analysis, k-means cluster analysis was conducted using three clusters. The cluster membership for each region is provided in Table D.1-6, while cluster memberships for each observation (i.e., station/year combination) are presented in Table D.1-7.

Table D.1-5 Rank correlations among ion, dissolved metal, and total metal principal components.

| Rank Correlations (rs) | | | | | | | | |
|------------------------|--------------|--------------|--------------|-------------|-------------|--------------|------------|------------|
| | DISMET PC1 | DISMET PC2 | DISMET PC3 | ION PC1 | ION PC2 | ION PC3 | TOTMET PC1 | TOTMET PC2 |
| DISMET PC1 | | | | | | | | |
| DISMET PC2 | 0.00 | | | | | | | |
| DISMET PC3 | -0.02 | -0.01 | | | | | | |
| ION PC1 | 0.56 | 0.27 | 0.35 | | | | | |
| ION PC2 | 0.41 | -0.15 | -0.47 | 0.02 | | | | |
| ION PC3 | -0.18 | 0.48 | -0.12 | -0.01 | -0.01 | | | |
| TOTMET PC1 | 0.70 | -0.21 | -0.25 | 0.16 | 0.52 | -0.18 | | |
| TOTMET PC2 | 0.23 | 0.82 | 0.22 | 0.52 | -0.10 | 0.32 | -0.02 | |
| TOTMET PC4 | 0.06 | 0.16 | -0.51 | -0.05 | 0.30 | 0.07 | -0.01 | 0.06 |

Bold values represent significant correlations where $|rs| \geq |0.13|$ for $n = 244$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) exists between the input variable and summary variable (i.e., PC).

Table D.1-6 Summary of cluster membership by region.

| Waterbody | Total No. of Station/Year Combinations | Cluster | | |
|------------------------------|--|-----------|-----------|-----------|
| | | 1 | 2 | 3 |
| Athabasca River | 74 | 1 | 1 | 72 |
| Athabasca River Delta | 4 | 0 | 0 | 4 |
| Eastern tributaries | 20 | 10 | 9 | 1 |
| Firebag River | 8 | 8 | 0 | 0 |
| Fort Creek | 4 | 1 | 3 | 0 |
| McLean Creek | 7 | 0 | 6 | 1 |
| Unnamed Creek | 1 | 1 | 0 | 0 |
| Regional lakes | 22 | 20 | 2 | 0 |
| Isadore's Lake | 4 | 3 | 1 | 0 |
| Kearl Lake | 7 | 7 | 0 | 0 |
| McClelland Lake | 4 | 4 | 0 | 0 |
| Shipyard Lake | 7 | 6 | 1 | 0 |
| Muskeg River | 47 | 33 | 13 | 1 |
| Alsands Drain | 1 | 0 | 1 | 0 |
| Jackpine Creek | 7 | 6 | 1 | 0 |
| Muskeg Creek | 8 | 5 | 3 | 0 |
| Muskeg River | 20 | 14 | 5 | 1 |
| Shelley Creek | 1 | 0 | 1 | 0 |
| Stanley Creek | 6 | 5 | 1 | 0 |
| Wapasu Creek | 4 | 3 | 1 | 0 |
| Southern tributaries | 20 | 13 | 5 | 2 |
| Christina River | 8 | 5 | 3 | 0 |
| Clearwater River | 10 | 8 | 0 | 2 |
| Hangingstone River | 2 | 0 | 2 | 0 |
| Steepbank River | 18 | 14 | 3 | 1 |
| North Steepbank River | 4 | 4 | 0 | 0 |
| Steepbank River | 14 | 10 | 3 | 1 |
| Western tributaries | 39 | 3 | 34 | 2 |
| Beaver River | 3 | 0 | 3 | 0 |
| Calumet River | 5 | 0 | 5 | 0 |
| Ells River | 7 | 2 | 3 | 2 |
| MacKay River | 11 | 1 | 10 | 0 |
| Poplar Creek | 6 | 0 | 6 | 0 |
| Tar River | 7 | 0 | 7 | 0 |
| Total | 244 | 94 | 67 | 83 |

Table D.1-7 Summary of cluster membership and cluster distances by station and year for the water quality dataset.

| Region | Station | Year | Cluster Number | Station | Year | Cluster Number |
|-----------------------|-------------|------|----------------|------------|------|----------------|
| 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-D | 1997 | 3 | ATR-FR | 2002 | 3 |
| | ATR-DC-E | 2003 | 1 | ATR-FR | 2003 | 3 |
| | ATR-DC-E | 1998 | 3 | ATR-FR | 2004 | 3 |
| | ATR-DC-E | 2000 | 3 | ATR-FR-CC | 2005 | 3 |
| | ATR-DC-E | 2001 | 3 | ATR-MR-E | 2000 | 3 |
| | ATR-DC-E | 2002 | 3 | 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-M | 2000 | 3 | ATR-MR-E | 2004 | 3 |
| | ATR-DC-W | 1998 | 3 | ATR-MR-E | 2005 | 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-DD | 2002 | 3 | ATR-MR-W | 2004 | 3 |
| | ATR-DD | 2003 | 3 | ATR-MR-W | 2005 | 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-W | 2005 | 3 | ATR-SR-E | 2002 | 3 |
| | ATR-ER | 2000 | 3 | ATR-SR-E | 2003 | 3 |
| | ATR-ER | 2001 | 3 | ATR-SR-E | 2004 | 3 |
| | ATR-ER | 2004 | 3 | ATR-SR-E | 2005 | 3 |
| | ATR-FC-CC-D | 1997 | 3 | ATR-SR-M | 2000 | 3 |
| | ATR-FC-E | 2001 | 2 | ATR-SR-W | 2000 | 3 |
| | ATR-FC-E | 2000 | 3 | ATR-SR-W | 2001 | 3 |
| | ATR-FC-E | 2002 | 3 | ATR-SR-W | 2002 | 3 |
| | ATR-FC-E | 2003 | 3 | ATR-SR-W | 2003 | 3 |
| | ATR-FC-E-D | 1998 | 3 | ATR-SR-W | 2004 | 3 |
| | ATR-FC-M | 2000 | 3 | ATR-SR-W | 2005 | 3 |
| | ATR-FC-W | 2000 | 3 | EMR-1 | 2003 | 3 |
| Athabasca River Delta | ARD-1 | 2000 | 3 | ARD-1 | 2003 | 3 |
| | ARD-1 | 2001 | 3 | ARD-1 | 2004 | 3 |
| Eastern Tributaries | FIR-1 | 2002 | 1 | FOC-1 | 2001 | 2 |
| | FIR-1 | 2003 | 1 | FOC-1 | 2003 | 2 |
| | FIR-1 | 2004 | 1 | MCC-1 | 1999 | 2 |
| | FIR-1 | 2005 | 1 | MCC-1 | 2001 | 2 |
| | FIR-2 | 2003 | 1 | MCC-1 | 2002 | 2 |
| | FIR-2 | 2004 | 1 | MCC-1 | 2003 | 2 |
| | FIR-2 | 2005 | 1 | MCC-1 | 2004 | 2 |
| | FIR-2X | 2002 | 1 | MCC-1 | 2005 | 2 |
| | FOC-1 | 2002 | 1 | MCC-1 | 2000 | 3 |
| | FOC-1 | 2000 | 2 | UNC-1 | 2000 | 1 |

Table D.1-7 (Cont'd.)

| Region | Station | Year | Cluster Number | Station | Year | Cluster Number |
|----------------------|---------|------|----------------|---------|------|----------------|
| Lakes | ISL-1 | 2000 | 1 | MCL-1 | 2000 | 1 |
| | ISL-1 | 2004 | 1 | MCL-1 | 2001 | 1 |
| | ISL-1 | 2005 | 1 | MCL-1 | 2002 | 1 |
| | ISL-1 | 2001 | 2 | MCL-1 | 2003 | 1 |
| | KEL-1 | 1998 | 1 | SHL-1 | 1999 | 1 |
| | KEL-1 | 2000 | 1 | SHL-1 | 2000 | 1 |
| | KEL-1 | 2001 | 1 | SHL-1 | 2002 | 1 |
| | KEL-1 | 2002 | 1 | SHL-1 | 2003 | 1 |
| | KEL-1 | 2003 | 1 | SHL-1 | 2004 | 1 |
| | KEL-1 | 2004 | 1 | SHL-1 | 2005 | 1 |
| | KEL-1 | 2005 | 1 | SHL-1 | 2001 | 2 |
| Muskeg River | ALD-1 | 1999 | 2 | MUR-1 | 1997 | 3 |
| | JAC-1 | 2000 | 1 | MUR-2 | 1999 | 2 |
| | JAC-1 | 2001 | 1 | MUR-4 | 1999 | 2 |
| | JAC-1 | 2002 | 1 | MUR-5 | 1999 | 1 |
| | JAC-1 | 2003 | 1 | MUR-6 | 1999 | 1 |
| | JAC-1 | 2004 | 1 | MUR-6 | 2000 | 1 |
| | JAC-1 | 2005 | 1 | MUR-6 | 2001 | 1 |
| | JAC-1 | 1999 | 2 | MUR-6 | 2002 | 1 |
| | MUC-1 | 2000 | 1 | MUR-6 | 2003 | 1 |
| | MUC-1 | 2001 | 1 | MUR-6 | 2004 | 1 |
| | MUC-1 | 2002 | 1 | MUR-6 | 2005 | 1 |
| | MUC-1 | 2003 | 1 | MUR-6 | 1998 | 2 |
| | MUC-1 | 2005 | 1 | SHC-1 | 1999 | 2 |
| | MUC-1 | 1998 | 2 | STC-1 | 1999 | 1 |
| | MUC-1 | 1999 | 2 | STC-1 | 2001 | 1 |
| | MUC-1 | 2004 | 2 | STC-1 | 2002 | 1 |
| | MUR-1 | 2000 | 1 | STC-1 | 2003 | 1 |
| | MUR-1 | 2001 | 1 | STC-1 | 2004 | 1 |
| | MUR-1 | 2002 | 1 | STC-1 | 2005 | 2 |
| | MUR-1 | 2003 | 1 | WAC-1 | 1999 | 1 |
| | MUR-1 | 2004 | 1 | WAC-1 | 2004 | 1 |
| | MUR-1 | 2005 | 1 | WAC-1 | 2005 | 1 |
| | MUR-1 | 1998 | 2 | WAC-1 | 1998 | 2 |
| | MUR-1 | 1999 | 2 | | | |
| Southern Tributaries | CHR-1 | 2005 | 1 | CLR-1 | 2003 | 1 |
| | CHR-1 | 2002 | 2 | CLR-1 | 2004 | 3 |
| | CHR-1 | 2003 | 2 | CLR-1 | 2005 | 3 |
| | CHR-1 | 2004 | 2 | CLR-2 | 2001 | 1 |
| | CHR-2 | 2002 | 1 | CLR-2 | 2002 | 1 |
| | CHR-2 | 2003 | 1 | CLR-2 | 2003 | 1 |
| | CHR-2 | 2004 | 1 | CLR-2 | 2004 | 1 |
| | CHR-2 | 2005 | 1 | CLR-2 | 2005 | 1 |
| | CLR-1 | 2001 | 1 | HAR-1 | 2004 | 2 |
| | CLR-1 | 2002 | 1 | HAR-1 | 2005 | 2 |
| Steepbank River | NSR-1 | 2002 | 1 | STR-1 | 1998 | 2 |
| | NSR-1 | 2003 | 1 | STR-1 | 2004 | 2 |
| | NSR-1 | 2004 | 1 | STR-1 | 2000 | 3 |
| | NSR-1 | 2005 | 1 | STR-2 | 2002 | 1 |
| | STR-1 | 1997 | 1 | STR-2 | 2003 | 1 |
| | STR-1 | 2001 | 1 | STR-2 | 2005 | 1 |

Table D.1-7 (Cont'd.)

| Region | Station | Year | Cluster Number | Station | Year | Cluster Number |
|-------------------------|---------|------|----------------|---------|------|----------------|
| Steepbank River, cont'd | STR-1 | 2002 | 1 | STR-2 | 2004 | 2 |
| | STR-1 | 2003 | 1 | STR-3 | 2004 | 1 |
| | STR-1 | 2005 | 1 | STR-3 | 2005 | 1 |
| Western Tributaries | BER-1 | 2003 | 2 | MAR-1 | 2004 | 2 |
| | BER-1 | 2004 | 2 | MAR-1 | 2005 | 2 |
| | BER-1 | 2005 | 2 | MAR-2 | 2005 | 1 |
| | CAR-1 | 2002 | 2 | MAR-2 | 2002 | 2 |
| | CAR-1 | 2003 | 2 | MAR-2 | 2003 | 2 |
| | CAR-1 | 2004 | 2 | MAR-2 | 2004 | 2 |
| | CAR-1 | 2005 | 2 | POC-1 | 2000 | 2 |
| | CAR-2 | 2005 | 2 | POC-1 | 2001 | 2 |
| | ELR-1 | 2002 | 1 | POC-1 | 2002 | 2 |
| | ELR-1 | 1998 | 2 | POC-1 | 2003 | 2 |
| | ELR-1 | 2003 | 2 | POC-1 | 2004 | 2 |
| | ELR-1 | 2004 | 2 | POC-1 | 2005 | 2 |
| | ELR-1 | 2005 | 3 | TAR-1 | 1998 | 2 |
| | ELR-2 | 2004 | 1 | TAR-1 | 2002 | 2 |
| | ELR-2 | 2005 | 3 | TAR-1 | 2003 | 2 |
| | MAR-1 | 1998 | 2 | TAR-1 | 2004 | 2 |
| | MAR-1 | 2000 | 2 | TAR-1 | 2005 | 2 |
| | MAR-1 | 2001 | 2 | TAR-2 | 2004 | 2 |
| | MAR-1 | 2002 | 2 | TAR-2 | 2005 | 2 |
| | MAR-1 | 2003 | 2 | | | |

Cluster 1 is comprised of a total of 94 station/year combinations, consisting of a majority of the lakes, Muskeg River, Steepbank River, southern tributary observations and half of the eastern tributary observations (including all of the Firebag River, and one of the Fort Creek and Unnamed Creek observations). In addition, one of the Athabasca River stations, located upstream of Donald Creek, that was sampled in 2003, two observations for the Ells (at the mouth in 2001 and 2002) and MacKay (upstream of Petro-Canada MacKay River, in 2005) rivers are grouped with this cluster.

Cluster 2, which is comprised of 67 station/year combinations, includes a majority of the western tributaries (including Beaver, Calumet, Ells, MacKay, and Tar rivers, and Poplar Creek), and half of the eastern tributaries (including most of the Fort Creek and McLean Creek observations). A small number of the lakes, Muskeg River, Steepbank River, and southern tributary (Christina and Hangingstone Rivers), and one of the Athabasca River stations (upstream of Fort Creek in 2001) observations also group with this cluster.

The third cluster includes 72 station/year combinations and was comprised almost exclusively of Athabasca River and ARD stations, except for the two Athabasca River stations that group with Clusters 1 and 2. In addition, stations from McLean Creek (mouth in 2000), the Muskeg River (mouth in 1997), the Clearwater River (upstream of Fort McMurray in 2004 and 2005), the Steepbank River (mouth in 2000), and the Ells River (mouth and upstream of CNRL Lease 7 in 2005) group with this cluster.

Detailed Cluster Characteristics

The characteristics of each cluster were evaluated by examining scatterplots of the primary PCs (i.e., PC1 and PC2) for ions, dissolved metals, and total metals to identify trends in water quality common to each cluster (Figure D.1-1 to Figure D.1-3).

Dissolved Metals

Three clusters are evident in the plot of the dissolved metals PCs (Figure D.1-1). Cluster 1 exhibits negative DISMET PC1 scores and a range of DISMET PC2 scores; stations grouped with this cluster have low concentrations of those metals strongly correlated with DISMET PC1 (strontium, uranium, nickel, b, molybdenum, copper, and cobalt) and a range of concentrations for those metals strongly correlated with DISMET PC2 (lithium, manganese, boron and iron) (Table D.1-2). Cluster 2 is characterized by positive DISMET PC1 and DISMET PC2 scores, which indicates that stations in this cluster have high concentrations of metals. Cluster 3 exhibits positive DISMET PC1 and negative DISMET PC2 scores, indicating stations in this cluster have high concentrations of most metals, with the exception of lithium, manganese, boron, and iron (i.e., metals correlated with DISMET PC2).

Total Metals

Three clusters are evident in the plot of the total metals principal components (Figure D.1-2). Cluster 1 exhibited negative TOTMET PC1 and a range of TOTMET PC2 scores; these results indicate that stations grouped with this cluster had low concentrations of most metals and varying concentrations of manganese, lithium, and boron, which varied among stations grouped in this cluster. Cluster 2 was characterized by positive TOTMET PC1 and TOTMET PC2 scores, which indicates that stations in this cluster have high concentrations of metals. Cluster 3 exhibited positive TOTMET PC1 and negative TOTMET PC2 scores, indicating stations in this cluster have high concentrations of most metals, with the exception of lithium, manganese, and boron (i.e., metals correlated with TOTMET PC2).

Ions

The clusters formed for ion PCs (Figure D.1-3) exhibit greater overlap compared to the metals PCs, which helps explain why these PCs did not drive the cluster analysis. Cluster 1 is characterized by low concentrations of sodium and chloride and a range of concentrations of all other ions, except sulphide. Cluster 2 was characterized by high concentrations of all ions with the exception of chloride and sodium, which exhibited a range of concentrations. Cluster 3 exhibits generally high concentrations of sodium and chloride and a range of concentrations of most other ions.

Other Variables

Variables that exhibited strong correlations with the PCs also were used to characterize clusters. Rank correlations for PCs and nutrients, conventional variables, and total phenols are presented in Table D.1-8. Correlations between input variables for PCs and nutrients, conventional variables, and total phenols are presented in Table D.1-9.

Figure D.1-1 Scatterplot of dissolved metal principal components 1 and 2 grouped by cluster number.

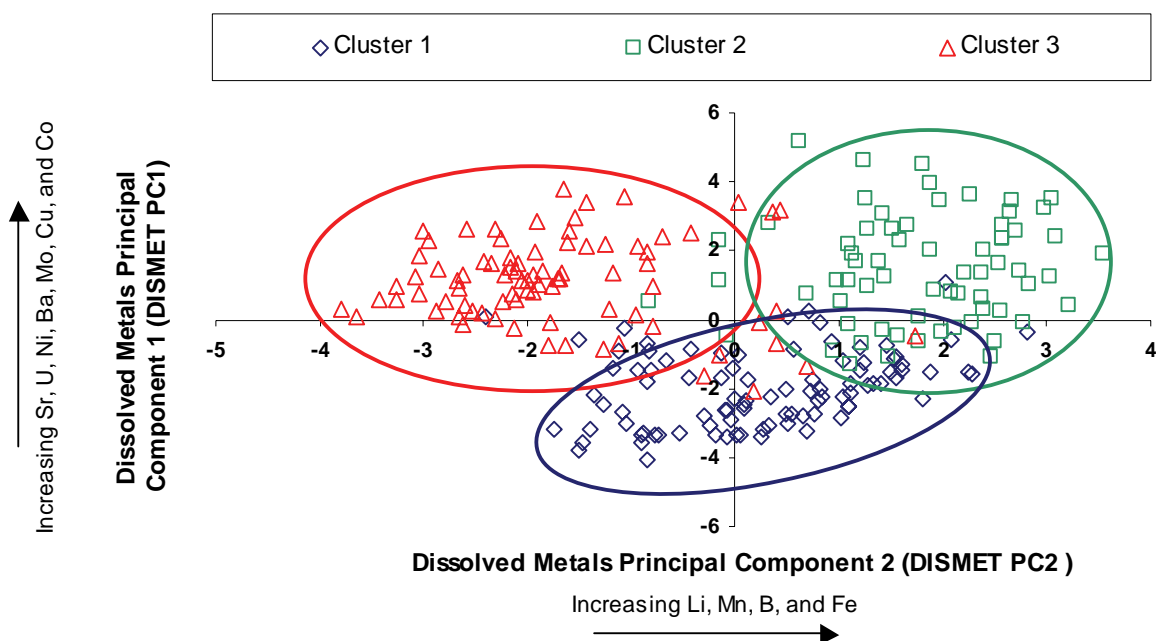


Figure D.1-2 Scatterplot of total metal principal components 1 and 2 grouped by cluster number.

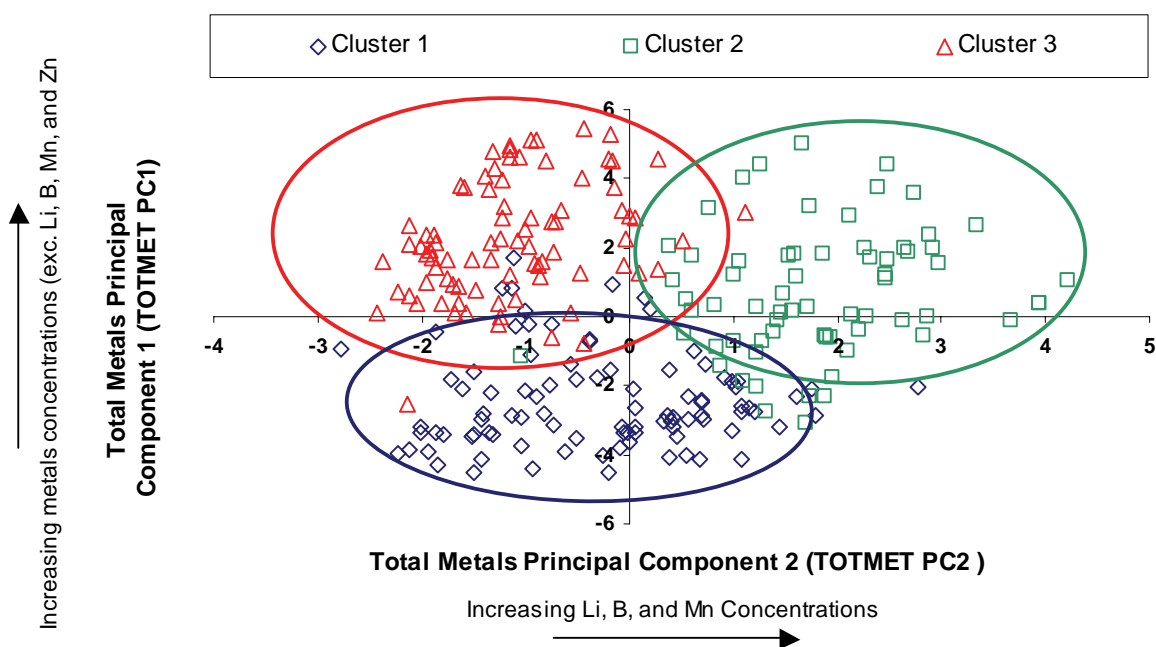
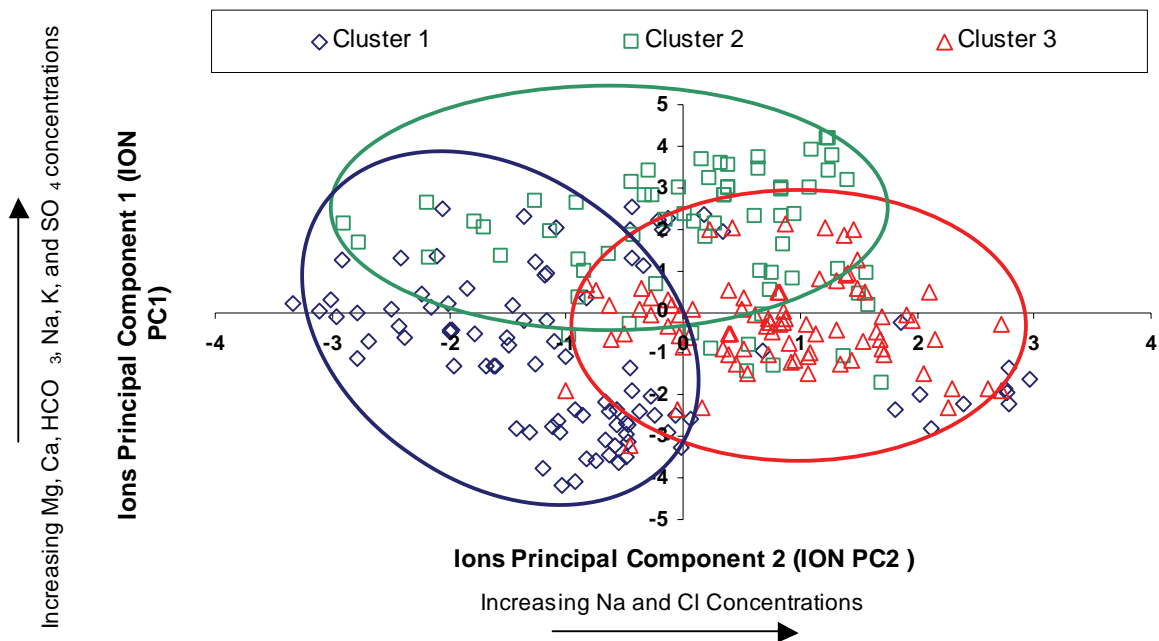


Figure D.1-3 Scatterplot of ions principal components 1 and 2 grouped by cluster number.



ION PC1 was the only PC that exhibited strong correlations with conventional variables and nutrients. This PC was strongly correlated with conductivity, hardness, alkalinity, and TDS. These correlations were primarily driven by bicarbonate, calcium, and magnesium ion (Table D.1-9). These relationships are not surprising given that these conventional analytes are derived from or strongly influenced by these ions. These results indicate that stations with high calcium, magnesium, and bicarbonate concentrations also have high scores for ION PC1.

Moderate correlations, ranging from 0.50 to 0.75, were observed between conventional variables and nutrients and a number of the other PCs. Strong correlations were observed between DISMET PC2 scores and DOC ($r_s = 0.75$) and TOC ($r_s = 0.72$), indicating that the metals associated with this PC (lithium, manganese, boron, and iron) were bound to organic material. Similar, but weaker correlations were observed between TOC and DOC and TOTMET PC2 (represents lithium and boron). TOTMET PC1 exhibited strong correlations with TSS ($r_s = 0.70$), suggesting that most metals were bound to particulate material or were present in a particulate form.

Summary of Cluster Characteristics

The key characteristics of each cluster including the predominant stations in the cluster and trends for dissolved and total metals, ions, nutrients and conventional variables are summarized in Table D.1-10.

Table D.1-8 Rank correlations among principal components and nutrients, conventional variables, and total phenols.

| Conventional Variables | Dissolved Metals PCs | | | Ion PCs | | | Total Metals PCs | | |
|------------------------|----------------------|--------------|--------------|--------------|--------------|--------------|------------------|-------------|--------------|
| | DISMET PC1 | DISMET PC2 | DISMET PC3 | ION PC1 | ION PC2 | ION PC3 | TOTMET PC1 | TOTMET PC2 | TOTMET PC4 |
| Conductivity | 0.52 | 0.24 | 0.41 | 0.95 | 0.06 | -0.04 | 0.15 | 0.48 | -0.16 |
| DOC | -0.23 | 0.75 | 0.07 | 0.03 | -0.30 | 0.57 | -0.31 | 0.59 | 0.07 |
| Hardness | 0.38 | 0.22 | 0.50 | 0.90 | -0.34 | -0.09 | 0.00 | 0.44 | -0.22 |
| pH | 0.22 | -0.02 | -0.12 | 0.31 | 0.00 | -0.15 | 0.07 | 0.13 | 0.37 |
| Alkalinity | 0.31 | 0.39 | 0.53 | 0.87 | -0.39 | 0.03 | -0.11 | 0.59 | -0.20 |
| TDS | 0.40 | 0.42 | 0.38 | 0.82 | -0.07 | 0.15 | 0.03 | 0.61 | -0.17 |
| TOC | -0.19 | 0.72 | 0.12 | 0.06 | -0.31 | 0.55 | -0.27 | 0.58 | -0.01 |
| TSS | 0.35 | -0.22 | -0.21 | -0.03 | 0.32 | -0.13 | 0.70 | -0.07 | -0.14 |
| Colour | -0.05 | 0.57 | -0.25 | -0.16 | -0.10 | 0.48 | 0.08 | 0.38 | 0.14 |
| Nutrients | | | | | | | | | |
| Dissolved phosphorus | -0.12 | 0.45 | -0.17 | -0.14 | -0.14 | 0.29 | -0.05 | 0.20 | -0.09 |
| Total phosphorus | 0.15 | 0.26 | -0.36 | -0.07 | 0.10 | 0.16 | 0.42 | 0.23 | -0.08 |
| TKN | -0.04 | 0.52 | 0.06 | 0.14 | -0.22 | 0.36 | -0.16 | 0.45 | -0.09 |
| Phenols | | | | | | | | | |
| Total phenols | -0.02 | 0.30 | 0.03 | 0.00 | -0.22 | 0.22 | -0.07 | 0.27 | -0.09 |

Bold values represent significant correlations where $|rs| \geq |0.13|$ for $n = 244$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between variables.

Table D.1-9 Rank correlations of conventional variables, nutrients, and total phenols with ions and dissolved and total metals for the water quality dataset.

| | Conventional Variables | | | | | | | | | Nutrients | | | Total Phenols |
|------------------|------------------------|-------|----------|-------|------------|-------|-------|-------|--------|----------------------|------------------|-------|---------------|
| | Conductivity | DOC | Hardness | pH | Alkalinity | TDS | TOC | TSS | Colour | Dissolved Phosphorus | Total Phosphorus | TKN | |
| Dissolved Metals | | | | | | | | | | | | | |
| Arsenic | 0.11 | 0.12 | -0.06 | 0.08 | -0.05 | 0.10 | 0.13 | 0.18 | 0.28 | 0.29 | 0.38 | 0.14 | -0.06 |
| Barium | 0.65 | -0.41 | 0.68 | 0.18 | 0.54 | 0.49 | -0.38 | 0.17 | -0.34 | -0.26 | 0.01 | -0.13 | -0.06 |
| Boron | 0.35 | 0.52 | 0.25 | 0.19 | 0.41 | 0.44 | 0.50 | -0.20 | 0.23 | 0.07 | -0.08 | 0.37 | 0.08 |
| Cobalt | 0.43 | 0.17 | 0.33 | 0.01 | 0.37 | 0.47 | 0.24 | 0.15 | 0.15 | 0.16 | 0.10 | 0.19 | 0.07 |
| Copper | 0.32 | -0.32 | 0.24 | 0.15 | 0.16 | 0.20 | -0.24 | 0.30 | -0.21 | -0.20 | 0.01 | -0.10 | -0.02 |
| Iron | 0.02 | 0.55 | 0.01 | -0.16 | 0.14 | 0.17 | 0.54 | -0.12 | 0.63 | 0.57 | 0.39 | 0.36 | 0.34 |
| Lithium | 0.52 | 0.50 | 0.48 | 0.14 | 0.61 | 0.56 | 0.51 | -0.19 | 0.23 | 0.11 | 0.02 | 0.40 | 0.16 |
| Manganese | 0.48 | 0.40 | 0.45 | -0.19 | 0.53 | 0.58 | 0.44 | -0.07 | 0.33 | 0.44 | 0.25 | 0.34 | 0.22 |
| Molybdenum | 0.06 | -0.52 | -0.10 | 0.18 | -0.19 | -0.11 | -0.49 | 0.35 | -0.21 | -0.12 | 0.08 | -0.36 | -0.18 |
| Nickel | 0.29 | -0.06 | 0.21 | 0.05 | 0.21 | 0.31 | -0.02 | 0.25 | 0.08 | -0.04 | 0.16 | 0.06 | 0.24 |
| Strontium | 0.63 | -0.31 | 0.51 | 0.29 | 0.40 | 0.42 | -0.29 | 0.27 | -0.23 | -0.28 | 0.00 | -0.13 | -0.10 |
| Titanium | -0.04 | 0.15 | -0.05 | 0.26 | -0.04 | 0.09 | 0.11 | 0.11 | 0.31 | 0.17 | 0.34 | 0.17 | 0.23 |
| Uranium | 0.36 | -0.48 | 0.23 | 0.21 | 0.11 | 0.18 | -0.43 | 0.33 | -0.23 | -0.24 | 0.05 | -0.23 | -0.17 |
| Vanadium | 0.04 | 0.00 | -0.17 | 0.00 | -0.17 | -0.02 | 0.00 | 0.24 | 0.16 | 0.12 | 0.27 | 0.08 | -0.09 |
| Zinc | 0.22 | -0.17 | 0.13 | -0.17 | 0.10 | 0.11 | -0.09 | 0.04 | -0.25 | -0.03 | -0.14 | -0.03 | -0.11 |
| Total Metals | | | | | | | | | | | | | |
| Aluminum | -0.14 | -0.27 | -0.29 | 0.07 | -0.38 | -0.23 | -0.26 | 0.70 | 0.16 | -0.02 | 0.43 | -0.21 | -0.15 |
| Barium | 0.55 | -0.40 | 0.56 | 0.19 | 0.42 | 0.42 | -0.36 | 0.37 | -0.25 | -0.22 | 0.16 | -0.12 | -0.04 |
| Boron | 0.41 | 0.51 | 0.30 | 0.20 | 0.45 | 0.50 | 0.49 | -0.14 | 0.25 | 0.06 | -0.02 | 0.36 | 0.11 |

Bold values represent significant correlations where $|rs| \geq |0.13|$ for $n = 244$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between variables.

Table D.1-9 (Cont'd.)

| | Conventional Variables | | | | | | | | | Nutrients | | | Total Phenols |
|----------------------|------------------------|-------|----------|-------|------------|-------|-------|-------|--------|----------------------|------------------|-------|---------------|
| | Conductivity | DOC | Hardness | pH | Alkalinity | TDS | TOC | TSS | Colour | Dissolved Phosphorus | Total Phosphorus | TKN | |
| Total Metals, cont'd | | | | | | | | | | | | | |
| Cobalt | 0.17 | -0.12 | 0.01 | -0.08 | -0.03 | 0.09 | -0.06 | 0.64 | 0.15 | 0.05 | 0.43 | -0.02 | 0.04 |
| Iron | 0.02 | 0.23 | -0.04 | -0.14 | -0.02 | 0.09 | 0.24 | 0.55 | 0.58 | 0.42 | 0.75 | 0.18 | 0.22 |
| Lead | 0.04 | -0.33 | -0.12 | 0.02 | -0.20 | -0.06 | -0.27 | 0.63 | -0.05 | -0.12 | 0.25 | -0.16 | -0.14 |
| Lithium | 0.55 | 0.46 | 0.49 | 0.16 | 0.61 | 0.59 | 0.47 | -0.14 | 0.22 | 0.09 | 0.05 | 0.35 | 0.18 |
| Manganese | 0.23 | 0.23 | 0.15 | -0.07 | 0.15 | 0.27 | 0.25 | 0.48 | 0.43 | 0.34 | 0.67 | 0.21 | 0.19 |
| Molybdenum | 0.00 | -0.50 | -0.14 | 0.14 | -0.23 | -0.16 | -0.47 | 0.33 | -0.18 | -0.14 | 0.06 | -0.33 | -0.16 |
| Nickel | 0.19 | -0.09 | 0.10 | 0.00 | 0.09 | 0.20 | -0.04 | 0.39 | 0.08 | -0.07 | 0.22 | 0.01 | 0.15 |
| Strontium | 0.63 | -0.33 | 0.51 | 0.31 | 0.39 | 0.42 | -0.31 | 0.27 | -0.25 | -0.31 | -0.02 | -0.13 | -0.10 |
| Titanium | -0.11 | -0.26 | -0.24 | 0.10 | -0.33 | -0.19 | -0.25 | 0.68 | 0.16 | 0.01 | 0.47 | -0.19 | -0.07 |
| Uranium | 0.29 | -0.42 | 0.20 | 0.26 | 0.07 | 0.15 | -0.39 | 0.38 | -0.16 | -0.24 | 0.12 | -0.18 | -0.11 |
| Vanadium | -0.10 | -0.25 | -0.25 | 0.03 | -0.34 | -0.18 | -0.24 | 0.68 | 0.16 | 0.01 | 0.43 | -0.19 | -0.12 |
| Zinc | 0.25 | -0.31 | 0.16 | -0.18 | 0.10 | 0.13 | -0.22 | 0.35 | -0.25 | -0.06 | 0.07 | -0.05 | -0.08 |
| Major Ions | | | | | | | | | | | | | |
| Bicarbonate | 0.83 | 0.26 | 0.95 | 0.26 | 1.00 | 0.80 | 0.27 | -0.20 | -0.03 | -0.01 | -0.10 | 0.29 | 0.15 |
| Calcium | 0.86 | 0.05 | 0.98 | 0.26 | 0.91 | 0.78 | 0.07 | -0.08 | -0.11 | -0.07 | -0.06 | 0.13 | 0.11 |
| Chloride | 0.47 | -0.15 | 0.14 | 0.11 | 0.09 | 0.30 | -0.16 | 0.22 | -0.08 | -0.05 | 0.13 | -0.06 | -0.10 |
| Magnesium | 0.84 | 0.13 | 0.97 | 0.32 | 0.94 | 0.75 | 0.14 | -0.17 | -0.14 | -0.11 | -0.14 | 0.20 | 0.07 |
| Potassium | 0.62 | 0.00 | 0.53 | 0.18 | 0.51 | 0.52 | 0.01 | 0.06 | -0.17 | -0.21 | 0.03 | 0.13 | -0.11 |
| Sodium | 0.53 | 0.11 | 0.20 | 0.18 | 0.25 | 0.47 | 0.10 | 0.11 | 0.07 | -0.05 | 0.04 | 0.07 | -0.05 |
| Sulphate | 0.46 | -0.46 | 0.30 | 0.18 | 0.14 | 0.28 | -0.42 | 0.23 | -0.31 | -0.29 | -0.02 | -0.27 | -0.22 |
| Sulphide | 0.03 | 0.48 | 0.08 | -0.13 | 0.13 | 0.21 | 0.48 | -0.14 | 0.41 | 0.22 | 0.13 | 0.33 | 0.21 |

Bold values represent significant correlations where $|rs| \geq |0.13|$ for $n = 244$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between variables.

Table D.1-10 Summary of cluster membership and characteristics.

| Cluster | Predominant Stations Present in Cluster | General Characteristics of Cluster | | | |
|----------|---|---|---|---|---|
| | | Ion Concentrations | Dissolved Metal Concentrations | Total Metal Concentrations | Other Variables |
| 1 | <ul style="list-style-type: none"> Lakes (all stations) Steepbank R. (all stations) Muskeg R (Jackpine Cr., Muskeg Cr., Stanley Cr., and Wapasu Cr.) Southern tributaries (only Christina R. and Clearwater R.) Eastern tributaries (only Firebag R., Fort Cr., and Unnamed Cr.) | Low concentrations of sodium and chloride and a range of concentrations of all other ions (except sulphide) | Low concentrations of Sr, U, Ni, Ba, Mo, Cu, and Co and range of Li, Mn, B, and Fe concentrations | Low concentrations of most metals and a range of Mn, Li, and B concentrations | Range of conductivity, hardness, alkalinity, TDS, DOC and TOC |
| 2 | <ul style="list-style-type: none"> Western tributaries (all stations) Muskeg R. (all stations) Southern tributaries (only Christina R. and Hangingstone R.) Steepbank R. (only Steepbank R.) Eastern tributaries (only Fort Cr. and McLean Cr.) | High concentrations of most ions and a range of chloride and sodium concentrations | High concentrations of metals | High concentrations of metals | High conductivity, hardness, alkalinity, TDS, DOC, and TOC |
| 3 | <ul style="list-style-type: none"> Athabasca R. (all stations) Athabasca R. Delta (all stations) | High concentrations of sodium and chloride and a range of concentrations of other ions (except sulphide) | High concentrations of most metals, with the exception of Li, Mn, B, and Fe | High concentrations of most metals, with the exception of Li, Mn, and B | Range of conductivity, hardness, alkalinity, TDS, and low DOC and TOC |

Cluster 1, which includes a majority of the lakes, Muskeg River, Steepbank River, southern tributary, and eastern tributary stations, represents stations characterized by low concentrations of ions, dissolved metals, and most total metals, with the possible exception of manganese, lithium, and boron. These stations also exhibited low hardness, alkalinity, TDS, and DOC.

Cluster 2 is comprised of a majority of the western tributary stations and about half of the eastern tributary stations. These stations have high concentrations of various ions, including magnesium, calcium, bicarbonate, and potassium, and most dissolved and total metals, and high hardness, alkalinity, TDS, and DOC.

Cluster 3 includes all but one of the Athabasca River and ARD stations. These stations exhibit relatively high concentrations of most ions and dissolved and total metals (except lithium, boron, iron, and manganese), and high hardness, alkalinity, TDS, and DOC.

D.2 STATISTICAL ANALYSIS OF SEASONAL WATER QUALITY DATA

D.2.1 Introduction

Seasonal water chemistry data were analyzed to determine what, if any, seasonal patterns are apparent in the data. Although the fall RAMP water quality sampling program is the most extensive, and forms the basis for all findings and recommendations, water quality measurements have also been made in winter, spring and summer to varying extents since 1997. Analyses were conducted to indicate whether fall data are sufficient for broadly characterizing the state of aquatic environments throughout the year, their ability to capture extreme seasonal fluctuations, and whether they can adequately represent the range of variability exhibited by metals and ions in other seasons. The data used in the seasonal water quality analysis included the Athabasca River and ARD, various tributaries to the Athabasca River and regional lakes.

Two separate analyses were undertaken to determine whether seasonal patterns could be detected in the data. First, seasonal comparisons were made of the frequency with which water quality variables exceeded guidelines for the protection of aquatic life. Second, the seasonal water quality dataset was reduced by using PCA to identify the source of seasonal variability. PCs were also correlated against conventional variables such as total suspended solids (TSS) to help ascertain what underlying processes may be at play that give rise to the observed patterns.

D.2.2 Seasonal Comparison to Water Quality Guidelines

All water quality data collected by RAMP from 1997 to 2005 that were appropriate for this analysis (over 47,000 records) were screened against Alberta acute and sublethal water quality guidelines for the protection of aquatic life (AENV 1999a) and Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQG) (CCME 2003). Analytes for which no AENV or CCME guidelines exist were screened against applicable guidelines from other jurisdictions where appropriate.

Table D.2-1 summarizes the number of analytes that exceed guidelines as a percentage of the total number of analytes in each of two regions (Athabasca River and ARD, and tributaries) by season for the period from 1997 to 2005. The analytes most commonly exceeding guidelines were similar from season to season, with total aluminum and iron exceeding accepted guidelines more often than any other analyte in all seasons. Fall

water quality, however, tends to stay within guidelines more frequently than in other seasons, particularly spring in which guideline exceedances occurred twice as often, for example, in the Athabasca River and the ARD. This suggests that while fall is perhaps representative of the types of analytes that commonly exceed guidelines, it may not be capturing the extreme fluctuations that are occurring in other seasons, particularly spring.

Table D.2-1 RAMP water quality guideline exceedances as a percentage of all variables by region and season from 1997 to 2005.

| Region | Season | % Exceedance | Analytes Most Frequently Exceeding Guidelines | | | |
|---------------------------|--------|--------------|---|--------------------------|--------------|-----------------|
| | | | 1 | 2 | 3 | 4 |
| Athabasca River and Delta | Fall | 4.25 | Total Al | Total Fe | Total Cu | Total P |
| | Spring | 8.60 | Total Al | Total P | Total Fe | Total Co |
| | Summer | 5.20 | Total Al | Total Fe | Total Co | Total Cu |
| | Winter | 3.05 | Total Fe | Total Al | Total P | Dissolved P |
| Tributaries | Fall | 3.48 | Total Fe | Dissolved Fe | Total Al | Total phenolics |
| | Spring | 4.56 | Total Fe | Total Al | Total P | Dissolved Fe |
| | Summer | 3.77 | Total Fe | Total Al | Dissolved Fe | Total P |
| | Winter | 4.18 | Total Fe | Dissolved O ₂ | Total P | Total Al |

The frequency of spring exceedances is likely a result of increased TSS. Spring snowmelt increases flow which causes previously settled material to become suspended; much of this material consists largely of iron, aluminum, phosphorus, and copper. As might be expected given the high frequency of guideline exceedance for the Athabasca River and ARD in spring (8.60%), TSS and many of these elements correlated well for Cluster 3, which accounts largely for the Athabasca River (please see Table D.2-9).

The fact that low dissolved oxygen in winter commonly exceeds guidelines in what are likely low-flowing tributaries, may be some cause for concern, given the potential for winter kill. The rate of dissolved iron exceedances in other seasons may be related to water percolating through rock and soil that stains the water with this element.

D.2.3 PCA of Seasonal Water Quality

D.2.3.1 Methods for PCA

Data Screening

The seasonal water quality dataset included 70 monitoring stations, which were monitored during one or more seasons for 1 to 9 years, for a total of 472 observations for each station/year/season.

Before PCA was conducted, data were screened to exclude:

- Any variables with concentrations below detection limits in over 50% of observations in each station/year/season combination; and

- Any variables with missing values for 15% or more of observations in each station/year/season combination.

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 dataset was comprised of analyses conducted by two different laboratories, EnviroTest Laboratories (ETL), who conducted the analyses from 1997-2001, and Alberta Research Council (ARC), who conducted analyses from 2002-2005. In general, method detection limits for metals were higher at ETL. As a result, the analytical detection limits reported by ARC were revised to be consistent with results reported by ETL, to ensure the variable detection limits did not confound results of the statistical analyses.

Data Reduction

Data were ranked after screening; a listing of all data that comprised the PCA is provided in Table D.2-2. Separate PCAs were conducted for dissolved metals, total metals, and major ions. PCAs were conducted using no rotation, and unstandardized PCs were saved for use as summary variables in subsequent analyses.

The first and second PC plots for station/year/season combination, for each of dissolved and total metals, and major ions revealed few discernable patterns, indicating that the variability arising from each of these drivers (stations, years and seasons) may be difficult to detect simultaneously. Therefore, for each of the three clusters identified in the cluster analysis described above in Section D.1.3.2, first and second PC scores were re-plotted for each station/year/season combination by dissolved and total metals, and major ions. Table D.2-3 contains the seasonal water quality cluster membership; the clusters are summarized below:

- Cluster 1 - comprised of a total of 420 station/year/season combinations, consisting of the majority of eastern and southern tributaries and lakes, and the Steepbank and Muskeg Rivers;
- Cluster 2 - 278 station/year/season combinations, and was largely associated with western tributaries, some eastern and southern tributaries, and some stations from the Muskeg River; and
- Cluster 3 - comprised of 143 station/year/season combinations, and was largely associated with the Athabasca River and Delta.

Relationships between the input variables and output summary variables were evaluated using correlation analysis, to determine which input variables were most strongly influencing the PCs. The magnitude and direction of these correlations were used to interpret PC scores in subsequent analyses. The magnitude of the correlation was used to identify input variables that were strongly influencing the PCs. r -values between either 0.50 and 0.75 or -0.50 and -0.75 were classified as moderate correlations, while those greater than $|0.75|$ were classified as strong. The direction of correlation was used to determine whether metals or ion input variables increased or decreased with PCs.

Table D.2-2 RAMP water quality stations comprising the seasonal principal component analysis.

| Region | Station | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-----------------------|-------------|------|------|------|------|------|---------|---------|---------|---------|
| Athabasca River | ATR-DC-CC | | | | | | F | F | F | F |
| | ATR-DC-CC-D | F S | | | | | | | | |
| | ATR-DC-E | | F | | F | F | F | F | F | F |
| | ATR-DC-M | | | | F | | | | | |
| | ATR-DC-W | | F | | F | F | F | F | F | F |
| | ATR-DD | | | | | | P S W F | P S W F | P S W F | W |
| | ATR-DD-CC | | | | | | | | | P S W F |
| | ATR-DD-E | | | | | | | | | P S W F |
| | ATR-DD-W | | | | | | | | | P S W F |
| | ATR-ER | | | W | F | F | | | F | |
| | ATR-FC-CC-D | F S | | | | | | | | |
| | ATR-FC-E | | | | F | F | F | F | | |
| | ATR-FC-E-D | | F | | | | | | | |
| | ATR-FC-M | | | | F | | | | | |
| | ATR-FC-W | | | | F | F | F | F | | |
| | ATR-FC-W-D | | F | | | | | | | |
| | ATR-FR | | | | | | F | F | F | |
| | ATR-FR-CC | | | | | | | | | F |
| | ATR-MR-E | | | | F | F | F | F | F | F |
| | ATR-MR-E-D | | F | | | | | | | |
| | ATR-MR-M | | | | F | | | | | |
| | ATR-MR-W | | | | F | F | F | F | F | F |
| | ATR-MR-W-D | | F | | | | | | | |
| | ATR-SR-E | | | | F | F | F | F | F | F |
| | ATR-SR-M | | | | F | | | | | |
| | ATR-SR-W | | | | F | F | F | F | F | F |
| | EMR-1 | | | | | | | F | | |
| Athabasca River Delta | ARD-1 | | | S | F | F | | F | F | |
| Eastern Tributaries | FIR-1 | | | | | | P S W F | P S W F | P S W F | P S W F |
| | FIR-2 | | | | | | | P S W F | P S W F | P S W F |
| | FIR-2X | | | | | | P S W F | P S | | |
| | FOC-1 | | | | F S | F | F | F | | |
| | MCC-1 | | | F | F | F | F | F | F | P S F |
| | UNC-1 | | | | F | | | | | |

A blank indicates that the data were never collected, or were screened out as outlined in the text.

P – spring; S – summer; W – winter; F – fall.

Table D.2-2 (Cont'd.)

| Region | Station | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|----------------------|---------|------|------|------|------|------|------|------|------|------|
| Lakes | ISL-1 | | S | | F | FS | | | FS | FS |
| | KEL-1 | | FS | | F | FS | F | FW | FS | FS |
| | MCL-1 | | | | F | FS | F | F | | |
| | SHL-1 | | S | PSF | FS | FS | FS | FS | FS | FS |
| Muskeg River | ALD-1 | | | F | | | | | | |
| | JAC-1 | | | F | F | F | F | F | PSF | F |
| | MUC-1 | | F | F | F | F | F | F | PSF | F |
| | MUR-1 | FS | PSF | F | F | F | F | F | F | F |
| | MUR-2 | S | | PSWF | | | | | | |
| | MUR-4 | | | F | | | | | | |
| | MUR-5 | | | PSWF | | | | | | |
| | MUR-6 | | F | PSF | F | F | F | F | F | F |
| | SHC-1 | | | F | | | | | | |
| | STC-1 | | | F | | F | PSWF | PSF | PSF | PSF |
| | WAC-1 | | F | FW | | | | | F | F |
| Southern Tributaries | CHR-1 | | | | | | PSWF | PSWF | PSWF | PSWF |
| | CHR-2 | | | | | | PSWF | PSWF | PSW | PSWF |
| | CLR-1 | | | | | PWF | PSWF | PSWF | PSWF | PSWF |
| | CLR-2 | | | | | PSWF | PSWF | PSWF | PSWF | PSWF |
| | HAR-1 | | | | | | | | PSF | PSF |
| Steepbank River | NSR-1 | | | | | | PSF | PSF | PSF | PSF |
| | STR-1 | PFW | PSF | W | F | F | FW | F | F | F |
| | STR-2 | | | | | | FW | F | F | F |
| | STR-3 | | | | | | | | PSWF | PSF |
| Western Tributaries | BER-1 | | | | | | | FS | FS | FS |
| | CAR-1 | | | | | | PSF | PSF | PSF | PSF |
| | CAR-2 | | | | | | | | | PSF |
| | ELR-1 | | PSF | | | | PSF | PSWF | PSWF | PSWF |
| | ELR-1B | | | | | | | | W | |
| | ELR-2 | | | | | | | | PFW | PSF |
| | MAR-1 | | F | | F | F | FW | F | PSWF | F |
| | MAR-2 | | | | | | FW | PSWF | F | F |
| | POC-1 | | | | F | F | F | F | F | F |
| | TAR-1 | | PSF | | | | PSF | PSF | PSWF | PSF |
| | TAR-2 | | | | | | | | PSF | PSF |

A blank indicates that the data were never collected, or were screened out as outlined in the text.

P – spring; S – summer; W – winter; F – fall.

Table D.2-3 RAMP seasonal water quality cluster membership summary by region.

| Region | Total # of Station/Year/ Season Combinations | Cluster | | |
|------------------------------|---|------------|------------|------------|
| | | 1 | 2 | 3 |
| Athabasca River | 94 | | | 94 |
| Athabasca River Delta | 5 | | | 5 |
| Eastern Tributaries | 49 | 36 | 12 | 1 |
| Firebag River | 34 | 34 | | |
| Fort Creek | 5 | 1 | 4 | |
| McLean Creek | 9 | | 8 | 1 |
| Unnamed Creek | 1 | 1 | | |
| Western Tributaries | 93 | 7 | 78 | 8 |
| Beaver River | 6 | | 6 | |
| Calumet River | 15 | | 15 | |
| Ells River | 25 | 6 | 11 | 8 |
| MacKay River | 19 | 1 | 18 | |
| Poplar Creek | 6 | | 6 | |
| Tar River | 22 | | 22 | |
| Southern Tributaries | 76 | 50 | 18 | 8 |
| Christina River | 31 | 19 | 12 | |
| Clearwater River | 39 | 31 | | 8 |
| Hangingstone River | 6 | | 6 | |
| Muskeg River | 76 | 48 | 24 | 4 |
| Alsands Drain | 1 | | 1 | |
| Jackpine Creek | 9 | 8 | 1 | |
| Muskeg Creek | 12 | 5 | 5 | 2 |
| Muskeg River | 32 | 19 | 11 | 2 |
| Shelley Creek | 2 | | 2 | |
| Stanley Creek | 15 | 12 | 3 | |
| Wapasu Creek | 5 | 4 | 1 | |
| Steepbank River | 38 | 32 | 5 | 1 |
| N. Steepbank River | 12 | 12 | | |
| Steepbank River | 26 | 20 | 5 | 1 |
| Lakes | 39 | 37 | 2 | 0 |
| Isadore's Lake | 8 | 6 | 2 | |
| Kearl Lake | 12 | 12 | | |
| McClelland Lake | 5 | 5 | | |
| Shipyard Lake | 14 | 14 | | |
| Total | 841 | 420 | 278 | 143 |

D.2.3.2 Results of PCA

Data Reduction

Dissolved Metals

The variance in dissolved metals accounted for by first three PCs amounted to 59% of the total for Cluster 1, 58% of the total for Cluster 2, and 61% of the total for Cluster 3 (Table D.2-4).

Table D.2-4 Pearson correlations of input variables with principal components for dissolved metals in each of three clusters.

| Input Variable | Dissolved Metals Summary Variable (Principal Component) | | | | | | | | |
|----------------------|---|--------|--------|------------|--------|--------|------------|--------|--------|
| | Cluster #1 | | | Cluster #2 | | | Cluster #3 | | |
| | PC1 | PC2 | PC3 | PC1 | PC2 | PC3 | PC1 | PC2 | PC3 |
| % Variance Explained | 28.82 | 18.20 | 11.44 | 28.08 | 15.29 | 14.46 | 27.92 | 19.03 | 13.85 |
| Cobalt | 0.836 | -0.08 | -0.079 | 0.709 | -0.34 | -0.455 | 0.642 | 0.482 | 0.042 |
| Uranium | 0.792 | -0.257 | -0.086 | 0.605 | 0.165 | -0.285 | 0.154 | 0.619 | 0.37 |
| Copper | 0.665 | -0.391 | 0.141 | 0.483 | -0.45 | 0.435 | 0.626 | 0.251 | 0.518 |
| Aluminum | 0.617 | 0.302 | 0.082 | 0.53 | -0.342 | 0.466 | 0.719 | 0.023 | 0.218 |
| Arsenic | 0.562 | 0.152 | -0.481 | 0.617 | 0.564 | 0.168 | 0.528 | -0.369 | 0.021 |
| Molybdenum | 0.555 | 0.143 | 0.558 | 0.44 | -0.364 | -0.668 | 0.592 | 0.45 | -0.462 |
| Iron | 0.281 | 0.734 | 0.189 | 0.516 | 0.067 | -0.209 | 0.6 | -0.423 | -0.315 |
| Vanadium | 0.121 | 0.687 | -0.36 | 0.627 | 0.522 | 0.28 | 0.494 | -0.309 | 0.094 |
| Titanium | 0.257 | 0.567 | 0.195 | 0.495 | 0.278 | 0.256 | 0.647 | -0.521 | 0.109 |
| Boron | 0.383 | -0.293 | -0.578 | 0.257 | 0.31 | -0.367 | 0.231 | -0.045 | -0.784 |
| Zinc | 0.303 | -0.474 | 0.372 | 0.403 | -0.565 | 0.318 | 0.144 | 0.726 | -0.346 |

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between input and summary variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between input and summary variables.

Although there are few strong correlations overall between dissolved metals and any of the PCs, PC1 tended to be moderately and positively correlated with a number of variables including dissolved cobalt, uranium, copper, aluminum and arsenic.

Total Metals

The variance in total metals accounted for by first three PCs amounted to 54% of the total for Cluster 1, 71% of the total for Cluster 2, and 78% of the total for Cluster 3 (Table D.2-5).

Total metals correlated strongly with the PCs. In particular, lithium and boron appeared closely correlated to each other, and especially in Cluster 2 and Cluster 3, and appeared poorly correlated with other analytes. Clusters 2 and Cluster 3 are also more similar to each other than to Cluster 1, given their similar correlation patterns, such as the strong correlations of PC1 with nickel, aluminum and molybdenum.

Table D.2-5 Pearson correlations of input variables with principal components for total metals in each of three clusters.

| Input Variable | Dissolved Metals Summary Variable (Principal Component) | | | | | | | |
|----------------------|---|--------|------------|--------|--------|------------|-------|--------|
| | Cluster #1 | | Cluster #2 | | | Cluster #3 | | |
| | PC1 | PC2 | PC1 | PC2 | PC3 | PC1 | PC2 | PC3 |
| % Variance Explained | 29.59 | 24.57 | 31.27 | 23.10 | 16.26 | 39.15 | 20.73 | 17.70 |
| Lithium | 0.818 | -0.437 | 0.156 | 0.915 | -0.037 | 0.198 | 0.875 | -0.198 |
| Boron | 0.718 | -0.372 | 0.04 | 0.897 | 0.146 | -0.193 | 0.774 | -0.48 |
| Barium | 0.641 | -0.283 | 0.425 | 0.172 | -0.764 | 0.649 | 0.16 | 0.525 |
| Nickel | 0.538 | 0.439 | 0.766 | 0.022 | -0.137 | 0.808 | 0.158 | 0.232 |
| Aluminum | 0.118 | 0.85 | 0.689 | -0.314 | 0.425 | 0.885 | -0.18 | -0.187 |
| Iron | 0.277 | 0.6 | 0.773 | 0.02 | 0.031 | 0.899 | -0.11 | -0.331 |
| Molybdenum | 0.475 | 0.509 | 0.486 | 0.158 | 0.632 | -0.229 | 0.412 | 0.812 |
| Zinc | 0.408 | 0.151 | 0.632 | -0.227 | -0.309 | 0.58 | 0.166 | 0.115 |

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between input and summary variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between input and summary variables.

Major Ions

Only two PCs were generated for each of the three clusters in the major ions dataset. The variance in ions accounted for by PCs amounted to 75% of the total for Cluster 1, 76% of the total for Cluster 2, and 80% of the total for Cluster 3 (Table D.2-6).

Table D.2-6 Pearson correlations of input variables with principal components for the major ions for each of three clusters.

| Input Variable | Dissolved Metals Summary Variable (Principal Component) | | | | | |
|----------------------|---|--------|------------|--------|------------|--------|
| | Cluster #1 | | Cluster #2 | | Cluster #3 | |
| | PC1 | PC2 | PC1 | PC2 | PC1 | PC2 |
| % Variance Explained | 42.03 | 32.49 | 57.22 | 18.76 | 51.31 | 28.23 |
| Sulphate | 0.808 | 0.238 | 0.557 | 0.451 | 0.885 | 0.251 |
| Potassium | 0.717 | 0.013 | 0.766 | 0.105 | 0.425 | -0.175 |
| Magnesium | 0.639 | -0.703 | 0.87 | 0.3 | 0.915 | 0.33 |
| Sodium | 0.63 | 0.621 | 0.793 | -0.538 | 0.609 | -0.76 |
| Calcium | 0.625 | -0.694 | 0.788 | 0.37 | 0.866 | 0.409 |
| Chloride | 0.398 | 0.729 | 0.727 | -0.629 | 0.395 | -0.864 |

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between variables.

In all clusters, nearly all the variables correlated strongly or moderately with PC1, indicating that these variables are well correlated with one another. In addition, there is a strong negative correlation between salinity (sodium and chloride) and hardness (magnesium and calcium) in PC2 across all three clusters. While it is not clear why this should be the case, it may be related to saline seeps and the underlying bedrock and geology throughout these regions.

Other Variables

Rank correlations between PCs for each of dissolved and total metals and ions, and other conventional variables were used to further characterize principal components in each of the three clusters (Table D.2-7 to Table D.2-9).

The correlations among principal components and conventional variables are not particularly strong for Cluster 1. This may be a result of the variety of watercourses comprising Cluster 1 (Section D.1.3.2), many of which are small tributaries with highly variable flow regimes that may confound the correlation with conventional variables. The exception is the correlation between conductivity and the first PC for major ions (comprising sulphate, potassium, magnesium, sodium, and calcium). This is not surprising given the contribution that these ions make to conductivity.

Many stronger correlations are exhibited between PCs and conventional variables for Cluster 2. This is particularly true for PC1 (comprising magnesium, sodium, calcium, potassium and sulphate). As such, it is not surprising that variables such as conductivity, which is promoted by these ions, and hardness (magnesium and calcium) are highly correlated with PC1.

Table D.2-7 Rank correlations (*r*-values) between principal components and conventional variables for Cluster 1.

| | Dissolved Metals | | | Total Metals | | Major Ions | |
|------------------|------------------|---------------|---------------|--------------|---------------|---------------|---------------|
| | PC1 | PC2 | PC3 | PC1 | PC2 | PC1 | PC2 |
| Conductivity | 0.275 | -0.45 | -0.034 | 0.514 | -0.489 | 0.856 | -0.326 |
| DOC | 0.015 | 0.072 | -0.267 | 0.048 | -0.205 | -0.212 | -0.045 |
| Hardness | 0.152 | -0.458 | 0.014 | 0.419 | -0.621 | 0.619 | -0.677 |
| pH | -0.176 | -0.109 | -0.421 | 0.15 | -0.318 | 0.105 | -0.164 |
| Total Alkalinity | 0.183 | -0.45 | -0.013 | 0.449 | -0.626 | 0.596 | -0.641 |
| TDS | 0.233 | -0.339 | -0.067 | 0.456 | -0.506 | 0.652 | -0.347 |
| TOC | 0.083 | 0.047 | -0.251 | 0.087 | -0.176 | -0.198 | -0.047 |
| TSS | 0.033 | 0.349 | -0.109 | 0.015 | 0.514 | -0.133 | 0.338 |
| Colour | 0.036 | 0.497 | 0.004 | -0.069 | 0.245 | -0.408 | 0.062 |

DOC – dissolved organic carbon; TDS – total dissolved solids; TOC – total organic carbon; TSS – total suspended solids.

Bold values represent significant correlations where $|r_{0.05(2)}| \geq |0.138|$ for $n=211$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between input and summary variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between input and summary variables.

Table D.2-8 Rank correlations (*r*-values) between principal components and conventional variables for Cluster 2.

| | Dissolved Metals | | | Total Metals | | | Major Ions | |
|------------------|------------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | PC1 | PC2 | PC3 | PC1 | PC2 | PC3 | PC1 | PC2 |
| Conductivity | 0.135 | -0.003 | -0.517 | -0.069 | 0.62 | -0.485 | 0.941 | 0.014 |
| DOC | 0.309 | 0.367 | -0.197 | 0.025 | 0.258 | 0.053 | 0.234 | -0.454 |
| Hardness | 0.016 | -0.118 | -0.561 | -0.074 | 0.478 | -0.61 | 0.827 | 0.273 |
| pH | -0.096 | 0.387 | 0.003 | -0.202 | 0.011 | 0.254 | 0.025 | -0.138 |
| Total Alkalinity | -0.011 | -0.073 | -0.595 | -0.103 | 0.547 | -0.596 | 0.822 | 0.129 |
| TDS | 0.202 | 0.063 | -0.529 | -0.026 | 0.611 | -0.452 | 0.92 | -0.04 |
| TOC | 0.334 | 0.292 | -0.141 | 0.03 | 0.232 | -0.013 | 0.206 | -0.439 |
| TSS | 0.275 | -0.159 | 0.071 | 0.631 | -0.255 | 0.024 | -0.241 | 0.014 |
| Colour | 0.459 | 0.25 | -0.071 | 0.332 | 0.087 | 0.216 | -0.044 | -0.33 |

DOC – dissolved organic carbon; TDS – total dissolved solids; TOC – total organic carbon; TSS – total suspended solids.

Bold values represent significant correlations where $|r_{0.05(2)}| \geq |0.165|$ for $n=141$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between input and summary variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between input and summary variables.

Table D.2-9 Rank correlations (*r*-values) between principal components and conventional variables for Cluster 3.

| | Dissolved Metals | | | Total Metals | | | Major Ions | |
|------------------|------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | PC1 | PC2 | PC3 | PC1 | PC2 | PC3 | PC1 | PC2 |
| Conductivity | -0.254 | 0.603 | -0.109 | -0.494 | 0.246 | 0.504 | 0.915 | -0.165 |
| DOC | 0.361 | -0.435 | -0.178 | 0.465 | 0.129 | -0.549 | -0.666 | 0.081 |
| Hardness | -0.232 | 0.558 | 0.19 | -0.371 | 0.118 | 0.666 | 0.887 | 0.301 |
| pH | -0.341 | -0.113 | 0.557 | -0.106 | -0.313 | 0.127 | 0.097 | 0.25 |
| Total Alkalinity | -0.178 | 0.603 | 0.112 | -0.339 | 0.179 | 0.613 | 0.841 | 0.29 |
| TDS | 0.089 | 0.45 | -0.142 | -0.109 | 0.371 | 0.325 | 0.567 | -0.257 |
| TOC | 0.426 | -0.353 | -0.177 | 0.504 | 0.137 | -0.471 | -0.661 | 0.117 |
| TSS | 0.34 | -0.2 | 0.357 | 0.785 | -0.177 | -0.1 | -0.529 | 0.121 |
| Colour | 0.378 | -0.465 | 0.01 | 0.631 | -0.086 | -0.494 | -0.75 | 0.096 |

DOC – dissolved organic carbon; TDS – total dissolved solids; TOC – total organic carbon; TSS – total suspended solids.

Bold values represent significant correlations where $|r_{0.05(2)}| \geq |0.178|$ for $n=120$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between input and summary variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between input and summary variables.

Moderate to strong positive and negative correlations exist for PC1 of major ions for Cluster 3. A strong correlation also exists between TSS and the total metals PC1 (0.785), which includes iron, nickel, aluminum and zinc. This offers some guidance to explain the high incidence of water quality guidelines exceedances for total iron and aluminum in spring (Table D.2-1). Increased spring river flow causes bed and bank material to become suspended in the water column, increasing the level of total suspended solids (TSS), which contains high levels of iron and aluminum (PC1).

The high correlations between hardness and PC1 of the major ions is not surprising given the elevated loadings of calcium and magnesium, especially for Cluster 2 and Cluster 3. The same is true for conductivity which is a function of the major ions in the water column. The negative correlation between TSS and TDS for PC1 of major ions for all clusters, though not consistently strong, was suggestive of differing water sources that may dominate at different times of the year. For example, spring will have a higher TSS signal than in other seasons, because of a higher proportion of flow coming from snowmelt and a relatively lower proportion of groundwater. The opposite is true in winter, where a higher groundwater proportion will carry a higher dissolved fraction, leading to a negative correlation between suspended and dissolved solids.

Principal Component Plots of Seasonal Patterns

Seasonal characteristics for each cluster were evaluated by examining scatterplots of the primary principal components (i.e., PC1 and PC2) for total metals, dissolved metals and major ions. The axes of these plots are representative of the analytes to the extent indicated by correlations contained in Table D.2-4 to Table D.2-6. The data in the scatterplots are station/season/year combinations, coded by season, and their position in the plot indicates the level to which they correspond with each principal component. Also plotted were the first principal components from different analyte categories for a given cluster, to search for correlations in different seasons among different analyte categories (e.g., PC1 of total metals versus PC1 of major ions).

Distinct seasonal groupings in the scatterplots indicate that at different times of the year, certain groups of analytes will be more prevalent in the aquatic environment than at other times of the year. The converse, however, is not necessarily true. There are other numerous sources of variability in the dataset that may confound or overwhelm the seasonal component, making detection of any potential seasonal clusters possible only after these other sources of variability have been isolated.

A confidence ellipse was charted around each seasonal grouping according to a Gaussian bivariate confidence interval on the centroid. The resulting ellipse is centered on the sample means for each season. The unbiased sample standard deviations of both PC axes determine the major axes of the ellipse and the sample covariance between both PC axes, its orientation. The size of the ellipse was specified by using the Systat default probability of 0.683 (SPSS, 2000).

PC scatterplots for Clusters 1 and 2 reveal little in the way of distinct seasonal patterns (Figure D.2-1, Figure D.2-2); this is broadly true for all of major ions, total and dissolved metals in both of these clusters. There do appear, however, to be noticeably different concentrations of total and dissolved metals at different times of the year. Spring and winter appear to be the most different from one another, across which summer and fall both vary. In other plots not shown for Clusters 1 and 2, this general tendency also appears, with spring and winter showing somewhat distinct groupings, while summer and fall are spread across the range of variability.

Figure D.2-1 Scatterplot of total metals PC1 and PC2, Cluster 1, grouped by season.

