# SUMMARY OF HYDRAULIC CONDITIONS AND HABITAT FORECASTS AT 1984 MIDDLE RIVER STUDY SITES

DRAFT REPORT

Prepared for:

ALASKA POWER AUTHORITY

Prepared by:

N. Diane Hilliard
Shelley Williams
E. Woody Trihey
R. Curt Wilkinson
Cleveland R. Steward, III

May 1985

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued) Page

TABLE OF CONTENTS (Continued) Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued) Page

SUMMARY OF HYDRAULIC CONDITIONS

AND HABITAT FORECASTS AT

1984 MIDDLE RIVER STUDY SITES

DRAFT REPORT

Prepared for:

ALASKA POWER AUTHORITY

Prepared by:

N. Diane Hilliard
Shelley Williams
E. Woody Trihey
R. Curt Wilkinson
Cleveland R. Steward, III

May 1985

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued) Page

TABLE OF CONTENTS (Contirued) Page

TABLE OF CONTENTS (Continued) Page

LIST OF FIGURES

LIST OF FIGURES (Continued) Page

LIST OF FIGURES (Continued)

LIST OF FIGURES (Continued)

LIST OF FIGURES (Continued)

LIST OF FIGURES (Continued)

LIST OF TABLES

Page

LIST OF PLATES

Page

LIST OF PLATES (Continued) Page

# ACKNOWLEDGEMENTS

Preparation of this report was funded by the Alaska Power Authority as part of the licensing studies for the proposed Susitna Hydroelectric Project. The engineering and environmental studies being conducted to support the Application for License are directed by Harza-Ebasco Susitna Joint Venture.

ADF&G Su Hydro provided essential support for the successful completion of the field studies, rating curve analysis and model calibration. In addition ADF&G had lead responsibility for data base management and preparation of the three appendices which accompany the main text. The ADF&G Su Hydro staff who participated in the field studies, analyses, and report preparation are listed below:

| | |
|---|---|
| Andy Hoffmann | Sheryl Salasky |
| Karen Meier | Kathy Johnson |
| John McConnaughy | Jim Anderson |
| Kathy Sheehan | Jeff Bigler |
| Dan Kingsley | Allen Bingham |
| Mary Sniffer | Donna Buckholtz |
| | Alice Freeman |

John McConnaughy developed and applied numerous computer programs which facilitated data reduction and model calibration. In addition he produced the site specific WUA and time series plots. Allen Bingham selected the statistical analyses and assembled the data base necessary to test the degree to which models were calibrated. Special recognition is given Karen Meier for completing the rating curve analysis and drafting section II of this report as well as coordinating the ADF&G effort which supported the preparation of this work.

# PART I

# INTRODUCTION

This report presents data reduction methods and results of the 1984 field studies conducted by E. Woody Trihey and Associates (EWT&A) and the Alaska Department of Fish and Game Su Hydro Aquatic Studies Group (ADF&G Su Hydro) in the Talkeetna-to-Devil Canyon segment of the Susitna River (Middle River). Although field studies and analyses described in this report were completed by a joint EWT&A and ADF&G Su Hydro study team, the primary responsibility for the field study design, hydraulic model calibration and preparation of this report rests with EWT&A. Thus the information and technical interpretations in this report are the responsibility of EWT&A and do not necessarily represent the opinion of the Alaska Department of Fish and Game.

The response of fish habitat to naturally occurring variations in streamflow could not be cost-effectively evaluated solely by monitoring a system as large as the middle Susitna River. Therefore, at the onset of the 1982 field studies the U.S. Fish and Wildlife Service's Instream Flow Incremental Methodology (IFIM) (Bovee 1982) was selected as a means of quantifying the response of aquatic habitats to changes in streamflow. PHABSIM is a collection of computer programs associated with the IFIM which can be applied to simulate instream hydraulic conditions and the corresponding amount of available fish habitat for selected species/life stage. The PHABSIM modeling system is intended for use in those situations where the flow regime and channel structure are the major factors influencing the availability of fish habitat (Trihey 1979). The PHABSIM computer programs include the IFG-2 and IFG-4 hydraulic models, and the HABTAT program. The HABTAT program integrates hydraulic model output with species specific habitat suitability criteria to calculate weighted usable areas (WUA), an index value representing the availability of potential fish habitat as a function of streamflow. Habitat modeling results presented in this report are limited to juvenile chinook salmon (Oncorhynchus tshawytscha) and spawning chum salmon (O. keta). These species/life stages have been identified as primary evaluation species for the Middle River (EWT&A and WCC 1985). Habitat variables important to rearing fish differ significantly from those of adult spawners. Therefore, different modeling concepts and combinations of physical habitat variables are used to evaluate the response of spawning and rearing habitats to incremental changes in streamflow.

