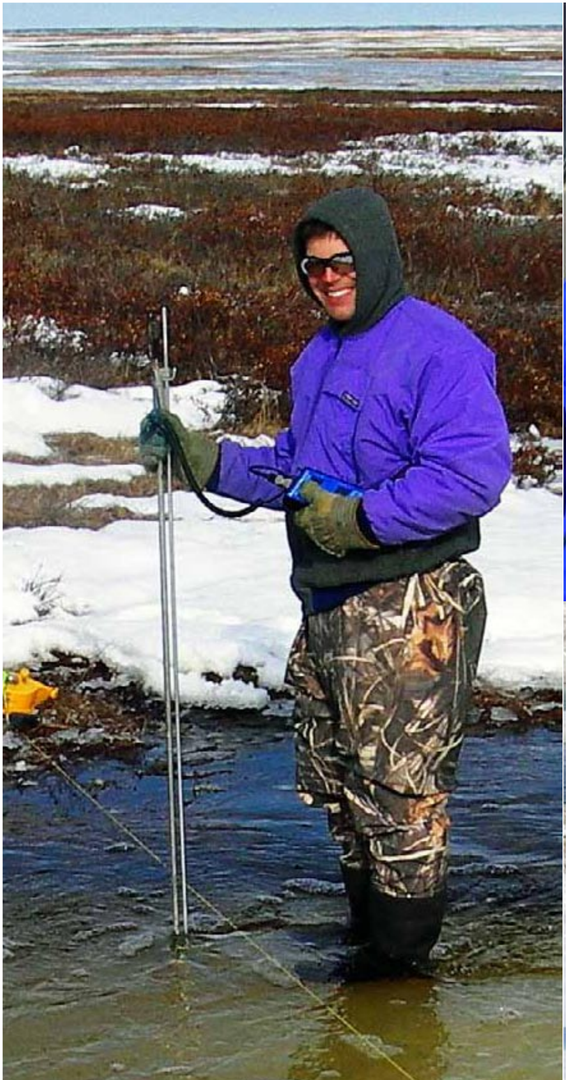

2006 Colville River Delta and Fish Creek Basin Spring Breakup and Hydrological Assessment

Submitted to ConocoPhillips

Submitted by Baker

January 2007

108604-MBJ-RPT-001

2006

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Executive Summary

This report presents the observations and findings of the 2006 Colville River Delta (CRD) and Fish Creek Basin (FCB) Hydrological Assessment. This 2006 assessment represents the fifteenth season of study within the CRD and the sixth season within the FCB in support of the Alpine Development Project and the Alpine Satellite Development Plan. The primary objectives of the 2006 assessment included:

- Documentation of the distribution of floodwaters, water elevation, and discharge during spring breakup.
- Analysis of the 2006 observations and comparison of the results to past years observations.
- Extrapolation of historical records to refine design criteria and evaluate the existing design basis.

Observations and measurements were recorded at eleven locations in the CRD, twenty-one locations adjacent to existing Alpine Facilities, and eighteen locations in the FCB. In addition, 0.3 feet of snow melt recharge was documented at the Alpine drinking water lakes, several feet of thermoerosion was measured at the 62-foot Alpine swale bridge, and a comprehensive hydraulic analysis was completed for the Alpine swale bridges and culverts.

The 2006 CRD breakup was characterized by high water surface elevations throughout the delta with many 2006 observed peak water surface elevations within 0.2 feet of the historical record. The timing of the 2006 CRD breakup was average. The peak water surface elevation at Monument 1 was the second highest level on record and was within 0.05 feet of the 2004 record peak water surface elevation. The peak discharge at Monument 1 was the fourth highest on record and 25,000 cfs greater than the average observed peak annual discharge.

The 2006 FCB breakup was characterized by relatively low water surface elevations throughout the basin. The timing of the 2006 breakup of the Ublutuoch River and Fish and Judy Creeks was average. The 2006 peak water surface elevation and peak discharge of the Ublutuoch River were the lowest levels on record since observations began in 2001. The peak stage at each monitoring location along Fish and Judy Creeks were also the lowest since observations began in 2001.

Presented in this report are the results of extreme value statistical extrapolation of the CRD and FCB stage and discharge records. These analyses included a validation of the 2D open water model results based on observed stage records in the CRD and a refinement of the Ublutuoch River HECRAS model results.

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1.0 Introduction

This 2006 Spring Breakup and Hydrologic Assessment report presents the results of the 2006 spring breakup monitoring conducted in the Colville River Delta (CRD) and Fish Creek Basin (FCB).

- **Chapter 1 Introduction** discusses the objectives of the 2006 program and presents an historical climatic analysis.
- **Chapter 2 Methods** describes the methods of both the fieldwork and the data analyses.
- **Chapter 3 Monitoring Locations** outlines and discusses the CRD and FCB monitoring sites.
- **Chapter 4 CRD 2006 Breakup** presents the CRD observations, stage, and discharge results as well as a discussion of the Alpine pad and erosion survey, drinking water lakes recharge, ice bridge monitoring, and Monument 1 water temperature results.
- **Chapter 5 FCB 2006 Breakup** presents the FCB observations, stage, and discharge results as well as a discussion of the Fish Creek water temperature results.
- **Chapter 6 CRD Flood and Stage Frequency** presents the results of the Colville River flood frequency analysis review and the CRD stage frequency analysis.
- **Chapter 7 FCB Flood and Stage Frequency** presents the results of the FCB flood frequency analysis review and the FCB stage frequency analysis.
- **Chapter 8 Reference Materials** contains the references used in the development of this report. **A list of Acronyms and a Glossary** are included to assist the reader in determining the meaning of abbreviations and the definitions of terms used in the report.
- **Appendice**s include a tabulation of survey control and gage locations and direct discharge measurement notes.

Fieldwork began on May 9th and was completed on June 16, 2006. Figure 1-1 identifies the CRD and FCB 2006 monitoring region. This 2006 hydrologic field program represents the 15th year of investigations in the CRD in support of the Alpine Development Project (ADP) and the 6th year in the FCB in support of the Alpine Satellite Development Plan (ASDP).

During hydrological documentation of spring breakup in 2006, Baker was pleased to have the steadfast support of Alaska Clean Seas, CPAI, Kuukpik/LCMF, Inc., and Maritime Helicopter. Their support contributed to another safe and productive breakup monitoring season and is sincerely appreciated.

1.1 CRD 2006 Objectives

Located within the floodplain of the CRD on the North Slope of Alaska, the Alpine Facilities are owned by ConocoPhillips, Alaska, Inc. (CPAI) and Anadarko Petroleum Company, and operated by CPAI. In this report, Alpine facilities refers to the CD1 processing facility and CD2, CD3, and CD4 drilling pads and access roads. The spring breakup flooding is historically the largest annual flooding event in the North Slope region. Annual spring breakup monitoring activities have been conducted specifically for the ADP since 1992. In 2006, observations and measurements were recorded at eleven locations in the CRD and twenty-one locations adjacent to existing Alpine facilities.

The primary objective of the 2006 spring breakup program in the CRD was to document the distribution of floodwater, measure water levels throughout the CRD, and directly measure discharge at Monument 1, which is at the southern boundary of the CRD, approximately 3 miles southeast of Nuiqsut. Particular attention was given to the locations of existing and proposed facilities at Monuments as identified in Figure 1-2. Monitoring at the Alpine facilities (Gages identified in Figure 1-3) was also undertaken to satisfy permit stipulations identified in USACE Permit No. POA-2004-253 and State of Alaska Department of Natural Resources (DNR) Fish Habitat Permit FH04-III-0238. This monitoring included direct and indirect measurement of discharge through the existing drainage structures.

As part of the proposed ASDP CD5 development, CPAI has proposed the construction of the Nigliq Bridge, located to the west of CD2 and the Paleo Bridge located at the Nigliq Paleochannel. Another primary objective of the 2006 program was to emphasize the documentation of the distribution patterns of flow upstream, downstream, and at the site of the Nigliq Bridge, as well as to directly measure discharge at this location.

Operation of the Alpine Facilities currently relies on water withdrawal from local lakes L9312 and L9313. To help establish whether sufficient water is available for future withdrawal, monitoring of the recharge of the lakes is conducted each spring breakup season. The 2006 monitoring of recharge to lakes L9312 and L9313 was completed to comply with State of Alaska Department of Fish and Game (ADF&G) permits FG99-111-0051-Amendment #5 and FG97-111-0190-Amendment #5, respectively.

The 2006 spring breakup program objectives also included documentation of the affects to flow and channel morphology caused by the ice bridges installed across the Kachemach River and the East Channel of the Colville River.

1.2 FCB 2006 Objectives

CPAI has proposed the development of three satellite drilling pads in the National Petroleum Reserve, Alaska (NPRA) as part of the ASDP. The proposed drilling pads, designated CD5, CD6, and CD7, would be accessed by gravel road from CD2 via the Nigliq Bridge and Ublutuoch Bridge. The proposed pads and access roads are located within the FCB; observations and measurements were recorded at eighteen locations in the FCB in 2006.

The primary objective of the 2006 spring breakup program in the FCB was to document the distribution of surface water throughout the region with particular attention to the locations near proposed facilities as identified in Figure 1-4. The primary hydrological facilities associated with ASDP are the Ublutuoch Bridge located at River Mile (RM) 6.8 on the Ublutuoch River and the smaller drainage Sites located along the proposed ASDP access road. A secondary objective of the 2006 spring breakup program included documentation of the extent of breakup at Fish and Judy Creeks. No facilities are proposed to cross these creeks; however, a basin wide knowledge is useful in assessing the relative magnitude of breakup within the FCB compared with past breakup seasons.

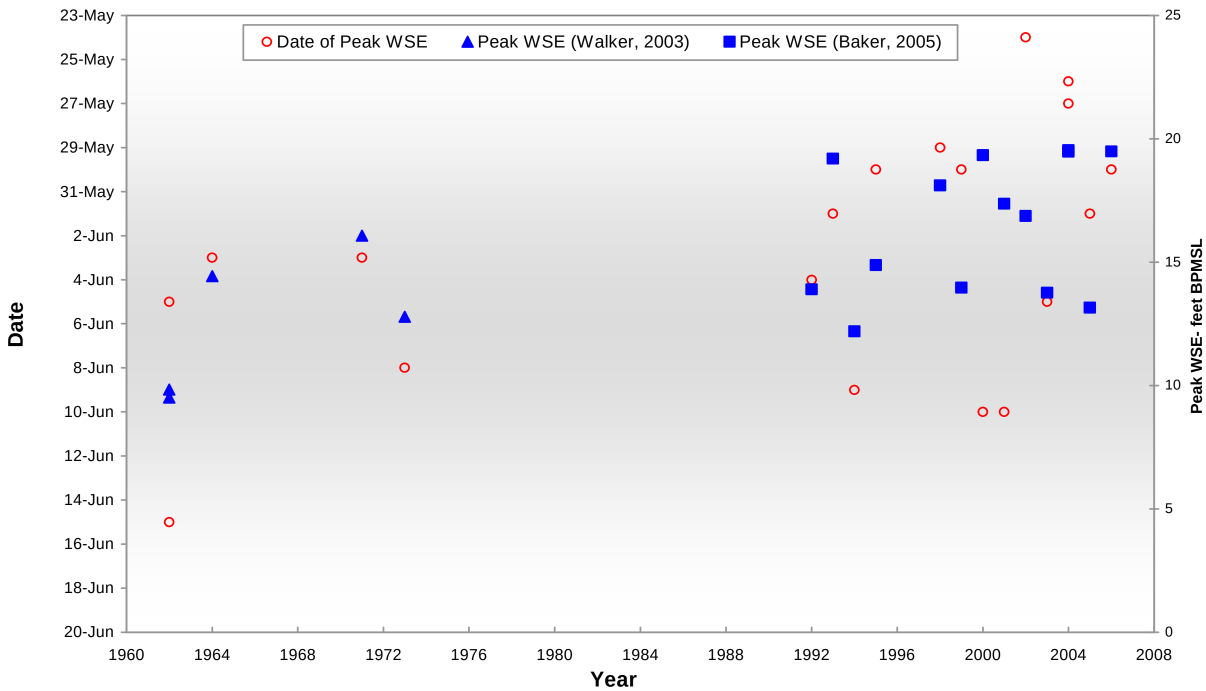
1.3 CRD Historical Climactic Analyses

In general, the hydrologic year for the CRD averages only about four months and has been documented intermittently since 1962. Spring is dominated by flooding, which may be divided into three periods: pre-breakup flooding, breakup flooding, and post-breakup flooding (Walker 2003). Conditions such as snow pack, sustained cold or warm temperatures, ice depth, wind direction, and rain contribute to the breakup cycle. Although all of these conditions affect the timing of breakup, consistent historical climactic data is primarily limited to daily temperatures.

To compare 2006 air temperature with historical air temperatures, spring breakup was defined as the period between May 11 and June 17. Historical daily mean air temperatures were compiled from weather stations at Anaktuvak Pass, Nuiqsut, Kuparuk, and Alpine from 1992 to 2006. During the spring breakup timeframe, the historical daily temperatures ranged from 25°F to 46°F. In 2006 the daily mean temperatures ranged from 26°F to 48°F, which generally fall within the historical average air temperature ranges.

1.4 CRD Historical Analyses of the Timing of Breakup

The peak annual water surface elevations in the CRD have historically occurred within a 10-day timeframe approximately between May 29 and June 7. Graph 1-1 presents the date and elevation of annual peak water surface elevation near Monument 1 for the years where data is available between 1962 and 2006. The elevations and dates of breakup at the head of the delta for 1962, 1964, 1971, and 1973 were presented in Walker (2003) and in Baker (2005c) for 1992 through 2005. Elevations presented by Walker are in reference to meters above sea level (MASL) and for this graphical presentation were converted to feet BPMSL assuming that zero MASL is equal to zero feet BPMSL.

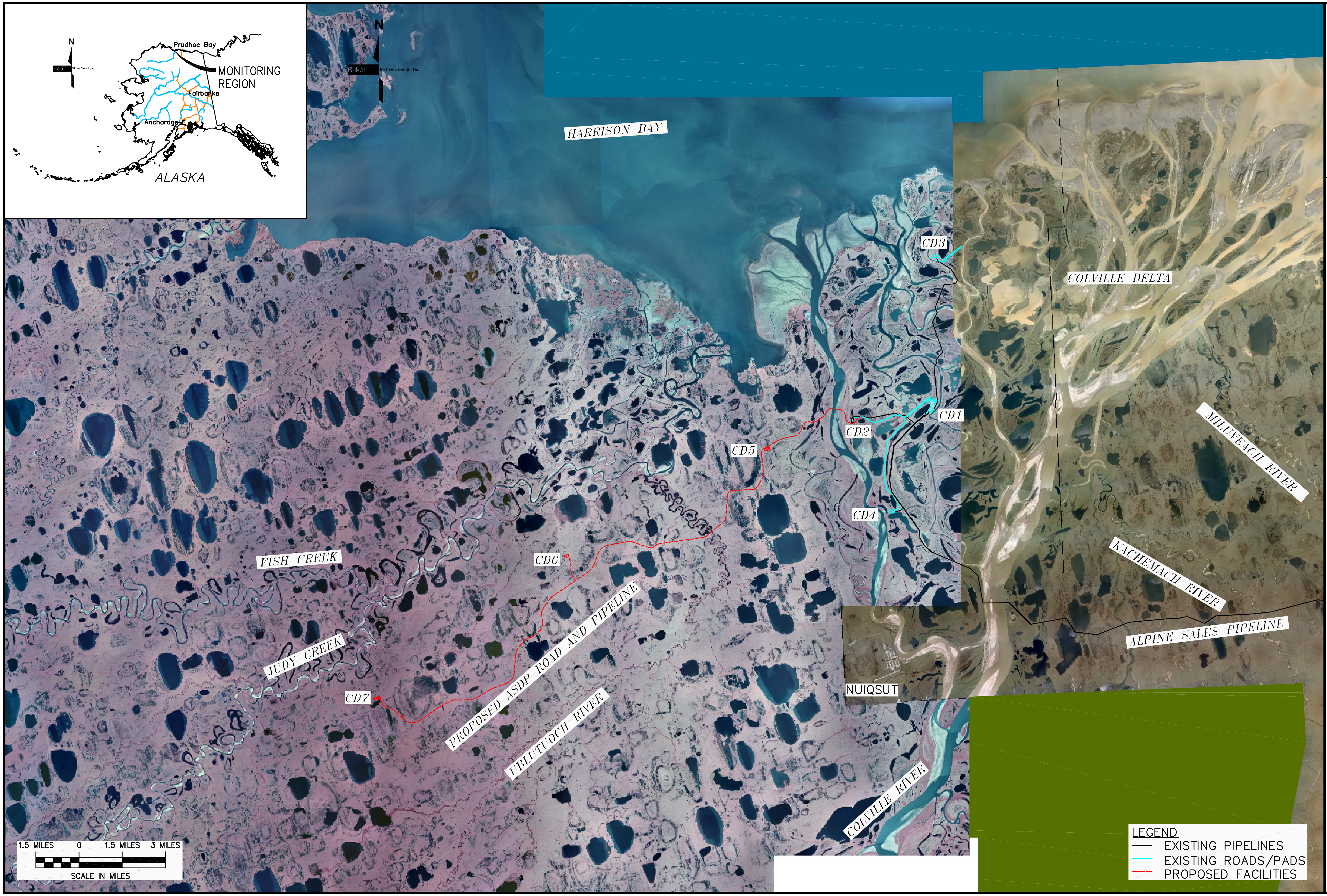


Graph 1-1 Monument 1 Date of Peak Annual Water Surface Elevation

The comparison of spring breakup from 1962 to present generally suggests that higher river stage events are observed when breakup occurs earlier in the spring. This condition is likely due to ice cover in the CRD. Breakup events that occur later in the spring generally tend to be associated with a lower stage and are generally preceded by a smaller flood event (Walker 2003). The 2006 peak water surface elevation occurred in the CRD at Monument 1 on May 30, falling within the historical 10-day span of May 29 to June 7. Thus, the timing of the 2006 spring breakup is considered relatively typical.

1.5 FCB Historical Climatic Analysis

The length of record of breakup observations in the FCB is short in duration and this must be considered when comparing the 2006 observations to the past. Peak stage at the Ublutuoch River in 2006 occurred on June 7, and based on a comparison of historical observations of the Ublutuoch River between 2001 and 2006, the average date of peak stage is June 4. Therefore, the timing of the 2006 breakup is considered to be approximately 3 days later than average.



2006 SPRING BREAK-UP MONITORING REGION

FIGURE 1-1 (SHEET 1 OF 1)

Michael Baker Jr., Inc.
A Unit of Michael Baker Corporation
1400 West Benson Blvd., Suite 200
Anchorage, Alaska 99503
Phone: (907) 273-1600
Fax: (907) 273-1699

Baker

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE 1_1
CHECKED:	MTA	SCALE:	1" = 3 MILES

2006 SPRING BREAK-UP
COLVILLE RIVER DELTA
MONUMENTS
FIGURE 1-2
(SHEET 1 OF 1)

Michael Baker Jr., Inc.
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Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_1_2
CHECKED:	MTA	SCALE:	1" = 2 MILES

2006 SPRING BREAK-UP
ALPINE FACILITIES
GAGES

FIGURE 1-3
(SHEET 1 OF 1)

Michael Baker Jr., Inc.
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DATE:	11/30/06
DRAWN:	AMG
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PROJECT:	108604
FILE:	FIGURE_1_3
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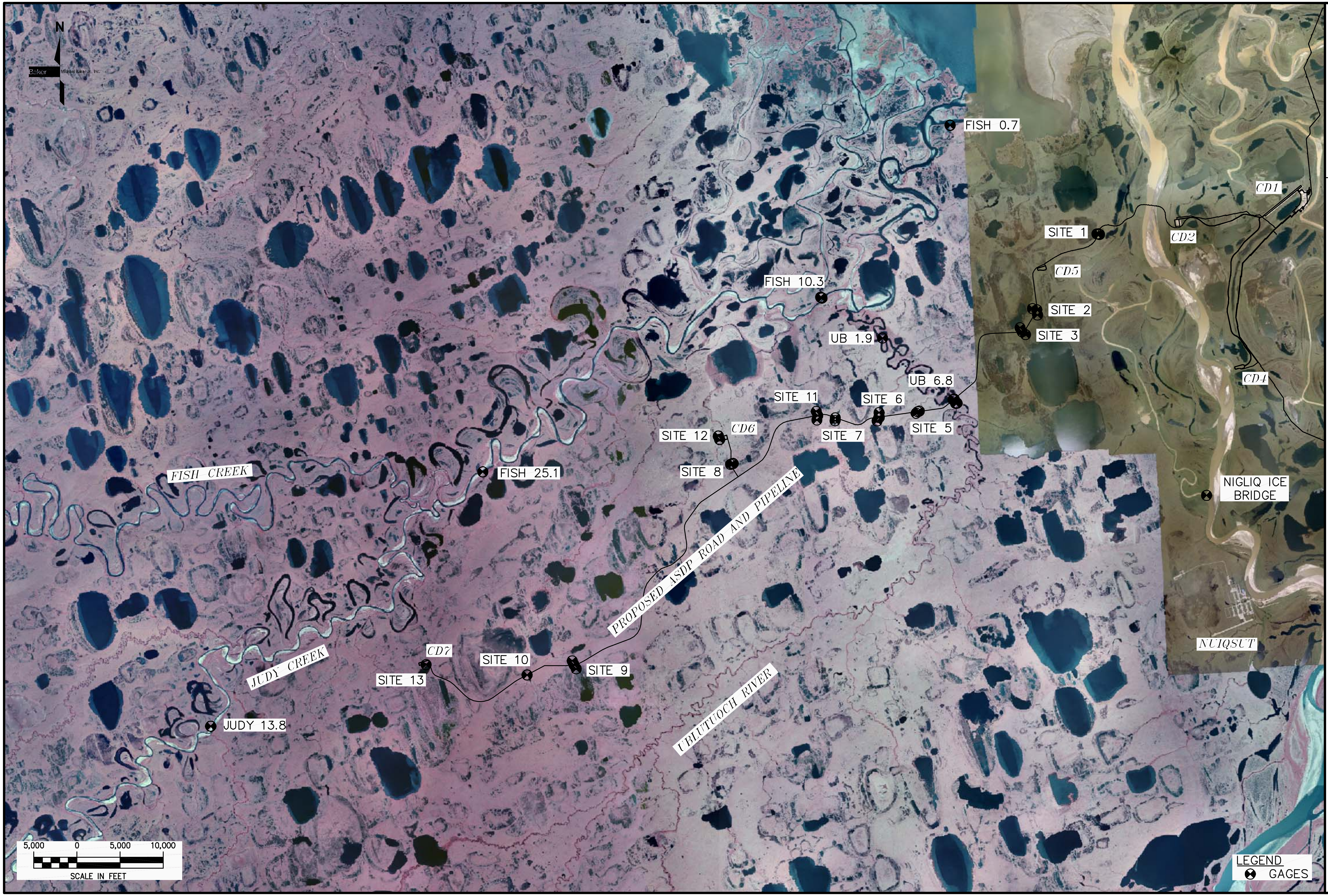

2006 SPRING BREAK-UP
FISH CREEK BASIN
MONITORING SITES

FIGURE 1-4
(SHEET 1 OF 1)

Michael Baker Jr., Inc.
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Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	WAP	FILE:	FIGURE 1_4
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2.0 Methodology

The primary methods used during the 2006 spring breakup monitoring program were observations of the distribution of flow, measurement of water surface elevation, and measurement of discharge. The 2006 field methods were based on standard techniques proven to be safe, reliable, efficient, and accurate for the conditions found in the CRD and FCB during spring breakup; they are described in this chapter. Snow survey and flood frequency analysis methods are also described.

2.1 Visual Observations

Visual observations were conducted from the ground via Haggland tracked vehicles between May 7 and May 17, and from the air via helicopter between May 18 and June 16, 2006. Observations were recorded daily in field notebooks. Digital photographs were also collected daily to document the extent of breakup. With each photograph, the horizontal position of the camera, date, and time were electronically imprinted onto each electronic file.

2.2 Water Surface Elevation

2.2.1 Staff Gages

Water surface elevations were monitored at the study locations using graduated stream staff gages. Water elevations were measured daily at Gages visually at intervals according to the priority of the monitoring location. The elevation of each gage was surveyed to benchmark elevations using optical differential level loop surveys. The basis of elevation for each gage set is indicated on each graph and the horizontal position of the monuments and gages are presented in Appendix A. The surveys were completed in May 2006 just prior to breakup and were referenced to the British Petroleum Mean Sea Level (BPMSL) datum. Existing monuments were used for vertical control at all sites except for Site 13 located near the proposed CD7 pad. In 2006, Kuukpik/LCMF established new vertical control near the CD7 pad using differential GPS techniques. In February of 2006, Kuukpik/LCMF determined the elevation of Monument 1 to be 27.59 feet BPMSL using second-order three wire level techniques. Between 1996 and 2005, the elevation of Monument 1 was accepted to be 27.74 feet BPMSL based on a 1996 Lounsbury, Inc. survey; however, for the 2006 water level tabulation, the basis of elevation at Monument 1 is redefined based on the 2006 Kuukpik/LCMF survey.

The staff gages located at CD1 and CD2 consist of permanently-mounted metal gage faceplates attached to drill steel. The staff gage sets at all other locations consisted of one to five staff gage assemblies. Each gage assembly consisted of a metal gage faceplate mounted on a two-by-four timber attached with U-bolts to 1.5-inch angle iron posts driven into the ground. Installation of each staff gage was completed prior to the arrival of breakup floodwater. The horizontal position of each gage was recorded using a handheld Garmin 60 Global Positioning System (GPS) in North American Datum of 1983 (NAD 83). All elevations presented in this report are in feet and are based on BPMSL datum.

2.2.2 Pressure Transducer

In addition to the visual spot measurement of water surface elevations using the staff gages, four pressure transducers were installed to collect water surface elevation data. The pressure transducers periodically measured the pressure imparted by water at the sensor, allowing the depth of water above the sensor to be calculated. The respective effects of variations in temperature and barometric pressure were taken into account and the resulting data yielded a near complete record of the fluctuations in water surface elevation for the time between visual measurements.

For the measurement of absolute water pressure, an In-Situ, Inc.™ Level TROLL 500 sensor was used. The instrument is a non-vented pressure sensor that collected and stored data points of pressure and temperature. The factory calibrated transducers collected absolute pressure and water temperature at 15-minute intervals which represents a near continuous record. The measured pressure datum is the sum of the forces imparted by both the water column and atmospheric conditions. For this reason, a daily local barometric pressure correction was applied.

Prior to deployment of each pressure transducer, the transducers were configured using Win-Situ LT, a Microsoft® Windows-based operating program. Absolute pressure was set to zero. Transducers were housed in a segment of perforated galvanized steel pipe and clamped to angle iron which was set in the active channel near the ground surface. The sensor of each transducer was surveyed to establish a vertical datum using local control. The survey was performed again prior to removal to quantify potential disturbance during breakup. Because sensors were not submerged at the time of placement, an accurate correction factor for observed atmospheric and absolute pressures could be established to calculate adjusted gage pressures. Barometric pressure was obtained from Alpine Air Traffic Control. Water depth was determined based on the recorded pressure data and barometric pressure.

Water surface elevations were then determined by summing the calculated water depth and the surveyed sensor elevation. A standard conversion at 0°C was used to calculate all water depths from adjusted gage pressures. Fluctuations in water temperature varied from 0° to 14.5°C over the entire sampling period. Due to the limited range in temperature and observed water depth, temperature impacted the calculation of water surface elevation by less than 0.01 feet.

2.3 Discharge Measurement Methods

Discharge was both indirectly computed and directly measured using single point velocity measurements, Acoustic Doppler Current Profiler (ADCP) technologies, and standard USGS midsection techniques. The method selected at each site depended on a variety of site-specific conditions including safety, location, depth of water, volume, and the nature and composition of the channel. Generally, discharge measurements were taken as close to the observed peak stage as possible.

2.3.1 USGS Midsection Techniques

Direct discharge measurements at the ASDP Sites, Ublutuoch River RM 6.8, and at the Alpine swale bridges were completed using standard USGS midsection techniques (Rantz 1982). A tag line was used to define the cross section and delineate the measurement subsections within the channel. Select discharge measurements in the Alpine culverts were directly measured using a USGS wading rod and either a Price AA or Price Pygmy velocity meter. At the Alpine swale bridges and Ublutuoch River RM 6.8, a Price AA current meter and sounding reel mounted on a boat-type boom was used to measure velocity, and a 30-pound Columbus-type lead sounding weight was used to stabilize the meter and measure depth. Photo 2-1 presents a typical discharge measurement by boat at the Ublutuoch River.

Photo 2-1 Ublutuoch River Boat Discharge Measurement, June 9, 2006.

Photo 2-2 Small Stream Wading Discharge Measurement, June 7, 2006

Measurements were completed at the Alpine swale bridges from the bridge deck; at the Ublutuoch River, the measurement was completed from a boat. At the ASDP Sites, a USGS wading rod was used with a variety of velocity meters which included a Price AA, Price Pygmy, and Marsh McBirney Flow Mate 2000 velocity meters. Photo 2-2 shows a typical discharge measurement by wading at Site 10.

The meter selection depended on the conditions of the channel during the measurement. In 2006, all Price AA and Pygmy velocity meters were calibrated by the USGS at the Office of Surface Water Hydraulic Laboratory and individual meter ratings were used for each velocity meter.

2.3.2 Acoustic Doppler Current Profiler (ADCP)

Direct measurement of discharge on a river the size of the Colville River during the breakup season presents unique and extreme challenges. Given the location, depths and velocities of flow, the presence of passing channel ice, and weather conditions, implementation of accurate USGS midsection techniques can be very difficult, risky, and time intensive. The advent of the ADCP has allowed the direct measurement of repeatable and accurate river discharge in conditions that previously have been extremely difficult, dangerous, or impossible. In many cases, the ADCP discharge measurement system is considerably faster than traditional methods, and can provide equivalent levels of accuracy.

Baker performed direct discharge measurements on the Colville River at Monument 1 and the Nigliq Channel at Monument 23 using ADCP techniques and procedures following the USGS *Quality-Assurance Plan for Discharge Measurements Using Acoustic Doppler Current Profilers* (2005).

HARDWARE AND SOFTWARE

For the direct discharge measurements on the Colville River and Nigliq Channel, a Teledyne RD Instruments™ 600 kHz Workhorse Sentinel broadband ADCP was used. The unit has a four-beam transducer with 20-degree beam. Power was supplied to the unit and supporting laptop via a deep-cycle marine battery and 400-watt power inverter. An IOGear™ USB-to-Serial converter cable was used to connect the ADCP to the laptop, and to increase data delivery rate.

BBTalk, a DOS-based communication program, was used to perform the necessary pre-deployment tests. WinRiver, a Microsoft Windows-based data acquisition and playback software, was used to configure, initiate, and communicate with the ADCP while on the river. WinRiver, in conjunction with WinADCP, was also used to review and evaluate collected discharge data after returning from the field.

PRE-DEPLOYMENT TESTING

Prior to deployment of the ADCP unit, a full suite of tests was run according to the manufacturer’s instructions using BBTalk. The tests confirmed that the signal path and all major signal processing subsystems were functioning properly. Tests also confirmed accurate tilt and pitch readings. A beam continuity test was performed to verify that the transducer beams were connected and operational. Pre-deployment tasks also included compass calibration and calibration verification. Internal compass error was within the specified 2-degree limit.

ADCP Deployment and Data Collection

The Sentinel ADCP was mounted to a 13-foot Achilles SGX-132 inflatable raft powered by a 10 hp outboard motor using a framework fabricated of aluminum tube spanning the boat's fore gunwales. The aluminum framework provided a rigid and secure placement of the ADCP unit while allowing necessary adjustments as river conditions required as identified in Photo 2-3.

Cross sections were identified at established monitoring sites and a minimum of four transects were completed such that measured discharges varied by less than 10%. Cross section end points were dependent on one of the following two factors:

- The minimum water depth to provide acceptable data, which was approximately 6 feet; or
- Limited access to the east bank due to flowing channel ice.

Photo 2-3 Preparing for ADCP Measurement at Monument 1D Site, May 26, 2006.

End points were marked with buoys and using handheld GPS units. The position of the boat was determined by tracking the bottom of the channel. Distances to the right and left edge of water were estimated from GPS coordinates.

ADCP Background and Data Processing

Discharge measurements on May 29 and 30 were conducted near the Monument 1 downstream gage due to the presence of ribbon ice along the east bank of the Colville River near Monument 1. The discharge at both sites was accepted to represent the flow of the Colville River due to confinement of flow within the reach. On May 31, ribbon ice had cleared from the channel and the remaining measurements were conducted near the Monument 1 centerline gage. Discharge on the Nigliq channel was collected near Monument 23 at the proposed bridge crossing.

The ADCP measures the velocity of particles in the water which on average move at the same horizontal velocity of the water, relative to the ADCP unit. The velocity of flow is then calculated relative to the earth based on the simultaneous velocity and position of the boat. This is commonly obtained in one of two ways:

- Tracking the bottom of the channel with the ADCP; or

- Using an external, differentially corrected Global Positioning System (DGPS).

In channels like the Colville, where the bed material is composed of fine-grained material and water velocities are sufficient to entrain bed materials, a moving bed can result. When using bottom tracking, a moving bed will tend to impact the accuracy of the results by biasing the velocity and discharge lower than actual values. This phenomenon can be eliminated with the use of DGPS. In Alaska, the DGPS signal is not as readily available or as accurate as it is in the Lower 48. Therefore the bias due to a moving bed must be documented and accounted for to accurately estimate discharge. The Loop Method is a technique to determine if a moving bed is present and if present, to provide an approximate correction to the final discharge. The USGS has recently established guidance for the Loop Method outlining two procedures (USGS 2006) which include:

- Mean correction
- Distributed correction

Based on the results of the USGS Loop Method, a moving bed was present in 2006. The mean correction procedure was applied to discharge calculations on both the Colville River and Nigliq Channel. The results of daily loop tests were used to estimate the mean velocity of the moving bed. This correction was multiplied by the cross-sectional area perpendicular to the mean observed flow direction resulting in the corrected discharge. The resulting correction was applied to each transect and the daily direct discharge measurement was determined by averaging all of the corrected discharge measurements.

In addition to the mean correction, the distributed correction procedure was performed and the resulting correction applied to the discharge measurement collected on the Colville River during open water conditions on June 1. The results of each method were compared relative to one another and to the Monument 1 stage-discharge rating curve. The results of this comparison were favorable and given the simplicity of the mean correction procedure and the similarity of the resulting discharges from the two procedures during open water conditions, the mean correction procedure was accepted for each corrected daily discharge calculation.

2.3.3 Indirect Measurements

Each culvert in the Alpine CD2 and CD4 facility access roads was hydraulically analyzed as a single barrel culvert using Haestad Methods Culvert Master v 1.0 software for water surface elevation conditions observed throughout the 2006 breakup season. The average velocity and discharge were estimated through the CD2 and CD4 culverts based on the following variables:

- Headwater and tailwater elevations adjacent to each culvert

- Culvert diameter and length from Kuukpik/LCMF as built drawings
- Culvert upstream and downstream invert elevation
- Culvert Manning's roughness coefficient (0.012 for smooth steel and 0.024 for CMP)

The timing of recorded water surface elevations at the Alpine Gages and the peak stage observations were selected to represent conditions throughout breakup. Indirect calculations were also conducted to estimate discharge for the Colville River and Nigliq Channel using the slope-area method (Benson and Dalrymple 1967). Water surface elevation and slope data were obtained from observations made at gages at the time of direct discharge measurements. Cross-section geometry was based on cross sections surveyed by Kuukpik/LCMF in 2003 and 2004 on the Nigliq Channel and Colville River, respectively.

2.4 Erosion Survey Methods

Road and pad erosion inspections were performed to determine if any significant erosion to the facilities' pads and roads had occurred as a result of the spring breakup. These visual inspections were undertaken daily throughout breakup and after floodwaters receded. A bridge scour survey was conducted for the 62-foot and 452-foot swale bridges using discharge sounding measurement data from 2000 to 2006. The analysis was conducted after breakup and was intended to determine the location and the extent of channel scour at the upstream edge of each CD2 road bridges.

Annual channel profiles were tabulated and graphed for each bridge by subtracting the measured depth at each measuring cross section from the water surface elevation at the time of the discharge measurement. This method was applied to the annual discharge measurements conducted at each bridge for each year where a discharge measurement was conducted during breakup. Five cross-sectional profiles were tabulated for the 62-foot swale bridge and seven cross-sectional profiles were tabulated for the 452-foot swale bridge. Due to the 62-foot bridge being obstructed with snow, no measurements were made in 2003 and 2005; consequently, no channel profiles could be created for these years.

2.5 Snow Survey Methods

Snow water equivalent (SWE) surveys were conducted for the Alpine drinking water lakes L9312 and L9313 catchment basins on May 9, 2006, prior to spring breakup. Snow surveys were performed according to procedures outlined in NRCS Snow Survey Sampling Guide (NRCS 2006) and British Columbia Snow Survey Manual (BC Ministry of Environment 1981). Snow measurements were obtained using $1^{5}/_{8}$-inch inside diameter Model 3600 Mt. Rose snow sampling tubes and scale. Sampling sites were selected along three transects bisecting each lake's drainage basins to provide a representative estimate of lake recharge from snow melt. Stationing for each sampling site was recorded in latitude and longitude using a handheld GPS. Transect one (T1) was positioned along the long axis of the lake while transects two (T2) and three (T3) were positioned parallel to one another and perpendicular to T1 near the margins of the catchment basins.

2.6 Flood Frequency Analysis Methods

The magnitude and frequency of annual observed peak discharge of the Colville River and at selected FCB locations have been estimated by Baker annually. Complete summaries of the 2006 analyses are provided in the relevant discussions in Chapters 6 and 7. Magnitude and frequency of peak discharge for past flood events are presented in the following reports:

- Colville River was estimated in 2002 (Baker and Hydroconsult 2002)
- Ublutuoch River was estimated in 2002 (URS 2002).
- FCB small stream sites were estimated in 2003 (PND 2003).

Baker estimated the 2006 magnitude and frequency of peak stream discharge for the Colville River and for streams within the FCB in 2006. The analysis was based on measured peak annual discharge values and the USGS regional regression equations for Region 7 as published in the 2003 USGS Water Resources Investigation Report 03-4188, “Estimating the Magnitude and Frequency of Peak Streamflows for Ungaged Sites on Streams in Alaska and Conterminous Basins in Canada” (Curran, Meyer, and Tasker 2003). In addition, a stage frequency analysis was conducted in the CRD and for the Ublutuoch River based on the observed record. HYFRAN hydrologic frequency analysis software (INRS-ETE 2002) was used to statistically extrapolate hydrologic data sets.

3.0 2006 Monitoring Locations

The CRD and FCB 2006 monitoring locations were similar to those presented in the 2005 Colville River Delta and Fish Creek Basin Spring Breakup and Hydrological Assessment (Baker 2005). The primary differences in 2006 compared to 2005 were the addition of Sites 8, 11, 12, and 13 in the FCB, adjustments in the location of Sites 7 and 9 (also in the FCB), and a reduction in the number of monitoring locations on Fish and Judy Creeks. The six FCB 2006 sites were different than the 2005 sites due to proposed changes in the alignment of the ASDP road which changed the areas of each drainage basin contributing to flow at the monitoring location. Baker did not monitor at Judy Creek RM 7.0 and Fish Creek RM 32.4 because the USGS established gaging stations at these locations in 2006. Details of the 2006 monitoring program locations are shown in Table 3-1.

Table 3-1 2006 Monitoring Program

Colville River Delta (CRD)	18	Alpine Gage Locations (Gages)	Located at CD1, CD2, CD3, and CD4
	3	River crossings	Study sites at each CD3 pipeline river crossing bridges
	9	Monument Gage Locations (Monuments)	Includes Monument 35 at the Helmricks Homestead site
	2	Nigliq PaleoChannel gages	
Fish Creek Basin (FCB)	12	ASDP Monitoring Sites (Sites)	
	6	River monitoring locations	Fish Creek, Judy Creek, and Ublutuoch River
Subtotal	50		
Drainage Structures	2	Alpine swale bridges	62-foot and 452-foot bridges
	65	Alpine culverts	CD2 (26), CD3 (1), CD4 (38)
Total	**117**		

In addition to the monitoring locations presented in this report by Baker, the USGS collected surface water streamflow measurements in 2006 at several locations within the limits of the study area. The USGS locations included the gage 15875000 of the Colville River at Umiat, gage 15861000 of Judy Creek at RM 7.0, and gage 15860000 of Fish Creek at RM 32. The provisional results of the USGS investigations are presented at (http://nwis.waterdata.usgs.gov/ak/nwis/inventory).

3.1 Colville River Delta (CRD)

3.1.1 CRD Monuments

The 2006 CRD monitoring sites extended from the head of the delta at Monument 1 at RM 25 to near the western downstream boundary of the delta at Monument 28 at RM 1.7, and at the Helmricks Homestead near Monument 35 at RM 3, near the eastern downstream boundary. The Monument 1 reach includes gage sets at Monument 1 Downstream, Monument 1, and Monument 1 Upstream; each installed on the west bank of the Colville River Main Channel. Photo 3-1 shows Monument 1 reach on May 29, 2006, representing the only reach of the Colville River where the flow from all primary contributors is confined in a single channel. Monument 28 and the Helmricks Homestead monitoring locations are within the braided floodplain of the CRD and represent flooding conditions near the downstream boundary where the CRD reaches the Beaufort Sea. Monument 1 has been monitored annually since 1992, while Monuments 28 and Helmricks Homestead have been monitored intermittently since 1999.

Photo 3-1 Monument 1 Reach, May 29, 2006.

2006 monitoring of the East Channel included the Monument 9 gage located at RM 20.5, which is located on the west bank of the East Channel. This location is downstream of the Putu Channel and upstream of the entrance to the Sakoonang Channel near the horizontal directionally drilled (HDD) crossing of the Alpine Sales Pipeline. This location was selected to represent the conditions in the Colville River-East Channel and to document breakup at HDD. Monitoring at Monument 9 has been relatively limited in the past.

Photo 3-2 Nigliq Channel from CD2 looking South, June 4, 2006.

The monitoring locations along the Nigliq Channel included locations at Monument 20 at RM 13.1, Monument 22 at RM 9.7, and Monument 23 at RM 7.6, which are located near CD2 and CD4 pads. These locations were selected to represent conditions along the Nigliq Channel from downstream of CD2 to upstream of CD4. Photo 3-2 shows a view of this segment of the Nigliq Channel looking from the CD2 pad towards the south. Monument 20 is located on the east bank, Monument 22 is located on the west bank, and Monument 23 is located on the east bank of the Nigliq Channel; they have been monitored intermittently since 1998.

3.1.2 Alpine Gages

Gages 1, 3, 4, 6, 7, 8, 9, and 10 are located adjacent to Alpine Facilities at CD1 and CD2 and represent conditions between the Sakoonang and Nigliq Channels. These gages were established to monitor conditions adjacent to the existing facilities and have been monitored annually since 1998. Gages 11 and 12 (located adjacent to the CD3 pad) and CD3 pipeline crossings of the Sakoonang (Crossing #2), Tamayayak (Crossing #4), and Ulamnigiaq (Crossing #5) channels were established to monitor conditions adjacent to these existing facilities and have been monitored intermittently since 2000. Gages 13 through 20 were established in 2005 and were installed adjacent to the CD4 road and pad to document conditions of the Nigliq Channel along these facilities. In addition, two gage sets were also monitored near the Nigliq Paleochannel along the proposed ASDP road and are referred to as Nigliq PaleoEast and Nigliq PaleoWest. These gage locations were established to represent conditions along the proposed ASDP road alignment.

3.2 Fish Creek Basin (FCB) Sites

3.2.1 Fish and Judy Creeks

Three monitoring sites were maintained along Fish Creek in 2006 and included RM 0.7, RM 10.3, RM 25.1. Fish RM 0.7 was located on the southeast bank of Fish Creek 0.7 river miles upstream of the mouth of Fish Creek near Harrison Bay. Fish 0.7 was selected to represent the downstream conditions where Fish Creek flows into Harrison Bay. Fish 10.3 was located on the northwest bank of Fish Creek approximately one mile upstream of the Ublutuoch River-Fish Creek confluence. Fish 10.3 was selected to document the water surface elevation of Fish Creek upstream of the confluence with the Ublutuoch River. Fish 25.1 was located on the southeast bank of Fish Creek and was selected to represent stage along the Fish Creek River upstream of the Fish Creek-Ublutuoch River confluence.

3.2.2 Ublutuoch River

The Ublutuoch River monitoring sites included locations at RM 1.9 and RM 6.8. Ublutuoch 1.9 was located on the southwest bank of the Ublutuoch River 1.9 miles southeast of the Ublutuoch River-Fish Creek confluence. The site was originally selected as an alternative bridge crossing site, but is currently observed to represent conditions between Ublutuoch River 6.8 and the Ublutuoch River-Fish Creek confluence. The monitoring site at the proposed Ublutuoch River Bridge site included gage sets at RM 6.7, 6.8, and 6.9 on the northeast bank of the Ublutuoch River, see Photo 3-3. These gage locations were selected to document the conditions of breakup at the location of the proposed Ublutuoch River Bridge.

Photo 3-3 Ublutuoch River UB 6.8, June 4, 2006.

3.2.3 ASDP Sites

Along the ASDP road alignment, Sites 1, 2, 3, 5, 6, and 10 were located similar to the 2005 investigation (Baker 2005c). In 2006, Sites 7 and 9 were each moved from their 2005 location to the north and south respectively. These sites were modified to account for adjustments in the ASDP road alignment.

Sites 8, 11, 12, and 13 were added in 2006. Site 8 included eastern, centerline, and western gage sets at a location of low topography relative to the immediate vicinity. Site 11 included a northern, centerline, and southern gage set adjacent to an unnamed stream along the proposed ASDP road alignment. Site 12 included a northern and southern gage set along an unnamed stream. The stream is located 200 feet west of the proposed CD6 pad and the site was selected to document water surface elevation at the stream during breakup. Site 12 is located approximately 4,000 feet north of the 2005 Site 8 (Baker 2005c) and at the location of 2003 and 2004 Site 1 (PND 2003, 2005). Site 13 included a single gage set on the eastern shore of Lake M9915. Lake M9915 is adjacent to the proposed CD7 pad and Site 13 was selected to document water surface elevations at the lake during breakup.

4.0 Colville River Delta (CRD) 2006 Spring Breakup

This chapter presents the images, data, and analyses for the 2006 spring breakup monitoring program in the CRD. Section 4.1 describes the spring breakup observations and Section 4.2 describes the water surface elevation (stage) monitoring activities. Section 4.3 contains discharge measurement descriptions and analyses for Monuments 1 and 23, the Alpine swale bridges, and the Alpine culverts. The results of the Alpine Pad and Road Erosion Survey are discussed in Section 0. The Alpine Lakes recharge and snow survey analysis is presented in Section 4.5, Section 4.6 discusses the CRD ice bridge monitoring, and Section 0 contains Monument 1 temperature data. Figures are presented in Section 4.8 and stage, observation records, and discharge measurement data tables are at the end of the chapter in Section 4.9.

4.1 Daily Observations (May 23 – June 1)

Daily observations began when the leading edge of breakup entered the CRD and continued throughout breakup. Favorable weather and sufficient logistical support allowed for daily observations in the CRD and at Alpine in 2006. Observations of the East Channel at Monument 1, at Monument 9 near HDD, along the Nigliq Channel at Monuments 20, 22, 23 and 28, and the Alpine Facilities are described in this section.

4.1.1 CRD Daily Observations

Meltwater was initially reported at Umiat on May 23. A reconnaissance flight on May 24 identified rising waters at Ocean Point directly upstream of an ice jam in the Colville River (Photo 4-1). Local melt and low flow conditions continued on the East and Nigliq channels through May 25. On May 26, ice remained intact across the East Channel, while shallow flow entered the Nigliq Channel.

Photo 4-1 Ice Jam near Ocean Point, May 24, 2006

Photo 4-2 Ice Jam in East and Sakoonang Channels, May 29, 2006.

Photo 4-3 Ice at HDD, May 30, 2006.

EAST AND NIGLIQ CHANNEL OBSERVATIONS

On May 27, the edge of breakup flood waters reached the river banks at Monuments 1, 20, and 23 in the East and Nigliq Channels. A portion of the flow in the East Channel was observed to be diverting into the Nigliq Channel due to the presence of an ice jam north of Monument 9. Waters continued to rise in the CRD through May 28 producing ice floes in the East and Nigliq Channels.

The East Channel ice jam at Monument 9 continued through May 29 (Photo 4-2) and by that evening the ice jam spanned the entire East Channel, extending nearly 2.5 miles downstream of HDD (Photo 4-3). Also on May 29, an additional ice jam formed in the sharp bend of the Nigliq Channel immediately downstream of Nuiqsut.

Peak stage was observed at Monuments 1 and 9 on the morning of May 30. Floodwaters continued to rise at Monuments 20, 22, 23, and 28 on May 30. The Nigliq Channel ice jam extended nearly a mile upstream of CD4 to Monument 20. The ice jam in the East Channel began to release by the early afternoon on May 30, resulting in a drop in stage at Monuments 1 and 9. Moving ice was observed in the Nigliq Channel, while waters continued to rise at Monuments 20, 22, 23, and 28.

The Nigliq Channel and Monuments 20, 22, 23, and 28 reached peak stage in the early morning hours of May 31. The ice jam in the Nigliq Channel moved slowly downstream leaving ice stranded along the banks. Later in the morning of May 31, the ice jam on the East Channel released and water levels at Monuments 1 and 9 quickly dropped. On June 1, the ice jams in the Nigliq Channel released and the stage at Monuments 20, 22, 23, and 28 rapidly dropped.

4.1.2 Alpine Gages

Breakup floodwaters first reached the Alpine Gages on May 29. A steady increase in the stage was observed, impacted by the effects of the ice jams in the East and Nigliq Channels. Due in part to these ice jams, water began flowing from the East Channel into the Sakoonang, Tamayagiaq, and Ulamnigiaq Channels.

The highest water observed at the Sakoonang and Tamayagiaq pipeline bridges occurred the morning of May 30. Also on May 30, the culverts along the CD4 road were observed flowing full, and the area around the CD4 pad was inundated with flood waters. By that evening, the CD4 region experienced peak stage.

In the early morning of May 31, prior to the ice jam release in the East Channel, the CD2 and CD3 region reached peak water surface elevations. As the ice jam in the East Channel cleared, waters levels near CD3 and CD4 began to drop rapidly leaving large sheets of stranded ice near the CD4 pad and culverts.

By mid-morning on June 1, the ice jam in the Nigliq Channel had cleared, and the stage near CD1 and CD2 quickly dropped. Large sheets of ice were observed, particularly near the CD2 62-foot swale bridge and at the culvert batteries. As water levels quickly receded, ice was stranded near the CD2 pad, swale bridges, and culverts.

4.2 CRD and Alpine Stage

Stage in the CRD and at Alpine was measured daily from May 27 through June 15. Stage in the East and Nigliq Channels, as well as around the Alpine Facilities, was well documented and provide a complete stage record for 2006 at the study sites.

4.2.1 CRD Stage

Water surface elevations (WSE) during breakup in 2006 were monitored along the East Channel at Monument 1, at Monument 9 near HDD, and along the Nigliq Channel at Monuments 20, 22, 23 and 28. In addition to Monument 1, stage was recorded ½ mile upstream at Monument 1U and ½ mile downstream at Monument 1D. James Helmricks also provided data (Helmricks Homestead, near Monument 35). Figure 1-2 shows the locations of all CRD Monuments.

EAST CHANNEL STAGE (MAY 27 – JUNE 2)

On May 27, flow was observed at Monument 9 and measurements were recorded at Monuments 1 and 9. By the morning of May 28, the stage had increased approximately two feet in the East Channel. At Helmricks Homestead, between May 27 and May 29, a steady rise in stage was observed of about one foot per day. On May 29, an ice jam spanned the East Channel and the stage had increased nearly six feet at Monument 1. Ice remained intact along the banks at Monument 1 and overbank flooding was observed at the HDD East pad. By mid-morning on May 30, Monuments 1 and 9 reached peak stage of 19.49 feet and 19.12 feet, respectively. Helmricks reported a peak WSE of 5.73 feet later that morning. By the afternoon of May 30, the ice jam in the East Channel began to release, and the stage at Monuments 1 and 9 dropped approximately one foot. On May 31, the ice jam in the East Channel cleared and stage decreased by four feet at Monument 1 and by six feet at Monument 9. The final stage measurements were recorded at Monument 1 on June 1 and at Monument 9 on June 2.

Stage, observation records, and discharge measurements for the Monuments in the East Channel are presented in Table 4-19, Table 4-20, Table 4-21, and Table 4-22; Photo 4-1, Photo 4-2, and Photo 4-3 show the breakup conditions in the East Channel.

NIGLIQ CHANNEL STAGE (MAY 27 – JUNE 1)

In the Nigliq Channel, measurements at Monuments 20 and 23 began on May 27. An ice jam was observed in the Nigliq Channel on May 28, the day Monuments 22 and 28 recorded first water. By the afternoon of May 29, the ice jams caused waters to rise nearly four feet at Monument 20, three feet at Monument 22, nearly two feet at Monument 23 and one foot at Monument 28. Stage continued to rise at the Nigliq Monuments through May 30, reaching peak stage of 15.34 feet at Monument 20, 9.95 feet at Monument 22, 8.99 feet at Monument 23 and 3.74 at Monument 28. Wide slow flow was observed entering the Nigliq Paleochannel near the PaleoEast and PaleoWest gages. The paleochannel gages reached peak stage in the early morning of May 31 at 9.70 feet for the PaleoEast gage and 9.62 feet for the PaleoWest gage. Later that morning, the ice jam in the Nigliq Channel had moved approximately one mile downstream, leaving stranded ice along the banks of the channel at Monument 20. The ice jam released in the Nigliq Channel on June 1. Stage, observation records, and discharge measurements are presented in Table 4-23, Table 4-24, Table 4-25, Table 4-26, and Table 4-27.

4.2.2 Alpine Facilities Stage

WSE were monitored near the Alpine Facilities at gages placed around CD1, CD2, CD3 and CD4 roads and pads (Alpine Gages). Figure 1-3 shows the locations of the Gages and pipeline bridge crossings where each measurement was recorded. The discussion below follows the flow of water, beginning with CD4 and ending with the CD1 facilities.

CD4 FACILITIES STAGE (GAGES 15–20)

CD4 was the first Alpine location to see breakup floodwaters. Floodwaters and the ice jams in the East and Nigliq Channels observed on May 29 caused waters to rise nearly four feet by May 30 at Gages 19 and 20 on the southwest corner of the CD4 pad. Along the CD4 road, a rise in water of about 2 ½ feet occurred by May 30 at Gages 15 through 18. As the ice jam expanded in the Nigliq Channel, the stage at the CD4 gages increased, finally reaching peak stage during the evening of May 30. Peak stage was recorded to be 14.30 feet at Gage 20, 14.67 feet at Gage 18, and 12.60 feet at Gage 16. After the ice jam in the East Channel released in the morning of May 31, the stage at the CD4 pad dropped nearly three feet leaving large sheets of ice stranded near the pad and road. By the time the Nigliq Channel ice jam released on June 1, little water was adjacent to the CD4 gages and the final measurements were taken on June 3.

Stage and observation records for the gages near CD4 are presented in Table 4-28 and Table 4-29; Photo 4-4 and Photo 4-5 show the breakup conditions at CD4.

Photo 4-4 CD4 with Floodwater, May 30, 2006.

Photo 4-5 Stranded Ice next to CD4, June 1, 2006.

CD3 FACILITIES STAGE (PIPELINE CHANNEL CROSSINGS, GAGES 11–12)

The pipeline bridge crossings of the Sakoonang (Photo 4-6), Tamayagiaq (Photo 4-7) and Ulamnigiaq (Photo 4-8) Channels near CD3 were observed from May 27 to June 3. On May 28, floodwaters and ice jams observed in the East and Nigliq Channels caused a steady rise in stage at each of the crossings. By May 30, the stage had increased four feet at the Sakoonang, two feet at the Tamayagiaq, and 2½ feet at the Ulamnigiaq pipeline crossing sites. The peak stage occurred the early morning of May 31, when the Sakoonang Channel crossing reached

Photo 4-6 Sakoonang Channel Pipeline Bridge, June 2, 2006.

an elevation of 8.71 feet. The ice jam in the East Channel released later that morning, causing the stage at the crossings to drop approximately one foot by late morning. The stage continued to decrease through the final measurements on June 3. Table 4-30 presents the stage and observation records for the CD3 pipeline bridge crossings at the Sakoonang, Tamayagiaq, and Ulamnigiaq Channels.

Photo 4-7 Tamayagiaq Channel Pipeline Bridge, June 2, 2006.

Photo 4-8 Ulamnigiaq Pipeline Bridge, June 2, 2006.

Photo 4-9 CD3 Pad, June 1, 2006.

Gage 12, on the east side of CD3, first recorded water on May 27. Gage 11, on the west side of CD3, recorded first water on May 28. Floodwaters rose about one foot through May 30 and Gage11 reached a peak stage of 5.55 feet in the early morning of May 31. Gage 12 reached a peak stage of 5.35 feet on the morning of June 1. By June 2, Gage 11 was dry and Gage 12 recorded a stage of 4.31 feet. Photo 4-9 shows the CD3 pad on June 1. Table 4-31 presents the stage and observation records for Gages 11 and 12 near CD3.

CD2 Facilities Stage (Gages 3–8)

Gages 3 through 7 along the CD2 road and pad first recorded water on May 28. Floodwaters and the ice jam in the Nigliq Channel observed on May 28 caused stage to rise about one foot throughout May 29. On May 30, the CD2 road culvert batteries at Gages 6 and 7 were flowing full, while the CD2 bridges were experiencing high flows near Gages 3 and 4. Gage 8 at the northwest corner of the CD2 pad began to show increasing water levels and by the early morning of May 31, Gages 3 through 8 reached peak stage of 9.72 feet at Gage 3, 8.85 feet at Gage 4, 9.95 feet at Gage 6, 9.17 feet at Gage 7 and 9.34 feet at Gage 8. Stage began to drop as floodwaters receded and the East Channel ice jam released the morning of May 31. By June 1, the Nigliq Channel ice jam released and the stage dropped by 1½ feet. The final readings for the CD2 gages occurred on June 3. Table 4-32 and Table 4-33 present the stage and observation records for Gages 3 through 8, near CD2. Photo 4-10 shows the CD2 pad on May 31.

Photo 4-10 CD2 Pad, May 31, 2006.

Photo 4-11 CD1 Pad, May 28, 2006.

CD1 FACILITIES STAGE (GAGES 1, 9, 10)

Gage 1 on the east side of the CD1 pad on the Sakoonang Channel was monitored from May 28 to June 9. Gage 9 at Lake L9312 and Gage 10 at Lake L9313 were monitored from May 28 throughout the summer of 2006. Gage 1 recorded a three-foot increase in stage by the morning of May 30, while stage at Gages 9 and 10 increased by two feet. Gage 1 reached a peak stage in the early morning of May 31 of 9.29 feet and Gages 9 and 10 reached peak stages of 9.55 feet and 9.95 feet, respectively. As floodwaters receded and the ice jams released in the East and Nigliq Channels, stage began dropping. By June 1, the ice jam in the Nigliq Channel had cleared, and the stage at Gages 1, 9, and 10 decreased by approximately 1½ feet. Gage 9 and Gage 10 also showed recharge of the lakes L9312 and L9313 by local melt and by floodwater from the Colville River. Table 4-34 and Table 4-35 present the stage and observation records for Gages 1, 9, and 10 near CD1. Photo 4-11 presents the conditions at the CD1 pad on May 28.

4.3 CRD Discharge

Over the span of the five days between May 29 and June 2, a variety of direct and indirect discharge measurements were completed at locations throughout the CRD and at the Alpine Facilities. The peak discharge was estimated based on daily measurements at the Monument 1 reach, as well as through the Alpine Facilities drainage structures.

4.3.1 Monument 1 Discharge

DIRECT DISCHARGE MEASUREMENTS

Between May 29 and June 1, four direct discharge measurements were completed on the Colville River in the vicinity of the Monument 1 reach using ADCP techniques (Photo 4-12). Processed discharge data is presented in Appendix B. A minimum of four transects and one loop test were completed each of the four days. Standard deviation of daily measured discharges ranged from 1 to 3 % of the mean total discharge. Loop tests confirmed the presence of a moving bed on all four sampling days and provided adjustment values for measured discharge.

Photo 4-12 Direct Discharge (ADCP) Measurement on Colville River, May 29, 2006.

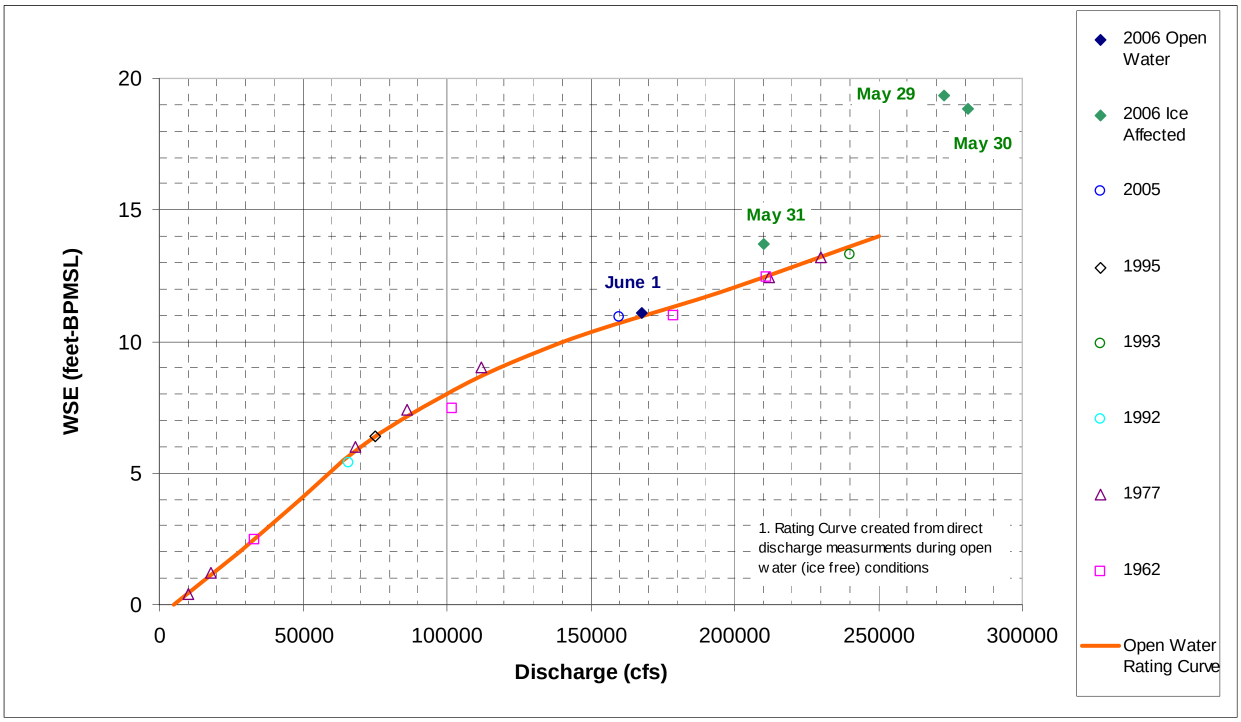
Mean corrected discharge ranged from 168,000 to 281,000 cfs. Based on pressure transducer data and ADCP results, the peak discharge occurred on May 30, approximately seven hours after stage began to drop below peak at Monument 1. Mean flow velocities ranged from 3.3 to 4.4 fps. The maximum mean velocity was observed on May 31 and corresponded with the maximum water surface slope. Table 4-1 summarizes the 2006 daily discharge measurement data on the Colville River at Monument 1 and Figure 4-1 Sheet 1 presents a plan of the location of each discharge measurement at Monument 1. The June 1 measurement is rated as fair considering the presence of open water conditions, calm water, and relationship to the 1962 conventional measurement. The May 29 through May 31 measurements were rated as poor based on the presence of ice in the channel, rough waters, and the absence of comparable conventional measurements.

Table 4-1 Measured Daily Discharge Summary – Monument 1

Site Number	Date & Time	WSE (ft)	Made By	Mean Width (ft)	Mean Area (ft^2)	Mean Velocity (ft/s)	Mean Discharge (cfs)	Corrected Discharge[1] (cfs)	MS Rated[2]	Number of Transects	MS Type
Mon 1D	5/29/06 17:00	19.32	MDM, MTA	3,486	73,253	3.28	240,135	273,000	P	4	ADCP
Mon 1D	5/30/06 14:00	18.86	MDM, MTA	3,487	71,786	3.70	265,398	281,000	P	4	ADCP
Mon 1	5/31/06 17:00	13.69	MDM, MTA	2,951	46,259	4.36	201,270	210,000	P	6	ADCP
Mon 1	6/1/06 16:00	11.07	MDM, MTA	3,099	43,237	3.71	153,206	168,000	F	6	ADCP

Notes:
1. Corrected Discharge - Average velocity of moving bed from Loop Test applied to each transect
2. Measured Rating - E - Excellent, G - Good, F - Fair, P - Poor

The 2006 spring breakup is the first year that direct discharge measurements are available before and after peak stage occurred at Monument 1. During the May 29 and May 30 discharge measurements, extensive ice jamming in the Nigliq and East Channels resulted in near record stage at Monument 1. Peak discharge occurred on May 30 shortly after water surface elevations began to drop, coinciding with the downstream migration of the East and Nigliq Channel ice jams. By May 31, stage had dropped significantly at Monument 1 by approximately five feet in 24 hours. As the East Channel ice jam cleared and water surface slope at Monument 1 increased, the ice jam was still present in the Nigliq Channel. These relationships to some extent influenced the direct discharge measurements and stage at Monument 1. When this stage and discharge relationship is compared with the Monument 1 rating curve (Graph 4-1) these discharge values plot above the rating curve, as is expected given the ice conditions on these days.



Graph 4-1 Monument 1 Rating Curve with Observed Direct Discharge Values

The May 31 direct discharge measurement yielded a mean discharge value and observed stage that plots approximately 15% above the rating curve. The May 31 measurement was collected during ice-affected conditions resulting in an elevated stage compared to open water conditions. The June 1 direct discharge measurement was collected during open water conditions and yielded a mean discharge value and observed stage that plots within 2% of the rating curve, suggesting that the rating curve has not shifted significantly over time. Since the June 1 discharge measurement plots within 5% of the rating curve, the 2006 measurement is considered a verification of the rating curve (Rantz 1982, Vol. 2 pg 346). Table 4-2 presents a historical tabulation of published peak annual discharge of the Colville River between 1992 and 2006 compared with the historical peak water surface elevations.

Table 4-2 Colville River Breakup Peak Annual Discharge, 1992-2006

Year	Monument 1 Peak Discharge (cfs)			Monument 1 Peak Water Surface Elevation (feet-BPMSL)	
	Discharge	Method	Reference	Mon 1	Reference
2006	281,000	ADCP Measurement	This report	19.49	This report
2005	195,000	Estimated-Mon 1 Rating Curve	Baker 2005	13.18	Baker 2005
2004	360,000	Estimated-Indirect Calculation	Baker 2004	19.54	Baker 2004
2003	232,000	Estimated-Mon 1 Rating Curve	Baker 2006	13.76	Baker 2003
2002	249,000	Estimated-Mon 1 Rating Curve	Baker 2006	16.87	Baker 2002d
2001	255,000	Estimated-Mon 1 Rating Curve	Baker 2006	17.37	Baker 2001
2000	580,000	Estimated-Indirect Calculation	Baker 2000	19.33	Baker 2000
1999	203,000	Estimated-Indirect Calculation	Baker 1999	13.97	Baker 1999
1998	213,000	Estimated-Indirect Calculation	Baker 1998	18.11	Baker 1998
1997	177,000	Estimated-Indirect Calculation	Baker 2002a	15.05	Baker 1999
1996	160,000	Estimated-Indirect Calculation	Shannon & Wilson 1996a	17.19	Shannon & Wilson 1996a
1995	233,000	Estimated-Indirect Calculation	ABR 1996	14.88	Shannon & Wilson 1996a
1994	165,000	Estimated-Indirect Calculation	ABR 1994b	12.20	ABR 1996
1993	379,000	Estimated-Indirect Calculation	ABR 1994a	19.20	ABR 1996
1992	164,000	Estimated-Indirect Calculation	ABR 1993	13.90	ABR1996

INDIRECT DISCHARGE MEASUREMENTS

Discharge at Monument 1 in 2006 was also estimated using slope-area computations to compare the indirect discharge results from prior spring breakup events during similar conditions. Water surface elevation and slope data were obtained from gages and pressure transducers at Monuments 1U and 1D. Cross-section geometry, based on topography provided by Kuukpik/LCMF in 2004 (Kuukpik/LCMF 2004), is presented in Figure 4-1, Sheets 2 through 4.

Indirect discharge calculations estimated that May 29 to June 1 discharge ranged from 218,000 to 305,000 cfs, with the peak estimated discharge occurring on May 30. The Colville River peak indirect discharge value was within 9% of the direct discharge measurement using direct ADCP techniques. Because the difference between indirect and direct peak discharge measurements was less than 10%, the indirect discharge estimates for the 2006 peak Colville River discharge is considered to be a good estimate of discharge (Benson and Dalrymple 1967). Therefore, the 2006 annual peak discharge of the Colville River is accepted based on the ADCP direct discharge measurement results.

4.3.2 Monument 23 Discharge

Photo 4-13 Nigliq Channel South of Monument 23, June 1, 2006.

ADCP techniques were used to measure discharge of the Nigliq Channel at Monument 23 on June 1, approximately four hours after completing direct discharge measurements at Monument 1. Processed discharge data is presented in Appendix B. Four transects and one loop test were conducted over a twenty minute period. The loop test confirmed a moving bed and provided adjustment values with a resulting mean corrected discharge of 43,000 cfs. Standard deviation of the four measured discharges was approximately 4% of mean total discharge. Table 4-3 summarizes the 2006 discharge measurement data on the Nigliq Channel at Monument 23 and Figure 4-2 Sheet 1 presents a plan of the location of the discharge measurement at Monument 23.

The proximity in time of discharge measurements at Monument 1 and Monument 23 allows for a direct comparison of flow distribution from the Colville River into the Nigliq Channel. On June 1, approximately 26% of the total Colville River flow was measured in the Nigliq Channel at Monument 23. The ADCP direct measurement was rated as fair given the repeatability of measured discharge values, open water conditions, and accuracy of loop method correction procedures (USGS 2006).

Table 4-3 Measured Discharge Summary – Monument 23

Site Number	Date & Time	WSE (ft)	Made By	Mean Width (ft)	Mean Area (ft^2)	Mean Velocity (ft/s)	Mean Discharge (cfs)	Corrected Discharge[1] (cfs)	MS Rated[2]	Number of Transects	MS Type
Mon 23	6/1/06 18:00	5.9	MDM, MTA	1,165	16,850	2.07	34,840	43,000	F	4	ADCP

Notes:
1. Corrected Discharge - Average velocity of moving bed from Loop Test applied to each transect
2. Measured Rating - E - Excellent, G - Good, F - Fair, P - Poor

Open channel conditions allowed a water surface elevation and slope comparison near Monument 23 at the time of the direct discharge measurement. An indirect discharge analysis was conducted to estimate the 2006 peak discharge of the Nigliq Channel, based on the most current topography surveyed by Kuukpik/LCMF in 2005 (Kuukpik/LCMF 2005), and presented in Figure 4-2 Sheet 2. Estimated indirect discharge results using the slope-area method and stage measurements at Monuments 22 and 23 were very close to the measured directly with the ADCP on June 1. The indirect results were approximately 3% less than the ADCP measurement. Assuming similar channel conditions between May 30 and 31, the water surface elevations and slopes suggest a peak discharge of approximately 68,000 cfs occurred in the early morning hours of May 31. However, on May 31 open water conditions did not exist due to the presence of ribbon ice extending downstream to Monument 23 and ice jamming at Monument 20. Therefore, the peak discharge of the Nigliq Channel is likely greater than the June 1 direct discharge measurement and likely less than the May 31 indirect discharge measurement.

4.3.3 Alpine Swale Bridge Discharge

To monitor the performance of drainage structures and to comply with stipulated monitoring requirements outlined in USACE Permit No. POA-2004-253, velocity and discharge at the swale bridges were measured and estimated for a variety of conditions.

Photo 4-14 62-foot Swale Bridge, May 29, 2006.

Photo 4-15 452-foot Swale Bridge, May 29, 2006.

On May 31, discharges at the 62-foot (Photo 4-14) and 452-foot (Photo 4-15) swale bridges were measured at 980 and 3320 cfs, respectively. Table 4-4 presents a summary of the 2006 discharge measurement data at the Alpine swale bridges. The complete discharge notes are presented in Appendix C. The mean adjusted velocity of the 62-foot bridge was 1.59 fps and the maximum adjusted velocity was 2.24 fps. The mean adjusted velocity of the 452-foot bridge was 1.89 fps and the maximum adjusted velocity was 2.55 fps. The maximum non-adjusted at-point velocity recorded was 2.79 fps at the 62-foot bridge and 2.77 fps at the 452-foot bridge. Each mean and maximum adjusted velocity accounts for the angle of flow coefficient while the non-adjusted at-point velocity represents the actual velocity of the water as measured.

Table 4-4 Measured Discharge Summary – Alpine Swale Bridges

Site Number	Date Time	WSE (ft)	Made By	Width (ft)	Area (ft²)	Mean Vel (ft/s)	Discharge (cfs)	MS Rated[1]	Number of Sections	MS Type
62-foot Bridge	5/31/06 16:20	8.49	SLB, EJK, JPM	55.00	614.60	1.59	980	F	20	Cable
452-foot Bridge	5/31/06 17:50	8.42	SLB, EJK, JPM	409.00	1725.20	1.89	3260	F	29	Cable

Notes: 1. Measured Rating -
E - Excellent: Point plots nearly on the rating curve; within 2% of true value
G - Good: Within 5% of true value
F - Fair: Within 7-10% of true value
P - Poor: Velocity < 0.70 ft/s; Shallow depth for measurement; less than 15% of true value

In 2006, both bridge measurements recorded the highest water surface elevation of any bridge discharge measurement between 2000 and 2005. Table 4-5 summarizes discharge measurement data at the Alpine swale bridges between 2000 and 2006.

Table 4-5 Historical Discharge Summary - Alpine Swale Bridges 2000-2006

Site Number	Date	WSE (ft)	Made By	Width (ft)	Area (ft²)	Mean Vel (ft/s)[1]	Discharge (cfs)	MS Rated[2]	Number of Sections	MS Type	References
62-Foot Bridge	05/31/06	8.49	JPM, SLB, EJK	55	615	1.59	980	F	20	Cable	This report
	–[3]	–	–	–	–	–	–	–	–	–	Baker 2005c
	05/29/04	8.34	JWW, MTA	55	451	1.60	720	F	17	Cable	Baker 2005b
	–[3]	–	–	–	–	–	–	–	–	–	Baker 2003b
	05/25/02	6.74	JWW, HA	56.0	283	1.52	430	G	17	Cable	Baker 2002d
	06/11/01	7.64	JWW, CD	56	336	1.79	600	G	15	Cable	Baker 2001e
	06/10/00	7.87	JA, JA, JC	47	175	3.30	580	F	13	Cable	Baker 2000
452-Foot Bridge	05/31/06	8.42	JPM, SLB, EJK	409	1730	1.89	3260	F	29	Cable	This report
	06/02/05	6.13	JPM, MDC, EJK	445	841	1.37	1100	G	20	Wading	Baker 2005c
	05/29/04	8.34	JWW, MTA	446	1700	1.40	2400	F	18	Cable	Baker 2005b
	06/08/03	5.48	JWW, HA	444	478	0.88	420	G	16	Wading	Baker 2003b
	05/25/02	6.74	JWW, HA	445	930	3.47	3200	G	17	Cable	Baker 2002d
	06/11/01	7.64	JWW, CD	460	1538	2.4	3700	G	16	Cable	Baker 2001e
	06/09/00	7.34	JA, JA	437	1220	3.27	4000	F	15	Cable	Baker 2000

Notes: 1. Mean velocities adjusted with angle of flow coefficient
2. Measured Rating -
E - Excellent: Point plots nearly on the rating curve; within 2% of true value
G - Good: Within 5% of true value
F - Fair: Within 7-10% of true value
P - Poor: Velocity < 0.70 ft/s; Shallow depth for measurement; less than 15% of true value
3. Bridge obstructed with snow, no measurement made

The 2006 peak flow through the 62-foot and 452-foot swale bridges likely occurred at the time of peak stage prior to the discharge measurements. The peak stage occurred on May 31 at an elevation of 9.72 feet as measured at Gage 3. Peak discharge through the bridges was estimated based on the assumption that the measured average adjusted velocity was representative of the average velocity at peak stage. It was also assumed that the average total depth at peak flow was 1.47 and 1.32 feet greater than during the discharge measurement for the 62-foot and 452-foot swale bridges respectively. This assumption was based on the difference in stage between peak and observed stage at the time of the discharge measurement. The peak discharge through the 62-foot bridge is estimated to have been 1,100 cfs and

4,400 cfs through the 452-foot bridge. Table 4-6 summarizes estimated peak annual discharge data at the Alpine swale bridges between 2000 and 2006.

Table 4-6 Estimated Peak Discharge Summary – Alpine Swale Bridges 2000-2006

Date & Time	Peak WSE (ft)[1]	452-Foot Bridge Discharge (cfs)[2]	452-Foot Bridge Mean Vel (ft/s)	62-Foot Bridge Discharge (cfs)[2]	62-Foot Bridge Mean Vel (ft/s)	References
05/31/06 03:00	9.72	4400	1.77	1100	1.59	This report
05/31/05 08:00	6.48	1400	1.37	–[3]	–	Baker 2005c
05/27/04 13:30	9.97	3400	1.38	860	1.59	Baker 2005b
06/07/2003[4]	6.31	730	0.88	–[3]	–	Baker 2003b
05/26/2002[4]	7.59	4000	3.47	500	1.52	Baker 2002d
06/11/2001[4]	7.95	3900	2.40	620	1.79	Baker 2001e
06/12/2000[4]	9.48	7085	3.60	975	4.30	Baker 2000

Notes:
1. Permanent Staff Gage #3 high water mark
2. Estimated peak discharge
3. Bridge obstructed with snow, no measurement made
4. Unknown time of peak stage

Between 2000 and 2002, the peak estimated flow through the 452-foot bridge represented approximately 88% of the total annual peak estimated discharge through both swale bridges. The flow ratio changed in 2004, with the peak estimated flow through the 452-foot bridge representing approximately 80% of the total estimated peak discharge through both swale bridges for 2004 and 2006 (no measurements were taken in 2003 or 2005 at the 62-foot bridge).

4.3.4 Alpine Culverts Discharge

Stage, velocity, and discharge were measured and estimated at the CD2 and CD4 culverts to monitor the performance of the drainage structures and to comply with stipulated monitoring requirements outlined in USACE Permit No. POA-2004-253 and State of Alaska DNR Fish Habitat Permit FH04-III-0238. The location and naming convention of the CD2 and CD4 culverts are presented in Figure 4-3. The stage and as built culvert dimensions were used to indirectly calculate culvert discharge for a variety of conditions throughout breakup. During the 2006 breakup, water was observed to have passed through all of the CD2 road culverts and each of the CD4 road culverts located in the paleochannel region north of the CD4 pad. While snow and ice were present in the Alpine vicinity during breakup, its presence generally had limited impact on the hydraulic performance and discharge of the CD2 and CD4 road culverts.

ALPINE CULVERTS INDIRECT ESTIMATED DISCHARGE AND VELOCITY

Discharge

Flow through the CD2 road culverts is estimated to have first occurred on May 29. The peak discharge through the CD2 culverts coincided with peak stage on May 31 at approximately 3:00 AM and ranged from as little as 2 cfs through culvert CD2-25 to as much as 74 cfs through culvert CD2-12. The total discharge through all CD2 culverts during peak stage was approximately 1200 cfs. The results of the CD2 culverts analysis are presented in Table 4-7. In the tabulation of discharge, a zero discharge represents either water in the culvert with zero velocity or the absence of water in the culvert.

Table 4-7 CD2 Road Culverts Estimated Discharge Summary

Culvert #	5/28/06 4:00 PM	5/29/06 3:30 PM	5/30/06 10:00 AM	5/30/06 9:30 PM	5/31/06 3:00 AM	5/31/06 6:00 AM	5/31/06 10:00 PM	6/1/06 10:30 AM
CD2-1	0.00	18.45	27.99	47.84	51.76	38.15	12.72	6.64
CD2-2	0.00	17.82	27.12	46.68	51.26	37.28	12.31	6.40
CD2-3	0.00	24.04	34.44	56.59	58.33	44.77	16.30	9.36
CD2-4	0.00	28.03	38.80	62.02	59.49	48.51	18.80	11.35
CD2-5	0.00	27.36	38.09	61.21	59.44	47.99	18.34	10.99
CD2-6	0.00	27.91	38.66	61.83	59.41	48.38	18.73	11.30
CD2-7	0.00	28.05	38.81	62.03	59.46	48.50	18.81	11.32
CD2-8	0.00	21.09	31.03	51.95	55.40	41.37	14.44	7.95
CD2-9	0.00	11.91	20.17	36.73	44.76	29.69	8.62	2.98
CD2-10	0.00	15.16	24.13	41.19	49.51	32.89	11.11	3.93
CD2-11	0.00	15.44	24.35	41.78	49.86	33.41	11.29	4.10
CD2-12	0.00	28.04	40.89	63.24	73.51	50.94	20.24	7.78
CD2-13	0.00	18.26	27.97	44.90	53.05	36.09	13.42	4.55
CD2-14	0.00	25.15	36.22	53.79	62.20	43.08	18.42	6.41
CD2-15	0.00	15.14	23.93	37.01	44.83	30.28	12.50	2.99
CD2-16	0.00	0.00	0.45	4.17	8.33	2.91	0.00	0.00
CD2-17	0.00	0.00	1.10	6.36	11.46	4.77	0.00	0.00
CD2-18	0.00	2.89	8.17	16.93	24.66	14.28	3.40	0.00
CD2-19	0.00	0.54	3.49	10.08	16.60	8.46	0.73	0.00
CD2-20	0.00	18.73	28.45	39.31	48.95	32.61	16.90	3.18
CD2-21	0.00	32.23	43.37	51.68	60.72	41.27	26.20	6.88
CD2-22	0.00	35.83	46.92	54.07	62.41	42.76	28.07	7.81
CD2-23	0.00	49.56	59.44	57.78	63.31	44.51	34.34	12.29
CD2-24	0.00	52.14	61.33	58.60	63.12	44.37	36.39	13.24
CD2-25	0.00	0.00	0.00	0.00	1.63	0.00	0.00	0.00
CD2-26	0.00	0.00	0.00	0.69	3.45	0.38	0.00	0.00
Total	**0**	**514**	**725**	**1068**	**1197**	**848**	**372**	**151**

Flow through the CD4 road culverts is estimated to have first occurred on May 30. The peak discharge through the CD4 culverts coincided with peak stage on May 30 at approximately 10:30 PM and ranged from as little as 0.1 cfs through culvert CD4-19 to as much as 166 cfs through culverts CD4-20A through culvert CD4-22. The total discharge through the northern CD4 paleochannel culverts (CD4-19–CD4-23D) during peak stage was approximately 1300 cfs. The total discharge through the southern CD4 paleochannel culverts (CD4-24–CD4-33) during peak stage was approximately 850 cfs. The difference between the observed flow volume through the northern and southern CD4 culverts is likely due to flow from Lake L9323 into the Nigliq Channel. The results of the CD4 culverts analysis are presented in Table 4-8.

Table 4-8 CD4 Road Culverts Estimated Discharge Summary

Culvert #	5/29/06 8:00 PM	5/30/06 9:00 AM	5/30/06 5:00 PM	5/30/06 10:30 PM	5/31/06 9:30 AM	6/1/06 10:00 AM	6/2/06 9:00 AM	6/3/06 9:00 AM
CD4-19	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00
CD4-20A	0.00	0.00	110.50	165.68	74.39	80.20	51.61	0.00
CD4-20	0.00	0.00	111.83	165.67	74.39	91.57	65.67	0.00
CD4-21	0.00	0.00	111.81	165.64	74.37	85.18	57.38	0.00
CD4-22	0.00	0.00	110.03	165.68	74.39	64.51	36.11	0.00
CD4-23	0.00	0.00	61.33	145.75	53.25	17.40	3.12	0.00
CD4-23A	0.00	0.00	65.04	149.64	135.08	20.12	4.57	0.00
CD4-23B	0.00	0.00	84.07	162.18	67.00	34.78	13.85	0.00
CD4-23C	0.00	0.00	58.26	103.33	103.75	20.97	6.74	0.00
CD4-23D	0.00	0.00	61.21	103.63	104.03	24.40	8.82	0.00
CD4-24	0.00	1.06	60.89	84.32	17.23	0.00	0.00	0.00
CD4-25	0.00	0.40	57.83	81.97	15.05	0.00	0.00	0.00
CD4-26	0.00	0.73	62.24	84.70	17.43	0.00	0.00	0.00
CD4-27	0.00	0.72	62.16	84.70	17.37	0.00	0.00	0.00
CD4-28	0.00	0.85	60.63	84.14	16.96	0.00	0.00	0.00
CD4-29	0.00	2.15	66.39	87.97	21.12	0.00	0.00	0.00
CD4-30	0.00	2.25	67.28	87.99	21.72	0.00	0.00	0.00
CD4-31	0.00	1.47	65.28	86.47	19.73	0.00	0.00	0.00
CD4-32	0.00	0.81	63.94	84.56	18.78	0.00	0.00	0.00
CD4-33	0.00	2.21	62.16	88.83	19.40	0.00	0.00	0.00
Northern Battery Total	**0**	**0**	**774**	**1327**	**761**	**439**	**248**	**0**
Southern Battery Total	**0**	**13**	**629**	**856**	**185**	**0**	**0**	**0**

Headwater and Tailwater Differential

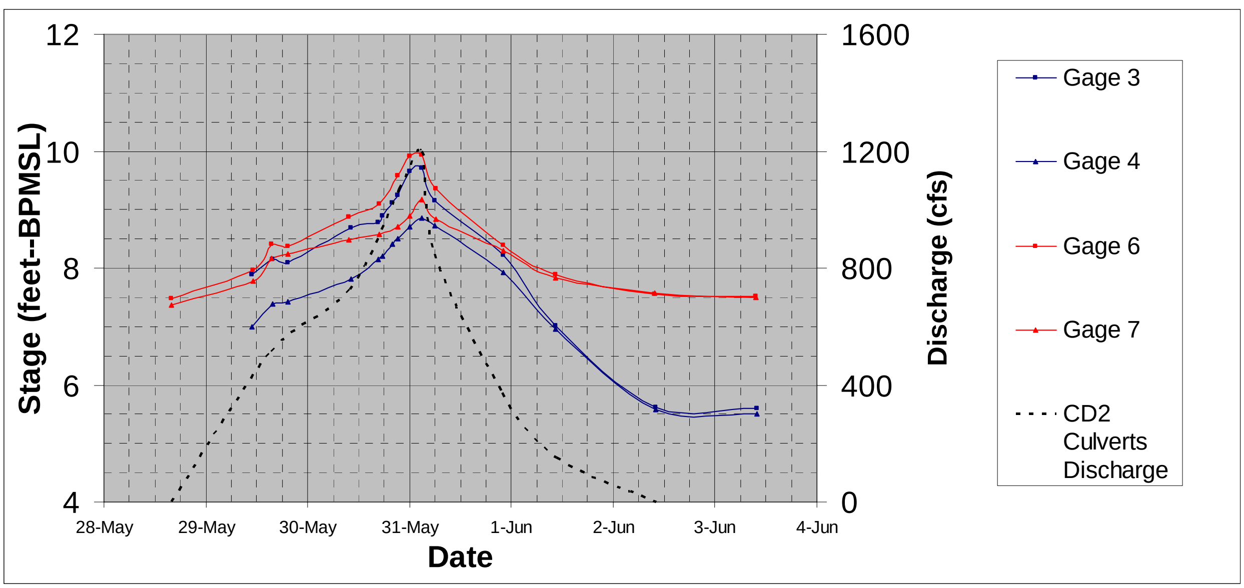
The differential between headwater and tailwater elevations for the CD2 culverts is based on the water surface elevation differential between Gages 3 and 4 and between Gages 6 and 7. At the CD2 culverts, the maximum water surface elevation differential between the gage sets did not occur during peak stage, but occurred approximately three hours prior to the observed peak stage. The maximum recorded water surface elevation differential along the CD2 road was recorded on May 31 at 12:00 AM and was recorded to be a differential of 1.0 feet between Gages 3 and 4 and the same between Gages 6 and 7. The water surface elevation differential along the CD2 road was greater than 0.5 feet for less than a 48-hour duration between May 29 and May 31. Flow is estimated to have stopped on June 2 for the CD2 culverts. A comparison of stage and discharge during breakup for CD2 culverts is presented in Graph 4-2.

The differential between headwater and tailwater elevations for the CD4 culverts is represented by the water surface elevation differential between Gages 15 and 16 at the northern culvert battery and between Gages 17 and 18 at the southern culvert battery. At the northern CD4 culverts, the maximum water surface elevation differential between the gage sets occurred during peak stage on May 30 at 10:30 PM and was recorded to be a differential of 2.5 feet between Gages 15 and 16 (Photo 4-16). At the southern CD4 culverts, the maximum water surface elevation differential between the gage sets did not occur during peak stage, but occurred approximately five hours prior to the observed peak stage. The maximum recorded water surface elevation differential at the southern CD4 culverts was 2.7 feet and was observed on May 30 at 5:15 PM between Gages 17 and 18 (Photo 4-17).

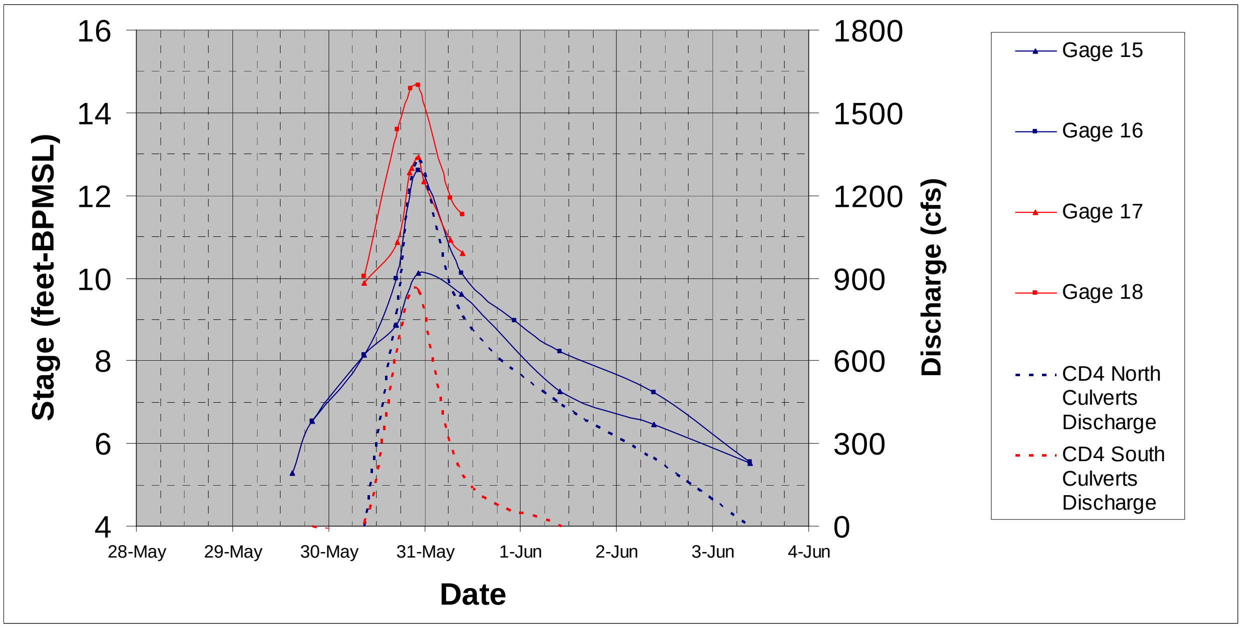
Photo 4-16 Northern CD4 Culvert Battery, May 30, 2006.

Photo 4-17 Southern CD4 Culvert Battery, May 30, 2006.

The water surface elevation differential along the CD4 road at the northern culverts was greater than 0.5 feet for less than four days between May 29 and June 2; the water surface elevation differential along the CD4 road at the southern culverts was greater than 0.5 feet for less than a 24-hour duration between May 30 and May 31. Flow is estimated to have stopped on June 3 for the CD4 culverts. A comparison of stage and discharge during breakup for the CD4 culverts is presented in Graph 4-3.



Graph 4-2 CD2 Road Culverts Estimated Discharge vs. Stage



Graph 4-3 CD4 Road Culverts Estimated Discharge vs. Stage

Velocity

For the CD2 road culverts, the peak average velocity of 4.8 fps is estimated to have occurred on May 30 at 9:30 PM, approximately 5½ hours prior to peak stage. At the time of peak discharge through the CD2 road culverts at 3:00 AM on May 31, the average velocity of each culvert ranged from 2.8 fps through culvert CD2-25 to 5.5 fps through culvert CD2-15. A summary of average velocity values for each CD2 culvert is presented in Table 4-9. In the tabulation of velocities, a zero velocity generally represents water in the culvert with a zero velocity and a blank cell generally represents the absence of water in the culvert.

A summary of average velocity values for each CD4 culvert is presented in Table 4-10. For the northern CD4 culverts, the peak average velocity of 7.9 fps is estimated to have occurred at peak stage on May 30 at 10:30 PM. At the time of peak discharge through the northern CD4 culverts at 10:30 PM on May 30, the average velocity of each culvert ranged from 1.7 fps through culvert CD4-19 to 9.5 fps through culvert CD4-23. For the southern CD4 culverts, the peak average velocity of 8.2 fps is estimated to have occurred on May 30 at 5:00 PM, approximately 5½ hours prior to peak stage. At the time of peak discharge through the southern CD4 culverts at 10:30 PM on May 30, the average velocity of each culvert ranged from 7.1 fps through culvert CD4-33 to 7.6 fps through culverts CD4-25 through CD4-27.

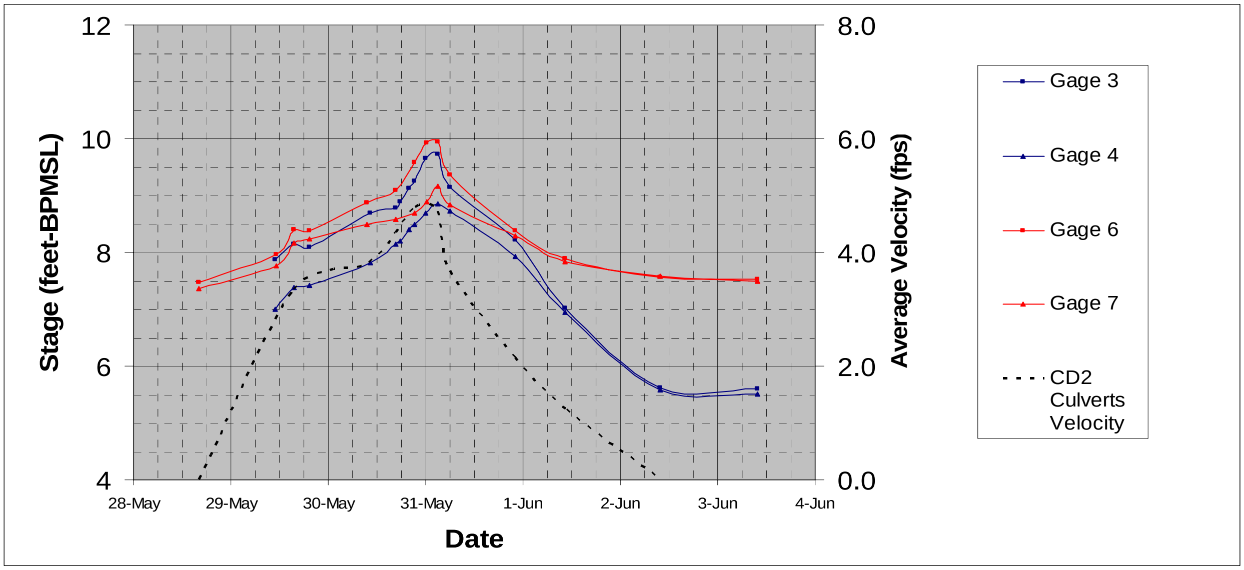
Table 4-9 CD2 Road Culverts Estimated Average Velocity Summary

Culvert #	5/28/06 4:00 PM	5/29/06 3:30 PM	5/30/06 10:00 AM	5/30/06 9:30 PM	5/31/06 3:00 AM	5/31/06 6:00 AM	5/31/06 10:00 PM	6/1/06 10:30 AM
CD2-1		3.05	3.80	5.85	5.21	4.37	1.94	1.39
CD2-2		2.89	3.63	5.62	5.11	4.22	1.84	1.31
CD2-3		2.72	3.43	5.27	4.84	4.00	1.75	1.23
CD2-4		2.65	3.35	5.13	4.73	3.92	1.71	1.20
CD2-5		2.69	3.39	5.18	4.73	3.95	1.73	1.22
CD2-6		2.61	3.31	5.08	4.73	3.89	1.68	1.18
CD2-7		2.69	3.39	5.18	4.73	3.95	1.74	1.22
CD2-8		2.73	3.45	5.32	4.90	4.04	1.76	1.23
CD2-9		2.67	3.35	5.04	4.68	3.70	1.65	0.98
CD2-10		3.00	3.57	5.01	4.73	3.65	1.83	1.11
CD2-11		2.56	3.13	4.51	4.33	3.32	1.59	0.92
CD2-12		3.02	3.59	4.69	4.58	3.53	1.89	1.07
CD2-13		2.74	3.32	4.42	4.31	3.29	1.70	0.92
CD2-14		3.26	3.79	4.65	4.57	3.47	2.01	1.08
CD2-15		4.56	4.97	5.64	5.48	4.16	2.71	1.48
CD2-16			2.04	3.62	4.35	3.29		
CD2-17			2.56	4.04	4.75	3.75		
CD2-18		3.28	4.33	5.29	5.39	3.72	2.56	
CD2-19		2.14	3.45	4.58	5.26	3.88	2.31	
CD2-20		4.51	4.87	4.71	5.05	3.57	2.76	1.23
CD2-21		4.71	5.06	4.71	5.09	3.56	2.93	1.34
CD2-22		5.06	5.33	4.85	5.17	3.64	3.06	1.46
CD2-23		5.12	5.33	4.68	5.04	3.54	3.09	1.52
CD2-24		5.01	5.23	4.66	5.02	3.53	3.04	1.49
CD2-25					2.84			
CD2-26				2.28	3.44	1.95		
Average	**0.0**	**3.3**	**3.8**	**4.8**	**4.7**	**3.7**	**2.1**	**1.2**

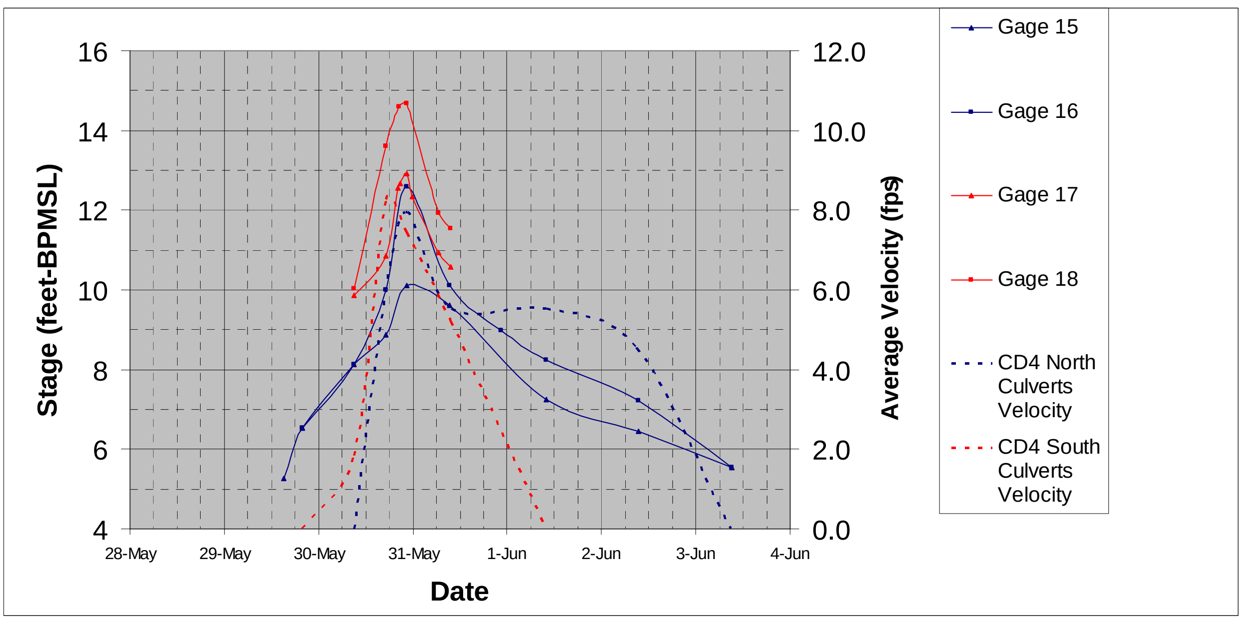
Table 4-10 CD4 Road Culverts Estimated Average Velocity Summary

Culvert #	5/29/06 8:00 PM	5/30/06 9:00 AM	5/30/06 5:00 PM	5/30/06 10:30 PM	5/31/06 9:30 AM	6/1/06 10:00 AM	6/2/06 9:00 AM	6/3/06 9:00 AM
CD4-19		0.00		1.66				0.00
CD4-20A		0.00	5.80	8.44	3.79	6.39	6.02	0.00
CD4-20		0.00	5.70	8.44	3.79	5.96	5.68	0.00
CD4-21		0.00	5.69	8.44	3.79	5.97	5.53	0.00
CD4-22		0.00	5.61	8.44	3.79	4.61	3.59	0.00
CD4-23		0.00	6.55	9.46	4.07	5.11	3.24	0.00
CD4-23A		0.00	6.40	9.30	9.73	5.31	3.58	0.00
CD4-23B		0.00	6.36	8.80	4.04	6.20	4.80	0.00
CD4-23C		0.00	5.59	8.22	8.37	4.96	4.11	0.00
CD4-23D		0.00	5.70	8.25	8.30	5.29	4.42	0.00
CD4-24		1.28	7.92	7.20	5.32			
CD4-25		1.99	7.78	7.56	5.12			
CD4-26		2.11	7.99	7.62	5.34			
CD4-27		2.09	7.98	7.62	5.33			
CD4-28		1.98	7.91	7.49	5.30			
CD4-29		1.82	8.19	7.31	5.64			
CD4-30		2.05	8.23	7.36	5.69			
CD4-31		2.17	8.13	7.48	5.53			
CD4-32		2.35	8.07	7.60	5.45			
CD4-33		0.69	10.28	7.07	3.23			
Northern Average		**0.0**	**5.9**	**7.9**	**5.5**	**5.5**	**4.6**	**0.0**
Southern Average	**0.0**	**1.9**	**8.2**	**7.4**	**5.2**	**0.0**		

The average velocity estimated for the CD2 and CD4 culverts is related to the water surface differential between the headwater and the tailwater. The average velocity for each culvert was found to be greatest during the largest differential between the headwater and the tailwater. A comparison of stage and average velocity for the CD2 and CD4 culverts is presented in Graph 4-4 and Graph 4-5 respectively.



Graph 4-4 CD2 Road Culverts Estimated Average Velocity vs. Stage



Graph 4-5 CD4 Road Culverts Estimated Average Velocity vs. Stage

ALPINE CULVERTS DISCHARGE AND VELOCITY DIRECT MEASUREMENTS

To validate the indirect calculated velocity and discharge estimates for the Alpine culverts, depth and velocity measurements were collected at each culvert where pressure flow was not observed. Velocity at some culverts was not measured due to safety concerns, and other culverts were not measured when pressure flow conditions were observed. For this analysis, a single at-point measured velocity at six tenths depth at the outlet of the culvert was used to represent the average cross-sectional velocity in the culvert.

Eastern CD2 culvert velocity measurements were collected on May 31 between 9:41 AM and 10:28 AM using a Price AA meter and are presented in Table 4-11. These measurements represent conditions at the eastern CD2 culverts approximately seven hours after peak stage occurred at Gages 3 and 4. The average velocity of the CD2 culverts that were measured is 3.1 fps and range from 0.5 fps through culvert CD2-18 to 5.2 fps through culvert CD2-13. The total discharge of the measured eastern CD2 culverts was 119 cfs and ranged from 0.6 cfs through culvert CD2-16 to 48 cfs through culvert CD2-13. Considering the timing of the data collection, this set of data at the CD2 culverts is considered representative of flow conditions during peak discharge.

Table 4-11 Eastern CD2 Road Culverts-May 31 Discharge Measurements

Culvert #	Date Time	WSE (ft)	Made By	Width (ft)	Area (ft^2)	Mean Vel (ft/s)	Discharge (cfs)	MS Rated[1]	Number of Sections	MS Type
CD2-12	5/31/06 10:28 AM	9.30	MDM, EJK	6.0	12.3	0.00	0.00	P	1	Wading
CD2-13	5/31/06 10:25 AM	9.30	MDM, EJK	5.0	9.3	5.20	48.47	P	1	Wading
CD2-14	5/31/06 10:20 AM	9.28	MDM, EJK	Not Measured	10.8	Not Measured	Not Measured			Wading
CD2-15	5/31/06 10:16 AM	9.26	MDM, EJK	4.0	6.3	4.10	25.76	P	1	Wading
CD2-16	5/31/06 10:05 AM	9.26	MDM, EJK	2.1	0.4	1.32	0.57	P	1	Wading
CD2-17	5/31/06 10:04 AM	9.23	MDM, EJK	3.3	2.1	0.00	0.00	P	1	Wading
CD2-18	5/31/06 9:58 AM	9.21	MDM, EJK	3.8	3.9	0.54	2.14	P	1	Wading
CD2-19	5/31/06 9:53 AM	9.19	MDM, EJK	3.0	1.5	4.28	6.33	P	1	Wading
CD2-20	5/31/06 9:49 AM	9.17	MDM, EJK	2.7	Not Measured	Not Measured	Not Measured			Wading
CD2-21	5/31/06 9:47 AM	9.15	MDM, EJK	Not Measured	Not Measured	Not Measured	Not Measured			Wading
CD2-22	5/31/06 9:43 AM	9.15	MDM, EJK	2.7	11.7	3.05	35.53	P	1	Wading
CD2-23	5/31/06 9:41 AM	9.15	MDM, EJK	Not Measured	Not Measured	Not Measured	Not Measured			Wading
CD2-24	5/31/06 9:41 AM	9.15	MDM, EJK	Not Measured		Not Measured				Wading
Notes: 1. Measured Rating - P - Poor: Moving bed, less than 15% of true value							Average Measured Velocity (ft/s)			3.1
							Total Measured Discharge (cfs)			119

Western CD2 culvert velocity measurements were collected on June 1 between 8:00 AM and 8:35 AM using a Pygmy meter and are presented in Table 4-12. These measurements represent conditions at the western CD2 culverts approximately 29 hours after peak stage occurred at Gages 6 and 7. The average velocity of the measured CD2 culverts is 0.7 fps and ranged from 0.1 fps through culvert CD2-1 to 1.5 fps through culvert CD2-11. The total discharge of the measured western CD2 culverts was 13 cfs and ranged from 0.8 cfs through culvert CD2-1 to 6 cfs through culvert CD2-11. Considering the timing of the data collection was greater than 24 hours after peak stage, this set of data at the CD2 culverts is not considered representative of flow conditions during peak discharge.

Table 4-12 Western CD2 Road Culverts-June 1 Discharge Measurements

Culvert #	Date Time	WSE (ft)	Made By	Width (ft)	Area (ft^2)	Mean Vel (ft/s)	Discharge (cfs)	MS Rated[1]	Number of Sections	MS Type
CD2-1	6/1/06 8:35 AM	7.89	MDM, EJK	4.0	7.5	0.10	0.75	P	1	Wading
CD2-2	6/1/06 8:31 AM	7.89	MDM, EJK	3.9	4.7	0.59	2.78	P	1	Wading
CD2-3	6/1/06 8:27 AM	7.89	MDM, EJK	4.0	7.5	0.00	0.00	P	1	Wading
CD2-4	6/1/06 8:12 AM	7.89	MDM, EJK	3.7	9.4	0.00	0.00	P	1	Wading
CD2-5	6/1/06 8:12 AM	7.89	MDM, EJK	3.8	8.7	0.00	0.00	P	1	Wading
CD2-6	6/1/06 8:12 AM	7.89	MDM, EJK	3.7	9.4	0.00	0.00	P	1	Wading
CD2-7	6/1/06 8:12 AM	7.89	MDM, EJK	3.7	9.4	0.00	0.00	P	1	Wading
CD2-8	6/1/06 8:10 AM	7.89	MDM, EJK	4.0	6.7	0.00	0.00	P	1	Wading
CD2-9	6/1/06 8:07 AM	7.80	MDM, EJK	4.1	3.2	0.61	1.96	P	1	Wading
CD2-10	6/1/06 8:02 AM	7.82	MDM, EJK	4.8	2.8	0.64	1.78	P	1	Wading
CD2-11	6/1/06 8:00 AM	7.72	MDM, EJK	4.4	4.1	1.51	6.14	P	1	Wading
Notes: 1. Measured Rating - P - Poor: Moving bed, less than 15% of true value							Average Measured Velocity (ft/s)			0.7
							Total Measured Discharge (cfs)			13

Southern CD4 culvert velocity measurements were collected on May 31 between 8:20 AM and 8:51 AM using a Price AA meter and are presented in Table 4-13. These measurements represent conditions at the southern CD4 culverts approximately ten hours after peak stage occurred at Gages 17 and 18. The average velocity of the measured CD4 culverts is 5.5 fps and ranged from 3.8 fps through culvert CD4-33 to 6.3 fps through culvert CD4-24. The total discharge of the measured southern CD4 culverts was 196 cfs and ranged from 15 cfs through culvert CD4-25 to 26 cfs through culvert CD4-30. Considering the timing of the data collection, this set of data at the CD4 culverts is considered representative of flow conditions during peak discharge.

Table 4-13 Southern CD4 Road Culverts-May 31 Discharge Measurements

Culvert #	Date Time	WSE (ft)	Made By	Width (ft)	Area (ft²)	Mean Vel (ft/s)	Discharge (cfs)	MS Rated[1]	Number of Sections	MS Type
CD4-24	5/31/06 8:20 AM	11.53	MDM, EJK	3.6	2.8	6.26	17.60	P	1	Wading
CD4-25	5/31/06 8:21 AM	11.53	MDM, EJK	3.6	2.8	5.26	14.77	P	1	Wading
CD4-26	5/31/06 8:27 AM	11.53	MDM, EJK	3.8	3.5	5.20	18.41	P	1	Wading
CD4-27	5/31/06 8:31 AM	11.53	MDM, EJK	3.8	3.5	5.60	19.81	P	1	Wading
CD4-28	5/31/06 8:34 AM	11.53	MDM, EJK	3.8	3.5	5.48	19.38	P	1	Wading
CD4-29	5/31/06 8:40 AM	11.53	MDM, EJK	3.9	4.3	5.55	23.88	P	1	Wading
CD4-30	5/31/06 8:42 AM	11.53	MDM, EJK	3.9	4.3	5.99	25.77	P	1	Wading
CD4-31	5/31/06 8:42 AM	11.53	MDM, EJK	3.7	3.2	5.84	18.51	P	1	Wading
CD4-32	5/31/06 8:47 AM	11.53	MDM, EJK	3.6	2.8	6.06	17.03	P	1	Wading
CD4-33	5/31/06 8:51 AM	11.53	MDM, EJK	4.0	5.5	3.83	20.97	P	1	Wading
Notes: 1. Measured Rating - P - Poor: Moving bed, less than 15% of true value							**Average Measured Velocity (ft/s)**			**5.5**
							Total Measured Discharge (cfs)			**196**

ALPINE CULVERTS INDIRECT AND DIRECT DISCHARGE ESTIMATES COMPARISON

To evaluate the accuracy of the indirect discharge estimates, the directly measured discharge results were compared to the indirect estimates of velocity and discharge. The range of differences between the timing of the Alpine Gage readings and the culvert measurements is between one and four hours. For this reason, as well as considering the complexities of flow distributions in the Alpine region, some differences between the results of the two methods are expected.

The comparison between the May 31 eastern CD2 culverts direct and indirect measurements is presented in Table 4-14. The indirect estimates of discharge agree relatively well with the measured discharge with the exception of culvert CD2-12. Based on flow observations in the field, culvert CD2-12 was obstructed by snow or ice. The difference between the average measured velocity and the average estimated velocity is approximately -19%. The difference between the average measured discharge and the average estimated discharge is approximately -14%. The difference in discharge results was less than 15%, therefore the indirect discharge estimates for the May 31 time period at the eastern CD2 culverts are considered to be a fair estimate of discharge (Benson and Dalrymple 1967).

Table 4-14 Eastern CD2 Road Culverts – May 31 Discharge Measurement Comparison

Culvert	Time of Direct Measurement	Mean Velocity (ft/s)	Direct Measured Discharge (cfs)	Time of Indirect Measurement	Indirect Calculated Velocity (ft/s)	Indirect Calculated Discharge (cfs)	Velocity % Difference Compared to Measured	Discharge % Difference Compared to Measured
CD2-12	5/31/06 10:28 AM	0.00	0.0	5/31/06 6:00 AM	3.53	50.9		
CD2-13	5/31/06 10:25 AM	5.20	48.5	5/31/06 6:00 AM	3.29	36.1	37%	26%
CD2-14	5/31/06 10:20 AM	Not Measured	Not Measured	5/31/06 6:00 AM	3.47	43.1		
CD2-15	5/31/06 10:16 AM	4.10	25.8	5/31/06 6:00 AM	4.16	30.3	-1%	-18%
CD2-16	5/31/06 10:05 AM	1.32	0.6	5/31/06 6:00 AM	3.29	2.9	-148%	-411%
CD2-17	5/31/06 10:04 AM	0.00	0.0	5/31/06 6:00 AM	3.75	4.8		
CD2-18	5/31/06 9:58 AM	0.54	2.1	5/31/06 6:00 AM	3.72	14.3	-583%	-569%
CD2-19	5/31/06 9:53 AM	4.28	6.3	5/31/06 6:00 AM	3.88	8.5	9%	-34%
CD2-20	5/31/06 9:49 AM	Not Measured	Not Measured	5/31/06 6:00 AM	3.57	32.6		
CD2-21	5/31/06 9:47 AM	Not Measured	Not Measured	5/31/06 6:00 AM	3.56	41.3		
CD2-22	5/31/06 9:43 AM	3.05	35.5	5/31/06 6:00 AM	3.64	42.8	-19%	-20%
CD2-23	5/31/06 9:41 AM	Not Measured	Not Measured	5/31/06 6:00 AM	3.54	44.5		
CD2-24	5/31/06 9:41 AM	Not Measured	0.0	5/31/06 6:00 AM	3.53	44.4		
Average Measured Velocity (ft/s)		**3.1**		**Average Calculated Velocity (ft/s)**		**3.7**	**V Difference**	**-19%**
Total Measured Discharge (cfs)		**119**		**Total Calculated Discharge (cfs)**		**135**	**Q Difference**	**-14%**

The comparison between the June 1 western CD2 culverts direct and indirect measurements are presented in Table 4-15. The indirect estimates of discharge generally do not agree well with the measured discharge most likely due to the influences of snow and ice and also due to the small discharge at each culvert. The difference between the average measured velocity and the average estimated velocity is approximately -65%. The difference between the average measured discharge and the average estimated discharge is approximately -79%. The difference in discharge results was greater than 25%, therefore the indirect discharge estimates for the June 1 time period at the CD2 culverts are considered to be a poor estimate of discharge (Benson and Dalrymple 1967).

Table 4-15 Western CD2 Road Culverts – June 1 Discharge Measurement Comparison

Culvert	Time of Direct Measurement	Mean Velocity (ft/s)	Direct Measured Discharge (cfs)	Time of Indirect Measurement	Indirect Calculated Velocity (fps)	Indirect Calculated Discharge (cfs)	Velocity % Difference Compared to Measured	Discharge % Difference Compared to Measured
CD2-1	6/1/06 8:35 AM	0.10	0.7	6/1/06 10:30 AM	1.39	6.6	-1287%	-786%
CD2-2	6/1/06 8:31 AM	0.59	2.8	6/1/06 10:30 AM	1.31	6.4	-121%	-131%
CD2-3	6/1/06 8:27 AM	0.00	0.0	6/1/06 10:30 AM	1.23	9.4		
CD2-4	6/1/06 8:12 AM	0.00	0.0	6/1/06 10:30 AM	1.20	11.4		
CD2-5	6/1/06 8:12 AM	0.00	0.0	6/1/06 10:30 AM	1.22	11.0		
CD2-6	6/1/06 8:12 AM	0.00	0.0	6/1/06 10:30 AM	1.18	11.3		
CD2-7	6/1/06 8:12 AM	0.00	0.0	6/1/06 10:30 AM	1.22	11.3		
CD2-8	6/1/06 8:10 AM	0.00	0.0	6/1/06 10:30 AM	1.23	8.0		
CD2-9	6/1/06 8:07 AM	0.61	2.0	6/1/06 10:30 AM	0.98	3.0	-60%	-52%
CD2-10	6/1/06 8:02 AM	0.64	1.8	6/1/06 10:30 AM	1.11	3.9	-75%	-121%
CD2-11	6/1/06 8:00 AM	1.51	6.1	6/1/06 10:30 AM	0.92	4.1	39%	33%
Average Measured Velocity (ft/s)		**0.7**		**Average Calculated Velocity (ft/s)**		**1.1**	**V Difference**	**-65%**
Total Measured Discharge (cfs)		**13**		**Total Calculated Discharge (cfs)**		**24**	**Q Difference**	**-79%**

The comparison between the May 31 southern CD4 culverts direct and indirect measurements is presented in Table 4-16. The indirect estimates of discharge agree relatively well with the measured discharge. The difference between the average measured velocity and the estimated average velocity is approximately 6%. The difference between the average measured discharge and the average estimated discharge is also approximately 6%. The difference between indirect and direct discharge results were less than 10%, therefore the indirect discharge estimates for the May 31 time period at the southern CD4 culverts are considered to be a good estimate of discharge (Benson and Dalrymple 1967).

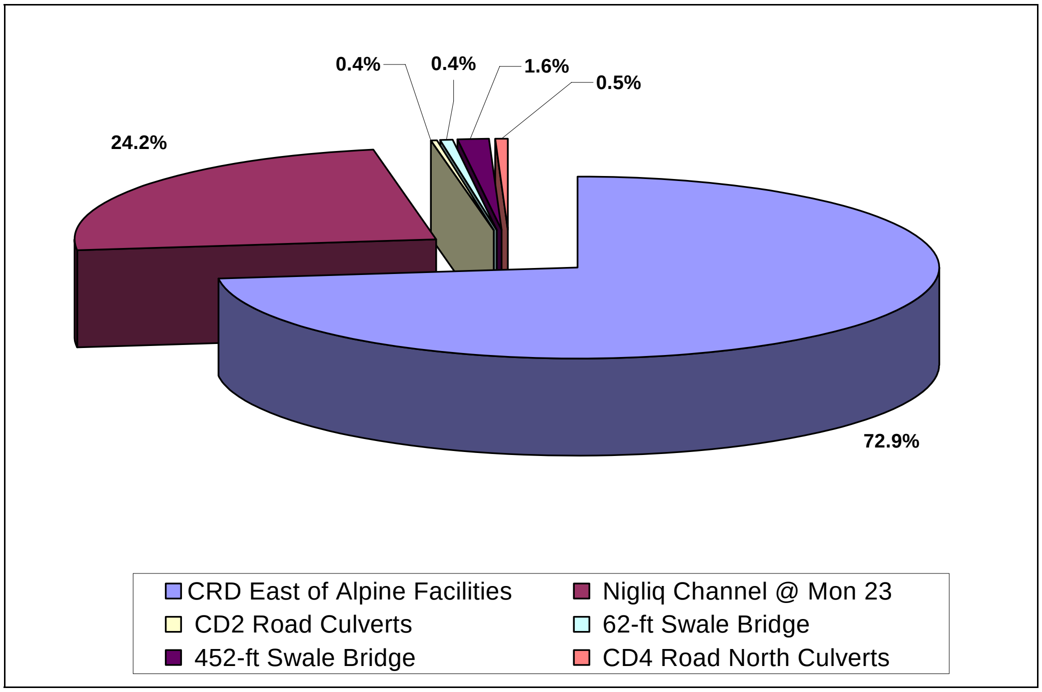
Table 4-16 Southern CD4 Road Culverts – May 31 Discharge Measurement Comparison

Culvert #	Time of Direct Measurement	Mean Velocity (ft/s)	Direct Measured Discharge (cfs)	Time of Indirect Measurement	Indirect Calculated Velocity (ft/s)	Indirect Calculated Discharge (cfs)	Velocity % Difference Compared to Measured	Discharge % Difference Compared to Measured
CD4-24	5/31/06 8:20 AM	6.26	17.6	5/31/06 9:30 AM	5.32	17.2	15%	2%
CD4-25	5/31/06 8:21 AM	5.26	14.8	5/31/06 9:30 AM	5.12	15.1	3%	-2%
CD4-26	5/31/06 8:27 AM	5.20	18.4	5/31/06 9:30 AM	5.34	17.4	-3%	5%
CD4-27	5/31/06 8:31 AM	5.60	19.8	5/31/06 9:30 AM	5.33	17.4	5%	12%
CD4-28	5/31/06 8:34 AM	5.48	19.4	5/31/06 9:30 AM	5.30	17.0	3%	13%
CD4-29	5/31/06 8:40 AM	5.55	23.9	5/31/06 9:30 AM	5.64	21.1	-2%	12%
CD4-30	5/31/06 8:42 AM	5.99	25.8	5/31/06 9:30 AM	5.69	21.7	5%	16%
CD4-31	5/31/06 8:42 AM	5.84	18.5	5/31/06 9:30 AM	5.53	19.7	5%	-7%
CD4-32	5/31/06 8:47 AM	6.06	17.0	5/31/06 9:30 AM	5.45	18.8	10%	-10%
CD4-33	5/31/06 8:51 AM	3.83	21.0	5/31/06 9:30 AM	3.23	19.4	16%	7%
Average Measured Velocity (ft/s)		**5.5**			**Average Calculated Velocity (ft/s)**	**5.2**	**V Difference**	**6%**
Total Measured Discharge (cfs)		**196**			**Total Calculated Discharge (cfs)**	**185**	**Q Difference**	**6%**

The June 1 discharge measurement results represent conditions greater than 24 hours after peak stage at the Alpine culverts in conditions where flow represented relatively little discharge. The May 31 discharge results represent conditions less than 24 hours after peak stage at the Alpine culverts and the results agree relatively well with few exceptions. Under most field conditions, the computation of peak discharge through culverts should provide reliable results (Peck 1982). Considering the logistical constraints associated with data collection, complexity of the hydraulic conditions during breakup at Alpine, and the limitations of this analysis, fair to good indirect estimates of discharge are accepted for the conditions within 24 hours of peak stage.

4.3.5 CRD Peak Discharge Flow Distribution

At the time of 2006 peak discharge in the CRD, approximately 73% of flow in the CRD passed to the east of Alpine Facilities in the east channel. Approximately 3% of the peak discharge in 2006 passed through the Alpine Facilities culverts and swale bridges. Graph 4-6 presents the 2006 estimated flow distribution at the time of peak discharge.



Graph 4-6 2006 CRD Estimated Peak Flow Distribution

4.4 Alpine Pad and Road Erosion Survey Results

Alpine's gravel pads and access roads were inspected for erosion following spring breakup on June 14 and July 21. At no location along the gravel structures was a significant amount of erosion observed. The edges of the CD1 and CD3 pads were not inundated with flood water; however, the gravel bases along the pads and roads of CD2 and CD4 were partially submerged (Photo 4-18). As a result, a relatively small volume of fine-grained sediment was washed from the CD2 and CD4 road embankments in certain areas; however, no slumping or side slope deterioration was observed. Photo 4-19 and Photo 4-20 presents the minor erosion observed on the north side of the CD4 road in the northern paleochannel region which represents the only location along the CD2 and CD4 road where

Photo 4-18 Peak Headwater at Northern CD4 Culvert Battery, May 30, 2006.

minor erosion was observed. High water marks along the gravel facilities were identified along the CD2 and CD4 road; however no sign of erosion was identified at any other location. The conditions of the majority of the CD2 and CD4 road after breakup are best represented by Photo 4-21, and Photo 4-22. The CD2 and CD4 pads were structurally unaffected by floodwaters.

Photo 4-19 Fine Grained Sediment Settlement on Eastern Side of CD4 Road at STA 160+00, June 15, 2006.

Photo 4-20 High Water Mark Survey on Eastern Side of CD4 Access Road at STA 160+00, June 15, 2006.

Photo 4-21 Northern Side of CD4 Access Road Erosion after Breakup at STA 200+00, June 15, 2006.