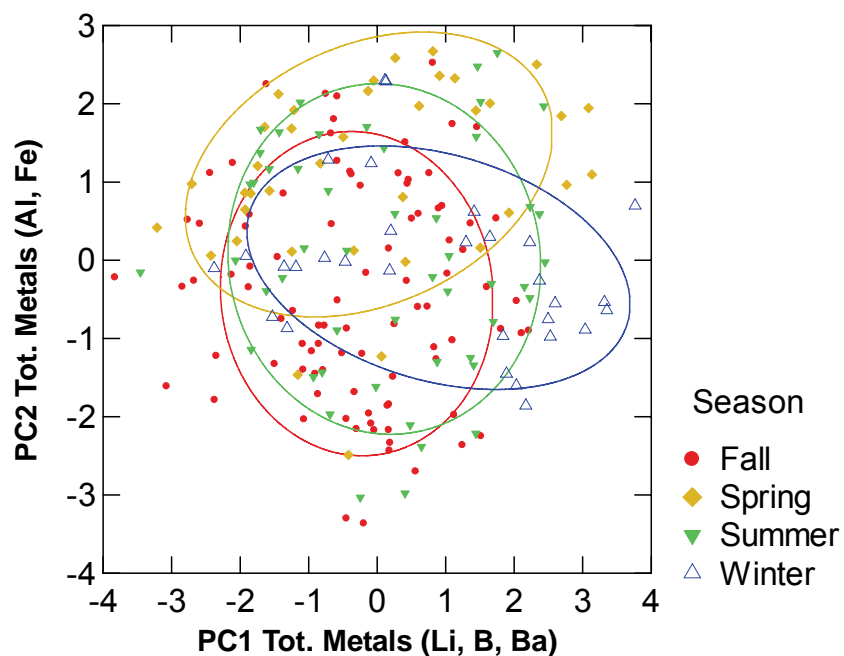
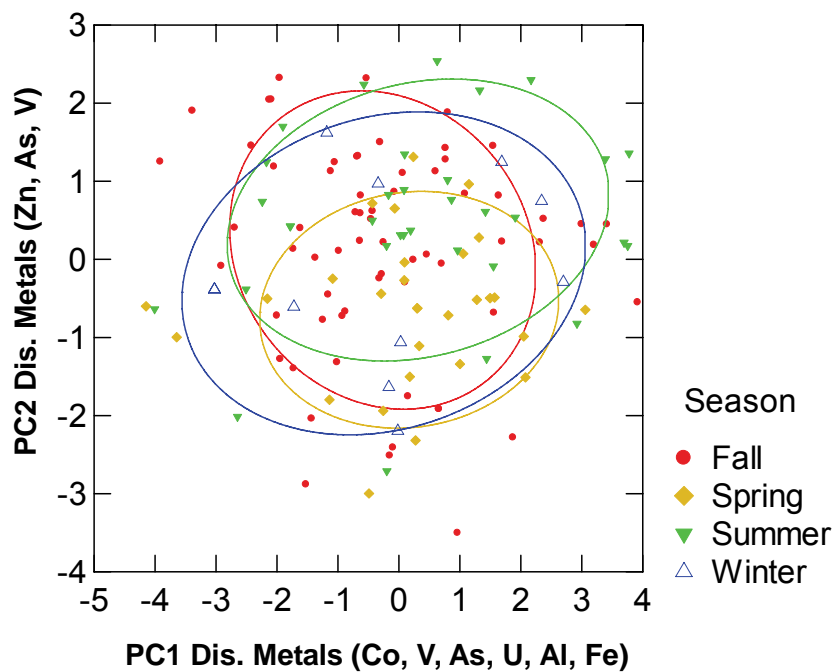


Figure D.2-2 Scatterplot of dissolved metals PC1 and PC2, Cluster #2 grouped by season.



Principal component scatterplots for Cluster 3 (Athabasca River and ARD) have well-resolved seasonal patterns (Figure D.2-3 plots PC1 and PC2, Cluster 3, for total metals, Figure D.2-4 plots PC1 and PC2, Cluster 3, for major ions, and Figure D.2-5 plots PC1 for total metals against PC1 for major ions, Cluster 3).

The stronger seasonal patterning demonstrated in Cluster 3 plots over those of Clusters 1 and 2 are mainly related to the types of watercourses comprising each cluster. As indicated in (Table D.1-6), the cluster memberships for Clusters 1 and 2 are made up of smaller rivers and tributaries spread across numerous regions, each of which will contribute different and variable analyte signals, while Cluster 3 is made up almost entirely of the Athabasca River. The Athabasca River is a major river originating in the Rockies and will thus carry a more coherent signal, remaining largely unaffected by its tributaries. It seems reasonable that if the numerous drivers of variability could be reduced in Clusters 1 and 2, distinct seasonal pattern detection would be more likely. Alternatively, there may be too few years of consistent seasonal sampling for these groupings of tributaries, and that resolved patterns may become more apparent with additional years of seasonal data.

Figure D.2-3 and Figure D.2-4 represent the first two principal components for total metals and major ions for what is largely the Athabasca River. The total metals display groupings that are very distinct in spring and winter, with high metal concentrations in spring, especially for iron and aluminum as represented by PC1, but also for metals represented by PC2. In winter, however, only PC2 metal concentrations are high. The groupings for summer and fall are much more variable and tend to span the range exhibited by spring and winter. The major ions also show distinctly different patterns between spring and winter. Spring has a much lower ion concentration signal than winter for those ions represented by PC1.

Figure D.2-3 Scatterplot of Cluster 3 total metals PC1 and PC2 grouped by season.

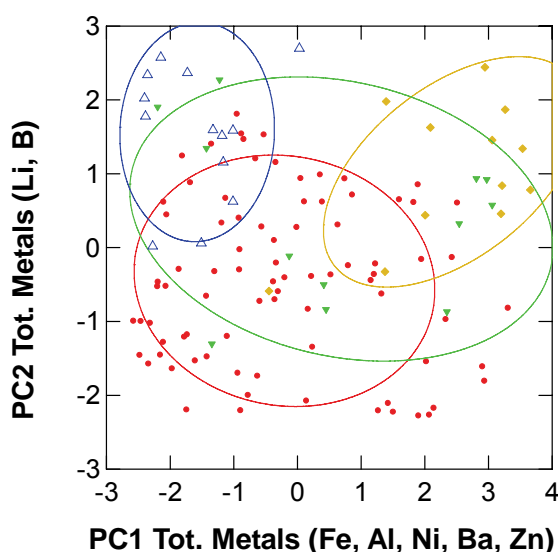


Figure D.2-4 Scatterplot of Cluster 3 major ions PC1 and PC2 grouped by season.

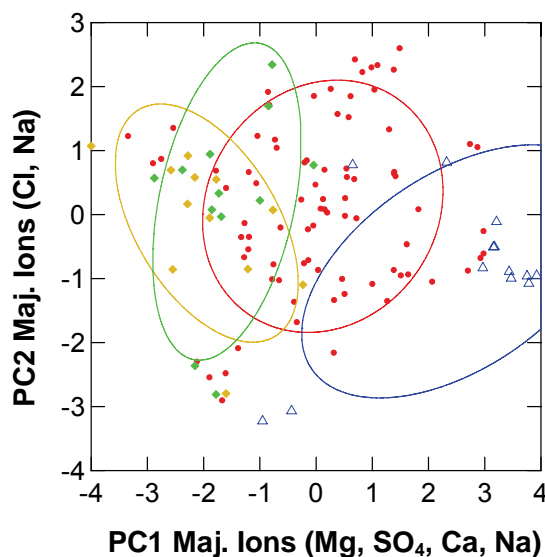


Figure D.2-5 Scatterplot of Cluster 3 total metals PC1 and major ions PC1 grouped by season.

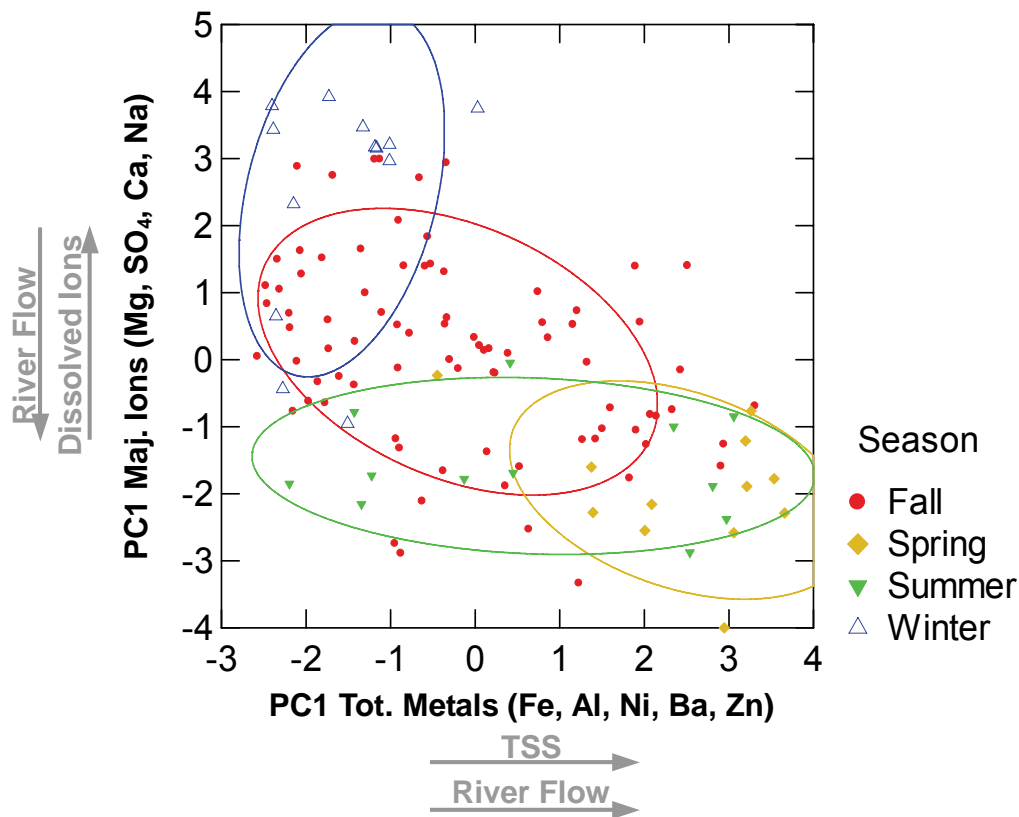


Figure D.2-5 shows the first principal component from each of the total metals and the major ions. Here, the seasonal patterns become more distinctive, and follow the general seasonal river flow regime that might be expected. In spring, there is higher runoff from snowmelt and the increased flow leads to higher suspension of settled material, and lower dissolved ion concentrations. In the winter, however, as precipitation settles on the surface as snow, river flows are lower and made up of a higher groundwater fraction. This influences the capacity of the water to retain suspended solids, which correlates strongly with total metals such as iron and aluminum, while the groundwater contributes a higher dissolved ion signal. The arrows in Figure D.2-5 indicate that as river flow increases, total suspended solids (TSS) increase, while dissolved ions decrease, as can be inferred from the patterning in spring and winter.

D.2.4 Summary of Seasonal Water Quality Data

The fall water quality sampling program is more extensive than other seasons and forms the basis for the bulk of RAMP results and conclusions. The winter, spring and summer programs, however, are undertaken every year to complement these results and conclusions, either by extending confidence in the findings that arise out of the fall data, or by highlighting issues that may not be apparent in the fall dataset.

The analysis investigated the frequency with which analytes exceeded accepted water quality guidelines in different seasons. The findings indicate that while it is often the same analytes that exceed guidelines from season to season (such as aluminum and iron), the number of fall exceedances may be somewhat lower than other seasons, particularly in the Athabasca River, where spring exceedances may be twice as frequent as in fall, and even more so than in winter. A likely explanation for differences in the frequency of guideline exceedance is the strong correlation between total metals and TSS. This suggests that spring run-off from snowmelt is likely the predominant factor for the high concentrations of suspended particulates, which would lead to a higher guideline exceedance frequency for metals such as iron and aluminum.

A more general exploration was also undertaken of the types of seasonal patterns that may be apparent from examining principal components. The findings from the principal component analysis were mixed, depending on a variety of factors. Data from Clusters 1 and 2 showed poor seasonal patterning, while Cluster 3, which largely represented the Athabasca River, clustered into clearly distinguishable patterns.

Although fall data are best suited for general annual reporting, there are specific seasonal issues, particularly apparent in the Athabasca River, that seem to relate to the annual flow regime. Water flowing during spring and winter has different characteristics that arise from different water sources, which influence the frequency with which guidelines are exceeded. Additional seasonal data collection may help to identify seasonal changes that may be occurring at stations outside of the Athabasca River, where seasonal groupings are less clear, though do show a tendency to follow the pattern of the Athabasca River.

D.3 ASSESSMENT OF HISTORICAL CHLOROPHYLL *a* DATA

D.3.1 Introduction

An analysis was performed to determine whether or not changes to chlorophyll *a* data and its relationships with waterborne toxicants and other nutrient indicators were apparent following changes made to sample handling methodology in 2005.

D.3.2 Methods

The endpoints used to evaluate 2005 results against RAMP 1997-2004 results included proportional incidence of non-detectable chlorophyll *a* values, and non-parametric correlations between chlorophyll *a* and other nutrient indicators (i.e., total nitrogen, TKN, total phosphorus, dissolved phosphorus, ammonia-N, BOD, nitrate-nitrite), PCs representing dissolved metals, PCs representing total metals, and PCs representing ions.

To maintain consistency with other RAMP water quality assessments, and because it represents the largest seasonal dataset, only fall chlorophyll *a* data were included in this analysis.

D.3.2.1 Proportion of Non-detectable Chlorophyll *a* Values

Only those stations that were sampled in 2005 and at least once prior to 2005 were included in the analysis, in order to compare the proportion of non-detectable chlorophyll *a* values before and after the change in sample filtration methods in 2005. Percentages of chlorophyll *a* values below, at, or greater than the detection limit

(0.001 mg/L) were calculated for all RAMP sampling years (1997-2005). Results for each year were graphically compared to determine if a change in the proportion of non-detectable chlorophyll *a* values was apparent following the 2005 change in sample preparation methods.

D.3.2.2 Spearman Rank Correlations between Chlorophyll *a* and Other Analytes

Given the large proportion of values near or below detection, chlorophyll *a* data were typically non-normally distributed. Therefore, data were ranked to reduce the effects of non-normality and facilitate non-parametric statistical analyses. Spearman rank correlations were calculated to determine whether significant relationships existed between chlorophyll *a* and other nutrient indicators (i.e., total nitrogen, TKN, total phosphorus, dissolved phosphorus, ammonia-N, BOD, nitrate-nitrite), PCs representing dissolved metals, PCs representing total metals, and PCs representing ions. Derivation of these PCs is discussed in Section D.1.3.1.

Correlations were calculated for three temporal data composites: pre-2005 (1997-2004, inclusive), 2005 data, and 1997-2005. Two-tailed correlations ($\alpha = 0.05$) were used to account for either positive or inverse relationships. Significance was determined by comparing resulting r_s values to critical r_s ; if $r_s > \text{critical } r_s$ then the correlation is significant. The strength of correlations was evaluated as follows:

- Weak correlations: $r_s < |0.5|$;
- Moderate correlations: $|0.5| < r_s < |0.75|$; and
- Strong correlations: $r_s > |0.75|$.

Results of correlations made for each time period were compared qualitatively to determine whether or not relationships between chlorophyll *a* and other water quality analytes were different following the 2005 change in sample preparation methods.

D.3.2.3 Scatterplots between Chlorophyll *a* and Other Analytes

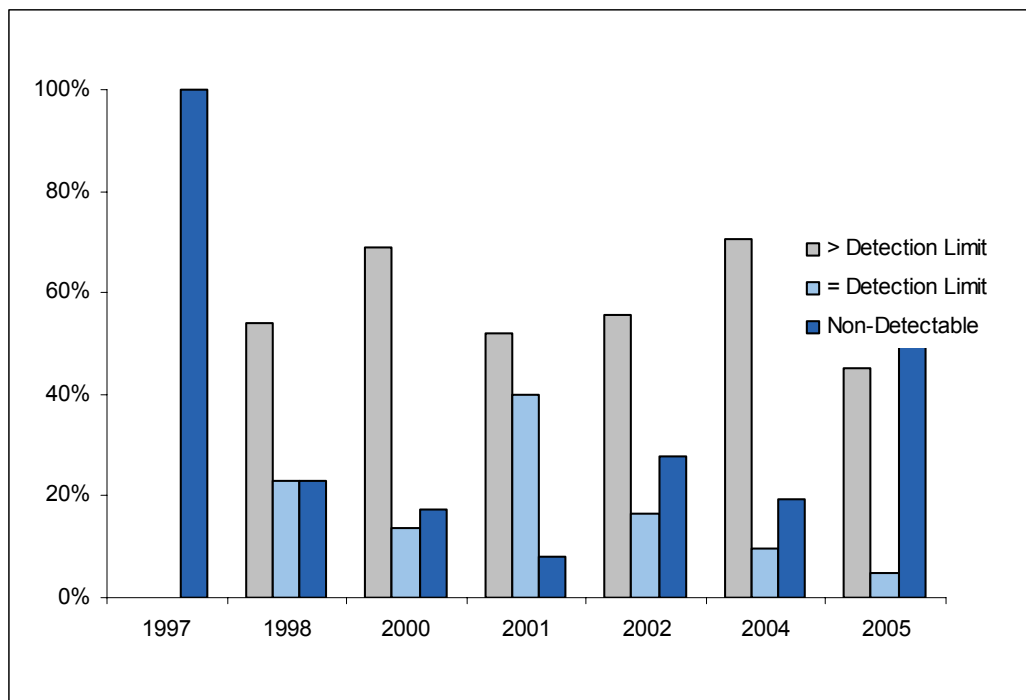
Scatterplots were used to visually assess relationships between chlorophyll *a* and other nutrient indicators (i.e., total nitrogen, TKN, total phosphorus, dissolved phosphorus, ammonia-N, BOD, nitrate-nitrite), principal components (PCs) representing dissolved metals, PCs representing total metals, and PCs representing ions. Data from each location and sampling year (1997-2005) were included on one scatterplot, but results were grouped by station status (operational vs. baseline) and time period (pre-2005 vs. 2005) to compare bivariate relationships before and after the 2005 change in chlorophyll *a* sample preparation methods. Scatterplots were used to visually evaluate the strength and meaningfulness of significant relationships identified by Spearman rank correlations.

D.3.3 Results

The proportion of non-detectable chlorophyll *a* values was clearly higher in 2005 than in preceding years (Figure D.3-1). In fall 2005, 21 of 42 (50%) chlorophyll observations were below the detection limit, and 2 of 42 (5%) were at the detection limit. In 2005, chlorophyll *a* values fell within the range of < 0.001 mg/L (below detection) to 0.026 mg/L; the fall maximum was 0.015 mg/L. These values are classified by the

analytical lab (ETL) as low- to mid-range concentrations, which are associated with ± 12 -20% measurement uncertainty.

Figure D.3-1 Proportion of chlorophyll *a* values greater than, at, and less than detection limit during the fall (1997-2005).



Significant relationships were identified between chlorophyll *a* and some nutrients, ions, and metals when Spearman Rank Correlations were performed using pre-2005 data; fewer significant relationships were identified using 2005 data (Table D.3-1). All significant relationships identified for both pre-2005 and 2005 were classified as weak ($r_s < |0.5|$), and scatterplots confirmed that no meaningful trends were observable between chlorophyll *a* and any of the other water quality analytes measured during the RAMP program (Figure D.3-2 to Figure D.3-5).

D.3.4 Conclusions and Recommendations

Prior to 2005, a large proportion of chlorophyll *a* values fell below analytical detection limits, resulting in a positively-skewed dataset with a high risk of measurement error. Based on the results of this comparative analysis, it is reasonable to conclude that the change in chlorophyll *a* sample handling methodology in 2005 may have decreased the frequency of detectable values, by halting the photosynthesis process more quickly after sample collection through filtering of samples soon after collection. The associated increase in skewness and measurement uncertainty has rendered the chlorophyll *a* data even less effective for incorporation into statistical analyses.

Prior to 2005, chlorophyll *a* did not exhibit strong or meaningful relationships with other waterborne chemicals, including metals or other, more direct, measures of nutrient status, such as concentrations of nitrogen or phosphorus in water. In 2005, relationships were even weaker, indicating that the change in sampling methods did not increase the utility or significance of chlorophyll *a* data in identifying potential effects on water quality in the RAMP monitoring area. It is therefore recommended that strong consideration be given to the elimination of chlorophyll *a* as an analyte in the RAMP Water Quality Component.

Table D.3-1 Results of Spearman Rank Correlation analyses between fall values for chlorophyll *a* and nutrients, dissolved metals (PCs), ions (PCs), and total metals (PCs).

| | 1997-2004 | 2005 | 1997-2005 |
|-----------------|---------------|---------------|---------------|
| Ammonia-N | 0.123 | 0.149 | 0.129 |
| BOD | 0.001 | n/a | 0.006 |
| Nitrate+Nitrite | -0.031 | -0.134 | -0.043 |
| Dissolved P | 0.008 | -0.254 | -0.082 |
| Total P | 0.331 | 0.212 | 0.280 |
| TKN | -0.183 | -0.124 | -0.170 |
| Total Nitrogen | -0.179 | -0.124 | -0.169 |
| DISSMPC1 | 0.129 | 0.108 | 0.124 |
| DISSMPC2 | -0.217 | -0.473 | -0.280 |
| DISMPC3 | -0.193 | -0.268 | -0.177 |
| DISMPC4 | 0.048 | 0.326 | 0.106 |
| IONPC1 | -0.099 | 0.077 | -0.047 |
| IONPC2 | 0.324 | 0.230 | 0.297 |
| IONPC3 | -0.045 | -0.393 | -0.121 |
| TOTMPC1 | 0.365 | 0.286 | 0.345 |
| TOTMPC2 | -0.157 | -0.271 | -0.184 |
| TOTMETPC3 | -0.141 | 0.119 | -0.071 |
| TOTMETPC4 | -0.131 | 0.185 | -0.075 |

Bold values = significant (> critical r_s).

Figure D.3-2 Scatterplots showing relationships between fall values for chlorophyll *a* and nutrients.

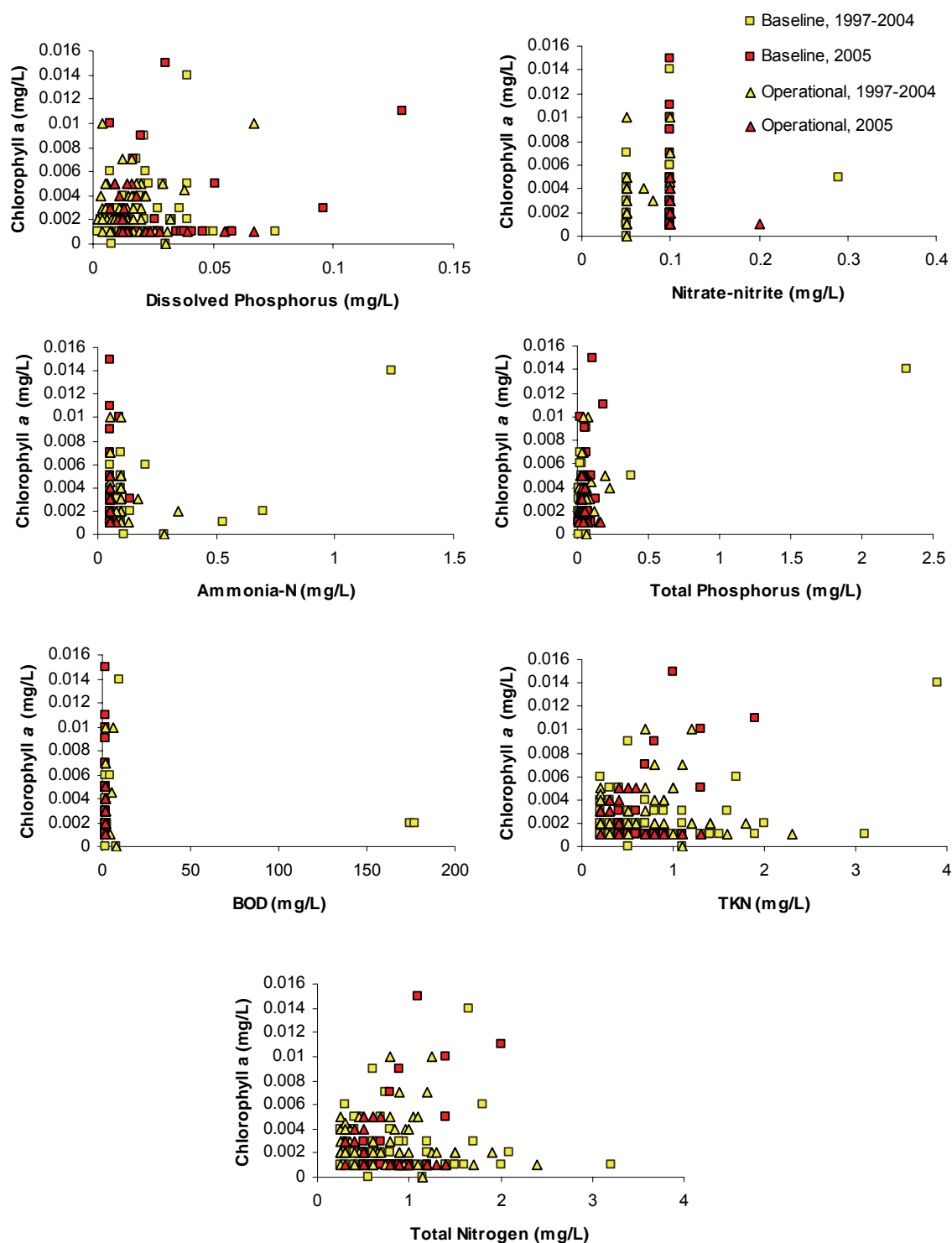


Figure D.3-3 Scatterplots showing relationships between fall values for chlorophyll *a* and dissolved metals (PCs).

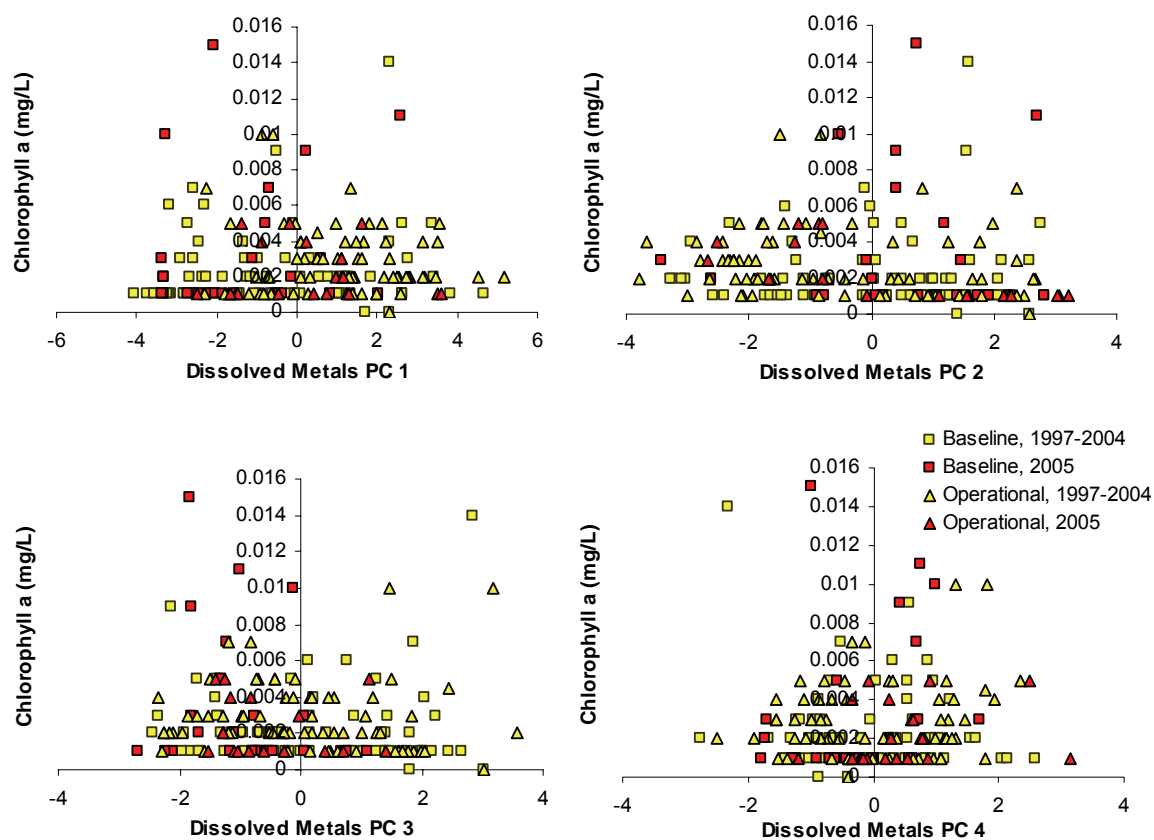


Figure D.3-4 Scatterplots showing relationships between fall values for chlorophyll *a* and total metals (PCs).

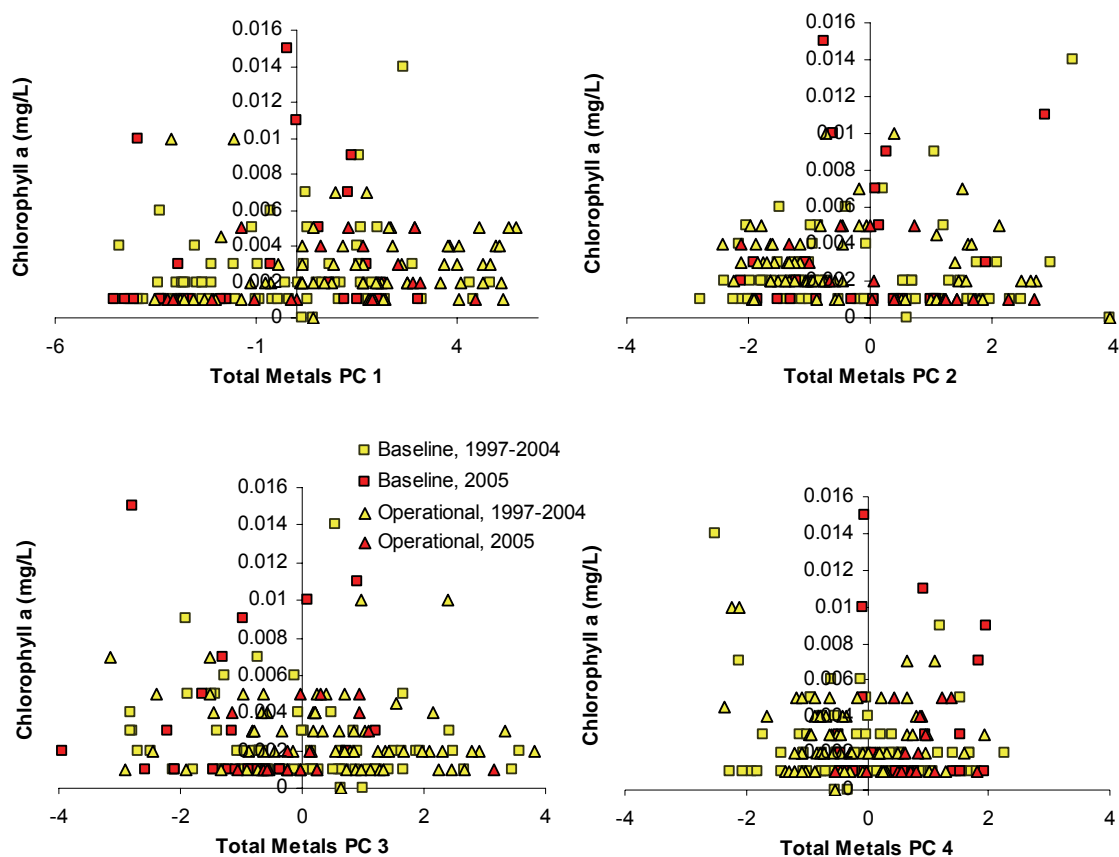
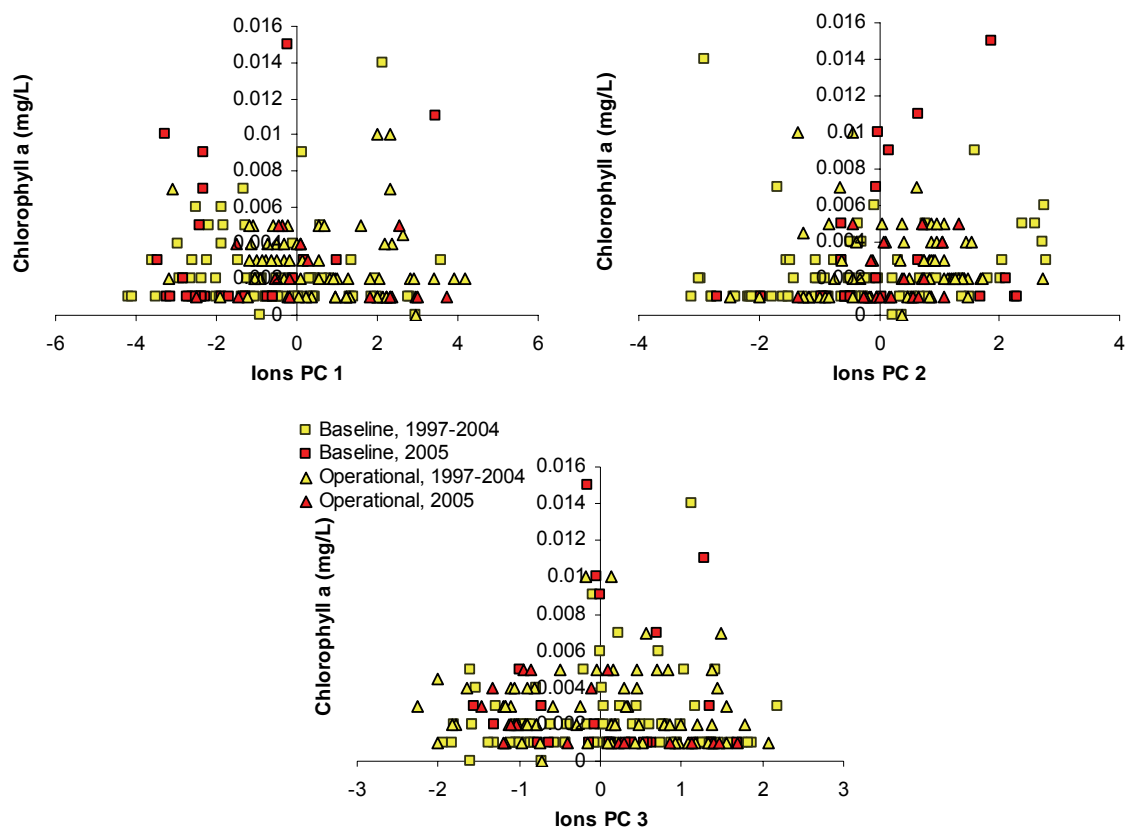


Figure D.3-5 Scatterplots showing relationships between fall values for chlorophyll a and ions (PCs).



Appendix E
Sediment Quality Component

E.0 SEDIMENT QUALITY COMPONENT

E.1 PCA AND CLUSTER ANALYSIS OF SEDIMENT QUALITY DATA

E.1.1 Introduction

RAMP sediment quality data from 1997 to 2005 for the Athabasca River, Athabasca River Delta (ARD), tributaries of the Athabasca River within the RAMP FSA, and 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 (Jones and Boyer 2002). Correlation analyses were used to evaluate relationships within and between groups of chemical and conventional variables. More information on this approach is described in Appendix D.

The historical sediment chemistry dataset included 60 monitoring stations, which were monitored in the fall for 1 to 9 years, for a total of 195 station/year combinations (Table E.1-1).

E.1.2 Methods

E.1.2.1 Principal Components Analysis

Principal Components Analysis (PCA) was used to reduce the sediment chemistry dataset and to facilitate broad comparisons of sediment quality among stations. Separate analyses were conducted on the total metals and PAH datasets. Data preparation and analyses were conducted using the same methods used for the water quality dataset, which are described in Appendix D.

E.1.2.2 Cluster Analysis

Hierarchical and K-means cluster analysis were conducted in accordance with procedures described in Appendix D, except for the following deviations. Cluster analysis was conducted on the total metals and PAHs principal components, as well as grain size, total organic carbon (TOC), and total inorganic carbon (TIC). Due to the large differences in magnitudes among these chemical and physical variables, data were standardized to z-scores prior to conducting the analyses.

Relationships among variables used in cluster analysis were evaluated using rank correlations.

E.1.3 Results

E.1.3.1 Principal Components Analysis

Data Screening

Analytes with missing values for 15% or more of station/year combinations or non-detectable values for 50% or more of station/year combinations were excluded from the dataset. Variables excluded included:

- **Non-detectable values** – PAHs including acenaphthylene, anthracene, dibenz[ah]anthracene, methyl methyl acenaphthene, and methyl-biphenyl, and metals including antimony, bismuth, cadmium, mercury, silver, and tin; and

- **Missing values** – PAHs including 1-methylnaphthalene, 1-methylphenanthrene, 2,3,5- trimethylnaphthalene, 2,6-dimethylnaphthalene, 2-methylnaphthalene, and, 3,6-dimethylphenanthrene, and metals including aluminum, antimony, bismuth, boron, calcium, iron, magnesium, manganese, phosphorus, potassium, sodium, sulphur, tin, and titanium.

Table E.1-1 RAMP sediment quality stations included in the historical dataset, 1997 to 2005.

| Region | Station | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|------------------------------|-------------|------|------|------|------|------|------|------|------|------|
| Athabasca River | ATR-DC-CC | √ | | | | | | | | |
| | ATR-DC-E | | √ | | √ | √ | √ | √ | √ | |
| | ATR-DC-W | | √ | | √ | √ | √ | √ | √ | |
| | ATR-DD-E | | | | | | √ | √ | √ | |
| | ATR-DD-W | | | | | | √ | √ | √ | |
| | ATR-ER | | | | √ | √ | √ | √ | √ | |
| | ATR-FC-CC-D | √ | | | | | | | | |
| | ATR-FC-E | | | | √ | √ | √ | √ | | |
| | ATR-FC-E-D | | √ | | | | | | | |
| | ATR-FC-W | | | | √ | √ | √ | √ | | |
| | ATR-FC-W-D | | √ | | | | | | | |
| | ATR-FR-E | | | | | | √ | √ | √ | |
| | ATR-FR-W | | | | | | √ | √ | √ | |
| | ATR-MR-E | | | | √ | √ | √ | √ | √ | |
| | ATR-MR-E-D | | √ | | | | | | | |
| | ATR-MR-W | | | | √ | √ | √ | √ | √ | |
| | ATR-MR-W-D | | √ | | | | | | | |
| | ATR-SR-E | | | | √ | √ | √ | √ | √ | |
| | ATR-SR-W | | | | √ | √ | √ | √ | √ | |
| | ATR-UFM | | | | | | √ | √ | √ | |
| Athabasca River Delta | BPC | | | √ | √ | √ | √ | √ | | √ |
| | FLB | | | | √ | | | | | |
| | FLC | | | | | √ | √ | √ | | √ |
| | GIC | | | | | √ | √ | √ | | √ |
| | ARD-1 | | | √ | √ | | | | | |
| | ARD-2 | | | | | | | | | |
| | ATR-OF* | | | | | | | | | √ |
| | BEC* | | | | | | | | | √ |
| | BPC-2* | | | | | | | | | √ |
| | CC-1* | | | | | | | | | √ |
| | E-A* | | | | | | | | | √ |
| | EMR-1* | | | | | | | | | √ |
| | JC-1* | | | | | | | | | √ |

* One-time extensive survey of ARD sediments conducted in 2005.

Table E.1-1 (Cont'd.)

| Region | Station | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|--|---------|------|------|------|------|------|------|------|------|------|
| Eastern Tributaries | FIR-1 | | | | | | √ | √ | √ | √ |
| | FIR-2 | | | | | | | √ | √ | √ |
| | FIR-2X | | | | | | √ | | | |
| | FOC-1 | | | | √ | | √ | | | |
| | MCC-1 | | | √ | √ | √ | √ | | | √ |
| Western Tributaries | CAR-1 | | | | | | √ | | √ | |
| | CAR-2 | | | | | | | | | √ |
| | ELR-1 | | √ | | | | √ | √ | √ | √ |
| | ELR-2 | | | | | | | | √ | √ |
| | MAR-1 | √ | √ | | | √ | √ | | √ | |
| | MAR-2 | | | | | √ | | | √ | |
| | POC-1 | √ | | | | | √ | | √ | |
| | TAR-1 | | √ | | | | √ | √ | √ | √ |
| | TAR-2 | | | | | | | | √ | √ |
| Southern Tributaries (south of Fort McMurray) | CHR-1 | | | | | | √ | √ | √ | |
| | CHR-2 | | | | | | √ | √ | √ | |
| | CLR-1 | | | | | √ | √ | √ | | |
| | CLR-2 | | | | | √ | √ | √ | | |
| | HAR-1 | | | | | | | | √ | |
| Muskeg River | JAC-1 | √ | | | | | | | √ | |
| | MUR-1 | √ | √ | √ | √ | √ | √ | √ | √ | |
| | MUR-1b | | | | √ | | | √ | | |
| | MUR-2 | | | | √ | | | √ | √ | |
| | MUR-4 | √ | | | √ | | | √ | | |
| | MUR-5 | | | | √ | | | √ | | |
| | MUR-6 | | | | √ | | | √ | | |
| | MUR-D2 | | | | | | | √ | √ | |
| | STC-1 | | | | | | | √ | | |
| Steepbank River | NSR-1 | | | | | | √ | √ | √ | √ |
| | STR-1 | √ | √ | | | | √ | | | √ |
| | STR-2 | | | | | | √ | | | √ |
| | STR-3 | | | | | | | | | √ |
| Lakes | ISL-1 | | | | | √ | | | | |
| | KEL-1 | | | | | √ | | | √ | |
| | MCL-1 | | | | | | √ | √ | | |
| | SHL-1 | | | | | √ | √ | √ | √ | |

* One-time extensive survey of ARD sediments conducted in 2005.

Data Reduction

Two separate PCAs were conducted on the total metals and PAHs datasets.

Total Metals The total metals PCA produced two principal components (PCs) which accounted for a total of 83% (75% and 8%, respectively) of the variance in the dataset. The relationships between the input variables and output summary variables are summarized in Table E.1-2.

Table E.1-2 Pearson correlations of input variables with output summary variables (i.e., principal components) for total metals dataset.

| Input Variable | Summary Variable (Principal Component) | |
|----------------|--|------------|
| | SEDMET PC1 | SEDMET PC2 |
| Lead | 0.96 | -0.02 |
| Cobalt | 0.95 | 0.10 |
| Nickel | 0.95 | 0.02 |
| Copper | 0.94 | 0.15 |
| Chromium | 0.91 | -0.03 |
| Barium | 0.91 | 0.23 |
| Vanadium | 0.91 | 0.03 |
| Zinc | 0.87 | 0.32 |
| Uranium | 0.87 | -0.30 |
| Arsenic | 0.87 | 0.14 |
| Strontium | 0.86 | 0.17 |
| Thallium | 0.83 | -0.35 |
| Beryllium | 0.78 | -0.52 |
| Selenium | 0.74 | 0.41 |
| Molybdenum | 0.66 | -0.51 |

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) exists between the input variable and summary variable (i.e., PC).

SEDMET PC1 explained most of the variance in the dataset and was strongly or moderately correlated with all of the input variables. SEDMET PC2 exhibited moderate correlations with beryllium and molybdenum; however, these variables exhibited stronger loadings with SEDMET PC1. SEDMET PC2 was not used in subsequent correlation analyses because of its accounting for such a small portion of the variance in the dataset, but was used in the cluster analyses.

PAHS The PAHS PCA produced a total of three PCs, the first two of which accounted for 82% (75% and 8%, respectively) of the variability in the sediment chemistry dataset. The relationships between the input variables and output summary variables are summarized in Table E.1-3.

Table E.1-3 Pearson correlations of input variables with output summary variables (i.e., principal components) for PAH dataset.

| Input Variable | Summary Variable (Principal Component) | |
|---------------------------------|--|------------|
| | SEDORG PC1 | SEDORG PC2 |
| C1-Phenanthrenes/Anthracenes | 0.96 | 0.11 |
| C1-Dibenzothiophenes | 0.96 | 0.08 |
| C1-Fluoranthenes/Pyrenes | 0.96 | 0.13 |
| Chrysene | 0.95 | 0.14 |
| Pyrene | 0.95 | -0.02 |
| C2-Phenanthrenes/Anthracenes | 0.95 | 0.18 |
| C2-Dibenzothiophenes | 0.95 | 0.20 |
| Benz[a]anthracene | 0.94 | 0.00 |
| C1-Phenanthrenes/Anthracenes | 0.93 | -0.09 |
| C2-Benzofluoranthenes/Pyrenes | 0.93 | 0.15 |
| Benzo[a]pyrene | 0.93 | 0.02 |
| Dibenzothiophene | 0.92 | -0.11 |
| Benzo[b/j/k]fluoranthene | 0.92 | -0.01 |
| C4-Naphthalenes | 0.91 | 0.17 |
| Benzo[ghi]perylene | 0.91 | 0.07 |
| Fluoranthene | 0.89 | -0.23 |
| C2-Fluorenes | 0.89 | 0.16 |
| C2-Fluoranthenes/Pyrenes | 0.88 | 0.19 |
| Phenanthrene | 0.88 | -0.33 |
| C3-Naphthalenes | 0.88 | -0.23 |
| C3-Dibenzothiophenes | 0.88 | 0.29 |
| C1-Fluorenes | 0.88 | -0.10 |
| Indeno[1,2,3-cd]pyrene | 0.87 | 0.04 |
| C4-Phenanthrenes/Anthracenes | 0.86 | 0.19 |
| C2-Benzofluoranthenes/Pyrenes | 0.86 | 0.31 |
| C2-Benz[a]anthracenes/Chrysenes | 0.85 | 0.30 |
| C1-Benzofluoranthenes/Pyrenes | 0.83 | 0.32 |
| C2-Fluorenes | 0.82 | 0.21 |
| C1-Benz[a]anthracenes/Chrysenes | 0.82 | 0.25 |
| C4-Dibenzothiophenes | 0.82 | 0.26 |
| Fluorene | 0.81 | -0.47 |
| Acenaphthene | 0.80 | -0.24 |
| Retene | 0.78 | -0.11 |
| Dimethyl-Biphenyl | 0.72 | -0.19 |
| C2-Naphthalenes | 0.67 | -0.62 |
| Biphenyl | 0.60 | -0.61 |
| Naphthalene | 0.54 | -0.73 |
| C1-Naphthalenes | 0.51 | -0.69 |

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) exists between the input variable and summary variable (i.e., PC).

All of the PAHs were strongly or moderately correlated with SEDPAH PC1. Four of the PAHs, biphenyl, C1 naphthalene, C2-naphthalene, and naphthalene, also exhibited similar or greater moderate negative correlations with SEDPAH PC2 (Table E.1-3). These are the lowest molecular weight and most volatile PAHs measured by RAMP, which may suggest that PAH PC2 is representative of recently exposed or deposited PAHs. SEDPAH PC1 was used to represent these chemicals in subsequent analysis; however, because the correlations between these PAHs and the PCs were negative, any negative correlations observed with other variables will represent positive correlations (i.e., negative correlation + negative correlation = positive correlation).

Relationships among Principal Components

Rank correlations (Table E.1-4) were used to assess whether any strong relationships exist among the PCs. Only one moderate correlation was observed between SEDMET PC1 and SEDPAH PC2. This correlation indicates that concentrations of most metals are positively related to the concentrations of biphenyl, C1 naphthalene, C2-naphthalene, and naphthalene.

Table E.1-4 Rank correlations (r_s) among principal components.

| | SEDMET PC1 | SEDPAH PC1 |
|------------|--------------|------------|
| SEDMET PC1 | - | - |
| SEDPAH PC1 | 0.40 | - |
| SEDPAH PC2 | -0.59 | -0.03 |

Bold values represent significant correlations where $|r_s| \geq |0.14|$ for $n = 195$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between variables.

Dark shading indicates a strong correlation ($r > |0.75|$) exists between variables.

E.1.3.2 Cluster Analysis

Cluster Membership

Based on results of hierarchical cluster analysis, k-means cluster analysis was conducted using four clusters. The cluster membership for each region is presented in Table E.1-5.

The first cluster is comprised of a total of 76 station/year combinations, including almost all of the southern tributary and Steepbank River station observations, and approximately half of the eastern tributary (Firebag River and McLean Crerek), Muskeg River (variety of stations), and western tributary (Calumet River, Ells River, MacKay River, Tar River, and Poplar Creek) station observations. This cluster also includes about a quarter of the Athabasca River station observations (upstream of Donald Creek, Firebag River, Steepbank River, and downstream of development) and two ARD observations (Old Fort and Fletcher Channel).

The second cluster, which includes 70 station/year combinations, represents almost all of the ARD stations and almost half of the Athabasca River stations (upstream of Embarras River, Fort Creek, Muskeg River, Steepbank River, Fort McMurray, and downstream of development). This cluster also contains a third of the western tributaries (Calumet

River, Ells River, MacKay River, Tar River, and Poplar Creek), one of the southern tributaries (Clearwater River upstream of Fort McMurray in 2002), two of the Muskeg River station observations (mouth in 2002 and 2005), two of the eastern tributaries (Fort Creek in 2002 and McLean Creek in 1999), and a third of the regional lake station observations (Isadore's and Shipyard lakes).

Table E.1-5 Summary of cluster membership by region.

| Waterbody | Total No. of Station/Year Combinations | Cluster | | | |
|------------------------------|--|-----------|-----------|-----------|-----------|
| | | 1 | 2 | 3 | 4 |
| Athabasca River | 67 | 17 | 30 | 0 | 20 |
| Athabasca River Delta | 23 | 2 | 21 | 0 | 0 |
| Eastern tributaries | 13 | 8 | 2 | 0 | 3 |
| Fort Creek | 2 | 0 | 1 | 0 | 1 |
| McLean Creek | 5 | 2 | 1 | 0 | 2 |
| Firebag River | 6 | 6 | 0 | 0 | 0 |
| Regional lakes | 9 | 0 | 3 | 6 | 0 |
| Isadore's Lake | 1 | 0 | 1 | 0 | 0 |
| Kearl Lake | 2 | 0 | 0 | 2 | 0 |
| Shipyard Lake | 4 | 0 | 2 | 2 | 0 |
| McLelland Lake | 2 | 0 | 0 | 2 | 0 |
| Muskeg River | 28 | 14 | 2 | 6 | 6 |
| Muskeg River | 25 | 13 | 2 | 5 | 5 |
| Jackpine Creek | 2 | 1 | 0 | 0 | 1 |
| Stanley Creek | 1 | 0 | 0 | 1 | 0 |
| Southern tributaries | 14 | 13 | 1 | 0 | 0 |
| Clearwater River | 6 | 5 | 1 | 0 | 0 |
| Christina River | 6 | 6 | 0 | 0 | 0 |
| Hangingstone River | 2 | 2 | 0 | 0 | 0 |
| Steepbank River | 11 | 9 | 0 | 0 | 2 |
| North Steepbank River | 4 | 4 | 0 | 0 | 0 |
| Steepbank River | 7 | 5 | 0 | 0 | 2 |
| Western tributaries | 29 | 13 | 10 | 1 | 5 |
| Mackay River | 7 | 2 | 3 | 0 | 2 |
| Calumet River | 4 | 2 | 1 | 1 | 0 |
| Ells River | 8 | 4 | 3 | 0 | 1 |
| Poplar Creek | 3 | 1 | 1 | 0 | 1 |
| Tar River | 7 | 4 | 2 | 0 | 1 |
| Total | 195 | 76 | 70 | 13 | 36 |

The third cluster includes 13 stations. These are comprised of almost all of the regional lake stations/sampling events (excluding Isadore's Lake), a quarter of the Muskeg River stations (Muskeg River and Stanley Creek), and one of the western tributary observations (Calumet River upstream of CNRL in 2005).

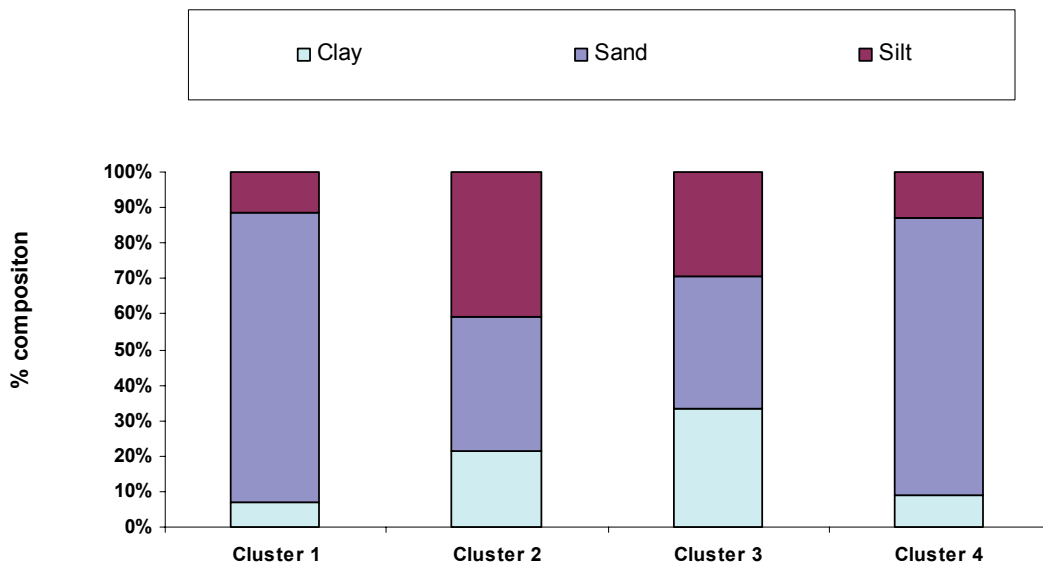
The fourth cluster, which includes 36 stations, include a approximately a quarter of the Athabasca River stations (upstream of Donald Creek, Fort Creek, Muskeg River), and the Steepbank River), eastern tributaries (Fort Creek And McLean Creek), Muskeg River stations (Muskeg River and Jackpine Creek), two Steepbank River stations (mouth in 1997 and 1998), and five western tributary station observations (various station observations).

Cluster Characteristics

The characteristics of each cluster were evaluated by examining scatterplots of variables used for cluster analysis including the primary principal components (i.e., PC1 and PC2) for metals and PAHs, as well as grain size, and TOC and TIC, to identify trends in sediment quality common to each cluster.

Grain Size The average sediment composition of each cluster is presented in Figure E.1-1. Stations grouped with Clusters 1 and 4 exhibited sediments composed primarily of sand with low percentages of fines (i.e., silt and clay); these stations include almost all of the southern tributary, Steepbank River, and eastern tributary station/year combinations, and more than half of the Athabasca River, Western tributary, and Muskeg River station/year combinations. Stations grouped with Clusters 2 and 3 exhibited higher percentages of fines and lower percentages of sand. These stations include the depositional ARD and regional lake stations, and a third of the Muskeg River and Western tributary station observations (i.e., sampling events).

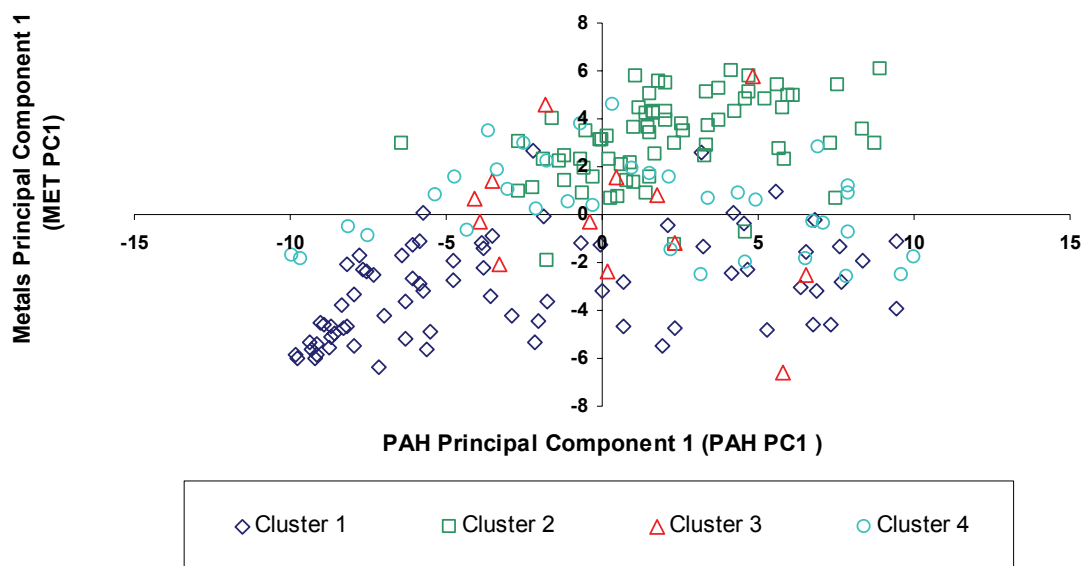
Figure E.1-1 Average percent clay, sand, and silt in sediments of stations grouped with each cluster.



Metals and PAHs The first PC for metals (i.e., SEDMET PC1) was plotted against both of the PAHs principal components (i.e., SEDPAH PC1 and PC2) to determine if there were any spatial patterns in metals and PAHs concentrations that were driving the cluster groupings. The second metals PC was not plotted against the first metals PC or PAHs PC because it accounted for a very small percentage of the variability in metals that was better explained by the first PC.

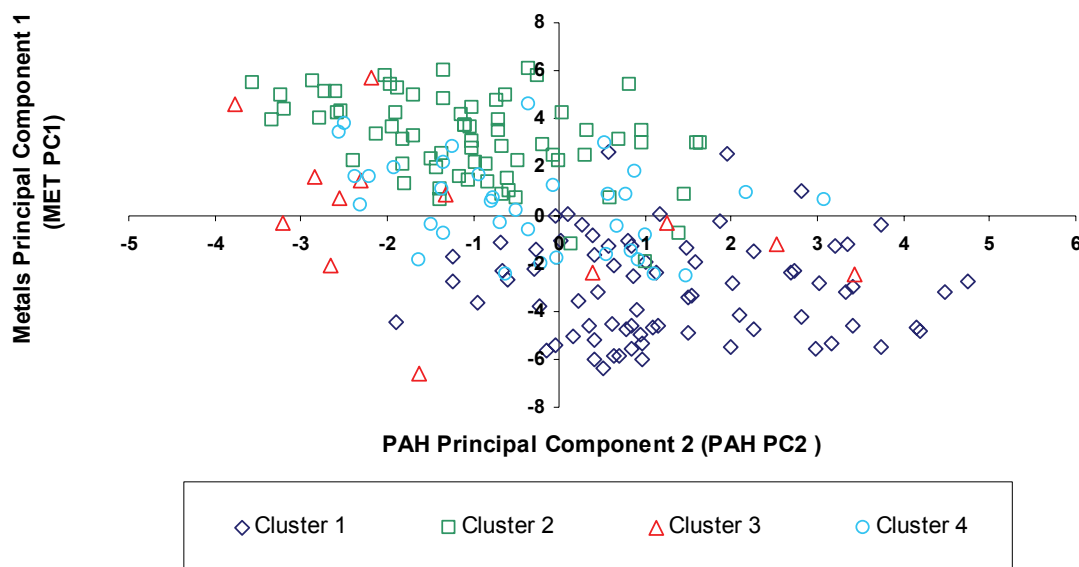
Four clusters are apparent in the first plot of SEDMET PC1 and SEDPAH PC1, (Figure E.1-2). Clusters 1 and 2 are distinct from one another, while Clusters 3 and 4 overlap with one another between Clusters 1 and 2. Cluster 1, representing almost all of the southern tributary and Steepbank River station observations, along with half of the eastern tributary, Muskeg River, and western tributary station observations and a quarter of the Athabasca River station observations, was characterized by a range of PAH PC1 scores and negative MET PC1 scores. These scores indicate that these stations exhibit low concentrations of most metals and variable concentrations of PAHs. Cluster 2, representing almost all of the ARD stations and about half of the Athabasca River stations, along with a third of the western tributaries and regional lake stations, exhibited positive MET PC1 and PAH PC1 indicating these stations exhibited high concentrations of metals and PAHs. Stations grouped with Cluster 3 (regional lakes and Muskeg River) and Cluster 4 (one quarter of Athabasca River stations and a small number of eastern tributary, Muskeg River, Steepbank River, and western tributaries) were not tightly grouped, exhibiting a range of metal and PAH concentrations.

Figure E.1-2 Scatterplot of total metal principal component 1 (SEDMET PC1) and PAHs principal component 1 (SEDPAH PC1) grouped by cluster number.



A plot of SEDMET PC1 against SEDPAH PC2, which represents low molecular constituents including biphenyl, C1 naphthalene, C2-naphthalene, and naphthalene, is presented in Figure E.1-3. As was observed in Figure E.1-2, Clusters 1 and 2 are distinct from one another, while Clusters 3 and 4 exhibit a wide range of values that fall in between these two clusters. Cluster 1 exhibits low MET PC1 scores and high PAH PC2 scores indicating these stations had low concentrations of metals and biphenyl, C1 naphthalene, C2-naphthalene, and naphthalene (recall that these PAHs were negatively correlated with the principal component). Cluster 2 had positive MET PC1 and negative PAH PC2 scores, indicating that these stations had high concentrations of metals and biphenyl, C1 naphthalene, C2-naphthalene, and naphthalene. Clusters 3 and 4 exhibited a range of MET PC1 and PAH PC2 scores indicating these stations had variable concentrations of metals and biphenyl, C1 naphthalene, C2-naphthalene, and naphthalene.

Figure E.1-3 Scatterplot of total metal principal component 1 (SEDMET PC1) and PAHs principal component 2 (SEDPAH PC2) grouped by cluster number.



TIC/TOC Figure E.1-4 illustrates average TIC and TOC composition in sediments for each cluster. TIC and TOC concentrations are generally similar among stations grouped with Clusters 1, 2, and 4 and dissimilar to stations grouped with Cluster 3. Cluster 3, which represents the regional lakes and a quarter of the Muskeg River stations, exhibits a much higher range of TOC concentrations.

Relationships between Variables used for Cluster Analysis Rank correlations were used to evaluate the relationships between variables used for cluster analysis (Table E.1-6).

Figure E.1-4 Average percent TIC and TOC in sediments of stations grouped with each cluster.

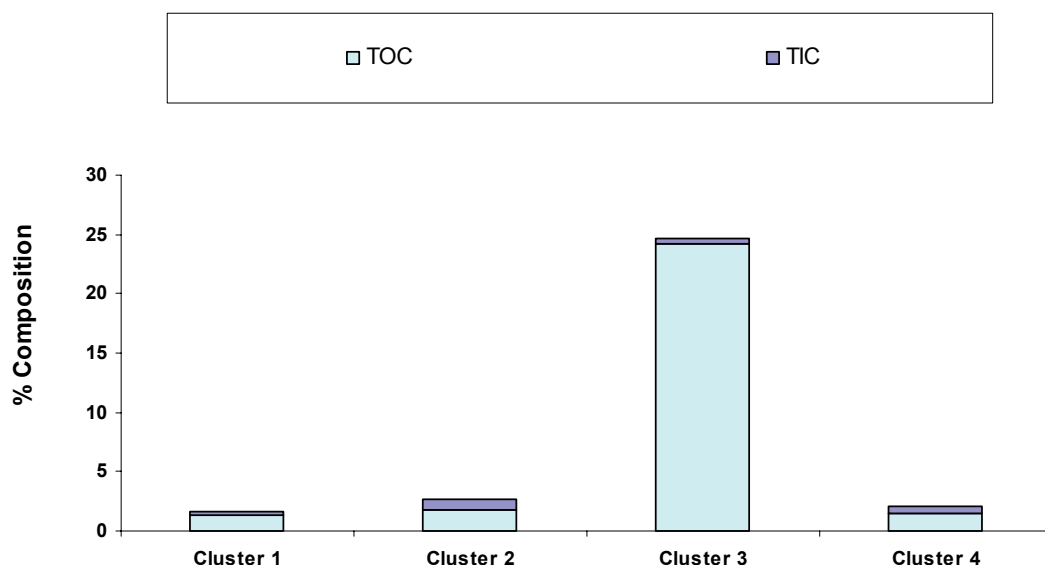


Table E.1-6 Rank correlations (r_s) between principal components, grain size, TOC, and TIC.

| Rank Correlations (r_s) | | | | | | | | | |
|-----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | MET PC1 | METPC2 | PAH PC1 | PAH PC2 | PAHPC3 | TOC | TIC | % Clay | % Sand |
| MET PC1 | | | | | | | | | |
| MET PC2 | 0.00 | 1.00 | | | | | | | |
| PAH PC1 | 0.40 | -0.09 | | | | | | | |
| PAH PC2 | -0.59 | 0.03 | -0.03 | | | | | | |
| PAH PC3 | -0.15 | -0.26 | -0.05 | 0.13 | | | | | |
| TOC | 0.32 | 0.19 | 0.64 | -0.15 | -0.11 | | | | |
| TIC | 0.63 | 0.04 | 0.23 | -0.45 | -0.16 | 0.10 | | | |
| % Clay | 0.73 | 0.20 | 0.43 | -0.48 | -0.27 | 0.48 | 0.45 | | |
| % Sand | -0.78 | -0.22 | -0.43 | 0.52 | 0.30 | -0.48 | -0.53 | -0.93 | |
| % Silt | 0.77 | 0.20 | 0.41 | -0.48 | -0.29 | 0.42 | 0.57 | 0.81 | -0.95 |

Bold values represent significant correlations where $|r_s| \geq |0.14|$ for $n = 195$.

Light shading indicates a moderate correlation ($|0.50| > r < |0.75|$) exists between the input variable and summary variable (i.e., PC).

Dark shading indicates a strong correlation ($r > |0.75|$) exists between the input variable and summary variable (i.e., PC).

A small number of strong and moderate correlations were observed between principal components and grain size and organic content. MET PC1, representing metals in sediment, were positively correlated with TIC and percent clay and silt and negatively correlated with percent sand, indicating sediments with high percent fines and inorganic carbon contained high concentrations of metals. MET PC1 was also negatively correlated with PAH PC2, which represents biphenyl, C1 naphthalene, C2-naphthalene, and naphthalene, indicating sediments with high metals concentrations have high concentrations of these PAHs (recall PAH PC2 was negatively correlated with these PAHs). PAH PC1 was positively correlated with TOC and PAH PC2 was positively correlated with percent sand.

Within the grain size variables, not surprisingly, percent clay and silt were negatively correlated with percent sand and positively correlated with each other. TIC was positively correlated with percent silt and negatively correlated with percent sand.

Summary of Groupings

A summary of the groupings is provided in Table E.1-7:

- Cluster 1 includes almost all of the southern tributary and Steepbank River, approximately half of the eastern tributary, western tributary, and Muskeg River, and one quarter of the Athabasca River station/sampling event combinations. These stations are characterized by low concentrations of metals, PAHs, TIC/TOC, and a high percentage of sand and low percentage of fines;
- Cluster 2 includes almost all of the ARD, approximately half of the Athabasca River, and a third of the western tributary station observations. These stations were characterized by high concentrations of metals and PAHs, low concentrations of TIC/TOC, and high percentage of fines and low percentage of sand;
- Cluster 3 is comprised of almost all of the regional lake and a quarter of the Muskeg River station/sampling event combinations. Stations grouped with this cluster had a range of metals, PAH, and TIC concentrations, the highest but most variable TOC concentrations, and a high percentage of fines and low percentage of sand; and
- Cluster 4 includes the remaining Athabasca River station observations and a small number of observations for the eastern tributaries and the Muskeg River. These stations were characterized by a range of metals and PAH concentrations, low TOC and TIC concentrations, and a high percentage of fines and low percentage of sand.

Cluster memberships for each observation (i.e., station/year combination) are presented in Table E.1-8.