The IFG-2 and IFG-4 hydraulic models wre calibrated for eight side channels of the Middle River and linked with the HABTAT program to forecast the influence of incremental changes in streamflow on juvenile chinook rearing habitat. A modified version of the HABTAT program (DIHAB) was developed by EWT&A to calculate WUA directly from measured depths and velocities at observed streamflows thereby eliminating the need for hydraulic simulation models in those instances where the WUA response is principally determined by flow effects on depth. The DIHAB model was applied at 14 mainstem margin and backwater areas to evaluate the influence of mainstem discharge on chum salmon spawning habitat.

This report consists of an introduction and three technical sections, each supported by a technical appendix, which describe the field data and analytical procedures used to model the response of juvenile chinook and spawning chum habitat to incremental changes in streamflow. The first technical section (Part II) describes the stage-discharge and site flow analysis which presents various relationships between mainstem discharge, site-specific flow, and water surface elevation that are extensively used in subsequent analyses to: appraise the accuracy of calibrated IFG models, estimate site-specific water surface elevations at modeling sites for different mainstem discharges, and convert the mainstem hydrograph into a site-specific flow hydrograph.

In Part III of this report, calibration procedures for the eight IFG hydraulic models are described in detail and WUA forecasts obtained by linking the calibrated hydraulic models to the HABTAT model are presented for juvenile chinook. Suitable rearing conditions for juvenile chinook are dependent on cover and low to moderate velocities. The Susitna River conveys glacial runoff during the summer growing season, and the associated turbidities provide cover for rearing chinook (Schmidt et al. 1984). Therefore, under natural conditions, object cover (such as provided by substrate, debris, or overhanging vegetation) is generally not as important a factor to juvenile chinook in turbid water habitats of the middle river as it would be in a large non glacial river. Habitat suitability criteria for cover, velocity and depth used in this report are based upon data collected in Middle River habitats (Schmidt et al. 1984) have been derived as described in EWT&A and WCC 1985. Rearing habitat for juvenile chinook at each study site is expressed as the relationship between WUA and mainstem discharge. In addition, time series WUA plots based on the 1984 USGS record of average daily streamflows for the Susitna River at Gold Creek are provided to indicate the temporal stability of rearing conditions at the study sites throughout the open water growing season (May 20 - September 15).

Part IV of this report presents the evaluation of chum spawning habitat using the direct input habitat model (DIHAB) developed by EWT&A. The availability of chum salmon spawning habitat is highly dependent upon the presence of upwelling and suitable substrate (Estes and Vincent-Lang 1984). Although the location of upwelling areas is generally fixed, use of these areas by spawning chum is influenced by mainstem discharge. High velocities may periodically limit the availability of upwelling areas, or abnormally low mainstem discharges during the spawning season may dewater or limit access to upwelling areas.

Since most of the reported chum spawning in side channel and mainstem habitats occurs along shoreline margins or in backwater areas (Barrett et al. 1984), depth is the principal variable influencing the response of the WUA curve to variation in discharge. Hence the direct input habitat model (DIHAB) which can utilize site-specific stage-discharge relationships as input data was chosen over the IFG hydraulic models which also require detailed measurement of velocity for proper calibration.

Habitat suitability criteria for spawning chum salmon used with the direct input model are based on data collected in the middle river (Estes and Vincent-Lang 1984), and review of pertinent literature (Steward 1985). Chum spawning habitat is described at each study site as a relationship between WUA and mainstem discharge, as well as by time series plots based on 1984 average daily streamflow records for the Susitna River at Gold Creek.

# PART II

# RELATIONSHIPS BETWEEN MAINSTEM DISCHARGE, SITE FLOW AND WATER SURFACE ELEVATION

## INTRODUCTION

The proposed Susitna hydroelectric project would alter the natural flow regime of the middle Susitna River, thereby influencing the mainstem water surface elevation (stage) which in turn affects stage and flow in side channel areas. During the 1984 field season, staff gages were installed to monitor changes in water surface elevations at 22 mainstem and side channel study sites (Figure II-1). Site specific data were collected to develop relationships between mainstem discharge, site flow and water surface elevation. Generally, these relationships can be described by discontinuous linear regression equations using logarithmic transformed variables.

The objective of this portion of the 1984 middle river modeling studies was to monitor water surface elevation at mainstem and side channel study sites and obtain site-specific flow measurements to develop quantitative relationships between: a) mainstem stage and mainstem discharge (WSEL vs. Q); b) site flow and stage (q vs. WSEL); and c) site flow and mainstem discharge (q vs. Q). These relationships are extensively used in the calibration and application of models used to evaluate chinook rearing habitat (Part III of this report), and in the application of direct input habitat models for chum salmon spawning (Part IV of this report).