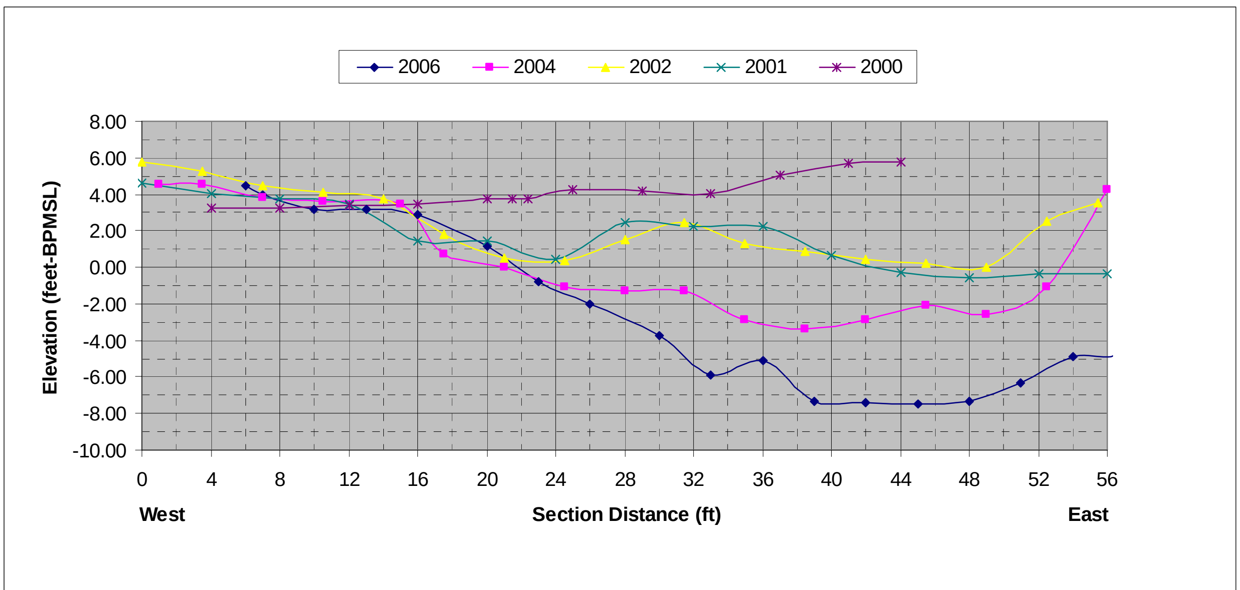
Photo 4-22 Southern Side of CD4 Access Road Erosion after Breakup at STA 200+00, June 15, 2006.

4.4.1 Alpine Swale Bridge Scour/Thermoerosion Analysis Results

The 62-foot and 452-foot Alpine swale bridges' piers and abutments were constructed during the winter of 1999/2000. The scour observed since construction at the 452-foot bridge has been generally less than 1 foot. However, after spring breakup in 2006 at the 62-foot bridge, the maximum observed scour was noted to be approaching the design limits of the east sheet pile abutment.

Since 2000, an increasing amount of channel scour has occurred at the 62-foot swale bridge at the measured cross section, particularly near the east abutment. Graph 4-7 presents the sounding measurements at the 62-foot swale bridge from 2000 to 2006. The difference between the annual channel profiles is the result of scour caused by the erosion and thermoerosion of the ice bonded sediments within the bed.

The sub-aqueous thermoerosion condition is the thermal and hydraulic process of erosion of fine-grained ice-bonded sediments. The energy of moving water each spring has caused thermal disruption of the ice rich permafrost and the transport of the sediment from the region between the bridge abutments. The erosion condition is limited to the hydraulic process and takes place when the energy of moving water each spring transports thawed sediment from the region. The effects of the scour, which includes erosion and melting processes, are greatest during spring flooding. A review of historical thermoerosion indicates that thermoerosion occurs during breakup if peak stage is greater than approximately 8.6 feet.

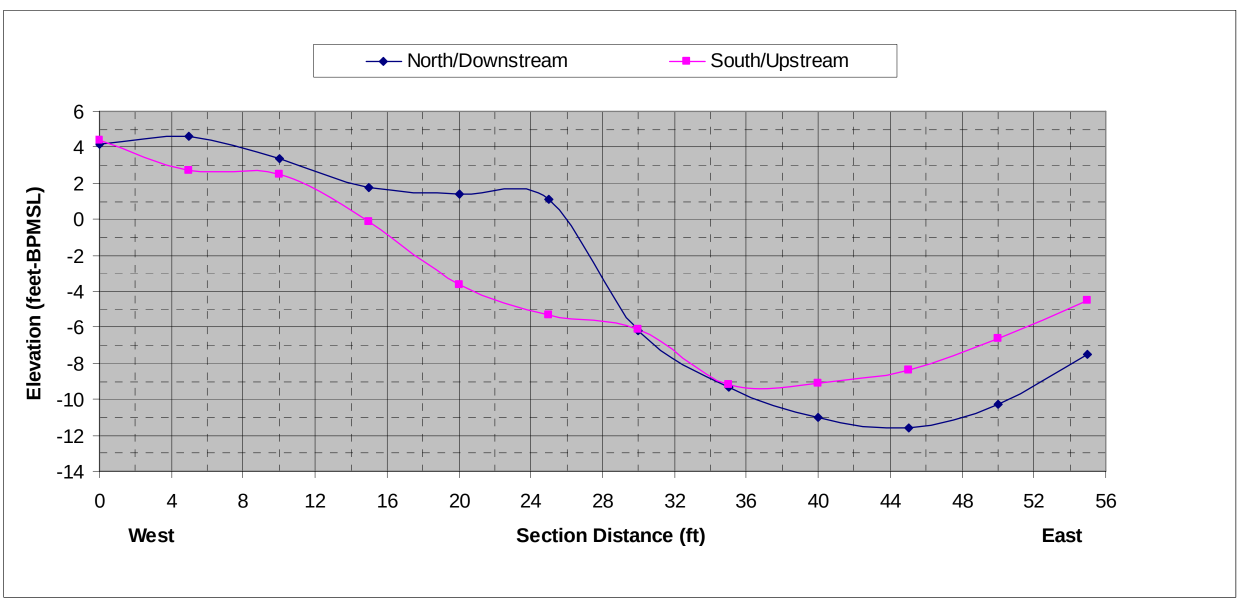


Graph 4-7 Annual Bridge Bed Level – 62-Foot Alpine Swale Bridge 2000-2006

For this analysis, the baseline was taken to be the discharge measurement soundings in 2000. In 2000, the soundings were recorded two days prior to the estimated peak stage. Therefore, a portion of the scour which occurred during the 2000 breakup was not accounted for until the 2001 discharge measurement soundings. The majority of the scour which occurred between the soundings in 2000 and 2001 likely took place during the 2000 breakup after the discharge measurement.

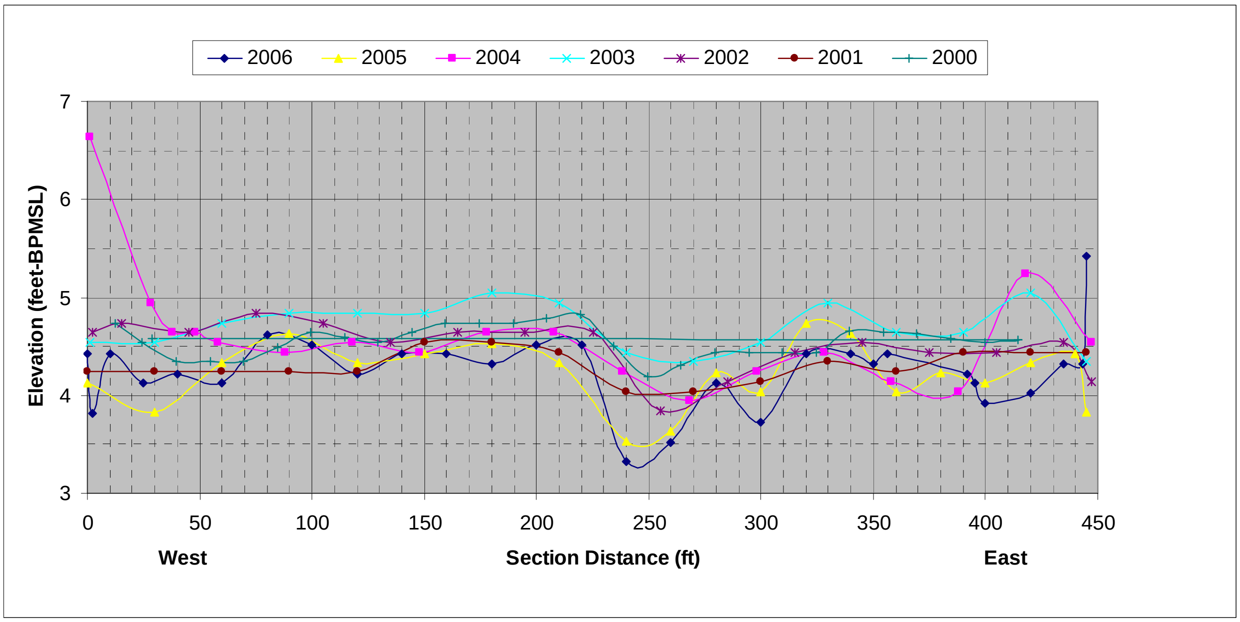
The mean amount of channel scour between 2000 and 2001 was -2.5 feet. The peak stage in 2001 and 2002 were each relatively low when compared to 2000, 2004, and 2006 peak stage. The corresponding peak discharges in 2001 and 2002 were the lowest flow estimates through the 62-foot swale bridge at 620 cfs and 500 cfs, respectively. These conditions resulted in limited scour in 2001 and 2002. In 2003, water levels were not high enough for significant flow to pass through the 62-foot bridge. Peak discharge in 2004 was 806 cfs and peak stage reached a record high level. The mean channel scour between 2002 and 2004 was -1.9 feet. In 2005, water levels were again not high enough for significant flow to pass through the 62-foot bridge. The peak discharge in 2006 also occurred prior to the annual discharge measurement and was a record 1,100 cfs. The mean scour between 2004 and 2006 was -2.6 feet.

On July 21 2006, the channel was surveyed on the upstream and downstream edges of the bridge to validate the 2006 soundings measured during breakup and to determine the extent of scour downstream of the bridge. The post breakup 2006 channel survey indicated that the mean upstream channel depth was -0.3 feet deeper than the downstream channel and the maximum scour depth of -11.6 feet was recorded on the downstream side of the bridge. Graph 4-8 presents the 2006 upstream and downstream channel survey conducted on July 21.



Graph 4-8 Post Breakup Channel Survey – 62-Foot Alpine Swale Bridge 2006

There is no indication of significant channel scour along the measured cross section at the 452-foot swale bridge. Minor channel scour has occurred between 2005 and 2006 near the bridge midpoint in the area of the 250-foot measuring section to a maximum depth of 3.5 feet in 2005 and 3.3 feet in 2006. The mean channel elevation from 2000 to 2006 was 4.5 feet, indicating that the maximum depth of net scour was approximately one foot. Graph 4-9 presents the historical discharge soundings at the 452-foot swale bridge.



Graph 4-9 Annual Bridge Scour – 452-Foot Alpine Swale Bridge 2000-2006

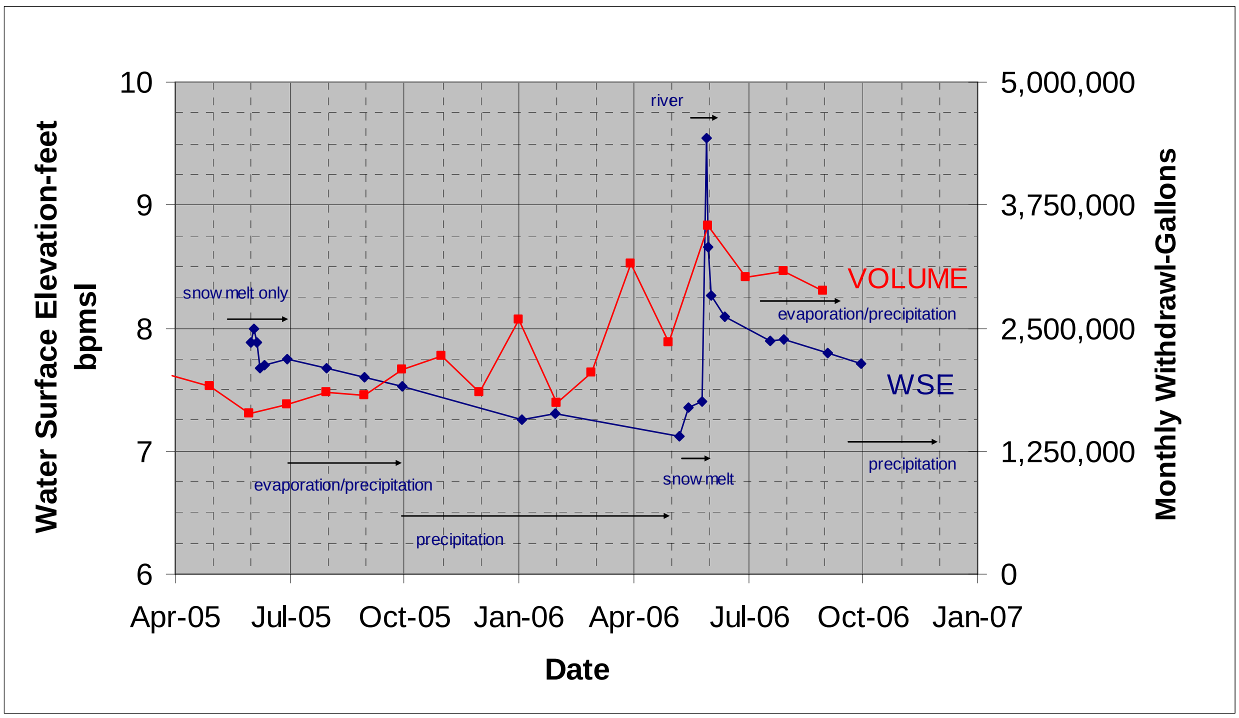
The channel bed at the 62-foot and 452-foot bridges are composed of deltaic deposits that include but are not limited to silt, silty sand, sandy silt, sand, organic sand and organics with moisture content ranging from 25% to greater than 80% (Duane Miller & Associates 1998). Because of the lack of variation between the average estimated peak velocities during each discharge measurement, the difference in thermoerosion and erosion rates between the two bridges is partially attributed to the vegetative cover that protects the channel at the 452-foot swale bridge. Furthermore, more local sour is anticipated for the narrower 62-foot bridge since the abutment zones of influence overlap.

4.5 Alpine Drinking Water Lakes Recharge

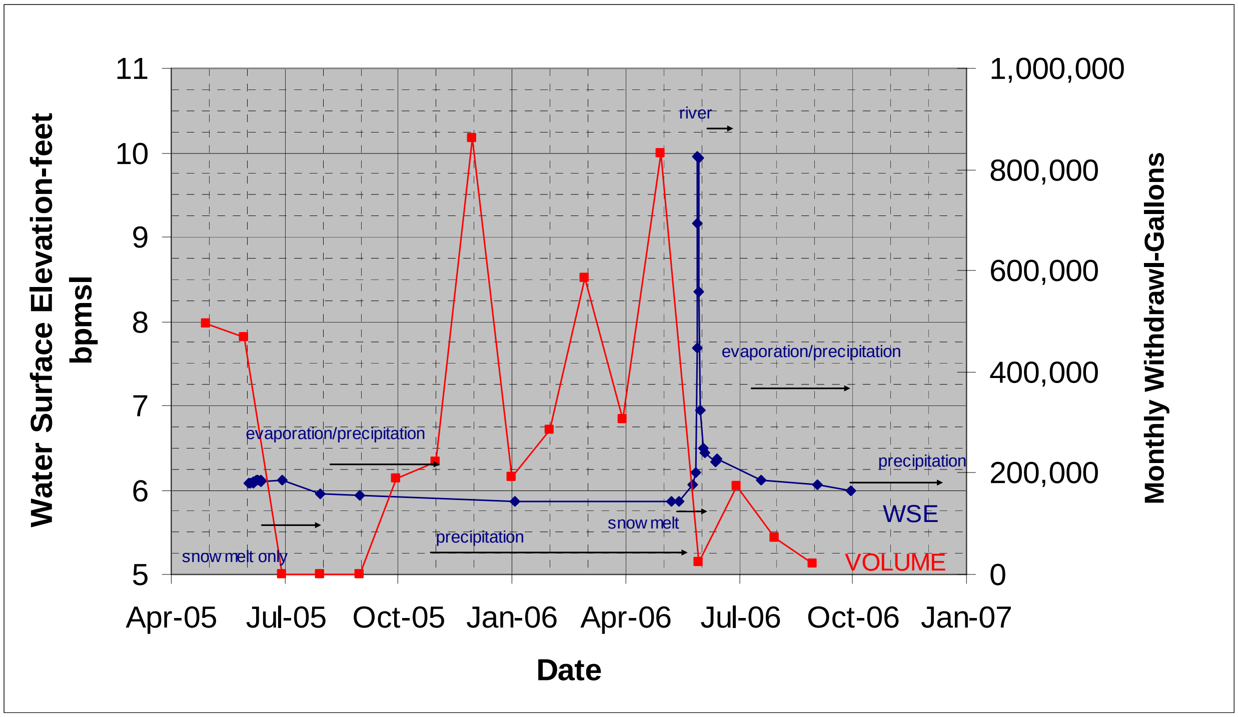
The Alpine drinking water lakes L9312 and L9313 were monitored before, during, and after breakup to assess recharge and to evaluate the mechanisms causing recharge. Snow surveys were conducted within each lakes drainage basin to determine the volume of lake recharge due to snow melt for comparison with the observed increase in water surface elevation. Water level surveys and water surface elevation records of Gages 9 and 10 were the primary references used in evaluating the water surface elevations at lakes

L9312 and L9313, respectively. During 2006 breakup, both lakes were recharged by snowmelt and the Colville River to above bankfull water surface levels. This condition was documented in accordance with ADF&G permits FG99-111-0051-Amendment #5 and FG97-111-0190-Amendment #5.

The monthly water withdrawal volumes and the water surface elevations between June 2005 and October 2006 for lakes L9312 and L9313 are presented on Graph 4-10 and Graph 4-11. The monthly Alpine water withdrawal volume is represented in red, while the measured lake water surface elevation is represented in blue. Additionally, the evaporation and recharge mechanisms are presented for seasonal time durations. In 2005, snow melt from within each lake's drainage sub-basin was the only mechanism of recharge. In 2006, the full recharge of the Alpine drinking water lakes was the result of local snow-melt and the overland flow of floodwaters from the Colville River. During the summer of 2005 and 2006, the water surface elevation of each lake declined as a result of evaporation and water withdrawal by Alpine facilities.



Graph 4-10 Lake L9312 Water Surface Elevation versus Monthly Water Withdrawn



Graph 4-11 Lake L9313 Water Surface Elevation versus Monthly Water Withdrawn

4.5.1 Lake L9312 2006 Recharge

Between May 9 and May 27, the water surface elevation in Lake L9312 increased from 7.12 feet to 7.40 feet. The 0.28-foot rise in water surface elevation is attributed to snow- and ice-melt runoff within the lake's own drainage sub-basin. A peak water surface elevation of 9.55 feet was documented on the morning of May 31 and was the result of overland flow from the Colville River. As the discharge of the Colville River decreased and the ice jams in the East, Sakoonang, and Nigliq Channels released, the water surface elevation at Lake L9312 decreased to 8.26 feet on June 4. The water surface elevation of Lake L9312 continued to recede throughout the summer represented by a measured stage elevation of 7.89 feet on July 21. The water surface elevations for Lake L9312 (Gage 9) are presented in Table 4-35.

4.5.2 Lake L9313 2006 Recharge

Between May 9 and May 27, the water surface elevation in Lake L9313 increased from 5.86 feet to 6.07 feet. On the morning of May 29, the water surface elevation of Lake L9313 continued to rise to 6.20 feet before an increase in discharge of the Colville River and ice jams in the East, Sakoonang, and Nigliq Channels caused overland flooding. The 0.34-foot rise in water surface elevation is attributed to the melting of snow and ice within the lake's own drainage sub-basin. Floodwaters flowed into Lake L9313 and a stage of 9.17 feet was measured on May 30. The water surface elevation continued to rise to a peak elevation of 9.95 feet on May 31. As the ice jams in the Sakoonang and Nigliq Channels released and discharge of the Colville River decreased, water surface elevation of Lake L9313 decreased to 6.49 feet on June 4. Photo 4-23 illustrates recharge of the lakes and Photo 4-24 shows the lakes after recharge.

The water surface elevation of Lake L9313 continued to recede throughout the summer represented by a measured water surface elevation of 6.11 feet on July 21. The water surface elevations for Lake L9313 (Gage 10) are presented in Table 4-35.

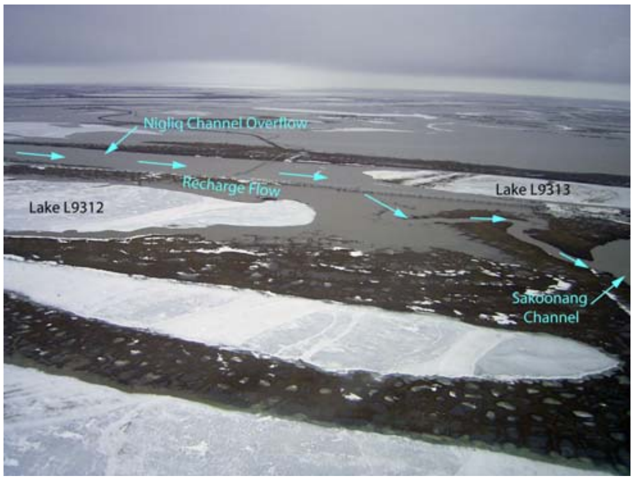


Photo 4-23 Alpine Drinking Water Lakes being Recharged during Breakup, May 31, 2006.

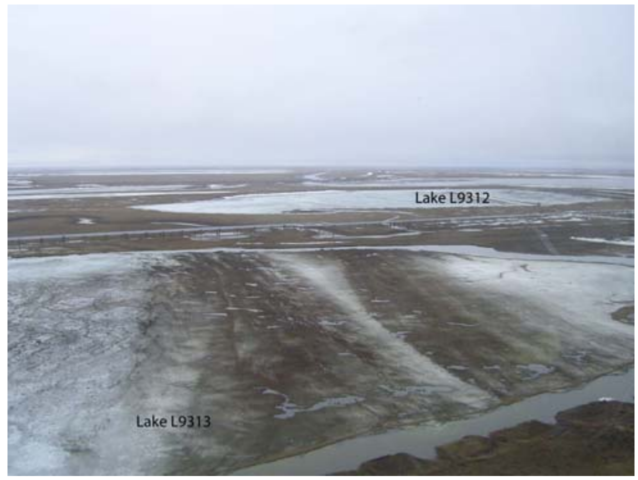


Photo 4-24 Alpine Drinking Water Lakes Fully Recharged after Breakup, June 7, 2006.

4.5.3 Snow Survey

On May 9 prior to breakup, a snow survey was conducted within the sub-drainage basins for the Alpine drinking water lakes L9312 and L9313. 1999 AreoMap contours and aerial photography were used to estimate lakes L9312 and L9313 catchment basin areas. Figure 4-4 and Figure 4-5 present the sample locations and the drainage basin boundaries for each lake. The surface area of each lake at the time of breakup was estimated to exclude anchored shore ice using 1-foot bathymetric contours from the July 28, 2002 depth survey at each lake (MJM Research 2004). Anchored shore ice forms throughout the winter along the margins of each Alpine drinking water lake to an average thickness of approximately five feet near the time of breakup. The results of the 2006 snow survey, the catchment basin areas, and lake surface areas were used to estimate the rise in lake water surface elevation based on a complete melting of the snow within each sub-basin. It was assumed that the presence of permafrost inhibited the loss of water to infiltration.

The snow survey field data, snow water equivalent, and density results for Lakes L9312 and L9313 are presented in Table 4-17 and Table 4-18, respectively. For Lake L9312, the average snow water equivalent (SWE) for transects T1, T2, and T3 sampled cores were 2.6, 2.5, and 2.1 inches, respectively. The average snow depth without a dirt plug for the catchment area was 11.2 inches. The greatest measured snow depth was 17.0 inches while the least measured depth was 8.5 inches. The average SWE for the Lake L9312 drainage sub-basin was 2.4 inches (0.20 feet) with an average water density of 22.0%. The densest core measured was from transect T2 Station 2 with a density of 30.7%.

Table 4-17 Lake L9312 Snow Survey Field Data and Results May 9, 2006

Snow Survey Data Sheet										
Date: 5/9/2006			**Snow Course:** Lake L9312					**Observers:** MTA, EJK, SLB		
Time: 12:00 to 13:31			**Driving Wrench Used:** No					**Tube Section Used:** 1		
Transect No.	**Station No.**	**Lat deg-min-sec**	**Long deg-min-sec**	**Snow Depth (in)**		**Core Length (in)**	**Tube & Core Weight (lb)**	**Empty Tube Weight (lb)**	**Water Equivalent (in)**	**Density %**
				w/ Dirt Plug	**w/o Dirt Plug**					
1	1	70-20-13.9	150-56-02.4	14.0	12.0	9.0	1.70	1.49	2.8	23.4
	2	70-20-06.4	150-56-21.7	—[1]	9.0	8.0	1.66	1.49	2.3	25.2
	3	70-19-54.3	150-56-41.6	—[1]	8.5	8.5	1.64	1.49	2.0	23.6
	4	70-19-49.7	150-57-02.5	—[1]	10.5	10.5	1.70	1.49	2.8	26.7
	5	70-19-40.3	150-57-15.2	—[1]	14.0	13.0	1.80	1.49	4.1	29.6
	6	70-19-38.1	150-57-18.1	11.5	10.0	6.5	1.62	1.49	1.7	17.4
2	1	70-19-58.0	150-57-27.7	10.0	9.5	7.0	1.58	1.49	1.2	12.6
	2	70-19-50.8	150-57-06.6	—[1]	10.0	10.0	1.72	1.49	3.1	30.7
	3	70-19-43.4	150-56-45.2	18.0	17.0	11.0	1.72	1.49	3.1	18.1
3	1	70-19-52.5	150-56-21.0	17	15.5	12.0	1.70	1.49	2.8	18.1
	2	70-20-01.7	150-56-36.0	—[1]	9	8.5	1.60	1.49	1.5	16.3
	3	70-20-11.1	150-56-49.8	10	9	8.0	1.64	1.49	2.0	22.3
Total					122.0				26.6	
Average					11.1				2.4	
Notes	1. Frozen ground surface reached, no dirt plug reported									

Based on the estimated breakup lake surface area and the average SWE within the lake drainage sub-basin, it was estimated that total spring snowmelt recharge would result in an increase in the water surface elevation of Lake L9312 by 0.34 feet. Prior to river recharge between May 9 and May 27, Lake L9312 experienced an increase in lake water surface elevation of 0.28 feet. Considering the impact of water withdrawn by Alpine on the water surface elevation of Lake L9312 between May 9 and May 27 without recharge, a decrease of 0.05 feet would have been expected. Therefore, considering the withdrawal of water by Alpine, the predicted rise in water surface elevation based on the results of the SWE survey is 0.29 feet and the observed recharge represented approximately 95% of the predicted rise in water surface elevation prior to river recharge.

For Lake L9313, the average SWE for transects T1, T2, and T3 sampled cores were 3.4, 8.9, and 1.7 inches, respectively. The average snow depth without a dirt plug for the catchment area was 12.0 inches. The greatest measured snow depth was 20.5 inches while the least measured depth was 6.0 inches. The average SWE for the Lake L9312 drainage sub-basin was 2.8 inches (0.24 feet) with an average water density of 23.8%. The densest core measured was from transect T1 Station 3 with a density of 33.4%.

Table 4-18 Lake L9313 Snow Survey Field Data and Results May 9, 2006

Snow Survey Data Sheet										
Date:	5/9/2006		**Snow Course:**		Lake L9313			**Observers:**	MTA, EJK, SLB	
Time:	14:15 to 15:10		**Driving Wrench Used:**		No			**Tube Section Used:**	1	
Transect No.	**Station No.**	**Lat deg-min-sec**	**Long deg-min-sec**	**Snow Depth (in) w/ Dirt Plug**	**Snow Depth (in) w/o Dirt Plug**	**Core Length (in)**	**Tube & Core Weight (lb)**	**Empty Tube Weigth (lb)**	**Water Equivalent (in)**	**Density %**
1	1	70-20-46.4	150-55-44.2	21.5	20.5	16.5	1.84	1.49	4.7	22.8
	2	70-20-38.5	150-56-02.3	—[1]	9.0	8.5	1.64	1.49	2.0	22.3
	3	70-20-31.5	150-56-27.6	—[1]	6.0	6.0	1.64	1.49	2.0	33.4
	4	70-20-25.5	150-56-52.2	—[1]	14.0	12.5	1.80	1.49	4.1	29.6
	5	70-20-19.2	150-57-21.1	—[1]	19.0	11.5	1.82	1.49	4.4	23.2
2	1	70-20-18.2	150-56-39.2	9	7.5	6.5	1.60	1.49	1.5	19.6
	2	70-20-28.3	150-56-42.6	—[1]	12.0	12.0	1.74	1.49	3.3	27.8
	3	70-20-32.9	150-56-48.2	17.0	16	13.5	1.80	1.49	4.1	25.9
3	1	70-20-38.7	150-56-29.8	12.0	10.5	5.0	1.54	1.49	0.7	6.4
	2	70-20-35.6	150-56-17.0	—[1]	8	7.5	1.66	1.49	2.3	28.4
	3	70-20-32.6	150-56-04.5	—[1]	9.0	8.0	1.64	1.49	2.0	22.3
Total					131.5				31.1	
Average					12.0				2.8	
Notes	1. Frozen ground surface reached, no dirt plug reported									

Based on the estimated breakup lake area and the average SWE within the lake drainage sub-basin, it was estimated that total spring snowmelt recharge would result in an increase in the water surface elevation of Lake L9313 by 0.38 feet. Prior to river recharge between May 9 and May 29, Lake L9313 experienced an increase in lake water surface elevation of 0.34 feet. Considering the impact of water withdrawn by Alpine on the water surface elevation of Lake L9313 between May 9 and May 27 without recharge, a decrease of 0.03 feet would have been expected. Therefore, considering the withdrawal of water by Alpine, the predicted rise in water surface elevation based on the results of the SWE survey is 0.35 feet, and the observed recharge represented approximately 98% of the predicted rise in water surface elevation prior to river recharge.

The Alpine drinking water lakes L9312 and L9313 water surface elevation and SWE analysis results are limited by the nature of conditions during spring breakup and by the methods used in obtaining stage readings prior to and during breakup. Considering that the precision of water surface elevation measurements are recorded to the nearest 0.01 feet, an uncertainty of 0.02 feet is accepted for the observed stage recordings. However, the results of this analysis suggest that methods used have produced accurate results. Regardless of the results of the snow recharge analysis, lakes L9312 and L9313 recharged to a bankfull capacity and recharge conditions comply with the ADF&G permits FG99-111-0051-Amendment #5 and FG97-111-0190-Amendment #5.

4.6 Ice Bridge Monitoring

No significant erosion or scour was observed during breakup at or near the Colville River East Channel or at the Kachemach River ice bridge crossings. Photo 4-25 and Photo 4-26 represent conditions at the Kachemach River ice bridge crossing during and ten days after breakup, respectively. Photo 4-27 represents conditions of the Kachemach River at the ice bridge crossing in late July after breakup. Photo 4-28 and Photo 4-29 represent the Colville River East Channel ice bridge during and post breakup.

Photo 4-25 Kachemach River Ice Bridge during Breakup with Ice Road in Place, June 1, 2006.

Photo 4-26 Kachemach River Ice Bridge after Breakup with Ice Road Remnants, June 11, 2005.

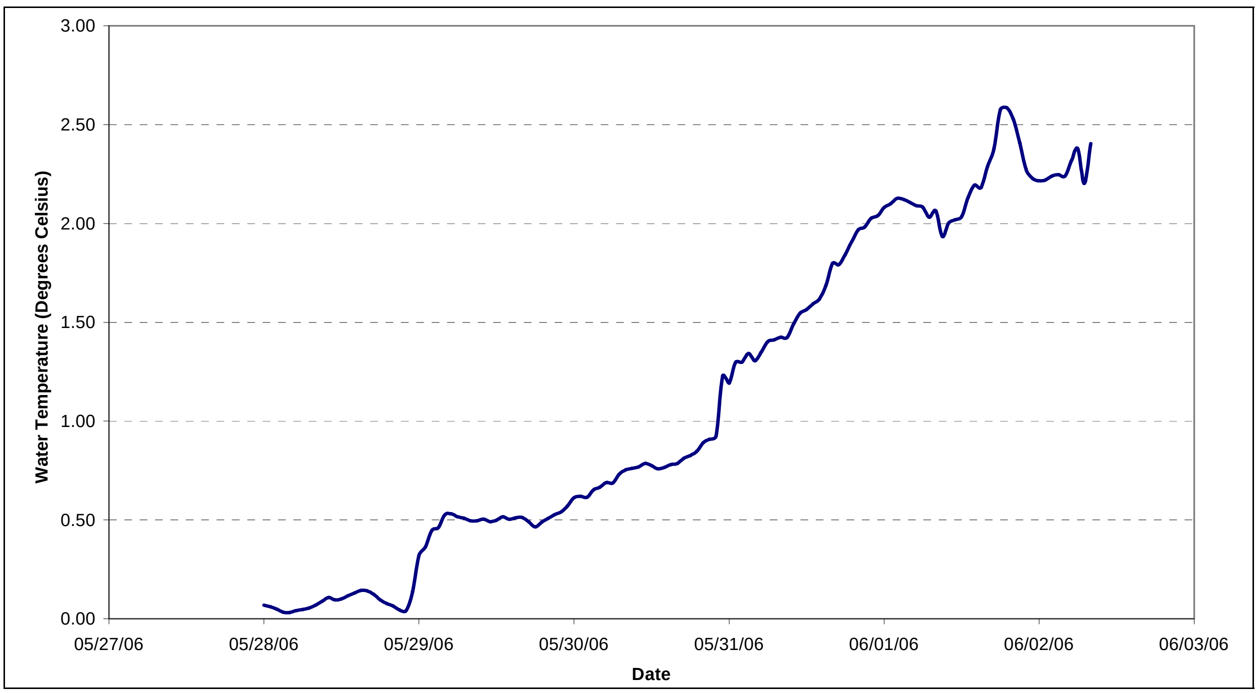
Photo 4-27 Kachemach River Ice Bridge Location after Breakup without Ice Road Remnants, July 20, 2006.

Photo 4-28 Colville East Channel Ice Bridge during Breakup with Ice Road Remnants, May 29, 2006.

Photo 4-29 Colville East Channel Ice Bridge Location after Breakup, July 27, 2006.

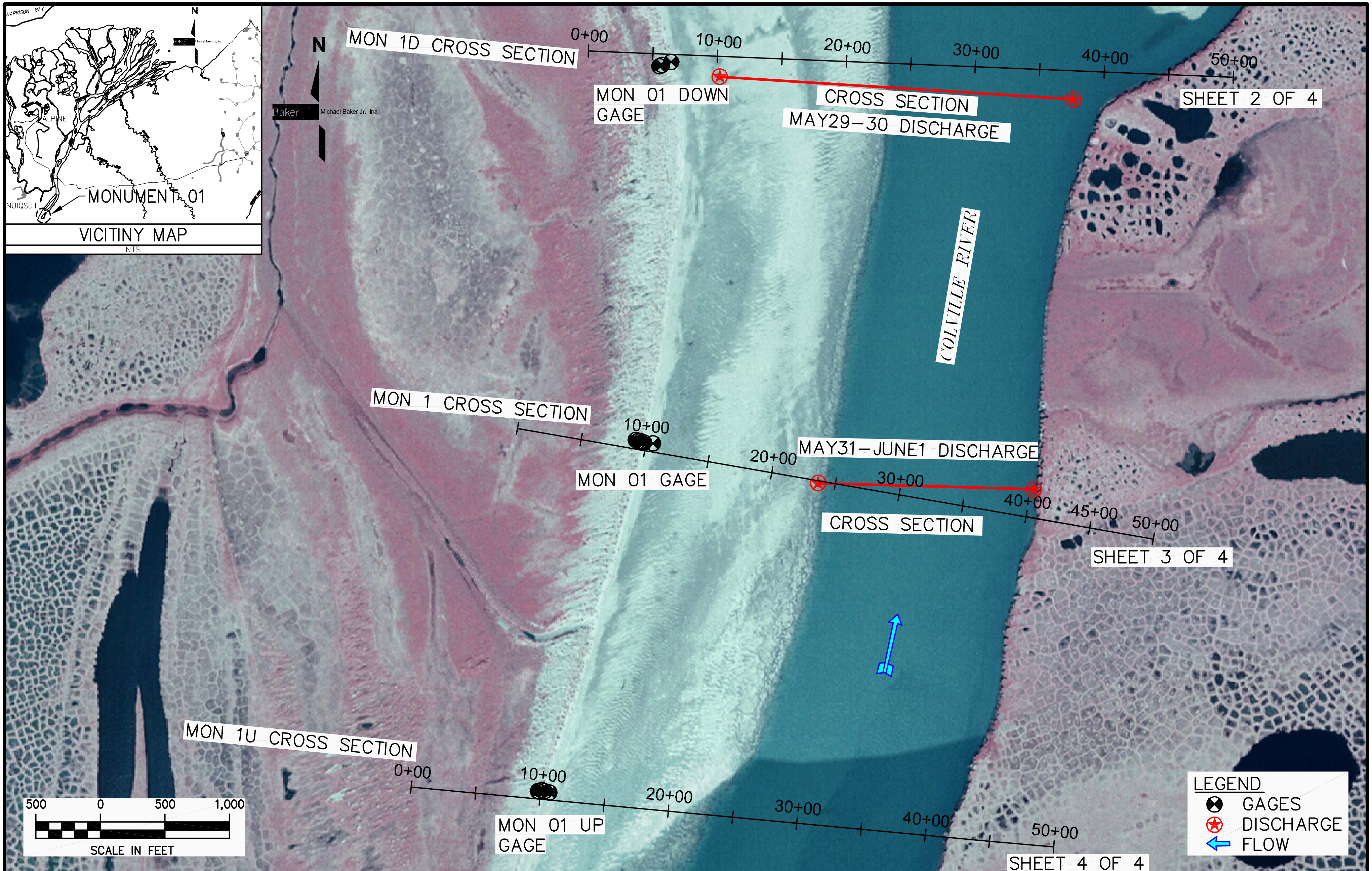
4.7 Monument 1 Water Temperature

Hourly water temperature recorded at Monument 1 Upstream by the pressure transducer is presented in Graph 4-12. Rapid increases in water temperature occurred on the evening of May 29 correlating well with the observed rise in water surface elevation. A second spike in water temperature occurred in the evening hours of May 31. It was during this time period that the most rapid drop in water surface elevation was recorded by the pressure transducer (Table 4-1). At some time between placement and removal of the pressure transducer, bed material buried the sensor to a depth of approximately 0.85 feet. The timing and rate of the sediment deposition is unknown. Effects of this burial are likely such that recorded temperature changes are attenuated, muting any rapid changes in temperature of passing flow.



Graph 4-12 Monument 1 Hourly Water Temperature

4.8 Figures



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	ANG	FILE:	FIGURE_4_1
CHECKED:	MTA	SCALE:	1" = 1,000'

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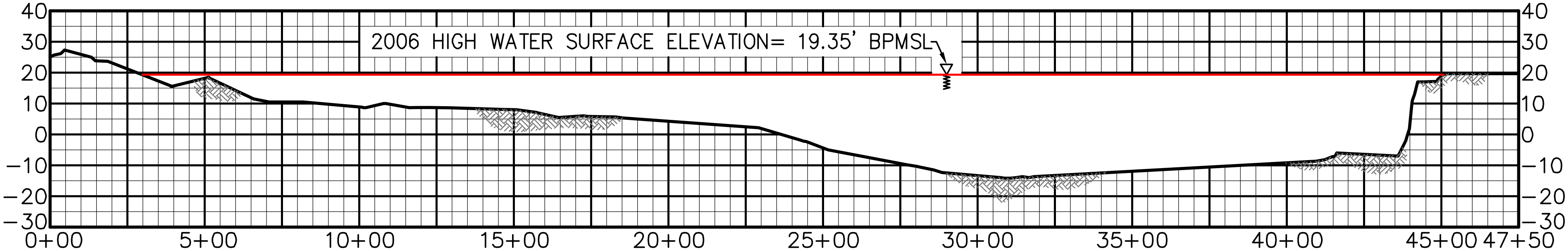
2006 SPRING BREAK-UP
MONUMENT 01
PLAN

FIGURE 4-1
(SHEET 1 OF 4)

NOTES
1. BASIS OF ELEVATION, MONUMENT MON 01.
2. CHANNEL PROFILE MEASUREMENTS COMPLETED AUGUST 2004 BY KUUKPIK/LCMF INC.



1D COLVILLE RIVER CROSS SECTION AT MONUMENT 1 DOWNSTREAM
SCALE: HORZ. 1"= 500' / VERT. 1" = 50'

250 0 250 500
HORIZONTAL SCALE IN FEET

25 0 25 50
VERTICAL SCALE IN FEET

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Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_1 PROFILES
CHECKED:	MTA	SCALE:	AS SHOWN

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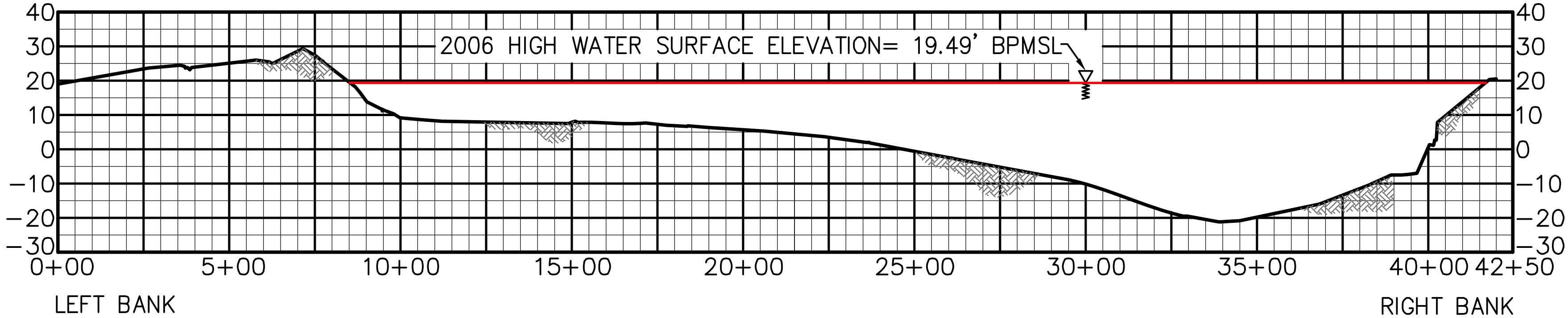
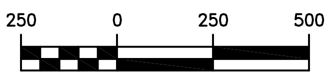
2006 SPRING BREAK-UP
MONUMENT 01 DOWN
CROSS SECTION

FIGURE 4-1
(SHEET 2 OF 4)

NOTES
1. BASIS OF ELEVATION, MONUMENT MON 01.
2. CHANNEL PROFILE MEASUREMENTS COMPLETED AUGUST 2004 BY KUUKPIK/LCMF INC.



(1) COLVILLE RIVER CROSS SECTION AT MONUMENT 1
SCALE: HORZ. 1"= 500' / VERT. 1" = 50'



HORIZONTAL SCALE IN FEET

VERTICAL SCALE IN FEET

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DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_1 PROFILES
CHECKED:	MTA	SCALE:	AS SHOWN

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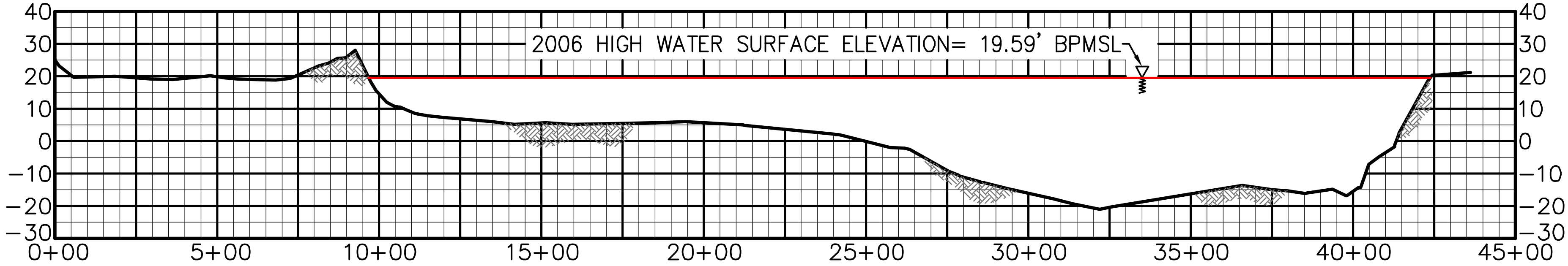
2006 SPRING BREAK-UP
MONUMENT 01
CROSS SECTION

FIGURE 4-1
(SHEET 3 OF 4)

NOTES
1. BASIS OF ELEVATION, MONUMENT MON 01.
2. CHANNEL PROFILE MEASUREMENTS COMPLETED AUGUST 2004 BY KUUKPIK/LCMF INC.



1U COLVILLE RIVER CROSS SECTION AT MONUMENT 1 UPSTREAM
SCALE: HORZ. 1"= 500' / VERT. 1" = 50'

250 0 250 500
HORIZONTAL SCALE IN FEET

25 0 25 50
VERTICAL SCALE IN FEET

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_1 PROFILES
CHECKED:	MTA	SCALE:	AS SHOWN

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2006 SPRING BREAK-UP
MONUMENT 01 UP
CROSS SECTION

FIGURE 4-1
(SHEET 4 OF 4)

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DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_2
CHECKED:	MTA	SCALE:	1" = 1,000'

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2006 SPRING BREAK-UP

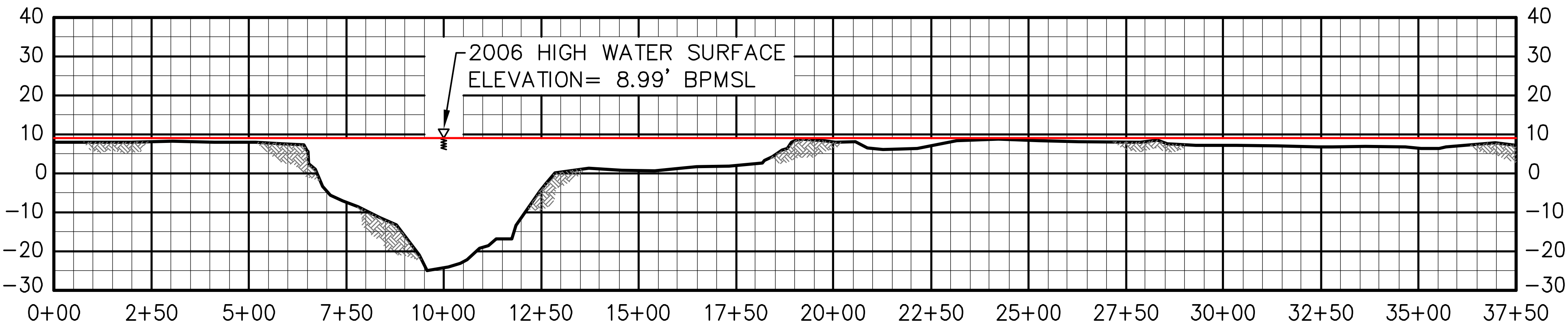
MONUMENT 23

PLAN

FIGURE 4-2

(SHEET 1 OF 2)

NOTES
1. BASIS OF ELEVATION, MONUMENT MON 23.
2. CHANNEL PROFILE MEASUREMENTS COMPLETED OCTOBER 2003 BY KUUKPIK/LCMF INC.



LEFT BANK

RIGHT BANK

1 MONUMENT 23 CROSS SECTION

SCALE: HORZ. 1"= 400' / VERT. 1" = 40'

200 0 200 400

HORIZONTAL SCALE IN FEET

20 0 20 40

VERTICAL SCALE IN FEET

ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_2 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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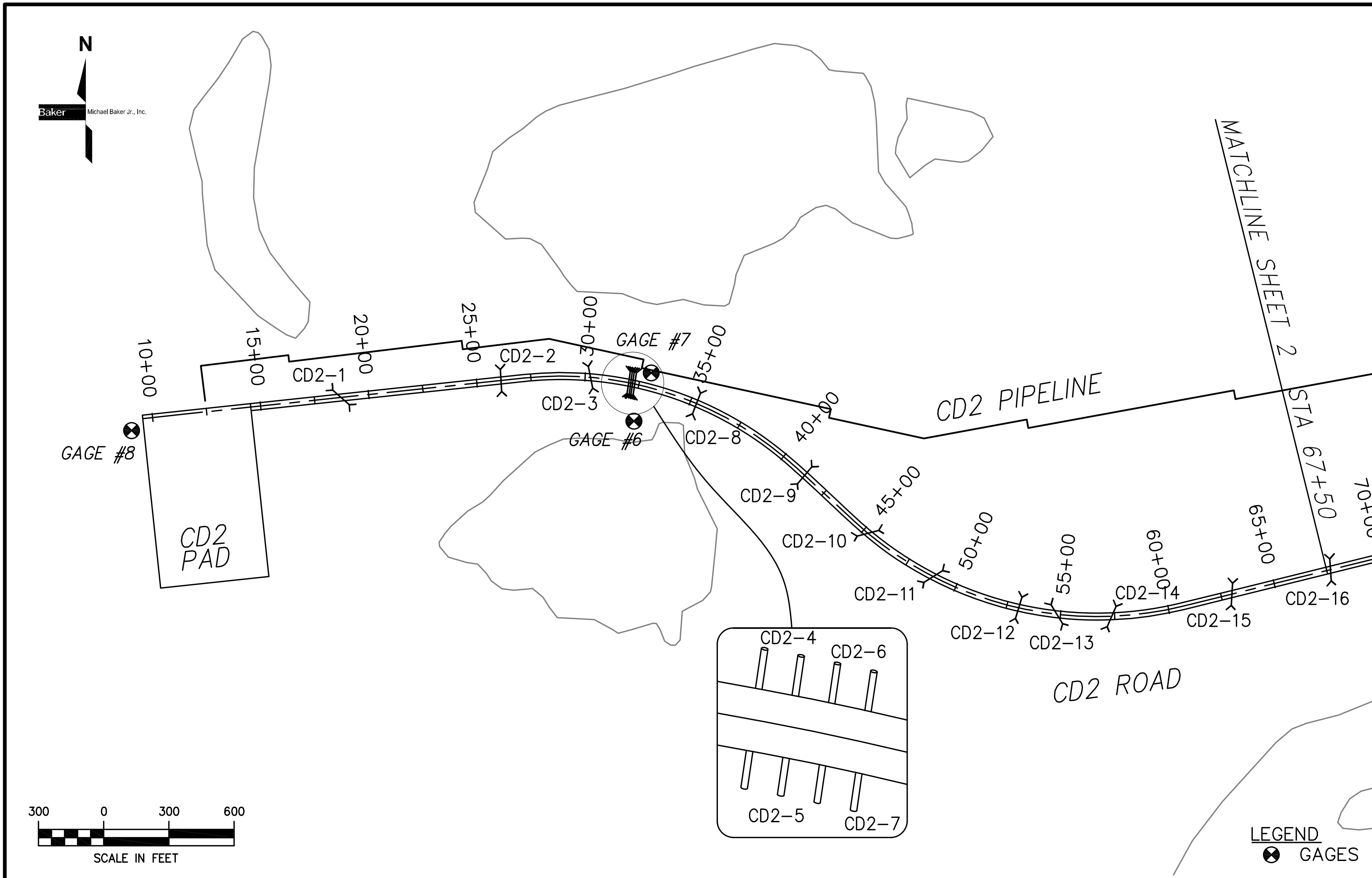
2006 SPRING BREAK-UP
MONUMENT 23
CROSS SECTION

FIGURE 4-2
(SHEET 2 OF 2)



ConocoPhillips Alaska, Inc.

DATE: 11/30/06	PROJECT: 108604
DRAWN: AMG	FILE: FIGURE_4_3
CHECKED: MTA	SCALE: 1"= 600'

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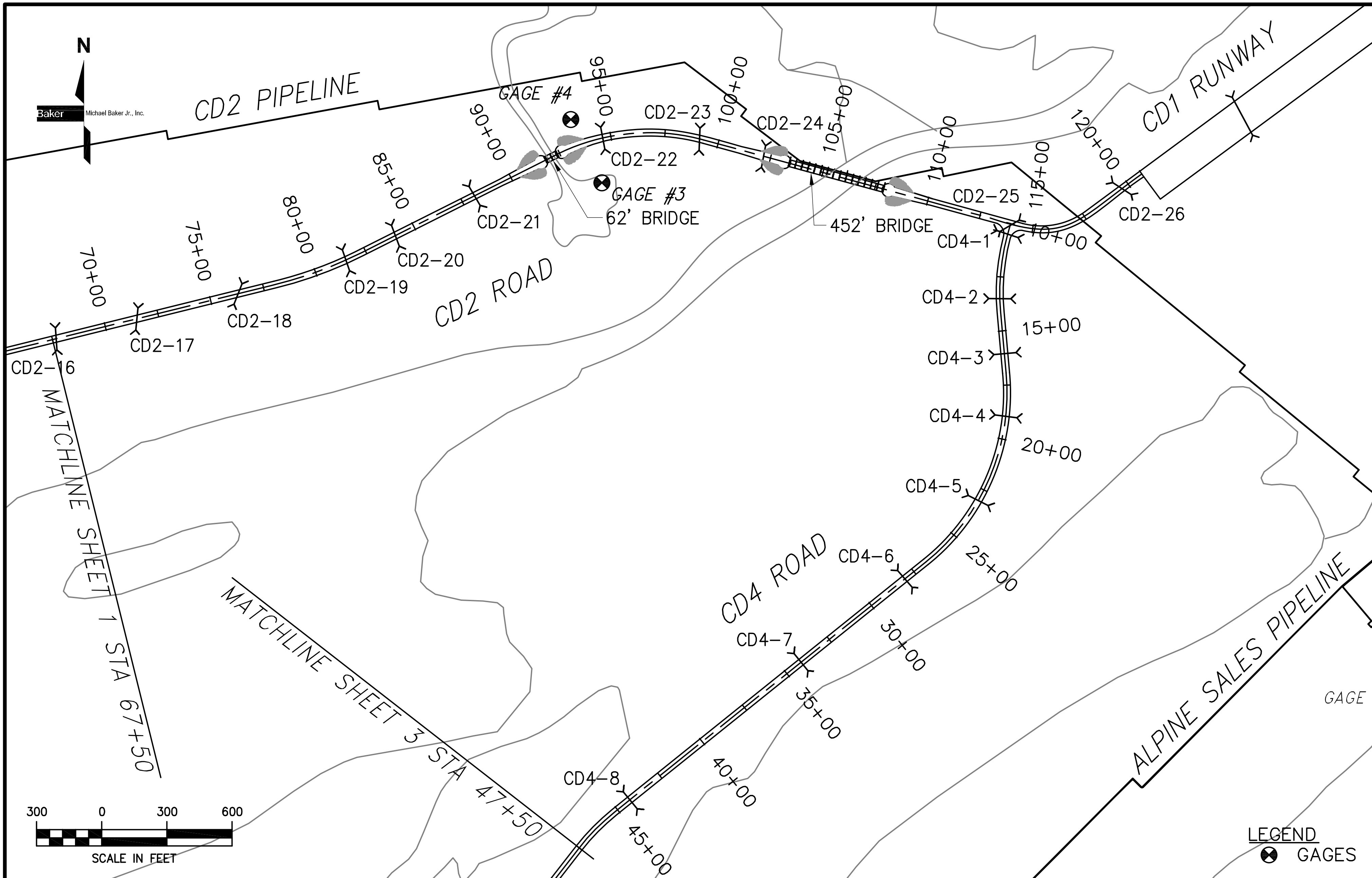
2006 SPRING BREAK-UP

ALPINE FACILITY

DRAINAGE STRUCTURE LOCATION

FIGURE 4-3

(SHEET 1 OF 6)



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_3
CHECKED:	MTA	SCALE:	1"= 600'

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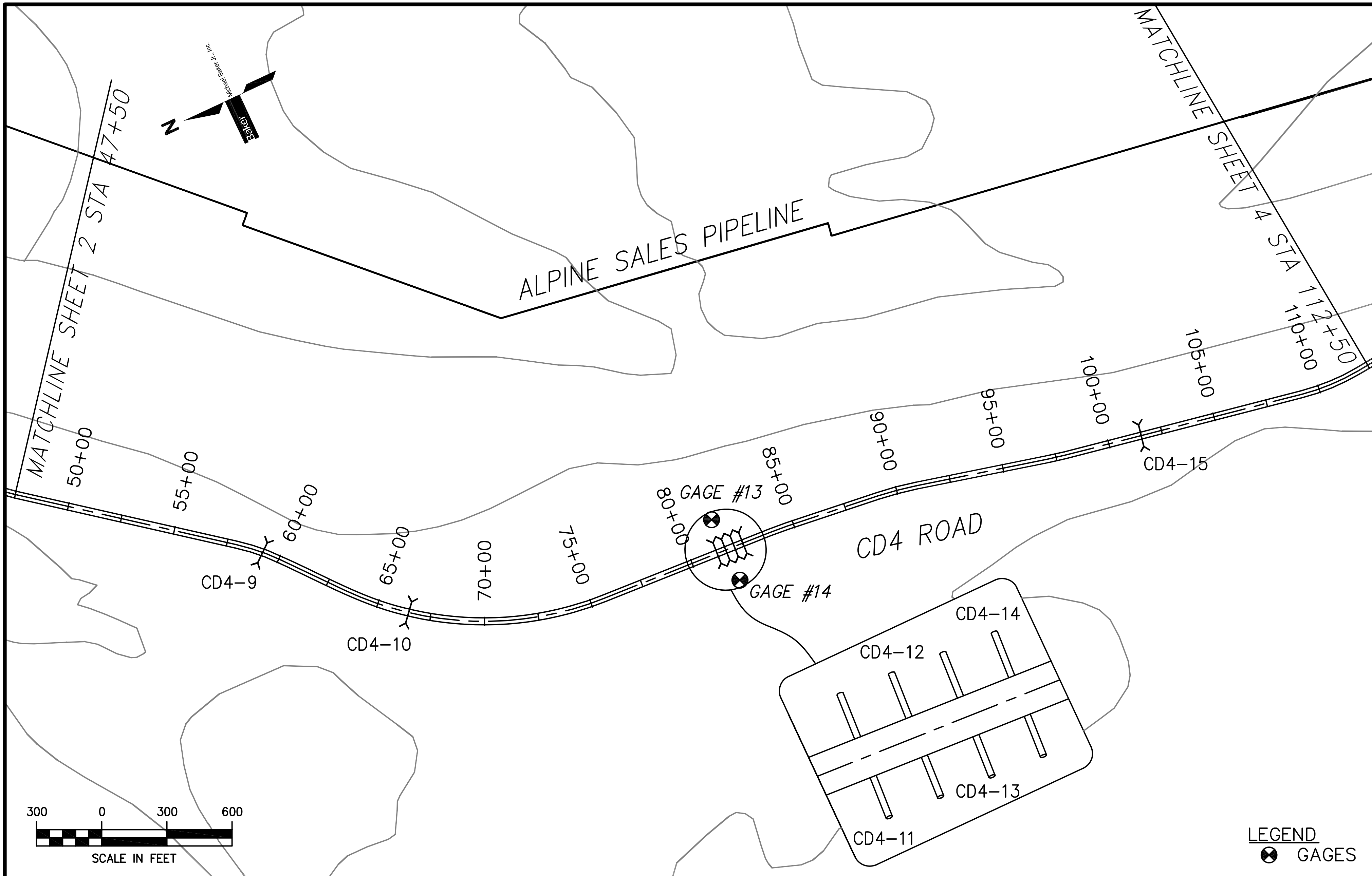
2006 SPRING-BREAK-UP
ALPINE FACILITY
DRAINAGE STRUCTURE LOCATION

FIGURE 4-3
(SHEET 2 OF 6)



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_3
CHECKED:	MTA	SCALE:	1"= 600'

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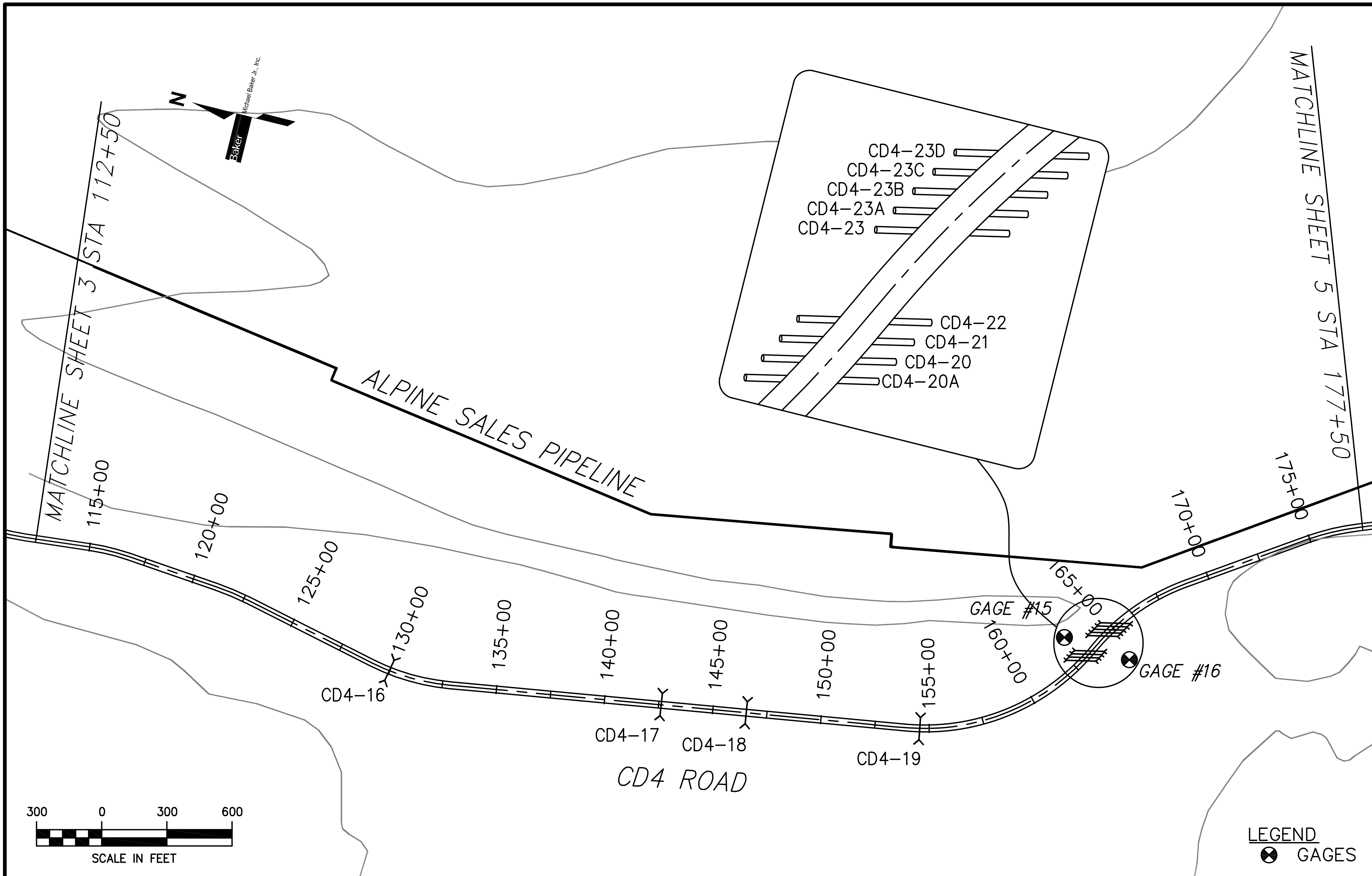
2006 SPRING BREAK-UP
ALPINE FACILITY
DRAINAGE STRUCTURE LOCATION

FIGURE 4-3
(SHEET 3 OF 6)



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_3
CHECKED:	MTA	SCALE:	1"= 600'

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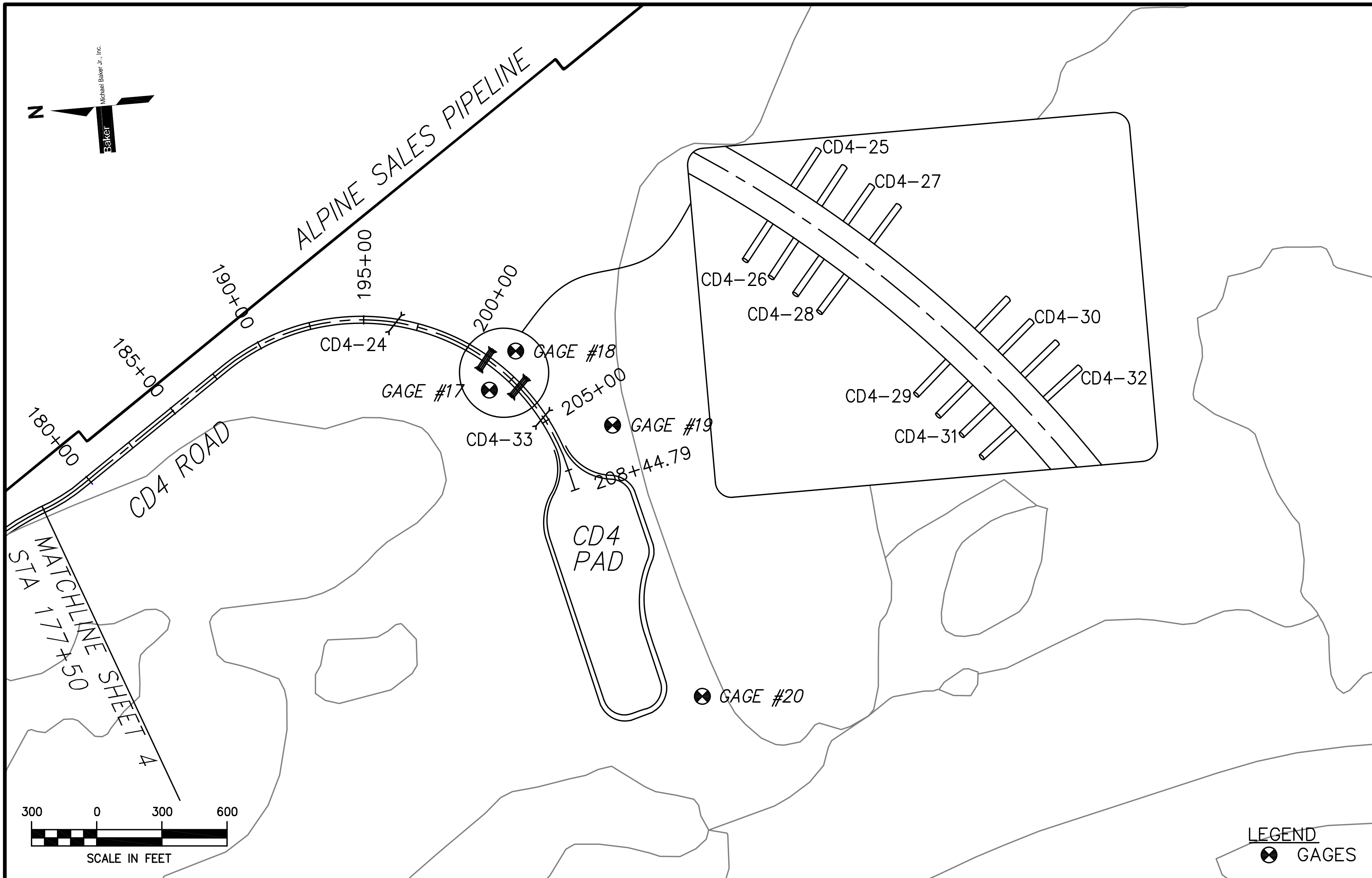
2006 SPRING BREAK-UP

ALPINE FACILITY

DRAINAGE STRUCTURE LOCATION

FIGURE 4-3

(SHEET 4 OF 6)



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_3
CHECKED:	MTA	SCALE:	1"= 600'

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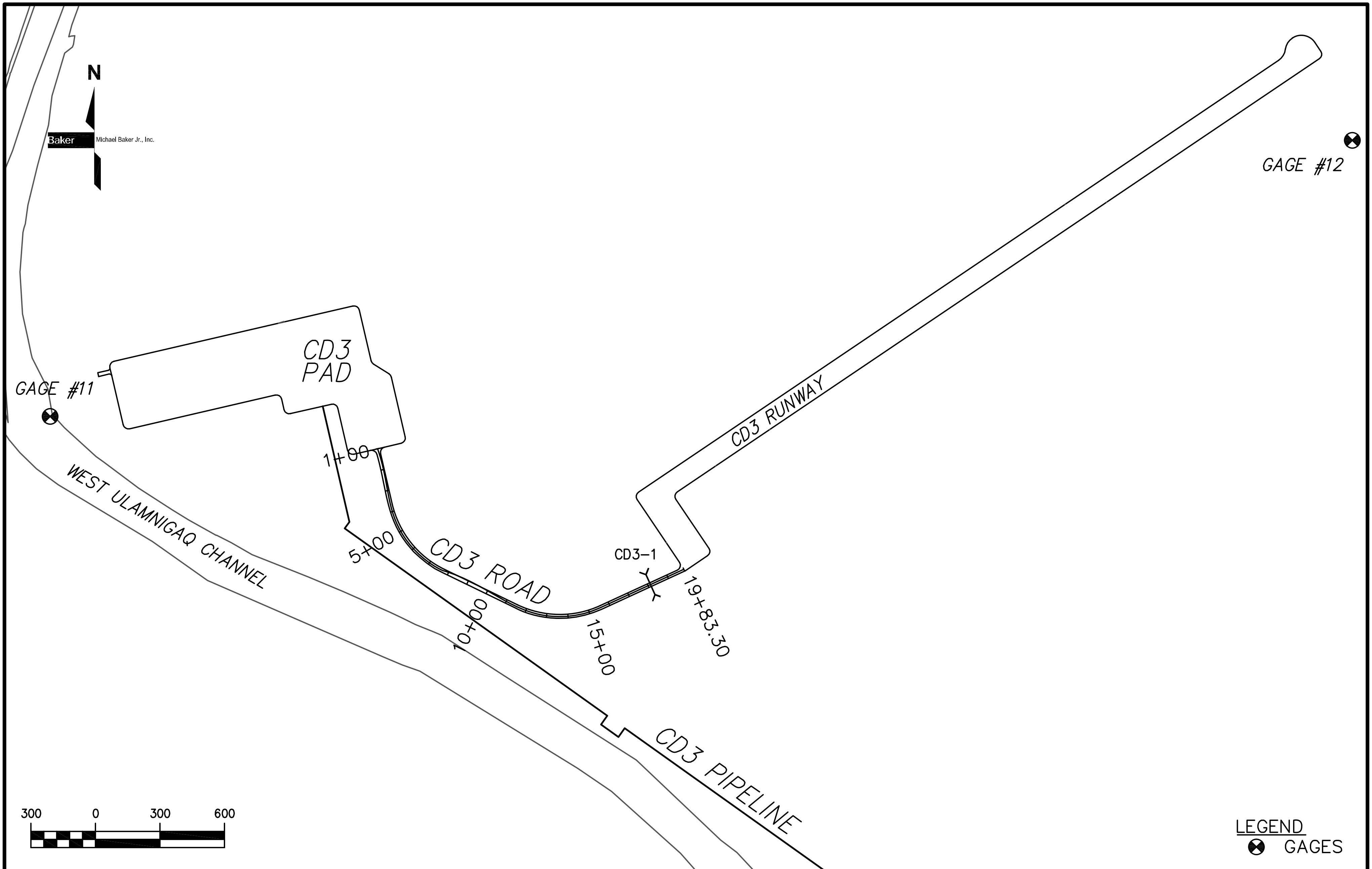
2006 SPRING BREAK-UP
ALPINE FACILITY
DRAINAGE STRUCTURE LOCATION
FIGURE 4-3
(SHEET 5 OF 6)



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_4_3
CHECKED:	MTA	SCALE:	1"= 600'

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2006 SPRING BREAK-UP
ALPINE FACILITY
DRAINAGE STRUCTURE LOCATION
FIGURE 4-3
(SHEET 6 OF 6)

ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	MMP	FILE:	FIGURE_4_4&4_5
CHECKED:	MTA	SCALE:	1" = 600'

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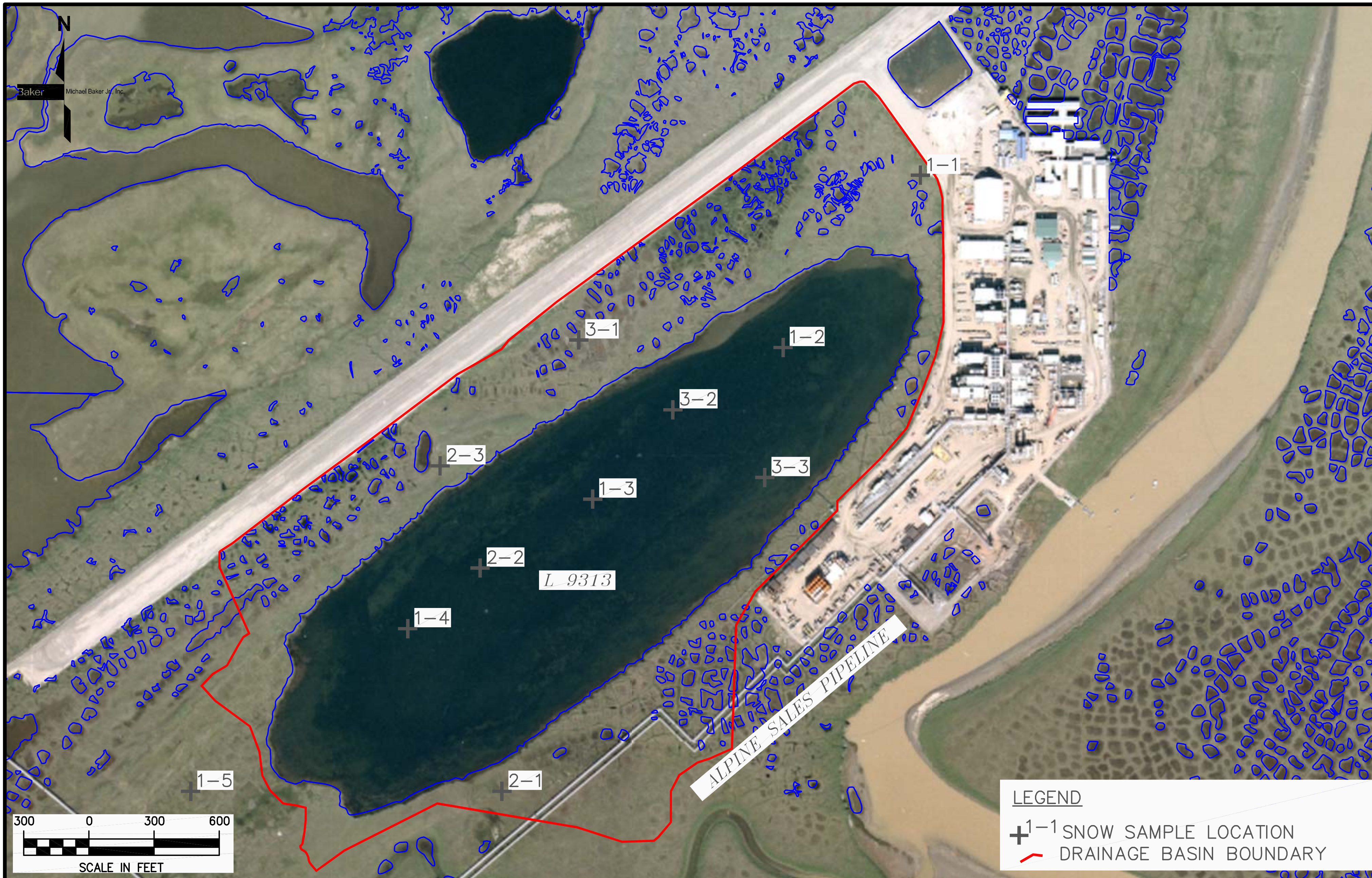
2006 SPRING BREAK-UP
L9312
SNOW SURVEY
FIGURE 4-4
(SHEET 1 OF 1)



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	MMP	FILE:	FIGURE_4_4&4_5
CHECKED:	MTA	SCALE:	1" = 600'

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2006 SPRING BREAK-UP
L9313
SNOW SURVEY

FIGURE 4-5
(SHEET 1 OF 1)

4.9 Tables

Table 4-19 Monument 1

	WSE (ft BPMSL)	Q (cfs)	
Date and Time	Mon1	Mon 1	Observations
5/27/06 4:45 PM	9.54		First water read on gages.
5/28/06 8:00 AM	11.57		Channel ice in reach gone, but ice present on east bank.
5/28/06 4:15 PM	12.57		Ice jam near bifurcation of Niqliq causing flow to divert.
5/29/06 9:15 AM	18.66		Significant stage increase, East Channel mostly ice free.
5/29/06 1:00 PM	19.15		Ice jam spans entire Niqliq channel upstream of Nuiqsut.
5/29/06 4:45 PM	19.32	273,000	Conduct discharge measurement.
5/30/06 7:30 AM	19.44		Intact channel ice on both east and west banks DS of ice jam.
5/30/06 10:00 AM	19.49		High water estimated the morning of 30 May.
5/30/06 11:00 AM	19.25		Ice jam begins to release, stage starts to drop.
5/30/06 12:30 PM	18.86	281,000	Conduct discharge measurement.
5/30/06 2:30 PM	18.73		Stage dropping; East Channel nearly clear of moving ice.
5/31/06 10:30 AM	14.51		Ice jam of East Channel cleared; stranded ice on banks.
5/31/06 4:15 PM	13.69	210,000	Conduct discharge measurement.
6/1/06 2:45 PM	11.07	168,000	Conduct discharge measurement.

Notes:
1. Elevations are based on Monument MON1 of 27.59 feet BPMSL, established by LCMF in 2006.
2. WSE line for Monument 9 (Mon9) included for reference.

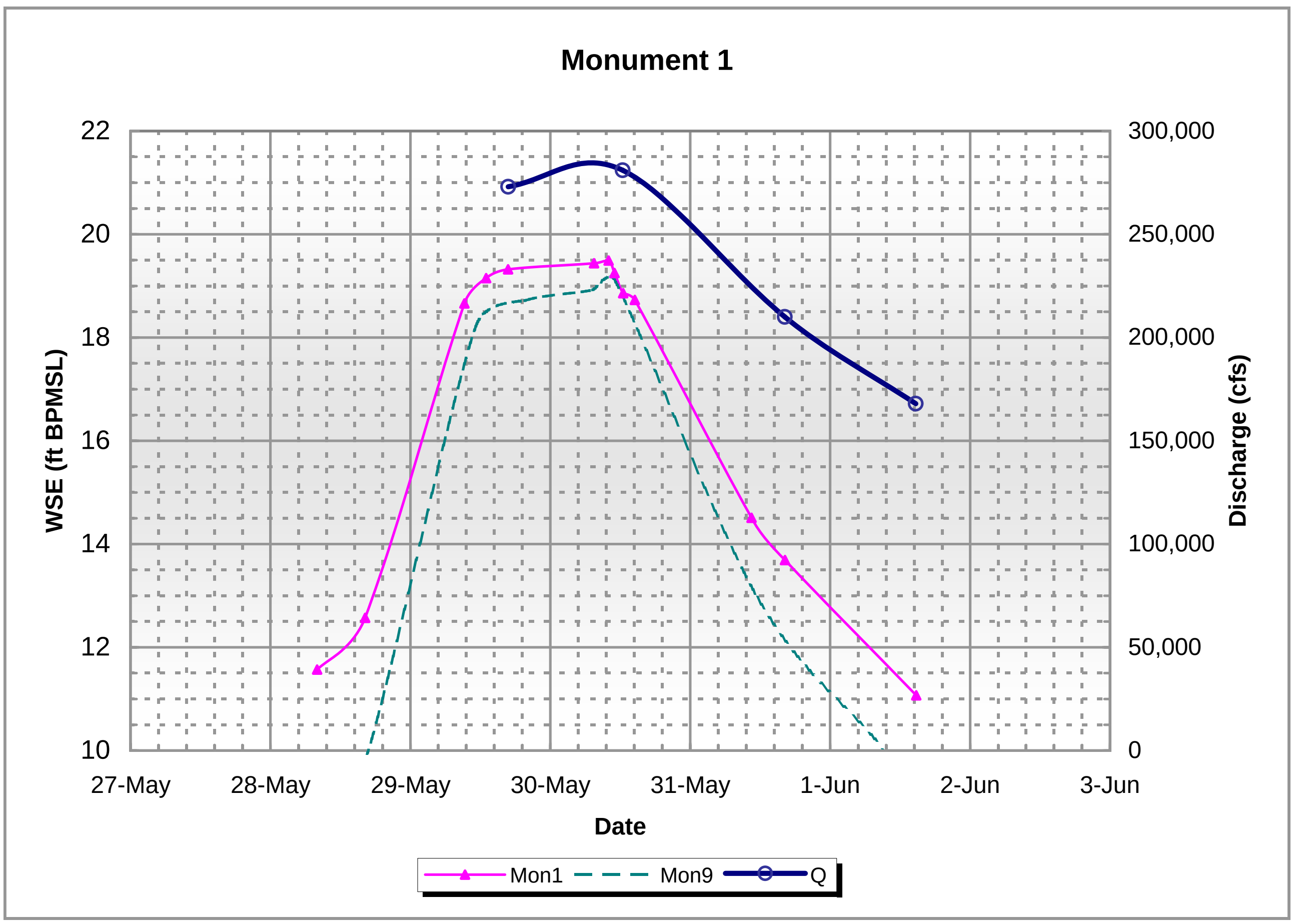


Table 4-20 Monument 1Upstream and 1Downstream

	WSE (ft BPMSL)	Q (cfs)	
Date and Time	Mon1	Mon 1	Observations
5/27/06 4:45 PM	9.54		First water read on gages.
5/28/06 8:00 AM	11.57		Channel ice in reach gone, but ice present on east bank.
5/28/06 4:15 PM	12.57		Ice jam near bifurcation of Niqliq causing flow to divert.
5/29/06 9:15 AM	18.66		Significant stage increase, East Channel mostly ice free.
5/29/06 1:00 PM	19.15		Ice jam spans entire Niqliq channel upstream of Nuiqsut.
5/29/06 4:45 PM	19.32	273,000	Conduct discharge measurement.
5/30/06 7:30 AM	19.44		Intact channel ice on both east and west banks DS of ice jam.
5/30/06 10:00 AM	19.49		High water estimated the morning of 30 May.
5/30/06 11:00 AM	19.25		Ice jam begins to release, stage starts to drop.
5/30/06 12:30 PM	18.86	281,000	Conduct discharge measurement.
5/30/06 2:30 PM	18.73		Stage dropping; East Channel nearly clear of moving ice.
5/31/06 10:30 AM	14.51		Ice jam of East Channel cleared; stranded ice on banks.
5/31/06 4:15 PM	13.69	210,000	Conduct discharge measurement.
6/1/06 2:45 PM	11.07	168,000	Conduct discharge measurement.

Notes:

1. Elevations are based on Monument MON1 of 27.59 feet BPMSL, established by LCMF in 2006.
2. WSE line for Monument 9 (Mon9) included for reference.

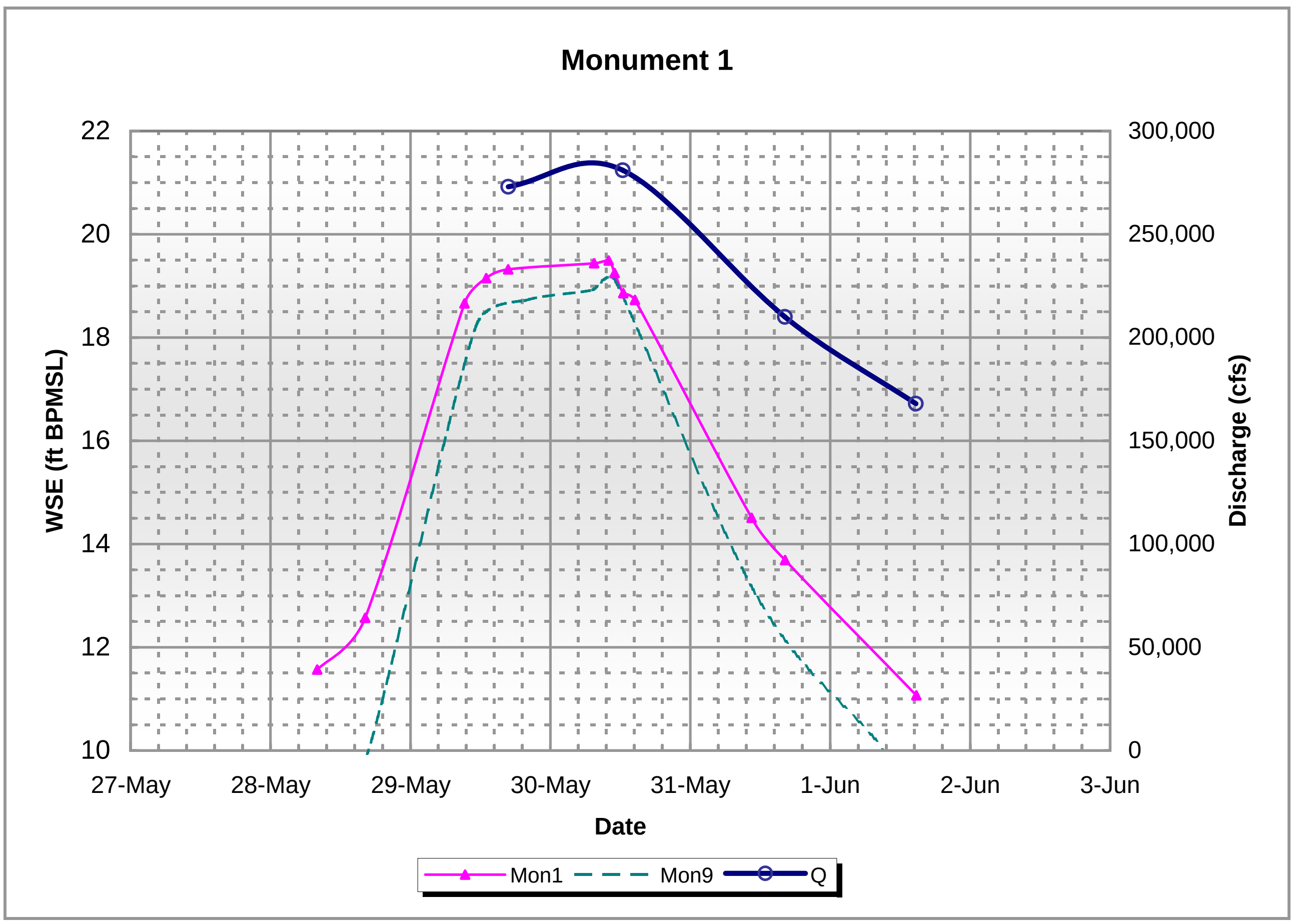


Table 4-21 Monument 9

Date and Time	WSE (feet BPMSL) Mon9	Q (cfs)	Observations
5/25/06 9:15 AM	3.62		
5/26/06 2:30 PM	4.07		
5/27/06 12:30 PM	6.86		Observed flow at site.
5/28/06 8:30 AM	9.28		
5/28/06 4:15 PM	9.81		Ice bridge and jam in East channel diverting flow in Niqliq.
5/29/06 11:15 AM	18.22		Ice jam spans East and Nigliq channels.
5/29/06 7:45 PM	18.72		Flow overbank across HDD pad and thermosyphons.
5/30/06 7:15 AM	18.92		
5/30/06 10:00 AM	19.12		High water estimated morning of 30 May.
5/30/06 3:15 PM	18.82		Stage dropping; moving ice near HDD pad.
5/31/06 11:30 AM	12.97		Ice jam on East channel cleared; stranded ice on banks.
6/1/06 9:00 AM	10.05		
6/2/06 8:00 AM	7.78		

Notes:

1. Elevations are based on Monument Mon9 of 25.03 feet BPMSL, established by Lounsbury in 1996.
2. WSE lines for Mon1 and Helmricks are presented for reference.
3. No discharge measurements were collected for this site.

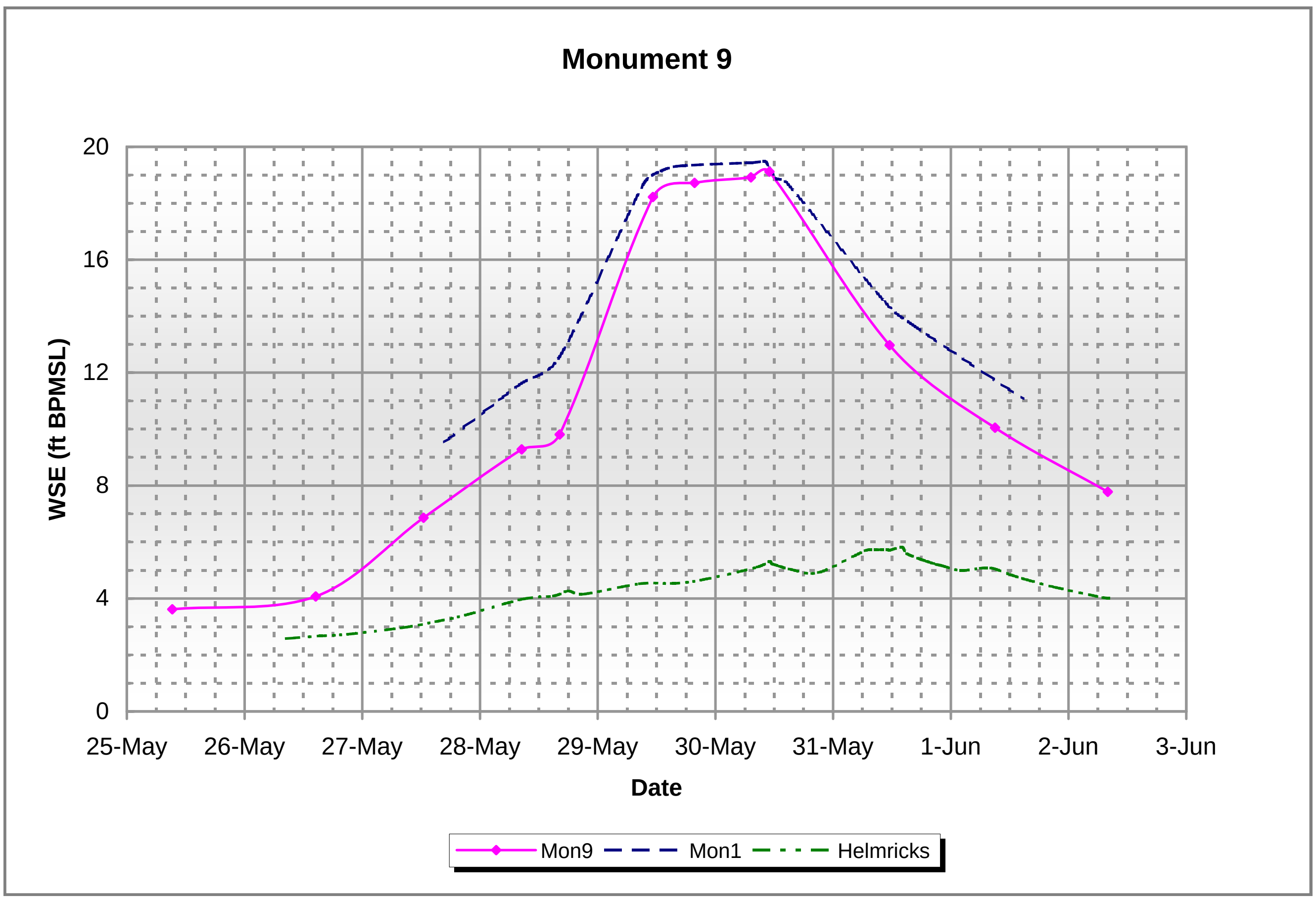


Table 4-22 Helmricks

Date and Time	WSE (feet BPMSL) Helmricks	Q (cfs)	Observations
5/25/06 8:30 AM	2.32		
5/26/06 2:30 PM	2.67		
5/27/06 12:30 PM	3.18		Steady rise in flood waters.
5/28/06 8:30 AM	3.97		
5/28/06 4:15 PM	4.09		
5/29/06 11:15 AM	4.52		Ice jam in East and Nigliq channels observed near Alpine.
5/29/06 7:45 PM	4.65		
5/30/06 7:15 AM	5.11		Peaking in surges; runway half-flooded.
5/30/06 11:00 AM	5.31		
5/30/06 3:15 PM	5.05		Shore lead only, water still flowing into lake.
5/31/06 11:30 AM	5.73		Most of the runway under water; ice jam developed near Dune Island.
6/1/06 9:00 AM	5.07		
6/2/06 8:00 AM	4.01		Channel ice still present in east and main channels.

Notes:

1. Elevations based on observations conducted by James Helmricks.
2. WSE lines for Mon1 and Mon9 are presented for reference.
3. No discharge measurements were collected for this site.

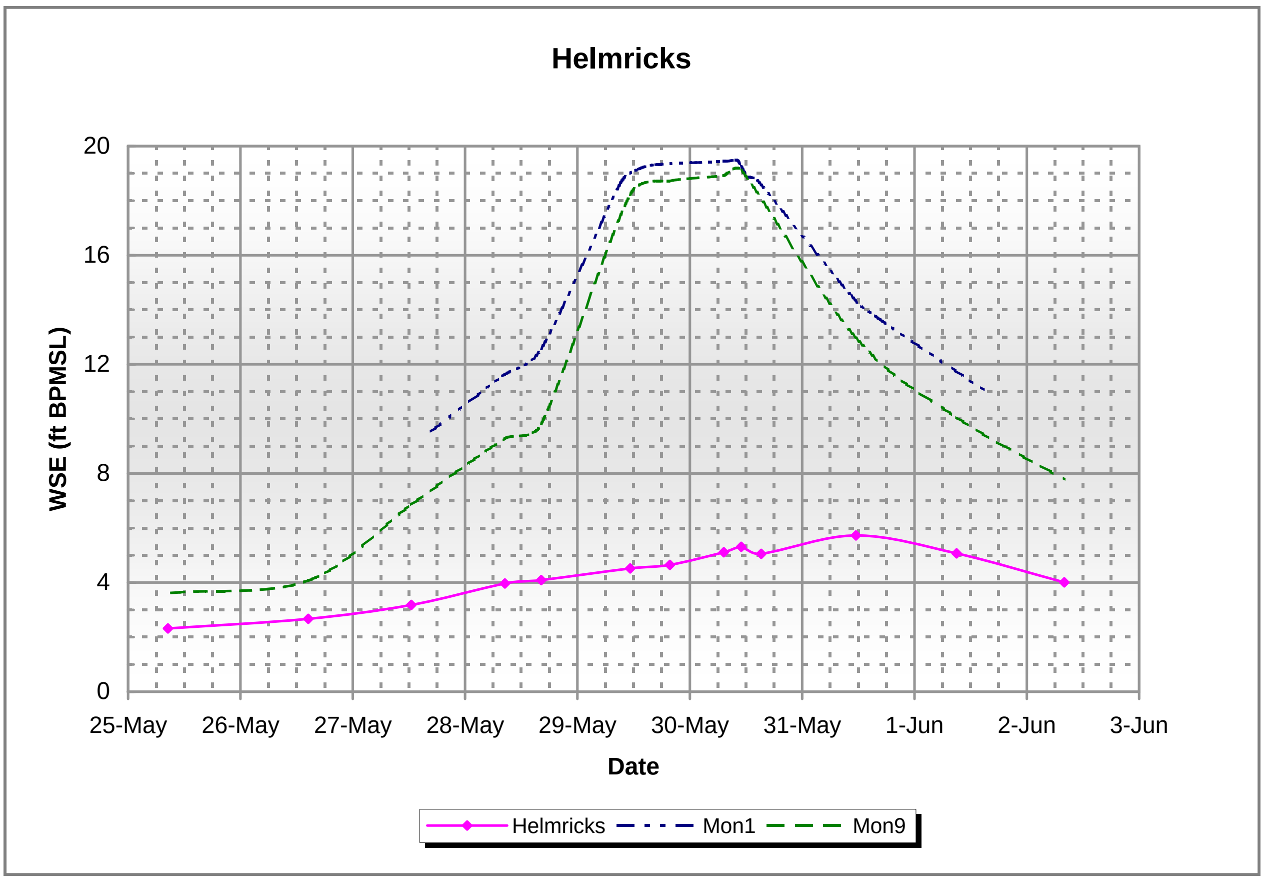


Table 4-23 Monument 20

Date and Time	WSE (feet BPMSL) Mon20	Q (cfs)	Observations
5/25/06 10:30 AM	2.82		
5/26/06 2:45 PM	2.07		
5/27/06 5:00 PM	4.79		
5/28/06 9:00 AM	6.77		Ice bridge and jam in east channel near Niqliq.
5/28/06 3:15 PM	7.12		Flow diverted from east channel into Niqliq due to ice jam.
5/29/06 11:00 AM	10.11		
5/30/06 8:00 AM	10.62		
5/30/06 5:00 PM	15.26		Water slowly rising; large ice pieces moving in channel.
5/31/06 2:00 AM	15.34		High water estimated the early morning of 31 May.
5/31/06 10:00 AM	11.65		Ice jam moved approximately 1 mile downstream; stranded ice on bank.
6/1/06 10:00 AM	8.09		Ice jam cleared

Notes:

1. Elevations are based on Monument Mon20 of 19.17 feet BPMSL, established by Lounsbury in 1996.
2. WSE lines for Mon22, Mon23 and Mon28 are presented for reference.
3. No discharge measurements were collected for this site.

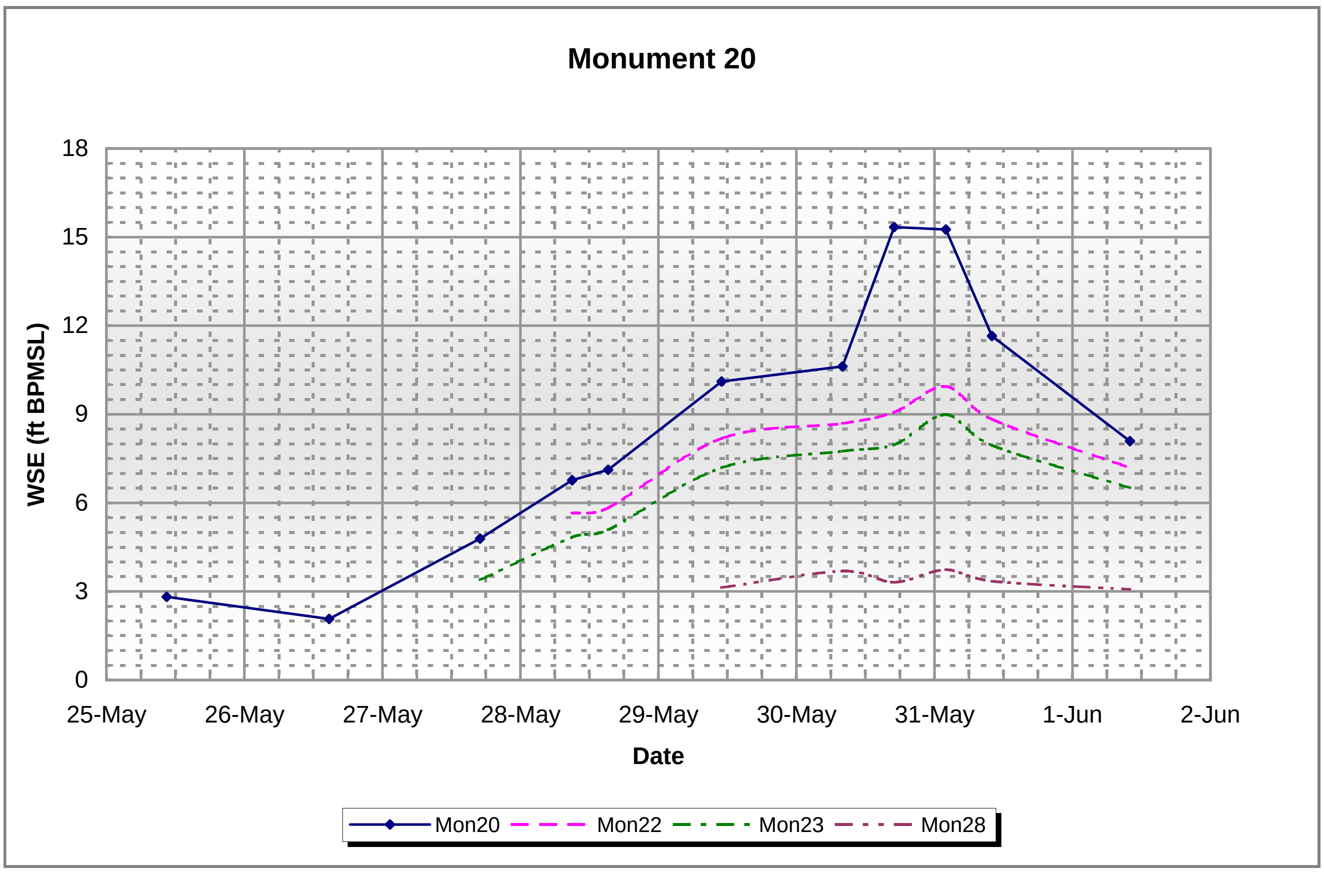


Table 4-24 Monument 22

Date and Time	WSE (feet BPMSL) Mon22	Q (cfs)	Observations
5/27/06 5:00 PM			Gage dry.
5/28/06 9:00 AM	5.65		Ice bridge and jam in east channel near Niqliq.
5/28/06 3:15 PM	5.83		Flow diverted from east channel into Niqliq due to ice jam.
5/29/06 11:00 AM	8.18		
5/30/06 8:00 AM	8.67		
5/30/06 5:00 PM	9.07		Water slowly rising; large ice pieces moving in channel.
5/31/06 2:00 AM	9.95		High water estimated the early morning of 31 May.
5/31/06 10:00 AM	8.83		Ice jam moved approximately 1 mile downstream; stranded ice on bank.
6/1/06 10:00 AM	7.19		Ice jam cleared.

Notes:

1. Elevations are based on Monument Mon22 of 10.13 feet BPMSL, established by Lounsbury in 1996.
2. WSE lines for Mon20, Mon23 and Mon28 are presented for reference.
3. No discharge measurements were collected for this site.

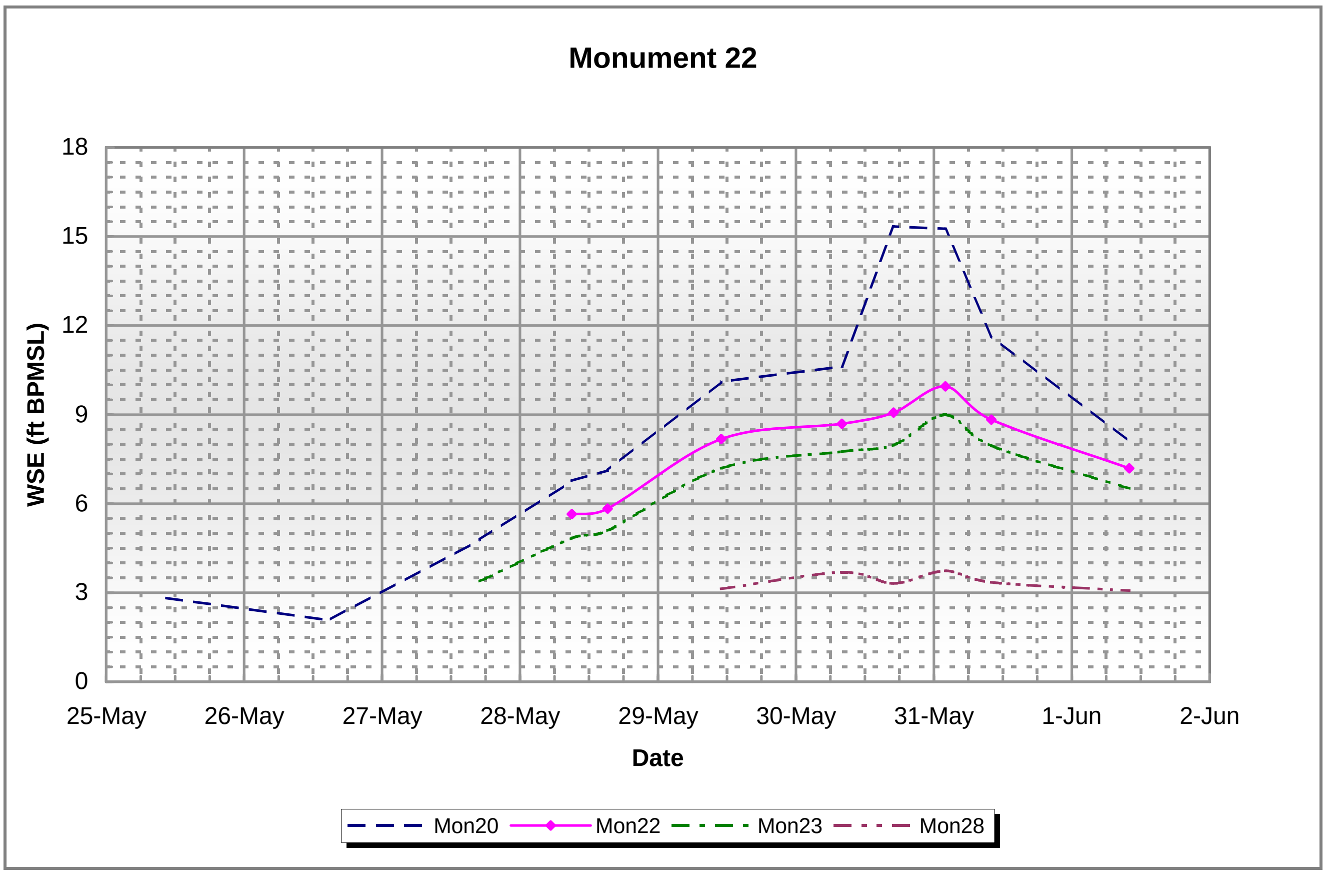


Table 4-25 Monument 23

Date and Time	WSE (feet BPMSL) Mon23	Q (cfs)	Observations
5/26/06 2:45 PM			Gage dry.
5/27/06 5:00 PM	3.39		
5/28/06 9:00 AM	4.84		Ice bridge and jam in east channel near Niqliq.
5/28/06 3:15 PM	5.09		Flow diverted from east channel into Niqliq due to ice jam.
5/29/06 11:00 AM	7.19		
5/30/06 8:00 AM	7.75		
5/30/06 5:00 PM	7.97		Water slowly rising; large ice pieces moving in channel.
5/31/06 2:00 AM	8.99		High water estimated the early morning of 31 May.
5/31/06 10:00 AM	7.95		Ice jam moved approximately 1 mile downstream; stranded ice on bank.
6/1/06 10:00 AM	6.51	43,000	Ice jam cleared.

Notes:

1. Elevations are based on Monument Mon23 of 9.53 feet BPMSL, established by Lounsbury in 1996.
2. WSE lines for Mon20, Mon22 and Mon28 are presented for reference.

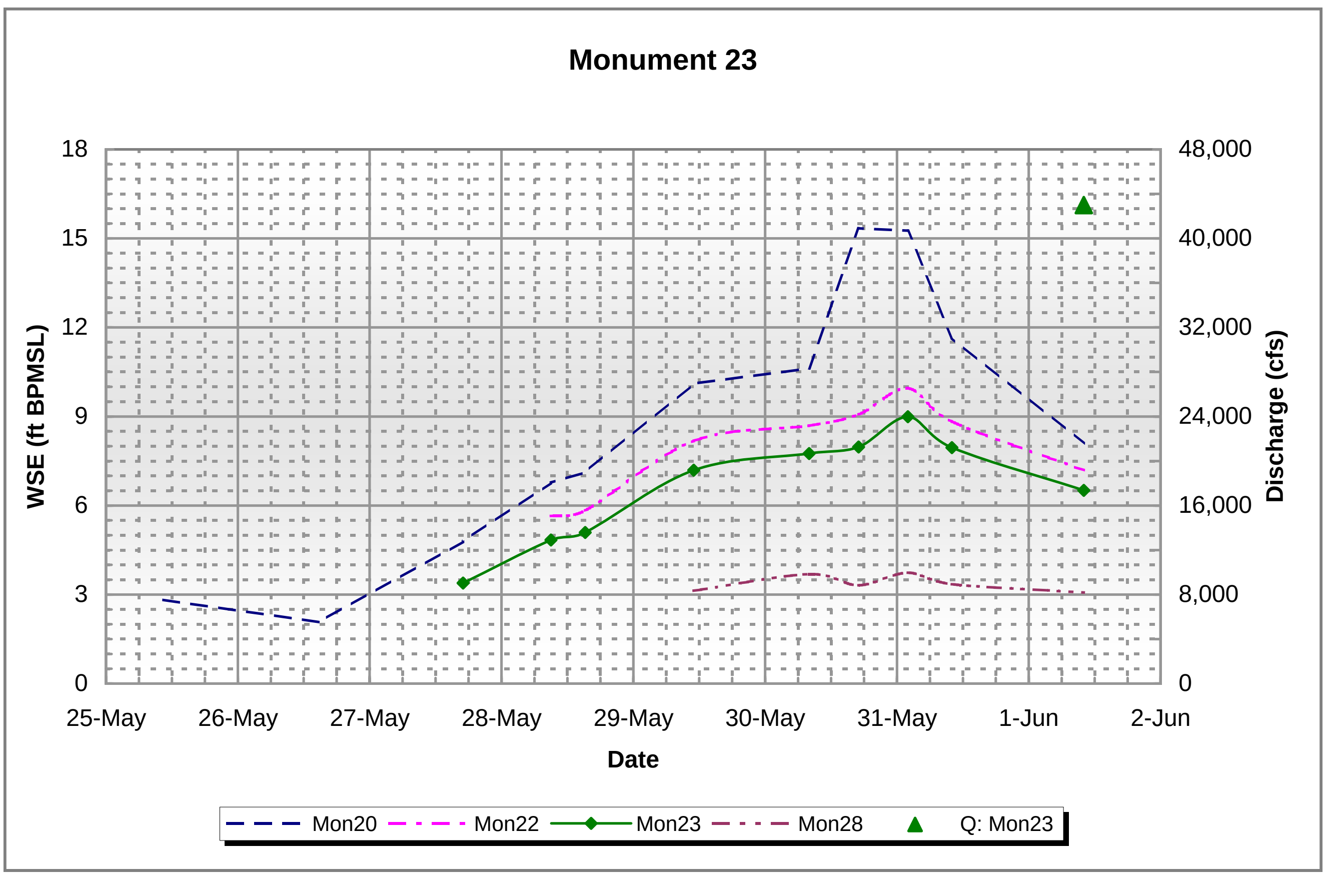


Table 4-26 Monument 28

Date and Time	WSE (feet BPMSL) Mon28	Q (cfs)	Observations
5/27/06 5:00 PM			Gage dry.
5/28/06 9:00 AM	2.61		Ice bridge and jam in east channel near Niqliq.
5/29/06 11:00 AM	3.13		
5/30/06 8:00 AM	3.69		
5/30/06 5:00 PM	3.31		Water slowly rising; large ice pieces moving in channel.
5/31/06 2:00 AM	3.74		High water estimated the early morning of 31 May.
5/31/06 10:00 AM	3.35		Ice jam moved approximately 1 mile downstream; stranded ice on bank.
6/1/06 10:00 AM	3.07		Ice jam cleared.

Notes:

1. Elevations are based on Monument Mon28 of 3.66 feet BPMSL, established by Lounsbury in 1996.
2. WSE lines for Mon20, Mon22 and Mon23 are presented for reference.
3. No discharge measurements were collected for this site.

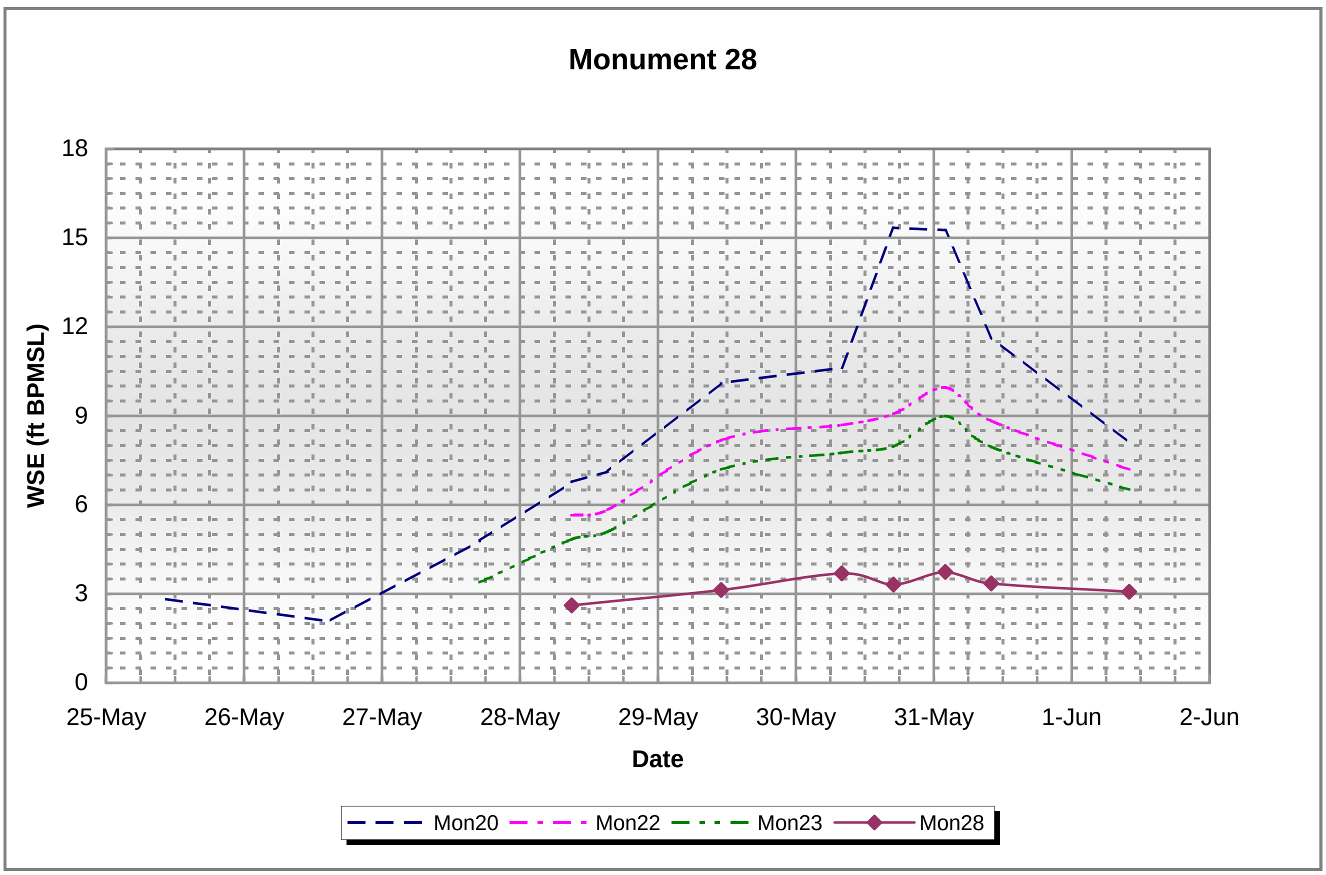


Table 4-27 PaleoEast and PaleoWest Gages

	WSE (feet BPMSL)		Q (cfs)	
Date and Time	**Paleo E**	**Paleo W**		**Observations**
5/30/06 5:30 PM	8.77	8.95		Wide, slow flow entering channel due to ice jam in Nigliq channel.
5/31/06 1:00 AM	9.70	9.62		High water estimated the early morning of 31 May.
5/31/06 9:15 AM	9.25	9.11		Stage decreasing.
6/1/06 10:45 AM	8.12			Paleo West observed dry; Ice jam in Nigliq channel cleared.

Notes:

1. Elevations for Paleo East are based on Monument NPRA2 of 7.67 ft BPMSL, established by LCMF in 2005.
2. Elevations for Paleo West are based on Monument CLEAR1951 of 25.50 ft BPMSL., established by LCMF in 2005.
3. No discharge measurements were conducted at this site.

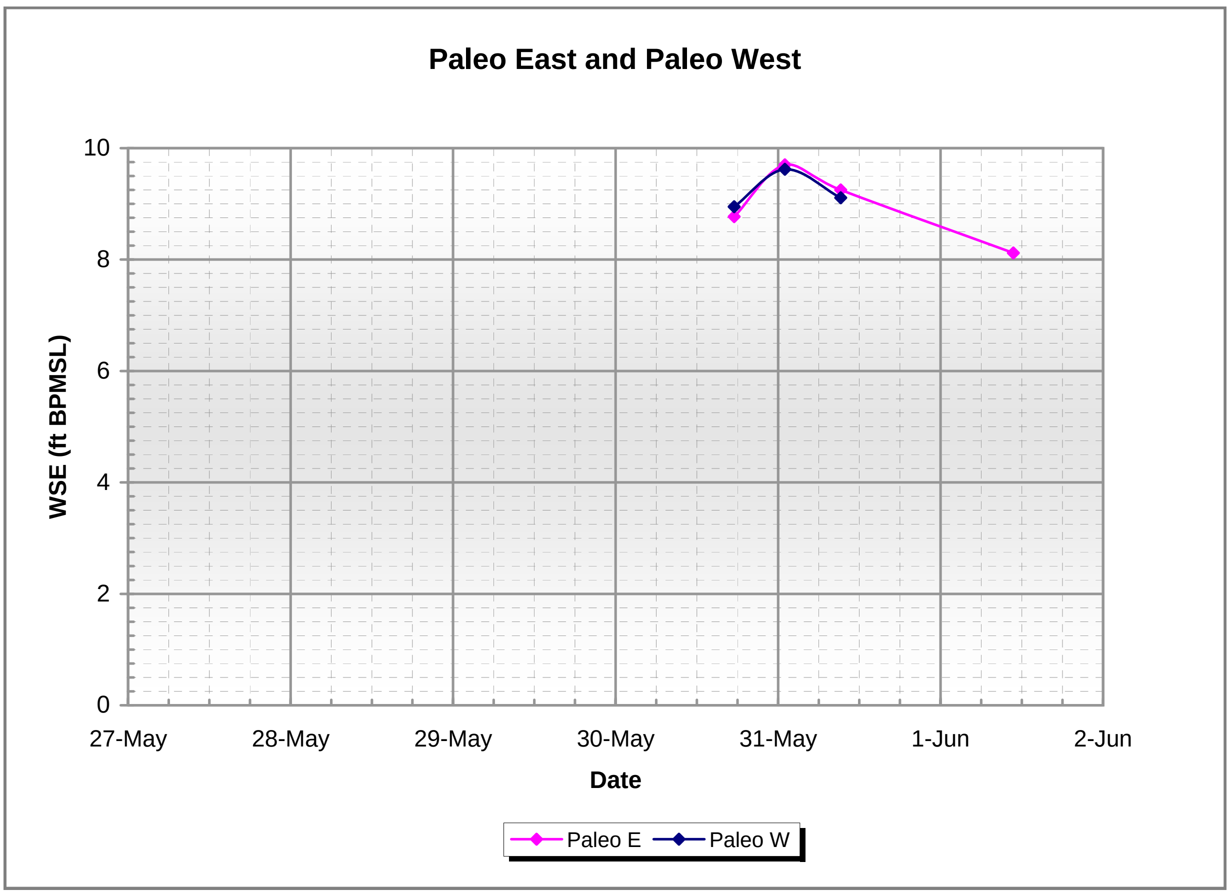


Table 4-28 CD4 Road Gages (Gages 15, 16, 17, and 18)

	WSE (feet BPMSL)				
Date and Time	Gage 15	Gage 16	Gage 17	Gage 18	Observations
5/29/06 3:00 PM	5.27				Ice jam in Nigliq and East Channels; flow diverting because of jam.
5/29/06 7:45 PM	6.54	6.54			First flow through CD-4 culverts observed.
5/30/06 9:00 AM	8.14	8.13	9.87	10.03	
5/30/06 5:00 PM	8.87	10.00	10.86	13.60	Culvert battery near gages flowing full with rising stage.
5/30/06 8:15 PM			12.55	14.59	
5/30/06 10:30 PM	10.12	12.60	12.92	14.67	High water estimated the evening of 30 May.
5/31/06 9:15 AM	9.62	10.12	10.59	11.53	Ice jam in East Channel clear.
6/1/06 9:45 AM	7.26	8.23			
6/2/06 9:30 AM	6.46	7.23			Nigliq Channel ice jam clear.
6/3/06 9:15 AM	5.53	5.55			Final reading; no observable flow.

Notes:

1. Basis of elevation for Gage15 and Gage16 based on NANUQ CP-2 of 13.70 ft BPMSL.
2. Basis of elevation for Gage17 and Gage18 based on monument 05-20-01B of 25.68 ft BPMSL.

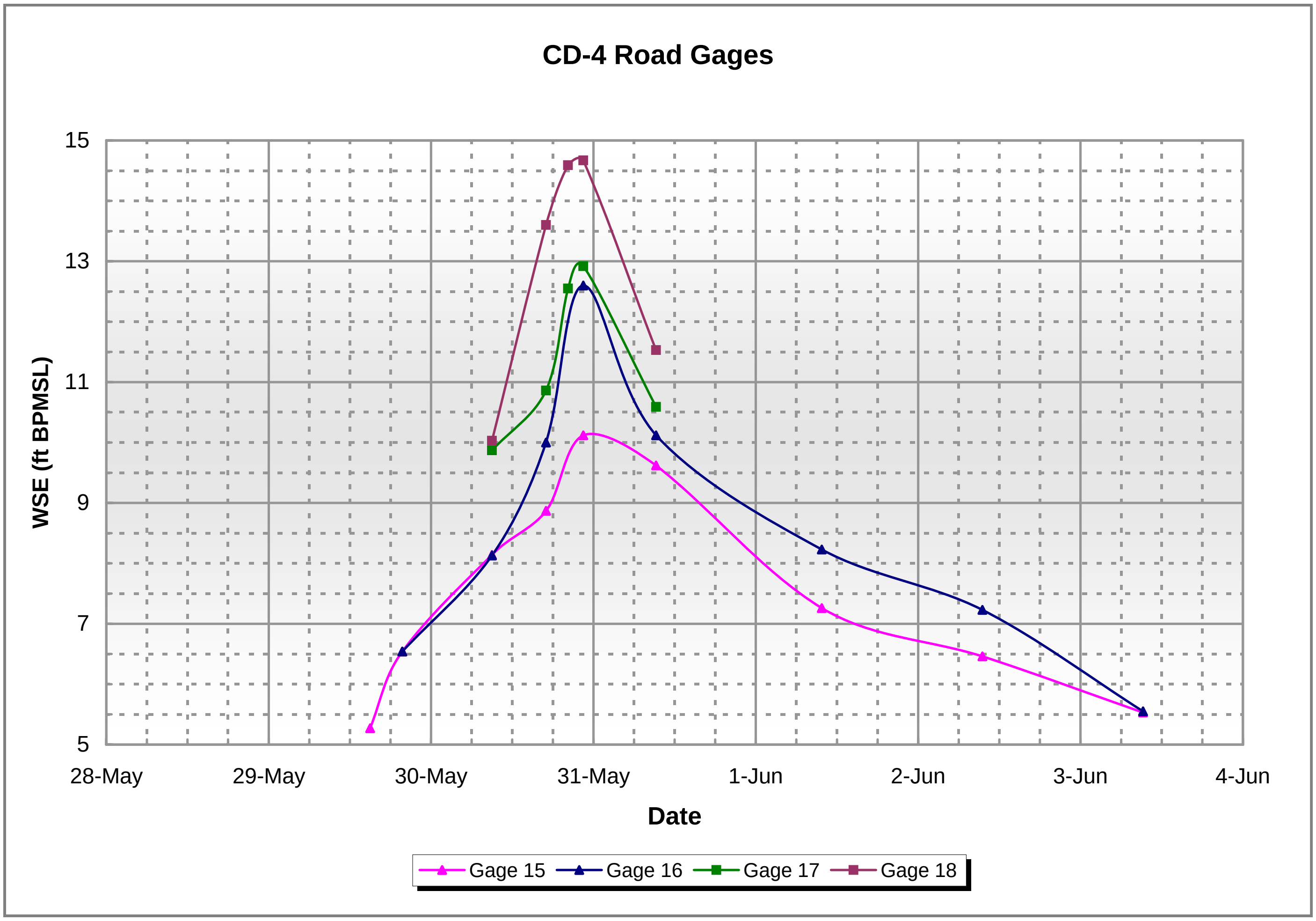


Table 4-29 CD4 Gages 19 and 20

	WSE (ft BPMSL)		
Date and Time	**Gage19**	**Gage20**	**Observations**
5/29/06 2:45 PM	10.21	9.83	Ice jam in East and Nigliq Channels.
5/29/06 8:15 PM	10.28	9.61	Flow diverted overland because of ice jam.
5/30/06 8:45 AM	10.54	10.18	Steady rising water.
5/30/06 5:30 PM	13.82		Gage19 completely under water.
5/30/06 8:30 PM	14.68		
5/30/06 10:30 PM	14.80	14.30	High water for Gage19 and Gage20 estimated the evening 30 May.
5/31/06 10:30 AM		11.31	Drift line on SW corner of CD-4 pad surveyed.
6/1/06 9:00 AM		7.95	Gage19 under stranded ice. Ice jam in East and Nigliq Channels cleared.
6/2/06 9:15 AM		7.50	

Notes:

1. Basis of elevation for Gage19 based on monument 05-20-01B of 25.68 ft BPMSL.
2. Elevations for Gage20 based on monument 05-01-21D of 12.44 ft BPMSL.