Table E.1-7 Summary of cluster membership and characteristics for sediments.

| Cluster | Predominant Stations Present in Cluster | General Characteristics of Cluster | | | |
|----------|---|------------------------------------|--|----------------------------|--|
| | | Ion Concentrations | Dissolved Metal Concentrations | Total Metal Concentrations | Other Variables |
| 1 | <ul style="list-style-type: none"> Majority of southern tributary and Steepbank R. 1/2 eastern and western tributaries, and Muskeg R. 1/4 Athabasca R. | Low metals | Range of PAHs Low biphenyl, C1 naphthalene, C2-naphthalene, and naphthalene | High sand and low fines | Low TIC and TOC |
| 2 | <ul style="list-style-type: none"> Majority of ARD 1/2 Athabasca R. 1/3 western tributary | High metals | High but less variable PAHs | High fines and low sand | Low TOC and TIC |
| 3 | <ul style="list-style-type: none"> Majority of regional lakes 1/4 Muskeg R. | Range of metals concentrations | Range of PAH concentrations | High fines and low sand | High but variable TOC and a range of TOC |
| 4 | <ul style="list-style-type: none"> 1/4 Athabasca R. Small number of eastern tributaries and Muskeg R. | Range of metals concentrations | Range of PAH concentrations | High sand and low fines | Low TOC and TIC |

Table E.1-8 Summary of cluster membership by station ID and year for the sediment chemistry dataset.

| Region | Station | Year | Cluster Number | Station | Year | Cluster Number |
|-----------------------|-------------|------|----------------|------------|------|----------------|
| Athabasca River | ATR-DC-E | 2003 | 1 | ATR-MR-E | 2000 | 2 |
| | ATR-DC-W | 2000 | 1 | ATR-MR-E | 2002 | 2 |
| | ATR-DC-W | 2002 | 1 | ATR-MR-E | 2003 | 2 |
| | ATR-DC-W | 2003 | 1 | ATR-MR-E | 2004 | 2 |
| | ATR-DC-W | 2004 | 1 | ATR-MR-W | 2002 | 2 |
| | ATR-DD-W | 2003 | 1 | ATR-MR-W | 2003 | 2 |
| | ATR-DD-W | 2004 | 1 | ATR-MR-W | 2004 | 2 |
| | ATR-FC-W | 2000 | 1 | ATR-SR-E | 2002 | 2 |
| | ATR-FR-E | 2002 | 1 | ATR-SR-E | 2004 | 2 |
| | ATR-FR-E | 2003 | 1 | ATR-SR-W | 2002 | 2 |
| | ATR-FR-E | 2004 | 1 | ATR-SR-W | 2004 | 2 |
| | ATR-FR-W | 2003 | 1 | ATR-UFM | 2002 | 2 |
| | ATR-FR-W | 2004 | 1 | ATR-UFM | 2004 | 2 |
| | ATR-SR-E | 2000 | 1 | ATR-DC-E | 1998 | 4 |
| | ATR-SR-E | 2003 | 1 | ATR-DC-E | 2000 | 4 |
| | ATR-SR-W | 2003 | 1 | ATR-DC-E | 2001 | 4 |
| | ATR-UFM | 2003 | 1 | ATR-DC-E | 2002 | 4 |
| | ATR-DC-CC | 1997 | 2 | ATR-DC-E | 2004 | 4 |
| | ATR-DD-E | 2003 | 2 | ATR-DC-W | 1998 | 4 |
| | ATR-DD-E | 2004 | 2 | ATR-DC-W | 2001 | 4 |
| | ATR-DD-W | 2002 | 2 | ATR-DD-E | 2002 | 4 |
| | ATR-ER | 2000 | 2 | ATR-FC-E | 2000 | 4 |
| | ATR-ER | 2001 | 2 | ATR-FC-E | 2001 | 4 |
| | ATR-ER | 2002 | 2 | ATR-FC-E-D | 1998 | 4 |
| | ATR-ER | 2003 | 2 | ATR-FC-W | 2001 | 4 |
| | ATR-ER | 2004 | 2 | ATR-MR-E | 2001 | 4 |
| | ATR-ER | 2005 | 2 | ATR-MR-E-D | 1998 | 4 |
| | ATR-FC-CC-D | 1997 | 2 | ATR-MR-W | 2000 | 4 |
| | ATR-FC-E | 2002 | 2 | ATR-MR-W | 2001 | 4 |
| | ATR-FC-E | 2003 | 2 | ATR-MR-W-D | 1998 | 4 |
| | ATR-FC-W | 2002 | 2 | ATR-SR-E | 2001 | 4 |
| | ATR-FC-W | 2003 | 2 | ATR-SR-W | 2000 | 4 |
| | ATR-FC-W-D | 1998 | 2 | ATR-SR-W | 2001 | 4 |
| | ATR-FR-W | 2002 | 2 | | | |
| Athabasca River Delta | OF | 2005 | 1 | EA | 2005 | 2 |
| | FLC | 2001 | 1 | EMR-1 | 2005 | 2 |
| | ARD-2 | 2005 | 2 | FLB | 2000 | 2 |
| | BEC | 2005 | 2 | FLC | 2002 | 2 |
| | BPC | 1999 | 2 | FLC | 2003 | 2 |
| | BPC | 2000 | 2 | FLC | 2005 | 2 |
| | BPC | 2001 | 2 | GIC | 2001 | 2 |
| | BPC | 2002 | 2 | GIC | 2002 | 2 |
| | BPC | 2003 | 2 | GIC | 2003 | 2 |
| | BPC | 2005 | 2 | GIC | 2005 | 2 |
| | BPC-2 | 2005 | 2 | JC-1 | 2005 | 2 |
| | CC-1 | 2005 | 2 | | | |
| Eastern tributaries | FIR-1 | 2002 | 1 | MCC-1 | 2005 | 1 |
| | FIR-1 | 2003 | 1 | FOC-1 | 2002 | 2 |
| | FIR-1 | 2004 | 1 | MCC-1 | 1999 | 2 |
| | FIR-2 | 2003 | 1 | FOC-1 | 2000 | 4 |

Table E.1-8 (Cont'd.)

| Region | Station | Year | Cluster Number | Station | Year | Cluster Number |
|-----------------------------|---------|------|----------------|---------|------|----------------|
| Eastern tributaries, cont'd | FIR-2 | 2004 | 1 | MCC-1 | 2000 | 4 |
| | FIR-2X | 2002 | 1 | MCC-1 | 2001 | 4 |
| | MCC-1 | 2002 | 1 | | | |
| Lakes | ISL-1 | 2001 | 2 | MCL-1 | 2002 | 3 |
| | SHL-1 | 2001 | 2 | MCL-1 | 2003 | 3 |
| | SHL-1 | 2004 | 2 | SHL-1 | 2002 | 3 |
| | KEL-1 | 2001 | 3 | SHL-1 | 2003 | 3 |
| | KEL-1 | 2004 | 3 | | | |
| Muskeg River | JAC-1 | 2004 | 1 | MUR-1 | 2002 | 2 |
| | MUR-1 | 2001 | 1 | MUR-1 | 2005 | 2 |
| | MUR-1 | 2003 | 1 | MUR-2 | 2005 | 3 |
| | MUR-1 | 2004 | 1 | MUR-4 | 2003 | 3 |
| | MUR-1B | 2003 | 1 | MUR-5 | 2000 | 3 |
| | MUR-2 | 2000 | 1 | MUR-5 | 2003 | 3 |
| | MUR-2 | 2003 | 1 | MUR-6 | 2000 | 3 |
| | MUR-2 | 2004 | 1 | STC-1 | 2003 | 3 |
| | MUR-4 | 1997 | 1 | JAC-1 | 1997 | 4 |
| | MUR-4 | 2000 | 1 | MUR-1 | 1997 | 4 |
| | MUR-6 | 2003 | 1 | MUR-1 | 1998 | 4 |
| | MUR-D2 | 2003 | 1 | MUR-1 | 1999 | 4 |
| | MUR-D2 | 2004 | 1 | MUR-1 | 2000 | 4 |
| | MUR-D2 | 2005 | 1 | MUR-1B | 2000 | 4 |
| | | | | | | |
| Southern tributaries | CHR-1 | 2002 | 1 | CLR-1 | 2003 | 1 |
| | CHR-1 | 2003 | 1 | CLR-2 | 2001 | 1 |
| | CHR-1 | 2004 | 1 | CLR-2 | 2002 | 1 |
| | CHR-2 | 2002 | 1 | CLR-2 | 2003 | 1 |
| | CHR-2 | 2003 | 1 | HAR-1 | 2004 | 1 |
| | CHR-2 | 2004 | 1 | HAR-1 | 2005 | 1 |
| | CLR-1 | 2001 | 1 | CLR-1 | 2002 | 2 |
| Steepbank River | NSR-1 | 2002 | 1 | STR-2 | 2002 | 1 |
| | NSR-1 | 2003 | 1 | STR-2 | 2005 | 1 |
| | NSR-1 | 2004 | 1 | STR-3 | 2005 | 1 |
| | NSR-1 | 2005 | 1 | STR-1 | 1997 | 4 |
| | STR-1 | 2002 | 1 | STR-1 | 1998 | 4 |
| | STR-1 | 2005 | 1 | | | |
| Western tributaries | CAR-1 | 2004 | 1 | ELR-1 | 2005 | 2 |
| | CAR-1 | 2005 | 1 | ELR-1A | 2005 | 2 |
| | ELR-1 | 2002 | 1 | MAR-1 | 2001 | 2 |
| | ELR-1 | 2003 | 1 | MAR-1 | 2002 | 2 |
| | ELR-2 | 2004 | 1 | MAR-1 | 2004 | 2 |
| | ELR-2 | 2005 | 1 | POC-1 | 2002 | 2 |
| | MAR-2 | 2001 | 1 | TAR-1 | 2002 | 2 |
| | MAR-2 | 2004 | 1 | TAR-1 | 2004 | 2 |
| | POC-1 | 2004 | 1 | CAR-2 | 2005 | 3 |
| | TAR-1 | 2003 | 1 | ELR-1 | 1998 | 4 |
| | TAR-1 | 2005 | 1 | MAR-1 | 1997 | 4 |
| | TAR-2 | 2004 | 1 | MAR-1 | 1998 | 4 |
| | TAR-2 | 2005 | 1 | POC-1 | 1997 | 4 |
| | CAR-1 | 2002 | 2 | TAR-1 | 1998 | 4 |
| | ELR-1 | 2004 | 2 | MAR-4 | 2004 | 2 |

E.2 COMPARISON OF RESULTS OF SEDIMENT TOXICITY TESTS WITH VARIOUS SEDIMENT CHEMISTRY VARIABLES

E.2.1 Introduction

An analysis was performed to determine whether or not growth and survival of selected species exhibited meaningful relationships with other potential indicators of sediment toxicity, including concentrations of metals, PAHs, and predicted PAH toxicity.

E.2.2 Methods

Relationships between indicators of sediment toxicity were evaluated using Spearman rank correlations between sediment toxicity (growth and survival of *Chironomus tentans* and *Hyalella azteca*) and the PAH Hazard Index, PCs representing individual PAH compounds, and PCs representing metals.

For the purpose of maintaining consistent with other RAMP sediment quality evaluations, only fall data were evaluated.

E.2.2.1 PAH Hazard Index

The PAH Hazard Index was calculated according to methods described by Neff *et al.* (2005) in order to provide an estimate of the worst-case hazard posed by sediment PAHs to benthic organisms. The method involves first standardizing PAH concentrations to concentrations of total recoverable hydrocarbons (TRH). However, in 2005, TRHs were not evaluated, given RAMP methods shifted to measurement of hydrocarbons using the CCME four-fraction test, as described in RAMP (2005a). Given a strong linear relationship exists between TRH and the sum of recoverable hydrocarbon fractions 2 (C10-C16), 3 (C16-C34), and 4 (C34-C40), a regression model was created from 2004 data to estimate TRH totals from the sums of these fractions for 2005.

Models using both transformed (natural log) and untransformed data were compared to determine which was capable of producing the most accurate estimates. The best fit model was then used to generate estimates of TRH for each station in 2005, and concentrations of each PAH were standardized to these estimates according to the following equation:

$$(1) \text{ Standardized PAH} = \text{PAH} / \text{Estimated TRH} * 1,000,000$$

In order to estimate acute toxicity, octanol/water partition coefficients (*K_{ow}*) and molecular weights (MW) were required for each measured sediment PAH. *K_{ow}* and MW values were obtained from several sources, including Neff *et al.* (2005), Neff (personal communication, 2006), and Mackay *et al.* (1992). Remaining molecular weights were determined using the online ChemFinder (www.chemfinder.com), and remaining *K_{ow}* values were estimated by entering Chemical Abstracts Service (CAS) registry numbers (generated using ChemFinder) into LogKow, an application developed by the Syracuse Research Corporation. *K_{ow}* for the following two PAH compounds could not be found or estimated: C1 and C2 Benzo[fluoranthene]/Pyrene.

The following equation from Neff *et al.* (2005) was then used to estimate the acute toxicity of each PAH:

$$(2) \log \text{LC50(mM/L)} = -1.162 \log K_{ow} + 2.496$$

Since acute toxicity levels are measured in ($\mu\text{g/L}$), however, the following equation was applied to convert from mM/L:

$$(3) \text{ Acute Toxicity } (\mu\text{g/L}) = 10^{-1.162 \log K_{ow} + 2.496} * \text{MW} * 1000$$

The chronic toxicity for each PAH was then estimated by dividing the acute toxicity by 5:

$$(4) \text{ Chronic Toxicity } (\mu\text{g/L}) = \text{Acute Toxicity} / 5$$

Neff *et al.* (2005) reason that 5 represents a conservative estimate of the acute/chronic ratio for aromatic hydrocarbons. Each standardized PAH estimate in the sediment porewater was then divided by its chronic toxicity in order to generate a hazard quotient (HQ):

$$(5) \text{ HQ} = \text{Standardized PAH} / \text{Chronic Toxicity}$$

Hazard quotients for all of the PAHs detected in each station's sediment (with known K_{ow} 's) were summed to produce a Hazard Index (HI):

$$(6) \text{ HI} = \sum \text{HQ}$$

E.2.2.2 Spearman Rank Correlations between Sediment Toxicity Indicators

Spearman Rank Correlations were run in order to determine whether or not significant relationships existed between sediment toxicity indicators (10 day growth and survival of *Chironomus tentans*, and 10-14 day growth and survival of *Hyalella azteca*) and PAH HI values, PCs representing individual PAH compounds, and PCs representing metals. Two-tailed correlations ($\alpha = 0.05$) were used in order to account for either positive or inverse relationships. Significance was determined by comparing resulting r_s values to critical r_s ; if $r_s > \text{critical } r_s$ then the correlation is significant. The strength of correlations was evaluated using the same methods applied in the water quality analysis component (Appendix D):

- Weak correlations: $r_s < |0.5|$;
- Moderate correlations: $|0.5| < r_s < |0.75|$; and
- Strong correlations: $r_s > |0.75|$.

E.2.2.3 Scatterplots between Sediment Toxicity Indicators

Scatterplots were used to visually assess relationships between sediment toxicity indicators (10 day growth and survival of *Chironomus tentans*, and 10-14 day growth and survival of *Hyalella azteca*) and PAH Hazard Index values, PCs representing individual PAH compounds, and PCs representing metals. Scatterplots were used to visually evaluate the strength of significant relationships identified by Spearman Rank Correlations.

E.2.3 Results

E.2.3.1 Standardizing PAHs to TRHs

Once a key outlier was removed, untransformed data provided a better and more meaningful fit than log-transformed data according to linear regression between TRH

and the sum of recoverable hydrocarbon fractions 2, 3, and 4 (Figure E.2-1). The resulting equation was $TRH = 2.183 \cdot (F2 + F3 + F4) - 224.231$. Since the model was generating negative TRH values for very low inputs, a 0-intercept was forced by removing the y-intercept term (-224.231), and the resulting model ($TRH = 2.183 \cdot [F2 + F3 + F4]$) provided the best estimate over the other methods (Figure E.2-1).

E.2.3.2 PAH Hazard Index

Octanol/water partitioning coefficients (K_{ow}), acute toxicity, and chronic toxicity used to calculate hazard quotients for each measured sediment PAH are presented in Table E.2-1. Hazard index values, created by summing hazard quotients for each PAH, are summarized in Table E.2-2 for each station sampled in 2005.

E.2.3.3 Relationships between Sediment Toxicity Indicators

No significant relationships were identified between sediment toxicity results (10-day growth and survival of *Chironomus tentans*, or 10/14-day growth and survival of *Hyalella azteca*) and PAH Hazard Index values (Table E.2-3). Significant relationships were identified between *Chironomus tentans* growth and PAH PC1, and *Hyalella azteca* survival and Metals PC1 (Table E.2-3). However, these relationships were classified as weak ($r_s < |0.5|$), and scatterplots confirmed that no meaningful trends were apparent (Figure E.2-2 to Figure E.2-4).

These data indicate that observed toxicity to test organisms exposed to RAMP sediments is not clearly related to metal or PAH concentrations in these sediments.

Figure E.2-1 A comparison between various regression models for estimating total recoverable hydrocarbons (TRH) using the sum of recoverable hydrocarbon fractions 2, 3, and 4.

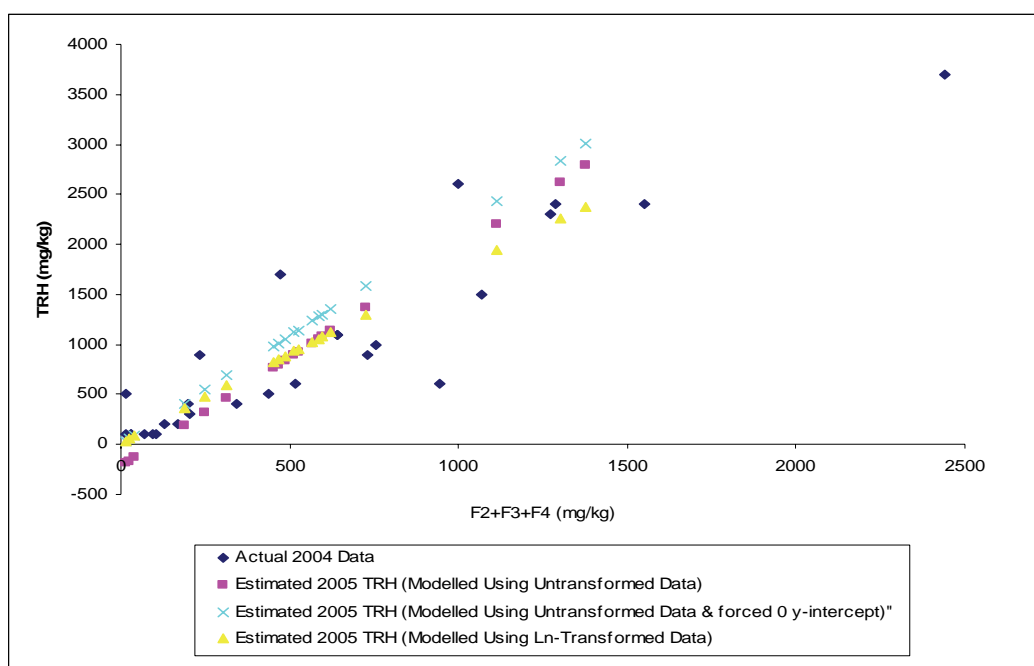


Figure E.2-2 Scatterplots showing relationships between sediment toxicity indicators and PAH Hazard Index values.

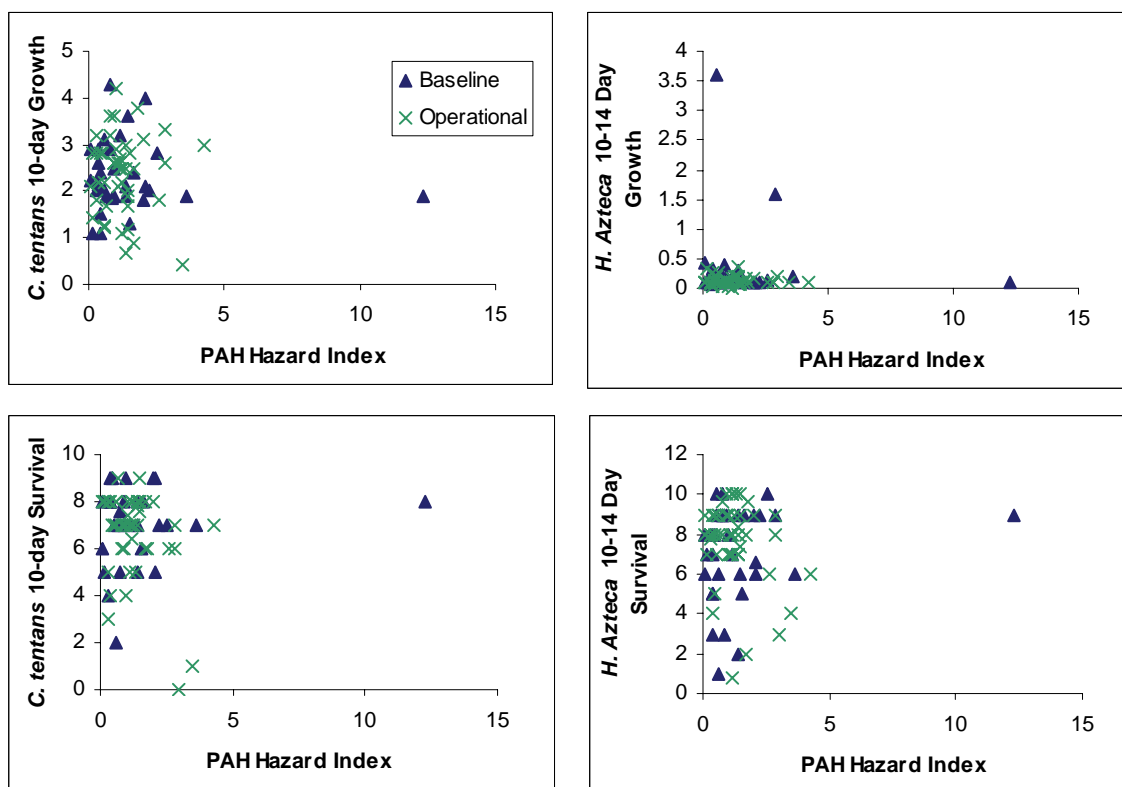


Figure E.2-3 Scatterplots showing relationships between sediment toxicity indicators and PCs representing individual PAH compounds.

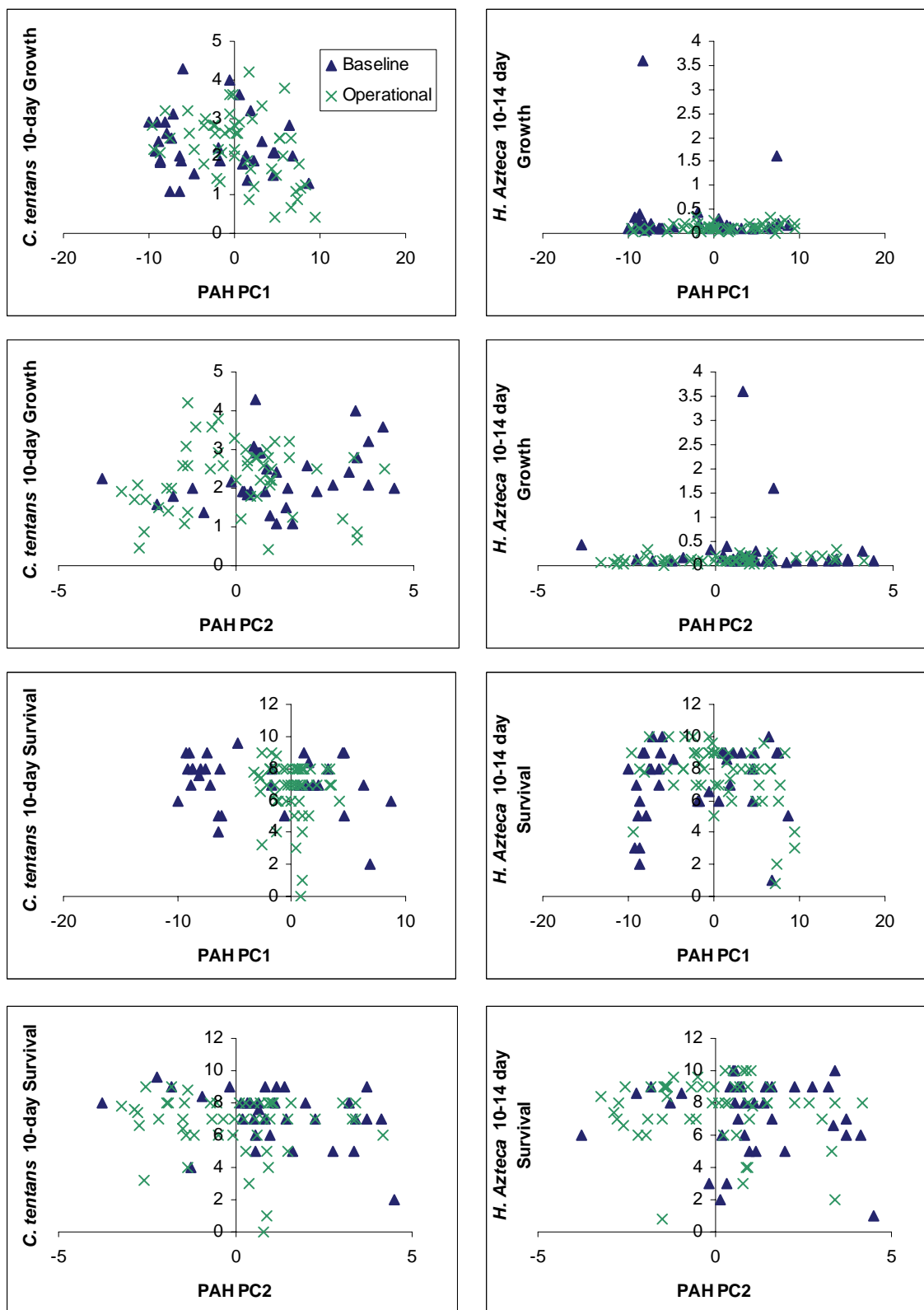


Figure E.2-4 Scatterplots showing relationships between sediment toxicity indicators and PCs representing metals.

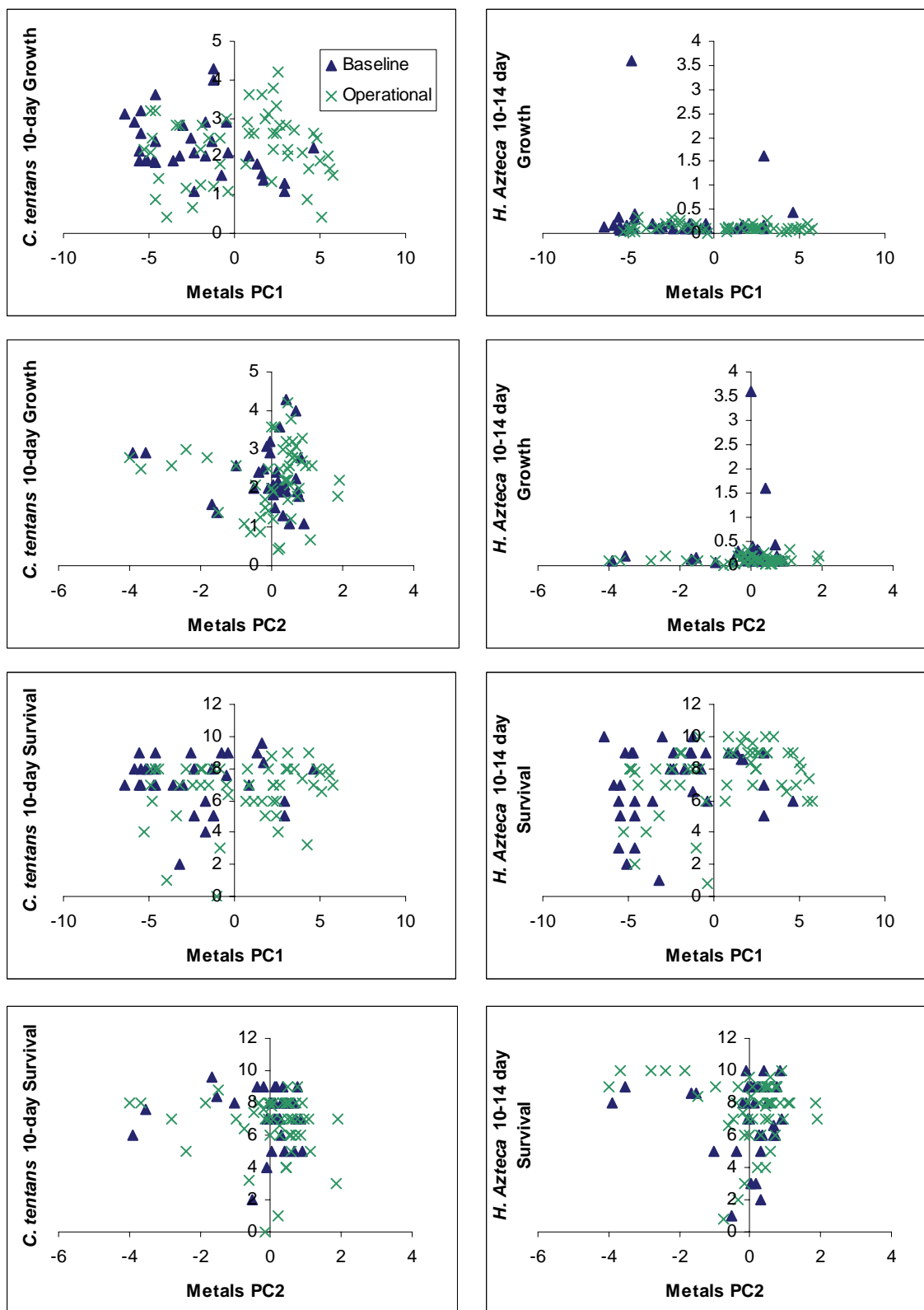


Table E.2-1 Octanol/water partitioning coefficients (*K_{ow}*), acute toxicity, and chronic toxicity used to calculate hazard quotients for each sediment PAH measured during the RAMP program.

| PAH | <i>K_{ow}</i> | Acute Toxicity (µg/L) | Chronic Toxicity (µg/L) |
|--------------------------------|-----------------------|-----------------------|-------------------------|
| Acenaphthene | 8317.64 | 1360 | 270 |
| Acenaphthylene | 11748.98 | 1181 | 180 |
| Anthracene | 34673.69 | 300 | 60 |
| Benzo(a)anthracene | 812830.52 | 9.8 | 2 |
| Benzo(a)pyrene | 1096478.20 | 7.6 | 1.5 |
| Benzo(b)fluoranthene | 933254.30 | 9.1 | 1.83 |
| Benzo(ghi)perylene | 3162277.66 | 2.4 | 0.49 |
| Biphenyl | 8912.51 | 1420 | 250 |
| C1 benzo(a)anthracene/Chrysene | 2630267.99 | 2.7 | 0.53 |
| C1 Benzofluoranthene/Pyrene | n/a | n/a | n/a |
| C1 dibenzothiophene | 72443.60 | 140 | 28 |
| C1 fluoranthene/pyrene | 524807.46 | 15 | 3.1 |
| C1 fluorene | 93325.43 | 96 | 19 |
| C1 naphthalene | 7413.10 | 1420 | 284 |
| C1 phenanthrene/anthracene | 138038.43 | 64 | 13 |
| C2 benzo(a)anthracene/Chrysene | 7585775.75 | 0.8 | 0.16 |
| C2 Benzofluoranthene/Pyrene | n/a | n/a | n/a |
| C2 dibenzothiophene | 316227.77 | 27 | 5.4 |
| C2 fluoranthene/pyrene | 630957.34 | 13.1 | 2.63 |
| C2 fluorene | 158489.32 | 56 | 11 |
| C2 naphthalene | 23442.29 | 410 | 81 |
| C2 phenanthrene/anthracene | 323593.66 | 26 | 5.1 |
| C3 dibenzothiophene | 537031.80 | 16 | 3.1 |
| C3 fluoranthene/pyrene | 1905460.72 | 3.9 | 0.77 |
| C3 fluorene | 316227.77 | 16 | 5.3 |
| C3 naphthalene | 79432.82 | 130 | 17 |
| C3 phenanthrene/anthracene | 1000000.00 | 7.4 | 1.5 |
| C4 dibenzothiophene | 1258925.41 | 6.1 | 1.23 |
| C4 naphthalene | 354813.39 | 42 | 4.1 |
| C4 phenanthrene/anthracene | 3235936.57 | 2 | 0.4 |
| Chrysene | 724435.96 | 11 | 2.2 |
| Dibenzo(ah)anthracene | 5623413.25 | 1.3 | 0.25 |
| Dibenzothiophene | 30902.95 | 350 | 70 |
| Dimethyl-Biphenyl | 71055.88 | 131.6 | 26.31 |
| Fluoranthene | 165958.69 | 55 | 11 |
| Fluorene | 15135.61 | 730 | 150 |
| Indeno(123-cd)pyrene | 10000000.00 | 0.64 | 0.13 |
| Methyl Acenaphthene | 37051.01 | 258.8 | 51.76 |
| Methyl-Biphenyl | 20151.16 | 525.2 | 105.04 |
| Naphthalene | 2344.23 | 4870 | 970 |
| Phenanthrene | 28840.32 | 367 | 55 |
| Pyrene | 151356.12 | 61 | 12 |
| Retene | 2229975.03 | 3.1 | 0.62 |

Table E.2-2 Hazard Index (HI) values for each RAMP 2005 station.

| Station | PAH Hazard Index |
|---------|------------------|
| ARD-2 | 1.047 |
| ATR-ER | 0.954 |
| ATR-OF | 0.338 |
| BEC | 1.072 |
| BPC | 1.341 |
| BPC-2 | 1.054 |
| CAR-1 | 0.603 |
| CAR-2 | 0.069 |
| CC-1 | 0.994 |
| E-A | 1.372 |
| ELR-1 | 1.533 |
| ELR-1A | 2.549 |
| ELR-2 | 1.334 |
| EMR-1 | 0.768 |
| FLC | 0.522 |
| GIC | 1.150 |
| HAR-1 | 0.880 |
| JC-1 | 0.620 |
| MCC-1 | 1.417 |
| MUR-1 | 0.362 |
| MUR-2 | 1.403 |
| MUR-D2 | 0.153 |
| NSR-1 | 0.115 |
| STR-1 | 1.685 |
| STR-2 | 1.396 |
| STR-3 | 0.365 |
| TAR-1 | 0.959 |
| TAR-2 | 0.195 |

Table E.2-3 Results of Spearman Rank Correlation analyses between sediment toxicity indicators and PAH Hazard Index values, principal components (PCs) representing individual PAH compounds, and PCs representing metals.

| Sediment Toxicity Indicator | Hazard Index | PAH PC1 | PAH PC2 | MET PC1 | MET PC2 |
|---|--------------|---------------|---------|--------------|---------|
| <i>Hyalella azteca</i> 10-14 day Growth | -0.042 | 0.050 | 0.181 | -0.184 | -0.040 |
| <i>Hyalella azteca</i> 10-14 day Survival | 0.054 | -0.082 | -0.079 | 0.259 | -0.024 |
| <i>Chironomus tentans</i> 10 day Growth | -0.022 | -0.306 | 0.126 | -0.081 | 0.080 |
| <i>Chironomus tentans</i> 10 day Survival | -0.099 | -0.183 | -0.135 | -0.016 | -0.141 |

Bold values = significant (> critical r_s).

Appendix F

**Benthic Invertebrate
Community Component**

F.0 BENTHIC INVERTEBRATE COMMUNITY COMPONENT

F.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 Chapter 5 to as a measure against which to judge the significance of temporal trends in reaches exposed to oil sands operations.

F.2 BENTHIC INVERTEBRATE SAMPLE PROCESSING PROCEDURES

F.2.1 Laboratory Methods

In preparation for laboratory processing, samples were checked upon arrival to the laboratory to ensure that they are adequately sealed, labeled and that the preservative has effectively penetrated the entire sample. Samples were then rinsed of the residual fine debris and preservative (provided a minimum exposure of 72 hours to formalin occurred). Samples were either sorted immediately, or transferred to 80% ethanol, prior to sorting and taxonomic work. After sorting and identification, freshwater macro-invertebrates were stored in a solution of 70 to 80% ethanol, and 5% glycerin in vials or jars with airtight lids.

To expedite the sorting process, samples with large pieces of organic matter were divided in the laboratory into appropriate size fractions. The most commonly used fractions were coarse (> 1.00 mm) and fine (250 µm - 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 F.2-1.

F.2.2 Coarse Fraction

The coarse fraction (contents of the 2-mm and 1-mm sieves) was transferred into individual containers and 70 % alcohol added, prior to sorting. At least ¼ of the coarse fraction was sorted, with the amount of material sorted determined either by volume or weight.

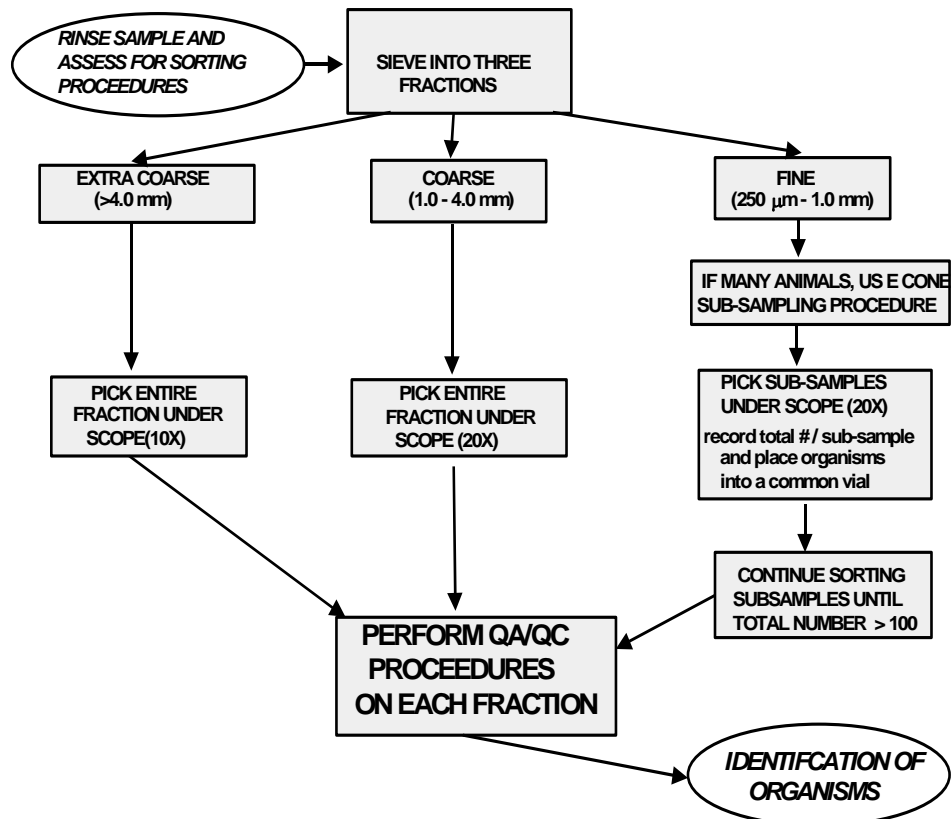
F.2.3 Fine Fraction

The fine fraction (contents of 0.180-mm sieve) was transferred into a 2-L container for decanting. Warm water was added to the 2-L container, swirled and decanted to mobilize organic material into a 0.180 mm sieve. This was repeated until all organic material was washed out of the sand. The sand was scanned under magnifying glass for heavy-shelled or stone-cased animals.

When there was a lot of organic material in the fine fractions and/or large numbers of organisms, a sub-sampling of the fine fractions was done as described below.

The fine fraction was sorted in its entirety when possible. When there were large amounts of the fine fraction, the material was sub-sampled using an Imhoff Cone and bubbler (Wrona *et al.* 1982). Either $\frac{1}{4}$ 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.

Figure F.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 should be modified as necessary for station-specific samples.



F.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 F.2-1). Small, early-instar or damaged specimens were identified to the lowest level possible, generally to family.

Table F.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 | Leave 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 are mounted for identification.

F.3 CALCULATING NORMAL RANGES

Though rigorous analyses of variance can be used to test for effects of oil sands operations by comparison of potentially influenced watercourses to those that are not, the RAMP design has considerable statistical power, and thus the potential to detect effects that are negligible. 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 watercourses as erosional or depositional river reaches, or a lake, and then calculated the "normal range of variability" for reference watercourses within each of those habitat types. Observed variations in operational watercourses were then compared to the observed normal ranges for baseline watercourses.

F.3.1 Methods

As in the main text, the following indices of composition were calculated:

- Total abundance (#/m²);

- 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 F.3-1. Regional reference ranges were determined as means \pm 2 standard deviations (SD), representing the range about the mean over which ~95% of observations can be expected to lie.

Table F.3-1 Means and standard deviations of indices of benthic community composition for baseline watercourses in the RAMP study area.

| Index | Erosional Habitats | | | Depositional Habitats | | | Lakes | | |
|---|--------------------|------|-----|-----------------------|------|-----|-------|------|----|
| | Mean | SD | N | Mean | SD | N | Mean | SD | N |
| Log ₁₀ Total abundance (#/m ²) | 3.89 | 0.49 | 257 | 3.77 | 0.77 | 598 | 3.51 | 0.59 | 89 |
| Log ₁₀ Richness | 1.47 | 0.13 | | 1.00 | 0.28 | | 0.88 | 0.28 | |
| Simpson's Diversity | 0.87 | 0.08 | | 0.64 | 0.24 | | 0.68 | 0.16 | |
| Evenness | 0.90 | 0.08 | | 0.75 | 0.23 | | 0.82 | 0.13 | |
| Log ₁₀ EPT (%) | 1.35 | 0.29 | | 0.20 | 0.37 | | 0.27 | 0.42 | |

We also used Correspondence Analysis (CA), a multivariate ordination procedure. CA orders such that a biplots of site scores represents the similarities among sites. Sites close together in the biplots have similar fauna, while sites far apart tend to have fewer similarities in their fauna. CA also orders the taxa, and a biplots of taxa can be overlain over the biplots of sites. The position of taxa in the biplots indicates, roughly, the samples in which taxa are their most abundant. The CA was generated using the data from baseline watercourses. Separate analyses were performed for riverine reaches and for lakes.

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 2001). The results of the CA of baseline reaches from the entire RAMP program (1998 to 2005) are shown in (Figure F.3-1).

The CA for the river reaches (Figure F.3-1) showed a relatively distinct separation between erosional and depositional habitats. Erosional reaches tended to contain those taxa typical of riffle environments including mayflies (Ephemeroptera), stoneflies (Plecoptera) and caddisflies (Trichoptera), as well as beetles (Coleoptera) and dance flies

(Empididae). Enchytraeidae are worms that are typically associated with cooler water and/or sources of groundwater. They were also more prevalent in erosional reaches. In contrast, benthic taxa more typically associated with slow- or standing-water environments were more prevalent in depositional reaches including snails (Gastropoda), sphaeriid clams (Bivalvia), seed shrimps (Ostracoda), sand flies (Ceratopogonidae) and midges (Chironomidae). The ellipses that enclosed 95% of the observations from all reference reaches defined the normal range of variability for erosional and depositional reaches.

A similar process for defining the normal range of variability was carried out for the lakes. All data from Kearl and McClelland (all years, all samples) were compiled, and a CA carried out. As with the CA for reaches, the ellipse enclosing the baseline lake samples is the expected range of variability for samples from Shipyard Lake (Figure F.3-2). The ordination biplots (Figure F.3-2, a, b) showed that samples from McClelland Lake tended to be more dominated by mites (Hydracarina), mayflies (Ephemeroptera) and snails (Gastropoda), while samples from Kearl Lake tended to be more dominated by naidids worms, clams (Bivalvia), ostracods, chironomids, and scuds (Amphipoda).

Samples from watercourses exposed to oil sands development were projected onto these ordination biplots using the following:

$$Site\ Score = \frac{(\sum TS \bullet TA) / \sum TA}{\sqrt{eigenvalue}}$$

where;

- TS is the weighted average “score” for taxa for the CA Axis 1 (or Axis 2);
- TA is the taxa abundance at a site; and
- The eigenvalue is for whichever Axis the score is being calculated for (i.e., Axis 1 or Axis 2).

Sites that fall outside the ellipse for the baseline watercourses could be considered to be unusual, and that may be considered evidence of an effect (Kilgour *et al.*, 1998).

Figure F.3-1 Correspondence Analysis of the riverine baseline samples from the RAMP study area. The ellipse in (a) represents the 95% confidence region for baseline erosional and depositional samples.

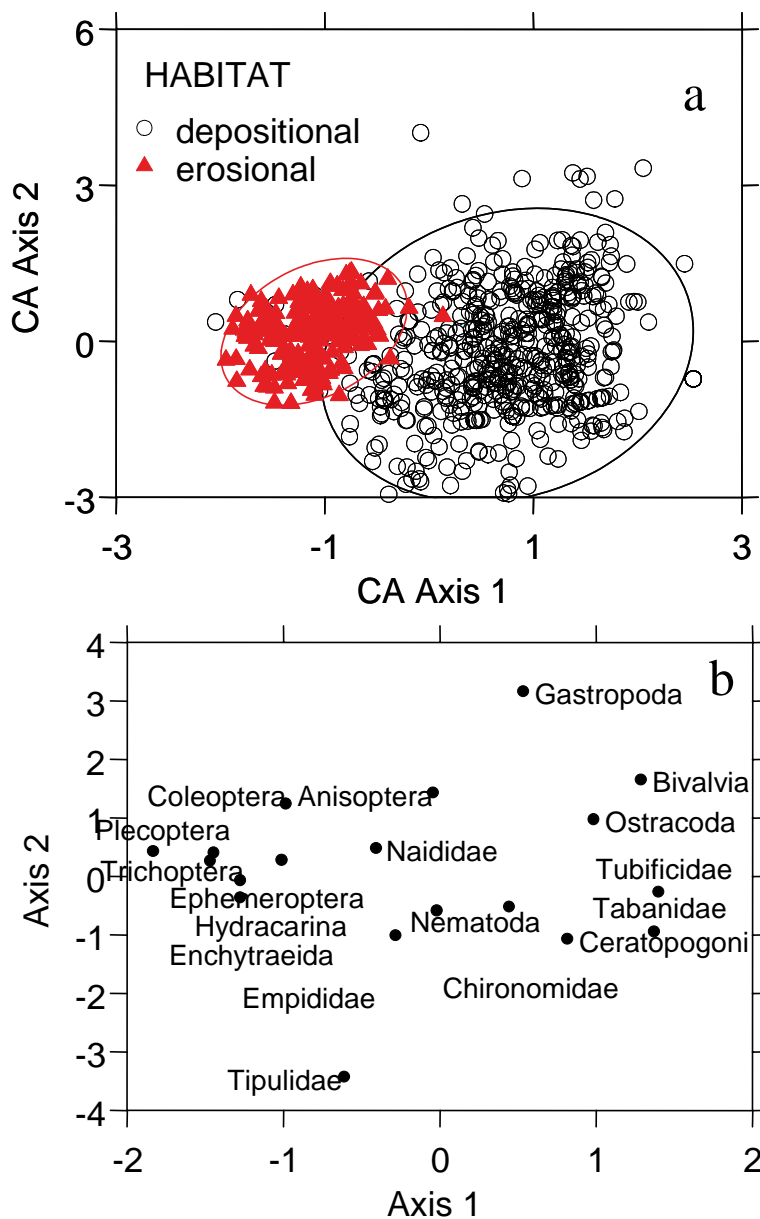
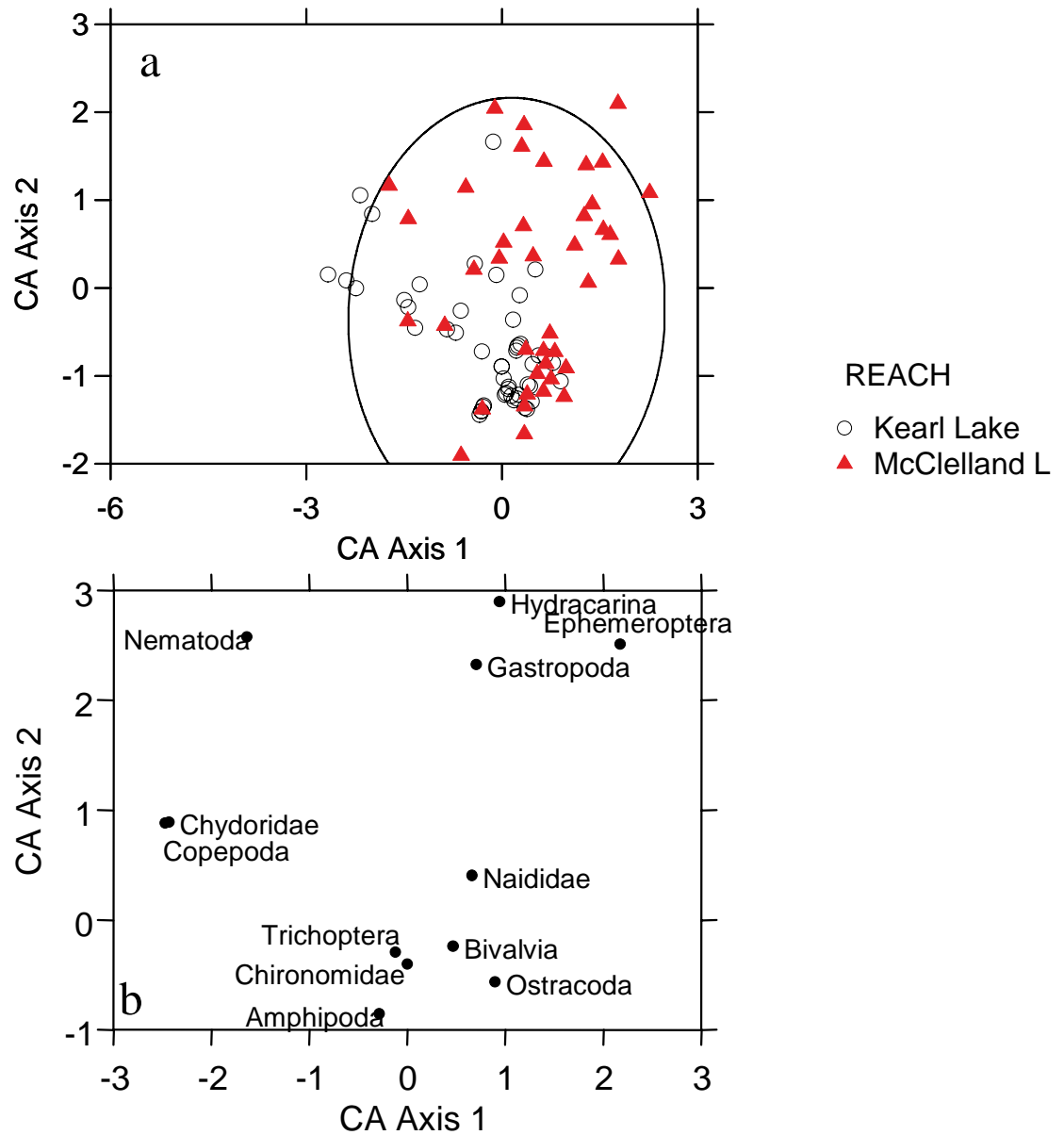


Figure F.3-2 Correspondence Analysis of the lake baseline samples from the RAMP study area. The ellipse in (a) represents the 95% confidence region for baseline lake samples.



Appendix G
Fish Population Component

G.0 FISH POPULATION COMPONENT

G.1 COMMON AND SCIENTIFIC NAMES FOR FISH SPECIES CAPTURED IN THE 2005 RAMP FISH POPULATION COMPONENT

Table G.1-1 Common and scientific names for fish species captured for the RAMP Fish Population Component, 2005.

| Common Name | Scientific Name | Code |
|--------------------|-------------------------------|------|
| Arctic grayling | <i>Thymallus arcticus</i> | ARGR |
| brook stickleback | <i>Culaea inconstans</i> | BRST |
| 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 |
| 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 |

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

| Variable | Variable Condition | Code | Pathology Index Value |
|------------------|--|------|-----------------------|
| 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 |
| 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 |

Appendix H
Acid-Sensitive Lakes Component

H.0 ACID-SENSITIVE LAKES COMPONENT

H.1 SUMMARY OF RAMP DATA 1999-2005

See Table H.1-1 on the following pages.

Table H.1-1 Summary of RAMP data, 1999-2005.

| No _x -So _x GIS No. | Original RAMP Name | Lab pH | | | | | | | | Total Alkalinity (mg/L CaCO ₃) | | | | | | | | Gran Alkalinity (mg/L as CaCO ₃) | | | | | | | |
|---|--------------------------|--------|------|------|------|------|------|------|------|--|-------|------|-------|-------|-------|----------|--------------|--|-------|-------|-------|-------|----------|--------------|--|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean µg/L | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean µg/L | |
| 168 | A21 | 4.62 | 4.99 | 5.02 | 5.00 | 5.03 | 4.91 | 4.58 | 4.88 | 0.8 | 1.85 | 1.8 | 1.75 | 1.71 | 1.20 | 0.50 | 27.20 | 0.21 | 0.55 | 0.12 | 0.20 | 0.00 | -2.74 | -5.53 | |
| 169 | A24 | 4.40 | 4.63 | 4.80 | 4.74 | 4.76 | 4.87 | 4.40 | 4.66 | 0.0 | 0.55 | 1.2 | 1.03 | 1.13 | 1.30 | 0.00 | 14.86 | 0 | 0.00 | 0.00 | -0.57 | 0.00 | 0.00 | -1.9 | |
| 170 | A26 | 6.46 | 5.14 | 5.34 | 5.45 | 5.40 | 5.28 | 5.09 | 5.45 | 9.3 | 1.74 | 2.1 | 2.48 | 2.39 | 1.80 | 1.63 | 61.34 | -1.53 | 0.00 | 0.57 | 0.60 | 0.10 | -1.86 | -7.07 | |
| 167 | A29 | 5.43 | 5.9 | 5.93 | 5.67 | 5.95 | 5.67 | 5.75 | 5.76 | 2.3 | 3.19 | 3.1 | 3.02 | 3.55 | 2.60 | 3.00 | 59.29 | -0.60 | 0.56 | 1.22 | 1.60 | 0.90 | -0.39 | 10.97 | |
| 166 | A86 | 6.12 | 6.62 | | 6.69 | 6.63 | 6.66 | 6.58 | 6.55 | 5.6 | 6.81 | | 7.62 | 7.85 | 7.60 | 8.13 | 145.37 | 5.03 | | 6.10 | 6.10 | 5.90 | 5.45 | 114.32 | |
| 287 | 25 | | | | 5.18 | 5.16 | 5.13 | 4.82 | 5.07 | | | | 1.86 | 1.84 | 1.60 | 1.19 | 32.45 | | | 0.00 | 0.20 | 0.10 | -2.86 | -12.8 | |
| 289 | 27 | | | | 6.47 | 6.46 | 6.37 | 6.38 | 6.42 | | | | 5.16 | 5.05 | 4.80 | 4.50 | 97.55 | | | 3.90 | 3.30 | 3.20 | 1.03 | 57.15 | |
| 290 | 28 | | | | 5.89 | 5.79 | 5.82 | 5.39 | 5.72 | | | | 3.93 | 4.68 | 3.50 | 2.88 | 74.95 | | | 2.66 | 2.40 | 1.30 | -0.29 | 30.35 | |
| 342 | 82 | | | | 6.84 | 6.76 | 6.66 | 6.57 | 6.71 | | | | 11.39 | 10.73 | 10.60 | 6.00 | 193.60 | | | 10.94 | 8.70 | 8.70 | 5.44 | 168.90 | |
| 354 | 94 | | | | 7.24 | 7.15 | 7.00 | 7.15 | 7.13 | | | | 26.56 | 18.41 | 17.60 | 15.06 | 388.15 | | | 26.49 | 16.90 | 15.90 | 12.93 | 361.10 | |
| 165 | A42 | 6.89 | 6.49 | 6.66 | 7.01 | 7.07 | 6.95 | 7.14 | 6.89 | 9.9 | 11.33 | 11.3 | 18.57 | 16.89 | 21.80 | 16.69 | 304.03 | 12.13 | 10.63 | 19.43 | 14.80 | 20.20 | 16.41 | 312.00 | |
| 171 | A47 | 5.35 | 6.66 | 5.41 | 6.69 | 6.71 | 6.53 | 6.79 | 6.31 | 2.0 | 7.89 | 3.5 | 9.85 | 10.18 | 7.90 | 9.31 | 144.54 | 6.64 | 1.61 | 8.79 | 7.90 | 6.20 | 7.20 | 127.80 | |
| 172 | A59 | 4.87 | 5.24 | 6.56 | 5.36 | 5.67 | 5.12 | 4.93 | 5.39 | 2.1 | 3.49 | 6.1 | 3.48 | 4.79 | 3.00 | 2.22 | 71.86 | 3.56 | 4.01 | 2.59 | 2.30 | 1.10 | 0.17 | 45.77 | |
| 223 | P94 | | | | 7.40 | 7.42 | 7.33 | 7.36 | 7.38 | | | | 40.12 | 41.38 | 41.20 | 32.19 | 774.45 | | | 41.67 | 40.50 | 40.50 | 34.51 | 785.90 | |
| 225 | P96 | | | | 7.41 | 7.43 | 7.14 | 7.45 | 7.36 | | | | 37.53 | 31.18 | 34.30 | 25.00 | 640.05 | | | 37.97 | 29.90 | 33.20 | 25.53 | 633.00 | |
| 226 | P97 | | | | 6.83 | 6.86 | 6.67 | 7.62 | 6.99 | | | | 15.31 | 15.28 | 13.50 | 34.25 | 391.70 | | | 15.21 | 13.30 | 11.70 | 35.11 | 376.60 | |
| 227 | P98 | | | | 7.32 | 7.46 | 7.30 | 6.62 | 7.17 | | | | 35.29 | 34.81 | 33.70 | 9.88 | 568.40 | | | 35.66 | 33.60 | 32.60 | 13.74 | 578.00 | |
| 267 | 1 | | | | 7.64 | 7.97 | 7.65 | 7.69 | 7.74 | | | | 46.31 | 42.17 | 42.10 | 31.75 | 811.65 | | | 45.66 | 40.90 | 41.20 | 30.72 | 792.40 | |
| 452 | L4 | 5.81 | 5.61 | 6.15 | 5.69 | 6.04 | 6.07 | 5.54 | 5.84 | 5.1 | 4.69 | 5.7 | 4.81 | 5.56 | 5.10 | 4.38 | 100.71 | 4.73 | 3.83 | 4.23 | 2.60 | 3.30 | 4.13 | 76.07 | |
| 470 | L7 | 6.29 | 6.58 | 6.70 | 6.08 | 6.36 | 6.46 | 6.05 | 6.36 | 9.0 | 8.66 | 10.1 | 7.07 | 8.39 | 7.50 | 6.60 | 163.64 | 8.94 | 9.25 | 6.49 | 6.50 | 5.50 | 7.39 | 146.88 | |
| 471 | L8 | 6.75 | 7.06 | 7.16 | 6.98 | 7.24 | 7.00 | 7.17 | 7.05 | 21.7 | 20.30 | 20.4 | 18.78 | 23.97 | 19.80 | 17.51 | 407.13 | 20.11 | 19.60 | 18.32 | 22.10 | 18.40 | 17.54 | 386.90 | |
| 400 | L39 | 6.49 | 6.8 | 6.89 | 6.85 | 6.75 | 6.89 | 6.43 | 6.73 | 11.5 | 11.98 | 12.2 | 9.93 | 9.73 | 11.00 | 7.31 | 210.29 | 10.26 | 9.13 | 8.48 | 7.80 | 9.40 | 5.06 | 167.10 | |
| 268 | E15 | | 7.07 | 7.12 | 7.14 | 7.28 | 7.01 | 7.14 | 7.12 | | 21.30 | 21.9 | 27.91 | 22.33 | 17.50 | 13.44 | 414.53 | 24.03 | 22.88 | 28.23 | 20.60 | 15.80 | 13.88 | 418.07 | |
| 182 | P23 | | | | 6.87 | 7.34 | 9.27 | 7.72 | 7.80 | | | | 11.90 | 42.91 | 51.00 | 45.94 | 758.75 | | | 11.00 | 41.70 | 49.80 | 45.14 | 738.20 | |
| 185 | P27 | | | | 5.20 | 5.37 | 5.28 | 6.19 | 5.51 | | | | 3.43 | 3.92 | 2.90 | 6.63 | 84.40 | | | 3.17 | 1.90 | 1.60 | 7.18 | 69.25 | |
| 209 | P7 | | | | 6.35 | 6.42 | 6.32 | 4.90 | 6.00 | | | | 7.15 | 8.51 | 6.60 | 2.63 | 124.45 | | | 6.89 | 6.80 | 5.00 | 6.41 | 125.50 | |
| 270 | 4 | | | | 8.03 | 8.50 | 8.28 | 8.44 | 8.31 | | | | 81.00 | 78.66 | 68.20 | 64.06 | 1,459.60 | | | 81.17 | 78.00 | 67.40 | 63.47 | 1,450.20 | |
| 271 | 6 | | | | 7.87 | 9.46 | 9.44 | 8.20 | 8.74 | | | | 84.53 | 69.57 | 65.30 | 59.75 | 1,395.75 | | | 84.36 | 68.20 | 64.10 | 59.30 | 1,379.80 | |
| 418 | Kearl L. | | | | | 7.94 | 8.04 | 8.00 | 7.99 | | | | 78.84 | 78.20 | 68.13 | 1,501.13 | | | | 78.00 | 77.40 | 68.11 | 1,490.07 | | |
| 436 | L18 | 6.86 | 7.09 | 7.29 | 7.12 | 7.18 | 7.28 | 7.43 | 7.18 | 19.9 | 20.21 | 20.9 | 21.28 | 21.53 | 22.20 | 22.13 | 423.03 | 18.08 | 18.38 | 19.19 | 20.00 | 20.60 | 19.46 | 385.70 | |
| 442 | L23 | 6.34 | 6.79 | 6.80 | 6.82 | 6.82 | 6.84 | 6.90 | 6.76 | 8.0 | 8.43 | 8.7 | 9.54 | 9.03 | 9.20 | 8.75 | 176.14 | 6.99 | 6.31 | 7.96 | 7.20 | 7.50 | 6.13 | 140.30 | |
| 444 | L25 | 6.51 | 6.87 | 6.91 | 6.63 | 6.85 | 6.89 | 7.02 | 6.81 | 9.0 | 9.95 | 10.5 | 8.55 | 9.17 | 10.50 | 11.19 | 196.57 | 8.30 | 7.69 | 6.44 | 7.60 | 8.80 | 7.98 | 156.03 | |
| 447 | L28 | 4.99 | 5.02 | 5.31 | 5.19 | 5.36 | 5.54 | 4.96 | 5.19 | 2.1 | 2.16 | 3.0 | 2.62 | 3.09 | 3.50 | 2.25 | 53.23 | 1.45 | 0.89 | 1.13 | 1.20 | 1.90 | -0.37 | 20.67 | |
| 448 | L29 | 3.97 | | 4.44 | 4.17 | 4.33 | 4.27 | 4.28 | 4.24 | 0.0 | | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 | -1.9 | 0.00 | 0.00 | -7.6 | |
| 454 | L46 | 6.64 | 7.04 | 6.90 | 6.81 | 6.93 | 6.54 | 6.61 | 6.78 | 24.2 | 15.10 | 11.8 | 12.07 | 11.13 | 11.20 | 9.41 | 271.00 | 14.95 | 10.01 | 11.17 | 9.00 | 9.60 | 8.56 | 210.97 | |
| 455 | L47 | 6.69 | 6.82 | 6.76 | 6.78 | 6.93 | 6.66 | 6.82 | 6.78 | 16.0 | 13.34 | 10.7 | 12.25 | 12.81 | 16.60 | 10.06 | 262.17 | 12.88 | 9.08 | 11.08 | 11.00 | 14.90 | 8.02 | 223.20 | |
| 457 | L49 | 6.15 | 6.84 | 6.43 | 6.60 | 6.71 | 6.63 | 6.56 | 6.56 | 6.6 | 10.10 | 6.8 | 8.38 | 9.38 | 11.00 | 8.00 | 172.29 | 9.71 | 4.99 | 7.34 | 7.10 | 9.30 | 6.74 | 150.60 | |
| 464 | L60 | 6.29 | 6.99 | 7.02 | 6.87 | 7.30 | 7.26 | 7.12 | 6.98 | 9.6 | 11.75 | 16.1 | 15.24 | 16.76 | 18.60 | 13.34 | 289.69 | 11.35 | 14.20 | 14.11 | 15.10 | 17.00 | 12.01 | 279.23 | |
| 175 | P13 | | | | 7.53 | 8.08 | 9.12 | 7.90 | 8.16 | | | | 49.30 | 45.30 | 44.40 | 40.88 | 899.40 | | | 50.48 | 44.40 | 43.30 | 43.43 | 908.05 | |
| 199 | P49 | | | | 6.76 | 6.64 | 6.66 | 6.81 | 6.72 | | | | 9.17 | 8.73 | 8.60 | 8.63 | 175.65 | | | 7.70 | 7.00 | 6.90 | 11.31 | 164.55 | |
| 473 | A301 | | | 7.25 | 7.21 | 7.20 | 7.20 | 7.29 | 7.23 | | | 22.5 | 22.51 | 22.59 | 22.10 | 20.53 | 440.96 | | 20.30 | 21.05 | 21.00 | 20.40 | 18.36 | 404.44 | |
| 118 | L107 | | 7.17 | 7.18 | 7.16 | 7.25 | 7.29 | 7.49 | 7.25 | | 24.06 | 23.1 | 23.34 | 24.28 | 23.90 | 23.81 | 475.13 | 22.29 | 20.25 | 21.33 | 22.50 | 22.30 | 21.59 | 434.20 | |
| 84 | L109 | 6.66 | 7.18 | 7.14 | 7.00 | 7.10 | 7.01 | 7.22 | 7.04 | 18.2 | 21.44 | 20.6 | 19.19 | 19.74 | 18.40 | 18.13 | 387.60 | 20.60 | 18.53 | 18.21 | 17.90 | 16.70 | 16.56 | 361.67 | |
| 88 | O-10 | 6.47 | 6.93 | 6.77 | 6.85 | 7.03 | 6.86 | | 6.82 | 10.4 | 13.06 | 11.1 | 10.99 | 12.81 | 12.00 | | 234.53 | 12.55 | 9.18 | 10.13 | 11.00 | 10.30 | | 212.64 | |
| 90 | R1 | 6.58 | 7.09 | 7.12 | 7.03 | 7.10 | 7.04 | 7.14 | 7.01 | 13.5 | 15.80 | 15.6 | 15.23 | 15.40 | 15.50 | 15.31 | 303.74 | 14.68 | 13.79 | 13.94 | 13.70 | 14.10 | 13.31 | 278.40 | |
| 146 | E52 | 6.56 | 7.13 | 7.16 | 7.11 | 7.17 | 7.20 | 7.07 | 7.06 | 14.7 | 17.63 | 18.8 | 20.03 | 19.41 | 20.60 | 19.59 | 373.40 | 17.55 | 16.86 | 19.41 | 18.00 | 19.00 | 18.27 | 363.63 | |
| 152 | E59 | 6.46 | 6.83 | 6.87 | 6.80 | 6.91 | 6.99 | 6.84 | 6.81 | 9.7 | 9.01 | 9.7 | 9.91 | 11.12 | 12.10 | 10.50 | 205.74 | 7.41 | 7.14 | 8.48 | 9.50 | 10.30 | 7.59 | 168.07 | |
| 89 | E68 | | 7.03 | 6.93 | 6.80 | 6.87 | 6.85 | 6.89 | 6.90 | | 14.81 | 13.3 | 11.74 | 12.36 | 12.20 | 13.44 | 259.33 | 14.50 | 12.04 | 10.81 | 10.60 | 10.40 | 11.70 | 233.48 | |
| 91 | O-1/E55 | 5.64 | 5.99 | 6.04 | 6.15 | 6.48 | 6.46 | 6.65 | 6.20 | 3.9 | 4.46 | 4.2 | 4.82 | 6.11 | 6.10 | 9.50 | 111.71 | 3.35 | 1.98 | 3.30 | 3.80 | 3.70 | 7.69 | 79.40 | |
| 97 | O-2 E67 | 6.35 | 6.79 | 6.75 | 6.88 | 6.87 | 6.87 | 6.37 | 6.70 | 9.7 | 10.26 | 10.1 | 11.47 | 11.21 | 11.50 | 5.88 | 200.34 | 9.83 | 8.56 | 10.61 | 9.20 | 9.70 | 3.73 | 172.10 | |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 2 of 10)