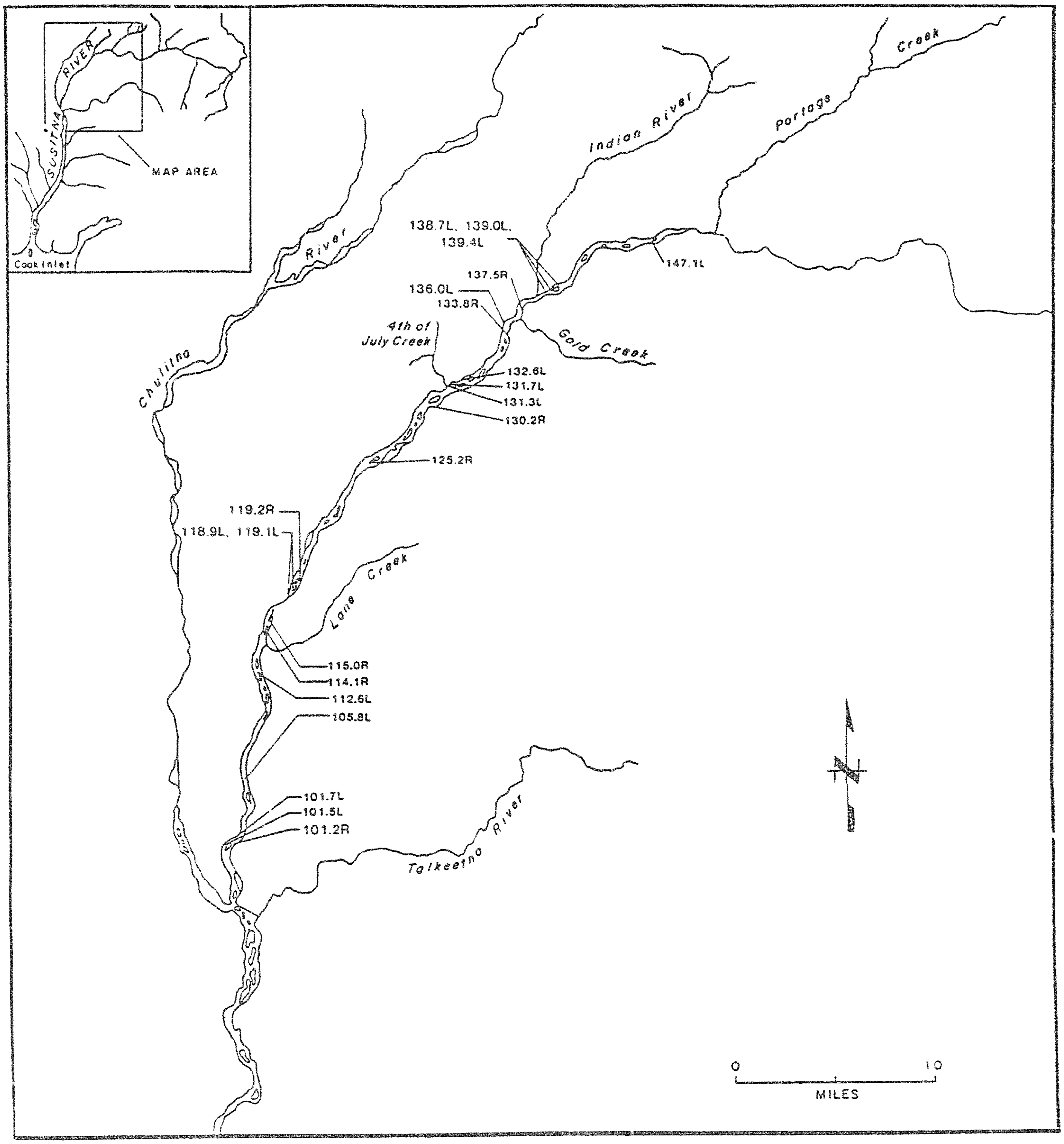


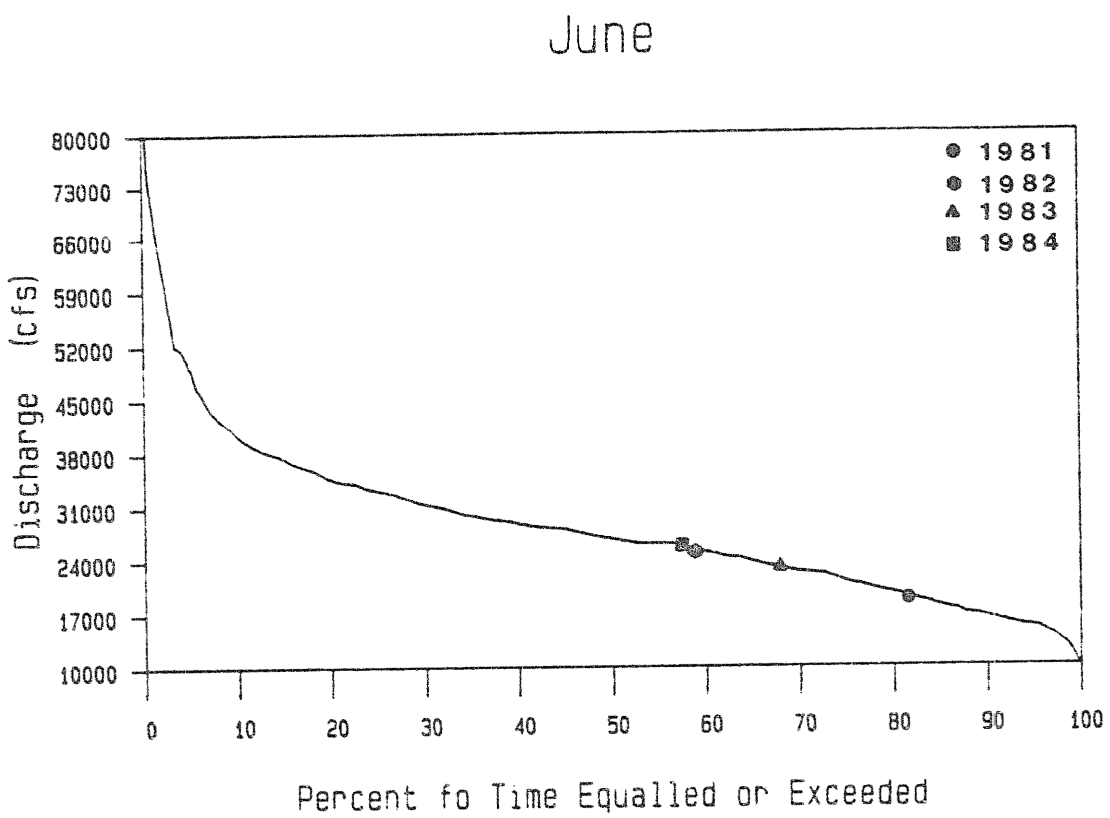

Figure II-1. Middle river study sites.

Flow duration analyses are useful in comparing discharge magnitudes of a particular year to those occurring over the historical period of record. Figure II-2 shows the range of mean daily discharges at Gold Creek between 1950 and 1984 for the months of June, July, August, and September, as well as the percent of time flows were equalled or exceeded.

The 50-percent exceedence value represents a typical medium discharge, the 90-percent, a typical low discharge, and the 10-percent, a typical high. The exceedence value corresponding to the mean monthly discharges during the years 1981, 1982, 1983, and 1984 are also shown in Figure II-2.

## METHODS

Staff gage location and installation: Leopold and Stevens staff gages graduated in 0.01 foot increments from zero to 3.33 feet were installed at all modeling sites during August 1984. Staff gages were located on each cross section within the IFG study sites to facilitate obtaining water surface elevations without surveying long distances when collecting multiple sets of calibration data from the hydraulic models. Often as many as three tiered staff gages were installed per cross section to span the variations in WSEL which was associated within the range of mainstem discharges being monitored. Each staff gage was surveyed to a known elevation (project datum) previously established throughout the middle river by R&M Consultants, Inc. from 1980 through 1982. This allowed conversion of site-specific water surface elevation readings to a common elevation throughout the middle river.