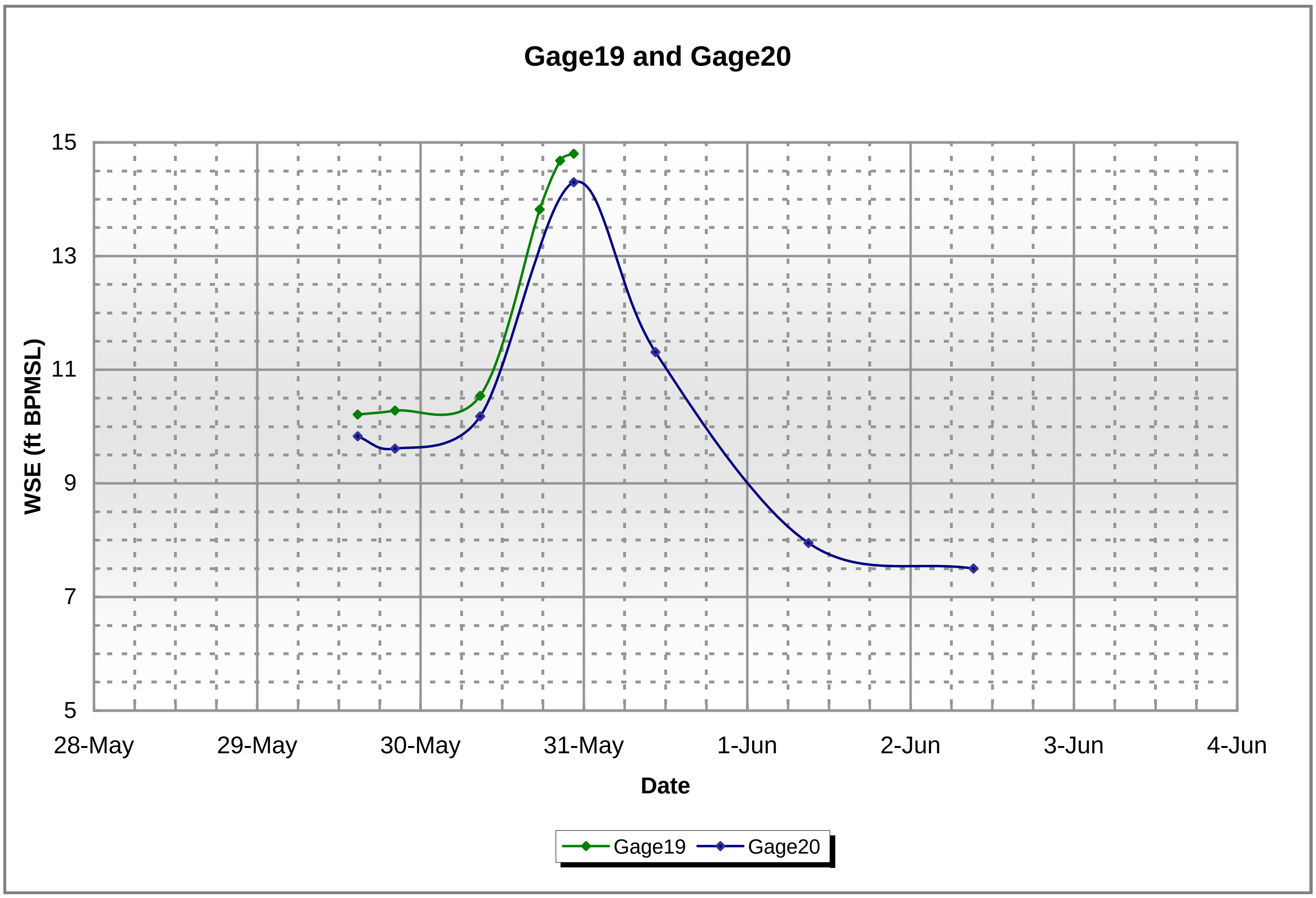


Table 4-30 Pipeline Crossings: Sakoonang, Tamayagiaq, and Ulamnigiaq Channels

	WSE (ft BPMSL)			
Date and Time	**SAK**	**TAM**	**ULAM**	**Observations**
5/27/06 3:00 PM		4.00	3.80	
5/28/06 11:00 AM	3.37	5.10	4.80	Ice jam observed in Nigliq and East Channels.
5/30/06 9:00 AM	7.31	7.70	7.10	Steady rise in water elevations.
5/31/06 3:00 AM	8.71			High water estimated at the SAK crossing in the early morning of 31 May.
5/31/06 8:15 AM	8.59	6.80	6.00	Ice jam in East Channel cleared, crossings running ice-free.
6/1/06 8:15 AM	7.28	6.40	6.00	Nigliq Channel ice jam cleared.
6/2/06 7:45 AM	5.46	5.30	4.80	Significant water level decrease.
6/3/06 2:30 PM	4.41	4.00	3.80	Final readings.

Notes:

1. Basis of elevation for Crossing #2 (SAK) on SAK-LT of 10.17 feet BPMSL.
2. Basis of elevation for Crossing #4 (TAM) on STM-RT of 10.07 feet BPMSL.
3. Basis of elevation for Crossing #5 (ULAM) on monument FIORD1 of 9.30 feet BPMSL.

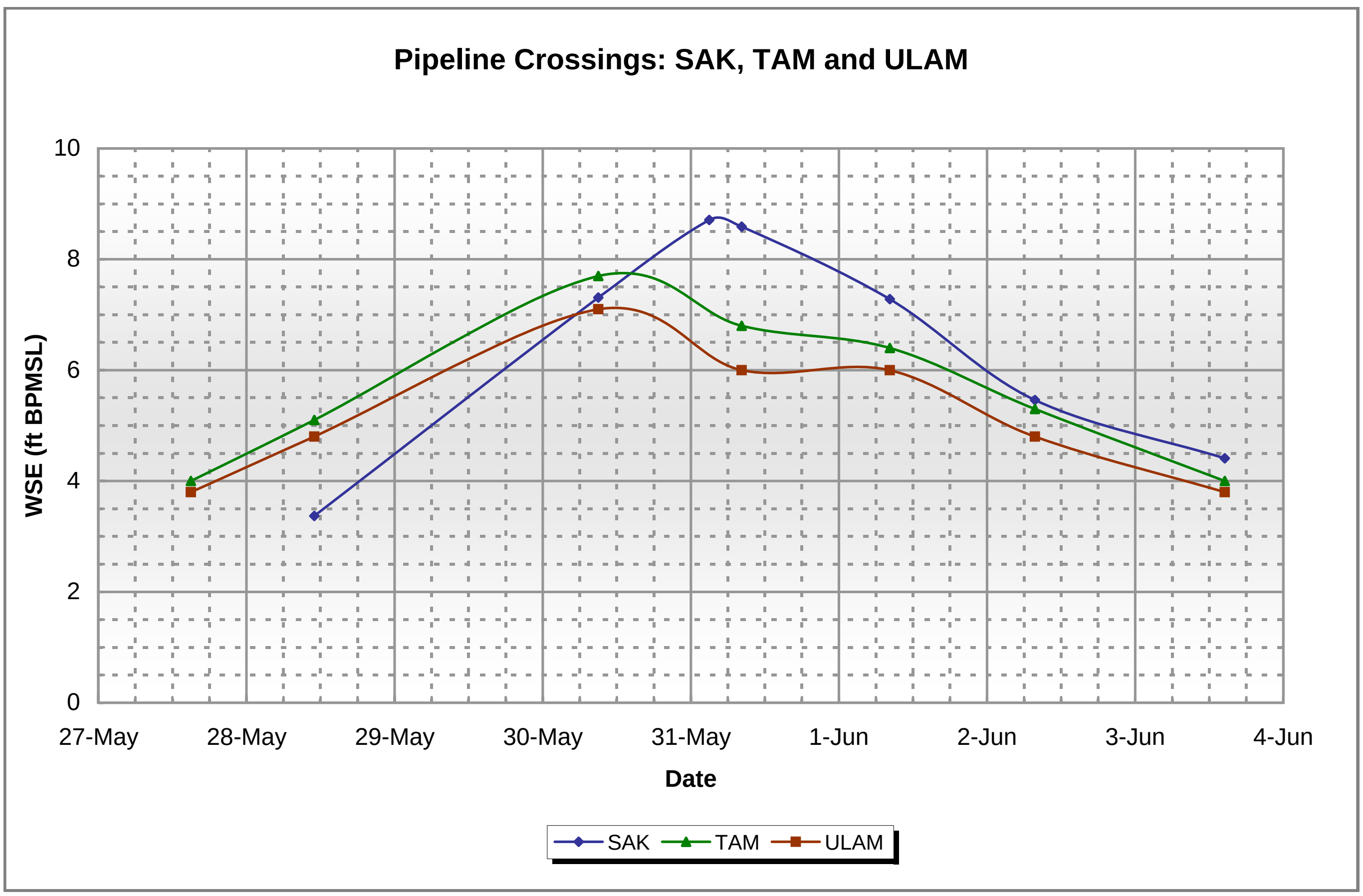


Table 4-31 Gages 11 and 12

	WSE (ft BPMSL)		
Date and Time	**Gage 11**	**Gage 12**	**Observations**
5/27/06 2:45 PM		2.67	
5/28/06 11:15 AM	4.51	4.00	Ice jam in East and Nigliq Channels.
5/30/06 8:45 AM	5.44	5.06	Flow diverted overland because of ice jam.
5/31/06 1:00 AM	5.55	5.12	High water for Gage 11 estimated the morning of 5/31/06
5/31/06 8:30 AM	5.44	4.90	
6/1/06 1:00 AM		5.35	High water for Gage 12 estimated the morning of 6/1/06
6/1/06 8:30 AM	5.27	5.24	Ice jam in East and Nigliq Channels clears.
6/2/06 7:45 AM		4.31	Gage 11 reported dry.

Notes:

1. Elevations for Gage 11 (W Ulam) are based on monument FIORD17 of 8.31 ft BPMSL.
2. Elevations for Gage 12 (E Ulam) are based on monument FIORD15 of 6.53 ft BPMSL.

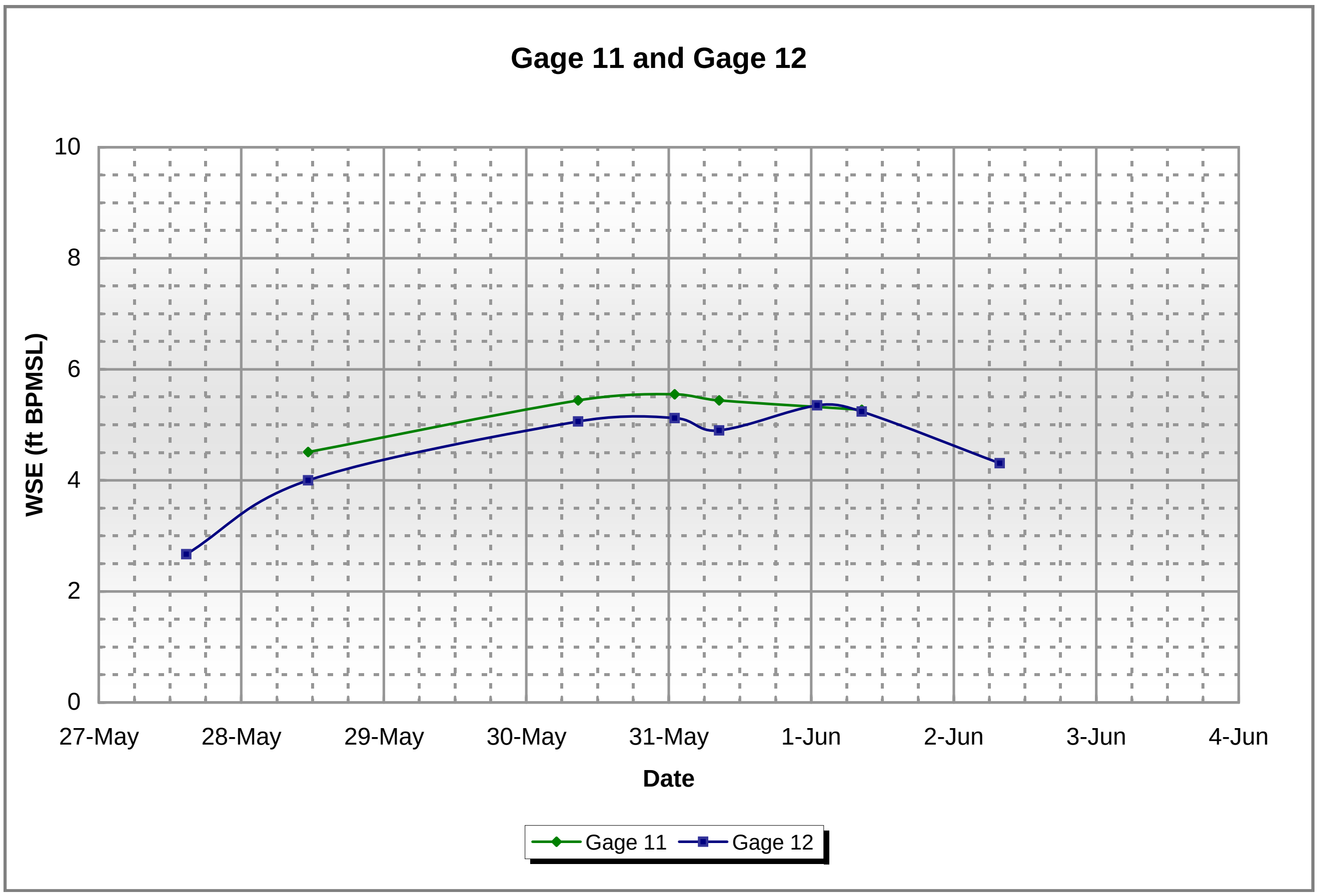


Table 4-32 Gages 3, 4, 6, and 7

	WSE (feet BPMSL)				
Date and Time	**Gage 3**	**Gage 4**	**Gage 6**	**Gage 7**	**Observations**
5/28/06 4:00 PM			7.48	7.37	Gages observed with local melt only.
5/29/06 3:30 PM	8.15	7.38	8.40	8.16	Ice jam in Nigliq and East Channels; flow diverting because of jam.
5/30/06 10:20 AM	8.69	7.82	8.87	8.49	
5/30/06 9:15 PM	9.25	8.50	9.58	8.70	Culvert battery near gages flowing full with rising stage.
5/31/06 3:00 AM	9.72	8.85	9.94	9.17	High water estimated the morning of 31 May.
5/31/06 6:00 AM	9.15	8.72	9.36	8.84	Ice jam in East Channel clear.
5/31/06 10:00 PM	8.22	7.92	8.39	8.29	
6/1/06 10:30 AM	7.02	6.95	7.89	7.84	Nigliq Channel ice jam clear.
6/2/06 9:45 AM	5.61	5.58	7.56	7.58	Final reading; no observable flow.

Notes:

1. Basis of elevation for Gage3, Gage4, Gage6 and Gage7 established by LCMF in 2006.

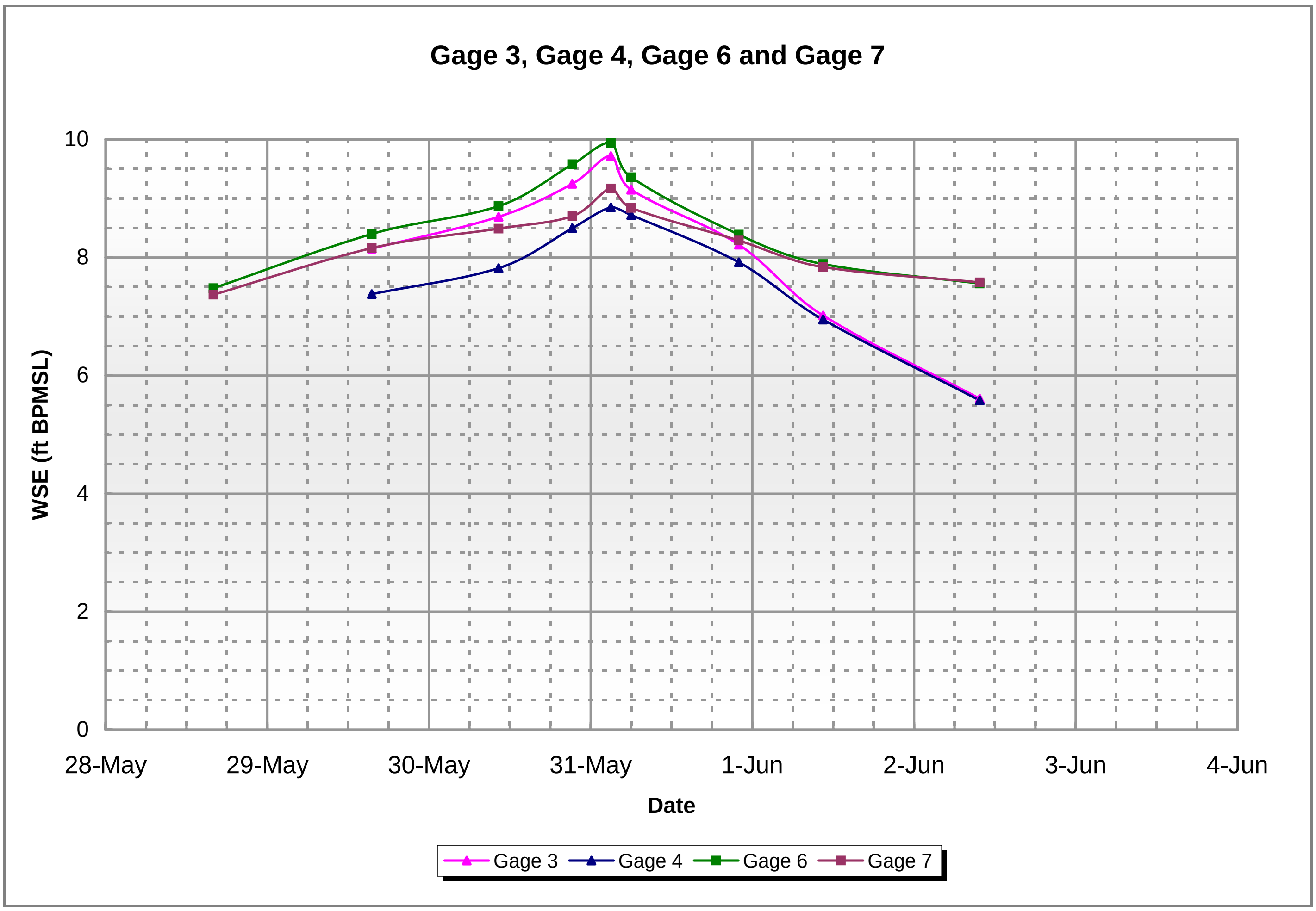


Table 4-33 Gage 8

	WSE (ft BPMSL)	
Date and Time	Gage 8	Observations
5/30/06 9:30 AM	8.18	Ice jam in Nigliq Channel causing water to divert.
5/30/06 4:45 PM	8.29	Increasing stage.
5/30/06 9:30 PM	8.53	
5/31/06 3:00 AM	9.34	High water estimated the morning of 5/31/06.
6/1/06 10:15 AM	8.11	Ice jam in Nigliq Channel releases.
6/2/06 9:45 AM	8.05	
6/3/06 9:45 AM	8.03	Final reading.

Notes:

1. Basis of elevation for Gage 8 established by LCMF in 2006.

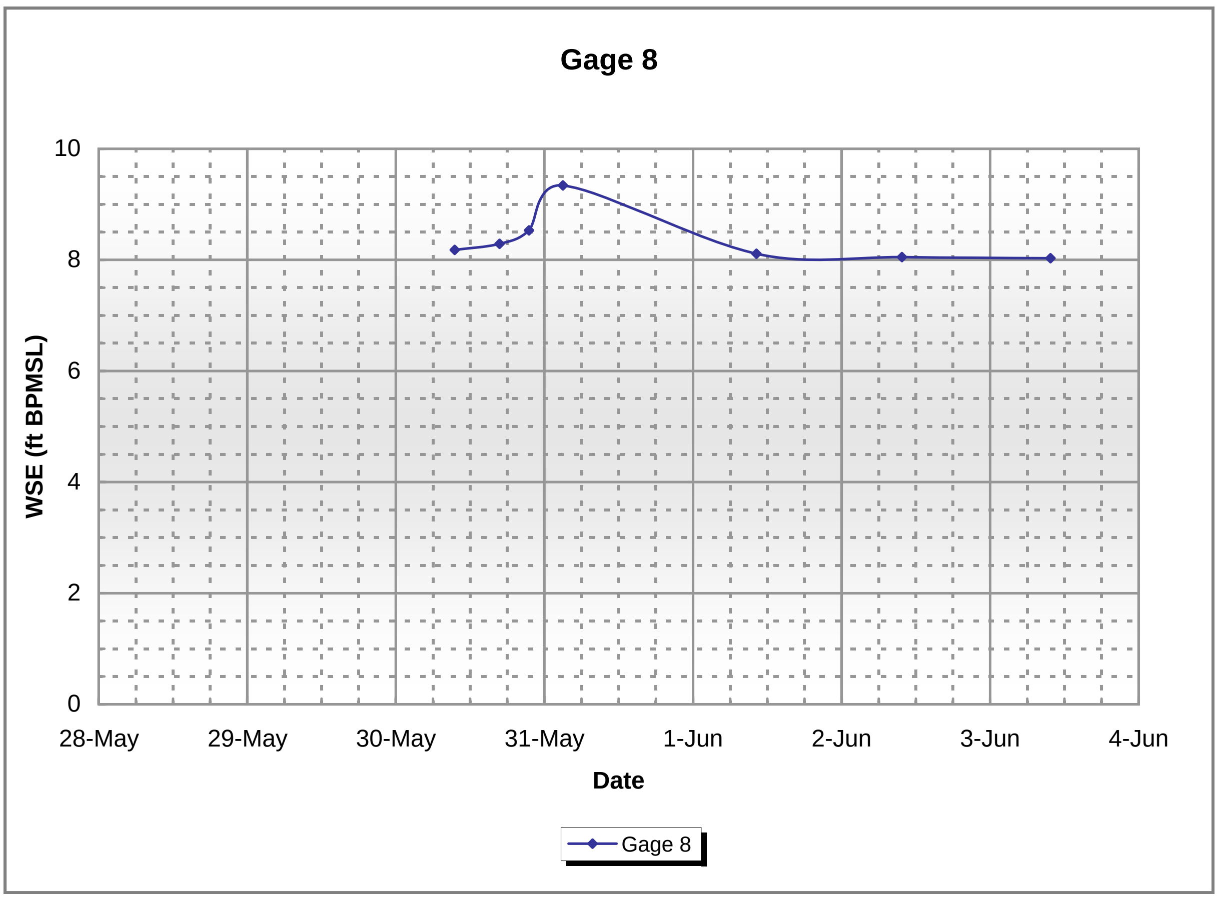


Table 4-34 Gage 1

Date and Time	WSE (ft BPMSL) Gage1	Observations
5/28/06 7:15 AM	3.23	Ice jam observed in Nigliq and East Channels.
5/29/06 11:30 AM	4.85	Flow diverting because of ice jam.
5/29/06 4:00 PM	5.37	
5/29/06 8:45 PM	6.40	Steady rise in water elevations.
5/30/06 10:00 AM	7.25	
5/30/06 6:15 PM	7.95	
5/31/06 3:00 AM	9.29	High water estimated the morning of 5/31/06.
5/31/06 7:30 AM	8.90	
6/1/06 8:30 AM	7.71	Ice jam clears in Nigliq and East Channels.
6/2/06 10:30 AM	5.55	Water elevations decreasing.
6/3/06 10:15 AM	4.60	
6/4/06 10:45 AM	3.78	
6/5/06 8:00 AM	3.17	
6/9/06 4:45 PM	1.17	

Notes:

1. Basis of elevation for Gage 1 established by LCMF in 2006.

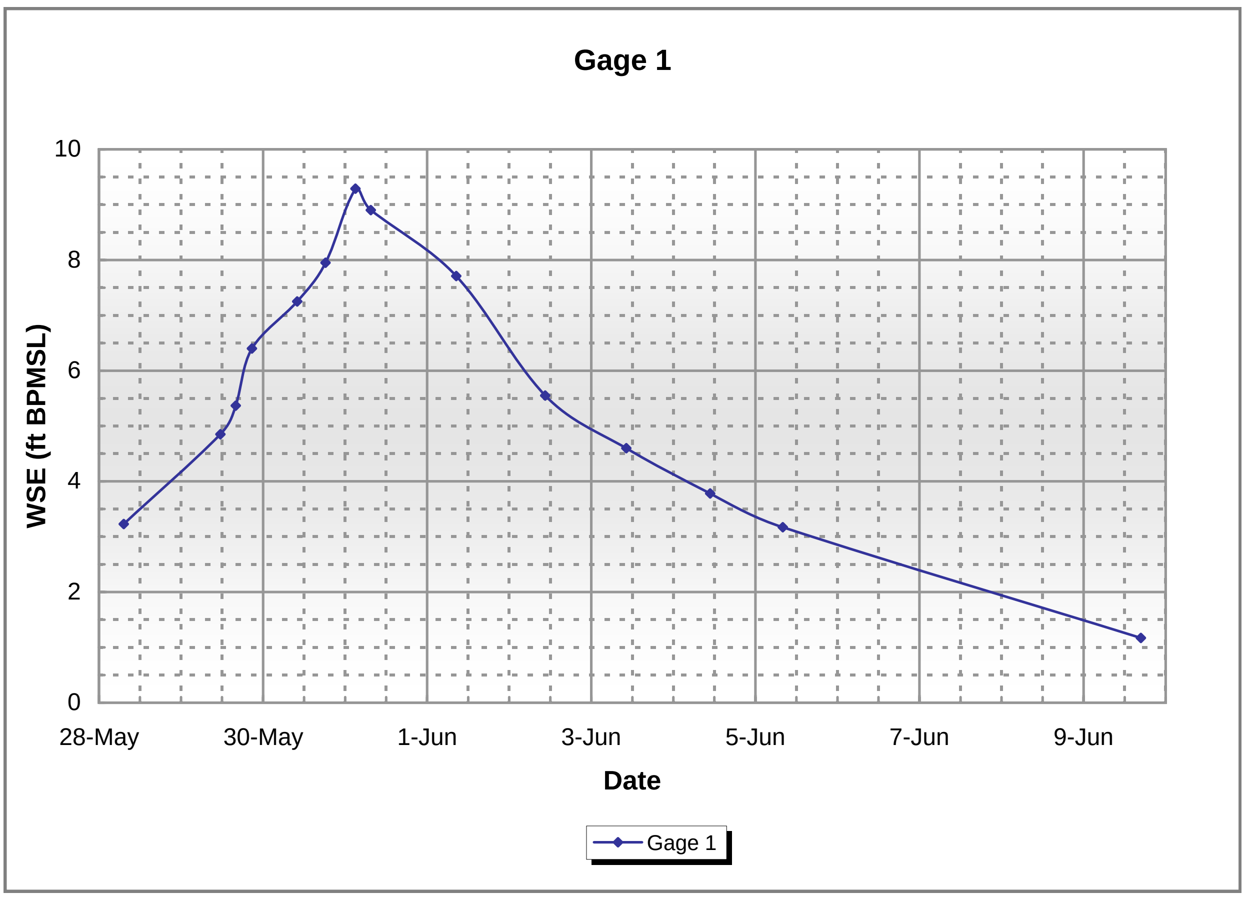
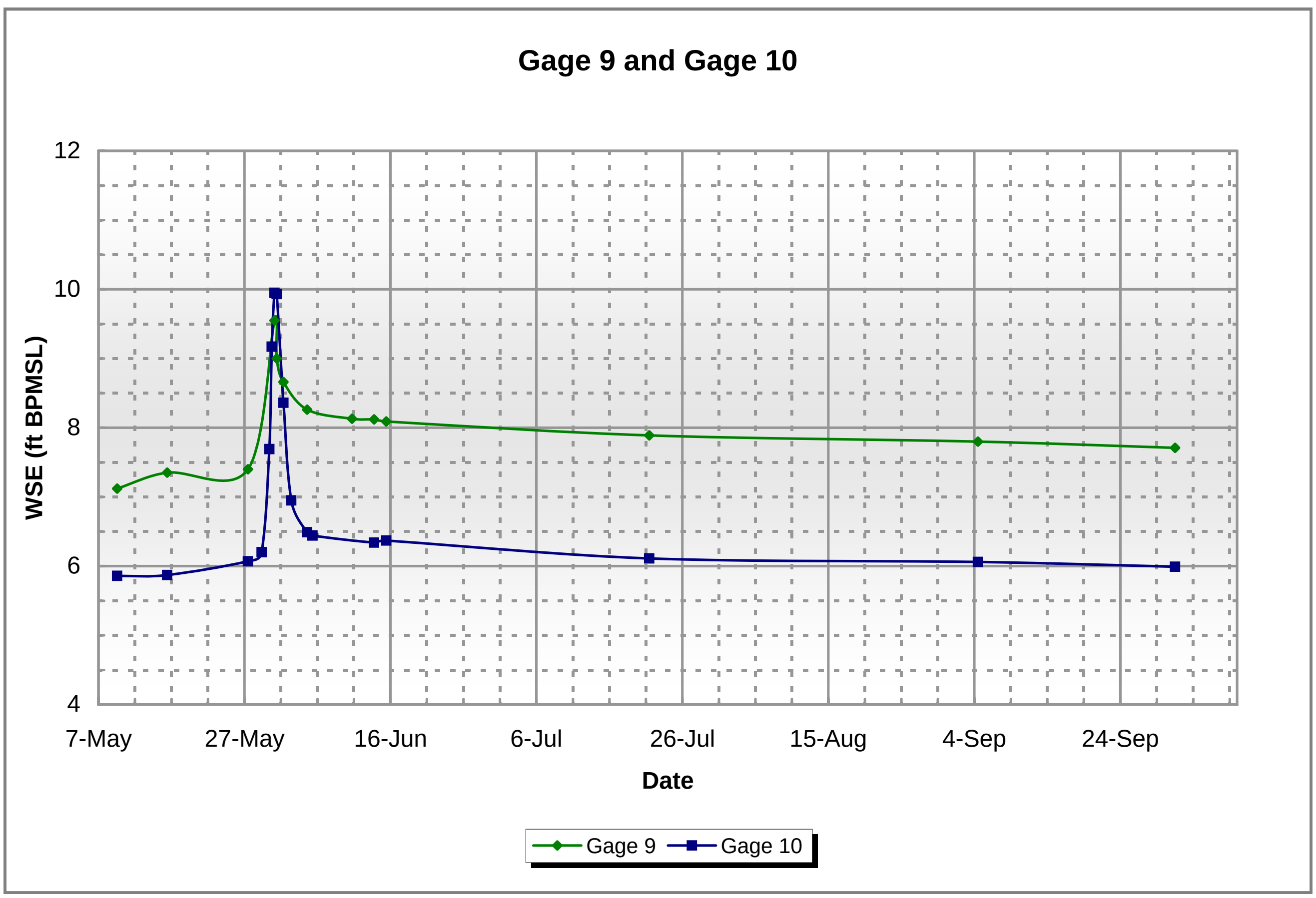


Table 4-35 Gages 9 and 10

	WSE (ft BPMSL)		
Date and Time	Gage 9	Gage 10	Observations
5/9/06 1:45 PM	7.12	5.86	Lakes ice-covered.
5/16/06 10:00 AM	7.35	5.87	
5/27/06 11:30 AM	7.40	6.07	Lake ice remains attached to edge.
5/29/06 8:30 AM		6.20	Ice jams in East and Nigliq Channels causing water to divert.
5/30/06 9:45 AM		7.69	Increasing stage.
5/30/06 6:00 PM		9.17	
5/31/06 3:00 AM	9.55	9.95	High water estimated the morning of 5/31/06.
5/31/06 10:00 AM	9.00	9.93	Ice jam in East channel releases.
6/1/06 8:15 AM	8.66	8.36	Ice jam in Nigliq Channel releases.
6/2/06 10:15 AM		6.95	Ice present in center of lakes, mostly released from lake edge.
6/4/06 2:00 PM	8.26	6.49	
6/5/06 8:00 AM		6.44	Ice remains in center of lakes.
6/10/06 5:30 PM	8.13		
6/13/06 6:30 PM	8.12	6.34	Mostly melted surface ice.
6/15/06 10:30 AM	8.09	6.37	
7/21/06 11:15 AM	7.89	6.11	
9/4/06 12:00 PM	7.80	6.06	Provided by LCMF.
10/1/06 12:00 PM	7.71	5.99	Final reading.

Notes:

1. Gage9 is located near Lake 9312 and Gage10 is located near Lake 9313.
2. Elevation for Gage9 based on TBM 02-01-39P of 11.49 ft BPMSL, established by LCMF in 2005.
3. Elevation for Gage10 based on Bolt on VSM of 11.28 ft BPMSL, established by LCMF in 2005.



5.0 Fish Creek Basin (FCB) 2006 Spring Breakup

This section presents the images, data, and analyses for the 2006 spring breakup monitoring program in the FCB. Section 5.1 describes the spring breakup observations and Section 5.2 describes the water surface elevation (stage) monitoring activities and discharge measurement descriptions and analyses. Section 5.3 compares the 2006 breakup to the historic record. Section 5.4 contains Fish Creek water temperature data. Plan and profile figures of the Ublutuoch River UB 6.8 and each ASDP Site are presented in Section 5.5 and the data tables for the FCB locations are at the end of the chapter in Section 5.5.

5.1 FCB Daily Observations May 28 – June 16

Daily observations in the FCB began with observations of flow at Judy Creek 13.8 (J13.8) on May 28 and continued throughout breakup until June 16. Observations in the FCB were relatively complete in 2006 due to favorable weather conditions and sufficient logistical support. The 2006 FCB spring breakup flood occurred a few days after the CRD breakup.

5.1.1 Fish and Judy Creeks

Judy Creek was the first channel to become active in the FCB with floodwaters reaching pressure sensors at J13.8 on May 27. The first flowing water in the FCB was observed in Judy Creek on May 28, approximately one mile above the confluence with Fish Creek. As floodwater in Judy Creek advanced downstream, flow in Fish Creek also became active with floodwaters reaching pressure sensors at Fish Creek F25.1 on May 30. Ice and snow were observed in both Fish and Judy Creeks at the beginning of breakup and remained in Fish and Judy Creeks through June 6. Photo 5-1 shows conditions of Judy Creek on June 3. By June 7, both channels were flowing relatively ice-free.

Photo 5-1 Judy Creek, June 3, 2006.

5.1.2 Ublutuoch River

Localized melt and standing water along the Ublutuoch River was noted several days prior to the occurrence of floodwater and on May 30, a reconnaissance flight over the Ublutuoch River revealed the leading edge of saturated snow at UB 6.8. Snow was observed in the channel impacting flow through June 1 and the first measurable water was recorded at UB 6.8 on June 2. Floodwater continued to rise in

Photo 5-2 Floating ice in the Ublutuoch River, June 7, 2006.

the Ublutuoch River and the first reading at UB 1.9 was recorded on June 3. On June 6, at UB 6.8, the reach was clear of ice; however, floating ice persisted upstream and downstream of the site. On June 7, flow continued to be restricted by floating ice in the Ublutuoch River (see Photo 5-2). By June 11, the ice was still present upstream and downstream of UB 6.8; however, their presence and influence on the distribution of floodwaters was diminished.

5.1.3 Small Streams

Monitoring of breakup at the twelve FCB Sites along the proposed ASDP road began on June 2 at Sites 1 through 8 and Sites 11 and 12; on June 3 at Sites 9 and 10; and on June 7 at Site 13. The timing and duration of the presence of surface water and flow at each of the Sites was controlled by the melting of snow, ice, and tundra within each drainage basin. At Sites 2, 8, 9, and 13, no flow was observed; at the remaining Sites, high water was observed two to three days after initiation of flow. The melting of snow and ice steadily continued throughout the breakup season at each Site and the final water surface elevation measurements occurred on June 16.

5.2 FCB Water Surface Elevations and Discharge

5.2.1 Fish and Judy Creeks Water Surface Elevations

Water surface elevation measurements at Judy Creek J13.8 began on May 27 and continued until June 13; the Judy Creek data are presented in Table 5-7. The high water elevation at J13.8 of 35.56 feet was estimated to have occurred on May 30 and stage generally declined throughout the remaining breakup event. Because all Fish Creek monitoring locations were downstream of the Fish and Judy confluence, the water surface elevation records of Fish Creek were each initially impacted by flow from Judy Creek. Water surface elevations at Fish Creek F0.7, F10.3, and F25.1 continued from May 30 through June 17; data are presented in Table 5-8. The high water elevation of 17.91 feet at F25.1 was estimated to have occurred in the afternoon of May 30 and was the result of flow from Judy Creek. After May 30, stage steadily declined until June 5 when stage increased for several days due to flow originating from the Fish Creek headwaters, see Photo 5-3. Stage at F25.1 during this secondary peak did not exceed the elevation of the primary peak and after June 13 stage steady declined. At F0.7 and F10.3, seasonal high water surface elevations were observed early in the breakup season resulting from Judy Creek flow. Photo 5-4 shows the conditions of Fish Creek at F0.7 on June 11.

Photo 5-3 Fish Creek F25.1. June 3, 2006.

Photo 5-4 Fish Creek F0.7, June 11, 2006.

5.2.2 Ublutuoch River Water Surface Elevations and Discharge

Water surface elevation measurements at Ublutuoch River UB 6.8 began on June 2 and continued until June 11. Discharge data are presented in Table 5-1; complete discharge notes are in Appendix C.

Table 5-1 Ublutuoch River UB 6.9 Direct Discharge Measurement 2006 Summary

Site Number	Date Time	WSE (ft)	Made By	Width (ft)	Area (ft^2)	Mean Vel (ft/s)	Discharge (cfs)	MS Rated*	Number of Sections	MS Type
UB 6.9	6/3/06 12:20	5.73	EJK, AMG, JPM	218	362	0.91	331	P	24	Wading/Boat
UB 6.9	6/4/06 10:50	6.59	MDM, AMG, JPM	253	688	1.13	779	P	30	Wading/Boat
UB 6.9	6/5/06 10:00	6.13	JPM, MTA, AMG	246	605	1.38	837	P	30	Wading/Boat
UB 6.9	6/6/06 10:25	6.39	MDM, MTA, EJK	259	759	1.58	1197	P	28	Wading/Boat
UB 6.9	6/7/06 10:15	6.36	JPM, MDM, SLB	259	781	1.65	1289	P	33	Wading/Boat
UB 6.9	6/8/06 10:46	6.12	AMG, JPM	263	820	1.55	1272	P	29	Wading/Boat
UB 6.9	6/9/09 10:45	5.71	MTA, AMG, SLB	263	763	1.48	1132	P	26	Wading/Boat
UB 6.9	6/10/06 10:51	5.14	MTA, AMG, SLB	133	654	1.34	876	P	14	Boat
UB 6.9	6/11/06 9:55	4.66	MTA, AMG, SLB	140	712	0.96	686	P	15	Boat

*Measured Rating -

E - Excellent:	Point plots nearly on the rating curve; within 2% of true value
G - Good:	Within 5% of true value
F - Fair:	Within 7-10% of true value
P - Poor:	Velocity < 0.70 ft/s; Shallow depth for measurement; less than 15% of true value

Water surface elevations generally increased steadily from the initial water surface elevation measurement until the peak stage was observed. The peak water elevation was estimated to have occurred at UB 6.8 in the early morning of June 7 with an elevation of 6.19 feet. The peak discharge of 1290 cfs was also recorded on June 7, the day with the highest mean velocity. Photo 5-5 shows the conditions of the Ublutuoch River at UB 6.8 on June 9. After peak stage and discharge, water levels declined throughout breakup with the last observations recorded on June 11. Observations of stage at UB 1.9 were relatively limited in 2006; however, stage at UB 1.9 was consistent with observations at UB 6.8. Table 5-9 presents the observations, water surface elevations, and discharge measurements recorded for UB 1.9, UB 6.7, UB 6.8, and UB 6.9.

Photo 5-5 Ublutuoch River UB 6.8, June 9, 2006.

5.2.3 Small Streams (ASDP Sites) Water Surface Elevations and Discharge

Water surface elevation monitoring and discharge measurements at the twelve small stream sites along the proposed ASDP road began on June 2 and continued until June 16. The timing of peak stage ranged from June 2 at Sites 3, 5, and 12 to June 9 at Site 6. Flow was observed at eight of the twelve Sites; no detectable flow was observed at Sites 2, 8, 9, and 13. The timing of peak discharge ranged from June 3 at Site 1 to June 12 at Site 3. Table 5-2 presents a summary of each 2006 direct discharge measurements for each ASDP Site. The complete discharge notes are presented in Appendix C.

Table 5-2 2006 Sites Direct Discharge Measurement Summary

Site Number	Date Time	WSE (ft)	Made By	Width (ft)	Area (ft^2)	Mean Vel (ft/s)	Discharge (cfs)	MS Rated[1]	Number of Sections	MS Type
ASDP1W	6/3/06 9:30	10.63	MDM, MTA	22.00	19.10	0.14	2.69	P	12	Wading
ASDP1W	6/4/06 17:48	10.60	WLS, MTA, SLB	10.00	4.40	0.13	0.55	P	11	Wading
ASDP1W	6/5/06 16:30	10.59	MDM, SLB, EJK	22.00	18.35	0.01	0.21	P	12	Wading
ASDP2	No Discharge Measurements at this site									
ASDP3N	6/5/06 16:15	19.75	MDM, EJK, SLB	3.50	4.07	0.34	1.39	P	7	Wading
ASDP3C	6/7/06 8:02	20.36	MTA, AMG	10.00	6.80	0.34	4.07	P	10	Wading
ASDP3N	6/10/06 16:50	19.79	MTA, SLB, AMG	20.00	12.90	0.42	5.36	P	10	Wading
ASDP3C	6/12/06 13:25	20.39	AMG, SLB, MTA	36.00	15.10	0.36	5.42	P	14	Wading
ASDP3C	6/16/06 11:17	20.37	AMG, SLB	22.00	10.90	0.36	3.97	P	12	Wading
ASDP5S	6/3/06 11:46	14.75	MTA, MDM	16.00	10.85	0.47	5.14	P	17	Wading
ASDP5S	6/4/06 16:45	14.67	WLS, MTA, SLB	16.00	15.09	0.28	4.27	P	9	Wading
ASDP5S	6/5/06 15:05	14.67	MDM, EJK, SLB	26.00	19.26	0.09	1.73	P	18	Wading
ASDP5N	6/7/06 8:56	12.80	MTA, AMG	16.00	21.50	0.38	8.16	P	9	Wading
ASDP5C/N	6/8/06 9:55	14.15	SLB, EJK	20.00	10.70	0.75	8.07	P	21	Wading
ASDP5N	6/9/06 12:55	12.75	MTA, AMG, SLB	11.00	5.59	0.72	4.05	P	13	Wading
ASDP6N	6/4/06 16:15	16.62	WLS, MTA, SLB	10.00	11.65	0.59	6.89	P	11	Wading
ASDP6A	6/5/06 14:25	16.63	MDM, SLB, EJK	10.00	9.91	1.62	16.10	P	11	Wading
ASDP6A	6/6/06 16:55	16.58	AMG, JPM, SLB	21.00	25.61	0.55	14.07	F	12	Wading
ASDP6A	6/7/06 9:51	17.09	MTA, AMG	22.00	22.80	1.29	29.51	P	12	Wading
ASDP6A	6/8/06 13:50	17.47	SLB, EJK	53.00	53.85	1.08	58.27	P	28	Wading
ASDP6A	6/9/06 14:06	17.51	MTA, SLB, AMG	32.00	43.40	1.64	70.98	P	17	Wading
ASDP6A	6/10/06 13:40	17.33	MTA, SLB, AMG	30.00	34.30	1.65	56.87	P	16	Wading
ASDP6A	6/12/06 8:18	17.24	MTA, SLB, AMG	22.00	27.40	1.60	43.91	P	12	Wading
ASDP7C	6/5/06 15:50	22.78	MDM, EJK, SLB	3.00	1.16	0.36	0.42	P	7	Wading
ASDP7C	6/6/06 15:50	22.82	JPM, AMG, SLB	3.80	1.61	0.12	0.18	P	7	Wading
ASDP7S	6/7/06 10:44	23.81	MTA, AMG	20.00	19.30	0.23	4.37	P	11	Wading
ASDP7N	6/8/06 14:30	22.29	EJK, SLB	48.00	23.65	0.13	3.17	P	18	Wading
ASDP8	No Discharge Measurements at this site									
ASDP9C	6/6/06 10:35	69.59	JPM, AMG, SLB	75.00	23.51	0.24	5.69	P	40	Wading
ASDP10	6/3/06 16:35	65.16	MTA, EJK	5.00	1.60	1.80	2.88	P	6	Wading
ASDP10	6/4/06 9:04	65.16	MTA, EJK	15.00	5.42	1.09	5.89	P	16	Wading
ASDP10	6/5/06 9:15	65.24	MDM, EJK	17.00	11.25	0.64	7.21	P	18	Wading
ASDP10	6/6/06 8:55	65.12	JPM, AMG, SLB	23.00	12.00	1.57	18.85	P	14	Wading
ASDP10	6/7/06 15:22	64.99	AMG, MTA	25.00	34.60	0.82	28.30	P	14	Wading
ASDP10	6/8/06 15:12	64.97	EJK, SLB	26.00	15.40	1.04	15.97	P	14	Wading
ASDP10	6/11/06 14:05	64.73	MTA, AMG, SLB	18.00	6.20	1.50	10.33	P	10	Wading
ASDP11N	6/3/06 13:16	19.27	MDM, MTA	9.00	4.50	0.31	1.40	P	10	Wading
ASDP11C	6/4/06 11:02	20.86	MTA, EJK	15.50	7.70	0.11	0.86	P	18	Wading
ASDP11N	6/5/06 12:45	19.22	MDM, EJK, SLB	5.00	2.30	0.32	0.74	F	11	Wading
ASDP11N	6/6/06 15:00	19.23	JPM, AMG, SLB	13.00	11.55	0.23	2.69	P	13	Wading
ASDP11N	6/7/06 11:23	19.23	AMG, MTA	12.00	12.20	0.20	2.44	F	7	Wading
ASDP12S-A	6/3/06 15:38	16.67	MTA, EJK	26.00	28.25	0.68	19.13	F	14	Wading
ASDP12S-A	6/4/06 10:30	16.65	MTA, EJK	27.00	33.40	0.88	29.31	P	15	Wading
ASDP12S-A	6/5/06 10:34	16.89	MDM, EJK	30.00	30.70	0.80	24.66	P	25	Wading
ASDP12S-A	6/6/06 13:52	16.83	JPM, AMG, SLB	33.00	33.78	1.34	45.15	F	17	Wading
ASDP12N-A	6/7/06 14:00	16.10	MTA, AMG	30.00	56.40	0.82	46.41	P	16	Wading
ASDP12S-A	6/10/06 15:32	16.68	MTA, AMG, SLB	32.00	33.50	1.35	45.34	P	17	Wading
ASDP12S-A	6/12/06 10:25	16.43	MTA, AMG, SLB	39.00	22.90	1.75	40.06	P	21	Wading
ASDP12S-A	6/16/06 8:47	0.00	AMG, SLB	12.00	11.15	1.66	18.48	P	7	Wading
ASDP13	No Discharge Measurements at this site									

Notes: 1. Measured Rating -

- E - Excellent: Point plots nearly on the rating curve; within 2% of true value
- G - Good: Within 5% of true value
- F - Fair: Within 7-10% of true value
- P - Poor: Velocity < 0.70 ft/s; Shallow depth for measurement; less than 15% of true value

Photo 5-6 Site 1, June 3, 2006.

Photo 5-7 Site 2, June 4, 2006.

Photo 5-8 Site 3, June 10, 2006.

SITE 1

The Site 1 centerline peak water surface elevation was estimated to have occurred during the morning of June 4 at an elevation of 10.08 feet. Throughout breakup, stage fluctuated by approximately 0.21 feet at the centerline gage. Flow was not present on June 2 and peak discharge was recorded on June 3 at 2.7 cfs as shown in Photo 5-6. Flow dropped to less than 1 cfs by June 4 and by June 7 no flow was observed. Table 5-10 presents the observations, water surface elevations, and discharge measurements recorded for Site 1.

SITE 2

The Site 2 centerline peak water surface elevation occurred on June 3 at an elevation of 19.53 feet. Photo 5-7 shows the conditions of Site 2 the day after peak stage on June 4. Throughout breakup, stage fluctuated by approximately 0.12 feet at the centerline gage. Flow was not present at any time during breakup. Table 5-11 presents the observations and water surface elevations recorded for Site 2.

SITE 3

The Site 3 centerline peak water surface elevation occurred on June 2 at an elevation of 20.45 feet. Throughout breakup, stage fluctuated by approximately 0.25 feet at the centerline gage. Flow was 1.4 cfs on June 5 and peak discharge was recorded on June 12 at 5.4 cfs. The conditions of Site 3 are shown in Photo 5-8 on June 10. Flow dropped to less than 4 cfs by June 16. Table 5-12 presents the observations, water surface elevations, and discharge measurements recorded for Site 3.

SITE 5

The Site 5 centerline peak water surface elevation occurred on June 2 at an elevation of 14.50 feet. Throughout breakup, stage fluctuated by approximately 0.67 feet at the centerline gage. Flow was 1.7 cfs on June 5 and peak discharge was recorded on June 7 at 8.2 cfs. Photo 5-9 shows the conditions of Site 5 the day after peak discharge on June 8. Flow dropped to 4 cfs by June 9. Table 5-13 presents the observations, water surface elevations, and discharge measurements recorded for Site 5.

Photo 5-9 Site 5, June 8, 2006.

SITE 6

The Site 6 centerline peak water surface elevation occurred on June 9 at an elevation of 17.51 feet. Throughout breakup, stage fluctuated by approximately 0.88 feet at the centerline gage. Flow was 14.1 cfs on June 6 and peak discharge was recorded on June 9 at 71 cfs. The conditions of Site 6 are shown in Photo 5-10 on June 7. Flow dropped to 44 cfs by June 12. Table 5-14 presents the observations, water surface elevations, and discharge measurements recorded for Site 6.

Photo 5-10 Site 6, June 7, 2006.

SITE 7

The conditions of Site 7 are shown in Photo 5-11 on June 2. The Site 7 centerline peak water surface elevation occurred on June 4 at an elevation of 23.33 feet. Throughout breakup, stage fluctuated by approximately 0.51 feet at the centerline gage. Flow was 0.2 cfs on June 6 and peak discharge was recorded on June 7 at 4.4 cfs. Flow dropped to 3.2 cfs by June 8. Table 5-15 presents the observations, water surface elevations, and discharge measurements recorded for Site 7.

Photo 5-11 Site 7, June 2, 2006.

Photo 5-12 Site 8, June 10, 2006.

Photo 5-13 Site 9, June 13, 2006.

Photo 5-14 Site 10, June 10, 2006.

SITE 8

The Site 8 centerline peak water surface elevation occurred on June 2 at an elevation of 24.36 feet. Throughout breakup, stage fluctuated by approximately 0.29 feet at the centerline gage. Flow was not present at any time during breakup. The conditions of Site 8 are shown in Photo 5-12 on June 10. Table 5-16 presents the observations and water surface elevations recorded for Site 8.

SITE 9

The Site 9 centerline peak water surface elevation occurred on June 7 at an elevation of 69.90 feet. The conditions of Site 9 are shown in Photo 5-13 on June 13. Throughout breakup, stage fluctuated by approximately 0.45 feet at the centerline gage. Flow was not present at any time during breakup. Table 5-17 presents the observations, water surface elevations, and discharge measurements recorded for Site 9.

SITE 10

The Site 10 peak water surface elevation at Unnamed Lake occurred on June 5 at an elevation of 65.25 feet. Throughout breakup, stage fluctuated by approximately 0.52 feet. Flow at the lake outlet was 7.2 cfs on June 5 and peak discharge was recorded on June 7 at 28.3 cfs. The conditions of Site 10 are shown in Photo 5-14 on June 10. Flow dropped to 10.3 cfs by June 11. Table 5-18 presents the observations, water surface elevations, and discharge measurements recorded for Site 10.

SITE 11

The Site 11 centerline peak water surface elevation occurred on June 2 at an elevation of 20.95 feet. Photo 5-15 shows the conditions of Site 11 the day after peak stage on June 3. Throughout breakup, stage fluctuated by approximately 0.75 feet at the centerline gage. Flow was less than 1 cfs on June 4 and peak discharge was recorded on June 6 at 2.7 cfs. Flow dropped to 2.4 cfs by June 7. Table 5-19 presents the observations, water surface elevations, and discharge measurements recorded for Site 11.

Photo 5-15 Site 11, June 3, 2006.

SITE 12

The Site 12 centerline peak water surface elevation occurred on June 2 at an elevation of 17.00 feet. Throughout breakup, stage fluctuated by approximately 0.57 feet at the centerline gage. Flow was 24.7 cfs on June 5 and peak discharge was recorded on June 7 at 46.4 cfs. The conditions of Site 12 are shown in Photo 5-16 on June 12. Flow dropped to 18.5 cfs by June 16. Table 5-20 presents the observations, water surface elevations, and discharge measurements recorded for Site 12.

Photo 5-16 Site 12, June 12, 2006.

SITE 13

The Site 13 peak water surface elevation at Lake M9915 occurred on June 7 at an elevation of 58.47 feet. Throughout breakup, stage steadily declined by approximately 0.43 feet. An aerial view of Lake M9915 and the proposed CD7 pad is presented in Photo 5-17. Table 5-21 presents the observations and water surface elevations recorded for Site 13.

Photo 5-17 Site 13 Lake M9915 CD7 pad, June 15, 2006.

5.3 FCB 2006 Breakup Comparison to Historical Record

The 2006 breakup in the FCB was characterized by relatively low water surface elevations throughout the basin. The timing of breakup throughout the FCB occurred over a large range of dates; however the overall occurrence was within approximately 3 days of average.

5.3.1 FCB Water Surface Elevation Comparison

A comparison of historical observations at Fish and Judy Creeks from 2001 through 2006 suggests that the 2006 timing of breakup for these creeks was approximately 3 days earlier than average. The 2006 peak stage at each monitoring location along the Ublutuoch River, Fish Creek, and Judy Creek were the lowest peak stage on record and ranged between one and two feet below the average peak water surface elevation. A tabulation of recorded peak annual water surface elevations for the FCB is presented in Table 5-3. Based on this comparison, the stage in the FCB is likely to exceed the observed 2006 stage on average 5 out of 6 spring breakup events.

Table 5-3 Historical Date and Elevation of Fish, Judy, and Ublutuoch Rivers Peak Annual Stage

Location	Date and Elevation Peak Annual Stage (feet-BPMSL)											
	2001 [1]		2002 [2]		2003 [3]		2004 [4]		2005 [5]		2006	
Fish Creek												
F 0.7	12-Jun	4.09	27-May	4.67	NM	NM	30-May	4.53	9-Jun	3.48	3-Jun	3.00
F 10.3	NM	NM	NM	NM	NM	NM	7-Jun	9.15	10-Jun	7.59	31-May	6.01
F 25.1	10-Jun	18.92	25-May	18.23	6-Jun	19.51	NM	NM	8-Jun	19.98	31-May	17.91
Judy Creek												
J 13.8	7-Jun	39.66	25-May	35.86	6-Jun	36.58	NM	NM	4-Jun	37.25	30-May	35.56
Ublutuoch River												
UB 1.9	NM	NM	NM	NM	7-Jun	7.66	7-Jun	8.43	9-Jun	6.38	7-Jun	5.11
Notes:	NM = Not Measured 1. URS 2001 2. URS 2002 3. Baker 2003a 4. Baker 2005a 5. Baker 2005c											

5.3.2 Ublutuoch River Discharge and Water Surface Elevation Comparison

A comparison of historical observations of the Ublutuoch River from 2001 through 2006 suggests that the average date of peak stage is June 4, therefore the 2006 timing of the Ublutuoch River breakup is considered to be approximately 3 days later than average. In 2006, the peak water surface elevation and peak discharge at UB 6.8 were the lowest levels on record. A tabulation of recorded peak annual water surface elevations for the Ublutuoch River is presented in Table 5-4. Based on this comparison, the stage and discharge of the Ublutuoch River is likely to exceed the observed 2006 stage and discharge at RM 6.8 on average during 5 out of 6 spring breakup events.

Table 5-4 Ublutuoch River UB 6.8 2001–2006 Peak Stage and Direct Discharge Measurement Summary

Year	Peak Stage (feet-bpmsl)	Date of Peak Stage	Location of Peak Stage	Peak Discharge (cfs)	Date of Peak Discharge	Location of Peak Discharge	Reference
2006	6.19	7-Jun	RM 6.8	1,290	6-Jun	RM 6.8	This Report
2005	10.01	7-Jun	RM 6.8	1,680	9-Jun	RM 6.8	Baker 2005c
2004	10.50	6-Jun	RM 6.8 Up	2,800	5-Jun	RM 6.8	Baker 2005a
2003	10.14	6-Jun	RM 6.8 Up	1,300	9-Jun	RM 6.8	Baker 2003a
2002	9.49	24-May	RM 8.0	1,900	22-May	RM 13.7	URS 2002
2001	18.09	10-Jun	RM 13.7	1,440	10-Jun	RM 13.7	URS 2001

5.3.3 ASDP Sites Discharge and Water Surface Elevation Comparison

The discharge and stage record at some of the ASDP Sites is relatively limited in duration; however, up to four years of discharge records exist at several of the medium and large site locations.

Classification was developed for discussion purposes, based on the 2003 through 2006 historical discharge record. The ASDP Sites have been classified into six small sites (record peak discharge less than 10 cfs, Sites 1, 2, 3, 7, 8, 11); three medium sites (record peak discharge between 10 and 30 cfs, Sites 5, 9, 10); and two large sites (record peak discharge greater than 30 cfs, Sites 6 and 12). Site 13 is Lake M9915 and not included in the classification or discussion. The historical peak annual discharge is presented in Table 5-5.

Table 5-5 ASDP Sites Peak Annual Measured Discharge Historical Summary

Location	Peak Spring Discharge (cfs)			
	2003 [1]	2004 [2]	2005 [3]	2006
Site 1	NM	NM	1.5	2.7
Site 2	NM	NM	0	0.0
Site 3	0	NM	0.3	5.4
Site 5	15	15	4.6	8.2
Site 6	48	NM	14.5	71
Site 7	NM	NM	0	4.4
Site 8	NM	NM	NM	0.0
Site 9	22	15	13.0	5.7
Site 10	NM	NM	15.6	28.3
Site 11	NM	NM	NM	2.7
Site 12	155	85	71	46.4
Notes:	NM = Not Measured 1. PND 2003 2. PND 2005 3. Baker 2005c			

The average numbers of years of discharge record for the small, medium, and large sites are 1.8 years, 3.3 years, and 3.5 years respectively. More emphasis (monitoring) has been placed on the medium and large drainages since maintaining the structural integrity of these proposed ASDP drainage structures at these sites are more essential than the small sites.

At the three sites where peak discharge was measured each of the four years (Sites 5, 9, and 12), the 2006 peak discharge was less than 2003 and 2004 in all cases and less than 2005 in two of the three cases. At the remaining six sites where multiple years of measurement records exist (Sites 1, 2, 3, 6, 7, and 10), the 2006 peak discharge was greater than any discharge measurement in five of the six cases. Based on this comparison, the discharge at each ASPD Site is likely to exceed the observed 2006 discharge, on average, approximately 1 out of 3 spring breakup events.

The stage record is presented in Table 5-6 and includes observations in 2005 and 2006. In all cases where stage was measured in 2005, the measured peak stage in 2006 was less than the 2005 value. Based on this comparison, the stage at each site is likely to exceed the observed 2006 stage, on average, approximately 1 out of 2 spring breakup events.

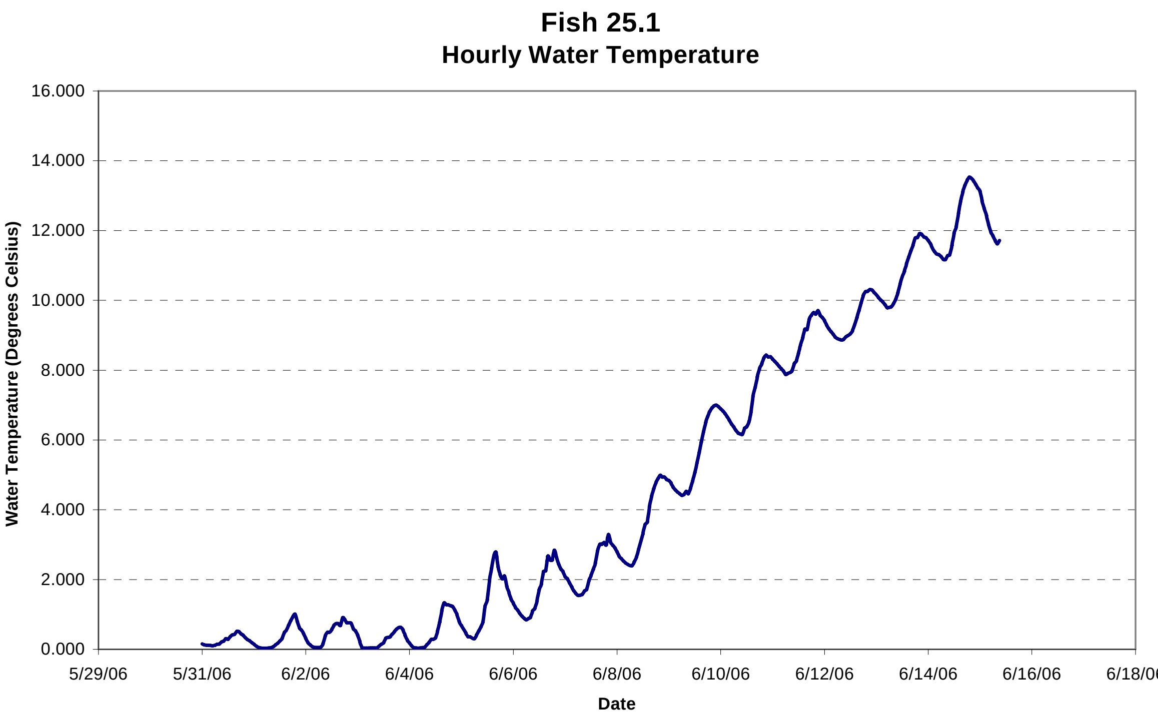
Table 5-6 Historical Sites Peak Annual Measured Stage

Location	Peak Annual Stage (feet-bpmsl)			
	2003 [1]	2004 [2]	2005 [3]	2006
Site 1	NM	NM	10.38	10.08
Site 2	NM	NM	19.62	19.53
Site 3	NM	NM	20.67	20.45
Site 5	NM	NM	15.13	14.50
Site 6	NM	NM	19.61	17.51
Site 7	NM	NM	24.44	23.33
Site 8	NM	NM	NM	24.36
Site 9	NM	NM	NM	69.90
Site 10	NM	NM	66.51	65.25
Site 11	NM	NM	NM	20.89
Site 12S	NM	NM	NM	17.00

Notes: NM = Not Measured
1. PND 2003
2. PND 2005
3. Baker 2005c

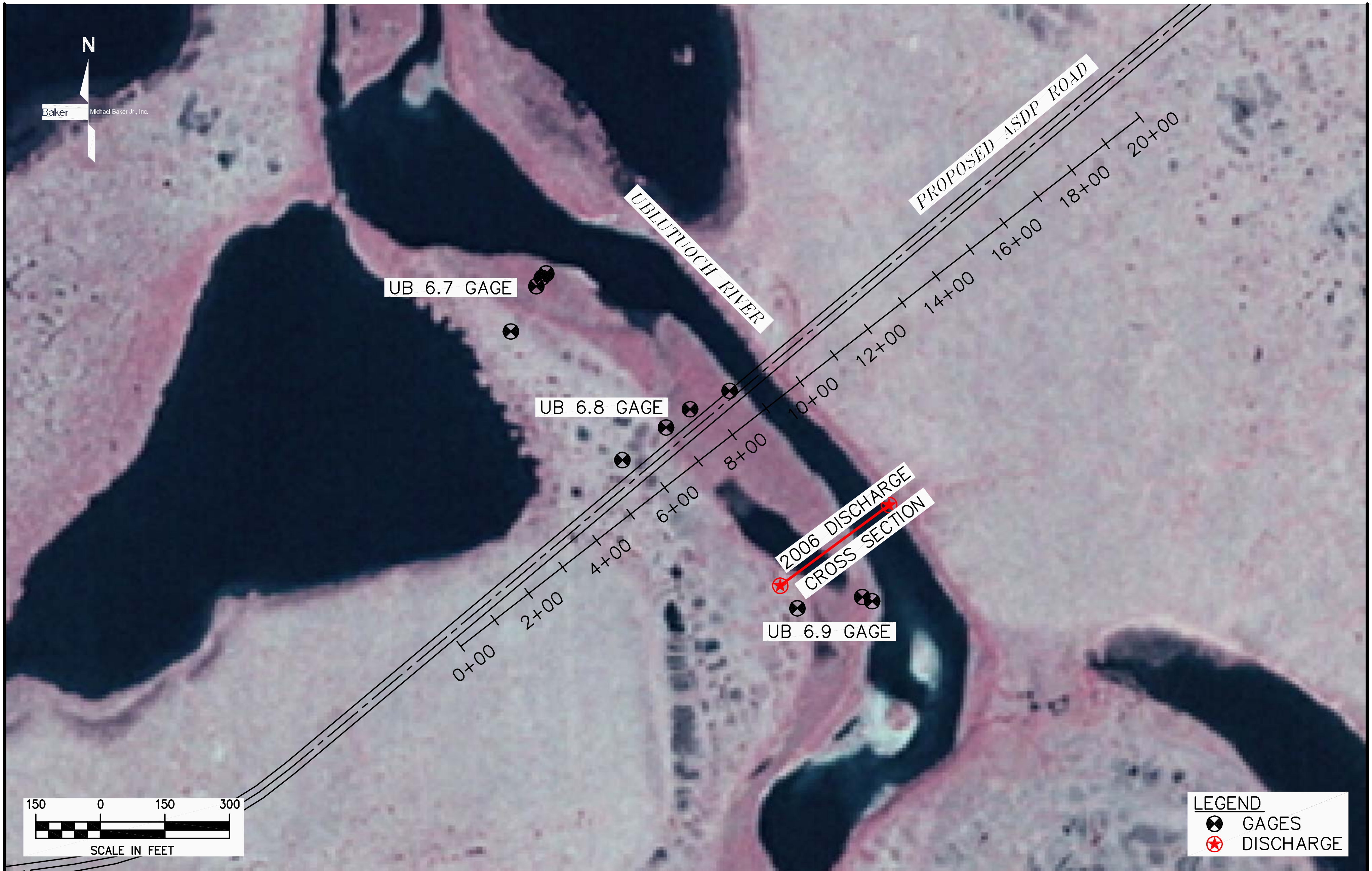
5.4 Fish Creek Water Temperature

Hourly water temperature, recorded by the pressure transducer at Fish Creek F25.1, is presented in Graph 5-1. Initial flow observed at F25.1 originated primarily from Judy Creek and the water temperature remained below 2º Celsius until June 5. With the increase in flow from Judy and Fish Creeks on approximately June 6, the water temperature began to steadily increase throughout the balance of the monitoring period. Of interest is the presence of a diurnal temperature swing with daily peak water temperatures occurring on the average at 7 PM each evening. The water temperature cycle was influenced by ambient air temperature, solar radiation, and the diurnal contribution of meltwater from smaller drainages within the FCB.



Graph 5-1 Fish Creek F25.1 Hourly Water Temperature 2006

5.5 Figures



ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_1
CHECKED:	MTA	SCALE:	1" = 300'

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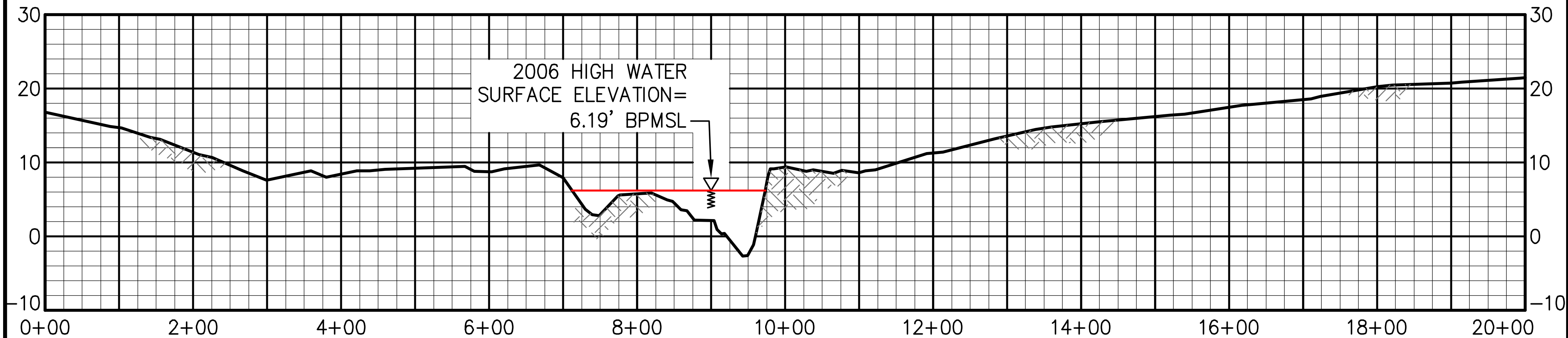
2006 SPRING BREAK-UP
UBLUTUOCH 6.8
PLAN

FIGURE 5-1
(SHEET 1 OF 2)

NOTES
1. BASIS OF ELEVATION, MONUMENT JACK.
2. CHANNEL PROFILE MEASUREMENTS COMPLETED AUGUST 2003 BY KUUKPIK/LCMF INC.



6.8 UBLUTUOCH RIVER CROSS SECTION AT RM 6.8
SCALE: HORZ. 1"= 200' / VERT. 1" = 20'

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_1 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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2006 SPRING BREAK-UP
UBLUTUOCH 6.8
CROSS SECTION
FIGURE 5-1
(SHEET 2 OF 2)

ConocoPhillips
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DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_2-5_6&5_10
CHECKED:	MTA	SCALE:	1" = 300'

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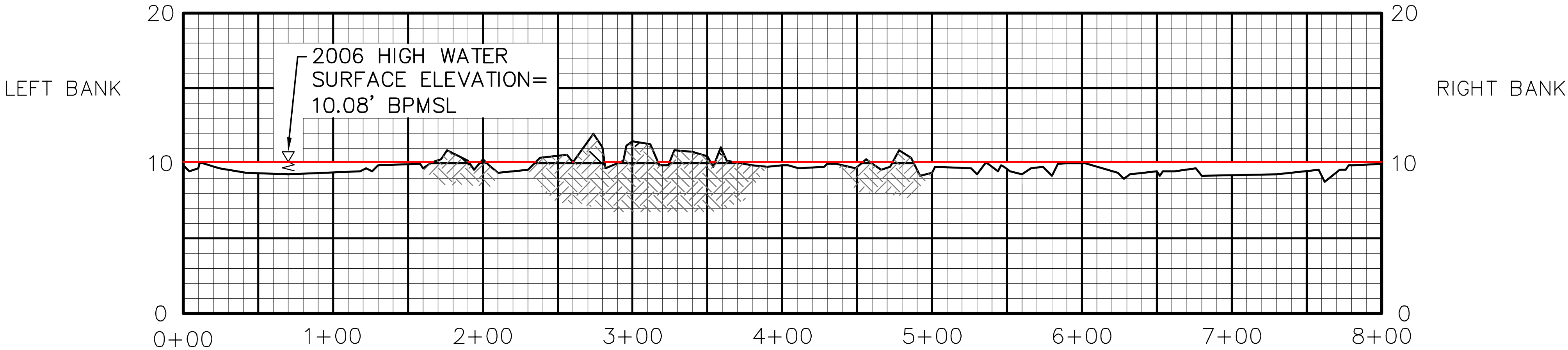
2006 SPRING BREAK-UP
ASDP SITE 1
PLAN

FIGURE 5-2
(SHEET 1 OF 2)

NOTES:
1. BASIS OF ELEVATION, MONUMENT NPRA3.
2. LOCATION OF STA 0+00, 70°20'12.2"N 151°07'05.9"W.
3. LOCATION OF STA 8+00, 70°20'04.7"N 151°07'12.6"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2005 BY MICHAEL BAKER JR. INC.



1 CROSS SECTION @ S-1

SCALE: HORZ. 1"= 100' / VERT. 1" = 10'

50 0 50 100

HORIZONTAL SCALE IN FEET

5 0 5 10

VERTICAL SCALE IN FEET

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_2 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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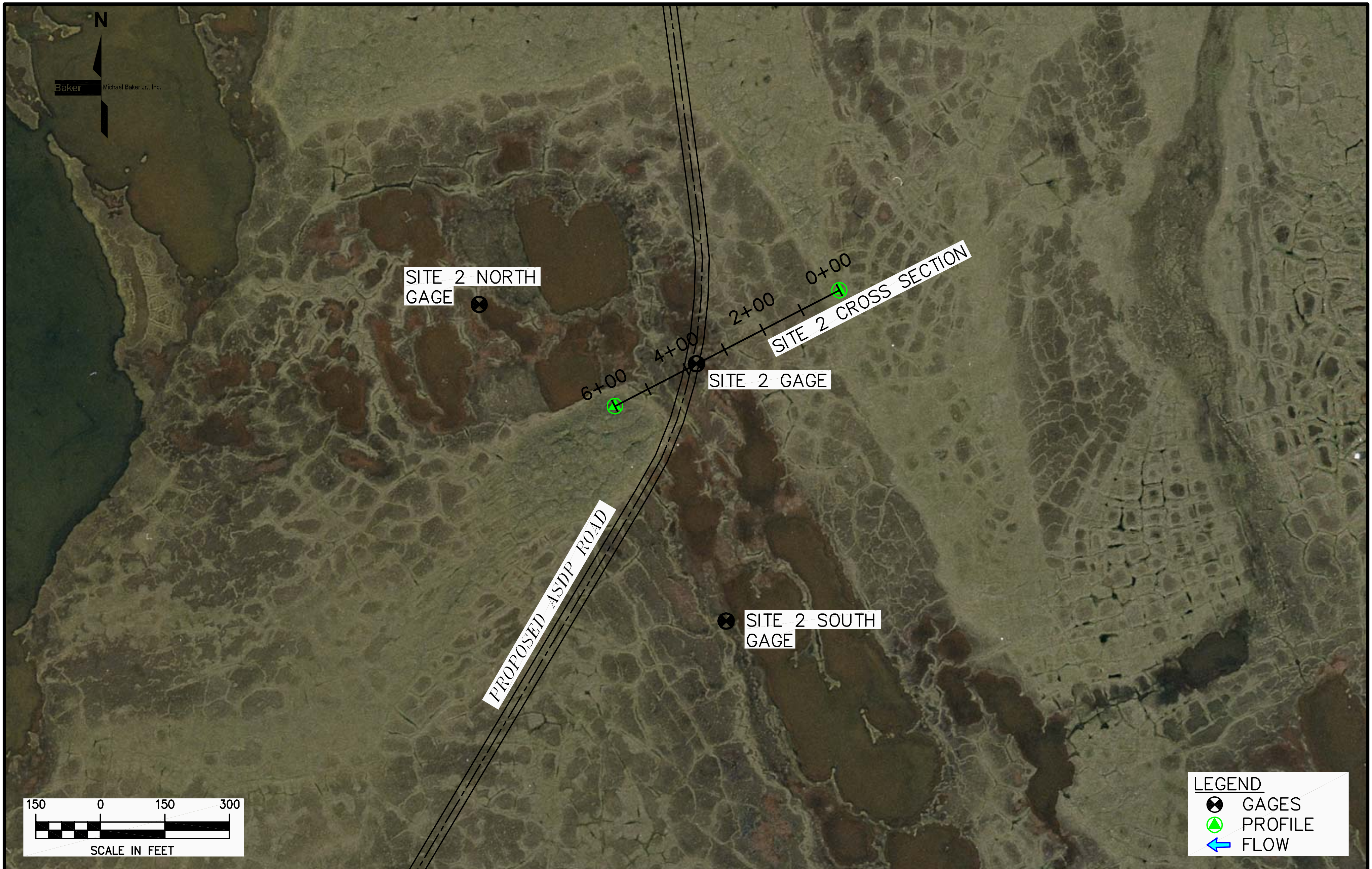
2006 SPRING BREAK-UP

ASDP SITE 1

CROSS SECTION

FIGURE 5-2

(SHEET 2 OF 2)



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_2-5_6&5_10
CHECKED:	MTA	SCALE:	1" = 300'

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2006 SPRING BREAK-UP

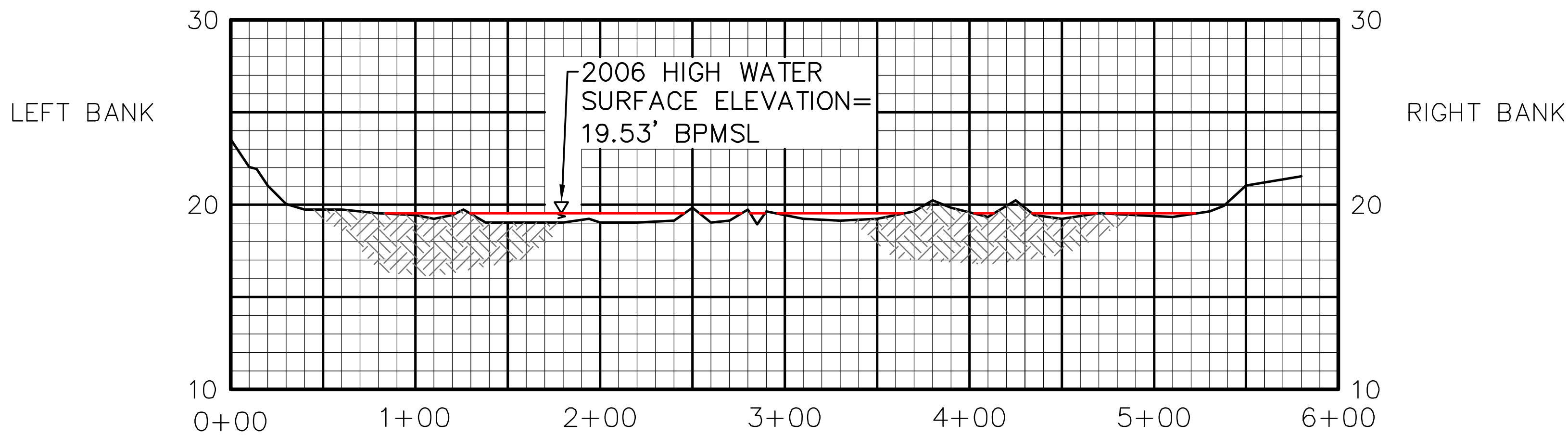
ASDP SITE 2

PLAN

FIGURE 5-3

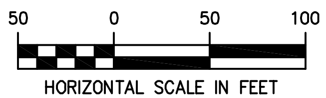
(SHEET 1 OF 2)

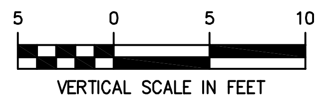
NOTES:
1. BASIS OF ELEVATION, MONUMENT CDW.
2. LOCATION OF STA 0+00, 70°8'43.1"N 151°10'50.7"W.
3. LOCATION OF STA 5+80, 70°18'45.6"N 151°10'35.3"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2005 BY MICHAEL BAKER JR. INC.



2 CROSS SECTION @ S-2

SCALE: HORZ. 1"= 100' / VERT. 1" = 10'





ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_3 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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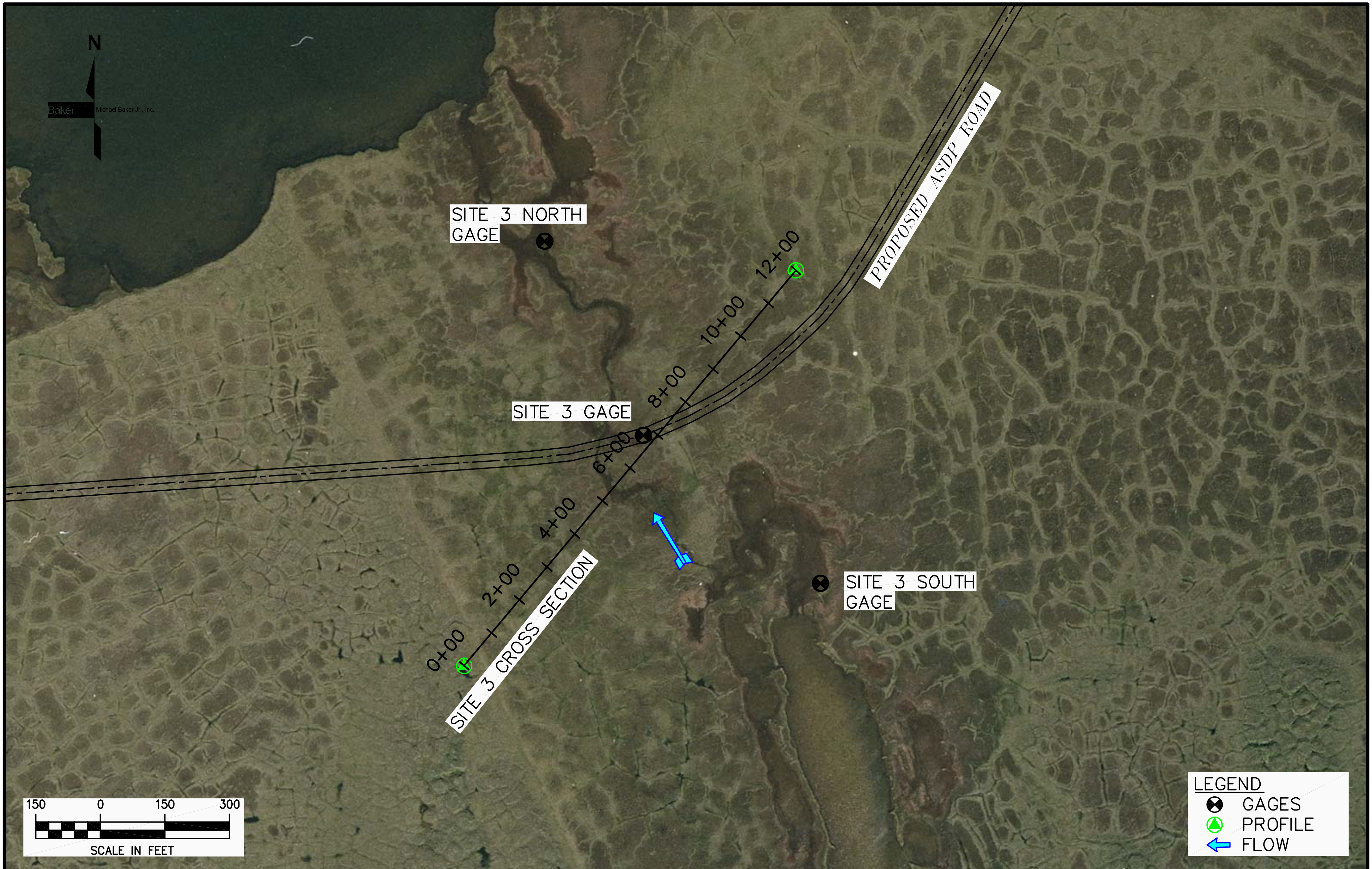
2006 SPRING BREAK-UP

ASDP SITE 2

CROSS SECTION

FIGURE 5-3

(SHEET 2 OF 2)



ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_2-5_6&5_10
CHECKED:	MTA	SCALE:	1" = 300'

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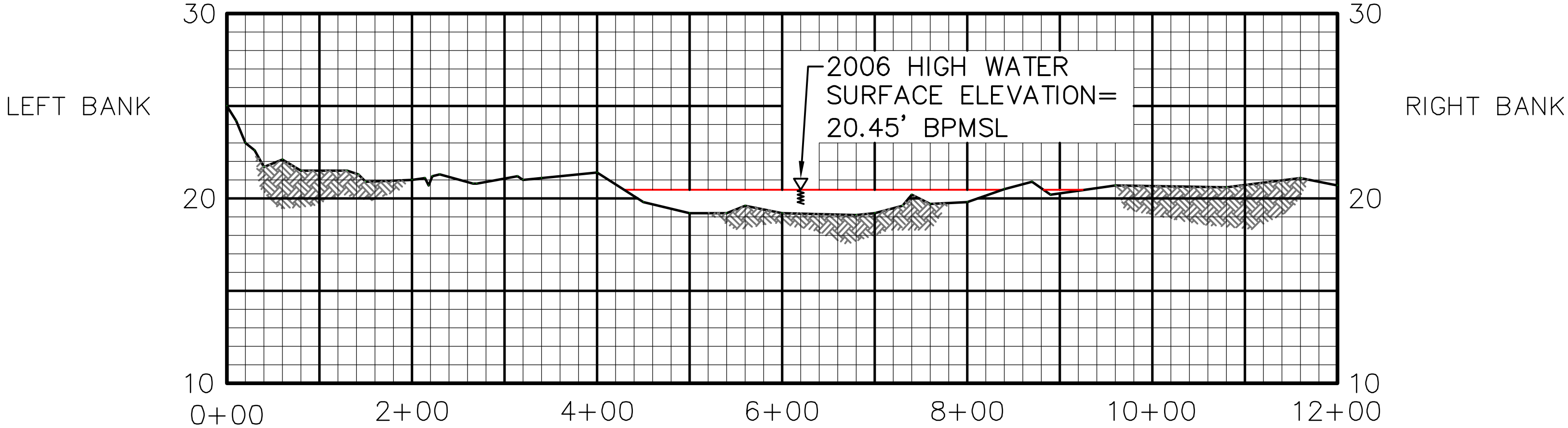
2006 SPRING BREAK-UP
ASDP SITE 3
PLAN

FIGURE 5-4
(SHEET 1 OF 2)

NOTES:
1. BASIS OF ELEVATION MONUMENT AMYLEE.
2. LOCATION OF STA 0+00, 70°18'14.5"N 151°11'50.2"W.
3. LOCATION OF STA 12+00, 70°18'23.3"N 151°11'26.9"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2005 BY MICHAEL BAKER JR. INC.



3 CROSS SECTION @ S-3
SCALE: HORZ. 1"= 200' / VERT. 1" = 10'

100 0 100 200
HORIZONTAL SCALE IN FEET

5 0 5 10
VERTICAL SCALE IN FEET

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_4 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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2006 SPRING BREAK-UP
ASDP SITE 3
CROSS SECTION

FIGURE 5-4
(SHEET 2 OF2)

ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_2-5_6&5_10
CHECKED:	MTA	SCALE:	1" = 300'

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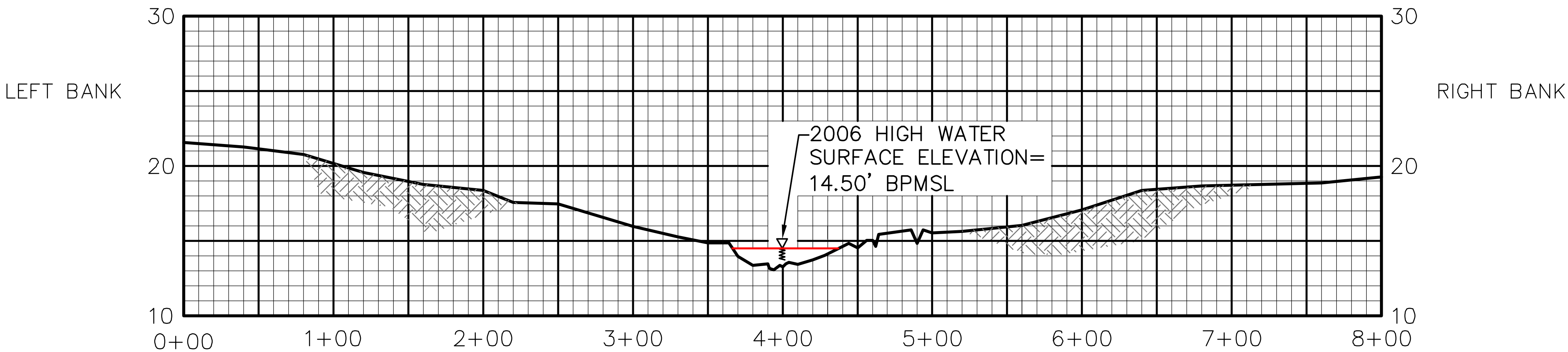
2006 SPRING BREAK-UP
ASDP SITE 5
PLAN

FIGURE 5-5
(SHEET 1 OF 2)

NOTES:
1. BASIS OF ELEVATION, MONUMENT CHAR.
2. LOCATION OF STA 0+00, 70°16'53.0"N 151°17'48.8"W.
3. LOCATION OF STA 8+00, 70°16'50.8"N 151°17'26.0"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2005 BY MICHAEL BAKER JR. INC.



5 CROSS SECTION @ S-5
SCALE: HORZ. 1"= 100' / VERT. 1" = 10'

50 0 50 100
HORIZONTAL SCALE IN FEET

5 0 5 10
VERTICAL SCALE IN FEET

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_5 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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2006 SPRING BREAK-UP
ASDP SITE 5
CROSS SECTION
FIGURE 5-5
(SHEET 2 OF 2)

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_2-5_6&5_10
CHECKED:	MTA	SCALE:	1" = 300'

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2006 SPRING BREAK-UP

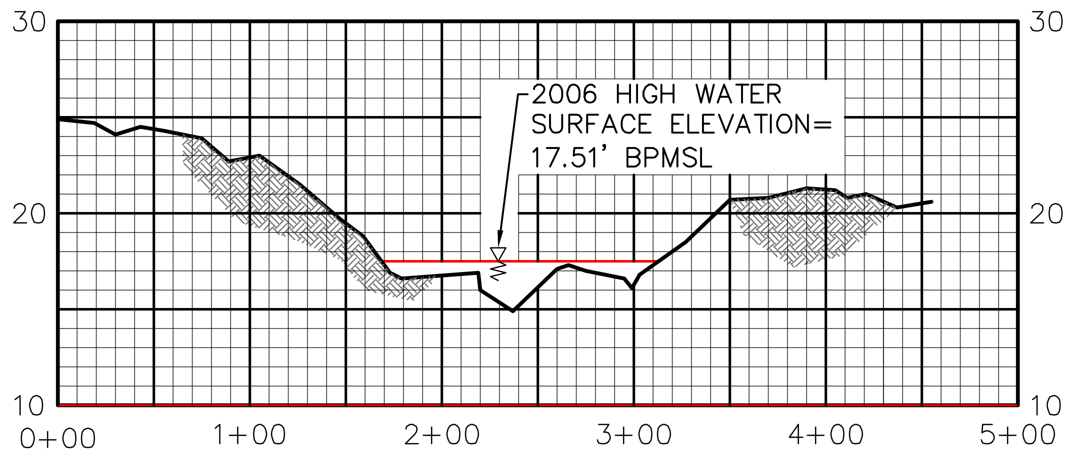
ASDP SITE 6

PLAN

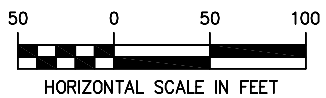
FIGURE 5-6

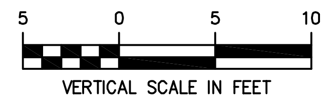
(SHEET 1 OF 2)

NOTES:
1. BASIS OF ELEVATION, MONUMENT ALMA.
2. LOCATION OF STA 0+00, 70°16'45.9"N 151°19'53.9"W.
3. LOCATION OF STA 4+55, 70°16'47.4"N 151°19'41.4"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2005 BY MICHAEL BAKER JR. INC.



6 CROSS SECTION @ S-6
SCALE: HORZ. 1"= 100' / VERT. 1" = 10'





ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_6 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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2006 SPRING BREAK-UP

ASDP SITE 6

CROSS SECTION

FIGURE 5-6

(SHEET 2 OF 2)

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DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_7-5_9&5_11-5_13
CHECKED:	MTA	SCALE:	1" = 300 Feet

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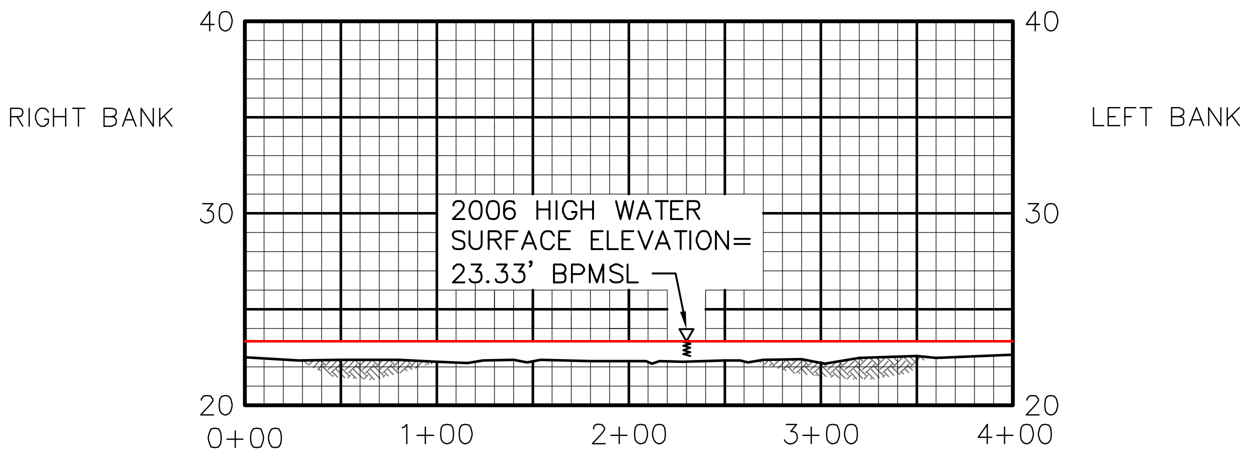
2006 SPRING BREAK-UP
ASDP SITE 7
PLAN
FIGURE 5-7
(SHEET 1 OF 2)

NOTES:
1. BASIS OF ELEVATION, MONUMENT BRAD.
2. LOCATION OF STA 0+00, 70°16'46.6"N 151°22'10.7"W.
3. LOCATION OF STA 3+90, 70°16'47.9"N 151°22'21.3"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2006 BY MICHAEL BAKER JR. INC.



7 CROSS SECTION @ S-7

SCALE: HORZ. 1"= 100' / VERT. 1" = 10'

50 0 50 100

HORIZONTAL SCALE IN FEET

5 0 5 10

VERTICAL SCALE IN FEET

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_7 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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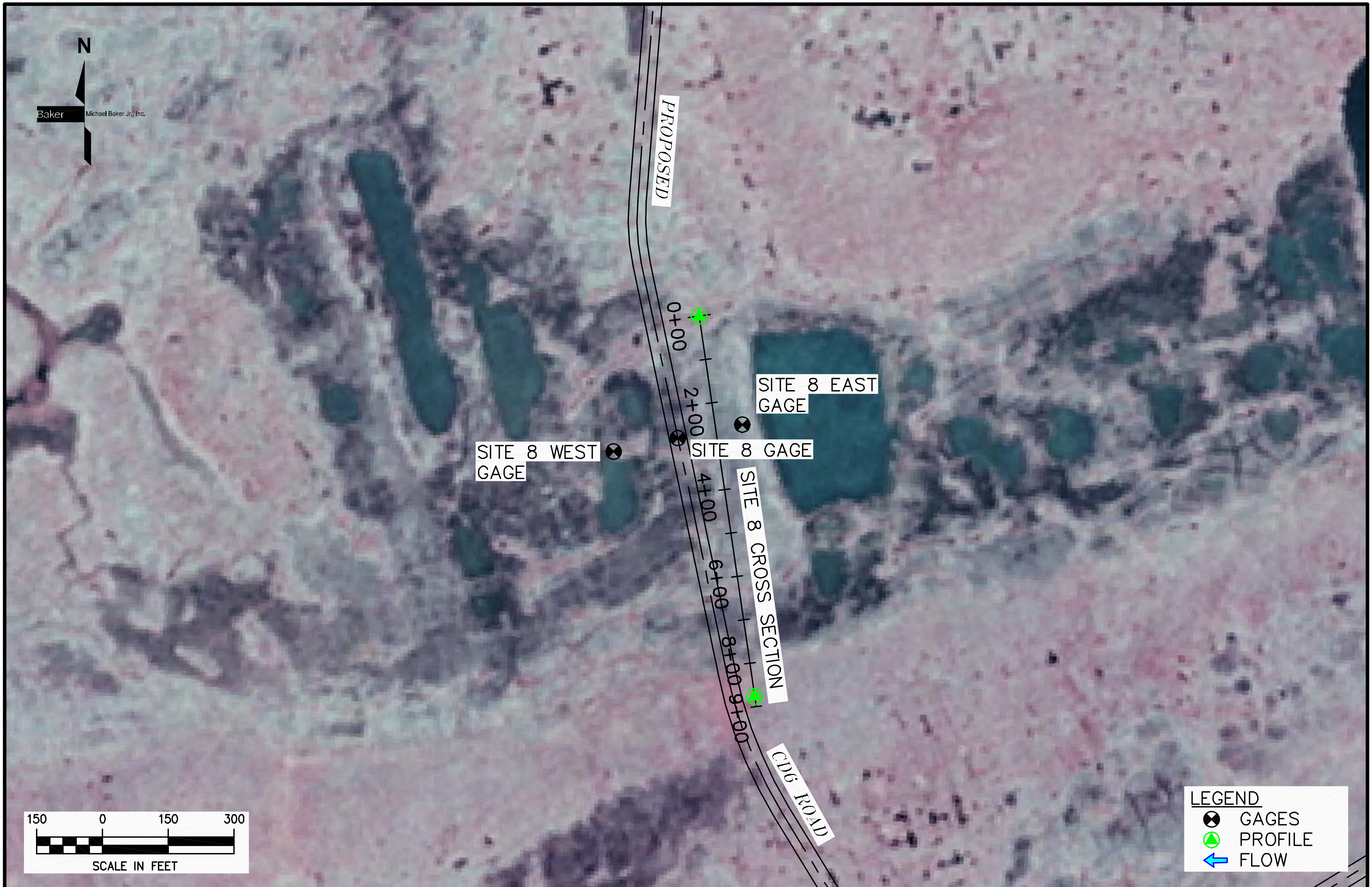
2006 SPRING BREAK-UP

ASDP SITE 7

CROSS SECTION

FIGURE 5-7

(SHEET 2 OF 2)



ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_7-5_9&5_11-5_13
CHECKED:	MTA	SCALE:	1" = 300 Feet

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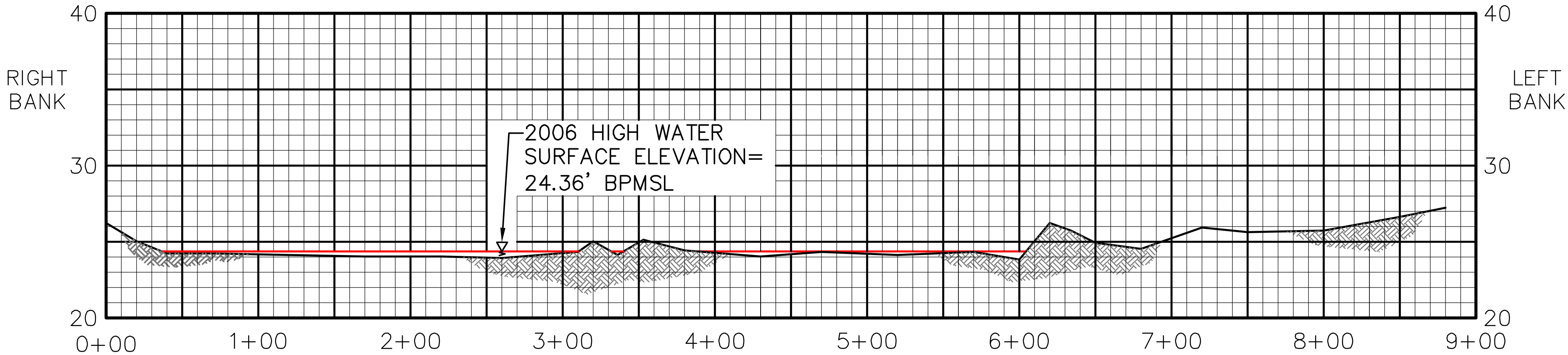
2006 SPRING BREAK-UP
ASDP SITE 8
PLAN

FIGURE 5-8
(SHEET 1 OF 2)

NOTES:
1. BASIS OF ELEVATION, MONUMENT KELLY.
2. LOCATION OF STA 0+00, 70°16'00.7"N 151°28'07.6"W.
3. LOCATION OF STA 8+80, 70°15'52.2"N 151°28'03.3"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2006 BY MICHAEL BAKER JR. INC.



8 CROSS SECTION @ S–8
SCALE: HORZ. 1"= 100' / VERT. 1" = 10'

50 0 50 100
HORIZONTAL SCALE IN FEET

5 0 5 10
VERTICAL SCALE IN FEET

ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_8 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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2006 SPRING BREAK-UP
ASPD SITE 8
CROSS SECTION
FIGURE 5-8
(SHEET 2 OF2)

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_7-5_9&5_11-5_13
CHECKED:	MTA	SCALE:	1" = 300 Feet

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2006 SPRING BREAK-UP

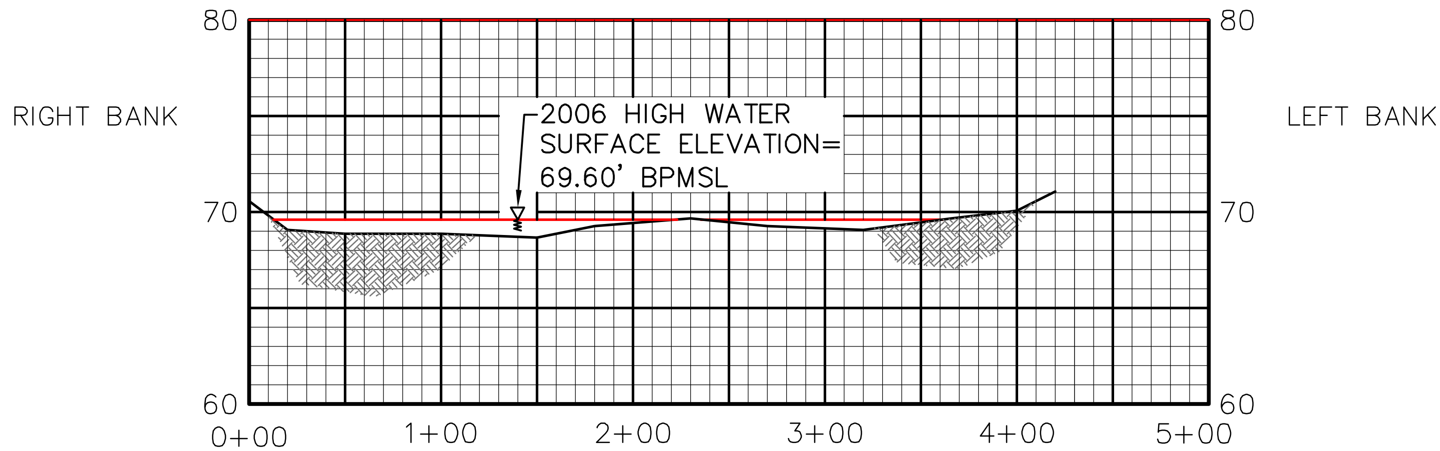
ASDP SITE 9

PLAN

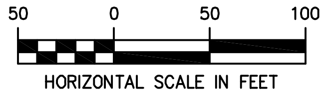
FIGURE 5-9

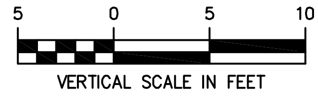
(SHEET 1 OF 2)

NOTES:
1. BASIS OF ELEVATION MONUMENT PATTY.
2. LOCATION OF STA 0+00, 70°12'12.2"N 151°37'26.7"W.
3. LOCATION OF STA 4+20, 70°12'13.9"N 151°37'15.2"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2006 BY MICHAEL BAKER JR. INC.



9 CROSS SECTION @ S-9
SCALE: HORZ. 1"= 100' / VERT. 1" = 10'





ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_9 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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2006 SPRING BREAK-UP
ASDP SITE 9
CROSS SECTION
FIGURE 5-9
(SHEET 2 OF 2)

ConocoPhillips
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DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_2-5_6&5_10
CHECKED:	MTA	SCALE:	1" = 300'

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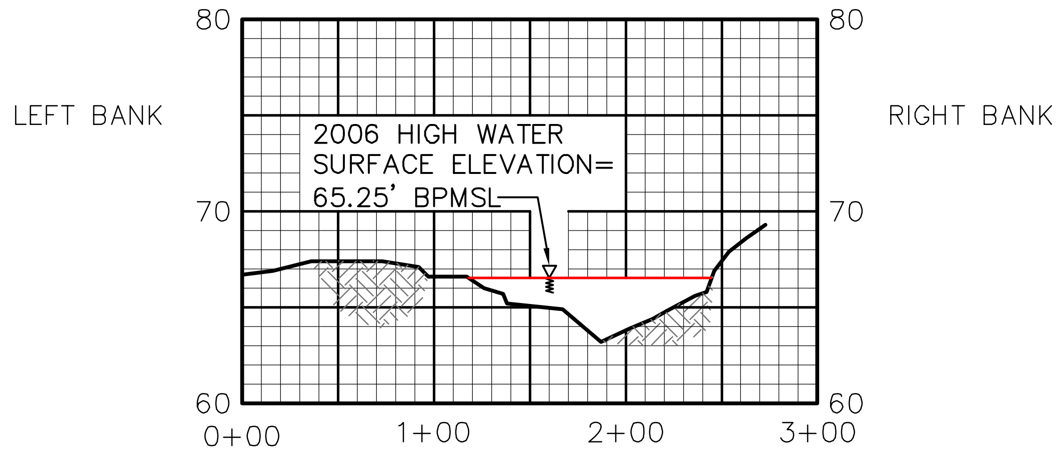
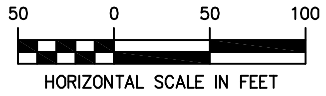
2006 SPRING BREAK-UP
ASDP SITE 10
PLAN
FIGURE 5-10
(SHEET 1 OF 2)

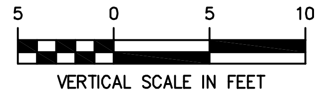
NOTES:
1. BASIS OF ELEVATION, MONUMENT MECKEL.
2. LOCATION OF STA 0+00, 70°12'02.0"N 151°39'59.9"W.
3. LOCATION OF STA 3+00, 70°12'02.8"N 151°39'52.2"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2005 BY MICHAEL BAKER JR. INC.



10 CROSS SECTION @ S-10

SCALE: HORZ. 1"= 100' / VERT. 1" = 10'





ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_10 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

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2006 SPRING BREAK-UP

ASDP SITE 10

CROSS SECTION

FIGURE 5-10

(SHEET 2 OF 2)

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_7-5_9&5_11-5_13
CHECKED:	MTA	SCALE:	1" = 300 Feet

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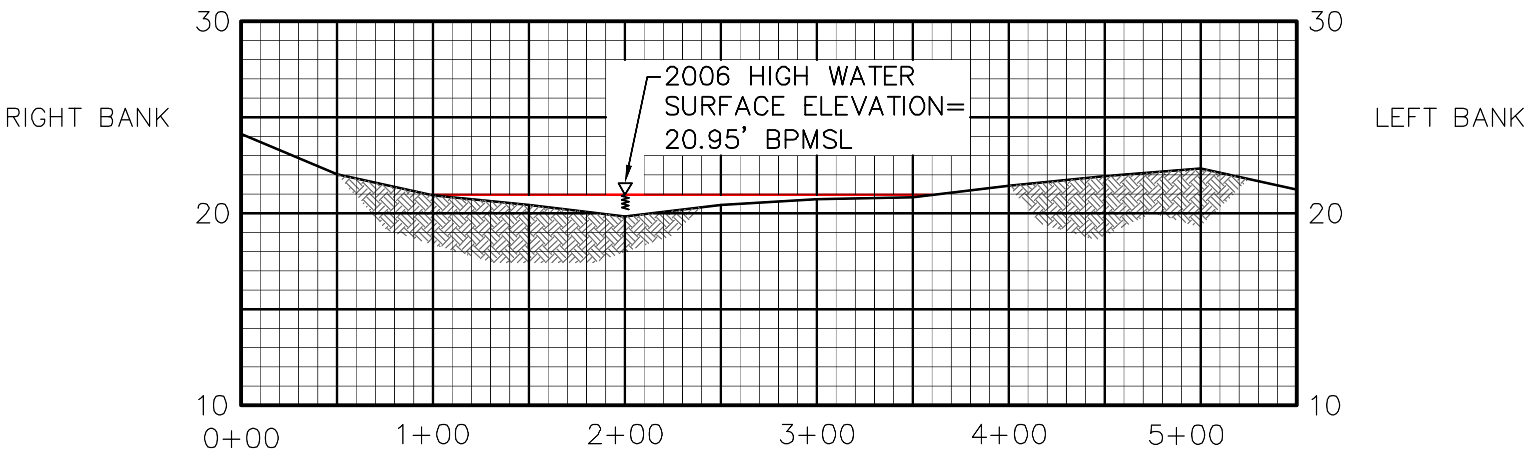
2006 SPRING BREAK-UP
ASDP SITE 11
PLAN

FIGURE 5-11
(SHEET 1 OF 2)

NOTES:
1. BASIS OF ELEVATION MONUMENT BRAD.
2. LOCATION OF STA 0+00, 70°12'51.2"N 151°23'10.4"W.
3. LOCATION OF STA 5+50, 70°12'50.1"N 151°23'26.1"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2006 BY MICHAEL BAKER JR. INC.



11 CROSS SECTION @ S-11
SCALE: HORZ. 1"= 100' / VERT. 1" = 10'

50 0 50 100
HORIZONTAL SCALE IN FEET

5 0 5 10
VERTICAL SCALE IN FEET

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_11 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

Baker

Michael Baker Jr., Inc.
A Unit of Michael Baker Corporation
1400 West Benson Blvd., Suite 200
Anchorage, Alaska 99503
Phone: (907) 273-1600
Fax: (907) 273-1699

2006 SPRING BREAK-UP
ASDP SITE 11
CROSS SECTION

FIGURE 5-11
(SHEET 2 OF 2)

ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURES 5_7-5.DWG
CHECKED:	MTA	SCALE:	1" = 300 Feet

Baker

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Anchorage, Alaska 99503
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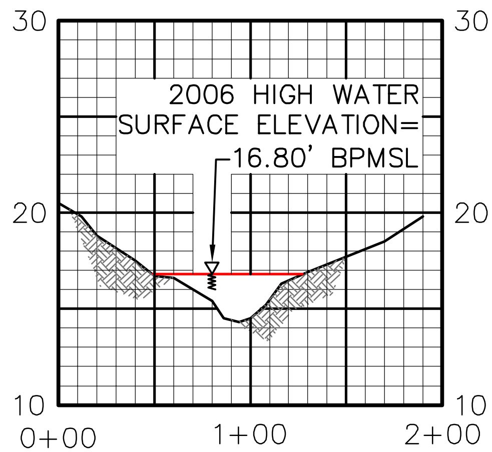
2006 SPRING BREAK-UP
ASDP SITE 12
PLAN

FIGURE 5-12
(SHEET 1 OF 2)

NOTES:

1. BASIS OF ELEVATION MONUMENT KELLY.
2. LOCATION OF STA 0+00, 70°16'25.4"N 151°28'49.5"W.
3. LOCATION OF STA 1+90, 70°16'26.4"N 151°28'44.6"W.
4. CHANNEL PROFILE MEASUREMENTS COMPLETED JUNE 2006 BY MICHAEL BAKER JR. INC.



12 CROSS SECTION @ S–12

SCALE: HORZ. 1"= 100' / VERT. 1" = 10'

50 0 50 100

HORIZONTAL SCALE IN FEET

5 0 5 10

VERTICAL SCALE IN FEET

ConocoPhillips
Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE_5_12 PROFILE
CHECKED:	MTA	SCALE:	AS SHOWN

Baker

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2006 SPRING BREAK-UP

ASDP SITE 12

CROSS SECTION

FIGURE 5-12

(SHEET 2 OF 2)

ConocoPhillips Alaska, Inc.

DATE:	11/30/06	PROJECT:	108604
DRAWN:	AMG	FILE:	FIGURE 5_13
CHECKED:	MTA	SCALE:	1" = 300 Feet

Baker

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2006 SPRING BREAK-UP
ASDP SITE 13
PLAN

FIGURE 5-13
(SHEET 1 OF 1)

5.6 Tables

Table 5-7 Judy Creek

Date and Time	WSE (feet BPMSL) J13.8	Q (cfs)	Observations
5/28/06 9:30 AM			Flow observed approximately 1 mile above confluence with Fish Creek.
5/30/06 4:00 PM	35.56		High Water - estimated the afternoon of 5/30/06.
6/3/06 4:45 PM	33.18		Small amount of snow left in channel.
6/7/06 4:00 PM	33.52		Channel flowing ice-free.
6/11/06 2:30 PM	32.93		
6/13/06 5:00 PM	32.71		Final gage reading.

Notes:

1. Elevations are based on Monument 4BN of 40.87 feet BPMSL, established by Lounsbury in 2001.
2. WSE line PT: J13.8 based on pressure transducer data at Judy 13.8.
3. Pressure transducer identified the high water elevation of 38.95 feet BPMSL on 6/30/06 at 5:00 PM.
4. Tabulated values and graph data points from gage readings at J13.8.
5. No discharge measurements were collected for this site.

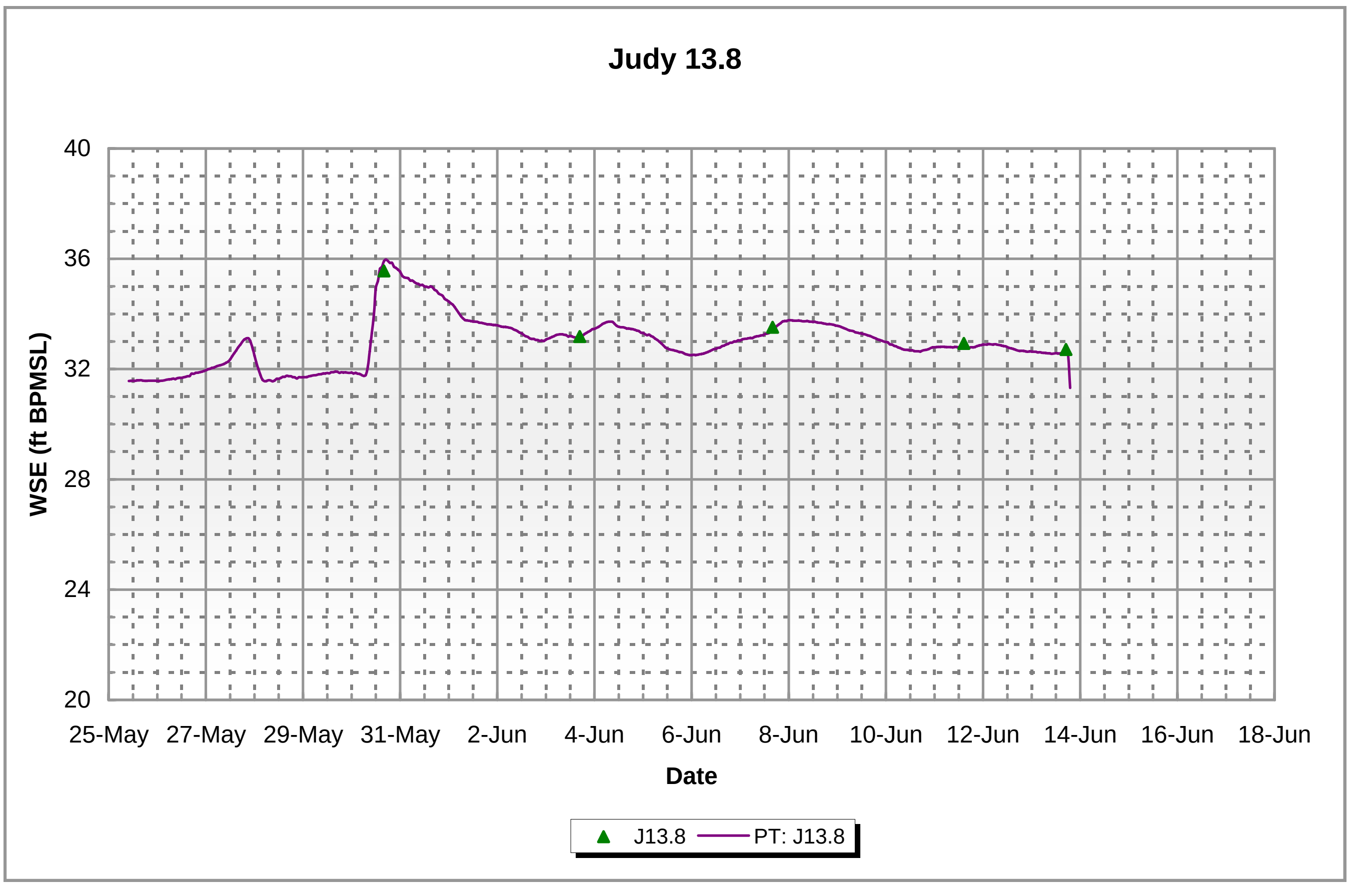


Table 5-8 Fish Creek

	WSE (feet BPMSL)			Q (cfs)	
Date and Time	F0.7	F10.3	F25.1		Observations
5/31/06 4:00 PM		6.01	17.91		High water estimated the afternoon of 5/31/06.
6/3/06 5:30 PM	3.00	5.06	14.07		Foam lines from high water observed on gages.
6/5/06 6:00 PM	2.92	5.39	14.08		Snow visible in channel.
6/7/06 3:15 PM	2.56	5.35			Channel flowing ice-free.
6/11/06 2:45 PM		5.30	16.59		Final gage readings.

Notes:

1. Elevations for F0.7 are based on Monument D1A South of 3.90 feet BPMSL, established by Lounsbury in 2002.
2. Elevations for F10.3 are based on Monument C2 of 12.30 feet BPMSL, established by Lounsbury in 2002.
3. Elevations for F25.1 are based on Monument 2S of 21.44 feet BPMSL, established by Lounsbury in 2001.
4. WSE line PT: F25.1 based on pressure transducer data.
5. Tabulated values and graph data points from gage readings at F25.1.
6. No discharge measurements were collected at these sites.

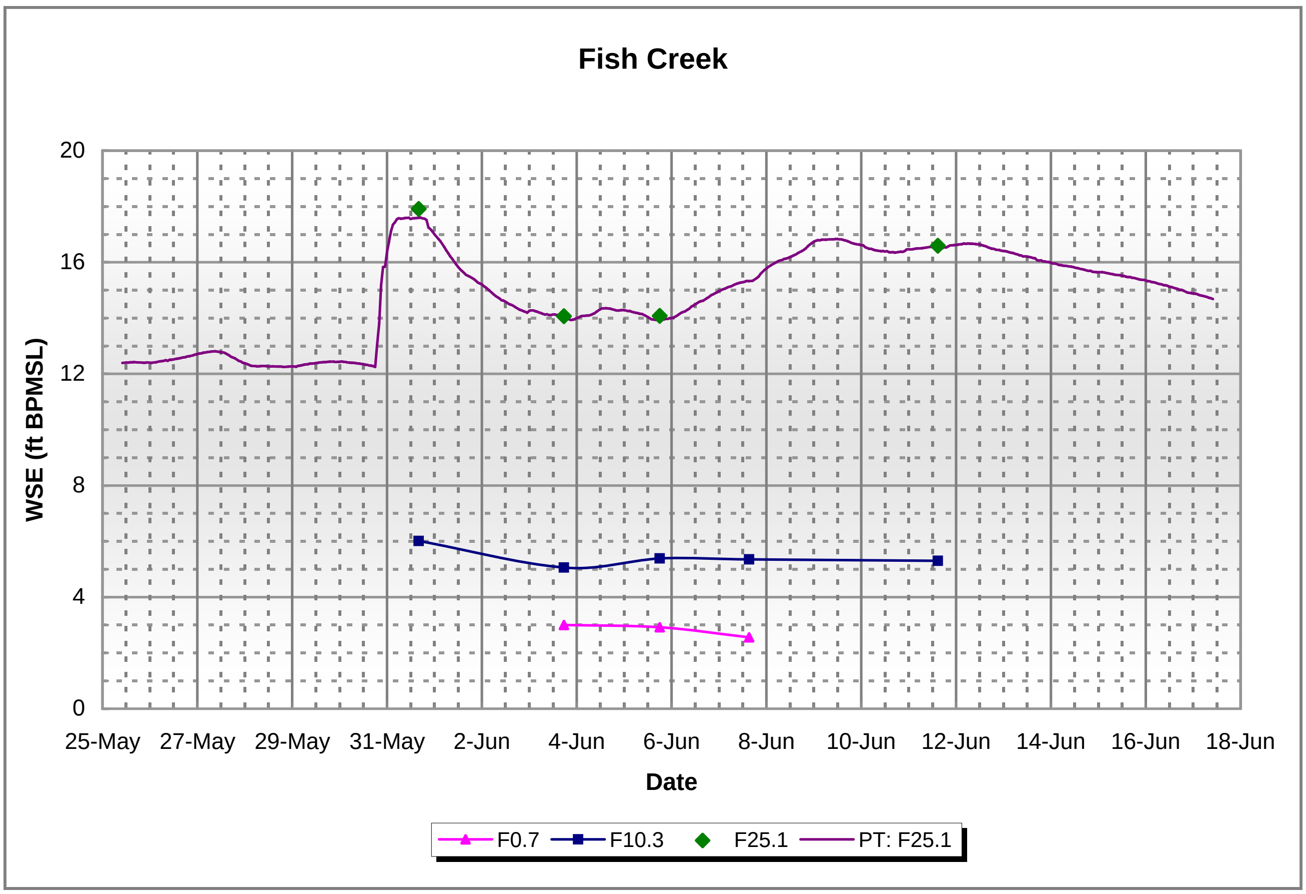


Table 5-9 Ublutuoch River

Date and Time	UB 1.9	UB 6.7	UB 6.8	UB 6.9	Q (cfs) UB 6.9	
6/2/06 10:15 AM		5.22	5.36	5.90		First water recorded on gages.
6/3/06 12:30 PM	4.39	5.10	5.16	5.73	340	Snow and ice present in channel and along banks.
6/4/06 11:00 AM		5.79	6.00	6.59	780	
6/5/06 10:15 AM		5.50	5.64	6.13	840	Main channel free of ice; ice jams up and downstream.
6/6/06 10:30 AM		5.86	6.04	6.39	1200	
6/7/06 12:00 AM			6.19	6.57		High Water estimated at the early morning of June 7.
6/7/06 10:30 AM	5.11	6.08	6.08	6.36	1290	Peak Discharge at UB6.9.
6/8/06 11:00 AM		5.94	5.93	6.12	1280	
6/9/06 10:45 AM		5.58	5.57	5.71	1140	Ice jams up and downstream of UB6.9.
6/10/06 9:00 AM	4.66	5.02	5.05	5.14	880	Ice jams released.
6/11/06 10:00 AM		4.62	4.60	4.66	690	Channel free of ice and snow.

Notes:

1. Elevations for UB 1.9 based on Monument UBN 01 of 12.09 feet BPMSL, established by LCMF in 2003.
2. Elevations for UB 6.7, UB 6.8 and UB 6.9 based on Monument JACK of 23.45 feet BPMSL, established by LCMF in 2003.