| No. _x -So. _x GIS No. | Original RAMP Name | Specific Cond. (µS/cm) | | | | | | | | Total Dissolved Solids (mg/L) | | | | | | Turbidity (NTU) | | | | | | | |
|---|--------------------------|------------------------|------|------|--------|--------|--------|--------|--------|-------------------------------|-------|------|--------|--------|--------|-----------------|------|-------|-------|-------|------|-------|-------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean |
| 168 | A21 | 17.3 | 14 | 16.2 | 16.4 | 14.20 | 13.80 | 16.00 | 15.41 | 70.5 | 52.0 | 54 | 45.0 | 49.30 | 54.12 | 6.5 | 2.8 | 3.20 | 2.70 | 3.60 | | 1.20 | 3.33 |
| 169 | A24 | 14.1 | 14 | 16.7 | 14.8 | 15.10 | 12.50 | 17.20 | 14.91 | 41.5 | 42.8 | 52 | 58.5 | 27.30 | 44.32 | 8.1 | 4.6 | 2.70 | 5.00 | 8.50 | | 1.40 | 5.05 |
| 170 | A26 | 13.9 | 12 | 13.5 | 15.6 | 14.00 | 14.30 | 11.60 | 13.56 | 55.5 | 36.2 | 44 | 33.0 | 74.70 | 48.68 | 1.6 | 7.9 | 9.80 | 1.40 | 7.40 | | 1.40 | 4.92 |
| 167 | A29 | 12.0 | 13 | 12.9 | 13.5 | 13.70 | 12.60 | 11.20 | 12.70 | 28.5 | 37.0 | 43 | 39.5 | 32.00 | 36.04 | 1.4 | 1.5 | 2.30 | 1.30 | 3.70 | | 1.50 | 1.95 |
| 166 | A86 | 22.2 | 25 | | 25.8 | 27.30 | 28.50 | 23.30 | 25.35 | 45.0 | 44.5 | | 47.0 | 59.30 | 48.95 | 1.2 | 0.79 | | 1.40 | 1.60 | | 10.00 | 3.00 |
| 287 | 25 | | | | 14.1 | 14.00 | 12.60 | 12.10 | 13.20 | | | | 33.0 | 74.70 | 53.85 | | | | 2.70 | 4.20 | | 1.50 | 2.80 |
| 289 | 27 | | | | 15.0 | 16.50 | 17.20 | 11.70 | 15.10 | | | | 28.0 | 35.30 | 31.65 | | | | 1.60 | 2.70 | | 1.30 | 1.87 |
| 290 | 28 | | | | 18.2 | 21.70 | 17.00 | 13.90 | 17.70 | | | | 48.5 | 63.30 | 55.90 | | | | 0.91 | 4.10 | | 1.10 | 2.04 |
| 342 | 82 | | | | 34.1 | 31.10 | 36.10 | 21.50 | 30.70 | | | | 122.5 | 92.00 | 107.25 | | | | 1.00 | 4.50 | | 2.30 | 2.60 |
| 354 | 94 | | | | 62.7 | 45.00 | 44.40 | 32.20 | 46.08 | | | | 88.5 | 80.00 | 84.25 | | | | 1.20 | 2.80 | | 1.00 | 1.67 |
| 165 | A42 | 31.4 | 35 | 34.8 | 49.1 | 43.40 | 55.40 | 37.90 | 41.00 | | 114.4 | 108 | 139.0 | 137.30 | 124.55 | 15.0 | 30.0 | 26.00 | 18.00 | 18.00 | | 20.00 | 21.17 |
| 171 | A47 | 29.1 | 31 | 22.3 | 38.2 | 32.10 | 34.10 | 27.40 | 30.60 | | 56.7 | 61 | 30.0 | 53.50 | 45.74 | 3.0 | 1.4 | 1.30 | 2.70 | 2.70 | | 2.60 | 2.28 |
| 172 | A59 | 21.2 | 25 | 22.6 | 25.0 | 27.40 | 28.80 | 20.20 | 24.31 | 115.0 | 95.9 | 18 | 69.5 | 84.00 | 76.38 | 7.8 | 2.5 | 1.70 | 3.40 | 1.50 | | 1.20 | 3.02 |
| 223 | P94 | | | | 120.2 | 117.10 | 117.40 | 85.80 | 110.13 | | | | 151.5 | 179.00 | 165.25 | | | | 2.30 | 1.50 | | 2.00 | 1.93 |
| 225 | P96 | | | | 85.2 | 72.80 | 83.40 | 55.10 | 74.13 | | | | 81.5 | 102.50 | 92.00 | | | | 1.80 | 1.00 | | 1.80 | 1.53 |
| 226 | P97 | | | | 42.0 | 45.00 | 45.20 | 70.90 | 50.78 | | | | 60.5 | 110.50 | 85.50 | | | | 1.30 | 0.67 | | 1.10 | 1.02 |
| 227 | P98 | | | | 83.6 | 79.40 | 80.10 | 32.30 | 68.85 | | | | 105.5 | 114.00 | 109.75 | | | | 1.40 | 0.63 | | 1.70 | 1.24 |
| 267 | 1 | | | | 97.2 | 89.60 | 90.00 | 56.30 | 83.28 | | | | 60.5 | 93.00 | 76.75 | | | | 2.00 | 2.30 | | 1.20 | 1.83 |
| 452 | L4 | 23.8 | 24 | 22.6 | 22.3 | 21.50 | 21.80 | 20.20 | 22.31 | 64.0 | 67.5 | 52 | 50.5 | 70.00 | 60.80 | 1.4 | 0.46 | 0.63 | 0.56 | 0.69 | 0.60 | 1.10 | 0.78 |
| 470 | L7 | 31.1 | 36 | 30.6 | 26.0 | 27.50 | 25.90 | 23.60 | 28.67 | 66.5 | 84.0 | 69 | 84.5 | 100.50 | 80.86 | 0.9 | 1.1 | 1.00 | 0.57 | 1.00 | 1.00 | 0.41 | 0.85 |
| 471 | L8 | 54.8 | 46 | 49.4 | 45.8 | 49.30 | 49.20 | 40.90 | 47.91 | 79.0 | 72.5 | 74 | 52.0 | 81.00 | 71.64 | 3.9 | 2.5 | 2.10 | 1.40 | 1.10 | 1.85 | 2.50 | 2.19 |
| 400 | L39 | 30.6 | 32 | 30.0 | 26.5 | 25.40 | 28.50 | 21.10 | 27.73 | 61.5 | 50.7 | 62 | 31.5 | 62.00 | 53.50 | 9.1 | 7.0 | 11.00 | 4.90 | 7.10 | | 1.60 | 6.78 |
| 268 | E15 | | 49 | 57.1 | 68.1 | 53.80 | 45.30 | 35.10 | 51.40 | | 178.6 | 219 | 90.5 | 90.50 | 144.73 | | 9.5 | 4.00 | 1.80 | 1.50 | 1.50 | 2.90 | 3.53 |
| 182 | P23 | | | | 31.4 | 88.90 | 101.50 | 80.50 | 75.58 | | | | 34.5 | 84.00 | 59.25 | | | | 1.30 | 6.20 | | 3.90 | 3.80 |
| 185 | P27 | | | | 24.0 | 22.30 | 19.30 | 21.30 | 21.73 | | | | 64.0 | 67.00 | 65.50 | | | | 0.52 | 0.60 | | 0.48 | 0.53 |
| 209 | P7 | | | | 22.2 | 28.00 | 22.80 | 22.70 | 23.93 | | | | 35.0 | 71.00 | 53.00 | | | | 1.40 | 0.72 | | 0.52 | 0.88 |
| 270 | 4 | | | | 163.9 | 150.80 | 140.80 | 112.00 | 141.88 | | | | 132.0 | 144.50 | 138.25 | | | | 2.40 | 2.40 | 1.80 | 2.70 | 2.33 |
| 271 | 6 | | | | 172.3 | 137.00 | 129.20 | 104.00 | 135.63 | | | | 101.5 | 120.00 | 110.75 | | | | 3.10 | 2.70 | | 2.80 | 2.87 |
| 418 | Kearl L. | | | | 163.80 | 165.90 | 141.00 | 156.90 | | | | | 146.00 | 146.00 | | | | | 8.30 | | 1.50 | 1.50 | 3.77 |
| 436 | L18 | 60.7 | 61 | 62.7 | 63.7 | 63.20 | 64.50 | 62.60 | 62.63 | 45.0 | 45.3 | 47 | 23.0 | 39.30 | 40.00 | 0.5 | 0.8 | 0.68 | 0.87 | 0.65 | | 0.51 | 0.67 |
| 442 | L23 | 26.1 | 22 | 25.8 | 26.2 | 24.40 | 25.30 | 22.90 | 24.67 | 50.5 | 37.4 | 45 | 29.5 | 45.30 | 41.48 | 1.3 | 1.1 | 2.40 | 1.50 | 1.60 | | 1.80 | 1.62 |
| 444 | L25 | 28.6 | 26 | 30.3 | 28.1 | 28.70 | 30.60 | 29.50 | 28.83 | 22.5 | 38.1 | 38 | 33.0 | 32.00 | 32.64 | 3.5 | 2.5 | 3.20 | 1.30 | 1.50 | | 2.50 | 2.42 |
| 447 | L28 | 21.7 | 17 | 20.7 | 20.3 | 18.90 | 19.50 | 19.70 | 19.69 | 82.5 | 76.0 | 63 | 65.5 | 76.70 | 72.74 | 1.7 | 1.4 | 4.30 | 2.10 | 4.10 | | 0.94 | 2.42 |
| 448 | L29 | 21.0 | | 15.9 | 22.1 | 16.50 | 14.70 | 13.70 | 17.32 | 37.5 | | 58 | 27.5 | 41.30 | 41.02 | 4.1 | | 21.00 | 3.90 | 8.00 | | 5.00 | 8.40 |
| 454 | L46 | 89.4 | 58 | 58.0 | 54.6 | 49.30 | 53.60 | 45.70 | 58.37 | 93.0 | 95.0 | 64 | 83.0 | 86.00 | 84.20 | 15.0 | 11.0 | 13.00 | 20.00 | 29.00 | | 20.00 | 18.00 |
| 455 | L47 | 71.5 | 55 | 59.2 | 56.4 | 47.50 | 52.30 | 47.70 | 55.66 | 66.5 | 84.5 | 102 | 72.5 | 84.70 | 82.04 | 15.0 | 7.3 | 53.00 | 5.30 | 20.00 | | 7.80 | 18.07 |
| 457 | L49 | 67.2 | 57 | 59.3 | 62.7 | 55.00 | 59.00 | 45.00 | 57.89 | 75.5 | 84.5 | 98 | 59.5 | 85.30 | 80.60 | 4.6 | 7.0 | 14.00 | 6.10 | 6.30 | | 5.00 | 7.17 |
| 464 | L60 | 57.0 | 54 | 60.9 | 60.4 | 55.90 | 56.80 | 46.20 | 55.89 | 74.4 | 81.0 | 77 | 61.5 | 78.00 | 74.40 | 2.5 | 4.7 | 5.20 | 3.60 | 2.80 | | 16.00 | 5.80 |
| 175 | P13 | | | | 117.2 | 109.90 | 109.50 | 89.10 | 106.43 | | | | 117.0 | 171.70 | 144.35 | | | | 7.50 | 11.00 | | 6.70 | 8.40 |
| 199 | P49 | | | | 25.4 | 24.80 | 26.00 | 21.10 | 24.33 | | | | 14.0 | 50.50 | 32.25 | | | | 1.80 | 2.30 | 2.80 | 2.40 | 2.33 |
| 473 | A301 | | | 55.0 | 55.1 | 53.20 | 54.00 | 50.80 | 53.62 | | | 44 | 27.0 | 63.00 | 44.50 | | | 1.40 | 1.90 | 1.50 | | 1.10 | 1.47 |
| 118 | L107 | | 60 | 61.0 | 60.3 | 60.70 | 61.70 | 56.90 | 60.10 | | 48.0 | 34 | 25.5 | 62.00 | 42.25 | | 0.43 | 0.58 | 0.48 | 0.53 | | 0.38 | 0.48 |
| 84 | L109 | 51.2 | 59 | 54.9 | 51.3 | 49.80 | 48.90 | 44.80 | 51.41 | 69.5 | 67.0 | 49 | 41.0 | 82.00 | 61.60 | 0.9 | 1.3 | 1.40 | 1.40 | 1.70 | | 0.99 | 1.28 |
| 88 | O-10 | 33.7 | 32 | 32.7 | 32.9 | 37.10 | 35.60 | | 34.00 | 80.5 | 73.2 | 54 | 37.5 | 73.50 | 63.74 | 4.7 | 5.3 | 6.40 | 4.90 | 1.00 | | | 4.46 |
| 90 | R1 | 39.4 | 37 | 41.6 | 49.8 | 40.30 | 41.10 | 39.30 | 41.21 | 55.4 | 55.5 | 40 | 32.0 | 78.00 | 52.08 | 1.4 | 0.91 | 0.96 | 1.70 | 1.10 | | 1.10 | 1.19 |
| 146 | E52 | 45.2 | 46 | 51.0 | 53.2 | 52.60 | 52.70 | 32.80 | 47.64 | 86.1 | 71.0 | 86 | 35.0 | 80.00 | 71.60 | 1.2 | 1.3 | 1.10 | 1.50 | 1.50 | | 0.64 | 1.21 |
| 152 | E59 | 29.4 | 24 | 29.2 | 29.8 | 31.60 | 32.40 | 20.10 | 28.00 | 43.0 | 37.5 | 44 | 19.0 | 44.00 | 37.40 | 2.1 | 1.4 | 1.10 | 1.20 | 1.80 | | 0.94 | 1.42 |
| 89 | E68 | | 40 | 41.7 | 41.7 | 39.70 | 38.20 | 26.40 | 37.95 | | 71.5 | 81 | 50.0 | 55.00 | 64.27 | | | 3.7 | 4.10 | 2.70 | | 2.60 | 3.89 |
| 91 | O-1/E55 | 20.8 | 25 | 19.5 | 19.8 | 21.10 | 22.30 | 18.20 | 20.96 | 55.0 | 48.0 | 55 | 20.5 | 37.00 | 43.00 | 0.7 | 1.6 | 1.20 | 1.60 | 1.70 | | 0.80 | 1.26 |
| 97 | O-2 E67 | 31.1 | 31 | 30.3 | 31.0 | 31.60 | 32.20 | 15.80 | 29.00 | 72.5 | 62.0 | 63 | 43.5 | 53.50 | 58.90 | 1.0 | 0.87 | 0.89 | 1.10 | 1.00 | | 1.70 | 1.09 |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 3 of 10)

| No.-So. GIS No. | Original RAMP Name | Total Suspended Solids (mg/L) | | | | | | Colour (TCU) | | | | | | | | Sodium (mg/L) | | | | | | | |
|--------------------|--------------------------|-------------------------------|-------|--------|-------|-------|--------|--------------|-------|------|------|--------|--------|--------|--------|---------------|------|-------|------|------|-------|------|------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean |
| 168 | A21 | 14.1 | 6.4 | | 4.0 | 11.50 | 9.00 | 308 | 276.2 | 322 | 272 | 285.80 | 233.30 | 264.30 | 280.17 | 0.99 | 0.79 | 0.960 | 0.51 | 0.74 | 0.48 | 0.49 | 0.71 |
| 169 | A24 | 8.0 | 2.7 | 8.80 | 15.3 | 40.50 | 15.05 | 250 | 223.9 | 270 | 297 | 226.70 | | 259.70 | 254.55 | 0.57 | 0.57 | 0.370 | 0.91 | 0.98 | 0.79 | 0.25 | 0.63 |
| 170 | A26 | 2.3 | 15.6 | 28.00 | 1.9 | 34.00 | 16.35 | 77 | 103.8 | 106 | 124 | 151.70 | 110.70 | 157.70 | 118.70 | 0.90 | 0.67 | 0.610 | 0.45 | 0.77 | 0.44 | 0.35 | 0.60 |
| 167 | A29 | 1.2 | 5.0 | | 4.0 | 2.00 | 3.05 | 43 | 78.1 | 103 | 74 | 82.20 | 61.50 | 78.70 | 74.29 | 0.70 | 1.03 | 1.160 | 0.77 | 0.71 | 1.30 | 1.22 | 0.98 |
| 166 | A86 | 2.0 | 2.3 | | 2.1 | 2.00 | 2.11 | 47 | 47.7 | | 30 | 50.20 | | 87.50 | 52.36 | 0.78 | 0.59 | | 0.67 | 0.78 | 1.20 | 0.73 | 0.79 |
| 287 | 25 | | | | 8.4 | 16.70 | 12.57 | | | | 146 | 223.20 | | 193.50 | 187.63 | | | | 0.48 | 0.68 | 0.90 | 0.34 | 0.60 |
| 289 | 27 | | | | 5.3 | 8.70 | 7.02 | | | | 43 | 43.20 | 37.40 | 50.80 | 43.68 | | | | 0.62 | 0.62 | 0.61 | 0.53 | 0.59 |
| 290 | 28 | | | | 2.6 | 19.30 | 10.94 | | | | 126 | 340.30 | 106.50 | 122.70 | 173.80 | | | | 0.53 | 0.99 | 0.55 | 0.71 | 0.69 |
| 342 | 82 | | | | 4.4 | 12.50 | 8.47 | | | | 52 | 63.60 | 60.70 | 71.70 | 62.00 | | | | 1.36 | 1.42 | 2.21 | 1.32 | 1.58 |
| 354 | 94 | | | | 2.7 | 6.30 | 4.51 | | | | 25 | 43.30 | 33.60 | 39.90 | 35.38 | | | | 1.44 | 1.38 | 1.60 | 1.10 | 1.38 |
| 165 | A42 | | 175.0 | | 122.5 | 85.00 | 127.50 | 54 | 87.0 | 92 | 60 | 79.50 | 42.70 | 77.20 | 70.34 | 8.13 | 3.11 | 1.890 | 2.04 | 2.99 | 4.20 | 7.08 | 4.21 |
| 171 | A47 | 6.6 | 2.1 | | 4.0 | 3.60 | 4.08 | 60 | 88.2 | 261 | 107 | 91.10 | 62.60 | 99.00 | 109.87 | 0.75 | 0.42 | 0.820 | 0.70 | 0.68 | 0.70 | 0.76 | 0.69 |
| 172 | A59 | 70.0 | 8.4 | 0.75 | 15.0 | 5.00 | 19.83 | 256 | 316.0 | 43 | 232 | 429.40 | 371.00 | 244.70 | 270.16 | 2.50 | 0.76 | 0.770 | 1.47 | 0.96 | 1.00 | 0.84 | 1.19 |
| 223 | P94 | | | | 6.8 | 2.70 | 4.77 | | | | 154 | 156.40 | | 214.30 | 175.03 | | | | 7.10 | 6.17 | 7.09 | 5.28 | 6.41 |
| 225 | P96 | | | | 5.4 | 0.90 | 3.17 | | | | 57 | 105.60 | | 149.10 | 103.90 | | | | 1.07 | 0.82 | 1.44 | 0.82 | 1.04 |
| 226 | P97 | | | | 4.0 | 2.00 | 3.00 | | | | 95 | 233.50 | | 134.60 | 154.27 | | | | 1.29 | 1.10 | 1.09 | 1.28 | 1.19 |
| 227 | P98 | | | | 4.9 | 0.60 | 2.73 | | | | 118 | 143.70 | | 199.00 | 153.43 | | | | 1.38 | 1.08 | 1.16 | 2.01 | 1.41 |
| 267 | 1 | | | | 5.8 | 4.70 | 5.23 | | | | 19 | 25.80 | | 38.10 | 27.63 | | | | 1.44 | 2.07 | 1.53 | 0.95 | 1.50 |
| 452 | L4 | 7.9 | 1.6 | 1.20 | 2.7 | 1.00 | 2.88 | 208 | 337.4 | 216 | 245 | 269.90 | 217.10 | 245.80 | 248.44 | 1.02 | 0.45 | 0.430 | 0.46 | 0.48 | 0.48 | 0.41 | 0.53 |
| 470 | L7 | 1.6 | 0.9 | 0.60 | 2.9 | 1.30 | 1.45 | 202 | 371.9 | 278 | 300 | 361.70 | 251.50 | 292.90 | 293.87 | 0.92 | 0.64 | 0.780 | 0.68 | 0.62 | 0.64 | 0.48 | 0.68 |
| 471 | L8 | 6.6 | 4.8 | 3.20 | 3.3 | 0.70 | 3.72 | 105 | 152.2 | 162 | 148 | 179.30 | 142.60 | 154.20 | 149.11 | 2.56 | 2.07 | 2.540 | 2.09 | 2.63 | 1.92 | 1.46 | 2.18 |
| 400 | L39 | 16.4 | 22.0 | 41.30 | 17.5 | 7.60 | 20.96 | 55 | 76.7 | 63 | 114 | 76.00 | 86.50 | 203.10 | 96.39 | 5.39 | 1.76 | 1.650 | 1.90 | 2.28 | 1.61 | 0.99 | 2.23 |
| 268 | E15 | | 56.0 | 18.00 | 1.4 | 4.70 | 20.03 | | 132.1 | 103 | 129 | 152.50 | 138.10 | 98.80 | 125.58 | | 3.85 | 3.880 | 3.42 | 3.19 | 3.01 | 5.57 | 3.82 |
| 182 | P23 | | | | 2.7 | 7.20 | 4.96 | | | | 179 | 73.00 | | 98.40 | 116.83 | | | | 0.85 | 1.67 | 2.90 | 1.63 | 1.76 |
| 185 | P27 | | | | 0.3 | 0.60 | 0.45 | | | | 257 | 297.20 | | 255.20 | 269.67 | | | | 0.46 | 0.50 | 0.61 | 0.59 | 0.54 |
| 209 | P7 | | | | 4.3 | 1.00 | 2.65 | | | | 236 | 289.50 | | 263.30 | 262.83 | | | | 0.72 | 0.47 | 0.54 | 0.57 | 0.57 |
| 270 | 4 | | | | 5.5 | 6.00 | 5.75 | | | | 34 | 34.10 | 38.30 | 26.00 | 33.10 | | | | 2.00 | 2.11 | 1.81 | 1.80 | 1.93 |
| 271 | 6 | | | | 7.3 | 4.00 | 5.65 | | | | 31 | 27.90 | | 27.40 | 28.70 | | | | 6.28 | 6.35 | 5.95 | 4.73 | 5.83 |
| 418 | Kearl L. | | | | | 3.50 | 3.50 | | | | | 75.60 | 62.20 | 60.20 | 66.00 | | | | | 8.41 | 9.16 | 7.56 | 8.38 |
| 436 | L18 | 0.4 | 1.4 | 0.60 | 5.6 | 1.50 | 1.89 | 13 | 14.1 | 14 | 12 | 11.90 | 10.90 | 9.10 | 12.19 | 2.56 | 2.28 | 2.450 | 2.45 | 2.64 | 2.68 | 2.58 | 2.52 |
| 442 | L23 | 1.7 | 1.4 | 3.00 | 3.1 | 1.20 | 2.09 | 47 | 50.2 | 44 | 37 | 54.30 | 42.60 | 51.60 | 46.70 | 0.91 | 0.82 | 0.850 | 0.88 | 0.86 | 0.93 | 0.82 | 0.87 |
| 444 | L25 | 3.9 | 2.6 | 4.80 | 5.9 | 3.20 | 4.07 | 20 | 40.4 | 46 | 29 | 25.10 | 25.30 | 23.40 | 29.84 | 0.98 | 0.81 | 1.060 | 0.84 | 0.91 | 0.99 | 0.83 | 0.92 |
| 447 | L28 | 0.3 | 2.1 | 10.20 | 5.7 | 9.50 | 5.56 | 381 | 426.6 | 466 | 422 | 485.60 | 435.10 | 407.70 | 431.94 | 1.41 | 0.95 | 1.390 | 1.32 | 1.15 | 1.84 | 1.37 | 1.35 |
| 448 | L29 | 5.0 | | 60.00 | 10.5 | 16.50 | 23.00 | 215 | | 164 | 238 | 218.90 | | 210.80 | 209.18 | 0.61 | | 1.430 | 0.34 | 0.83 | 0.92 | 0.73 | 0.81 |
| 454 | L46 | 3.6 | 10.7 | 3.80 | 7.6 | 32.00 | 11.53 | 207 | 251.5 | 233 | 249 | 372.00 | 308.70 | 279.90 | 271.50 | 5.16 | 3.31 | 3.580 | 3.26 | 3.46 | 4.17 | 2.96 | 3.70 |
| 455 | L47 | 11.8 | 10.3 | 148.00 | 3.4 | 28.20 | 40.35 | 133 | 162.6 | 111 | 153 | 166.80 | 100.00 | 134.90 | 137.37 | 3.62 | 3.01 | 3.580 | 2.95 | 2.97 | 3.23 | 2.39 | 3.11 |
| 457 | L49 | 4.3 | 10.0 | 16.20 | 4.1 | 3.20 | 7.57 | 98 | 199.4 | 179 | 177 | 222.30 | 223.60 | 223.20 | 189.03 | 4.33 | 3.45 | 3.910 | 3.77 | 3.22 | 4.04 | 2.50 | 3.60 |
| 464 | L60 | 3.5 | 3.3 | 4.83 | 7.0 | 8.00 | 5.33 | 72 | 193.4 | 152 | 164 | 162.40 | 150.50 | 162.30 | 151.07 | 3.08 | 2.68 | 2.760 | 2.80 | 2.45 | 2.82 | 2.52 | 2.73 |
| 175 | P13 | | | | 25.5 | 29.00 | 27.25 | | | | 150 | 143.20 | | 111.40 | 134.83 | | | | 8.75 | 8.55 | 10.30 | 8.41 | 9.00 |
| 199 | P49 | | | | 4.0 | 3.00 | 3.50 | | | | 57 | 71.20 | 67.60 | 64.80 | 65.05 | | | | 0.92 | 0.88 | 1.88 | 0.85 | 1.13 |
| 473 | A301 | | | 2.40 | 2.5 | 1.50 | 2.13 | | | 30 | 29 | 41.80 | 39.10 | 62.00 | 40.38 | | | 1.530 | 1.70 | 1.50 | 1.60 | 1.41 | 1.55 |
| 118 | L107 | | 0.8 | | 0.3 | 0.40 | 0.51 | | 8.0 | 11 | 11 | 12.40 | 8.80 | 8.50 | 9.93 | | 1.77 | 2.990 | 1.91 | 1.89 | 2.05 | 1.83 | 2.07 |
| 84 | L109 | 0.1 | 0.9 | 0.70 | 2.0 | 0.50 | 0.84 | 140 | 111.4 | 94 | 119 | 132.90 | 125.70 | 90.90 | 116.23 | 2.04 | 1.90 | 2.040 | 1.96 | 1.96 | 2.02 | 1.70 | 1.95 |
| 88 | O-10 | 10.9 | 25.0 | 37.00 | 18.0 | 1.00 | 18.38 | 107 | 69.8 | 63 | 79 | 89.80 | 81.10 | | 81.57 | 5.24 | 3.00 | 2.830 | 2.62 | 1.24 | 1.21 | | 2.69 |
| 90 | R1 | 1.2 | 1.3 | 1.50 | 1.4 | 0.70 | 1.23 | 81 | 57.0 | 51 | 55 | 68.60 | 72.10 | 64.90 | 64.34 | 1.63 | 1.49 | 1.630 | 1.64 | 1.52 | 1.62 | 1.45 | 1.57 |
| 146 | E52 | 2.8 | 0.5 | 0.20 | 0.6 | 2.00 | 1.21 | 283 | 283.5 | 255 | 241 | 221.70 | 215.20 | 205.10 | 243.49 | 1.50 | 0.82 | 1.250 | 1.05 | 1.01 | 1.01 | 0.96 | 1.09 |
| 152 | E59 | 2.2 | 1.6 | 1.60 | 1.3 | 1.30 | 1.60 | 96 | 82.3 | 94 | 73 | 61.50 | 46.10 | 61.80 | 73.54 | 0.48 | 0.40 | 0.510 | 0.50 | 0.54 | 0.67 | 0.53 | 0.52 |
| 89 | E68 | | 5.9 | 3.83 | 5.2 | 24.30 | 9.79 | | 311.2 | 310 | 217 | 205.70 | 147.30 | 181.40 | 228.80 | | 1.04 | 1.450 | 1.04 | 1.25 | 1.11 | 1.05 | 1.16 |
| 91 | O-1/E55 | 0.8 | 2.4 | 2.80 | 3.3 | 2.80 | 2.43 | 277 | 286.1 | 276 | 239 | 247.00 | 185.80 | 213.60 | 246.26 | 0.42 | 0.37 | 0.330 | 0.43 | 0.54 | 1.02 | 0.59 | 0.53 |
| 97 | O-2 E67 | 1.0 | 1.2 | | 0.7 | 0.60 | 0.87 | 294 | 307.0 | 302 | 280 | 238.80 | 210.60 | 186.30 | 259.77 | 0.54 | 0.44 | 0.930 | 0.46 | 0.45 | 0.47 | 0.58 | 0.55 |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 4 of 10)

| No.-So. GIS No. | Original RAMP Name | Potassium (mg/L) | | | | | | | | Calcium (mg/L) | | | | | | | | Magnesium (mg/L) | | | | | | | |
|--------------------|--------------------------|------------------|-------|-------|-------|-------|-------|-------|------|----------------|------|-------|-------|-------|-------|-------|-------|------------------|------|--------|------|------|------|-------|------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean |
| 168 | A21 | 0.480 | 0.410 | 0.330 | 0.310 | 0.340 | 0.300 | 0.003 | 0.31 | 1.63 | 1.62 | 1.730 | 1.52 | 1.40 | 1.24 | 1.34 | 1.50 | 0.55 | 0.50 | 0.5000 | 0.45 | 0.35 | 0.36 | 0.42 | 0.45 |
| 169 | A24 | 0.450 | 0.470 | 0.420 | 0.470 | 0.440 | 0.330 | 0.003 | 0.37 | 0.88 | 0.74 | 1.020 | 0.89 | 1.16 | 0.97 | 1.14 | 0.97 | 0.35 | 0.36 | 0.3700 | 0.36 | 0.34 | 0.26 | 0.37 | 0.34 |
| 170 | A26 | 0.640 | 0.380 | 0.410 | 0.520 | 0.500 | 0.500 | 0.003 | 0.42 | 4.29 | 1.18 | 1.170 | 1.39 | 1.34 | 1.26 | 1.49 | 1.73 | 0.94 | 0.35 | 0.3600 | 0.50 | 0.40 | 0.42 | 0.43 | 0.49 |
| 167 | A29 | 0.350 | 0.470 | 0.200 | 0.350 | 0.370 | 0.340 | 0.003 | 0.30 | 1.17 | 1.25 | 1.600 | 1.25 | 1.50 | 1.32 | 1.64 | 1.39 | 0.48 | 0.48 | 0.4600 | 0.54 | 0.44 | 0.49 | 0.56 | 0.49 |
| 166 | A86 | 1.450 | 1.430 | | 1.670 | 1.950 | 2.090 | 1.810 | 1.73 | 1.89 | 2.16 | | 2.33 | 2.45 | 2.50 | 3.23 | 2.43 | 0.88 | 0.86 | | 0.93 | 0.91 | 0.93 | 1.01 | 0.92 |
| 287 | 25 | | | | 0.400 | 0.540 | 0.450 | 0.003 | 0.35 | | | | 1.17 | 1.32 | 0.99 | 1.24 | 1.18 | | | | 0.35 | 0.33 | 0.28 | 0.33 | 0.32 |
| 289 | 27 | | | | 0.370 | 0.400 | 0.410 | 0.003 | 0.30 | | | | 1.74 | 1.90 | 1.89 | 2.19 | 1.93 | | | | 0.50 | 0.56 | 0.59 | 0.65 | 0.58 |
| 290 | 28 | | | | 0.410 | 0.530 | 0.460 | 0.003 | 0.35 | | | | 1.81 | 2.87 | 1.62 | 1.89 | 2.05 | | | | 0.88 | 0.79 | 0.82 | 0.88 | 0.84 |
| 342 | 82 | | | | 1.330 | 1.190 | 1.220 | 0.810 | 1.14 | | | | 3.30 | 3.12 | 2.33 | 2.79 | 2.89 | | | | 1.58 | 1.39 | 1.27 | 1.38 | 1.41 |
| 354 | 94 | | | | 1.000 | 0.850 | 0.710 | 0.210 | 0.69 | | | | 7.57 | 5.69 | 5.09 | 6.52 | 6.22 | | | | 2.66 | 1.94 | 1.88 | 1.95 | 2.11 |
| 165 | A42 | 0.340 | 0.470 | 0.440 | 0.790 | 0.590 | 0.660 | 0.003 | 0.47 | 4.82 | 5.44 | 5.510 | 7.87 | 6.75 | 8.40 | 9.75 | 6.93 | 1.19 | 1.31 | 1.3400 | 1.70 | 1.38 | 1.82 | 1.67 | 1.49 |
| 171 | A47 | 0.530 | 0.630 | 0.320 | 0.910 | 0.760 | 0.780 | 0.280 | 0.60 | 1.32 | 4.18 | 3.100 | 5.13 | 4.49 | 4.22 | 6.37 | 4.12 | 0.46 | 0.83 | 0.7300 | 1.14 | 0.91 | 0.91 | 1.00 | 0.85 |
| 172 | A59 | 0.440 | 0.360 | 1.380 | 0.530 | 0.660 | 0.570 | 0.070 | 0.57 | 2.78 | 3.36 | 2.110 | 2.81 | 3.20 | 3.30 | 3.33 | 2.98 | 0.77 | 0.78 | 0.8300 | 0.83 | 0.71 | 0.85 | 0.78 | 0.79 |
| 223 | P94 | | | | 1.600 | 1.410 | 1.470 | 0.910 | 1.35 | | | | 12.80 | 12.80 | 12.90 | 20.90 | 14.85 | | | | 5.95 | 5.20 | 5.25 | 6.03 | 5.61 |
| 225 | P96 | | | | 0.930 | 0.800 | 1.140 | 0.200 | 0.77 | | | | 11.90 | 10.00 | 10.80 | 14.78 | 11.87 | | | | 4.21 | 3.40 | 4.07 | 3.87 | 3.89 |
| 226 | P97 | | | | 0.660 | 1.020 | 1.140 | 0.300 | 0.78 | | | | 5.63 | 6.43 | 5.22 | 21.25 | 9.63 | | | | 1.95 | 1.98 | 1.76 | 4.42 | 2.53 |
| 227 | P98 | | | | 0.650 | 0.360 | 0.700 | 0.320 | 0.51 | | | | 11.70 | 11.80 | 11.20 | 6.82 | 10.38 | | | | 4.09 | 3.92 | 3.91 | 2.05 | 3.49 |
| 267 | 1 | | | | 0.920 | 0.920 | 0.840 | 0.310 | 0.75 | | | | 13.20 | 11.90 | 11.70 | 15.58 | 13.10 | | | | 4.05 | 3.62 | 3.77 | 3.39 | 3.71 |
| 452 | L4 | 0.220 | 0.130 | 0.130 | 0.070 | 0.090 | 0.130 | 0.003 | 0.11 | 3.31 | 3.67 | 3.510 | 3.47 | 3.41 | 3.11 | 4.28 | 3.54 | 1.13 | 1.16 | 0.9300 | 1.00 | 0.92 | 0.82 | 1.10 | 1.01 |
| 470 | L7 | 0.510 | 0.340 | 0.240 | 0.100 | 0.120 | 0.230 | 0.003 | 0.22 | 4.18 | 5.19 | 4.990 | 4.31 | 4.61 | 3.68 | 5.77 | 4.68 | 1.39 | 1.55 | 1.4700 | 1.31 | 1.28 | 1.09 | 1.38 | 1.35 |
| 471 | L8 | 0.290 | 0.110 | 0.110 | 0.120 | 0.050 | 0.160 | 0.003 | 0.12 | 5.87 | 5.84 | 5.900 | 5.61 | 6.16 | 5.75 | 7.41 | 6.08 | 2.72 | 2.61 | 2.6700 | 2.14 | 2.22 | 1.97 | 2.36 | 2.38 |
| 400 | L39 | 0.470 | 0.550 | 0.550 | 0.460 | 0.420 | 0.440 | 0.003 | 0.41 | 3.13 | 3.25 | 2.970 | 2.84 | 2.66 | 2.97 | 2.59 | 2.92 | 1.48 | 1.42 | 1.4000 | 1.23 | 1.09 | 1.21 | 1.06 | 1.27 |
| 268 | E15 | | 0.550 | 0.570 | 0.510 | 0.400 | 0.370 | 0.003 | 0.40 | | | | 8.01 | 6.51 | 5.40 | 6.87 | 7.46 | | 1.93 | 1.9500 | 1.77 | 1.64 | 1.56 | 1.53 | 1.73 |
| 182 | P23 | | | | 0.110 | 0.040 | 0.160 | 0.003 | 0.08 | | | | 4.76 | 13.10 | 14.70 | 25.63 | 14.55 | | | | 1.30 | 2.98 | 3.83 | 3.91 | 3.01 |
| 185 | P27 | | | | 0.060 | 0.040 | 0.150 | 0.003 | 0.06 | | | | 3.78 | 3.53 | 2.30 | 4.58 | 3.55 | | | | 0.99 | 0.91 | 0.79 | 1.22 | 0.98 |
| 209 | P7 | | | | 0.100 | 0.030 | 0.070 | 0.003 | 0.05 | | | | 3.97 | 4.63 | 3.23 | 4.08 | 3.98 | | | | 1.11 | 1.30 | 1.10 | 1.13 | 1.16 |
| 270 | 4 | | | | 0.320 | 0.220 | 0.160 | 0.003 | 0.18 | | | | 24.10 | 21.20 | 19.20 | 32.24 | 24.19 | | | | 8.09 | 7.33 | 6.98 | 7.35 | 7.44 |
| 271 | 6 | | | | 1.600 | 1.160 | 0.540 | 0.003 | 0.83 | | | | 21.50 | 15.80 | 14.50 | 26.52 | 19.58 | | | | 6.65 | 5.89 | 5.10 | 5.67 | 5.83 |
| 418 | Kearl L. | | | | | 0.910 | 0.840 | 0.003 | 0.58 | | | | 16.90 | 16.60 | 27.57 | 20.36 | | | | | 6.54 | 6.34 | 7.08 | 6.65 | |
| 436 | L18 | 1.070 | 1.060 | 1.400 | 1.060 | 1.100 | 1.070 | 0.700 | 1.07 | 6.13 | 6.47 | 6.280 | 6.52 | 6.53 | 6.26 | 9.60 | 6.83 | 2.02 | 2.02 | 2.0900 | 2.08 | 2.04 | 2.02 | 2.19 | 2.07 |
| 442 | L23 | 0.420 | 0.430 | 0.390 | 0.400 | 0.430 | 0.390 | 0.003 | 0.35 | 3.01 | 2.94 | 2.890 | 3.05 | 2.79 | 2.75 | 3.04 | 2.92 | 1.08 | 1.06 | 1.0600 | 1.07 | 0.96 | 0.94 | 0.94 | 1.02 |
| 444 | L25 | 0.600 | 0.710 | 0.630 | 0.600 | 0.670 | 0.640 | 0.220 | 0.58 | 3.27 | 3.51 | 3.510 | 3.04 | 3.17 | 3.36 | 4.38 | 3.46 | 0.94 | 0.99 | 1.0300 | 0.86 | 0.84 | 0.92 | 1.03 | 0.94 |
| 447 | L28 | 0.470 | 0.280 | 0.290 | 0.260 | 0.350 | 0.380 | 0.003 | 0.29 | 2.17 | 2.21 | 2.150 | 2.15 | 2.08 | 2.27 | 2.14 | 2.17 | 0.70 | 0.68 | 0.6600 | 0.66 | 0.62 | 0.68 | 0.64 | 0.66 |
| 448 | L29 | 0.170 | | 0.110 | 0.080 | 0.120 | 0.220 | 0.003 | 0.12 | 0.70 | | 0.580 | 0.50 | 0.56 | 0.52 | 0.20 | 0.51 | 0.19 | | 0.2000 | 0.16 | 0.15 | 0.14 | 0.16 | 0.17 |
| 454 | L46 | 1.070 | 0.820 | 0.720 | 0.510 | 0.720 | 0.900 | 0.000 | 0.68 | 7.81 | 6.74 | 5.310 | 5.58 | 5.37 | 4.69 | 6.57 | 6.01 | 2.88 | 2.37 | 2.0300 | 1.96 | 1.80 | 1.72 | 1.80 | 2.08 |
| 455 | L47 | 1.050 | 0.800 | 0.690 | 0.660 | 0.790 | 2.400 | 0.270 | 0.95 | 7.32 | 6.29 | 5.680 | 6.05 | 5.19 | 17.60 | 7.17 | 7.90 | 2.42 | 1.99 | 1.8000 | 1.83 | 1.57 | 7.53 | 2.37 | 2.79 |
| 457 | L49 | 0.880 | 0.720 | 0.670 | 0.700 | 0.860 | 0.900 | 0.170 | 0.70 | 5.43 | 6.31 | 5.110 | 5.72 | 5.38 | 5.34 | 6.12 | 5.63 | 1.89 | 2.07 | 1.6700 | 1.85 | 1.68 | 1.78 | 1.53 | 1.78 |
| 464 | L60 | 0.590 | 0.760 | 0.550 | 0.560 | 0.660 | 0.630 | 0.003 | 0.54 | 5.24 | 6.47 | 6.510 | 6.51 | 6.69 | 6.14 | 7.56 | 6.45 | 1.78 | 2.26 | 2.2500 | 2.12 | 2.08 | 2.05 | 1.89 | 2.06 |
| 175 | P13 | | | | 0.690 | 0.710 | 0.390 | 0.160 | 0.49 | | | | 13.40 | 12.00 | 10.20 | 17.22 | 13.21 | | | | 5.05 | 4.60 | 4.51 | 5.46 | 4.91 |
| 199 | P49 | | | | 0.430 | 0.410 | 0.490 | 0.003 | 0.33 | | | | 2.65 | 2.66 | 2.59 | 3.48 | 2.85 | | | | 1.35 | 1.30 | 1.23 | 1.40 | 1.32 |
| 473 | A301 | | | | | 0.610 | 0.600 | 0.650 | 0.61 | | | 6.220 | 6.11 | 5.97 | 5.78 | 8.16 | 6.45 | | | | | | | | |
| 118 | L107 | | 1.030 | 0.650 | 1.200 | 0.990 | 0.980 | 0.610 | 0.91 | | 7.78 | 7.460 | 7.48 | 7.42 | 7.24 | 11.40 | 8.13 | | 1.59 | 1.6000 | 1.57 | 1.52 | 1.56 | 1.80 | 1.61 |
| 84 | L109 | 0.430 | 0.570 | 0.600 | 0.580 | 0.450 | 0.550 | 0.010 | 0.46 | 6.01 | 6.50 | 6.220 | 5.98 | 5.89 | 5.49 | 7.61 | 6.24 | 2.24 | 2.29 | 2.2900 | 2.12 | 2.04 | 1.97 | 2.31 | 2.18 |
| 88 | O-10 | 0.500 | 0.530 | 0.700 | 0.600 | 0.460 | 0.450 | | 0.54 | 3.94 | 3.95 | 3.260 | 3.33 | 4.47 | 4.13 | | 3.85 | 1.43 | 1.58 | 1.4900 | 1.49 | 1.49 | 1.43 | | 1.49 |
| 90 | R1 | 0.390 | 0.430 | 0.470 | 0.500 | 0.520 | 0.550 | 0.360 | 0.46 | 4.54 | 4.82 | 4.810 | 4.60 | 4.67 | 4.56 | 6.07 | 4.87 | 1.57 | 1.65 | 1.6900 | 1.63 | 1.56 | 1.58 | 1.86 | 1.65 |
| 146 | E52 | 0.800 | 0.700 | 0.580 | 0.700 | 0.710 | 0.690 | 0.100 | 0.61 | 7.23 | 7.99 | 7.990 | 8.26 | 8.05 | 7.74 | 12.34 | 8.51 | 1.63 | 1.74 | 1.8600 | 1.88 | 1.78 | 1.82 | 2.13 | 1.83 |
| 152 | E59 | 0.270 | 0.270 | 0.260 | 0.420 | 0.320 | 0.300 | 0.003 | 0.26 | 4.24 | 3.84 | 4.130 | 3.97 | 4.17 | 4.27 | 5.08 | 4.24 | 1.12 | 1.00 | 1.0800 | 1.06 | 1.07 | 1.11 | 1.23 | 1.10 |
| 89 | E68 | | 0.275 | 0.190 | 0.260 | 0.290 | 0.300 | 0.003 | 0.22 | | 6.59 | 6.210 | 5.23 | 5.35 | 4.87 | 7.76 | 6.00 | | 2.06 | 1.9300 | 1.59 | 1.58 | 1.44 | 1.95 | 1.76 |
| 91 | O-1/E55 | 0.230 | 0.140 | 0.140 | 0.180 | 0.190 | 0.160 | 0.003 | 0.15 | 3.23 | 3.19 | 3.080 | 3.02 | 3.20 | 3.29 | 6.22 | 3.60 | 0.73 | 0.68 | 0.6700 | 0.69 | 0.70 | 0.76 | 13.64 | 2.55 |
| 97 | O-2 E67 | 0.160 | 0.160 | 0.080 | 0.160 | 0.160 | 0.160 | 0.003 | 0.13 | 5.42 | 5.70 | 5.290 | 5.23 | 5.04 | 4.93 | 3.78 | 5.06 | 1.36 | 1.42 | 1.3400 | 1.33 | 1.23 | 1.26 | 0.79 | 1.25 |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 5 of 10)

| No.-So. GIS No. | Original RAMP Name | Bicarbonate (mg/L) | | | | | | | | Chloride (mg/L) | | | | | | | | Sulphate (mg/L) | | | | | | | |
|--------------------|--------------------------|--------------------|-------|------|--------|-------|-------|-------|-------|-----------------|------|------|------|------|------|------|------|-----------------|-------|------|-------|------|-------|-------|-------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean |
| 168 | A21 | 0.9 | 2.26 | 2.1 | 2.13 | 2.08 | 1.50 | 0.61 | 1.66 | 0.1 | 0.10 | 0.15 | 0.15 | 0.09 | 0.16 | 0.09 | 0.12 | 2.1 | 1.67 | 1.3 | 1.61 | 1.39 | 1.31 | 0.96 | 1.48 |
| 169 | A24 | | 0.67 | 1.5 | 1.25 | 1.37 | 1.60 | 0.00 | 1.06 | 0.1 | 0.11 | 0.15 | 0.21 | 0.11 | 0.23 | 0.19 | 0.16 | 1.6 | 1.45 | 1.0 | 0.63 | 0.73 | 0.75 | 0.75 | 0.98 |
| 170 | A26 | 11.4 | 2.12 | 2.6 | 3.02 | 2.91 | 2.20 | 1.98 | 3.74 | 0.2 | 0.10 | 0.15 | 0.18 | 0.12 | 0.12 | 0.12 | 0.15 | 1.5 | 1.83 | 1.7 | 1.40 | 1.00 | 1.11 | 0.95 | 1.34 |
| 167 | A29 | 2.8 | 3.89 | 3.8 | 3.68 | 4.33 | 3.10 | 3.66 | 3.60 | 0.1 | 0.18 | 0.15 | 0.20 | 0.13 | 0.17 | 0.27 | 0.17 | 1.3 | 0.66 | 0.5 | 0.87 | 0.35 | 0.90 | 0.73 | 0.76 |
| 166 | A86 | 6.8 | 8.31 | | 9.29 | 9.57 | 9.30 | 9.91 | 8.87 | 0.2 | 0.20 | | 0.38 | 0.26 | 0.48 | 0.41 | 0.32 | 1.3 | 1.15 | | 2.26 | 1.52 | 2.08 | 1.30 | 1.61 |
| 287 | 25 | | | | 2.26 | 2.24 | 2.00 | 1.45 | 1.99 | | | | 0.20 | 0.11 | 0.23 | 0.26 | 0.20 | | | | 1.91 | 1.27 | 1.51 | 1.25 | 1.49 |
| 289 | 27 | | | | 6.29 | 6.15 | 5.90 | 5.49 | 5.96 | | | | 0.21 | 0.13 | 0.24 | 0.17 | 0.19 | | | | 0.38 | 0.76 | 0.98 | 1.19 | 0.83 |
| 290 | 28 | | | | 4.79 | 5.71 | 4.30 | 3.51 | 4.58 | | | | 0.21 | 0.11 | 0.26 | 0.25 | 0.21 | | | | 0.88 | 0.70 | 0.74 | 0.65 | 0.75 |
| 342 | 82 | | | | 13.88 | 13.08 | 12.90 | 7.32 | 11.80 | | | | 0.39 | 0.28 | 0.68 | 0.45 | 0.45 | | | | 0.52 | 0.42 | 1.20 | 0.69 | 0.71 |
| 354 | 94 | | | | 32.38 | 22.45 | 21.40 | 18.37 | 23.65 | | | | 0.44 | 0.21 | 0.30 | 0.24 | 0.30 | | | | 0.25 | 0.27 | 0.62 | 0.39 | 0.38 |
| 165 | A42 | 12.0 | 13.81 | 13.7 | 22.64 | 20.59 | 26.50 | 20.35 | 18.52 | 0.3 | 0.22 | 0.15 | 0.53 | 0.26 | 1.23 | 0.77 | 0.49 | 1.4 | 1.38 | 0.7 | 0.61 | 0.27 | 1.12 | 1.34 | 0.97 |
| 171 | A47 | 2.4 | 9.62 | 4.2 | 12.01 | 12.41 | 9.60 | 11.35 | 8.81 | 0.1 | 0.21 | 0.15 | 0.47 | 0.26 | 0.38 | 0.35 | 0.28 | 2.0 | 0.90 | 1.0 | 2.02 | 0.92 | 1.58 | 1.90 | 1.47 |
| 172 | A59 | 2.5 | 4.25 | 7.4 | 4.24 | 5.83 | 3.70 | 2.71 | 4.38 | 0.1 | 0.12 | 0.15 | 0.29 | 1.49 | 0.22 | 0.17 | 0.36 | 2.8 | 0.48 | 1.3 | 2.55 | 1.72 | 2.72 | 0.92 | 1.79 |
| 223 | P94 | | | | 48.92 | 50.45 | 50.20 | 39.25 | 47.21 | | | | 0.61 | 0.34 | 0.41 | 0.24 | 0.40 | | | | 13.74 | 9.07 | 9.70 | 10.09 | 10.65 |
| 225 | P96 | | | | 45.76 | 38.01 | 41.80 | 30.48 | 39.01 | | | | 0.54 | 0.15 | 0.37 | 0.18 | 0.31 | | | | 0.90 | 0.73 | 2.00 | 1.85 | 1.37 |
| 226 | P97 | | | | 18.67 | 18.63 | 16.50 | 41.76 | 23.89 | | | | 0.14 | 0.17 | 0.23 | 0.22 | 0.19 | | | | 0.56 | 0.43 | 1.85 | 1.48 | 1.08 |
| 227 | P98 | | | | 43.03 | 42.44 | 41.10 | 12.04 | 34.65 | | | | 0.34 | 0.12 | 0.31 | 0.29 | 0.26 | | | | 2.14 | 1.13 | 1.64 | 1.25 | 1.54 |
| 267 | 1 | | | | 56.46 | 51.42 | 51.40 | 38.71 | 49.50 | | | | 0.34 | 0.25 | 0.26 | 0.15 | 0.25 | | | | 0.72 | 0.30 | 0.61 | 0.37 | 0.50 |
| 452 | L4 | 6.2 | 5.72 | 6.9 | 5.86 | 6.78 | 6.20 | 5.33 | 6.14 | 0.6 | 0.02 | 0.15 | 0.10 | 0.07 | 0.15 | 0.14 | 0.18 | 1.2 | 0.71 | 0.9 | 0.61 | 0.56 | 0.83 | 0.48 | 0.74 |
| 470 | L7 | 10.9 | 10.56 | 12.3 | 8.62 | 10.23 | 9.10 | 8.04 | 9.97 | 0.1 | 0.08 | 0.15 | 0.10 | 0.09 | 0.11 | 0.13 | 0.11 | 1.4 | 1.11 | 0.6 | 0.75 | 0.40 | 0.66 | 0.49 | 0.78 |
| 471 | L8 | 26.5 | 24.75 | 24.9 | 22.90 | 29.23 | 24.20 | 21.34 | 24.83 | 0.1 | 0.06 | 0.15 | 0.12 | 0.14 | 0.25 | 0.16 | 0.14 | 1.8 | 1.37 | 1.1 | 0.70 | 1.01 | 1.39 | 1.15 | 1.21 |
| 400 | L39 | 14.0 | 14.60 | 14.9 | 12.10 | 11.87 | 13.50 | 8.92 | 12.83 | 0.6 | 0.26 | 0.4 | 0.34 | 0.42 | 0.42 | 0.25 | 0.39 | 2.9 | 1.25 | 1.1 | 0.95 | 0.73 | 1.42 | 0.76 | 1.29 |
| 268 | E15 | | 25.97 | 26.7 | 34.03 | 27.23 | 21.40 | 16.38 | 25.28 | | | 0.15 | 0.29 | 0.10 | 0.23 | 0.35 | 0.22 | | | 0.35 | 0.25 | 0.39 | 0.44 | 0.21 | 0.95 |
| 182 | P23 | | | | 14.51 | 52.32 | 43.50 | 56.01 | 41.59 | | | | 0.18 | 0.15 | 0.22 | 0.21 | 0.19 | | | | 1.20 | 0.32 | 0.30 | 0.41 | 0.56 |
| 185 | P27 | | | | 4.19 | 4.77 | 3.50 | 8.08 | 5.14 | | | | 0.10 | 0.07 | 0.13 | 0.13 | 0.11 | | | | 0.76 | 0.30 | 0.44 | 0.22 | 0.43 |
| 209 | P7 | | | | 8.72 | 10.37 | 8.10 | 3.20 | 7.60 | | | | 0.11 | 0.09 | 0.08 | 0.21 | 0.12 | | | | 0.38 | 0.32 | 0.25 | 0.33 | 0.32 |
| 270 | 4 | | | | 98.76 | 91.57 | 83.20 | 75.37 | 87.23 | | | | 0.35 | 0.25 | 0.50 | 0.46 | 0.39 | | | | 0.38 | 0.18 | 0.28 | 0.52 | 0.34 |
| 271 | 6 | | | | 103.07 | 59.04 | 50.90 | 72.85 | 71.47 | | | | 0.48 | 0.10 | 0.47 | 0.30 | 0.34 | | | | 0.48 | 0.23 | 0.26 | 0.29 | 0.32 |
| 418 | Kearl L. | | | | 96.12 | 95.40 | 83.06 | 91.53 | | | | | 0.28 | 0.46 | 0.35 | 0.36 | | | | | 3.09 | 3.81 | 4.13 | 3.68 | |
| 436 | L18 | 24.2 | 24.64 | 25.4 | 25.95 | 26.25 | 27.10 | 26.98 | 25.79 | 0.1 | 0.20 | 0.15 | 0.18 | 0.14 | 0.25 | 0.29 | 0.19 | 7.1 | 7.42 | 7.8 | 7.62 | 6.79 | 6.90 | 7.50 | 7.29 |
| 442 | L23 | 9.8 | 10.27 | 10.6 | 11.63 | 11.00 | 11.20 | 10.67 | 10.73 | | | 0.15 | 0.15 | 0.09 | 0.12 | 0.07 | 0.11 | 1.8 | 1.49 | 1.3 | 1.13 | 0.74 | 0.76 | 0.89 | 1.16 |
| 444 | L25 | 10.9 | 12.13 | 12.8 | 10.42 | 11.18 | 12.80 | 13.64 | 11.98 | 0.1 | 0.11 | 0.15 | 0.22 | 0.09 | 0.24 | 0.16 | 0.15 | 3.1 | 2.84 | 2.6 | 3.41 | 2.76 | 2.69 | 2.46 | 2.84 |
| 447 | L28 | 2.5 | 2.64 | 3.6 | 3.20 | 3.76 | 4.30 | 2.74 | 3.25 | 0.1 | 0.05 | 0.15 | 0.26 | 0.07 | 0.19 | 0.08 | 0.13 | 1.9 | 1.08 | 1.2 | 1.41 | 0.70 | 1.11 | 1.05 | 1.21 |
| 448 | L29 | | | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | 0.3 | 0.10 | 0.06 | 0.08 | 0.64 | 0.25 | 0.7 | | 0.7 | 0.34 | 0.27 | 0.18 | 0.32 | 0.42 |
| 454 | L46 | 29.4 | 18.41 | 14.4 | 14.72 | 13.56 | 13.70 | 11.47 | 16.52 | 0.1 | 0.08 | 0.15 | 0.19 | 0.10 | 0.20 | 0.09 | 0.13 | 13.7 | 10.08 | 11.3 | 10.55 | 6.57 | 8.33 | 8.00 | 9.78 |
| 455 | L47 | 19.5 | 16.26 | 13.0 | 14.93 | 15.62 | 20.30 | 12.27 | 15.99 | 0.1 | 0.09 | 0.15 | 0.18 | 0.10 | 0.58 | 0.10 | 0.19 | 13.3 | 9.84 | 13.1 | 10.60 | 5.33 | 5.38 | 8.96 | 9.50 |
| 457 | L49 | 8.1 | 12.31 | 8.3 | 10.22 | 11.44 | 13.40 | 9.75 | 10.50 | | 0.07 | 0.15 | 0.18 | 0.10 | 0.36 | 0.19 | 0.17 | 19.0 | 14.06 | 14.4 | 16.71 | 9.97 | 11.15 | 8.84 | 13.45 |
| 464 | L60 | 11.8 | 14.33 | 19.6 | 18.58 | 20.43 | 22.60 | 16.27 | 17.65 | | 0.09 | 0.15 | 0.19 | 0.07 | 0.17 | 0.13 | 0.13 | 13.1 | 10.12 | 9.3 | 9.64 | 5.85 | 5.18 | 6.69 | 8.55 |
| 175 | P13 | | | | 60.11 | 55.23 | 44.20 | 49.84 | 52.35 | | | | 0.32 | 0.21 | 0.23 | 0.12 | 0.22 | | | | 9.18 | 3.95 | 4.70 | 4.16 | 5.50 |
| 199 | P49 | | | | 11.18 | 10.65 | 10.40 | 10.52 | 10.69 | | | | 0.17 | 0.15 | 0.49 | 0.14 | 0.24 | | | | 1.32 | 0.69 | 1.43 | 0.80 | 1.06 |
| 473 | A301 | | | 27.5 | 27.45 | 27.55 | 26.90 | 25.03 | 26.88 | | | 1.4 | 1.08 | 1.08 | 1.06 | 1.05 | 1.13 | | | 1.2 | 1.18 | 0.98 | 1.29 | 2.36 | 1.40 |
| 118 | L107 | | 29.34 | 28.2 | 28.46 | 29.60 | 29.10 | 29.03 | 28.96 | | | 2.6 | 2.36 | 2.40 | 2.62 | 2.42 | 2.48 | | | 1.00 | 0.9 | 0.96 | 0.95 | 1.07 | 0.98 |
| 84 | L109 | 22.1 | 26.14 | 25.1 | 23.39 | 24.07 | 22.40 | 22.10 | 23.62 | 1.6 | 1.80 | 2.1 | 1.78 | 1.52 | 1.61 | 1.61 | 1.71 | 0.8 | 0.68 | 0.6 | 0.49 | 0.47 | 0.56 | 0.60 | 0.61 |
| 88 | O-10 | 12.7 | 15.93 | 13.5 | 13.40 | 15.61 | 14.70 | | 14.31 | 0.9 | 0.82 | 1.0 | 0.89 | 0.70 | 0.84 | | 0.86 | 1.2 | 1.10 | 0.3 | 0.45 | 0.89 | 0.25 | | 0.70 |
| 90 | R1 | 16.5 | 19.26 | 19.0 | 18.56 | 18.77 | 19.00 | 18.67 | 18.53 | 1.0 | 1.05 | 1.3 | 1.26 | 1.06 | 1.31 | 1.15 | 1.16 | 0.8 | 0.58 | 0.7 | 0.50 | 0.35 | 0.51 | 1.21 | 0.66 |
| 146 | E52 | 17.9 | 21.49 | 22.9 | 24.43 | 23.67 | 25.10 | 23.89 | 22.76 | 0.8 | 0.13 | 0.15 | 0.34 | 0.15 | 0.18 | 0.29 | 0.29 | 2.7 | 2.71 | 2.7 | 3.51 | 2.45 | 2.35 | 2.70 | 2.73 |
| 152 | E59 | 11.8 | 10.99 | 11.8 | 12.09 | 13.56 | 14.70 | 12.80 | 12.54 | 0.2 | 0.09 | 0.15 | 0.15 | 0.11 | 0.18 | 0.12 | 0.14 | 2.0 | 2.32 | 2.1 | 2.54 | 1.56 | 2.09 | 1.90 | 2.07 |
| 89 | E68 | | 18.06 | 16.2 | 14.31 | 15.07 | 14.80 | 16.38 | 15.80 | | 0.11 | 0.15 | 0.31 | 2.50 | 0.18 | 0.02 | 0.54 | | | | 3.58 | 3.4 | 5.02 | 2.91 | 3.09 |
| 91 | O-1/E55 | 4.8 | 5.44 | 5.1 | 5.88 | 7.45 | 7.40 | 11.58 | 6.80 | 0.2 | 0.10 | 0.15 | 0.14 | 0.10 | 0.17 | 0.02 | 0.13 | 1.6 | 1.36 | 1.4 | 1.30 | 0.88 | 1.44 | 1.08 | 1.30 |
| 97 | O-2 E67 | 11.8 | 12.51 | 12.4 | 13.98 | 13.67 | 14.10 | 7.16 | 12.22 | 0.1 | 0.07 | 0.15 | 0.22 | 0.10 | 0.14 | 0.12 | 0.13 | 1.4 | 1.21 | 1.1 | 1.05 | 0.94 | 1.03 | 1.45 | 1.16 |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 6 of 10)

| No.-So. GIS No. | Original RAMP Name | Total Dissolved Nitrogen (µg/L) | | | | | | | | Ammonia (µg/L) | | | | | | | | Nitrate+Nitrite (µg/L) | | | | | | | |
|--------------------|--------------------------|---------------------------------|------|------|------|--------|----------|----------|----------|----------------|--------|-------|-------|--------|----------|--------|-------|------------------------|--------|--------|--------|--------|--------|--------|--------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean |
| 168 | A21 | 1068 | 586 | 1783 | 586 | 539 | 446.38 | 645.00 | 807.79 | 62.5 | 19.3 | 12.4 | 18.1 | 13.8 | 20.09 | 3.67 | 21.4 | 72 | 2.71 | 7.24 | 1.29 | 4.50 | 0.50 | 3.01 | 15.07 |
| 169 | A24 | 965 | 617 | 1425 | 722 | 544 | 829.34 | 687.00 | 826.96 | 91.4 | 8.0 | 79.7 | 10.4 | 24.2 | 61.94 | 2.65 | 39.8 | 12 | 10.75 | 72.03 | 1.16 | 2.78 | 1.29 | 2.83 | 14.63 |
| 170 | A26 | 1074 | 595 | 733 | 789 | 675 | 698.83 | 611.00 | 739.41 | 33.1 | 9.0 | 16.5 | 76.0 | 15.9 | 69.21 | 0.50 | 36.6 | 3 | 6.00 | 12.78 | 63.69 | 10.23 | 127.32 | 3.00 | 32.24 |
| 167 | A29 | 572 | 635 | 875 | 587 | 657 | 532.05 | 651.00 | 644.18 | 12.7 | 20.5 | 23.0 | 6.9 | 53.1 | 4.32 | 8.98 | 18.5 | 2 | 0.67 | 6.02 | 0.64 | 2.84 | 0.27 | 1.95 | 2.06 |
| 166 | A86 | 819 | 791 | | 903 | 845 | 798.34 | 1,680.00 | 972.88 | 18.0 | 54.1 | | 54.7 | 57.0 | 46.01 | 114.00 | 57.3 | 3 | 0.17 | | 39.2 | 9.57 | 0.75 | 2.81 | 9.31 |
| 287 | 25 | | | | 748 | 780 | 619.38 | 1,120.00 | 816.93 | | | | 9.4 | 20.4 | 60.56 | 0.50 | 30.1 | | | | 0.58 | 2.47 | 2.00 | 3.97 | 2.26 |
| 289 | 27 | | | | 459 | 460 | 461.33 | 515.00 | 473.79 | | | | 11.4 | 6.9 | 6.90 | 0.50 | 8.4 | | | | 0.48 | 0.19 | 1.33 | 1.36 | 0.84 |
| 290 | 28 | | | | 668 | 698 | 546.02 | 1,030.00 | 735.51 | | | | 31.0 | 10.4 | 8.08 | 5.23 | 13.7 | | | | 21.35 | 2.06 | 3.83 | 2.48 | 7.43 |
| 342 | 82 | | | | 1282 | 1243 | 2,154.48 | 1,470.00 | 1,537.40 | | | | 5.9 | 22.6 | 1,088.98 | 76.10 | 298.4 | | | | 0.99 | 1.32 | 33.89 | 6.92 | 10.78 |
| 354 | 94 | | | | 1378 | 1040 | 1,074.61 | 974.00 | 1,116.61 | | | | 150.2 | 14.7 | 21.75 | 42.80 | 57.4 | | | | 6.44 | 0.16 | 0.50 | 2.96 | 3.19 |
| 165 | A42 | 105 | 1836 | | 2608 | 1537 | 1,574.37 | 1,481.62 | 1,523.81 | 8.4 | 94.1 | | 79.8 | 13.5 | 30.47 | 29.80 | 42.7 | 0.50 | 160.96 | | 1.08 | 0.50 | 0.50 | 6.18 | 33.84 |
| 171 | A47 | 536 | 1176 | 978 | 1924 | 1148 | 1,454.65 | 1,026.19 | 1,177.50 | 55.4 | 12.7 | 12.2 | 46.1 | 22.3 | 66.00 | 30.60 | 35.0 | 4 | 367.29 | 15.66 | 732.93 | 84.53 | 620.98 | 135.00 | 280.06 |
| 172 | A59 | 838 | 961 | 945 | 774 | 1465 | 969.82 | 647.66 | 942.99 | 9.3 | 85.1 | 10.6 | 13.1 | 390.7 | 17.78 | 27.70 | 79.2 | 5 | 7.59 | 6.19 | 0.96 | 42.33 | 0.50 | 2.39 | 10.76 |
| 223 | P94 | | | | 2195 | 2043 | 2,081.88 | 1,900.00 | 2,055.10 | | | | 56.4 | 22.9 | 34.42 | 19.70 | 33.3 | | | | 16.18 | 1.39 | 0.50 | 13.10 | 10.22 |
| 225 | P96 | | | | 1576 | 1461 | 2,149.29 | 1,360.00 | 1,636.49 | | | | 8.9 | 215.7 | 597.84 | 146.00 | 242.1 | | | | 0.44 | 1.67 | 14.58 | 38.80 | 13.87 |
| 226 | P97 | | | | 1045 | 1054 | 1,314.67 | 1,570.00 | 1,245.89 | | | | 10.8 | 100.7 | 455.28 | 13.40 | 145.0 | | | | 0.75 | 1.71 | 20.36 | 3.72 | 6.64 |
| 227 | P98 | | | | 1624 | 1097 | 1,085.73 | 1,210.00 | 1,254.19 | | | | 219.1 | 25.6 | 23.61 | 5.00 | 68.3 | | | | 43.69 | 2.32 | 0.50 | 1.78 | 15.93 |
| 267 | 1 | | | | 1108 | 1102 | 1,059.16 | 1,209.13 | 1,119.62 | | | | 6.2 | 5.1 | 10.02 | 13.40 | 8.7 | | | | 1.2 | 0.50 | 1.51 | 1.01 | 1.06 |
| 452 | L4 | 588 | 592 | 684 | 577 | 502 | 630.72 | 610.00 | 597.78 | 3.5 | 25.7 | 11.6 | 11.7 | 9.1 | 72.04 | 4.07 | 19.7 | 2 | 3.90 | 76.8 | 5.19 | 0.12 | 135.30 | 4.81 | 32.60 |
| 470 | L7 | 939 | 597 | 511 | 576 | 570 | 455.05 | 1,660.00 | 758.41 | 22.3 | 16.7 | 5.2 | 11.2 | 13.9 | 40.56 | 8.58 | 16.9 | 3 | 17.54 | 8.31 | 0.94 | 0.50 | 0.50 | 4.60 | 5.80 |
| 471 | L8 | 817 | 819 | 735 | 765 | 662 | 624.14 | 1,000.00 | 774.77 | 17.0 | 36.9 | 9.6 | 7.9 | 6.8 | 28.32 | 3.53 | 15.7 | 1 | 9.24 | 3.68 | 77.97 | 0.50 | 3.84 | 5.13 | 14.55 |
| 400 | L39 | 602 | 419 | 543 | 486 | 479 | 398.39 | 793.00 | 531.42 | 6.5 | 18.4 | 101.2 | 7.5 | 8.5 | 40.48 | 67.10 | 35.7 | 1 | 6.71 | 6.94 | 0.95 | 0.50 | 1.42 | 21.80 | 5.66 |
| 268 | E15 | | 1465 | 1232 | 2689 | 1459 | 855.02 | 916.18 | 1,436.11 | | | 32.9 | 12.5 | 1509.2 | 356.1 | 29.48 | 326.6 | | 6.00 | 2.49 | 8.42 | 1.62 | 0.50 | 4.75 | 4.66 |
| 182 | P23 | | | | 401 | 536 | 1,065.15 | 520.00 | 630.66 | | | | 28.4 | 5.0 | 33.59 | 0.50 | 22.3 | | | | 2.11 | 0.50 | 0.97 | 2.16 | 1.44 |
| 185 | P27 | | | | 699 | 618 | 527.84 | 584.00 | 607.12 | | | | 13.2 | 18.5 | 41.27 | 4.58 | 19.4 | | | | 72.42 | 0.50 | 0.50 | 7.53 | 26.82 |
| 209 | P7 | | | | 535 | 572 | 573.95 | 616.00 | 574.26 | | | | 9.8 | 5.2 | 36.93 | 5.35 | 14.3 | | | | 0.76 | 0.50 | 0.50 | 2.41 | 1.22 |
| 270 | 4 | | | | 1695 | 1332 | 1,210.68 | 1,230.00 | 1,366.91 | | | | 122.6 | 6.7 | 12.20 | 22.80 | 41.1 | | | | 11.28 | 0.50 | 0.60 | 1.88 | 3.57 |
| 271 | 6 | | | | 2177 | 1343 | 1,282.18 | 1,000.00 | 1,450.63 | | | | 440.8 | 2.8 | 13.02 | 10.70 | 116.8 | | | | 91.86 | 0.50 | 0.50 | 5.52 | 32.63 |
| 418 | Kearl L. | | | | 1127 | 941.64 | 943.00 | 1,004.03 | | | | | 247.6 | 52.57 | 17.80 | 106.0 | | | | | 1.97 | 0.38 | 4.24 | 2.20 | |
| 436 | L18 | 258 | 340 | 297 | 324 | 271 | 318.53 | 258.02 | 295.31 | 15.1 | 5.2 | 11.6 | 15.5 | 310.5 | 10.51 | 11.60 | 54.3 | 2 | 5.12 | 2.3 | 13.23 | 0.50 | 0.48 | 1.54 | 3.58 |
| 442 | L23 | 340 | 396 | 787 | 342 | 326 | 466.72 | 599.36 | 465.16 | 17.0 | 11.9 | 21.6 | 2.7 | 5.1 | 27.44 | 18.80 | 14.9 | 1 | 0.62 | 8.69 | 0.44 | 0.50 | 2.23 | 1.75 | 2.16 |
| 444 | L25 | 246 | 404 | 386 | 398 | 283 | 388.31 | 366.26 | 353.09 | 1.6 | 17.3 | 11.8 | 32.9 | 2.4 | 63.97 | 9.91 | 20.0 | 1 | 6.30 | 3.31 | 35.52 | 0.36 | 1.02 | 2.04 | 7.05 |
| 447 | L28 | 567 | 537 | 850 | 690 | 534 | 605.63 | 535.60 | 617.04 | 9.6 | 20.0 | 12.8 | 18.2 | 13.8 | 10.56 | 26.80 | 16.0 | 18 | 13.72 | 52.75 | 14.55 | 0.20 | 0.50 | 2.40 | 17.00 |
| 448 | L29 | 422 | | 631 | 498 | 345 | 354.19 | 672.00 | 487.04 | 3.0 | | 18.6 | 15.5 | 10.9 | 43.31 | 12.60 | 17.3 | 3 | | 5.61 | 1.09 | 0.50 | 0.66 | 8.79 | 3.24 |
| 454 | L46 | 2028 | 712 | 1003 | 940 | 1046 | 1,180.44 | 1,169.30 | 1,153.97 | 597.0 | 22.3 | 24.9 | 16.1 | 26.2 | 105.58 | 35.40 | 118.2 | 60 | 19.47 | 54.74 | 172.22 | 1.34 | 195.62 | 3.20 | 72.37 |
| 455 | L47 | 1425 | 1040 | 2180 | 1242 | 1052 | 2,188.71 | 990.07 | 1,445.54 | 81.8 | 64.7 | 215.3 | 67.0 | 11.3 | 314.16 | 28.40 | 111.8 | 26 | 40.56 | 72.78 | 277.37 | 21.81 | 287.76 | 151.00 | 125.35 |
| 457 | L49 | 672 | 690 | 1968 | 966 | 966 | 1,146.73 | 802.60 | 1,030.15 | 15.2 | 20.0 | 82.5 | 47.9 | 51.3 | 89.63 | 35.70 | 48.9 | 13 | 17.84 | 278.62 | 200.17 | 131.11 | 46.09 | 20.80 | 101.03 |
| 464 | L60 | 644 | 659 | 1591 | 808 | 705 | 807.39 | 693.29 | 843.84 | | 10.8 | 47.2 | 55.4 | 15.2 | 16.46 | 23.20 | 28.0 | 1 | 9.46 | 9.03 | 61.32 | 0.50 | 0.50 | 1.51 | 13.72 |
| 175 | P13 | | | | 2385 | 2458 | 2,891.18 | 2,150.00 | 2,471.13 | | | | 24.0 | 22.9 | 94.26 | 18.60 | 39.9 | | | | 9.77 | 0.36 | 1.49 | 2.78 | 3.60 |
| 199 | P49 | | | | 673 | 652 | 695.00 | 628.00 | 662.00 | | | | 16.4 | 6.6 | 9.04 | 0.50 | 10.7 | | | | 0.96 | 0.50 | 0.50 | 1.72 | 1.06 |
| 473 | A301 | | | | 470 | 388 | 424.37 | 425.00 | 426.89 | | | 11.1 | 3.6 | 3.3 | 23.96 | 0.50 | 10.5 | | | 12.26 | 0.69 | 0.50 | 1.57 | 1.80 | 3.36 |
| 118 | L107 | | 328 | 776 | 388 | 298 | 445.93 | 335.50 | 428.57 | | | 12.4 | 1.1 | 2.7 | 4.05 | 0.50 | 4.1 | | 0.45 | 13.54 | 5.26 | 0.50 | 0.02 | 3.03 | 3.80 |
| 84 | L109 | 601 | 496 | 918 | 610 | 550 | 573.67 | 674.00 | 631.68 | 13.0 | 0.0005 | 16.8 | 13.9 | 4.1 | 113.44 | 0.50 | 26.9 | 4 | 3.38 | 12.49 | 23.16 | 2.79 | 7.35 | 2.23 | 7.86 |
| 88 | O-10 | 851 | 839 | 2248 | 953 | 644 | 736.34 | | 1,045.23 | 2.7 | 0.0005 | 38.9 | 7.4 | 12.2 | 47.46 | | 18.1 | 1 | 2.52 | 6.08 | 0.54 | 0.50 | 1.09 | | 1.99 |
| 90 | R1 | 515 | 450 | 636 | 546 | 399 | 600.86 | 462.00 | 515.63 | 5.8 | 0.1700 | 17.5 | 3.4 | 2.4 | 72.29 | 0.50 | 16.9 | 4 | 0.37 | 19.88 | 4.74 | 0.12 | 0.92 | 0.50 | 5.05 |
| 146 | E52 | 1060 | 557 | | 633 | 482 | 648.70 | 593.00 | 662.41 | 10.6 | 0.0005 | 26.9 | 14.6 | 6.2 | 62.91 | 27.70 | 21.3 | 48 | 35.48 | 18.39 | 45.14 | 0.50 | 1.73 | 43.70 | 27.56 |
| 152 | E59 | 384 | 357 | 1050 | 439 | 417 | 433.18 | 801.00 | 554.48 | 16.1 | 3.9 | 12.6 | 18.1 | 28.1 | 202.99 | 11.60 | 41.9 | 3 | 4.29 | 9.61 | 55.56 | 2.85 | 0.04 | 1.97 | 10.97 |
| 89 | E68 | | 634 | 1800 | 588 | 568 | 726.22 | 745.00 | 843.48 | | | 9.0 | 41.6 | 15.0 | 53.81 | 20.10 | 25.3 | | 20.60 | 109.93 | 1.03 | 9.07 | 81.54 | 2.61 | 37.46 |
| 91 | O-1/E55 | 708 | 504 | 2425 | 566 | 641 | 571.49 | 632.00 | 863.92 | 27.1 | 2.4 | 7.5 | 14.0 | 13.5 | 71.03 | 17.30 | 21.8 | 9 | 6.02 | 46.26 | 5.23 | 11.52 | 0.56 | 9.19 | 12.58 |
| 97 | O-2 E67 | 500 | 602 | 848 | 753 | 519 | 469.84 | 824.00 | 645.12 | 10.3 | 3.1 | 23.0 | 23.4 | 15.9 | 80.98 | 20.90 | 25.4 | 6 | 22.41 | 14.1 | 24.67 | 10.10 | 7.46 | 2.72 | 12.43 |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 7 of 10)