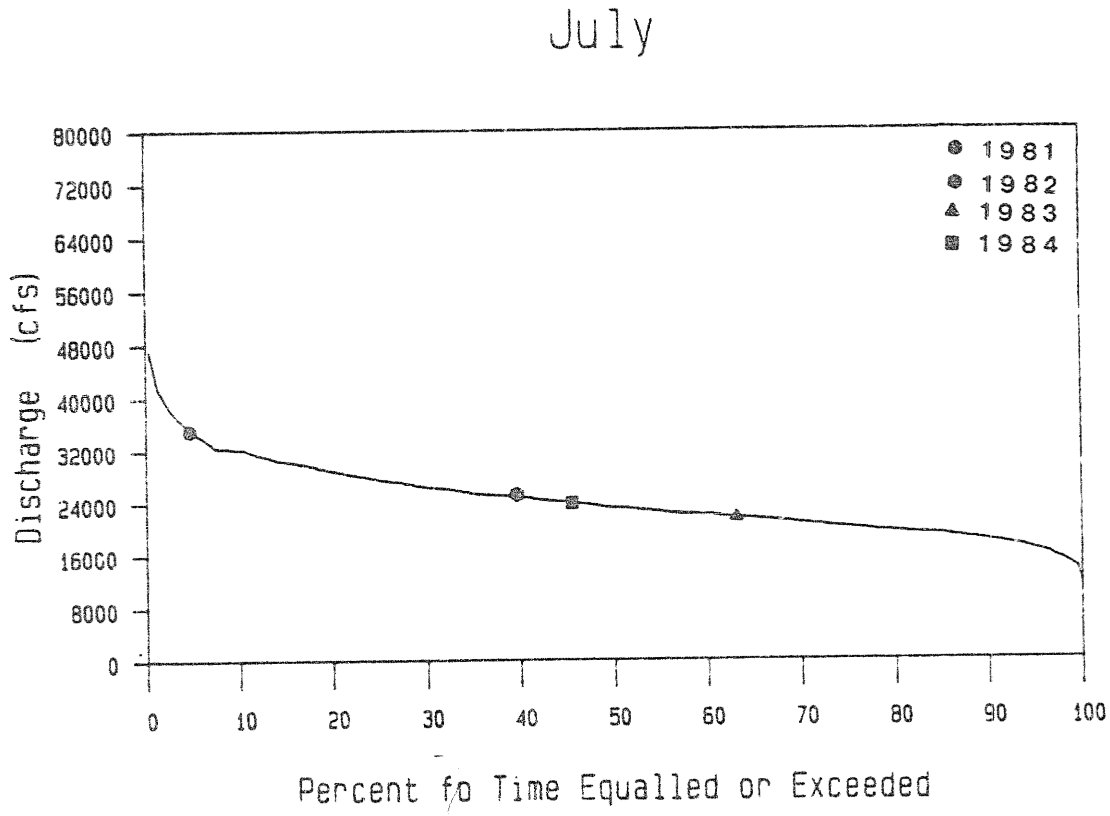
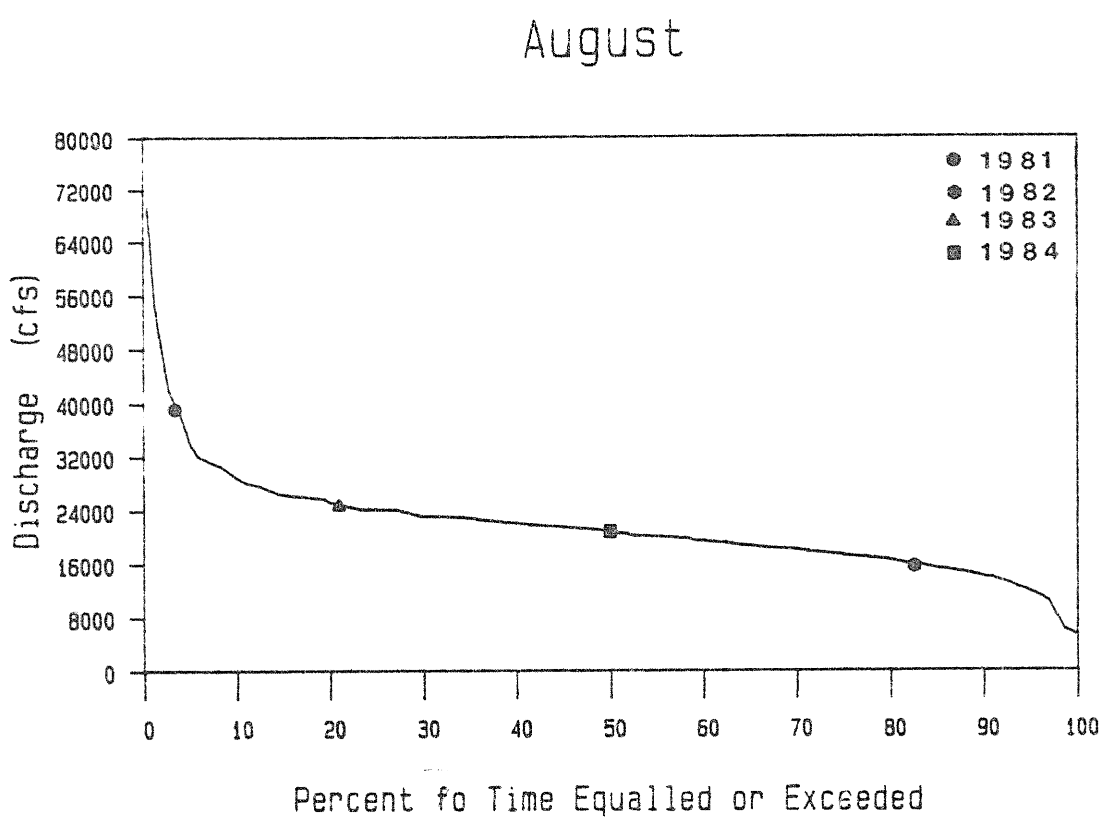




Figure II-2. Flow durations curves for June, July, August, and September, based on mean daily Susitna River discharges at Gold Creek, 1950-1984 and corresponding flow exceedence values for mean monthly discharges, 1981-1984.