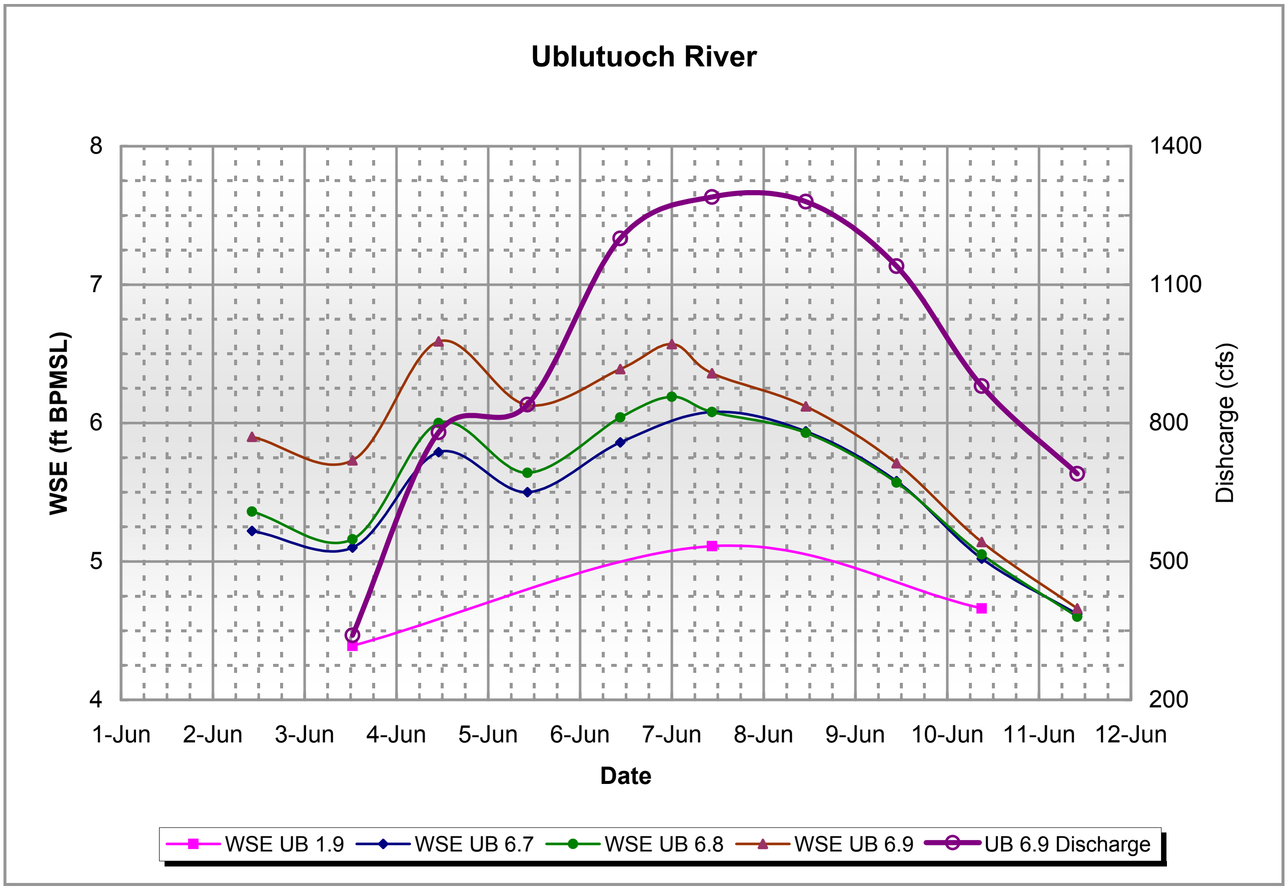


Table 5-10 Site 1

	WSE (feet BPMSL)				
Date and Time	**S1E**	**S1**	**S1W**	**Q (cfs)**	**Observations**
6/2/06 9:00 AM	9.51	9.97	10.60	0.00	No flow observed.
6/3/06 9:45 AM	9.51	10.02	10.63	2.69	
6/4/06 3:00 AM	9.58	10.08	10.70		High water estimated the morning of June 4.
6/4/06 5:15 PM	9.49	9.97	10.60	0.55	
6/5/06 4:15 PM	9.49	9.95	10.59	0.21	
6/7/06 7:15 AM	9.43	9.95	10.59	0.00	Channel free of ice and snow; no observable flow.
6/8/06 8:15 AM	9.49	9.96	10.59		
6/10/06 5:00 PM	9.48	9.94	10.59		Minor flow observed in channel.
6/13/06 3:30 PM	9.45	9.91	10.54		
6/16/06 12:00 PM	9.41	9.87	10.49		

Notes:

1. Elevations are based on Monument NPRA of 16.94 feet BPMSL, established by LCMF.

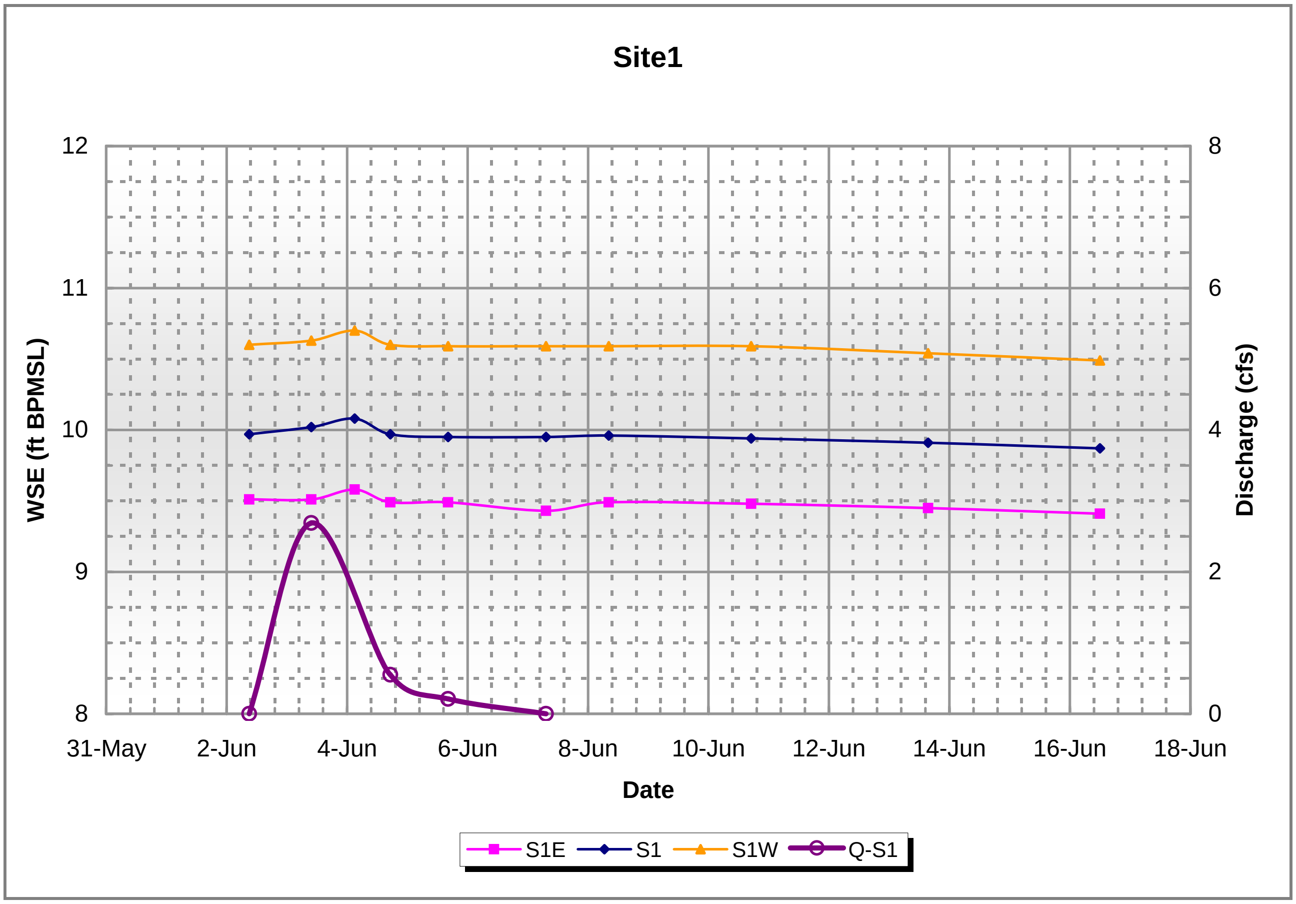


Table 5-11 Site 2

	WSE (feet BPMSL)				
Date and Time	S2S	S2	S2N	Q (cfs)	Observations
6/2/06 9:30 AM	19.59	19.51			No flow observed in channel.
6/3/06 10:15 AM	19.58	19.53	19.59		No flow observed in channel.
6/4/06 5:15 PM	19.52	19.49	19.56		No flow observed in channel.
6/5/06 3:45 PM	19.49	19.50	19.56		No flow observed in channel.
6/7/06 7:30 AM	19.52	19.51	19.57		90% clear of ice and snow; no observable flow.
6/8/06 8:30 AM	19.53	19.51	19.56		
6/10/06 5:00 PM	19.49	19.48	19.53		No flow observed in channel.
6/13/06 3:45 PM	19.46	19.45	19.50		
6/16/06 11:45 AM	19.42	19.41	19.45		

Notes:

1. Elevations are based on Monument CDW of 3.69 feet BPMSL, established by LCMF in 2003.
2. No discharge measurements were taken at this site.

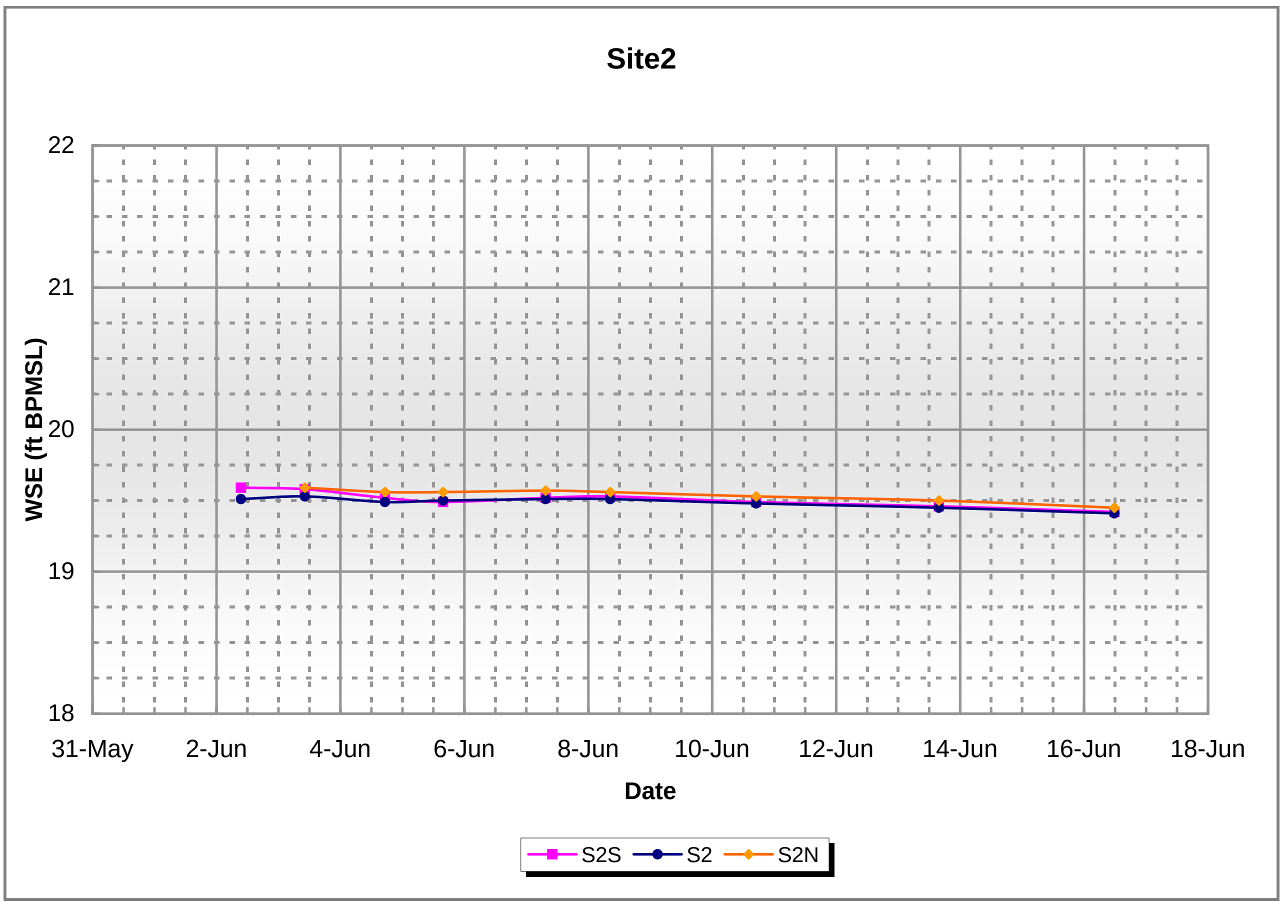


Table 5-12 Site 3

Date and Time	WSE (feet BPMSL) S3N	S3	S3S	Q (cfs)	Observations
6/2/06 9:30 AM		20.45	21.37		High water observed the morning of June 2.
6/3/06 10:30 AM	19.82	20.25	21.33		No flow observed in channel.
6/4/06 4:45 PM	19.78	20.20	21.34		No flow observed in channel.
6/5/06 3:30 PM	19.75	20.25	21.35	1.39	
6/7/06 7:30 AM	19.81	20.36	21.46	3.61	Mostly clear of ice and snow.
6/8/06 8:45 AM	19.81	20.39	21.47		
6/10/06 4:30 PM	19.79	20.37		5.36	Channel is free of ice and snow.
6/12/06 12:45 PM	19.79	20.39	21.50	5.42	
6/16/06 10:30 AM	19.77	20.37	21.50	3.97	

Notes:

1. Elevations are based on Monument AMYLEE of 27.50 feet BPMSL, established by LCMF in 2005.

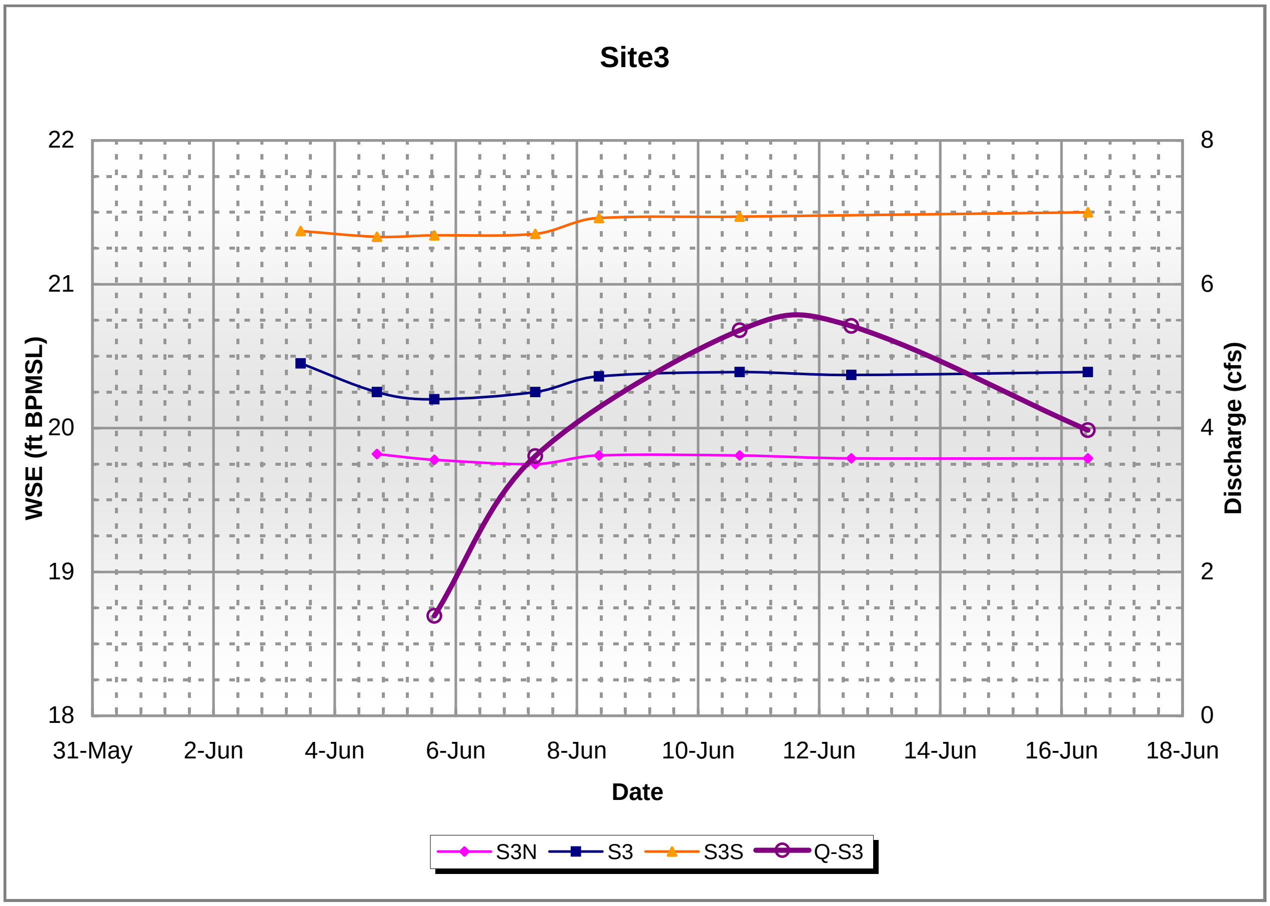


Table 5-13 Site 5

Date and Time	WSE (feet BPMSL) S5N	S5	S5S	Q (cfs)	Observations
6/2/06 11:45 AM		14.36	14.75		
6/2/06 11:00 PM	13.79	14.50	14.87		High water estimated the evening of June 2.
6/3/06 10:45 AM	13.56	14.35	14.75	5.14	
6/4/06 4:30 PM	12.82	14.32	14.67	4.27	
6/5/06 2:45 PM	12.82	14.15	14.67	1.73	
6/7/06 8:30 AM	12.81	14.17	14.70	8.16	Reach mostly clear of ice and snow.
6/8/06 9:30 AM	12.81	14.16	14.68	8.07	
6/9/06 1:00 PM	12.75	14.11	14.64	8.07	
6/10/06 11:45 AM	12.69	14.06	14.60		Small flow observed in channel.
6/13/06 3:45 PM	12.59	13.97	14.50		
6/16/06 10:30 AM	12.47	13.83	14.38		

Notes:

1. Elevations are based on Monument CHAR of 24.05 feet BPMSL, established by LCMF in 2005.

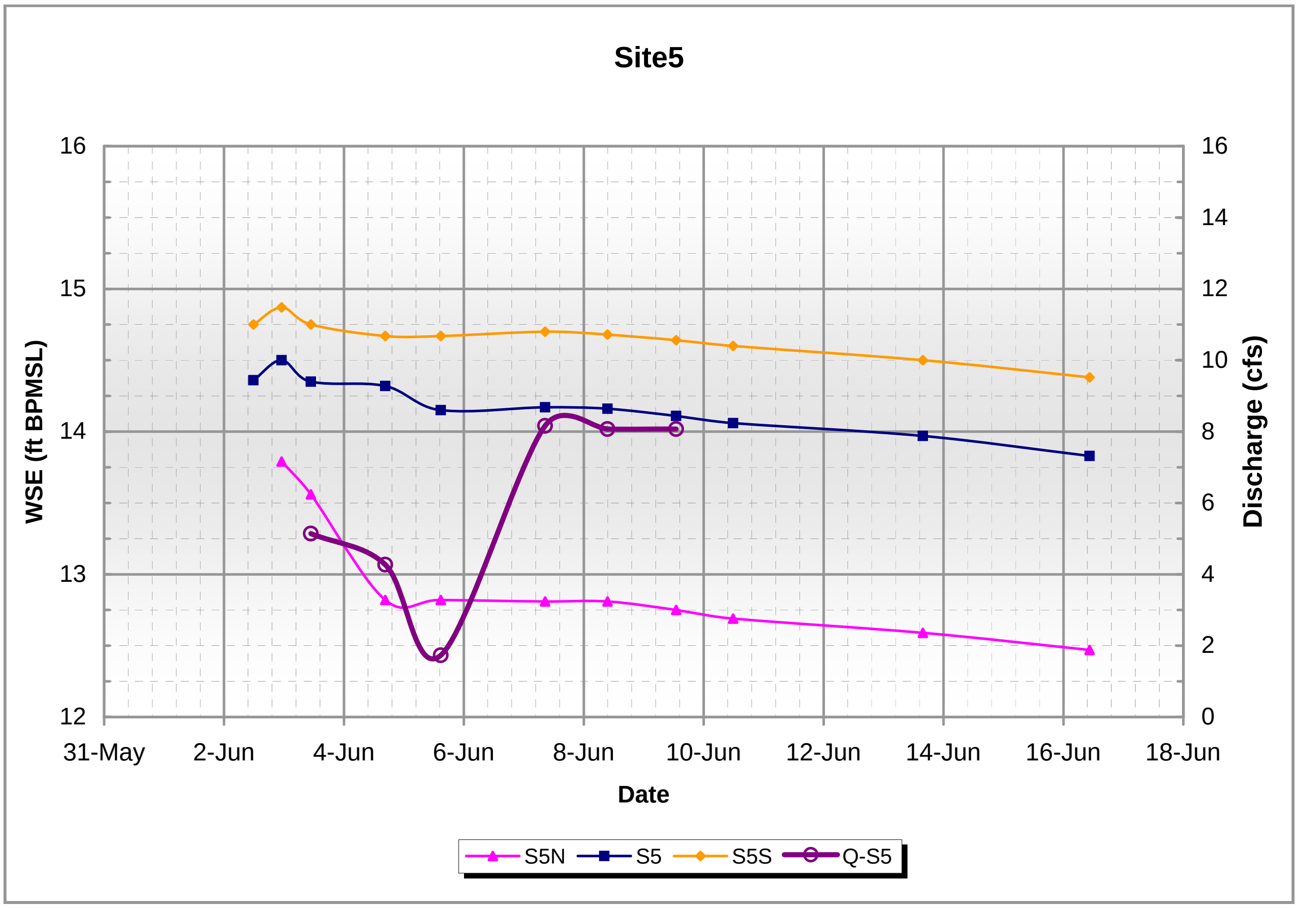


Table 5-14 Site 6

Date and Time	WSE (feet BPMSL) S6N	S6	S6S	Q (cfs)	Observations
6/2/06 11:45 AM	16.13		18.01		
6/3/06 12:30 PM	16.19		18.13		No observed flow. Snow present in channel.
6/4/06 4:15 PM	16.62		18.49		Some flow (<5%) observed west of main channel.
6/5/06 1:45 PM	16.40	16.63	18.04	16.10	
6/6/06 4:15 PM	16.30	16.58	18.12	14.07	Flow observed. Snow still present on channel banks.
6/7/06 9:30 AM	16.65	17.09	18.47	29.51	Increasing stage.
6/8/06 1:15 PM	16.84	17.47	18.76	58.27	
6/9/06 1:30 PM	16.90	17.51	18.89	70.98	High water observed the afternoon of June 9.
6/10/06 12:30 PM	16.81	17.33	18.73	56.87	
6/12/06 8:00 AM	16.76	17.24	18.65	43.91	Channel flowing free of ice and snow.
6/16/06 10:15 AM	16.60	16.95	18.37		

Notes:

1. Elevations are based on Monument ALMA of 25.06 feet BPMSL, established by LCMF in 2005.
2. One discharge measurement was taken at S6N as 7.04 cfs on 6/4/06 at 16:15.

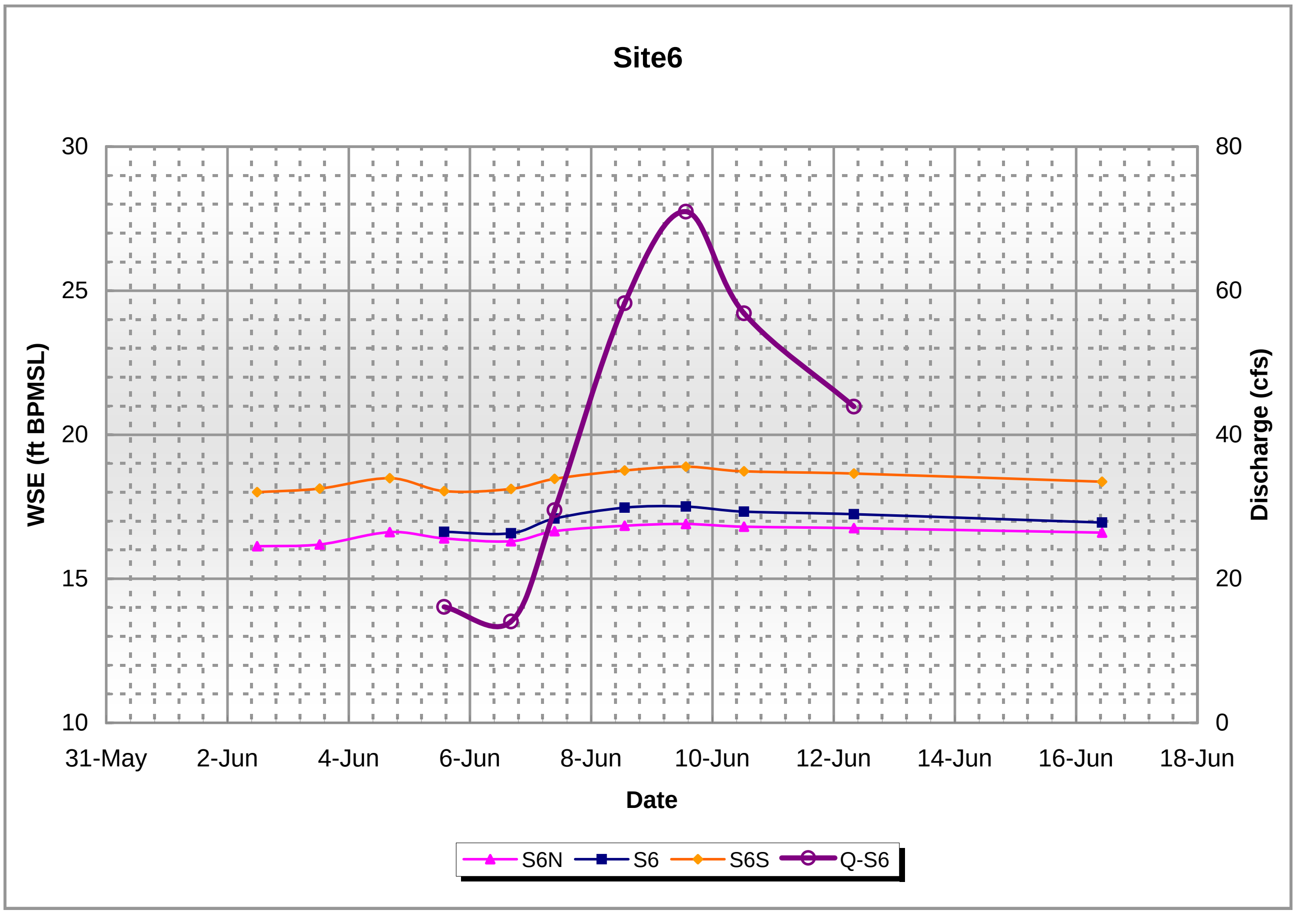


Table 5-15 Site 7

	WSE (feet BPMSL)				
Date and Time	S7N	S7	S7S	Q (cfs)	Observations
6/2/06 11:30 AM	22.39	23.30	23.92		
6/3/06 12:30 PM	22.32	23.23	23.71		No flow observed in channel.
6/4/06 2:00 AM	22.45	23.33			High Water estimated the early morning of June 4.
6/4/06 3:00 PM	22.17	23.10	23.49		Small flow (< 1 cfs) observed in channel.
6/5/06 1:15 PM	22.09	22.78		0.42	
6/6/06 3:15 PM	22.17	22.86		0.18	Channel mostly clear of ice and snow.
6/7/06 10:00 AM	22.31	22.97	23.81	4.37	Channel clear of ice and snow.
6/8/06 2:45 PM	22.29	22.97	23.80	3.17	
6/10/06 3:45 PM	22.25	22.94	23.75		Flow observed in channel.
6/13/06 4:00 PM	22.19	22.87	23.65		
6/14/06 7:45 AM	22.16	22.87	23.64		
6/16/06 9:45 AM	22.13	22.82	23.58		

Notes:

1. Elevations are based on Monument BRAD of 25.78 feet BPMSL, established by LCMF in 2005.

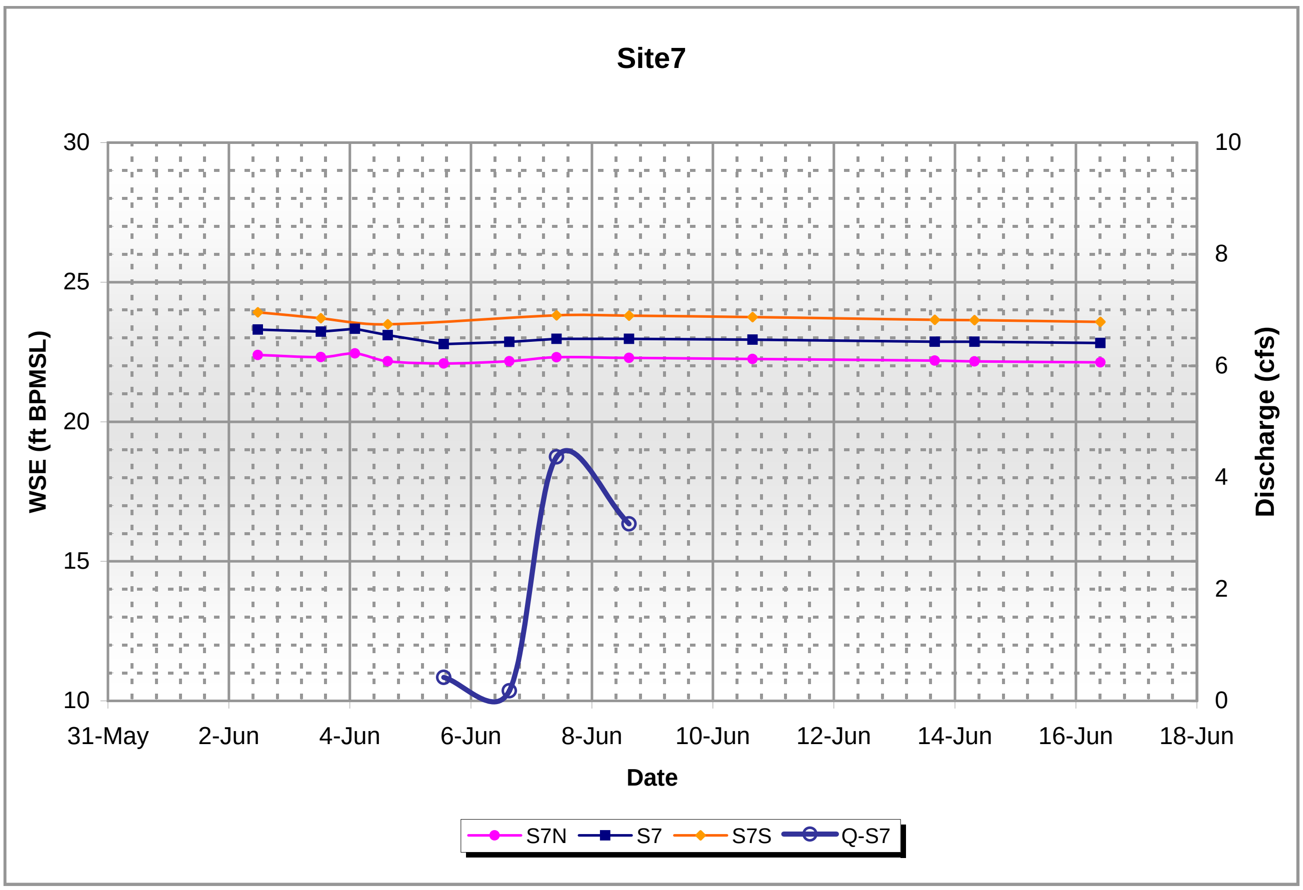


Table 5-16 Site 8

	WSE (feet BPMSL)				
Date and Time	S8E	S8	S8W	Q (cfs)	Observations
6/2/06 11:30 AM	25.36	24.36			High water observed the morning of June 2.
6/3/06 3:45 PM	25.36	24.29	24.35		No flow observed in channel.
6/4/06 9:30 AM	25.36	24.30	24.29		No flow observed in channel.
6/5/06 9:45 AM	25.33	24.26	24.27		No flow observed in channel.
6/6/06 11:00 AM	25.39	24.34	24.33		No flow observed in channel.
6/7/06 2:15 PM	25.36	24.31	24.31		No observable flow in channel; small sheet flow by lake.
6/10/06 2:45 PM	25.23	24.19	24.18		No observable flow in channel.
6/13/06 4:30 PM	25.21	24.12	24.11		No flow. Ponded water between lakes.
6/14/06 8:45 AM	25.20	24.08	24.09		No observable flow in channel.
6/16/06 9:45 AM	25.14	24.07	24.05		No flow observed in channel.

Notes:

1. Elevations are based on Monument KELLYof 27.36 feet BPMSL, established by LCMF in 2005.
2. No discharge measurements were collected at this site.

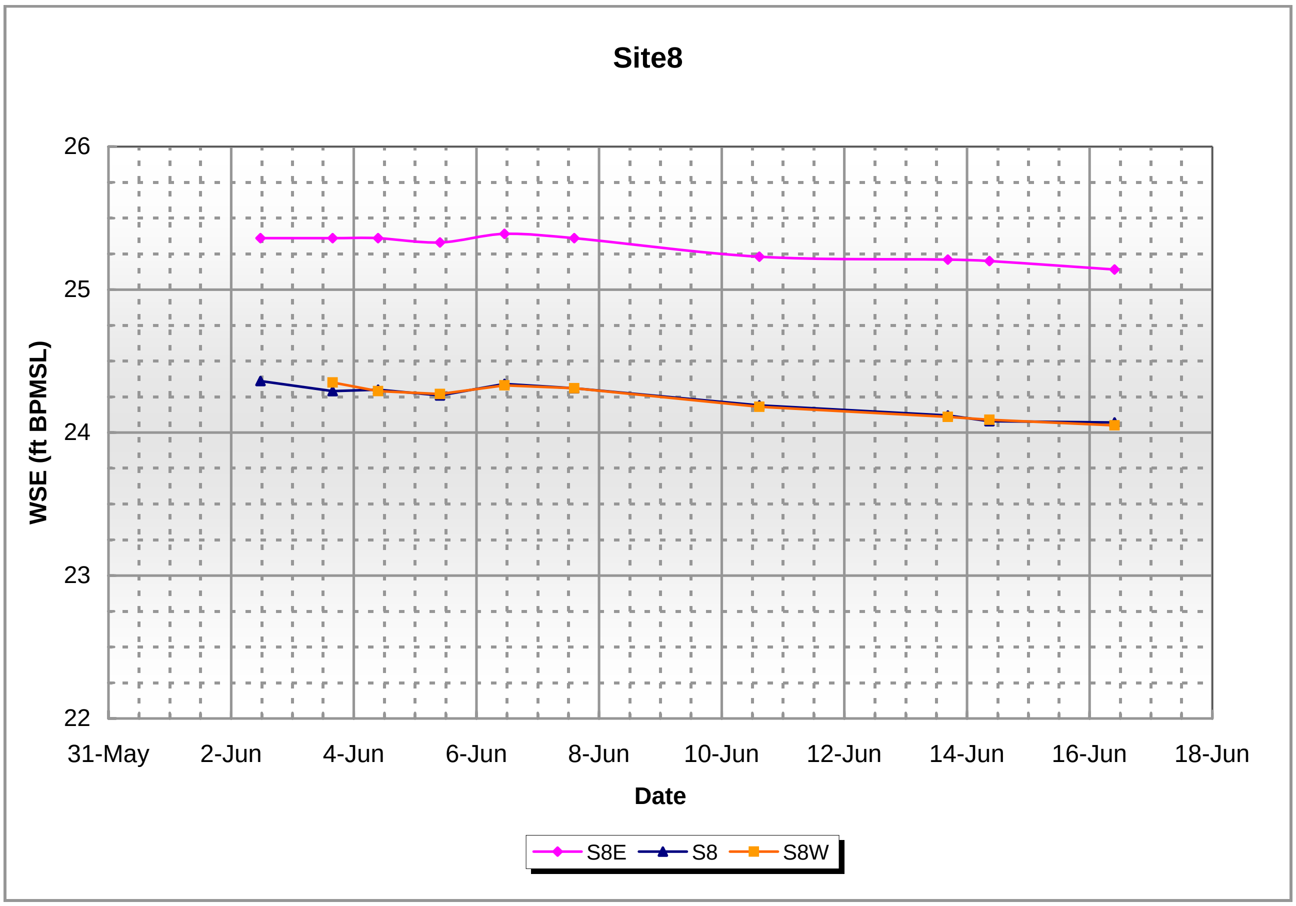


Table 5-17 Site 9

	WSE (feet BPMSL)				
Date and Time	S9N	S9	S9S	Q (cfs)	Observations
6/3/06 4:00 PM	68.65	69.45	70.96		No flow observed in channel.
6/4/06 9:15 AM	68.66	69.53	71.01		
6/5/06 9:30 AM	68.76	69.59	71.04		No flow observed in channel.
6/6/06 9:30 AM	68.83	69.59	71.10		Sheet flow observed approximately 120 ft upstream of S9.
6/7/06 2:30 PM	68.84	69.90	71.12		High water observed the afternoon of June 7.
6/10/06 2:45 PM	68.80	69.56	71.08		Minor observed flow.
6/13/06 4:30 PM	68.74	69.49	71.01		
6/14/06 11:45 AM	68.73	69.50	71.01		
6/16/06 9:30 AM	68.69	69.45			

Notes:

1. Elevations are based on Monument PATTY of 68.79 feet BPMSL, established by LCMF in 2005.
2. One discharge measurement was conducted at S9 of 5.69 cfs on 6/6/06 at 10:35.

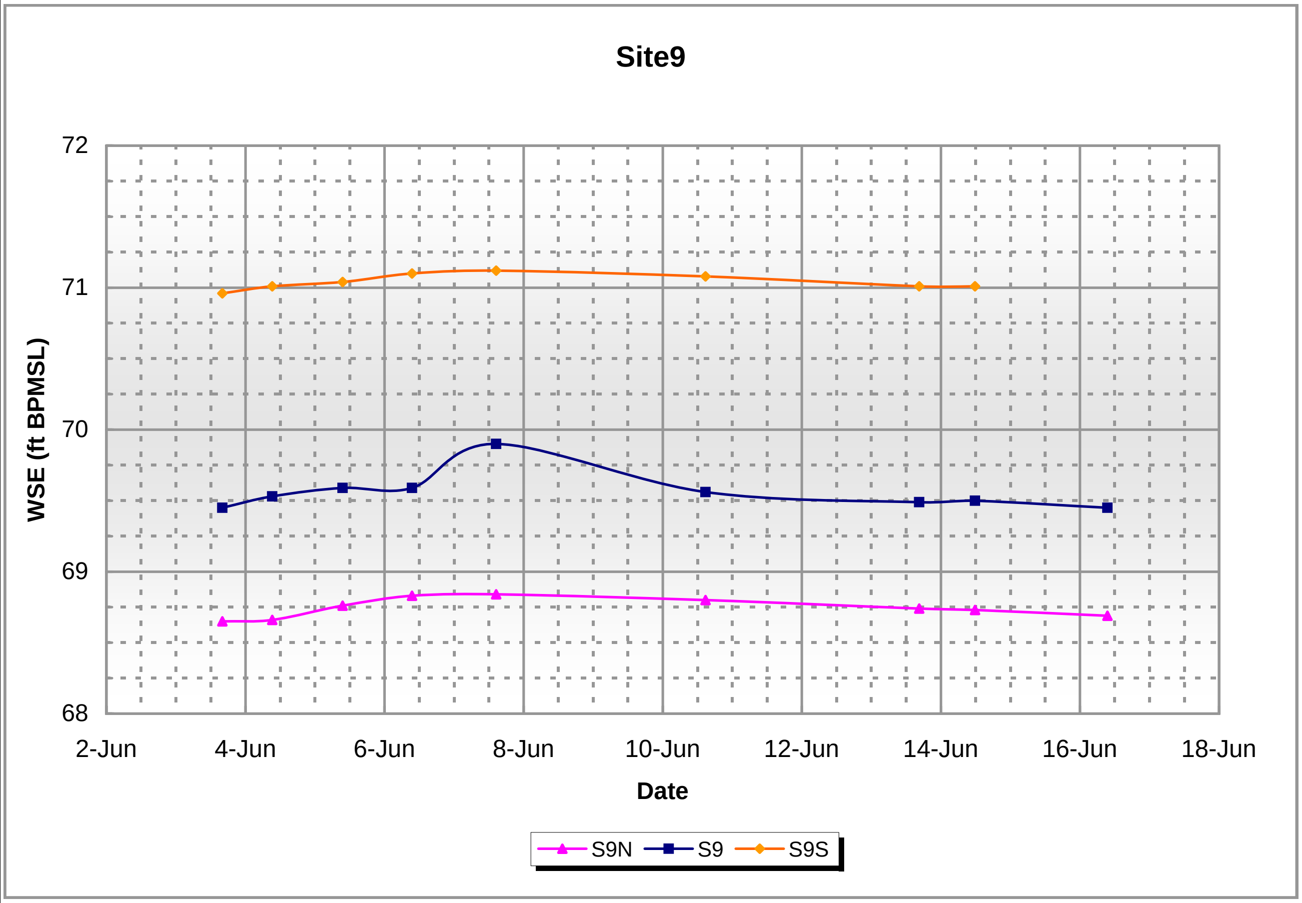


Table 5-18 Site 10

Date and Time	WSE (feet BPMSL) S10	Q (cfs)	Observations
6/3/06 4:30 PM	65.16	2.88	
6/4/06 8:30 AM	65.15	5.89	Small flow observed.
6/5/06 9:15 AM	65.25	7.21	High water observed the morning of June 5.
6/6/06 8:45 AM	65.24	18.85	Sheet flow observed to left of main channel.
6/7/06 2:45 PM	65.18	28.30	
6/8/06 2:45 PM	65.12	15.97	
6/10/06 2:30 PM	64.99		Channel flowing.
6/11/06 1:45 PM	64.97	10.33	Channel free of ice and snow; lake still ice-covered.
6/13/06 4:45 PM	64.84		
6/16/06 9:15 AM	64.73		

Notes:

1. Elevations are based on Monument MECKEL of 71.68 feet BPMSL, established by LCMF in 2005.

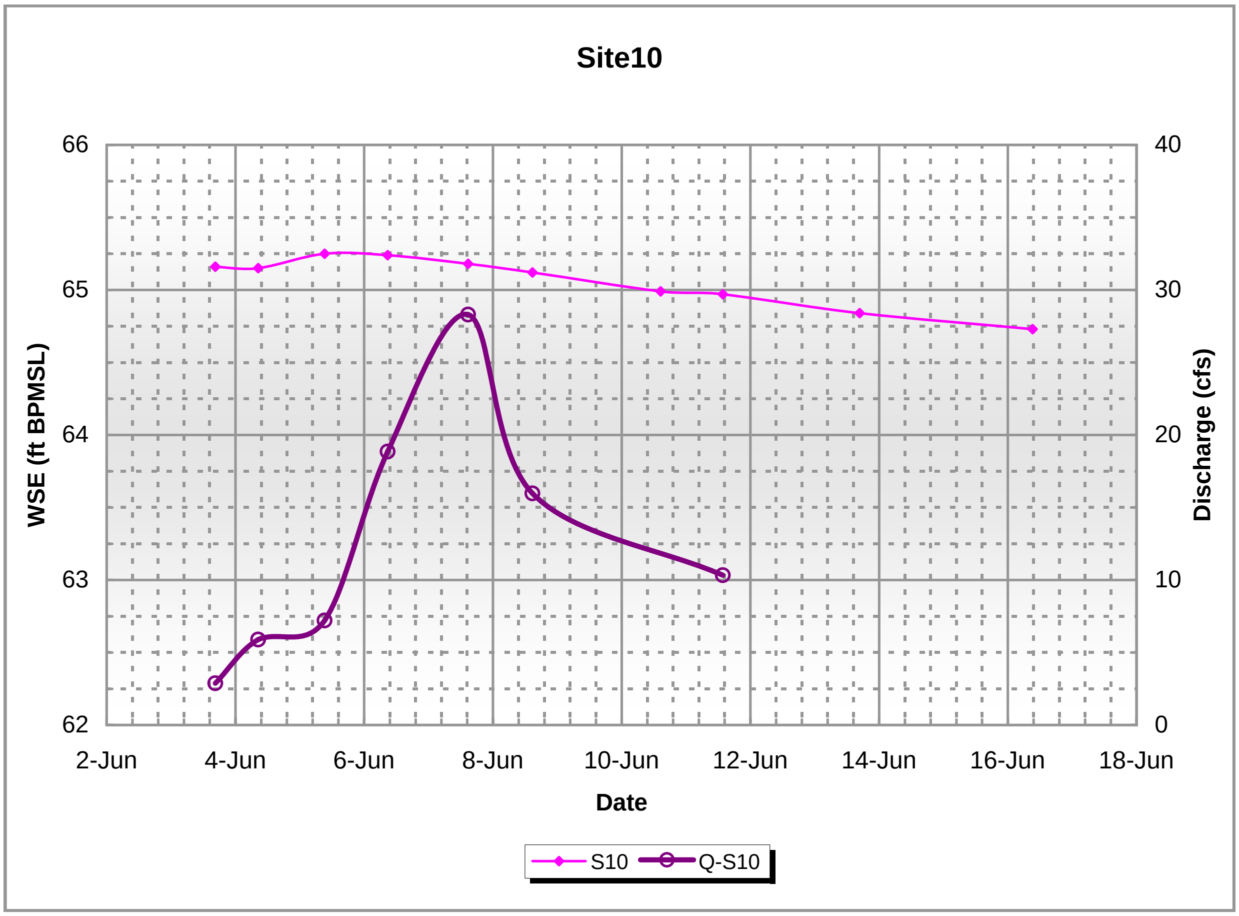


Table 5-19 Site 11

Date and Time	WSE (feet BPMSL) S11N	S11	S11S	Q (cfs)	Observations
6/2/06 11:15 AM	19.67	20.95	20.97		
6/3/06 1:00 AM	19.46	20.89	21.04		High water estimated the early morning of June 3 at S11S.
6/3/06 12:45 PM	19.27	20.86	20.87	1.40	
6/4/06 10:30 AM	19.22	20.60	20.70	0.86	
6/5/06 12:15 PM	19.10	20.55	20.45	0.74	
6/6/06 3:00 PM	19.23	20.51		2.69	Snow and ice present on edges of channel.
6/7/06 11:15 AM	19.20	20.49	20.56	2.44	
6/8/06 10:30 AM	19.09	20.35	20.39		
6/10/06 3:45 PM	19.04	20.35	20.41		Small flow (<1 cfs) observed in channel.
6/12/06 11:30 AM	18.97	20.31	20.37		
6/16/06 10:00 AM	18.83	20.20	20.24		

Notes:

1. Elevations are based on Monument BRAD of 25.78 feet BPMSL, established by LCMF in 2005.

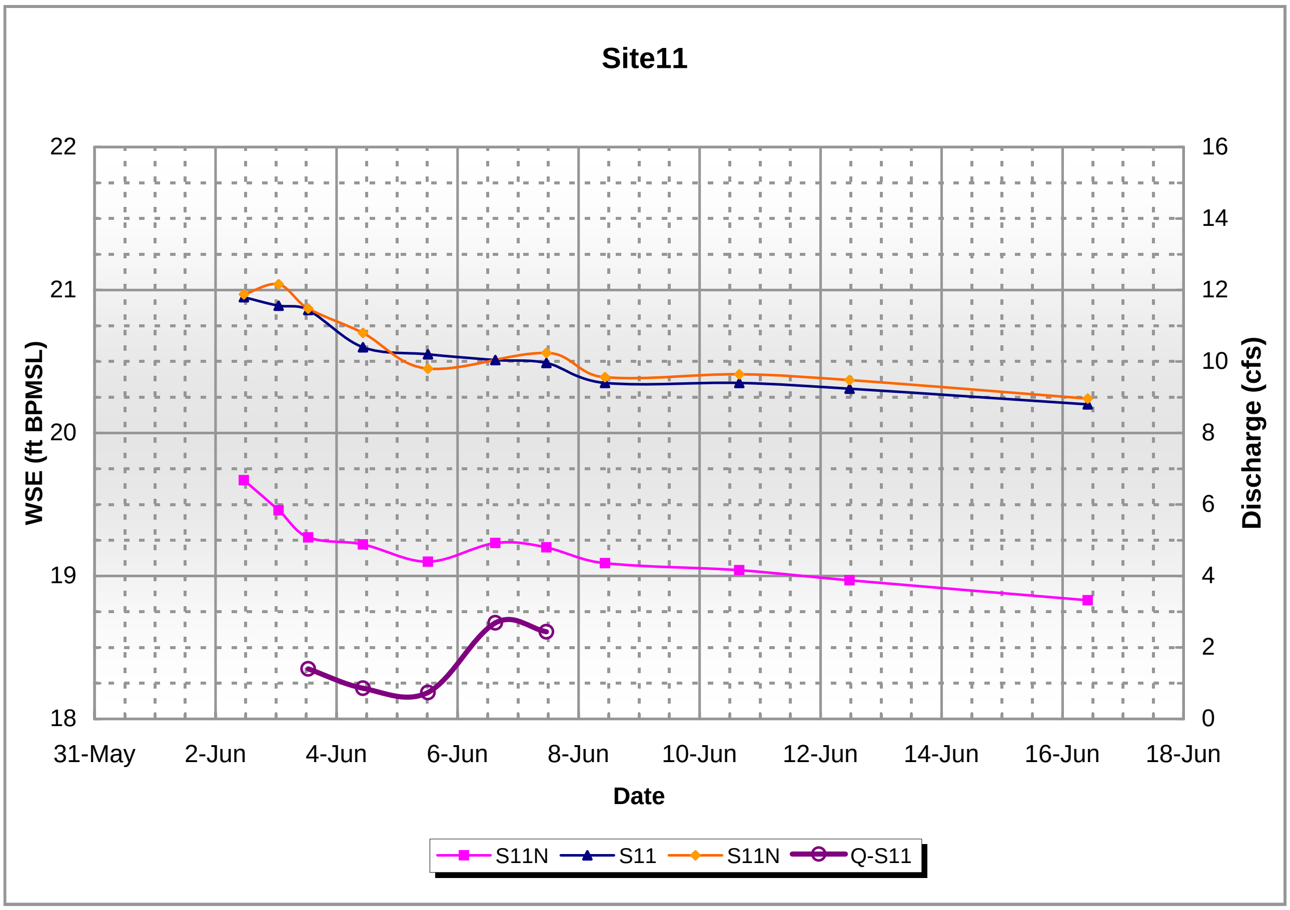


Table 5-20 Site 12

Date and Time	WSE (feet BPMSL) S12N	WSE (feet BPMSL) S12S	Q (cfs)	Observations
6/2/06 11:00 AM	16.08	17.00		High water observed the morning of June 2 .
6/3/06 3:30 PM		16.67	19.13	
6/4/06 9:45 AM		16.67	29.31	
6/5/06 10:00 AM		16.65	24.66	Flow observed in channel.
6/6/06 1:45 PM		16.81	45.15	Snow present in channel.
6/7/06 1:30 PM	16.06	16.83	46.41	
6/8/06 10:45 AM	16.10	16.88		High water observed the morning of June 8 .
6/10/06 3:00 PM	16.00	16.78	45.34	
6/12/06 9:30 AM	15.91	16.68	40.06	
6/16/06 8:00 AM		16.43	18.48	

Notes:

1. Elevations are based on Monument KELLY of 27.36 feet BPMSL, established by LCMF in 2005.

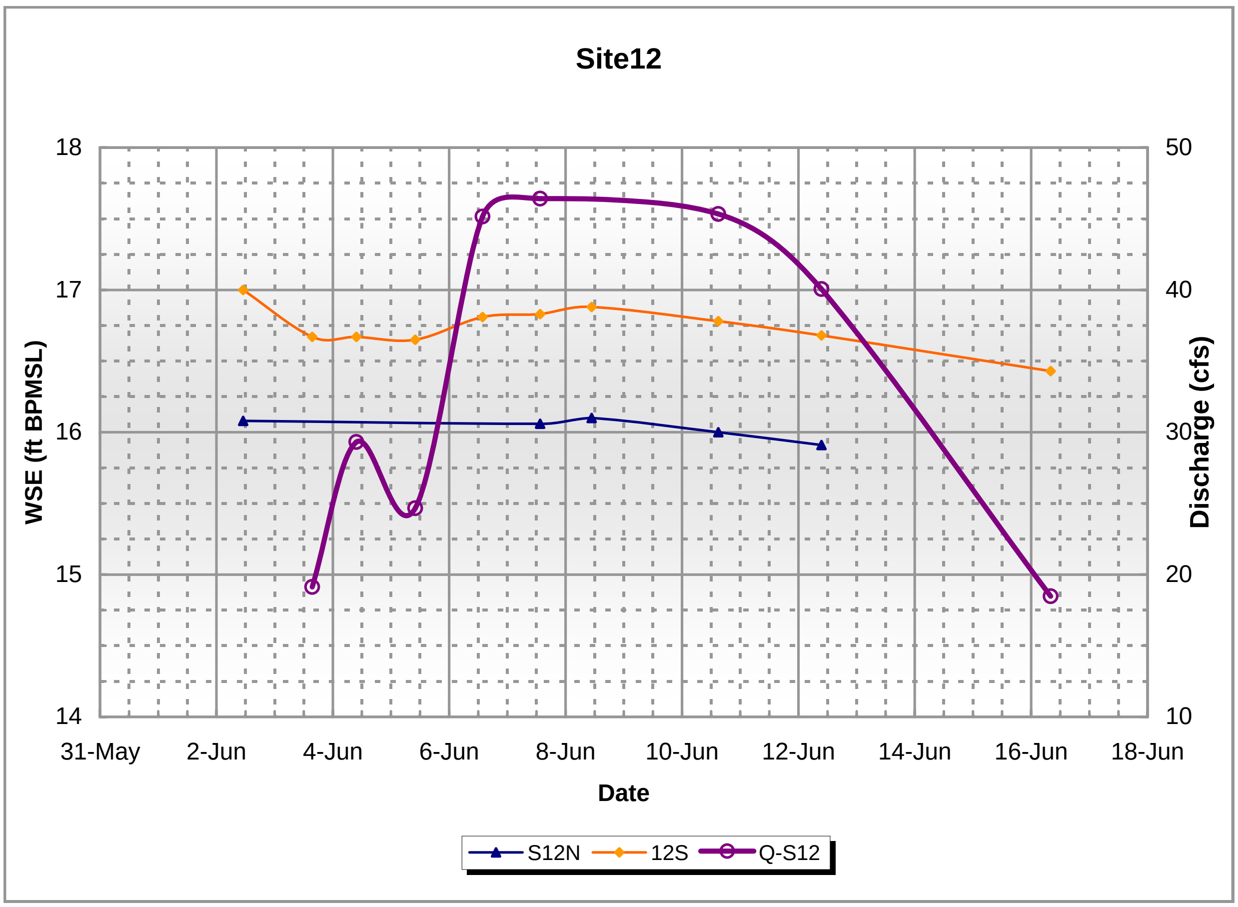
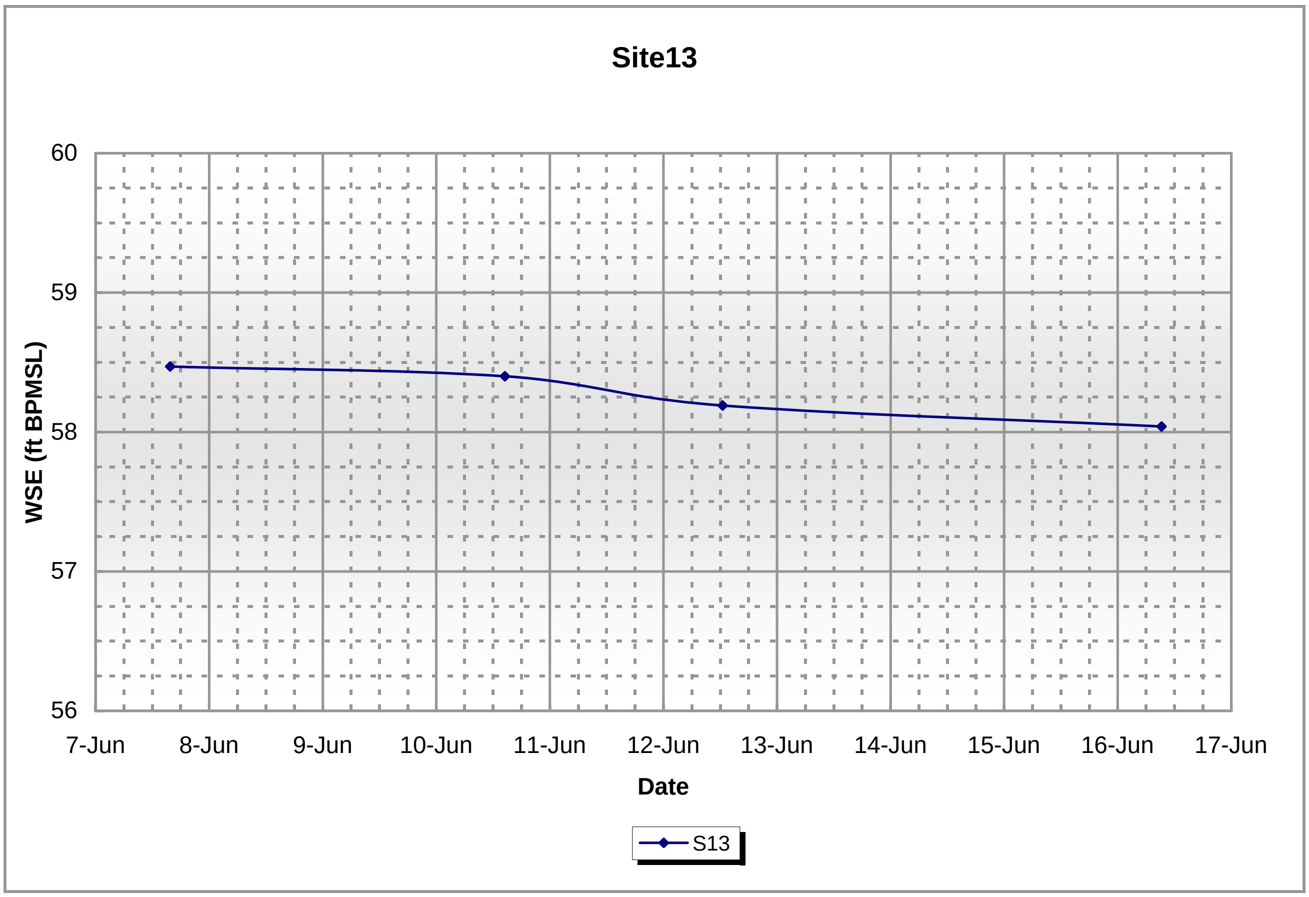


Table 5-21 Site 13

Date and Time	WSE (feet BPMSL) S13	Q (cfs) Q	Observations
6/7/06 3:45 PM	58.47		High water observed the afternoon of June 7.
6/10/06 2:30 PM	58.40		No flow observed in channel.
6/12/06 12:30 PM	58.19		
6/16/06 9:15 AM	58.04		No flow observed in channel.

Notes:

1. Elevations are based on Monument BAKER of 66.82 feet BPMSL, established by LCMF in 2005.
2. No discharge measurement were taken at this site.



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6.0 Colville River Delta Flood and Stage Frequency

This chapter reviews the history and results of a variety of Colville River flood frequency analyses and the design criteria developed based on the results of hydraulic modeling. In addition, this chapter for the first time presents the results of a CRD stage frequency analysis of the CRD. The hydraulic modeling and stage frequency results are then compared.

A variety of CRD flood frequency analyses and surface water elevation predictions have been prepared in support of developing design criteria for the Alpine Development Project. A comparison of the historic spring breakup observations, including those in 2006, was conducted to evaluate established design criteria and to review design criteria for future facilities. This evaluation has been conducted each season after CRD breakup since 2000.

6.1 Colville River Flood Frequency Analysis (History of)

The available record of peak annual discharge and water surface elevation in the CRD is for the most part a result of studies supporting Alpine development. To extend the limited existing record to allow for estimates of low frequency return interval floods of 50 and 200 years, a variety of flood frequency analyses have been conducted several times during the Alpine Development Project.

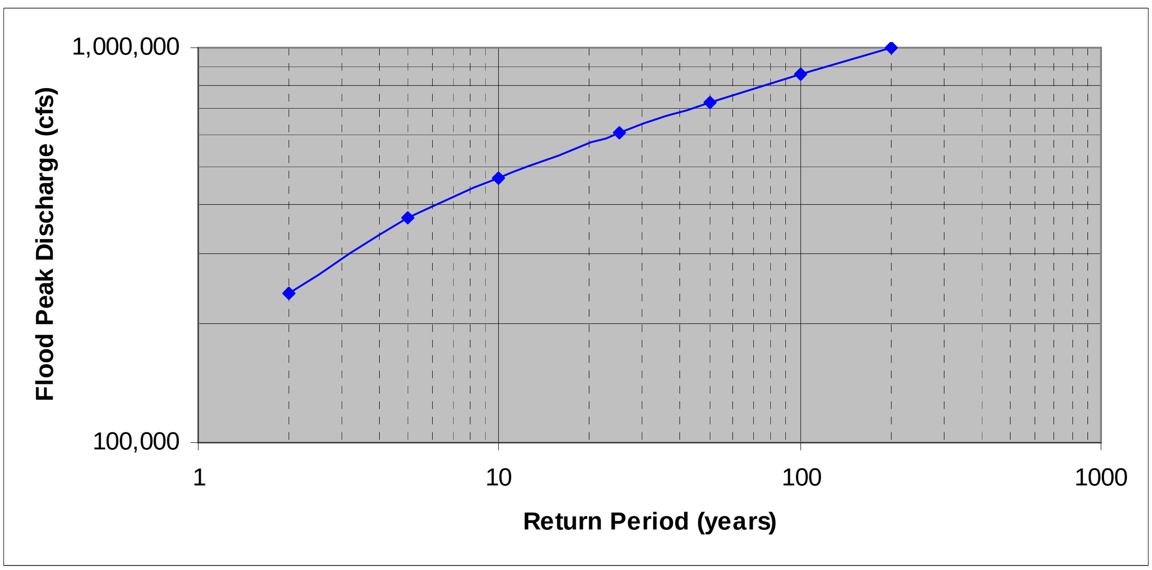
The return intervals for developing design criteria for the Alpine Development Project were established in 1997 as events with a recurrence interval equal to 50 and 200 years. The following flood frequency analyses were prepared in support of the Alpine Development Project.

- In 1996, a flood frequency analysis was conducted based on flood peak discharges for 1962, 1977, 1992, 1993, 1994, 1995, and 1996. The seven years of record were statistically analyzed using a Single Station Flood Frequency Analysis, USGS Regression Equations, and Extrapolation of the Colville River based on Similar Rivers (Shannon & Wilson 1996b).
- In 1998, the flood frequency was updated based on nine years of record for the Colville River and existing flood data for the Kuparuk River and the Sagavanirktok River. The methods used in the 1998 analysis were the same as originally used in the 1996 analysis, but included a longer record (Baker and Shannon & Wilson 1998).
- In September 2002, the Colville River Flood Frequency Analysis was again updated to include additional data including the spring breakup peak discharge through the 2002 season. The results of the updated analysis are presented in Table 6-1 and represent the current regulatory reviewed and accepted design flood peak discharge values for the Colville River. (Baker and Hydroconsult 2002).

Table 6-1 2002 Colville River Flood Frequency Analysis Results

Return Period	Flood Peak Discharge (cfs)
2-year	240,000
5-year	370,000
10-year	470,000
25-year	610,000
50-year	730,000
100-year	860,000
200-year	1,000,000

The 2002 analysis included three additional years of data and a revision of the 1997 peak discharge for the Colville River. A two-station correlation analysis was conducted and the results were compared to the USGS envelope curve (Jones and Fahl 1994). The comparison concluded that a computed 200-year flood for the Colville River of 1,000,000 cfs is *"conservative and there can be little or no hydrologic argument for considering any design values significantly above this magnitude"* (Baker and Hydroconsult 2002). The 2002 flood frequency analysis results are presented in Graph 6-1.



Graph 6-1 2002 Colville River Flood Frequency Analysis Results

6.2 Comparison of Colville River Observed Peak Discharge with 2002 Flood Frequency Predictions (2006 CRD Limited Flood Frequency Analysis)

The CRD estimated peak annual discharge presented in Table 4-2 represents a 15 year continuous record at Monument 1. The historic values estimated and measured to date are lower than the 50- and 200-year flood recurrence intervals (see Graph 6-1/Table 6-1).

To compare this record with the flood frequency predictions prepared in 2002, a limited flood frequency analysis was undertaken. The purpose was not intended to replace the 2002 analysis, but was undertaken as an independent verification of the 2002 analysis. The 1962 and 1977 data was not included in this analysis to limit the review to the continuous record collected in support of the Alpine Development.

6.2.1 Recurrence Interval

A recurrence interval was assigned to each of the annual peak discharge values between 1992 and 2006 using the Weibull plotting position equation (USACE, 1982) shown below:

$$P=m/N+1$$

The Weibull plotting position formula was selected based on the simplicity of the equation and on FEMA recommendations (FEMA 2003). Based on the Weibull plotting position equation, the tabulated 1992-2006 peak annual discharge and recurrence intervals are presented in Table 6-2, ordered by discharge magnitude.

Table 6-2 Colville River Peak Annual Discharge and Recurrence Intervals (1992-2006)

Year	Discharge (cfs)	Probability	Return Period
2000	580,000	0.06	16.0
1993	379,000	0.13	8.0
2004	360,000	0.19	5.3
2006	281,000	0.25	4.0
2001	255,000	0.31	3.2
2002	249,000	0.38	2.7
1995	233,000	0.44	2.3
2003	232,000	0.50	2.0
1998	213,000	0.56	1.8
1999	203,000	0.63	1.6
2005	195,000	0.69	1.5
1997	177,000	0.75	1.3
1994	165,000	0.81	1.2
1992	164,000	0.88	1.1
1996	160,000	0.94	1.1

6.2.2 Probable Peak Annual Discharge for Given Return Periods

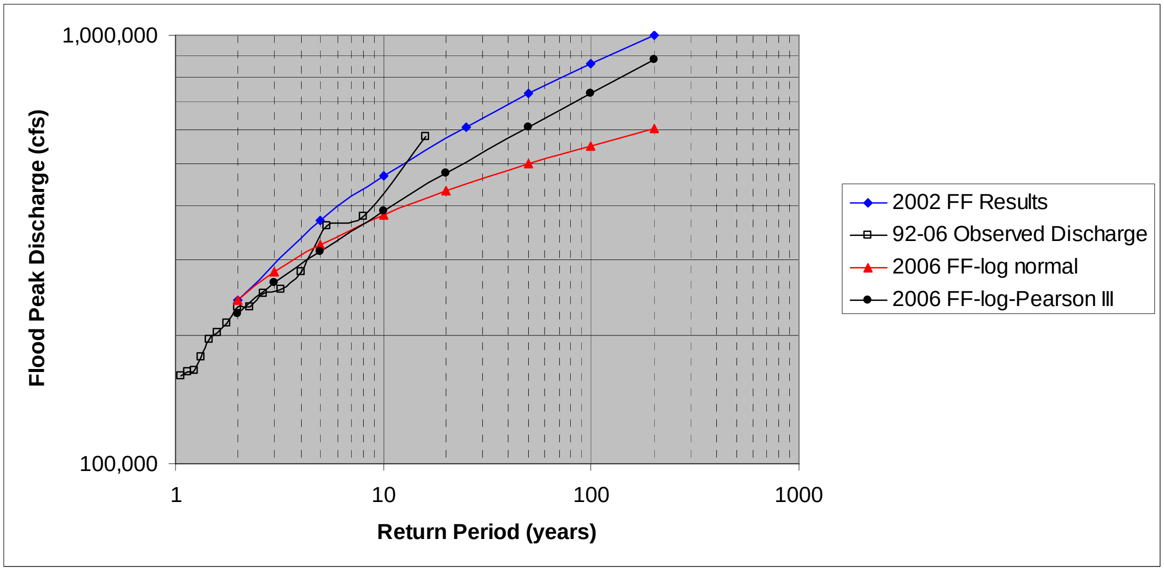
Once the plotting positions of the annual peak discharges were determined using the Weibull equation, HYFRAN hydrologic frequency analysis software (INRS-ETE 2002) was used to calculate the probable peak annual discharge for floods up to a recurrence interval of 200 years. The distributions were calculated using both log-normal and log-Pearson III distributions (USACE 2002 and FEMA 2003). The results are presented in Table 6-3.

Table 6-3 Colville River 2006 Flood Frequency Analysis Results

Year	Probable Peak Annual Discharge (cfs)	
	log-normal	log-Pearson type III
2-year	240,000	224,000
3-year	280,000	264,000
5-year	324,000	313,000
10-year	380,000	388,000
20-year	433,000	475,000
50-year	502,000	611,000
100-year	553,000	734,000
200-year	605,000	878,000

6.2.3 Results Comparison

The 1992-2006 peak discharge recurrence intervals (Table 6-2), 2002 flood frequency results (Table 6-1), and the 2006 flood frequency analysis results (Table 6-3) are presented in Graph 6-2. The 2006 analyses which included an additional four years of data support the 2002 conclusion that the flood frequency value for a 200-year flood is conservative. All observed annual peak discharge values for the Colville River between 1992 and 2006 plot below the 2002 Flood Frequency Analysis Results curve, with the exception of the 2000 peak discharge estimate. In addition, the 2002 flood frequency results are each greater in magnitude than the computed 2006 flood frequency values for either a log-normal or log-Pearson III extrapolation.



Graph 6-2 Colville River Flood Frequency Analysis Comparison

Review of Graph 6-2 suggests that the peak annual discharge for all breakup flood events between 1992 and 2006 was less than the 2002 predicted values presented in Table 6-1, with the exception of the year 2000. One potential explanation for the differences between the 2002 flood frequency results and this 2006 extrapolation is that the 1962 and 1977 flood events were considered in 2002, but were not considered in the 2006 analysis. While the 1962 and 1977 flood data is not as available as the results from the Alpine Development investigations, it is usually better to include all historical data rather than to exclude it. For this reason the results of the 2002 flood frequency analysis are accepted rather than the results of the 2006 limited flood frequency analysis.

Another explanation is that the majority of the peak annual discharge values developed for the Colville River in support of the Alpine Development are estimates based on indirect calculations (exceptions are the 2006 direct discharge measurement and the 2001, 2002, 2003, and 2005 discharge values, which were based on the Monument 1 rating curve). However, the 2002 Flood Frequency Analysis was also based on discharge data derived using estimated indirect calculations.

The 2002 Flood Frequency Analysis estimated annual peak discharge values are consistently greater than the discharge values observed between 1992 and 2006. This suggests that the discharge estimates used to define the Alpine Development Project criteria are valid and conservative values. There is no justification to modify the results of the 2002 analysis and the 2002 conclusions are therefore reasonable and validated for the purpose of establishing conservative design criteria for Alpine.

6.3 Colville River Delta 2 Dimensional Surface Water Model

The Colville River Delta 2 dimensional surface water model was initially developed in 1997 as a method to estimate the water surface elevation and velocity at the locations of proposed Alpine Development Project facilities for design flood conditions. After an evaluation of options including normal depth analysis, 1 dimensional modeling, and 2 dimensional Finite Element Surface Water Modeling System (FESWMS), the 2-dimensional FESWMS model was selected based on the complexity of the CRD and the accuracy of the analysis method. The 2-dimensional open water FESWMS model (2D open water model) has undergone the following development:

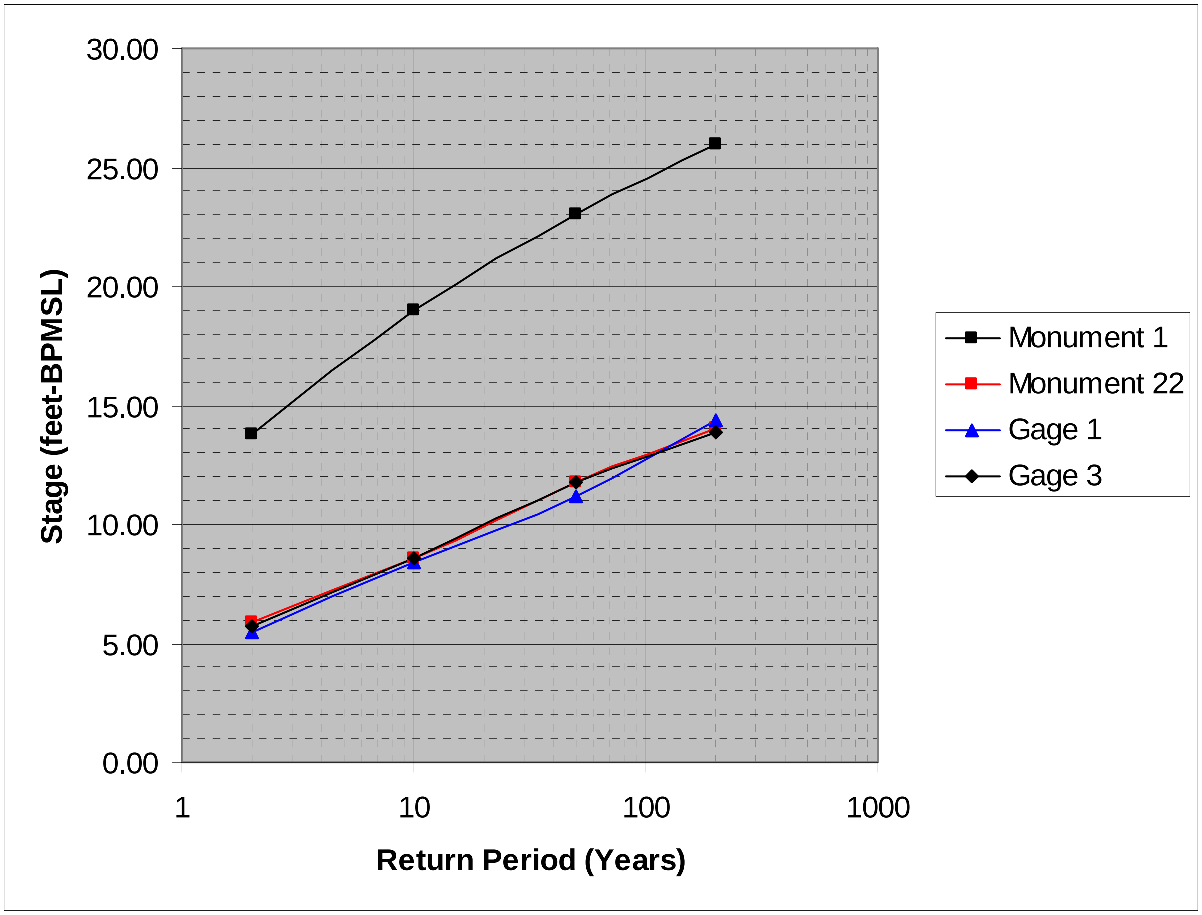
- The 2D open water model was originally developed in 1997 to predict peak water surface elevations and velocities for 50-, 100-, and 200-year flood events as part of the original Alpine facilities at CD1 and CD2 (Shannon & Wilson 1997).
- In the fall of 1997, field surveys conducted in the area of the proposed Alpine facilities identified discrepancies for a portion of the ground surface elevations used to develop the original finite element mesh. Consequently, the ground surface elevations of the finite element mesh and model input data were refined and improved to match the 1997 field surveys (Baker 1998b).The results from this analysis became the hydraulic design basis for the CD1 and CD2 facility designs.
- In 2002, the model was again updated to incorporate the proposed CD3 and CD4 satellite developments. Model runs for the 10-, 50-, and 200-year return events were completed. Modifications to the model included new topography at the CD3 and CD4 facility locations and modifications to the mesh to include the proposed facilities at CD3 and CD4. Topography changes were made only on the floodplains and no channel modifications were made (Baker 2002a.). The results from this analysis became the hydraulic design basis for the CD3 and CD4 facility designs.
- In 2006, the model was again updated to include as-built alignment conditions along the CD4 road and pad. This 2006 model update is the hydraulic basis for the 2006 flood analysis and used for comparisons between the observed floods (1992 – 2006) and the water surface elevations predicted by the 2D open water model. The 2D open water model predictions are presented in Table 6-4.

  Additional modifications in 2006 also included the addition of the proposed CD5 Nigliq Bridge located to west of the CD2 pad. The updates to the model included an updated bridge location, modified road alignment, and the inclusion of 2005 survey data at the new bridge location (Baker 2006b). The results from this analysis became the hydraulic design basis for the CD5 facility design criteria.

Table 6-4 Colville River Delta 2D Model Predicted Water Surface Elevations

Observed Site	2D Model Predicted Water Surface Elevation based on open water conditions (feet-BPMSL)			
	2-year	10-year	50-year	200-year
Colville River - East Channel				
Monument 1	13.80	19.00	23.00	26.00
Monument 9 (HDD)	11.00	15.80	18.90	21.00
Helmricks	3.80	5.30	5.90	6.30
Colville River - Nigliq Channel				
Monument 20	7.80	11.30	14.40	16.50
Monument 22	5.90	8.60	11.80	14.00
Monument 23	4.90	7.00	10.10	12.10
Monument 28	3.10	3.30	3.70	4.40
Paleo East	*5.30*	*7.90*	11.10	13.10
Paleo West	*5.50*	*8.10*	11.20	13.20
CD1 Pad				
Gage 1	5.50	8.40	11.20	14.40
Gage 9	6.70	9.70	11.10	15.30
Gage 10	6.70	9.70	12.80	15.30
CD2 Pad				
Gage 8	*5.40*	8.80	10.70	12.40
CD3 Pad				
Gage 11	3.80	6.20	6.80	7.50
Gage 12	4.50	6.20	6.90	7.90
CD4 Pad				
Gage 19	7.20	11.00	14.10	16.40
Gage 20	7.20	10.70	13.80	15.90
CD2 Road				
Gage 3	5.70	8.60	11.80	13.90
Gage 4	5.10	7.60	9.90	11.80
Gage 6	*6.40*	8.80	11.90	14.10
Gage 7	*5.00*	8.60	9.80	11.80
CD3 Pipeline				
Crossing #2 (SAK) Gage	4.90	8.40	11.10	12.80
Crossing #4 (TAM) Gage	5.80	8.30	9.20	9.90
Crossing #5 (ULAM) Gage	4.40	7.10	7.90	8.70
CD4 Road				
Gage 13	6.60	9.90	12.90	15.40
Gage 14	6.40	9.20	12.10	14.20
Gage 15	6.60	9.90	12.90	15.40
Gage 16	6.60	10.10	13.70	15.80
Gage 17	7.20	10.40	13.70	15.80
Gage 18	6.60	11.00	14.40	16.60

The 2D open water model was developed to predict conditions during low frequency, high magnitude flood events such as the 50-, 100-, and 200-year recurrence interval floods. However, to present the relationship between stage and discharge for the open water conditions for lower magnitude flood events, 2-year and 10-year model results have also been developed. The model is based on open water, steady state conditions and does not account for snow, channel ice, or ice jams. Graph 6-3 presents predicted water surface elevations for selected CRD locations for 2-year, 10-year, 50-year, and 200-year floods.



Graph 6-3 Colville River Delta 2D Model Predicted Water Surface Elevations vs. Return Period

The water surface elevation predictions of the 2D open water model will generally be lower than observed water surface elevations during small magnitude flood events (less than 50-year return interval) when channel ice and snow are present in the CRD. And indeed, the observed water surface elevations during small flood events between 1998 and 2006 have been typically higher than the model predictions. As discussed in Section 6.2, all of the observations of spring breakup in the CRD are for flood conditions of lower magnitude than the 50-year and 200-year flood recurrence interval and were to some extend influenced by the presence of ice. This condition during low magnitude floods was anticipated during the development of the 2D open water model as the influences of ice in the CRD is greatest during these low magnitude floods.

Because the 2D model does not take into consideration the impacts of ice and snow, a more representative means was needed to predict and assign return periods to water surface elevations in the CRD for small magnitude flood events. Furthermore, ice-influenced flood stage is primarily influenced by the ice regime, thus ice-induced flooding must be analyzed based on stage frequency (USACE 1991). To accurately compare the 2D open water model with observations in the CRD, a stage frequency analysis was conducted. It is discussed in the next section.

6.4 Colville River Delta Stage Frequency Analysis

The CRD stage record was used to develop a stage frequency relationship in the CRD based on historical flood events. The stage frequency analysis can be used to evaluate and validate the predictions of the 2D open water model. Since the 2006 spring breakup monitoring represented the 15th consecutive season of monitoring breakup for Alpine in the CRD, an adequate stage record exists to develop a stage frequency analysis. The following analysis was completed using frequency analysis methods for ice jam floods outlined in the Hydrology of Floods in Canada, A Guide to Planning and Design (NRCC 1989).

6.4.1 Existing Annual Peak Stage Records in the CRD

Water surface elevations at most locations have been monitored throughout the CRD in support of Alpine development since 1992. The locations and distribution of monitoring sites has varied based on the objectives of the field program each year, but has included Monument 1 since 1992 and Monument 22 and Gages 1 and 3 since 1998. Table 6-5 presents the observed peak water surface elevations in the CRD between 1992 and 2006 for these locations. Based on a review of the annual breakup observations between 1992 and 2006 at these locations, each peak water surface elevation was impacted by either ice jams within the CRD or the presence of over-winter low channel ice in the channels. Because of this, the stage frequency analysis did not include the free-flow open water flooding condition and was limited to the ice impacted conditions experienced during the spring.

Table 6-5 1992-2006 Historical Colville River Delta Observed Peak Stage (WSE)

Year	WSE (feet-BPMSL)				Reference
	Mon 1	Mon 22	Gage 1	Gage 3	
2006	19.49	9.95	9.29	9.72	This report
2005	13.18	7.65	4.46	6.48	Baker 2005
2004	19.54	10.17	8.88	9.97	Baker 2004
2003	13.76	7.02	6.07	6.31	Baker 2003
2002	16.87	7.94	7.68	7.59	Baker 2002
2001	17.37	8.80	6.95	7.95	Baker 2001
2000	19.33	9.58	9.10	9.48	Baker 2000
1999	13.97	5.89	4.64	5.79	Baker 1999
1998	18.11	10.20	9.51	8.02	Baker 1998
1997	15.05	NR	NR	NR	Baker 1999
1996	17.19	NR	NR	NR	Shannon & Wilson 1996
1995	14.88	NR	NR	NR	Shannon & Wilson 1996
1994	12.20	NR	NR	NR	ABR 1996
1993	19.20	NR	NR	NR	ABR 1996
1992	13.90	NR	NR	NR	ABR 1996
Notes: NR = No Record					

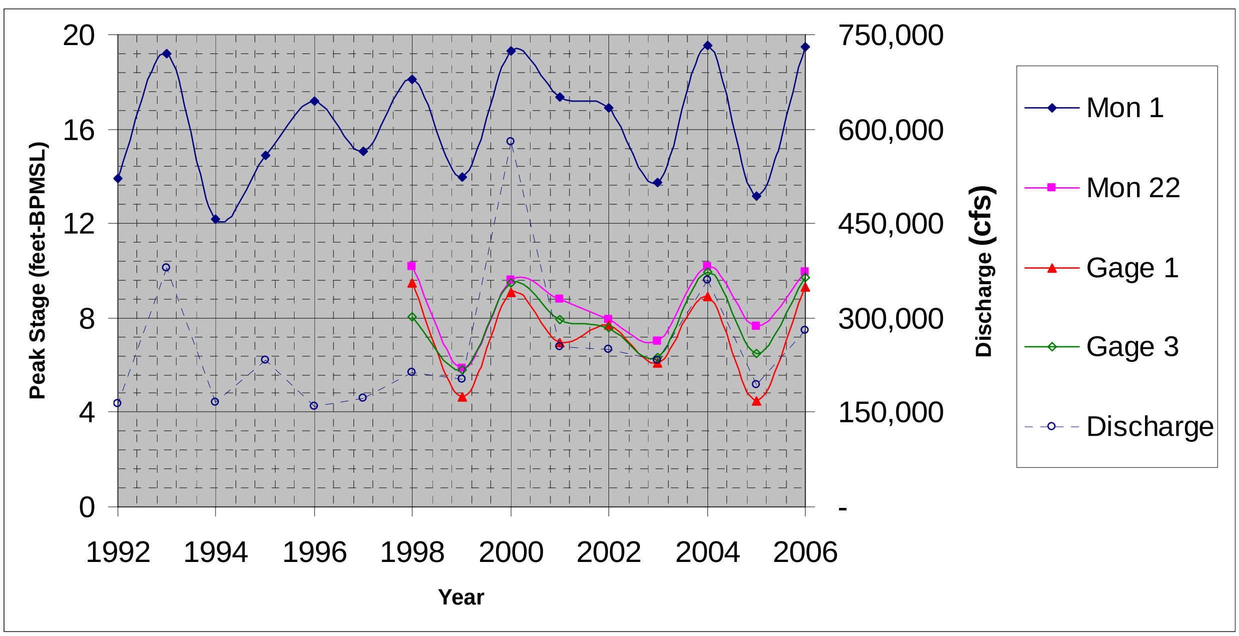
The sites were selected based on the available record for water surface elevation observations since 1992, and to represent the location of existing and proposed facilities. A further explanation of each monitoring location is presented below:

- Monument 1 is located upstream of the CRD on the only reach of the Colville River where all major tributaries flow in a single channel. Annual peak water surface elevations at this location are important as they generally represent flow magnitude and water level conditions of the Colville River and CRD. Monument 1 is located upstream of the hydraulic influences of Alpine.
- Monument 22 is located on the Nigliq Channel one mile south of CD2. Annual peak water surface elevations at this location are important as they generally represent water level conditions of the Nigliq Channel near Alpine and is located upstream of the potential hydraulic influences of Alpine.
- Gage 1 is located on the Sakoonang Channel directly east of Alpine. Annual peak water surface elevations at this location are important as they generally represent water level conditions of the Sakoonang Channel near Alpine. Due to the absence of obstructions in the Sakoonang Channel, Gage 1 is located without potential hydraulic influences due to Alpine.
- Gage 3 is located on the upstream side of the CD2 road in the swale region north of Nanuq Lake. Annual peak water surface elevations at this location are important as they generally represent conditions on the upstream s1ide of the CD2 road near Alpine. Stage at this location is hydraulically influenced by the presence of the CD2 road. The observations at this site in 1998 and 1999 are non-

representative of current conditions since the swale road between the 62-foot and 452-foot bridges was not constructed until 2000.

The observations of peak water surface elevations in the CRD between 1992 and 1997 were recorded prior to any gravel facility construction in the Alpine region. At the time of the 1998 breakup, Alpine facilities were comprised of CD1 pad and airstrip. During the 1999 breakup, Alpine facilities also included the CD2 pad and CD2 road less the segment of CD2 road between the swale bridges. At the time of the 2000 through 2004 breakups, Alpine facilities were also comprised of the segment of CD2 road between the swale bridges. Finally, during the 2005 and 2006 breakup, Alpine facilities also consisted of the CD3 pad and CD4 road and pad.

The CRD 1992 through 2006 observed peak annual stage and the Monument 1 peak annual discharge are presented in Graph 6-4. With the exception of the 1998 and 1999 observations at Gage 3, all of the recorded water surface elevations are generally based on the CRD hydraulic conditions observed in 2005 and 2006 which include the CD1, CD2, CD3, and CD4 facilities. The current CRD hydraulic conditions assume that the CD3 and CD4 facility construction has not significantly altered the distribution of flow or the annual peak water surface elevations in the Alpine region. With the exception of localized elevation of stage near the CD4 pad in 2006, this assumption has been generally verified.



Graph 6-4 Colville River Delta Observed Peak Stage and Discharge vs. Year

With few exceptions, the stage in the Alpine region at Monument 22, Gage 1, and Gage 3 is directly related to the stage at Monument 1. However, there is not a good relationship between stage at each of the monitoring sites in the CRD and discharge at Monument 1. This poor relationship between stage in the CRD and discharge at Monument 1 is primarily due to the influences of ice and snow in the CRD during the observed spring breakup events between 1998 and 2006. Another potential explanation for the poor relationship to discharge is, with the exception of the 2006 direct discharge measurement and the 2001, 2002, 2003, and 2005 estimates of discharge based on the Monument 1 rating curve, the majority of the peak annual discharge estimates for the Colville River are based on indirect calculations.

Because of the conditions in the CRD during spring breakup and the nature of the methods used to estimate and measure discharge in the CRD during spring breakup, a degree of uncertainty is associated with each annual estimate of peak discharge. Since the historical relationship of stage in the CRD is the primary consideration, a stage frequency relationship is a useful means of evaluating the historical record.

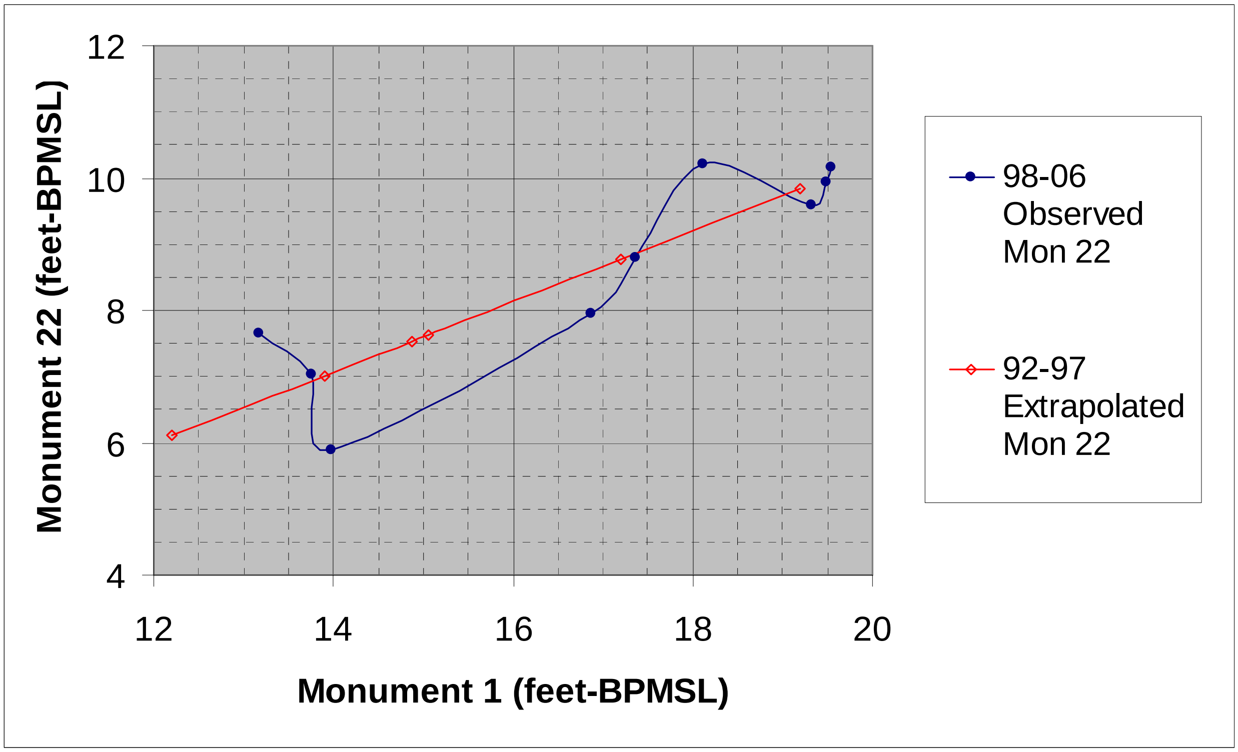
6.4.2 Peak Water Surface Elevation Extrapolation

The recorded annual peak stage at Monument 22 and Gage 1 between 1998 through 2006 and at Gage 3 between 2000 and 2006 represent the current configuration at Alpine. These annual peak water surface elevation records for Monument 22, Gage 1, and Gage 3 were extrapolated back to 1992 based on their relationship with annual observations at Monument 1. Line equations were created based on a comparison with each location's annual peak water surface elevation to Monument 1. An independent line of best fit was developed for each data set. The linear equations used for Monument 20, Gage 1, and Gage 3 are presented in Table 6- along with the extrapolated annual peak water surface elevations back to 1992.

Table 6-6 Extrapolated CRD Peak Water Surface Elevations Based on Monument 1

Year	WSE (feet-BPMSL)			
	Mon 1	Mon 22	Gage 1	Gage 3
1999	*13.97*	**-**	-	**6.50**
1998	*18.11*	**-**	-	**8.79**
1997	*15.05*	**7.62**	**6.11**	**7.09**
1996	*17.19*	**8.76**	**7.64**	**8.28**
1995	*14.88*	**7.53**	**5.98**	**7.00**
1994	*12.20*	**6.10**	**4.06**	**5.52**
1993	*19.20*	**9.83**	**9.09**	**9.39**
1992	*13.90*	**7.01**	**5.28**	**6.46**
Linear Equations	-	y = 0.5324x-0.3914	y = 0.7186x-4.7087	y = 0.553x-1.2297

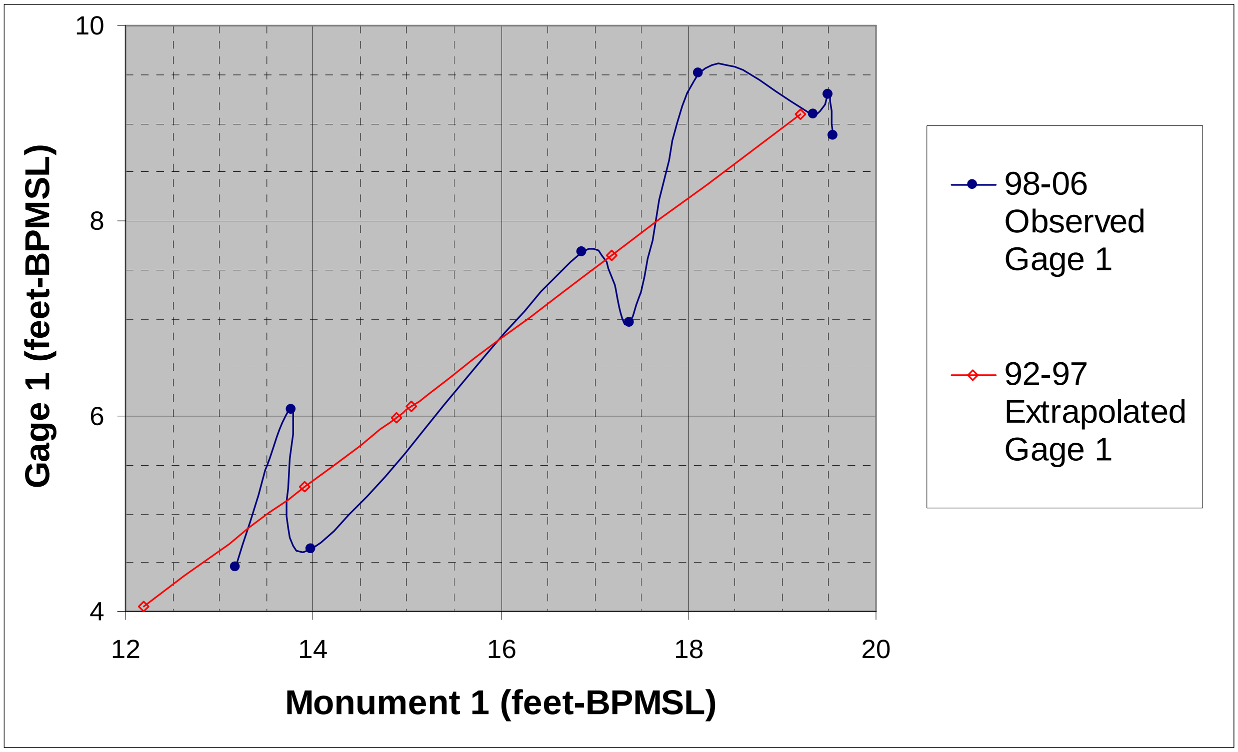
Graph 6-5 presents the comparison of the observed and extrapolated water surface elevations for Monument 22 with respect to Monument 1. For the 1998-2006 record, the maximum and average absolute value difference between the line equation results and the observed annual peak water surface elevations at Monument 22 are 1.2 feet and 0.3 feet respectively.



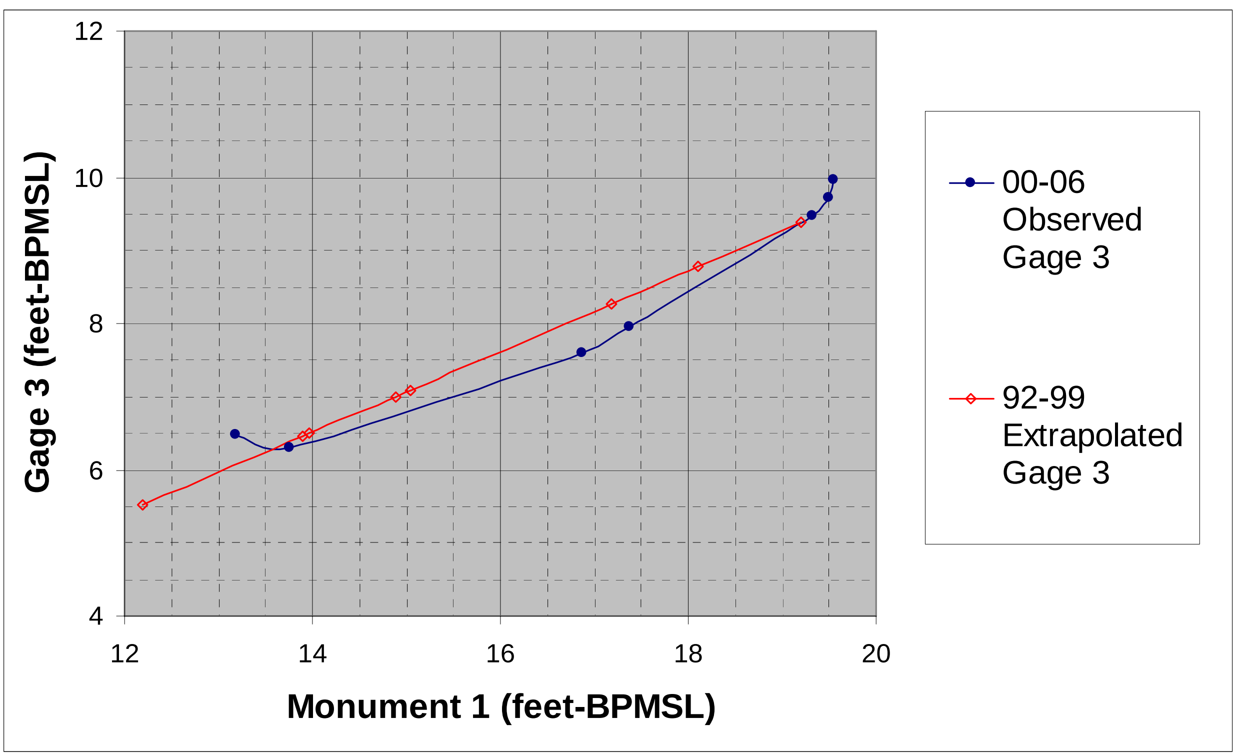
Graph 6-5 Monument 22 Extrapolated Water Surface Elevations vs. Monument 1

Graph 6-6 presents the comparison of the observed and extrapolated water surface elevations for Gage 1 with respect to Monument 1. For the 1998-2006 record, the maximum and average absolute value difference between the line equation results and the observed annual peak water surface elevations at Gage 1 are 1.2 feet and 0.5 feet respectively.

Graph 6-7 presents the comparison of the observed and extrapolated water surface elevations for Gage 3 with respect to Monument 1. For the 2000-2006 record, the maximum and average absolute value difference between the line equation results and the observed annual peak water surface elevations at Gage 3 are 0.5 feet and 0.3 feet respectively.

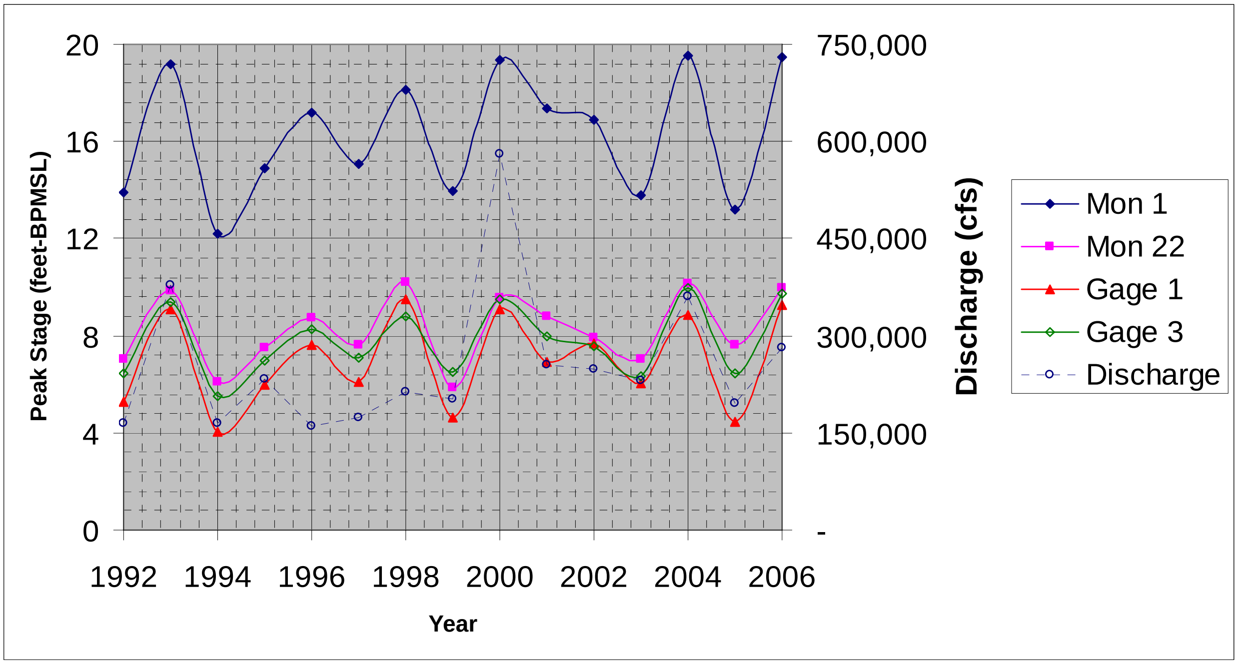


Graph 6-6 Gage 1 Extrapolated Water Surface Elevations vs. Monument 1



Graph 6-7 Gage 3 Extrapolated Water Surface Elevations vs. Monument 1

Based on a comparison of the extrapolated data at Monument 22, Gage 1, and Gage 3, the extrapolated peak water surface elevation for any single observation is likely to represent the actual stage observed at each of the three locations within approximately one foot. However, the extrapolated data are just as likely to represent the average actual observed stage at each site within approximately 0.5 feet and so it is acceptable to apply the extrapolated data back to 1992. A stage frequency relationship was developed to compare the observations in the CRD to the predictions of the 2D open water model. A graph of the observed and extrapolated annual peak water surface elevations compared to discharge between 1992 and 2006 are presented in Graph 6-8.



Graph 6-8 Colville River Delta Observed and Extrapolated Peak Stage and Discharge vs. Year

As was found to be the case between 1998 and 2006, there is not a good relationship between peak annual discharge at Monument 1 and peak annual stage in the CRD. However, the relationship between peak annual stage in the Alpine region is relatively consistent to the observed peak annual stage at Monument 1. This historical stage relationship allows for establishment of recurrence intervals for each flood between 1992 and 2006.

6.4.3 Recurrence Interval of Annual Peak Water Surface Elevations in CRD

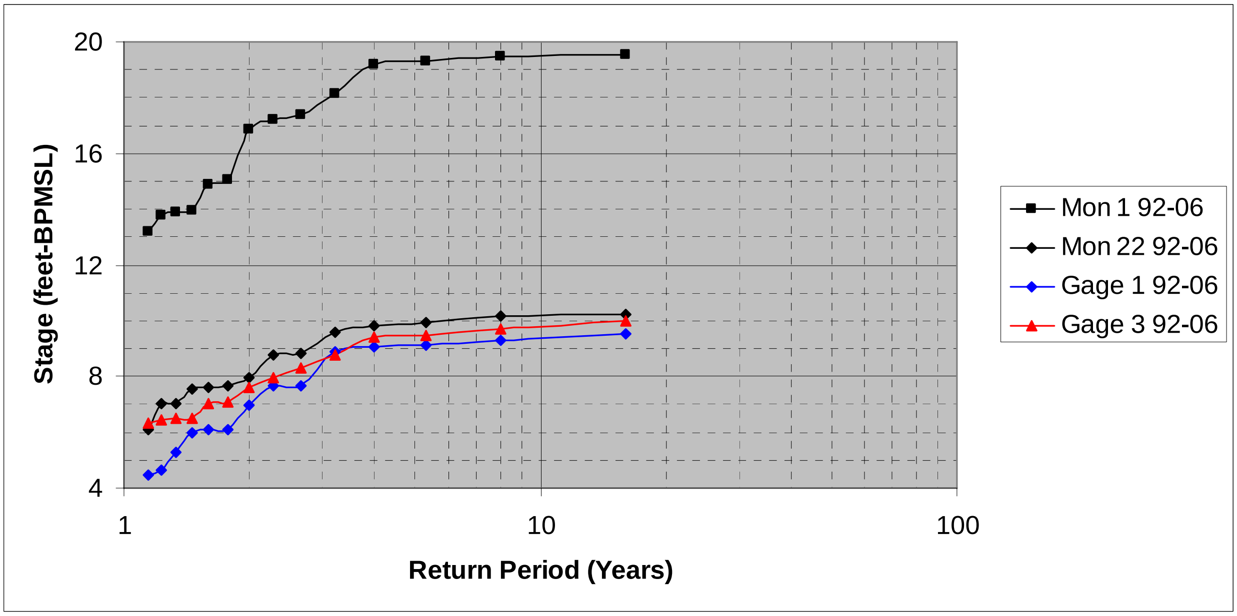
Using the extrapolated and observed annual peak water surface elevation data for the 15-year record between 1992 and 2006, a recurrence interval was assigned to each peak annual stage at the four CRD locations using the Weibull plotting position equation.

The peak water surface elevation and recurrence intervals were calculated using similar exceedence probability techniques used for the 1992 to 2006 discharge record (NRCC 1989), and the results are presented in Table 6-7. Since each annual peak water surface elevation is the result of a breakup-type jam, a single tabulation has been developed for the ice-impacted condition rather than separate frequency curves for the ice jam events and the open water non-ice impacted free-flow events (FEMA 2003). The shaded values represent extrapolated estimates of stage, while the non-shaded values represent observed peak annual water surface elevations.

Table 6-7 Observed and Extrapolated Annual Peak Water Surface Elevations and Recurrence Intervals

Year	Mon 1		Mon 22		Gage 1		Gage 3	
	Stage (feet-BPMSL)	Return Period (years)	Stage (feet-BPMSL)	Return Period (years)	Stage (feet-BPMSL)	Return Period (years)	Stage (feet-BPMSL)	Return Period (years)
2006	**19.49**	8	**9.95**	5	**9.29**	8	**9.72**	8
2005	**13.18**	1	**7.65**	2	**4.46**	1	**6.48**	1
2004	**19.54**	16	**10.17**	8	**8.88**	3	**9.97**	16
2003	**13.76**	1	**7.02**	1	**6.07**	2	**6.31**	1
2002	**16.87**	2	**7.94**	2	**7.68**	3	**7.59**	2
2001	**17.37**	3	**8.80**	3	**6.95**	2	**7.95**	2
2000	**19.33**	5	**9.58**	3	**9.10**	5	**9.48**	5
1999	**13.97**	1	**5.89**	1	**4.64**	1	6.50	1
1998	**18.11**	3	**10.20**	16	**9.51**	16	8.79	3
1997	**15.05**	2	7.62	2	6.11	2	7.09	2
1996	**17.19**	2	8.76	2	7.64	2	8.28	3
1995	**14.88**	2	7.53	1	5.98	1	7.00	2
1994	**12.20**	1	6.10	1	4.06	1	5.52	1
1993	**19.20**	4	9.83	4	9.09	4	9.39	4
1992	**13.90**	1	7.01	1	5.28	1	6.46	1
Average	**16.27**		**8.27**		**6.98**		**7.77**	

A physical upper limit is evident at each of the four CRD monitoring locations reviewed in this analysis as presented in Graph 6-9. The physical upper limit is defined as the water surface elevation at which point the ice spills over the floodplain, the blockage is relieved, and there is little potential for further rise (NRCC 1989). At Monument 1, this physical upper limit is approximately 19.5 feet, and in the Alpine vicinity, the physical upper limit is between approximately 9.5 and 10.5 feet. A review of the topography at each location confirms that the bank elevations correspond with these physical upper limits.



Graph 6-9 CRD Observed Peak Annual Water Surface Elevations 1992-2006

6.4.4 Stage Frequency Analysis CRD

Based on USACE and FEMA guidelines, it is generally considered risky to extrapolate stage data for a river impacted by ice beyond the observed record (USACE 2002 and FEMA 2003). In the case of the CRD, the observed record is 15 years and stage has been demonstrated to be impacted by ice during each spring breakup event. However, and only for the purpose of comparing the observations between 1992 and 2006 with the 2D open water model, extreme value statistical analysis was used to extend the record to 50 years, or 3.3 times the record length.

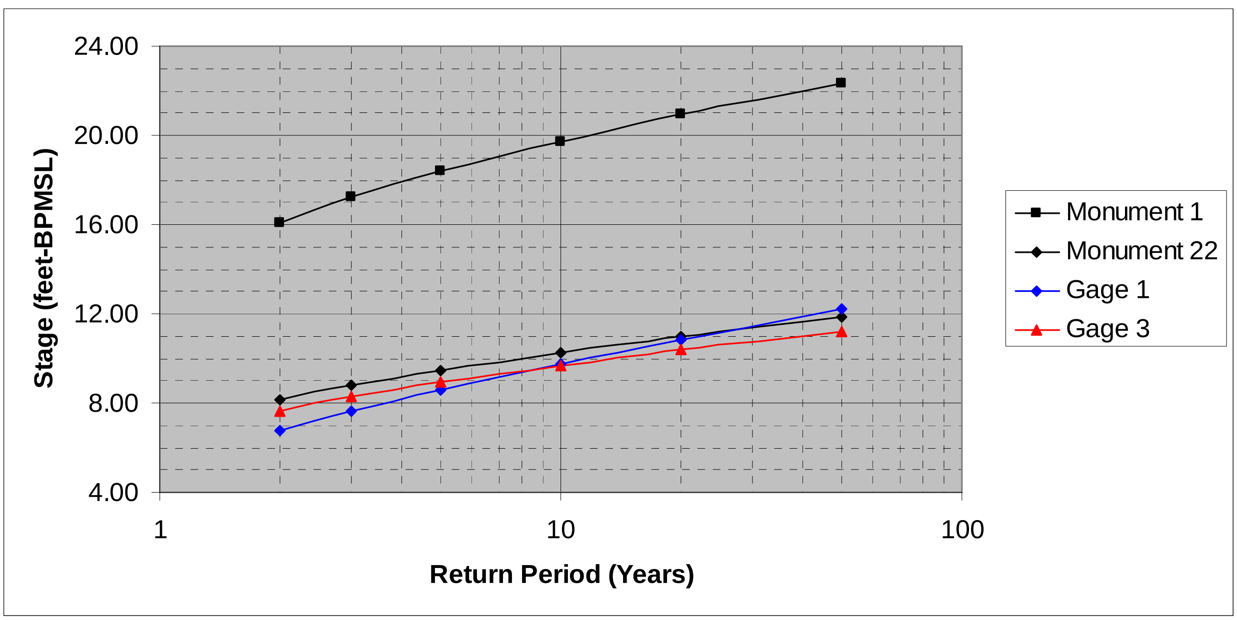
Although the development of flood predictions is risky for rivers such as the Colville River prone to ice jams due to variability in stage, the objective of this analysis is not to redefine the Alpine design criteria which was established based on the 2D open water model; rather, this analysis is intended to supplement this criteria specifically for low magnitude ice-impacted flood events similar to the events observed between 1992 and 2006.

Once the plotting positions of the annual peak water surface elevations were determined using the Weibull equation, HYFRAN hydrologic frequency analysis software (INRS-ETE 2002) was used to calculate the probable peak water surface elevations for floods. The distributions were calculated using both log-normal and log-Pearson III distributions (USACE 2002 and FEMA 2003). The probable peak water surface elevations are presented in Table 6-8. In all cases for the 50-year flood events, the log-normal results provided higher values when compared to the log-Pearson III results. The more conservative log-normal results are accepted.

Table 6-8 CRD Stage Frequency Analysis Results

Return Period (years)	Stage (feet-BPMSL)							
	Mon 1		Mon 22		Gage 1		Gage 3	
	log Normal	log Pearson III	log Normal	log Pearson III	log Normal	log Pearson III	log Normal	log Pearson III
2	16.08	16.17	8.15	8.23	6.73	6.85	7.65	7.65
3	17.22	17.31	8.81	8.88	7.62	7.73	8.28	8.30
5	18.40	18.42	9.49	9.51	8.58	8.61	8.94	8.94
10	19.74	19.66	10.28	10.21	9.75	9.62	9.70	9.69
20	20.92	20.72	10.98	10.79	10.83	10.48	10.38	10.35
50	22.34	21.94	11.83	11.45	12.19	11.49	11.19	11.16

The results of the log-normal statistical extrapolation of the historical record of the CRD are presented in Graph 6-10. These results do not take into consideration the physical upper limit which exists at Monument 1 and at Alpine. However, based on the extrapolation of peak annual stage at Monument 22, Gage 1, and Gage 3, the difference between the extrapolated peak water surface elevations for the Alpine region is generally less than one foot for flood events with a recurrence interval equal to or less than 50-years.



Graph 6-10 CRD Stage Frequency Analysis Results – log-normal

6.4.5 Stage Frequency Compared to 2D Open Water Model Results

OBSERVED FLOOD EVENTS COMPARED TO 2D OPEN WATER MODEL (1992-2006)

Based on a linear comparison of the 2D open water model results and the results of the Weibull plotting position stage analysis at the four locations reviewed during this analysis, the 2D open water model has as expected predicted lower stage for the majority of the floods observed between 1992 and 2006. A tabulation of the average difference between the 2D open water model predictions and the observed water surface elevations are presented in Table 6-9.

Table 6-9 Average Difference between 2D Open Water Model Predictions and Observed Stage 1992-2006

Range of Return Period (years)	(feet)			
	Mon 1	Mon 22	Gage 1	Gage 3
Greater than 10	0.1	-1.1	-0.7	-0.9
Between 2 to 10	-3.2	-2.7	-2.2	-2.3
Less than 2	-0.5	-1.3	0.0	-1.0

The 2D open water model has, on average, predicted a lower water surface elevation than was observed in the Alpine region for floods with recurrence intervals of less than 2 years and greater than 10 years by approximately one foot. For floods with recurrence intervals equal to or greater than a 2-year but less than a 10-year recurrence interval, the 2D open water model has, on average, predicted a lower stage than was observed in the Alpine region by approximately 2.5 feet.

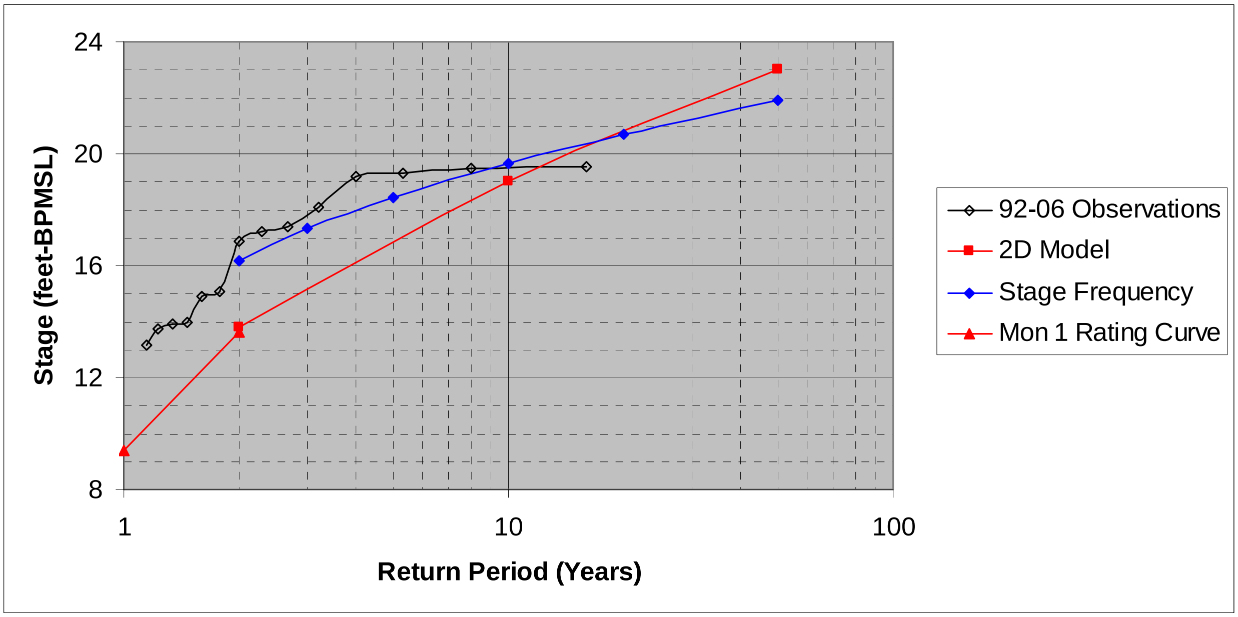
Some differences in observations are to be expected for the lower magnitude ice impacted floods between 1992 and 2006. The 2D open water model is based on free-flow open water conditions and each of the observed peak spring breakup water surface elevations were impacted by ice and snow. A portion of the differences can be attributed to the interpolation of data between 1992 and 1997 and the linear interpolation of the results of the 2D open water model between the 2-, 10-, and 50-year return intervals. However, the magnitude of the differences between the 2d open water model and the results of the stage frequency analysis decrease as the recurrence interval increases. This is due to the physical upper limits of within the CRD and the reduction in the hydraulic influences of snow and ice in the CRD as the stage increases. It is for the relatively high discharge and high stage conditions that the 2D open water model was originally intended.

Therefore, this analysis has demonstrated that for observed flood events in the Alpine region with a recurrence interval of greater than 10 years, the 2D open water model is likely to predict water surface elevations within approximately one foot of observed stage. For observed lower magnitude flood events in the Alpine region, the 2D open water model is likely to predict water surface elevations within approximately 2.5 feet of observed stage.

PREDICTED FLOOD EVENTS UP TO 50-YEAR RETURN INTERVAL COMPARED TO 2D OPEN WATER MODEL

Comparisons of the results of the Monument 1 log-normal stage frequency analysis are presented in Graph 6-11. Based on this comparison at Monument 1, the 2D open water model and the Monument 1 rating curve have predicted a lower peak stage for each low magnitude flood observed between 1992 and

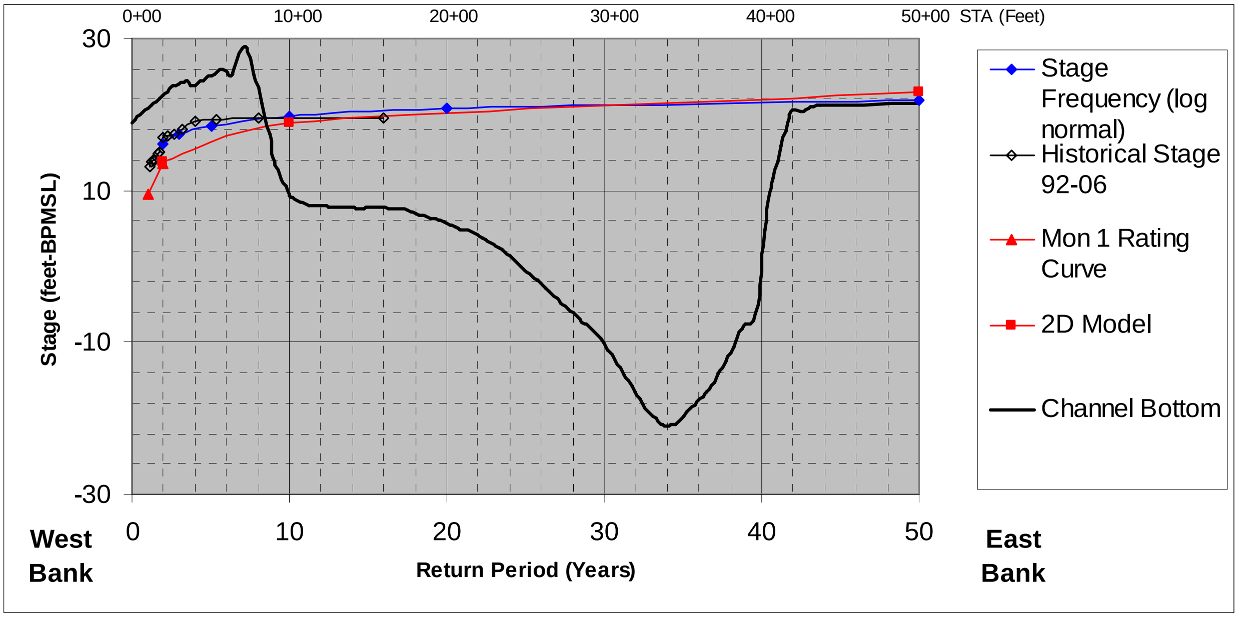
2006, but have also predicted a higher stage for floods with a return interval greater than 22 years. In addition, the observed 16-year stage at Monument 1, near the physical upper limit, is lower than the predictions of the 2D open water model and the stage frequency analysis.



Graph 6-11 Monument 1 Stage Frequency Results Compared with 2D Open Water Model Results

The difference in the relationship between stage and discharge at Monument 1 for open water and ice-impacted conditions is apparent in the difference between the 1992-2006 observations compared to the Monument 1 rating curve and the 2D open water model. This relationship was also demonstrated by the results of the discharge measurements collected in 2006 which are presented with Graph 4-1. The open water 2D model and the Monument 1 rating curve accurately predicted the stage for the open water flow conditions observed on June 1, 2006. However, for the flow conditions between May 29 and May 31, the effects of ice in the CRD caused the stage to reach elevations greater than would be expected for open water conditions based on either the open water Monument 1 rating curve or the open water 2D model.

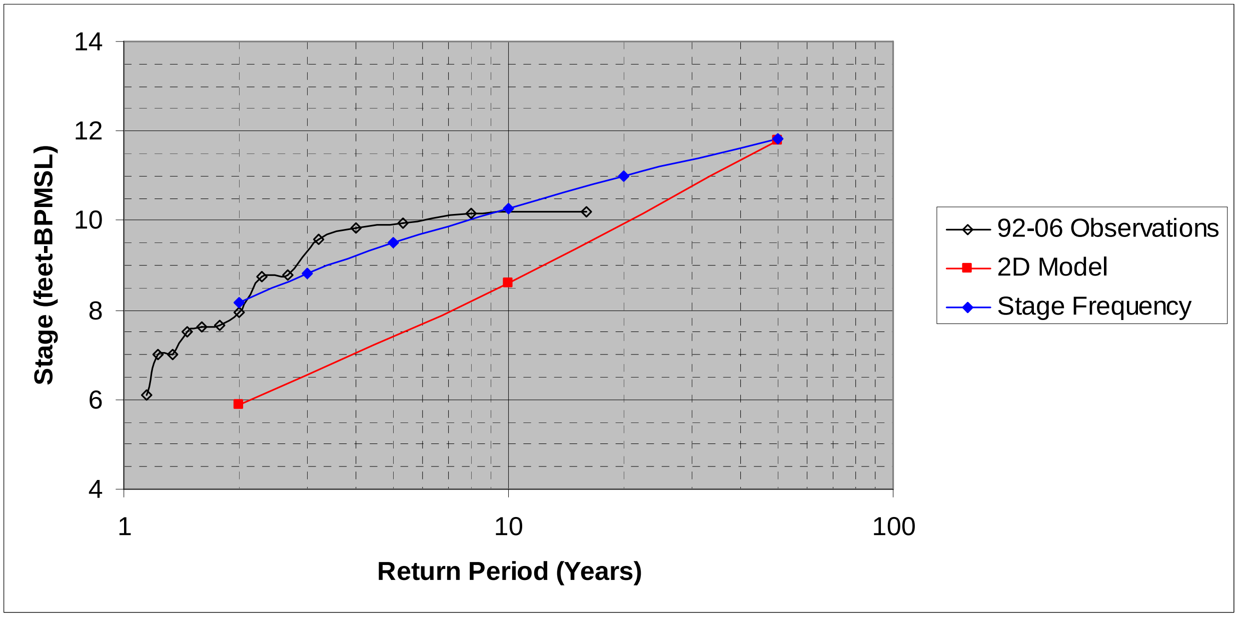
For either the open water or ice-impacted condition, the physical upper limit at Monument 1 is a result of the widening floodplain as represented in Graph 6-12. The physical characteristics of the channel produce a relatively consistent increase in stage with an increase in either discharge or ice influences. However, at a stage of approximately 19.5 feet BPMSL, the channel transitions into a wider floodplain causing a flattening of the rating curve for an increase in either discharge or ice influence.