| No _x -So _x GIS No. | Original RAMP Name | Total Phosphate (µg/L) | | | | | | | | Dissolved Phosphate (µg/L) | | | | | | | | Dissolved Inorganic Carbon (mg/L) | | | | | | | |
|---|--------------------------|------------------------|-------|-------|-------|-------|--------|--------|-------|----------------------------|------|-------|------|-------|--------|-------|-------|-----------------------------------|------|-------|-------|-------|-------|-------|--|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | |
| 168 | A21 | 112.5 | 55.4 | 57.9 | 57.9 | 76.7 | 53.20 | 40.80 | 64.9 | 67.0 | 33.3 | 39.6 | 24.9 | 32.0 | 32.00 | 42.10 | 38.7 | 0.17 | 0.4 | 0.38 | 0.30 | 0.49 | 0.39 | 0.35 | |
| 169 | A24 | 109.3 | 63.3 | 62.0 | 76.1 | 106.9 | 65.70 | 38.70 | 74.6 | 61.5 | 34.1 | 46.5 | 29.3 | 20.1 | 34.90 | 21.70 | 35.4 | 0.14 | 0.3 | 0.29 | 0.33 | 0.31 | 0.17 | 0.25 | |
| 170 | A26 | 53.9 | 56.1 | 65.7 | 40.1 | 108.9 | 39.50 | 43.30 | 58.2 | 22.3 | 20.6 | 16.7 | 21.5 | 26.9 | 22.50 | 21.40 | 21.7 | 0.24 | 0.4 | 0.36 | 0.42 | 0.34 | 0.29 | 0.33 | |
| 167 | A29 | 27.8 | 27.5 | 32.1 | 25.7 | 42.9 | 26.80 | 26.60 | 29.9 | 6.5 | 5.9 | 7.5 | 5.8 | 7.1 | 7.10 | 6.20 | 6.6 | 0.46 | 0.7 | 0.45 | 0.58 | 0.71 | 0.73 | 0.61 | |
| 166 | A86 | 26.8 | 23.4 | | 31.5 | 41.0 | 38.20 | 60.10 | 36.8 | 8.5 | 8.4 | | 9.9 | 13.2 | 13.00 | 14.70 | 11.3 | 1.08 | | 1.36 | 1.43 | 1.55 | 1.31 | 1.35 | |
| 287 | 25 | | | | 52.8 | 84.0 | 55.90 | 45.60 | 59.6 | | | | 20.2 | 33.2 | 29.70 | 27.20 | 27.6 | | | 0.32 | 0.37 | 0.33 | 0.25 | 0.32 | |
| 289 | 27 | | | | 28.3 | 30.8 | 17.50 | 20.70 | 24.3 | | | | 6.2 | 5.7 | 5.20 | 5.10 | 5.6 | | | 1.01 | 0.87 | 0.96 | 0.75 | 0.90 | |
| 290 | 28 | | | | 21.2 | 95.6 | 17.10 | 17.40 | 37.8 | | | | 8.9 | 35.3 | 6.70 | 6.10 | 14.3 | | | 0.38 | 0.47 | 0.48 | 0.35 | 0.42 | |
| 342 | 82 | | | | 23.0 | 48.8 | 41.70 | 44.00 | 39.4 | | | | 9.5 | 7.9 | 9.60 | 12.10 | 9.8 | | | 1.90 | 1.71 | 1.96 | 1.02 | 1.65 | |
| 354 | 94 | | | | 18.9 | 30.4 | 25.60 | 13.70 | 22.2 | | | | 4.6 | 4.1 | 4.30 | 4.70 | 4.4 | | | 5.20 | 3.44 | 3.46 | 2.53 | 3.66 | |
| 165 | A42 | 200.4 | 299.1 | 256.3 | 209.6 | 199.0 | 104.70 | 159.50 | 204.1 | 12.5 | 16.5 | 17.4 | 17.9 | 15.0 | 8.40 | 13.20 | 14.4 | 2.23 | 1.8 | 2.98 | 2.82 | 4.75 | 4.84 | 3.23 | |
| 171 | A47 | 41.4 | 52.6 | 36.3 | 97.6 | 94.8 | 43.90 | 80.30 | 63.8 | 10.3 | 29.2 | 13.5 | 70.3 | 29.4 | 29.70 | 24.00 | 29.5 | 1.07 | 0.3 | 1.48 | 1.60 | 1.34 | 1.65 | 1.24 | |
| 172 | A59 | 192.2 | 62.1 | 27.9 | 74.3 | 79.7 | 74.20 | 55.70 | 80.9 | 42.2 | 21.8 | 7.1 | 14.4 | 38.6 | 50.20 | 19.70 | 27.7 | 0.30 | 1.2 | 0.34 | 0.40 | 0.34 | 0.34 | 0.48 | |
| 223 | P94 | | | | 77.2 | 61.9 | 66.20 | 69.10 | 68.6 | | | | 23.6 | 27.3 | 23.40 | 24.90 | 24.8 | | | 6.83 | 6.91 | 7.33 | 4.96 | 6.51 | |
| 225 | P96 | | | | 34.1 | 20.6 | 71.90 | 41.50 | 42.0 | | | | 12.5 | 10.2 | 15.10 | 11.50 | 12.3 | | | 7.09 | 5.49 | 6.87 | 4.21 | 5.91 | |
| 226 | P97 | | | | 29.9 | 25.1 | 38.80 | 28.10 | 30.5 | | | | 8.8 | 10.8 | 15.60 | 13.30 | 12.1 | | | 2.56 | 2.04 | 2.18 | 6.38 | 3.29 | |
| 227 | P98 | | | | 31.9 | 19.1 | 32.40 | 46.10 | 32.4 | | | | 14.7 | 11.0 | 13.00 | 10.60 | 12.3 | | | 6.38 | 6.42 | 6.47 | 1.27 | 5.13 | |
| 267 | 1 | | | | 31.8 | 30.6 | 29.70 | 24.30 | 29.1 | | | | 6.0 | 5.0 | 5.10 | 5.40 | 5.4 | | | 10.01 | 9.03 | 8.92 | 6.59 | 8.64 | |
| 452 | L4 | 45.0 | 21.4 | 17.4 | 14.8 | 22.0 | 35.80 | 35.50 | 27.4 | 13.4 | 11.2 | 8.9 | 7.3 | 10.9 | 19.90 | 10.40 | 11.7 | 0.25 | 0.6 | 0.24 | 0.48 | 0.68 | 0.35 | 0.43 | |
| 470 | L7 | 27.4 | 17.3 | 18.3 | 23.3 | 23.7 | 20.40 | 12.30 | 20.4 | 14.7 | 11.0 | 11.7 | 6.4 | 10.6 | 10.20 | 7.10 | 10.2 | 0.81 | 1.3 | 0.52 | 0.65 | 0.97 | 0.49 | 0.79 | |
| 471 | L8 | 57.3 | 44.1 | 39.9 | 27.4 | 30.5 | 42.80 | 41.40 | 40.5 | 13.2 | 13.8 | 13.0 | 10.5 | 12.3 | 15.50 | 9.40 | 12.5 | 4.00 | 4.0 | 3.45 | 3.98 | 3.93 | 3.00 | 3.73 | |
| 400 | L39 | 53.9 | 41.9 | 55.6 | 36.0 | 36.6 | 27.70 | 22.20 | 39.1 | 4.1 | 5.7 | 5.8 | 4.1 | 2.8 | 5.60 | 2.40 | 4.4 | 2.63 | 2.9 | 2.32 | 2.44 | 2.67 | 0.96 | 2.31 | |
| 268 | E15 | | 127.0 | 61.3 | 27.8 | 27.6 | 34.50 | 53.40 | 55.3 | | | 12.7 | 9.7 | 18.2 | 8.4 | 7.90 | 9.10 | 3.50 | 4.0 | 5.16 | 3.63 | 3.15 | 3.30 | 3.80 | |
| 182 | P23 | | | | 23.2 | 105.0 | 215.20 | 56.90 | 100.1 | | | | 7.5 | 16.6 | 28.50 | 15.20 | 17.0 | | | 2.04 | 9.37 | 9.68 | 10.16 | 7.81 | |
| 185 | P27 | | | | 12.4 | 17.8 | 19.60 | 20.80 | 17.7 | | | | 6.9 | 7.9 | 8.10 | 10.10 | 8.3 | | | 0.27 | 0.26 | 0.36 | 0.74 | 0.41 | |
| 209 | P7 | | | | 21.4 | 20.1 | 20.30 | 18.70 | 20.1 | | | | 7.5 | 10.0 | 10.70 | 8.30 | 9.1 | | | 0.82 | 0.96 | 1.08 | 0.30 | 0.79 | |
| 270 | 4 | | | | 39.2 | 40.9 | 37.70 | 41.90 | 39.9 | | | | 11.7 | 9.6 | 7.20 | 8.10 | 9.2 | | | 17.79 | 14.52 | 14.51 | 13.77 | 15.15 | |
| 271 | 6 | | | | 51.5 | 43.2 | 39.30 | 42.80 | 44.2 | | | | 15.8 | 11.1 | 8.00 | 5.50 | 10.1 | | | 18.69 | 14.14 | 12.74 | 13.20 | 14.69 | |
| 418 | Kearl L. | | | | | 23.0 | 27.20 | 22.10 | 24.1 | | | | | 5.6 | 6.60 | 5.10 | 5.8 | | | | 15.67 | 17.59 | 14.54 | 15.93 | |
| 436 | L18 | 20.0 | 20.8 | 16.7 | 29.8 | 18.2 | 17.30 | 15.80 | 19.8 | 7.5 | 9.6 | 10.9 | 12.2 | 7.9 | 7.70 | 10.70 | 9.5 | 4.56 | 4.6 | 4.67 | 4.73 | 4.95 | 4.92 | 4.73 | |
| 442 | L23 | 22.4 | 14.8 | 14.7 | 15.1 | 22.8 | 18.30 | 19.10 | 18.2 | 7.2 | 5.9 | 6.0 | 4.7 | 8.0 | 7.20 | 7.00 | 6.6 | 1.49 | 1.5 | 1.77 | 1.61 | 1.73 | 1.62 | 1.63 | |
| 444 | L25 | 40.7 | 37.4 | 42.4 | 34.6 | 30.7 | 39.40 | 31.60 | 36.7 | 7.2 | 10.9 | 10.8 | 15.3 | 6.7 | 11.40 | 6.20 | 9.8 | 1.87 | 2.2 | 1.71 | 1.89 | 2.31 | 2.30 | 2.04 | |
| 447 | L28 | 69.2 | 57.1 | 86.8 | 83.8 | 129.3 | 98.80 | 80.20 | 86.5 | 59.3 | 47.5 | 65.5 | 57.6 | 84.0 | 79.20 | 66.10 | 65.6 | 0.17 | 0.4 | 0.33 | 0.30 | 0.65 | 0.29 | 0.35 | |
| 448 | L29 | 26.3 | | 76.2 | 28.0 | 61.4 | 30.50 | 42.00 | 44.1 | 7.9 | | 6.4 | 6.2 | 7.1 | 9.60 | 10.30 | 7.9 | | 0.4 | 0.33 | 0.26 | 0.28 | 0.25 | 0.30 | |
| 454 | L46 | 150.4 | 127.8 | 156.4 | 189.9 | 340.8 | 265.00 | 104.00 | 190.6 | 97.6 | 46.4 | 102.7 | 96.7 | 155.8 | 141.80 | 61.50 | 100.4 | 1.40 | 1.8 | 2.05 | 1.59 | 2.62 | 1.24 | 1.78 | |
| 455 | L47 | 128.7 | 74.1 | 214.3 | 86.1 | 171.2 | 167.60 | 86.50 | 132.6 | 55.8 | 46.9 | 30.7 | 52.3 | 47.9 | 23.20 | 37.50 | 42.0 | 2.10 | 1.9 | 2.15 | 2.11 | 20.27 | 1.35 | 4.98 | |
| 457 | L49 | 79.7 | 75.0 | 126.1 | 79.7 | 112.5 | 124.60 | 77.00 | 96.4 | 38.8 | 34.4 | 73.9 | 50.9 | 70.2 | 57.70 | 45.50 | 53.1 | 1.45 | 1.0 | 1.35 | 1.34 | 1.92 | 0.90 | 1.33 | |
| 464 | L60 | 94.9 | 128.4 | 94.1 | 90.3 | 90.2 | 154.60 | 138.40 | 113.0 | 40.0 | 84.8 | 49.2 | 58.6 | 31.1 | 39.10 | 41.40 | 49.2 | 1.85 | 2.9 | 2.85 | 2.98 | 3.73 | 2.38 | 2.78 | |
| 175 | P13 | | | | 174.8 | 291.6 | 323.60 | 208.50 | 249.6 | | | | 35.3 | 52.0 | 44.30 | 31.80 | 40.9 | | | 9.56 | 7.98 | 7.07 | 7.70 | 8.08 | |
| 199 | P49 | | | | 41.8 | 50.4 | 51.30 | 55.00 | 49.6 | | | | 10.6 | 10.5 | 10.80 | 7.40 | 9.8 | | | 1.86 | 1.59 | 1.73 | 1.57 | 1.69 | |
| 473 | A301 | | | 14.5 | 18.0 | 15.4 | 18.00 | 17.30 | 16.6 | | | 4.5 | 4.0 | 3.8 | 5.00 | 1.20 | 3.7 | | | 4.8 | 4.82 | 4.43 | 4.73 | 4.60 | |
| 118 | L107 | | 4.2 | 3.6 | 6.6 | 5.7 | 6.00 | 5.70 | 5.3 | | 2.4 | 2.3 | 2.7 | 1.8 | 2.10 | 2.20 | 2.2 | 5.40 | 5.4 | 5.04 | 5.16 | 5.78 | 5.07 | 5.31 | |
| 84 | L109 | 13.9 | 13.5 | 12.3 | 13.7 | 13.2 | 13.90 | 12.20 | 13.2 | 7.7 | 9.3 | 7.8 | 6.9 | 6.4 | 7.10 | 7.20 | 7.5 | 4.51 | 4.2 | 3.88 | 3.49 | 4.13 | 3.47 | 3.94 | |
| 88 | O-10 | 44.5 | 38.8 | 52.9 | 47.4 | 15.1 | 22.40 | | 36.9 | 5.1 | 4.9 | 4.8 | 5.1 | 4.7 | 5.40 | | 5.0 | 2.60 | 2.4 | 2.17 | 2.20 | 2.27 | | 2.32 | |
| 90 | R1 | 13.6 | 7.9 | 6.8 | 9.5 | 8.3 | 12.30 | 10.00 | 9.8 | 6.0 | 4.6 | 3.8 | 3.2 | 2.9 | 4.10 | 3.30 | 4.0 | 2.90 | 3.1 | 3.01 | 2.84 | 3.29 | 2.87 | 3.01 | |
| 146 | E52 | 52.1 | 48.4 | 39.1 | 45.8 | 44.7 | 31.60 | 31.40 | 41.9 | 39.8 | 42.7 | 32.9 | 38.5 | 26.7 | 27.40 | 25.50 | 33.4 | 2.86 | 3.5 | 3.61 | 3.68 | 3.94 | 3.58 | 3.53 | |
| 152 | E59 | 31.1 | 21.9 | 23.9 | 29.0 | 26.1 | 28.90 | 24.40 | 26.5 | 8.4 | 11.7 | 10.4 | 14.2 | 7.4 | 8.60 | 6.90 | 9.7 | 1.42 | 1.8 | 1.95 | 2.20 | 2.99 | 2.06 | 2.06 | |
| 89 | E68 | | 50.6 | 60.5 | 60.1 | 129.7 | 51.20 | 44.70 | 66.1 | | 25.8 | 28.4 | 28.2 | 30.7 | 25.60 | 18.80 | 26.2 | 2.27 | 2.3 | 2.10 | 2.40 | 2.30 | 2.34 | 2.29 | |
| 91 | O-1/E55 | 34.0 | 27.1 | 31.4 | 46.3 | 51.4 | 44.10 | 27.80 | 37.4 | 19.9 | 14.2 | 21.3 | 17.5 | 23.5 | 14.30 | 15.50 | 18.0 | 0.35 | 0.5 | 0.54 | 0.73 | 1.07 | 1.40 | 0.76 | |
| 97 | O-2 E67 | 34.2 | 33.7 | 28.6 | 35.9 | 33.0 | 34.00 | 55.40 | 36.4 | 20.8 | 28.2 | 24.2 | 26.4 | 24.6 | 23.50 | 19.90 | 23.9 | 1.27 | 1.7 | 1.49 | 1.81 | 2.11 | 0.81 | 1.52 | |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 8 of 10)

| No. _x -So. _x GIS No. | Original RAMP Name | Dissolved Organic Carbon (mg/L) | | | | | | | | Chlorophyll a (µg/L) | | | | | | | | Gran Bicarbonate (mg/L) | | | | |
|---|--------------------------|---------------------------------|-------|------|-------|-------|-------|-------|-------|----------------------|--------|------|--------|--------|--------|--------|--------|-------------------------|--------|-------|-------|-------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 2001 | 2002 | 2004 | 2005 | Mean |
| 168 | A21 | 23.0 | 19.66 | 23.3 | 21.76 | 19.68 | 16.79 | 21.72 | 20.85 | 14.9 | 9.66 | 8 | 8.33 | 7.33 | 10.34 | 1.68 | 9.82 | 0.7 | 0.15 | 0.00 | 0.00 | 0.21 |
| 169 | A24 | 15.5 | 15.38 | 16.6 | 26.06 | 19.75 | 37.27 | 22.01 | 21.79 | 29.7 | 15.01 | 4 | 1.44 | 14.79 | 17.17 | 5.96 | 13.73 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| 170 | A26 | 18.1 | 10.83 | 12.0 | 16.70 | 16.54 | 14.83 | 16.70 | 15.10 | 16.1 | 18.43 | 22 | 9.23 | 21.93 | 11.84 | 2.30 | 16.51 | 0.0 | 0.70 | 0.20 | 0.00 | 0.22 |
| 167 | A29 | 12.8 | 13.28 | 17.1 | 16.54 | 15.91 | 14.84 | 16.21 | 15.24 | 8.2 | 14.70 | 37 | 3.75 | 13.34 | 12.15 | 4.75 | 14.82 | 0.7 | 1.49 | 1.10 | 0.00 | 0.82 |
| 166 | A86 | 15.5 | 13.89 | | 14.69 | 16.32 | 21.60 | 23.87 | 17.64 | 13.6 | 6.89 | | 13.34 | 13.29 | 9.95 | 33.81 | 11.41 | | 7.44 | 7.10 | 6.64 | 7.06 |
| 287 | 25 | | | | 15.56 | 18.64 | 20.12 | 16.61 | 17.73 | | | | 9.64 | 16.27 | 7.89 | 3.23 | 11.27 | | 0.00 | 0.10 | 0.00 | 0.03 |
| 289 | 27 | | | | 12.17 | 12.97 | 11.88 | 12.74 | 12.44 | | | | 9.07 | 9.57 | 9.00 | 2.87 | 9.21 | | 4.75 | 3.80 | 1.25 | 3.27 |
| 290 | 28 | | | | 20.06 | 28.73 | 19.06 | 20.48 | 22.08 | | | | 3.40 | 17.52 | 6.89 | 2.84 | 9.27 | | 3.24 | 1.60 | 0.00 | 1.61 |
| 342 | 82 | | | | 26.09 | 25.01 | 25.21 | 28.98 | 26.32 | | | | 5.82 | 16.03 | 25.67 | 10.56 | 15.84 | | 13.34 | 10.70 | 6.63 | 10.22 |
| 354 | 94 | | | | 25.44 | 23.60 | 22.14 | 28.49 | 24.92 | | | | 2.74 | 8.76 | 5.76 | 2.37 | 5.75 | | 32.30 | 19.40 | 15.77 | 22.49 |
| 165 | A42 | 36.6 | 40.60 | 49.8 | 55.52 | 47.34 | 46.16 | 51.01 | 46.73 | 112.4 | 368.77 | 285 | 144.03 | 92.47 | 89.71 | 47.32 | 181.99 | 12.9 | 23.68 | 24.70 | 20.01 | 20.34 |
| 171 | A47 | 11.3 | 15.46 | 31.3 | 20.79 | 20.62 | 19.00 | 21.51 | 19.99 | 16.7 | 9.69 | 31 | 5.46 | 19.21 | 6.33 | 12.05 | 14.75 | 2.0 | 10.71 | 7.50 | 8.78 | 7.24 |
| 172 | A59 | 44.3 | 37.12 | 17.7 | 30.01 | 35.64 | 35.27 | 34.62 | 33.52 | 75.6 | 48.24 | 18 | 4.38 | 26.93 | 14.87 | 16.26 | 31.25 | 4.9 | 3.16 | 1.30 | 0.21 | 2.39 |
| 223 | P94 | | | | 49.46 | 51.51 | 50.40 | 35.73 | 46.78 | | | | 22.12 | 7.66 | 12.29 | 23.83 | 14.02 | | 50.80 | 49.30 | 42.08 | 47.39 |
| 225 | P96 | | | | 31.95 | 34.06 | 34.65 | 29.66 | 32.58 | | | | 10.42 | 5.16 | 7.83 | 13.93 | 7.80 | | 46.30 | 40.50 | 31.13 | 39.31 |
| 226 | P97 | | | | 27.60 | 36.31 | 29.97 | 26.54 | 30.11 | | | | 11.64 | 5.97 | 13.28 | 17.94 | 10.30 | | 18.55 | 14.30 | 42.81 | 25.22 |
| 227 | P98 | | | | 33.57 | 34.22 | 32.54 | 28.59 | 32.23 | | | | 9.69 | 1.53 | 6.54 | 31.78 | 5.92 | | 43.48 | 39.80 | 16.75 | 33.34 |
| 267 | 1 | | | | 22.43 | 22.81 | 23.01 | 29.59 | 24.46 | | | | 7.70 | 6.09 | 6.56 | 6.00 | 6.78 | | 55.67 | 50.20 | 37.45 | 47.77 |
| 452 | L4 | 23.0 | 27.40 | 24.8 | 26.25 | 26.60 | 20.71 | 24.12 | 24.70 | 19.9 | 9.03 | 13 | 4.18 | 6.78 | 7.04 | 11.13 | 9.91 | 4.7 | 5.15 | 4.00 | 5.04 | 4.71 |
| 470 | L7 | 22.9 | 30.97 | 28.5 | 31.37 | 33.66 | 30.77 | 25.65 | 29.12 | 7.3 | 7.62 | 5 | 2.54 | 8.23 | 2.68 | 1.84 | 5.63 | 11.3 | 7.92 | 6.70 | 9.00 | 8.72 |
| 471 | L8 | 20.3 | 20.66 | 25.6 | 21.60 | 23.53 | 20.41 | 18.36 | 21.49 | 27.1 | 17.96 | 25 | 10.29 | 6.52 | 13.99 | 16.13 | 16.84 | 23.9 | 22.33 | 22.50 | 21.39 | 22.53 |
| 400 | L39 | 12.1 | 11.97 | 13.0 | 16.02 | 13.45 | 25.88 | 18.46 | 15.84 | 32.7 | 38.51 | 66 | 28.50 | 31.64 | 10.80 | 2.16 | 34.75 | 11.1 | 10.34 | 11.40 | 6.17 | 9.76 |
| 268 | E15 | | 16.66 | 81.2 | 43.30 | 30.83 | 32.27 | 50.84 | 42.51 | | | | 3.61 | 18.55 | 12.64 | 13.95 | 90.57 | 27.9 | 34.42 | 19.30 | 16.93 | 24.63 |
| 182 | P23 | | | | 18.46 | 15.38 | 20.09 | 15.79 | 17.43 | | | | 8.25 | 28.41 | 140.45 | 8.03 | 59.04 | | 13.41 | 38.60 | 55.04 | 35.68 |
| 185 | P27 | | | | 31.47 | 31.31 | 34.20 | 19.26 | 29.06 | | | | 1.80 | 3.60 | 5.39 | 2.60 | 3.60 | | 3.87 | 2.00 | 8.75 | 4.87 |
| 209 | P7 | | | | 25.72 | 30.70 | 19.39 | 27.03 | 25.71 | | | | 3.94 | 3.84 | 2.79 | 3.27 | 3.52 | | 8.40 | 6.10 | 7.82 | 7.44 |
| 270 | 4 | | | | 28.41 | 28.13 | 58.53 | 31.95 | 36.76 | | | | 11.45 | 15.99 | 11.18 | 10.26 | 12.87 | | 98.97 | 74.60 | 77.39 | 83.65 |
| 271 | 6 | | | | 23.97 | 26.42 | 53.63 | 21.59 | 31.40 | | | | 3.74 | 7.32 | 8.12 | 7.34 | 6.39 | | 102.85 | 52.70 | 72.31 | 75.95 |
| 418 | Kearl L. | | | | 23.53 | 25.15 | 16.23 | 21.64 | | | | | 9.72 | 8.43 | 6.20 | 9.08 | | | | 88.50 | 83.04 | 85.77 |
| 436 | L18 | 7.6 | 7.08 | 8.7 | 8.35 | 8.04 | 13.71 | 7.66 | 8.73 | 7.1 | 6.81 | 5 | 14.47 | 2.61 | 2.81 | 1.56 | 6.51 | 22.4 | 23.40 | 25.00 | 23.73 | 23.63 |
| 442 | L23 | 13.9 | 11.31 | 13.6 | 13.30 | 13.38 | 19.38 | 13.26 | 14.01 | 8.2 | 5.85 | 15 | 11.88 | 7.24 | 7.26 | 10.11 | 9.17 | 7.7 | 9.71 | 9.10 | 7.48 | 8.50 |
| 444 | L25 | 6.8 | 7.79 | 11.0 | 8.61 | 8.02 | 13.04 | 8.94 | 9.17 | 29.5 | 12.81 | 16 | 3.20 | 6.14 | 13.71 | 12.96 | 13.52 | 9.4 | 7.85 | 10.70 | 9.73 | 9.41 |
| 447 | L28 | 26.5 | 27.46 | 28.2 | 27.98 | 28.78 | 30.87 | 28.39 | 28.32 | 2.6 | 2.65 | 4 | 3.43 | 5.07 | 6.14 | 3.19 | 4.03 | 1.1 | 1.37 | 2.30 | 0.00 | 1.19 |
| 448 | L29 | 17.7 | | 13.0 | 20.34 | 16.81 | 13.55 | 16.99 | 16.39 | 8.0 | | 35 | 20.89 | 15.01 | 11.90 | 12.44 | 18.19 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| 454 | L46 | 16.9 | 23.40 | 23.2 | 23.25 | 29.43 | 22.90 | 28.89 | 23.99 | 2.6 | 57.13 | 6 | 7.37 | 103.94 | 7.30 | 180.48 | 30.80 | 12.2 | 13.61 | 11.70 | 10.44 | 11.99 |
| 455 | L47 | 19.3 | 20.46 | 18.4 | 20.29 | 24.12 | 36.62 | 21.35 | 22.93 | 25.1 | 4.25 | 60 | 1.34 | 36.31 | 71.20 | 18.64 | 33.03 | 11.1 | 13.51 | 18.20 | 9.78 | 13.14 |
| 457 | L49 | 16.3 | 23.00 | 19.9 | 20.72 | 25.15 | 26.71 | 26.41 | 22.60 | 10.0 | 40.04 | 19 | 8.11 | 3.38 | 8.84 | 16.14 | 14.89 | 6.1 | 8.95 | 11.30 | 8.22 | 8.64 |
| 464 | L60 | 15.4 | 18.65 | 17.3 | 19.71 | 23.10 | 23.32 | 21.60 | 19.87 | 18.1 | 19.87 | 18 | 2.58 | 53.03 | 173.06 | 84.94 | 47.47 | 17.3 | 17.20 | 20.70 | 14.64 | 17.46 |
| 175 | P13 | | | | 44.79 | 48.96 | 52.21 | 41.86 | 46.96 | | | | 51.43 | 128.03 | 135.65 | 74.90 | 105.04 | | 61.55 | 43.50 | 52.96 | 52.67 |
| 199 | P49 | | | | 14.74 | 17.07 | 21.20 | 24.49 | 19.38 | | | | 14.81 | 24.74 | 10.22 | 19.80 | 16.59 | | 9.38 | 8.40 | 13.78 | 10.52 |
| 473 | A301 | | | 13.8 | 13.32 | 14.37 | 24.20 | 12.12 | 15.57 | | | 7 | 3.94 | 6.20 | 6.22 | 3.54 | 5.96 | 24.8 | 25.66 | 24.90 | 22.39 | 24.42 |
| 118 | L107 | | 6.99 | 8.3 | 9.84 | 9.70 | 22.48 | 7.97 | 10.87 | | 1.53 | 3 | 2.88 | 1.93 | 2.16 | 1.05 | 2.23 | 24.7 | 26.01 | 27.20 | 26.32 | 26.06 |
| 84 | L109 | 19.1 | 14.34 | 15.7 | 19.09 | 21.73 | 30.17 | 16.21 | 19.47 | 2.9 | 3.63 | 4 | 2.17 | 3.49 | 2.70 | 1.78 | 3.15 | 22.6 | 22.20 | 20.30 | 20.19 | 21.32 |
| 88 | O-10 | 24.4 | 21.65 | 14.8 | 24.83 | 20.94 | 34.86 | | 23.58 | 24.3 | 29.87 | 34 | 30.83 | 4.76 | 7.12 | | 21.76 | 11.2 | 12.35 | 12.50 | | 12.01 |
| 90 | R1 | 15.8 | 12.82 | 23.9 | 15.26 | 16.62 | 33.40 | 14.22 | 18.86 | 3.7 | 3.88 | 4 | 3.08 | 4.09 | 5.37 | 2.27 | 4.04 | 16.8 | 16.99 | 17.10 | 16.23 | 16.78 |
| 146 | E52 | 24.0 | 21.22 | 22.1 | 22.88 | 22.85 | 24.74 | 25.19 | 23.29 | 5.1 | 4.37 | 7 | 2.14 | 7.61 | 12.93 | 0.60 | 6.53 | 20.6 | 23.66 | 23.20 | 22.27 | 22.42 |
| 152 | E59 | 13.9 | 10.47 | 12.0 | 12.51 | 12.53 | 15.90 | 13.60 | 12.98 | 10.2 | 4.18 | 7 | 2.31 | 7.60 | 6.99 | 5.06 | 6.32 | 8.7 | 10.34 | 12.60 | 9.25 | 10.22 |
| 89 | E68 | | 22.59 | 24.9 | 20.15 | 20.61 | 21.52 | 21.96 | 21.96 | | 12.88 | 10 | 14.20 | 11.46 | 8.85 | 12.07 | 11.55 | 14.7 | 13.17 | 12.70 | 14.27 | 13.71 |
| 91 | O-1/E55 | 20.9 | 18.96 | 17.8 | 19.59 | 20.26 | 28.17 | 24.15 | 21.41 | 9.4 | 13.06 | 12 | 11.66 | 17.89 | 28.07 | 5.56 | 15.39 | 2.4 | 4.02 | 4.50 | 9.37 | 5.08 |
| 97 | O-2 E67 | 24.4 | 22.01 | 24.2 | 22.56 | 21.77 | 26.69 | 21.54 | 23.31 | 10.0 | 2.87 | 3 | 2.00 | 5.54 | 6.38 | 17.45 | 4.95 | 10.4 | 12.94 | 11.80 | 4.54 | 9.93 |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 9 of 10)

| No.-So _x GIS No. | Original RAMP Name | Iron (mg/L) | | | | | | Silica (mg/L) | | | | | Total Nitrogen (µg/L) | | | | | | Total Kjeldahl Nitrogen (µg/L) | | | | | |
|--------------------------------|--------------------------|-------------|------|------|-------|--------|------|---------------|------|------|------|------|-----------------------|------|------|------|------|------|--------------------------------|------|------|----------|----------|------|
| | | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 2001 | 2003 | 2004 | 2005 | Mean | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 2001 | 2002 | 2003 | 2004 | 2005 | Mean |
| 168 | A21 | 1.03 | 0.81 | 0.65 | 0.635 | 0.989 | 0.82 | | 0.25 | 0.16 | 0.68 | 0.37 | 2731 | 642 | 718 | 753 | 652 | 1099 | 2724 | 640 | 714 | 753.39 | 648.99 | 1096 |
| 169 | A24 | 0.68 | 0.71 | 0.49 | 0.507 | 0.717 | 0.62 | 0.2 | 0.93 | 0.64 | 0.78 | | 1305 | 950 | 1131 | 1015 | 702 | 1020 | 1233 | 948 | 1128 | 1,013.46 | 699.17 | 1004 |
| 170 | A26 | 0.33 | 0.31 | 0.52 | 0.319 | 0.451 | 0.39 | 0.2 | 0.55 | 0.13 | 0.38 | 0.35 | 2995 | 940 | 1197 | 955 | 747 | 1367 | 2982 | 876 | 1187 | 828.07 | 744.00 | 1324 |
| 167 | A29 | 0.09 | 0.08 | 0.07 | 0.039 | 0.077 | 0.07 | | 0.26 | 0.09 | 0.04 | 0.13 | 1754 | 758 | 1031 | 875 | 831 | 1050 | 1748 | 758 | 1028 | 874.44 | 829.05 | 1047 |
| 166 | A86 | | 0.01 | 0.08 | 0.067 | 0.113 | 0.09 | | 0.12 | | 0.32 | 0.22 | | 997 | 967 | 1292 | 2270 | 1382 | | 958 | 958 | 1,291.68 | 2,267.19 | 1369 |
| 287 | 25 | | 0.34 | 0.63 | 0.381 | 0.543 | 0.47 | | 0.33 | | 0.15 | 0.24 | | 840 | 1236 | 898 | 785 | 940 | | 840 | 1234 | 896.06 | 781.03 | 938 |
| 289 | 27 | | 0.03 | 0.01 | 0.038 | 0.046 | 0.04 | | 0.14 | 0.09 | 0.13 | 0.12 | | 565 | 621 | 561 | 667 | 603 | | 564 | 621 | 559.31 | 665.64 | 602 |
| 290 | 28 | | 0.11 | 0.85 | 0.097 | 0.188 | 0.31 | | 0.09 | 0.18 | 0.35 | 0.20 | | 970 | 1076 | 661 | 663 | 843 | | 948 | 1074 | 657.59 | 660.52 | 835 |
| 342 | 82 | | 0.02 | 0.01 | 0.012 | 0.02 | 0.02 | | 0.16 | 0.06 | 0.10 | 0.11 | | 1281 | 1714 | 2626 | 2150 | 1943 | | 1280 | 1713 | 2,591.81 | 2,143.08 | 1932 |
| 354 | 94 | | 0.01 | 0.01 | 0.015 | 0.0207 | 0.02 | | 0.12 | 0.04 | 0.02 | 0.06 | | 1511 | 1332 | 1225 | 1110 | 1294 | | 1505 | 1332 | 1,224.93 | 1,107.04 | 1292 |
| 165 | A42 | 0.03 | 0.06 | 0.01 | 0.012 | 0.023 | 0.03 | | 0.48 | 0.04 | 0.29 | 0.27 | | 5664 | 5040 | 3801 | 6558 | 5266 | | 5663 | 5040 | 3,800.62 | 6,552.21 | 5264 |
| 171 | A47 | 0.32 | 0.19 | 0.14 | 0.091 | 0.166 | 0.18 | | 1.76 | 1.78 | 0.52 | 1.36 | | 1341 | 1929 | 1534 | 1648 | 1367 | 1564 | 1325 | 1196 | 1,026.71 | 1,232.40 | 1246 |
| 172 | A59 | 0.03 | 0.28 | 0.50 | 0.510 | 0.602 | 0.38 | | 2.31 | 1.41 | 0.62 | 1.45 | 2386 | 1386 | 1627 | 1154 | 1050 | 1521 | 2380 | 1385 | 1585 | 1,154.16 | 1,047.43 | 1510 |
| 223 | P94 | | 0.01 | 0.01 | 0.005 | | 0.01 | | 3.00 | 3.42 | 2.48 | 2.97 | 0 | 2786 | 2165 | 2370 | 2350 | 1934 | | 2769 | 2164 | 2,369.92 | 2,336.90 | 2410 |
| 225 | P96 | | 0.01 | 0.01 | 0.024 | | 0.02 | | 0.48 | 1.39 | 2.38 | 1.42 | 0 | 1693 | 1616 | 2624 | 1700 | 1527 | | 1692 | 1615 | 2,609.40 | 1,661.20 | 1894 |
| 226 | P97 | | 0.03 | 0.30 | 0.122 | | 0.15 | | 0.21 | 1.29 | 0.73 | 0.75 | 0 | 1165 | 1139 | 1502 | 1150 | 991 | | 1164 | 1137 | 1,481.17 | 1,146.28 | 1232 |
| 227 | P98 | | 0.03 | 0.01 | 0.016 | | 0.02 | | 2.20 | 1.85 | 0.24 | 1.43 | 0 | 1812 | 1137 | 1246 | 1270 | 1093 | | 1768 | 1135 | 1,245.80 | 1,268.22 | 1354 |
| 267 | 1 | | 0.02 | 0.01 | 0.008 | 0.0093 | 0.01 | | 0.49 | 0.36 | 0.20 | 0.35 | 0 | 1471 | 1337 | 1371 | 1132 | 1062 | | 1470 | 1337 | 1,369.26 | 1,130.91 | 1327 |
| 452 | L4 | 0.23 | 0.24 | 0.36 | 0.180 | | 0.25 | | 0.11 | 0.77 | 0.69 | 0.52 | 610 | 627 | 593 | 774 | 826 | 686 | 533 | 621 | 592 | 638.70 | 821.19 | 641 |
| 470 | L7 | 0.65 | 0.37 | 0.76 | 0.497 | | 0.57 | | 1.72 | 0.23 | 2.00 | 1.32 | 521 | 620 | 608 | 507 | 592 | 570 | 513 | 619 | 608 | 506.60 | 587.40 | 567 |
| 471 | L8 | 0.16 | 0.06 | 0.22 | 0.098 | | 0.13 | | 1.50 | 1.65 | 0.10 | 1.08 | 971 | 974 | 734 | 942 | 904 | 905 | 967 | 896 | 734 | 938.62 | 898.87 | 887 |
| 400 | L39 | 0.01 | 0.05 | 0.07 | 0.086 | | 0.07 | 3.3 | 1.88 | 2.24 | 3.19 | 2.66 | 4050 | 1015 | 1134 | 729 | 762 | 1538 | 4043 | 1014 | 1134 | 727.50 | 740.20 | 1532 |
| 268 | E15 | 0.02 | 0.14 | 0.06 | 0.049 | 0.04 | 0.06 | | 0.47 | 0.38 | 0.61 | 0.49 | 2127 | 2773 | 1603 | 1150 | 1454 | 1822 | 2125 | 2765 | 1602 | 1,149.76 | 1,449.05 | 1818 |
| 182 | P23 | | 0.22 | 0.18 | 0.163 | | 0.19 | | 0.59 | 2.58 | 0.61 | 1.26 | | 483 | 953 | 2430 | 692 | 1140 | | 481 | 953 | 2,428.69 | 689.84 | 1138 |
| 185 | P27 | | 0.30 | 0.30 | 0.251 | | 0.28 | | 1.16 | 0.48 | 0.72 | 0.79 | | 687 | 611 | 605 | 680 | 646 | | 614 | 611 | 604.90 | 672.47 | 626 |
| 209 | P7 | | 0.42 | 0.54 | 0.210 | | 0.39 | | 0.49 | 0.20 | 1.38 | 0.69 | | 610 | 717 | 631 | 683 | 660 | | 609 | 717 | 631.09 | 680.59 | 659 |
| 270 | 4 | | 0.01 | 0.05 | | 0.001 | 0.03 | | 2.13 | 2.67 | 1.63 | 2.14 | | 1998 | 1639 | 1601 | 2040 | 1819 | | 1987 | 1639 | 1,600.34 | 2,038.12 | 1816 |
| 271 | 6 | | 0.01 | 0.01 | 0.020 | 0.009 | 0.01 | | 1.76 | | 0.62 | 1.19 | | 2390 | 1555 | 1529 | 1450 | 1731 | | 2298 | 1555 | 1,529.16 | 1,444.48 | 1707 |
| 418 | Kearl L. | | | 0.01 | 0.003 | | 0.00 | | 2.01 | 2.87 | 3.71 | 2.86 | | | 1385 | 1251 | 1420 | 1352 | | | 1383 | 1,250.76 | 1,415.76 | 1350 |
| 436 | L18 | 0.03 | 0.01 | 0.01 | 0.010 | 0.001 | 0.03 | | 0.28 | 0.43 | 0.26 | 0.32 | 284 | 349 | 307 | 383 | 320 | 329 | 282 | 336 | 307 | 382.45 | 318.39 | 325 |
| 442 | L23 | 0.08 | 0.01 | 0.23 | 0.113 | 0.176 | 0.15 | 1.0 | 1.07 | 1.22 | 1.33 | 1.16 | 828 | 384 | 646 | 683 | 496 | 607 | 819 | 384 | 646 | 680.44 | 493.96 | 605 |
| 444 | L25 | 0.06 | 0.03 | 0.01 | 0.034 | 0.0124 | 0.03 | | 0.07 | 0.05 | 0.01 | 0.04 | 445 | 432 | 443 | 660 | 598 | 515 | 442 | 396 | 443 | 658.70 | 595.56 | 507 |
| 447 | L28 | 1.63 | 1.38 | 1.87 | 1.510 | 1.53 | 1.58 | 2.7 | 0.36 | 1.22 | 1.73 | 1.50 | 1984 | 665 | 620 | 707 | 655 | 926 | 1931 | 650 | 620 | 707.19 | 652.35 | 912 |
| 448 | L29 | 0.22 | 0.41 | 0.32 | 0.350 | | 0.32 | 0.2 | 0.03 | 0.02 | 0.15 | 0.03 | 4141 | 553 | 748 | 509 | 772 | 1345 | 4135 | 552 | 748 | 508.03 | 763.21 | 1341 |
| 454 | L46 | 1.38 | 2.20 | 3.88 | 2.160 | 1.7 | 2.26 | 4.4 | 2.15 | 4.65 | 3.33 | 3.64 | 1761 | 1393 | 2075 | 1605 | 2933 | 1954 | 1707 | 1221 | 2074 | 1,409.64 | 2,929.31 | 1868 |
| 455 | L47 | 0.60 | 0.76 | 1.11 | 1.320 | 0.664 | 0.89 | 1.4 | 1.53 | 2.14 | 2.13 | 1.79 | 3443 | 1265 | 1737 | 3209 | 1241 | 2179 | 3370 | 987 | 1715 | 2,920.76 | 1,089.83 | 2016 |
| 457 | L49 | 1.00 | 1.17 | 1.61 | 2.370 | 1.27 | 1.48 | 3.0 | 0.71 | 0.41 | 0.66 | 1.20 | 4436 | 1126 | 1017 | 1372 | 972 | 1785 | 4157 | 926 | 886 | 1,325.67 | 950.96 | 1649 |
| 464 | L60 | 0.81 | 0.86 | 0.74 | 0.915 | 0.722 | 0.81 | 0.7 | 0.04 | 0.39 | 1.35 | 0.62 | 2640 | 874 | 1111 | 2035 | 1563 | 1645 | 2631 | 813 | 1111 | 2,034.67 | 1,561.98 | 1630 |
| 175 | P13 | | 0.10 | 0.12 | 0.078 | | 0.10 | | 0.88 | 1.26 | 0.44 | 0.86 | | 3480 | 3816 | 4307 | 3160 | 3691 | | 3471 | 3816 | 4,305.28 | 3,157.22 | 3687 |
| 199 | P49 | | 0.04 | 0.01 | 0.101 | | 0.07 | | 0.12 | 0.06 | 0.15 | 0.11 | | 910 | 834 | 968 | 990 | 925 | | 909 | 834 | 967.91 | 988.28 | 925 |
| 473 | A301 | 0.03 | 0.01 | 0.06 | 0.017 | | 0.04 | 1.5 | 1.62 | 1.73 | 1.48 | 1.59 | 1085 | 568 | 426 | 982 | 506 | 713 | 1072 | 567 | 426 | 980.49 | 504.20 | 710 |
| 118 | L107 | 0.01 | 0.04 | 0.01 | 0.317 | | 0.18 | 0.3 | 0.18 | 0.14 | 0.16 | 0.20 | 944 | 341 | 301 | 576 | 359 | 504 | 930 | 336 | 301 | 575.69 | 355.97 | 500 |
| 84 | L109 | 0.64 | 0.62 | 0.47 | 0.554 | | 0.57 | 2.5 | 2.00 | 2.53 | 2.10 | 2.28 | 1834 | 568 | 523 | 587 | 535 | 809 | 1822 | 545 | 520 | 579.64 | 532.77 | 800 |
| 88 | O-10 | 0.02 | 0.01 | 0.06 | 0.086 | | 0.06 | 1.1 | 0.27 | 0.11 | | 0.50 | 2484 | 1535 | 690 | 844 | | 1388 | 2478 | 1534 | 690 | 842.82 | | 1386 |
| 90 | R1 | 0.13 | 0.06 | 0.16 | 0.000 | | 0.09 | 2.8 | 2.24 | 2.63 | 2.77 | 2.61 | 2204 | 468 | 434 | 564 | 592 | 852 | 2185 | 463 | 434 | 562.94 | 597.00 | 848 |
| 146 | E52 | 0.83 | 0.83 | 0.65 | 0.646 | | 0.74 | 1.5 | 0.47 | 0.61 | 1.21 | 0.94 | 894 | 559 | 583 | 808 | 682 | 705 | 876 | 514 | 583 | 805.87 | 638.30 | 683 |
| 152 | E59 | 0.18 | 0.24 | 0.01 | 0.034 | | 0.15 | 0.2 | 0.06 | 0.56 | 0.21 | 0.27 | 2175 | 464 | 513 | 594 | 520 | 853 | 2165 | 409 | 510 | 594.40 | 518.03 | 839 |
| 89 | E68 | 0.96 | 0.79 | 0.77 | 0.342 | | 0.72 | 0.3 | 0.34 | 0.44 | 0.00 | 0.28 | 3802 | 724 | 1057 | 858 | 1100 | 1508 | 3693 | 723 | 1048 | 776.63 | 1,097.39 | 1468 |
| 91 | O-1/E55 | 0.50 | 0.32 | 0.40 | 0.165 | | 0.35 | 0.2 | 0.04 | 0.02 | 0.62 | 0.23 | 2159 | 736 | 944 | 998 | 710 | 1109 | 2113 | 731 | 932 | 996.99 | 700.81 | 1095 |
| 97 | O-2 E67 | 0.85 | 0.95 | 0.82 | 0.823 | | 0.86 | 0.9 | 0.70 | 0.42 | 0.21 | 0.55 | 2318 | 593 | 460 | 579 | 950 | 980 | 2303 | 568 | 450 | 571.85 | 947.28 | 968 |

Shaded values are less than detection limits.

Table H.1-1 (Cont'd., 10 of 10)

| No _x -So _x GIS No. | Original RAMP Name | Sum Base Cations (meq/L) | | | | | | | | Dissolved Aluminum (mg/L) | | | |
|---|--------------------------|--------------------------|-------|-------|--------|--------|--------|--------|--------|---------------------------|------|------|--------|
| | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | Mean | 2003 | 2004 | 2005 | Mean |
| 168 | A21 | 181.9 | 166.8 | 177.6 | 142.9 | 139.5 | 120.0 | 122.7 | 154.8 | 251 | 173 | 182 | 202.00 |
| 169 | A24 | 109.0 | 103.3 | 108.1 | 125.6 | 139.7 | 112.6 | 98.4 | 116.4 | 172 | 173 | 170 | 171.67 |
| 170 | A26 | 346.8 | 126.5 | 125.0 | 143.3 | 146.0 | 129.3 | 124.8 | 169.5 | 113 | 105 | 120 | 112.67 |
| 167 | A29 | 137.2 | 158.7 | 173.2 | 149.2 | 151.4 | 171.4 | 181.0 | 156.8 | 47.4 | 37.3 | 50.4 | 45.03 |
| 166 | A86 | 237.7 | 240.7 | | 264.6 | 280.9 | 306.8 | 322.1 | 266.1 | 21 | 22.3 | 27.8 | 23.70 |
| 287 | 25 | | | | 118.3 | 136.4 | 123.1 | 103.9 | 125.9 | 197 | 116 | 170 | 161.00 |
| 289 | 27 | | | | 164.3 | 178.0 | 179.8 | 185.6 | 174.1 | 17.9 | 15.3 | 25.5 | 19.57 |
| 290 | 28 | | | | 196.2 | 264.8 | 183.9 | 197.4 | 215.0 | 197 | 54.9 | 61.8 | 104.57 |
| 342 | 82 | | | | 387.7 | 362.2 | 348.0 | 330.9 | 366.0 | 17.4 | 16.1 | 25.7 | 19.73 |
| 354 | 94 | | | | 684.6 | 525.2 | 496.3 | 539.0 | 568.7 | 12.6 | 11.5 | 17.4 | 13.83 |
| 165 | A42 | 700.6 | 526.4 | 478.5 | 641.3 | 595.3 | 768.3 | 931.8 | 618.4 | 9.7 | 7.38 | 11.8 | 9.63 |
| 171 | A47 | 149.9 | 311.1 | 258.5 | 403.4 | 347.8 | 335.7 | 440.3 | 301.1 | 15.1 | 12 | 19.2 | 15.43 |
| 172 | A59 | 322.0 | 274.0 | 242.3 | 285.9 | 276.7 | 292.6 | 268.4 | 282.2 | 73.7 | 76.7 | 61.5 | 70.63 |
| 223 | P94 | | | | 1477.7 | 1370.7 | 1421.3 | 1791.6 | 1423.2 | 8.2 | 6.54 | | 7.37 |
| 225 | P96 | | | | 1010.2 | 834.6 | 965.3 | 1096.3 | 936.7 | 12.5 | 12.5 | | 12.50 |
| 226 | P97 | | | | 514.2 | 557.5 | 481.7 | 1486.7 | 517.8 | 41.4 | 41.4 | | 41.40 |
| 227 | P98 | | | | 996.7 | 967.2 | 948.6 | 604.3 | 970.8 | 4.66 | 4.66 | | 4.66 |
| 267 | 1 | | | | 1077.7 | 1004.9 | 981.7 | 1105.3 | 1021.5 | 3.2 | 2.25 | 2.99 | 2.81 |
| 452 | L4 | 308.0 | 301.4 | 273.6 | 277.1 | 268.9 | 246.8 | 321.9 | 279.3 | 43.2 | 41.9 | | 42.55 |
| 470 | L7 | 375.9 | 422.9 | 409.9 | 354.9 | 365.3 | 306.9 | 422.3 | 372.6 | 201 | 135 | | 168.00 |
| 471 | L8 | 635.3 | 598.9 | 627.2 | 549.8 | 605.5 | 536.5 | 627.5 | 592.2 | 14.3 | 20.3 | | 17.30 |
| 400 | L39 | 524.3 | 369.5 | 349.1 | 337.2 | 332.3 | 329.0 | 259.6 | 373.6 | 21.3 | 32.3 | | 26.80 |
| 268 | E15 | | 787.2 | 793.7 | 706.9 | 608.6 | 538.1 | 710.9 | 686.9 | 6.3 | 7.31 | 8.9 | 7.50 |
| 182 | P23 | | | | 384.1 | 972.2 | 1178.5 | 1670.8 | 844.9 | 3.7 | 18 | | 10.85 |
| 185 | P27 | | | | 291.5 | 273.7 | 210.1 | 354.5 | 258.4 | 66.2 | 50.5 | | 58.35 |
| 209 | P7 | | | | 323.2 | 359.1 | 276.9 | 321.2 | 319.7 | 39.3 | 24.7 | | 32.00 |
| 270 | 4 | | | | 1962.7 | 1757.8 | 1614.7 | 2290.9 | 1778.4 | 1 | 1.15 | 0.75 | 0.97 |
| 271 | 6 | | | | 1933.5 | 1578.5 | 1415.4 | 1995.1 | 1642.5 | 6.9 | 6.38 | 1.06 | 4.78 |
| 418 | Kearl L. | | | | 0.0 | 1770.0 | 1769.4 | 2286.3 | 1179.8 | 0.94 | 0.94 | | 0.94 |
| 436 | L18 | 610.6 | 615.2 | 627.5 | 630.0 | 636.5 | 622.3 | 788.9 | 623.7 | 1.6 | 0.25 | 0.57 | 0.81 |
| 442 | L23 | 289.3 | 280.5 | 278.3 | 288.7 | 266.5 | 264.9 | 264.5 | 278.0 | 9.4 | 3.43 | 9.2 | 7.34 |
| 444 | L25 | 298.4 | 309.9 | 322.0 | 274.3 | 283.9 | 302.7 | 344.9 | 298.5 | 3.5 | 5.32 | 2.48 | 3.77 |
| 447 | L28 | 239.2 | 214.7 | 229.4 | 225.6 | 213.7 | 258.9 | 218.8 | 230.2 | 366 | 244 | 232 | 280.67 |
| 448 | L29 | 81.4 | | 110.4 | 54.9 | 79.4 | 83.1 | 55.0 | 81.9 | 140 | 128 | | 134.00 |
| 454 | L46 | 878.3 | 696.1 | 606.0 | 594.4 | 584.8 | 579.8 | 604.6 | 656.6 | 516 | 369 | 327 | 404.00 |
| 455 | L47 | 748.5 | 628.8 | 604.7 | 597.5 | 537.4 | 1699.2 | 663.5 | 802.7 | 681 | 397 | 338 | 472.00 |
| 457 | L49 | 637.2 | 653.5 | 579.5 | 619.4 | 568.6 | 611.5 | 544.0 | 611.6 | 259 | 568 | 288 | 371.67 |
| 464 | L60 | 556.8 | 644.6 | 643.9 | 635.2 | 628.2 | 613.7 | 642.1 | 620.4 | 22.2 | 16.2 | 35.8 | 24.73 |
| 175 | P13 | | | | 1482.0 | 1367.0 | 1337.8 | 1678.0 | 1395.6 | 16.1 | 14.8 | | 15.45 |
| 199 | P49 | | | | 294.2 | 288.4 | 324.7 | 325.8 | 302.4 | 30.3 | 20.4 | | 25.35 |
| 473 | A301 | | | 595.3 | 590.1 | 558.0 | 551.7 | 703.6 | 573.8 | 4.27 | 1.32 | | 2.80 |
| 118 | L107 | | 622.2 | 650.4 | 616.0 | 602.7 | 603.7 | 811.9 | 619.0 | 3.92 | 7.8 | | 5.86 |
| 84 | L109 | 583.8 | 609.8 | 602.7 | 572.8 | 558.4 | 537.8 | 644.0 | 577.5 | 36 | 38.1 | | 37.05 |
| 88 | O-10 | 554.9 | 471.0 | 426.2 | 418.0 | 411.2 | 387.8 | 0.0 | 444.8 | 48.7 | 50.4 | | 49.55 |
| 90 | R1 | 436.5 | 452.0 | 461.9 | 447.7 | 440.7 | 442.0 | 528.0 | 446.8 | 5.9 | 5.9 | | 5.90 |
| 146 | E52 | 580.4 | 595.2 | 620.7 | 630.2 | 610.0 | 597.3 | 835.0 | 605.7 | 52.3 | 52 | | 52.15 |
| 152 | E59 | 331.4 | 298.1 | 323.7 | 317.7 | 327.7 | 341.1 | 377.7 | 323.3 | 6.7 | 3.48 | | 5.09 |
| 89 | E68 | | 549.8 | 536.4 | 443.5 | 458.6 | 417.3 | 593.2 | 481.1 | 78.3 | 64.5 | | 71.40 |
| 91 | O-1/E55 | 245.3 | 234.7 | 226.7 | 230.7 | 245.5 | 275.1 | 1457.9 | 243.0 | 95.8 | 76.7 | | 86.25 |
| 97 | O-2 E67 | 409.8 | 424.3 | 416.6 | 394.4 | 376.2 | 374.1 | 278.3 | 399.2 | 55 | 52.6 | | 53.80 |

Shaded values are less than detection limits.

H.2 DISSOLVED METALS IN RAMP LAKES 2003-2005

See Table H.2-1 and Table H.2-2 on the following pages.

Table H.2-1 Dissolved metals in RAMP lakes, 2003-2005.

| RAMP Name | Nox-Sox GIS No. | Date/Time | Ag-D | Al-D | As-D | Ba-D | B-D | Be-D | Bi-D | Ca-D | Cd-D | Cl-D | Co-D | Cr-D | Cu-D | Fe-D | Li-D |
|-----------|-----------------|-----------------|--------|------|-------|------|------|--------|--------|-------|--------|-------|--------|-------|-------|------|------|
| A21 | 168 | 8/28/2003 7:20 | 0.0025 | 251 | 0.53 | 8.8 | 4 | 0.02 | 0.006 | 1.11 | 0.005 | 0.1 | 0.38 | 0.47 | 1.08 | 765 | 0.6 |
| A21 | 168 | 9/23/2004 13:05 | 0.0014 | 173 | 0.4 | 8.2 | 5 | 0.019 | 0.0048 | 1.23 | 0.215 | 0.05 | 0.294 | 0.37 | 0.54 | 635 | 0.91 |
| A21 | 168 | 8/29/2005 13:40 | 0.001 | 182 | 0.42 | 8.64 | 4.17 | 0.022 | 0.0061 | 1.42 | 0.024 | 0.05 | 0.43 | 0.4 | 0.389 | 989 | 0.72 |
| A24 | 169 | 8/28/2003 7:50 | 0.0025 | 172 | 0.28 | 8.2 | 3.8 | 0.02 | 0.009 | 0.94 | 0.04 | 0.3 | 0.29 | 0.3 | 0.94 | 568 | 1 |
| A24 | 169 | 8/25/2004 12:05 | 0.0024 | 173 | 0.28 | 9.19 | 3.94 | 0.011 | 0.0056 | 0.961 | 0.0265 | 0.41 | 0.378 | 0.35 | 0.415 | 507 | 0.73 |
| A24 | 169 | 9/24/2004 12:10 | 0.0011 | 162 | 0.249 | 9.46 | 4.51 | 0.017 | 0.0038 | 1.04 | 0.04 | 0.14 | 0.338 | 0.37 | 0.76 | 433 | 0.81 |
| A24 | 169 | 8/29/2005 13:15 | 0.0003 | 170 | 0.27 | 7.9 | 3.3 | 0.017 | 0.005 | 0.92 | 0.029 | 0.05 | 0.414 | 0.283 | 0.27 | 717 | 0.43 |
| A26 | 170 | 8/28/2003 8:00 | 0.0025 | 113 | 0.31 | 7.4 | 4.5 | 0.16 | 0.007 | 1.14 | 0.005 | 0.1 | 0.29 | 0.28 | 0.43 | 564 | 1.3 |
| A26 | 170 | 9/24/2004 11:20 | 0.001 | 105 | 0.257 | 8.2 | 4.39 | 0.012 | 0.0034 | 1.31 | 0.062 | 0.127 | 0.194 | 0.22 | 0.52 | 319 | 0.66 |
| A26 | 170 | 8/29/2005 12:15 | 0.0012 | 120 | 0.26 | 9.09 | 3.63 | 0.019 | 0.0056 | 1.23 | 0.0162 | 0.05 | 0.344 | 0.23 | 0.318 | 451 | 0.5 |
| A29 | 167 | 8/28/2003 7:45 | 0.0025 | 47.4 | 0.32 | 6.5 | 4.7 | 0.02 | 0.0025 | 1.24 | 0.005 | 0.1 | 0.064 | 0.1 | 0.3 | 73 | 0.3 |
| A29 | 167 | 9/24/2004 10:25 | 0.0003 | 37.3 | 0.261 | 5.61 | 5.69 | 0.005 | 0.0005 | 1.29 | 0.017 | 0.14 | 0.029 | 0.15 | 0.206 | 39.2 | 0.62 |
| A29 | 167 | 8/29/2005 10:00 | 0.0003 | 50.4 | 0.263 | 5.78 | 5.2 | 0.008 | 0.0031 | 1.39 | 0.0047 | 0.05 | 0.042 | 0.109 | 0.146 | 77 | 0.65 |
| A86 | 166 | 8/28/2003 8:35 | 0.007 | 21 | 0.42 | 9.4 | 11.1 | 0.02 | 0.006 | 2.37 | 0.01 | 1 | 0.049 | 0.17 | 0.37 | 70 | 0.9 |
| A86 | 166 | 8/26/2004 12:45 | 0.0003 | 22.3 | 0.416 | 10.1 | 11.5 | 0.009 | 0.0043 | 2.58 | 0.0118 | 0.28 | 0.026 | 0.069 | 0.163 | 67 | 0.34 |
| A86 | 166 | 9/23/2004 12:30 | 0.0003 | 28.9 | 0.398 | 9.3 | 13.4 | 0.005 | 0.0016 | 2.51 | 0.001 | 0.73 | 0.0486 | 0.239 | 0.24 | 48.8 | 0.98 |
| A86 | 166 | 8/28/2005 11:50 | 0.0003 | 27.8 | 0.444 | 9.06 | 10.8 | 0.01 | 0.0022 | 2.55 | 0.001 | 0.17 | 0.088 | 0.11 | 0.203 | 113 | 0.78 |
| 25 | 287 | 8/28/2003 7:15 | 0.0025 | 197 | 0.31 | 12.6 | 4.2 | 0.02 | 0.012 | 1.2 | 0.005 | 0.1 | 0.39 | 0.37 | 0.75 | 677 | 0.4 |
| 25 | 287 | 8/26/2004 12:00 | 0.001 | 116 | 0.25 | 9.82 | 4.4 | 0.02 | 0.0056 | 1.04 | 0.055 | 0.72 | 0.308 | 0.214 | 0.357 | 381 | 0.6 |
| 25 | 287 | 9/24/2004 12:00 | 0.0043 | 113 | 0.232 | 10.9 | 4.2 | 0.022 | 0.0048 | 1.09 | 0.079 | 0.22 | 0.355 | 1.88 | 1.76 | 404 | 0.45 |
| 25 | 287 | 8/29/2005 12:45 | 0.0022 | 170 | 0.258 | 12.2 | 3.47 | 0.03 | 0.008 | 1.09 | 0.023 | 0.05 | 0.384 | 0.28 | 0.58 | 543 | 0.2 |
| 27 | 289 | 8/28/2003 7:10 | 0.0025 | 17.9 | 0.36 | 8.6 | 5.9 | 0.02 | 0.005 | 1.74 | 0.013 | 0.2 | 0.042 | 0.1 | 0.8 | 36 | 0.5 |
| 27 | 289 | 9/24/2004 10:30 | 0.0003 | 15.3 | 0.246 | 9.2 | 5.7 | 0.007 | 0.0017 | 2.01 | 0.064 | 0.28 | 0.0194 | 0.14 | 0.252 | 38.4 | 0.6 |
| 27 | 289 | 8/29/2005 11:00 | 0.0003 | 25.5 | 0.267 | 9.33 | 5.5 | 0.008 | 0.011 | 1.89 | 0.0021 | 0.05 | 0.0189 | 0.111 | 0.3 | 46 | 0.69 |
| 28 | 290 | 8/28/2003 8:30 | 0.007 | 197 | 0.52 | 8.5 | 6.7 | 0.2 | 0.0025 | 2.64 | 0.03 | 0.4 | 0.24 | 0.45 | 1.8 | 911 | 1.9 |
| 28 | 290 | 9/24/2004 11:10 | 0.0003 | 54.9 | 0.29 | 4.36 | 4.63 | 0.006 | 0.0017 | 1.63 | 0.053 | 0.2 | 0.051 | 0.221 | 0.143 | 97 | 0.81 |
| 28 | 290 | 8/29/2005 11:45 | 0.0006 | 61.8 | 0.267 | 3.96 | 4.4 | 0.01 | 0.0055 | 1.51 | 0.0074 | 0.05 | 0.0985 | 0.13 | 0.139 | 188 | 0.9 |
| 82 | 342 | 8/28/2003 7:00 | 0.0025 | 17.4 | 0.4 | 7.8 | 9.9 | 0.02 | 0.008 | 2.98 | 0.02 | 1.3 | 0.05 | 0.18 | 0.24 | 1.5 | 2 |
| 82 | 342 | 9/23/2004 11:35 | 0.0003 | 16.1 | 0.35 | 7.64 | 11 | 0.0015 | 0.0038 | 2.49 | 0.005 | 0.52 | 0.055 | 0.21 | 0.75 | 11.8 | 2.77 |
| 82 | 342 | 8/28/2005 12:30 | 0.0009 | 25.7 | 0.316 | 6.87 | 9.7 | 0.0036 | 0.0016 | 2.15 | 0.0024 | 0.202 | 0.022 | 0.13 | 0.21 | 20 | 2.1 |
| 94 | 354 | 8/28/2003 7:25 | 0.0025 | 12.6 | 0.46 | 7.6 | 12 | 0.02 | 0.0025 | 5.2 | 0.005 | 0.1 | 0.031 | 0.15 | 0.63 | 10 | 0.9 |
| 94 | 354 | 9/23/2004 14:00 | 0.0003 | 11.5 | 0.461 | 7.7 | 9.12 | 0.0015 | 0.0018 | 5.55 | 0.001 | 0.273 | 0.0277 | 0.21 | 0.158 | 15.2 | 1.19 |
| 94 | 354 | 8/28/2005 10:30 | 0.0005 | 17.4 | 0.412 | 6.84 | 9 | 0.0048 | 0.0013 | 4.55 | 0.0024 | 0.16 | 0.015 | 0.123 | 0.103 | 20.7 | 1 |
| A42 | 165 | 8/28/2003 8:25 | 0.0025 | 9.7 | 0.52 | 9.2 | 15.6 | 0.02 | 0.0025 | 6.43 | 0.016 | 0.6 | 0.1 | 0.7 | 0.83 | 23 | 2.6 |
| A42 | 165 | 9/23/2004 8:30 | 0.0003 | 7.38 | 0.66 | 14.5 | 15 | 0.0015 | 0.0092 | 8.7 | 0.001 | 0.35 | 0.053 | 0.23 | 0.25 | 12 | 2.46 |
| A42 | 165 | 8/28/2005 14:45 | 0.001 | 11.8 | 0.43 | 10.2 | 9.9 | 0.0015 | 0.0025 | 6.48 | 0.0022 | 0.05 | 0.049 | 0.12 | 0.43 | 23 | 1.51 |
| A47 | 171 | 8/28/2003 8:05 | 0.0025 | 15.1 | 0.48 | 9.5 | 12.9 | 0.02 | 0.008 | 4.28 | 0.005 | 0.3 | 0.044 | 0.18 | 0.3 | 153 | 2.1 |
| A47 | 171 | 9/23/2004 9:30 | 0.0003 | 12 | 0.39 | 9.4 | 14.3 | 0.0015 | 0.0039 | 4.34 | 0.001 | 0.26 | 0.025 | 0.11 | 0.18 | 91 | 2.12 |
| A47 | 171 | 8/28/2005 14:00 | 0.0003 | 19.2 | 0.5 | 10.5 | 14 | 0.0015 | 0.0014 | 4.6 | 0.0028 | 0.05 | 0.028 | 0.101 | 0.25 | 166 | 1.78 |
| A59 | 172 | 8/28/2003 8:20 | 0.0025 | 73.7 | 0.38 | 5.8 | 10.8 | 0.02 | 0.005 | 3.08 | 0.005 | 0.4 | 0.14 | 0.37 | 0.33 | 486 | 2.2 |
| A59 | 172 | 9/1/2003 8:05 | 0.0025 | 8.2 | 0.27 | 12.1 | 33.2 | 0.02 | 0.0025 | 12.5 | 0.01 | 0.4 | 0.04 | 0.23 | 0.52 | 9 | 6.5 |
| A59 | 172 | 9/23/2004 10:30 | 0.0003 | 76.7 | 0.372 | 6.08 | 10.4 | 0.006 | 0.0078 | 3.32 | 0.007 | 0.18 | 0.115 | 0.31 | 0.343 | 510 | 2.06 |

Shaded values are less than detection limits.