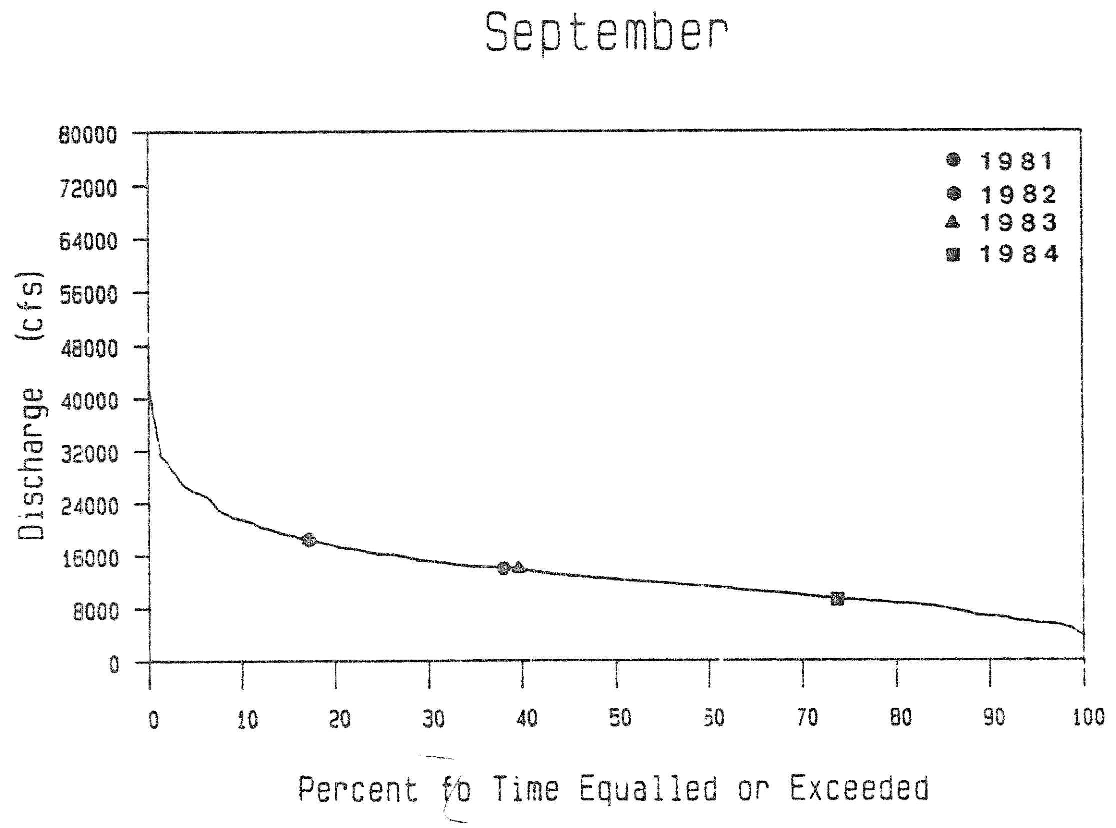




Figure II-2. Flow durations curves for June, July, August, and September, based on mean daily Susitna River discharges at Gold Creek, 1950-1984 and corresponding flow exceedence values for mean monthly discharges, 1981-1984.

Staff gage locations were identified by river mile (RM), location within the site, position relative to flow level (high, medium, low) and the associated cross section number (Table II-1).

Table II-1. Identification codes for staff gages.

| Location in Site | Code | Flow Level | Code |
|---|---|---|---|
| Mainstem | M | High | A |
| Side Channel | S | Medium | B |
| Side Channel Mouth | W | Low | C |
| Side Channel Head | H | | |
| Other | X | | |
| Spawning Sites | P | | |

Low water gages were typically installed and surveyed to a known elevation in September when the medium flow gages were about to be dewatered because of receding streamflows.

Data Collection: Staff gage readings were obtained at three to five different mainstem discharge levels during the August through October field season. Gage height was read to the nearest 0.01 ft. Water surface elevations were surveyed by differential leveling to the nearest 0.01 ft if the staff gages were dewatered, and during cross section and thalweg surveys.

Site-specific flow measurements were obtained at one cross section in each IFG model site at a minimum of three different mainstem discharges. The discharge cross section was located in a stable portion of the study site where the velocity distribution remained relatively constant over a range of flows. Most discharge cross sections were located at the head of a riffle or in the transition zone between a riffle and run.

Flow measurements were obtained using a top-set wading rod and Marsh-McBirney electronic flow meters, or Price AA meters. Depth and velocity measurements were taken across each cross section at 20 to 25 points (verticals) in accordance with standard methods of the U.S. Geological Survey. If the flow velocity was not perpendicular to the cross section, the flow angle was recorded. Site flow was calculated with a hand calculator or an Epson HX-20 portable computer using the formula:

$$q = \sum_{i=1}^{n} (d_i) \times (w_i) \times (V_i) \times \alpha_i$$

where:

$d_i$ = depth of cell i

$w_i$ = width of cell i

$V_i$ = velocity of cell i

$\alpha_i$ = flow angle of cell i

More detailed procedures for staff gage location and streamflow measurement may be found in the FY84 ADF&G Su Hydro Aquatic Studies Procedures Manual (ADF&G Su Hydro 1984).

Average daily streamflows for the Susitna River at Gold Creek were obtained from the U.S. Geological Survey gaging station located at Gold Creek (USGS 15292000). Instantaneous discharges were calculated from a time-lag analysis in those instances when rapidly rising or falling mainstem discharges complicated use of mean daily values.