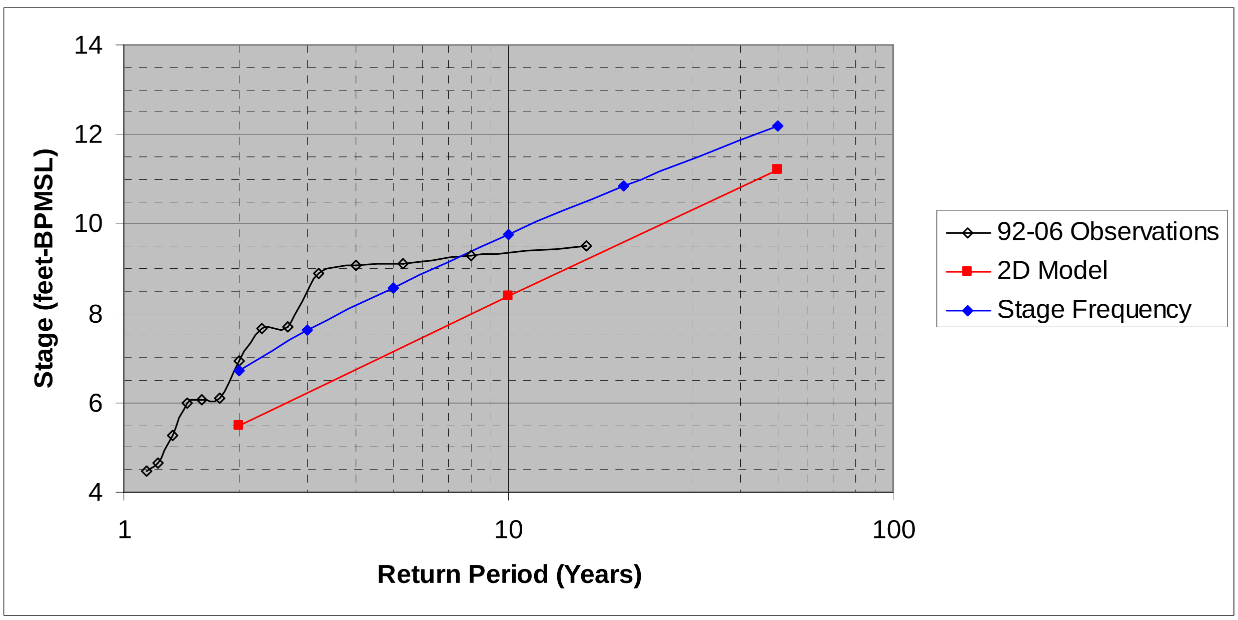
Graph 6-12 Monument 1 Stage Frequency Analysis Results Compared with Channel Bottom

Comparisons of the results of the Monument 22 log-normal stage frequency analysis are presented in Graph 6-13. Based on this comparison at Monument 22, the 2D open water model has predicted a lower stage for the low magnitude floods observed between 1992 and 2006, but has predicted the same stage for floods with a return interval equal to 50 years. In addition, the observed 16-year stage at Monument 22, near the physical upper limit, is lower than the predictions of the stage frequency analysis, but higher than the predictions of the 2D open water model.

Comparisons of the results of the Gage 1 log-normal stage frequency analysis are presented in Graph 6-14. Based on this comparison at Gage 1, the 2D open water model has predicted a lower stage for the low magnitude floods observed between 1992 and 2006 and has predicted flood stage 1.0 foot less than the results of this stage frequency analysis for a 50-year event. In addition, the observed 16-year stage at Gage 1, near the physical upper limit, is lower than the predictions of the stage frequency analysis, but higher than the predictions of the 2D open water model.

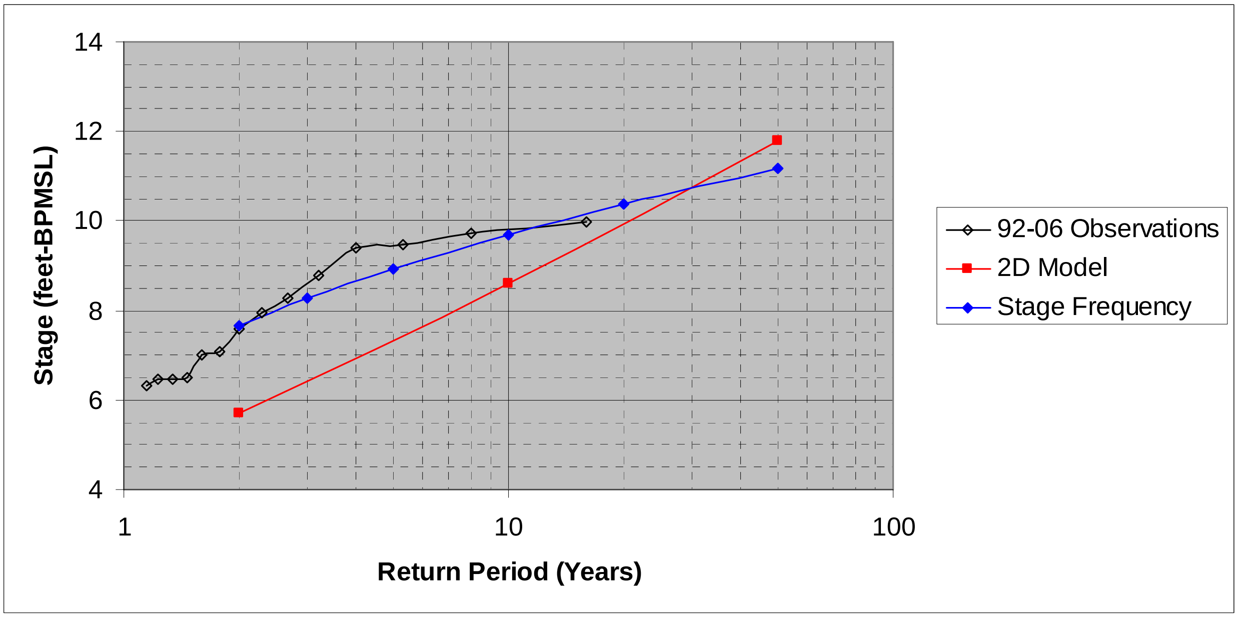


Graph 6-13 Monument 22 Stage Frequency Results Compared with 2D Open Water Model Results



Graph 6-14 Gage 1 Stage Frequency Results Compared with 2D Open Water Model Results

Comparisons of the results of the Gage 3 log-normal stage frequency analysis are presented in Graph 6-15. Based on this comparison at Gage 3, the 2D open water model has predicted a lower stage for the low magnitude floods observed between 1992 and 2006, but has also predicted higher stage for floods with a return interval greater than 30 years. In addition, the observed 16-year stage at Gage 3, near the physical upper limit, is lower than the predictions of the stage frequency analysis, but higher than the predictions of the 2D open water model.



Graph 6-15 Gage 3 Stage Frequency Results Compared with 2D Open Water Model Results

The peak observed water surface elevations in the CRD between 1992 and 2006 are each between 1.2 and 2.8 feet lower than the stage frequency predictions for a 50-year flood. A summary of each location is presented below:

- At Monument 1, the stage frequency prediction for a 50-year stage is 22.34 feet BPMSL, which is 2.8 feet higher than the record high observation in 2004 at an elevation of 19.54 feet BPMSL.
- At Monument 22, the stage frequency prediction for a 50-year stage is 11.83 feet BPMSL, which is 1.63 feet higher than the record high observation in 1998 at an elevation of 10.20 feet BPMSL.
- At Gage 1, the stage frequency prediction of a 50-year stage is 12.19 feet BPMSL which is 2.68 feet higher than the record high observation in 1998 at an elevation of 9.51 feet BPMSL.
- At Gage 3, the stage frequency prediction of a 50-year stage is 11.19 feet BPMSL which is 1.22 feet higher than the record high observation in 2004 at an elevation of 9.97 feet BPMSL.

The differences between the observed 16-year peak stage, extrapolated stage frequency results, and the predictions of the 2D open water model suggest that the 2D open water model predictions are within one foot of the anticipated 50-year water surface elevations at each of the four locations.

With the exception of the Sakoonang Channel Gage 1, the 50-year stage frequency predictions are each less than the 2D open water model predictions for a 50-year flood. The Gage 1 differential between the

2D open water model and the stage frequency results is generally within the accuracy of the 2D open water model predictions of one foot.

Based on the results of this analysis, the 50-year 2D open water model elevations are acceptable representations of flood levels during large magnitude flood events in the CRD. The 2D open water model predictions for the CRD are considered validated at Monument 1, Monument 22, Gage 1, and Gage 3.

6.5 CD4 Pad Stage Frequency Analysis

The difference between the observed peak stage at the CD4 pad in 2006 and the predictions of the 2D open water model were found to be greater at this location than at any site observed in 2006. The peak annual stage record near CD4 is not as complete as other locations in the CRD, however considering the 2006 observations, a site specific stage frequency analysis was undertaken. The stage at the CD4 pad in 2006 was impacted by ice jams in the Nigliq and East Channels. Gage 18, located south of the southern CD4 paleochannel culvert battery, was selected as the CD4 location for this stage frequency analysis because it represents the lowest gravel elevation at the CD4 road near the CD4 pad. This location is the most sensitive area near CD4 to elevated water surface elevations in the Nigliq Channel.

6.5.1 Existing Annual Peak Stage Records at the CD4 Pad

The stage record in the vicinity of the CD4 pad is presented in Table 6-10. This tabulation includes all observed peak water surface elevations along the Nigliq Channel, at Monument 1, and near the CD4 pad between 1992 and 2006 and is presented with respect to river miles (RM) of the Nigliq Channel.

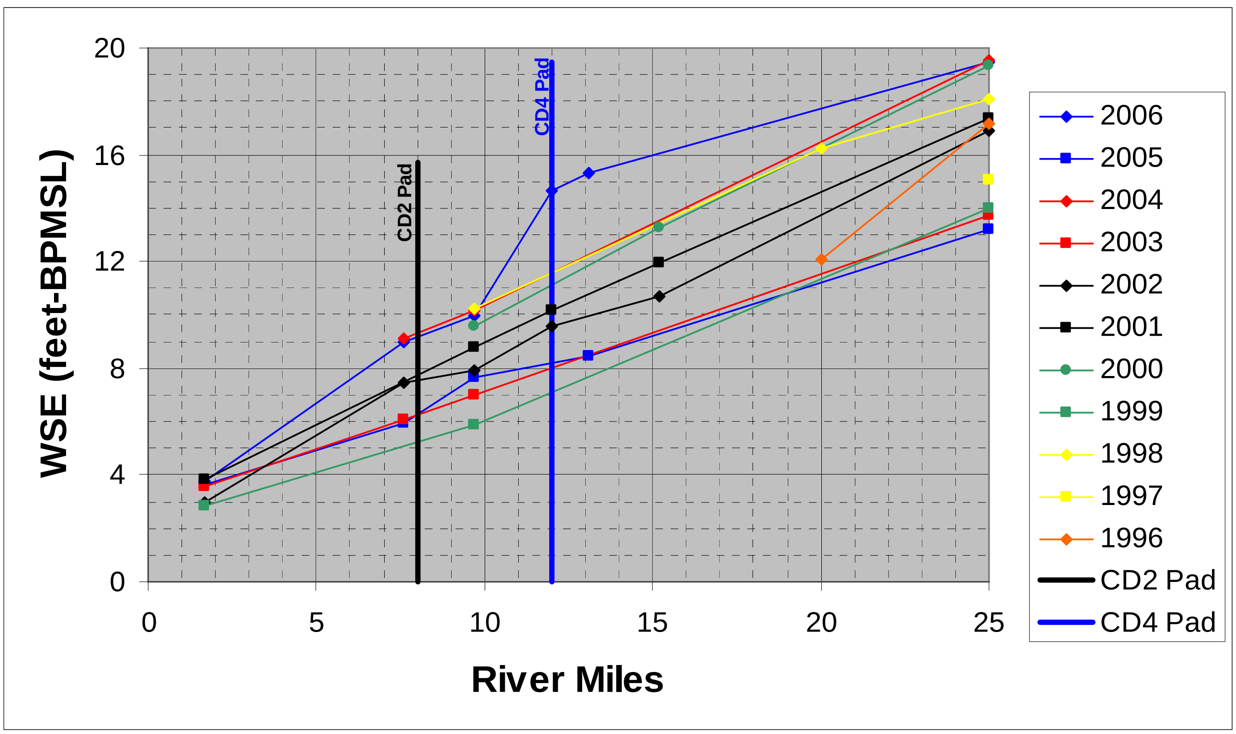
Table 6-10 Monument 1 and Nigliq Channel Peak Water Surface Elevations vs. River Mile

Gage	WSE (feet-BPMSL)								Reference
	Mon 1	Mon 10	Mon 12	Mon 20	CD4	Mon 22	Mon 23	Mon 28	
River Mile	25	20	15.2	13.1	12	9.7	7.6	1.7	
2006	19.49	N R	N R	15.34	14.67	9.95	8.99	3.74	This report
2005	13.18	N R	N R	8.42	N R	7.65	5.95	3.60	Baker 2005c
2004	19.54	N R	N R	N R	N R	10.17	9.14	N R	Baker 2005b
2003	13.76	N R	N R	N R	N R	7.02	6.07	3.57	Baker 2003b
2002	16.87	N R	10.72	N R	9.6	7.94	7.45	3.00	Baker 2002d
2001	17.37	N R	11.94	N R	10.16	8.80	N R	3.83	Baker 2001e
2000	19.33	N R	13.26	N R	N R	9.58	N R	N R	Baker 2000
1999	13.97	N R	N R	N R	N R	5.89	N R	2.85	Baker 1999
1998	18.11	16.21	N R	N R	N R	10.20	N R	N R	Baker 1998a
1997	15.05	N R	N R	N R	N R	N R	N R	N R	Baker 1999
1996	17.19	12.11	N R	N R	N R	N R	N R	N R	Shannon & Wilson 1996
1995	14.88	N R	N R	N R	N R	N R	N R	N R	Shannon & Wilson 1996
1994	12.20	N R	N R	N R	N R	N R	N R	N R	ABR 1996
1993	19.20	N R	N R	N R	N R	N R	N R	N R	ABR 1996
1992	13.90	N R	N R	N R	N R	N R	N R	N R	ABR 1996
Notes:	NR = No Record								

The 1992 through 2006 water surface elevation record at the CD4 pad can be divided into two data sets. The first set of observations, between 1992 and 1997, is limited to photographic records and observed peak water surface elevation near Monument 1. The second set, between 1998 and 2006, includes photographic observations along the Nigliq Channel and some measurements of annual peak stage at CD4.

Graph 6-16 presents the annual peak water surface elevations along the Nigliq Channel, based on river mile, and also includes the locations and pad elevations of the CD2 and CD4 pads. This presentation of water surface elevations assumes a constant water surface slope between observations.

A review of the observed peak stage along the Nigliq Channel, with the exception of the 2006 breakup, suggests that the Nigliq Channel has maintained a relatively consistent slope during breakup between 1996 and 2006. However, peak water surface elevation data gaps in the CD4 pad region do exist and for this reason there is a level of uncertainty as to the slope of the channel during the breakup events for the years where observations are limited.



Graph 6-16 Annual Nigliq Channel Peak Water Surface Elevations vs. River Mile

6.5.2 Record Peak Water Surface Elevation Extrapolation at the CD4 Pad

The following five annual peak water surface elevation observations represent the annual stage record at the CD4 pad region:

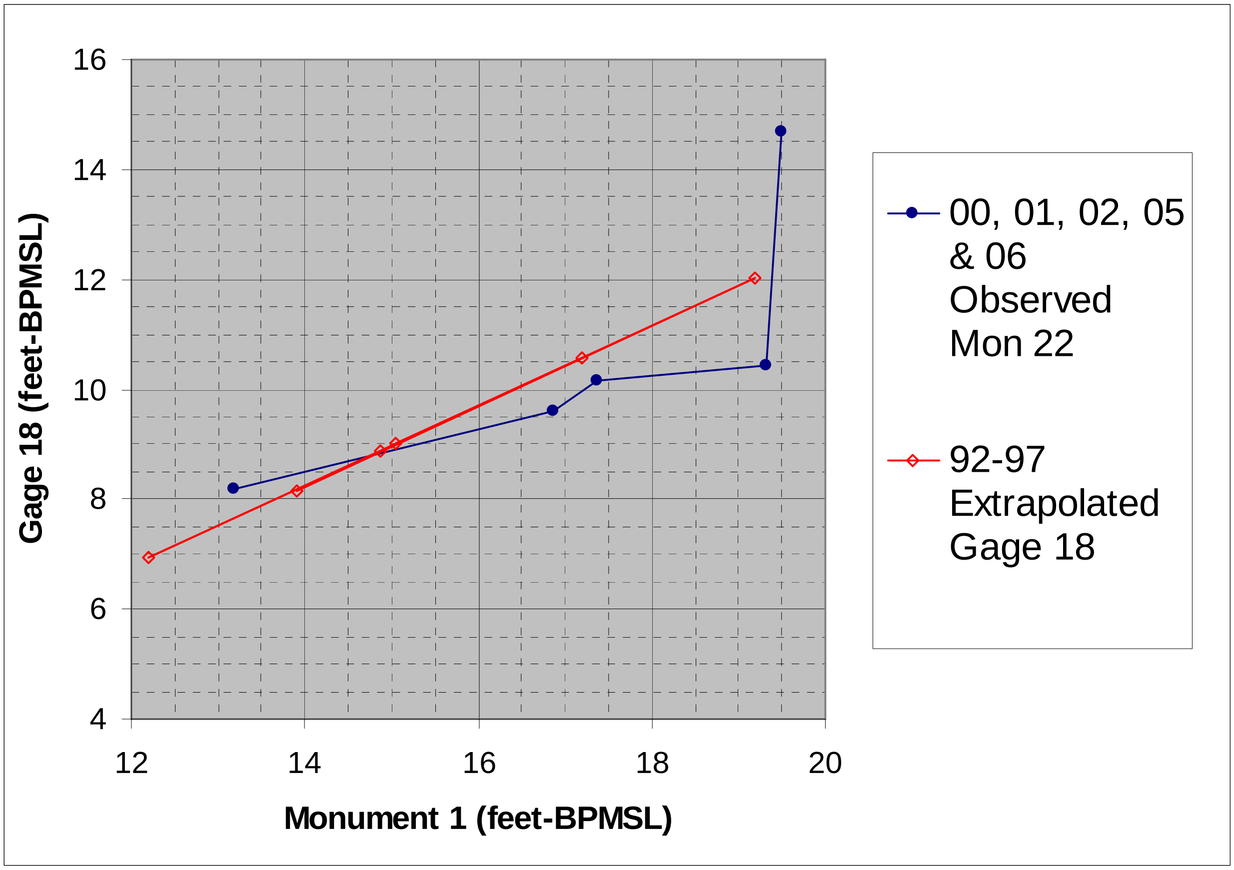
- The peak water surface elevation at Gage 18 was accepted to represent the peak stage at the CD4 pad in 2006.
- The 2005 peak water surface elevation at the CD4 pad did not reach gages at the CD4 pad and was therefore estimated based on a linear interpolation of observations between Monuments 20 and 22.
- The peak water surface elevation at Monument 20N in 2001 and 2002 was accepted to represent the peak stage at the CD4.
- In 2000, water surface elevation were not monitored at the CD4 pad, however the 2000 peak water surface elevation was estimated based on a linear interpolation between Monuments 12 and 22.

To extrapolate annual peak water surface elevations for the years between 1992 and 1997, these five annual peak water surface elevation observations were compared to the peak observations at Monument 1. The linear equation used for this analysis is presented in Table 6-11 along with the extrapolated peak water surface elevations at the CD4 pad between 1992 and 1997.

Table 6-11 Extrapolated CD4 Pad Water Surface Elevations Based on Monument 1

Year	WSE (feet-BPMSL)	
	Mon 1	Gage 18
1997	15.05	9.01
1996	17.19	10.57
1995	14.88	8.88
1994	12.20	6.93
1993	19.20	12.03
1992	13.90	8.17
Linear Equation	-	**y = 0.9289x- 1.9647**

To identify the limitations of the extrapolated record, the observed and extrapolated annual peak water surface elevations for the CD4 pad was analyzed and plotted with respect to Monument 1. Graph 6-17 presents the comparison of the observed and extrapolated water surface elevations. For the 2000, 2001, 2002, 2005, and 2006 record, the maximum and average absolute value difference between the line equation results and the observed annual peak water surface elevations at the CD4 pad are 2.4 feet and 1.2 feet respectively; therefore, the extrapolated peak water surface elevation for any single observation is likely to represent the actual stage observed at the CD4 pad within approximately two feet.



Graph 6-17 CD4 Pad Extrapolated Water Surface Elevations vs. Monument 1

For the years 1998, 1999, 2003, and 2004, water surface elevations were not monitored at the CD4 pad. The 1998 peak annual water surface elevation was estimated based on a linear interpolation between Monuments 10 and 22. The 1999, 2003, and 2004 peak annual water surface elevation was estimated based on a linear interpolation between Monuments 1 and 22 observations. By including the five years of direct observations near CD4 with the six years of extrapolated measurements and four years of interpolation, the peak annual stage record was extended to 15 years of record. While most of the values in this analysis do not include direct observations at CD4, it is better to interpolate between historical data than to exclude it.

6.5.3 Recurrence Interval of the Annual Peak Water Surface Elevation at the CD4 Pad

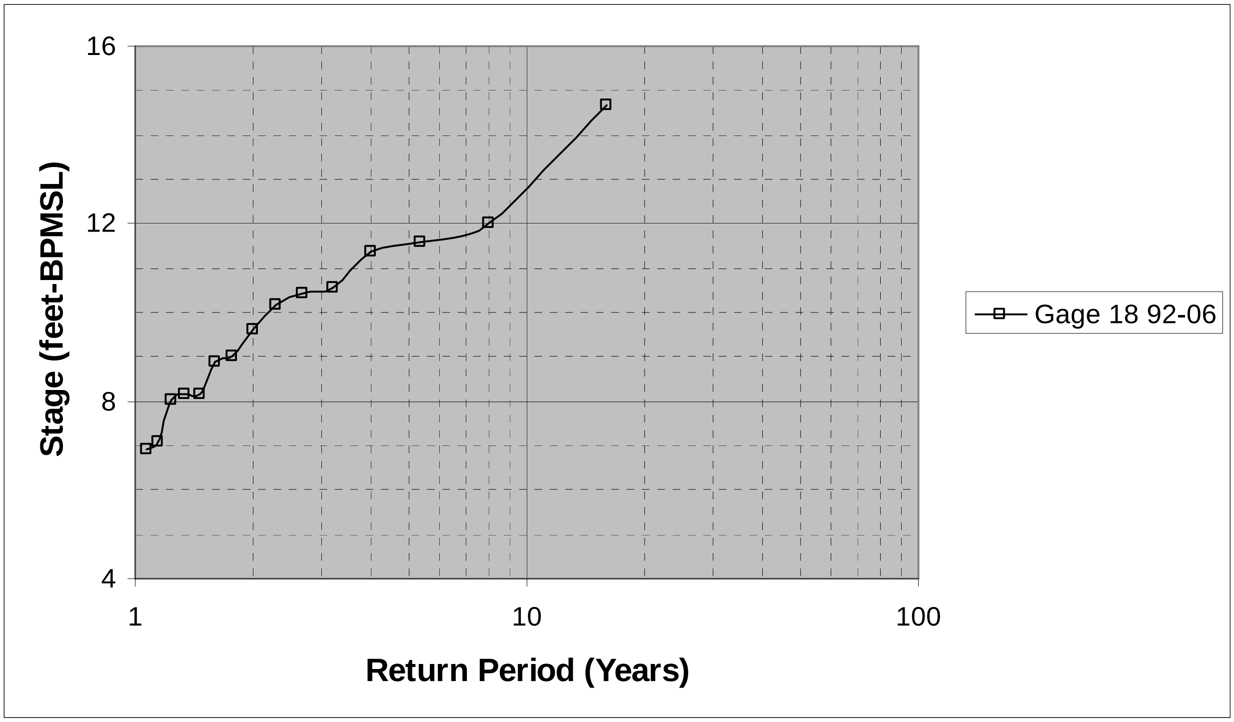
Using the extrapolated, interpolated, and observed annual peak water surface elevation data for the 15 year record between 1992 and 2006 at CD4, a recurrence interval was assigned to each stage at the CD4 pad using the Weibull plotting position equation. A summary of the observed, extrapolated, and linearly interpolated peak annual water surface elevations and recurrence intervals at CD4 are presented in Table 6-. The shaded values represent extrapolated and linearly interpolated estimates of stage while the non-shaded values represent observed peak water surface elevations. The same limitations as applied to the CRD analysis also apply to this CD4 pad analysis with the following notable exceptions. Based on graphs 6-16 and 6-17, the 2006 peak stage at CD4 may be an outlier with a return period greater than 16 years. However, since this area is prone to ice jams, the results of this analysis could be considered as a lower limit of the predicted peak water surface elevation in the CD4 pad region since this analysis did not take into consideration the potential for undocumented ice jams in the Nigliq Channel.

Table 6-12 Observed, Extrapolated, and Linearly Interpolated Peak Annual Water Surface Elevations at CD4 Pad

Year	Stage (feet-BPMSL)	Return Period (years)
2006	**14.67**	**16**
1993	12.03	8
2004	11.58	5
1998	11.39	4
1996	10.57	3
2000	10.44	3
2001	**10.16**	**2**
2002	**9.6**	**2**
1997	9.01	2
1995	8.88	2
2005	8.17	1
1992	8.17	1
2003	8.03	1
1999	7.10	1
1994	6.93	1
Average	9.70	

Based on a review of the existing annual peak water surface elevations and the photographic record in the CD4 pad region, the 2006 peak stage represents the highest observed water surface elevation for all years between 1992 and 2006 with two possible exceptions. It is possible that a higher water surface elevation occurred at the CD4 pad in 1993 and in 1998. Documentation of peak stage does not exist at this location for these years in the form of either a photographic record or stage record.

The CD4 stage record is presented in Graph 6-18. The physical upper limit that is evident in other locations within the CRD is not evident at the CD4 pad due to the 2006 peak stage record. The lack of a physical upper limit in this analysis could be attributed to the lack of site specific observations at the CD4 pad or it could be that the 2006 peak stage at CD4 has a greater return interval than a 16-year event. Another consideration is that it could be that the physical upper limit of the Nigliq Channel adjacent to the CD4 pad has not yet been observed.



Graph 6-18 CD4 Observed, Extrapolated, and Linearly Interpolated Peak Water Surface Elevation 1992-2006

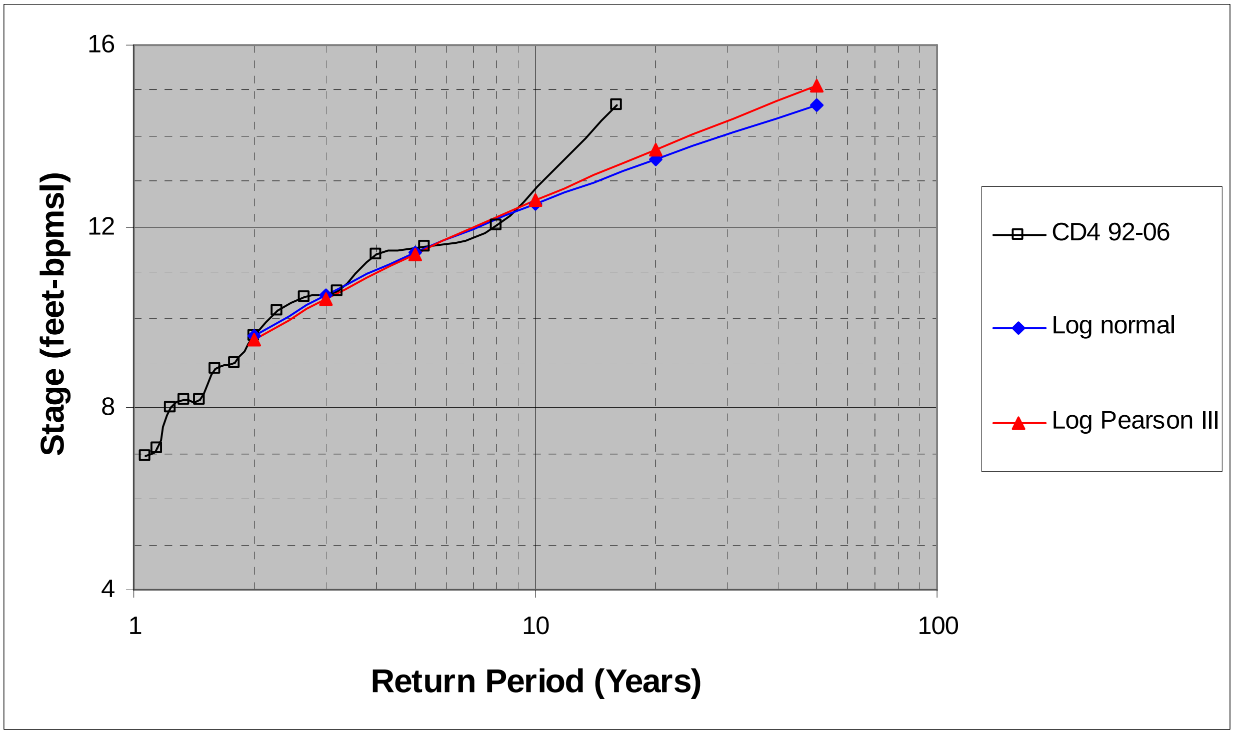
6.5.4 Stage Frequency Analysis CD4 Pad

The same stage frequency analysis methods used in the CRD were also applied to the CD4 pad annual peak water surface elevations. The results of this analysis are presented in Table 6-13. The log-Pearson III results provided higher extrapolated values for the 50-year flood events when compared to the log-normal results. The more conservative log-Pearson III results are accepted.

Table 6-13 CD4 Pad Stage Frequency Analysis Results

Return Period	Probable Peak Annual WSE (feet-BPMSL)	
	Log Normal	Log Pearson III
2-years	9.58	9.50
3-years	10.48	10.42
5-years	11.42	11.38
10-years	12.51	12.57
20-years	13.50	13.69
50-years	14.69	15.10

The results of the log-normal and log-Pearson III statistical extrapolation in the CD4 pad region are presented in Graph 6-19. Also included in the graph is the Weibull plotting position for CD4 records.



Graph 6-19 CD4 Pad Stage Frequency Analysis Results

6.5.5 Stage Frequency Compared to 2D Open Water Model Results

1992-2006 Observed Flood Events Compared to 2D Open Water Model

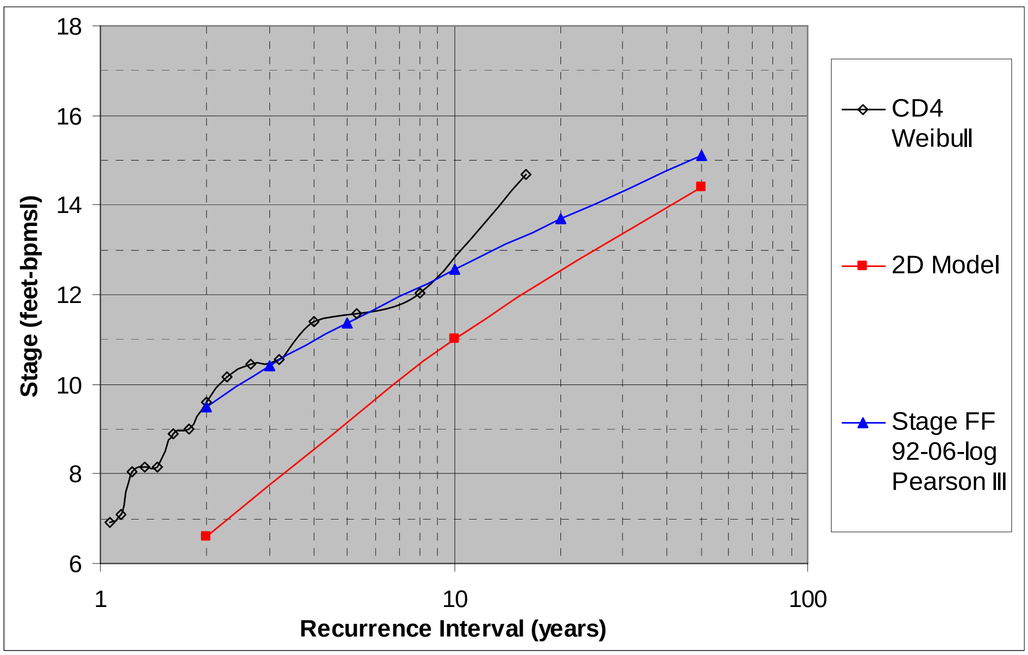
Based on a linear comparison of the 2D open water model and the results of the Weibull plotting position stage analysis at the CD4 pad, the 2D open water model has predicted a lower stage for each of the floods observed between 1992 and 2006. The average difference between the observed and predicted stage for floods with return periods of less than 2 years was approximately two feet. For floods with return periods equal to or greater than 2 years, the average predicted stage was approximately three feet lower than the observed flood stage.

For the CRD and the CD4 region, the 2D open water model was developed to predict conditions during low frequency, high magnitude flood events such as the 50-, 100-, and 200-year recurrence interval floods. The model is based on open water, steady state conditions and does not account for snow, channel ice, or ice jams. Due to the observed low magnitude flood events since 1992 and the hydraulic conditions during the spring, the observed stage at CD4 has been higher than predicted by the open water model.

However, due to the known ice jams in the CD4 region, the linearly interpolated values used in this analysis represent the likely minimum peak annual water surface elevations. Therefore, it is possible that the differences between the 2D open water model and the observed peak water surface elevations are greater than discussed above.

PREDICTED FLOOD EVENTS UP TO 50-YEAR RETURN INTERVAL COMPARED TO THE 2D OPEN WATER MODEL

Comparisons of the results of the CD4 pad log-Pearson III stage extrapolation analysis are presented in Graph 6-20. Based on this comparison, the 2D open water model has predicted a lower stage for the low magnitude floods observed between 1992 and 2006 and has also predicted a lower stage for floods with a return interval equal to 50 years. The difference between the CD4 pad extrapolated peak water surface elevations and the 2D open water model predictions are approximately 0.7 feet for flood events with a recurrence interval equal to 50 years. However, due to the methods associated with compiling the historical stage data, it is possible that the 50-year peak water surface elevation based on this stage frequency analysis at the CD4 pad is greater than presented in Graph 6-20 but still likely within the accuracy of the 2D open water model, which is one foot.



Graph 6-20 CD4 Stage Frequency Results Compared with 2D Open Water Model Results

6.6 Comparison between 2006 CRD Observations and Predicted Water Surface Elevations

The 2006 observed peak water surface elevations and the 2D open water model predictions for 2-year, 10-year, 50-year, and 200-year floods are presented in Table 6-14. Also presented are the recurrence intervals at each monitoring location based on the 2D open water model predictions and the 2006 stage frequency analysis results.

Table 6-14 2006 Peak Colville River Delta Observed and Predicted Water Surface Elevations

Observed Site	2006 Observed Peak Water Surface Elevation (feet-BPMSL)	2D Model Predicted Water Surface Elevation based on open water conditions (feet-BPMSL)				Return Period of 2006 Observed Peak based on stage frequency analysis (years)	Return Period of 2006 Observed Peak based on 2D model open water conditions (years)
		2-year	10-year	50-year	200-year		
Colville River - East Channel							
Monument 1	19.49	13.80	19.00	23.00	26.00	**8**	15
Monument 9 (HDD)	19.12	11.00	15.80	18.90	21.00	*Insufficient Record*	66
Helmricks	5.81	3.80	5.30	5.90	6.30	*Insufficient Record*	44
Colville River - Nigliq Channel							
Monument 20	15.31	7.80	11.30	14.40	16.50	*Insufficient Record*	115
Monument 22	9.95	5.90	8.60	11.80	14.00	**5**	27
Monument 23	8.99	4.90	7.00	10.10	12.10	*Insufficient Record*	36
Monument 28	3.74	3.10	3.30	3.70	4.40	*Insufficient Record*	59
Paleo East	9.25	*5.30*	*7.90*	11.10	13.10	*Insufficient Record*	27
Paleo West	9.62	*5.50*	*8.10*	11.20	13.20	*Insufficient Record*	30
CD1 Pad							
Gage 1	9.29	5.50	8.40	11.20	14.40	**8**	23
Gage 9	9.55	6.70	9.70	11.10	15.30	*Insufficient Record*	10
Gage 10	9.95	6.70	9.70	12.80	15.30	*Insufficient Record*	13
CD2 Pad							
Gage 8	9.34	*5.40*	8.80	10.70	12.40	*Insufficient Record*	21
CD3 Pad							
Gage 11	5.55	3.80	6.20	6.80	7.50	*Insufficient Record*	8
Gage 12	5.35	4.50	6.20	6.90	7.90	*Insufficient Record*	6
CD4 Pad							
Gage 19	14.80	7.20	11.00	14.10	16.40	**16**	96
Gage 20	14.30	7.20	10.70	13.80	15.90	**16**	86
CD2 Road							
Gage 3	9.72	5.70	8.60	11.80	13.90	**8**	24
Gage 4	8.85	5.10	7.60	9.90	11.80	*Insufficient Record*	32
Gage 6	9.94	*6.40*	8.80	11.90	14.10	*Insufficient Record*	25
Gage 7	9.17	*5.00*	8.60	9.80	11.80	*Insufficient Record*	29
CD3 Pipeline							
Crossing #2 (SAK) Gage	8.71	4.90	8.40	11.10	12.80	*Insufficient Record*	15
Crossing #4 (TAM) Gage	7.70	5.80	8.30	9.20	9.90	*Insufficient Record*	8
Crossing #5 (ULAM) Gage	7.10	4.40	7.10	7.90	8.70	*Insufficient Record*	10
CD4 Road							
Gage 13	Dry	6.60	9.90	12.90	15.40	*Insufficient Record*	NA
Gage 14	9.87	6.40	9.20	12.10	14.20	*Insufficient Record*	19
Gage 15	10.12	6.60	9.90	12.90	15.40	*Insufficient Record*	13
Gage 16	12.60	6.60	10.10	13.70	15.80	*Insufficient Record*	38
Gage 17	12.92	7.20	10.40	13.70	15.80	*Insufficient Record*	41
Gage 18	14.67	6.60	11.00	14.40	16.60	**16**	68

6.7 2006 Discharge and Stage Summary

The 2006 discharge in the Colville River Delta is expected to be exceeded approximately once every 4 years. However, based on the 2006 stage frequency analysis, the 2006 flood stage in the CD1 and CD2 region is near the physical upper limits and is expected to be exceeded approximately once every 8 years. Based on the 2006 stage frequency analysis, the 2006 flood stage in the CD4 region is expected to be exceeded approximately once every 16 years.

7.0 Fish Creek Basin Flood and Stage Frequency

This chapter discusses the Ublutuoch River and ASDP Sites analyses and provides recommendations for use in developing design criteria for the proposed ASDP Ublutuoch River Bridge and ASDP access road drainage structures.

7.1 Ublutuoch River – River Mile 6.8

The proposed ASDP bridge crossing the Ublutuoch River is the largest proposed drainage structure between the CD5 and CD7 facilities. The Ublutuoch River flood frequency and stage frequency analyses are discussed in this section and will be important contributions in the development of design criteria for this proposed bridge.

7.1.1 Ublutuoch River Flood Frequency

The earliest available flood frequency analyses of the Ublutuoch River near the proposed ASDP bridge site were developed in 2002 at Ublutuoch RM 13.7 using a drainage basin area of 222 square miles, and in 2002 at Ublutuoch RM 8.0 using a drainage area of 233 square miles. The regression equations used in these analyses were based on regional rivers, calibrated for 2001 and 2002 observations, and based on the assumption that the 2001 and 2002 breakup events were each mean annual discharges (URS 2002). In 2005, the area of the drainage basin contributing to flow at Ublutuoch 6.8 was estimated to be 228 square miles and used to estimate the peak stream flow using 2003 USGS regional regression equations (Baker 2005). This section discusses the 2006 Baker Ublutuoch River flood frequency analysis.

A recurrence interval was assigned to each of the annual peak discharge values between 2001 and 2006 using the Weibull plotting position equation (USACE 1982) shown below:

$$P=m/N+1$$

The flood frequency record was statistically extrapolated using annual peak direct discharge measurements on the Ublutuoch River between 2001 and 2006. Because of the limitations of indirect discharge Ublutuoch River measurements due to the presence of snow and ice, only direct discharge measurements were used. The direct discharge record included measurements at Ublutuoch RM 13.7 in 2001, Ublutuoch RM 8.0 and RM 13.7 in 2002, and Ublutuoch RM 6.8 annually between 2003 and 2006. The 2001 to 2006 peak annual discharge probability and recurrence interval are presented in Table 7-1.

Table 7-1 Ublutuoch River Annual Discharge Probability and Return Period

Year	Peak Discharge (cfs)	Discharge Probability	Discharge Return Period	References
2006	1,290	1.00	1.0	This Report
2005	1,680	0.50	2.0	Baker 2005c
2004	2,800	0.17	6.0	Baker 2005a
2003	1,300	0.83	1.2	Baker 2003a
2002	1,900	0.33	3.0	URS 2002
2001	1,440	0.67	1.5	URS 2001

Using HYFRAN hydrologic frequency analysis software (INRS-ETE 2002), the peak annual discharge record of the Ublutuoch River was extended to a 100-year recurrence interval using a log-Pearson III extrapolation. For this analysis, the peak annual directly measured discharge was assumed to represent the peak annual discharge at Ublutuoch RM 6.8 regardless of the timing or the location of the measurement. Considering that the area of the drainage basins for the three locations vary by less than 5%, the difference in discharge between Ublutuoch RM 6.8 and RM 13.7 is estimated to be within approximately 5%. This is validated as the direct discharge measurements on May 24, 2002, at Ublutuoch RM 8.0 is approximately 6% greater than was measured at RM 13.7 on the same day. However, because the direct discharge record is not continuous for all years, the limitations of the results of this analysis should be considered in the development of design criteria for the proposed Ublutuoch River Bridge.

Table 7-2 presents a comparison of the recurrence intervals from the URS 2002 RM 8.0, the Baker 2005, and the 2006 flood frequency analyses. Depending on the method, the mean annual peak discharge at Ublutuoch RM 6.8 ranges from 1,570 cfs to 3,560 cfs. The 100-year peak discharge at Ublutuoch RM 6.8 ranges from 4,250 cfs to 9,820 cfs. Due to the assumptions used in the 2002 analysis and the limited number of historical peak annual direct discharge measurements, for the purpose of developing design criteria for the proposed bridge crossing, the 100-year peak discharge is conservatively accepted to be based on the USGS regression equations at RM 6.8.

Table 7-2 Ublutuoch River Peak Annual Flood Frequency Analyses Results Comparison

Return Period	Discharge (cfs)		
	USGS Regression Equations RM 6.8 [1]	URS Regression Equations RM 8 [2]	Historical Record Extrapolation RM 6.8 [3]
2-year	3,560	2,400	1,570
5-year	5,330	3,800	2,070
10-year	6,470	4,800	2,480
25-year	7,860	6,300	3,090
50-year	8,860	7,600	3,630
100-year	9,820	8,900	4,250

Notes:
1. Baker 2005c
2. URS 2002
3. Log-Pearson III Extrapolation, This Report

7.1.2 Ublutuoch River Stage Frequency

It is generally considered risky to extrapolate stage data for a river impacted by snow and ice beyond the observed record (USACE 2002 and FEMA 2003). In the case of the Ublutuoch River, the observed record is only five years and stage has been demonstrated to be impacted by snow and ice during each spring breakup event. However, for the purpose of comparing the observations between 2002 and 2006 with the HEC RAS model results (Baker 2003 and URS 2002) (see Section 7.1.3), extreme value statistical analysis was used to extend the record to 100 years, or 20 times the record length. The 2002 to 2006 peak annual stage probability and recurrence intervals are presented in Table 7-3. A recurrence interval was assigned to each of the annual peak stage values between 2001 and 2006 using the Weibull plotting position equation.

Table 7-3 Ublutuoch River Stage Probability and Return Period

Year	Peak Stage (feet-BPMSL)[1]	Stage Probability	Stage Return Period	Reference
2006	6.19	1.00	1.0	This Report
2005	10.01	0.60	1.7	Baker 2005c
2004	10.50	0.20	5.0	Baker 2005a
2003	10.14	0.40	2.5	Baker 2003a
2002	8.34	0.80	1.3	URS 2002

Notes: 1. Based on observations at RM 8.0 in 2002 and RM 6.8 2003 to 2006.

The stage frequency record was statistically extrapolated based on annual peak stage measurements on the Ublutuoch River between 2002 and 2006. The stage record included measurements at Ublutuoch RM 8.0 in 2002 and Ublutuoch RM 6.8 annually between 2003 and 2006. The 2002 stage value of 8.34 feet BPMSL was used in the analysis based on the peak stage at RM 8.0 of 9.49 feet BPMSL and the slope between Ublutuoch RM 8.0 and RM 13.7 at the time of peak stage at RM 8.0.

The peak annual stage record was extended using HYFRAN hydrologic frequency analysis software (INRS-ETE 2002) to a 100-year recurrence interval based on a log-normal extrapolation. The recurrence intervals for the stage frequency analyses is presented in Table 7-4.

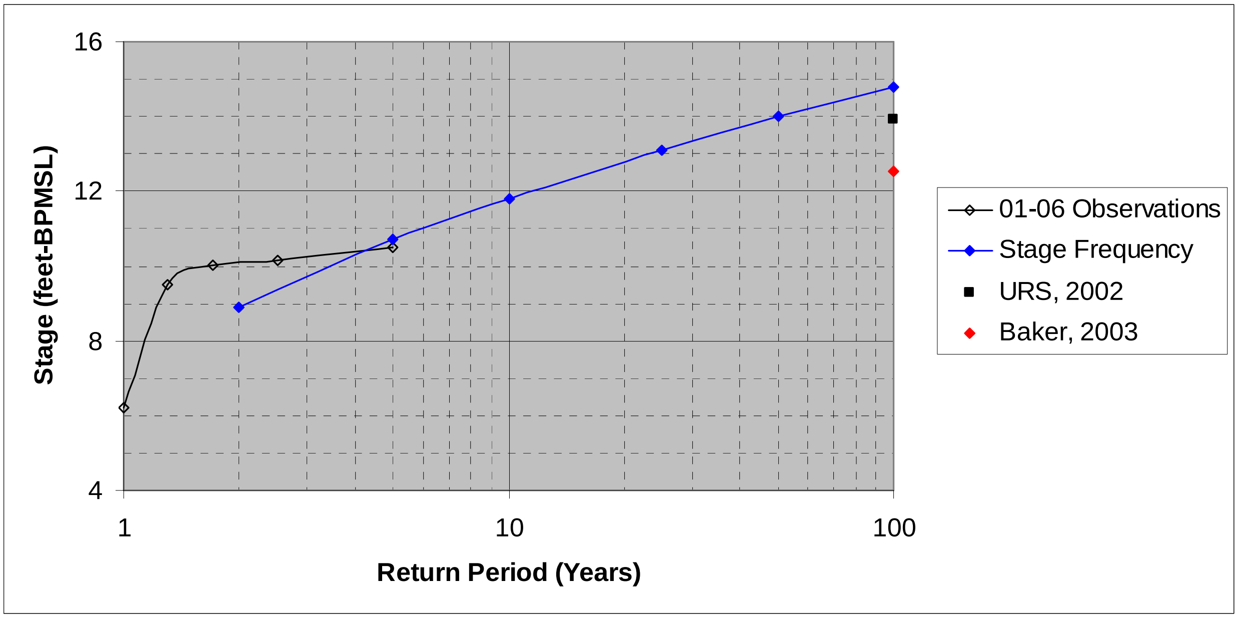
Table 7-4 Ublutuoch River Peak Annual Stage Frequency Analysis Results

Return Period	Log Normal Extrapolation RM 6.8 (feet-BPMSL)
2-year	8.9
5-year	10.7
10-year	11.8
25-year	13.1
50-year	14.0
100-year	14.8

7.1.3 Stage Frequency Analyses Comparison and Design Recommendation

The results of the stage frequency analysis, the return periods of the historical observations and the results of the hydraulic modeling of the Ublutuoch River are presented in Graph 7-1. Observations since 2001 suggest that a physical upper limit exists between 10 and 11 feet for the flood conditions experienced during the past 6 breakup seasons. A comparison of the HEC-RAS model results and the results of the 2006 stage frequency analysis shows:

- The mean annual stage at Ublutuoch RM 6.8 is 8.9 feet and the 100-year peak stage is 14.8 feet BPMSL based on the 2006 stage frequency analysis (Section 7.1.2).
- The 100-year predicted water surface elevation at Ublutuoch RM 6.8 is 12.53 feet BPMSL based on the results of an open water HEC-RAS model (Baker 2003).
- The 100-year predicted water surface elevation at Ublutuoch RM 8.0 is 14.5 feet BPMSL based on open water and ice/snow influenced HEC-RAS model results (URS 2002).
- The approximate 100-year water surface elevation at Ublutuoch RM 6.8 is equal to approximately 13.9 feet BPMSL, based on a slope between RM 8.57 and RM 8.0 of 0.0001 (URS 2002).



Graph 7-1 Ublutuoch River Stage Frequency Analysis Compared with Existing Model Results

For the purpose of developing design criteria for the proposed bridge crossing of the Ublutuoch River, the 100-year peak stage is accepted to be based on the 2006 stage frequency results of 14.8 BPMSL.

7.1.4 2006 Discharge and Stage Summary

The 2006 stage and discharge at Ublutuoch RM 6.8 are expected to be equaled or exceeded more than 4 times in 5 years, on average.

7.2 ASDP Sites Flood Frequency

Prior to 2006, flood frequency analyses were performed on a variety of small streams within the FCB in support of ASDP. In 2003 and 2004, PND, Inc. monitored various drainages during the breakup seasons (PND 2003, 2005). Flood frequency estimates were calculated for four drainages using approximate drainage areas and USGS regional regression equations. In 2005, Baker conducted spring breakup monitoring at nine potential small stream crossings, including four drainages monitored by PND. The 2005 analysis included a flood frequency analysis of the nine drainages using the USGS regional regression equations. To supplement past monitoring and accommodate changes in the ASDP road alignment, Baker modified the location of two sites and added four new sites for the 2006 spring breakup monitoring event.

7.2.1 2006 ASDP Sites Flood Frequency Analysis

Peak flow of the twelve 2006 sites were estimated using the 2003 USGS regression equations (Curran, Meyer, and Tasker 2003). Drainage basin areas contributing to flow at the locations identified in Figure

1-4 were estimated by Baker in 2005 and 2006 using AeroMap contours and aerial photography. Table 7-5 presents the estimated drainage basin area and the estimated annual peak discharge values ranging between 2- and 100- year return intervals.

Table 7-5 ASDP Sites Flood Frequency Analysis and Direct Discharge Results Comparison

ACDP Sites		Site1	Site 2	Site 3	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
2006 Baker Flood Frequency Analysis Results (cfs)													
Drainage Area (mi^2)		0.9	0.2	2.5	0.7	3.6	5.7	0.8	1.2	2.5	0.7	6.8	3.2
Return Period	2-year	25	8	64	21	87	133	23	34	64	21	154	80
	5-year	43	14	105	35	144	217	38	57	106	35	250	132
	10-year	55	18	134	45	182	273	50	73	135	46	315	168
	25-year	71	24	171	58	231	345	64	94	171	59	397	213
	50-year	83	28	198	68	267	397	74	109	198	68	457	246
	100-year	95	32	224	78	303	449	85	124	225	78	517	279
2004 PND Flood Frequency Analysis Results (cfs)													
Return Period	2-year	NA	NA	NA	52	75	NA	NA	52	NA	NA	169	NA
	5-year	NA	NA	NA	87	123	NA	NA	87	NA	NA	274	NA
	10-year	NA	NA	NA	111	157	NA	NA	111	NA	NA	344	NA
	25-year	NA	NA	NA	141	199	NA	NA	141	NA	NA	433	NA
	50-year	NA	NA	NA	164	230	NA	NA	164	NA	NA	498	NA
	100-year	NA	NA	NA	186	261	NA	NA	186	NA	NA	563	NA
2006 Baker Direct Discharge Results (cfs)													
2006		2.7	NOF	5.4	9.4	71.0	4.4	NOF	5.7	28.3	2.7	46.4	NOF
Notes: NA = Data is not available NOF = No observable flow at this site													

7.2.2 ASDP Sites Flood Frequency Analyses Comparison

Table 7-5 also presents a comparison between the Baker 2006 flood frequency analysis results, the 2004 PND flood frequency analysis results (PND 2005), and the 2006 direct discharge measurements collected at the twelve monitoring sites. The 2004 and the 2006 flood frequency analyses were completed using the 2003 USGS regression equations for Region 7. Differences in results between 2004 and 2006 are solely due to the differences in estimated drainage basin areas. Such estimates are subjective, given the limited local topographic relief, interpretation of available topographic data, and aerial imagery used.

The likely cause for the differences between the 2006 observed discharge values and the 2004 and 2006 flood frequency results are the regression equations used in these analyses. The regression equation issues include:

- The regression equations for Region 7 were developed by the USGS from a small number of gaged streams (25) across a wide area, extending as far southwest as Nome, east to the Canadian border, and encompassing the entire North Slope and Brooks Range. The resulting regression equations yield an average standard error of prediction of approximately 50%, relative to the 25 drainages used.
- The minimum applicable drainage area for the given equations is 1.13 square miles; a value that is larger than five of the twelve delineated drainage areas (Table 7-5).
- The affects of storage area can differ significantly between drainage areas and flood return intervals. The number and size of lakes and wetlands can significantly alter the amount of flow across a given

drainage by increasing the storage capacity of the basin. The presence of lakes, such as the lake identified at Site 13 (Lake M9915), can retain flood waters until a critical overbank elevation is reached, at which time residual floodwater is released. In such a case, flow may not be observed until a large magnitude flood occurs.

- Nearly all of the 25 streams and rivers used to generate the regression equations for Region 7 were in areas having limited or no storage, and only one gaging station (Nunavak Creek near Barrow, Alaska) had a drainage basin morphology representative of the FCB (polygons, wetlands, and/or ponds).

Though limitations and uncertainties exist, alternative applicable methods are generally unavailable. While appreciating the limits of the regression equations, a comparison of these independent flood frequency results and direct discharge measurements suggests that the flood frequency results provide a conservative estimate of low-recurrence flood discharge at the FCB sites. Given the 2006 results tabulated in Table 7-5, estimates of mean annual peak discharge are consistently larger than the maximum direct discharge measured in 2006. Observed peak 2006 discharge at the twelve sites ranged from 0% to 81% of the mean-annual flood estimate based on the USGS regression equations. At Sites 2, 8, and 13, no flow was observed. At Site 6, the maximum peak discharge was measured to be 71 cfs and the flood frequency analysis resulted in a mean annual discharge of 87 cfs. The predominantly low discharge values could be attributed to the relatively low stage observed in 2006 across the FCB (Section 5.3.1).

Generally, the topographic relief and storage capacity of the FCB limit the number of defined channels and increase the distribution of sheetflow and divided streamlets during the breakup season. In a few cases, flow is confined to a single well-defined channel, similar to that observed at Sites 6 and 12. As the recurrence interval for flooding increases, floodwater is less affected by storage capacity and begins to move downslope as overland flow. With the placement of the ASDP access road, flow will be confined as it is routed to, and flows through, placed drainage structures.

7.2.3 Proposed Drainage Structures Design Criteria Recommendations

For the purpose of evaluating potential fish passage through drainage structures, mean annual and low-flow design criteria are suggested to be based on observed historic flows, and not the USGS regression equations. For the purpose of developing design criteria for the sizing of the proposed drainage structures, the 100-year peak discharge is suggested to be based on the USGS regression equations.

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8.2 Acronyms

ADCP	Acoustic Doppler Current Profiler
ADF&G	Alaska Department of Fish and Game
ADP	Alpine Development Project
ASDP	Alpine Satellite Development Plan
BPMSL	British Petroleum Mean Sea Level
CMP	Corrugated Metal Pipe
CPAI	ConocoPhillips, Alaska, Inc.
CRD	Colville River Delta
DGPS	Differentially corrected Global Positioning System
DNR	Alaska Department of Natural Resources
FCB	Fish Creek Basin
GPS	Global Positioning System
HDD	Horizontal Directional Drilled
MASL	Meters Above Sea Level
MS	Measurement
NAD27	North American Datum of 1927
NAD83	North American Datum of 1983
NPRA	National Petroleum Reserve, Alaska
PT	Pressure Transducer
RM	River Mile
SWE	Snow Water Equivalent
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WSE	Water Surface Elevations

8.3 Glossary

Alpine
CD1 pad

Alpine Facilities
CD1, CD2, CD3, and CD4 pads, including access roads and bridges

Breakup
Period of disintegration of ice cover in rivers and lakes

Catchment Basin
See Drainage Basin

Conveyance
A measure of the carrying capacity of a river channel

Direct Discharge
A measurement of discharge based on observed flow velocities and the local cross sectional area of flow.

Discharge
The volume of a fluid passing through a cross section of a stream per unit time

Drainage Basin
A region of land where water from rain or snowmelt drains downhill into a body of water (e.g. river or lake)

Flood Frequency Analysis
Procedure of interpreting a record of flood events in terms of future probabilities of flood magnitude (discharge) occurrence

Floodplain
Land area adjoining a water body that is not normally submerged but may be submerged during flood conditions

Gage
Fixed vertical graduated scale for determining water surface elevation at a specific location

Headwater
The water surface elevation upstream of a structure such a culvert, bridge, or weir

Ice Bridge
A continuous ice cover of limited size extending from shore to shore; often man-made

Ice Floe
Free-floating piece of ice greater than about 1 meter (3feet) in size

Ice Jam
A stationary accumulation of fragmented ice or frazil, which restricts or blocks a stream channel

Ice Jamming
Process of ice accumulation to form an ice jam

Indirect Discharge
An estimate of discharge based on hydraulic equations relating the discharge to the water surface profile and the geometry of the channel. Measured water surface elevation and channel characteristics collected during field surveys are used in the discharge calculation.

Monument
Benchmark of known elevation and horizontal position relative to a defined datum, used for horizontal and vertical control in surveying.

Paleochannel
An ancient streambed or channel

Pressure Transducer
A type of measurement device that converts pressure-induced mechanical changes into an electrical signal

Reach
(1) The length of a channel uniform with respect to discharge, depth, area, and slope (e.g. "typical channel reach"), (2) the length of a stream between two specified gaging stations, control points, or computational points

Recurrence Interval
The average time interval between the actual occurrence of a hydrological event of a given or greater magnitude

Return Period
See Recurrence Interval

Runoff
Flow that is discharged from an area by stream channels; sometimes subdivided into surface runoff, ground water runoff, and seepage

Scour
The enlargement of a channel cross section by the erosion of streambed or bank material due to flowing water; often considered as being localized

Sheet Ice
A smooth, continuous ice cover formed by the in situ freezing or by the arrest and juxtaposition of ice floes in a single layer

Snow Density
The mass volume unit of snow expressed in mass/volume. Most commonly, it is expressed as a percentage – for a unit area, the depth of the SWE divided by the depth of the snow

Snow Survey
A general term for the manual sampling of snow

Snow Water Equivalent (SWE)
The liquid-water equivalent of the snowpack, expressed in terms of depth.

Sounding
Water depth measurement using a weighted line

Spring Breakup
See Breakup

Staff Gage
See Gage

Stage
The vertical distance from any selected and defined datum to the water surface

Stage Frequency Analysis
Procedure of interpreting a stage record of events in terms of future probabilities of flood stage occurrence

Stranded Ice
Ice that has been floating and has been deposited on the shore by a lowering of the water level

Tailwater
The water surface elevation downstream of a structure such a culvert, bridge, or weir

Thalweg
Deepest portion of the river channel; the line of major flow

Thermoerosion (subaqueous)
The thermal and mechanical erosion of ice-bonded sediment caused by the energy of moving water

Transect
A sample area, cross section, or line chosen as the basis for sampling one or more characteristics of a particular assemblage

Velocity Measurement Depth
Depth down from water surface; commonly 60% total depth in water of 2.5 feet or less or 20% and 80% total depth in water greater than 2.5 feet in depth.

Water Slope
Change in water surface elevation per unit distance

Water Surface Elevation (WSE)
See Stage

Appendix A Survey Control and Gage Summary

Table A-1: Summary of 2005 Vertical Control Monuments

Monument	Elevation (BPMSL - Feet)	Latitude (NAD83)	Longitude (NAD83)	Monument	Reference
05-01-18A	7.75	N 70° 19' 35.1"	W 150° 59' 37.0"	Rebar	LCMF CD4 TBM, 1-23-2005
05-01-21A	12.17	N 70° 17' 46.4"	W 150° 58' 46.5"	Rebar	LCMF CD4 TBM, 1-26-2005
05-01-21D	12.44	N 70° 17' 27.7"	W 150° 59' 37.0"	Rebar	LCMF CD4 TBM, 1-26-2005
ALMA	25.06	N 70° 16' 45.7"	W 151° 19' 53.2"	Alcap	LCMF static gps, 5-11-2005
AMYLEE	27.50	N 70° 18' 17.1"	W 151° 11' 56.8"	Alcap	LCMF static gps, 5-12-2005
BAKER	66.51	N 70° 12' 16.1"	W 151° 45' 23.0"	Alcap	LCMF static gps, 5-14-2006
BRAD	25.78	N 70° 16' 37.4"	W 151° 22' 10.5"	Alcap	LCMF static gps, 5-11-2005
C2	12.30	N 70° 18' 38.6"	W 151° 25' 31.3"	Rebar	Lounsbury 2002
CDW	30.69	N 70° 18' 41.7"	W 151° 10' 54.1"	-	LCMF, 10-2003
CHAR	24.05	N 70° 16' 54.9"	W 151° 17' 41.8"	Alcap	LCMF static gps, 5-11-2005
Clear 1951	25.50	N 70° 20' 16.1"	W 151° 06' 24.0"	BC	LCMF levels, 8-8-2002
D1A South	3.90	N 70° 22' 17.7"	W 151° 15' 17.9"	Rebar	Lounsbury 2002
FIORD 01	9.30	N 70° 24' 27.7"	W 150° 52' 40.2"	Alcap	LCMF, 11-2004
FIORD 15	6.53	N 70° 25' 06.0"	W 150° 54' 22.3"	Alcap	LCMF, 3-2005
FIORD 17	8.31	N 70° 25' 10.9"	W 150° 55' 11.7"	Alcap	LCMF, 3-2005
JACK	23.45	N 70° 16' 55.4"	W 151° 15' 52.6"	Alcap	LCMF levels, 8-2003
KELLY	27.36	N 70° 15' 49.4"	W 151° 29' 19.7"	Alcap	LCMF static gps, 5-11-2005
Line 3S1	36.62	N 70° 13' 09.7"	W 151° 50' 20.1"	Alcap	Lounsbury 2001
Line 3S2	23.37	N 70° 16' 09.7"	W 151° 52' 20.6"	Alcap	Lounsbury 2001
Line 4BW	40.87	N 70° 11' 11.9"	W 151° 57' 43.1"	Alcap	Lounsbury 2001
Line 2S	21.44	N 70° 15' 55.1"	W 151° 42' 07.6"	Rebar	Lounsbury 2001
MECKEL	70.19	N 70° 12' 00.6"	W 151° 39' 57.6"	Alcap	LCMF static gps, 5-12-2005
Mon 01	27.59	N 70° 09' 57.2"	W 150° 56' 23.8"	Alcap	LCMF 2006
Mon 09	25.03	N 70° 14' 40.6"	W 150° 51' 29.6"	Alcap	Lounsbury 1996
Mon 20	19.17	N 70° 16' 48.0"	W 151° 00' 41.7"	Alcap	Lounsbury 1996
Mon 22	10.13	N 70° 19' 05.2"	W 151° 03' 21.9"	Alcap	Lounsbury 1996
Mon 23	9.53	N 70° 20' 40.0"	W 151° 03' 40.7"	Alcap	Lounsbury 1996 (9.523 LCMF 6-26-2005)
Mon 28	3.66	N 70° 25' 31.9"	W 151° 04' 01.2"	Alcap	Lounsbury 1996
Mon 35	5.57	N 70° 25' 57.0"	W 150° 23' 00.4"	Alcap	Lounsbury 1996
NAN2	13.31	N 70° 18' 14.9"	W 150° 59' 50.6"	-	LCMF, 3-2005
NPRA 2	7.67	N 70° 20' 22.6"	W 151° 05' 41.7"	Alcap	LCMF, 3-2005
NPRA 3	16.94	N 70° 20' 04.3"	W 151° 07' 19.9"	Alcap	LCMF, 3-2005
PATTY	68.79	N 70° 12' 21.6"	W 151° 38' 29.1"	Alcap	LCMF static gps, 5-12-2005
SAK-LT	10.17	N 70° 21' 49.5"	W 150° 55' 34.0"	Alcap	LCMF, 12-2004
STM RT	10.07	N 70° 23' 37.7"	W 150° 54' 54.4"	Alcap	LCMF, 11-2004
UBN 01	12.09	N 70° 18' 11.8"	W 151° 19' 48.6"	Rebar	LCMF static gps, 7-27-2003
UBUSW	17.50	N 70° 14' 36.4"	W 151° 17' 51.7"	Alcap	Lounsbury 2001

Table A-2: Summary of 2005 Gage Locations

Gage Site	Gage	Latitude (NAD83)	Longitude (NAD83)	Basis of Elevation
CD 1	PG1	N 70° 20' 34.3"	W 150° 55' 15.3"	Mon 19
	PG9	N 70° 20' 01.2"	W 150° 57' 07.2"	
	PG10	N 70° 20' 32.6"	W 150° 55' 57.8"	
CD 2	PG3	N 70° 20' 24.1"	W 150° 58' 58.7"	Mon 12
	PG4	N 70° 20' 25.5"	W 150° 59' 00.0"	
	PG6	N 70° 20' 22.7"	W 151° 01' 45.3"	
	PG7	N 70° 20' 24.2"	W 151° 01' 44.4"	
	PG8	N 70° 20' 21.0"	W 151° 02' 52.2"	
SAK Pipe Bridge	TBM A	N 70° 21' 52.9"	W 150° 55' 17.4"	SAK-LT
	TBM B	N 70° 21' 52.5"	W 150° 55' 18.0"	
	TBM C	N 70° 21' 52.2"	W 150° 55' 19.1"	
	TBM D	N 70° 21' 52.2"	W 150° 55' 19.3"	
CD 3	Gage 11 TBM A	N 70° 25' 06.6"	W 150° 55' 19.8"	FIORD 17
	Gage 11 TBM B	N 70° 25' 06.8"	W 150° 55' 18.6"	
	Gage 11 TBM C	N 70° 25' 07.5"	W 150° 55' 16.2"	
	Gage 11 TBM D	N 70° 25' 08.1"	W 150° 55' 14.7"	
	Gage 12 TBM A	N 70° 25' 20.3"	W 150° 52' 21.3"	FIORD 15
	Gage 12 TBM B	N 70° 25' 20.4"	W 150° 52' 22.6"	
	Gage 12 TBM C	N 70° 25' 20.5"	W 150° 52' 24.3"	
CD 4	Gage 13	N 70° 19' 24.3"	W 150° 59' 43.4"	05-01-18A
	Gage 14	N 70° 19' 24.4"	W 150° 59' 47.4"	
	Gage 15	N 70° 18' 07.8"	W 150° 59' 34.6"	NAN2
	Gage 16	N 70° 18' 05.7"	W 150° 59' 33.5"	NAN2
	Gage 17	N 70° 17' 35.9"	W 150° 58' 57.9"	05-01-21A
	Gage 18	N 70° 17' 34.8"	W 150° 58' 54.4"	
	Gage 19	N 70° 17' 28.8"	W 150° 59' 10.1"	
	Gage 20	N 70° 17' 28.1"	W 150° 59' 41.6"	05-01-21D
Mon 01U	TBM A - 1	N 70° 09' 30.4"	W 150° 56' 43.3"	Mon 01
	TBM A	N 70° 09' 30.5"	W 150° 56' 44.4"	
	TBM B	N 70° 09' 30.6"	W 150° 56' 45.5"	
	TBM C	N 70° 09' 30.7"	W 150° 56' 45.9"	
	TBM D	N 70° 09' 30.7"	W 150° 56' 46.2"	
	TBM E	N 70° 09' 30.6"	W 150° 56' 46.8"	
	TBM F	N 70° 09' 30.6"	W 150° 56' 47.0"	
Mon 01	TBM A - 1	N 70° 09' 56.7"	W 150° 56' 17.7"	Mon 01
	TBM A	N 70° 09' 56.8"	W 150° 56' 18.5"	
	TBM B	N 70° 09' 56.9"	W 150° 56' 20.5"	
	TBM C	N 70° 09' 56.9"	W 150° 56' 21.1"	
	TBM D	N 70° 09' 57.0"	W 150° 56' 21.4"	
	TBM E	N 70° 09' 57.0"	W 150° 56' 21.9"	
	TBM F	N 70° 09' 57.1"	W 150° 56' 22.4"	

Gage Site	Gage	Latitude (NAD83)	Longitude (NAD83)	Basis of Elevation
Mon 01D	TBM A - 1	N 70° 10' 26.4"	W 150° 55' 58.1"	Mon 01
	TBM A	N 70° 10' 26.0"	W 150° 56' 10.2"	
	TBM B	N 70° 10' 25.8"	W 150° 56' 11.5"	
	TBM C	N 70° 10' 25.6"	W 150° 56' 13.7"	
	TBM D	N 70° 10' 25.5"	W 150° 56' 14.2"	
Mon 9	TBM A	N 70° 14' 40.2"	W 150° 51' 23.7"	Mon 09
	TBM B	N 70° 14' 40.1"	W 150° 51' 26.2"	
	TBM C	N 70° 14' 40.0"	W 150° 51' 27.1"	
	TBM D	N 70° 14' 39.9"	W 150° 51' 28.2"	
	TBM E	N 70° 14' 40.1"	W 150° 51' 28.5"	
Mon 20	TBM A	N 70° 16' 42.5"	W 150° 59' 58.6"	Mon 20
	TBM B	N 70° 16' 42.8"	W 150° 59' 55.4"	
	TBM C	N 70° 16' 42.8"	W 150° 59' 55.0"	
	TBM D	N 70° 16' 42.7"	W 150° 59' 54.6"	
Mon 22	TBM A	N 70° 19' 06.0"	W 151° 03' 19.9"	Mon 22
	TBM B	N 70° 19' 06.6"	W 151° 03' 18.3"	
	TBM C	N 70° 19' 06.8"	W 151° 03' 17.9"	
	TBM D	N 70° 19' 07.6"	W 151° 03' 15.2"	
Mon 23	TBM A	N 70° 20' 37.0"	W 151° 03' 59.1"	Mon 23
	TBM B	N 70° 20' 37.0"	W 151° 03' 56.0"	
	TBM C	N 70° 20' 37.0"	W 151° 03' 54.9"	
	TBM D	N 70° 20' 36.9"	W 151° 03' 53.5"	
Mon 28	TBM A	N 70° 25' 32.0"	W 151° 04' 01.2"	Mon 28
	TBM B	N 70° 25' 32.5"	W 151° 04' 11.3"	
Mon 35	TBM A	-	-	Mon 35
Nigliq Paleo West	TBM A	N 70° 20' 16.8"	W 151° 06' 17.2"	Clear 1951
	TBM B	N 70° 20' 16.8"	W 151° 06' 20.2"	
Nigliq Paleo East	TBM A	N 70° 20' 26.3"	W 151° 05' 35.3"	NPRA 2
	TBM B	N 70° 20' 26.2"	W 151° 05' 31.7"	
UB6.9	TBM A	N 70° 17' 00.2"	W 151° 15' 23.9"	Jack
	TBM B	N 70° 17' 00.3"	W 151° 15' 24.5"	
	TBM C	N 70° 17' 00.1"	W 151° 15' 28.9"	
UB6.8	TBM A	N 70° 17' 05.1"	W 151° 15' 33.1"	Jack
	TBM B	N 70° 17' 04.7"	W 151° 15' 35.8"	
	TBM C	N 70° 17' 04.3"	W 151° 15' 37.5"	
	TBM D	N 70° 17' 03.6"	W 151° 15' 40.5"	
UB6.7	TBM A	N 70° 17' 07.9"	W 151° 15' 45.3"	Jack
	TBM B	N 70° 17' 07.8"	W 151° 15' 45.6"	
	TBM C	N 70° 17' 07.6"	W 151° 15' 46.0"	
	TBM D	N 70° 17' 06.6"	W 151° 15' 47.8"	

Gage Site	Gage	Latitude (NAD83)	Longitude (NAD83)	Basis of Elevation
UB1.9	TBM A	N 70° 18' 15.7"	W 151° 19' 40.8"	UBN 1
	TBM B	N 70° 18' 15.1"	W 151° 19' 41.5"	
	TBM C	N 70° 18' 13.4"	W 151° 19' 43.6"	
Judy 7.0	TBM A	N 70° 13' 11.0"	W 151° 50' 19.3"	Line 3S1
	TBM B	N 70° 13' 10.2"	W 151° 50' 20.5"	
	TBM C	N 70° 13' 10.2"	W 151° 50' 20.2"	
Judy 13.8	TBM A	N 70° 11' 11.2"	W 151° 57' 38.9"	Line 4BW
	TBM B	N 70° 11' 11.3"	W 151° 57' 40.8"	
	TBM C	N 70° 11' 11.4"	W 151° 57' 42.20"	
Fish 25.1	TBM A	N 70° 15' 56.0"	W 151° 42' 10.5"	Line 2S
	TBM B	N 70° 15' 55.5"	W 151° 42' 09.4"	
	TBM C	N 70° 15' 55.4"	W 151° 42' 09.3"	
Fish 10.3	TBM A	N 70° 19' 04.2"	W 151° 22' 52.0"	C-2
	TBM B	N 70° 19' 04.5"	W 151° 22' 51.4"	
	TBM C	N 70° 19' 05.1"	W 151° 22' 53.4"	
	TBM D	N 70° 19' 05.3"	W 151° 22' 54.5"	
Fish 0.7	TBM A	N 70° 22' 17.2"	W 151° 15' 20.7"	D1A South
	TBM B	N 70° 22' 17.0"	W 151° 15' 20.5"	
Site 1	S1W	N 70° 20' 08.4"	W 151° 07' 14.2"	NPRA 3
	S1	N 70° 20' 08.4"	W 151° 07' 09.2"	
	S1E	N 70° 20' 07.8"	W 151° 07' 06.3"	
Site 2	S2N	N 70° 18' 45.5"	W 151° 10' 59.8"	CDW
	S2	N 70° 18' 44.0"	W 151° 10' 45.2"	
	S2S	N 70° 18' 38.1"	W 151° 10' 43.7"	
Site 3	S3S	N 70° 18' 16.1"	W 151° 11' 26.0"	AMYLEE
	S3	N 70° 18' 19.6"	W 15° 11' 37.7"	
	S3N	N 70° 18' 24.1"	W 15° 11' 44.0"	
Site 5	S5S	N 70° 16' 50.1"	W 151° 17' 43.1"	CHAR
	S5	N 70° 16' 51.8"	W 151° 17' 37.3"	
	S5N	N 70° 16' 54.1"	W 151° 17' 32.5"	
Site 6	S6S	N 70° 16' 42.6"	W 151° 19' 55.2"	ALMA
	S6A	N 70° 16' 46.6"	W 151° 19' 48.0"	
	S6N	N 70° 16' 51.9"	W 151° 19' 47.8"	
Site 7	S7S	N 70° 16' 49.9"	W 151° 22' 11.4"	BRAD
	S7C	N 70° 16' 47.3"	W 151° 22' 16.1"	
	S7N	N 70° 16' 44.1"	W 151° 22' 17.0"	
Site 8	S8W	N 70° 15' 57.5"	W 151° 28' 13.8"	KELLY
	S8	N 70° 15' 58.1"	W 151° 28' 08.8"	
	S8E	N 70° 15' 58.4"	W 151° 28' 04.4"	

Gage Site	Gage	Latitude (NAD83)	Longitude (NAD83)	Basis of Elevation
Site 9	S9S	N 70° 12' 08.4"	W 151° 37' 10.3"	PATTY
	S9C	N 70° 12' 13.4"	W 151° 37' 18.3"	
	S9N	N 70° 12' 17.5"	W 151° 37' 21.9"	
Site 10	S10	N 70° 12' 02.8"	W 151° 39' 55.1"	MECKEL
Site 11	S11S	N 70° 16' 45.5"	W 151° 23' 18.6"	BRAD
	S11C	N 70° 16' 50.5"	W 151° 23' 15.2"	
	S11N	N 70° 16' 55.2"	W 151° 23' 19.9"	
Site 12	S12S	N 70° 16' 26.1"	W 151° 28' 48.1"	KELLY
	S12N	N 70° 16' 30.1"	W 151° 28' 52.1"	
Site 13	S13	N 70° 12' 14.9"	W 151° 45' 25.8"	BAKER

Appendix B ADCP Discharge Results

Monument 1

Station No.: Monument 01D
Station Name: Colville River

Meas. No: 001
Date: 05/29/2006

Party:	MDM/MTA	Width:	3,490 ft	Processed by:	MDM
Boat/Motor:	Achilles w/ 25 hp	Area:	73,300 ft²	Mean Velocity:	3.28 ft/s
Gage Height:	0.00 ft	G.H.Change:	0.00	Discharge:	240,000 ft³/s

Area Method:	Mean Flow	ADCP Depth:	0.85 ft	Index Vel.:	0.00 ft/s	Rating No.:	1
Nav. Method:	Bottom Track	Shore Ens.:	10	Adj.Mean Vel:	0.00 ft/s	Qm Rating:	U
MagVar Method:	None (25.0°)	Top Est:	Power (0.1667)	Rated Area:	0.000 ft²	% Diff:	0.0%
Depth Sounder:	Not Used	Bottom Est:	Power (0.1667)	Control:	Unspecified		

Screening Thresholds:				ADCP:			
BT 3-Beam Solution:	ON	Max. Vel.:	7.29 ft/s	Type/Freq.:	Workhorse / 600 kHz		
WT 3-Beam Solution:	OFF	Max. Depth:	33.6 ft	Serial #:	0	Firmware:	16.28
BT Error Vel.:	0.33 ft/s	Mean Depth:	21.0 ft	Bin Size:	50 cm	Blank:	25 cm
WT Error Vel.:	3.50 ft/s	% Meas.:	63.63%	BT Mode:	5	BT Pings:	1
BT Up Vel.:	1.00 ft/s	Water Temp.:	None	WT Mode:	1	WT Pings:	1
WT Up Vel.:	5.00 ft/s	ADCP Temp.:	33.3 °F	WV:170			

Diag. Test:
Moving Bed Test:
Compass Test:
Meas. Location: Adjacent to Mon01 Downstream monitoring station

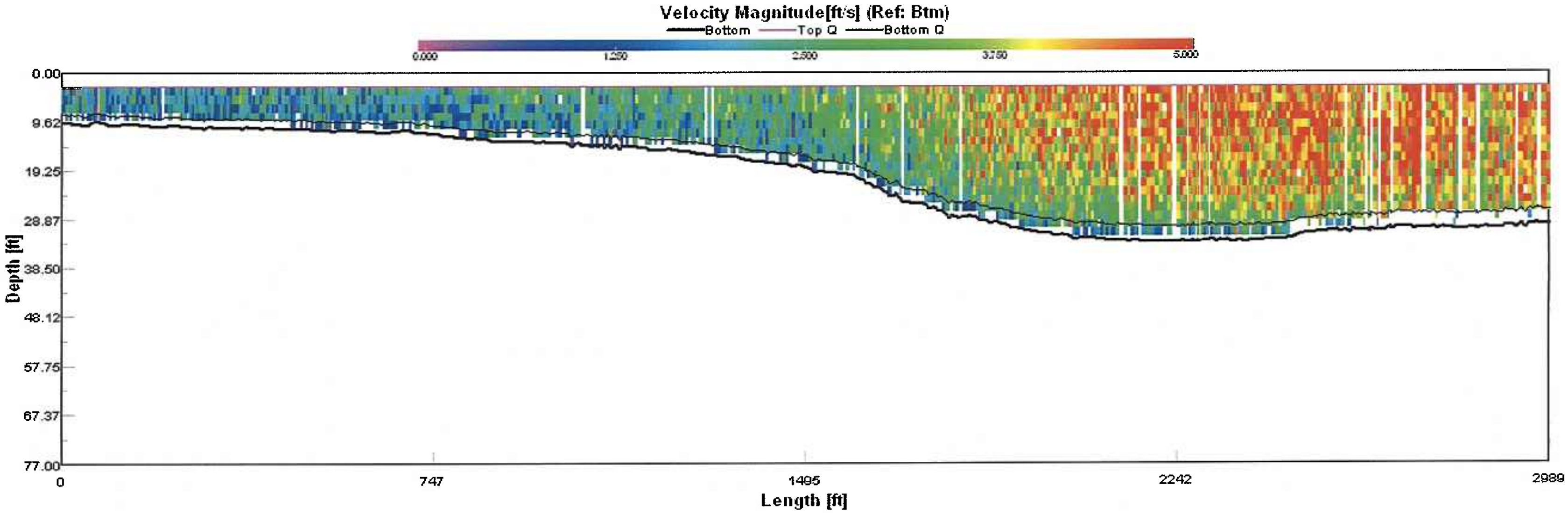
Filename Prefix: DATA_
Software: 1.06.00

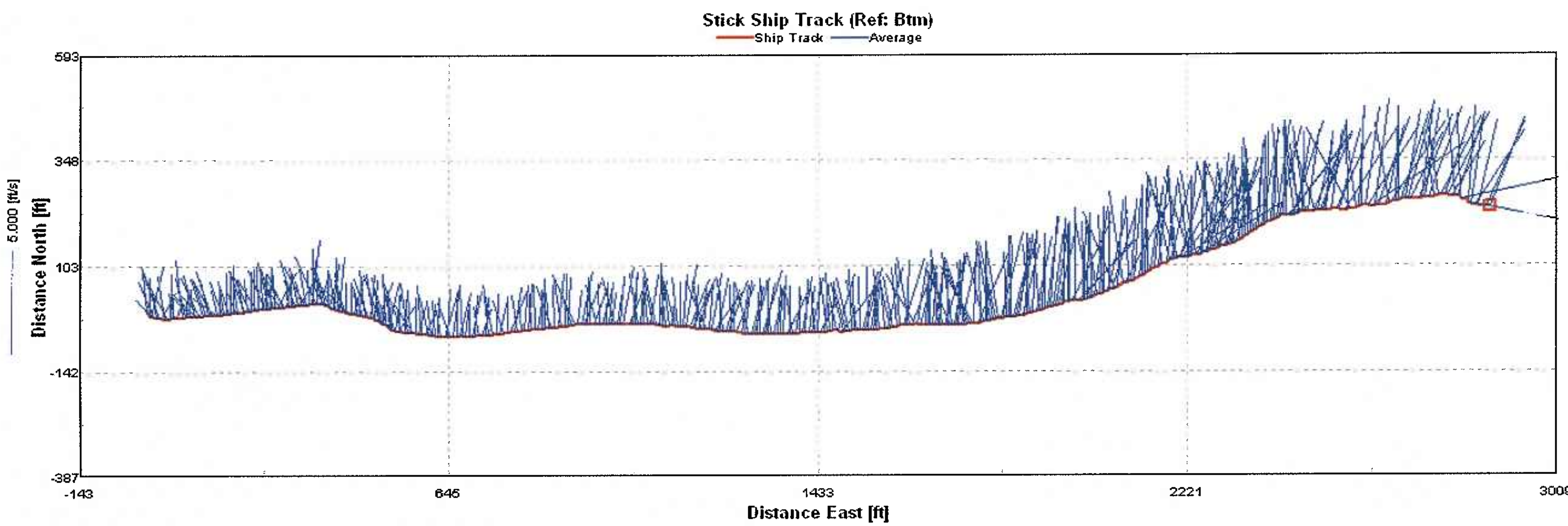
Tr.#		Edge D.		#Ens	Discharge						Width	Area	Time		Mean Vel.		% Bad		
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins	
001	L	270	453	508	25648	146280	19066	1726	45304	238025	3551	74077	19:20	19:33	3.69	3.21	5	0	
002	R	270	453	674	26675	150861	19877	1495	40177	239086	3516	73240	19:33	19:51	3.11	3.26	12	0	
004	L	236	353	402	27454	158336	20787	1493	35181	243250	3577	76144	19:53	20:04	4.83	3.19	4	0	#
003	R	236	353	517	27311	155676	20359	1389	35443	240178	3299	69551	20:05	20:18	3.76	3.45	8	0	#
Mean		253	403	525	26772	152788	20022	1526	39026	240135	3486	73253	**Total**	00:58	3.85	3.28	7	0	
SDev		20	58	112	822	5329	738	142	4774	2255	127	2753			0.72	0.12			
R/M%		13	25	51.8	6.7	7.9	8.6	22.1	25.9	2.2	8.0	9.0			44.74	7.88			

Remarks:

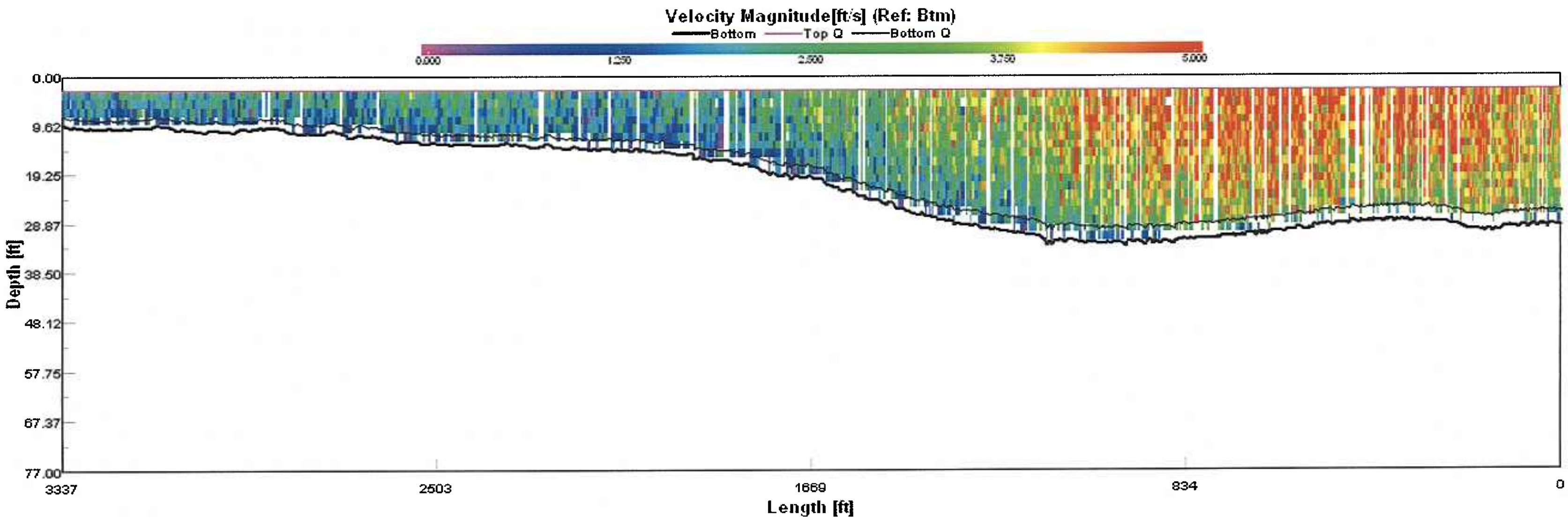
- transect has been subsectioned

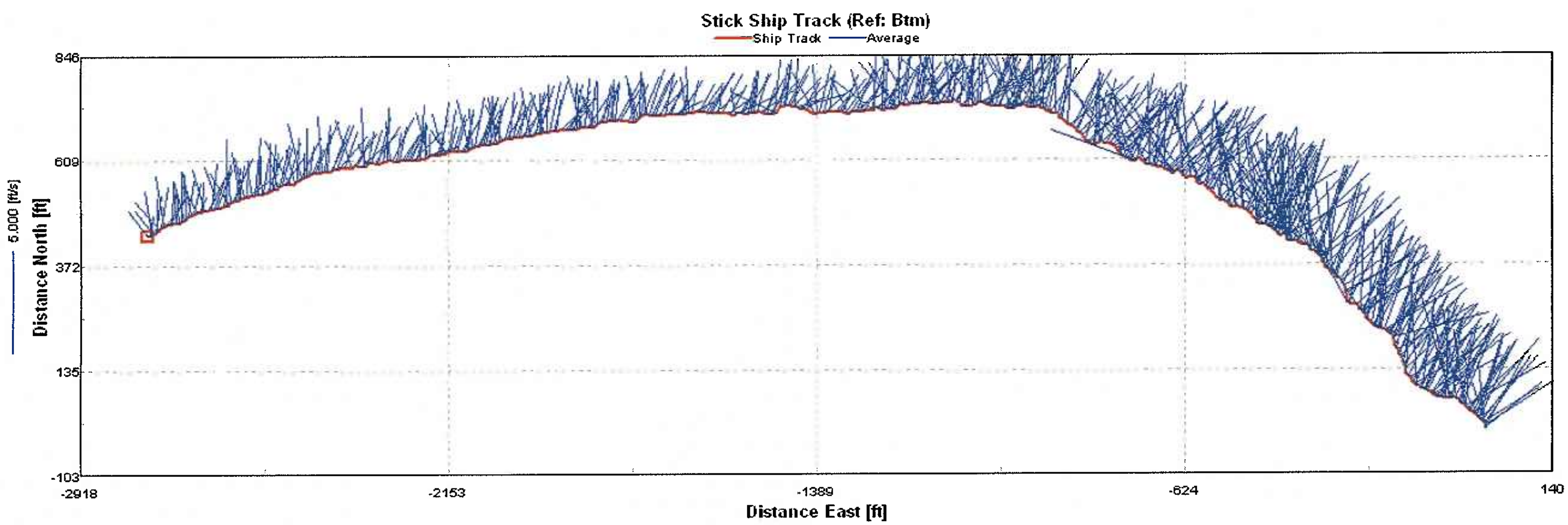
Monument 1 Discharge Transect 1, WinRiver Velocity and Ship Track Plots
May 29, 2006



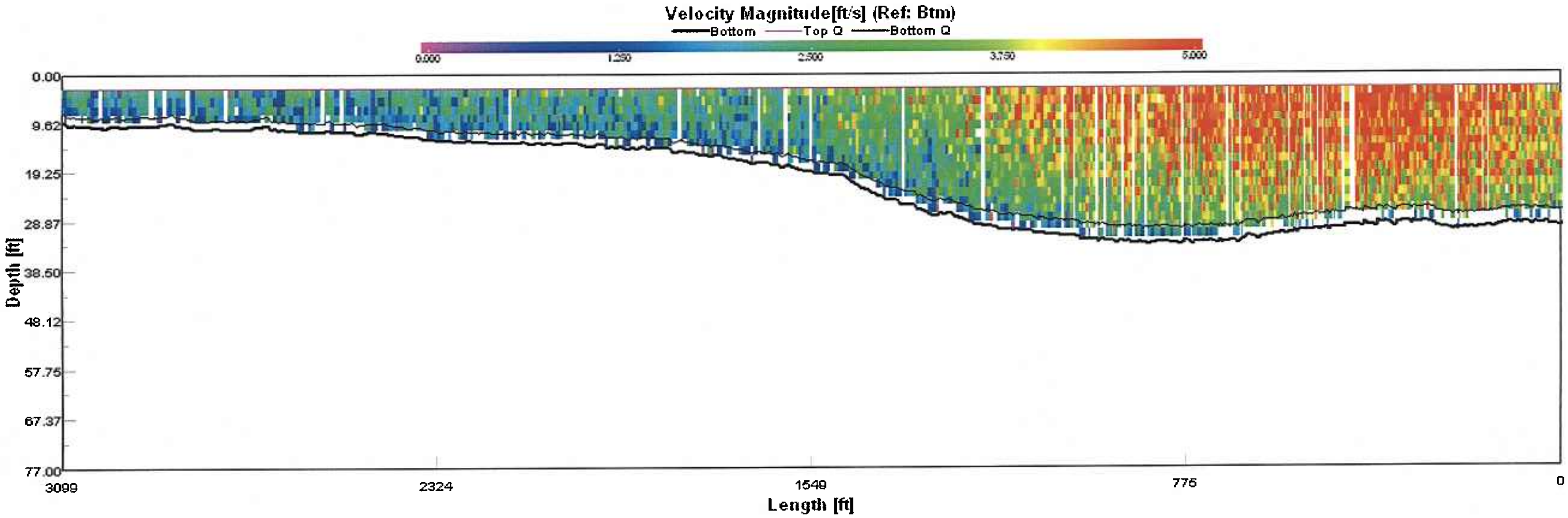


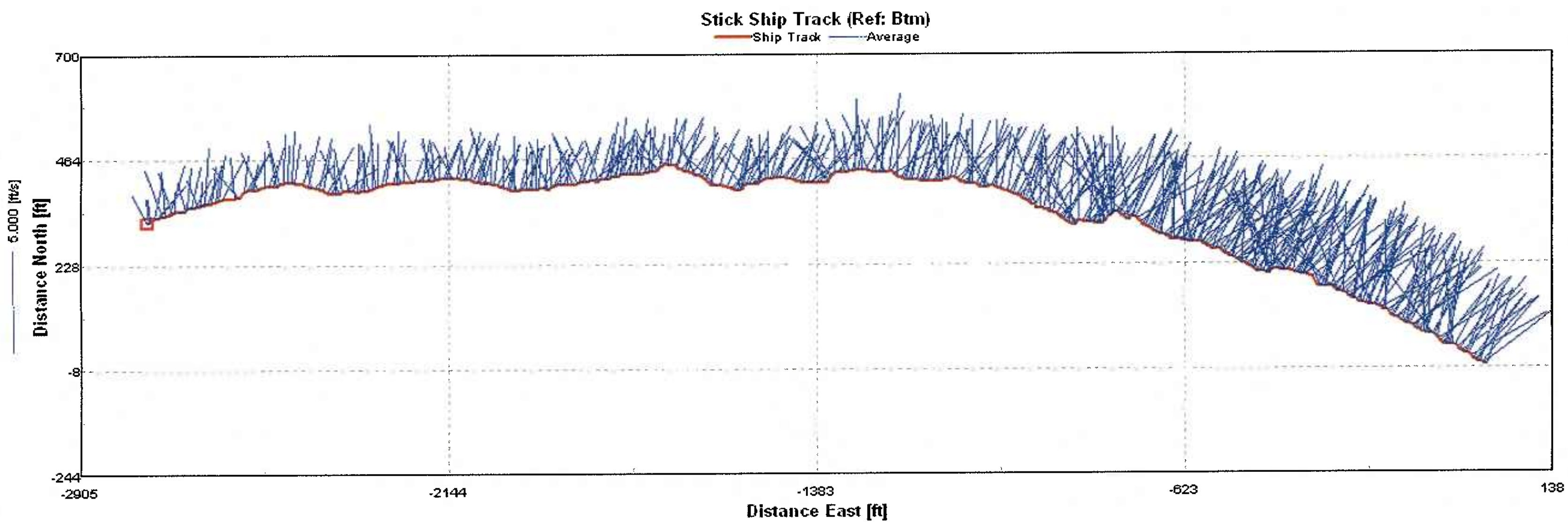
Monument 1 Discharge Transect 2, WinRiver Velocity and Ship Track Plots
May 29, 2006



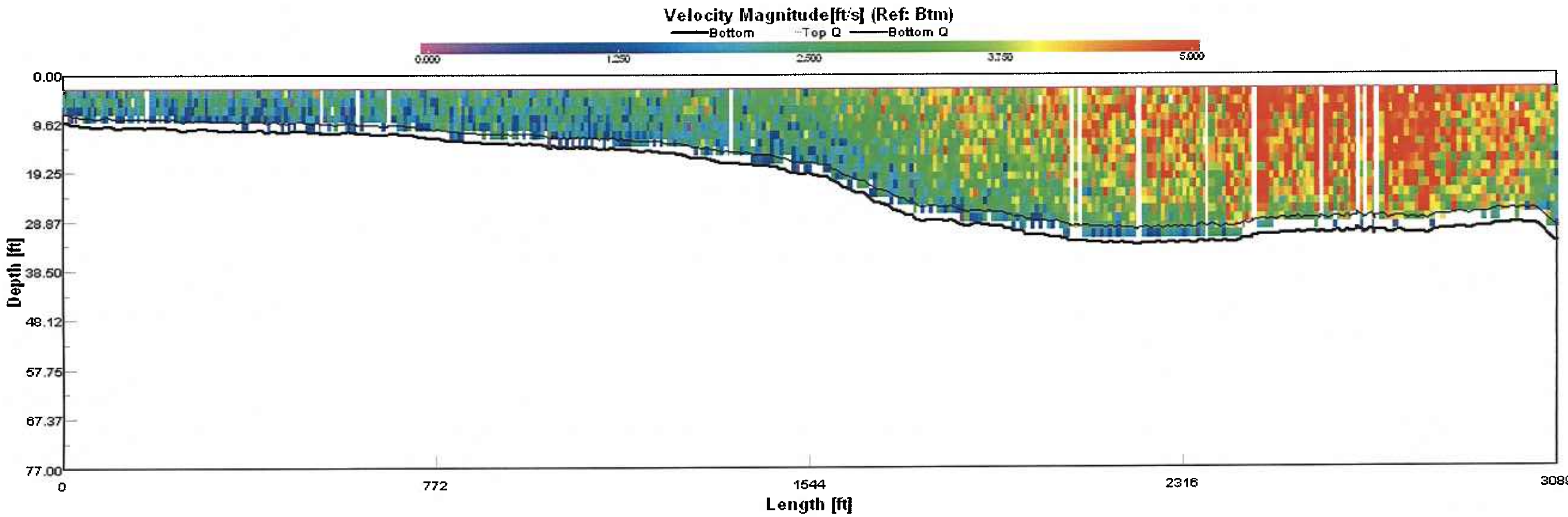


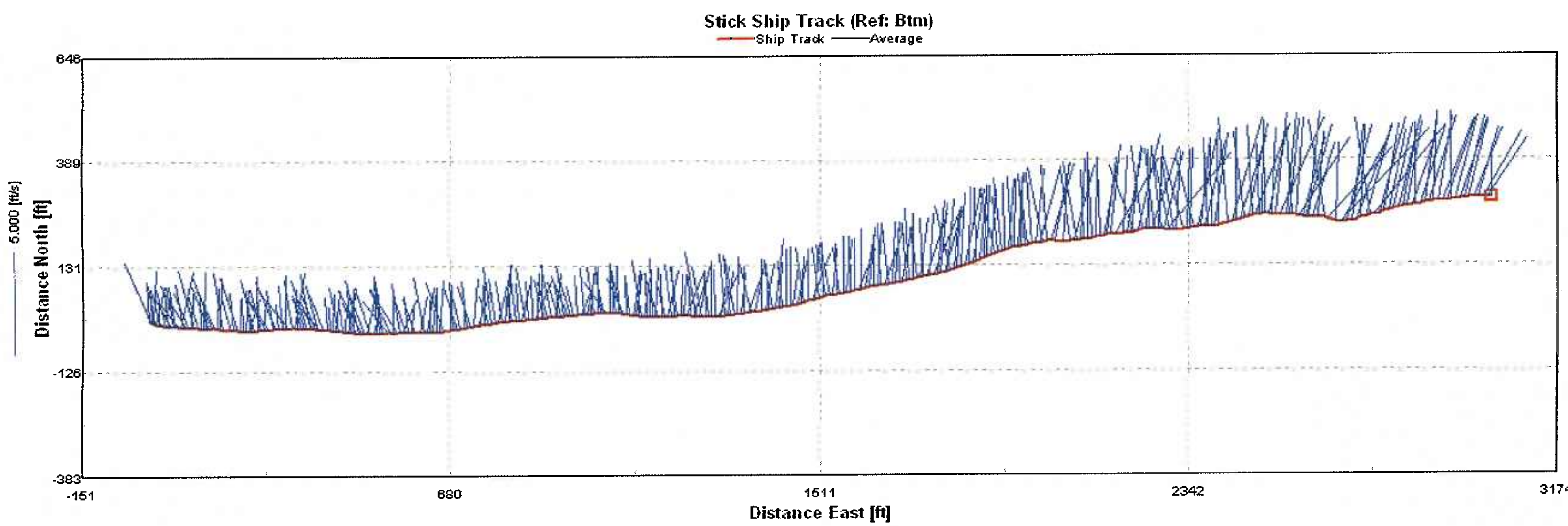
Monument 1 Discharge Transect 3, WinRiver Velocity and Ship Track Plots
May 29, 2006



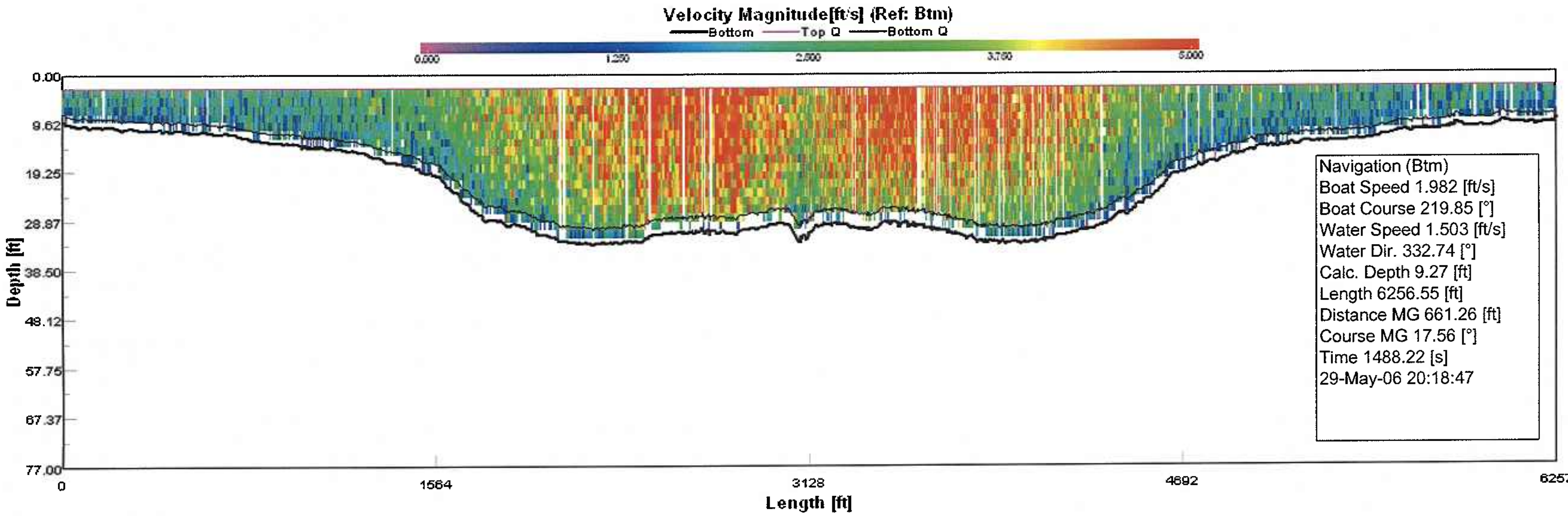


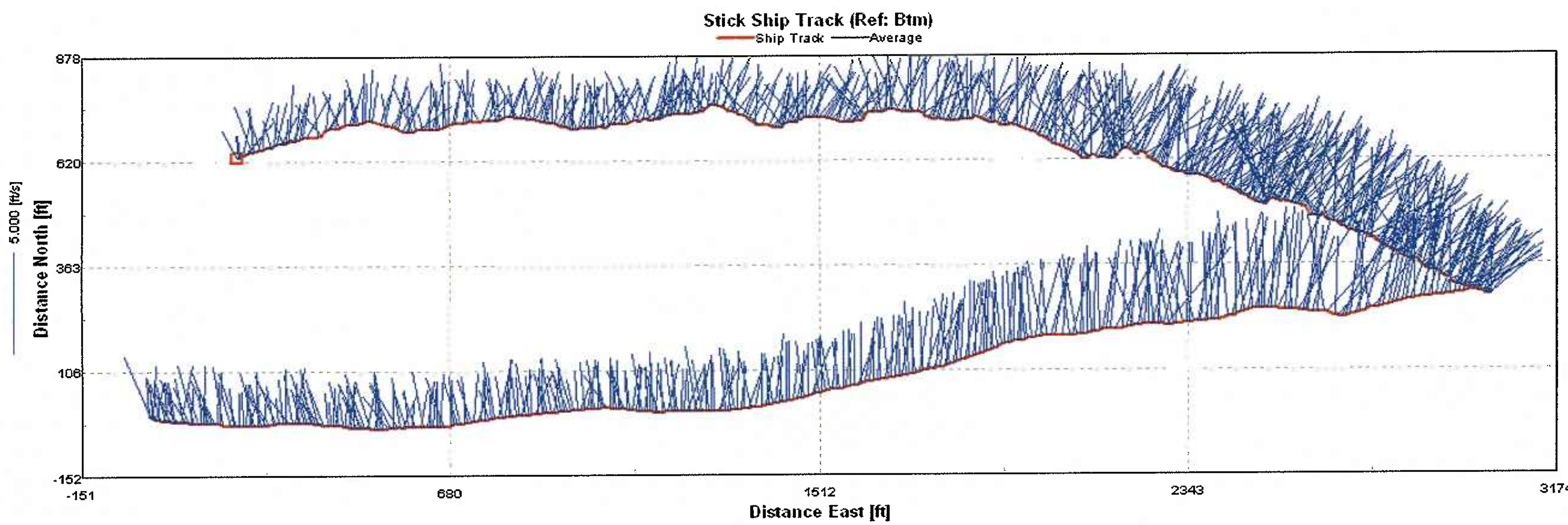
Monument 1 Discharge Transect 4, WinRiver Velocity and Ship Track Plots
May 29, 2006





Monument 1 Discharge Loop Test, WinRiver Velocity and Ship Track Plots
May 29, 2006





Station No.: Monument 01D

Station Name: Colville River

Meas. No: 002

Date: 05/30/2006

Party:	MDM/MTA	Width:	3,490 ft	Processed by:	MDM
Boat/Motor:	Achilles w/ 25 hp	Area:	71,800 ft²	Mean Velocity:	3.70 ft/s
Gage Height:	0.00 ft	G.H.Change:	0.00	Discharge:	265,000 ft³/s

Area Method:	Avg. Course	ADCP Depth:	*1.10 ft	Index Vel.:	0.00 ft/s	Rating No.:	1
Nav. Method:	Bottom Track	Shore Ens.:	10	Adj.Mean Vel:	0.00 ft/s	Qm Rating:	U
MagVar Method:	None (23.0°)	Top Est:	Power (0.1667)	Rated Area:	0.000 ft²	% Diff:	0.0%
Depth Sounder:	Not Used	Bottom Est:	Power (0.1667)	Control:	Unspecified		

Screening Thresholds:				ADCP:			
BT 3-Beam Solution:	ON	Max. Vel.:	7.60 ft/s	Type/Freq.:	Workhorse / 600 kHz		
WT 3-Beam Solution:	OFF	Max. Depth:	34.7 ft	Serial #:	0	Firmware:	16.28
BT Error Vel.:	0.33 ft/s	Mean Depth:	20.6 ft	Bin Size:	50 cm	Blank:	25 cm
WT Error Vel.:	4.92 ft/s	% Meas.:	59.51%	BT Mode:	5	BT Pings:	1
BT Up Vel.:	32.81 ft/s	Water Temp.:	None	WT Mode:	1	WT Pings:	1
WT Up Vel.:	32.81 ft/s	ADCP Temp.:	34.4 °F	WV:170			

Diag. Test:

Moving Bed Test:

Compass Test:

Meas. Location: Adjacent to Mon01 Downstream monitoring station

Filename Prefix: DATA_20060530123039_

Software: 1.06.00

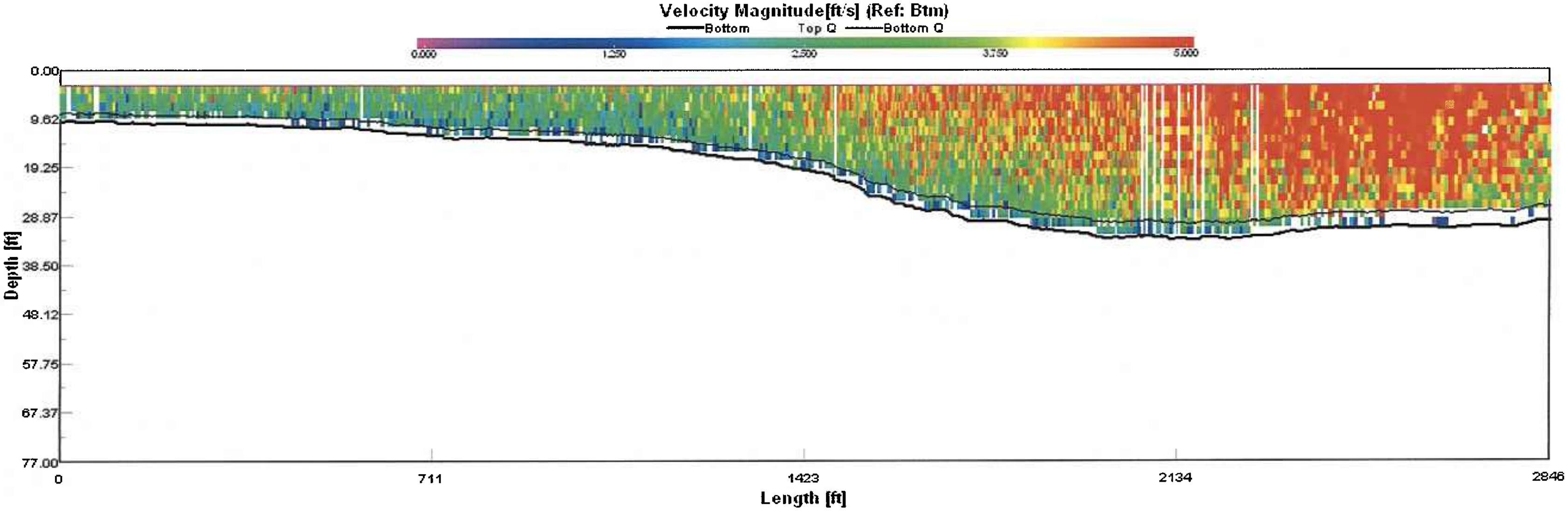
Tr.#		Edge D.		#Ens	Discharge						Width	Area	Time		Mean Vel.		% Bad		
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins	
000	L	500	320	557	33758	170832	22680	4999	36713	268982	3634	73088	16:17	16:32	3.21	3.68	3	0	#
000	R	329	321	442	34263	171958	23300	2763	39817	272100	3461	70994	16:32	16:44	4.12	3.83	3	0	
000	L	405	166	446	31569	175088	23246	3823	19797	253523	3334	69325	16:48	17:00	3.96	3.66	1	0	#
000	L	400	774	507	24112	113873	15952	3212	109839	266987	3519	73736	17:48	18:02	2.95	3.62	5	0	
Mean		409	395	488	30926	157938	21294	3699	51541	265398	3487	71786	**Total**	01:44	3.56	3.70	2	0	
SDev		70	263	55	4690	29432	3573	969	39848	8192	125	2015			0.57	0.09			
R/M%		42	154	23.6	32.8	38.8	34.5	60.4	174.7	7.0	8.6	6.1			32.74	5.73			

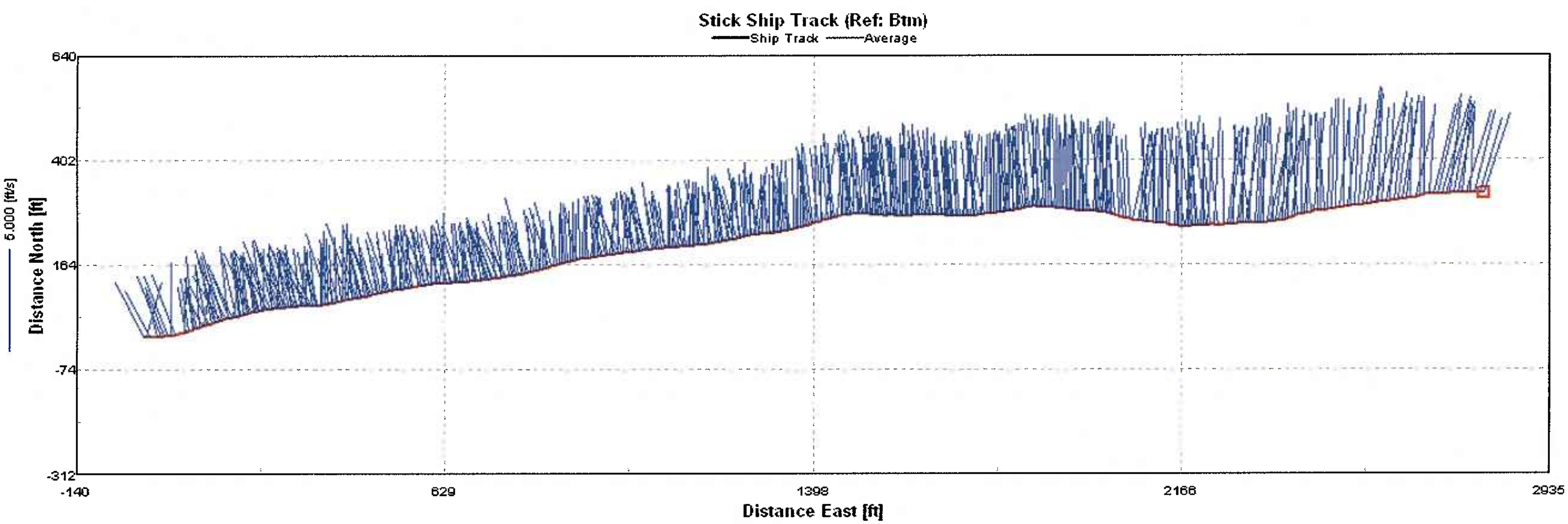
Remarks:

- transect has been subsectioned

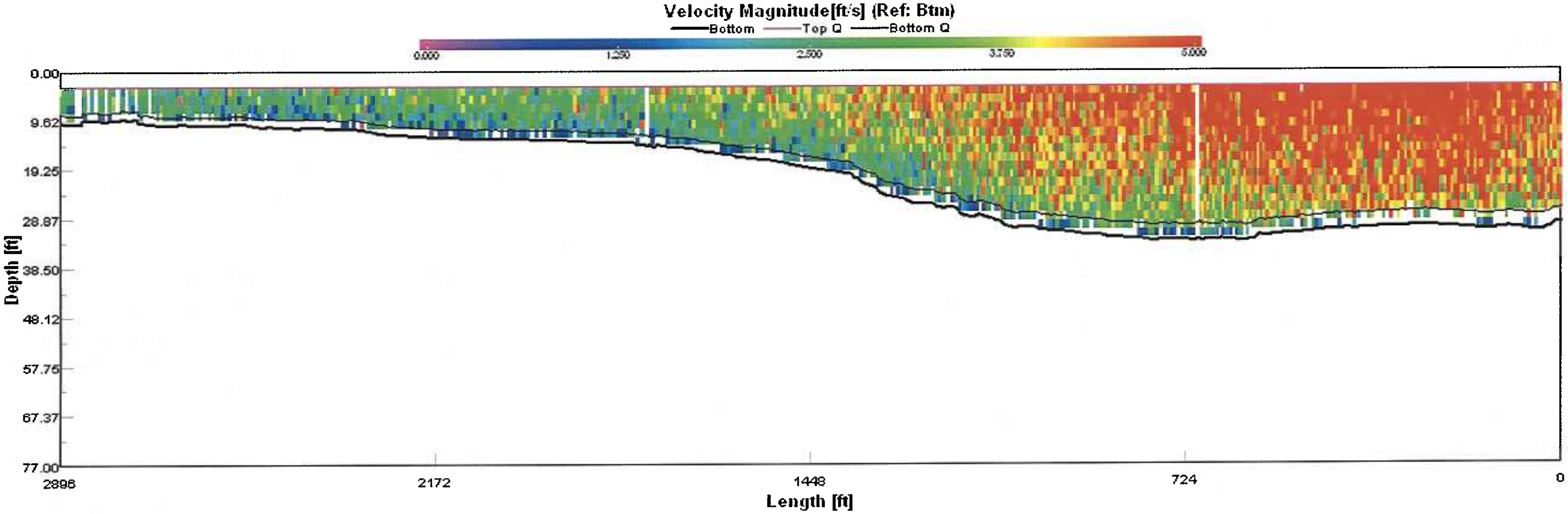
* - value not consistent for all transects

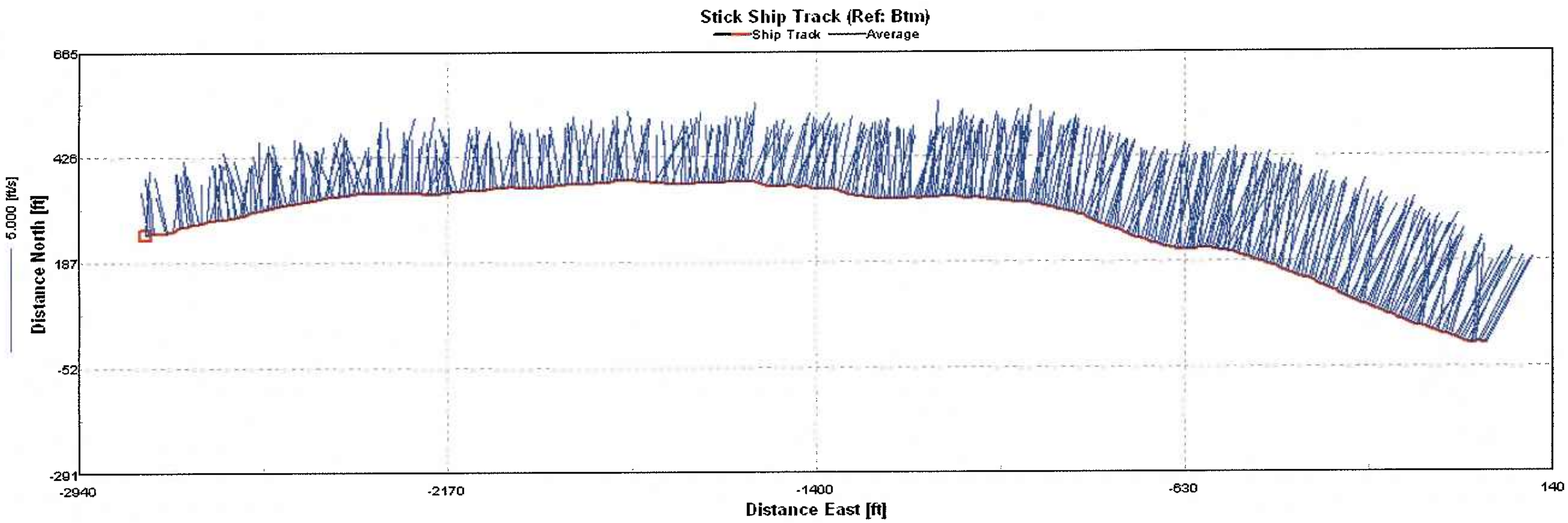
Monument 1 Discharge Transect 1, WinRiver Velocity and Ship Track Plots
May 30, 2006



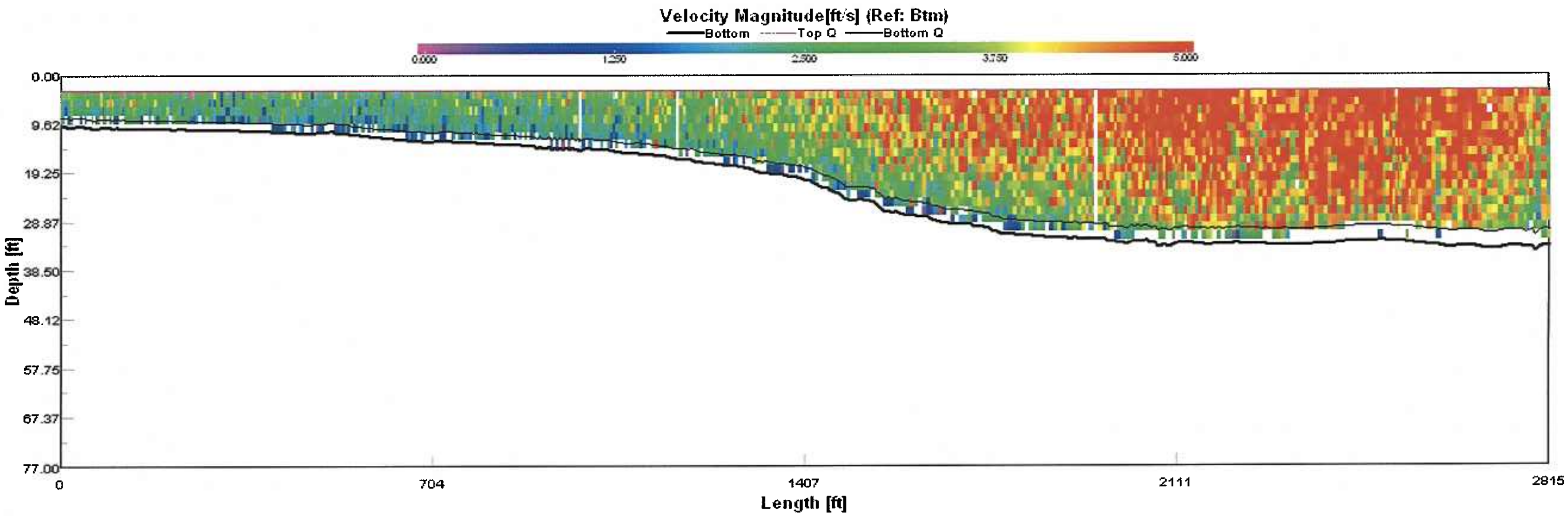


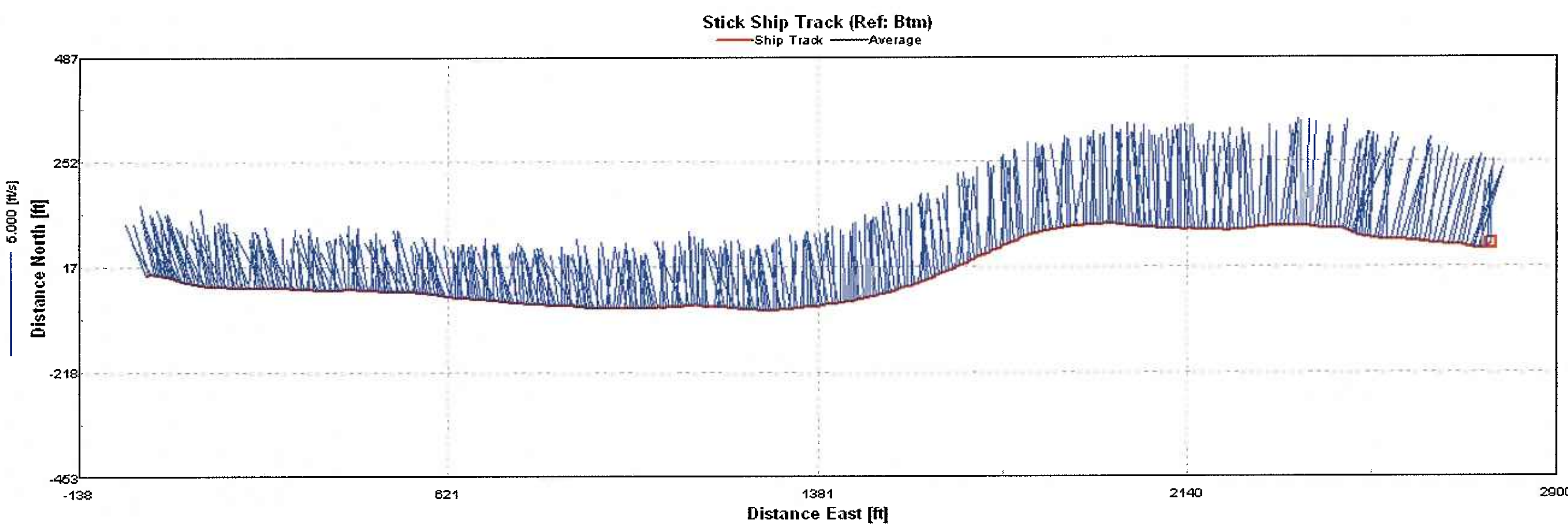
Monument 1 Discharge Transect 2, WinRiver Velocity and Ship Track Plots
May 30, 2006