Table H.2-1 (Cont'd., 2 of 6)

| RAMP Name | Nox-Sox GIS No. | Date/Time | Mn-D | Mo-D | Ni-D | Pb-D | Sb-D | Se-D | Sn-D | Sr-D | Th-D | Ti-D | Ti-D | U-D | V-D | Zn-D |
|-----------|-----------------|-----------------|-------|--------|--------|--------|--------|------|--------|------|--------|-------|--------|--------|-------|------|
| A21 | 168 | 8/28/2003 7:20 | 52.8 | 0.12 | 0.93 | 0.371 | 0.04 | 0.25 | 0.05 | 7.5 | 0.08 | 3.9 | 0.009 | 0.059 | 0.96 | 4.6 |
| A21 | 168 | 9/23/2004 13:05 | 40.4 | 0.095 | 1.14 | 0.26 | 0.0264 | 0.05 | 0.015 | 7.92 | 0.0184 | 3.15 | 0.004 | 0.0348 | 0.656 | 4.38 |
| A21 | 168 | 8/29/2005 13:40 | 60.8 | 0.066 | 0.861 | 0.243 | 0.02 | 0.05 | 0.0329 | 9.62 | 0.042 | 2.98 | 0.0037 | 0.0361 | 0.667 | 9.2 |
| A24 | 169 | 8/28/2003 7:50 | 58.7 | 0.068 | 0.55 | 0.134 | 0.02 | 0.25 | 0.05 | 5.6 | 0.025 | 2.6 | 0.006 | 0.016 | 0.67 | 4.68 |
| A24 | 169 | 8/25/2004 12:05 | 53.7 | 0.0576 | 0.703 | 0.22 | 0.0127 | 0.17 | 0.015 | 5.55 | 0.053 | 2.48 | 0.0071 | 0.0275 | 0.502 | 7.15 |
| A24 | 169 | 9/24/2004 12:10 | 59.8 | 0.07 | 0.97 | 0.193 | 0.0166 | 0.05 | 0.015 | 6.1 | 0.0149 | 2.13 | 0.0059 | 0.0242 | 0.397 | 7.04 |
| A24 | 169 | 8/29/2005 13:15 | 59 | 0.041 | 0.71 | 0.172 | 0.013 | 0.05 | 0.015 | 5.6 | 0.0264 | 1.73 | 0.0055 | 0.0211 | 0.433 | 9 |
| A26 | 170 | 8/28/2003 8:00 | 56.5 | 0.08 | 0.54 | 0.235 | 0.039 | 0.25 | 0.05 | 6.71 | 0.036 | 1.9 | 0.0015 | 0.015 | 0.61 | 3.6 |
| A26 | 170 | 9/24/2004 11:20 | 33.2 | 0.061 | 0.77 | 0.148 | 0.027 | 0.05 | 0.015 | 7.85 | 0.0046 | 1.41 | 0.0039 | 0.0149 | 0.45 | 4.99 |
| A26 | 170 | 8/29/2005 12:15 | 54.9 | 0.061 | 0.468 | 0.175 | 0.02 | 0.05 | 0.015 | 8.52 | 0.0333 | 1.59 | 0.0054 | 0.0167 | 0.504 | 4.12 |
| A29 | 167 | 8/28/2003 7:45 | 17.6 | 0.08 | 0.08 | 0.029 | 0.005 | 0.25 | 0.05 | 5.21 | 0.007 | 0.1 | 0.0015 | 0.0015 | 0.15 | 1.68 |
| A29 | 167 | 9/24/2004 10:25 | 3.14 | 0.044 | 0.126 | 0.0017 | 0.013 | 0.05 | 0.015 | 5.28 | 0.0023 | 0.07 | 0.0017 | 0.0022 | 0.047 | 1.93 |
| A29 | 167 | 8/29/2005 10:00 | 16.6 | 0.0325 | 0.124 | 0.047 | 0.01 | 0.05 | 0.015 | 6.54 | 0.0116 | 0.28 | 0.0024 | 0.0038 | 0.066 | 4.05 |
| A86 | 166 | 8/28/2003 8:35 | 2.82 | 0.1 | 0.22 | 0.029 | 0.025 | 0.25 | 0.05 | 9.38 | 0.013 | 0.1 | 0.0015 | 0.004 | 0.26 | 1.8 |
| A86 | 166 | 8/26/2004 12:45 | 0.737 | 0.085 | 0.115 | 0.018 | 0.0219 | 0.05 | 0.015 | 10.5 | 0.024 | 0.08 | 0.0022 | 0.004 | 0.134 | 3 |
| A86 | 166 | 9/23/2004 12:30 | 0.616 | 1.43 | 0.24 | 0.0273 | 0.032 | 0.05 | 0.015 | 10.6 | 0.0027 | 0.2 | 0.0027 | 0.0054 | 0.087 | 3.43 |
| A86 | 166 | 8/28/2005 11:50 | 8.04 | 0.071 | 0.101 | 0.08 | 0.019 | 0.05 | 0.015 | 11.7 | 0.0112 | 0.29 | 0.0029 | 0.0026 | 0.089 | 3.85 |
| 25 | 287 | 8/28/2003 7:15 | 80 | 0.14 | 0.57 | 0.377 | 0.026 | 0.25 | 0.05 | 7.47 | 0.041 | 3.6 | 0.01 | 0.032 | 1.01 | 4.41 |
| 25 | 287 | 8/26/2004 12:00 | 57.7 | 0.087 | 0.356 | 0.18 | 0.0292 | 0.11 | 0.015 | 6.62 | 0.0274 | 1.51 | 0.0062 | 0.0178 | 0.595 | 7.03 |
| 25 | 287 | 9/24/2004 12:00 | 53.1 | 0.138 | 2.03 | 0.276 | 0.037 | 0.05 | 0.015 | 7.24 | 0.0082 | 1.61 | 0.0033 | 0.0197 | 0.591 | 5.94 |
| 25 | 287 | 8/29/2005 12:45 | 65 | 0.0969 | 0.56 | 0.301 | 0.032 | 0.05 | 0.015 | 8.56 | 0.0455 | 3 | 0.0055 | 0.0296 | 0.84 | 6.22 |
| 27 | 289 | 8/28/2003 7:10 | 0.61 | 0.09 | 0.09 | 0.03 | 0.005 | 0.25 | 0.05 | 8.1 | 0.012 | 0.1 | 0.02 | 0.009 | 0.19 | 1.52 |
| 27 | 289 | 9/24/2004 10:30 | 1.54 | 0.061 | 0.055 | 0.0062 | 0.025 | 0.05 | 0.015 | 9.17 | 0.0046 | 0.06 | 0.0026 | 0.0067 | 0.086 | 1.18 |
| 27 | 289 | 8/29/2005 11:00 | 1.55 | 0.055 | 0.109 | 0.0362 | 0.024 | 0.05 | 0.015 | 9.9 | 0.039 | 0.22 | 0.0033 | 0.0118 | 0.078 | 2.56 |
| 28 | 290 | 8/28/2003 8:30 | 31.6 | 0.1 | 0.86 | 0.158 | 0.029 | 0.25 | 0.05 | 13.7 | 0.037 | 2.3 | 0.0015 | 0.049 | 0.74 | 5.2 |
| 28 | 290 | 9/24/2004 11:10 | 11.2 | 0.109 | 0.15 | 0.0323 | 0.0176 | 0.05 | 0.015 | 5.34 | 0.0034 | 0.31 | 0.0016 | 0.0034 | 0.162 | 3.81 |
| 28 | 290 | 8/29/2005 11:45 | 37.3 | 0.092 | 0.089 | 0.08 | 0.013 | 0.05 | 0.015 | 5.61 | 0.0172 | 0.69 | 0.0025 | 0.0038 | 0.237 | 5.24 |
| 82 | 342 | 8/28/2003 7:00 | 1.29 | 0.05 | 0.03 | 0.049 | 0.016 | 0.9 | 0.05 | 12.9 | 0.011 | 0.4 | 0.043 | 0.0015 | 0.37 | 4.24 |
| 82 | 342 | 9/23/2004 11:35 | 0.466 | 0.328 | 0.4 | 0.0497 | 0.0185 | 0.05 | 0.015 | 11 | 0.0063 | 0.06 | 0.0022 | 0.0016 | 0.105 | 2.39 |
| 82 | 342 | 8/28/2005 12:30 | 2.59 | 0.055 | 0.06 | 0.076 | 0.018 | 0.11 | 0.015 | 11.1 | 0.006 | 0.361 | 0.0015 | 0.0034 | 0.141 | 2.77 |
| 94 | 354 | 8/28/2003 7:25 | 0.66 | 0.15 | 0.03 | 0.016 | 0.03 | 0.25 | 0.05 | 18.6 | 0.006 | 0.1 | 0.018 | 0.0015 | 0.06 | 2.2 |
| 94 | 354 | 9/23/2004 14:00 | 0.875 | 0.427 | 0.16 | 0.0057 | 0.0177 | 0.05 | 0.015 | 20.7 | 0.002 | 0.02 | 0.0014 | 0.0012 | 0.03 | 1.26 |
| 94 | 354 | 8/28/2005 10:30 | 1.8 | 0.005 | 0.0025 | 0.0377 | 0.013 | 0.13 | 0.015 | 19 | 0.0049 | 0.16 | 0.0023 | 0.0016 | 0.084 | 1.57 |
| A42 | 165 | 8/28/2003 8:25 | 2.77 | 0.1 | 0.4 | 0.068 | 0.021 | 0.25 | 0.05 | 28.2 | 0.003 | 0.1 | 0.0015 | 0.006 | 0.04 | 3.2 |
| A42 | 165 | 9/23/2004 8:30 | 2.34 | 0.044 | 0.19 | 0.113 | 0.013 | 0.05 | 0.015 | 41.4 | 0.005 | 0.02 | 0.0009 | 0.0015 | 0.082 | 3.14 |
| A42 | 165 | 8/28/2005 14:45 | 1.52 | 0.028 | 0.113 | 0.079 | 0.018 | 0.05 | 0.031 | 43 | 0.0071 | 0.24 | 0.0002 | 0.0045 | 0.361 | 5.4 |
| A47 | 171 | 8/28/2003 8:05 | 8.4 | 0.13 | 0.07 | 0.053 | 0.019 | 0.25 | 0.05 | 18.8 | 0.004 | 0.4 | 0.0015 | 0.01 | 0.15 | 1.6 |
| A47 | 171 | 9/23/2004 9:30 | 2.28 | 0.24 | 0.07 | 0.06 | 0.022 | 0.05 | 0.015 | 19.3 | 0.0016 | 0.45 | 0.0007 | 0.0044 | 0.078 | 2.14 |
| A47 | 171 | 8/28/2005 14:00 | 4.1 | 0.115 | 0.044 | 0.068 | 0.023 | 0.05 | 0.015 | 24 | 0.0049 | 0.45 | 0.0002 | 0.0115 | 0.12 | 5.88 |
| A59 | 172 | 8/28/2003 8:20 | 107 | 0.044 | 0.19 | 0.19 | 0.026 | 0.25 | 0.05 | 12.9 | 0.022 | 1.5 | 0.0015 | 0.02 | 0.39 | 4.25 |
| A59 | 172 | 9/1/2003 8:05 | 3.68 | 0.01 | 0.03 | 0.036 | 0.012 | 0.25 | 0.05 | 62.9 | 0.0015 | 0.8 | 0.0015 | 0.0015 | 0.44 | 2.4 |
| A59 | 172 | 9/23/2004 10:30 | 135 | 0.101 | 0.45 | 0.255 | 0.0175 | 0.05 | 0.015 | 15 | 0.0054 | 1.23 | 0.0029 | 0.012 | 0.326 | 6 |

Shaded values are less than detection limits.

Table H.2-1 (Cont'd., 3 of 6)

| RAMP Name | Nox-Sox GIS No. | Date/Time | Ag-D | Al-D | As-D | Ba-D | B-D | Be-D | Bi-D | Ca-D | Cd-D | Cl-D | Co-D | Cr-D | Cu-D | Fe-D | Li-D |
|-----------|-----------------|-----------------|--------|------|-------|------|------|--------|--------|------|--------|------|--------|-------|-------|------|------|
| A59 | 172 | 8/28/2005 13:13 | 0.0003 | 61.5 | 0.243 | 5.19 | 7.38 | 0.003 | 0.0024 | 2.63 | 0.0109 | 0.05 | 0.127 | 0.16 | 0.151 | 602 | 1.3 |
| P94 | 223 | 8/25/2004 13:15 | 0.0003 | 6.54 | 0.268 | 11.3 | 36.2 | 0.003 | 0.0019 | 13.3 | 0.0033 | 0.17 | 0.029 | 0.116 | 0.112 | 5 | 5.11 |
| P96 | 225 | 8/25/2004 12:35 | 0.0003 | 12.5 | 0.356 | 13.4 | 11 | 0.0015 | 0.0005 | 11.2 | 0.0074 | 0.34 | 0.0294 | 0.1 | 0.167 | 24 | 2.98 |
| P97 | 226 | 8/25/2004 13:00 | 0.0006 | 41.4 | 0.3 | 9.86 | 10.8 | 0.0015 | 0.009 | 5.51 | 0.0125 | 0.51 | 0.057 | 0.26 | 0.094 | 122 | 2.69 |
| P98 | 227 | 8/26/2004 12:15 | 0.0003 | 4.66 | 0.286 | 8.59 | 9.1 | 0.004 | 0.0005 | 11.7 | 0.0307 | 0.27 | 0.0208 | 0.076 | 0.091 | 16 | 2.2 |
| 1 | 267 | 8/28/2003 8:15 | 0.006 | 3.2 | 0.23 | 8.1 | 11.3 | 0.02 | 0.0025 | 11.9 | 0.022 | 0.3 | 0.02 | 0.12 | 0.23 | 9 | 2.9 |
| 1 | 267 | 8/25/2004 12:50 | 0.0003 | 2.25 | 0.255 | 20 | 11.7 | 0.0015 | 0.0027 | 12.6 | 0.018 | 0.05 | 0.0108 | 0.11 | 0.077 | 8 | 2.09 |
| 1 | 267 | 8/28/2005 16:15 | 0.0003 | 2.99 | 0.229 | 14.3 | 10.3 | 0.0015 | 0.0005 | 9.6 | 0.001 | 0.05 | 0.0183 | 0.044 | 0.07 | 9.3 | 2.21 |
| L4 | 452 | 8/29/2003 11:30 | 0.0025 | 43.2 | 0.32 | 5.2 | 2.8 | 0.02 | 0.006 | 3.01 | 0.005 | 0.1 | 0.12 | 0.23 | 0.89 | 321 | 0.6 |
| L4 | 452 | 8/24/2004 12:10 | 0.0003 | 41.9 | 0.279 | 5.32 | 2.7 | 0.003 | 0.0079 | 3.19 | 0.0072 | 0.05 | 0.0393 | 0.097 | 0.076 | 180 | 0.16 |
| L7 | 470 | 8/29/2003 14:15 | 0.0025 | 201 | 0.33 | 10.8 | 3.5 | 0.02 | 0.0025 | 4.25 | 0.011 | 0.47 | 0.2 | 0.5 | 0.44 | 735 | 1.1 |
| L7 | 470 | 8/24/2004 16:00 | 0.0011 | 135 | 0.312 | 8.9 | 3.7 | 0.011 | 0.0019 | 4.04 | 0.0077 | 0.05 | 0.046 | 0.32 | 0.142 | 497 | 0.35 |
| L8 | 471 | 8/29/2003 11:00 | 0.0025 | 14.3 | 0.41 | 11.3 | 12.6 | 0.13 | 0.015 | 5.79 | 0.005 | 0.1 | 0.05 | 0.14 | 0.86 | 206 | 2.1 |
| L8 | 471 | 8/24/2004 12:25 | 0.0003 | 20.3 | 0.33 | 12.3 | 13.5 | 0.0015 | 0.0005 | 6.19 | 0.001 | 0.19 | 0.0249 | 0.07 | 0.072 | 98 | 1.7 |
| L39 | 400 | 8/29/2003 11:15 | 0.0025 | 21.3 | 0.08 | 3.1 | 5.8 | 0.02 | 0.008 | 2.4 | 0.03 | 0.1 | 0.036 | 0.29 | 0.97 | 39 | 1.5 |
| L39 | 400 | 8/30/2004 14:45 | 0.0003 | 32.3 | 0.112 | 3.77 | 6.41 | 0.01 | 0.0005 | 3.04 | 0.001 | 0.61 | 0.0184 | 0.3 | 0.117 | 85.9 | 1.63 |
| E15 | 268 | 8/29/2003 13:30 | 0.0025 | 6.3 | 0.37 | 6.97 | 8.6 | 0.09 | 0.006 | 6.2 | 0.012 | 0.9 | 0.02 | 0.21 | 0.47 | 76 | 1.5 |
| E15 | 268 | 8/24/2004 13:20 | 0.0007 | 7.31 | 0.321 | 7.59 | 8.24 | 0.004 | 0.0005 | 5.83 | 0.0026 | 0.14 | 0.0097 | 0.08 | 0.025 | 49 | 1.3 |
| E15 | 268 | 8/28/2005 17:00 | 0.0003 | 8.9 | 0.346 | 5.69 | 7.5 | 0.0015 | 0.001 | 5.03 | 0.001 | 0.05 | 0.022 | 0.08 | 0.1 | 40 | 1.4 |
| P23 | 182 | 9/1/2003 8:00 | 0.0025 | 3.7 | 0.26 | 31.8 | 10.3 | 0.02 | 0.0025 | 12.3 | 0.005 | 0.2 | 0.058 | 0.12 | 0.46 | 179 | 2 |
| P23 | 182 | 8/25/2004 13:05 | 0.0003 | 18 | 0.379 | 15.4 | 5 | 0.0015 | 0.0055 | 15.8 | 0.0033 | 0.14 | 0.082 | 0.123 | 0.191 | 163 | 1.2 |
| P27 | 185 | 9/1/2003 8:10 | 0.0025 | 66.2 | 0.3 | 4.64 | 2.9 | 0.02 | 0.0025 | 3.04 | 0.02 | 0.1 | 0.16 | 0.19 | 0.4 | 272 | 0.39 |
| P27 | 185 | 8/25/2004 13:10 | 0.0003 | 50.5 | 0.262 | 3.42 | 2.52 | 0.006 | 0.0025 | 2.53 | 0.0207 | 0.12 | 0.126 | 0.184 | 0.125 | 251 | 0.08 |
| P7 | 209 | 9/1/2003 8:20 | 0.0025 | 39.3 | 0.56 | 6.1 | 2.9 | 0.02 | 0.0025 | 4.2 | 0.005 | 0.1 | 0.099 | 0.12 | 0.42 | 476 | 0.8 |
| P7 | 209 | 8/25/2004 12:40 | 0.0003 | 24.7 | 0.423 | 3.93 | 2.88 | 0.0035 | 0.018 | 3.36 | 0.007 | 0.05 | 0.046 | 0.063 | 0.054 | 210 | 0.6 |
| 4 | 270 | 8/29/2003 13:15 | 0.0025 | 1 | 0.58 | 22.9 | 14.4 | 0.02 | 0.009 | 20.2 | 0.012 | 0.8 | 0.01 | 0.15 | 0.37 | 8 | 3.5 |
| 4 | 270 | 8/24/2004 8:50 | 0.0003 | 1.15 | 0.474 | 19.9 | 14.7 | 0.0015 | 0.0015 | 19 | 0.0043 | 0.3 | 0.009 | 0.02 | 0.097 | 3 | 2.82 |
| 4 | 270 | 8/28/2005 0:00 | 0.0003 | 0.75 | 0.464 | 17.9 | 15.4 | 0.0015 | 0.0012 | 18.7 | 0.001 | 0.05 | 0.019 | 0.05 | 0.129 | 1 | 3.4 |
| 6 | 271 | 8/28/2003 8:10 | 0.0025 | 6.9 | 0.93 | 13.4 | 24 | 0.02 | 0.0025 | 15 | 0.013 | 0.3 | 0.03 | 0.3 | 0.24 | 21 | 4.9 |
| 6 | 271 | 8/26/2004 12:55 | 0.0003 | 6.38 | 0.82 | 10.6 | 23.3 | 0.0015 | 0.0016 | 16 | 0.011 | 0.16 | 0.024 | 0.092 | 0.101 | 20 | 4.6 |
| 6 | 271 | 9/23/2004 15:10 | 0.0003 | 2.97 | 0.79 | 10.3 | 23.3 | 0.0015 | 0.0065 | 16.1 | 0.001 | 0.52 | 0.024 | 0.17 | 0.077 | 9 | 4.79 |
| 6 | 271 | 8/29/2005 15:00 | 0.0003 | 1.06 | 0.679 | 11.2 | 21.5 | 0.0015 | 0.0005 | 15.9 | 0.001 | 0.05 | 0.025 | 0.04 | 0.09 | 9 | 4.02 |
| KEARL | 418 | 8/24/2004 15:04 | 0.0003 | 0.94 | 0.309 | 11.1 | 45.8 | 0.0015 | 0.0005 | 17.8 | 0.001 | 0.33 | 0.019 | 0.02 | 0.118 | 3 | 5.5 |
| L18 | 436 | 8/28/2003 8:55 | 0.0025 | 1.6 | 0.28 | 16.9 | 21.2 | 0.02 | 0.0025 | 6.29 | 0.005 | 0.3 | 0.01 | 0.04 | 0.32 | 1.5 | 6.7 |
| L18 | 436 | 8/29/2004 8:45 | 0.0003 | 0.25 | 0.296 | 17.6 | 19.5 | 0.0015 | 0.0005 | 6.84 | 0.001 | 0.75 | 0.0098 | 0.095 | 0.453 | 1 | 6.4 |
| L18 | 436 | 8/27/2005 10:58 | 0.0006 | 0.57 | 0.296 | 17 | 19.6 | 0.0015 | 0.0013 | 6.1 | 0.001 | 0.22 | 0.0124 | 0.06 | 0.55 | 1 | 5.5 |
| L23 | 442 | 8/28/2003 7:55 | 0.0025 | 9.4 | 0.37 | 9.3 | 4.7 | 0.07 | 0.0025 | 2.63 | 0.005 | 0.3 | 0.049 | 0.11 | 0.43 | 242 | 2.3 |
| L23 | 442 | 8/29/2004 10:25 | 0.0003 | 3.43 | 0.321 | 9.04 | 5 | 0.0015 | 0.0005 | 2.88 | 0.001 | 0.77 | 0.0235 | 0.145 | 0.154 | 113 | 1.7 |
| L23 | 442 | 8/27/2005 17:45 | 0.0006 | 9.2 | 0.36 | 9.5 | 4 | 0.0015 | 0.0012 | 2.44 | 0.001 | 0.05 | 0.0252 | 0.16 | 0.169 | 176 | 1.4 |
| L25 | 444 | 8/28/2003 8:40 | 0.006 | 3.5 | 0.31 | 16.6 | 10.4 | 0.05 | 0.0025 | 2.96 | 0.005 | 0.6 | 0.02 | 0.08 | 0.33 | 14 | 2.5 |
| L25 | 444 | 8/29/2004 9:40 | 0.0003 | 5.32 | 0.349 | 15.8 | 9.7 | 0.005 | 0.0005 | 3.57 | 0.001 | 0.7 | 0.0374 | 0.106 | 0.314 | 34.2 | 2.59 |
| L25 | 444 | 8/27/2005 12:30 | 0.0003 | 2.48 | 0.328 | 14 | 10.5 | 0.0015 | 0.0016 | 3.37 | 0.001 | 0.14 | 0.03 | 0.07 | 0.283 | 12.4 | 2.23 |

Shaded values are less than detection limits.

Table H.2-1 (Cont'd., 4 of 6)

| RAMP Name | Nox-Sox GIS No. | Date/Time | Mn-D | Mo-D | Ni-D | Pb-D | Sb-D | Se-D | Sn-D | Sr-D | Th-D | Ti-D | Ti-D | U-D | V-D | Zn-D |
|-----------|-----------------|-----------------|-------|--------|--------|--------|--------|------|--------|------|--------|-------|--------|--------|--------|------|
| A59 | 172 | 8/28/2005 13:13 | 137 | 0.0079 | 0.153 | 0.181 | 0.011 | 0.05 | 0.015 | 14 | 0.0074 | 0.799 | 0.0024 | 0.0089 | 0.299 | 10.5 |
| P94 | 223 | 8/25/2004 13:15 | 1.92 | 0.0129 | 0.0025 | 0.0114 | 0.0133 | 0.05 | 0.045 | 64.3 | 0.0039 | 0.71 | 0.0014 | 0.0032 | 0.414 | 3.95 |
| P96 | 225 | 8/25/2004 12:35 | 9.7 | 0.099 | 0.13 | 0.015 | 0.0155 | 0.16 | 0.015 | 32.6 | 0.0012 | 0.35 | 0.0016 | 0.0092 | 0.26 | 4.09 |
| P97 | 226 | 8/25/2004 13:00 | 7.8 | 0.072 | 0.3 | 0.0172 | 0.0136 | 0.05 | 0.015 | 27.3 | 0.026 | 0.36 | 0.004 | 0.0018 | 0.396 | 2.61 |
| P98 | 227 | 8/26/2004 12:15 | 1.35 | 0.043 | 0.061 | 0.0201 | 0.012 | 0.19 | 0.0348 | 29.6 | 0.003 | 0.32 | 0.0008 | 0.0012 | 0.304 | 2.91 |
| 1 | 267 | 8/28/2003 8:15 | 0.24 | 0.01 | 0.03 | 0.005 | 0.019 | 0.25 | 0.05 | 41.1 | 0.0015 | 0.1 | 0.0015 | 0.0015 | 0.02 | 0.57 |
| 1 | 267 | 8/25/2004 12:50 | 0.95 | 0.005 | 0.0025 | 0.0094 | 0.0101 | 0.05 | 0.038 | 43.2 | 0.014 | 0.04 | 0.0013 | 0.0007 | 0.0571 | 3.52 |
| 1 | 267 | 8/28/2005 16:15 | 0.357 | 0.001 | 0.0025 | 0.0227 | 0.009 | 0.05 | 0.015 | 35.3 | 0.0014 | 0.15 | 0.0005 | 0.0015 | 0.038 | 1.34 |
| L4 | 452 | 8/29/2003 11:30 | 42.1 | 0.02 | 0.22 | 0.108 | 0.012 | 0.25 | 0.05 | 5.86 | 0.0015 | 0.5 | 0.0015 | 0.003 | 0.69 | 4.9 |
| L4 | 452 | 8/24/2004 12:10 | 5.48 | 0.048 | 0.173 | 0.0583 | 0.0093 | 0.05 | 0.015 | 5.86 | 0.026 | 0.5 | 0.001 | 0.002 | 0.756 | 4.21 |
| L7 | 470 | 8/29/2003 14:15 | 34.2 | 0.05 | 0.65 | 0.109 | 0.004 | 0.25 | 0.05 | 14.3 | 0.017 | 1.5 | 0.0015 | 0.007 | 0.54 | 4.5 |
| L7 | 470 | 8/24/2004 16:00 | 6.8 | 0.035 | 0.48 | 0.0503 | 0.0116 | 0.05 | 0.061 | 13 | 0.0121 | 0.87 | 0.0031 | 0.0069 | 0.56 | 4.92 |
| L8 | 471 | 8/29/2003 11:00 | 1.77 | 0.1 | 0.03 | 0.067 | 0.012 | 0.25 | 0.05 | 26.3 | 0.018 | 0.4 | 0.0037 | 0.007 | 0.18 | 1.6 |
| L8 | 471 | 8/24/2004 12:25 | 1.57 | 0.1 | 0.078 | 0.013 | 0.0099 | 0.19 | 0.015 | 26.3 | 0.0024 | 0.33 | 0.0012 | 0.0044 | 0.175 | 3.45 |
| L39 | 400 | 8/29/2003 11:15 | 0.28 | 0.06 | 0.08 | 0.045 | 0.002 | 0.25 | 0.05 | 13.8 | 0.008 | 0.6 | 0.008 | 0.017 | 0.19 | 2.1 |
| L39 | 400 | 8/30/2004 14:45 | 0.34 | 0.057 | 0.041 | 0.0204 | 0.0076 | 0.05 | 0.015 | 16 | 0.0067 | 0.59 | 0.0012 | 0.0194 | 0.219 | 1.23 |
| E15 | 268 | 8/29/2003 13:30 | 0.8 | 0.028 | 0.03 | 0.018 | 0.017 | 0.25 | 0.05 | 15.3 | 0.0015 | 0.2 | 0.0015 | 0.0015 | 0.19 | 1.51 |
| E15 | 268 | 8/24/2004 13:20 | 0.685 | 0.0062 | 0.0025 | 0.0155 | 0.0089 | 0.05 | 0.015 | 15.9 | 0.0034 | 0.06 | 0.0012 | 0.0013 | 0.191 | 4.76 |
| E15 | 268 | 8/28/2005 17:00 | 0.714 | 0.018 | 0.074 | 0.0355 | 0.01 | 0.05 | 0.015 | 16 | 0.0013 | 0.28 | 0.0002 | 0.001 | 0.109 | 3.01 |
| P23 | 182 | 9/1/2003 8:00 | 3.07 | 0.08 | 0.03 | 0.023 | 0.015 | 0.25 | 0.05 | 25.2 | 0.0015 | 0.1 | 0.0015 | 0.003 | 0.17 | 1.14 |
| P23 | 182 | 8/25/2004 13:05 | 15.2 | 0.093 | 0.009 | 0.0065 | 0.0103 | 0.05 | 0.058 | 27.6 | 0.02 | 0.48 | 0.0016 | 0.0151 | 0.317 | 1.62 |
| P27 | 185 | 9/1/2003 8:10 | 36.7 | 0.03 | 0.29 | 0.096 | 0.027 | 0.25 | 0.05 | 6.1 | 0.005 | 0.9 | 0.0015 | 0.0015 | 0.74 | 4.46 |
| P27 | 185 | 8/25/2004 13:10 | 29.6 | 0.0304 | 0.296 | 0.0472 | 0.0096 | 0.05 | 0.049 | 4.97 | 0.0116 | 0.47 | 0.0022 | 0.0013 | 0.52 | 6.14 |
| P7 | 209 | 9/1/2003 8:20 | 25.5 | 0.01 | 0.15 | 0.079 | 0.015 | 0.25 | 0.05 | 8.61 | 0.0015 | 0.1 | 0.0015 | 0.0015 | 0.2 | 4.9 |
| P7 | 209 | 8/25/2004 12:40 | 6.52 | 0.024 | 0.111 | 0.0192 | 0.0068 | 0.05 | 0.03 | 6.74 | 0.08 | 0.1 | 0.0011 | 0.001 | 0.151 | 3.55 |
| 4 | 270 | 8/29/2003 13:15 | 0.39 | 0.06 | 0.03 | 0.017 | 0.006 | 0.25 | 0.05 | 56.2 | 0.012 | 0.7 | 0.011 | 0.0015 | 0.18 | 1.13 |
| 4 | 270 | 8/24/2004 8:50 | 1.35 | 0.0345 | 0.0025 | 0.0111 | 0.0128 | 0.11 | 0.015 | 50.3 | 0.0033 | 0.54 | 0.001 | 0.0028 | 0.11 | 1.67 |
| 4 | 270 | 8/28/2005 0:00 | 0.265 | 0.044 | 0.0025 | 0.0194 | 0.014 | 0.05 | 0.015 | 54.3 | 0.002 | 0.44 | 0.0002 | 0.0042 | 0.056 | 0.67 |
| 6 | 271 | 8/28/2003 8:10 | 0.98 | 0.21 | 0.03 | 0.013 | 0.04 | 0.25 | 0.05 | 51.1 | 0.007 | 0.2 | 0.0015 | 0.027 | 0.22 | 2 |
| 6 | 271 | 8/26/2004 12:55 | 1.76 | 0.0188 | 0.0025 | 0.0076 | 0.0115 | 0.05 | 0.054 | 49.1 | 0.0112 | 0.02 | 0.0005 | 0.0096 | 0.078 | 4.1 |
| 6 | 271 | 9/23/2004 15:10 | 0.254 | 0.143 | 0.0025 | 0.0005 | 0.0132 | 0.05 | 0.015 | 50.9 | 0.013 | 0.07 | 0.0021 | 0.0076 | 0.046 | 1.1 |
| 6 | 271 | 8/29/2005 15:00 | 0.43 | 0.009 | 0.0025 | 0.0256 | 0.0085 | 0.05 | 0.015 | 47.5 | 0.0013 | 0.24 | 0.0002 | 0.0023 | 0.022 | 1.33 |
| KEARL | 418 | 8/24/2004 15:04 | 0.335 | 0.097 | 0.02 | 0.0059 | 0.0189 | 0.13 | 0.015 | 54.3 | 0.0014 | 0.47 | 0.0009 | 0.0045 | 0.201 | 1.92 |
| L18 | 436 | 8/28/2003 8:55 | 0.16 | 0.26 | 0.7 | 0.005 | 0.06 | 0.25 | 0.05 | 35.4 | 0.004 | 0.1 | 0.0015 | 0.007 | 0.07 | 2.6 |
| L18 | 436 | 8/29/2004 8:45 | 0.142 | 0.249 | 0.56 | 0.0069 | 0.075 | 0.05 | 0.015 | 35.2 | 0.0004 | 0.04 | 0.0002 | 0.0048 | 0.02 | 3.48 |
| L18 | 436 | 8/27/2005 10:58 | 0.211 | 0.231 | 0.57 | 0.0136 | 0.061 | 0.13 | 0.015 | 41.6 | 0.0027 | 0.22 | 0.0015 | 0.0039 | 0.046 | 2.58 |
| L23 | 442 | 8/28/2003 7:55 | 1.88 | 0.12 | 0.52 | 0.032 | 0.01 | 0.25 | 0.05 | 12.6 | 0.007 | 0.1 | 0.0015 | 0.006 | 0.09 | 1.38 |
| L23 | 442 | 8/29/2004 10:25 | 0.809 | 0.074 | 0.449 | 0.0203 | 0.024 | 0.13 | 0.015 | 12.9 | 0.0089 | 0.3 | 0.0002 | 0.0046 | 0.052 | 1.38 |
| L23 | 442 | 8/27/2005 17:45 | 1.38 | 0.067 | 0.47 | 0.0321 | 0.021 | 0.05 | 0.015 | 14.6 | 0.0084 | 0.36 | 0.0016 | 0.0054 | 0.099 | 3.16 |
| L25 | 444 | 8/28/2003 8:40 | 0.3 | 0.094 | 0.38 | 0.011 | 0.04 | 0.25 | 0.05 | 14.8 | 0.007 | 0.1 | 0.0015 | 0.008 | 0.14 | 1.19 |
| L25 | 444 | 8/29/2004 9:40 | 1.34 | 0.101 | 0.421 | 0.0165 | 0.047 | 0.05 | 0.015 | 16.2 | 0.0038 | 0.05 | 0.0011 | 0.0074 | 0.0498 | 3.69 |
| L25 | 444 | 8/27/2005 12:30 | 0.41 | 0.113 | 0.28 | 0.037 | 0.049 | 0.05 | 0.015 | 19.5 | 0.0046 | 0.17 | 0.002 | 0.0073 | 0.04 | 2.46 |

Shaded values are less than detection limits.

Table H.2-1 (Cont'd., 5 of 6)

| RAMP Name | Nox-Sox GIS No. | Date/Time | Ag-D | Al-D | As-D | Ba-D | B-D | Be-D | Bi-D | Ca-D | Cd-D | Cl-D | Co-D | Cr-D | Cu-D | Fe-D | Li-D |
|-----------|-----------------|-----------------|--------|------|-------|------|------|--------|--------|-------|--------|------|--------|-------|-------|------|------|
| L28 | 447 | 8/28/2003 7:05 | 0.0025 | 366 | 1.18 | 13.7 | 7.6 | 0.02 | 0.007 | 1.92 | 0.06 | 0.67 | 0.38 | 0.76 | 1.14 | 1935 | 2 |
| L28 | 447 | 9/1/2004 11:15 | 0.0041 | 244 | 1.22 | 11.3 | 8.9 | 0.014 | 0.0117 | 2.06 | 0.0257 | 0.54 | 0.246 | 0.5 | 0.543 | 1510 | 1.86 |
| L28 | 447 | 8/27/2005 13:30 | 0.0032 | 232 | 1.05 | 12.5 | 7.1 | 0.025 | 0.0056 | 1.88 | 0.029 | 0.28 | 0.372 | 0.58 | 0.47 | 1530 | 2 |
| L29 | 448 | 8/28/2003 7:30 | 0.0025 | 140 | 0.29 | 5.4 | 1.8 | 0.02 | 0.0025 | 0.35 | 0.03 | 0.1 | 0.11 | 0.25 | 0.56 | 356 | 0.05 |
| L29 | 448 | 8/25/2004 12:10 | 0.0009 | 128 | 0.245 | 5.77 | 2.22 | 0.004 | 0.0025 | 0.395 | 0.035 | 0.36 | 0.152 | 0.161 | 0.179 | 350 | 0.01 |
| L46 | 454 | 8/28/2003 7:40 | 0.0025 | 516 | 1.8 | 28.8 | 25.7 | 0.02 | 0.011 | 4.81 | 0.03 | 0.1 | 0.48 | 1.08 | 2.13 | 2909 | 8.3 |
| L46 | 454 | 9/1/2004 12:30 | 0.0061 | 369 | 1.29 | 28.8 | 26 | 0.043 | 0.0175 | 4.57 | 0.0113 | 0.23 | 0.581 | 0.79 | 1.91 | 2160 | 8.28 |
| L46 | 454 | 8/27/2005 17:00 | 0.0076 | 327 | 0.98 | 24.5 | 18.5 | 0.048 | 0.0086 | 5.05 | 0.0165 | 0.05 | 0.53 | 0.83 | 1.54 | 1700 | 6.2 |
| L47 | 455 | 8/28/2003 8:50 | 0.011 | 681 | 0.86 | 21.9 | 18 | 0.3 | 0.013 | 4.6 | 0.02 | 0.3 | 0.41 | 1 | 1.6 | 1370 | 5.7 |
| L47 | 455 | 9/1/2004 10:30 | 0.0061 | 397 | 0.915 | 25.5 | 19.9 | 0.053 | 0.0064 | 6.06 | 0.0164 | 0.47 | 0.679 | 0.63 | 1.61 | 1320 | 5.97 |
| L47 | 455 | 8/27/2005 14:20 | 0.0059 | 338 | 0.59 | 23.4 | 20.6 | 0.04 | 0.014 | 4.81 | 0.019 | 0.05 | 0.202 | 0.64 | 1.19 | 664 | 4.6 |
| L49 | 457 | 8/28/2003 8:45 | 0.012 | 259 | 0.92 | 22.4 | 22 | 0.1 | 0.012 | 4.59 | 0.03 | 0.4 | 0.37 | 0.65 | 1.89 | 1586 | 6.8 |
| L49 | 457 | 9/1/2004 13:00 | 0.0097 | 568 | 1.14 | 28 | 24.9 | 0.07 | 0.0127 | 5.47 | 0.0391 | 0.49 | 0.542 | 1.04 | 1.91 | 2370 | 7.92 |
| L49 | 457 | 8/27/2005 16:00 | 0.0078 | 288 | 0.758 | 24.3 | 17.8 | 0.055 | 0.0091 | 4.62 | 0.038 | 0.46 | 0.519 | 0.85 | 1.33 | 1270 | 5.9 |
| L60 | 464 | 8/28/2003 7:35 | 0.0025 | 22.2 | 0.66 | 13.2 | 16.8 | 0.02 | 0.0025 | 6.21 | 0.012 | 0.1 | 0.11 | 0.21 | 0.56 | 681 | 5.8 |
| L60 | 464 | 9/1/2004 13:30 | 0.0003 | 16.2 | 0.793 | 14.7 | 18 | 0.012 | 0.0062 | 6.36 | 0.001 | 0.6 | 0.212 | 0.196 | 0.369 | 915 | 6.8 |
| L60 | 464 | 8/27/2005 15:00 | 0.0021 | 35.8 | 0.645 | 16.6 | 16.2 | 0.011 | 0.0022 | 5.16 | 0.0024 | 0.05 | 0.177 | 0.2 | 0.478 | 722 | 5 |
| P13 | 175 | 9/1/2003 8:25 | 0.0025 | 16.1 | 0.89 | 17.2 | 61 | 0.14 | 0.0025 | 12.2 | 0.005 | 0.1 | 0.08 | 0.4 | 1.09 | 145 | 12.3 |
| P13 | 175 | 8/25/2004 12:00 | 0.0003 | 14.8 | 0.905 | 16.9 | 62.3 | 0.0035 | 0.0016 | 11.1 | 0.005 | 0.05 | 0.075 | 0.098 | 0.317 | 78 | 15.2 |
| P49 | 199 | 9/1/2003 8:15 | 0.0025 | 30.3 | 0.28 | 8.4 | 3 | 0.02 | 0.0025 | 2.38 | 0.005 | 0.1 | 0.04 | 0.04 | 1.19 | 60 | 0.9 |
| P49 | 199 | 8/25/2004 12:20 | 0.0003 | 20.4 | 0.372 | 10.4 | 3.29 | 0.005 | 0.0005 | 3.1 | 0.0147 | 0.31 | 0.0235 | 0.1 | 0.185 | 101 | 0.7 |
| A301 | 473 | 8/29/2003 11:45 | 0.0025 | 4.27 | 0.2 | 6 | 5.4 | 0.02 | 0.0025 | 5.59 | 0.005 | 0.8 | 0.01 | 0.24 | 0.74 | 39 | 1.1 |
| A301 | 473 | 8/30/2004 11:55 | 0.0003 | 1.32 | 0.157 | 6.54 | 5.93 | 0.0015 | 0.0005 | 6.12 | 0.001 | 1.42 | 0.009 | 0.02 | 0.025 | 17 | 0.81 |
| L107 | 118 | 8/29/2003 12:00 | 0.0025 | 3.92 | 0.17 | 3.98 | 5.8 | 0.06 | 0.0025 | 6.8 | 0.03 | 2.1 | 0.02 | 0.14 | 0.94 | 1.5 | 1.9 |
| L107 | 118 | 8/30/2004 10:10 | 0.0003 | 1.92 | 0.174 | 3.88 | 6.59 | 0.0015 | 0.0005 | 7.75 | 0.001 | 2.8 | 0.0015 | 0.139 | 0.133 | 1 | 2.6 |
| L109 | 84 | 8/29/2003 10:00 | 0.0025 | 36 | 0.25 | 7.6 | 5.7 | 0.02 | 0.0025 | 5.65 | 0.005 | 1.5 | 0.049 | 0.34 | 1.22 | 482 | 1.3 |
| L109 | 84 | 8/30/2004 13:15 | 0.0003 | 38.1 | 0.213 | 7.72 | 6.1 | 0.01 | 0.0013 | 5.72 | 0.001 | 1.99 | 0.0332 | 0.327 | 0.234 | 554 | 1 |
| O-10 | 88 | 8/29/2003 12:15 | 0.0025 | 48.7 | 0.14 | 8.4 | 4.9 | 0.29 | 0.0025 | 4.22 | 0.005 | 0.8 | 0.024 | 0.37 | 0.97 | 112 | 0.6 |
| O-10 | 88 | 8/30/2004 12:44 | 0.0003 | 50.4 | 0.175 | 8.1 | 4.89 | 0.007 | 0.014 | 4.35 | 0.001 | 1.15 | 0.027 | 0.31 | 0.396 | 85.9 | 0.84 |
| R1 | 90 | 8/29/2003 13:00 | 0.0025 | 5.9 | 0.25 | 4.6 | 4.7 | 0.02 | 0.015 | 4.25 | 0.013 | 2.1 | 0.01 | 0.21 | 0.48 | 157 | 0.8 |
| R1 | 90 | 8/30/2004 11:10 | 0.0003 | 7.8 | 0.182 | 5.03 | 4.99 | 0.0015 | 0.0017 | 4.62 | 0.0029 | 1.35 | 0.0168 | 0.19 | 0.174 | 317 | 1 |
| E52 | 146 | 8/29/2003 10:15 | 0.0025 | 52.3 | 0.58 | 17 | 7.1 | 0.02 | 0.0025 | 7.7 | 0.03 | 0.5 | 0.075 | 0.3 | 1.11 | 622 | 2.7 |
| E52 | 146 | 8/29/2004 12:10 | 0.0003 | 52 | 0.593 | 18.3 | 7.3 | 0.016 | 0.0005 | 8.5 | 0.008 | 0.52 | 0.084 | 0.297 | 0.792 | 646 | 2.39 |
| E59 | 152 | 8/29/2003 10:30 | 0.007 | 6.7 | 0.34 | 14 | 3.8 | 0.02 | 0.0025 | 3.98 | 0.005 | 0.4 | 0.07 | 0.1 | 1.15 | 80 | 1.1 |
| E59 | 152 | 8/29/2004 12:40 | 0.0003 | 3.48 | 0.345 | 14.6 | 4 | 0.005 | 0.0005 | 4.41 | 0.0032 | 0.57 | 0.0314 | 0.132 | 0.49 | 34.1 | 1.33 |
| E68 | 89 | 8/29/2003 13:45 | 0.0025 | 78.3 | 0.64 | 16.1 | 6.5 | 0.02 | 0.013 | 4.97 | 0.021 | 0.6 | 0.1 | 0.36 | 1.18 | 728 | 1.6 |
| E68 | 89 | 8/29/2004 14:10 | 0.0003 | 64.5 | 0.478 | 17.8 | 7.2 | 0.011 | 0.0005 | 5.07 | 0.0094 | 0.63 | 0.118 | 0.26 | 0.893 | 342 | 2.16 |
| O-1/E55 | 91 | 8/29/2003 14:00 | 0.0025 | 95.8 | 0.41 | 8.68 | 4 | 0.02 | 0.0025 | 3.02 | 0.005 | 0.6 | 0.08 | 0.25 | 0.63 | 355 | 0.5 |
| O-1/E55 | 91 | 8/29/2004 15:35 | 0.0003 | 76.7 | 0.322 | 8.46 | 3.93 | 0.0067 | 0.0005 | 3.71 | 0.009 | 0.63 | 0.035 | 0.19 | 0.28 | 165 | 0.61 |
| O-2 E67 | 97 | 8/29/2003 10:45 | 0.0025 | 55 | 0.6 | 11.8 | 4 | 0.02 | 0.028 | 4.58 | 0.005 | 0.1 | 0.06 | 0.2 | 0.94 | 887 | 1.1 |
| O-2 E67 | 97 | 8/29/2004 14:35 | 0.0003 | 52.6 | 0.53 | 12.3 | 3.65 | 0.008 | 0.0018 | 5.59 | 0.008 | 1.66 | 0.0658 | 0.264 | 0.47 | 823 | 0.94 |

Shaded values are less than detection limits.

Table H.2-1 (Cont'd., 6 of 6)

| RAMP Name | Nox-Sox GIS No. | Date/Time | Mn-D | Mo-D | Ni-D | Pb-D | Sb-D | Se-D | Sn-D | Sr-D | Th-D | Ti-D | Tl-D | U-D | V-D | Zn-D |
|-----------|-----------------|-----------------|-------|--------|--------|--------|--------|------|--------|------|--------|-------|--------|--------|-------|------|
| L28 | 447 | 8/28/2003 7:05 | 51.4 | 0.22 | 1.56 | 0.33 | 0.02 | 0.25 | 0.05 | 12.9 | 0.085 | 6.7 | 0.02 | 0.054 | 1.38 | 6.7 |
| L28 | 447 | 9/1/2004 11:15 | 27.1 | 0.225 | 1.57 | 0.307 | 0.03 | 0.13 | 0.015 | 12.9 | 0.048 | 3.4 | 0.0045 | 0.0456 | 0.86 | 5.69 |
| L28 | 447 | 8/27/2005 13:30 | 43.8 | 0.139 | 1.44 | 0.237 | 0.0279 | 0.15 | 0.015 | 14.8 | 0.0641 | 3.09 | 0.0051 | 0.0362 | 0.856 | 6.2 |
| L29 | 448 | 8/28/2003 7:30 | 19.6 | 0.04 | 0.23 | 0.101 | 0.019 | 0.25 | 0.05 | 2.4 | 0.014 | 0.8 | 0.0015 | 0.008 | 0.45 | 4.18 |
| L29 | 448 | 8/25/2004 12:10 | 22.1 | 0.0111 | 0.334 | 0.0866 | 0.0146 | 0.16 | 0.015 | 2.54 | 0.0094 | 1.06 | 0.0038 | 0.0094 | 0.348 | 6.5 |
| L46 | 454 | 8/28/2003 7:40 | 27.7 | 0.38 | 3.4 | 0.703 | 0.1 | 0.25 | 0.05 | 29.6 | 0.167 | 13.8 | 0.0015 | 0.159 | 2.85 | 6.9 |
| L46 | 454 | 9/1/2004 12:30 | 57.8 | 0.224 | 2.17 | 0.727 | 0.122 | 0.18 | 0.0311 | 25.8 | 0.129 | 8.8 | 0.0064 | 0.095 | 1.98 | 6.25 |
| L46 | 454 | 8/27/2005 17:00 | 43 | 0.257 | 2.47 | 0.39 | 0.072 | 0.19 | 0.041 | 33.9 | 0.154 | 7.2 | 0.007 | 0.102 | 1.57 | 8.68 |
| L47 | 455 | 8/28/2003 8:50 | 9.5 | 0.28 | 2.8 | 0.798 | 0.08 | 0.25 | 0.05 | 24 | 0.119 | 10 | 0.0015 | 0.106 | 3 | 9.6 |
| L47 | 455 | 9/1/2004 10:30 | 42.8 | 0.166 | 2.82 | 0.707 | 0.009 | 0.17 | 0.031 | 27.4 | 0.091 | 5.7 | 0.0061 | 0.0783 | 2.12 | 9.08 |
| L47 | 455 | 8/27/2005 14:20 | 10.4 | 0.158 | 2.66 | 0.418 | 0.093 | 0.13 | 0.015 | 27.6 | 0.086 | 6.2 | 0.0068 | 0.084 | 1.63 | 9.2 |
| L49 | 457 | 8/28/2003 8:45 | 23.4 | 0.44 | 3.2 | 0.34 | 0.09 | 0.53 | 0.05 | 27.9 | 0.09 | 5.3 | 0.0015 | 0.153 | 1.73 | 6.6 |
| L49 | 457 | 9/1/2004 13:00 | 46.6 | 0.451 | 3.23 | 0.613 | 0.118 | 0.25 | 0.038 | 27.2 | 0.133 | 10.4 | 0.0084 | 0.148 | 3.03 | 8.8 |
| L49 | 457 | 8/27/2005 16:00 | 59.7 | 0.256 | 3.31 | 0.307 | 0.092 | 0.24 | 0.035 | 29.2 | 0.135 | 4.5 | 0.0084 | 0.147 | 1.39 | 6.2 |
| L60 | 464 | 8/28/2003 7:35 | 4.51 | 0.33 | 1.34 | 0.082 | 0.03 | 0.25 | 0.05 | 32.5 | 0.014 | 0.31 | 0.0015 | 0.038 | 0.27 | 2.28 |
| L60 | 464 | 9/1/2004 13:30 | 26 | 0.368 | 1.08 | 0.0572 | 0.038 | 0.15 | 0.015 | 30.4 | 0.026 | 0.59 | 0.001 | 0.0241 | 0.275 | 1.95 |
| L60 | 464 | 8/27/2005 15:00 | 27.6 | 0.243 | 1.32 | 0.09 | 0.041 | 0.13 | 0.015 | 31.8 | 0.0274 | 0.92 | 0.0019 | 0.042 | 0.265 | 2.26 |
| P13 | 175 | 9/1/2003 8:25 | 2.65 | 0.13 | 0.32 | 0.464 | 0.02 | 0.25 | 0.05 | 70 | 0.011 | 0.9 | 0.0015 | 0.01 | 0.35 | 3.3 |
| P13 | 175 | 8/25/2004 12:00 | 6.67 | 0.108 | 0.119 | 0.0495 | 0.032 | 0.05 | 0.065 | 65.7 | 0.008 | 0.36 | 0.0008 | 0.009 | 0.374 | 3.05 |
| P49 | 199 | 9/1/2003 8:15 | 1.44 | 0.09 | 0.2 | 0.013 | 0.017 | 0.25 | 0.05 | 7 | 0.003 | 0.1 | 0.0015 | 0.008 | 0.18 | 1.67 |
| P49 | 199 | 8/25/2004 12:20 | 1.19 | 0.087 | 0.202 | 0.0067 | 0.0176 | 0.11 | 0.015 | 8.68 | 0.0054 | 0.105 | 0.0026 | 0.0071 | 0.117 | 2.5 |
| A301 | 473 | 8/29/2003 11:45 | 0.41 | 0.06 | 0.08 | 0.023 | 0.02 | 0.25 | 0.05 | 27.8 | 0.005 | 0.3 | 0.0037 | 0.0378 | 0.04 | 0.48 |
| A301 | 473 | 8/30/2004 11:55 | 0.323 | 0.054 | 0.047 | 0.0104 | 0.007 | 0.05 | 0.015 | 27 | 0.0061 | 0.29 | 0.0009 | 0.0301 | 0.025 | 1.64 |
| L107 | 118 | 8/29/2003 12:00 | 0.14 | 0.47 | 0.03 | 0.039 | 0.017 | 0.25 | 0.05 | 38.2 | 0.0015 | 0.2 | 0.014 | 0.23 | 0.05 | 1.92 |
| L107 | 118 | 8/30/2004 10:10 | 0.094 | 0.469 | 0.0025 | 0.0106 | 0.016 | 0.05 | 0.044 | 37.6 | 0.0056 | 0.06 | 0.0011 | 0.124 | 0.011 | 1.45 |
| L109 | 84 | 8/29/2003 10:00 | 6.03 | 0.09 | 0.37 | 0.068 | 0.009 | 0.25 | 0.05 | 29.4 | 0.007 | 0.6 | 0.0015 | 0.099 | 0.18 | 1.9 |
| L109 | 84 | 8/30/2004 13:15 | 6.72 | 0.074 | 0.283 | 0.0275 | 0.01 | 0.13 | 0.015 | 28.2 | 0.0139 | 0.92 | 0.0013 | 0.107 | 0.161 | 0.62 |
| O-10 | 88 | 8/29/2003 12:15 | 0.83 | 0.044 | 0.17 | 0.044 | 0.02 | 0.25 | 0.05 | 19.5 | 0.007 | 0.4 | 0.007 | 0.034 | 0.14 | 1.9 |
| O-10 | 88 | 8/30/2004 12:44 | 0.922 | 0.034 | 0.177 | 0.0149 | 0.013 | 0.16 | 0.035 | 18.7 | 0.06 | 0.24 | 0.0026 | 0.0335 | 0.078 | 1.95 |
| R1 | 90 | 8/29/2003 13:00 | 1.58 | 0.01 | 0.09 | 0.058 | 0.002 | 0.25 | 0.05 | 23.4 | 0.011 | 0.7 | 0.033 | 0.024 | 0.26 | 1.2 |
| R1 | 90 | 8/30/2004 11:10 | 3.32 | 0.017 | 0.105 | 0.043 | 0.01 | 0.05 | 0.046 | 23.5 | 0.0089 | 0.56 | 0.0008 | 0.0224 | 0.048 | 2.44 |
| E52 | 146 | 8/29/2003 10:15 | 6.86 | 0.18 | 1.17 | 0.124 | 0.018 | 0.25 | 0.05 | 18.5 | 0.025 | 0.5 | 0.0015 | 0.092 | 0.28 | 2.8 |
| E52 | 146 | 8/29/2004 12:10 | 21.6 | 0.147 | 1.02 | 0.153 | 0.044 | 0.16 | 0.015 | 18.3 | 0.0134 | 0.79 | 0.0007 | 0.087 | 0.265 | 3.5 |
| E59 | 152 | 8/29/2003 10:30 | 1.04 | 0.09 | 0.59 | 0.034 | 0.03 | 0.25 | 0.05 | 9.1 | 0.008 | 0.1 | 0.0015 | 0.021 | 0.11 | 1.9 |
| E59 | 152 | 8/29/2004 12:40 | 0.531 | 0.095 | 0.38 | 0.0151 | 0.045 | 0.14 | 0.015 | 9.28 | 0.0063 | 0.21 | 0.0012 | 0.014 | 0.056 | 2.45 |
| E68 | 89 | 8/29/2003 13:45 | 3.44 | 0.18 | 0.77 | 0.189 | 0.029 | 0.25 | 0.05 | 12 | 0.026 | 1.4 | 0.0015 | 0.063 | 0.64 | 3.5 |
| E68 | 89 | 8/29/2004 14:10 | 2.99 | 0.194 | 0.977 | 0.101 | 0.061 | 0.05 | 0.035 | 11 | 0.0057 | 0.75 | 0.0012 | 0.0476 | 0.352 | 3.99 |
| O-1/E55 | 91 | 8/29/2003 14:00 | 10.3 | 0.05 | 0.22 | 0.123 | 0.022 | 0.25 | 0.05 | 7.27 | 0.016 | 1.7 | 0.0015 | 0.016 | 0.42 | 2.71 |
| O-1/E55 | 91 | 8/29/2004 15:35 | 2.73 | 0.039 | 0.174 | 0.132 | 0.019 | 0.15 | 0.015 | 8.05 | 0.0058 | 0.75 | 0.0004 | 0.0114 | 0.147 | 2.2 |
| O-2 E67 | 97 | 8/29/2003 10:45 | 13 | 0.08 | 0.6 | 0.122 | 0.014 | 0.25 | 0.05 | 9.5 | 0.046 | 0.9 | 0.0015 | 0.049 | 0.24 | 2.06 |
| O-2 E67 | 97 | 8/29/2004 14:35 | 11.7 | 0.0785 | 0.564 | 0.124 | 0.021 | 0.05 | 0.046 | 10.3 | 0.0157 | 0.74 | 0.0002 | 0.0428 | 0.237 | 3.6 |

Shaded values are less than detection limits.

Table H.2-2 Total metals in RAMP lakes, 2003-2005.

| RAMP Name | No _x -So _x GIS No. | Date/Time | Ag-T | Al-T | As-T | Ba-T | Be-T | Bi-T | B-T | Ca-T | Cd-T | Cl-T | Co-T | Cr-T | Cu-T | Fe-T | Hg-T | K-T | Li-T | Mg-T | Mn-T | Mo-T | Na-T |
|-----------|--|-----------------|--------|------|-------|------|--------|--------|--------|------|--------|-------|--------|-------|-------|------|------|-----|------|------|------|--------|------|
| A21 | 168 | 9/10/2001 18:45 | 0.018 | 563 | 0.8 | 12 | 0.053 | 0.008 | 7.4 | 1.51 | 0.06 | 1.94 | 0.52 | 0.79 | 1.5 | 1261 | | | 1.9 | | 69.2 | 0.17 | |
| A21 | 168 | 8/28/2003 7:20 | 0.0025 | 649 | 0.69 | 13.8 | 0.02 | 0.01 | 6.4 | 1.11 | 0.05 | 0.3 | 0.48 | 1.11 | 1.4 | 1053 | | | 1.4 | | 53 | 0.21 | |
| A21 | 168 | 9/23/2004 13:05 | 0.0048 | 340 | 0.484 | 9.8 | 0.023 | 0.0072 | 5.46 | 1.26 | 0.241 | 0.38 | 0.342 | 0.55 | 0.88 | 894 | | | 1.06 | | 42.3 | 0.103 | |
| A21 | 168 | 8/29/2005 13:40 | 0.0018 | 232 | 0.497 | 10.4 | 5.9 | 0.03 | 0.0066 | 1.46 | 0.026 | 0.05 | 0.478 | 0.46 | 0.396 | 1100 | | | 0.7 | | 66 | 0.078 | |
| A24 | 169 | 10/2/2001 17:00 | 0.0025 | 268 | 0.48 | 9.4 | 0.02 | 0.008 | 4.1 | 1.06 | 0.09 | 1.5 | 0.45 | 0.8 | 0.81 | 745 | | | 1.3 | | 73.5 | 0.07 | |
| A24 | 169 | 8/28/2003 7:50 | 0.015 | 861 | 0.46 | 16.3 | 0.02 | 0.015 | 5.4 | 1.17 | 0.08 | 0.3 | 0.4 | 1.19 | 2.9 | 1141 | | | 1.8 | | 68.8 | 0.14 | |
| A24 | 169 | 8/25/2004 12:05 | 0.0057 | 213 | 0.327 | 9.63 | 0.022 | 0.0072 | 4.45 | 1.01 | 0.028 | 0.93 | 0.402 | 0.4 | 0.578 | 633 | | | 0.74 | | 55.9 | 0.07 | |
| A24 | 169 | 9/24/2004 12:10 | 0.0069 | 453 | 0.36 | 13.1 | 0.035 | 0.008 | 5.1 | 1.1 | 0.06 | 0.56 | 0.424 | 0.74 | 1.12 | 874 | | | 1.05 | | 64.9 | 0.101 | |
| A24 | 169 | 8/29/2005 13:15 | 0.0012 | 188 | 0.29 | 9.1 | 4.38 | 0.023 | 0.0061 | 0.96 | 0.0333 | 0.05 | 0.467 | 0.32 | 0.266 | 799 | | | 0.43 | | 65.7 | 0.048 | |
| A26 | 170 | 10/2/2001 16:00 | 0.0025 | 467 | 0.44 | 16.3 | 0.06 | 0.008 | 7 | 1.28 | 0.18 | 2.6 | 0.37 | 0.8 | 1.04 | 788 | | | 0.7 | | 79.2 | 0.15 | |
| A26 | 170 | 8/28/2003 8:00 | 0.009 | 8694 | 0.47 | 16.9 | 0.15 | 0.016 | 7.7 | 1.38 | 0.03 | 0.3 | 0.47 | 1.4 | 2 | 1238 | | | 2 | | 76.2 | 0.17 | |
| A26 | 170 | 9/24/2004 11:20 | 0.0029 | 153 | 0.267 | 8.8 | 0.019 | 0.0041 | 4.9 | 1.35 | 0.0679 | 0.886 | 0.211 | 0.29 | 0.548 | 402 | | | 0.66 | | 34.5 | 0.071 | |
| A26 | 170 | 8/29/2005 12:15 | 0.0013 | 155 | 0.293 | 10.5 | 4.8 | 0.021 | 0.0057 | 1.31 | 0.0183 | 0.05 | 0.397 | 0.268 | 0.319 | 578 | | | 0.5 | | 63.6 | 0.071 | |
| A29 | 168 | 9/10/2001 18:00 | 0.04 | 147 | | 9.5 | 0.38 | 0.006 | 7.4 | 2.41 | 0.07 | 9.2 | 0.23 | 0.61 | 0.9 | 263 | | | 3.4 | | 29.6 | 0.05 | |
| A29 | 168 | 8/28/2003 7:45 | 0.0025 | 163 | 0.41 | 10 | 0.02 | 0.0025 | 6.6 | 1.47 | 0.01 | 0.3 | 0.12 | 0.32 | 1.07 | 357 | | | 0.3 | | 33.1 | 0.12 | |
| A29 | 168 | 9/24/2004 10:25 | 0.0011 | 68.5 | 0.295 | 6.69 | 0.011 | 0.0016 | 5.79 | 1.32 | 0.025 | 0.73 | 0.094 | 0.178 | 0.301 | 209 | | | 0.62 | | 22.9 | 0.063 | |
| A29 | 168 | 8/29/2005 10:00 | 0.0017 | 77 | 0.315 | 7.68 | 6 | 0.01 | 0.004 | 1.51 | 0.0065 | 0.05 | 0.126 | 0.16 | 0.15 | 269 | | | 0.7 | | 38 | 0.053 | |
| A86 | 166 | 9/10/2001 16:45 | 0.011 | 52 | 0.5 | 10.6 | 0.02 | 0.0025 | 11.8 | 2.13 | 0.057 | 5.1 | 0.06 | 0.4 | 0.51 | 115 | | | 0.6 | | 21.1 | 0.1 | |
| A86 | 166 | 8/28/2003 8:35 | 0.007 | 46.3 | 0.48 | 11.3 | 0.02 | 0.007 | 12.2 | 2.57 | 0.01 | 1.2 | 0.07 | 0.35 | 0.68 | 165 | | | 1.2 | | 18.8 | 0.12 | |
| A86 | 166 | 8/26/2004 12:45 | 0.0034 | 40 | 0.44 | 10.6 | 0.008 | 0.0045 | 12 | 2.59 | 0.0159 | 0.61 | 0.051 | 0.117 | 0.232 | 136 | | | 0.3 | | 11 | 0.097 | |
| A86 | 166 | 9/23/2004 12:30 | 0.0066 | 50.9 | 0.42 | 9.9 | 0.009 | 0.0029 | 13.4 | 2.57 | 0.001 | 0.98 | 0.058 | 0.24 | 0.23 | 102 | | | 0.98 | | 6.72 | 1.44 | |
| A86 | 166 | 8/28/2005 11:50 | 0.0013 | 47.2 | 0.545 | 11.8 | 12.3 | 0.013 | 0.0028 | 2.77 | 0.0051 | 0.17 | 0.163 | 0.15 | 0.204 | 402 | | | 0.8 | | 49.5 | 0.101 | |
| 25 | 287 | 8/28/2003 7:15 | 0.0025 | 574 | 0.45 | 20.4 | 0.02 | 0.012 | 6.9 | 1.38 | 0.01 | 0.3 | 0.51 | 1.05 | 2.36 | 990 | | | 0.5 | | 96 | 0.2 | |
| 25 | 287 | 8/26/2004 12:00 | 0.0054 | 182 | 0.291 | 11.1 | 0.019 | 0.0101 | 4.44 | 1.06 | 0.063 | 0.9 | 0.333 | 0.3 | 0.533 | 727 | | | 0.6 | | 59.5 | 0.119 | |
| 25 | 287 | 9/24/2004 12:00 | 0.0054 | 248 | 0.287 | 13.2 | 0.029 | 0.008 | 4.41 | 1.13 | 0.08 | 0.83 | 0.355 | 1.88 | 1.76 | 754 | | | 0.44 | | 57.8 | 0.139 | |
| 25 | 287 | 8/29/2005 12:45 | 0.0026 | 213 | 0.273 | 14.6 | 5.39 | 0.03 | 0.0096 | 1.17 | 0.0254 | 0.05 | 0.425 | 0.33 | 0.583 | 630 | | | 0.2 | | 69.9 | 0.106 | |
| 27 | 289 | 8/28/2003 7:10 | 0.0025 | 181 | 0.44 | 12.1 | 0.02 | 0.007 | 7 | 1.95 | 0.01 | 0.3 | 0.1 | 0.37 | 0.81 | 360 | | | 0.6 | | 22.1 | 0.11 | |
| 27 | 289 | 9/24/2004 10:30 | 0.0036 | 51.3 | 0.267 | 10.2 | 0.007 | 0.0025 | 5.66 | 2.04 | 0.093 | 0.8 | 0.048 | 0.27 | 0.25 | 127 | | | 0.61 | | 7.9 | 0.064 | |
| 27 | 289 | 8/29/2005 11:00 | 0.0021 | 90 | 0.305 | 11.8 | 6.4 | 0.008 | 0.0108 | 2 | 0.0051 | 0.05 | 0.075 | 0.19 | 0.302 | 212 | | | 0.76 | | 22.2 | 0.064 | |
| 28 | 290 | 8/28/2003 8:30 | 0.012 | 520 | 0.65 | 13.9 | 0.13 | 0.006 | 9.4 | 3 | 0.01 | 0.3 | 0.55 | 0.94 | 2.7 | 1397 | | | 2.6 | | 60 | 0.13 | |
| 28 | 290 | 9/24/2004 11:10 | 0.0032 | 72.6 | 0.298 | 4.86 | 0.008 | 0.0025 | 5.1 | 1.64 | 0.0638 | 0.64 | 0.064 | 0.22 | 0.177 | 164 | | | 0.95 | | 14.2 | 0.125 | |
| 28 | 290 | 8/29/2005 11:45 | 0.0013 | 83 | 0.3 | 5.3 | 7 | 0.012 | 0.0056 | 1.61 | 0.0082 | 0.05 | 0.113 | 0.181 | 0.144 | 253 | | | 0.99 | | 42.3 | 0.115 | |
| 82 | 342 | 8/28/2003 7:00 | 0.009 | 51 | 0.5 | 11.1 | 0.02 | 0.012 | 11 | 3.44 | 0.03 | 2.8 | 0.07 | 0.5 | 0.25 | 80 | | | 2.1 | | 33.5 | 0.1 | |
| 82 | 342 | 9/23/2004 11:35 | 0.003 | 43.5 | 0.399 | 8.85 | 0.0015 | 0.0071 | 11.9 | 2.53 | 0.008 | 0.86 | 0.082 | 0.23 | 0.875 | 38.1 | | | 2.76 | | 8.68 | 0.339 | |
| 82 | 342 | 8/28/2005 12:30 | 0.0025 | 54.5 | 0.374 | 8.99 | 12.7 | 0.004 | 0.002 | 2.39 | 0.0038 | 0.2 | 0.0357 | 0.19 | 0.22 | 57 | | | 2.28 | | 16.2 | 0.075 | |
| 94 | 354 | 8/28/2003 7:25 | 0.0025 | 66.4 | 0.53 | 11 | 0.02 | 0.0025 | 13.4 | 5.69 | 0.01 | 0.3 | 0.044 | 0.69 | 0.82 | 225 | | | 1 | | 70.3 | 0.15 | |
| 94 | 354 | 9/23/2004 14:00 | 0.0014 | 32.3 | 0.46 | 8.19 | 0.0015 | 0.0054 | 10.1 | 5.56 | 0.001 | 0.84 | 0.037 | 0.21 | 0.17 | 75.9 | | | 1.25 | | 22.5 | 0.433 | |
| 94 | 354 | 8/28/2005 10:30 | 0.0009 | 28.6 | 0.432 | 7.93 | 9.6 | 0.0052 | 0.0014 | 4.77 | 0.0063 | 0.17 | 0.025 | 0.124 | 0.103 | 72 | | | 1.2 | | 24.1 | 0.0064 | |
| A42 | 165 | 9/10/2001 10:00 | 0.028 | 327 | 1 | 29.3 | 0.09 | 0.013 | 15.2 | 7.6 | 0.093 | 2.4 | 0.36 | 0.8 | 1.69 | 1313 | | | 2.6 | | 165 | 0.11 | |
| A42 | 165 | 9/10/2001 11:00 | 0.031 | 271 | 0.98 | 29.3 | 0.02 | 0.011 | 16 | 6.84 | 0.04 | 4.8 | 0.37 | 0.63 | 1.77 | 1332 | | | 3.6 | | 175 | 0.08 | |
| A42 | 165 | 9/10/2001 13:00 | 0.018 | 264 | 0.89 | 28.2 | 0.02 | 0.007 | 15.6 | 6.7 | 0.13 | 2.04 | 0.338 | 0.49 | 1.78 | 1289 | | | 1.8 | | 179 | 0.14 | |
| A42 | 165 | 8/28/2003 8:25 | 0.006 | 131 | 0.79 | 31.1 | 0.02 | 0.0025 | 20.3 | 7.8 | 0.01 | 0.7 | 0.22 | 0.76 | 1.33 | 1047 | | | 2.6 | | 231 | 0.08 | |
| A42 | 165 | 9/23/2004 8:30 | 0.0026 | 63.4 | 0.67 | 26.8 | 0.0033 | 0.0516 | 16.4 | 9.28 | 0.001 | 0.85 | 0.118 | 0.234 | 0.25 | 528 | | | 2.42 | | 111 | 0.09 | |
| A42 | 165 | 8/28/2005 14:45 | 0.0043 | 137 | 0.637 | 29.3 | 15.1 | 0.006 | 0.0037 | 8.4 | 0.013 | 0.05 | 0.24 | 0.286 | 0.45 | 1200 | | | 2 | | 168 | 0.061 | |
| A47 | 171 | 8/28/2003 8:05 | 0.0025 | 34.6 | 0.58 | 11.5 | 0.02 | 0.0025 | 16.5 | 4.6 | 0.01 | 0.3 | 0.053 | 0.42 | 0.82 | 226 | | | 2.3 | | 12.8 | 0.16 | |

Shaded values are less than detection limits.