Analysis: Streamflow and water surface elevation data were tabulated in a Wordstar file using an IBM PC XT and transferred to a Lotus file for graphing as log/log plots. Water surface elevation (y-axis) was plotted against mean daily discharge at Gold Creek (x-axis) for the 22 study sites. Plots of water surface elevation at the site and site flow versus mainstem discharge were also prepared for the eight IFG model sites. Each plot was visually inspected for outliers and, if necessary, the erroneous data points were corrected. Least squares regression equations describing relationships between the dependent and independent variables were calculated for each staff gage using a programmable HP 41 CF calculator. Extrapolation limits of the regression equations were established based on several factors: the number of data points, channel geometry, and breaching or controlling mainstem discharge. The breaching flow for each side channel study site was determined from field data or inspection of aerial photographs taken at several different mainstem discharges (Klinger-Kingsley 1985). The reviewed data were transferred to the Boeing mainframe computer for final analysis to confirm regression equations and for final plotting.

The relationship between side channel flow or stage and mainstem discharge is dependent upon the location of the staff gage in the side channel (head or mouth) and whether the side channel is breached or not ~~breached~~. Observations regarding the breached or non-breached condition of the side channel were recorded with each staff gage reading. This information was used to interpret the computer graphics and identify the influence of mainstem stage on breaching the head of the side channel or causing a backwater at the mouth. Observations regarding breached and non-breached conditions also assisted with identifying the mainstem discharge above which side channel flow was "controlled" by mainstem discharge. An inflection point on the site flow versus mainstem discharge plot identifies the transition from non-controlled to controlled flow conditions in the side channel. In general, the controlling mainstem discharge is equal to or slightly greater than the breaching discharge depending upon the shape of the channel cross section at the head of the side channel (Aaserude et al. 1985).

## RESULTS

Site specific flow and water surface elevations were monitored from August through October 1984, spanning the range of mainstem discharges of 4,000 to 34,200 cfs, as measured at Gold Creek. Whenever the mainstem discharge was sufficient to breach the side channel study sites (generally 8,000 to 10,000 cfs), direct relationships between mainstem discharge and side channel flow and water surface elevations were obtained. When channels were unbreached, their water surface elevations were influenced by local inflow, channel geometry and mainstem backwater. The site flow was influenced by upwelling, tributary inflow or local runoff. Hence relationships were not determined for these conditions.

Mainstem discharges at Gold Creek in 1984 were similar or slightly lower than typical discharges determined from the 35 year record (Figure II-2). Mean monthly discharges for June, July, August, and September corresponded to flow exceedence values of 50, 29, 52, and 73 percent, respectively.

Three relationships (site-specific water surface elevation versus mainstem discharge, site flow versus site-specific water surface elevation, and site flow versus mainstem discharge) are presented on one page for each IFG model site. The relationships between site-specific water surface elevations and mainstem discharge are presented for each of the 14 direct input model sites (Figures II-3 to II-24). Figures A-1.1 to A-1.7 present the water surface elevation versus discharge plots for all IFG cross sections with the exception of the discharge cross sections. Tables A-1.1 through A-1.22 present the data used in all plots and in the development of regression equations.

Site 101.2R: As indicated by inflection points in Figure III-3, the side channel breaches at 9,200 cfs and becomes controlled at 10,300 cfs. Staff gages at cross sections 2 and 5 are located in the right channel which becomes active at 14,000 cfs. The gravel bar which separates the main and right channels becomes submerged near 18,000 cfs and consequently, the same water surface elevation occurs in both channels above that flow.

Site 101.5L: The channel is controlled by the mainstem at discharges greater than 5,000 cfs. A large backwater area is present at the mouth of the channel. As mainstem discharge increases, the effect of mainstem backwater on stage extends further upstream. This is reflected in the inflection points for the stage-discharge curves which occur at increasingly higher mainstem discharge with increasing distance from the mouth of the channel (Figure II-4).

Three relationships (site-specific water surface elevation versus mainstem discharge, site flow versus site-specific water surface elevation, and site flow versus mainstem discharge) are presented on one page for each IFG model site. The relationships between site-specific water surface elevations and mainstem discharge are presented for each of the 14 direct input model sites (Figures II-3 to II-24). Figures A-1.1 to A-1.7 present the water surface elevation versus discharge plots for all IFG cross sections with the exception of the discharge cross sections. Tables A-1.1 through A-1.22 present the [illegible] a used in all plots and in the development of regression equations.

Site 101.2R: As indicated by inflection points in Figure III-3, the side channel breaches at 9,200 cfs and becomes controlled at 10,300 cfs. Staff gages at cross sections 2 and 5 are located in the right channel which becomes active at 14,000 cfs. The gravel bar which separates the main and right channels becomes submerged near 18,000 cfs and consequently, the same water surface elevation occurs in both channels above that flow.