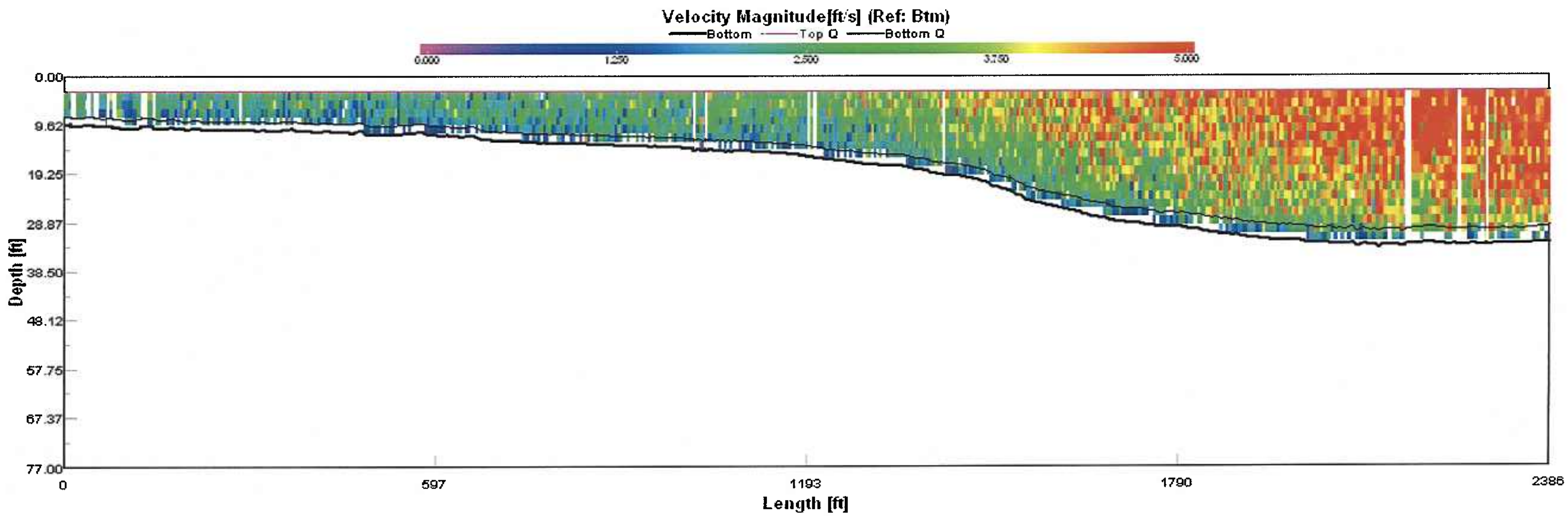


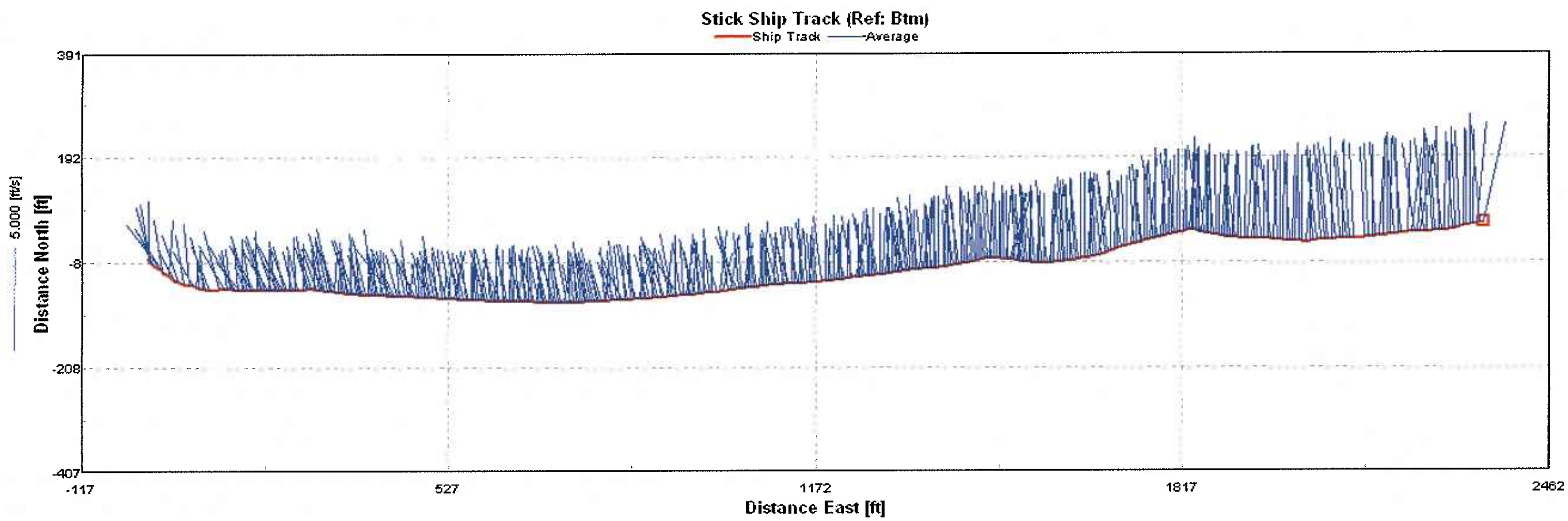
Monument 1 Discharge Transect 3, WinRiver Velocity and Ship Track Plots
May 30, 2006



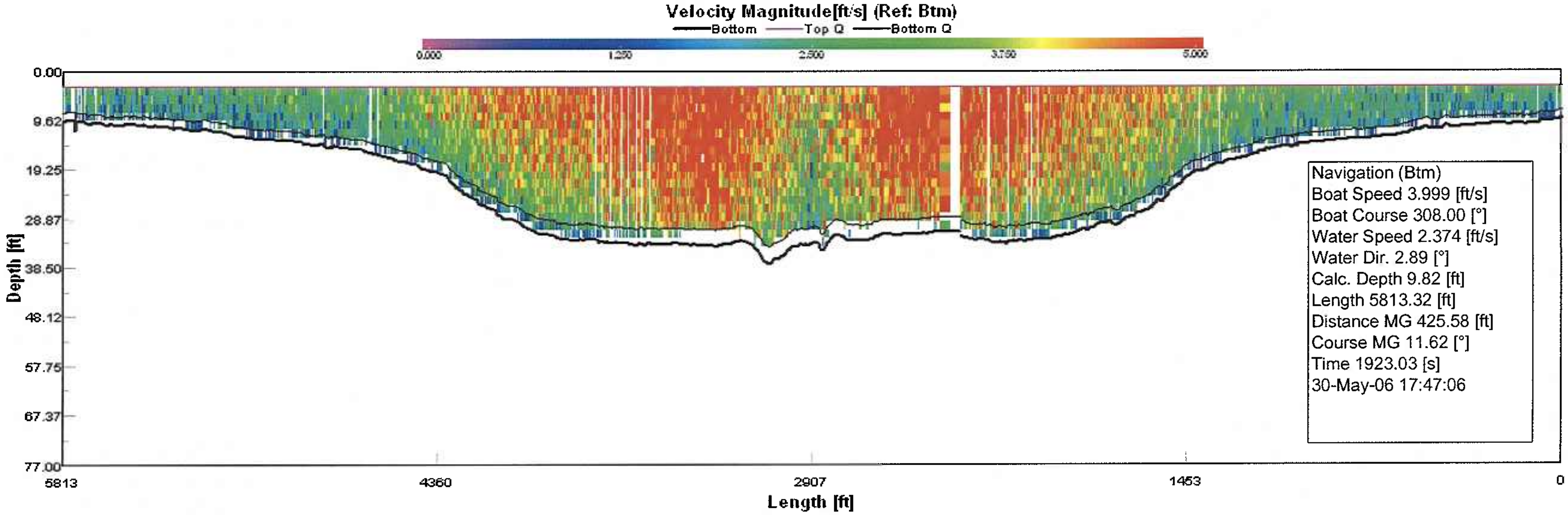


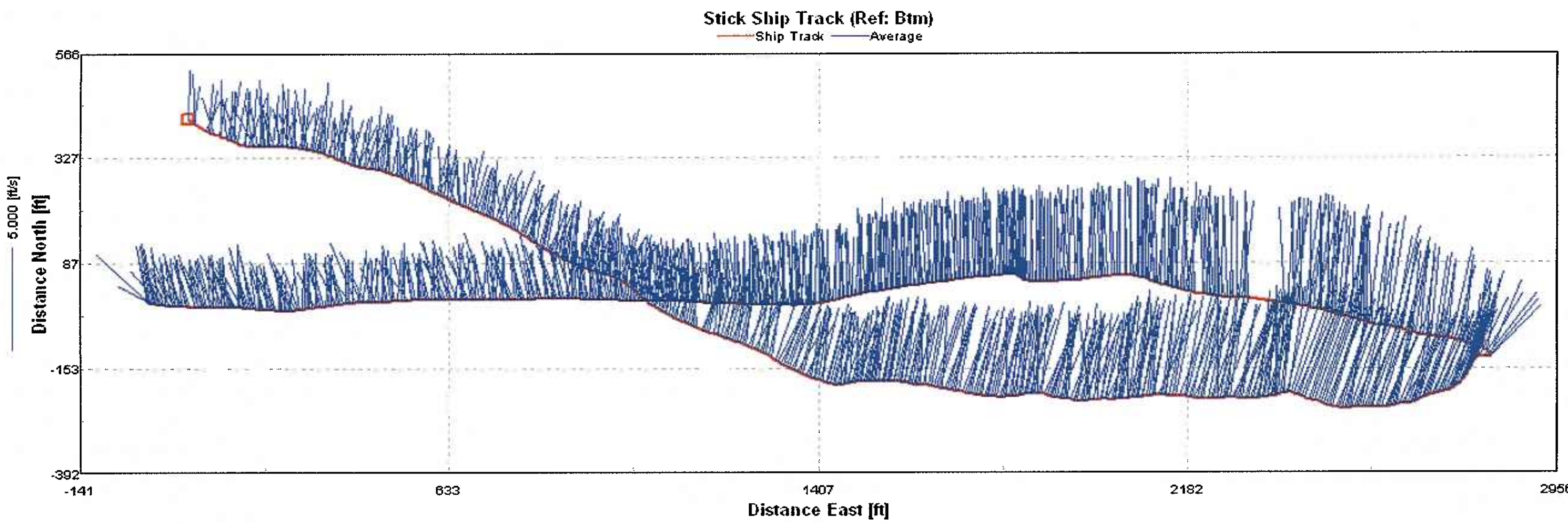
Monument 1 Discharge Transect 4, WinRiver Velocity and Ship Track Plots
May 30, 2006





Monument 1 Discharge Loop Test, WinRiver Velocity and Ship Track Plots
May 30, 2006





Station No.: Monument 01
Station Name: Colville River

Meas. No: 003
Date: 05/31/2006

Party:	MDM/MTA	Width:	2,950 ft	Processed by:	MDM
Boat/Motor:	Achilles w/ 25 hp	Area:	46,300 ft²	Mean Velocity:	4.36 ft/s
Gage Height:	0.00 ft	G.H.Change:	0.00	Discharge:	201,000 ft³/s

Area Method:	Mean Flow	ADCP Depth:	1.60 ft	Index Vel.:	0.00 ft/s	Rating No.:	1
Nav. Method:	Bottom Track	Shore Ens.:	10	Adj.Mean Vel:	0.00 ft/s	Qm Rating:	U
MagVar Method:	None (*23.0°)	Top Est:	Power (0.1667)	Rated Area:	0.000 ft²	% Diff:	0.0%
Depth Sounder:	Not Used	Bottom Est:	Power (0.1667)	Control:	Unspecified		

Screening Thresholds:				ADCP:			
BT 3-Beam Solution:	ON	Max. Vel.:	10.6 ft/s	Type/Freq.:	Workhorse / 600 kHz		
WT 3-Beam Solution:	OFF	Max. Depth:	38.8 ft	Serial #:	0	Firmware:	16.28
BT Error Vel.:	0.33 ft/s	Mean Depth:	15.7 ft	Bin Size:	50 cm	Blank:	25 cm
WT Error Vel.:	*4.92 ft/s	% Meas.:	68.85%	BT Mode:	5	BT Pings:	1
BT Up Vel.:	*32.81 ft/s	Water Temp.:	None	WT Mode:	1	WT Pings:	1
WT Up Vel.:	*32.81 ft/s	ADCP Temp.:	36.0 °F	WV:	170		

Diag. Test:
Moving Bed Test:
Compass Test:
Meas. Location: Adjacent to Mon01 monitoring station

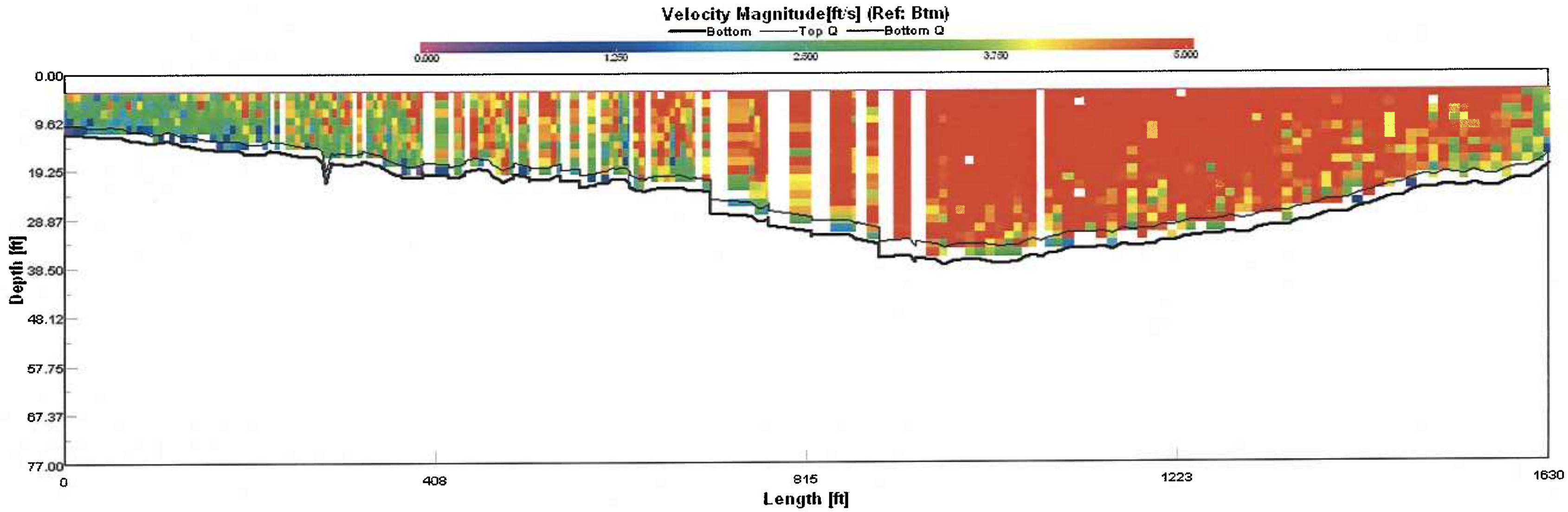
Filename Prefix: DATA_20060531155725_
Software: 1.06.00

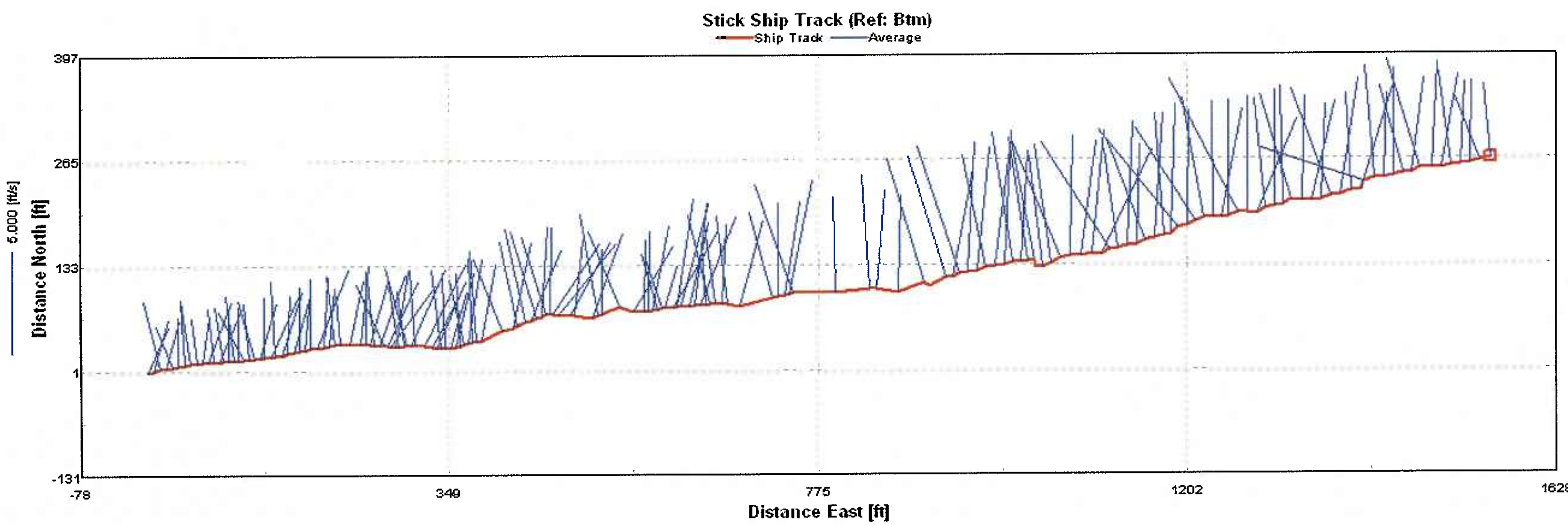
Tr.#		Edge D.		#Ens	Discharge						Width	Area	Time		Mean Vel.		% Bad		
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins	
000	L	1398	126	216	28818	142510	17344	15203	4077	207952	3090	49116	19:43	19:49	4.76	4.23	21	0	
000	R	1208	112	239	28671	138288	17409	8870	1315	194553	2840	43596	19:50	19:57	4.81	4.46	14	1	#
000	R	1303	126	243	29809	143829	17950	12943	3992	208523	2993	47142	20:02	20:08	5.13	4.42	19	0	
000	L	1300	155	184	27322	134343	16960	14803	5078	198507	3021	48273	20:11	20:16	5.98	4.11	13	0	#
000	R	1300	155	325	28517	139106	17697	12021	4765	202105	2820	43684	20:16	20:25	3.92	4.63	19	0	#
000	R	1221	164	254	28609	133412	17731	11442	4787	195980	2940	45746	20:44	20:50	4.42	4.28	11	0	#
Mean		1288	140	244	28624	138581	17515	12547	4002	201270	2951	46259	**Total**	01:07	4.84	4.36	16	0	
SDev		69	21	47	794	4196	351	2338	1384	5978	106	2323			0.69	0.18			
R/M%		15	37	57.9	8.7	7.5	5.7	50.5	94.0	6.9	9.1	11.9			42.59	11.80			

Remarks:

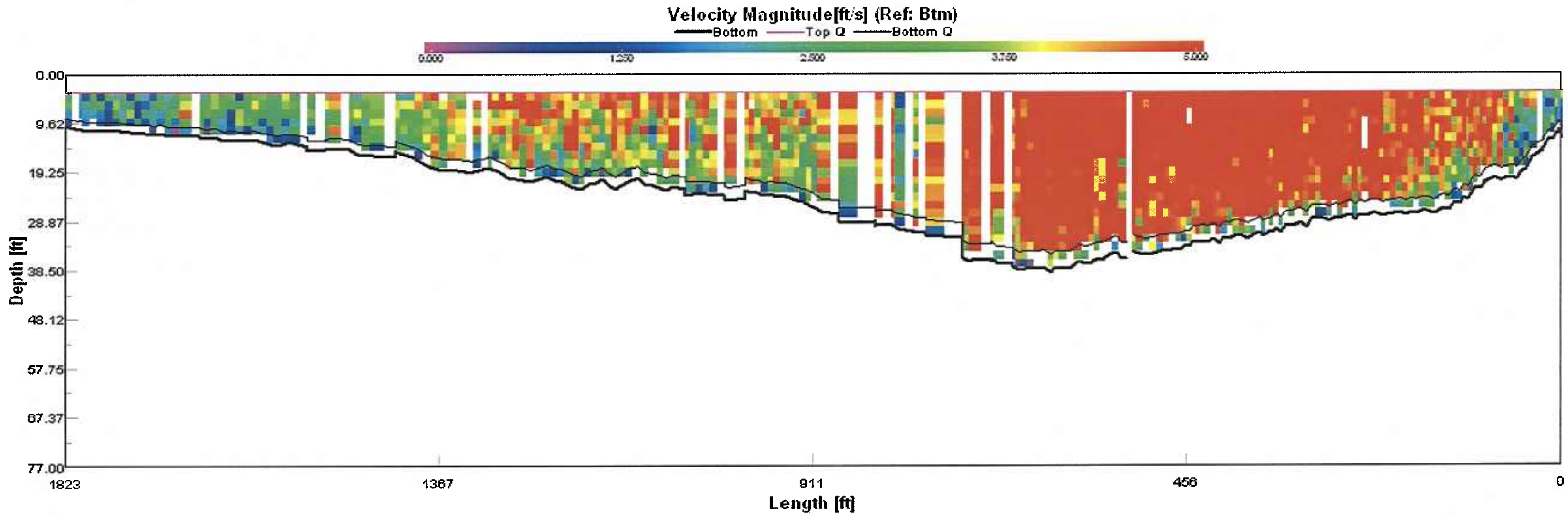
- transect has been subsectioned
* - value not consistent for all transects

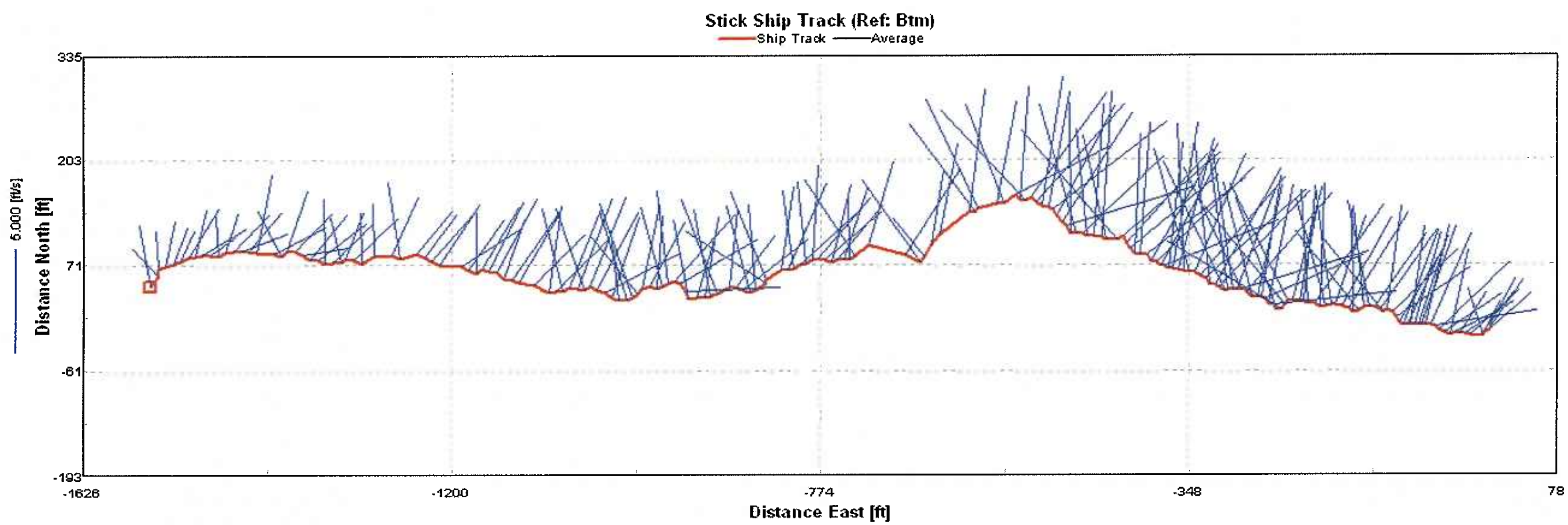
Monument 1 Discharge Transect 1, WinRiver Velocity and Ship Track Plots
May 31, 2006



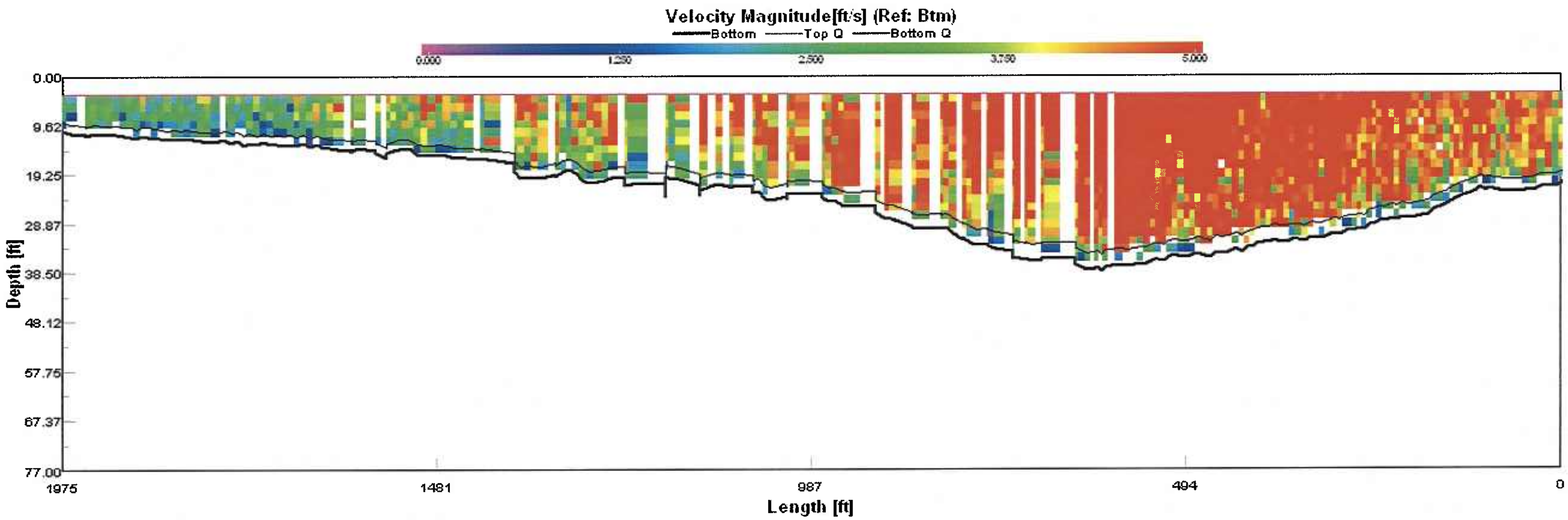


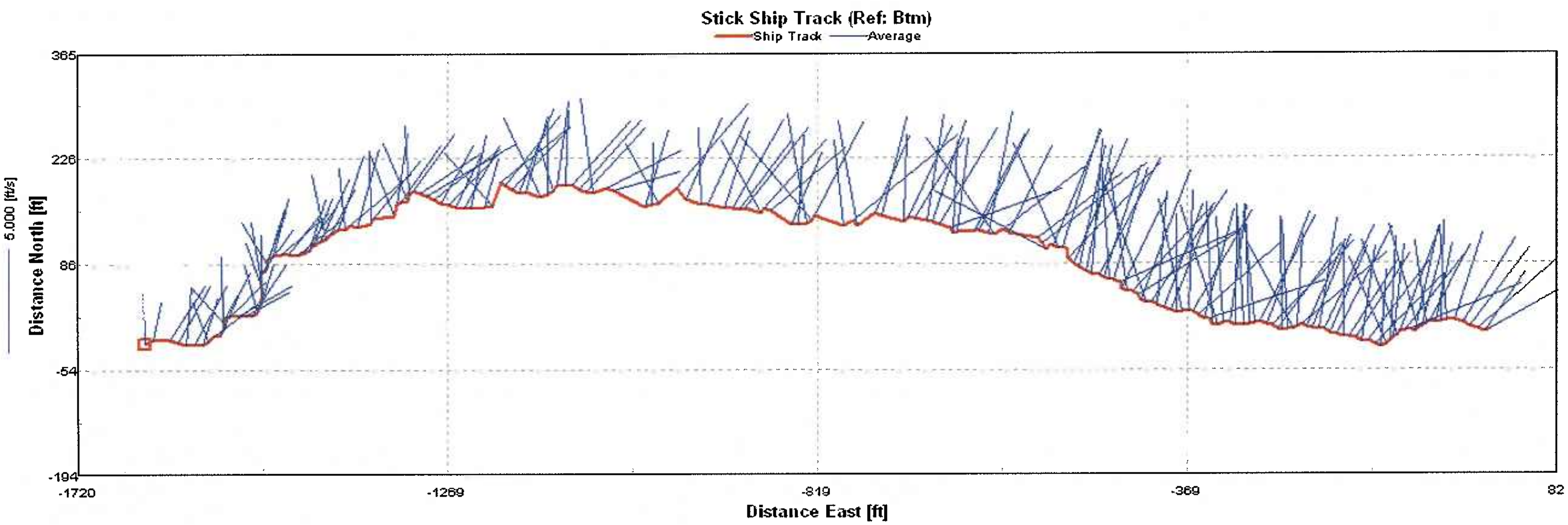
Monument 1 Discharge Transect 2, WinRiver Velocity and Ship Track Plots
May 31, 2006



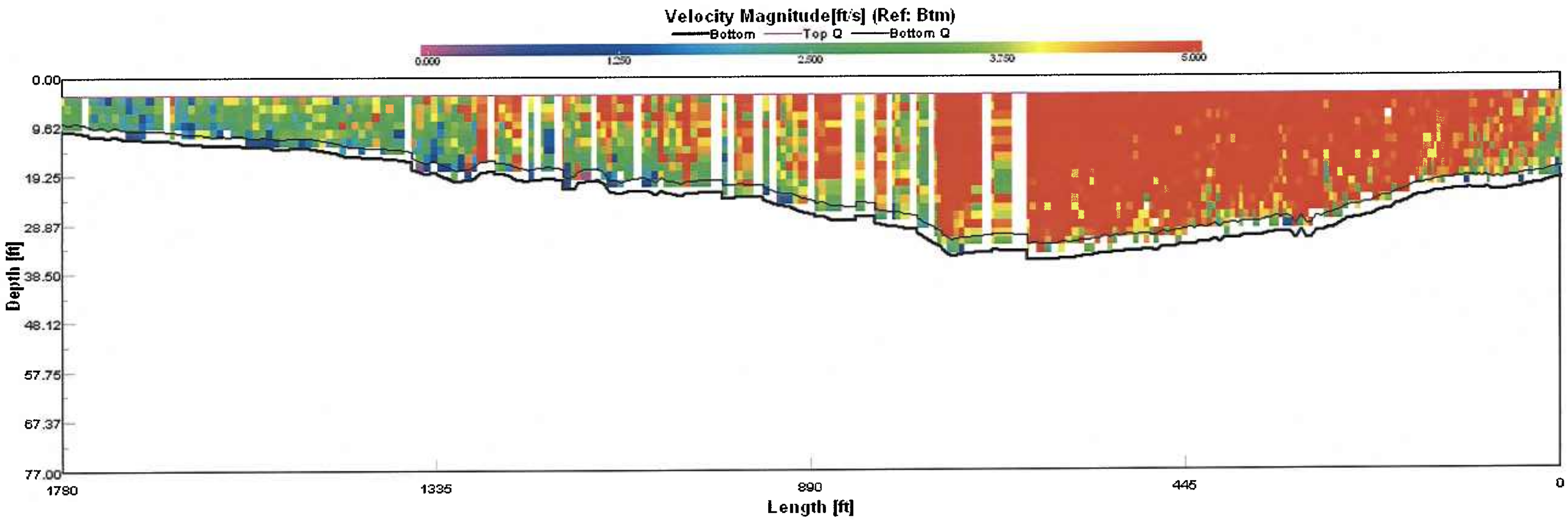


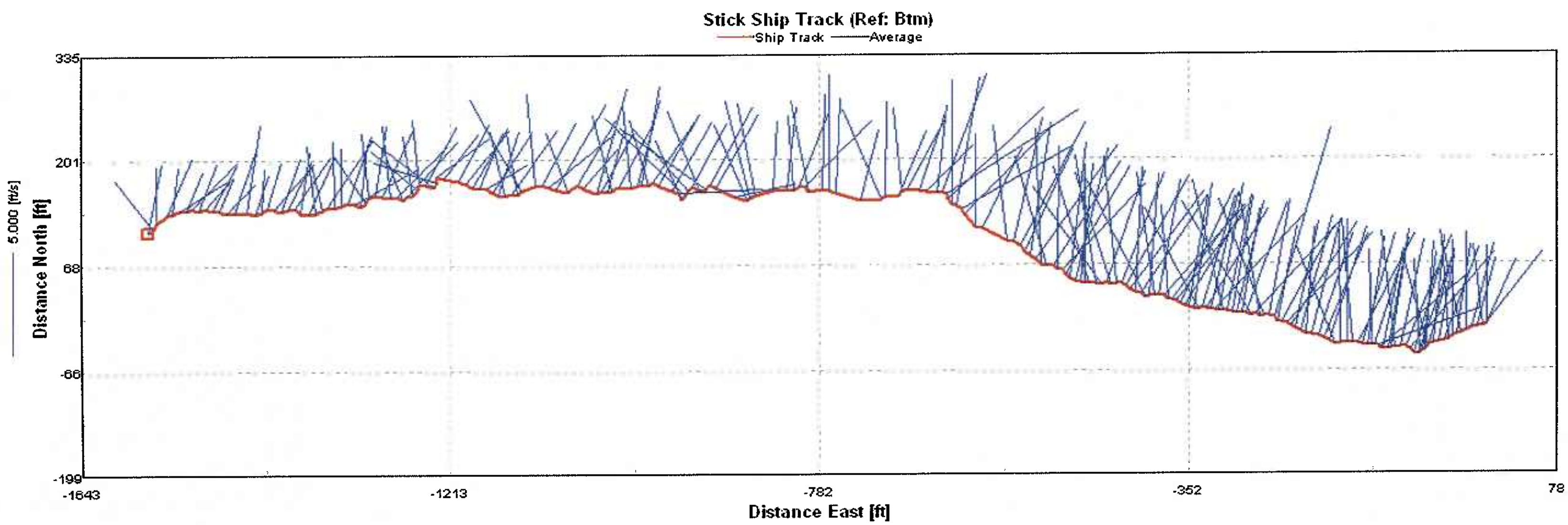
Monument 1 Discharge Transect 3, WinRiver Velocity and Ship Track Plots
May 31, 2006



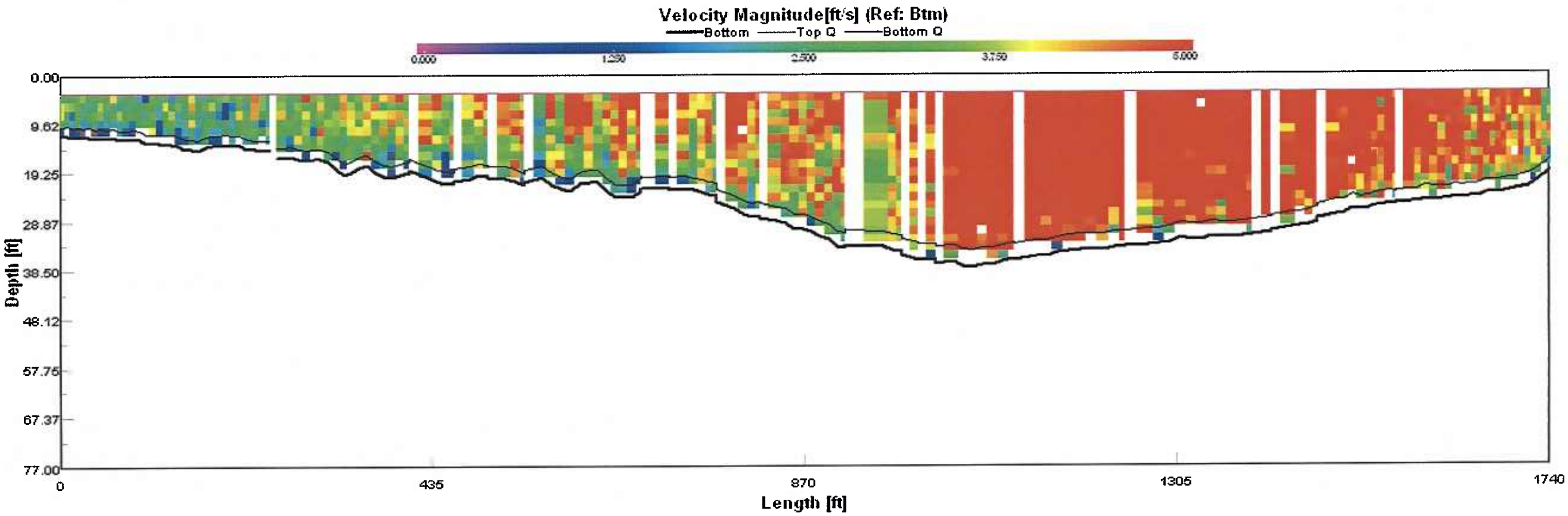


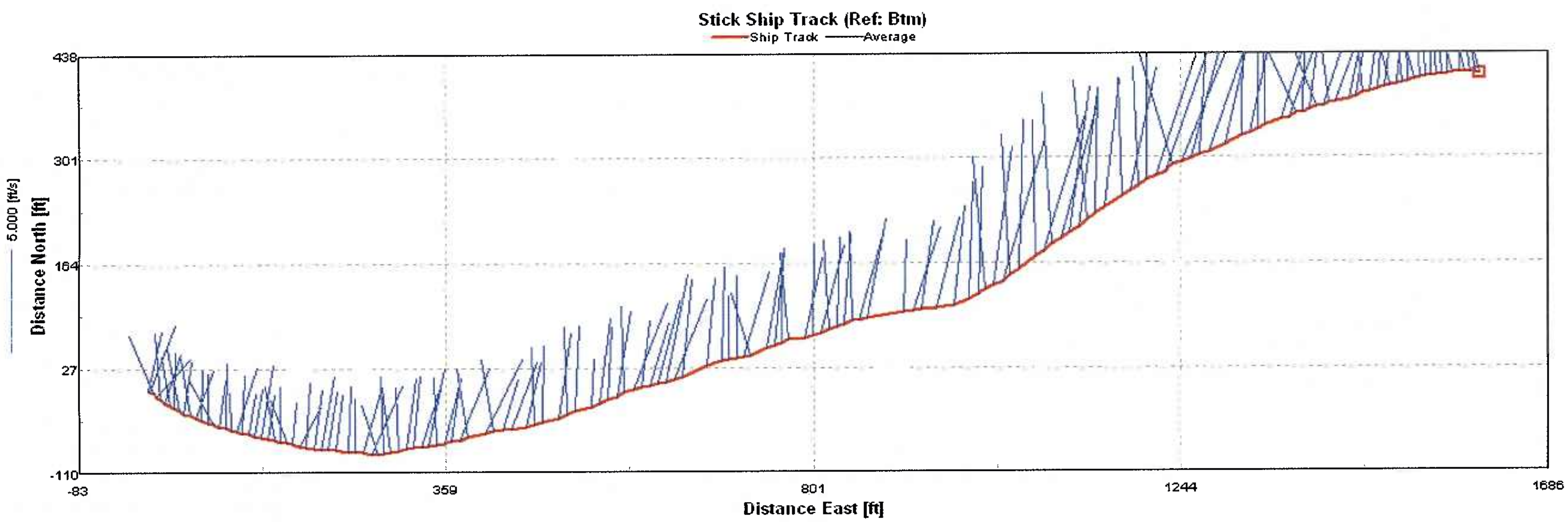
Monument 1 Discharge Transect 4, WinRiver Velocity and Ship Track Plots
May 31, 2006



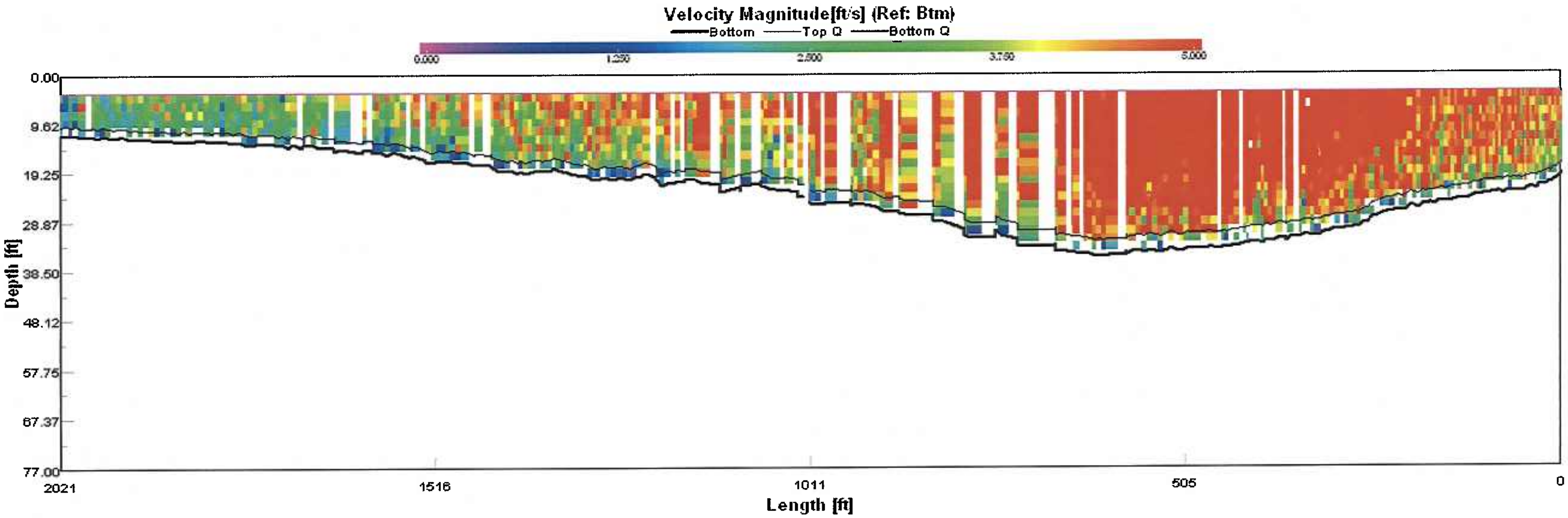


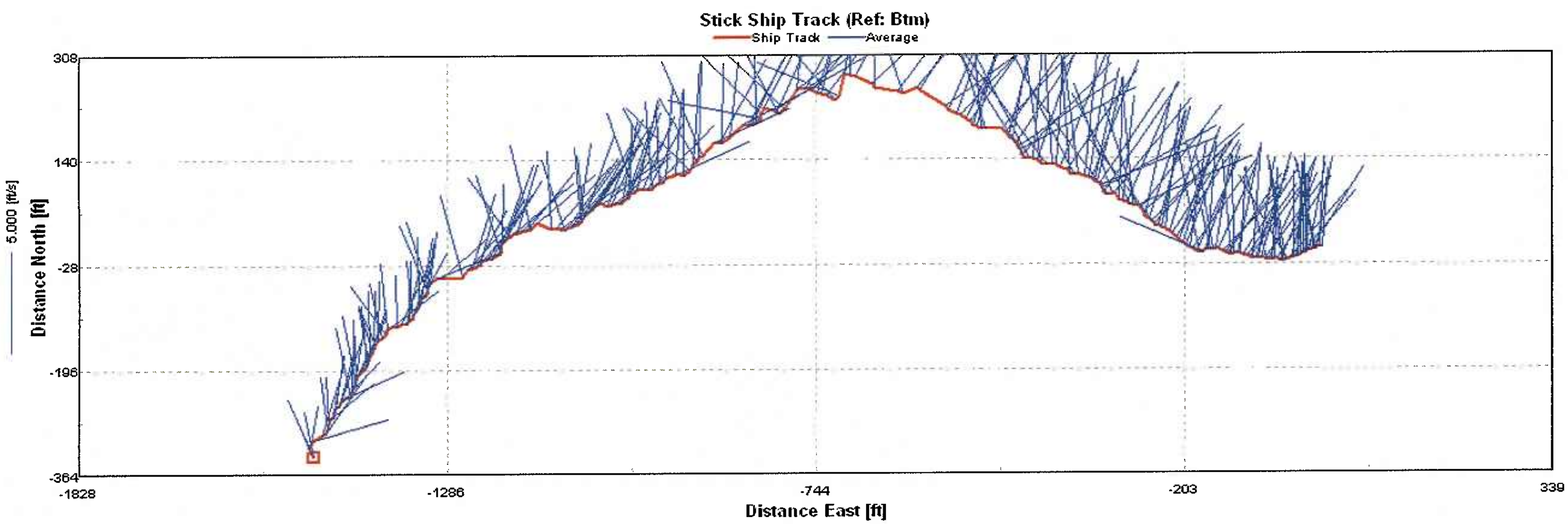
Monument 1 Discharge Transect 5, WinRiver Velocity and Ship Track Plots
May 31, 2006



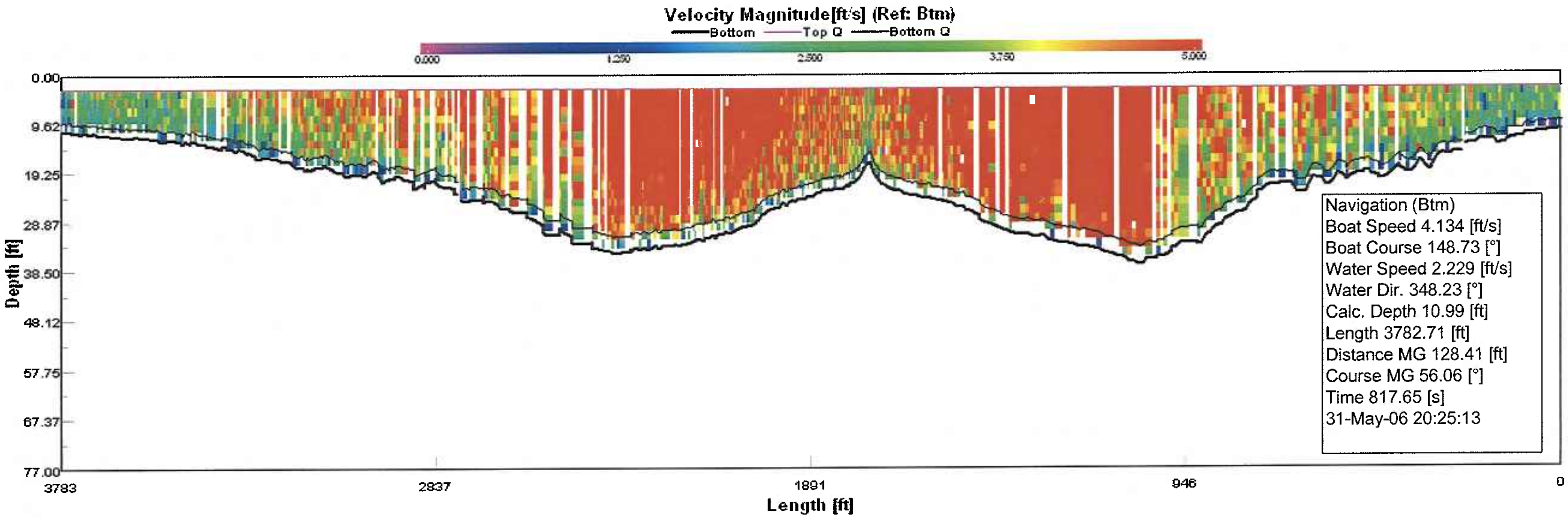


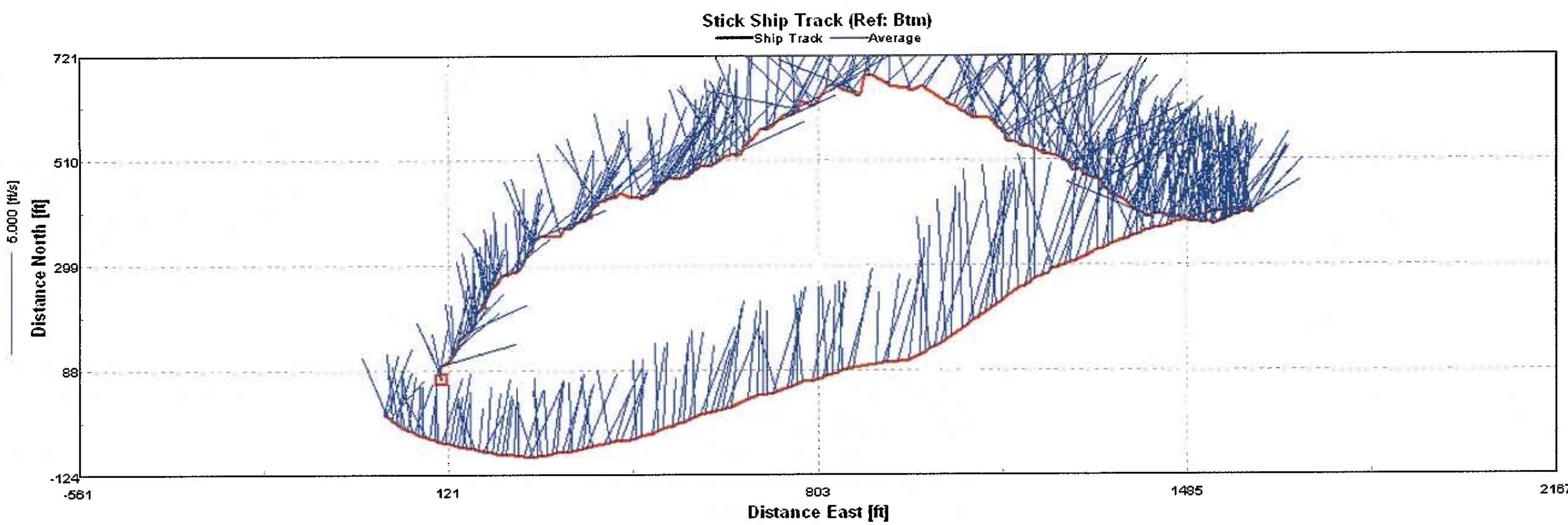
Monument 1 Discharge Transect 6, WinRiver Velocity and Ship Track Plots
May 31, 2006





Monument 1 Discharge Loop Test, WinRiver Velocity and Ship Track Plots
May 31, 2006





Station No.: Monument 01
Station Name: Colville River

Meas. No: 004
Date: 06/01/2006

Party:	MDM/MTA	Width:	3,100 ft	Processed by:	MDM
Boat/Motor:	Achilles w/ 25 hp	Area:	43,200 ft²	Mean Velocity:	3.54 ft/s
Gage Height:	0.00 ft	G.H.Change:	0.00	Discharge:	153,000 ft³/s

Area Method:	Mean Flow	ADCP Depth:	1.60 ft	Index Vel.:	0.00 ft/s	Rating No.:	1
Nav. Method:	Bottom Track	Shore Ens.:	10	Adj.Mean Vel:	0.00 ft/s	Qm Rating:	U
MagVar Method:	None (25.0°)	Top Est:	Power (0.1667)	Rated Area:	0.000 ft²	% Diff:	0.0%
Depth Sounder:	Not Used	Bottom Est:	Power (0.1667)	Control:	Unspecified		

Screening Thresholds:				ADCP:			
BT 3-Beam Solution:	ON	Max. Vel.:	8.18 ft/s	Type/Freq.:	Workhorse / 600 kHz		
WT 3-Beam Solution:	OFF	Max. Depth:	32.1 ft	Serial #:	0	Firmware:	16.28
BT Error Vel.:	0.33 ft/s	Mean Depth:	14.0 ft	Bin Size:	50 cm	Blank:	50 cm
WT Error Vel.:	3.50 ft/s	% Meas.:	63.35%	BT Mode:	5	BT Pings:	1
BT Up Vel.:	1.00 ft/s	Water Temp.:	None	WT Mode:	1	WT Pings:	1
WT Up Vel.:	*10.00 ft/s	ADCP Temp.:	37.6 °F	*WV:	313		

Diag. Test:
Moving Bed Test:
Compass Test:
Meas. Location: Adjacent to Mon01 monitoring station

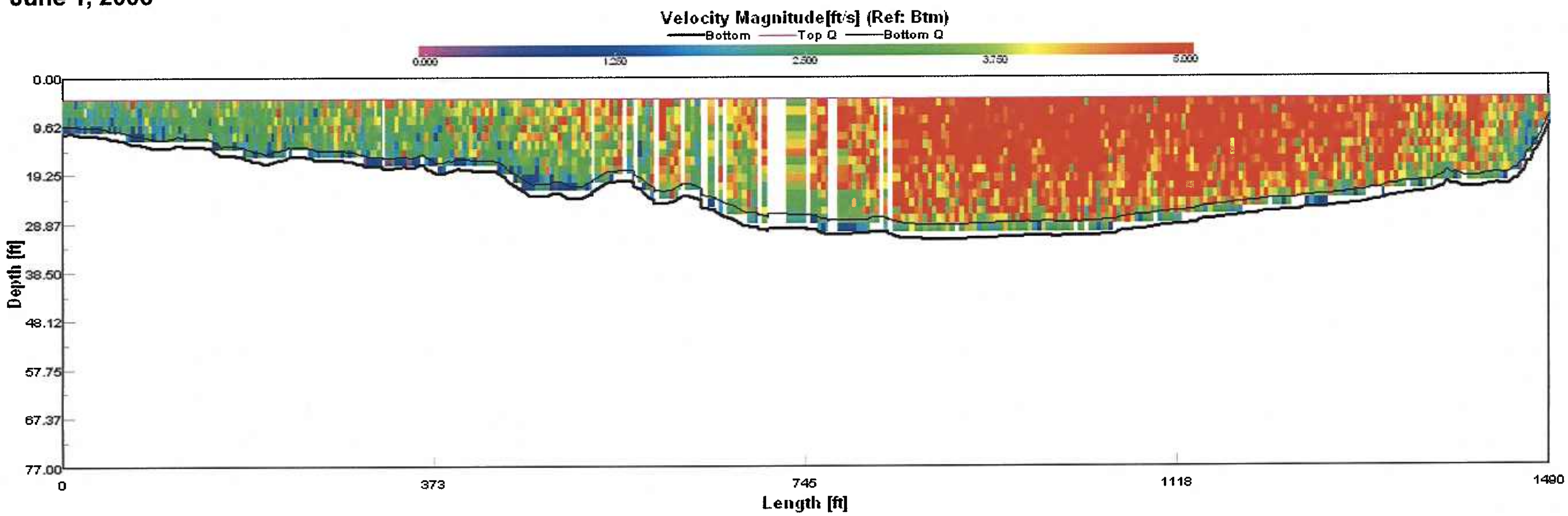
Filename Prefix: DATA_20060601142047_
Software: 1.06.00

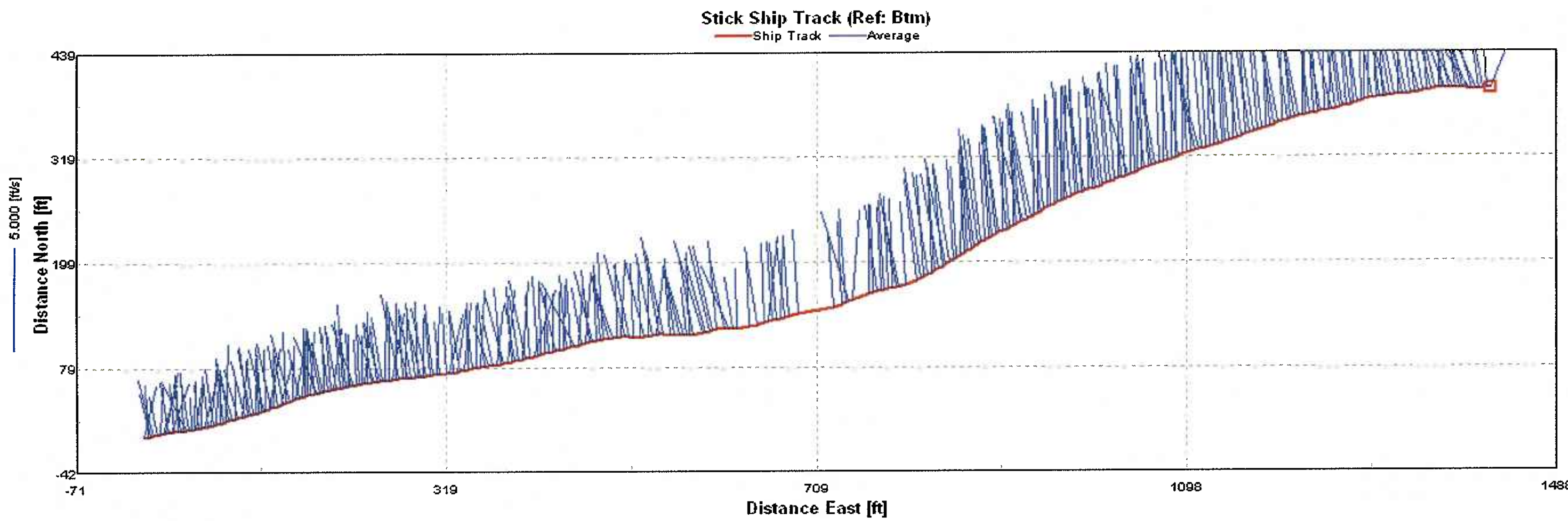
Tr.#		Edge D.		#Ens	Discharge						Width	Area	Time		Mean Vel.		% Bad		
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins	
000	L	1495	159	383	27222	96581	12969	14295	2770	153838	3102	43397	18:07	18:15	3.15	3.54	7	0	
000	R	1413	159	404	29214	100446	13460	11681	2453	157253	3090	42762	18:15	18:23	3.15	3.68	5	0	#
000	L	1388	178	323	27501	95610	12801	9787	4586	150284	3064	43398	18:24	18:31	3.87	3.46	5	0	#
000	R	1406	178	327	28742	99152	13478	10955	2143	154470	3106	43290	18:31	18:38	3.91	3.57	7	0	#
000	L	1472	178	282	27374	95672	13202	12000	3202	151450	3129	43545	18:48	18:53	4.32	3.48	9	0	#
000	R	1472	178	318	27422	94899	13003	12484	4136	151945	3102	43027	18:53	19:00	3.84	3.53	6	0	#
Mean		1441	172	340	27913	97060	13152	11867	3215	153206	3099	43237	**Total**	00:53	3.71	3.54	6	0	
SDev		44	10	45	844	2226	277	1516	965	2514	21	289			0.47	0.08			
R/M%		7	11	35.9	7.1	5.7	5.1	38.0	76.0	4.5	2.1	1.8			31.69	6.05			

Remarks:

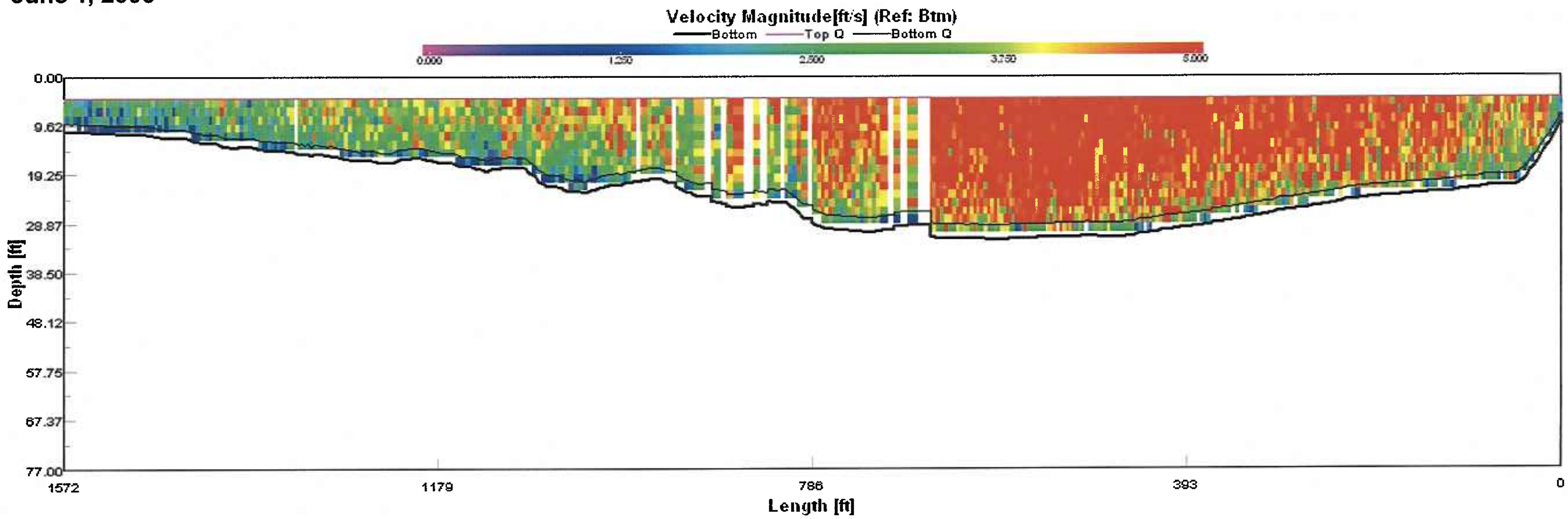
- transect has been subsectioned
* - value not consistent for all transects

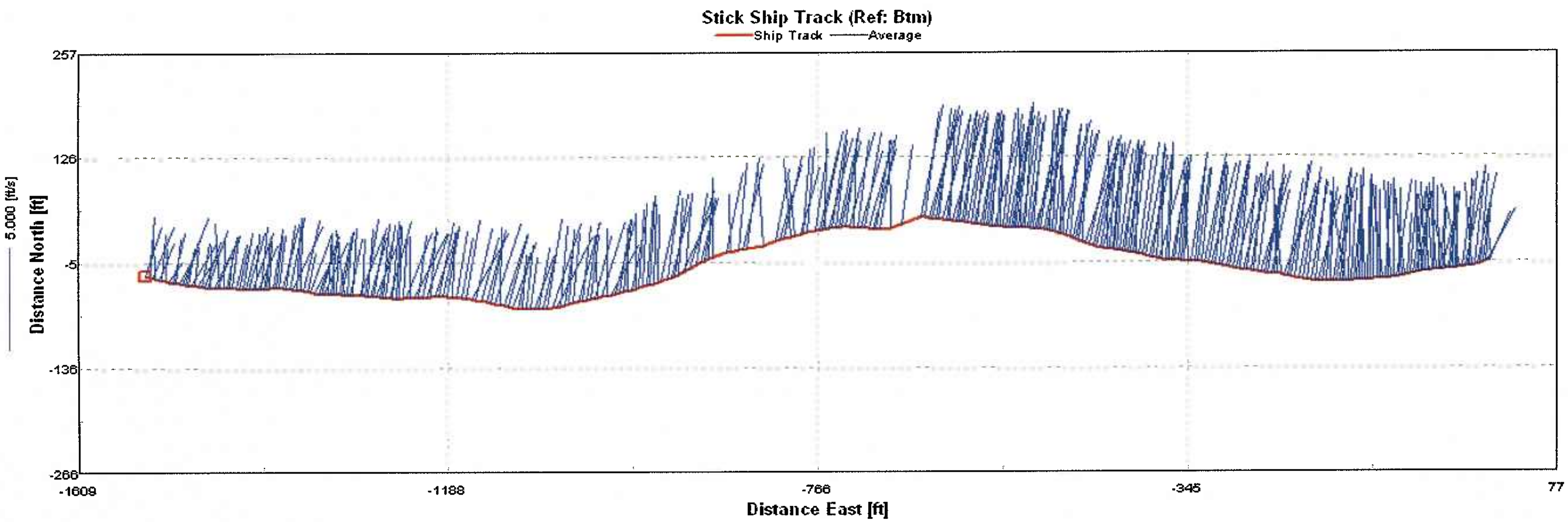
Monument 1 Discharge Transect 1, WinRiver Velocity and Ship Track Plots
June 1, 2006



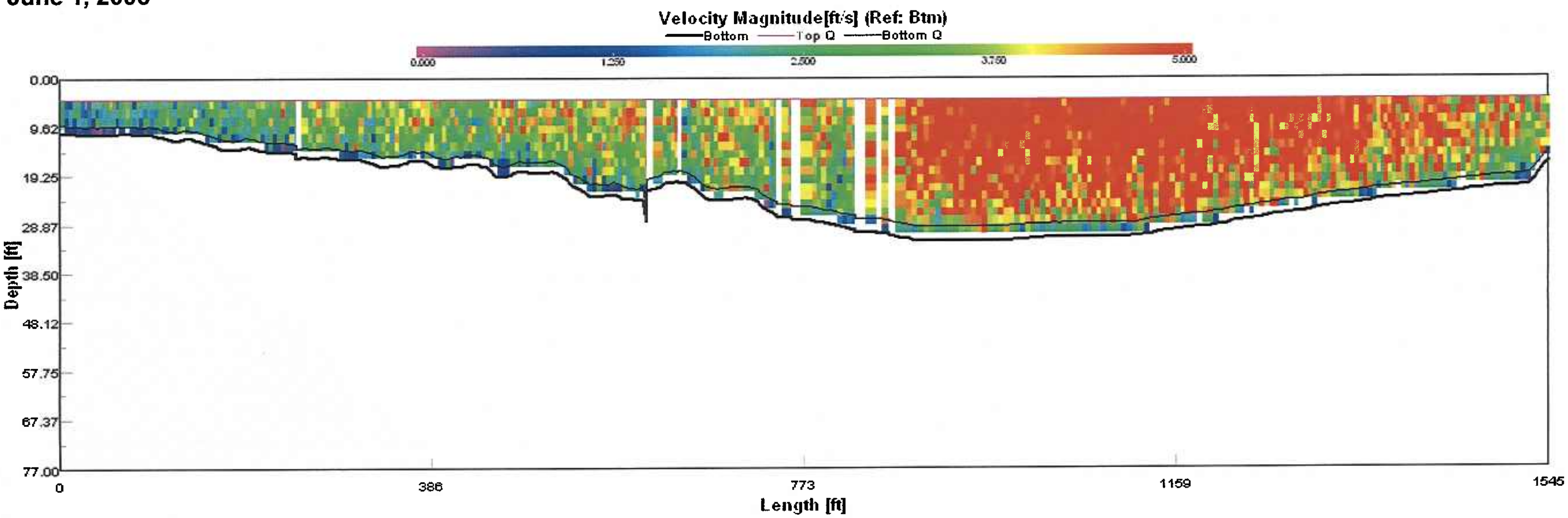


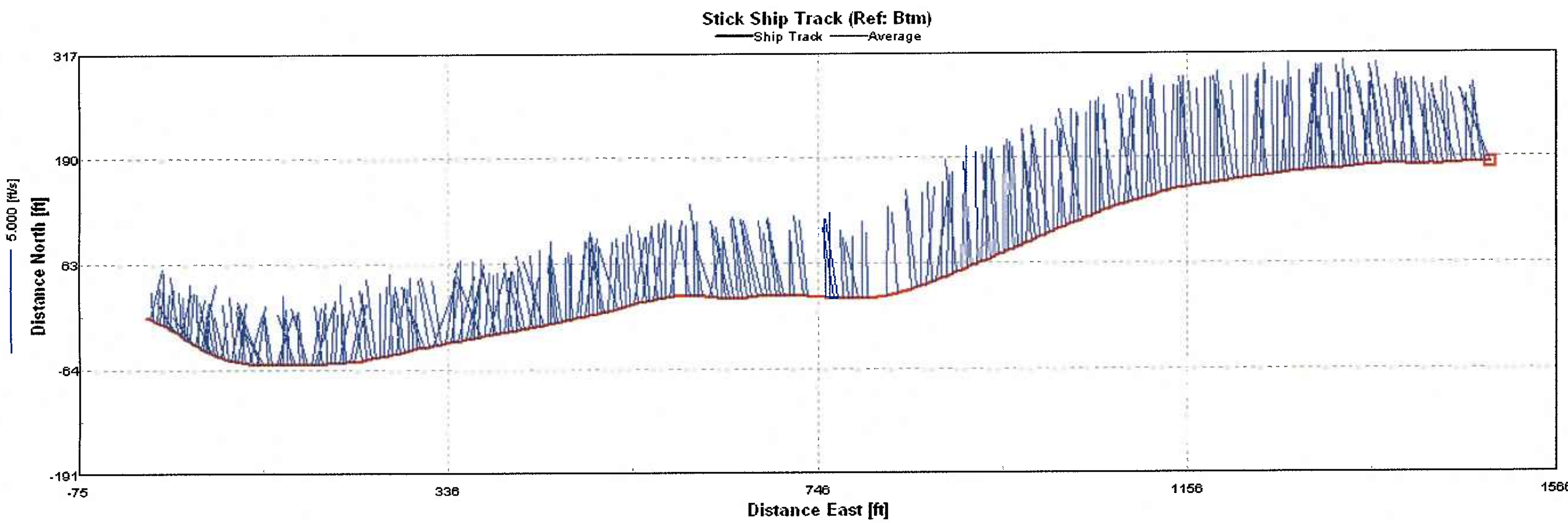
Monument 1 Discharge Transect 2, WinRiver Velocity and Ship Track Plots
June 1, 2006



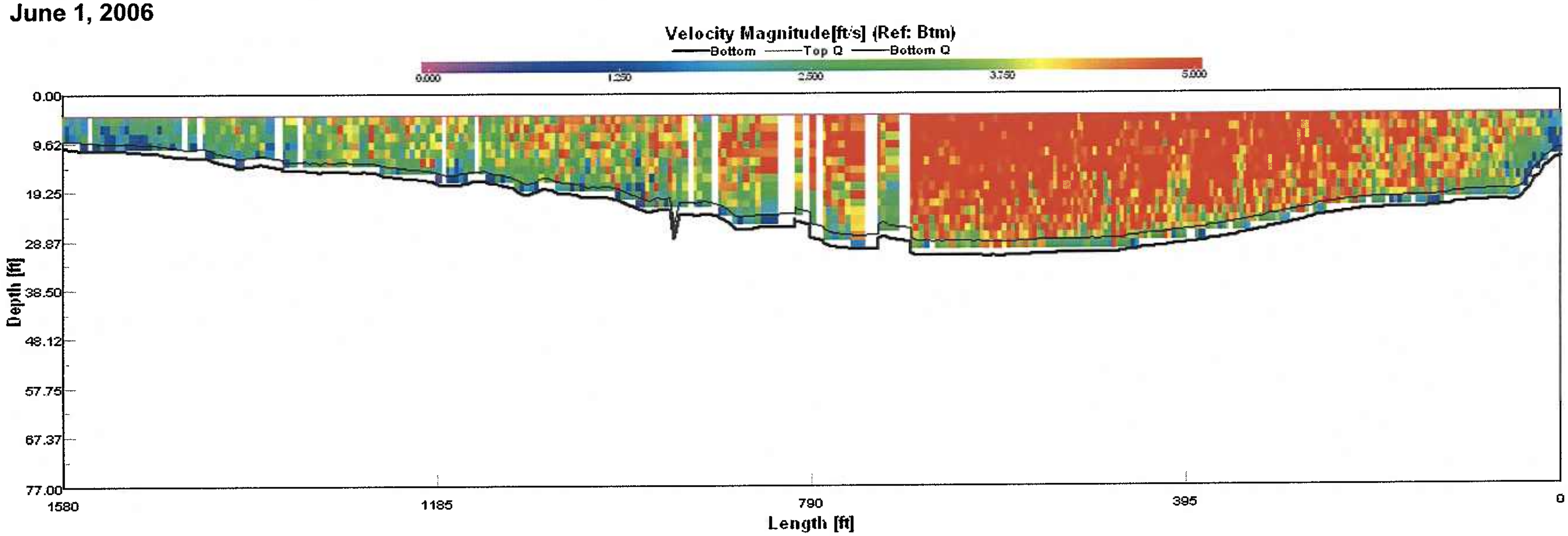


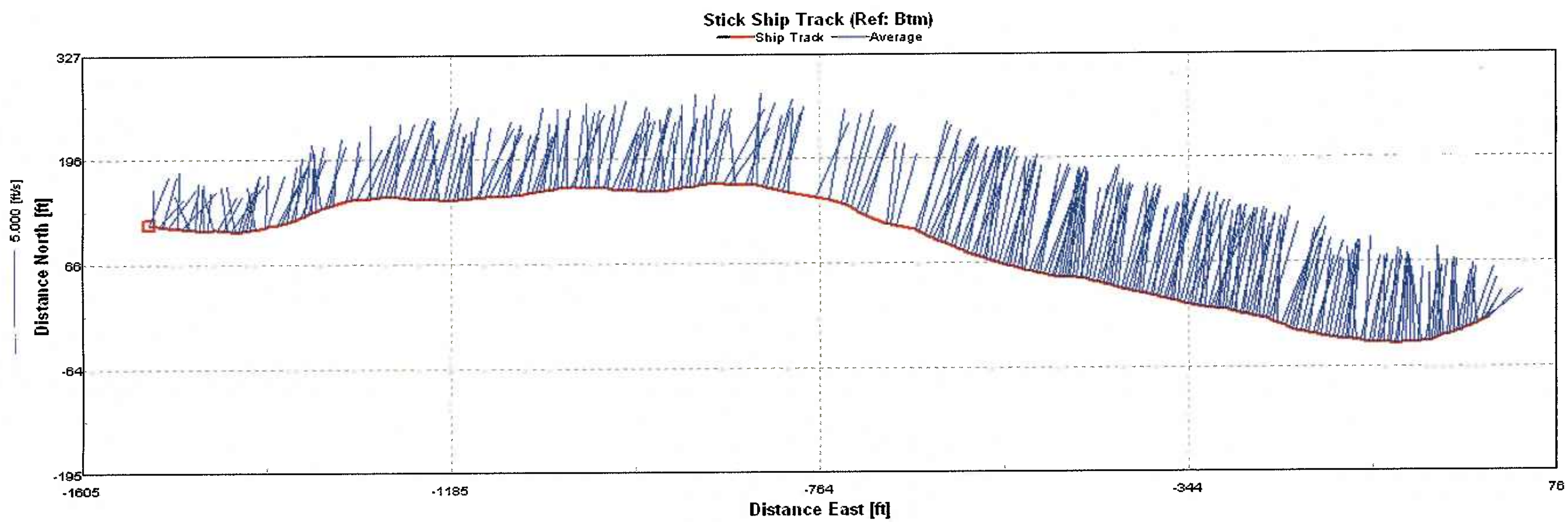
Monument 1 Discharge Transect 3, WinRiver Velocity and Ship Track Plots
June 1, 2006



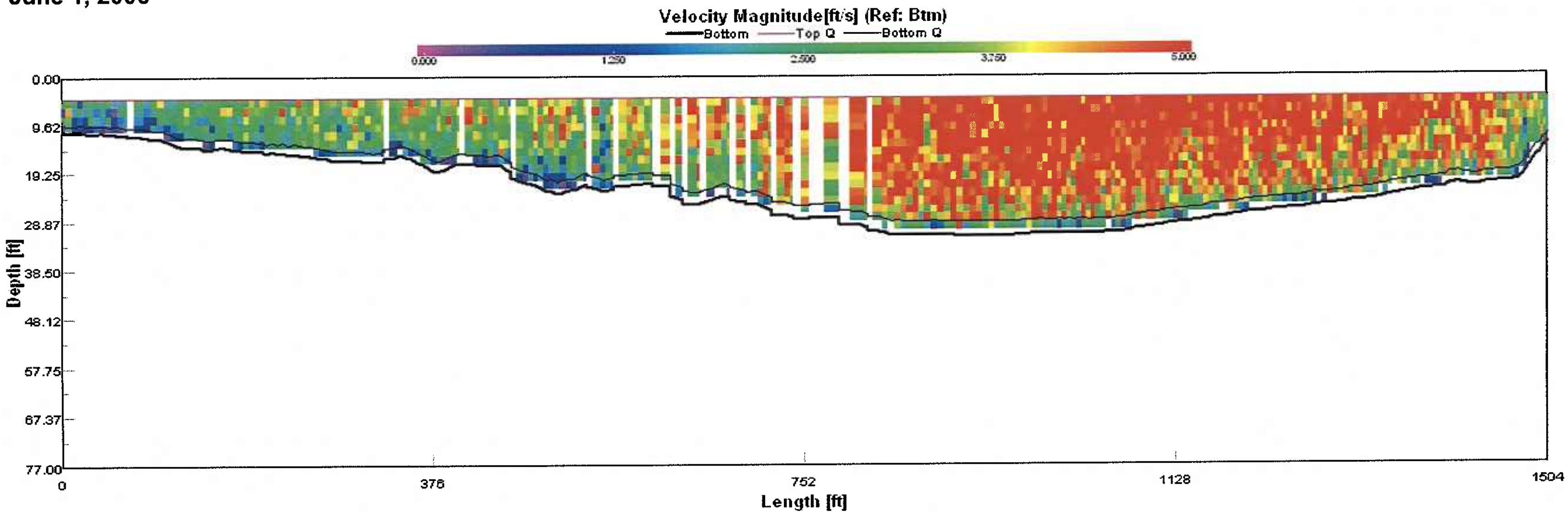


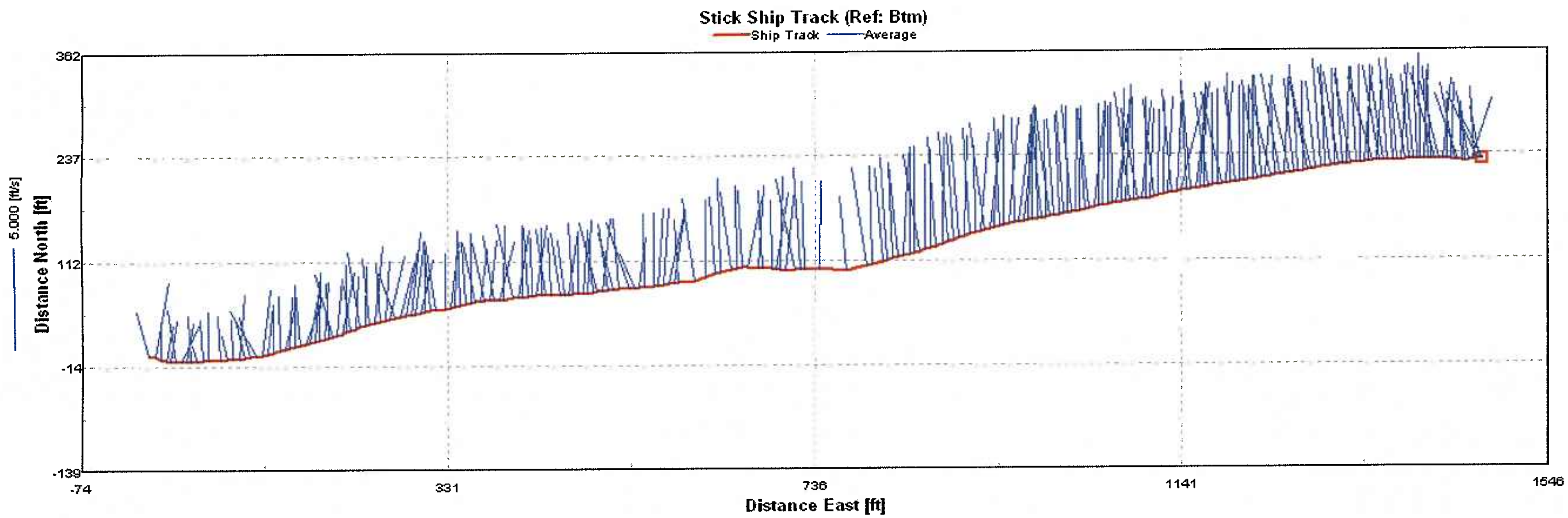
Monument 1 Discharge Transect 4, WinRiver Velocity and Ship Track Plots
June 1, 2006



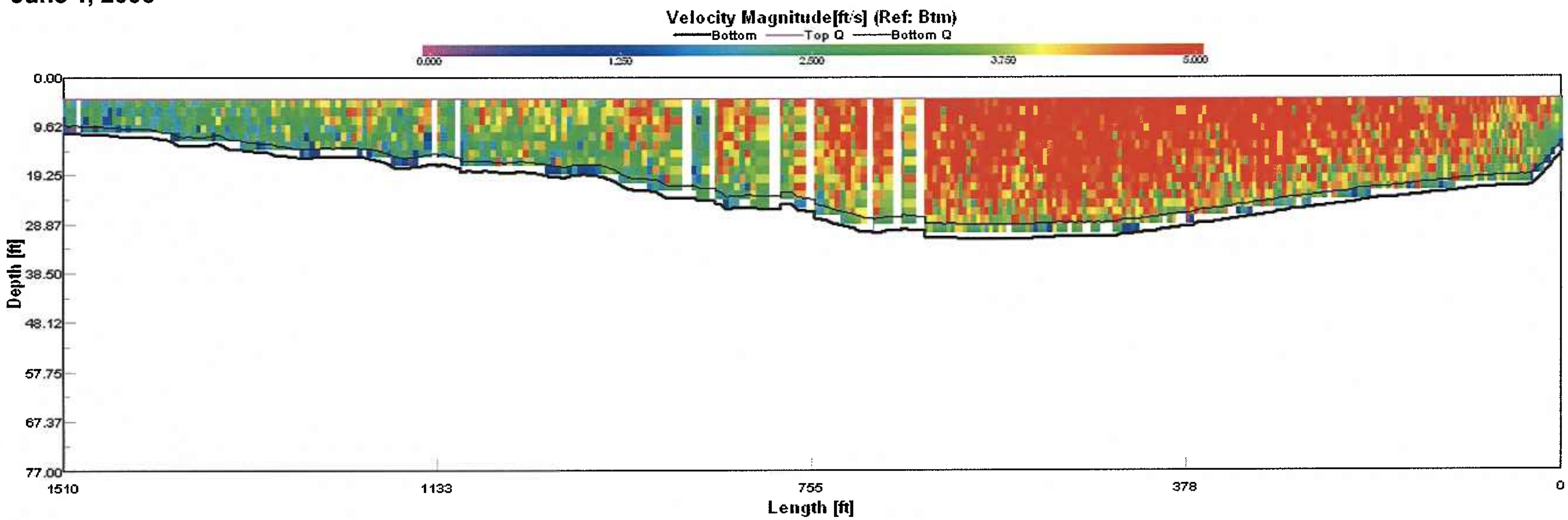


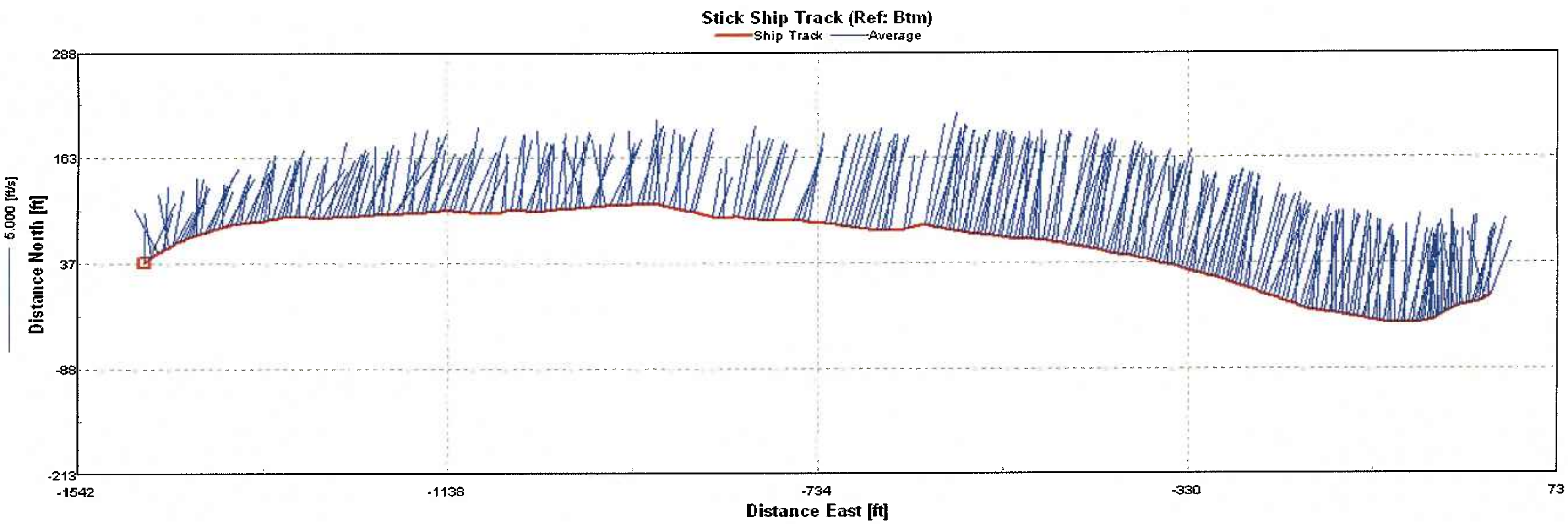
Monument 1 Discharge Transect 5, WinRiver Velocity and Ship Track Plots
June 1, 2006



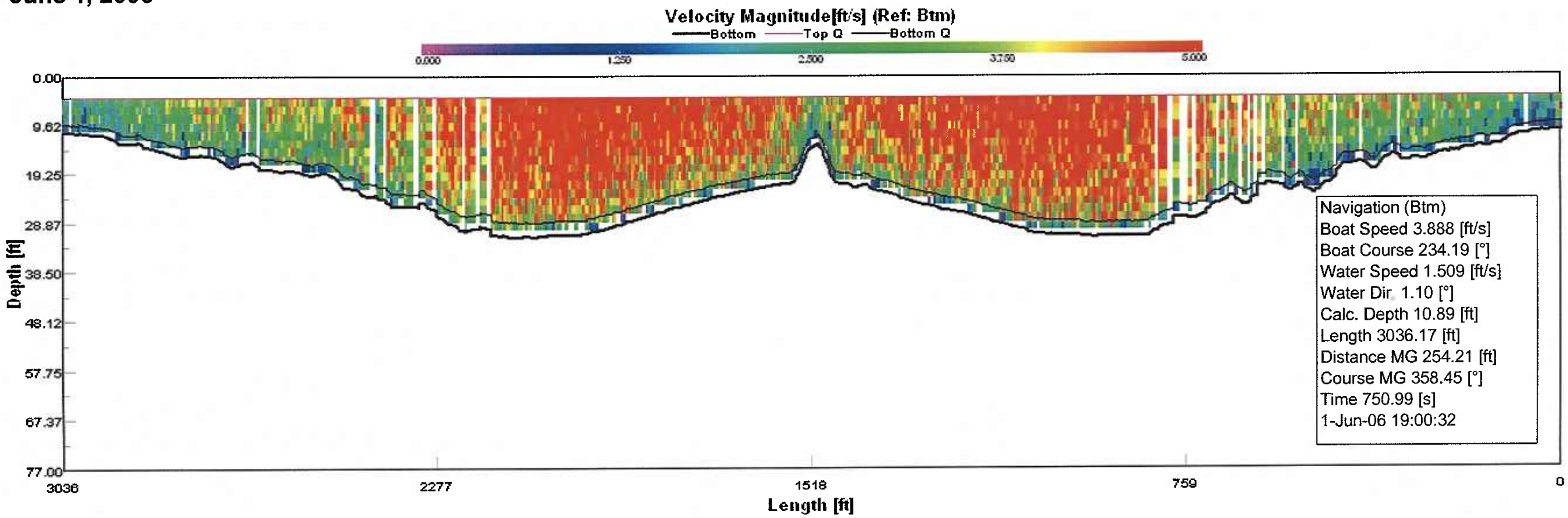


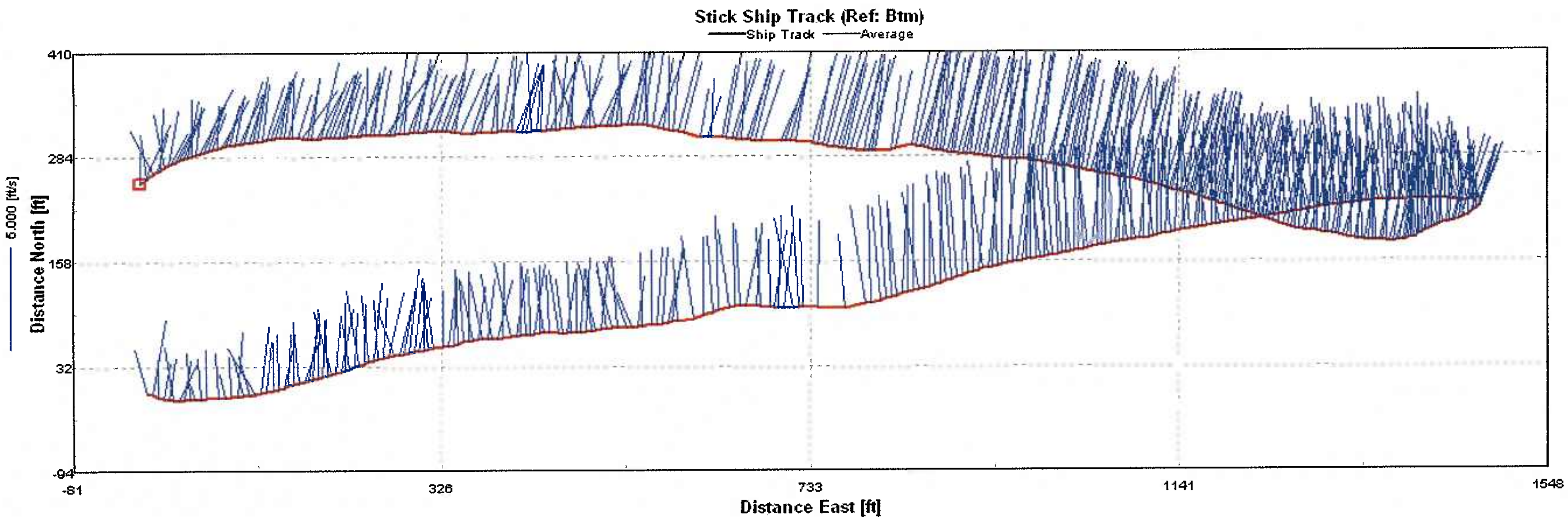
Monument 1 Discharge Transect 6, WinRiver Velocity and Ship Track Plots
June 1, 2006





Monument 1 Discharge Loop Test, WinRiver Velocity and Ship Track Plots
June 1, 2006





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Monument 23

Station No.: Monument 23
Station Name: Colville River

Meas. No: 001
Date: 06/01/2006

Party:	MDM/MTA	Width:	1,170 ft	Processed by:	MDM
Boat/Motor:	Achilles w/ 25 hp	Area:	16,900 ft²	Mean Velocity:	2.07 ft/s
Gage Height:	0.00 ft	G.H.Change:	0.00	Discharge:	34,800 ft³/s

Area Method:	Mean Flow	ADCP Depth:	1.60 ft	Index Vel.:	0.00 ft/s	Rating No.:	1
Nav. Method:	Bottom Track	Shore Ens.:	10	Adj.Mean Vel:	0.00 ft/s	Qm Rating:	U
MagVar Method:	None (25.0°)	Top Est:	Power (0.1667)	Rated Area:	0.000 ft²	% Diff:	0.0%
Depth Sounder:	Not Used	Bottom Est:	Power (0.1667)	Control:	Unspecified		

Screening Thresholds:				ADCP:			
BT 3-Beam Solution:	ON	Max. Vel.:	5.74 ft/s	Type/Freq.:	Workhorse / 600 kHz		
WT 3-Beam Solution:	OFF	Max. Depth:	29.6 ft	Serial #:	0	Firmware:	16.28
BT Error Vel.:	0.33 ft/s	Mean Depth:	14.5 ft	Bin Size:	50 cm	Blank:	50 cm
WT Error Vel.:	3.50 ft/s	% Meas.:	59.33%	BT Mode:	5	BT Pings:	1
BT Up Vel.:	1.00 ft/s	Water Temp.:	None	WT Mode:	1	WT Pings:	1
WT Up Vel.:	10.00 ft/s	ADCP Temp.:	36.3 °F	WV:	313		

Diag. Test:
Moving Bed Test:
Compass Test:
Meas. Location: Adjacent to Mon23 monitoring station

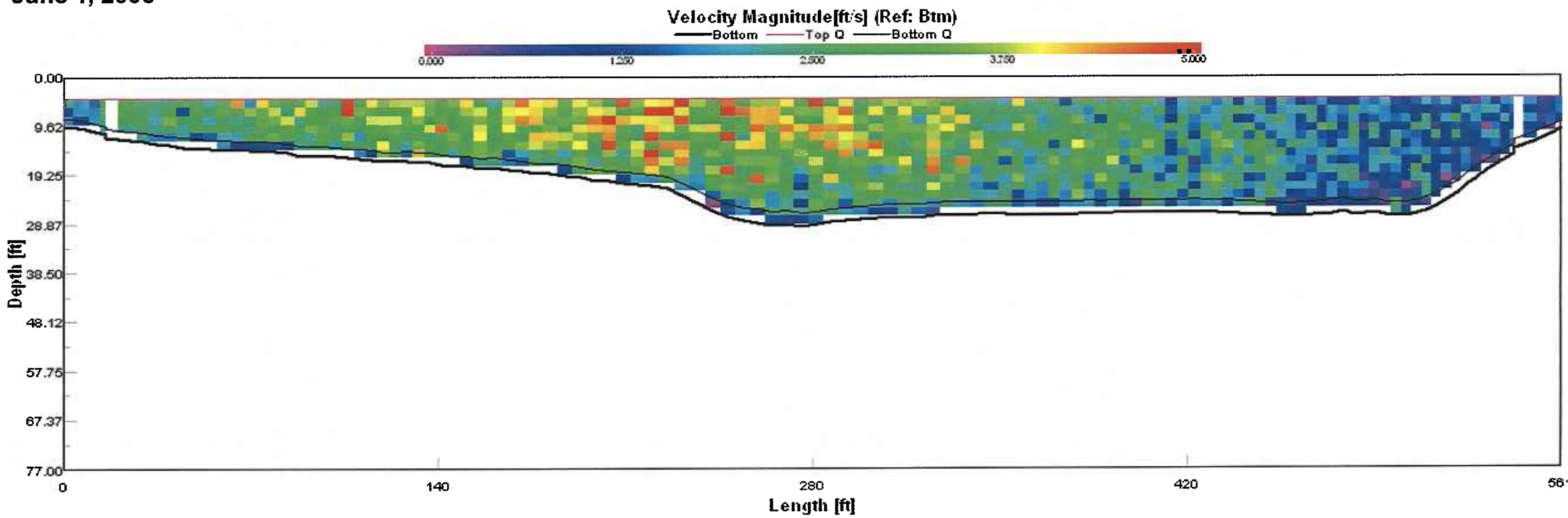
Filename Prefix: DATA_20060601173822_
Software: 1.06.00

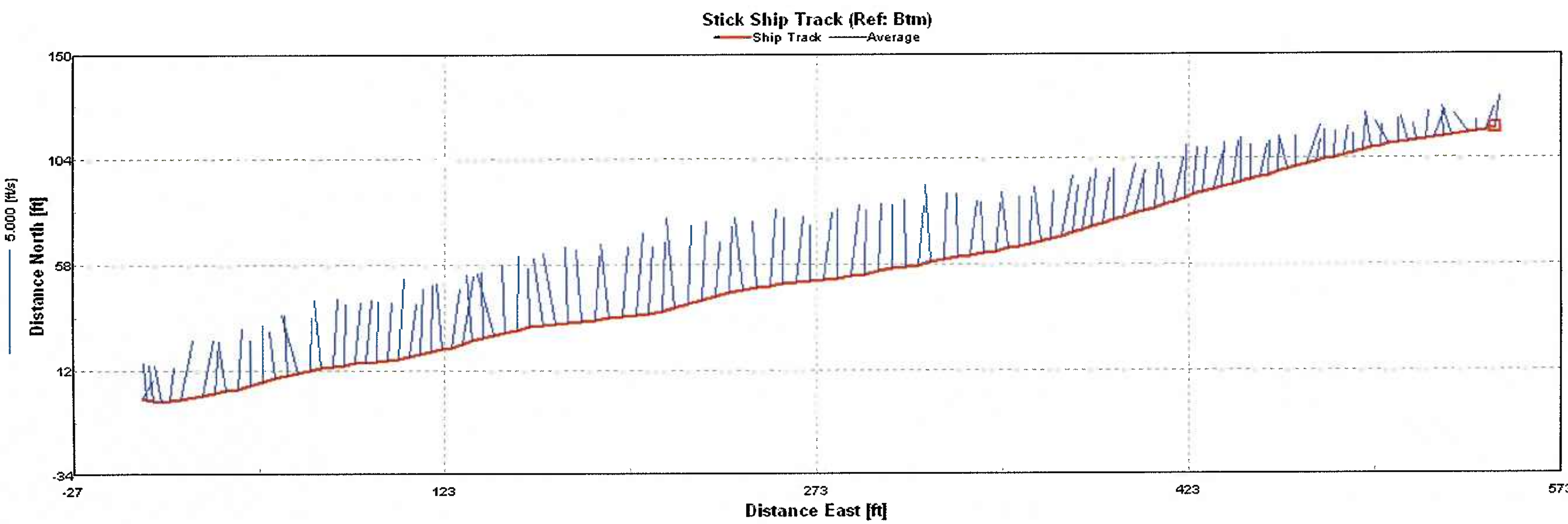
Tr.#		Edge D.		#Ens	Discharge						Width	Area	Time		Mean Vel.		% Bad		
		L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins	
000	L	21	604	124	6768	20455	2981	174	3846	34224	1167	16637	21:24	21:27	3.68	2.06	2	0	#
000	R	17	605	190	6882	20554	3085	118	2875	33514	1174	15375	21:27	21:31	2.54	2.18	1	0	#
000	L	5	604	109	6981	20992	3160	33.4	3955	35121	1179	16801	21:32	21:34	4.42	2.09	5	0	#
000	R	10	614	121	6734	20679	2887	81.7	6119	36501	1141	18585	21:36	21:38	3.70	1.96	1	0	#
Mean		13	607	136	6841	20670	3028	102	4199	34840	1165	16850	**Total**	00:14	3.58	2.07	1	0	
SDev		7	5	37	113	233	119	59.1	1369	1288	17	1321			0.78	0.09			
R/M%		121	2	59.6	3.6	2.6	9.0	138.1	77.3	8.6	3.2	19.1			52.59	10.41			

Remarks:

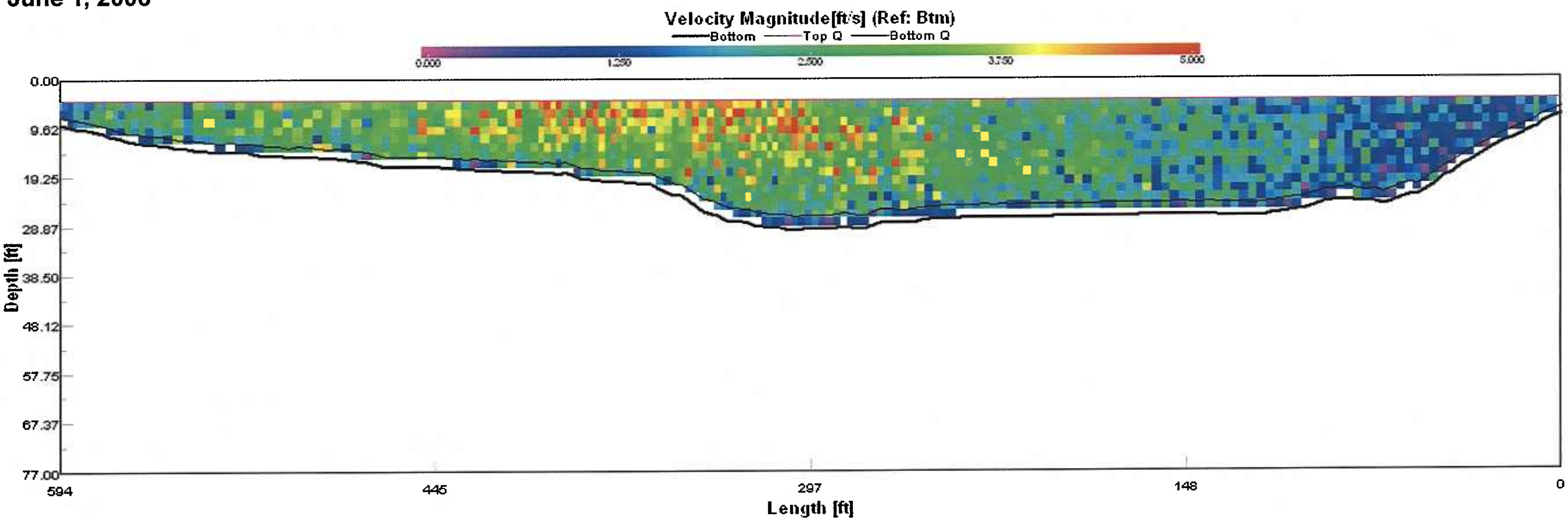
- transect has been subsectioned

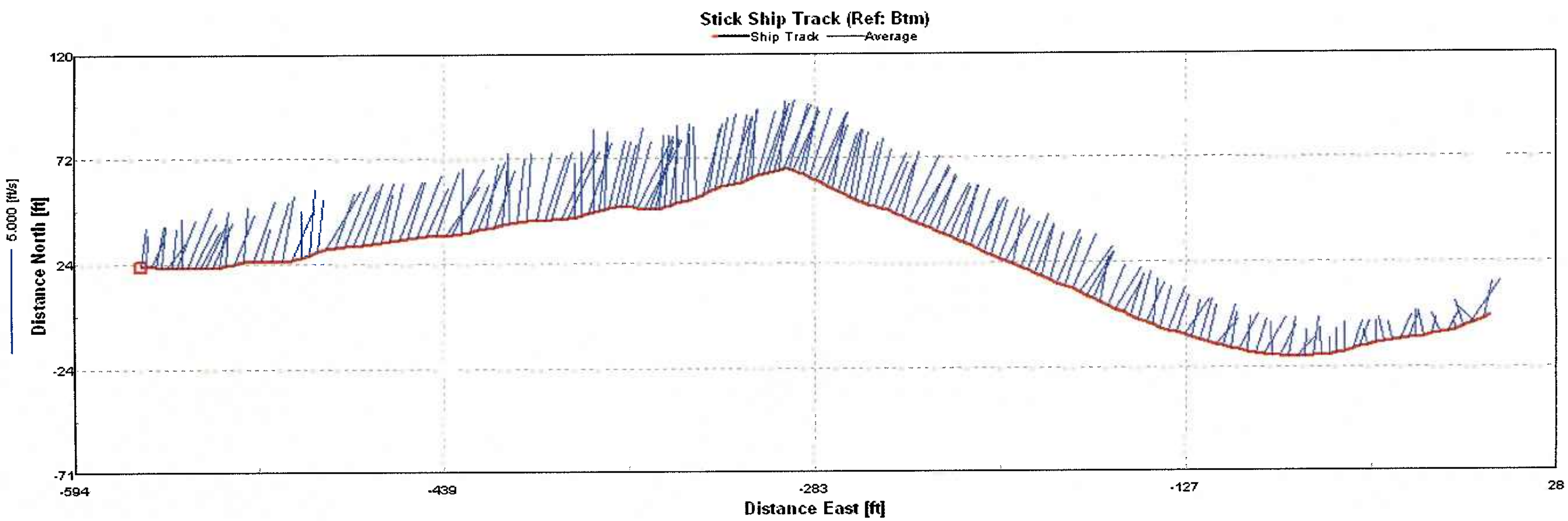
Monument 23 Discharge Transect 1, WinRiver Velocity and Ship Track Plots
June 1, 2006



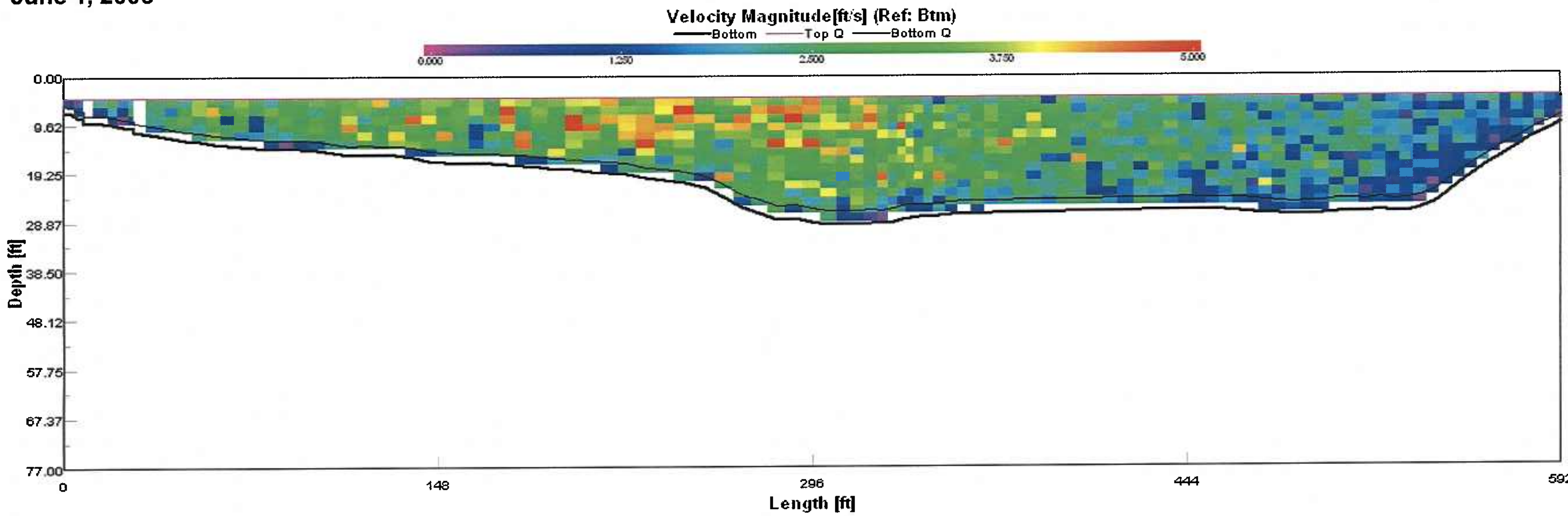


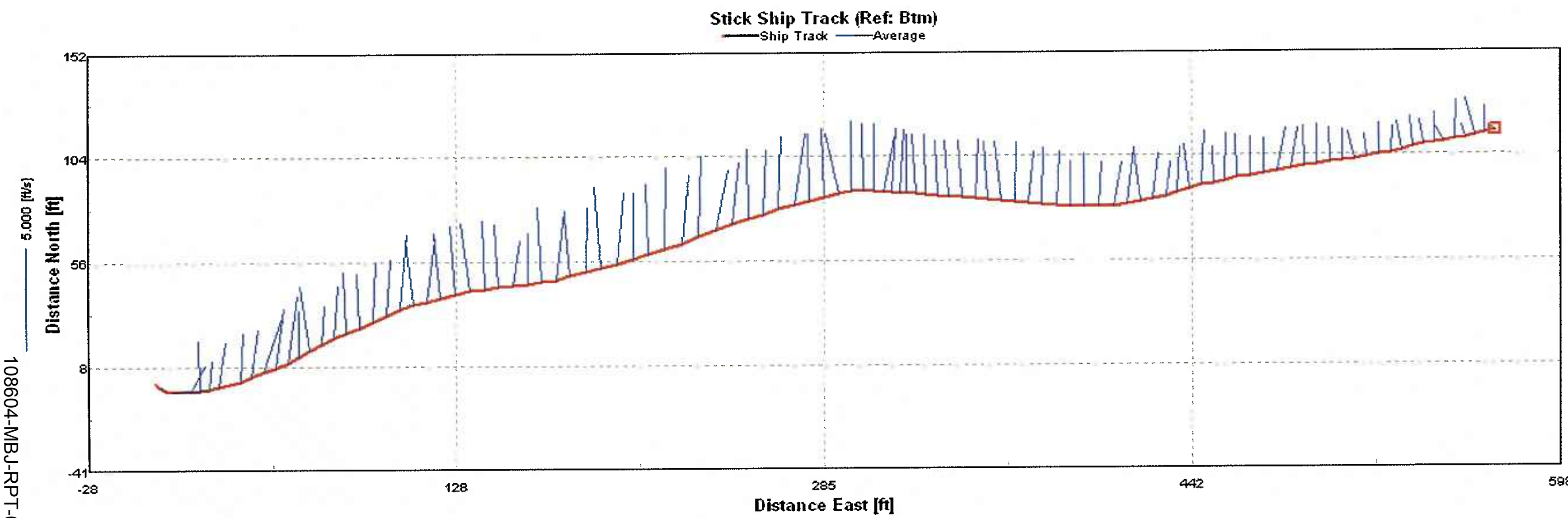
Monument 23 Discharge Transect 2, WinRiver Velocity and Ship Track Plots
June 1, 2006



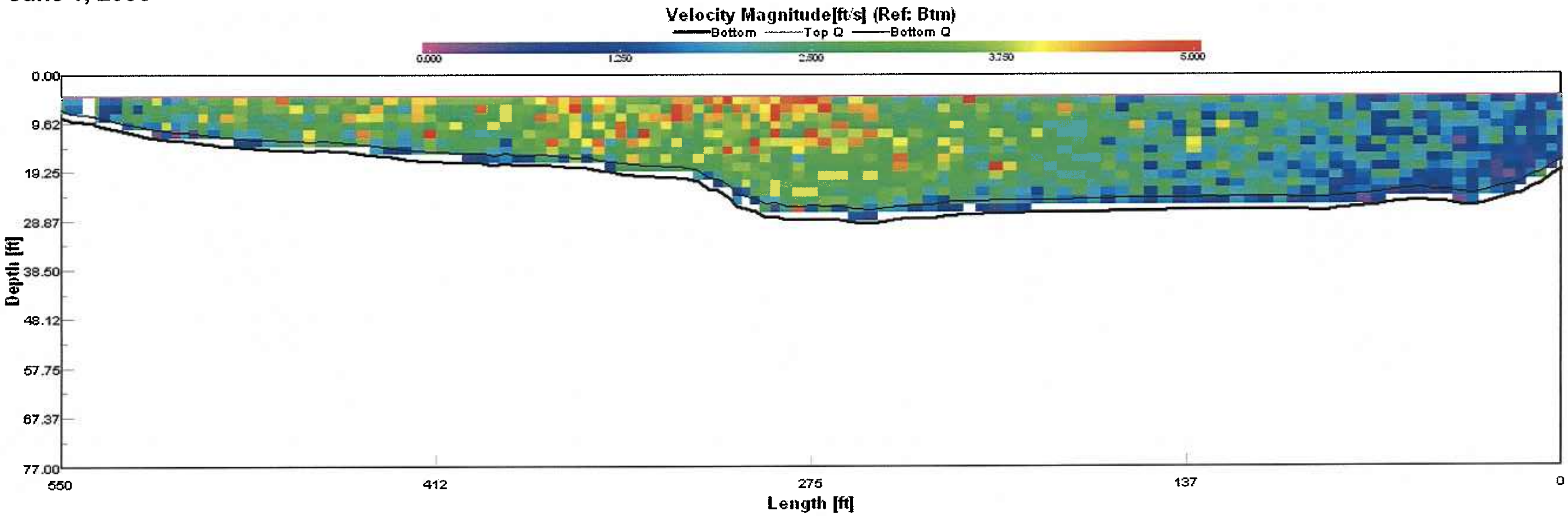


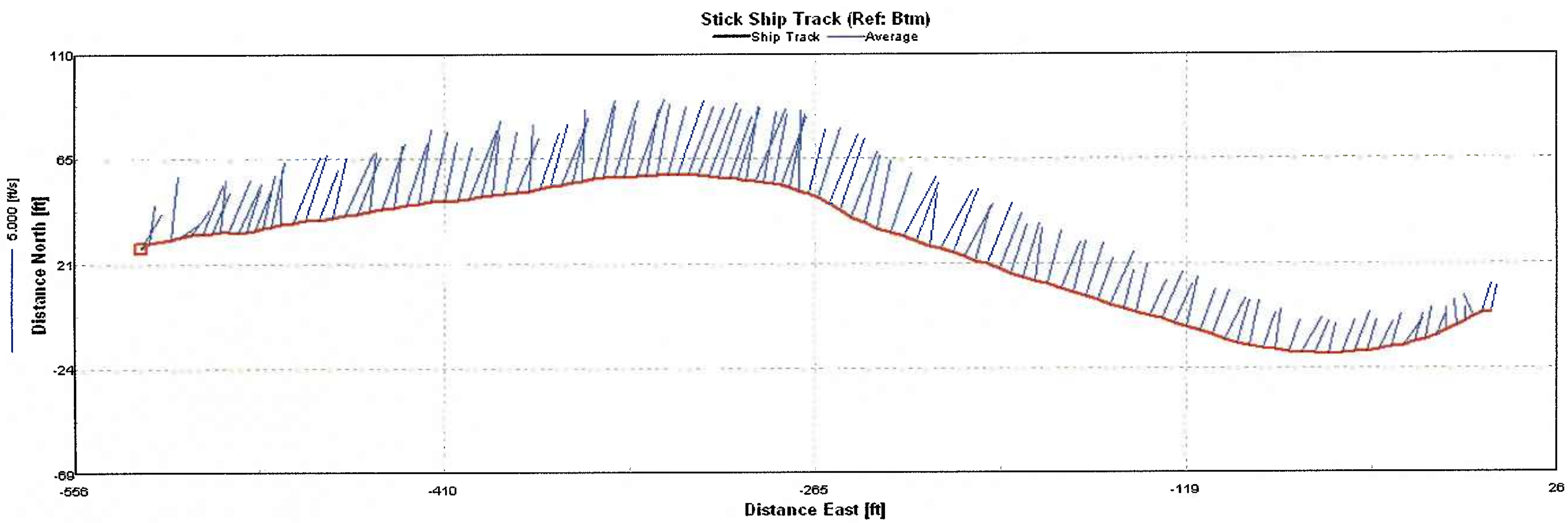
Monument 23 Discharge Transect 3, WinRiver Velocity and Ship Track Plots
June 1, 2006



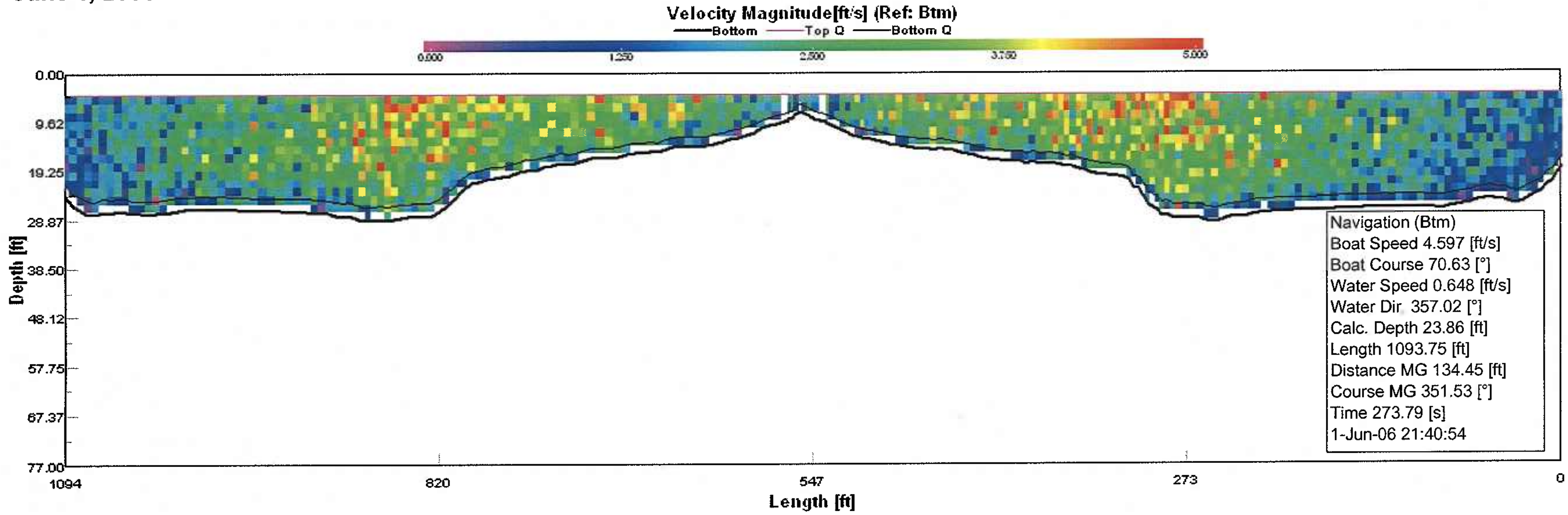


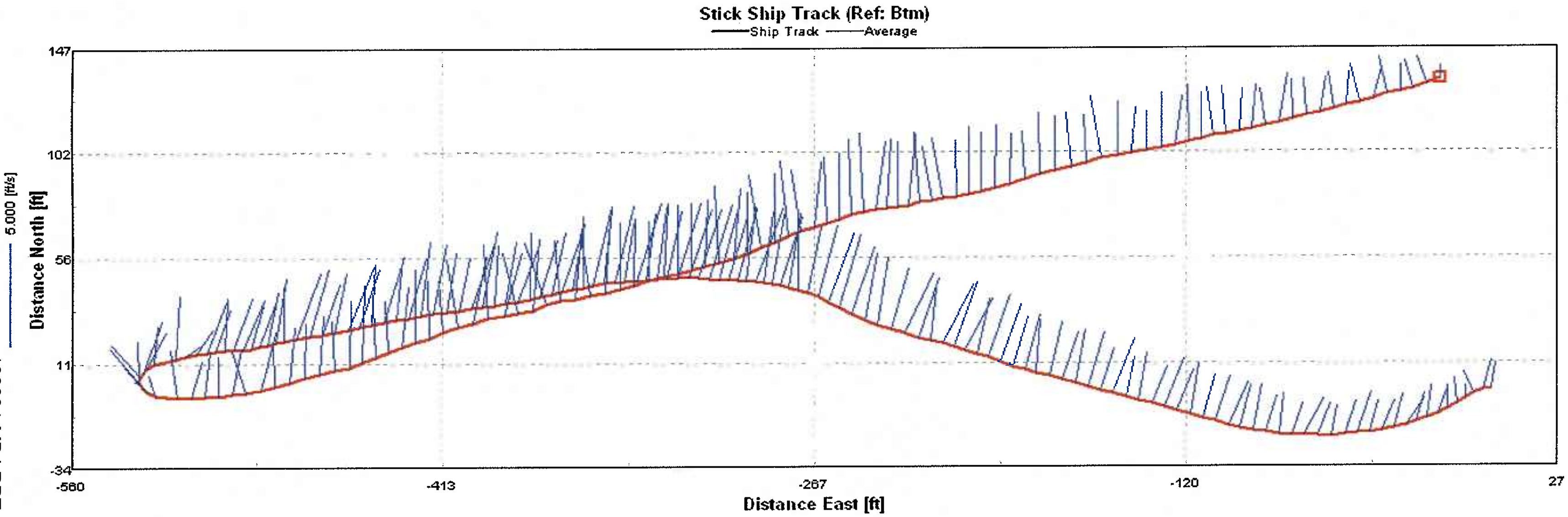
Monument 23 Discharge Transect 5, WinRiver Velocity and Ship Track Plots
June 1, 2006





Monument 23 Discharge Loop Test, WinRiver Velocity and Ship Track Plots
June 1, 2006





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Appendix C Direct Discharge Results

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Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. 452-foot Bridge/Alpine Start: 16:40 Finish: 17:50

Date 5/31/2006 Party SLB, EJK, JPM

Width 409 ft Area 1725 sq ft Vel. 1.89 fps Disch. 3258 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 29 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
PG3	8.43	8.40	0.03
PG4	8.25	8.15	0.10

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Firm, uniform, section of ice lodged in channel sta 356 to 392 assumed grounded

Flow: Steady Weather: Overcast, Winds 20 - 30 mph

Other: Variable horizontal angles Temp: 34°F

Gages: PE3 and PE4

Remarks: No snow or ice affecting outlet conditions, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: 452-foot Bridge 5/31/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	4.00						1.04	4.00	4.16
0.97	2	5.0	4.60	6/10	59	61	2.17	2.17	2.10	23.00	48.34
0.92	10	11.5	4.00	6/10	68	61	2.49	2.49	2.29	46.00	105.57
0.75	25	15.0	4.30	6/10	57	60	2.13	2.13	1.60	64.50	102.96
0.75	40	17.5	4.20	6/10	61	60	2.28	2.28	1.71	73.50	125.50
0.90	60	20.0	4.30	6/10	70	75	2.09	2.09	1.88	86.00	161.87
0.85	80	20.0	3.80	6/10	56	61	2.06	2.06	1.75	76.00	132.90
0.85	100	20.0	3.90	6/10	46	51	2.02	2.02	1.72	78.00	134.04
0.85	120	20.0	4.20	6/10	54	61	1.98	1.98	1.69	84.00	141.69
0.97	140	20.0	4.00	6/10	53	61	1.95	1.95	1.89	80.00	151.19
0.91	160	20.0	4.00	6/10	53	60	1.98	1.98	1.80	80.00	144.17
0.92	180	20.0	4.10	6/10	59	61	2.17	2.17	1.99	82.00	163.45
0.94	200	20.0	3.90	6/10	57	61	2.09	2.09	1.97	78.00	153.52
0.96	220	20.0	3.90	6/10	57	60	2.13	2.13	2.04	78.00	159.38
0.97	240	20.0	5.10	2/10	65	61	2.39	1.91	1.85	102.00	189.14
				8/10	39	61	1.44				
0.98	260	20.0	4.90	6/10	45	60	1.68	1.68	1.65	98.00	161.75
0.96	280	20.0	4.30	6/10	59	61	2.17	2.17	2.08	86.00	178.87
0.97	300	20.0	4.70	6/10	54	60	2.02	2.02	1.96	94.00	183.95
0.97	320	20.0	4.00	6/10	63	61	2.31	2.31	2.24	80.00	179.44
0.98	340	15.0	4.00	6/10	48	60	1.80	1.80	1.76	60.00	105.56
0.98	350	8.0	4.10	6/10	39	60	1.46	1.46	1.43	32.80	47.00
	356	3.0	4.00						0.70	12.00	8.40
	392	1.5	4.20						0.12	6.30	0.76
0.90	395	4.0	4.30	6/10	9	78	0.27	0.27	0.25	17.20	4.25
0.92	400	12.5	4.50	6/10	62	50	2.77	2.77	2.55	56.25	143.48
0.98	420	17.5	4.40	6/10	58	60	2.17	2.17	2.12	77.00	163.41
1.00	435	11.5	4.10	6/10	63	60	2.35	2.35	2.35	47.15	110.83
1.00	443	5.0	4.10	6/10	65	61	2.39	2.39	2.39	20.50	48.90
RB	445	1.0	3.00						1.20	3.00	3.60
SUM		**409.0**								**1725.2**	**3258.1**
			Estimated values								

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. 62-foot Bridge/Alpine Start: 14:40 Finish: 16:20

Date 5/31/2006 Party SLB, SJK, JPM

Width 55 ft Area 614.6 sq ft Vel. 1.59 fps Disch. 977.5 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 20 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
PE3	8.55	8.43	0.12
PE4	8.29	8.25	0.04

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Firm, fairly uniform, no snow or ice

Flow: Steady

Weather: Overcast, Winds 20 - 30 mph

Other: Variable horizontal angles

Temp: 34°F

Gages: PE3 and PE4

Remarks: No snow or ice affecting outlet conditions, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 JPM

Site/Date: 62-foot Bridge 5/31/2006

Angle Coeff.	Distance from initial point (ft)	Section Width 62-foot Bridge/Alpine	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	6	0.5	4.00						0.16	2.00	0.32
0.35	7	2.0	4.50	6/10	20	51	0.89	0.89	0.31	9.00	2.80
0.90	10	3.0	5.30	2/10	13	41	0.72	0.94	0.85	15.90	13.44
				8/10	21	41	1.16				
0.85	13	3.0	5.30	2/10	46	40	2.57	2.07	1.76	15.90	28.02
				8/10	28	40	1.57				
0.85	16	3.5	5.60	2/10	40	47	1.91	1.49	1.26	19.60	24.78
				8/10	25	53	1.07				
0.70	20	3.5	7.30	2/10	40	60	1.50	1.15	0.81	25.55	20.58
				8/10	30	85	0.80				
0.70	23	3.0	9.30	2/10	50	60	1.87	1.62	1.13	27.90	31.59
				8/10	37	61	1.37				
0.60	26	3.5	10.50	2/10	64	60	2.39	1.97	1.18	36.75	43.39
				8/10	42	61	1.55				
0.75	30	3.5	12.20	2/10	67	61	2.46	2.16	1.62	42.70	69.29
				8/10	50	60	1.87				
0.80	33	3.0	14.40	2/10	62	61	2.28	1.91	1.53	43.20	66.07
				8/10	42	61	1.55				
0.85	36	3.0	13.60	2/10	65	60	2.42	2.05	1.75	40.80	71.24
				8/10	45	60	1.68				
0.87	39	3.0	15.80	2/10	68	61	2.49	2.24	1.95	47.40	92.35
				8/10	54	61	1.98				
0.94	42	3.0	15.90	2/10	58	60	2.17	2.13	2.00	47.70	95.49
				8/10	57	61	2.09				
0.99	45	3.0	16.00	2/10	66	61	2.42	2.20	2.18	48.00	104.69
				8/10	54	61	1.98				
1.0	48	3.0	15.80	2/10	68	61	2.49	2.24	2.24	47.40	106.15
				8/10	54	61	1.98				
0.98	51	3.0	14.80	2/10	75	60	2.79	2.04	2.00	44.40	88.93
				8/10	35	61	1.29				

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 JPM

Site/Date: 62-foot Bridge 5/31/2006

Angle Coeff.	Distance from initial point (ft)	Section Width 62-foot Bridge/Alpine	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
0.92	54	3.0	13.40	2/10	66	61	2.42	1.78	1.64	40.20	65.99
				8/10	31	61	1.15				
0.80	57	3.0	13.00	2/10	43	61	1.58	1.47	1.17	39.00	45.79
				8/10	36	60	1.35				
0.50	60	2.0	8.60	2/10	15	63	0.54	0.71	0.36	17.20	6.12
				8/10	24	62	0.88				
RB	61	0.5	8.00						0.12	4.00	0.48
SUM		**55.0**								**614.60**	**977.51**
			Estimated values								

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 11:35 Finish: 12:20

Date 6/3/2006 Party EJK, AMG, JPM

Width 218 ft Area 362.2 sq ft Vel. 0.91 fps Disch. 331.1 cfs

Method 0.6 No. Secs. 24 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9A	3.22	3.26	0.04
UB6.9B	0.86	0.89	0.03
UB6.8A	0.54	0.50	0.04
UB6.7A	3.16	3.15	0.01
UB6.7B	1.32	1.32	0.00

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Ice and snow on banks, boundary conditions poorly defined

Flow: Unsteady

Weather: Overcast, Wind 0 - 20 mph

Other: Dense willow STA 117~162

Temp: 27^{o}F

Gages: UB6.9A, UB6.9B, UB6.8A, UB6.7A, UB6.7B

Remarks: Channel at section, upstream and downstream 80% Accluded with snow.