Table H.2-2 (Cont'd., 2 of 8)

| RAMP Name | No _x -So _x GIS No. | Date/Time | Ni-T | P-T | Pb-T | S-T | Sb-T | Se-T | Si-T | Sn-T | Sr-T | Th-T | Ti-T | Tl-T | U-T | V-T | Zn-T |
|-----------|--|-----------------|-------|-----|--------|-----|--------|------|------|--------|------|--------|------|--------|--------|-------|------|
| A21 | 168 | 9/10/2001 18:45 | 1.09 | | 0.7 | | 0.048 | 0.25 | | 0.05 | 10.4 | 0.12 | 9.9 | 0.0015 | 0.063 | 1.76 | 9.5 |
| A21 | 168 | 8/28/2003 7:20 | 1.1 | | 0.632 | | 0.03 | 0.25 | | 0.05 | 9.9 | 0.094 | 11 | 0.0015 | 0.103 | 1.65 | 6.2 |
| A21 | 168 | 9/23/2004 13:05 | 1.15 | | 0.385 | | 0.0274 | 0.05 | | 0.015 | 8.34 | 0.0184 | 5.7 | 0.0067 | 0.0476 | 1.11 | 4.39 |
| A21 | 168 | 8/29/2005 13:40 | 0.95 | | 0.245 | | 0.02 | 0.12 | | 0.033 | 9.62 | 0.044 | 3.2 | 0.0055 | 0.04 | 0.801 | 9.25 |
| A24 | 169 | 10/2/2001 17:00 | 0.78 | | 0.441 | | 0.019 | 0.25 | | 2.67 | 5.94 | 0.035 | 4.6 | 0.0015 | 0.025 | 0.89 | 7 |
| A24 | 169 | 8/28/2003 7:50 | 1.03 | | 0.672 | | 0.019 | 0.25 | | 0.29 | 7 | 0.049 | 13.4 | 0.0015 | 0.2 | 2.3 | 7.3 |
| A24 | 169 | 8/25/2004 12:05 | 0.803 | | 0.287 | | 0.0169 | 0.19 | | 0.015 | 5.67 | 0.022 | 3.16 | 0.0078 | 0.0336 | 0.625 | 14.6 |
| A24 | 169 | 9/24/2004 12:10 | 1.3 | | 0.461 | | 0.0194 | 0.05 | | 0.015 | 6.7 | 0.0146 | 7.5 | 0.0118 | 0.055 | 1.16 | 7.06 |
| A24 | 169 | 8/29/2005 13:15 | 0.802 | | 0.186 | | 0.013 | 0.05 | | 0.015 | 5.96 | 0.026 | 2.05 | 0.0055 | 0.0232 | 0.504 | 9.02 |
| A26 | 170 | 10/2/2001 16:00 | 0.68 | | 0.6 | | 0.037 | 0.25 | | 3.02 | 8.28 | 0.035 | 7.6 | 0.011 | 0.052 | 1.89 | 6.1 |
| A26 | 170 | 8/28/2003 8:00 | 1.31 | | 0.777 | | 0.037 | 0.7 | | 0.05 | 9.3 | 0.039 | 19 | 0.0015 | 0.05 | 2.5 | 5.2 |
| A26 | 170 | 9/24/2004 11:20 | 0.79 | | 0.203 | | 0.0318 | 0.05 | | 0.015 | 8.04 | 0.0046 | 1.74 | 0.0044 | 0.0179 | 0.605 | 4.97 |
| A26 | 170 | 8/29/2005 12:15 | 0.56 | | 0.199 | | 0.02 | 0.05 | | 0.015 | 9 | 0.0338 | 1.89 | 0.0062 | 0.0206 | 0.641 | 4.71 |
| A29 | 168 | 9/10/2001 18:00 | 0.37 | | 0.311 | | 0.03 | 0.2 | | 0.05 | 6.6 | 0.012 | 2.1 | 0.0015 | 0.007 | 0.31 | 4.2 |
| A29 | 168 | 8/28/2003 7:45 | 0.29 | | 0.247 | | 0.002 | 0.25 | | 0.05 | 6.28 | 0.008 | 2.3 | 0.0015 | 0.009 | 0.53 | 1.71 |
| A29 | 168 | 9/24/2004 10:25 | 0.13 | | 0.076 | | 0.0142 | 0.05 | | 0.015 | 5.43 | 0.0023 | 0.76 | 0.0018 | 0.0044 | 0.249 | 2.03 |
| A29 | 168 | 8/29/2005 10:00 | 1.06 | | 0.083 | | 0.0111 | 0.05 | | 0.015 | 6.93 | 0.0125 | 0.78 | 0.0039 | 0.005 | 0.211 | 4.11 |
| A86 | 166 | 9/10/2001 16:45 | 0.25 | | 0.21 | | 0.04 | 0.25 | | 0.05 | 9.33 | 0.006 | 0.5 | 0.0015 | 0.004 | 0.25 | 2.42 |
| A86 | 166 | 8/28/2003 8:35 | 0.81 | | 0.113 | | 0.021 | 0.25 | | 0.05 | 10.5 | 0.005 | 0.4 | 0.0015 | 0.008 | 0.28 | 2.21 |
| A86 | 166 | 8/26/2004 12:45 | 0.179 | | 0.044 | | 0.027 | 0.05 | | 0.015 | 10.6 | 0.025 | 0.32 | 0.0023 | 0.0053 | 0.191 | 3.83 |
| A86 | 166 | 9/23/2004 12:30 | 0.24 | | 0.081 | | 0.0465 | 0.13 | | 0.015 | 10.8 | 0.0027 | 0.55 | 0.0027 | 0.0057 | 0.158 | 3.5 |
| A86 | 166 | 8/28/2005 11:50 | 0.227 | | 0.081 | | 0.0202 | 0.05 | | 0.015 | 12.5 | 0.0119 | 1 | 0.0037 | 0.0055 | 0.221 | 6.44 |
| 25 | 287 | 8/28/2003 7:15 | 1.9 | | 1.01 | | 0.03 | 0.25 | | 0.05 | 10.4 | 0.048 | 11 | 0.0015 | 0.056 | 2.03 | 6.6 |
| 25 | 287 | 8/26/2004 12:00 | 0.529 | | 0.329 | | 0.038 | 0.17 | | 0.015 | 6.77 | 0.0264 | 3.2 | 0.0067 | 0.027 | 1.11 | 9.1 |
| 25 | 287 | 9/24/2004 12:00 | 2 | | 0.441 | | 0.04 | 0.05 | | 0.015 | 7.54 | 0.0082 | 4.9 | 0.0068 | 0.0323 | 1.23 | 5.92 |
| 25 | 287 | 8/29/2005 12:45 | 0.63 | | 0.348 | | 0.033 | 0.05 | | 0.015 | 8.71 | 0.046 | 3.34 | 0.0058 | 0.0337 | 0.997 | 6.26 |
| 27 | 289 | 8/28/2003 7:10 | 0.36 | | 0.311 | | 0.008 | 0.25 | | 0.05 | 9.2 | 0.01 | 2.3 | 0.0033 | 0.021 | 0.69 | 2.4 |
| 27 | 289 | 9/24/2004 10:30 | 0.095 | | 0.0449 | | 0.029 | 0.05 | | 0.015 | 9.47 | 0.0047 | 0.59 | 0.0031 | 0.0101 | 0.235 | 1.18 |
| 27 | 289 | 8/29/2005 11:00 | 1.16 | | 0.13 | | 0.0262 | 0.05 | | 0.015 | 10.4 | 0.039 | 1.3 | 0.0044 | 0.0162 | 0.352 | 2.68 |
| 28 | 290 | 8/28/2003 8:30 | 1.27 | | 0.425 | | 0.03 | 0.25 | | 0.05 | 17.1 | 0.027 | 8.7 | 0.0015 | 0.071 | 1.49 | 7.3 |
| 28 | 290 | 9/24/2004 11:10 | 0.15 | | 0.068 | | 0.0189 | 0.05 | | 0.015 | 5.42 | 0.0034 | 0.7 | 0.0026 | 0.0048 | 0.234 | 3.8 |
| 28 | 290 | 8/29/2005 11:45 | 0.41 | | 0.0807 | | 0.014 | 0.05 | | 0.015 | 5.73 | 0.018 | 1.07 | 0.0031 | 0.0042 | 0.33 | 5.27 |
| 82 | 342 | 8/28/2003 7:00 | 0.1 | | 0.37 | | 0.02 | 0.9 | | 0.05 | 14.6 | 0.014 | 0.7 | 0.04 | 0.006 | 0.42 | 4.31 |
| 82 | 342 | 9/23/2004 11:35 | 0.4 | | 0.171 | | 0.025 | 0.05 | | 0.015 | 11.4 | 0.0062 | 0.7 | 0.0022 | 0.0036 | 0.168 | 2.39 |
| 82 | 342 | 8/28/2005 12:30 | 0.079 | | 0.078 | | 0.0185 | 0.14 | | 0.015 | 12.3 | 0.007 | 0.99 | 0.0031 | 0.0049 | 0.246 | 2.78 |
| 94 | 354 | 8/28/2003 7:25 | 0.16 | | 0.298 | | 0.02 | 0.25 | | 0.05 | 20.7 | 0.006 | 0.7 | 0.0015 | 0.004 | 0.26 | 2.2 |
| 94 | 354 | 9/23/2004 14:00 | 0.161 | | 0.086 | | 0.026 | 0.05 | | 0.015 | 20.6 | 0.0019 | 0.4 | 0.0014 | 0.0016 | 0.067 | 1.65 |
| 94 | 354 | 8/28/2005 10:30 | 0.017 | | 0.038 | | 0.0131 | 0.14 | | 0.015 | 19.3 | 0.005 | 0.35 | 0.0023 | 0.0017 | 0.11 | 1.58 |
| A42 | 165 | 9/10/2001 10:00 | 0.63 | | 0.62 | | 0.08 | 0.5 | | 0.16 | 34.1 | 0.034 | 9 | 0.0015 | 0.037 | 1.25 | 8.5 |
| A42 | 165 | 9/10/2001 11:00 | 0.72 | | 0.68 | | 0.06 | 0.6 | | 0.05 | 34 | 0.027 | 9 | 0.0015 | 0.038 | 1.33 | 7.7 |
| A42 | 165 | 9/10/2001 13:00 | 0.71 | | 0.603 | | 0.091 | 0.25 | | 0.05 | 34 | 0.017 | 5.3 | 0.0015 | 0.031 | 1.14 | 8.6 |
| A42 | 165 | 8/28/2003 8:25 | 0.5 | | 0.283 | | 0.024 | 0.25 | | 0.05 | 37.4 | 0.0015 | 2.9 | 0.0015 | 0.018 | 0.75 | 3.2 |
| A42 | 165 | 9/23/2004 8:30 | 0.19 | | 0.409 | | 0.0159 | 0.05 | | 0.015 | 45.7 | 0.0069 | 1.7 | 0.0018 | 0.0093 | 0.51 | 3.12 |
| A42 | 165 | 8/28/2005 14:45 | 0.37 | | 0.206 | | 0.0184 | 0.13 | | 0.0306 | 43.6 | 0.018 | 2.9 | 0.0046 | 0.0222 | 0.962 | 5.41 |
| A47 | 171 | 8/28/2003 8:05 | 0.07 | | 0.141 | | 0.02 | 0.25 | | 0.05 | 20.4 | 0.0015 | 0.7 | 0.0015 | 0.011 | 0.22 | 1.58 |

Shaded values are less than detection limits.

Table H.2-2 (Cont'd., 3 of 8)

| RAMP Name | No _x -So _x GIS No. | Date/Time | Ag-T | Al-T | As-T | Ba-T | Be-T | Bi-T | B-T | Ca-T | Cd-T | Cl-T | Co-T | Cr-T | Cu-T | Fe-T | Hg-T | K-T | Li-T | Mg-T | Mn-T | Mo-T | Na-T |
|-----------|--|-----------------|--------|------|-------|------|--------|--------|--------|------|--------|------|--------|-------|-------|------|-------|------|------|------|------|--------|------|
| A47 | 171 | 9/23/2004 9:30 | 0.0012 | 30.3 | 0.439 | 9.9 | 0.0015 | 0.0055 | 14.9 | 4.43 | 0.001 | 1.07 | 0.035 | 0.129 | 0.266 | 156 | | | 2.15 | | 6.53 | 0.257 | |
| A59 | 172 | 9/10/2001 15:30 | 0.01 | 81.2 | 0.3 | 6 | 0.02 | 0.0025 | 11.2 | 3.1 | 0.024 | 3.1 | 0.08 | 0.2 | 0.56 | 372 | | | 1.6 | | 59.3 | 0.02 | |
| A59 | 172 | 8/28/2003 8:20 | 0.0025 | 110 | 0.39 | 6.7 | 0.02 | 0.0025 | 12.3 | 3.3 | 0.03 | 0.3 | 0.13 | 0.62 | 1.47 | 549 | | | 2.4 | | 112 | 0.07 | |
| A59 | 172 | 9/23/2004 10:30 | 0.0021 | 104 | 0.395 | 6.72 | 0.01 | 0.0107 | 11 | 3.4 | 0.0096 | 0.62 | 0.124 | 0.31 | 0.34 | 602 | | | 2.23 | | 141 | 0.113 | |
| A59 | 172 | 8/28/2005 13:13 | 0.0003 | 83 | 0.285 | 6.14 | 9.4 | 0.006 | 0.0031 | 2.8 | 0.013 | 0.05 | 0.135 | 0.21 | 0.155 | 698 | | | 1.36 | | 150 | 0.025 | |
| P94 | 223 | 9/1/2003 8:05 | 0.0025 | 45.8 | 0.25 | 13.5 | 0.02 | 0.0025 | 36.1 | 12.8 | 0.01 | 0.3 | 0.042 | 0.6 | 1.61 | 19 | | | 7.1 | | 18.9 | 0.02 | |
| P94 | 223 | 8/25/2004 13:15 | 0.0016 | 13.8 | 0.284 | 11.3 | 0.0015 | 0.0024 | 38.7 | 13.7 | 0.0048 | 1.76 | 0.041 | 0.168 | 0.112 | 7 | | | 5.4 | | 22.2 | 0.022 | |
| P94 | 223 | 8/31/2005 13:50 | 0.0015 | 18.4 | 0.267 | 11.5 | 29.6 | 0.0015 | 0.002 | 11.5 | 0.0031 | 0.21 | 0.06 | 0.157 | 0.172 | 22 | 0.005 | 1110 | 5.6 | 4.48 | 51.9 | 0.094 | 4610 |
| P96 | 225 | 8/25/2004 12:35 | 0.002 | 23.7 | 0.374 | 14 | 0.0015 | 0.0005 | 11.3 | 11.3 | 0.0093 | 1.72 | 0.049 | 0.13 | 0.189 | 52 | | | 3.36 | | 24.7 | 0.114 | |
| P96 | 225 | 8/31/2005 14:45 | 0.0015 | 36.3 | 0.308 | 11.4 | 10.8 | 0.01 | 0.0021 | 8.99 | 0.0024 | 0.11 | 0.046 | 0.168 | 0.151 | 66 | 0.005 | 600 | 2.5 | 2.78 | 31.8 | 0.069 | 642 |
| P97 | 226 | 8/25/2004 13:00 | 0.0022 | 62.4 | 0.331 | 10.9 | 0.006 | 0.0077 | 11.2 | 5.68 | 0.0199 | 1.66 | 0.132 | 0.327 | 0.144 | 180 | | | 2.7 | | 35 | 0.088 | |
| P97 | 226 | 8/31/2005 16:00 | 0.0019 | 99 | 0.36 | 12.4 | 11.2 | 0.005 | 0.012 | 5.39 | 0.0053 | 0.18 | 0.264 | 0.27 | 0.146 | 292 | 0.005 | 742 | 3.16 | 1.63 | 140 | 0.084 | 877 |
| P98 | 227 | 8/26/2004 12:15 | 0.0017 | 15.2 | 0.294 | 8.85 | 0.0015 | 0.0005 | 9.7 | 11.8 | 0.038 | 2.01 | 0.0289 | 0.106 | 0.104 | 28 | | | 2.56 | | 5.91 | 0.052 | |
| P98 | 227 | 8/31/2005 15:00 | 0.0015 | 12.4 | 0.303 | 12.5 | 10.4 | 0.0015 | 0.0057 | 12.5 | 0.006 | 0.26 | 0.041 | 0.108 | 0.131 | 41 | 0.005 | 699 | 2.8 | 3.16 | 12.3 | 0.073 | 1000 |
| 1 | 267 | 8/28/2003 8:15 | 0.007 | 10.8 | 0.22 | 12.1 | 0.02 | 0.0025 | 12.1 | 12.5 | 0.01 | 0.6 | 0.024 | 0.12 | 0.21 | 155 | | | 2.9 | | 81.7 | 0.02 | |
| 1 | 267 | 8/25/2004 12:50 | 0.0017 | 12.3 | 0.26 | 21.2 | 0.0015 | 0.0026 | 11.9 | 12.6 | 0.031 | 0.32 | 0.0205 | 0.116 | 0.096 | 106 | | | 2.6 | | 47.9 | 0.0066 | |
| 1 | 267 | 8/30/2005 16:15 | 0.0003 | 8.5 | 0.254 | 16.7 | 11.6 | 0.0015 | 0.0005 | 10.2 | 0.001 | 0.05 | 0.0241 | 0.05 | 0.069 | 80 | | | 2.4 | | 34.8 | 0.0029 | |
| L4 | 452 | 9/13/2001 13:30 | 0.027 | 64.6 | 0.37 | 5.7 | 0.09 | 0.0025 | 4 | 3.52 | 0.029 | 0.7 | 0.11 | 0.19 | 0.36 | 248 | | | 2 | | 11.3 | 0.05 | |
| L4 | 452 | 8/29/2003 11:30 | 0.0025 | 82.8 | 0.4 | 6.5 | 0.02 | 0.0025 | 3.2 | 3.41 | 0.03 | 0.3 | 0.14 | 0.31 | 4.13 | 440 | | | 0.6 | | 51.7 | 0.08 | |
| L4 | 452 | 8/24/2004 12:10 | 0.0016 | 46.3 | 0.304 | 5.51 | 0.0015 | 0.0076 | 2.88 | 3.25 | 0.0077 | 1.91 | 0.047 | 0.13 | 0.096 | 199 | | | 0.16 | | 5.8 | 0.052 | |
| L4 | 452 | 8/30/2005 9:35 | 0.0013 | 64.7 | 0.324 | 4.99 | 3.88 | 0.0015 | 0.0033 | 3.04 | 0.009 | 0.21 | 0.146 | 0.26 | 0.115 | 375 | 0.013 | 72 | 0.48 | 0.81 | 59 | 0.07 | 237 |
| L7 | 470 | 9/13/2001 14:30 | 0.02 | 188 | 0.45 | 11.5 | 0.11 | 0.0025 | 4.5 | 5.03 | 0.025 | 0.7 | 0.18 | 0.66 | 0.36 | 875 | | | 2.4 | | 23.6 | 0.039 | |
| L7 | 470 | 8/29/2003 14:15 | 0.0025 | 222 | 0.48 | 12.2 | 0.02 | 0.0025 | 5.7 | 4.54 | 0.01 | 0.3 | 0.21 | 0.54 | 1.7 | 952 | | | 1.3 | | 40.6 | 0.05 | |
| L7 | 470 | 8/24/2004 16:00 | 0.0017 | 157 | 0.336 | 9.59 | 0.012 | 0.0026 | 4.17 | 4.1 | 0.0111 | 1.1 | 0.111 | 0.41 | 0.141 | 667 | | | 0.35 | | 17.6 | 0.04 | |
| L7 | 470 | 8/30/2005 10:10 | 0.001 | 202 | 0.342 | 11 | 5.31 | 0.011 | 0.0022 | 3.96 | 0.014 | 0.12 | 0.185 | 0.51 | 0.118 | 568 | 0.013 | 61 | 0.7 | 0.99 | 26.5 | 0.059 | 437 |
| L8 | 471 | 9/13/2001 15:15 | 0.017 | 29.8 | 0.54 | 12 | 0.16 | 0.006 | 12.7 | 5.91 | 0.024 | 2 | 0.13 | 0.3 | 0.32 | 230 | | | 3.6 | | 17.3 | 0.06 | |
| L8 | 471 | 8/29/2003 11:00 | 0.0025 | 86.6 | 0.46 | 13.5 | 0.02 | 0.007 | 16.5 | 6.06 | 0.01 | 0.3 | 0.03 | 0.35 | 3 | 307 | | | 2.3 | | 10.6 | 0.1 | |
| L8 | 471 | 8/24/2004 12:25 | 0.0015 | 33.1 | 0.356 | 13.2 | 0.0015 | 0.0005 | 13.9 | 6.3 | 0.001 | 2.41 | 0.042 | 0.1 | 0.119 | 166 | | | 1.7 | | 12.3 | 0.137 | |
| L8 | 471 | 8/30/2005 10:20 | 0.0025 | 52.9 | 0.463 | 11.6 | 13.9 | 0.003 | 0.0022 | 5.12 | 0.005 | 0.21 | 0.044 | 0.21 | 0.21 | 186 | 0.005 | 281 | 1.65 | 1.77 | 15.3 | 0.12 | 1410 |
| L39 | 400 | 10/3/2001 10:15 | 0.0025 | 180 | 0.22 | 7.5 | 0.08 | 0.0025 | 7.6 | 3.31 | 0.03 | 0.3 | 0.09 | 0.8 | 0.3 | 921 | | | 2 | | 19.3 | 0.09 | |
| L39 | 400 | 8/29/2003 11:15 | 0.0025 | 95 | 0.15 | 5.6 | 0.02 | 0.006 | 7 | 2.71 | 0.01 | 0.3 | 0.032 | 0.49 | 1.67 | 566 | | | 1.5 | | 10.8 | 0.06 | |
| L39 | 400 | 8/30/2004 14:45 | 0.0013 | 70.2 | 0.13 | 5.17 | 0.013 | 0.0005 | 6.9 | 3.23 | 0.001 | 1.77 | 0.0311 | 0.471 | 0.11 | 335 | | | 1.78 | | 5.8 | 0.073 | |
| L39 | 400 | 9/7/2005 12:55 | 0.0014 | 161 | 0.185 | 6.2 | 7.39 | 0.018 | 0.0021 | 2.55 | 0.013 | 0.17 | 0.054 | 0.51 | 0.136 | 789 | 0.019 | 353 | 0.8 | 0.82 | 12.9 | 0.052 | 590 |
| E15 | 268 | 9/13/2001 16:00 | 0.033 | 16.3 | 0.5 | 21.3 | 0.1 | 0.0025 | 11.9 | 9.91 | 0.01 | 1.44 | 0.08 | 0.33 | 0.49 | 262 | | | 3.4 | | 60.3 | 0.01 | |
| E15 | 268 | 8/29/2003 13:30 | 0.0025 | 62.1 | 0.41 | 8.5 | 0.02 | 0.006 | 9.4 | 6.5 | 0.01 | 0.8 | 0.01 | 0.32 | 2.53 | 149 | | | 1.9 | | 22.2 | 0.03 | |
| E15 | 268 | 8/24/2004 13:20 | 0.0009 | 16.1 | 0.363 | 8.13 | 0.005 | 0.0005 | 8.2 | 5.89 | 0.0051 | 1.38 | 0.0167 | 0.1 | 0.055 | 91 | | | 1.3 | | 22.3 | 0.022 | |
| E15 | 268 | 8/28/2005 17:00 | 0.0003 | 25.5 | 0.42 | 8.72 | 9.03 | 0.0015 | 0.0021 | 5.87 | 0.0024 | 0.05 | 0.045 | 0.11 | 0.098 | 188 | | | 1.5 | | 50.9 | 0.024 | |
| P23 | 182 | 9/1/2003 8:00 | 0.0025 | 36.2 | 0.24 | 39.2 | 0.02 | 0.0025 | 12 | 12.8 | 0.01 | 0.3 | 0.053 | 0.11 | 1.61 | 911 | | | 2 | | 49.8 | 0.08 | |
| P23 | 182 | 8/25/2004 13:05 | 0.0015 | 40.1 | 0.435 | 29.5 | 0.003 | 0.0048 | 5.5 | 16.1 | 0.0072 | 1.12 | 0.12 | 0.14 | 0.19 | 652 | | | 1.3 | | 51.9 | 0.165 | |
| P23 | 182 | 8/31/2005 10:00 | 0.0015 | 13.2 | 0.251 | 38.5 | 9.7 | 0.004 | 0.0012 | 14.2 | 0.014 | 0.13 | 0.056 | 0.12 | 0.1 | 691 | 0.005 | 74 | 1.4 | 2.77 | 44.3 | 0.05 | 1050 |
| P27 | 185 | 9/1/2003 8:10 | 0.0025 | 105 | 0.26 | 5.7 | 0.14 | 0.0025 | 7.4 | 3.32 | 0.01 | 0.3 | 0.157 | 0.3 | 1.5 | 314 | | | 0.4 | | 40.1 | 0.04 | |
| P27 | 185 | 8/25/2004 13:10 | 0.0018 | 56 | 0.274 | 3.55 | 0.005 | 0.0031 | 2.65 | 2.56 | 0.0208 | 1.29 | 0.133 | 0.196 | 0.08 | 287 | | | 0.2 | | 30.3 | 0.0335 | |
| P27 | 185 | 8/31/2005 9:00 | 0.0015 | 72 | 0.299 | 4.11 | 3.57 | 0.0015 | 0.0024 | 3.27 | 0.021 | 0.14 | 0.178 | 0.24 | 0.083 | 354 | 0.005 | 37 | 0.39 | 0.87 | 41.1 | 0.041 | 266 |
| P7 | 209 | 9/1/2003 8:20 | 0.0025 | 46 | 0.65 | 6.8 | 0.1 | 0.0025 | 5.4 | 4.47 | 0.01 | 0.3 | 0.13 | 0.57 | 0.42 | 660 | | | 0.9 | | 30.7 | 0.05 | |
| P7 | 209 | 8/25/2004 12:40 | 0.0015 | 29.3 | 0.447 | 4.46 | 0.0015 | 0.019 | 2.91 | 3.4 | 0.0105 | 1.91 | 0.0655 | 0.14 | 0.055 | 286 | | | 0.66 | | 9.5 | 0.0254 | |

Shaded values are less than detection limits.

Table H.2-2 (Cont'd., 4 of 8)

| RAMP Name | No _x -So _x GIS No. | Date/Time | Ni-T | P-T | Pb-T | S-T | Sb-T | Se-T | Si-T | Sn-T | Sr-T | Th-T | Ti-T | Tl-T | U-T | V-T | Zn-T |
|-----------|--|-----------------|--------|------|--------|------|--------|------|------|--------|------|--------|------|--------|--------|-------|------|
| A47 | 171 | 9/23/2004 9:30 | 0.08 | | 0.114 | | 0.023 | 0.05 | | 0.015 | 20 | 0.0017 | 0.82 | 0.0013 | 0.0065 | 0.122 | 2.15 |
| A59 | 172 | 9/10/2001 15:30 | 0.1 | | 0.24 | | 0.017 | 0.25 | | 0.05 | 13.7 | 0.007 | 1.8 | 0.0015 | 0.009 | 0.28 | 5.3 |
| A59 | 172 | 8/28/2003 8:20 | 0.33 | | 0.32 | | 0.024 | 0.25 | | 0.05 | 14.1 | 0.0015 | 2.2 | 0.0015 | 0.019 | 0.44 | 4.3 |
| A59 | 172 | 9/23/2004 10:30 | 0.453 | | 0.314 | | 0.019 | 0.05 | | 0.015 | 15.4 | 0.0054 | 1.81 | 0.003 | 0.0159 | 0.455 | 5.98 |
| A59 | 172 | 8/28/2005 13:13 | 0.172 | | 0.204 | | 0.0111 | 0.05 | | 0.015 | 14 | 0.0075 | 1.36 | 0.0025 | 0.0127 | 0.427 | 10.7 |
| P94 | 223 | 9/1/2003 8:05 | 0.03 | | 0.256 | | 0.045 | 0.25 | | 0.05 | 66.3 | 0.0015 | 0.8 | 0.0015 | 0.0015 | 0.49 | 2.57 |
| P94 | 223 | 8/25/2004 13:15 | 0.0025 | | 0.0236 | | 0.019 | 0.11 | | 0.045 | 65.4 | 0.0044 | 0.83 | 0.0009 | 0.0043 | 0.446 | 3.94 |
| P94 | 223 | 8/31/2005 13:50 | 0.113 | 79.4 | 0.069 | 4.91 | 0.012 | 0.05 | 2.77 | 0.015 | 62 | 0.001 | 1.03 | 0.0025 | 0.0053 | 0.342 | 2.33 |
| P96 | 225 | 8/25/2004 12:35 | 1.19 | | 0.123 | | 0.019 | 0.27 | | 0.015 | 33.3 | 0.0014 | 0.73 | 0.0016 | 0.0126 | 0.325 | 4.81 |
| P96 | 225 | 8/31/2005 14:45 | 0.22 | 49.8 | 0.056 | 1.43 | 0.0135 | 0.05 | 2.61 | 0.015 | 29.9 | 0.003 | 0.99 | 0.0024 | 0.0127 | 0.377 | 3.99 |
| P97 | 226 | 8/25/2004 13:00 | 0.41 | | 0.0532 | | 0.0183 | 0.1 | | 0.015 | 28.2 | 0.0261 | 0.67 | 0.0028 | 0.0024 | 0.51 | 3.19 |
| P97 | 226 | 8/31/2005 16:00 | 0.64 | 56.7 | 0.068 | 1.29 | 0.0126 | 0.05 | 0.68 | 0.015 | 29.6 | 0.019 | 0.9 | 0.0047 | 0.0024 | 0.548 | 5.26 |
| P98 | 227 | 8/26/2004 12:15 | 0.092 | | 0.0426 | | 0.0164 | 0.2 | | 0.049 | 29.6 | 0.003 | 0.6 | 0.0017 | 0.0021 | 0.344 | 2.93 |
| P98 | 227 | 8/31/2005 15:00 | 0.206 | 38.7 | 0.068 | 1.11 | 0.0138 | 0.05 | 0.89 | 0.0355 | 33.1 | 0.0093 | 0.55 | 0.0024 | 0.0027 | 0.276 | 1.85 |
| 1 | 267 | 8/28/2003 8:15 | 0.13 | | 0.107 | | 0.018 | 0.25 | | 0.05 | 42.4 | 0.0015 | 0.4 | 0.0015 | 0.0015 | 0.146 | 0.63 |
| 1 | 267 | 8/25/2004 12:50 | 0.0025 | | 0.0285 | | 0.0139 | 0.05 | | 0.075 | 43 | 0.0135 | 0.24 | 0.0011 | 0.0019 | 0.121 | 3.57 |
| 1 | 267 | 8/28/2005 16:15 | 0.0025 | | 0.0334 | | 0.0096 | 0.05 | | 0.015 | 37 | 0.0015 | 0.37 | 0.0006 | 0.002 | 0.081 | 2.18 |
| L4 | 452 | 9/13/2001 13:30 | 0.18 | | 0.319 | | 0.03 | 0.7 | | 0.05 | 6.52 | 0.006 | 0.6 | 0.0015 | 0.0015 | 0.87 | 5.86 |
| L4 | 452 | 8/29/2003 11:30 | 0.29 | | 0.599 | | 0.01 | 0.25 | | 0.05 | 6.61 | 0.004 | 1.4 | 0.0015 | 0.0015 | 0.9 | 5 |
| L4 | 452 | 8/24/2004 12:10 | 0.221 | | 0.0655 | | 0.0103 | 0.05 | | 0.015 | 5.96 | 0.029 | 0.68 | 0.0011 | 0.0024 | 0.784 | 4.88 |
| L4 | 452 | 8/30/2005 9:35 | 0.249 | 41.8 | 0.099 | 0.49 | 0.007 | 0.05 | 0.95 | 0.015 | 6.25 | 0.0002 | 1.03 | 0.0034 | 0.0024 | 0.862 | 4.6 |
| L7 | 470 | 9/13/2001 14:30 | 0.66 | | 0.212 | | 0.025 | 0.25 | | 0.05 | 16.4 | 0.017 | 1.4 | 0.0015 | 0.0015 | 0.76 | 4.27 |
| L7 | 470 | 8/29/2003 14:15 | 0.7 | | 0.249 | | 0.002 | 0.25 | | 0.05 | 15.2 | 0.012 | 1.9 | 0.0015 | 0.01 | 0.67 | 4.5 |
| L7 | 470 | 8/24/2004 16:00 | 0.542 | | 0.0728 | | 0.0169 | 0.11 | | 0.06 | 13.2 | 0.0125 | 1.09 | 0.0032 | 0.0075 | 0.712 | 4.97 |
| L7 | 470 | 8/30/2005 10:10 | 0.59 | 20.9 | 0.0706 | 0.53 | 0.0132 | 0.05 | 2.1 | 0.015 | 14.4 | 0.0016 | 1.58 | 0.0037 | 0.0069 | 0.46 | 4.93 |
| L8 | 471 | 9/13/2001 15:15 | 0.12 | | 0.129 | | 0.044 | 0.54 | | 0.05 | 27.7 | 0.011 | 0.3 | 0.0015 | 0.006 | 0.32 | 3.49 |
| L8 | 471 | 8/29/2003 11:00 | 0.14 | | 0.442 | | 0.01 | 0.25 | | 0.05 | 28.4 | 0.012 | 1.8 | 0.0015 | 0.006 | 0.46 | 1.54 |
| L8 | 471 | 8/24/2004 12:25 | 0.13 | | 0.0319 | | 0.0137 | 0.15 | | 0.015 | 26.7 | 0.0022 | 0.61 | 0.0015 | 0.0055 | 0.245 | 9.03 |
| L8 | 471 | 8/30/2005 10:20 | 0.18 | 55 | 0.0622 | 0.94 | 0.0119 | 0.05 | 0.49 | 0.015 | 25.8 | 0.0002 | 0.78 | 0.0028 | 0.0076 | 0.421 | 2.88 |
| L39 | 400 | 10/3/2001 10:15 | 0.23 | | 0.212 | | 0.013 | 0.25 | | 2.54 | 19 | 0.046 | 4.1 | 0.0015 | 0.044 | 1.67 | 2.9 |
| L39 | 400 | 8/29/2003 11:15 | 0.17 | | 0.21 | | 0.002 | 0.25 | | 0.05 | 16.7 | 0.019 | 2.2 | 0.0015 | 0.033 | 0.88 | 2.14 |
| L39 | 400 | 8/30/2004 14:45 | 0.087 | | 0.0509 | | 0.0078 | 0.13 | | 0.015 | 17.1 | 0.0064 | 1.22 | 0.0015 | 0.0239 | 0.522 | 1.25 |
| L39 | 400 | 9/7/2005 12:55 | 0.109 | 25 | 0.121 | 0.66 | 0.0091 | 0.05 | 3.53 | 0.015 | 16.9 | 0.0075 | 2.38 | 0.0034 | 0.0322 | 0.686 | 3.54 |
| E15 | 268 | 9/13/2001 16:00 | 0.03 | | 0.63 | | 0.029 | 0.8 | | 0.05 | 28.8 | 0.0015 | 0.8 | 0.0015 | 0.005 | 0.27 | 3.09 |
| E15 | 268 | 8/29/2003 13:30 | 0.13 | | 0.324 | | 0.01 | 0.25 | | 0.05 | 17.1 | 0.007 | 1.2 | 0.0015 | 0.0015 | 0.39 | 1.57 |
| E15 | 268 | 8/24/2004 13:20 | 0.024 | | 0.132 | | 0.0121 | 0.05 | | 0.015 | 16.3 | 0.0034 | 0.3 | 0.0012 | 0.0018 | 0.251 | 4.78 |
| E15 | 268 | 8/28/2005 17:00 | 0.07 | | 0.057 | | 0.011 | 0.05 | | 0.015 | 16.4 | 0.0013 | 0.64 | 0.001 | 0.0035 | 0.304 | 3.89 |
| P23 | 182 | 9/1/2003 8:00 | 0.03 | | 0.195 | | 0.019 | 0.25 | | 0.05 | 26.4 | 0.005 | 1 | 0.0015 | 0.0015 | 0.25 | 1.99 |
| P23 | 182 | 8/25/2004 13:05 | 0.04 | | 0.0601 | | 0.0118 | 0.11 | | 0.058 | 29.6 | 0.0204 | 1.6 | 0.0013 | 0.0182 | 0.379 | 2.28 |
| P23 | 182 | 8/31/2005 10:00 | 0.11 | 66 | 0.102 | 0.59 | 0.0092 | 0.05 | 0.83 | 0.015 | 32 | 0.0015 | 0.57 | 0.0018 | 0.0027 | 0.132 | 1.76 |
| P27 | 185 | 9/1/2003 8:10 | 0.4 | | 0.307 | | 0.03 | 0.25 | | 0.05 | 6.6 | 0.0015 | 1.3 | 0.005 | 0.0015 | 0.83 | 4.8 |
| P27 | 185 | 8/25/2004 13:10 | 0.323 | | 0.0526 | | 0.013 | 0.05 | | 0.05 | 5 | 0.0111 | 0.62 | 0.0023 | 0.0015 | 0.576 | 6.13 |
| P27 | 185 | 8/31/2005 9:00 | 0.363 | 28.1 | 0.161 | 0.84 | 0.011 | 0.05 | 1.5 | 0.015 | 6.75 | 0.0051 | 1.6 | 0.0021 | 0.0014 | 0.78 | 4.58 |
| P7 | 209 | 9/1/2003 8:20 | 0.25 | | 0.084 | | 0.016 | 0.25 | | 0.05 | 9.1 | 0.0015 | 0.23 | 0.0015 | 0.0015 | 0.26 | 4.8 |
| P7 | 209 | 8/25/2004 12:40 | 0.138 | | 0.0244 | | 0.0081 | 0.05 | | 0.038 | 6.84 | 0.078 | 0.4 | 0.0012 | 0.001 | 0.19 | 4.14 |

Shaded values are less than detection limits.

Table H.2-2 (Cont'd., 5 of 8)

| RAMP Name | No _x -So _x GIS No. | Date/Time | Ag-T | Al-T | As-T | Ba-T | Be-T | Bi-T | B-T | Ca-T | Cd-T | Cl-T | Co-T | Cr-T | Cu-T | Fe-T | Hg-T | K-T | Li-T | Mg-T | Mn-T | Mo-T | Na-T |
|-----------|--|-----------------|--------|------|-------|------|--------|--------|--------|-------|--------|-------|--------|-------|-------|------|-------|-----|------|-------|------|--------|------|
| P7 | 209 | 8/31/2005 9:20 | 0.0012 | 50.5 | 0.511 | 7.32 | 4.65 | 0.0034 | 0.0016 | 3.92 | 0.008 | 0.17 | 0.229 | 0.203 | 0.094 | 614 | 0.005 | 39 | 0.39 | 0.96 | 59.9 | 0.0325 | 271 |
| 4 | 270 | 8/29/2003 13:15 | 0.0025 | 10.6 | 0.52 | 27.4 | 0.02 | 0.007 | 16.7 | 20.8 | 0.02 | 1 | 0.01 | 0.55 | 0.38 | 107 | | | 4.1 | | 38 | 0.07 | |
| 4 | 270 | 8/24/2004 8:50 | 0.0026 | 6.73 | 0.485 | 20.7 | 0.0015 | 0.0014 | 15.5 | 19.4 | 0.0049 | 1.69 | 0.0156 | 0.073 | 0.128 | 66 | | | 3.1 | | 24.5 | 0.045 | |
| 4 | 270 | 8/28/2005 0:00 | 0.0003 | 16.4 | 0.53 | 22 | 18.7 | 0.0015 | 0.0013 | 19.9 | 0.0047 | 0.05 | 0.0311 | 0.092 | 0.132 | 213 | | | 3.45 | | 41.7 | 0.053 | |
| 6 | 271 | 8/28/2003 8:10 | 0.0025 | 14.9 | 1.02 | 17.9 | 0.02 | 0.0025 | 25.9 | 16 | 0.01 | 0.7 | 0.04 | 0.78 | 0.25 | 150 | | | 5.1 | | 96 | 0.24 | |
| 6 | 271 | 8/26/2004 12:55 | 0.0024 | 8.84 | 0.87 | 11.6 | 0.0015 | 0.0015 | 24.1 | 16.3 | 0.0174 | 0.61 | 0.03 | 0.056 | 0.106 | 87.1 | | | 4.7 | | 36.7 | 0.028 | |
| 6 | 271 | 9/23/2004 15:10 | 0.0015 | 9.7 | 0.831 | 11.6 | 0.0015 | 0.0064 | 23.6 | 16.2 | 0.001 | 0.936 | 0.036 | 0.2 | 0.111 | 92 | | | 4.96 | | 34.7 | 0.156 | |
| 6 | 271 | 8/29/2005 15:00 | 0.0003 | 7.7 | 0.81 | 15.6 | 24.1 | 0.0015 | 0.0005 | 17.3 | 0.001 | 0.05 | 0.035 | 0.068 | 0.094 | 288 | | | 4.2 | | 119 | 0.0243 | |
| KEARL | 418 | 8/24/2004 15:04 | 0.0022 | 12.7 | 0.307 | 11.5 | 0.005 | 0.0005 | 45.8 | 18.1 | 0.0029 | 2.08 | 0.029 | 0.09 | 0.166 | 25 | | | 5.6 | | 9.19 | 0.107 | |
| KEARL | 418 | 8/30/2005 8:55 | 0.0014 | 14 | 0.3 | 12.4 | 46.1 | 0.0015 | 0.0014 | 15.2 | 0.0029 | 0.18 | 0.038 | 0.099 | 0.2 | 58 | 0.005 | 597 | 4.7 | 5.18 | 14.5 | 0.088 | 7000 |
| L18 | 436 | 9/13/2001 12:00 | 0.021 | 16.4 | 0.46 | 19.5 | 0.2 | 0.0025 | 20.1 | 6.53 | 0.058 | 2.6 | 0.18 | 0.36 | 1.1 | 35 | | | 7.9 | | 12.6 | 0.24 | |
| L18 | 436 | 8/28/2003 8:55 | 0.0025 | 13.6 | 0.3 | 19.1 | 0.02 | 0.0025 | 20.1 | 6.5 | 0.01 | 0.3 | 0.027 | 0.13 | 0.87 | 25 | | | 6.8 | | 14.1 | 0.26 | |
| L18 | 436 | 8/29/2004 8:45 | 0.0003 | 3.6 | 0.328 | 19.5 | 0.0015 | 0.0005 | 20.5 | 7.12 | 0.0023 | 2.11 | 0.018 | 0.164 | 0.441 | 17.5 | | | 6.8 | | 14.9 | 0.249 | |
| L18 | 436 | 8/27/2005 10:58 | 0.0013 | 4.7 | 0.334 | 19.1 | 22 | 0.0015 | 0.0013 | 6.65 | 0.0053 | 0.268 | 0.0302 | 0.083 | 0.555 | 27 | | | 6.1 | | 8.8 | 0.241 | |
| L23 | 442 | 10/3/2001 15:30 | 0.0025 | 19.6 | 0.42 | 11.7 | 0.07 | 0.0025 | 5.4 | 3.08 | 0.01 | 2.5 | 0.06 | 0.3 | 0.29 | 206 | | | 2.2 | | 19.7 | 0.08 | |
| L23 | 442 | 8/28/2003 7:55 | 0.0025 | 23.1 | 0.44 | 11.2 | 0.02 | 0.0025 | 6.5 | 2.79 | 0.03 | 0.3 | 0.08 | 0.41 | 0.45 | 394 | | | 2.3 | | 21.4 | 0.13 | |
| L23 | 442 | 8/29/2004 10:25 | 0.0003 | 10.2 | 0.366 | 11 | 0.0015 | 0.0005 | 5.07 | 3.1 | 0.001 | 2.06 | 0.05 | 0.177 | 0.152 | 273 | | | 1.93 | | 14.8 | 0.0747 | |
| L23 | 442 | 8/27/2005 17:45 | 0.0014 | 16.3 | 0.426 | 12.3 | 5 | 0.005 | 0.0016 | 2.72 | 0.0046 | 0.05 | 0.061 | 0.16 | 0.17 | 337 | | | 1.4 | | 14.9 | 0.079 | |
| L25 | 444 | 9/13/2001 10:30 | 0.019 | 70 | 0.52 | 18 | 0.12 | 0.008 | 10.4 | 3.63 | 0.091 | 1.36 | 0.17 | 0.4 | 0.72 | 395 | | | 3.8 | | 38.9 | 0.095 | |
| L25 | 444 | 8/28/2003 8:40 | 0.009 | 48.1 | 0.36 | 20.1 | 0.05 | 0.0025 | 11.2 | 3.23 | 0.01 | 0.9 | 0.1 | 0.3 | 0.65 | 159 | | | 3 | | 24.5 | 0.14 | |
| L25 | 444 | 8/29/2004 9:40 | 0.0003 | 41.9 | 0.411 | 19.6 | 0.0015 | 0.0005 | 10.2 | 3.84 | 0.0061 | 2.03 | 0.102 | 0.2 | 0.313 | 230 | | | 2.75 | | 25.1 | 0.103 | |
| L25 | 444 | 8/27/2005 12:30 | 0.0023 | 13.5 | 0.39 | 16.8 | 12.6 | 0.003 | 0.0017 | 3.56 | 0.0035 | 0.18 | 0.071 | 0.105 | 0.287 | 151 | | | 2.6 | | 19.8 | 0.125 | |
| L28 | 447 | 10/3/2001 13:00 | 0.007 | 958 | 1.42 | 22.7 | 0.02 | 0.011 | 11.3 | 2.32 | 0.055 | 1.2 | 0.41 | 1.4 | 1.06 | 2212 | | | 3.3 | | 35.9 | 0.25 | |
| L28 | 447 | 8/28/2003 7:05 | 0.042 | 675 | 1.58 | 19 | 0.02 | 0.011 | 8.5 | 1.92 | 0.05 | 2.2 | 0.39 | 1.92 | 1.11 | 2415 | | | 2.5 | | 50 | 0.51 | |
| L28 | 447 | 9/1/2004 11:15 | 0.0049 | 302 | 1.31 | 13.1 | 0.026 | 0.0124 | 9.5 | 2.16 | 0.027 | 0.74 | 0.273 | 0.62 | 0.548 | 1730 | | | 1.85 | | 31.1 | 0.236 | |
| L28 | 447 | 8/27/2005 13:30 | 0.0035 | 264 | 1.2 | 14.5 | 7.8 | 0.028 | 0.0059 | 1.97 | 0.03 | 0.28 | 0.4 | 0.63 | 0.47 | 1720 | | | 2.13 | | 47.6 | 0.156 | |
| L29 | 448 | 10/3/2001 11:45 | 0.0025 | 1457 | 0.48 | 17.3 | 0.02 | 0.011 | 7.2 | 0.46 | 0.03 | 0.3 | 0.23 | 1.7 | 0.87 | 864 | | | 0.8 | | 29.4 | 0.09 | |
| L29 | 448 | 8/28/2003 7:30 | 0.008 | 551 | 0.32 | 10.8 | 0.02 | 0.0025 | 2.8 | 0.39 | 0.01 | 0.3 | 0.16 | 0.75 | 1.38 | 574 | | | 0.6 | | 23.5 | 0.07 | |
| L29 | 448 | 8/25/2004 12:10 | 0.0034 | 159 | 0.278 | 6.41 | 0.007 | 0.0037 | 2.33 | 0.397 | 0.0372 | 1.98 | 0.155 | 0.26 | 0.242 | 396 | | | 0.11 | | 22.1 | 0.027 | |
| L29 | 448 | 8/31/2005 11:15 | 0.0096 | 371 | 0.294 | 8.16 | 4.63 | 0.018 | 0.0061 | 0.455 | 0.038 | 0.05 | 0.186 | 0.49 | 0.94 | 497 | 0.005 | 183 | 0.55 | 0.129 | 25.2 | 0.076 | 96.4 |
| L46 | 454 | 10/3/2001 16:15 | 0.01 | 1938 | 1.43 | 43.3 | 0.02 | 0.02 | 26.2 | 5.83 | 0.01 | 0.94 | 0.43 | 2.6 | 1.89 | 3420 | | | 9.8 | | 35.3 | 0.21 | |
| L46 | 454 | 8/28/2003 7:40 | 0.029 | 3472 | 2.9 | 69.3 | 0.02 | 0.027 | 30.7 | 5.13 | 0.01 | 0.3 | 1.07 | 4.64 | 4.7 | 6528 | | | 8.3 | | 77.6 | 0.48 | |
| L46 | 454 | 9/1/2004 12:30 | 0.0217 | 2160 | 2.11 | 58 | 0.11 | 0.0266 | 28.4 | 4.85 | 0.0184 | 0.22 | 0.918 | 3.13 | 2.01 | 4310 | | | 9.9 | | 78.7 | 0.257 | |
| L46 | 454 | 8/27/2005 17:00 | 0.0084 | 614 | 1.23 | 31.4 | 20.3 | 0.06 | 0.0118 | 5.09 | 0.026 | 0.05 | 0.65 | 1.78 | 1.55 | 2330 | | | 6.3 | | 50.7 | 0.293 | |
| L47 | 455 | 10/3/2001 14:30 | 0.02 | 6410 | 1.89 | 83.2 | 0.2 | 0.027 | 27.3 | 6.77 | 0.16 | 0.6 | 2.2 | 7.3 | 3.4 | 4582 | | | 11.7 | | 119 | 0.21 | |
| L47 | 455 | 8/28/2003 8:50 | 0.015 | 2201 | 1.17 | 40 | 0.05 | 0.025 | 25 | 4.6 | 0.04 | 0.3 | 0.78 | 2.9 | 2.6 | 2248 | | | 7.1 | | 22.5 | 0.26 | |
| L47 | 455 | 9/1/2004 10:30 | 0.0098 | 1080 | 1.13 | 32.3 | 0.08 | 0.0148 | 21.6 | 6.2 | 0.0183 | 1.47 | 0.909 | 1.52 | 1.61 | 2040 | | | 6.7 | | 54.5 | 0.23 | |
| L47 | 455 | 8/27/2005 14:20 | 0.0068 | 666 | 0.729 | 30.9 | 26.2 | 0.054 | 0.0148 | 5.14 | 0.031 | 0.05 | 0.446 | 1.17 | 1.23 | 1080 | | | 5.7 | | 29.7 | 0.165 | |
| L49 | 457 | 10/3/2001 13:45 | 0.024 | 1843 | 1.08 | 48.6 | 0.11 | 0.021 | 30 | 5.5 | 0.07 | 1.6 | 0.69 | 2.6 | 2.47 | 2181 | | | 9.9 | | 41.8 | 0.37 | |
| L49 | 457 | 8/28/2003 8:45 | 0.018 | 816 | 1.26 | 32.1 | 0.1 | 0.014 | 24 | 4.6 | 0.06 | 0.3 | 0.45 | 2.2 | 3.42 | 2160 | | | 8.2 | | 29 | 0.56 | |
| L49 | 457 | 9/1/2004 13:00 | 0.0116 | 864 | 1.36 | 35.6 | 0.081 | 0.0162 | 25.7 | 5.9 | 0.054 | 1.19 | 0.948 | 1.51 | 1.91 | 3040 | | | 8.6 | | 92.8 | 0.492 | |
| L49 | 457 | 8/27/2005 16:00 | 0.0079 | 398 | 0.89 | 29.6 | 19 | 0.066 | 0.0114 | 4.94 | 0.048 | 0.54 | 0.67 | 0.97 | 1.4 | 1760 | | | 6.3 | | 74 | 0.293 | |
| L60 | 464 | 10/3/2001 15:00 | 0.008 | 60.9 | 0.73 | 19.1 | 0.02 | 0.0025 | 19.8 | 6.9 | 0.01 | 2.4 | 0.17 | 0.43 | 0.58 | 1220 | | | 6 | | 26 | 0.26 | |
| L60 | 464 | 8/28/2003 7:35 | 0.0025 | 45.1 | 0.94 | 16.4 | 0.02 | 0.0025 | 22.1 | 6.6 | 0.01 | 0.3 | 0.16 | 0.42 | 0.9 | 1099 | | | 6.1 | | 35.7 | 0.36 | |
| L60 | 464 | 9/1/2004 13:30 | 0.003 | 27.5 | 1.12 | 18.7 | 0.014 | 0.0063 | 19.5 | 6.86 | 0.0036 | 1.82 | 0.324 | 0.25 | 0.367 | 1620 | | | 6.9 | | 98.9 | 0.436 | |

Shaded values are less than detection limits.

Table H.2-2 (Cont'd., 6 of 8)

| RAMP Name | No _x -So _x GIS No. | Date/Time | Ni-T | P-T | Pb-T | S-T | Sb-T | Se-T | Si-T | Sn-T | Sr-T | Th-T | Ti-T | Tl-T | U-T | V-T | Zn-T |
|-----------|--|-----------------|--------|------|--------|------|--------|------|------|--------|------|--------|-------|--------|--------|-------|------|
| P7 | 209 | 8/31/2005 9:20 | 0.33 | 29.5 | 0.0443 | 0.73 | 0.0073 | 0.05 | 0.86 | 0.015 | 8.97 | 0.0023 | 0.56 | 0.0019 | 0.0009 | 0.229 | 11.1 |
| 4 | 270 | 8/29/2003 13:15 | 0.03 | | 0.076 | | 0.03 | 0.25 | | 0.05 | 58.7 | 0.007 | 0.7 | 0.0015 | 0.004 | 0.24 | 1.21 |
| 4 | 270 | 8/24/2004 8:50 | 0.0025 | | 0.0549 | | 0.015 | 0.13 | | 0.03 | 51.3 | 0.0036 | 0.9 | 0.0011 | 0.004 | 0.141 | 1.69 |
| 4 | 270 | 8/28/2005 0:00 | 0.0025 | | 0.0556 | | 0.014 | 0.14 | | 0.0305 | 57.4 | 0.0021 | 0.9 | 0.0002 | 0.0058 | 0.154 | 2.09 |
| 6 | 271 | 8/28/2003 8:10 | 0.09 | | 0.044 | | 0.039 | 0.25 | | 0.05 | 55.1 | 0.0015 | 1.2 | 0.0015 | 0.033 | 0.25 | 4.68 |
| 6 | 271 | 8/26/2004 12:55 | 0.0025 | | 0.014 | | 0.0152 | 0.05 | | 0.059 | 49.9 | 0.0117 | 0.103 | 0.0005 | 0.0106 | 0.115 | 4.08 |
| 6 | 271 | 9/23/2004 15:10 | 0.0025 | | 0.076 | | 0.0154 | 0.05 | | 0.015 | 51.5 | 0.0122 | 0.26 | 0.0021 | 0.0093 | 0.08 | 1.48 |
| 6 | 271 | 8/29/2005 15:00 | 0.0025 | | 0.0267 | | 0.0089 | 0.05 | | 0.015 | 52.1 | 0.0013 | 0.49 | 0.0004 | 0.0053 | 0.071 | 2.02 |
| KEARL | 418 | 8/24/2004 15:04 | 0.06 | | 0.0314 | | 0.0231 | 0.18 | | 0.038 | 55.1 | 0.0011 | 0.75 | 0.0011 | 0.0064 | 0.257 | 3.56 |
| KEARL | 418 | 8/30/2005 8:55 | 0.26 | 37.4 | 0.0485 | 2.09 | 0.0191 | 0.05 | 3.98 | 0.015 | 55.1 | 0.0013 | 1.3 | 0.0018 | 0.0063 | 0.251 | 1.24 |
| L18 | 436 | 9/13/2001 12:00 | 0.59 | | 0.582 | | 0.09 | 0.5 | | 0.05 | 38.3 | 0.005 | 0.6 | 0.0015 | 0.013 | 0.15 | 3.35 |
| L18 | 436 | 8/28/2003 8:55 | 0.72 | | 0.088 | | 0.09 | 0.25 | | 0.05 | 37.5 | 0.004 | 0.1 | 0.0015 | 0.005 | 0.09 | 2.59 |
| L18 | 436 | 8/29/2004 8:45 | 0.62 | | 0.0212 | | 0.076 | 0.05 | | 0.015 | 36.9 | 0.0004 | 0.13 | 0.0002 | 0.0109 | 0.05 | 3.5 |
| L18 | 436 | 8/27/2005 10:58 | 0.66 | | 0.0206 | | 0.0683 | 0.13 | | 0.015 | 42.6 | 0.0027 | 0.44 | 0.0021 | 0.0105 | 0.071 | 10.3 |
| L23 | 442 | 10/3/2001 15:30 | 0.48 | | 0.054 | | 0.034 | 0.25 | | 1.06 | 14.3 | 0.005 | 0.1 | 0.0015 | 0.012 | 0.16 | 1.91 |
| L23 | 442 | 8/28/2003 7:55 | 1.88 | | 0.093 | | 0.011 | 0.25 | | 0.05 | 13.8 | 0.005 | 0.4 | 0.0015 | 0.006 | 0.14 | 1.65 |
| L23 | 442 | 8/29/2004 10:25 | 0.5 | | 0.0297 | | 0.0238 | 0.05 | | 0.015 | 14.1 | 0.0115 | 0.391 | 0.0004 | 0.0059 | 0.086 | 1.39 |
| L23 | 442 | 8/27/2005 17:45 | 0.55 | | 0.0328 | | 0.0211 | 0.05 | | 0.015 | 16.1 | 0.0085 | 0.56 | 0.0017 | 0.0075 | 0.132 | 4.45 |
| L25 | 444 | 9/13/2001 10:30 | 0.56 | | 0.323 | | 0.072 | 0.7 | | 0.05 | 18.6 | 0.005 | 3 | 0.0015 | 0.02 | 0.39 | 3.31 |
| L25 | 444 | 8/28/2003 8:40 | 1.08 | | 0.149 | | 0.04 | 0.25 | | 0.05 | 16.7 | 0.006 | 0.8 | 0.0015 | 0.011 | 0.32 | 1.93 |
| L25 | 444 | 8/29/2004 9:40 | 0.46 | | 0.1 | | 0.0486 | 0.12 | | 0.015 | 17.4 | 0.0037 | 0.55 | 0.0026 | 0.0127 | 0.238 | 3.72 |
| L25 | 444 | 8/27/2005 12:30 | 0.36 | | 0.0369 | | 0.05 | 0.05 | | 0.033 | 20.5 | 0.0046 | 0.31 | 0.0025 | 0.0117 | 0.127 | 2.5 |
| L28 | 447 | 10/3/2001 13:00 | 1.88 | | 0.48 | | 0.02 | 0.25 | | 2.03 | 15.7 | 0.138 | 15.5 | 0.016 | 0.09 | 3.32 | 7.6 |
| L28 | 447 | 8/28/2003 7:05 | 1.7 | | 0.612 | | 0.02 | 0.25 | | 0.05 | 15.2 | 0.084 | 13 | 0.04 | 0.077 | 2.2 | 6.8 |
| L28 | 447 | 9/1/2004 11:15 | 1.74 | | 0.397 | | 0.03 | 0.14 | | 0.015 | 13.8 | 0.053 | 4.6 | 0.0053 | 0.0485 | 1.06 | 6.26 |
| L28 | 447 | 8/27/2005 13:30 | 1.54 | | 0.238 | | 0.028 | 0.18 | | 0.0302 | 15.4 | 0.0644 | 4 | 0.0056 | 0.0393 | 1.08 | 6.33 |
| L29 | 448 | 10/3/2001 11:45 | 0.96 | | 0.487 | | 0.022 | 0.25 | | 2.14 | 3.83 | 0.063 | 21 | 0.02 | 0.057 | 4.33 | 6 |
| L29 | 448 | 8/28/2003 7:30 | 0.42 | | 0.37 | | 0.01 | 0.25 | | 0.05 | 3.3 | 0.021 | 13 | 0.0015 | 0.03 | 1.76 | 6.5 |
| L29 | 448 | 8/25/2004 12:10 | 0.375 | | 0.115 | | 0.0219 | 0.14 | | 0.0466 | 2.61 | 0.0098 | 1.54 | 0.0053 | 0.0119 | 0.481 | 6.38 |
| L29 | 448 | 8/31/2005 11:15 | 1 | 46.4 | 0.205 | 0.48 | 0.0197 | 0.05 | 1.5 | 0.015 | 3.2 | 0.0268 | 5.8 | 0.0114 | 0.0209 | 1.23 | 7.32 |
| L46 | 454 | 10/3/2001 16:15 | 3.2 | | 0.808 | | 0.092 | 0.25 | | 1.64 | 35.9 | 0.235 | 28 | 0.017 | 0.14 | 6.3 | 8.6 |
| L46 | 454 | 8/28/2003 7:40 | 5.6 | | 1.87 | | 0.13 | 0.8 | | 0.107 | 35 | 0.61 | 79 | 0.012 | 0.34 | 11.5 | 14 |
| L46 | 454 | 9/1/2004 12:30 | 3.26 | | 1.5 | | 0.121 | 0.2 | | 0.077 | 29.3 | 0.333 | 41 | 0.029 | 0.171 | 8.55 | 9.37 |
| L46 | 454 | 8/27/2005 17:00 | 3.92 | | 0.528 | | 0.077 | 0.19 | | 0.045 | 34.9 | 0.188 | 17 | 0.0125 | 0.12 | 3.04 | 8.8 |
| L47 | 455 | 10/3/2001 14:30 | 8.4 | | 2.34 | | 0.118 | 0.25 | | 2.1 | 37 | 0.72 | 60 | 0.077 | 0.351 | 15.5 | 30.1 |
| L47 | 455 | 8/28/2003 8:50 | 3.8 | | 1.39 | | 0.1 | 0.6 | | 0.05 | 27 | 0.18 | 34 | 0.008 | 0.19 | 6.2 | 10.6 |
| L47 | 455 | 9/1/2004 10:30 | 3.89 | | 0.986 | | 0.086 | 0.23 | | 0.053 | 28.3 | 0.0914 | 12.1 | 0.0168 | 0.104 | 4.37 | 9.75 |
| L47 | 455 | 8/27/2005 14:20 | 3.31 | | 0.603 | | 0.098 | 0.21 | | 0.015 | 29.6 | 0.087 | 11.3 | 0.0127 | 0.103 | 3.02 | 9.25 |
| L49 | 457 | 10/3/2001 13:45 | 5.2 | | 0.93 | | 0.2 | 0.25 | | 2.2 | 32.1 | 0.34 | 32 | 0.023 | 0.265 | 6.86 | 13.5 |
| L49 | 457 | 8/28/2003 8:45 | 3.4 | | 0.692 | | 0.09 | 0.6 | | 0.05 | 32.2 | 0.16 | 14 | 0.0015 | 0.21 | 3 | 6.6 |
| L49 | 457 | 9/1/2004 13:00 | 4.04 | | 0.82 | | 0.12 | 0.25 | | 0.038 | 29.2 | 0.136 | 13.9 | 0.0182 | 0.189 | 4.35 | 9.01 |
| L49 | 457 | 8/27/2005 16:00 | 3.94 | | 0.392 | | 0.095 | 0.25 | | 0.043 | 31 | 0.138 | 6.4 | 0.0116 | 0.17 | 2.05 | 6.9 |
| L60 | 464 | 10/3/2001 15:00 | 1.49 | | 0.139 | | 0.045 | 0.25 | | 1.18 | 34.4 | 0.022 | 1 | 0.0015 | 0.052 | 0.52 | 3.2 |
| L60 | 464 | 8/28/2003 7:35 | 1.77 | | 0.18 | | 0.04 | 0.25 | | 0.05 | 34.5 | 0.026 | 0.5 | 0.0015 | 0.042 | 0.4 | 2.33 |
| L60 | 464 | 9/1/2004 13:30 | 1.47 | | 0.0724 | | 0.046 | 0.2 | | 0.015 | 32.7 | 0.0265 | 1.03 | 0.0019 | 0.0345 | 0.425 | 1.97 |

Shaded values are less than detection limits.

Table H.2-2 (Cont'd., 7 of 8)

| RAMP Name | No _x -So _x GIS No. | Date/Time | Ag-T | Al-T | As-T | Ba-T | Be-T | Bi-T | B-T | Ca-T | Cd-T | Cl-T | Co-T | Cr-T | Cu-T | Fe-T | Hg-T | K-T | Li-T | Mg-T | Mn-T | Mo-T | Na-T |
|-----------|--|-----------------|--------|------|-------|------|--------|--------|--------|------|--------|------|--------|-------|-------|------|-------|------|------|------|------|--------|------|
| L60 | 464 | 8/27/2005 15:00 | 0.0036 | 59.8 | 0.863 | 20.6 | 18.9 | 0.021 | 0.003 | 5.71 | 0.0083 | 0.05 | 0.302 | 0.281 | 0.476 | 1330 | | | 5.7 | | 89 | 0.284 | |
| P13 | 175 | 9/1/2003 8:25 | 0.0025 | 73.9 | 0.9 | 24.8 | 0.02 | 0.0025 | 62 | 11.9 | 0.01 | 0.3 | 0.13 | 0.42 | 1.74 | 550 | | | 12.4 | | 134 | 0.15 | |
| P13 | 175 | 8/25/2004 12:00 | 0.0028 | 51.2 | 1.06 | 21 | 0.01 | 0.0022 | 62 | 11.7 | 0.0103 | 1.02 | 0.121 | 0.187 | 0.317 | 365 | | | 15.3 | | 65.3 | 0.132 | |
| P13 | 175 | 8/31/2005 12:50 | 0.0028 | 77 | 0.9 | 22.7 | 55.7 | 0.019 | 0.0043 | 11.6 | 0.0104 | 0.13 | 0.117 | 0.18 | 0.329 | 587 | 0.005 | 769 | 14 | 4.61 | 116 | 0.0695 | 7240 |
| P49 | 199 | 9/1/2003 8:15 | 0.0025 | 72.9 | 0.34 | 12.6 | 0.02 | 0.0025 | 6.3 | 2.51 | 0.01 | 0.3 | 0.074 | 0.2 | 1.26 | 196 | | | 1 | | 26.2 | 0.09 | |
| P49 | 199 | 8/25/2004 12:20 | 0.0069 | 49 | 0.441 | 12.1 | 0.006 | 0.0012 | 3.84 | 3.16 | 0.03 | 1.48 | 0.143 | 0.18 | 0.286 | 432 | | | 0.7 | | 46 | 0.104 | |
| P49 | 199 | 8/31/2005 11:50 | 0.0025 | 80 | 0.4 | 12.4 | 5.7 | 0.011 | 0.0029 | 2.71 | 0.018 | 0.05 | 0.156 | 0.16 | 0.534 | 336 | 0.005 | 436 | 0.88 | 1.11 | 45.1 | 0.101 | 272 |
| A301 | 473 | 10/5/2001 13:30 | 0.008 | 10.7 | 0.15 | 7.3 | 0.02 | 0.0025 | 6.8 | 6.74 | 0.01 | 1.5 | 0.02 | 0.05 | 0.21 | 157 | | | 1.5 | | 17.8 | 0.08 | |
| A301 | 473 | 8/29/2003 11:45 | 0.0025 | 7.3 | 0.18 | 7.6 | 0.02 | 0.0025 | 6.1 | 5.6 | 0.01 | 0.8 | 0.01 | 0.4 | 0.75 | 240 | | | 1.1 | | 34.2 | 0.11 | |
| A301 | 473 | 8/30/2004 11:55 | 0.0028 | 0.25 | 0.161 | 7.34 | 0.006 | 0.0017 | 6.2 | 6.32 | 0.001 | 2.3 | 0.013 | 0.02 | 0.025 | 145 | | | 0.8 | | 18.3 | 0.054 | |
| A301 | 473 | 9/7/2005 10:30 | 0.0012 | 19.5 | 0.181 | 8.14 | 10 | 0.005 | 0.0012 | 6.04 | 0.013 | 1.18 | 0.026 | 0.13 | 0.272 | 115 | 0.005 | 1020 | 1.5 | 2.07 | 17.3 | 0.067 | 1290 |
| L107 | 118 | 10/5/2001 10:15 | 0.0025 | 6.8 | 0.15 | 4.45 | 0.02 | 0.0025 | 6.7 | 7.86 | 0.01 | 2.9 | 0.04 | 0.05 | 0.75 | 24 | | | 2 | | 32.1 | 0.55 | |
| L107 | 118 | 8/29/2003 12:00 | 0.0025 | 10.8 | 0.17 | 4.5 | 0.02 | 0.0025 | 6.6 | 7.52 | 0.01 | 2.6 | 0.01 | 0.25 | 1.05 | 9 | | | 1.9 | | 6.3 | 0.49 | |
| L107 | 118 | 8/30/2004 10:10 | 0.0015 | 5.3 | 0.182 | 4.29 | 0.0015 | 0.0005 | 6.9 | 8.25 | 0.0035 | 2.79 | 0.0014 | 0.14 | 0.136 | 3.4 | | | 2.64 | | 6.08 | 0.471 | |
| L107 | 118 | 9/7/2005 9:20 | 0.0013 | 32.3 | 0.199 | 4.37 | 7.9 | 0.003 | 0.0013 | 7.9 | 0.0081 | 2.74 | 0.0112 | 0.129 | 0.201 | 23 | 0.005 | 992 | 2.57 | 1.44 | 8.71 | 0.485 | 1730 |
| L109 | 84 | 10/5/2001 11:30 | 0.0025 | 34.2 | 0.2 | 8.5 | 0.02 | 0.0025 | 8.1 | 6.57 | 0.01 | 2.7 | 0.05 | 0.3 | 0.33 | 842 | | | 1.2 | | 44.5 | 0.06 | |
| L109 | 84 | 8/29/2003 10:00 | 0.0025 | 70.8 | 0.28 | 9 | 0.02 | 0.008 | 8.2 | 5.84 | 0.01 | 1.5 | 0.071 | 0.46 | 1.66 | 750 | | | 1.3 | | 32.6 | 0.11 | |
| L109 | 84 | 8/30/2004 13:15 | 0.0022 | 52.5 | 0.222 | 8.74 | 0.009 | 0.0014 | 6.85 | 6.08 | 0.001 | 3.01 | 0.046 | 0.38 | 0.231 | 760 | | | 1.2 | | 26.3 | 0.079 | |
| L109 | 84 | 9/7/2005 11:30 | 0.002 | 54 | 0.235 | 8.34 | 7.16 | 0.01 | 0.0021 | 5.73 | 0.019 | 1.74 | 0.054 | 0.311 | 0.325 | 648 | 0.005 | 487 | 1.17 | 1.76 | 19.2 | 0.076 | 1570 |
| O-10 | 88 | 10/5/2001 12:15 | 0.0025 | 130 | 0.23 | 9.6 | 0.02 | 0.0025 | 7.4 | 3.41 | 0.01 | 1.41 | 0.1 | 0.4 | 0.6 | 610 | | | 1 | | 41.6 | 0.09 | |
| O-10 | 88 | 8/29/2003 12:15 | 0.0025 | 74.6 | 0.25 | 10.5 | 0.02 | 0.0025 | 6.1 | 4.45 | 0.01 | 1.2 | 0.18 | 1.01 | 1.06 | 219 | | | 1 | | 8.9 | 0.09 | |
| O-10 | 88 | 8/30/2004 12:44 | 0.0016 | 76.1 | 0.194 | 9.47 | 0.007 | 0.018 | 5.2 | 4.65 | 0.0023 | 2.32 | 0.047 | 0.37 | 0.39 | 181 | | | 0.84 | | 9.92 | 0.034 | |
| R1 | 90 | 10/5/2001 12:45 | 0.0025 | 11.2 | 0.13 | 5.7 | 0.02 | 0.0025 | 6.6 | 4.9 | 0.01 | 1.8 | 0.04 | 0.05 | 0.27 | 292 | | | 1.1 | | 21.4 | 0.01 | |
| R1 | 90 | 8/29/2003 13:00 | 0.0025 | 13.6 | 0.29 | 5.47 | 0.02 | 0.012 | 4.5 | 4.68 | 0.01 | 2.1 | 0.01 | 0.31 | 0.46 | 323 | | | 0.8 | | 30.4 | 0.02 | |
| R1 | 90 | 8/30/2004 11:10 | 0.0015 | 13.2 | 0.186 | 6.32 | 0.006 | 0.0017 | 5.5 | 4.92 | 0.004 | 2.62 | 0.028 | 0.223 | 0.173 | 524 | | | 1.11 | | 35.5 | 0.0173 | |
| R1 | 90 | 9/7/2005 10:55 | 0.0011 | 26.2 | 0.195 | 6.44 | 7.97 | 0.004 | 0.0014 | 4.78 | 0.0128 | 1.19 | 0.043 | 0.171 | 0.249 | 400 | 0.005 | 759 | 1.11 | 1.42 | 26.9 | 0.076 | 1260 |
| E52 | 146 | 10/4/2001 11:45 | 0.0025 | 101 | 0.78 | 20.4 | 0.02 | 0.0025 | 7.9 | 8.6 | 0.04 | 0.3 | 0.11 | 0.3 | 1.22 | 903 | | | 2.4 | | 22.4 | 0.17 | |
| E52 | 146 | 8/29/2003 10:15 | 0.008 | 73 | 0.66 | 18.9 | 0.05 | 0.0025 | 10 | 8.19 | 0.01 | 0.3 | 0.073 | 0.85 | 1.09 | 757 | | | 2.8 | | 14.6 | 0.22 | |
| E52 | 146 | 8/29/2004 12:10 | 0.0003 | 68.2 | 0.628 | 20.3 | 0.016 | 0.0005 | 8.77 | 8.85 | 0.009 | 2.71 | 0.1 | 0.373 | 0.793 | 732 | | | 2.39 | | 27.5 | 0.152 | |
| E52 | 146 | 9/8/2005 9:55 | 0.0024 | 105 | 0.63 | 19.3 | 9.3 | 0.026 | 0.0039 | 8.24 | 0.017 | 0.05 | 0.0983 | 0.292 | 0.85 | 721 | 0.031 | 577 | 3 | 1.63 | 16.1 | 0.586 | 806 |
| E59 | 152 | 10/4/2001 13:30 | 0.0025 | 61.5 | 0.35 | 16.4 | 0.02 | 0.0025 | 6.7 | 4.46 | 0.07 | 0.3 | 0.08 | 0.05 | 0.87 | 292 | | | 1.5 | | 7 | 0.06 | |
| E59 | 152 | 8/29/2003 10:30 | 0.005 | 28.5 | 0.36 | 16 | 0.4 | 0.0025 | 5.2 | 4.16 | 0.03 | 0.6 | 0.07 | 0.24 | 1.88 | 186 | | | 1.1 | | 9.25 | 0.105 | |
| E59 | 152 | 8/29/2004 12:40 | 0.0003 | 15 | 0.391 | 16.9 | 0.005 | 0.0005 | 4.24 | 4.7 | 0.0049 | 0.54 | 0.061 | 0.132 | 0.49 | 190 | | | 1.32 | | 9.04 | 0.095 | |
| E59 | 152 | 9/8/2005 11:00 | 0.0013 | 44 | 0.381 | 16.8 | 7.18 | 0.016 | 0.002 | 4.39 | 0.01 | 0.18 | 0.0732 | 0.13 | 0.56 | 196 | 0.042 | 332 | 1.77 | 1.02 | 8.74 | 0.098 | 390 |
| E68 | 89 | 10/4/2001 14:00 | 0.005 | 255 | 0.74 | 21.5 | 0.02 | 0.0025 | 6.9 | 6.5 | 0.03 | 0.61 | 0.21 | 0.4 | 1.01 | 1266 | | | 2.4 | | 12 | 0.13 | |
| E68 | 89 | 8/29/2003 13:45 | 0.014 | 1054 | 1.19 | 31.4 | 0.02 | 0.011 | 10 | 5.69 | 0.05 | 0.3 | 0.48 | 1.57 | 3.01 | 2228 | | | 3.5 | | 28.2 | 0.25 | |
| E68 | 89 | 8/29/2004 14:10 | 0.0003 | 83 | 0.554 | 20.3 | 0.01 | 0.0005 | 7.6 | 5.39 | 0.0158 | 1.83 | 0.158 | 0.29 | 0.89 | 463 | | | 2.21 | | 7.07 | 0.196 | |
| E68 | 89 | 9/8/2005 11:30 | 0.0035 | 173 | 0.68 | 22.2 | 8 | 0.024 | 0.0047 | 6 | 0.0277 | 0.05 | 0.185 | 0.37 | 0.94 | 827 | 0.054 | 263 | 2.6 | 1.57 | 11.1 | 0.165 | 820 |
| O-1/E55 | 91 | 10/4/2001 15:45 | 0.0025 | 182 | 0.38 | 10.9 | 0.02 | 0.0025 | 5.7 | 3.44 | 0.021 | 0.74 | 0.08 | 0.2 | 0.56 | 570 | | | 0.8 | | 15.2 | 0.05 | |
| O-1/E55 | 91 | 8/29/2003 14:00 | 0.0025 | 126 | 0.45 | 10.4 | 0.02 | 0.005 | 4.7 | 3.36 | 0.01 | 0.3 | 0.12 | 0.51 | 3.15 | 484 | | | 1 | | 18.8 | 0.07 | |
| O-1/E55 | 91 | 8/29/2004 15:35 | 0.0003 | 101 | 0.382 | 10.3 | 0.01 | 0.0005 | 4.17 | 3.75 | 0.0078 | 1.38 | 0.081 | 0.25 | 0.282 | 285 | | | 0.61 | | 16.2 | 0.042 | |
| O-1/E55 | 91 | 9/8/2005 13:00 | 0.0036 | 169 | 0.409 | 12.1 | 5.9 | 0.01 | 0.0045 | 3.46 | 0.052 | 0.05 | 0.115 | 0.7 | 0.5 | 387 | 0.074 | 187 | 0.86 | 0.72 | 21.8 | 0.078 | 267 |
| O-2 E67 | 97 | 10/4/2001 14:45 | 0.0063 | 109 | 0.52 | 14.3 | 0.02 | 0.0025 | 4.3 | 5.6 | 0.025 | 0.3 | 0.08 | 0.17 | 0.7 | 953 | | | 0.9 | | 16.6 | 0.07 | |
| O-2 E67 | 97 | 8/29/2003 10:45 | 0.0025 | 98 | 0.53 | 13.6 | 0.02 | 0.015 | 6.6 | 5 | 0.01 | 0.3 | 0.08 | 0.32 | 2.2 | 979 | | | 1.3 | | 24.7 | 0.07 | |
| O-2 E67 | 97 | 8/29/2004 14:35 | 0.0003 | 59 | 0.592 | 13.4 | 0.008 | 0.0018 | 3.86 | 5.61 | 0.008 | 3.75 | 0.075 | 0.3 | 0.473 | 979 | | | 0.94 | | 21.6 | 0.075 | |

Shaded values are less than detection limits.

Table H.2-2 (Cont'd., 8 of 8)

| RAMP Name | No _x -So _x GIS No. | Date/Time | Ni-T | P-T | Pb-T | S-T | Sb-T | Se-T | Si-T | Sn-T | Sr-T | Th-T | Ti-T | Tl-T | U-T | V-T | Zn-T |
|-----------|--|-----------------|--------|------|--------|------|--------|------|-------|-------|------|--------|------|--------|--------|--------|------|
| L60 | 464 | 8/27/2005 15:00 | 1.72 | | 0.116 | | 0.046 | 0.16 | | 0.038 | 34.4 | 0.037 | 1.5 | 0.0025 | 0.05 | 0.431 | 3.49 |
| P13 | 175 | 9/1/2003 8:25 | 0.32 | | 0.522 | | 0.03 | 0.25 | | 0.05 | 74.8 | 0.007 | 1.7 | 0.0015 | 0.018 | 0.73 | 3.42 |
| P13 | 175 | 8/25/2004 12:00 | 0.244 | | 0.133 | | 0.033 | 0.05 | | 0.07 | 73.4 | 0.008 | 1.93 | 0.0011 | 0.0179 | 0.562 | 3.18 |
| P13 | 175 | 8/31/2005 12:50 | 0.24 | 303 | 0.154 | 2.69 | 0.0227 | 0.13 | 1.03 | 0.015 | 75.1 | 0.015 | 2.2 | 0.0032 | 0.0182 | 0.525 | 2.06 |
| P49 | 199 | 9/1/2003 8:15 | 0.25 | | 0.16 | | 0.039 | 0.25 | | 0.05 | 8 | 0.0015 | 0.1 | 0.0015 | 0.008 | 0.41 | 1.67 |
| P49 | 199 | 8/25/2004 12:20 | 0.27 | | 0.0463 | | 0.025 | 0.14 | | 0.015 | 8.91 | 0.0051 | 0.33 | 0.0035 | 0.0094 | 0.284 | 2.5 |
| P49 | 199 | 8/31/2005 11:50 | 0.33 | 61 | 0.198 | 0.76 | 0.0186 | 0.05 | 0.37 | 0.015 | 8.43 | 0.0045 | 0.92 | 0.0044 | 0.0143 | 0.319 | 2.01 |
| A301 | 473 | 10/5/2001 13:30 | 0.03 | | 0.04 | | 0.007 | 0.25 | | 0.99 | 30.8 | 0.0015 | 0.5 | 0.0015 | 0.035 | 0.08 | 0.79 |
| A301 | 473 | 8/29/2003 11:45 | 0.1 | | 0.102 | | 0.012 | 0.25 | | 0.05 | 29.1 | 0.0015 | 0.3 | 0.0015 | 0.05 | 0.1 | 0.52 |
| A301 | 473 | 8/30/2004 11:55 | 0.047 | | 0.0291 | | 0.0087 | 0.05 | | 0.045 | 30.3 | 0.0094 | 0.46 | 0.0009 | 0.054 | 0.0025 | 1.65 |
| A301 | 473 | 9/7/2005 10:30 | 0.12 | 27.1 | 0.0708 | 1.07 | 0.0111 | 0.05 | 1.64 | 0.015 | 30.5 | 0.0022 | 0.86 | 0.0017 | 0.0566 | 0.102 | 1.52 |
| L107 | 118 | 10/5/2001 10:15 | 0.03 | | 0.07 | | 0.005 | 0.25 | | 1.42 | 41.4 | 0.0015 | 0.3 | 0.0015 | 0.36 | 0.07 | 1.33 |
| L107 | 118 | 8/29/2003 12:00 | 0.03 | | 0.153 | | 0.02 | 0.25 | | 0.05 | 40.3 | 0.003 | 0.1 | 0.011 | 0.36 | 0.06 | 3.58 |
| L107 | 118 | 8/30/2004 10:10 | 0.0025 | | 0.042 | | 0.0168 | 0.13 | | 0.043 | 39.8 | 0.0056 | 0.13 | 0.0012 | 0.331 | 0.014 | 1.45 |
| L107 | 118 | 9/7/2005 9:20 | 0.05 | 14.8 | 0.149 | 0.68 | 0.016 | 0.05 | 0.312 | 0.015 | 44.2 | 0.0035 | 0.54 | 0.0019 | 0.39 | 0.094 | 1.63 |
| L109 | 84 | 10/5/2001 11:30 | 0.13 | | 0.052 | | 0.002 | 0.25 | | 1.15 | 33.8 | 0.014 | 0.8 | 0.0015 | 0.086 | 0.25 | 0.54 |
| L109 | 84 | 8/29/2003 10:00 | 0.47 | | 0.194 | | 0.013 | 0.25 | | 0.05 | 31 | 0.009 | 1.2 | 0.0015 | 0.116 | 0.26 | 1.96 |
| L109 | 84 | 8/30/2004 13:15 | 0.283 | | 0.0279 | | 0.0105 | 0.13 | | 0.015 | 30.1 | 0.0139 | 1.09 | 0.0014 | 0.12 | 0.218 | 0.62 |
| L109 | 84 | 9/7/2005 11:30 | 0.296 | 23.1 | 0.13 | 0.53 | 0.0142 | 0.05 | 2.34 | 0.015 | 32.7 | 0.0066 | 2 | 0.0021 | 0.129 | 0.233 | 2.54 |
| O-10 | 88 | 10/5/2001 12:15 | 0.11 | | 0.177 | | 0.011 | 0.25 | | 1.3 | 22.8 | 0.031 | 1.6 | 0.0015 | 0.079 | 0.69 | 2.28 |
| O-10 | 88 | 8/29/2003 12:15 | 0.53 | | 0.095 | | 0.024 | 0.25 | | 0.05 | 21.7 | 0.0015 | 0.9 | 0.0052 | 0.042 | 0.16 | 1.91 |
| O-10 | 88 | 8/30/2004 12:44 | 0.214 | | 0.0218 | | 0.0132 | 0.18 | | 0.037 | 20.1 | 0.06 | 0.48 | 0.0026 | 0.037 | 0.152 | 1.9 |
| R1 | 90 | 10/5/2001 12:45 | 0.03 | | 0.045 | | 0.011 | 0.25 | | 1.61 | 26.3 | 0.0015 | 0.6 | 0.0015 | 0.025 | 0.11 | 0.55 |
| R1 | 90 | 8/29/2003 13:00 | 0.26 | | 0.146 | | 0.002 | 0.25 | | 0.05 | 26.4 | 0.017 | 0.6 | 0.012 | 0.03 | 0.23 | 1.24 |
| R1 | 90 | 8/30/2004 11:10 | 0.102 | | 0.0627 | | 0.0105 | 0.05 | | 0.058 | 25.1 | 0.0101 | 0.62 | 0.0009 | 0.0282 | 0.074 | 5.73 |
| R1 | 90 | 9/7/2005 10:55 | 0.19 | 18.8 | 0.117 | 0.73 | 0.0138 | 0.05 | 2.88 | 0.015 | 27.8 | 0.0041 | 1.3 | 0.0022 | 0.034 | 0.117 | 2.43 |
| E52 | 146 | 10/4/2001 11:45 | 1.31 | | 0.267 | | 0.037 | 0.25 | | 2.15 | 20.1 | 0.035 | 1.6 | 0.0015 | 0.122 | 0.5 | 4.3 |
| E52 | 146 | 8/29/2003 10:15 | 1.13 | | 0.172 | | 0.019 | 0.25 | | 0.05 | 19.4 | 0.018 | 1 | 0.0015 | 0.1 | 0.35 | 2.9 |
| E52 | 146 | 8/29/2004 12:10 | 1.08 | | 0.178 | | 0.041 | 0.05 | | 0.015 | 19.2 | 0.013 | 0.94 | 0.0008 | 0.0921 | 0.327 | 4.77 |
| E52 | 146 | 9/8/2005 9:55 | 1.35 | 41.3 | 0.181 | 1.09 | 0.038 | 0.05 | 1.3 | 0.015 | 20.3 | 0.0132 | 1.69 | 0.0025 | 0.11 | 0.408 | 2.89 |
| E59 | 152 | 10/4/2001 13:30 | 0.44 | | 0.112 | | 0.03 | 0.25 | | 1.38 | 9.53 | 0.011 | 2 | 0.0015 | 0.024 | 0.31 | 1.75 |
| E59 | 152 | 8/29/2003 10:30 | 0.77 | | 0.125 | | 0.03 | 0.7 | | 0.05 | 9.69 | 0.006 | 0.4 | 0.0015 | 0.026 | 0.2 | 2.2 |
| E59 | 152 | 8/29/2004 12:40 | 0.44 | | 0.0623 | | 0.0449 | 0.15 | | 0.015 | 9.83 | 0.008 | 0.31 | 0.0018 | 0.019 | 0.141 | 2.86 |
| E59 | 152 | 9/8/2005 11:00 | 0.53 | 34.6 | 0.072 | 1.03 | 0.044 | 0.05 | 0.44 | 0.06 | 10.6 | 0.0023 | 0.77 | 0.0039 | 0.0236 | 0.212 | 2.6 |
| E68 | 89 | 10/4/2001 14:00 | 1 | | 0.287 | | 0.031 | 0.25 | | 1.64 | 15.2 | 0.08 | 3.9 | 0.0015 | 0.085 | 1.16 | 5.5 |
| E68 | 89 | 8/29/2003 13:45 | 2 | | 0.72 | | 0.04 | 0.25 | | 0.05 | 15.1 | 0.098 | 12.6 | 0.014 | 0.2 | 3.04 | 8.9 |
| E68 | 89 | 8/29/2004 14:10 | 1.05 | | 0.13 | | 0.0604 | 0.13 | | 0.043 | 11.6 | 0.0056 | 1.4 | 0.0012 | 0.0526 | 0.48 | 4.3 |
| E68 | 89 | 9/8/2005 11:30 | 1.23 | 55.4 | 0.251 | 1.51 | 0.046 | 0.05 | 0.39 | 0.015 | 15.2 | 0.011 | 2.4 | 0.0046 | 0.075 | 0.72 | 7.2 |
| O-1/E55 | 91 | 10/4/2001 15:45 | 0.21 | | 0.246 | | 0.02 | 0.25 | | 2.02 | 7.9 | 0.016 | 4.1 | 0.0039 | 0.023 | 0.76 | 2.56 |
| O-1/E55 | 91 | 8/29/2003 14:00 | 0.31 | | 0.372 | | 0.017 | 0.25 | | 0.05 | 8.1 | 0.003 | 2.1 | 0.0015 | 0.0216 | 0.55 | 2.73 |
| O-1/E55 | 91 | 8/29/2004 15:35 | 0.17 | | 0.133 | | 0.018 | 0.11 | | 0.015 | 8.4 | 0.0056 | 1.5 | 0.0004 | 0.0141 | 0.308 | 2.23 |
| O-1/E55 | 91 | 9/8/2005 13:00 | 0.33 | 69 | 0.421 | 0.9 | 0.0198 | 0.05 | 0.58 | 0.015 | 9.1 | 0.0062 | 3.1 | 0.0027 | 0.0268 | 0.517 | 6.5 |
| O-2 E67 | 97 | 10/4/2001 14:45 | 0.56 | | 0.139 | | 0.009 | 0.25 | | 0.99 | 11 | 0.019 | 1.1 | 0.0015 | 0.05 | 0.36 | 4.48 |
| O-2 E67 | 97 | 8/29/2003 10:45 | 0.7 | | 0.317 | | 0.02 | 0.25 | | 0.05 | 10.2 | 0.026 | 1.8 | 0.009 | 0.05 | 0.32 | 2.56 |
| O-2 E67 | 97 | 8/29/2004 14:35 | 0.56 | | 0.126 | | 0.02 | 0.14 | | 0.05 | 10.3 | 0.0155 | 0.89 | 0.0002 | 0.0444 | 0.276 | 5.82 |

Shaded values are less than detection limits.

H.3 MEAN DISSOLVED METAL CONCENTRATIONS FOR EACH RAMP LAKE 2001-2005

Table H.3-1 Mean dissolved metal concentrations (µg/L) for each RAMP lake, 2001-2005.

| ID # | Lake | Silver | Alum. | Arsenic | Boron | Barium | Beryl. | Bismuth | Cadm. | Cobalt | Chrom. | Copper | Iron | Lithium | Mang. |
|--|-------|--------------------------|-------|---------|-------|--------|--------------|--------------|--------------|--------|--------|--------|-------------|---------|-------|
| | | 0.005^a | | | | | 0.003 | 0.005 | 0.002 | | | | 0.75 | | |
| Stony Mountains Sub-Region | | | | | | | | | | | | | | | |
| 168 | A21 | 0.0016 | 202 | 0.450 | 8.5 | 4.4 | 0.020 | 0.0056 | 0.081 | 0.368 | 0.413 | 0.67 | 796 | 0.74 | 51.3 |
| 169 | A24 | 0.0016 | 169 | 0.270 | 8.7 | 3.9 | 0.016 | 0.0059 | 0.034 | 0.355 | 0.326 | 0.60 | 556 | 0.74 | 57.8 |
| 170 | A26 | 0.0016 | 113 | 0.276 | 8.2 | 4.2 | 0.064 | 0.0053 | 0.028 | 0.276 | 0.243 | 0.42 | 445 | 0.82 | 48.2 |
| 168 | A29 | 0.0010 | 45 | 0.281 | 6.0 | 5.2 | 0.011 | 0.0020 | 0.009 | 0.045 | 0.120 | 0.22 | 63 | 0.52 | 12.4 |
| 166 | A86 | 0.0019 | 25 | 0.420 | 9.5 | 11.7 | 0.011 | 0.0035 | 0.006 | 0.053 | 0.147 | 0.24 | 75 | 0.75 | 3.1 |
| 287 | 25 | 0.0025 | 149 | 0.263 | 11.4 | 4.1 | 0.023 | 0.0076 | 0.041 | 0.359 | 0.686 | 0.86 | 501 | 0.41 | 64.0 |
| 289 | 27 | 0.0010 | 20 | 0.291 | 9.0 | 5.7 | 0.012 | 0.0059 | 0.026 | 0.027 | 0.117 | 0.45 | 40 | 0.60 | 1.2 |
| 290 | 28 | 0.0026 | 105 | 0.359 | 5.6 | 5.2 | 0.072 | 0.0032 | 0.030 | 0.130 | 0.267 | 0.69 | 399 | 1.20 | 26.7 |
| 342 | 82 | 0.0012 | 20 | 0.355 | 7.4 | 10.2 | 0.008 | 0.0045 | 0.009 | 0.042 | 0.173 | 0.40 | 11 | 2.29 | 1.4 |
| 354 | 94 | 0.0011 | 14 | 0.444 | 7.4 | 10.0 | 0.009 | 0.0019 | 0.003 | 0.025 | 0.161 | 0.30 | 15 | 1.03 | 1.1 |
| West of Fort McMurray Sub-Region | | | | | | | | | | | | | | | |
| 165 | A42 | 0.0013 | 10 | 0.537 | 11.3 | 13.5 | 0.008 | 0.0047 | 0.006 | 0.067 | 0.350 | 0.50 | 19 | 2.19 | 2.2 |
| 171 | A47 | 0.0010 | 15 | 0.457 | 9.8 | 13.7 | 0.008 | 0.0044 | 0.003 | 0.032 | 0.130 | 0.24 | 137 | 2.00 | 4.9 |
| 172 | A59 | 0.0014 | 55 | 0.316 | 7.3 | 15.4 | 0.012 | 0.0044 | 0.008 | 0.106 | 0.268 | 0.34 | 402 | 3.02 | 95.7 |
| 223 | P94 | 0.0003 | 7 | 0.268 | 11.3 | 36.2 | 0.003 | 0.0019 | 0.003 | 0.029 | 0.116 | 0.11 | 5 | 5.11 | 1.9 |
| 225 | P96 | 0.0003 | 13 | 0.356 | 13.4 | 11.0 | 0.002 | 0.0005 | 0.007 | 0.029 | 0.100 | 0.17 | 24 | 2.98 | 9.7 |
| 226 | P97 | 0.0006 | 41 | 0.300 | 9.9 | 10.8 | 0.002 | 0.0090 | 0.013 | 0.057 | 0.260 | 0.09 | 122 | 2.69 | 7.8 |
| 227 | P98 | 0.0003 | 5 | 0.286 | 8.6 | 9.1 | 0.004 | 0.0005 | 0.031 | 0.021 | 0.076 | 0.09 | 16 | 2.20 | 1.4 |
| 267 | 1 | 0.0022 | 3 | 0.238 | 14.1 | 11.1 | 0.008 | 0.0019 | 0.014 | 0.016 | 0.091 | 0.13 | 9 | 2.40 | 0.5 |
| Northeast of Fort McMurray Sub-Region | | | | | | | | | | | | | | | |
| 452 | L4 | 0.0014 | 43 | 0.300 | 5.3 | 2.8 | 0.012 | 0.0070 | 0.006 | 0.080 | 0.164 | 0.48 | 251 | 0.38 | 23.8 |
| 470 | L7 | 0.0018 | 168 | 0.321 | 9.9 | 3.6 | 0.016 | 0.0022 | 0.009 | 0.123 | 0.410 | 0.29 | 616 | 0.73 | 20.5 |
| 471 | L8 | 0.0014 | 17 | 0.370 | 11.8 | 13.1 | 0.066 | 0.0078 | 0.003 | 0.037 | 0.105 | 0.47 | 152 | 1.90 | 1.7 |
| 400 | L39 | 0.0014 | 27 | 0.096 | 3.4 | 6.1 | 0.015 | 0.0043 | 0.016 | 0.027 | 0.295 | 0.54 | 62 | 1.57 | 0.3 |
| 268 | E15 | 0.0012 | 8 | 0.346 | 6.8 | 8.1 | 0.032 | 0.0025 | 0.005 | 0.017 | 0.123 | 0.20 | 55 | 1.40 | 0.7 |
| 182 | P23 | 0.0014 | 11 | 0.320 | 23.6 | 7.7 | 0.011 | 0.0040 | 0.004 | 0.070 | 0.122 | 0.33 | 171 | 1.60 | 9.1 |
| 185 | P27 | 0.0014 | 58 | 0.281 | 4.0 | 2.7 | 0.013 | 0.0025 | 0.020 | 0.143 | 0.187 | 0.26 | 262 | 0.24 | 33.2 |
| 209 | P7 | 0.0014 | 32 | 0.492 | 5.0 | 2.9 | 0.012 | 0.0103 | 0.006 | 0.073 | 0.092 | 0.24 | 343 | 0.70 | 16.0 |
| 270 | 4 | 0.0010 | 1 | 0.506 | 20.2 | 14.8 | 0.008 | 0.0039 | 0.006 | 0.013 | 0.073 | 0.20 | 4 | 3.24 | 0.7 |
| 271 | 6 | 0.0008 | 4 | 0.805 | 11.4 | 23.0 | 0.006 | 0.0028 | 0.007 | 0.026 | 0.151 | 0.13 | 15 | 4.58 | 0.9 |
| 418 | KEARL | 0.0003 | 1 | 0.309 | 11.1 | 45.8 | 0.002 | 0.0005 | 0.001 | 0.019 | 0.020 | 0.12 | 3 | 5.50 | 0.3 |

^a Detection limits in bold below each metal.

Shaded values are above 95th percentile of observed concentrations.

Table H.3-1 (Cont'd., 2 of 4)

| ID # | Lake | Silver | Alum. | Arsenic | Boron | Barium | Beryl. | Bismuth | Cadm. | Cobalt | Chrom. | Copper | Iron | Lithium | Mang. |
|-------------------------------------|------|--------------------|-------|---------|-------|--------|--------|---------|-------|--------|--------|--------|-------|---------|-------|
| | | 0.005 ^a | | | | | 0.003 | 0.005 | 0.002 | | | | 0.75 | | |
| Birch Mountains Sub-Region | | | | | | | | | | | | | | | |
| 436 | L18 | 0.0011 | 1 | 0.291 | 17.2 | 20.1 | 0.008 | 0.0014 | 0.002 | 0.011 | 0.065 | 0.44 | 1 | 6.20 | 0.2 |
| 442 | L23 | 0.0011 | 7 | 0.350 | 9.3 | 4.6 | 0.024 | 0.0014 | 0.002 | 0.033 | 0.138 | 0.25 | 177 | 1.80 | 1.4 |
| 444 | L25 | 0.0022 | 4 | 0.329 | 15.5 | 10.2 | 0.019 | 0.0015 | 0.002 | 0.029 | 0.085 | 0.31 | 20 | 2.44 | 0.7 |
| 447 | L28 | 0.0033 | 281 | 1.150 | 12.5 | 7.9 | 0.020 | 0.0081 | 0.038 | 0.333 | 0.613 | 0.72 | 1658 | 1.95 | 40.8 |
| 448 | L29 | 0.0017 | 134 | 0.268 | 5.6 | 2.0 | 0.012 | 0.0025 | 0.033 | 0.131 | 0.206 | 0.37 | 353 | 0.03 | 20.9 |
| 454 | L46 | 0.0054 | 404 | 1.357 | 27.4 | 23.4 | 0.037 | 0.0124 | 0.019 | 0.530 | 0.900 | 1.86 | 2256 | 7.59 | 42.8 |
| 455 | L47 | 0.0077 | 472 | 0.788 | 23.6 | 19.5 | 0.131 | 0.0111 | 0.018 | 0.430 | 0.757 | 1.47 | 1118 | 5.42 | 20.9 |
| 457 | L49 | 0.0098 | 372 | 0.939 | 24.9 | 21.6 | 0.075 | 0.0113 | 0.036 | 0.477 | 0.847 | 1.71 | 1742 | 6.87 | 43.2 |
| 464 | L60 | 0.0016 | 25 | 0.699 | 14.8 | 17.0 | 0.014 | 0.0036 | 0.005 | 0.166 | 0.202 | 0.47 | 773 | 5.87 | 19.4 |
| 175 | P13 | 0.0014 | 15 | 0.898 | 17.1 | 61.7 | 0.072 | 0.0021 | 0.005 | 0.078 | 0.249 | 0.70 | 112 | 13.75 | 4.7 |
| 199 | P49 | 0.0014 | 25 | 0.326 | 9.4 | 3.1 | 0.013 | 0.0015 | 0.010 | 0.032 | 0.070 | 0.69 | 81 | 0.80 | 1.3 |
| Canadian Shield Sub-Region | | | | | | | | | | | | | | | |
| 473 | A301 | 0.0014 | 3 | 0.179 | 6.3 | 5.7 | 0.011 | 0.0015 | 0.003 | 0.010 | 0.130 | 0.38 | 28 | 0.96 | 0.4 |
| 118 | L107 | 0.0014 | 3 | 0.172 | 3.9 | 6.2 | 0.031 | 0.0015 | 0.016 | 0.011 | 0.140 | 0.54 | 1 | 2.25 | 0.1 |
| 84 | L109 | 0.0014 | 37 | 0.232 | 7.7 | 5.9 | 0.015 | 0.0019 | 0.003 | 0.041 | 0.334 | 0.73 | 518 | 1.15 | 6.4 |
| 88 | O-10 | 0.0014 | 50 | 0.158 | 8.3 | 4.9 | 0.149 | 0.0083 | 0.003 | 0.026 | 0.340 | 0.68 | 99 | 0.72 | 0.9 |
| 90 | R1 | 0.0014 | 7 | 0.216 | 4.8 | 4.8 | 0.011 | 0.0084 | 0.008 | 0.013 | 0.200 | 0.33 | 237 | 0.90 | 2.5 |
| Caribou Mountains Sub-Region | | | | | | | | | | | | | | | |
| 146 | E52 | 0.0014 | 52 | 0.587 | 17.7 | 7.2 | 0.018 | 0.0015 | 0.019 | 0.080 | 0.299 | 0.95 | 634 | 2.55 | 14.2 |
| 152 | E59 | 0.0036 | 5 | 0.343 | 14.3 | 3.9 | 0.013 | 0.0015 | 0.004 | 0.051 | 0.116 | 0.82 | 57 | 1.22 | 0.8 |
| 89 | E68 | 0.0014 | 71 | 0.559 | 17.0 | 6.9 | 0.016 | 0.0068 | 0.015 | 0.109 | 0.310 | 1.04 | 535 | 1.88 | 3.2 |
| 91 | O-1 | 0.0014 | 86 | 0.366 | 8.6 | 4.0 | 0.013 | 0.0015 | 0.007 | 0.058 | 0.220 | 0.46 | 260 | 0.56 | 6.5 |
| 97 | O-2 | 0.0014 | 54 | 0.565 | 12.1 | 3.8 | 0.014 | 0.0149 | 0.007 | 0.063 | 0.232 | 0.71 | 855 | 1.02 | 12.4 |
| Stony Mountains Sub-Region | | | | | | | | | | | | | | | |
| 168 | A21 | 0.09 | 0.98 | 0.291 | 0.029 | 0.12 | 0.03 | 8.3 | 0.047 | 3.34 | 0.006 | 0.043 | 0.761 | 6.06 | |
| 169 | A24 | 0.06 | 0.73 | 0.180 | 0.016 | 0.13 | 0.02 | 5.7 | 0.030 | 2.24 | 0.006 | 0.022 | 0.501 | 6.97 | |
| 170 | A26 | 0.07 | 0.59 | 0.186 | 0.029 | 0.12 | 0.03 | 7.7 | 0.025 | 1.63 | 0.004 | 0.016 | 0.521 | 4.24 | |
| 168 | A29 | 0.05 | 0.11 | 0.026 | 0.009 | 0.12 | 0.03 | 5.7 | 0.007 | 0.15 | 0.002 | 0.003 | 0.088 | 2.55 | |
| 166 | A86 | 0.42 | 0.17 | 0.039 | 0.024 | 0.10 | 0.02 | 10.5 | 0.013 | 0.17 | 0.002 | 0.004 | 0.143 | 3.02 | |
| 287 | 25 | 0.12 | 0.88 | 0.284 | 0.031 | 0.12 | 0.02 | 7.5 | 0.031 | 2.43 | 0.006 | 0.025 | 0.759 | 5.90 | |
| 289 | 27 | 0.07 | 0.08 | 0.024 | 0.018 | 0.12 | 0.03 | 9.1 | 0.019 | 0.13 | 0.009 | 0.009 | 0.118 | 1.75 | |
| 290 | 28 | 0.10 | 0.37 | 0.090 | 0.020 | 0.12 | 0.03 | 8.2 | 0.019 | 1.10 | 0.002 | 0.019 | 0.380 | 4.75 | |
| 342 | 82 | 0.14 | 0.16 | 0.058 | 0.018 | 0.35 | 0.03 | 11.7 | 0.008 | 0.27 | 0.016 | 0.002 | 0.205 | 3.13 | |
| 354 | 94 | 0.19 | 0.06 | 0.020 | 0.020 | 0.14 | 0.03 | 19.4 | 0.004 | 0.09 | 0.007 | 0.001 | 0.058 | 1.68 | |

^a Detection limits in bold below each metal.Shaded values are above 95th percentile of observed concentrations.

Table H.3-1 (Cont'd., 3 of 4)

| ID #. | Lake | Molybd. | Nickel | Lead | Antim. | Selen. | Tin | Stront. | Thor. | Titan. | Thal. | Uran. | Vanad. | Zinc |
|--|-------|--------------------|--------|-------|--------|--------|------|---------|-------|--------|-------|-------|--------|------|
| | | 0.005 ^a | | | 0.004 | 0.1 | 0.03 | | 0.003 | 0.04 | 0.003 | 0.003 | | |
| West of Fort McMurray Sub-Region | | | | | | | | | | | | | | |
| 165 | A42 | 0.06 | 0.23 | 0.087 | 0.017 | 0.12 | 0.03 | 37.5 | 0.005 | 0.12 | 0.001 | 0.004 | 0.161 | 3.91 |
| 171 | A47 | 0.16 | 0.06 | 0.060 | 0.021 | 0.12 | 0.03 | 20.7 | 0.004 | 0.43 | 0.001 | 0.009 | 0.116 | 3.21 |
| 172 | A59 | 0.04 | 0.21 | 0.166 | 0.017 | 0.15 | 0.03 | 26.2 | 0.009 | 1.08 | 0.002 | 0.011 | 0.364 | 5.79 |
| 223 | P94 | 0.01 | 0.00 | 0.011 | 0.013 | 0.05 | 0.05 | 64.3 | 0.004 | 0.71 | 0.001 | 0.003 | 0.414 | 3.95 |
| 225 | P96 | 0.10 | 0.13 | 0.015 | 0.016 | 0.16 | 0.02 | 32.6 | 0.001 | 0.35 | 0.002 | 0.009 | 0.260 | 4.09 |
| 226 | P97 | 0.07 | 0.30 | 0.017 | 0.014 | 0.05 | 0.02 | 27.3 | 0.026 | 0.36 | 0.004 | 0.002 | 0.396 | 2.61 |
| 227 | P98 | 0.04 | 0.06 | 0.020 | 0.012 | 0.19 | 0.03 | 29.6 | 0.003 | 0.32 | 0.001 | 0.001 | 0.304 | 2.91 |
| 267 | 1 | 0.01 | 0.01 | 0.012 | 0.013 | 0.12 | 0.03 | 39.9 | 0.006 | 0.10 | 0.001 | 0.001 | 0.038 | 1.81 |
| Northeast of Fort McMurray Sub-Region | | | | | | | | | | | | | | |
| 452 | L4 | 0.03 | 0.20 | 0.083 | 0.011 | 0.15 | 0.03 | 5.9 | 0.014 | 0.50 | 0.001 | 0.003 | 0.723 | 4.56 |
| 470 | L7 | 0.04 | 0.57 | 0.080 | 0.008 | 0.15 | 0.06 | 13.7 | 0.015 | 1.19 | 0.002 | 0.007 | 0.550 | 4.71 |
| 471 | L8 | 0.10 | 0.05 | 0.040 | 0.011 | 0.22 | 0.03 | 26.3 | 0.010 | 0.37 | 0.002 | 0.006 | 0.178 | 2.53 |
| 400 | L39 | 0.06 | 0.06 | 0.033 | 0.005 | 0.15 | 0.03 | 14.9 | 0.007 | 0.60 | 0.005 | 0.018 | 0.205 | 1.67 |
| 268 | E15 | 0.02 | 0.04 | 0.023 | 0.012 | 0.12 | 0.03 | 15.7 | 0.002 | 0.18 | 0.001 | 0.001 | 0.163 | 3.09 |
| 182 | P23 | 0.09 | 0.02 | 0.015 | 0.013 | 0.15 | 0.05 | 26.4 | 0.011 | 0.29 | 0.002 | 0.009 | 0.244 | 1.38 |
| 185 | P27 | 0.03 | 0.29 | 0.072 | 0.018 | 0.15 | 0.05 | 5.5 | 0.008 | 0.69 | 0.002 | 0.001 | 0.630 | 5.30 |
| 209 | P7 | 0.02 | 0.13 | 0.049 | 0.011 | 0.15 | 0.04 | 7.7 | 0.041 | 0.10 | 0.001 | 0.001 | 0.176 | 4.23 |
| 270 | 4 | 0.05 | 0.01 | 0.016 | 0.011 | 0.14 | 0.03 | 53.6 | 0.006 | 0.56 | 0.004 | 0.003 | 0.115 | 1.16 |
| 271 | 6 | 0.10 | 0.01 | 0.012 | 0.018 | 0.10 | 0.03 | 49.7 | 0.008 | 0.13 | 0.001 | 0.012 | 0.092 | 2.13 |
| 418 | KEARL | 0.10 | 0.02 | 0.006 | 0.019 | 0.13 | 0.02 | 54.3 | 0.001 | 0.47 | 0.001 | 0.005 | 0.201 | 1.92 |
| Birch Mountains Sub-Region | | | | | | | | | | | | | | |
| 436 | L18 | 0.25 | 0.61 | 0.009 | 0.065 | 0.14 | 0.03 | 37.4 | 0.002 | 0.12 | 0.001 | 0.005 | 0.045 | 2.89 |
| 442 | L23 | 0.09 | 0.48 | 0.028 | 0.018 | 0.14 | 0.03 | 13.4 | 0.008 | 0.25 | 0.001 | 0.005 | 0.080 | 1.97 |
| 444 | L25 | 0.10 | 0.36 | 0.022 | 0.045 | 0.12 | 0.03 | 16.8 | 0.005 | 0.11 | 0.002 | 0.008 | 0.077 | 2.45 |
| 447 | L28 | 0.19 | 1.52 | 0.291 | 0.026 | 0.18 | 0.03 | 13.5 | 0.066 | 4.40 | 0.010 | 0.045 | 1.032 | 6.20 |
| 448 | L29 | 0.03 | 0.28 | 0.094 | 0.017 | 0.21 | 0.03 | 2.5 | 0.012 | 0.93 | 0.003 | 0.009 | 0.399 | 5.34 |
| 454 | L46 | 0.29 | 2.68 | 0.607 | 0.098 | 0.21 | 0.04 | 29.8 | 0.150 | 9.93 | 0.005 | 0.119 | 2.133 | 7.28 |
| 455 | L47 | 0.20 | 2.76 | 0.641 | 0.061 | 0.18 | 0.03 | 26.3 | 0.099 | 7.30 | 0.005 | 0.089 | 2.250 | 9.29 |
| 457 | L49 | 0.38 | 3.25 | 0.420 | 0.100 | 0.34 | 0.04 | 28.1 | 0.119 | 6.73 | 0.006 | 0.149 | 2.050 | 7.20 |
| 464 | L60 | 0.31 | 1.25 | 0.076 | 0.036 | 0.18 | 0.03 | 31.6 | 0.022 | 0.61 | 0.001 | 0.035 | 0.270 | 2.16 |
| 175 | P13 | 0.12 | 0.22 | 0.257 | 0.026 | 0.15 | 0.06 | 67.9 | 0.010 | 0.63 | 0.001 | 0.010 | 0.362 | 3.18 |
| 199 | P49 | 0.09 | 0.20 | 0.010 | 0.017 | 0.18 | 0.03 | 7.8 | 0.004 | 0.10 | 0.002 | 0.008 | 0.149 | 2.09 |

^a Detection limits in bold below each metal.Shaded values are above 95th percentile of observed concentrations.

Table H.3-1 (Cont'd., 4 of 4)

| ID #. | Lake | Molybd. | Nickel | Lead | Antim. | Selen. | Tin | Stront. | Thor. | Titan. | Thal. | Uran. | Vanad. | Zinc |
|-------------------------------------|------|---------|--------------------------|-------|--------------|------------|-------------|---------|--------------|-------------|--------------|--------------|--------|------|
| | | | 0.005^a | | 0.004 | 0.1 | 0.03 | | 0.003 | 0.04 | 0.003 | 0.003 | | |
| Canadian Shield Sub-Region | | | | | | | | | | | | | | |
| 473 | A301 | 0.06 | 0.06 | 0.017 | 0.014 | 0.15 | 0.03 | 27.4 | 0.006 | 0.30 | 0.002 | 0.034 | 0.033 | 1.06 |
| 118 | L107 | 0.47 | 0.02 | 0.025 | 0.017 | 0.15 | 0.05 | 37.9 | 0.004 | 0.13 | 0.008 | 0.177 | 0.031 | 1.69 |
| 84 | L109 | 0.08 | 0.33 | 0.048 | 0.010 | 0.19 | 0.03 | 28.8 | 0.010 | 0.76 | 0.001 | 0.103 | 0.171 | 1.26 |
| 88 | O-10 | 0.04 | 0.17 | 0.029 | 0.017 | 0.21 | 0.04 | 19.1 | 0.034 | 0.32 | 0.005 | 0.034 | 0.109 | 1.93 |
| 90 | R1 | 0.01 | 0.10 | 0.051 | 0.006 | 0.15 | 0.05 | 23.5 | 0.010 | 0.63 | 0.017 | 0.023 | 0.154 | 1.82 |
| Caribou Mountains Sub-Region | | | | | | | | | | | | | | |
| 146 | E52 | 0.16 | 1.10 | 0.139 | 0.031 | 0.21 | 0.03 | 18.4 | 0.019 | 0.65 | 0.001 | 0.090 | 0.273 | 3.15 |
| 152 | E59 | 0.09 | 0.49 | 0.025 | 0.038 | 0.20 | 0.03 | 9.2 | 0.007 | 0.16 | 0.001 | 0.018 | 0.083 | 2.18 |
| 89 | E68 | 0.19 | 0.87 | 0.145 | 0.045 | 0.15 | 0.04 | 11.5 | 0.016 | 1.08 | 0.001 | 0.055 | 0.496 | 3.75 |
| 91 | O-1 | 0.04 | 0.20 | 0.128 | 0.021 | 0.20 | 0.03 | 7.7 | 0.011 | 1.23 | 0.001 | 0.014 | 0.284 | 2.46 |
| 97 | O-2 | 0.08 | 0.58 | 0.123 | 0.018 | 0.15 | 0.05 | 9.9 | 0.031 | 0.82 | 0.001 | 0.046 | 0.239 | 2.83 |

^a Detection limits in bold below each metal.

Shaded values are above 95th percentile of observed concentrations.

H.4 SEASONAL CHANGES IN CHEMICAL VARIABLES IN TEN RAMP LAKES

Figure H.4-1 Seasonal changes in ph in ten RAMP lakes, AENV data.

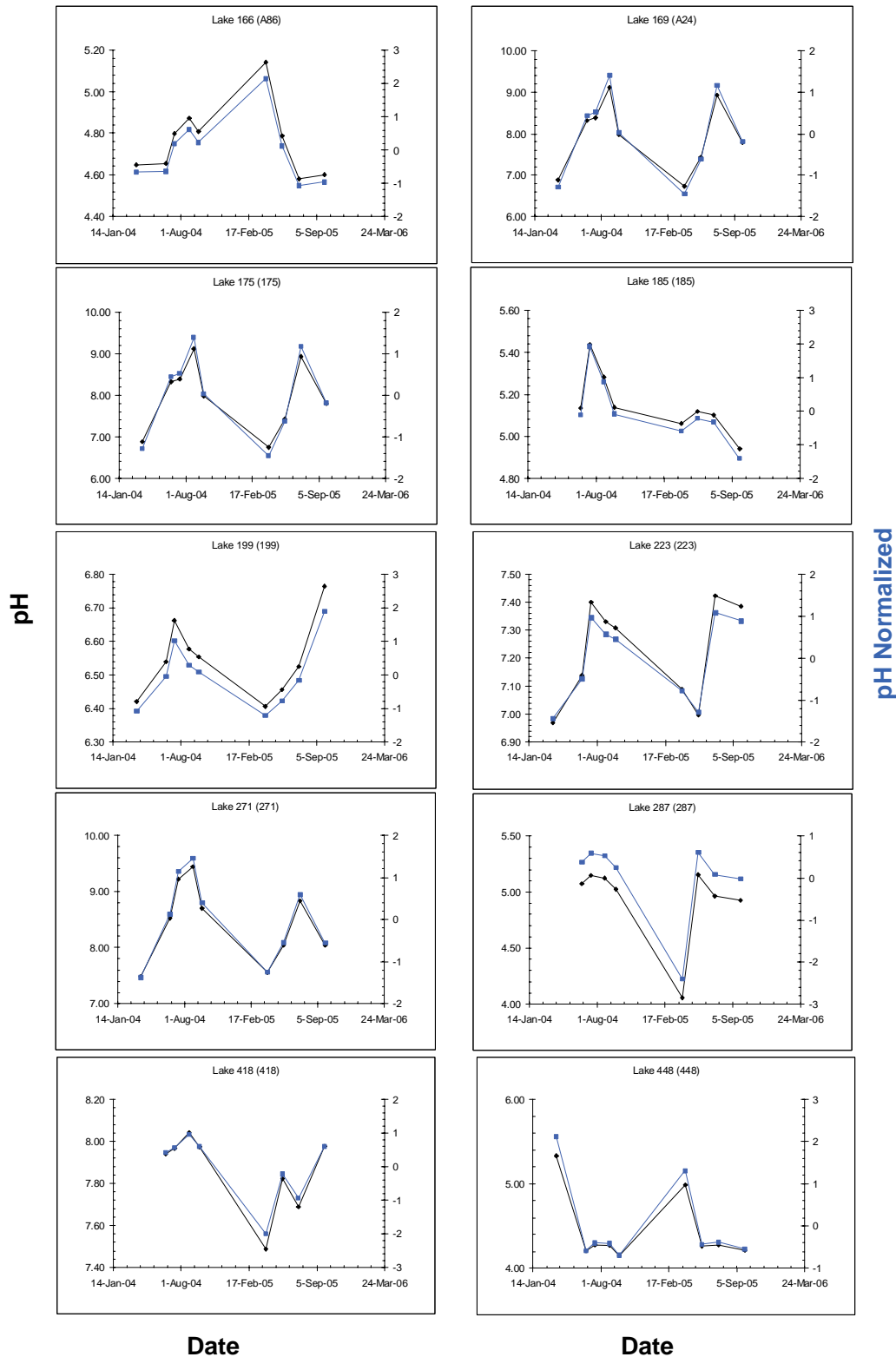


Figure H.4-2 Seasonal changes in gran alkalinity in ten RAMP lakes, AENV data.

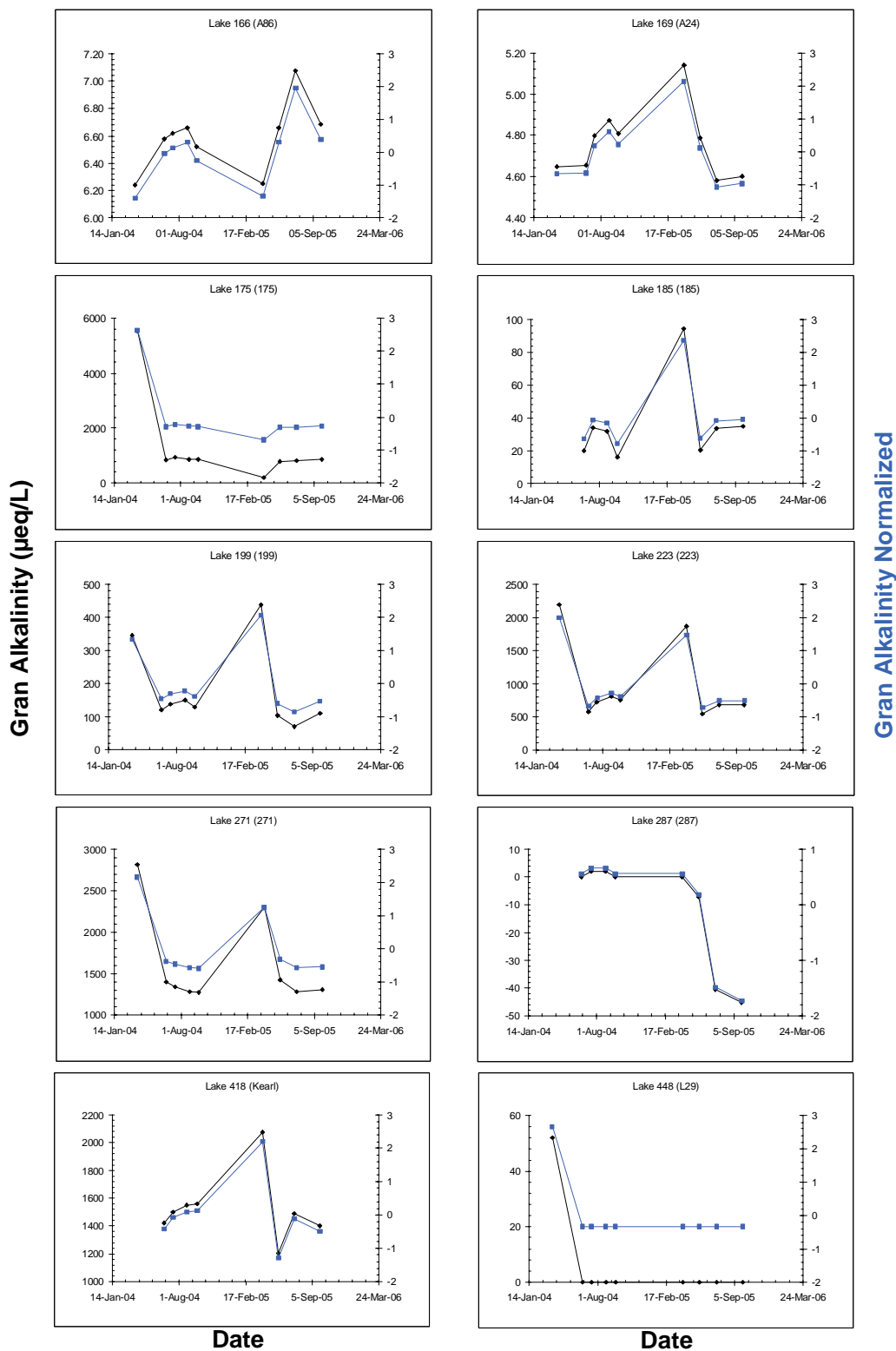


Figure H.4-3 Seasonal changes in base cations in ten RAMP lakes, AENV data.

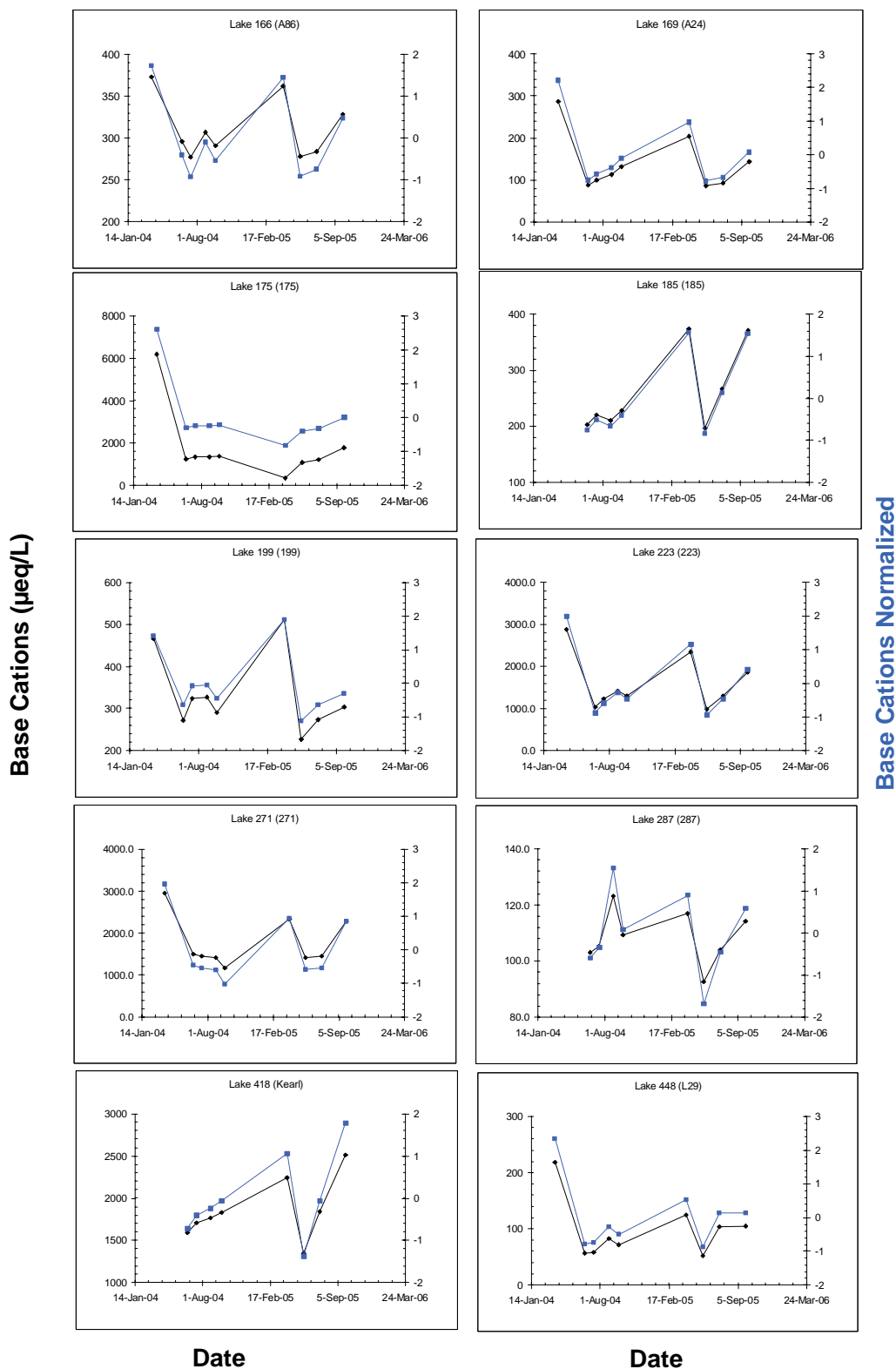


Figure H.4-4 Seasonal changes in sulphate in ten RAMP lakes, AENV data.

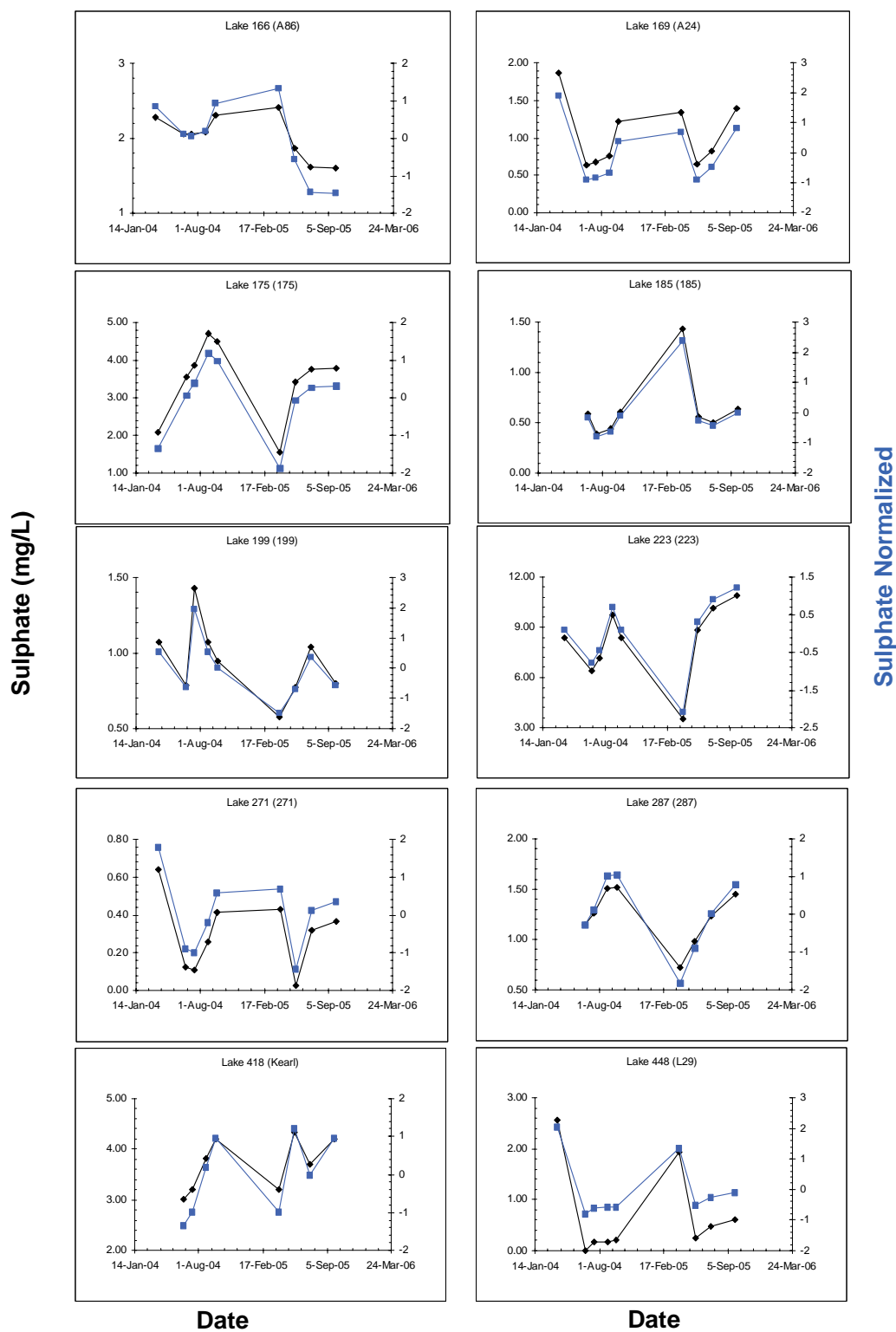


Figure H.4-5 Seasonal changes in dissolved organic carbon in ten RAMP lakes, AENV data.

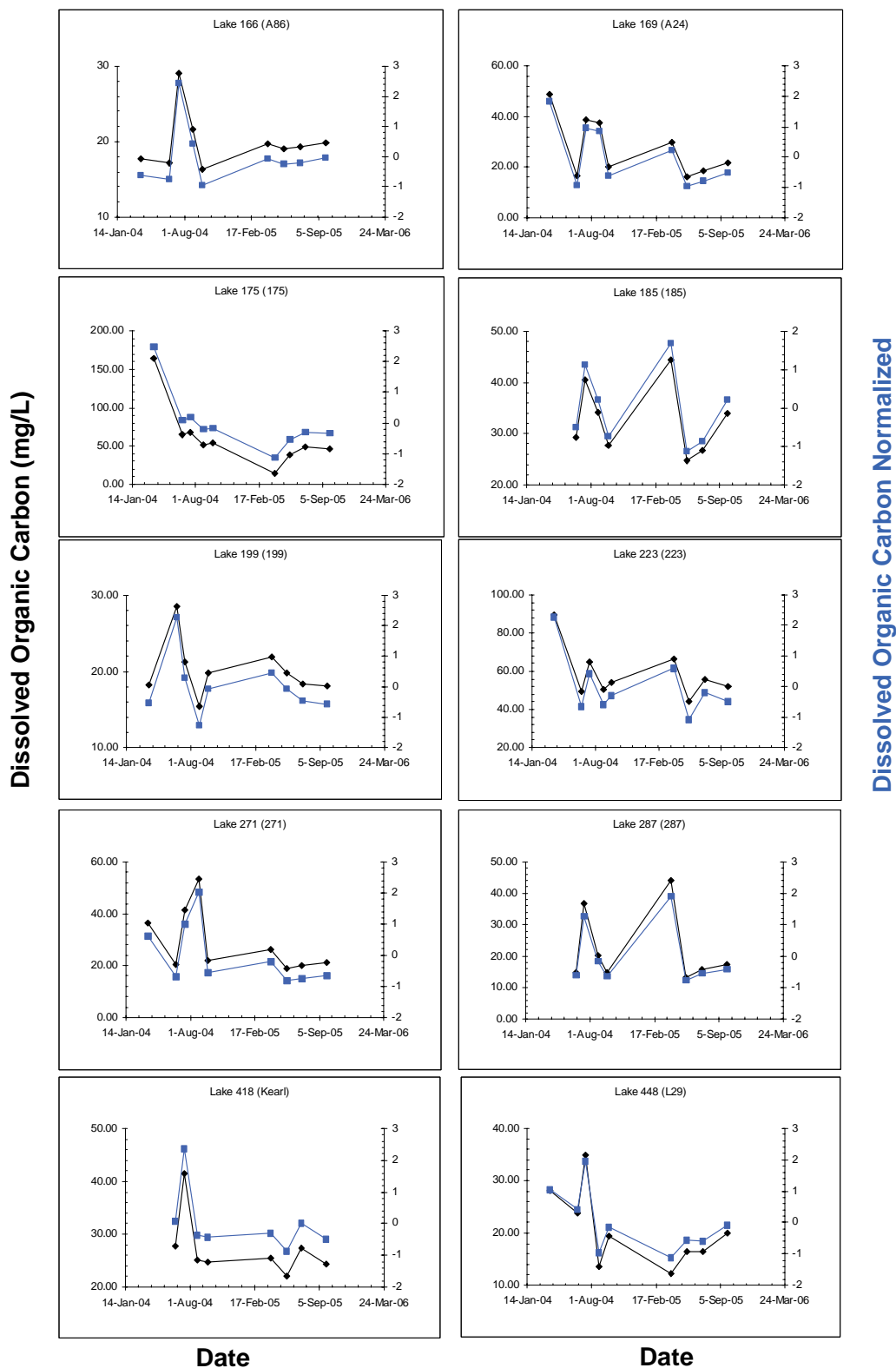
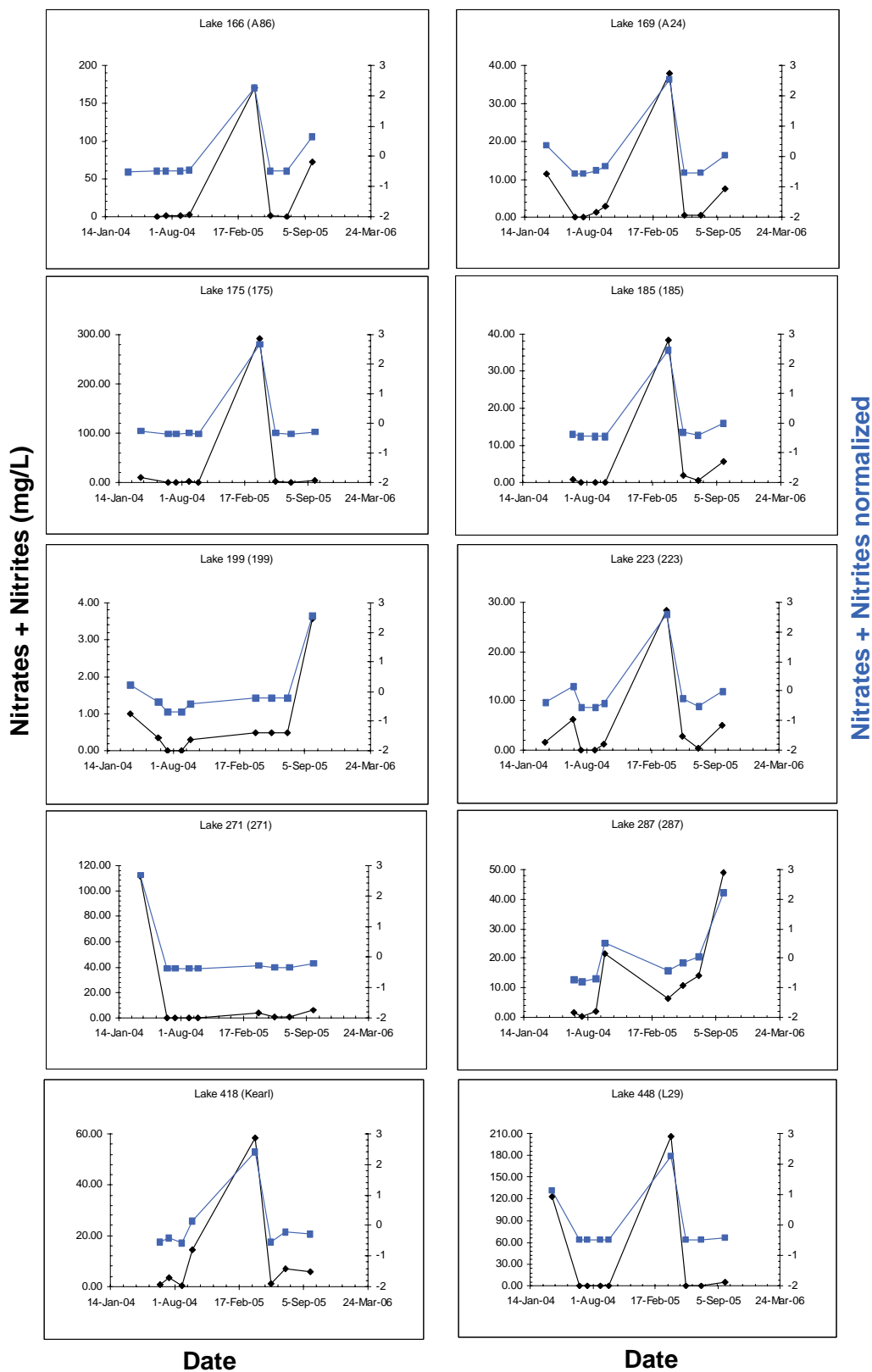


Figure H.4-6 Seasonal changes in nitrates+nitrites in ten RAMP lakes, AENV data.



H.5 ESTIMATES OF ANALYTICAL ERROR IN MEASUREMENT ENDPOINTS

Estimates of analytical error in six water quality parameters, expressed as the standard deviation, were obtained from the Limnology Laboratory at the University of Alberta (Table H.5-1). These values represent an estimate of the precision of each analysis at the concentration indicated in the table. These standard deviations were used in the Mann-Kendall trend analysis to judge the significance of observed trends. Analytical error was incorporated in the trend analysis by eliminating, as statistically insignificant, all difference-pairs in the Mann-Kendall calculations that were less than one standard deviation.

Table H.5-1 Estimates of analytical error.

| Concentration | Standard Deviation |
|--|--------------------|
| pH (units) | |
| 4.00 | 0.004 |
| 7.00 | 0.007 |
| Gran Alkalinity (mg/L) | |
| 1 ^a | 0.038 |
| 20 | 0.76 |
| 100 | 1.04 |
| Sum Base Cations (µeq/L) | |
| 0 | 0.6 |
| 100 | 2.5 |
| 250 | 4.5 |
| 500 | 9.5 |
| Sulphate (mg/L) | |
| 0.1 | 0.04 |
| 0.5 | 0.02 |
| 2.0 | 0.02 |
| 5 | 0.1 |
| 10 | 0.17 |
| Nitrates (mg/L) | |
| 0.01 | 0.0003 |
| 0.05 | 0.0016 |
| 0.2 | 0.0049 |
| Dissolved Organic Carbon (mg/L) | |
| 2.00 | 0.09 |
| 10 | 0.07 |
| 20.0 | 0.08 |
| 50 | 0.23 |

^a Calculated by extrapolation.