Ice and significant backwater effect, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/3/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	278	4.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	270	9.0	0.80	SURFACE	15	41	0.83	0.75	0.75	7.20	5.38
1.0	260	10.0	1.50	6/10	20	47	0.96	0.96	0.96	15.00	14.45
1.0	250	10.0	1.90	6/10	30	56	1.21	1.21	1.21	19.00	22.95
1.0	240	10.0	2.20	6/10	30	56	1.21	1.21	1.21	22.00	26.58
1.0	230	10.0	2.60	6/10	30	50	1.35	1.35	1.35	26.00	35.12
1.0	220	10.0	3.30	6/10	40	59	1.52	1.52	1.52	33.00	50.30
1.0	210	10.0	3.30	6/10	30	49	1.38	1.38	1.38	33.00	45.47
1.0	200	10.0	3.30	6/10	30	49	1.38	1.38	1.38	33.00	45.47
1.0	190	7.5	3.10	6/10	30	49	1.38	1.38	1.38	23.25	32.04
1.0	185	5.0	2.70	6/10	30	52	1.30	1.30	1.30	13.50	17.54
1.0	180	7.5	2.30	6/10	30	52	1.30	1.30	1.30	17.25	22.42
1.0	170	10.0	2.30	6/10	10	44	0.52	0.52	0.52	23.00	11.98
1.0	160	10.0	1.20	6/10	3	69	0.12	0.12	0.12	12.00	1.39
1.0	150	10.0	0.80	6/10	0	40	0.00	0.00	0.00	8.00	0.00
1.0	140	10.0	0.50	6/10	0	40	0.00	0.00	0.00	5.00	0.00
1.0	130	10.0	0.30	6/10	0	40	0.00	0.00	0.00	3.00	0.00
1.0	120	10.0	0.40	6/10	0	40	0.00	0.00	0.00	4.00	0.00
1.0	110	10.0	1.60	6/10	0	40	0.00	0.00	0.00	16.00	0.00
1.0	100	10.0	0.60	6/10	0	40	0.00	0.00	0.00	6.00	0.00
1.0	90	10.0	1.50	6/10	0	40	0.00	0.00	0.00	15.00	0.00
1.0	80	10.0	1.40	6/10	0	40	0.00	0.00	0.00	14.00	0.00
1.0	70	10.0	1.40	6/10	0	40	0.00	0.00	0.00	14.00	0.00
LB	60	5.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**218.0**								**362.20**	**331.09**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:25 Finish: 10:50

Date 6/4/2006 Party MDM, AMG, JPM

Width 253 ft Area 687.9 sq ft Vel. 1.13 fps Disch. 778.9 cfs

Method Surface / 0.6 No. Secs. 30 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.7B	2.08	2.05	0.03
UB6.8A	1.44	1.34	0.10
UB6.9B	1.86	1.76	0.10

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow, ice and willow on banks, non-uniform, boundary poorly defined

Flow: Unsteady

Weather: Overcast,
Winds 10 - 12 mph

Other:

Temp: 28°F

Gages: UB6.7B, UB6.8A, UB6.9B

Remarks: Channel affected by in-place snow and ice, with significant backwater from ice jam 800-1500 ft downstream, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/4/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	293	6.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	280	11.5	1.50	6/10	0	40	0.00	0.00	0.00	17.25	0.00
1.0	270	10.0	2.40	6/10	25	51	1.11	1.11	1.11	24.00	26.57
1.0	260	9.0	2.70	6/10	35	49	1.60	1.60	1.60	24.30	39.00
1.0	252	8.0	3.00	6/10	40	50	1.80	1.80	1.80	24.00	43.08
1.0	244	8.0	3.30	6/10	40	47	1.91	1.91	1.91	26.40	50.39
1.0	236	8.0	3.80	6/10	40	47	1.91	1.91	1.91	30.40	58.02
1.0	228	8.0	3.90	6/10	40	48	1.87	1.87	1.87	31.20	58.32
1.0	220	8.0	4.60	6/10	40	46	1.95	1.95	1.95	36.80	71.75
1.0	212	8.0	4.80	6/10	40	47	1.91	1.91	1.91	38.40	73.29
1.0	204	6.5	4.70	6/10	40	49	1.83	1.83	1.83	30.55	55.95
1.0	199	7.0	4.50	6/10	40	52	1.73	1.73	1.73	31.50	54.39
1.0	190	8.5	5.70	6/10	30	45	1.50	1.50	1.50	48.45	72.63
1.0	182	6.5	5.00	6/10	25	43	1.31	1.31	1.31	32.50	42.56
1.0	177	6.0	3.80	6/10	25	40	1.41	1.41	1.41	22.80	32.07
1.0	170	5.5	3.30	6/10	25	45	1.25	1.25	1.25	18.15	22.73
1.0	166	7.0	2.40	SURFACE	20	49	0.92	0.83	0.83	16.80	13.98
1.0	156	10.0	2.00	6/10	10	41	0.56	0.56	0.56	20.00	11.15
1.0	146	10.0	1.60	6/10	10	50	0.46	0.46	0.46	16.00	7.37
0.7	136	10.0	1.50	SURFACE	20	54	0.84	0.76	0.53	15.00	7.95
0.7	126	10.0	1.30	6/10	5	49	0.24	0.24	0.17	13.00	2.23
0.1	116	10.0	2.00	SURFACE	3	63	0.13	0.11	0.01	20.00	0.23
0.8	106	10.0	2.50	SURFACE	5	63	0.20	0.18	0.14	25.00	3.51
0.9	96	10.0	2.40	6/10	15	51	0.67	0.67	0.57	24.00	13.70
1.0	86	10.0	2.40	6/10	20	47	0.96	0.96	0.96	24.00	23.12
1.0	76	10.0	2.30	6/10	15	55	0.62	0.62	0.62	23.00	14.35
-1.0	66	10.0	2.40	6/10	15	42	0.81	0.81	-0.81	24.00	-19.47
1.0	56	10.0	2.40	6/10	0	40	0.00	0.00	0.00	24.00	0.00
1.0	46	8.0	0.80				0.00	0.00	0.00	6.40	0.00
LB	40	3.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**253.0**								**687.90**	**778.87**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 8:57 Finish: 10:00

Date 6/5/2006 Party JPM, MTA, AMG

Width 246 ft Area 604.5 sq ft Vel. 1.38 fps Disch. 836.5 cfs

Method Surface / 0.6 No. Secs. 30 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9B	1.35	1.3	0.05
UB6.8A	1.00	0.98	0.02
UB6.7B	1.79	1.76	0.03

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Slush, ice and willows on banks, channel bottom ice and snow, non uniform, boundary indefinite

Flow: Unsteady

Weather: Overcast, Wind 5 - 10 mph

Other:

Temp: 38^oF

Gages: UB6.9B, UB6.8A, UB6.7B

Remarks: Ice jam 1000-1500 ft downstream, channel constricted by snow and ice, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	288	4.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	280	6.5	1.40	6/10	20	43	1.05	1.05	1.05	9.10	9.57
1.0	275	6.0	1.70	6/10	40	51	1.76	1.76	1.76	10.20	17.96
1.0	268	7.5	2.20	6/10	40	45	1.99	1.99	1.99	16.50	32.88
1.0	260	8.0	2.50	6/10	40	43	2.08	2.08	2.08	20.00	41.69
1.0	252	7.5	2.70	6/10	40	43	2.08	2.08	2.08	20.25	42.21
1.0	245	7.0	3.00	6/10	40	42	2.13	2.13	2.13	21.00	44.81
1.0	238	7.0	3.30	6/10	40	42	2.13	2.13	2.13	23.10	49.29
1.0	231	7.0	3.50	6/10	40	43	2.08	2.08	2.08	24.50	51.07
1.0	224	7.0	3.90	6/10	40	40	2.24	2.24	2.24	27.30	61.14
1.0	217	7.0	4.30	6/10	50	49	2.28	2.28	2.28	30.10	68.77
1.0	210	6.0	4.40	6/10	50	51	2.20	2.20	2.20	26.40	57.97
1.0	205	5.0	4.40	6/10	40	41	2.19	2.19	2.19	22.00	48.08
1.0	200	5.0	4.40	6/10	40	53	1.69	1.69	1.69	22.00	37.28
1.0	195	5.0	4.30	6/10	40	44	2.04	2.04	2.04	21.50	43.81
1.0	190	5.0	5.00	6/10	40	45	1.99	1.99	1.99	25.00	49.82
1.0	185	5.0	4.80	6/10	40	49	1.83	1.83	1.83	24.00	43.95
1.0	180	5.0	4.20	6/10	40	51	1.76	1.76	1.76	21.00	36.97
1.0	175	5.0	3.80	6/10	30	44	1.53	1.53	1.53	19.00	29.12
1.0	170	6.5	3.10	6/10	20	41	1.10	1.10	1.10	20.15	22.20
1.0	162	7.5	2.00	SURFACE	7	41	0.40	0.36	0.36	15.00	5.35
1.0	155	8.5	1.40	6/10	3	65	0.12	0.12	0.12	11.90	1.45
0.90	145	10.0	1.00	SURFACE	15	61	0.56	0.51	0.46	10.00	4.55
0.85	135	15.0	1.00	SURFACE	3	44	0.17	0.15	0.13	15.00	1.96
1.0	115	17.5	1.70	6/10	2	55	0.10	0.10	0.10	29.75	2.99
1.0	100	17.5	2.00	6/10	3	67	0.12	0.12	0.12	35.00	4.16
1.0	80	17.5	1.90	6/10	7	44	0.37	0.37	0.37	33.25	12.32
1.0	65	15.0	1.90	6/10	10	43	0.53	0.53	0.53	28.50	15.17
1.0	50	11.5	2.00				0.00	0.00	0.00	23.00	0.00
LB	42	4.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**246.0**								**604.50**	**836.54**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:00 Finish: 10:25

Date 6/6/2006 Party MDM, MTA, EJK

Width 259 ft Area 758.9 sq ft Vel. 1.58 fps Disch. 1197 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 28 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.7B	2.11	2.12	0.01
UB6.8A	1.35	1.38	0.03
UB6.9B	1.55	1.56	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks

Flow:

Weather: Cloudy, Scattered Rain
Wind 10 - 20 mph

Other:

Temp: 40^{o}F

Gages: UB6.7B, Ub6.8A, UB6.9B

Remarks: Ice jams were present about 100 yards upstream and downstream from x-section,

AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	289	4.5	0.50				0.00	0.00	0.00	2.25	0.00
1.0	280	8.5	2.10	6/10	35	41	1.91	1.91	1.91	17.85	34.17
1.0	272	7.5	2.90	6/10	40	44	2.04	2.04	2.04	21.75	44.32
1.0	265	7.5	3.20	6/10	40	40	2.24	2.24	2.24	24.00	53.75
1.0	257	7.5	3.50	6/10	50	46	2.43	2.43	2.43	26.25	63.86
1.0	250	7.0	3.60	8/10	40	41	2.19	2.55	2.55	25.20	64.15
				2/10	52	40	2.91				
1.0	243	7.0	4.00	8/10	40	44	2.04	2.38	2.38	28.00	66.71
				2/10	50	41	2.73				
1.0	236	6.5	4.30	8/10	40	43	2.08	2.41	2.41	27.95	67.24
				2/10	50	41	2.73				
1.0	230	5.5	4.40	8/10	40	40	2.24	2.48	2.48	24.20	60.10
				2/10	50	41	2.73				
1.0	225	5.0	4.80	8/10	40	42	2.13	2.43	2.43	24.00	58.33
				2/10	50	41	2.73				
1.0	220	5.0	5.20	8/10	40	40	2.24	2.45	2.45	26.00	63.73
				2/10	50	42	2.66				
1.0	215	5.0	5.40	8/10	40	43	2.08	2.29	2.29	27.00	61.71
				2/10	50	45	2.49				
1.0	210	5.0	5.50	8/10	40	43	2.08	2.26	2.26	27.50	62.11
				2/10	50	46	2.43				
1.00	205	5.0	5.50	8/10	40	45	1.99	2.19	2.19	27.50	60.14
				2/10	50	47	2.38				
1.00	200	5.0	5.50	8/10	40	45	1.99	2.19	2.19	27.50	60.14
				2/10	50	47	2.38				
1.0	195	5.0	5.40	8/10	40	43	2.08	2.18	2.18	27.00	58.98
				2/10	50	49	2.28				
1.0	190	5.0	5.50	8/10	40	46	1.95	2.12	2.12	27.50	58.23
				2/10	50	49	2.28				
1.0	185	6.5	5.30	8/10	40	42	2.13	2.16	2.16	34.45	74.40
				2/10	40	41	2.19				

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/6/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1.0	177	7.5	4.40	8/10	25	44	1.28	1.64	1.64	33.00	54.00
				2/10	40	45	1.99				
1.0	170	8.5	3.70	6/10	25	43	1.31	1.31	1.31	31.45	41.19
1.0	160	15.0	2.00	6/10	5	55	0.22	0.22	0.22	30.00	6.61
1.0	140	20.0	1.20	6/10	10	55	0.42	0.42	0.42	24.00	10.09
1.0	120	20.0	1.40	6/10	0	40	0.00	0.00	0.00	28.00	0.00
1.0	100	20.0	2.30	6/10	3	40	0.19	0.19	0.19	46.00	8.53
0.90	80	20.0	2.10	6/10	10	47	0.49	0.49	0.44	42.00	18.48
0.94	60	20.0	2.20	6/10	15	47	0.73	0.73	0.68	44.00	30.07
1.0	40	15.0	2.30	6/10	10	49	0.47	0.47	0.47	34.50	16.20
LB	30	5.0	0.00	6/10	0	40	0.00	0.00	0.00	0.00	0.00
SUM		**259.0**								**758.85**	**1197.24**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By SLB/JPM
Check By JPM

Discharge Measurement Notes

Station No. Ublutoch River Start: 8:40 Finish: 10:15

Date 6/7/2006 Party JPM, MDM, SLB

Width 259 ft Area 780.5 sq ft Vel. 1.65 fps Disch. 1289 cfs

Method 0.2 / 0.6 / 0.8 Surface No. Secs. 33 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.7B	2.35	2.34	0.01
UB6.8A	1.42	1.42	0.00
UB6.9B	1.54	1.53	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass, snow and willows on banks, channel bed fairly firm, ice, snow and willows in channel, banks poorly defined

Flow: Steady

Weather: Partly Cloudy
Winds 0 - 5 mph

Other:

Temp: 39°F

Gages: UB6.7B, UB6.8A, UB6.9B

Remarks: Ice jam 1000-1500 downstream causing backwater, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	295	2.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	290	5.0	1.40	6/10	20	40	1.13	1.13	1.13	7.00	7.90
1.0	285	7.5	2.50	8/10	40	49	1.83	2.04	2.04	18.75	38.17
				2/10	40	40	2.24				
1.0	275	9.0	3.20	8/10	40	43	2.08	2.29	2.29	28.80	65.82
				2/10	50	45	2.49				
1.0	267	7.5	3.60	8/10	40	42	2.13	2.46	2.46	27.00	66.54
				2/10	50	40	2.79				
1.0	260	7.0	3.80	8/10	40	41	2.19	2.19	2.19	26.60	58.27
				2/10	50	51	2.20				
1.0	253	7.0	3.90	8/10	40	42	2.13	2.46	2.46	27.30	67.28
				2/10	60	48	2.79				
1.0	246	6.5	4.10	8/10	40	40	2.24	2.48	2.48	26.65	66.18
				2/10	50	41	2.73				
1.0	240	6.0	4.50	8/10	40	42	2.13	2.46	2.46	27.00	66.54
				2/10	50	40	2.79				
1.0	234	6.0	4.70	8/10	50	49	2.28	2.51	2.51	28.20	70.67
				2/10	50	41	2.73				
1.0	228	6.0	5.00	8/10	40	43	2.08	2.47	2.47	30.00	74.08
				2/10	60	47	2.85				
1.0	222	5.5	5.60	8/10	40	40	2.24	2.52	2.52	30.80	77.53
				2/10	50	40	2.79				
0.90	217	5.5	5.70	8/10	40	41	2.19	2.39	2.15	31.35	67.52
				2/10	50	43	2.60				
1.0	211	6.0	6.00	8/10	40	42	2.13	2.34	2.34	36.00	84.18
				2/10	50	44	2.54				
1.0	205	6.0	5.80	8/10	40	43	2.08	2.16	2.16	34.80	75.24
				2/10	40	40	2.24				
1.0	199	6.0	5.50	8/10	40	42	2.13	2.13	2.13	33.00	70.42
				2/10	40	42	2.13				
1.0											

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1.0	193	6.0	5.40	8/10	40	45	1.99	2.16	2.16	32.40	70.06
				2/10	50	48	2.33				
1.0	187	6.5	5.50	8/10	30	49	1.38	1.78	1.78	35.75	63.70
				2/10	40	41	2.19				
1.0	180	7.5	4.50	8/10	25	44	1.28	1.68	1.68	33.75	56.78
				2/10	40	43	2.08				
1.0	172	7.5	4.10	8/10	20	43	1.05	1.37	1.37	30.75	42.06
				2/10	30	40	1.68				
1.0	165	9.5	2.20	6/10	7	44	0.37	0.37	0.37	20.90	7.75
1.0	153	10.0	1.60	6/10	5	62	0.20	0.20	0.20	16.00	3.16
1.0	145	11.5	1.20	SURFACE	15	46	0.74	0.67	0.67	13.80	9.22
1.0	130	14.5	1.10	SURFACE	7	47	0.35	0.31	0.31	15.95	5.00
1.0	116	12.5	1.80	SURFACE	3	52	0.15	0.13	0.13	22.50	2.98
1.0	105	10.5	1.30	6/10	0	40	0.00	0.00	0.00	13.65	0.00
1.0	95	10.0	2.20	6/10	3	45	0.17	0.17	0.17	22.00	3.68
1.0	85	10.0	2.10	6/10	7	48	0.34	0.34	0.34	21.00	7.17
1.0	75	10.0	2.10	6/10	15	63	0.54	0.54	0.54	21.00	11.43
1.0	65	10.0	2.20	6/10	20	52	0.87	0.87	0.87	22.00	19.20
1.0	55	10.0	2.30	6/10	15	41	0.83	0.83	0.83	23.00	19.11
1.0	45	9.5	2.40	6/10	10	47	0.49	0.49	0.49	22.80	11.14
LB	36	4.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**259.0**								**780.50**	**1288.78**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:06 Finish: 10:46

Date 6/8/2006 Party AMG, JPM

Width 263 ft Area 820 sq ft Vel. 1.55 fps Disch. 1272 cfs

Method 0.2 / 0.6 / 0.8 Surface No. Secs. 29 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9B	1.39	1.29	0.10
UB6.8B	1.30	1.27	0.03
UB6.7B	2.23	2.20	0.03

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Non uniform, smooth and firm except willows, sta 115-170, boundaries fairly well defined

Flow: Steady

Weather: Partly Cloudy, Calm

Other:

Temp: 45°F

Gages: UB6.9B, UB6.8B, UB6.7B

Remarks: Ice jam 1000-1500 ft downstream, backwater affecting stage, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)	
RB	298	4.0	0.00				0.00	0.00	0.00	0.00	0.00	0.90
1.0	290	9.0	2.10	6/10	40	45	1.99	1.99	1.99	18.90	37.66	
1.0	280	9.0	3.20	2/10	50	45	2.49	2.12	2.12	28.80	61.15	0.92
				8/10	40	51	1.76					
1.0	272	8.0	3.80	2/10	50	42	2.66	2.35	2.35	30.40	71.45	0.94
				8/10	40	44	2.04					
1.0	264	7.5	4.10	2/10	50	41	2.73	2.38	2.38	30.75	73.26	0.96
				8/10	40	44	2.04					0.97
1.0	257	7.0	4.50	2/10	50	40	2.79	2.46	2.46	31.50	77.63	0.98
				8/10	40	42	2.13					
1.0	250	7.0	4.50	2/10	50	43	2.60	2.44	2.44	31.50	76.95	0.99
				8/10	50	49	2.28					
1.0	243	7.0	4.80	2/10	50	43	2.60	2.47	2.47	33.60	83.06	
				8/10	45	43	2.34					
1.0	236	6.5	5.20	2/10	50	42	2.66	2.40	2.40	33.80	81.06	1.00
				8/10	40	42	2.13					
1.0	230	6.0	5.50	2/10	50	42	2.66	2.35	2.35	33.00	77.56	
				8/10	40	44	2.04					
1.0	224	6.0	6.10	2/10	50	46	2.43	2.28	2.28	36.60	83.57	0.99
				8/10	40	42	2.13					
1.0	218	6.0	6.20	2/10	50	47	2.38	2.23	2.23	37.20	83.06	0.98
				8/10	40	43	2.08					0.97
1.0	212	6.0	6.20	2/10	50	51	2.20	2.24	2.24	37.20	83.34	0.96
				8/10	50	49	2.28					
1.0	206	6.0	5.80	2/10	40	46	1.95	2.04	2.04	34.80	71.05	
				8/10	40	42	2.13					0.94
1.0	200	6.5	5.60	2/10	40	50	1.80	1.96	1.96	36.40	71.51	0.92
				8/10	40	42	2.13					
1.0	193	7.0	5.60	2/10	40	51	1.76	1.81	1.81	39.20	71.14	0.90
				8/10	40	48	1.87					

CONTINUED ON FOLLOWING SHEET

0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1.0	186	7.0	5.20	2/10	40	51	1.76	1.48	1.48	36.40	53.87
				8/10	25	47	1.20				
1.0	179	8.0	4.40	2/10	30	43	1.57	1.17	1.17	35.20	41.24
				8/10	15	44	0.78				
1.0	170	9.5	3.50	SURFACE	15	48	0.71	0.64	0.64	33.25	21.32
1.0	160	10.0	1.70	SURFACE	7	47	0.35	0.31	0.31	17.00	5.33
0.6	150	12.5	1.30	SURFACE	7	41	0.40	0.36	0.21	16.25	3.48
0.5	135	17.5	0.90	SURFACE	5	49	0.24	0.22	0.10	15.75	1.56
0.0	115	15.0	1.50	SURFACE	0	40	0.00	0.00	0.00	22.50	0.00
1.0	105	12.5	2.20	6/10	0	40	0.00	0.00	0.00	27.50	0.00
1.0	90	17.5	2.00	6/10	3	82	0.10	0.10	0.10	35.00	3.53
1.0	70	17.5	2.00	6/10	7	53	0.31	0.31	0.31	35.00	10.89
1.0	55	15.0	2.10	6/10	15	54	0.64	0.64	0.64	31.50	20.01
1.0	40	10.0	2.10	6/10	7	50	0.33	0.33	0.33	21.00	6.90
LB	35	2.5	0.00	6/10	0	40	0.00	0.00	0.00	0.00	0.00
SUM		**263.0**								**820.00**	**1271.58**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:30 Finish: 10:45

Date 6/9/2006 Party MTA, AMG, SLB

Width 263 ft Area 762.6 sq ft Vel. 1.48 fps Disch. 1132 cfs

Method 0.2 / 0.6 / 0.8 Surface No. Secs. 26 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9A	3.25	3.24	0.01
UB6.9B	0.87	0.86	0.01
UB6.7B	1.84	1.84	0.00
UB6.8A	0.92	0.91	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks

Flow:

Weather: Clear, Sunny, Winds 0 - 5 mph

Other:

Temp: 50°F

Gages: UB6.9A, UB6.9B, UB6.7B, UB6.8A

Remarks: Ice jams upstream and downstream, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/9/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	296	3.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	290	7.0	3.30	6/10	40	48	1.87	1.87	1.87	23.10	43.18
1.0	282	7.5	4.20	6/10	40	44	2.04	2.04	2.04	31.50	64.18
1.0	275	7.5	4.00	6/10	40	45	1.99	1.99	1.99	30.00	59.78
1.0	267	7.5	4.20	8/10	50	48	2.33	2.36	2.36	31.50	74.24
				2/10	50	47	2.38				
1.0	260	7.5	4.30	8/10	50	48	2.33	2.24	2.24	32.25	72.34
				2/10	50	52	2.15				
1.0	252	7.5	4.60	8/10	40	43	2.08	2.41	2.41	34.50	83.00
				2/10	50	41	2.73				
1.0	245	7.5	4.80	8/10	50	50	2.24	2.42	2.42	36.00	87.13
				2/10	50	43	2.60				
1.0	237	7.5	5.50	8/10	40	45	1.99	2.21	2.21	41.25	91.28
				2/10	50	46	2.43				
1.0	230	7.5	5.70	8/10	40	42	2.13	2.23	2.23	42.75	95.46
				2/10	50	48	2.33				
1.0	222	7.5	5.90	8/10	40	44	2.04	2.11	2.11	44.25	93.43
				2/10	40	41	2.19				
1.0	215	7.5	5.70	8/10	40	50	1.80	1.87	1.87	42.75	80.05
				2/10	40	46	1.95				
1.0	207	7.5	5.30	8/10	30	41	1.64	1.82	1.82	39.75	72.27
				2/10	40	45	1.99				
1.0	200	7.5	5.20	8/10	30	44	1.53	1.72	1.72	39.00	67.11
				2/10	40	47	1.91				
1.0	192	7.5	5.10	8/10	30	44	1.53	1.65	1.65	38.25	62.98
				2/10	40	51	1.76				
1.0	185	8.5	4.80	8/10	15	42	0.81	1.23	1.23	40.80	50.08
				2/10	30	41	1.64				
1.0	175	10.0	3.60	8/10	15	48	0.71	0.80	0.80	36.00	28.83
				2/10	20	51	0.89				
1.0	165	12.5	1.50	6/10	1	41	0.07	0.07	0.07	18.75	1.39

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/9/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
0.94	150	22.5	0.80	SURFACE	3	85	0.10	0.09	0.08	18.00	1.49
0.9	120	20.0	0.90	SURFACE	0	40	0.00	0.00	0.00	18.00	0.00
1.0	110	10.0	1.70	6/10	0	40	0.00	0.00	0.00	17.00	0.00
1.0	100	15.0	1.70	6/10	0	40	0.00	0.00	0.00	25.50	0.00
1.0	80	20.0	1.40	6/10	0	40	0.00	0.00	0.00	28.00	0.00
0.9	60	17.5	1.60	6/10	1	50	0.06	0.06	0.06	28.00	1.62
0.9	45	13.5	1.90	6/10	3	95	0.09	0.09	0.08	25.65	2.07
LB	33	6.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**263.0**								**762.55**	**1131.91**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:20 Finish: 10:51

Date 6/10/2006 Party SLB, MTA, AMG

Width 133 ft Area 653.9 sq ft Vel. 1.34 fps Disch. 876.1 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 14 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9B	0.30	0.26	0.04
UB6.9A	2.67	2.63	0.04
UB6.8A	0.39	0.36	0.03
UB6.7B	1.28	1.26	0.02

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter ______ ft above bottom of weight

Weight 30 lbs

Spin Test ______ after ______ Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Water in left bank channel not connected downstream, no flow

Flow: Weather: Cloudy, Calm

Other: Temp: 50°F

Gages: UB6.9B, UB6.9A, UB6.8A, UB6.7B

Remarks: Ice jam upstream and downstream, banks at measurement location 95%, clear of snow and ice, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/10/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	298	1.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	295	6.5	3.60	8/10	20	40	1.13	1.18	1.18	23.40	27.54
				2/10	25	46	1.23				
1.0	285	10.0	5.30	8/10	30	43	1.57	1.83	1.83	53.00	96.79
				2/10	40	43	2.08				
1.0	275	10.0	5.70	8/10	30	41	1.64	1.84	1.84	57.00	104.91
				2/10	40	44	2.04				
1.0	265	10.0	5.60	8/10	30	44	1.53	1.74	1.74	56.00	97.51
				2/10	40	46	1.95				
1.0	255	10.0	5.50	8/10	40	55	1.63	1.62	1.62	55.00	89.06
				2/10	30	42	1.60				
1.0	245	10.0	5.80	8/10	25	42	1.34	1.47	1.47	58.00	85.41
				2/10	30	42	1.60				
1.0	235	10.0	5.40	8/10	20	52	0.87	1.06	1.06	54.00	57.37
				2/10	25	45	1.25				
1.0	225	10.0	5.80	8/10	20	50	0.91	1.04	1.04	58.00	60.37
				2/10	25	48	1.18				
1.0	215	10.0	5.60	8/10	25	45	1.25	1.27	1.27	56.00	70.91
				2/10	25	44	1.28				
1.0	205	10.0	5.30	8/10	25	46	1.23	1.28	1.28	53.00	67.99
				2/10	25	42	1.34				
1.0	195	10.0	5.10	8/10	20	47	0.96	1.18	1.18	51.00	60.43
				2/10	25	40	1.41				
1.0	185	10.0	4.20	8/10	15	41	0.83	0.95	0.95	42.00	40.04
				2/10	20	42	1.08				
1.0	175	10.0	3.20	8/10	7	41	0.40	0.55	0.55	32.00	17.73
				2/10	15	48	0.71				
LB	165	5.0	1.10	6/10	0	40	0.00	0.00	0.00	5.50	0.00
SUM		**133.0**								**653.90**	**876.06**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:10 Finish: 9:55

Date 6/11/2006 Party MTA, AMG, SLB

Width 140 ft Area 711.5 sq ft Vel. 0.96 fps Disch. 685.9 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 15 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9A	2.2	2.19	0.01
UB6.7B	0.88	0.86	0.02
UB6.8A	-0.04	-0.06	0.02

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter ______ ft above bottom of weight

Weight 30 lbs

Spin Test ______ after ______ Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows on banks

Flow:

Weather: Sunny, Partly Cloudy
Winds 0 - 15 mph

Other:

Temp: 52°F

Gages: UB6.9A, UB6.7B, UB6.8A

Remarks: Ice jams cleared directly upstream and downstream, ice jams 1/2 mile upstream and downstream

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/11/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	300	2.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	295	7.5	2.80	6/10	10	62	0.38	0.38	0.38	21.00	7.88
1.0	285	10.0	6.60	8/10	20	41	1.10	1.37	1.37	66.00	90.59
				2/10	30	41	1.64				
1.0	275	10.0	6.80	8/10	25	43	1.31	1.40	1.40	68.00	95.50
				2/10	30	45	1.50				
1.0	265	10.0	7.40	8/10	20	40	1.13	1.35	1.35	74.00	99.78
				2/10	30	43	1.57				
1.0	255	10.0	7.10	8/10	20	41	1.10	1.22	1.22	71.00	86.69
				2/10	25	42	1.34				
1.0	245	10.0	6.80	8/10	20	45	1.01	1.09	1.09	68.00	74.13
				2/10	25	48	1.18				
1.0	235	10.0	6.40	8/10	15	42	0.81	0.87	0.87	64.00	55.56
				2/10	20	49	0.92				
1.0	225	10.0	6.30	8/10	15	49	0.70	0.84	0.84	63.00	52.99
				2/10	20	46	0.98				
1.0	215	10.0	5.70	8/10	15	51	0.67	0.76	0.76	57.00	43.39
				2/10	15	40	0.85				
1.0	205	10.0	5.50	8/10	15	58	0.59	0.57	0.57	55.00	31.50
				2/10	15	62	0.55				
1.0	195	10.0	4.30	8/10	15	52	0.66	0.68	0.68	43.00	29.18
				2/10	15	49	0.70				
1.0	185	10.0	3.40	8/10	3	65	0.12	0.32	0.32	34.00	10.93
				2/10	10	44	0.52				
1.0	175	12.5	2.20	6/10	5	42	0.28	0.28	0.28	27.50	7.76
LB	160	7.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**140.0**								**711.50**	**685.88**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. ASDP1 Start: 8:56 Finish: 9:30

Date 6/3/2006 Party MDM, MTA

Width 22.0 ft Area 19.10 sq ft Vel. 0.14 fps Disch. 2.69 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S1W	0.42	0.42	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Weeds and grass - length 1-1.5 in length, ice on bed and snow on banks

Flow: Weather: Wind gusts to 25 mph

Other: Temp: 27°F

Gages: S1W

Remarks: Due to wind and weed, selected Marsh McBirney flow mate 2000. Wind caused increase in surface velocity and the weeds impacted the AA at 6/10th depth. Measured a 2/10 due to weeds, Marsh McBirney.

Site/Date: ASDP1 6/3/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00							0.00	0.00
1.0	2	2.0	0.40	6/10	N/A	40	-0.04	-0.04	-0.04	0.80	-0.03
1.0	4	2.0	0.75	6/10	N/A	40	-0.02	-0.02	-0.02	1.50	-0.03
1.0	6	2.0	1.10	2/10	N/A	40	0.16	0.13	0.13	2.20	0.29
1.0	8	2.0	1.20	2/10	N/A	40	0.35	0.28	0.28	2.40	0.67
1.0	10	2.0	1.25	2/10	N/A	40	0.40	0.32	0.32	2.50	0.80
1.0	12	2.0	1.20	2/10	N/A	40	0.40	0.32	0.32	2.40	0.77
1.0	14	2.0	1.00	2/10	N/A	40	0.16	0.13	0.13	2.00	0.26
1.0	16	2.0	0.90	6/10	N/A	40	0.00	0.00	0.00	1.80	0.00
1.0	18	2.0	0.75	6/10	N/A	40	0.00	0.00	0.00	1.50	0.00
1.0	20	2.0	0.65	6/10	N/A	40	-0.03	-0.03	-0.03	1.30	-0.04
LB	22	1.0	0.70	6/10	N/A	40	0.00	0.00	0.00	0.70	0.00
SUM		**22.0**								**19.10**	**2.69**

Point velocities measured at 2/10 depth were multiplied by 0.8 to obtain mean in vertical.

2006 | Michael Baker Jr., Inc. | Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP1 Start: 17:38 Finish: 17:48

Date 6/4/2006 Party WLS, MTA, SLB

Width 10.0 ft Area 4.40 sq ft Vel. 0.13 fps Disch. 0.55 cfs

Method 0.6 No. Secs. 11 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S1W	0.39	0.39	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______ Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass, channel free of snow and ice

Flow: ______ Weather: Partly Cloudy, Winds 0-5 mph

Other: ______ Temp: 28°F

Gages: S1W

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP1 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.10	6/10	N/A	40	0.00	0.00	0.00	0.05	0.00
1.0	1	1.0	0.50	6/10	N/A	40	0.23	0.23	0.23	0.50	0.12
1.0	2	1.0	0.50	6/10	N/A	40	0.12	0.12	0.12	0.50	0.06
1.0	3	1.0	0.45	6/10	N/A	40	0.16	0.16	0.16	0.45	0.07
1.0	4	1.0	0.45	6/10	N/A	40	0.16	0.16	0.16	0.45	0.07
1.0	5	1.0	0.55	6/10	N/A	40	0.12	0.12	0.12	0.55	0.07
1.0	6	1.0	0.60	6/10	N/A	40	0.04	0.04	0.04	0.60	0.02
1.0	7	1.0	0.60	6/10	N/A	40	0.15	0.15	0.15	0.60	0.09
1.0	8	1.0	0.45	6/10	N/A	40	0.10	0.10	0.1	0.45	0.05
1.0	9	1.0	0.20	6/10	N/A	40	0.02	0.02	0.02	0.20	0.00
LB	10	0.5	0.10	6/10	N/A	40	0.00	0.00	0.00	0.05	0.00
SUM		**10.0**								**4.40**	**0.55**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By AMG

Check By JPM

Discharge Measurement Notes

Station No. ASDP1 Start: 16:20 Finish: 16:30

Date 6/5/2006 Party MDM, SLB, EJK

Width 22.0 ft Area 18.35 sq ft Vel. 0.01 fps Disch. 0.21 cfs

Method 0.6 No. Secs. 12 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S1W	0.38	0.38	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test NA after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass

Flow: Slow

Weather:

Other:

Temp: 38^{o}F

Gages: S1W

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP1 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.15	6/10	N/A	40	0.00	0.00	0.00	0.15	0.00
1.0	2	2.0	0.70	6/10	N/A	40	0.05	0.05	0.05	1.40	0.07
1.0	4	2.0	1.00	6/10	N/A	40	0.01	0.01	0.01	2.00	0.02
1.0	6	2.0	1.20	6/10	N/A	40	0.00	0.00	0.00	2.40	0.00
1.0	8	2.0	1.20	6/10	N/A	40	0.01	0.01	0.01	2.40	0.02
1.0	10	2.0	1.25	6/10	N/A	40	0.03	0.03	0.03	2.50	0.08
1.0	12	2.0	1.20	6/10	N/A	40	0.00	0.00	0.00	2.40	0.00
1.0	14	2.0	0.90	6/10	N/A	40	0.01	0.01	0.01	1.80	0.02
1.0	16	2.0	0.65	6/10	N/A	40	0.00	0.00	0.00	1.30	0.00
1.0	18	2.0	0.55	6/10	N/A	40	0.00	0.00	0.00	1.10	0.00
1.0	20	2.0	0.45	6/10	N/A	40	0.00	0.00	0.00	0.90	0.00
RB	22	1.0	0.00							0.00	0.00
SUM		**22.0**								**18.35**	**0.21**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MTA/JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 16:27 Finish: 16:35

Date 6/3/2006 Party MTA, EJK

Width 5.0 ft Area 1.6 sq ft Vel. 1.8 fps Disch. 2.88 cfs

Method 0.6 No. Secs. 6 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.84	0.84	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, channel bottom grass and ice

Flow:

Weather:

Other:

Temp: 27°F

Gages: S10

Remarks: Ice and snow impacts to cross section, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/3/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.10				0.00	0.00	0.00	0.05	0.00
1.0	1	1.0	0.10	6/10	N/A	40	0.91	0.91	0.91	0.10	0.09
1.0	2	1.0	0.40	6/10	N/A	40	2.79	2.79	2.79	0.40	1.12
1.0	3	1.0	0.60	6/10	N/A	40	1.62	1.62	1.62	0.60	0.97
1.0	4	1.0	0.40	6/10	N/A	40	1.74	1.74	1.74	0.40	0.70
LB	5	0.5	0.10	6/10	N/A	40	0.00	0.00	0.00	0.05	0.00
SUM		**5.0**								**1.60**	**2.88**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MTA/JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 8:47 Finish: 9:04

Date 6/4/2006 Party EJK, MTA

Width 15.0 ft Area 5.42 sq ft Vel. 1.09 fps Disch. 5.89 cfs

Method 0.6 No. Secs. 16 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.84	0.84	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, right banks flow over ice and left bank flow over grass, channel bottom grass and ice

Flow:

Weather: Partly Cloudy

Other:

Temp: 28°F

Gages: S10

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.15				0.00	0.00	0.00	0.08	0.00
0.96	1	1.0	0.15	6/10	9	40	0.25	0.25	0.24	0.15	0.04
0.96	2	1.0	0.15	6/10	16	43	0.39	0.39	0.37	0.15	0.06
0.96	3	1.0	0.25	6/10	21	40	0.54	0.54	0.52	0.25	0.13
0.96	4	1.0	0.25	6/10	29	40	0.73	0.73	0.70	0.25	0.18
0.98	5	1.0	0.26	6/10	40	41	0.98	0.98	0.96	0.26	0.25
1.0	6	1.0	0.25	6/10	59	50	1.18	1.18	1.18	0.25	0.30
1.0	7	1.0	0.30	6/10	64	40	1.58	1.58	1.58	0.30	0.47
1.0	8	1.0	0.45	6/10	80	40	1.97	1.97	1.97	0.45	0.89
0.98	9	1.0	0.55	6/10	93	40	2.29	2.29	2.24	0.55	1.23
0.98	10	1.0	0.70	6/10	86	40	2.12	2.12	2.08	0.70	1.46
0.98	11	1.0	0.75	6/10	41	40	1.03	1.03	1.00	0.75	0.75
1.0	12	1.0	0.60	SURFACE	9	42	0.24	0.21	0.21	0.60	0.13
1.0	13	1.0	0.30				0.00	0.00	0.00	0.30	0.00
1.0	14	1.0	0.30				0.00	0.00	0.00	0.30	0.00
LB	15	0.5	0.15				0.00	0.00	0.00	0.08	0.00
SUM		**15.0**								**5.42**	**5.89**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

 Michael Baker Jr., Inc.

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 9:00 Finish: 9:15

Date 6/5/2006 Party MDM, EJK

Width 17.0 ft Area 11.25 sq ft Vel. 0.64 fps Disch. 7.21 cfs

Method 0.6 No. Secs. 18 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.80	0.80	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______ Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: channel bottom sediment and ice, x-section at outlet of deep pool, long grass

Flow: uniform, laminar

Weather: Overcast, Winds 0 - 5 mph

Other:

Temp: 38°F

Gages: S10

Remarks: Does not include minor sheet flow out of main channel, possibly contributing to 0-5% flow out of lake/pond, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	1	1.0	0.30	6/10	N/A	40	0.00	0.00	0.00	0.30	0.00
1.0	2	1.0	0.30	6/10	N/A	40	0.14	0.14	0.14	0.30	0.04
1.0	3	1.0	0.30	6/10	N/A	40	0.15	0.15	0.15	0.30	0.05
1.0	4	1.0	0.40	6/10	N/A	40	0.49	0.49	0.49	0.40	0.20
1.0	5	1.0	0.80	6/10	N/A	40	0.44	0.44	0.44	0.80	0.35
1.0	6	1.0	0.40	6/10	N/A	40	0.42	0.42	0.42	0.40	0.17
1.0	7	1.0	1.00	6/10	N/A	40	0.51	0.51	0.51	1.00	0.51
1.0	8	1.0	1.25	6/10	N/A	40	0.80	0.80	0.80	1.25	1.00
1.0	9	1.0	1.25	6/10	N/A	40	0.95	0.95	0.95	1.25	1.19
1.0	10	1.0	1.10	6/10	N/A	40	1.08	1.08	1.08	1.10	1.19
1.0	11	1.0	1.00	6/10	N/A	40	0.95	0.95	0.95	1.00	0.95
1.0	12	1.0	0.85	6/10	N/A	40	0.62	0.62	0.62	0.85	0.53
1.0	13	1.0	0.80	6/10	N/A	40	0.59	0.59	0.59	0.80	0.47
1.0	14	1.0	0.70	6/10	N/A	40	0.56	0.56	0.56	0.70	0.39
1.0	15	1.0	0.40	6/10	N/A	40	0.23	0.23	0.23	0.40	0.09
1.0	16	1.0	0.30	6/10	N/A	40	0.27	0.27	0.27	0.30	0.08
LB	17	0.5	0.20				0.00	0.00	0.00	0.10	0.00
SUM		**17.0**								**11.25**	**7.21**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc.

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 8:40 Finish: 8:55

Date 6/6/2006 Party SLB, AMG, JPM

Width 23.0 ft Area 12.00 sq ft Vel. 1.57 fps Disch. 18.85 cfs

Method Surface / 0.6 No. Secs. 14 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.92	0.92	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______ Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Non uniform, long grass, boundary conditions fairly well defined, firm

Flow: Steady Weather: Overcast, Winds 0 - 5 mph

Other: Temp: 40°F

Gages: S10

Remarks: Estimate 13 cfs sheet flow to left of channel see JPM notebook page 17 and AMG notebook page 63, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1.0	5	0.5	0.00				0.00	0.00	0.00	0.00	0.00
0.97	6	1.0	0.60	SURFACE	35	40	1.94	1.74	1.69	0.60	1.01
0.97	7	1.0	0.80	6/10	40	44	2.01	2.01	1.95	0.80	1.56
0.97	8	1.5	0.50	6/10	40	52	1.70	1.70	1.65	0.75	1.24
0.97	10	2.0	0.70	6/10	40	48	1.85	1.85	1.79	1.40	2.51
0.97	12	2.0	1.20	6/10	50	45	2.46	2.46	2.38	2.40	5.71
0.97	14	1.5	0.50	6/10	40	50	1.77	1.77	1.72	0.75	1.29
0.85	15	1.0	0.60	6/10	40	42	2.11	2.11	1.79	0.60	1.07
1.0	16	1.5	0.50	SURFACE	40	46	1.93	1.73	1.73	0.75	1.30
0.98	18	2.0	0.45	6/10	30	46	1.45	1.45	1.42	0.90	1.28
0.85	20	2.5	0.50	6/10	20	41	1.08	1.08	0.92	1.25	1.15
1.0	23	3.5	0.30	6/10	7	40	0.40	0.40	0.40	1.05	0.42
1.0	27	2.5	0.30	6/10	10	55	0.41	0.41	0.41	0.75	0.31
1.0	28	0.5	0.00							0.00	0.00
SUM		**23.0**								**12.00**	**18.85**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 14:52 Finish: 15:22

Date 6/7/2006 Party AMG, MTA

Width 25.0 ft Area 34.60 sq ft Vel. 0.82 fps Disch. 28.3 cfs

Method Surface / 0.6 No. Secs. 14 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.86	0.86	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______ Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom mud, channel and lake potion at overflow

100% free of snow and ice

Flow: ______ Weather: Partly Cloudy, Calm

Other: ______ Temp: 39°F

Gages: S10

Remarks: Measurement made in pool below fall from lake, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
0.90	2	2.0	0.30	SURFACE	-7	54	0.30	0.27	0.24	0.60	0.14
0.0	4	2.0	0.50	6/10	10	59	0.39	0.39	0.00	1.00	0.00
0.60	6	2.0	1.10	6/10	10	41	0.55	0.55	0.33	2.20	0.73
0.60	8	2.0	1.75	6/10	15	54	0.62	0.62	0.37	3.50	1.30
0.94	10	2.0	2.30	6/10	15	52	0.65	0.65	0.61	4.60	2.81
0.96	12	2.0	2.60	6/10	10	58	0.39	0.39	0.38	5.20	1.98
0.99	14	2.0	2.90	6/10	15	42	0.80	0.80	0.79	5.80	4.58
1.0	16	2.0	2.80	6/10	30	46	1.45	1.45	1.45	5.60	8.12
0.99	18	2.0	1.60	6/10	40	49	1.81	1.81	1.79	3.20	5.73
0.97	20	2.0	0.70	6/10	20	44	1.01	1.01	0.98	1.40	1.37
0.97	22	2.0	0.60	SURFACE	25	44	1.26	1.14	1.10	1.20	1.32
0.99	24	1.5	0.20	SURFACE	20	54	0.83	0.74	0.74	0.30	0.22
LB	25	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**25.0**								**34.60**	**28.30**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 14:55 Finish: 15:12

Date 6/8/2006 Party EJK, SLB

Width 26 ft Area 15.40 sq ft Vel. 1.04 fps Disch. 15.97 cfs

Method Surface / 0.6 No. Secs. 14 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.80	0.80	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass, x-section 40 ft from gage 10

Flow: 1-2% in grass on left bank

Weather: Sunny, Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 45°F

Gages: S10

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.20	6/10	N/A	40	0.03	0.03	0.03	0.20	0.01
1.0	2	2.0	0.10	6/10	N/A	40	0.41	0.41	0.41	0.20	0.08
1.0	4	2.0	0.30	6/10	N/A	40	0.35	0.35	0.35	0.60	0.21
1.0	6	2.0	0.55	6/10	N/A	40	1.71	1.71	1.71	1.10	1.88
1.0	8	2.0	0.65	6/10	N/A	40	1.73	1.73	1.73	1.30	2.25
1.0	10	2.0	1.40	6/10	N/A	40	1.47	1.47	1.47	2.80	4.12
1.0	12	2.0	1.60	6/10	N/A	40	1.09	1.09	1.09	3.20	3.49
1.0	14	2.0	1.35	6/10	N/A	40	0.39	0.39	0.39	2.70	1.05
1.0	16	2.0	0.60	6/10	N/A	40	1.11	1.11	1.11	1.20	1.33
1.0	18	2.0	0.35	6/10	N/A	40	0.91	0.91	0.91	0.70	0.64
1.0	20	2.0	0.35	6/10	N/A	40	0.93	0.93	0.93	0.70	0.65
1.0	22	2.0	0.05	SURFACE	N/A	40	0.33	0.30	0.30	0.10	0.03
1.0	24	2.0	0.15	6/10	N/A	40	0.22	0.22	0.22	0.30	0.07
RB	26	1.0	0.30	6/10	N/A	40	0.52	0.52	0.52	0.30	0.16
SUM		**26.0**								**15.40**	**15.97**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 13:45 Finish: 14:05

Date 6/11/2006 Party MTA, AMG, SLB

Width 18 ft Area 6.2 sq ft Vel. 1.5 fps Disch. 10.33 cfs

Method Surface / 0.6 No. Secs. 10 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.65	0.65	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass, wind blowing in the direction of flow

Flow:

Weather: Sunny, Partly Cloudy
Winds 10 - 15 mph

Other:

Temp: 52°F

Gages: S10

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/11/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	2	2.0	0.30	SURFACE	20	49	0.92	0.83	0.83	0.60	0.50
1.0	4	2.0	0.30	SURFACE	50	46	2.43	2.19	2.19	0.60	1.31
1.0	6	2.0	0.50	SURFACE	60	46	2.92	2.62	2.62	1.00	2.62
1.0	8	2.0	0.65	6/10	30	41	1.64	1.64	1.64	1.30	2.13
1.0	10	2.0	0.60	6/10	40	47	1.91	1.91	1.91	1.20	2.29
1.0	12	2.0	0.30	SURFACE	25	41	1.37	1.24	1.24	0.60	0.74
1.0	14	2.0	0.45	SURFACE	20	50	0.91	0.82	0.82	0.90	0.74
1.0	16	2.0	0.35				0.00	0.00	0.00	0.70	0.00
LB	18	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**18.0**								**6.90**	**10.33**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MTA/JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 13:04 Finish: 13:16

Date 6/3/2006 Party MDM, MTA

Width 9 ft Area 4.5 sq ft Vel. 0.31 fps Disch. 1.4 cfs

Method 0.6 No. Secs. 10 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S11N	0.15	0.15	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1462

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, channel bottom grass

Flow:

Weather: Wind 20 mph

Other:

Temp: 27°F

Gages: S11N

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/3/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.20	6/10			0.00	0.00	0.00	0.10	0.00
1.0	1	1.0	0.40	6/10	N/A	40	0.23	0.23	0.23	0.40	0.09
1.0	2	1.0	0.50	6/10	N/A	40	0.35	0.35	0.35	0.50	0.18
1.0	3	1.0	0.50	6/10	N/A	40	0.33	0.33	0.33	0.50	0.17
1.0	4	1.0	0.60	6/10	N/A	40	0.35	0.35	0.35	0.60	0.21
1.0	5	1.0	0.60	6/10	N/A	40	0.28	0.28	0.28	0.60	0.17
1.0	6	1.0	0.65	6/10	N/A	40	0.58	0.58	0.58	0.65	0.38
1.0	7	1.0	0.60	6/10	N/A	40	0.30	0.30	0.3	0.60	0.18
1.0	8	1.0	0.40	6/10	N/A	40	0.06	0.06	0.06	0.40	0.02
LB	9	0.5	0.30	6/10			0.00	0.00	0.00	0.15	0.00
SUM		**9.0**								**4.50**	**1.40**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MTA/JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 10:48 Finish: 11:02

Date 6/4/2006 Party MTA, EJK

Width 15.5 ft Area 7.70 sq ft Vel. 0.11 fps Disch. 0.86 cfs

Method 0.6 No. Secs. 18 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S11C	0.15	0.15	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom mud and grass

Flow:

Weather:

Other:

Temp: 28°F

Gages: S11C

Remarks: Channel is impacted by snow and ice, Pygmy meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.00				0.00	0.00	0.00	0.00	0.00
0.90	1	1.0	0.60	6/10	7	47.6	0.17	0.17	0.15	0.60	0.09
0.90	2	1.0	0.55	6/10	20	40.3	0.51	0.51	0.46	0.55	0.25
0.94	3	1.0	0.55	6/10	9	41.2	0.24	0.24	0.23	0.55	0.13
0.94	4	1.0	0.50	6/10	10	40	0.27	0.27	0.25	0.50	0.13
0.94	5	1.0	0.40	6/10	12	40	0.32	0.32	0.30	0.40	0.12
0.96	6	1.0	0.40	6/10	14	40	0.37	0.37	0.35	0.40	0.14
1.0	7	1.0	0.45	6/10	0	40	0.00	0.00	0.00	0.45	0.00
1.0	8	1.0	0.50	6/10	0	40	0.00	0.00	0.00	0.50	0.00
1.0	9	1.0	0.50	6/10	0	40	0.00	0.00	0.00	0.50	0.00
1.0	10	1.0	0.55	6/10	0	40	0.00	0.00	0.00	0.55	0.00
1.0	11	1.0	0.55	6/10	0	40	0.00	0.00	0.00	0.55	0.00
1.0	12	1.0	0.40	6/10	0	40	0.00	0.00	0.00	0.40	0.00
1.0	13	1.0	0.50	6/10	0	40	0.00	0.00	0.00	0.50	0.00
1.0	14	1.0	0.50	6/10	0	40	0.00	0.00	0.00	0.50	0.00
1.0	15	1.0	0.40	6/10	0	40	0.00	0.00	0.00	0.40	0.00
1.0	16	1.0	0.35	6/10	0	40	0.00	0.00	0.00	0.35	0.00
LB	17	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**15.5**								**7.70**	**0.86**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 12:30 Finish: 12:45

Date 6/5/2006 Party MDM, EJK, SLB

Width 5.0 ft Area 2.3 sq ft Vel. 0.32 fps Disch. 0.74 cfs

Method 0.6 No. Secs. 11 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S11N	-0.02	-0.02	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Confined outlet of ponded area, grass ~1ft, free on snow and ice

Flow: Laminar, uniform

Weather: Overcast, Cool
Winds 0 - 5 mph

Other:

Temp: 38^{o}F

Gages: S11N

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/5/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	1	0.25	0.40	6/9	N/A	40	0.01	0.01	0.01	0.10	0.00
1.0	1.5	0.5	0.45	6/10	N/A	40	0.04	0.04	0.04	0.23	0.01
1.0	2	0.5	0.40	6/10	N/A	40	0.07	0.07	0.07	0.20	0.01
1.0	2.5	0.5	0.45	6/10	N/A	40	0.08	0.08	0.08	0.23	0.02
1.0	3	0.5	0.40	6/10	N/A	40	0.04	0.04	0.04	0.20	0.01
1.0	3.5	0.5	0.40	6/10	N/A	40	0.10	0.10	0.10	0.20	0.02
1.0	4	0.5	0.45	6/10	N/A	40	0.12	0.12	0.12	0.23	0.03
1.0	4.5	0.5	0.50	6/10	N/A	40	0.67	0.67	0.67	0.25	0.17
1.0	5	0.5	0.60	6/10	N/A	40	0.94	0.94	0.94	0.30	0.28
1.0	5.5	0.5	0.55	6/10	N/A	40	0.69	0.69	0.69	0.28	0.19
1.0	6	0.25	0.30	6/10	N/A	40	0.02	0.02	0.02	0.08	0.00
SUM		**5.0**								**2.30**	**0.74**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 14:40 Finish: 15:00

Date 6/6/2006 Party JPM, AMG, SLB

Width 13 ft Area 11.55 sq ft Vel. 0.23 fps Disch. 2.69 cfs

Method Surface / 0.6 No. Secs. 13 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S11N	0.11	0.11	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Ice on left bank, grass on right bank, firm, non uniform

Flow: Steady

Weather: Partly Cloudy
Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S11N

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	2	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	4	1.5	0.30	SURFACE	5	88	0.14	0.13	0.13	0.45	0.06
1.0	5	1.0	0.30	6/10	5	52	0.23	0.23	0.23	0.30	0.07
1.0	6	1.0	1.20	6/10	10	43	0.53	0.53	0.53	1.20	0.64
1.0	7	1.0	1.40	6/10	10	45	0.50	0.50	0.50	1.40	0.70
1.0	8	1.0	1.60	6/10	7	45	0.36	0.36	0.36	1.60	0.58
1.0	9	1.0	1.60	6/10	5	45	0.26	0.26	0.26	1.60	0.42
1.0	10	1.0	1.55	6/10	3	55	0.14	0.14	0.14	1.55	0.22
1.0	11	1.0	1.35	6/10	0	40	0.00	0.00	0.00	1.35	0.00
1.0	12	1.0	1.10	6/10	0	40	0.00	0.00	0.00	1.10	0.00
1.0	13	1.0	0.60	6/10	0	40	0.00	0.00	0.00	0.60	0.00
1.0	14	1.0	0.40	6/10	0	40	0.00	0.00	0.00	0.40	0.00
RB	15	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**13.0**								**11.55**	**2.69**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 11:11 Finish: 11:23

Date 6/7/2006 Party AMG, MTA

Width 12.0 ft Area 12.20 sq ft Vel. 0.2 fps Disch. 2.44 cfs

Method Surface / 0.6 No. Secs. 7 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S11N	0.08	0.08	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Clear of ice, 95% clear of snow, near S11N gage

Flow:

Weather:

Other:

Temp: 39°F

Gages: S11N

Remarks: Sketch AMG page 68, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1	0	1.0	0.20	SURFACE	0	40	0.00	0.00	0.00	0.20	0.00
1.0	2	2.0	1.00	6/10	0	40	0.00	0.00	0.00	2.00	0.00
1.0	4	2.0	1.50	6/10	5	66	0.18	0.18	0.18	3.00	0.54
1.0	6	2.0	1.60	6/10	5	44	0.27	0.27	0.27	3.20	0.86
1.0	8	2.0	1.30	6/10	7	57	0.29	0.29	0.29	2.60	0.75
0.99	10	2.0	0.60	SURFACE	5	43	0.27	0.24	0.24	1.20	0.29
1.0	12	1.0	0.00	6/10	0	40	0.00	0.00	0.00	0.00	0.00
SUM		**12.0**								**12.20**	**2.44**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. Site 12 Start: 15:25 Finish: 15:38

Date 6/3/2006 Party EJK, MTA

Width 26.0 ft Area 28.25 sq ft Vel. 0.68 fps Disch. 19.13 cfs

Method 0.6 No. Secs. 14 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.67	0.67	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Channel bottom grass and frozen mud

Flow:

Weather: Cloudy, Winds 0 - 20 mph

Other:

Temp: 27°F

Gages: S12S-A

Remarks: Channel at discharge reached 100%, clear of snow and ice, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/3/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.75				0.00	0.00	0.00	0.75	0.00
1.0	2	2.0	0.90	6/10	N/A	40	0.13	0.13	0.13	1.80	0.23
0.94	4	2.0	1.00	6/10	N/A	40	0.04	0.04	0.04	2.00	0.08
0.94	6	2.0	1.20	6/10	N/A	40	0.08	0.08	0.08	2.40	0.19
0.94	8	2.0	1.60	6/10	N/A	40	0.62	0.62	0.58	3.20	1.86
0.96	10	2.0	1.90	6/10	N/A	40	1.04	1.04	1.00	3.80	3.80
0.96	12	2.0	1.80	6/10	N/A	40	1.19	1.19	1.14	3.60	4.10
0.96	14	2.0	1.90	6/10	N/A	40	1.31	1.31	1.26	3.80	4.79
0.94	16	2.0	1.50	6/10	N/A	40	1.37	1.37	1.29	3.00	3.87
0.94	18	2.0	0.60	6/10	N/A	40	0.15	0.15	0.14	1.20	0.17
0.94	20	2.0	0.40	6/11	N/A	40	0.02	0.02	0.02	0.80	0.02
1.0	22	2.0	0.40	6/12	N/A	40	0.02	0.02	0.02	0.80	0.02
1.0	24	2.0	0.40	6/13	N/A	40	0.00	0.00	0.00	0.80	0.00
LB	26	1.0	0.30	6/14	N/A	40	0.00	0.00	0.00	0.30	0.00
SUM		**26.0**								**28.25**	**19.13**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 9:59 Finish: 10:30

Date 6/4/2006 Party MTA, EJK

Width 27.0 ft Area 33.40 sq ft Vel. 0.88 fps Disch. 29.31 cfs

Method 0.6 No. Secs. 15 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.67	0.69	0.02

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, Channel bottom grass

Flow: Weather: Fair, Partly Cloudy

Other: Temp: 28°F

Gages: S12S-A

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/4/2006

0.85

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.65	6/10	0	40	0.00	0.00	0.00	0.65	0.00
1.0	2	2.0	0.60	6/10	4	41	0.12	0.12	0.12	1.20	0.15
1.0	4	2.0	0.85	6/10	15	41	0.38	0.38	0.38	1.70	0.65
1.0	6	2.0	1.10	6/10	23	40	0.59	0.59	0.59	2.20	1.29
1.0	8	2.0	1.40	6/10	26	40	0.66	0.66	0.66	2.80	1.85
1.0	10	2.0	1.70	6/10	43	40	1.07	1.07	1.07	3.40	3.65
1.0	12	2.0	1.80	6/10	43	40	1.07	1.07	1.07	3.60	3.87
1.0	14	2.0	1.70	6/10	51	40	1.27	1.27	1.27	3.40	4.31
1.0	16	2.0	1.55	6/10	51	40	1.27	1.27	1.27	3.10	3.93
1.0	18	2.0	1.50	6/10	53	40	1.32	1.32	1.32	3.00	3.95
1.0	20	2.0	1.40	6/10	37	41	0.91	0.91	0.91	2.80	2.54
1.0	22	2.0	1.10	6/10	34	41	0.83	0.83	0.83	2.20	1.84
1.0	24	2.0	0.90	6/10	15	41	0.38	0.38	0.38	1.80	0.69
1.0	26	1.5	0.80	6/10	19	40	0.49	0.49	0.49	1.20	0.59
1.0	27	0.5	0.70	6/10	0	40	0.00	0.00	0.00	0.35	0.00
SUM		**27.0**								**33.40**	**29.31**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 10:03 Finish: 10:34

Date 6/5/2006 Party MDM, EJK

Width 30.0 ft Area 30.70 sq ft Vel. 0.8 fps Disch. 24.66 cfs

Method Surface / 0.6 No. Secs. 25 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.65	0.65	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, Channel bottom grass 1 - 1.5 ft, x-section 30-40 ft upstream of S12S

Flow: Uniform

Weather: Overcast, Cool, Winds 0 - 10 mph

Other:

Temp: 38°F

Gages: S12S-A

Remarks: Wind blowing in the direction of flow, tall grass, velocities measured at 0.6 and near surface, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/5/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.50	6/10	N/A	40	0.08	0.08	0.08	0.25	0.02
1.0	1	1.0	0.50	6/10	N/A	40	0.03	0.03	0.03	0.50	0.02
1.0	2	1.0	0.50	6/10	N/A	40	0.12	0.12	0.12	0.50	0.06
1.0	3	1.0	0.45	6/10	N/A	40	0.12	0.12	0.12	0.45	0.05
1.0	4	1.0	0.50	6/10	N/A	40	0.08	0.08	0.08	0.50	0.04
1.0	5	1.0	0.55	6/10	N/A	40	0.16	0.16	0.16	0.55	0.09
1.0	6	1.0	0.60	6/10	N/A	40	0.31	0.31	0.31	0.60	0.19
1.0	7	1.0	0.70	SURFACE	N/A	40	1.36	1.22	1.22	0.70	0.86
1.0	8	1.0	0.85	SURFACE	N/A	40	1.50	1.35	1.35	0.85	1.15
1.0	9	1.0	0.95	SURFACE	N/A	40	1.75	1.58	1.58	0.95	1.50
1.0	10	1.0	1.50	SURFACE	N/A	40	1.81	1.63	1.63	1.50	2.44
1.0	11	1.0	1.40	6/10	N/A	40	1.43	1.43	1.43	1.40	2.00
1.0	12	1.0	1.50	6/10	N/A	40	1.28	1.28	1.28	1.50	1.92
1.0	13	1.0	1.60	6/10	N/A	40	1.63	1.63	1.63	1.60	2.61
1.0	14	1.0	1.60	6/10	N/A	40	1.57	1.57	1.57	1.60	2.51
1.0	15	1.0	1.60	6/10	N/A	40	1.67	1.67	1.67	1.60	2.67
1.0	16	1.0	1.70	6/10	N/A	40	1.25	1.25	1.25	1.70	2.13
1.0	17	1.0	1.60	6/10	N/A	40	1.19	1.19	1.19	1.60	1.90
1.0	18	1.5	1.50	6/10	N/A	40	0.66	0.66	0.66	2.25	1.49
1.0	20	2.0	1.25	6/10	N/A	40	0.12	0.12	0.12	2.50	0.30
1.0	22	2.0	1.10	6/10	N/A	40	0.07	0.07	0.07	2.20	0.15
1.0	24	2.0	0.90	6/10	N/A	40	0.11	0.11	0.11	1.80	0.20
1.0	26	2.0	0.75	6/10	N/A	40	0.09	0.09	0.09	1.50	0.14
1.0	28	2.0	0.75	6/10	N/A	40	0.13	0.13	0.13	1.50	0.20
LB	30	1.0	0.60	6/10	N/A	40	0.03	0.03	0.03	0.60	0.02
SUM		**30.0**								**30.70**	**24.66**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 13:30 Finish: 13:52

Date 6/6/2006 Party JPM, AMG, SLB

Width 33.0 ft Area 33.78 sq ft Vel. 1.34 fps Disch. 45.15 cfs

Method Surface / 0.6 No. Secs. 17 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.81	0.82	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______ Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, channel bottom grass, stream bed firm and uniform

Flow: Steady

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S12S-A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/6/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	9	0.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	10	2.0	0.50	SURFACE	7	53	0.31	0.28	0.28	1.00	0.28
1.0	13	3.0	1.10	6/10	25	45	1.24	1.24	1.24	3.30	4.09
1.0	16	2.5	1.15	6/10	25	44	1.26	1.26	1.26	2.88	3.63
1.0	18	2.0	1.20	6/10	20	43	1.03	1.03	1.03	2.40	2.47
1.0	20	2.0	1.10	6/10	25	41	1.35	1.35	1.35	2.20	2.97
1.0	22	2.0	1.20	6/10	30	48	1.39	1.39	1.39	2.40	3.34
1.0	24	2.0	1.30	6/10	40	46	1.93	1.93	1.93	2.60	5.02
1.0	26	2.0	1.30	6/10	30	42	1.58	1.58	1.58	2.60	4.11
1.0	28	2.0	1.30	6/10	40	47	1.88	1.88	1.88	2.60	4.89
1.0	30	2.0	1.65	6/10	30	47	1.42	1.42	1.42	3.30	4.69
1.0	32	2.0	1.35	6/10	40	43	2.06	2.06	2.06	2.70	5.56
1.0	34	2.0	0.95	6/10	25	40	1.39	1.39	1.39	1.90	2.64
1.0	36	2.0	0.75	SURFACE	20	41	1.08	0.97	0.97	1.50	1.46
1.0	38	2.0	0.60				0.00	0.00	0.00	1.20	0.00
1.0	40	2.0	0.60				0.00	0.00	0.00	1.20	0.00
RB	42	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**33.0**								**33.78**	**45.15**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 13:40 Finish: 14:00

Date 6/7/2006 Party MTA, AMG

Width 30.0 ft Area 56.40 sq ft Vel. 0.82 fps Disch. 46.41 cfs

Method Surface / 0.6 No. Secs. 16 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12N	10.06	10.06	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows on banks, channel bottom mud and grass, channel 100% clear of ice and 95% clear of snow

Flow:

Weather: Partly Cloudy

Other:

Temp: 39°F

Gages: S12N

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/7/2006

0.85

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.40				0.00	0.00	0.00	0.40	0.00
1.0	2	2.0	1.10	SURFACE	25	45	1.24	1.11	1.10	2.20	2.42
0.9	4	2.0	1.60	6/10	25	43	1.29	1.29	1.21	3.20	3.89
0.9	6	2.0	1.90	6/10	25	42	1.32	1.32	1.22	3.80	4.62
0.9	8	2.0	2.05	6/10	25	42	1.32	1.32	1.24	4.10	5.10
0.92	10	2.0	2.20	6/10	25	46	1.21	1.21	1.11	4.40	4.89
0.9	12	2.0	2.30	6/10	25	49	1.13	1.13	1.06	4.60	4.89
0.94	14	2.0	2.40	6/10	20	45	0.99	0.99	0.93	4.80	4.45
0.9	16	2.0	2.45	6/10	20	51	0.87	0.87	0.80	4.90	3.94
0.94	18	2.0	2.45	6/10	15	47	0.71	0.71	0.67	4.90	3.29
0.98	20	2.0	2.45	6/10	15	53	0.64	0.64	0.62	4.90	3.05
0.98	22	2.0	2.30	6/10	10	42	0.54	0.54	0.53	4.60	2.42
0.98	24	2.0	2.00	6/10	10	53	0.43	0.43	0.42	4.00	1.68
0.98	26	2.0	1.50	SURFACE	7	40	0.40	0.36	0.35	3.00	1.06
0.99	28	2.0	1.00	SURFACE	7	46	0.350	0.315	0.312	2.00	0.62
LB	30	1.0	0.60	SURFACE	3	45	0.16	0.15	0.15	0.6	0.09
SUM		**30.0**								**56.40**	**46.41**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

 Michael Baker Jr., Inc. Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 15:07 Finish: 15:32

Date 6/10/2006 Party MTA, SLB, AMG

Width 32.0 ft Area 33.50 sq ft Vel. 1.35 fps Disch. 45.34 cfs

Method Surface / 0.6 No. Secs. 17 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.78	0.78	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows on banks, channel bottom grass and willows, channel clear of ice and snow

Flow:

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 50°F

Gages: S12S-A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/10/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.10				0.00	0.00	0.00	0.10	0.00
1.0	2	2.0	0.55	SURFACE	10	45	0.51	0.46	0.46	1.10	0.50
1.0	4	2.0	0.85	SURFACE	15	56	0.61	0.55	0.55	1.70	0.94
1.0	6	2.0	0.90	SURFACE	30	49	1.38	1.24	1.24	1.80	2.23
1.0	8	2.0	1.40	6/10	30	44	1.53	1.53	1.53	2.80	4.29
1.0	10	2.0	1.65	SURFACE	40	45	1.99	1.79	1.79	3.30	5.92
1.0	12	2.0	1.20	SURFACE	40	43	2.08	1.88	1.88	2.40	4.50
1.0	14	2.0	1.10	6/10	40	49	1.83	1.83	1.83	2.20	4.03
1.0	16	2.0	1.20	6/10	30	40	1.68	1.68	1.68	2.40	4.04
1.0	18	2.0	1.20	6/10	40	46	1.95	1.95	1.95	2.40	4.68
1.0	20	2.0	1.25	6/10	20	41	1.10	1.10	1.10	2.50	2.75
1.0	22	2.0	1.30	SURFACE	30	42	1.60	1.44	1.44	2.60	3.76
1.0	24	2.0	1.15	SURFACE	30	46	1.47	1.32	1.32	2.30	3.04
1.0	26	2.0	1.25	SURFACE	30	46	1.47	1.32	1.32	2.50	3.30
1.0	28	2.0	0.95	SURFACE	20	57	0.80	0.72	0.72	1.90	1.36
1.0	30	2.0	0.75				0.00	0.00	0.00	1.50	0.00
RB	32	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**32.0**								**33.50**	**45.34**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 9:38 Finish: 10:25

Date 6/12/2006 Party MTA, AMG, SLB

Width 39.0 ft Area 22.90 sq ft Vel. 1.75 fps Disch. 40.06 cfs

Method Surface / 0.6 No. Secs. 21 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.68	0.68	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and willows

Flow:

Weather: Cloudy, No Wind

Other:

Temp: 42°F

Gages: S12S-A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/12/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.10				0.00	0.00	0.00	0.10	0.00
1.0	2	2.0	0.20	SURFACE	3	60	0.13	0.12	0.12	0.40	0.05
1.0	4	2.0	0.30	SURFACE	3	60	0.13	0.12	0.12	0.60	0.07
1.0	6	2.0	0.30	SURFACE	3	60	0.13	0.12	0.12	0.60	0.07
1.0	8	2.0	0.45	SURFACE	15	52	0.66	0.59	0.59	0.90	0.53
1.0	10	2.0	0.35	SURFACE	15	40	0.85	0.77	0.77	0.70	0.54
1.0	12	2.0	0.35	SURFACE	15	50	0.68	0.62	0.62	0.70	0.43
0.98	14	2.0	0.60	SURFACE	25	44	1.28	1.15	1.13	1.20	1.36
1.0	16	2.0	0.95	SURFACE	50	43	2.60	2.34	2.34	1.90	4.45
1.0	18	2.0	1.10	6/10	50	50	2.24	2.24	2.24	2.20	4.93
1.0	20	2.0	1.50	6/10	50	45	2.49	2.49	2.49	3.00	7.46
0.98	22	2.0	1.10	6/10	60	47	2.85	2.85	2.80	2.20	6.15
0.96	24	2.0	1.00	6/10	40	42	2.13	2.13	2.05	2.00	4.10
0.92	26	2.0	0.80	SURFACE	50	42	2.66	2.40	2.20	1.60	3.53
0.94	28	2.0	0.70	SURFACE	50	47	2.38	2.14	2.01	1.40	2.82
0.94	30	2.0	0.60	SURFACE	40	46	1.95	1.75	1.65	1.20	1.98
0.94	32	2.0	0.40	SURFACE	15	43	0.79	0.71	0.67	0.80	0.54
1.0	34	2.0	0.40	SURFACE	10	50	0.46	0.41	0.41	0.80	0.33
1.0	36	3.0	0.25	SURFACE	10	50	0.46	0.41	0.41	0.75	0.31
1.0	40	5.0	0.25	SURFACE	7	45	0.36	0.33	0.33	1.25	0.41
LB	46	3.0	0.10				0.00	0.00	0.00	0.30	0.00
SUM		**39.0**								**22.90**	**40.06**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 8:25 Finish: 8:47

Date 6/16/2006 Party AMG, SLB

Width 12.0 ft Area 11.15 sq ft Vel. 1.66 fps Disch. 18.48 cfs

Method Surface / 0.6 No. Secs. 7 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.43	0.43	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and mud

Flow:

Weather: Cloudy, Winds 5 - 15 mph

Other:

Temp: 34°F

Gages: S12S-A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/16/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.25	SURFACE	3	54	0.14	0.13	0.13	0.25	0.03
1.0	2	2.0	0.40	SURFACE	3	46	0.16	0.14	0.14	0.80	0.12
1.0	4	2.0	1.40	6/10	40	46	1.93	1.93	1.93	2.80	5.39
1.0	6	2.0	1.60	6/10	60	41	3.23	3.23	3.23	3.20	10.34
0.94	8	2.0	1.10	6/10	25	48	1.15	1.15	1.08	2.20	2.38
1.0	10	2.0	0.80	SURFACE	3	52	0.14	0.13	0.13	1.60	0.21
LB	12	1.0	0.30				0.00	0.00	0.00	0.30	0.00
SUM		**12.0**								**11.15**	**18.47**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 15:30 Finish: 16:15

Date 6/5/2006 Party MDM, EJK, SLB

Width 3.5 ft Area 4.07 sq ft Vel. 0.34 fps Disch. 1.39 cfs

Method 0.6 No. Secs. 7 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3N	-0.18	-0.18	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Narrow channel bound by saturated grass/tussocks

Flow:

Weather: Overcast, Cool, Wind 0 - 10 mph

Other:

Temp: 38°F

Gages: S3N

Remarks: Channel relatively free of grass, slow flow, wind blowing in direction of flow, Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.50	6/10	0		0.00	0.00	0.00	0.25	0.00
1.0	1	0.8	1.35	6/10	5	43	0.14	0.14	0.14	1.01	0.14
1.0	1.5	0.5	1.55	6/10	15	55	0.29	0.29	0.29	0.78	0.23
1.0	2	0.5	1.60	6/10	30	41	0.74	0.74	0.74	0.80	0.59
1.0	2.5	0.5	1.50	6/10	20	48	0.43	0.43	0.43	0.75	0.32
1.0	3	0.5	0.70	6/10	15	49	0.33	0.33	0.33	0.35	0.11
LB	3.5	0.3	0.50	6/10	0		0.00	0.00	0.00	0.13	0.00
SUM		**3.5**								**4.07**	**1.39**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 7:44 Finish: 8:02

Date 6/7/2006 Party MTA, AMG

Width 10.0 ft Area 6.80 sq ft Vel. 0.34 fps Disch. 4.07 cfs

Method Surface / 0.6 No. Secs. 10 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3C	-0.69	-0.69	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom mud and grass, no snow or ice in the channel

Flow:

Weather: Cloudy, Calm,

Other:

Temp: 39°F

Gages: S3C

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.00	6/10	0		0.00	0.00	0.00	0.00	0.00
1.0	2	1.5	0.50	2/10	0		0.00	0.00	0.00	0.75	0.00
1.0	3	1.0	0.65	SURFACE	15	56	0.60	0.54	0.54	0.65	0.35
1.0	4	1.0	0.60	6/10	15	60	0.56	0.56	0.56	0.60	0.34
1.0	5	1.0	1.20	6/10	10	54	0.42	0.42	0.42	1.20	0.51
1.0	6	1.0	1.20	6/10	20	63	0.71	0.71	0.71	1.20	0.85
1.0	7	1.0	1.10	6/10	15	51	0.66	0.66	0.66	1.10	0.73
1.0	8	1.0	0.80	SURFACE	20	53	0.84	0.76	0.76	0.80	0.61
1.0	9	1.0	0.50	SURFACE	10	47	0.48	0.43	0.43	0.50	0.22
RB	10	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**10.0**								**6.80**	**3.61**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 16:26 Finish: 16:50

Date 6/10/2006 Party MTA, SLB, AMG

Width 20.0 ft Area 12.90 sq ft Vel. 0.42 fps Disch. 5.36 cfs

Method Surface / 0.6 No. Secs. 10 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3N	-0.14	-0.14	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and mud

Flow: South to North

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 50°F

Gages: S3N

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/10/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	2	2.0	0.35	SURFACE	0	40	0.00	0.00	0.00	0.70	0.00
1.0	4	2.0	0.45	SURFACE	5	40	0.30	0.27	0.27	0.90	0.24
1.0	6	2.0	0.80	SURFACE	10	55	0.42	0.38	0.38	1.60	0.61
1.0	8	2.0	0.60	6/10	10	51	0.45	0.45	0.45	1.20	0.54
1.0	10	2.0	1.00	6/10	15	51	0.67	0.67	0.67	2.00	1.34
1.0	12	2.0	1.20	SURFACE	15	48	0.71	0.64	0.64	2.40	1.54
1.0	14	2.0	1.00	6/10	5	45	0.26	0.26	0.26	2.00	0.52
0.98	16	3.0	0.50	SURFACE	7	54	0.31	0.28	0.27	1.50	0.41
0.98	20	2.0	0.30	SURFACE	7	54	0.31	0.28	0.27	0.60	0.16
SUM		**20.0**								**12.90**	**5.36**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 13:00 Finish: 13:25

Date 6/12/2006 Party AMG, SLB, MTA

Width 36.0 ft Area 15.1 sq ft Vel. 0.36 fps Disch. 5.42 cfs

Method Surface / 0.6 No. Secs. 14 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3C	-0.66	-0.66	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and mud

Flow: Weather: Cloudy, Calm Winds

Other: Temp: 42^{o}F

Gages: S3C

Remarks: Channel and region 100% clear of snow and ice, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/12/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
	0	2.5	0.10				0.00	0.00	0.00	0.25	0.00
1.0	5	5.0	0.30	SURFACE	3	64	0.12	0.11	0.11	1.50	0.17
1.0	10	6.5	0.30	SURFACE	0	40	0.00	0.00	0.00	1.95	0.00
1.0	18	4.5	0.60	SURFACE	20	63	0.72	0.65	0.65	2.70	1.76
1.0	19	1.0	0.70	SURFACE	20	60	0.76	0.68	0.68	0.70	0.48
1.0	20	1.0	1.20	6/10	20	64	0.71	0.71	0.71	1.20	0.85
1.0	21	1.0	0.90	6/10	20	54	0.84	0.84	0.84	0.90	0.76
1.0	22	1.0	0.90	6/10	20	64	0.71	0.71	0.71	0.90	0.64
1.0	23	1.0	0.80	6/10	5	41	0.29	0.29	0.29	0.80	0.23
1.0	24	1.5	0.60	6/10	7	46	0.36	0.36	0.36	0.90	0.32
1.0	26	2.0	0.50	SURFACE	3	47	0.16	0.14	0.14	1.00	0.14
1.0	28	2.0	0.40	SURFACE	3	80	0.10	0.09	0.09	0.80	0.07
1.0	30	4.0	0.30	SURFACE	0	40	0.00	0.00	0.00	1.20	0.00
1.0	36	3.0	0.10				0.00	0.00	0.00	0.3	0.00
SUM		**36.0**								**15.10**	**5.42**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

 Michael Baker Jr., Inc. Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 11:00 Finish: 11:17

Date 6/16/2006 Party AMG, SLB

Width 22.0 ft Area 10.90 sq ft Vel. 0.36 fps Disch. 3.97 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3C	-0.68	-0.68	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and mud

Flow:

Weather:

Other:

Temp: 34°F

Gages: S3C

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/16/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.20				0.00	0.00	0.00	0.20	0.00
1.0	2	2.0	0.30	SURFACE	3	46	0.16	0.14	0.14	0.60	0.08
1.0	4	2.0	0.30	SURFACE	3	46	0.16	0.14	0.14	0.60	0.08
1.0	6	2.0	0.30	SURFACE	3	46	0.16	0.14	0.14	0.60	0.08
1.0	8	2.0	0.40	SURFACE	3	46	0.16	0.14	0.14	0.80	0.11
1.0	10	2.0	0.60	SURFACE	5	52	0.23	0.21	0.21	1.20	0.25
1.0	12	2.0	1.00	6/10	10	53	0.43	0.43	0.43	2.00	0.86
1.0	14	2.0	1.00	6/10	15	44	0.76	0.76	0.76	2.00	1.52
1.0	16	2.0	0.60	6/10	15	49	0.69	0.69	0.69	1.20	0.83
1.0	18	2.0	0.40	SURFACE	5	55	0.22	0.19	0.19	0.80	0.16
1.0	20	2.0	0.30				0.00	0.00	0.00	0.60	0.00
LB	22	1.0	0.30				0.00	0.00	0.00	0.30	0.00
SUM		**22.0**								**10.90**	**3.97**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 11:00 Finish: 11:46

Date 6/3/2006 Party MTA, MDM

Width 16.0 ft Area 10.85 sq ft Vel. 0.47 fps Disch. 5.14 cfs

Method 0.6 No. Secs. 17 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S5S	0.38	0.37	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Confined flow in snow and ice bound channel, approximately 75' upstream of S5S

Flow:

Weather: Wind gust to 25 mph

Other:

Temp: 27°F

Gages: S5S

Remarks: Ice and grass bed, grass ~1' long (max), some tussocks in channel ~0.3', wind blowing, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/3/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.50				0.00	0.00	0.00	0.25	0.00
1.0	1	1.0	0.60	6/10	N/A	40	1.06	1.06	1.06	0.60	0.64
1.0	2	1.0	0.75	6/10	N/A	40	1.01	1.01	1.01	0.75	0.76
1.0	3	1.0	0.70	6/10	N/A	40	0.71	0.71	0.71	0.70	0.50
1.0	4	1.0	0.75	6/10	N/A	40	0.77	0.77	0.77	0.75	0.58
1.0	5	1.0	0.70	6/10	N/A	40	1.19	1.19	1.19	0.70	0.83
1.0	6	1.0	0.70	6/10	N/A	40	0.74	0.74	0.74	0.70	0.52
1.0	7	1.0	0.65	6/10	N/A	40	0.56	0.56	0.56	0.65	0.36
1.0	8	1.0	0.70	6/10	N/A	40	0.50	0.50	0.5	0.70	0.35
1.0	9	1.0	0.80	6/10	N/A	40	0.18	0.18	0.18	0.80	0.14
1.0	10	1.0	0.75	6/10	N/A	40	0.22	0.22	0.22	0.75	0.17
1.0	11	1.0	0.75	6/10	N/A	40	0.27	0.27	0.27	0.75	0.20
1.0	12	1.0	0.75	6/10	N/A	40	0.1	0.1	0.1	0.75	0.08
1.0	13	1.0	0.70	6/10	N/A	40	0.02	0.02	0.02	0.70	0.01
1.0	14	1.0	0.65	6/10	N/A	40	0.00	0.00	0.00	0.65	0.00
1.0	15	1.0	0.50	6/10	N/A	40	0.00	0.00	0.00	0.50	0.00
LB	16	0.5	0.30	6/10	N/A	40	0.00	0.00	0.00	0.15	0.00
SUM		**16.0**								**10.85**	**5.14**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 16:27 Finish: 16:45

Date 6/4/2006 Party WLS, MTA, SLB

Width 16.0 ft Area 15.09 sq ft Vel. 0.28 fps Disch. 4.27 cfs

Method 0.6 No. Secs. 9 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S5S	0.30	0.30	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Ice on banks, channel bottom frozen mud, grass and ice

Flow:

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 28^{o}F

Gages: S5S

Remarks: Ice and snow impacted measurement, Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.35	6/10	0	40	0.00	0.00	0.00	0.35	0.00
1.0	2	2.0	0.55	6/10	4	42	0.12	0.12	0.12	1.10	0.13
0.96	4	2.0	0.75	6/10	8	44	0.20	0.20	0.20	1.50	0.29
1.0	6	2.0	1.25	6/10	9	41	0.24	0.24	0.24	2.50	0.60
1.0	8	2.0	1.30	6/10	8	41	0.22	0.22	0.22	2.60	0.56
1.0	10	2.0	2.15	6/10	22	41	0.55	0.55	0.55	4.30	2.36
1.0	12	2.0	0.82	6/10	7	45	0.18	0.18	0.18	1.64	0.29
1.0	14	2.0	0.45	6/10	1	47	0.05	0.05	0.05	0.90	0.04
LB	16	1.0	0.20	6/10	0	40	0.00	0.00	0.00	0.20	0.00
SUM		**16.0**								**15.09**	**4.27**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 14:45 Finish: 15:05

Date 6/5/2006 Party MDM, EJK, SLB

Width 26.0 ft Area 19.26 sq ft Vel. 0.09 fps Disch. 1.73 cfs

Method 0.6 No. Secs. 18 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S5S	0.30	0.30	0.00

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, channel bottom long grass 1 - 1.5', uniform channel

Flow: South to North

Weather: Sunny, Winds 0 - 10 mph

Other:

Temp: 38°F

Gages: S5S

Remarks: Could have used Pygmy Meter at below WS but wind blowing and influencing surface flow, wind blowing in the direction of flow, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	0.5	0.45	6/9	N/A	40	0.12	0.12	0.12	0.23	0.03
1.0	1	1.0	0.50	6/10	N/A	40	0.03	0.03	0.03	0.50	0.02
1.0	2	1.0	0.70	6/10	N/A	40	0.05	0.05	0.05	0.70	0.04
1.0	3	1.0	0.70	6/10	N/A	40	0.06	0.06	0.06	0.70	0.04
1.0	4	1.0	0.80	6/10	N/A	40	0.09	0.09	0.09	0.80	0.07
1.0	5	1.0	0.75	6/10	N/A	40	0.04	0.04	0.04	0.75	0.03
1.0	6	1.0	0.75	6/10	N/A	40	0.09	0.09	0.09	0.75	0.07
1.0	7	1.0	0.80	6/10	N/A	40	0.04	0.04	0.04	0.80	0.03
1.0	8	1.5	0.85	6/10	N/A	40	0.03	0.03	0.03	1.28	0.04
1.0	10	2.0	0.90	6/10	N/A	40	0.13	0.13	0.13	1.80	0.23
1.0	12	2.0	1.00	6/10	N/A	40	0.24	0.24	0.24	2.00	0.48
1.0	14	2.0	0.95	6/10	N/A	40	0.24	0.24	0.24	1.90	0.46
1.0	16	2.0	0.85	6/10	N/A	40	0.00	0.00	0.00	1.70	0.00
1.0	18	2.0	0.80	6/10	N/A	40	0.02	0.02	0.02	1.60	0.03
1.0	20	2.0	0.85	6/10	N/A	40	0.02	0.02	0.02	1.70	0.03
1.0	22	2.0	0.45	6/10	N/A	40	0.04	0.04	0.04	0.90	0.04
1.0	24	2.0	0.40	6/10	N/A	40	0.11	0.11	0.11	0.80	0.09
LB	26	1.0	0.35	6/10	N/A	40	0.00	0.00	0.00	0.35	0.00
SUM		**26.0**								**19.26**	**1.73**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 8:36 Finish: 8:56

Date 6/7/2006 Party MTA, AMG

Width 16.0 ft Area 21.50 sq ft Vel. 0.38 fps Disch. 8.16 cfs

Method Surface/0.6 No. Secs. 9 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S5N	0.63	0.62	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section:

Flow:

Weather: Overcast

Other:

Temp: 39°F

Gages: S5N

Remarks: X-section in deep hole location, minimal eddying, lew is start of 20 ft sheet flow containing less than 1% flow, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.40				0.00	0.00	0.00	0.40	0.00
0.7	2	2.0	0.60	SURFACE	5	59	0.20	0.18	0.13	1.20	0.16
0.7	4	2.0	0.80	SURFACE	5	40	0.29	0.26	0.18	1.60	0.29
0.98	6	2.0	1.00	6/10	5	40	0.29	0.29	0.29	2.00	0.58
1.0	8	2.0	1.90	6/10	15	52	0.65	0.65	0.65	3.80	2.47
1.0	10	2.0	3.00	2/10	10	45	0.50	0.58	0.58	6.00	3.48
				6/10	15	51	0.66				
				8/10	10	45	0.50				
0.92	12	2.0	2.20	6/10	7	45	0.36	0.36	0.33	4.40	1.45
0.6	14	2.0	0.90	6/10	5	46	0.26	0.26	0.15	1.80	-0.27
LB	16	1.0	0.30				0.00	0.00	0.00	0.30	0.00
SUM		**16.0**								**21.50**	**8.16**

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 9:30 Finish: 9:55

Date 6/8/2006 Party SLB, EJK

Width 20.0 ft Area 10.70 sq ft Vel. 0.75 fps Disch. 8.07 cfs

Method Surface No. Secs. 21 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S5N	0.63	0.63	0
S5C	0.64	0.63	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA011

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, banks are saturated with small amounts of flow, measurement taken between S5N and S5C

Flow:

Weather: Partly Cloudy

Other:

Temp: 45°F

Gages: between S5N and S5C

Remarks: Choose area with the best defined channel, almost zero wind, surface readings are absolutely possible with the Price AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.30				0.00	0.00	0.00	0.15	0.00
1.0	1	1.0	0.70	SURFACE	11	42	0.59	0.53	0.53	0.70	0.37
1.0	2	1.0	0.70	SURFACE	28	41	1.51	1.36	1.36	0.70	0.95
0.99	3	1.0	0.70	SURFACE	30	40	1.66	1.50	1.48	0.70	1.04
1.0	4	1.0	0.65	SURFACE	21	42	1.11	1.00	0.99	0.65	0.64
1.0	5	1.0	0.75	SURFACE	29	41	1.57	1.41	1.41	0.75	1.06
1.0	6	1.0	0.85	SURFACE	26	40	1.44	1.30	1.30	0.85	1.11
0.99	7	1.0	0.60	SURFACE	26	41	1.41	1.27	1.25	0.60	0.75
0.98	8	1.0	0.55	SURFACE	21	41	1.13	1.02	1.00	0.55	0.55
1.0	9	1.0	0.50	SURFACE	18	41	0.97	0.88	0.88	0.50	0.44
1.0	10	1.0	0.45	SURFACE	20	40	1.11	1.00	1.00	0.45	0.45
1.0	11	1.0	0.45	SURFACE	14	41	0.76	0.69	0.69	0.45	0.31
1.0	12	1.0	0.40	SURFACE	8	43	0.42	0.38	0.38	0.40	0.15
1.0	13	1.0	0.45	SURFACE	7	42	0.38	0.34	0.34	0.45	0.15
1.0	14	1.0	0.35	SURFACE	0	40	0.00	0.00	0.00	0.35	0.00
1.0	15	1.0	0.40	SURFACE	5	41	0.28	0.26	0.26	0.4	0.10
1.0	16	1.0	0.40				0.00	0.00	0.00	0.4	0.00
1.0	17	1.0	0.40				0.00	0.00	0.00	0.4	0.00
1.0	18	1.0	0.60				0.00	0.00	0.00	0.6	0.00
1.0	19	1.0	0.50				0.00	0.00	0.00	0.5	0.00
LB	20	0.5	0.30				0.00	0.00	0.00	0.15	0.00
SUM		**20.0**								**10.70**	**8.07**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 12:35 Finish: 12:55

Date 6/9/2006 Party MTA, AMG, SLB

Width 11.0 ft Area 5.59 sq ft Vel. 0.72 fps Disch. 4.05 cfs

Method Surface / 0.6 No. Secs. 13 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S5N	0.57	0.57	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel clear of snow, channel bottom mud

Flow:

Weather: Sunny, Clear, Winds 0 - 5 mph

Other:

Temp: 50^{o}F

Gages: S5N

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/9/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	0.5	0.30				0.00	0.00	0.00	0.15	0.00
1.0	1	1.0	0.30	SURFACE	15	59	0.58	0.52	0.52	0.30	0.16
1.0	2	0.8	0.30	SURFACE	20	51	0.89	0.80	0.80	0.23	0.18
0.96	2.5	0.5	0.60	6/10	15	43	0.79	0.79	0.76	0.30	0.23
1.0	3	0.5	1.00	6/10	15	42	0.81	0.81	0.81	0.50	0.41
1.0	3.5	0.5	1.20	6/10	20	45	1.01	1.01	1.01	0.60	0.61
1.0	4	0.5	1.20	6/10	20	43	1.05	1.05	1.05	0.60	0.63
1.0	4.5	0.5	1.00	6/10	25	50	1.13	1.13	1.13	0.50	0.57
1.0	5	0.5	0.90	6/10	20	43	1.05	1.05	1.05	0.45	0.47
1.0	5.5	0.5	0.50	SURFACE	20	46	0.98	0.89	0.89	0.25	0.22
1.0	6	1.3	0.30	SURFACE	10	40	0.57	0.51	0.51	0.38	0.19
1.0	8	2.5	0.35	SURFACE	10	48	0.48	0.43	0.43	0.88	0.38
RB	11	1.5	0.30				0.00	0.00	0.00	0.45	0.00
SUM		**11.0**								**5.59**	**4.05**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 15:42 Finish: 16:15

Date 6/4/2006 Party SLB, WLS, MTA

Width 10 ft Area 11.65 sq. ft. Vel. 0.59 fps Disch. 6.89 cfs

Method 0.6 No. Secs. 11 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6N	1.39	1.39	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom willows, grass and ice

Flow:

Weather: Partly Cloudy, Calm Winds

Other:

Temp: 28°F

Gages: S6N

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.30	6/10	0	40	0.00	0.00	0.00	0.15	0.00
1.0	1	1.0	0.75	6/10	10	42	0.26	0.26	0.26	0.75	0.19
0.96	2	1.0	0.90	6/10	23	40	0.59	0.59	0.56	0.90	0.51
0.96	3	1.0	1.05	6/10	20	42	0.49	0.49	0.47	1.05	0.49
0.96	4	1.0	1.75	6/10	15	41	0.38	0.38	0.37	1.75	0.64
0.94	5	1.0	1.65	6/10	44	41	1.07	1.07	1.01	1.65	1.66
0.94	6	1.0	1.60	6/10	48	41	1.17	1.17	1.10	1.60	1.76
0.94	7	1.0	1.30	6/10	24	40	0.61	0.61	0.57	1.30	0.75
0.96	8	1.0	1.10	6/10	20	40	0.51	0.51	0.49	1.10	0.54
1.0	9	1.0	1.00	6/10	11	41	0.29	0.29	0.29	1.00	0.29
LB	10	0.5	0.80	6/10	5	40	0.15	0.15	0.15	0.40	0.06
SUM		**10.0**								**11.65**	**6.89**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 14:15 Finish: 14:25

Date 6/5/2006 Party MDM, SLB, EJK

Width 10.0 ft Area 9.91 sq ft Vel. 1.62 fps Disch. 16.1 cfs

Method 0.6 No. Secs. 11 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6C	1.10	1.11	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass and willows on banks, channel bottom grass, measurement taken between S6C and S6S, between two ponds

Flow: Perpendicular to x-section, uniform

Weather: Wind 5 - 10 mph, with gusts to 15 mph

Other:

Temp: 38°F

Gages: S6C

Remarks: Wind blowing in direction of flow, willows on left bank, tall grass from 1-1.5', Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.35				0.00	0.00	0.00	0.18	0.00
1.0	1	1.0	0.60	SURFACE	10	42	0.26	0.23	0.23	0.60	0.14
1.0	2	1.0	0.50	SURFACE	27	40	0.68	0.62	0.62	0.50	0.31
1.0	3	1.0	0.70	6/10	47	41	1.14	1.14	1.14	0.70	0.80
1.0	4	1.0	0.80	6/10	62	40	1.54	1.54	1.54	0.80	1.23
1.0	5	1.0	1.10	6/10	54	40	1.34	1.34	1.34	1.10	1.48
1.0	6	1.0	1.15	6/10	65	50	1.29	1.29	1.29	1.15	1.49
1.0	7	1.0	1.55	6/10	116	40	2.84	2.84	2.84	1.55	4.40
1.0	8	1.0	1.50	6/10	91	40	2.24	2.24	2.24	1.50	3.36
1.0	9	1.0	1.30	6/10	76	40	1.88	1.88	1.88	1.30	2.44
LB	10	0.5	1.05	6/10	35	41	0.86	0.86	0.86	0.53	0.45
SUM		**10.0**								**9.91**	**16.10**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 16:30 Finish: 16:55

Date 6/6/2006 Party AMG, JPM, SLB

Width 21.0 ft Area 25.61 sq ft Vel. 0.55 fps Disch. 14.07 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6A	1.05	1.05	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, Channel bottom ice and grass, firm, fairly uniform

Flow: Steady

Weather: Cloudy, Winds 5 - 10 mph

Other:

Temp: 40°F

Gages: S6A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/6/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	28	1.0	0.30				0.00	0.00	0.00	0.30	0.00
1.0	26	2.0	0.60	SURFACE	7	44	0.37	0.33	0.33	1.20	0.40
1.0	24	2.0	0.70	SURFACE	15	45	0.74	0.67	0.67	1.40	0.94
1.0	22	1.5	1.45	6/10	20	45	0.99	0.99	0.99	2.18	2.16
1.0	21	1.0	1.95	6/10	20	47	0.95	0.95	0.95	1.95	1.85
1.0	20	1.5	2.05	6/10	15	41	0.82	0.82	0.82	3.08	2.53
1.0	18	2.0	2.20	6/10	15	43	0.78	0.78	0.78	4.40	3.43
1.0	16	2.0	2.00	6/10	7	42	0.38	0.38	0.38	4.00	1.52
1.0	14	2.0	1.30	6/10	5	52	0.23	0.23	0.23	2.60	0.60
1.0	12	2.0	1.00	SURFACE	7	46	0.35	0.32	0.32	2.00	0.64
1.0	10	2.5	1.00	SURFACE	0	40	0.00	0.00	0.00	2.50	0.00
LB	7	1.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**21.0**								**25.61**	**14.07**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 9:30 Finish: 9:51

Date 6/7/2006 Party MTA, AMG

Width 22.0 ft Area 22.80 sq ft Vel. 1.29 fps Disch. 29.51 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6A	1.56	1.55	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willow and grass on banks, channel bottom grass and willows

Flow: Weather: Cloudy, Winds 0 - 5 mph

Other: Temp: 39°F

Gages: S6C

Remarks: Channel at measurement is clear of snow and ice, channel represents 99% of flow, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	2	2.0	0.40	SURFACE	10	52	0.44	0.39	0.39	0.80	0.31
0.92	4	2.0	0.90	SURFACE	10	58	0.39	0.35	0.33	1.80	0.59
0.97	6	2.0	1.30	6/10	40	44	2.01	2.01	1.95	2.60	5.07
0.99	8	2.0	1.70	6/10	30	53	1.26	1.26	1.25	3.40	4.25
1.0	10	2.0	2.10	6/10	30	48	1.39	1.39	1.39	4.20	5.84
0.96	12	2.0	1.70	6/10	35	42	1.85	1.85	1.77	3.40	6.02
0.96	14	2.0	1.20	6/10	40	50	1.77	1.77	1.70	2.40	4.08
0.90	16	2.0	0.90	6/10	30	48	1.39	1.39	1.25	1.80	2.25
0.90	18	2.0	0.80	SURFACE	20	52	0.86	0.77	0.69	1.60	1.10
0.90	20	2.0	0.40	SURFACE	0	40	0.00	0.00	0.00	0.80	0.00
LB	22	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**22.0**								**22.80**	**29.51**

0.90
0.92
0.94
0.96
0.97
0.98
0.99
1.00
0.99
0.98
0.97
0.96
0.94
0.92
0.90
0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 13:20 Finish: 13:50

Date 6/8/2006 Party SLB, EJK

Width 53.0 ft Area 53.85 sq ft Vel. 1.08 fps Disch. 58.27 cfs

Method Surface / 0.6 No. Secs. 28 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6A	1.94	1.95	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow and willows on banks, channel bottom grass and willows, willows cover approximately 1/3 of channel bottom

Flow:

Weather: Partly Cloudy, Winds 5 - 15 mph

Other:

Temp: 45^{o}F

Gages: S6C

Remarks: Bed ice breaking free upstream during x-section up to 50 ft long 25 ft wide, Ice jam upstream occurred during discharge measurement, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.05	Thick Willows & Grass			0.00	0.00	0.00	0.05	0.00
1.0	2	2.0	0.20				0.00	0.00	0.00	0.40	0.00
1.0	4	2.0	0.40				0.00	0.00	0.00	0.80	0.00
1.0	6	2.0	0.80				0.00	0.00	0.00	1.60	0.00
1.0	8	2.0	1.25	SURFACE	35	40	1.94	1.74	1.74	2.50	4.35
1.0	10	2.0	0.90	SURFACE	30	40	1.66	1.50	1.50	1.80	2.70
1.0	12	2.0	1.35	SURFACE	40	44	2.01	1.81	1.81	2.70	4.89
1.0	14	2.0	1.30	6/10	20	42	1.06	1.06	1.06	2.60	2.76
1.0	16	2.0	1.45	6/10	50	44	2.51	2.51	2.51	2.90	7.28
1.0	18	2.0	1.70	6/10	50	55	2.01	2.01	2.01	3.40	6.83
1.0	20	2.0	2.00	6/10	40	49	1.81	1.81	1.81	4.00	7.23
1.0	22	2.0	1.85	6/10	50	43	2.57	2.57	2.57	3.70	9.51
1.0	24	2.0	1.25	6/10	40	50	1.77	1.77	1.77	2.50	4.43
1.0	26	2.0	1.50	6/10	31	59	1.16	1.16	1.16	3.00	3.49
1.0	28	2.0	1.30	Willows			0.00	0.00	0.00	2.60	0.00
1.0	30	2.0	1.30	SURFACE	7	49	0.33	0.30	0.30	2.60	0.77
1.0	32	2.0	1.20	SURFACE	15	46	0.73	0.66	0.66	2.40	1.57
1.0	34	2.0	1.35	SURFACE	10	40	0.56	0.51	0.51	2.70	1.37
1.0	36	2.0	1.15	SURFACE	10	43	0.53	0.47	0.47	2.30	1.09
1.0	38	2.0	0.95	Thick Willows & Grass			0.00	0.00	0.00	1.90	0.00
1.0	40	2.0	0.50				0.00	0.00	0.00	1.00	0.00
1.0	42	2.0	0.50				0.00	0.00	0.00	1.00	0.00
1.0	44	2.0	0.50				0.00	0.00	0.00	1.00	0.00
1.0	46	2.0	0.50				0.00	0.00	0.00	1.00	0.00
1.0	48	2.0	0.60				0.00	0.00	0.00	1.20	0.00
1.0	50	2.0	0.65				0.00	0.00	0.00	1.30	0.00
1.0	52	1.5	0.60				0.00	0.00	0.00	0.90	0.00
RB	53	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**53.0**								**53.85**	**58.27**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 13:42 Finish: 14:06

Date 6/9/2006 Party MTA, SLB, AMG

Width 32.0 ft Area 43.40 sq ft Vel. 1.64 fps Disch. 70.98 cfs

Method Surface / 0.6 No. Secs. 17 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6A	1.98	1.96	0.02

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______ Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows and grass on banks, channel bottom grass and willows, 90% free of snow

Flow: ______ Weather: Sunny, Winds 0 - 5 mph

Other: ______ Temp: 50°F

Gages: S6C

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/9/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	2	1.0	0.20				0.00	0.00	0.00	0.20	0.00
1.0	4	2.0	0.45	SURFACE	7	50	0.33	0.30	0.30	0.90	0.27
1.0	6	2.0	0.70	SURFACE	7	41	0.40	0.36	0.36	1.40	0.50
1.0	8	2.0	1.00	SURFACE	15	49	0.70	0.63	0.63	2.00	1.26
0.97	10	2.0	1.30	6/10	20	51	0.89	0.89	0.86	2.60	2.24
1.0	12	2.0	1.25	6/10	15	44	0.78	0.78	0.78	2.50	1.95
0.98	14	2.0	1.40	SURFACE	25	47	1.20	1.08	1.06	2.80	2.97
1.0	16	2.0	1.45	6/10	20	43	1.05	1.05	1.05	2.90	3.05
1.0	18	2.0	1.65	6/10	50	46	2.43	2.43	2.43	3.30	8.02
1.0	20	2.0	2.30	6/10	50	41	2.73	2.73	2.73	4.60	12.56
1.0	22	2.0	2.65	6/10	50	48	2.33	2.33	2.33	5.30	12.35
1.0	24	2.0	2.65	6/10	60	47	2.85	2.85	2.85	5.30	15.11
1.0	26	2.0	1.60	6/10	40	40	2.24	2.24	2.24	3.20	7.17
1.0	28	2.0	1.50	SURFACE	20	50	0.91	0.82	0.82	3.00	2.45
1.0	30	2.0	1.10	SURFACE	7	42	0.39	0.35	0.35	2.20	0.77
1.0	32	2.0	0.60	SURFACE	5	41	0.29	0.26	0.26	1.20	0.31
LB	34	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**32.0**								**43.40**	**70.98**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 13:15 Finish: 13:40

Date 6/10/2006 Party MTA, AMG, SLB

Width 30.0 ft Area 34.30 sq ft Vel. 1.65 fps Disch. 56.87 cfs

Method Surface / 0.6 No. Secs. 16 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6C	1.80	1.80	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass

Flow:

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 50°F

Gages: S6C

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/10/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	2	2.0	0.20	SURFACE			0.00	0.00	0.00	0.40	0.00
1.0	4	2.0	0.40	SURFACE	15	55	0.62	0.56	0.56	0.80	0.45
1.0	6	2.0	0.80	SURFACE	15	54	0.64	0.57	0.57	1.60	0.91
1.0	8	2.0	0.90	SURFACE	15	47	0.73	0.65	0.65	1.80	1.17
1.0	10	2.0	1.00	SURFACE	15	46	0.74	0.67	0.67	2.00	1.34
1.0	12	2.0	1.00	6/10	30	44	1.53	1.53	1.53	2.00	3.06
1.0	14	2.0	1.30	6/10	40	43	2.08	2.08	2.08	2.60	5.41
1.0	16	2.0	1.85	6/10	40	46	1.95	1.95	1.95	3.70	7.22
1.0	18	2.0	2.10	6/10	50	48	2.33	2.33	2.33	4.20	9.79
1.0	20	2.0	2.20	6/10	40	50	1.80	1.80	1.80	4.40	7.92
0.94	22	2.0	2.30	6/10	40	40	2.24	2.24	2.11	4.60	9.71
0.94	24	2.0	1.40	6/10	40	41	2.19	2.19	2.05	2.80	5.74
1.0	26	2.0	1.20	SURFACE	30	42	1.60	1.44	1.44	2.40	3.47
1.0	28	2.0	0.50	SURFACE	15	45	0.76	0.68	0.68	1.00	0.68
LB	30	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**30.0**								**34.30**	**56.87**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 8:01 Finish: 8:18

Date 6/12/2006 Party MTA, AMG, SLB

Width 22.0 ft Area 27.40 sq ft Vel. 1.6 fps Disch. 43.91 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6C	1.71	1.71	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows on banks, channel bottom grass, free of ice and snow

Flow:

Weather: Overcast, Calm

Other:

Temp: 42°F

Gages: S6C

Remarks: Tag-line a little skewed, angles taken, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/12/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.20				0.00	0.00	0.00	0.20	0.00
0.90	2	2.0	0.65	SURFACE	20	48	0.94	0.85	0.76	1.30	0.99
0.92	4	2.0	1.30	6/10	15	40	0.85	0.85	0.78	2.60	2.03
0.99	6	2.0	1.60	6/10	40	42	2.13	2.13	2.11	3.20	6.75
0.99	8	2.0	2.10	6/10	40	48	1.87	1.87	1.85	4.20	7.77
0.96	10	2.0	2.20	6/10	40	47	1.91	1.91	1.83	4.40	8.05
0.90	12	2.0	1.85	6/10	40	44	2.04	2.04	1.83	3.70	6.77
0.92	14	2.0	1.50	6/10	40	42	2.13	2.13	1.96	3.00	5.88
0.92	16	2.0	1.10	6/10	40	50	1.80	1.80	1.65	2.20	3.63
0.96	18	2.0	0.80	SURFACE	15	40	0.85	0.77	0.74	1.60	1.18
0.99	20	2.0	0.50	SURFACE	20	47	0.96	0.87	0.86	1.00	0.86
LB	22	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**22.0**								**27.40**	**43.91**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP7 Start: 15:20 Finish: 15:50

Date 6/5/2006 Party MDM, EJK, SLB

Width 3 ft Area 1.16 sq ft Vel. 0.36 fps Disch. 0.42 cfs

Method 0.6 No. Secs. 7 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S7C	0.23	0.23	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Banks grass and ice, bound by tussocks, 25 ft north of S7C

Flow:

Weather: Sunny, Winds 5 - 15 mph

Other:

Temp: 38°F

Gages: S7C

Remarks: Flew only at S7C, local melt at other gages, 0.5-1.0 ft grass, patchy grass, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP7 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	0.25	0.20	6/10	N/A	40	0.12	0.12	0.12	0.05	0.01
1.0	0.5	0.5	0.40	6/10	N/A	40	0.28	0.28	0.28	0.20	0.06
1.0	1.0	0.5	0.55	6/10	N/A	40	0.35	0.35	0.35	0.28	0.10
1.0	1.5	0.5	0.60	6/10	N/A	40	0.55	0.55	0.55	0.30	0.17
1.0	2.0	0.5	0.40	6/10	N/A	40	0.24	0.24	0.24	0.20	0.05
1.0	2.5	0.5	0.25	6/10	N/A	40	0.21	0.21	0.21	0.13	0.03
RB	3.0	0.25	0.00	6/10	N/A	40	0.00	0.00	0.00	0.00	0.00
SUM		**3.0**								**1.16**	**0.42**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP7 Start: 15:40 Finish: 15:50

Date 6/6/2006 Party JPM, AMG, SLB

Width 3.8 ft Area 1.61 sq ft Vel. 0.12 fps Disch. 0.18 cfs

Method 0.6 No. Secs. 7 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S7C	0.27	0.28	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, uniform, firm

Flow: Steady

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S7C

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP7 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	3	0.25	0.00	6/10	N/A	40	0.00	0.00	0.00	0.00	0.00
1.0	3.5	0.5	0.35	6/10	N/A	40	0.07	0.07	0.07	0.18	0.01
1.0	4.0	0.6	0.60	6/10	N/A	40	0.13	0.13	0.13	0.33	0.04
1.0	4.6	0.6	0.70	6/10	N/A	40	0.24	0.24	0.24	0.42	0.10
1.0	5.2	0.8	0.60	6/10	N/A	40	0.04	0.04	0.04	0.48	0.02
1.0	6.2	0.8	0.25	6/10	N/A	40	0.07	0.07	0.07	0.20	0.01
RB	6.8	0.3	0.00	6/10	N/A	40	0.00	0.00	0.00	0.00	0.00
SUM		**3.8**								**1.61**	**0.18**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP7 Start: 10:26 Finish: 10:44

Date 6/7/2006 Party MTA, AMG

Width 20 ft Area 19.3 sq ft Vel. 0.23 fps Disch. 4.37 cfs

Method Surface / 0.6 No. Secs. 11 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S7S	-0.11	-0.11	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass, x-section clear of snow and ice

Flow:

Weather:

Other:

Temp: 39°F

Gages: S7S

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP7 6/7/2006

							VELOCITY				
Angle Coeff.	**Distance from initial point** (ft)	**Section Width** (ft)	**Water Depth** (ft)	**Observed Depth** (ft)	**Revolution Count**	**Time Increment** (sec)	**At Point** (fps)	**Mean in Vertical** (fps)	**Adjusted for Angle Coeff** (fps)	**Area** (s.f.)	**Discharge** (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
0.90	2	2.0	0.50	SURFACE	15	49	0.33	0.29	0.26	1.00	0.26
0.97	4	2.0	0.90	SURFACE	15	54	0.30	0.27	0.26	1.80	0.47
0.50	6	2.0	1.20	6/10	15	46	0.34	0.34	0.17	2.40	0.41
0.85	8	2.0	1.30	6/10	20	46	0.45	0.45	0.38	2.60	1.00
0.70	10	2.0	1.60	6/10	15	57	0.28	0.28	0.20	3.20	0.63
0.92	12	2.0	1.50	6/10	15	50	0.32	0.32	0.29	3.00	0.88
0.92	14	2.0	1.10	SURFACE	5	55	0.12	0.10	0.10	2.20	0.21
0.90	16	2.0	0.75	SURFACE	10	48	0.23	0.21	0.19	1.50	0.28
0.90	18	2.0	0.60	SURFACE	7	46	0.18	0.16	0.14	1.20	0.17
LB	20	1.0	0.40	SURFACE	7	49	0.17	0.15	0.15	0.40	0.06
SUM		**20.0**								**19.30**	**4.37**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

 Michael Baker Jr., Inc.

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP7 Start: 14:10 Finish: 14:30

Date 6/8/2006 Party EJK, SLB

Width 48 ft Area 23.65 sq ft Vel. 0.13 fps Disch. 3.17 cfs

Method 0.6 No. Secs. 18 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S7N	0.06	0.06	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, set up ~30 ft upstream from gage S7N, saturated banks with ponding water

Flow:

Weather: Sunny, Partly Cloudy, Winds 10 - 15 mph

Other:

Temp: 45°F

Gages: S7N

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP7 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.15				0.00	0.00	0.00	0.15	0.00
1.0	2	2.0	0.25				0.00	0.00	0.00	0.50	0.00
1.0	4	2.0	0.30				0.00	0.00	0.00	0.60	0.00
1.0	6	2.0	0.25				0.00	0.00	0.00	0.50	0.00
1.0	8	2.0	0.10				0.00	0.00	0.00	0.20	0.00
1.0	10	2.0	0.50	6/10	N/A	40	0.03	0.03	0.03	1.00	0.03
1.0	12	2.0	0.50	6/10	N/A	40	0.09	0.09	0.09	1.00	0.09
1.0	14	3.0	0.80	6/10	N/A	40	0.24	0.24	0.24	2.40	0.58
1.0	18	4.0	0.85	6/10	N/A	40	0.12	0.12	0.12	3.40	0.41
1.0	22	3.0	0.70	6/10	N/A	40	0.35	0.35	0.35	2.10	0.74
1.0	24	3.0	0.50	6/10	N/A	40	0.24	0.24	0.24	1.50	0.36
1.0	28	4.0	0.60	6/10	N/A	40	0.13	0.13	0.13	2.40	0.31
1.0	32	4.0	0.40	6/10	N/A	40	0.05	0.05	0.05	1.60	0.08
1.0	36	4.0	0.60	6/10	N/A	40	0.04	0.04	0.04	2.40	0.10
1.0	40	4.0	0.50	6/10	N/A	40	0.10	0.10	0.10	2.00	0.20
1.0	44	3.0	0.40	6/10	N/A	40	0.19	0.19	0.19	1.20	0.23
1.0	46	2.0	0.25	6/10	N/A	40	0.07	0.07	0.07	0.50	0.04
RB	48	1.0	0.20				0.00	0.00	0.00	0.20	0.00
SUM		**48.0**								**23.65**	**3.17**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

 Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP9 Start: 10:00 Finish: 10:35

Date 6/6/2006 Party JPM, AMG, SLB

Width 75 ft Area 23.51 ft Vel. 0.24 fps Disch. 5.69 cfs

Method Surface / 0.6 No. Secs. 40 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S9C	0.20	0.20	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, measured 120 ft upstream from gage S9C

Flow:

Weather: Rain, Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S9C

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP9 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	0.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	1	2.0	0.45				0.00	0.00	0.00	0.90	0.00
0.55	4	3.5	0.40	SURFACE	15	41	0.38	0.35	0.19	1.40	0.27
0.60	8	3.0	0.50	SURFACE	20	42	0.49	0.44	0.27	1.50	0.40
0.30	10	2.5	0.60	SURFACE	10	40	0.27	0.24	0.07	1.50	0.11
0.0	13	2.5	0.60				0.00	0.00	0.00	1.50	0.00
RB	15	1.0	0.00				0.00	0.00	0.00	0.00	0.00
LB	20	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	22	1.5	0.45				0.00	0.00	0.00	0.68	0.00
1.0	23	1.0	0.50	SURFACE	60	42	1.42	1.28	1.28	0.50	0.64
1.0	24	1.0	0.35	SURFACE	40	42	0.95	0.86	0.86	0.35	0.30
1.0	25	1.0	0.20				0.00	0.00	0.00	0.20	0.00
0.96	26	1.5	0.50	SURFACE	30	43	0.71	0.64	0.61	0.75	0.46
1.0	28	2.5	0.40	SURFACE	20	44	0.47	0.42	0.42	1.00	0.42
RB	31	1.5	0.00				0.00	0.00	0.00	0.00	0.00
LB	48	0.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	49	1.5	0.55	SURFACE	80	44	1.80	1.62	1.62	0.83	1.34
1.0	51	3.0	0.40	SURFACE	15	56	0.29	0.26	0.26	1.20	0.31
RB	55	2.0	0.00				0.00	0.00	0.00	0.00	0.00
LB	56	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	58	2.0	0.40				0.00	0.00	0.00	0.80	0.00
1.0	60	2.0	0.30				0.00	0.00	0.00	0.60	0.00
1.0	62	2.5	0.10				0.00	0.00	0.00	0.25	0.00
0.94	65	3.0	0.40	SURFACE	25	40	0.64	0.57	0.54	1.20	0.65
0.75	68	3.0	0.40	SURFACE	15	51	0.31	0.28	0.21	1.20	0.25
RB	71	1.5	0.00				0.00	0.00	0.00	0.00	0.00
LB	83	1.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	86	3.0	0.30				0.00	0.00	0.00	0.90	0.00
0.70	89	2.0	0.35	SURFACE	10	41	0.26	0.24	0.17	0.70	0.12
RB	90	0.5	0.00				0.00	0.00	0.00	0.00	0.00

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP9 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	92	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	94	3.0	0.45	SURFACE	7	42	0.19	0.17	0.17	1.35	0.23
1.0	96	2.0	0.40				0.00	0.00	0.00	0.80	0.00
1.0	98	2.0	0.20				0.00	0.00	0.00	0.40	0.00
1.0	100	2.5	0.40				0.00	0.00	0.00	1.00	0.00
RB	103	1.5	0.00				0.00	0.00	0.00	0.00	0.00
LB	106	1.5	0.00				0.00	0.00	0.00	0.00	0.00
0.90	109	2.5	0.40	SURFACE	10	47	0.23	0.21	0.19	1.00	0.19
1.0	111	2.5	0.40				0.00	0.00	0.00	1.00	0.00
RB	114	1.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**75.0**								**23.51**	**5.69**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Alpine Swale Bridges

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. 452-foot Bridge/Alpine Start: 16:40 Finish: 17:50

Date 5/31/2006 Party SLB, EJK, JPM

Width 409 ft Area 1725 sq ft Vel. 1.89 fps Disch. 3258 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 29 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
PG3	8.43	8.40	0.03
PG4	8.25	8.15	0.10

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Firm, uniform, section of ice lodged in channel sta 356 to 392 assumed grounded

Flow: Steady

Weather: Overcast, Winds 20 - 30 mph

Other: Variable horizontal angles

Temp: 34°F

Gages: PE3 and PE4

Remarks: No snow or ice affecting outlet conditions, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: 452-foot Bridge 5/31/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	4.00						1.04	4.00	4.16
0.97	2	5.0	4.60	6/10	59	61	2.17	2.17	2.10	23.00	48.34
0.92	10	11.5	4.00	6/10	68	61	2.49	2.49	2.29	46.00	105.57
0.75	25	15.0	4.30	6/10	57	60	2.13	2.13	1.60	64.50	102.96
0.75	40	17.5	4.20	6/10	61	60	2.28	2.28	1.71	73.50	125.50
0.90	60	20.0	4.30	6/10	70	75	2.09	2.09	1.88	86.00	161.87
0.85	80	20.0	3.80	6/10	56	61	2.06	2.06	1.75	76.00	132.90
0.85	100	20.0	3.90	6/10	46	51	2.02	2.02	1.72	78.00	134.04
0.85	120	20.0	4.20	6/10	54	61	1.98	1.98	1.69	84.00	141.69
0.97	140	20.0	4.00	6/10	53	61	1.95	1.95	1.89	80.00	151.19
0.91	160	20.0	4.00	6/10	53	60	1.98	1.98	1.80	80.00	144.17
0.92	180	20.0	4.10	6/10	59	61	2.17	2.17	1.99	82.00	163.45
0.94	200	20.0	3.90	6/10	57	61	2.09	2.09	1.97	78.00	153.52
0.96	220	20.0	3.90	6/10	57	60	2.13	2.13	2.04	78.00	159.38
0.97	240	20.0	5.10	2/10	65	61	2.39	1.91	1.85	102.00	189.14
				8/10	39	61	1.44				
0.98	260	20.0	4.90	6/10	45	60	1.68	1.68	1.65	98.00	161.75
0.96	280	20.0	4.30	6/10	59	61	2.17	2.17	2.08	86.00	178.87
0.97	300	20.0	4.70	6/10	54	60	2.02	2.02	1.96	94.00	183.95
0.97	320	20.0	4.00	6/10	63	61	2.31	2.31	2.24	80.00	179.44
0.98	340	15.0	4.00	6/10	48	60	1.80	1.80	1.76	60.00	105.56
0.98	350	8.0	4.10	6/10	39	60	1.46	1.46	1.43	32.80	47.00
	356	3.0	4.00						0.70	12.00	8.40
	392	1.5	4.20						0.12	6.30	0.76
0.90	395	4.0	4.30	6/10	9	78	0.27	0.27	0.25	17.20	4.25
0.92	400	12.5	4.50	6/10	62	50	2.77	2.77	2.55	56.25	143.48
0.98	420	17.5	4.40	6/10	58	60	2.17	2.17	2.12	77.00	163.41
1.00	435	11.5	4.10	6/10	63	60	2.35	2.35	2.35	47.15	110.83
1.00	443	5.0	4.10	6/10	65	61	2.39	2.39	2.39	20.50	48.90
RB	445	1.0	3.00						1.20	3.00	3.60
SUM		**409.0**								**1725.2**	**3258.1**
			Estimated values								

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. 62-foot Bridge/Alpine Start: 14:40 Finish: 16:20

Date 5/31/2006 Party SLB, SJK, JPM

Width 55 ft Area 614.6 sq ft Vel. 1.59 fps Disch. 977.5 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 20 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
PE3	8.55	8.43	0.12
PE4	8.29	8.25	0.04

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Firm, fairly uniform, no snow or ice

Flow: Steady

Weather: Overcast, Winds 20 - 30 mph

Other: Variable horizontal angles

Temp: 34°F

Gages: PE3 and PE4

Remarks: No snow or ice affecting outlet conditions, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 JPM

Site/Date: 62-foot Bridge 5/31/2006

Angle Coeff.	Distance from initial point (ft)	Section Width 62-foot Bridge/Alpine	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	6	0.5	4.00						0.16	2.00	0.32
0.35	7	2.0	4.50	6/10	20	51	0.89	0.89	0.31	9.00	2.80
0.90	10	3.0	5.30	2/10	13	41	0.72	0.94	0.85	15.90	13.44
				8/10	21	41	1.16				
0.85	13	3.0	5.30	2/10	46	40	2.57	2.07	1.76	15.90	28.02
				8/10	28	40	1.57				
0.85	16	3.5	5.60	2/10	40	47	1.91	1.49	1.26	19.60	24.78
				8/10	25	53	1.07				
0.70	20	3.5	7.30	2/10	40	60	1.50	1.15	0.81	25.55	20.58
				8/10	30	85	0.80				
0.70	23	3.0	9.30	2/10	50	60	1.87	1.62	1.13	27.90	31.59
				8/10	37	61	1.37				
0.60	26	3.5	10.50	2/10	64	60	2.39	1.97	1.18	36.75	43.39
				8/10	42	61	1.55				
0.75	30	3.5	12.20	2/10	67	61	2.46	2.16	1.62	42.70	69.29
				8/10	50	60	1.87				
0.80	33	3.0	14.40	2/10	62	61	2.28	1.91	1.53	43.20	66.07
				8/10	42	61	1.55				
0.85	36	3.0	13.60	2/10	65	60	2.42	2.05	1.75	40.80	71.24
				8/10	45	60	1.68				
0.87	39	3.0	15.80	2/10	68	61	2.49	2.24	1.95	47.40	92.35
				8/10	54	61	1.98				
0.94	42	3.0	15.90	2/10	58	60	2.17	2.13	2.00	47.70	95.49
				8/10	57	61	2.09				
0.99	45	3.0	16.00	2/10	66	61	2.42	2.20	2.18	48.00	104.69
				8/10	54	61	1.98				
1.0	48	3.0	15.80	2/10	68	61	2.49	2.24	2.24	47.40	106.15
				8/10	54	61	1.98				
0.98	51	3.0	14.80	2/10	75	60	2.79	2.04	2.00	44.40	88.93
				8/10	35	61	1.29				

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 JPM

Site/Date: 62-foot Bridge 5/31/2006

Angle Coeff.	Distance from initial point (ft)	Section Width 62-foot Bridge/Alpine	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
0.92	54	3.0	13.40	2/10	66	61	2.42	1.78	1.64	40.20	65.99
				8/10	31	61	1.15				
0.80	57	3.0	13.00	2/10	43	61	1.58	1.47	1.17	39.00	45.79
				8/10	36	60	1.35				
0.50	60	2.0	8.60	2/10	15	63	0.54	0.71	0.36	17.20	6.12
				8/10	24	62	0.88				
RB	61	0.5	8.00						0.12	4.00	0.48
SUM		**55.0**								**614.60**	**977.51**
			Estimated values								

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Ublutuoch River

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 11:35 Finish: 12:20

Date 6/3/2006 Party EJK, AMG, JPM

Width 218 ft Area 362.2 sq ft Vel. 0.91 fps Disch. 331.1 cfs

Method 0.6 No. Secs. 24 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9A	3.22	3.26	0.04
UB6.9B	0.86	0.89	0.03
UB6.8A	0.54	0.50	0.04
UB6.7A	3.16	3.15	0.01
UB6.7B	1.32	1.32	0.00

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Ice and snow on banks, boundary conditions poorly defined

Flow: Unsteady

Weather: Overcast, Wind 0 - 20 mph

Other: Dense willow STA 117~162

Temp: 27°F

Gages: UB6.9A, UB6.9B, UB6.8A, UB6.7A, UB6.7B

Remarks: Channel at section, upstream and downstream 80% Accluded with snow.

Ice and significant backwater effect, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/3/2006

							VELOCITY				
Angle Coeff.	**Distance from initial point (ft)**	**Section Width (ft)**	**Water Depth (ft)**	**Observed Depth (ft)**	**Revolution Count**	**Time Increment (sec)**	**At Point (fps)**	**Mean in Vertical (fps)**	**Adjusted for Angle Coeff (fps)**	**Area (s.f.)**	**Discharge (cfs)**
RB	278	4.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	270	9.0	0.80	SURFACE	15	41	0.83	0.75	0.75	7.20	5.38
1.0	260	10.0	1.50	6/10	20	47	0.96	0.96	0.96	15.00	14.45
1.0	250	10.0	1.90	6/10	30	56	1.21	1.21	1.21	19.00	22.95
1.0	240	10.0	2.20	6/10	30	56	1.21	1.21	1.21	22.00	26.58
1.0	230	10.0	2.60	6/10	30	50	1.35	1.35	1.35	26.00	35.12
1.0	220	10.0	3.30	6/10	40	59	1.52	1.52	1.52	33.00	50.30
1.0	210	10.0	3.30	6/10	30	49	1.38	1.38	1.38	33.00	45.47
1.0	200	10.0	3.30	6/10	30	49	1.38	1.38	1.38	33.00	45.47
1.0	190	7.5	3.10	6/10	30	49	1.38	1.38	1.38	23.25	32.04
1.0	185	5.0	2.70	6/10	30	52	1.30	1.30	1.30	13.50	17.54
1.0	180	7.5	2.30	6/10	30	52	1.30	1.30	1.30	17.25	22.42
1.0	170	10.0	2.30	6/10	10	44	0.52	0.52	0.52	23.00	11.98
1.0	160	10.0	1.20	6/10	3	69	0.12	0.12	0.12	12.00	1.39
1.0	150	10.0	0.80	6/10	0	40	0.00	0.00	0.00	8.00	0.00
1.0	140	10.0	0.50	6/10	0	40	0.00	0.00	0.00	5.00	0.00
1.0	130	10.0	0.30	6/10	0	40	0.00	0.00	0.00	3.00	0.00
1.0	120	10.0	0.40	6/10	0	40	0.00	0.00	0.00	4.00	0.00
1.0	110	10.0	1.60	6/10	0	40	0.00	0.00	0.00	16.00	0.00
1.0	100	10.0	0.60	6/10	0	40	0.00	0.00	0.00	6.00	0.00
1.0	90	10.0	1.50	6/10	0	40	0.00	0.00	0.00	15.00	0.00
1.0	80	10.0	1.40	6/10	0	40	0.00	0.00	0.00	14.00	0.00
1.0	70	10.0	1.40	6/10	0	40	0.00	0.00	0.00	14.00	0.00
LB	60	5.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**218.0**								**362.20**	**331.09**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:25 Finish: 10:50

Date 6/4/2006 Party MDM, AMG, JPM

Width 253 ft Area 687.9 sq ft Vel. 1.13 fps Disch. 778.9 cfs

Method Surface / 0.6 No. Secs. 30 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.7B	2.08	2.05	0.03
UB6.8A	1.44	1.34	0.10
UB6.9B	1.86	1.76	0.10

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow, ice and willow on banks, non-uniform, boundary poorly defined

Flow: Unsteady

Weather: Overcast, Winds 10 - 12 mph

Other:

Temp: 28°F

Gages: UB6.7B, UB6.8A, UB6.9B

Remarks: Channel affected by in-place snow and ice, with significant backwater from ice jam 800-1500 ft downstream, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/4/2006

							VELOCITY				
Angle Coeff.	**Distance from initial point (ft)**	**Section Width (ft)**	**Water Depth (ft)**	**Observed Depth (ft)**	**Revolution Count**	**Time Increment (sec)**	**At Point (fps)**	**Mean in Vertical (fps)**	**Adjusted for Angle Coeff (fps)**	**Area (s.f.)**	**Discharge (cfs)**
RB	293	6.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	280	11.5	1.50	6/10	0	40	0.00	0.00	0.00	17.25	0.00
1.0	270	10.0	2.40	6/10	25	51	1.11	1.11	1.11	24.00	26.57
1.0	260	9.0	2.70	6/10	35	49	1.60	1.60	1.60	24.30	39.00
1.0	252	8.0	3.00	6/10	40	50	1.80	1.80	1.80	24.00	43.08
1.0	244	8.0	3.30	6/10	40	47	1.91	1.91	1.91	26.40	50.39
1.0	236	8.0	3.80	6/10	40	47	1.91	1.91	1.91	30.40	58.02
1.0	228	8.0	3.90	6/10	40	48	1.87	1.87	1.87	31.20	58.32
1.0	220	8.0	4.60	6/10	40	46	1.95	1.95	1.95	36.80	71.75
1.0	212	8.0	4.80	6/10	40	47	1.91	1.91	1.91	38.40	73.29
1.0	204	6.5	4.70	6/10	40	49	1.83	1.83	1.83	30.55	55.95
1.0	199	7.0	4.50	6/10	40	52	1.73	1.73	1.73	31.50	54.39
1.0	190	8.5	5.70	6/10	30	45	1.50	1.50	1.50	48.45	72.63
1.0	182	6.5	5.00	6/10	25	43	1.31	1.31	1.31	32.50	42.56
1.0	177	6.0	3.80	6/10	25	40	1.41	1.41	1.41	22.80	32.07
1.0	170	5.5	3.30	6/10	25	45	1.25	1.25	1.25	18.15	22.73
1.0	166	7.0	2.40	SURFACE	20	49	0.92	0.83	0.83	16.80	13.98
1.0	156	10.0	2.00	6/10	10	41	0.56	0.56	0.56	20.00	11.15
1.0	146	10.0	1.60	6/10	10	50	0.46	0.46	0.46	16.00	7.37
0.7	136	10.0	1.50	SURFACE	20	54	0.84	0.76	0.53	15.00	7.95
0.7	126	10.0	1.30	6/10	5	49	0.24	0.24	0.17	13.00	2.23
0.1	116	10.0	2.00	SURFACE	3	63	0.13	0.11	0.01	20.00	0.23
0.8	106	10.0	2.50	SURFACE	5	63	0.20	0.18	0.14	25.00	3.51
0.9	96	10.0	2.40	6/10	15	51	0.67	0.67	0.57	24.00	13.70
1.0	86	10.0	2.40	6/10	20	47	0.96	0.96	0.96	24.00	23.12
1.0	76	10.0	2.30	6/10	15	55	0.62	0.62	0.62	23.00	14.35
-1.0	66	10.0	2.40	6/10	15	42	0.81	0.81	-0.81	24.00	-19.47
1.0	56	10.0	2.40	6/10	0	40	0.00	0.00	0.00	24.00	0.00
1.0	46	8.0	0.80				0.00	0.00	0.00	6.40	0.00
LB	40	3.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**253.0**								**687.90**	**778.87**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

 Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 8:57 Finish: 10:00

Date 6/5/2006 Party JPM, MTA, AMG

Width 246 ft Area 604.5 sq ft Vel. 1.38 fps Disch. 836.5 cfs

Method Surface / 0.6 No. Secs. 30 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9B	1.35	1.3	0.05
UB6.8A	1.00	0.98	0.02
UB6.7B	1.79	1.76	0.03

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Slush, ice and willows on banks, channel bottom ice and snow, non uniform, boundary indefinite

Flow: Unsteady

Weather: Overcast, Wind 5 - 10 mph

Other:

Temp: 38°F

Gages: UB6.9B, UB6.8A, UB6.7B

Remarks: Ice jam 1000-1500 ft downstream, channel constricted by snow and ice, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	288	4.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	280	6.5	1.40	6/10	20	43	1.05	1.05	1.05	9.10	9.57
1.0	275	6.0	1.70	6/10	40	51	1.76	1.76	1.76	10.20	17.96
1.0	268	7.5	2.20	6/10	40	45	1.99	1.99	1.99	16.50	32.88
1.0	260	8.0	2.50	6/10	40	43	2.08	2.08	2.08	20.00	41.69
1.0	252	7.5	2.70	6/10	40	43	2.08	2.08	2.08	20.25	42.21
1.0	245	7.0	3.00	6/10	40	42	2.13	2.13	2.13	21.00	44.81
1.0	238	7.0	3.30	6/10	40	42	2.13	2.13	2.13	23.10	49.29
1.0	231	7.0	3.50	6/10	40	43	2.08	2.08	2.08	24.50	51.07
1.0	224	7.0	3.90	6/10	40	40	2.24	2.24	2.24	27.30	61.14
1.0	217	7.0	4.30	6/10	50	49	2.28	2.28	2.28	30.10	68.77
1.0	210	6.0	4.40	6/10	50	51	2.20	2.20	2.20	26.40	57.97
1.0	205	5.0	4.40	6/10	40	41	2.19	2.19	2.19	22.00	48.08
1.0	200	5.0	4.40	6/10	40	53	1.69	1.69	1.69	22.00	37.28
1.0	195	5.0	4.30	6/10	40	44	2.04	2.04	2.04	21.50	43.81
1.0	190	5.0	5.00	6/10	40	45	1.99	1.99	1.99	25.00	49.82
1.0	185	5.0	4.80	6/10	40	49	1.83	1.83	1.83	24.00	43.95
1.0	180	5.0	4.20	6/10	40	51	1.76	1.76	1.76	21.00	36.97
1.0	175	5.0	3.80	6/10	30	44	1.53	1.53	1.53	19.00	29.12
1.0	170	6.5	3.10	6/10	20	41	1.10	1.10	1.10	20.15	22.20
1.0	162	7.5	2.00	SURFACE	7	41	0.40	0.36	0.36	15.00	5.35
1.0	155	8.5	1.40	6/10	3	65	0.12	0.12	0.12	11.90	1.45
0.90	145	10.0	1.00	SURFACE	15	61	0.56	0.51	0.46	10.00	4.55
0.85	135	15.0	1.00	SURFACE	3	44	0.17	0.15	0.13	15.00	1.96
1.0	115	17.5	1.70	6/10	2	55	0.10	0.10	0.10	29.75	2.99
1.0	100	17.5	2.00	6/10	3	67	0.12	0.12	0.12	35.00	4.16
1.0	80	17.5	1.90	6/10	7	44	0.37	0.37	0.37	33.25	12.32
1.0	65	15.0	1.90	6/10	10	43	0.53	0.53	0.53	28.50	15.17
1.0	50	11.5	2.00				0.00	0.00	0.00	23.00	0.00
LB	42	4.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**246.0**								**604.50**	**836.54**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:00 Finish: 10:25

Date 6/6/2006 Party MDM, MTA, EJK

Width 259 ft Area 758.9 sq ft Vel. 1.58 fps Disch. 1197 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 28 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.7B	2.11	2.12	0.01
UB6.8A	1.35	1.38	0.03
UB6.9B	1.55	1.56	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks

Flow:

Weather: Cloudy, Scattered Rain
Wind 10 - 20 mph

Other:

Temp: 40^{o}F

Gages: UB6.7B, Ub6.8A, UB6.9B

Remarks: Ice jams were present about 100 yards upstream and downstream from x-section,

AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/6/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	289	4.5	0.50				0.00	0.00	0.00	2.25	0.00
1.0	280	8.5	2.10	6/10	35	41	1.91	1.91	1.91	17.85	34.17
1.0	272	7.5	2.90	6/10	40	44	2.04	2.04	2.04	21.75	44.32
1.0	265	7.5	3.20	6/10	40	40	2.24	2.24	2.24	24.00	53.75
1.0	257	7.5	3.50	6/10	50	46	2.43	2.43	2.43	26.25	63.86
1.0	250	7.0	3.60	8/10	40	41	2.19	2.55	2.55	25.20	64.15
				2/10	52	40	2.91				
1.0	243	7.0	4.00	8/10	40	44	2.04	2.38	2.38	28.00	66.71
				2/10	50	41	2.73				
1.0	236	6.5	4.30	8/10	40	43	2.08	2.41	2.41	27.95	67.24
				2/10	50	41	2.73				
1.0	230	5.5	4.40	8/10	40	40	2.24	2.48	2.48	24.20	60.10
				2/10	50	41	2.73				
1.0	225	5.0	4.80	8/10	40	42	2.13	2.43	2.43	24.00	58.33
				2/10	50	41	2.73				
1.0	220	5.0	5.20	8/10	40	40	2.24	2.45	2.45	26.00	63.73
				2/10	50	42	2.66				
1.0	215	5.0	5.40	8/10	40	43	2.08	2.29	2.29	27.00	61.71
				2/10	50	45	2.49				
1.0	210	5.0	5.50	8/10	40	43	2.08	2.26	2.26	27.50	62.11
				2/10	50	46	2.43				
1.00	205	5.0	5.50	8/10	40	45	1.99	2.19	2.19	27.50	60.14
				2/10	50	47	2.38				
1.00	200	5.0	5.50	8/10	40	45	1.99	2.19	2.19	27.50	60.14
				2/10	50	47	2.38				
1.0	195	5.0	5.40	8/10	40	43	2.08	2.18	2.18	27.00	58.98
				2/10	50	49	2.28				
1.0	190	5.0	5.50	8/10	40	46	1.95	2.12	2.12	27.50	58.23
				2/10	50	49	2.28				
1.0	185	6.5	5.30	8/10	40	42	2.13	2.16	2.16	34.45	74.40
				2/10	40	41	2.19				

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1.0	177	7.5	4.40	8/10	25	44	1.28	1.64	1.64	33.00	54.00
				2/10	40	45	1.99				
1.0	170	8.5	3.70	6/10	25	43	1.31	1.31	1.31	31.45	41.19
1.0	160	15.0	2.00	6/10	5	55	0.22	0.22	0.22	30.00	6.61
1.0	140	20.0	1.20	6/10	10	55	0.42	0.42	0.42	24.00	10.09
1.0	120	20.0	1.40	6/10	0	40	0.00	0.00	0.00	28.00	0.00
1.0	100	20.0	2.30	6/10	3	40	0.19	0.19	0.19	46.00	8.53
0.90	80	20.0	2.10	6/10	10	47	0.49	0.49	0.44	42.00	18.48
0.94	60	20.0	2.20	6/10	15	47	0.73	0.73	0.68	44.00	30.07
1.0	40	15.0	2.30	6/10	10	49	0.47	0.47	0.47	34.50	16.20
LB	30	5.0	0.00	6/10	0	40	0.00	0.00	0.00	0.00	0.00
SUM		**259.0**								**758.85**	**1197.24**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By SLB/JPM
Check By JPM

Discharge Measurement Notes

Station No. Ublutoch River Start: 8:40 Finish: 10:15

Date 6/7/2006 Party JPM, MDM, SLB

Width 259 ft Area 780.5 sq ft Vel. 1.65 fps Disch. 1289 cfs

Method 0.2 / 0.6 / 0.8 Surface No. Secs. 33 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.7B	2.35	2.34	0.01
UB6.8A	1.42	1.42	0.00
UB6.9B	1.54	1.53	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass, snow and willows on banks, channel bed fairly firm, ice, snow and willows in channel, banks poorly defined

Flow: Steady

Weather: Partly Cloudy
Winds 0 - 5 mph

Other:

Temp: 39°F

Gages: UB6.7B, UB6.8A, UB6.9B

Remarks: Ice jam 1000-1500 downstream causing backwater, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	295	2.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	290	5.0	1.40	6/10	20	40	1.13	1.13	1.13	7.00	7.90
1.0	285	7.5	2.50	8/10	40	49	1.83	2.04	2.04	18.75	38.17
				2/10	40	40	2.24				
1.0	275	9.0	3.20	8/10	40	43	2.08	2.29	2.29	28.80	65.82
				2/10	50	45	2.49				
1.0	267	7.5	3.60	8/10	40	42	2.13	2.46	2.46	27.00	66.54
				2/10	50	40	2.79				
1.0	260	7.0	3.80	8/10	40	41	2.19	2.19	2.19	26.60	58.27
				2/10	50	51	2.20				
1.0	253	7.0	3.90	8/10	40	42	2.13	2.46	2.46	27.30	67.28
				2/10	60	48	2.79				
1.0	246	6.5	4.10	8/10	40	40	2.24	2.48	2.48	26.65	66.18
				2/10	50	41	2.73				
1.0	240	6.0	4.50	8/10	40	42	2.13	2.46	2.46	27.00	66.54
				2/10	50	40	2.79				
1.0	234	6.0	4.70	8/10	50	49	2.28	2.51	2.51	28.20	70.67
				2/10	50	41	2.73				
1.0	228	6.0	5.00	8/10	40	43	2.08	2.47	2.47	30.00	74.08
				2/10	60	47	2.85				
1.0	222	5.5	5.60	8/10	40	40	2.24	2.52	2.52	30.80	77.53
				2/10	50	40	2.79				
0.90	217	5.5	5.70	8/10	40	41	2.19	2.39	2.15	31.35	67.52
				2/10	50	43	2.60				
1.0	211	6.0	6.00	8/10	40	42	2.13	2.34	2.34	36.00	84.18
				2/10	50	44	2.54				
1.0	205	6.0	5.80	8/10	40	43	2.08	2.16	2.16	34.80	75.24
				2/10	40	40	2.24				
1.0	199	6.0	5.50	8/10	40	42	2.13	2.13	2.13	33.00	70.42
				2/10	40	42	2.13				
1.0											

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1.0	193	6.0	5.40	8/10	40	45	1.99	2.16	2.16	32.40	70.06
				2/10	50	48	2.33				
1.0	187	6.5	5.50	8/10	30	49	1.38	1.78	1.78	35.75	63.70
				2/10	40	41	2.19				
1.0	180	7.5	4.50	8/10	25	44	1.28	1.68	1.68	33.75	56.78
				2/10	40	43	2.08				
1.0	172	7.5	4.10	8/10	20	43	1.05	1.37	1.37	30.75	42.06
				2/10	30	40	1.68				
1.0	165	9.5	2.20	6/10	7	44	0.37	0.37	0.37	20.90	7.75
1.0	153	10.0	1.60	6/10	5	62	0.20	0.20	0.20	16.00	3.16
1.0	145	11.5	1.20	SURFACE	15	46	0.74	0.67	0.67	13.80	9.22
1.0	130	14.5	1.10	SURFACE	7	47	0.35	0.31	0.31	15.95	5.00
1.0	116	12.5	1.80	SURFACE	3	52	0.15	0.13	0.13	22.50	2.98
1.0	105	10.5	1.30	6/10	0	40	0.00	0.00	0.00	13.65	0.00
1.0	95	10.0	2.20	6/10	3	45	0.17	0.17	0.17	22.00	3.68
1.0	85	10.0	2.10	6/10	7	48	0.34	0.34	0.34	21.00	7.17
1.0	75	10.0	2.10	6/10	15	63	0.54	0.54	0.54	21.00	11.43
1.0	65	10.0	2.20	6/10	20	52	0.87	0.87	0.87	22.00	19.20
1.0	55	10.0	2.30	6/10	15	41	0.83	0.83	0.83	23.00	19.11
1.0	45	9.5	2.40	6/10	10	47	0.49	0.49	0.49	22.80	11.14
LB	36	4.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**259.0**								**780.50**	**1288.78**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By AMG

Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:06 Finish: 10:46

Date 6/8/2006 Party AMG, JPM

Width 263 ft Area 820 sq ft Vel. 1.55 fps Disch. 1272 cfs

Method 0.2 / 0.6 / 0.8 Surface No. Secs. 29 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9B	1.39	1.29	0.10
UB6.8B	1.30	1.27	0.03
UB6.7B	2.23	2.20	0.03

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter 0.5 ft above bottom of weight

Weight 30 lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Non uniform, smooth and firm except willows, sta 115-170, boundaries fairly well defined

Flow: Steady Weather: Partly Cloudy, Calm

Other: Temp: 45°F

Gages: UB6.9B, UB6.8B, UB6.7B

Remarks: Ice jam 1000-1500 ft downstream, backwater affecting stage, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	298	4.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	290	9.0	2.10	6/10	40	45	1.99	1.99	1.99	18.90	37.66
1.0	280	9.0	3.20	2/10	50	45	2.49	2.12	2.12	28.80	61.15
				8/10	40	51	1.76				
1.0	272	8.0	3.80	2/10	50	42	2.66	2.35	2.35	30.40	71.45
				8/10	40	44	2.04				
1.0	264	7.5	4.10	2/10	50	41	2.73	2.38	2.38	30.75	73.26
				8/10	40	44	2.04				
1.0	257	7.0	4.50	2/10	50	40	2.79	2.46	2.46	31.50	77.63
				8/10	40	42	2.13				
1.0	250	7.0	4.50	2/10	50	43	2.60	2.44	2.44	31.50	76.95
				8/10	50	49	2.28				
1.0	243	7.0	4.80	2/10	50	43	2.60	2.47	2.47	33.60	83.06
				8/10	45	43	2.34				
1.0	236	6.5	5.20	2/10	50	42	2.66	2.40	2.40	33.80	81.06
				8/10	40	42	2.13				
1.0	230	6.0	5.50	2/10	50	42	2.66	2.35	2.35	33.00	77.56
				8/10	40	44	2.04				
1.0	224	6.0	6.10	2/10	50	46	2.43	2.28	2.28	36.60	83.57
				8/10	40	42	2.13				
1.0	218	6.0	6.20	2/10	50	47	2.38	2.23	2.23	37.20	83.06
				8/10	40	43	2.08				
1.0	212	6.0	6.20	2/10	50	51	2.20	2.24	2.24	37.20	83.34
				8/10	50	49	2.28				
1.0	206	6.0	5.80	2/10	40	46	1.95	2.04	2.04	34.80	71.05
				8/10	40	42	2.13				
1.0	200	6.5	5.60	2/10	40	50	1.80	1.96	1.96	36.40	71.51
				8/10	40	42	2.13				
1.0	193	7.0	5.60	2/10	40	51	1.76	1.81	1.81	39.20	71.14
				8/10	40	48	1.87				

CONTINUED ON FOLLOWING SHEET

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1.0	186	7.0	5.20	2/10	40	51	1.76	1.48	1.48	36.40	53.87
				8/10	25	47	1.20				
1.0	179	8.0	4.40	2/10	30	43	1.57	1.17	1.17	35.20	41.24
				8/10	15	44	0.78				
1.0	170	9.5	3.50	SURFACE	15	48	0.71	0.64	0.64	33.25	21.32
1.0	160	10.0	1.70	SURFACE	7	47	0.35	0.31	0.31	17.00	5.33
0.6	150	12.5	1.30	SURFACE	7	41	0.40	0.36	0.21	16.25	3.48
0.5	135	17.5	0.90	SURFACE	5	49	0.24	0.22	0.10	15.75	1.56
0.0	115	15.0	1.50	SURFACE	0	40	0.00	0.00	0.00	22.50	0.00
1.0	105	12.5	2.20	6/10	0	40	0.00	0.00	0.00	27.50	0.00
1.0	90	17.5	2.00	6/10	3	82	0.10	0.10	0.10	35.00	3.53
1.0	70	17.5	2.00	6/10	7	53	0.31	0.31	0.31	35.00	10.89
1.0	55	15.0	2.10	6/10	15	54	0.64	0.64	0.64	31.50	20.01
1.0	40	10.0	2.10	6/10	7	50	0.33	0.33	0.33	21.00	6.90
LB	35	2.5	0.00	6/10	0	40	0.00	0.00	0.00	0.00	0.00
SUM		**263.0**								**820.00**	**1271.58**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:30 Finish: 10:45

Date 6/9/2006 Party MTA, AMG, SLB

Width 263 ft Area 762.6 sq ft Vel. 1.48 fps Disch. 1132 cfs

Method 0.2 / 0.6 / 0.8 Surface No. Secs. 26 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9A	3.25	3.24	0.01
UB6.9B	0.87	0.86	0.01
UB6.7B	1.84	1.84	0.00
UB6.8A	0.92	0.91	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter ____ ft above bottom of weight

Weight 30 lbs

Spin Test ____ after ____ Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks

Flow:

Weather: Clear, Sunny, Winds 0 - 5 mph

Other:

Temp: 50°F

Gages: UB6.9A, UB6.9B, UB6.7B, UB6.8A

Remarks: Ice jams upstream and downstream, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/9/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	296	3.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	290	7.0	3.30	6/10	40	48	1.87	1.87	1.87	23.10	43.18
1.0	282	7.5	4.20	6/10	40	44	2.04	2.04	2.04	31.50	64.18
1.0	275	7.5	4.00	6/10	40	45	1.99	1.99	1.99	30.00	59.78
1.0	267	7.5	4.20	8/10	50	48	2.33	2.36	2.36	31.50	74.24
				2/10	50	47	2.38				
1.0	260	7.5	4.30	8/10	50	48	2.33	2.24	2.24	32.25	72.34
				2/10	50	52	2.15				
1.0	252	7.5	4.60	8/10	40	43	2.08	2.41	2.41	34.50	83.00
				2/10	50	41	2.73				
1.0	245	7.5	4.80	8/10	50	50	2.24	2.42	2.42	36.00	87.13
				2/10	50	43	2.60				
1.0	237	7.5	5.50	8/10	40	45	1.99	2.21	2.21	41.25	91.28
				2/10	50	46	2.43				
1.0	230	7.5	5.70	8/10	40	42	2.13	2.23	2.23	42.75	95.46
				2/10	50	48	2.33				
1.0	222	7.5	5.90	8/10	40	44	2.04	2.11	2.11	44.25	93.43
				2/10	40	41	2.19				
1.0	215	7.5	5.70	8/10	40	50	1.80	1.87	1.87	42.75	80.05
				2/10	40	46	1.95				
1.0	207	7.5	5.30	8/10	30	41	1.64	1.82	1.82	39.75	72.27
				2/10	40	45	1.99				
1.0	200	7.5	5.20	8/10	30	44	1.53	1.72	1.72	39.00	67.11
				2/10	40	47	1.91				
1.0	192	7.5	5.10	8/10	30	44	1.53	1.65	1.65	38.25	62.98
				2/10	40	51	1.76				
1.0	185	8.5	4.80	8/10	15	42	0.81	1.23	1.23	40.80	50.08
				2/10	30	41	1.64				
1.0	175	10.0	3.60	8/10	15	48	0.71	0.80	0.80	36.00	28.83
				2/10	20	51	0.89				
1.0	165	12.5	1.50	6/10	1	41	0.07	0.07	0.07	18.75	1.39

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/9/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
0.94	150	22.5	0.80	SURFACE	3	85	0.10	0.09	0.08	18.00	1.49
0.9	120	20.0	0.90	SURFACE	0	40	0.00	0.00	0.00	18.00	0.00
1.0	110	10.0	1.70	6/10	0	40	0.00	0.00	0.00	17.00	0.00
1.0	100	15.0	1.70	6/10	0	40	0.00	0.00	0.00	25.50	0.00
1.0	80	20.0	1.40	6/10	0	40	0.00	0.00	0.00	28.00	0.00
0.9	60	17.5	1.60	6/10	1	50	0.06	0.06	0.06	28.00	1.62
0.9	45	13.5	1.90	6/10	3	95	0.09	0.09	0.08	25.65	2.07
LB	33	6.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**263.0**								**762.55**	**1131.91**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:20 Finish: 10:51

Date 6/10/2006 Party SLB, MTA, AMG

Width 133 ft Area 653.9 sq ft Vel. 1.34 fps Disch. 876.1 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 14 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9B	0.30	0.26	0.04
UB6.9A	2.67	2.63	0.04
UB6.8A	0.39	0.36	0.03
UB6.7B	1.28	1.26	0.02

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter ft above bottom of weight

Weight 30 lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Water in left bank channel not connected downstream, no flow

Flow:

Weather: Cloudy, Calm

Other:

Temp: 50°F

Gages: UB6.9B, UB6.9A, UB6.8A, UB6.7B

Remarks: Ice jam upstream and downstream, banks at measurement location 95%, clear of snow and ice, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/10/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	298	1.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	295	6.5	3.60	8/10	20	40	1.13	1.18	1.18	23.40	27.54
				2/10	25	46	1.23				
1.0	285	10.0	5.30	8/10	30	43	1.57	1.83	1.83	53.00	96.79
				2/10	40	43	2.08				
1.0	275	10.0	5.70	8/10	30	41	1.64	1.84	1.84	57.00	104.91
				2/10	40	44	2.04				
1.0	265	10.0	5.60	8/10	30	44	1.53	1.74	1.74	56.00	97.51
				2/10	40	46	1.95				
1.0	255	10.0	5.50	8/10	40	55	1.63	1.62	1.62	55.00	89.06
				2/10	30	42	1.60				
1.0	245	10.0	5.80	8/10	25	42	1.34	1.47	1.47	58.00	85.41
				2/10	30	42	1.60				
1.0	235	10.0	5.40	8/10	20	52	0.87	1.06	1.06	54.00	57.37
				2/10	25	45	1.25				
1.0	225	10.0	5.80	8/10	20	50	0.91	1.04	1.04	58.00	60.37
				2/10	25	48	1.18				
1.0	215	10.0	5.60	8/10	25	45	1.25	1.27	1.27	56.00	70.91
				2/10	25	44	1.28				
1.0	205	10.0	5.30	8/10	25	46	1.23	1.28	1.28	53.00	67.99
				2/10	25	42	1.34				
1.0	195	10.0	5.10	8/10	20	47	0.96	1.18	1.18	51.00	60.43
				2/10	25	40	1.41				
1.0	185	10.0	4.20	8/10	15	41	0.83	0.95	0.95	42.00	40.04
				2/10	20	42	1.08				
1.0	175	10.0	3.20	8/10	7	41	0.40	0.55	0.55	32.00	17.73
				2/10	15	48	0.71				
LB	165	5.0	1.10	6/10	0	40	0.00	0.00	0.00	5.50	0.00
SUM		**133.0**								**653.90**	**876.06**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By SLB

Check By JPM

Discharge Measurement Notes

Station No. Ublutouch River Start: 9:10 Finish: 9:55

Date 6/11/2006 Party MTA, AMG, SLB

Width 140 ft Area 711.5 sq ft Vel. 0.96 fps Disch. 685.9 cfs

Method 0.2 / 0.6 / 0.8 No. Secs. 15 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
UB6.9A	2.2	2.19	0.01
UB6.7B	0.88	0.86	0.02
UB6.8A	-0.04	-0.06	0.02

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter ft above bottom of weight

Weight 30 lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows on banks

Flow: Weather: Sunny, Partly Cloudy

Winds 0 - 15 mph

Other: Temp: 52°F

Gages: UB6.9A, UB6.7B, UB6.8A

Remarks: Ice jams cleared directly upstream and downstream, ice jams 1/2 mile upstream and downstream

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: Ublutouch River 6/11/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	300	2.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	295	7.5	2.80	6/10	10	62	0.38	0.38	0.38	21.00	7.88
1.0	285	10.0	6.60	8/10	20	41	1.10	1.37	1.37	66.00	90.59
				2/10	30	41	1.64				
1.0	275	10.0	6.80	8/10	25	43	1.31	1.40	1.40	68.00	95.50
				2/10	30	45	1.50				
1.0	265	10.0	7.40	8/10	20	40	1.13	1.35	1.35	74.00	99.78
				2/10	30	43	1.57				
1.0	255	10.0	7.10	8/10	20	41	1.10	1.22	1.22	71.00	86.69
				2/10	25	42	1.34				
1.0	245	10.0	6.80	8/10	20	45	1.01	1.09	1.09	68.00	74.13
				2/10	25	48	1.18				
1.0	235	10.0	6.40	8/10	15	42	0.81	0.87	0.87	64.00	55.56
				2/10	20	49	0.92				
1.0	225	10.0	6.30	8/10	15	49	0.70	0.84	0.84	63.00	52.99
				2/10	20	46	0.98				
1.0	215	10.0	5.70	8/10	15	51	0.67	0.76	0.76	57.00	43.39
				2/10	15	40	0.85				
1.0	205	10.0	5.50	8/10	15	58	0.59	0.57	0.57	55.00	31.50
				2/10	15	62	0.55				
1.0	195	10.0	4.30	8/10	15	52	0.66	0.68	0.68	43.00	29.18
				2/10	15	49	0.70				
1.0	185	10.0	3.40	8/10	3	65	0.12	0.32	0.32	34.00	10.93
				2/10	10	44	0.52				
1.0	175	12.5	2.20	6/10	5	42	0.28	0.28	0.28	27.50	7.76
LB	160	7.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**140.0**								**711.50**	**685.88**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

ASDP Site 1

Michael Baker Jr., Inc.

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. ASDP1 Start: 8:56 Finish: 9:30

Date 6/3/2006 Party MDM, MTA

Width 22.0 ft Area 19.10 sq ft Vel. 0.14 fps Disch. 2.69 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S1W	0.42	0.42	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Weeds and grass - length 1-1.5 in length, ice on bed and snow on banks

Flow:

Weather: Wind gusts to 25 mph

Other:

Temp: 27°F

Gages: S1W

Remarks: Due to wind and weed, selected Marsh McBirney flow mate 2000. Wind caused increase in surface velocity and the weeds impacted the AA at 6/10th depth. Measured a 2/10 due to weeds, Marsh McBirney.

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP1 6/3/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00							0.00	0.00
1.0	2	2.0	0.40	6/10	N/A	40	-0.04	-0.04	-0.04	0.80	-0.03
1.0	4	2.0	0.75	6/10	N/A	40	-0.02	-0.02	-0.02	1.50	-0.03
1.0	6	2.0	1.10	2/10	N/A	40	0.16	0.13	0.13	2.20	0.29
1.0	8	2.0	1.20	2/10	N/A	40	0.35	0.28	0.28	2.40	0.67
1.0	10	2.0	1.25	2/10	N/A	40	0.40	0.32	0.32	2.50	0.80
1.0	12	2.0	1.20	2/10	N/A	40	0.40	0.32	0.32	2.40	0.77
1.0	14	2.0	1.00	2/10	N/A	40	0.16	0.13	0.13	2.00	0.26
1.0	16	2.0	0.90	6/10	N/A	40	0.00	0.00	0.00	1.80	0.00
1.0	18	2.0	0.75	6/10	N/A	40	0.00	0.00	0.00	1.50	0.00
1.0	20	2.0	0.65	6/10	N/A	40	-0.03	-0.03	-0.03	1.30	-0.04
LB	22	1.0	0.70	6/10	N/A	40	0.00	0.00	0.00	0.70	0.00
SUM		**22.0**								**19.10**	**2.69**

Point velocities measured at 2/10 depth were multiplied by 0.8 to obtain mean in vertical.

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP1 Start: 17:38 Finish: 17:48

Date 6/4/2006 Party WLS, MTA, SLB

Width 10.0 ft Area 4.40 sq ft Vel. 0.13 fps Disch. 0.55 cfs

Method 0.6 No. Secs. 11 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S1W	0.39	0.39	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______ Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass, channel free of snow and ice

Flow:

Weather: Partly Cloudy, Winds 0-5 mph

Other:

Temp: 28°F

Gages: S1W

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP1 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.10	6/10	N/A	40	0.00	0.00	0.00	0.05	0.00
1.0	1	1.0	0.50	6/10	N/A	40	0.23	0.23	0.23	0.50	0.12
1.0	2	1.0	0.50	6/10	N/A	40	0.12	0.12	0.12	0.50	0.06
1.0	3	1.0	0.45	6/10	N/A	40	0.16	0.16	0.16	0.45	0.07
1.0	4	1.0	0.45	6/10	N/A	40	0.16	0.16	0.16	0.45	0.07
1.0	5	1.0	0.55	6/10	N/A	40	0.12	0.12	0.12	0.55	0.07
1.0	6	1.0	0.60	6/10	N/A	40	0.04	0.04	0.04	0.60	0.02
1.0	7	1.0	0.60	6/10	N/A	40	0.15	0.15	0.15	0.60	0.09
1.0	8	1.0	0.45	6/10	N/A	40	0.10	0.10	0.1	0.45	0.05
1.0	9	1.0	0.20	6/10	N/A	40	0.02	0.02	0.02	0.20	0.00
LB	10	0.5	0.10	6/10	N/A	40	0.00	0.00	0.00	0.05	0.00
SUM		**10.0**								**4.40**	**0.55**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By AMG

Check By JPM

Discharge Measurement Notes

Station No. ASDP1 Start: 16:20 Finish: 16:30

Date 6/5/2006 Party MDM, SLB, EJK

Width 22.0 ft Area 18.35 sq ft Vel. 0.01 fps Disch. 0.21 cfs

Method 0.6 No. Secs. 12 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S1W	0.38	0.38	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test NA after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass

Flow: Slow

Weather:

Other:

Temp: 38°F

Gages: S1W

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP1 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.15	6/10	N/A	40	0.00	0.00	0.00	0.15	0.00
1.0	2	2.0	0.70	6/10	N/A	40	0.05	0.05	0.05	1.40	0.07
1.0	4	2.0	1.00	6/10	N/A	40	0.01	0.01	0.01	2.00	0.02
1.0	6	2.0	1.20	6/10	N/A	40	0.00	0.00	0.00	2.40	0.00
1.0	8	2.0	1.20	6/10	N/A	40	0.01	0.01	0.01	2.40	0.02
1.0	10	2.0	1.25	6/10	N/A	40	0.03	0.03	0.03	2.50	0.08
1.0	12	2.0	1.20	6/10	N/A	40	0.00	0.00	0.00	2.40	0.00
1.0	14	2.0	0.90	6/10	N/A	40	0.01	0.01	0.01	1.80	0.02
1.0	16	2.0	0.65	6/10	N/A	40	0.00	0.00	0.00	1.30	0.00
1.0	18	2.0	0.55	6/10	N/A	40	0.00	0.00	0.00	1.10	0.00
1.0	20	2.0	0.45	6/10	N/A	40	0.00	0.00	0.00	0.90	0.00
RB	22	1.0	0.00							0.00	0.00
SUM		**22.0**								**18.35**	**0.21**

0.90
0.92
0.94
0.96
0.97
0.98
0.99
1.00
0.99
0.98
0.97
0.96
0.94
0.92
0.90
0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

ASDP Site 3

2006 Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 15:30 Finish: 16:15

Date 6/5/2006 Party MDM, EJK, SLB

Width 3.5 ft Area 4.07 sq ft Vel. 0.34 fps Disch. 1.39 cfs

Method 0.6 No. Secs. 7 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3N	-0.18	-0.18	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Narrow channel bound by saturated grass/tussocks

Flow:

Weather: Overcast, Cool, Wind 0 - 10 mph

Other:

Temp: 38^{o}F

Gages: S3N

Remarks: Channel relatively free of grass, slow flow, wind blowing in direction of flow, Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.50	6/10	0		0.00	0.00	0.00	0.25	0.00
1.0	1	0.8	1.35	6/10	5	43	0.14	0.14	0.14	1.01	0.14
1.0	1.5	0.5	1.55	6/10	15	55	0.29	0.29	0.29	0.78	0.23
1.0	2	0.5	1.60	6/10	30	41	0.74	0.74	0.74	0.80	0.59
1.0	2.5	0.5	1.50	6/10	20	48	0.43	0.43	0.43	0.75	0.32
1.0	3	0.5	0.70	6/10	15	49	0.33	0.33	0.33	0.35	0.11
LB	3.5	0.3	0.50	6/10	0		0.00	0.00	0.00	0.13	0.00
SUM		**3.5**								**4.07**	**1.39**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By EJK

Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 7:44 Finish: 8:02

Date 6/7/2006 Party MTA, AMG

Width 10.0 ft Area 6.80 sq ft Vel. 0.34 fps Disch. 4.07 cfs

Method Surface / 0.6 No. Secs. 10 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3C	-0.69	-0.69	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom mud and grass, no snow or ice in the channel

Flow:

Weather: Cloudy, Calm,

Other:

Temp: 39°F

Gages: S3C

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.00	6/10	0		0.00	0.00	0.00	0.00	0.00
1.0	2	1.5	0.50	2/10	0		0.00	0.00	0.00	0.75	0.00
1.0	3	1.0	0.65	SURFACE	15	56	0.60	0.54	0.54	0.65	0.35
1.0	4	1.0	0.60	6/10	15	60	0.56	0.56	0.56	0.60	0.34
1.0	5	1.0	1.20	6/10	10	54	0.42	0.42	0.42	1.20	0.51
1.0	6	1.0	1.20	6/10	20	63	0.71	0.71	0.71	1.20	0.85
1.0	7	1.0	1.10	6/10	15	51	0.66	0.66	0.66	1.10	0.73
1.0	8	1.0	0.80	SURFACE	20	53	0.84	0.76	0.76	0.80	0.61
1.0	9	1.0	0.50	SURFACE	10	47	0.48	0.43	0.43	0.50	0.22
RB	10	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**10.0**								**6.80**	**3.61**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By AMG

Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 16:26 Finish: 16:50

Date 6/10/2006 Party MTA, SLB, AMG

Width 20.0 ft Area 12.90 sq ft Vel. 0.42 fps Disch. 5.36 cfs

Method Surface / 0.6 No. Secs. 10 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3N	-0.14	-0.14	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and mud

Flow: South to North

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 50^{o}F

Gages: S3N

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/10/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	2	2.0	0.35	SURFACE	0	40	0.00	0.00	0.00	0.70	0.00
1.0	4	2.0	0.45	SURFACE	5	40	0.30	0.27	0.27	0.90	0.24
1.0	6	2.0	0.80	SURFACE	10	55	0.42	0.38	0.38	1.60	0.61
1.0	8	2.0	0.60	6/10	10	51	0.45	0.45	0.45	1.20	0.54
1.0	10	2.0	1.00	6/10	15	51	0.67	0.67	0.67	2.00	1.34
1.0	12	2.0	1.20	SURFACE	15	48	0.71	0.64	0.64	2.40	1.54
1.0	14	2.0	1.00	6/10	5	45	0.26	0.26	0.26	2.00	0.52
0.98	16	3.0	0.50	SURFACE	7	54	0.31	0.28	0.27	1.50	0.41
0.98	20	2.0	0.30	SURFACE	7	54	0.31	0.28	0.27	0.60	0.16
SUM		**20.0**								**12.90**	**5.36**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 13:00 Finish: 13:25

Date 6/12/2006 Party AMG, SLB, MTA

Width 36.0 ft Area 15.1 sq ft Vel. 0.36 fps Disch. 5.42 cfs

Method Surface / 0.6 No. Secs. 14 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3C	-0.66	-0.66	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and mud

Flow:

Weather: Cloudy, Calm Winds

Other:

Temp: 42°F

Gages: S3C

Remarks: Channel and region 100% clear of snow and ice, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/12/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
	0	2.5	0.10				0.00	0.00	0.00	0.25	0.00
1.0	5	5.0	0.30	SURFACE	3	64	0.12	0.11	0.11	1.50	0.17
1.0	10	6.5	0.30	SURFACE	0	40	0.00	0.00	0.00	1.95	0.00
1.0	18	4.5	0.60	SURFACE	20	63	0.72	0.65	0.65	2.70	1.76
1.0	19	1.0	0.70	SURFACE	20	60	0.76	0.68	0.68	0.70	0.48
1.0	20	1.0	1.20	6/10	20	64	0.71	0.71	0.71	1.20	0.85
1.0	21	1.0	0.90	6/10	20	54	0.84	0.84	0.84	0.90	0.76
1.0	22	1.0	0.90	6/10	20	64	0.71	0.71	0.71	0.90	0.64
1.0	23	1.0	0.80	6/10	5	41	0.29	0.29	0.29	0.80	0.23
1.0	24	1.5	0.60	6/10	7	46	0.36	0.36	0.36	0.90	0.32
1.0	26	2.0	0.50	SURFACE	3	47	0.16	0.14	0.14	1.00	0.14
1.0	28	2.0	0.40	SURFACE	3	80	0.10	0.09	0.09	0.80	0.07
1.0	30	4.0	0.30	SURFACE	0	40	0.00	0.00	0.00	1.20	0.00
1.0	36	3.0	0.10				0.00	0.00	0.00	0.3	0.00
SUM		**36.0**								**15.10**	**5.42**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By SLB

Check By JPM

Discharge Measurement Notes

Station No. ASDP3 Start: 11:00 Finish: 11:17

Date 6/16/2006 Party AMG, SLB

Width 22.0 ft Area 10.90 sq ft Vel. 0.36 fps Disch. 3.97 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S3C	-0.68	-0.68	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and mud

Flow:

Weather:

Other:

Temp: 34°F

Gages: S3C

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP3 6/16/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.20				0.00	0.00	0.00	0.20	0.00
1.0	2	2.0	0.30	SURFACE	3	46	0.16	0.14	0.14	0.60	0.08
1.0	4	2.0	0.30	SURFACE	3	46	0.16	0.14	0.14	0.60	0.08
1.0	6	2.0	0.30	SURFACE	3	46	0.16	0.14	0.14	0.60	0.08
1.0	8	2.0	0.40	SURFACE	3	46	0.16	0.14	0.14	0.80	0.11
1.0	10	2.0	0.60	SURFACE	5	52	0.23	0.21	0.21	1.20	0.25
1.0	12	2.0	1.00	6/10	10	53	0.43	0.43	0.43	2.00	0.86
1.0	14	2.0	1.00	6/10	15	44	0.76	0.76	0.76	2.00	1.52
1.0	16	2.0	0.60	6/10	15	49	0.69	0.69	0.69	1.20	0.83
1.0	18	2.0	0.40	SURFACE	5	55	0.22	0.19	0.19	0.80	0.16
1.0	20	2.0	0.30				0.00	0.00	0.00	0.60	0.00
LB	22	1.0	0.30				0.00	0.00	0.00	0.30	0.00
SUM		**22.0**								**10.90**	**3.97**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

ASDP Site 5

2006 Michael Baker Jr., Inc. Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 11:00 Finish: 11:46

Date 6/3/2006 Party MTA, MDM

Width 16.0 ft Area 10.85 sq ft Vel. 0.47 fps Disch. 5.14 cfs

Method 0.6 No. Secs. 17 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S5S	0.38	0.37	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Confined flow in snow and ice bound channel, approximately 75' upstream of S5S

Flow: Weather: Wind gust to 25 mph

Other: Temp: 27°F

Gages: S5S

Remarks: Ice and grass bed, grass ~1' long (max), some tussocks in channel ~0.3', wind blowing, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/3/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.50				0.00	0.00	0.00	0.25	0.00
1.0	1	1.0	0.60	6/10	N/A	40	1.06	1.06	1.06	0.60	0.64
1.0	2	1.0	0.75	6/10	N/A	40	1.01	1.01	1.01	0.75	0.76
1.0	3	1.0	0.70	6/10	N/A	40	0.71	0.71	0.71	0.70	0.50
1.0	4	1.0	0.75	6/10	N/A	40	0.77	0.77	0.77	0.75	0.58
1.0	5	1.0	0.70	6/10	N/A	40	1.19	1.19	1.19	0.70	0.83
1.0	6	1.0	0.70	6/10	N/A	40	0.74	0.74	0.74	0.70	0.52
1.0	7	1.0	0.65	6/10	N/A	40	0.56	0.56	0.56	0.65	0.36
1.0	8	1.0	0.70	6/10	N/A	40	0.50	0.50	0.5	0.70	0.35
1.0	9	1.0	0.80	6/10	N/A	40	0.18	0.18	0.18	0.80	0.14
1.0	10	1.0	0.75	6/10	N/A	40	0.22	0.22	0.22	0.75	0.17
1.0	11	1.0	0.75	6/10	N/A	40	0.27	0.27	0.27	0.75	0.20
1.0	12	1.0	0.75	6/10	N/A	40	0.1	0.1	0.1	0.75	0.08
1.0	13	1.0	0.70	6/10	N/A	40	0.02	0.02	0.02	0.70	0.01
1.0	14	1.0	0.65	6/10	N/A	40	0.00	0.00	0.00	0.65	0.00
1.0	15	1.0	0.50	6/10	N/A	40	0.00	0.00	0.00	0.50	0.00
LB	16	0.5	0.30	6/10	N/A	40	0.00	0.00	0.00	0.15	0.00
SUM		**16.0**								**10.85**	**5.14**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 16:27 Finish: 16:45

Date 6/4/2006 Party WLS, MTA, SLB

Width 16.0 ft Area 15.09 sq ft Vel. 0.28 fps Disch. 4.27 cfs

Method 0.6 No. Secs. 9 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S5S	0.30	0.30	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Ice on banks, channel bottom frozen mud, grass and ice

Flow:

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 28°F

Gages: S5S

Remarks: Ice and snow impacted measurement, Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.35	6/10	0	40	0.00	0.00	0.00	0.35	0.00
1.0	2	2.0	0.55	6/10	4	42	0.12	0.12	0.12	1.10	0.13
0.96	4	2.0	0.75	6/10	8	44	0.20	0.20	0.20	1.50	0.29
1.0	6	2.0	1.25	6/10	9	41	0.24	0.24	0.24	2.50	0.60
1.0	8	2.0	1.30	6/10	8	41	0.22	0.22	0.22	2.60	0.56
1.0	10	2.0	2.15	6/10	22	41	0.55	0.55	0.55	4.30	2.36
1.0	12	2.0	0.82	6/10	7	45	0.18	0.18	0.18	1.64	0.29
1.0	14	2.0	0.45	6/10	1	47	0.05	0.05	0.05	0.90	0.04
LB	16	1.0	0.20	6/10	0	40	0.00	0.00	0.00	0.20	0.00
SUM		**16.0**								**15.09**	**4.27**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 14:45 Finish: 15:05

Date 6/5/2006 Party MDM, EJK, SLB

Width 26.0 ft Area 19.26 sq ft Vel. 0.09 fps Disch. 1.73 cfs

Method 0.6 No. Secs. 18 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S5S	0.30	0.30	0.00

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, channel bottom long grass 1 - 1.5', uniform channel

Flow: South to North

Weather: Sunny, Winds 0 - 10 mph

Other:

Temp: 38^{o}F

Gages: S5S

Remarks: Could have used Pygmy Meter at below WS but wind blowing and influencing surface flow, wind blowing in the direction of flow, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	0.5	0.45	6/9	N/A	40	0.12	0.12	0.12	0.23	0.03
1.0	1	1.0	0.50	6/10	N/A	40	0.03	0.03	0.03	0.50	0.02
1.0	2	1.0	0.70	6/10	N/A	40	0.05	0.05	0.05	0.70	0.04
1.0	3	1.0	0.70	6/10	N/A	40	0.06	0.06	0.06	0.70	0.04
1.0	4	1.0	0.80	6/10	N/A	40	0.09	0.09	0.09	0.80	0.07
1.0	5	1.0	0.75	6/10	N/A	40	0.04	0.04	0.04	0.75	0.03
1.0	6	1.0	0.75	6/10	N/A	40	0.09	0.09	0.09	0.75	0.07
1.0	7	1.0	0.80	6/10	N/A	40	0.04	0.04	0.04	0.80	0.03
1.0	8	1.5	0.85	6/10	N/A	40	0.03	0.03	0.03	1.28	0.04
1.0	10	2.0	0.90	6/10	N/A	40	0.13	0.13	0.13	1.80	0.23
1.0	12	2.0	1.00	6/10	N/A	40	0.24	0.24	0.24	2.00	0.48
1.0	14	2.0	0.95	6/10	N/A	40	0.24	0.24	0.24	1.90	0.46
1.0	16	2.0	0.85	6/10	N/A	40	0.00	0.00	0.00	1.70	0.00
1.0	18	2.0	0.80	6/10	N/A	40	0.02	0.02	0.02	1.60	0.03
1.0	20	2.0	0.85	6/10	N/A	40	0.02	0.02	0.02	1.70	0.03
1.0	22	2.0	0.45	6/10	N/A	40	0.04	0.04	0.04	0.90	0.04
1.0	24	2.0	0.40	6/10	N/A	40	0.11	0.11	0.11	0.80	0.09
LB	26	1.0	0.35	6/10	N/A	40	0.00	0.00	0.00	0.35	0.00
SUM		**26.0**								**19.26**	**1.73**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 8:36 Finish: 8:56

Date 6/7/2006 Party MTA, AMG

Width 16.0 ft Area 21.50 sq ft Vel. 0.38 fps Disch. 8.16 cfs

Method Surface/0.6 No. Secs. 9 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S5N	0.63	0.62	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section:

Flow:

Weather: Overcast

Other:

Temp: 39°F

Gages: S5N

Remarks: X-section in deep hole location, minimal eddying, lew is start of 20 ft sheet flow containing less than 1% flow, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.40				0.00	0.00	0.00	0.40	0.00
0.7	2	2.0	0.60	SURFACE	5	59	0.20	0.18	0.13	1.20	0.16
0.7	4	2.0	0.80	SURFACE	5	40	0.29	0.26	0.18	1.60	0.29
0.98	6	2.0	1.00	6/10	5	40	0.29	0.29	0.29	2.00	0.58
1.0	8	2.0	1.90	6/10	15	52	0.65	0.65	0.65	3.80	2.47
1.0	10	2.0	3.00	2/10	10	45	0.50	0.58	0.58	6.00	3.48
				6/10	15	51	0.66				
				8/10	10	45	0.50				
0.92	12	2.0	2.20	6/10	7	45	0.36	0.36	0.33	4.40	1.45
0.6	14	2.0	0.90	6/10	5	46	0.26	0.26	0.15	1.80	-0.27
LB	16	1.0	0.30				0.00	0.00	0.00	0.30	0.00
SUM		**16.0**								**21.50**	**8.16**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 9:30 Finish: 9:55

Date 6/8/2006 Party SLB, EJK

Width 20.0 ft Area 10.70 sq ft Vel. 0.75 fps Disch. 8.07 cfs

Method Surface No. Secs. 21 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S5N	0.63	0.63	0
S5C	0.64	0.63	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA011

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, banks are saturated with small amounts of flow, measurement taken between S5N and S5C

Flow:

Weather: Partly Cloudy

Other:

Temp: 45°F

Gages: between S5N and S5C

Remarks: Choose area with the best defined channel, almost zero wind, surface readings are absolutely possible with the Price AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.30				0.00	0.00	0.00	0.15	0.00
1.0	1	1.0	0.70	SURFACE	11	42	0.59	0.53	0.53	0.70	0.37
1.0	2	1.0	0.70	SURFACE	28	41	1.51	1.36	1.36	0.70	0.95
0.99	3	1.0	0.70	SURFACE	30	40	1.66	1.50	1.48	0.70	1.04
1.0	4	1.0	0.65	SURFACE	21	42	1.11	1.00	0.99	0.65	0.64
1.0	5	1.0	0.75	SURFACE	29	41	1.57	1.41	1.41	0.75	1.06
1.0	6	1.0	0.85	SURFACE	26	40	1.44	1.30	1.30	0.85	1.11
0.99	7	1.0	0.60	SURFACE	26	41	1.41	1.27	1.25	0.60	0.75
0.98	8	1.0	0.55	SURFACE	21	41	1.13	1.02	1.00	0.55	0.55
1.0	9	1.0	0.50	SURFACE	18	41	0.97	0.88	0.88	0.50	0.44
1.0	10	1.0	0.45	SURFACE	20	40	1.11	1.00	1.00	0.45	0.45
1.0	11	1.0	0.45	SURFACE	14	41	0.76	0.69	0.69	0.45	0.31
1.0	12	1.0	0.40	SURFACE	8	43	0.42	0.38	0.38	0.40	0.15
1.0	13	1.0	0.45	SURFACE	7	42	0.38	0.34	0.34	0.45	0.15
1.0	14	1.0	0.35	SURFACE	0	40	0.00	0.00	0.00	0.35	0.00
1.0	15	1.0	0.40	SURFACE	5	41	0.28	0.26	0.26	0.4	0.10
1.0	16	1.0	0.40				0.00	0.00	0.00	0.4	0.00
1.0	17	1.0	0.40				0.00	0.00	0.00	0.4	0.00
1.0	18	1.0	0.60				0.00	0.00	0.00	0.6	0.00
1.0	19	1.0	0.50				0.00	0.00	0.00	0.5	0.00
LB	20	0.5	0.30				0.00	0.00	0.00	0.15	0.00
SUM		**20.0**								**10.70**	**8.07**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By MTA

Check By JPM

Discharge Measurement Notes

Station No. ASDP5 Start: 12:35 Finish: 12:55

Date 6/9/2006 Party MTA, AMG, SLB

Width 11.0 ft Area 5.59 sq ft Vel. 0.72 fps Disch. 4.05 cfs

Method Surface / 0.6 No. Secs. 13 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S5N	0.57	0.57	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel clear of snow, channel bottom mud

Flow:

Weather: Sunny, Clear, Winds 0 - 5 mph

Other:

Temp: 50°F

Gages: S5N

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP5 6/9/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	0.5	0.30				0.00	0.00	0.00	0.15	0.00
1.0	1	1.0	0.30	SURFACE	15	59	0.58	0.52	0.52	0.30	0.16
1.0	2	0.8	0.30	SURFACE	20	51	0.89	0.80	0.80	0.23	0.18
0.96	2.5	0.5	0.60	6/10	15	43	0.79	0.79	0.76	0.30	0.23
1.0	3	0.5	1.00	6/10	15	42	0.81	0.81	0.81	0.50	0.41
1.0	3.5	0.5	1.20	6/10	20	45	1.01	1.01	1.01	0.60	0.61
1.0	4	0.5	1.20	6/10	20	43	1.05	1.05	1.05	0.60	0.63
1.0	4.5	0.5	1.00	6/10	25	50	1.13	1.13	1.13	0.50	0.57
1.0	5	0.5	0.90	6/10	20	43	1.05	1.05	1.05	0.45	0.47
1.0	5.5	0.5	0.50	SURFACE	20	46	0.98	0.89	0.89	0.25	0.22
1.0	6	1.3	0.30	SURFACE	10	40	0.57	0.51	0.51	0.38	0.19
1.0	8	2.5	0.35	SURFACE	10	48	0.48	0.43	0.43	0.88	0.38
RB	11	1.5	0.30				0.00	0.00	0.00	0.45	0.00
SUM		**11.0**								**5.59**	**4.05**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

ASDP Site 6

2006 Michael Baker Jr., Inc.

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 15:42 Finish: 16:15

Date 6/4/2006 Party SLB, WLS, MTA

Width 10 ft Area 11.65 sq. ft. Vel. 0.59 fps Disch. 6.89 cfs

Method 0.6 No. Secs. 11 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6N	1.39	1.39	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom willows, grass and ice

Flow:

Weather: Partly Cloudy, Calm Winds

Other:

Temp: 28°F

Gages: S6N

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.30	6/10	0	40	0.00	0.00	0.00	0.15	0.00
1.0	1	1.0	0.75	6/10	10	42	0.26	0.26	0.26	0.75	0.19
0.96	2	1.0	0.90	6/10	23	40	0.59	0.59	0.56	0.90	0.51
0.96	3	1.0	1.05	6/10	20	42	0.49	0.49	0.47	1.05	0.49
0.96	4	1.0	1.75	6/10	15	41	0.38	0.38	0.37	1.75	0.64
0.94	5	1.0	1.65	6/10	44	41	1.07	1.07	1.01	1.65	1.66
0.94	6	1.0	1.60	6/10	48	41	1.17	1.17	1.10	1.60	1.76
0.94	7	1.0	1.30	6/10	24	40	0.61	0.61	0.57	1.30	0.75
0.96	8	1.0	1.10	6/10	20	40	0.51	0.51	0.49	1.10	0.54
1.0	9	1.0	1.00	6/10	11	41	0.29	0.29	0.29	1.00	0.29
LB	10	0.5	0.80	6/10	5	40	0.15	0.15	0.15	0.40	0.06
SUM		**10.0**								**11.65**	**6.89**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 14:15 Finish: 14:25

Date 6/5/2006 Party MDM, SLB, EJK

Width 10.0 ft Area 9.91 sq ft Vel. 1.62 fps Disch. 16.1 cfs

Method 0.6 No. Secs. 11 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6C	1.10	1.11	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass and willows on banks, channel bottom grass, measurement taken between S6C and S6S, between two ponds

Flow: Perpendicular to x-section, uniform

Weather: Wind 5 - 10 mph, with gusts to 15 mph

Other:

Temp: 38°F

Gages: S6C

Remarks: Wind blowing in direction of flow, willows on left bank, tall grass from 1-1.5', Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.35				0.00	0.00	0.00	0.18	0.00
1.0	1	1.0	0.60	SURFACE	10	42	0.26	0.23	0.23	0.60	0.14
1.0	2	1.0	0.50	SURFACE	27	40	0.68	0.62	0.62	0.50	0.31
1.0	3	1.0	0.70	6/10	47	41	1.14	1.14	1.14	0.70	0.80
1.0	4	1.0	0.80	6/10	62	40	1.54	1.54	1.54	0.80	1.23
1.0	5	1.0	1.10	6/10	54	40	1.34	1.34	1.34	1.10	1.48
1.0	6	1.0	1.15	6/10	65	50	1.29	1.29	1.29	1.15	1.49
1.0	7	1.0	1.55	6/10	116	40	2.84	2.84	2.84	1.55	4.40
1.0	8	1.0	1.50	6/10	91	40	2.24	2.24	2.24	1.50	3.36
1.0	9	1.0	1.30	6/10	76	40	1.88	1.88	1.88	1.30	2.44
LB	10	0.5	1.05	6/10	35	41	0.86	0.86	0.86	0.53	0.45
SUM		**10.0**								**9.91**	**16.10**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 16:30 Finish: 16:55

Date 6/6/2006 Party AMG, JPM, SLB

Width 21.0 ft Area 25.61 sq ft Vel. 0.55 fps Disch. 14.07 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6A	1.05	1.05	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, Channel bottom ice and grass, firm, fairly uniform

Flow: Steady

Weather: Cloudy, Winds 5 - 10 mph

Other:

Temp: 40°F

Gages: S6A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	28	1.0	0.30				0.00	0.00	0.00	0.30	0.00
1.0	26	2.0	0.60	SURFACE	7	44	0.37	0.33	0.33	1.20	0.40
1.0	24	2.0	0.70	SURFACE	15	45	0.74	0.67	0.67	1.40	0.94
1.0	22	1.5	1.45	6/10	20	45	0.99	0.99	0.99	2.18	2.16
1.0	21	1.0	1.95	6/10	20	47	0.95	0.95	0.95	1.95	1.85
1.0	20	1.5	2.05	6/10	15	41	0.82	0.82	0.82	3.08	2.53
1.0	18	2.0	2.20	6/10	15	43	0.78	0.78	0.78	4.40	3.43
1.0	16	2.0	2.00	6/10	7	42	0.38	0.38	0.38	4.00	1.52
1.0	14	2.0	1.30	6/10	5	52	0.23	0.23	0.23	2.60	0.60
1.0	12	2.0	1.00	SURFACE	7	46	0.35	0.32	0.32	2.00	0.64
1.0	10	2.5	1.00	SURFACE	0	40	0.00	0.00	0.00	2.50	0.00
LB	7	1.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**21.0**								**25.61**	**14.07**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 9:30 Finish: 9:51

Date 6/7/2006 Party MTA, AMG

Width 22.0 ft Area 22.80 sq ft Vel. 1.29 fps Disch. 29.51 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6A	1.56	1.55	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willow and grass on banks, channel bottom grass and willows

Flow:

Weather: Cloudy, Winds 0 - 5 mph

Other:

Temp: 39^{o}F

Gages: S6C

Remarks: Channel at measurement is clear of snow and ice, channel represents 99% of flow,

AA Meter

Site/Date: ASDP6 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	2	2.0	0.40	SURFACE	10	52	0.44	0.39	0.39	0.80	0.31
0.92	4	2.0	0.90	SURFACE	10	58	0.39	0.35	0.33	1.80	0.59
0.97	6	2.0	1.30	6/10	40	44	2.01	2.01	1.95	2.60	5.07
0.99	8	2.0	1.70	6/10	30	53	1.26	1.26	1.25	3.40	4.25
1.0	10	2.0	2.10	6/10	30	48	1.39	1.39	1.39	4.20	5.84
0.96	12	2.0	1.70	6/10	35	42	1.85	1.85	1.77	3.40	6.02
0.96	14	2.0	1.20	6/10	40	50	1.77	1.77	1.70	2.40	4.08
0.90	16	2.0	0.90	6/10	30	48	1.39	1.39	1.25	1.80	2.25
0.90	18	2.0	0.80	SURFACE	20	52	0.86	0.77	0.69	1.60	1.10
0.90	20	2.0	0.40	SURFACE	0	40	0.00	0.00	0.00	0.80	0.00
LB	22	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**22.0**								**22.80**	**29.51**

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 13:20 Finish: 13:50

Date 6/8/2006 Party SLB, EJK

Width 53.0 ft Area 53.85 sq ft Vel. 1.08 fps Disch. 58.27 cfs

Method Surface / 0.6 No. Secs. 28 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6A	1.94	1.95	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow and willows on banks, channel bottom grass and willows, willows cover approximately 1/3 of channel bottom

Flow:

Weather: Partly Cloudy, Winds 5 - 15 mph

Other:

Temp: 45°F

Gages: S6C

Remarks: Bed ice breaking free upstream during x-section up to 50 ft long 25 ft wide, Ice jam upstream occurred during discharge measurement, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.05	Thick Willows & Grass			0.00	0.00	0.00	0.05	0.00
1.0	2	2.0	0.20				0.00	0.00	0.00	0.40	0.00
1.0	4	2.0	0.40				0.00	0.00	0.00	0.80	0.00
1.0	6	2.0	0.80				0.00	0.00	0.00	1.60	0.00
1.0	8	2.0	1.25	SURFACE	35	40	1.94	1.74	1.74	2.50	4.35
1.0	10	2.0	0.90	SURFACE	30	40	1.66	1.50	1.50	1.80	2.70
1.0	12	2.0	1.35	SURFACE	40	44	2.01	1.81	1.81	2.70	4.89
1.0	14	2.0	1.30	6/10	20	42	1.06	1.06	1.06	2.60	2.76
1.0	16	2.0	1.45	6/10	50	44	2.51	2.51	2.51	2.90	7.28
1.0	18	2.0	1.70	6/10	50	55	2.01	2.01	2.01	3.40	6.83
1.0	20	2.0	2.00	6/10	40	49	1.81	1.81	1.81	4.00	7.23
1.0	22	2.0	1.85	6/10	50	43	2.57	2.57	2.57	3.70	9.51
1.0	24	2.0	1.25	6/10	40	50	1.77	1.77	1.77	2.50	4.43
1.0	26	2.0	1.50	6/10	31	59	1.16	1.16	1.16	3.00	3.49
1.0	28	2.0	1.30	Willows			0.00	0.00	0.00	2.60	0.00
1.0	30	2.0	1.30	SURFACE	7	49	0.33	0.30	0.30	2.60	0.77
1.0	32	2.0	1.20	SURFACE	15	46	0.73	0.66	0.66	2.40	1.57
1.0	34	2.0	1.35	SURFACE	10	40	0.56	0.51	0.51	2.70	1.37
1.0	36	2.0	1.15	SURFACE	10	43	0.53	0.47	0.47	2.30	1.09
1.0	38	2.0	0.95	Thick Willows & Grass			0.00	0.00	0.00	1.90	0.00
1.0	40	2.0	0.50				0.00	0.00	0.00	1.00	0.00
1.0	42	2.0	0.50				0.00	0.00	0.00	1.00	0.00
1.0	44	2.0	0.50				0.00	0.00	0.00	1.00	0.00
1.0	46	2.0	0.50				0.00	0.00	0.00	1.00	0.00
1.0	48	2.0	0.60				0.00	0.00	0.00	1.20	0.00
1.0	50	2.0	0.65				0.00	0.00	0.00	1.30	0.00
1.0	52	1.5	0.60				0.00	0.00	0.00	0.90	0.00
RB	53	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**53.0**								**53.85**	**58.27**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 13:42 Finish: 14:06

Date 6/9/2006 Party MTA, SLB, AMG

Width 32.0 ft Area 43.40 sq ft Vel. 1.64 fps Disch. 70.98 cfs

Method Surface / 0.6 No. Secs. 17 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6A	1.98	1.96	0.02

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows and grass on banks, channel bottom grass and willows, 90% free of snow

Flow:

Weather: Sunny, Winds 0 - 5 mph

Other:

Temp: 50°F

Gages: S6C

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/9/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	2	1.0	0.20				0.00	0.00	0.00	0.20	0.00
1.0	4	2.0	0.45	SURFACE	7	50	0.33	0.30	0.30	0.90	0.27
1.0	6	2.0	0.70	SURFACE	7	41	0.40	0.36	0.36	1.40	0.50
1.0	8	2.0	1.00	SURFACE	15	49	0.70	0.63	0.63	2.00	1.26
0.97	10	2.0	1.30	6/10	20	51	0.89	0.89	0.86	2.60	2.24
1.0	12	2.0	1.25	6/10	15	44	0.78	0.78	0.78	2.50	1.95
0.98	14	2.0	1.40	SURFACE	25	47	1.20	1.08	1.06	2.80	2.97
1.0	16	2.0	1.45	6/10	20	43	1.05	1.05	1.05	2.90	3.05
1.0	18	2.0	1.65	6/10	50	46	2.43	2.43	2.43	3.30	8.02
1.0	20	2.0	2.30	6/10	50	41	2.73	2.73	2.73	4.60	12.56
1.0	22	2.0	2.65	6/10	50	48	2.33	2.33	2.33	5.30	12.35
1.0	24	2.0	2.65	6/10	60	47	2.85	2.85	2.85	5.30	15.11
1.0	26	2.0	1.60	6/10	40	40	2.24	2.24	2.24	3.20	7.17
1.0	28	2.0	1.50	SURFACE	20	50	0.91	0.82	0.82	3.00	2.45
1.0	30	2.0	1.10	SURFACE	7	42	0.39	0.35	0.35	2.20	0.77
1.0	32	2.0	0.60	SURFACE	5	41	0.29	0.26	0.26	1.20	0.31
LB	34	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**32.0**								**43.40**	**70.98**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 13:15 Finish: 13:40

Date 6/10/2006 Party MTA, AMG, SLB

Width 30.0 ft Area 34.30 sq ft Vel. 1.65 fps Disch. 56.87 cfs

Method Surface / 0.6 No. Secs. 16 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6C	1.80	1.80	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass

Flow:

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 50°F

Gages: S6C

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/10/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	2	2.0	0.20	SURFACE			0.00	0.00	0.00	0.40	0.00
1.0	4	2.0	0.40	SURFACE	15	55	0.62	0.56	0.56	0.80	0.45
1.0	6	2.0	0.80	SURFACE	15	54	0.64	0.57	0.57	1.60	0.91
1.0	8	2.0	0.90	SURFACE	15	47	0.73	0.65	0.65	1.80	1.17
1.0	10	2.0	1.00	SURFACE	15	46	0.74	0.67	0.67	2.00	1.34
1.0	12	2.0	1.00	6/10	30	44	1.53	1.53	1.53	2.00	3.06
1.0	14	2.0	1.30	6/10	40	43	2.08	2.08	2.08	2.60	5.41
1.0	16	2.0	1.85	6/10	40	46	1.95	1.95	1.95	3.70	7.22
1.0	18	2.0	2.10	6/10	50	48	2.33	2.33	2.33	4.20	9.79
1.0	20	2.0	2.20	6/10	40	50	1.80	1.80	1.80	4.40	7.92
0.94	22	2.0	2.30	6/10	40	40	2.24	2.24	2.11	4.60	9.71
0.94	24	2.0	1.40	6/10	40	41	2.19	2.19	2.05	2.80	5.74
1.0	26	2.0	1.20	SURFACE	30	42	1.60	1.44	1.44	2.40	3.47
1.0	28	2.0	0.50	SURFACE	15	45	0.76	0.68	0.68	1.00	0.68
LB	30	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**30.0**								**34.30**	**56.87**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By AMG

Check By JPM

Discharge Measurement Notes

Station No. ASDP6 Start: 8:01 Finish: 8:18

Date 6/12/2006 Party MTA, AMG, SLB

Width 22.0 ft Area 27.40 sq ft Vel. 1.6 fps Disch. 43.91 cfs

Method Surface / 0.6 No. Secs. 12 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S6C	1.71	1.71	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows on banks, channel bottom grass, free of ice and snow

Flow: Weather: Overcast, Calm

Other: Temp: 42°F

Gages: S6C

Remarks: Tag-line a little skewed, angles taken, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP6 6/12/2006

							VELOCITY				
Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	At Point (fps)	Mean in Vertical (fps)	Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.20				0.00	0.00	0.00	0.20	0.00
0.90	2	2.0	0.65	SURFACE	20	48	0.94	0.85	0.76	1.30	0.99
0.92	4	2.0	1.30	6/10	15	40	0.85	0.85	0.78	2.60	2.03
0.99	6	2.0	1.60	6/10	40	42	2.13	2.13	2.11	3.20	6.75
0.99	8	2.0	2.10	6/10	40	48	1.87	1.87	1.85	4.20	7.77
0.96	10	2.0	2.20	6/10	40	47	1.91	1.91	1.83	4.40	8.05
0.90	12	2.0	1.85	6/10	40	44	2.04	2.04	1.83	3.70	6.77
0.92	14	2.0	1.50	6/10	40	42	2.13	2.13	1.96	3.00	5.88
0.92	16	2.0	1.10	6/10	40	50	1.80	1.80	1.65	2.20	3.63
0.96	18	2.0	0.80	SURFACE	15	40	0.85	0.77	0.74	1.60	1.18
0.99	20	2.0	0.50	SURFACE	20	47	0.96	0.87	0.86	1.00	0.86
LB	22	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**22.0**								**27.40**	**43.91**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

ASDP Site 7

 Michael Baker Jr., Inc.

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP7 Start: 15:20 Finish: 15:50

Date 6/5/2006 Party MDM, EJK, SLB

Width 3 ft Area 1.16 sq ft Vel. 0.36 fps Disch. 0.42 cfs

Method 0.6 No. Secs. 7 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S7C	0.23	0.23	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Banks grass and ice, bound by tussocks, 25 ft north of S7C

Flow:

Weather: Sunny, Winds 5 - 15 mph

Other:

Temp: 38°F

Gages: S7C

Remarks: Flew only at S7C, local melt at other gages, 0.5-1.0 ft grass, patchy grass,

Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP7 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	0.25	0.20	6/10	N/A	40	0.12	0.12	0.12	0.05	0.01
1.0	0.5	0.5	0.40	6/10	N/A	40	0.28	0.28	0.28	0.20	0.06
1.0	1.0	0.5	0.55	6/10	N/A	40	0.35	0.35	0.35	0.28	0.10
1.0	1.5	0.5	0.60	6/10	N/A	40	0.55	0.55	0.55	0.30	0.17
1.0	2.0	0.5	0.40	6/10	N/A	40	0.24	0.24	0.24	0.20	0.05
1.0	2.5	0.5	0.25	6/10	N/A	40	0.21	0.21	0.21	0.13	0.03
RB	3.0	0.25	0.00	6/10	N/A	40	0.00	0.00	0.00	0.00	0.00
SUM		**3.0**								**1.16**	**0.42**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP7 Start: 15:40 Finish: 15:50

Date 6/6/2006 Party JPM, AMG, SLB

Width 3.8 ft Area 1.61 sq ft Vel. 0.12 fps Disch. 0.18 cfs

Method 0.6 No. Secs. 7 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S7C	0.27	0.28	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, uniform, firm

Flow: Steady

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S7C

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP7 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	3	0.25	0.00	6/10	N/A	40	0.00	0.00	0.00	0.00	0.00
1.0	3.5	0.5	0.35	6/10	N/A	40	0.07	0.07	0.07	0.18	0.01
1.0	4.0	0.6	0.60	6/10	N/A	40	0.13	0.13	0.13	0.33	0.04
1.0	4.6	0.6	0.70	6/10	N/A	40	0.24	0.24	0.24	0.42	0.10
1.0	5.2	0.8	0.60	6/10	N/A	40	0.04	0.04	0.04	0.48	0.02
1.0	6.2	0.8	0.25	6/10	N/A	40	0.07	0.07	0.07	0.20	0.01
RB	6.8	0.3	0.00	6/10	N/A	40	0.00	0.00	0.00	0.00	0.00
SUM		**3.8**								**1.61**	**0.18**

0.90
0.92
0.94
0.96
0.97
0.98
0.99
1.00
0.99
0.98
0.97
0.96
0.94
0.92
0.90
0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP7 Start: 10:26 Finish: 10:44

Date 6/7/2006 Party MTA, AMG

Width 20 ft Area 19.3 sq ft Vel. 0.23 fps Disch. 4.37 cfs

Method Surface / 0.6 No. Secs. 11 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S7S	-0.11	-0.11	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass, x-section clear of snow and ice

Flow:

Weather:

Other:

Temp: 39°F

Gages: S7S

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP7 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
0.90	2	2.0	0.50	SURFACE	15	49	0.33	0.29	0.26	1.00	0.26
0.97	4	2.0	0.90	SURFACE	15	54	0.30	0.27	0.26	1.80	0.47
0.50	6	2.0	1.20	6/10	15	46	0.34	0.34	0.17	2.40	0.41
0.85	8	2.0	1.30	6/10	20	46	0.45	0.45	0.38	2.60	1.00
0.70	10	2.0	1.60	6/10	15	57	0.28	0.28	0.20	3.20	0.63
0.92	12	2.0	1.50	6/10	15	50	0.32	0.32	0.29	3.00	0.88
0.92	14	2.0	1.10	SURFACE	5	55	0.12	0.10	0.10	2.20	0.21
0.90	16	2.0	0.75	SURFACE	10	48	0.23	0.21	0.19	1.50	0.28
0.90	18	2.0	0.60	SURFACE	7	46	0.18	0.16	0.14	1.20	0.17
LB	20	1.0	0.40	SURFACE	7	49	0.17	0.15	0.15	0.40	0.06
SUM		**20.0**								**19.30**	**4.37**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP7 Start: 14:10 Finish: 14:30

Date 6/8/2006 Party EJK, SLB

Width 48 ft Area 23.65 sq ft Vel. 0.13 fps Disch. 3.17 cfs

Method 0.6 No. Secs. 18 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S7N	0.06	0.06	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, set up ~30 ft upstream from gage S7N, saturated banks with ponding water

Flow:

Weather: Sunny, Partly Cloudy, Winds 10 - 15 mph

Other:

Temp: 45^{o}F

Gages: S7N

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP7 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.15				0.00	0.00	0.00	0.15	0.00
1.0	2	2.0	0.25				0.00	0.00	0.00	0.50	0.00
1.0	4	2.0	0.30				0.00	0.00	0.00	0.60	0.00
1.0	6	2.0	0.25				0.00	0.00	0.00	0.50	0.00
1.0	8	2.0	0.10				0.00	0.00	0.00	0.20	0.00
1.0	10	2.0	0.50	6/10	N/A	40	0.03	0.03	0.03	1.00	0.03
1.0	12	2.0	0.50	6/10	N/A	40	0.09	0.09	0.09	1.00	0.09
1.0	14	3.0	0.80	6/10	N/A	40	0.24	0.24	0.24	2.40	0.58
1.0	18	4.0	0.85	6/10	N/A	40	0.12	0.12	0.12	3.40	0.41
1.0	22	3.0	0.70	6/10	N/A	40	0.35	0.35	0.35	2.10	0.74
1.0	24	3.0	0.50	6/10	N/A	40	0.24	0.24	0.24	1.50	0.36
1.0	28	4.0	0.60	6/10	N/A	40	0.13	0.13	0.13	2.40	0.31
1.0	32	4.0	0.40	6/10	N/A	40	0.05	0.05	0.05	1.60	0.08
1.0	36	4.0	0.60	6/10	N/A	40	0.04	0.04	0.04	2.40	0.10
1.0	40	4.0	0.50	6/10	N/A	40	0.10	0.10	0.10	2.00	0.20
1.0	44	3.0	0.40	6/10	N/A	40	0.19	0.19	0.19	1.20	0.23
1.0	46	2.0	0.25	6/10	N/A	40	0.07	0.07	0.07	0.50	0.04
RB	48	1.0	0.20				0.00	0.00	0.00	0.20	0.00
SUM		**48.0**								**23.65**	**3.17**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

ASDP Site 9

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP9 Start: 10:00 Finish: 10:35

Date 6/6/2006 Party JPM, AMG, SLB

Width 75 ft Area 23.51 ft Vel. 0.24 fps Disch. 5.69 cfs

Method Surface / 0.6 No. Secs. 40 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S9C	0.20	0.20	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, measured 120 ft upstream from gage S9C

Flow:

Weather: Rain, Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S9C

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP9 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	0.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	1	2.0	0.45				0.00	0.00	0.00	0.90	0.00
0.55	4	3.5	0.40	SURFACE	15	41	0.38	0.35	0.19	1.40	0.27
0.60	8	3.0	0.50	SURFACE	20	42	0.49	0.44	0.27	1.50	0.40
0.30	10	2.5	0.60	SURFACE	10	40	0.27	0.24	0.07	1.50	0.11
0.0	13	2.5	0.60				0.00	0.00	0.00	1.50	0.00
RB	15	1.0	0.00				0.00	0.00	0.00	0.00	0.00
LB	20	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	22	1.5	0.45				0.00	0.00	0.00	0.68	0.00
1.0	23	1.0	0.50	SURFACE	60	42	1.42	1.28	1.28	0.50	0.64
1.0	24	1.0	0.35	SURFACE	40	42	0.95	0.86	0.86	0.35	0.30
1.0	25	1.0	0.20				0.00	0.00	0.00	0.20	0.00
0.96	26	1.5	0.50	SURFACE	30	43	0.71	0.64	0.61	0.75	0.46
1.0	28	2.5	0.40	SURFACE	20	44	0.47	0.42	0.42	1.00	0.42
RB	31	1.5	0.00				0.00	0.00	0.00	0.00	0.00
LB	48	0.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	49	1.5	0.55	SURFACE	80	44	1.80	1.62	1.62	0.83	1.34
1.0	51	3.0	0.40	SURFACE	15	56	0.29	0.26	0.26	1.20	0.31
RB	55	2.0	0.00				0.00	0.00	0.00	0.00	0.00
LB	56	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	58	2.0	0.40				0.00	0.00	0.00	0.80	0.00
1.0	60	2.0	0.30				0.00	0.00	0.00	0.60	0.00
1.0	62	2.5	0.10				0.00	0.00	0.00	0.25	0.00
0.94	65	3.0	0.40	SURFACE	25	40	0.64	0.57	0.54	1.20	0.65
0.75	68	3.0	0.40	SURFACE	15	51	0.31	0.28	0.21	1.20	0.25
RB	71	1.5	0.00				0.00	0.00	0.00	0.00	0.00
LB	83	1.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	86	3.0	0.30				0.00	0.00	0.00	0.90	0.00
0.70	89	2.0	0.35	SURFACE	10	41	0.26	0.24	0.17	0.70	0.12
RB	90	0.5	0.00				0.00	0.00	0.00	0.00	0.00

CONTINUED ON FOLLOWING SHEET

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP9 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	92	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	94	3.0	0.45	SURFACE	7	42	0.19	0.17	0.17	1.35	0.23
1.0	96	2.0	0.40				0.00	0.00	0.00	0.80	0.00
1.0	98	2.0	0.20				0.00	0.00	0.00	0.40	0.00
1.0	100	2.5	0.40				0.00	0.00	0.00	1.00	0.00
RB	103	1.5	0.00				0.00	0.00	0.00	0.00	0.00
LB	106	1.5	0.00				0.00	0.00	0.00	0.00	0.00
0.90	109	2.5	0.40	SURFACE	10	47	0.23	0.21	0.19	1.00	0.19
1.0	111	2.5	0.40				0.00	0.00	0.00	1.00	0.00
RB	114	1.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**75.0**								**23.51**	**5.69**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

ASDP Site 10

2006 Michael Baker Jr., Inc. Comp. By MTA/JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 16:27 Finish: 16:35

Date 6/3/2006 Party MTA, EJK

Width 5.0 ft Area 1.6 sq ft Vel. 1.8 fps Disch. 2.88 cfs

Method 0.6 No. Secs. 6 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.84	0.84	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, channel bottom grass and ice

Flow:

Weather:

Other:

Temp: 27°F

Gages: S10

Remarks: Ice and snow impacts to cross section, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/3/2006

							VELOCITY				
Angle Coeff.	**Distance from initial point** (ft)	**Section Width** (ft)	**Water Depth** (ft)	**Observed Depth** (ft)	**Revolution Count**	**Time Increment** (sec)	**At Point** (fps)	**Mean in Vertical** (fps)	**Adjusted for Angle Coeff** (fps)	**Area** (s.f.)	**Discharge** (cfs)
RB	0	0.5	0.10				0.00	0.00	0.00	0.05	0.00
1.0	1	1.0	0.10	6/10	N/A	40	0.91	0.91	0.91	0.10	0.09
1.0	2	1.0	0.40	6/10	N/A	40	2.79	2.79	2.79	0.40	1.12
1.0	3	1.0	0.60	6/10	N/A	40	1.62	1.62	1.62	0.60	0.97
1.0	4	1.0	0.40	6/10	N/A	40	1.74	1.74	1.74	0.40	0.70
LB	5	0.5	0.10	6/10	N/A	40	0.00	0.00	0.00	0.05	0.00
SUM		**5.0**								**1.60**	**2.88**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By MTA/JPM

Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 8:47 Finish: 9:04

Date 6/4/2006 Party EJK, MTA

Width 15.0 ft Area 5.42 sq ft Vel. 1.09 fps Disch. 5.89 cfs

Method 0.6 No. Secs. 16 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.84	0.84	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, right banks flow over ice and left bank flow over grass, channel bottom grass and ice

Flow:

Weather: Partly Cloudy

Other:

Temp: 28°F

Gages: S10

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.15				0.00	0.00	0.00	0.08	0.00
0.96	1	1.0	0.15	6/10	9	40	0.25	0.25	0.24	0.15	0.04
0.96	2	1.0	0.15	6/10	16	43	0.39	0.39	0.37	0.15	0.06
0.96	3	1.0	0.25	6/10	21	40	0.54	0.54	0.52	0.25	0.13
0.96	4	1.0	0.25	6/10	29	40	0.73	0.73	0.70	0.25	0.18
0.98	5	1.0	0.26	6/10	40	41	0.98	0.98	0.96	0.26	0.25
1.0	6	1.0	0.25	6/10	59	50	1.18	1.18	1.18	0.25	0.30
1.0	7	1.0	0.30	6/10	64	40	1.58	1.58	1.58	0.30	0.47
1.0	8	1.0	0.45	6/10	80	40	1.97	1.97	1.97	0.45	0.89
0.98	9	1.0	0.55	6/10	93	40	2.29	2.29	2.24	0.55	1.23
0.98	10	1.0	0.70	6/10	86	40	2.12	2.12	2.08	0.70	1.46
0.98	11	1.0	0.75	6/10	41	40	1.03	1.03	1.00	0.75	0.75
1.0	12	1.0	0.60	SURFACE	9	42	0.24	0.21	0.21	0.60	0.13
1.0	13	1.0	0.30				0.00	0.00	0.00	0.30	0.00
1.0	14	1.0	0.30				0.00	0.00	0.00	0.30	0.00
LB	15	0.5	0.15				0.00	0.00	0.00	0.08	0.00
SUM		**15.0**								**5.42**	**5.89**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 9:00 Finish: 9:15

Date 6/5/2006 Party MDM, EJK

Width 17.0 ft Area 11.25 sq ft Vel. 0.64 fps Disch. 7.21 cfs

Method 0.6 No. Secs. 18 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.80	0.80	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: channel bottom sediment and ice, x-section at outlet of deep pool, long grass

Flow: uniform, laminar

Weather: Overcast, Winds 0 - 5 mph

Other:

Temp: 38°F

Gages: S10

Remarks: Does not include minor sheet flow out of main channel, possibly contributing to 0-5% flow out of lake/pond, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	1	1.0	0.30	6/10	N/A	40	0.00	0.00	0.00	0.30	0.00
1.0	2	1.0	0.30	6/10	N/A	40	0.14	0.14	0.14	0.30	0.04
1.0	3	1.0	0.30	6/10	N/A	40	0.15	0.15	0.15	0.30	0.05
1.0	4	1.0	0.40	6/10	N/A	40	0.49	0.49	0.49	0.40	0.20
1.0	5	1.0	0.80	6/10	N/A	40	0.44	0.44	0.44	0.80	0.35
1.0	6	1.0	0.40	6/10	N/A	40	0.42	0.42	0.42	0.40	0.17
1.0	7	1.0	1.00	6/10	N/A	40	0.51	0.51	0.51	1.00	0.51
1.0	8	1.0	1.25	6/10	N/A	40	0.80	0.80	0.80	1.25	1.00
1.0	9	1.0	1.25	6/10	N/A	40	0.95	0.95	0.95	1.25	1.19
1.0	10	1.0	1.10	6/10	N/A	40	1.08	1.08	1.08	1.10	1.19
1.0	11	1.0	1.00	6/10	N/A	40	0.95	0.95	0.95	1.00	0.95
1.0	12	1.0	0.85	6/10	N/A	40	0.62	0.62	0.62	0.85	0.53
1.0	13	1.0	0.80	6/10	N/A	40	0.59	0.59	0.59	0.80	0.47
1.0	14	1.0	0.70	6/10	N/A	40	0.56	0.56	0.56	0.70	0.39
1.0	15	1.0	0.40	6/10	N/A	40	0.23	0.23	0.23	0.40	0.09
1.0	16	1.0	0.30	6/10	N/A	40	0.27	0.27	0.27	0.30	0.08
LB	17	0.5	0.20				0.00	0.00	0.00	0.10	0.00
SUM		**17.0**								**11.25**	**7.21**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By JPM

Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 8:40 Finish: 8:55

Date 6/6/2006 Party SLB, AMG, JPM

Width 23.0 ft Area 12.00 sq ft Vel. 1.57 fps Disch. 18.85 cfs

Method Surface / 0.6 No. Secs. 14 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.92	0.92	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Non uniform, long grass, boundary conditions fairly well defined, firm

Flow: Steady

Weather: Overcast, Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S10

Remarks: Estimate 13 cfs sheet flow to left of channel see JPM notebook page 17 and AMG notebook page 63, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1.0	5	0.5	0.00				0.00	0.00	0.00	0.00	0.00
0.97	6	1.0	0.60	SURFACE	35	40	1.94	1.74	1.69	0.60	1.01
0.97	7	1.0	0.80	6/10	40	44	2.01	2.01	1.95	0.80	1.56
0.97	8	1.5	0.50	6/10	40	52	1.70	1.70	1.65	0.75	1.24
0.97	10	2.0	0.70	6/10	40	48	1.85	1.85	1.79	1.40	2.51
0.97	12	2.0	1.20	6/10	50	45	2.46	2.46	2.38	2.40	5.71
0.97	14	1.5	0.50	6/10	40	50	1.77	1.77	1.72	0.75	1.29
0.85	15	1.0	0.60	6/10	40	42	2.11	2.11	1.79	0.60	1.07
1.0	16	1.5	0.50	SURFACE	40	46	1.93	1.73	1.73	0.75	1.30
0.98	18	2.0	0.45	6/10	30	46	1.45	1.45	1.42	0.90	1.28
0.85	20	2.5	0.50	6/10	20	41	1.08	1.08	0.92	1.25	1.15
1.0	23	3.5	0.30	6/10	7	40	0.40	0.40	0.40	1.05	0.42
1.0	27	2.5	0.30	6/10	10	55	0.41	0.41	0.41	0.75	0.31
1.0	28	0.5	0.00							0.00	0.00
SUM		**23.0**								**12.00**	**18.85**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

 Michael Baker Jr., Inc.

Comp. By MTA
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 14:52 Finish: 15:22

Date 6/7/2006 Party AMG, MTA

Width 25.0 ft Area 34.60 sq ft Vel. 0.82 fps Disch. 28.3 cfs

Method Surface / 0.6 No. Secs. 14 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.86	0.86	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test ______ after ______ Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom mud, channel and lake potion at overflow

100% free of snow and ice

Flow: ______ Weather: Partly Cloudy, Calm

Other: ______ Temp: 39^{o}F

Gages: S10

Remarks: Measurement made in pool below fall from lake, AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
0.90	2	2.0	0.30	SURFACE	-7	54	0.30	0.27	0.24	0.60	0.14
0.0	4	2.0	0.50	6/10	10	59	0.39	0.39	0.00	1.00	0.00
0.60	6	2.0	1.10	6/10	10	41	0.55	0.55	0.33	2.20	0.73
0.60	8	2.0	1.75	6/10	15	54	0.62	0.62	0.37	3.50	1.30
0.94	10	2.0	2.30	6/10	15	52	0.65	0.65	0.61	4.60	2.81
0.96	12	2.0	2.60	6/10	10	58	0.39	0.39	0.38	5.20	1.98
0.99	14	2.0	2.90	6/10	15	42	0.80	0.80	0.79	5.80	4.58
1.0	16	2.0	2.80	6/10	30	46	1.45	1.45	1.45	5.60	8.12
0.99	18	2.0	1.60	6/10	40	49	1.81	1.81	1.79	3.20	5.73
0.97	20	2.0	0.70	6/10	20	44	1.01	1.01	0.98	1.40	1.37
0.97	22	2.0	0.60	SURFACE	25	44	1.26	1.14	1.10	1.20	1.32
0.99	24	1.5	0.20	SURFACE	20	54	0.83	0.74	0.74	0.30	0.22
LB	25	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**25.0**								**34.60**	**28.30**

0.90
0.92
0.94
0.96
0.97
0.98
0.99
1.00
0.99
0.98
0.97
0.96
0.94
0.92
0.90
0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By EJK

Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 14:55 Finish: 15:12

Date 6/8/2006 Party EJK, SLB

Width 26 ft Area 15.40 sq ft Vel. 1.04 fps Disch. 15.97 cfs

Method Surface / 0.6 No. Secs. 14 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.80	0.80	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass, x-section 40 ft from gage 10

Flow: 1-2% in grass on left bank

Weather: Sunny, Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 45°F

Gages: S10

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/8/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	0	1.0	0.20	6/10	N/A	40	0.03	0.03	0.03	0.20	0.01
1.0	2	2.0	0.10	6/10	N/A	40	0.41	0.41	0.41	0.20	0.08
1.0	4	2.0	0.30	6/10	N/A	40	0.35	0.35	0.35	0.60	0.21
1.0	6	2.0	0.55	6/10	N/A	40	1.71	1.71	1.71	1.10	1.88
1.0	8	2.0	0.65	6/10	N/A	40	1.73	1.73	1.73	1.30	2.25
1.0	10	2.0	1.40	6/10	N/A	40	1.47	1.47	1.47	2.80	4.12
1.0	12	2.0	1.60	6/10	N/A	40	1.09	1.09	1.09	3.20	3.49
1.0	14	2.0	1.35	6/10	N/A	40	0.39	0.39	0.39	2.70	1.05
1.0	16	2.0	0.60	6/10	N/A	40	1.11	1.11	1.11	1.20	1.33
1.0	18	2.0	0.35	6/10	N/A	40	0.91	0.91	0.91	0.70	0.64
1.0	20	2.0	0.35	6/10	N/A	40	0.93	0.93	0.93	0.70	0.65
1.0	22	2.0	0.05	SURFACE	N/A	40	0.33	0.30	0.30	0.10	0.03
1.0	24	2.0	0.15	6/10	N/A	40	0.22	0.22	0.22	0.30	0.07
RB	26	1.0	0.30	6/10	N/A	40	0.52	0.52	0.52	0.30	0.16
SUM		**26.0**								**15.40**	**15.97**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP10 Start: 13:45 Finish: 14:05

Date 6/11/2006 Party MTA, AMG, SLB

Width 18 ft Area 6.2 sq ft Vel. 1.5 fps Disch. 10.33 cfs

Method Surface / 0.6 No. Secs. 10 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S10	0.65	0.65	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass, wind blowing in the direction of flow

Flow:

Weather: Sunny, Partly Cloudy
Winds 10 - 15 mph

Other:

Temp: 52°F

Gages: S10

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP10 6/11/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	2	2.0	0.30	SURFACE	20	49	0.92	0.83	0.83	0.60	0.50
1.0	4	2.0	0.30	SURFACE	50	46	2.43	2.19	2.19	0.60	1.31
1.0	6	2.0	0.50	SURFACE	60	46	2.92	2.62	2.62	1.00	2.62
1.0	8	2.0	0.65	6/10	30	41	1.64	1.64	1.64	1.30	2.13
1.0	10	2.0	0.60	6/10	40	47	1.91	1.91	1.91	1.20	2.29
1.0	12	2.0	0.30	SURFACE	25	41	1.37	1.24	1.24	0.60	0.74
1.0	14	2.0	0.45	SURFACE	20	50	0.91	0.82	0.82	0.90	0.74
1.0	16	2.0	0.35				0.00	0.00	0.00	0.70	0.00
LB	18	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**18.0**								**6.90**	**10.33**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

ASDP Site 11

 Michael Baker Jr., Inc. Comp. By MTA/JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 13:04 Finish: 13:16

Date 6/3/2006 Party MDM, MTA

Width 9 ft Area 4.5 sq ft Vel. 0.31 fps Disch. 1.4 cfs

Method 0.6 No. Secs. 10 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S11N	0.15	0.15	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1462

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, channel bottom grass

Flow:

Weather: Wind 20 mph

Other:

Temp: 27°F

Gages: S11N

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/3/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.20	6/10			0.00	0.00	0.00	0.10	0.00
1.0	1	1.0	0.40	6/10	N/A	40	0.23	0.23	0.23	0.40	0.09
1.0	2	1.0	0.50	6/10	N/A	40	0.35	0.35	0.35	0.50	0.18
1.0	3	1.0	0.50	6/10	N/A	40	0.33	0.33	0.33	0.50	0.17
1.0	4	1.0	0.60	6/10	N/A	40	0.35	0.35	0.35	0.60	0.21
1.0	5	1.0	0.60	6/10	N/A	40	0.28	0.28	0.28	0.60	0.17
1.0	6	1.0	0.65	6/10	N/A	40	0.58	0.58	0.58	0.65	0.38
1.0	7	1.0	0.60	6/10	N/A	40	0.30	0.30	0.3	0.60	0.18
1.0	8	1.0	0.40	6/10	N/A	40	0.06	0.06	0.06	0.40	0.02
LB	9	0.5	0.30	6/10			0.00	0.00	0.00	0.15	0.00
SUM		**9.0**								**4.50**	**1.40**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MTA/JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 10:48 Finish: 11:02

Date 6/4/2006 Party MTA, EJK

Width 15.5 ft Area 7.70 sq ft Vel. 0.11 fps Disch. 0.86 cfs

Method 0.6 No. Secs. 18 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S11C	0.15	0.15	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom mud and grass

Flow:

Weather:

Other:

Temp: 28^{o}F

Gages: S11C

Remarks: Channel is impacted by snow and ice, Pygmy meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/4/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.00				0.00	0.00	0.00	0.00	0.00
0.90	1	1.0	0.60	6/10	7	47.6	0.17	0.17	0.15	0.60	0.09
0.90	2	1.0	0.55	6/10	20	40.3	0.51	0.51	0.46	0.55	0.25
0.94	3	1.0	0.55	6/10	9	41.2	0.24	0.24	0.23	0.55	0.13
0.94	4	1.0	0.50	6/10	10	40	0.27	0.27	0.25	0.50	0.13
0.94	5	1.0	0.40	6/10	12	40	0.32	0.32	0.30	0.40	0.12
0.96	6	1.0	0.40	6/10	14	40	0.37	0.37	0.35	0.40	0.14
1.0	7	1.0	0.45	6/10	0	40	0.00	0.00	0.00	0.45	0.00
1.0	8	1.0	0.50	6/10	0	40	0.00	0.00	0.00	0.50	0.00
1.0	9	1.0	0.50	6/10	0	40	0.00	0.00	0.00	0.50	0.00
1.0	10	1.0	0.55	6/10	0	40	0.00	0.00	0.00	0.55	0.00
1.0	11	1.0	0.55	6/10	0	40	0.00	0.00	0.00	0.55	0.00
1.0	12	1.0	0.40	6/10	0	40	0.00	0.00	0.00	0.40	0.00
1.0	13	1.0	0.50	6/10	0	40	0.00	0.00	0.00	0.50	0.00
1.0	14	1.0	0.50	6/10	0	40	0.00	0.00	0.00	0.50	0.00
1.0	15	1.0	0.40	6/10	0	40	0.00	0.00	0.00	0.40	0.00
1.0	16	1.0	0.35	6/10	0	40	0.00	0.00	0.00	0.35	0.00
LB	17	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**15.5**								**7.70**	**0.86**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By EJK
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 12:30 Finish: 12:45

Date 6/5/2006 Party MDM, EJK, SLB

Width 5.0 ft Area 2.3 sq ft Vel. 0.32 fps Disch. 0.74 cfs

Method 0.6 No. Secs. 11 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S11N	-0.02	-0.02	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Confined outlet of ponded area, grass ~1ft, free on snow and ice

Flow: Laminar, uniform

Weather: Overcast, Cool
Winds 0 - 5 mph

Other:

Temp: 38^{o}F

Gages: S11N

Remarks: Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/5/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	1	0.25	0.40	6/9	N/A	40	0.01	0.01	0.01	0.10	0.00
1.0	1.5	0.5	0.45	6/10	N/A	40	0.04	0.04	0.04	0.23	0.01
1.0	2	0.5	0.40	6/10	N/A	40	0.07	0.07	0.07	0.20	0.01
1.0	2.5	0.5	0.45	6/10	N/A	40	0.08	0.08	0.08	0.23	0.02
1.0	3	0.5	0.40	6/10	N/A	40	0.04	0.04	0.04	0.20	0.01
1.0	3.5	0.5	0.40	6/10	N/A	40	0.10	0.10	0.10	0.20	0.02
1.0	4	0.5	0.45	6/10	N/A	40	0.12	0.12	0.12	0.23	0.03
1.0	4.5	0.5	0.50	6/10	N/A	40	0.67	0.67	0.67	0.25	0.17
1.0	5	0.5	0.60	6/10	N/A	40	0.94	0.94	0.94	0.30	0.28
1.0	5.5	0.5	0.55	6/10	N/A	40	0.69	0.69	0.69	0.28	0.19
1.0	6	0.25	0.30	6/10	N/A	40	0.02	0.02	0.02	0.08	0.00
SUM		**5.0**								**2.30**	**0.74**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 14:40 Finish: 15:00

Date 6/6/2006 Party JPM, AMG, SLB

Width 13 ft Area 11.55 sq ft Vel. 0.23 fps Disch. 2.69 cfs

Method Surface / 0.6 No. Secs. 13 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S11N	0.11	0.11	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Ice on left bank, grass on right bank, firm, non uniform

Flow: Steady

Weather: Partly Cloudy
Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S11N

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/6/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	2	1.0	0.00				0.00	0.00	0.00	0.00	0.00
1.0	4	1.5	0.30	SURFACE	5	88	0.14	0.13	0.13	0.45	0.06
1.0	5	1.0	0.30	6/10	5	52	0.23	0.23	0.23	0.30	0.07
1.0	6	1.0	1.20	6/10	10	43	0.53	0.53	0.53	1.20	0.64
1.0	7	1.0	1.40	6/10	10	45	0.50	0.50	0.50	1.40	0.70
1.0	8	1.0	1.60	6/10	7	45	0.36	0.36	0.36	1.60	0.58
1.0	9	1.0	1.60	6/10	5	45	0.26	0.26	0.26	1.60	0.42
1.0	10	1.0	1.55	6/10	3	55	0.14	0.14	0.14	1.55	0.22
1.0	11	1.0	1.35	6/10	0	40	0.00	0.00	0.00	1.35	0.00
1.0	12	1.0	1.10	6/10	0	40	0.00	0.00	0.00	1.10	0.00
1.0	13	1.0	0.60	6/10	0	40	0.00	0.00	0.00	0.60	0.00
1.0	14	1.0	0.40	6/10	0	40	0.00	0.00	0.00	0.40	0.00
RB	15	0.5	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**13.0**								**11.55**	**2.69**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By AMG

Check By JPM

Discharge Measurement Notes

Station No. ASDP11 Start: 11:11 Finish: 11:23

Date 6/7/2006 Party AMG, MTA

Width 12.0 ft Area 12.20 sq ft Vel. 0.2 fps Disch. 2.44 cfs

Method Surface / 0.6 No. Secs. 7 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S11N	0.08	0.08	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Clear of ice, 95% clear of snow, near S11N gage

Flow:

Weather:

Other:

Temp: 39°F

Gages: S11N

Remarks: Sketch AMG page 68, AA Meter

ASDP Site 12

2006 Michael Baker Jr., Inc.

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. Site 12 Start: 15:25 Finish: 15:38

Date 6/3/2006 Party EJK, MTA

Width 26.0 ft Area 28.25 sq ft Vel. 0.68 fps Disch. 19.13 cfs

Method 0.6 No. Secs. 14 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.67	0.67	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Channel bottom grass and frozen mud

Flow: Weather: Cloudy, Winds 0 - 20 mph

Other: Temp: 27°F

Gages: S12S-A

Remarks: Channel at discharge reached 100%, clear of snow and ice, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/3/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.75				0.00	0.00	0.00	0.75	0.00
1.0	2	2.0	0.90	6/10	N/A	40	0.13	0.13	0.13	1.80	0.23
0.94	4	2.0	1.00	6/10	N/A	40	0.04	0.04	0.04	2.00	0.08
0.94	6	2.0	1.20	6/10	N/A	40	0.08	0.08	0.08	2.40	0.19
0.94	8	2.0	1.60	6/10	N/A	40	0.62	0.62	0.58	3.20	1.86
0.96	10	2.0	1.90	6/10	N/A	40	1.04	1.04	1.00	3.80	3.80
0.96	12	2.0	1.80	6/10	N/A	40	1.19	1.19	1.14	3.60	4.10
0.96	14	2.0	1.90	6/10	N/A	40	1.31	1.31	1.26	3.80	4.79
0.94	16	2.0	1.50	6/10	N/A	40	1.37	1.37	1.29	3.00	3.87
0.94	18	2.0	0.60	6/10	N/A	40	0.15	0.15	0.14	1.20	0.17
0.94	20	2.0	0.40	6/11	N/A	40	0.02	0.02	0.02	0.80	0.02
1.0	22	2.0	0.40	6/12	N/A	40	0.02	0.02	0.02	0.80	0.02
1.0	24	2.0	0.40	6/13	N/A	40	0.00	0.00	0.00	0.80	0.00
LB	26	1.0	0.30	6/14	N/A	40	0.00	0.00	0.00	0.30	0.00
SUM		**26.0**								**28.25**	**19.13**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By JPM
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 9:59 Finish: 10:30

Date 6/4/2006 Party MTA, EJK

Width 27.0 ft Area 33.40 sq ft Vel. 0.88 fps Disch. 29.31 cfs

Method 0.6 No. Secs. 15 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.67	0.69	0.02

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. MBJP01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, Channel bottom grass

Flow: Weather: Fair, Partly Cloudy

Other: Temp: 28^{o}F

Gages: S12S-A

Remarks: Pygmy Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/4/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.65	6/10	0	40	0.00	0.00	0.00	0.65	0.00
1.0	2	2.0	0.60	6/10	4	41	0.12	0.12	0.12	1.20	0.15
1.0	4	2.0	0.85	6/10	15	41	0.38	0.38	0.38	1.70	0.65
1.0	6	2.0	1.10	6/10	23	40	0.59	0.59	0.59	2.20	1.29
1.0	8	2.0	1.40	6/10	26	40	0.66	0.66	0.66	2.80	1.85
1.0	10	2.0	1.70	6/10	43	40	1.07	1.07	1.07	3.40	3.65
1.0	12	2.0	1.80	6/10	43	40	1.07	1.07	1.07	3.60	3.87
1.0	14	2.0	1.70	6/10	51	40	1.27	1.27	1.27	3.40	4.31
1.0	16	2.0	1.55	6/10	51	40	1.27	1.27	1.27	3.10	3.93
1.0	18	2.0	1.50	6/10	53	40	1.32	1.32	1.32	3.00	3.95
1.0	20	2.0	1.40	6/10	37	41	0.91	0.91	0.91	2.80	2.54
1.0	22	2.0	1.10	6/10	34	41	0.83	0.83	0.83	2.20	1.84
1.0	24	2.0	0.90	6/10	15	41	0.38	0.38	0.38	1.80	0.69
1.0	26	1.5	0.80	6/10	19	40	0.49	0.49	0.49	1.20	0.59
1.0	27	0.5	0.70	6/10	0	40	0.00	0.00	0.00	0.35	0.00
SUM		**27.0**								**33.40**	**29.31**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 10:03 Finish: 10:34

Date 6/5/2006 Party MDM, EJK

Width 30.0 ft Area 30.70 sq ft Vel. 0.8 fps Disch. 24.66 cfs

Method Surface / 0.6 No. Secs. 25 Count 40 sec

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.65	0.65	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. 1420

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, Channel bottom grass 1 - 1.5 ft, x-section 30-40 ft upstream of S12S

Flow: Uniform

Weather: Overcast, Cool, Winds 0 - 10 mph

Other:

Temp: 38^{o}F

Gages: S12S-A

Remarks: Wind blowing in the direction of flow, tall grass, velocities measured at 0.6 and near surface, Marsh McBirney

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/5/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	0.5	0.50	6/10	N/A	40	0.08	0.08	0.08	0.25	0.02
1.0	1	1.0	0.50	6/10	N/A	40	0.03	0.03	0.03	0.50	0.02
1.0	2	1.0	0.50	6/10	N/A	40	0.12	0.12	0.12	0.50	0.06
1.0	3	1.0	0.45	6/10	N/A	40	0.12	0.12	0.12	0.45	0.05
1.0	4	1.0	0.50	6/10	N/A	40	0.08	0.08	0.08	0.50	0.04
1.0	5	1.0	0.55	6/10	N/A	40	0.16	0.16	0.16	0.55	0.09
1.0	6	1.0	0.60	6/10	N/A	40	0.31	0.31	0.31	0.60	0.19
1.0	7	1.0	0.70	SURFACE	N/A	40	1.36	1.22	1.22	0.70	0.86
1.0	8	1.0	0.85	SURFACE	N/A	40	1.50	1.35	1.35	0.85	1.15
1.0	9	1.0	0.95	SURFACE	N/A	40	1.75	1.58	1.58	0.95	1.50
1.0	10	1.0	1.50	SURFACE	N/A	40	1.81	1.63	1.63	1.50	2.44
1.0	11	1.0	1.40	6/10	N/A	40	1.43	1.43	1.43	1.40	2.00
1.0	12	1.0	1.50	6/10	N/A	40	1.28	1.28	1.28	1.50	1.92
1.0	13	1.0	1.60	6/10	N/A	40	1.63	1.63	1.63	1.60	2.61
1.0	14	1.0	1.60	6/10	N/A	40	1.57	1.57	1.57	1.60	2.51
1.0	15	1.0	1.60	6/10	N/A	40	1.67	1.67	1.67	1.60	2.67
1.0	16	1.0	1.70	6/10	N/A	40	1.25	1.25	1.25	1.70	2.13
1.0	17	1.0	1.60	6/10	N/A	40	1.19	1.19	1.19	1.60	1.90
1.0	18	1.5	1.50	6/10	N/A	40	0.66	0.66	0.66	2.25	1.49
1.0	20	2.0	1.25	6/10	N/A	40	0.12	0.12	0.12	2.50	0.30
1.0	22	2.0	1.10	6/10	N/A	40	0.07	0.07	0.07	2.20	0.15
1.0	24	2.0	0.90	6/10	N/A	40	0.11	0.11	0.11	1.80	0.20
1.0	26	2.0	0.75	6/10	N/A	40	0.09	0.09	0.09	1.50	0.14
1.0	28	2.0	0.75	6/10	N/A	40	0.13	0.13	0.13	1.50	0.20
LB	30	1.0	0.60	6/10	N/A	40	0.03	0.03	0.03	0.60	0.02
SUM		**30.0**								**30.70**	**24.66**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By MDM
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 13:30 Finish: 13:52

Date 6/6/2006 Party JPM, AMG, SLB

Width 33.0 ft Area 33.78 sq ft Vel. 1.34 fps Disch. 45.15 cfs

Method Surface / 0.6 No. Secs. 17 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.81	0.82	0.01

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Snow on banks, channel bottom grass, stream bed firm and uniform

Flow: Steady

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 40°F

Gages: S12S-A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/6/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
LB	9	0.5	0.00				0.00	0.00	0.00	0.00	0.00
1.0	10	2.0	0.50	SURFACE	7	53	0.31	0.28	0.28	1.00	0.28
1.0	13	3.0	1.10	6/10	25	45	1.24	1.24	1.24	3.30	4.09
1.0	16	2.5	1.15	6/10	25	44	1.26	1.26	1.26	2.88	3.63
1.0	18	2.0	1.20	6/10	20	43	1.03	1.03	1.03	2.40	2.47
1.0	20	2.0	1.10	6/10	25	41	1.35	1.35	1.35	2.20	2.97
1.0	22	2.0	1.20	6/10	30	48	1.39	1.39	1.39	2.40	3.34
1.0	24	2.0	1.30	6/10	40	46	1.93	1.93	1.93	2.60	5.02
1.0	26	2.0	1.30	6/10	30	42	1.58	1.58	1.58	2.60	4.11
1.0	28	2.0	1.30	6/10	40	47	1.88	1.88	1.88	2.60	4.89
1.0	30	2.0	1.65	6/10	30	47	1.42	1.42	1.42	3.30	4.69
1.0	32	2.0	1.35	6/10	40	43	2.06	2.06	2.06	2.70	5.56
1.0	34	2.0	0.95	6/10	25	40	1.39	1.39	1.39	1.90	2.64
1.0	36	2.0	0.75	SURFACE	20	41	1.08	0.97	0.97	1.50	1.46
1.0	38	2.0	0.60				0.00	0.00	0.00	1.20	0.00
1.0	40	2.0	0.60				0.00	0.00	0.00	1.20	0.00
RB	42	1.0	0.00				0.00	0.00	0.00	0.00	0.00
SUM		**33.0**								**33.78**	**45.15**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Michael Baker Jr., Inc.

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 13:40 Finish: 14:00

Date 6/7/2006 Party MTA, AMG

Width 30.0 ft Area 56.40 sq ft Vel. 0.82 fps Disch. 46.41 cfs

Method Surface / 0.6 No. Secs. 16 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12N	10.06	10.06	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MBJA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows on banks, channel bottom mud and grass, channel 100% clear of ice and 95% clear of snow

Flow:

Weather: Partly Cloudy

Other:

Temp: 39°F

Gages: S12N

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/7/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.40				0.00	0.00	0.00	0.40	0.00
1.0	2	2.0	1.10	SURFACE	25	45	1.24	1.11	1.10	2.20	2.42
0.9	4	2.0	1.60	6/10	25	43	1.29	1.29	1.21	3.20	3.89
0.9	6	2.0	1.90	6/10	25	42	1.32	1.32	1.22	3.80	4.62
0.9	8	2.0	2.05	6/10	25	42	1.32	1.32	1.24	4.10	5.10
0.92	10	2.0	2.20	6/10	25	46	1.21	1.21	1.11	4.40	4.89
0.9	12	2.0	2.30	6/10	25	49	1.13	1.13	1.06	4.60	4.89
0.94	14	2.0	2.40	6/10	20	45	0.99	0.99	0.93	4.80	4.45
0.9	16	2.0	2.45	6/10	20	51	0.87	0.87	0.80	4.90	3.94
0.94	18	2.0	2.45	6/10	15	47	0.71	0.71	0.67	4.90	3.29
0.98	20	2.0	2.45	6/10	15	53	0.64	0.64	0.62	4.90	3.05
0.98	22	2.0	2.30	6/10	10	42	0.54	0.54	0.53	4.60	2.42
0.98	24	2.0	2.00	6/10	10	53	0.43	0.43	0.42	4.00	1.68
0.98	26	2.0	1.50	SURFACE	7	40	0.40	0.36	0.35	3.00	1.06
0.99	28	2.0	1.00	SURFACE	7	46	0.350	0.315	0.312	2.00	0.62
LB	30	1.0	0.60	SURFACE	3	45	0.16	0.15	0.15	0.6	0.09
SUM		**30.0**								**56.40**	**46.41**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

Comp. By AMG
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 15:07 Finish: 15:32

Date 6/10/2006 Party MTA, SLB, AMG

Width 32.0 ft Area 33.50 sq ft Vel. 1.35 fps Disch. 45.34 cfs

Method Surface / 0.6 No. Secs. 17 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.78	0.78	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Willows on banks, channel bottom grass and willows, channel clear of ice and snow

Flow:

Weather: Partly Cloudy, Winds 0 - 5 mph

Other:

Temp: 50^{o}F

Gages: S12S-A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/10/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)	
RB	0	1.0	0.10				0.00	0.00	0.00	0.10	0.00	0.90
1.0	2	2.0	0.55	SURFACE	10	45	0.51	0.46	0.46	1.10	0.50	
1.0	4	2.0	0.85	SURFACE	15	56	0.61	0.55	0.55	1.70	0.94	0.92
1.0	6	2.0	0.90	SURFACE	30	49	1.38	1.24	1.24	1.80	2.23	
1.0	8	2.0	1.40	6/10	30	44	1.53	1.53	1.53	2.80	4.29	0.94
1.0	10	2.0	1.65	SURFACE	40	45	1.99	1.79	1.79	3.30	5.92	
1.0	12	2.0	1.20	SURFACE	40	43	2.08	1.88	1.88	2.40	4.50	0.96
1.0	14	2.0	1.10	6/10	40	49	1.83	1.83	1.83	2.20	4.03	0.97
1.0	16	2.0	1.20	6/10	30	40	1.68	1.68	1.68	2.40	4.04	0.98
1.0	18	2.0	1.20	6/10	40	46	1.95	1.95	1.95	2.40	4.68	
1.0	20	2.0	1.25	6/10	20	41	1.10	1.10	1.10	2.50	2.75	0.99
1.0	22	2.0	1.30	SURFACE	30	42	1.60	1.44	1.44	2.60	3.76	
1.0	24	2.0	1.15	SURFACE	30	46	1.47	1.32	1.32	2.30	3.04	
1.0	26	2.0	1.25	SURFACE	30	46	1.47	1.32	1.32	2.50	3.30	
1.0	28	2.0	0.95	SURFACE	20	57	0.80	0.72	0.72	1.90	1.36	1.00
1.0	30	2.0	0.75				0.00	0.00	0.00	1.50	0.00	
RB	32	1.0	0.00				0.00	0.00	0.00	0.00	0.00	
SUM		**32.0**								**33.50**	**45.34**	
												0.99
												0.98
												0.97
												0.96
												0.94
												0.92
												0.90

0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 9:38 Finish: 10:25

Date 6/12/2006 Party MTA, AMG, SLB

Width 39.0 ft Area 22.90 sq ft Vel. 1.75 fps Disch. 40.06 cfs

Method Surface / 0.6 No. Secs. 21 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.68	0.68	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after Meter No. NY4743

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and willows

Flow: Weather: Cloudy, No Wind

Other: Temp: 42^{o}F

Gages: S12S-A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/12/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.10				0.00	0.00	0.00	0.10	0.00
1.0	2	2.0	0.20	SURFACE	3	60	0.13	0.12	0.12	0.40	0.05
1.0	4	2.0	0.30	SURFACE	3	60	0.13	0.12	0.12	0.60	0.07
1.0	6	2.0	0.30	SURFACE	3	60	0.13	0.12	0.12	0.60	0.07
1.0	8	2.0	0.45	SURFACE	15	52	0.66	0.59	0.59	0.90	0.53
1.0	10	2.0	0.35	SURFACE	15	40	0.85	0.77	0.77	0.70	0.54
1.0	12	2.0	0.35	SURFACE	15	50	0.68	0.62	0.62	0.70	0.43
0.98	14	2.0	0.60	SURFACE	25	44	1.28	1.15	1.13	1.20	1.36
1.0	16	2.0	0.95	SURFACE	50	43	2.60	2.34	2.34	1.90	4.45
1.0	18	2.0	1.10	6/10	50	50	2.24	2.24	2.24	2.20	4.93
1.0	20	2.0	1.50	6/10	50	45	2.49	2.49	2.49	3.00	7.46
0.98	22	2.0	1.10	6/10	60	47	2.85	2.85	2.80	2.20	6.15
0.96	24	2.0	1.00	6/10	40	42	2.13	2.13	2.05	2.00	4.10
0.92	26	2.0	0.80	SURFACE	50	42	2.66	2.40	2.20	1.60	3.53
0.94	28	2.0	0.70	SURFACE	50	47	2.38	2.14	2.01	1.40	2.82
0.94	30	2.0	0.60	SURFACE	40	46	1.95	1.75	1.65	1.20	1.98
0.94	32	2.0	0.40	SURFACE	15	43	0.79	0.71	0.67	0.80	0.54
1.0	34	2.0	0.40	SURFACE	10	50	0.46	0.41	0.41	0.80	0.33
1.0	36	3.0	0.25	SURFACE	10	50	0.46	0.41	0.41	0.75	0.31
1.0	40	5.0	0.25	SURFACE	7	45	0.36	0.33	0.33	1.25	0.41
LB	46	3.0	0.10				0.00	0.00	0.00	0.30	0.00
SUM		**39.0**								**22.90**	**40.06**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006 Michael Baker Jr., Inc. Comp. By SLB
Check By JPM

Discharge Measurement Notes

Station No. ASDP12 Start: 8:25 Finish: 8:47

Date 6/16/2006 Party AMG, SLB

Width 12.0 ft Area 11.15 sq ft Vel. 1.66 fps Disch. 18.48 cfs

Method Surface / 0.6 No. Secs. 7 Count 40 sec min

GAGE READINGS			
Gage	Start	Finish	Change
S12S-A	0.43	0.43	0

Wading, cable, ice, boat

Upstrm or Dwnstrm side of bridge

Meter NA ft above bottom of weight

Weight NA lbs

Spin Test after

Meter No. MJBA01

Measurement Rated Excellent Good Fair Poor based on the following conditions

Cross Section: Grass on banks, channel bottom grass and mud

Flow:

Weather: Cloudy, Winds 5 - 15 mph

Other:

Temp: 34°F

Gages: S12S-A

Remarks: AA Meter

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP12 6/16/2006

0.85

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
RB	0	1.0	0.25	SURFACE	3	54	0.14	0.13	0.13	0.25	0.03
1.0	2	2.0	0.40	SURFACE	3	46	0.16	0.14	0.14	0.80	0.12
1.0	4	2.0	1.40	6/10	40	46	1.93	1.93	1.93	2.80	5.39
1.0	6	2.0	1.60	6/10	60	41	3.23	3.23	3.23	3.20	10.34
0.94	8	2.0	1.10	6/10	25	48	1.15	1.15	1.08	2.20	2.38
1.0	10	2.0	0.80	SURFACE	3	52	0.14	0.13	0.13	1.60	0.21
LB	12	1.0	0.30				0.00	0.00	0.00	0.30	0.00
SUM		**12.0**								**11.15**	**18.47**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75 0.80

Site/Date: ASDP11 6/7/2006

Angle Coeff.	Distance from initial point (ft)	Section Width (ft)	Water Depth (ft)	Observed Depth (ft)	Revolution Count	Time Increment (sec)	VELOCITY At Point (fps)	VELOCITY Mean in Vertical (fps)	VELOCITY Adjusted for Angle Coeff (fps)	Area (s.f.)	Discharge (cfs)
1	0	1.0	0.20	SURFACE	0	40	0.00	0.00	0.00	0.20	0.00
1.0	2	2.0	1.00	6/10	0	40	0.00	0.00	0.00	2.00	0.00
1.0	4	2.0	1.50	6/10	5	66	0.18	0.18	0.18	3.00	0.54
1.0	6	2.0	1.60	6/10	5	44	0.27	0.27	0.27	3.20	0.86
1.0	8	2.0	1.30	6/10	7	57	0.29	0.29	0.29	2.60	0.75
0.99	10	2.0	0.60	SURFACE	5	43	0.27	0.24	0.24	1.20	0.29
1.0	12	1.0	0.00	6/10	0	40	0.00	0.00	0.00	0.00	0.00
SUM		**12.0**								**12.20**	**2.44**

0.90 0.92 0.94 0.96 0.97 0.98 0.99 1.00 0.99 0.98 0.97 0.96 0.94 0.92 0.90 0.85

0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.75

2006

Baker

2006 Colville River Delta and Fish Creek Basin Spring Breakup and Hydrological Assessment

Michael Baker Jr., Inc. 1400 W. Benson Blvd., Suite 200, Anchorage, Alaska 99503

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