Site 101.5L: The channel is controlled by the mainstem at discharges greater than 5,000 cfs. A large backwater area is present at the mouth of the channel. As mainstem discharge increases, the effect of mainstem backwater on stage extends further upstream. This is [illegible] s for the stage-discharge curves which oc[illegible] m discharge with increasing distance from [illegible] e II-4).

<u>Site 101.7L</u>: A backwater area extends from below cross section 1 upstream to cross section 2 at mainstem discharges of 9,600 cfs or less. A gravel bar extends from the head to cross section 1 along the right side of the channel which is overtopped at 9,600 cfs. The amount of flow over the gravel bar determines the flow at cross section 1. Cross sections 2 through 4 are only affected by backwater above 9,600 cfs until the head of the site is breached at discharges greater than 23,000 cfs (Figure II-5).

<u>Site 105.8L</u>: The mainstem channel shape is constant below a discharge of 24,000 cfs. As indicated by the inflection points in Figure II-6, the water surface elevation associated with 24,000 cfs is coincident with a change in cross sectional geometry.

<u>Site 112.6L</u>: The channel is controlled by the mainstem at discharges greater than 5,000 cfs. At the discharge cross section, a linear curve describes the relationship between discharge and water surface elevation for the entire mainstem range of 5,000 to 35,000 cfs (Figure II-7). When developing the relationship between site flow and mainstem discharge, a high correlation was found to exist between the lower four data points. Includ~~ing~~ the fifth data point~~,~~ resulted ~~in~~ a much lower correlation, suggesting an inflection point exists in the relationship. The physical explanation for the change in slope is probably the head berm geometry. Near 10,800 cfs the water surface elevation at the head berm may coincide with a cross sectional grade break at the channel entrance.

Site 114.1R: Flow enters the study site at discharges greater than 5,000 and at 10,000 cfs through two channels. The flow in the channel is controlled above 8,800 cfs (Figure II-8).

Site 115.0R: Backwater from the mouth of the side channel extends upstream to cross section 1 at all discharges greater than 10,400 cfs (Figure II-9). Below 10,400 cfs, low flow is maintained by upwelling. Two heads d rect flow into the site and breach at 12,000 and 23,000 cfs.

Sites 118.9L and 119.1L: The mainstem channel shape is constant throughout the range of available data (Figures II-10 and II-11).

Site 119.2R: The side channel is controlled by the mainstem at all discharges greater than 10,000 cfs (Figure II-12). Above 23,000 cfs, the left bank is inundated and a change in the flow-discharge relationship can be expected. The lower half of the side channel, described by cross sections 1, 2, and 3, persists as a backwater area throughout the mainstem range of 5,000 to 23,000 cfs. The upper half of the side channel, represented by cross sections 4 and 5, is dry at discharges less than 10,000 cfs.

Site 125.2R: The side channel is breached at discharges greater than 4,300 cfs and becomes controlled at 6,210 cfs (Figure II-13).

Site 130.2R: Below a mainstem discharge of 16,100 cfs, flow is maintained throughout the study site by upwelling and is somewhat influenced by backwater (Figure II-14). Above 16,100 cfs the sand bar which separates the channel from the side channel is overtopped.

Site 131.3L: Flow enters the channel through two locations at 9,000 and 10,700 cfs. At 9,000 cfs, flow enters between cross sections 2 and 3. Flow through the head is controlled at all cross sections at discharges greater than 10,700 cfs (Figure II-15).

Site 131.7L: The three heads that direct flow into the channel breach at discharges of 5,000, 10,000 and 14,500 cfs. The study site is first breached at 5,000 cfs and controlled by the mainstem at discharges greater than 7,470 cfs (Figure II-16).

Site 132.6L: The two heads which direct flow into the side channel breach at discharges of 10,000 and 14,500 cfs. Ponded water is present between cross sections 5 through 9 at 10,000 cfs and dries up near 8,000 cfs. The channel flow is controlled by the mainstem at 11,900 cfs (Figure II-17). Above 23,100 cfs the water surface elevation at the lower two cross sections is influenced by backwater from the mainstem.

Site 133.8R: The mainstem channel shape is constant below a discharge of 15,600 cfs. The water surface elevation associated with 15,600 cfs is coincident with a change in cross sectional geometry as indicated by the inflection point in Figure II-18.

Site 136.0L: The channel is controlled by the mainstem at discharges greater than 5,000 cfs. Even at extremely high discharges, it remains distinctly separate from the mainstem; water does not flow across the island constituting the right bank, nor are there any overflow channels which might direct or divert water into or from the side channel at high flows. The cross sectional geometry is relatively constant throughout the site. Thus, the relationships developed are valid throughout the mainstem range of 5,000 to 35,000 cfs (Figure II-19).

Site 137.5R: Below 11,800 cfs the flow is maintained by upwelling throughout the study site. At discharges greater than 11,800 cfs, a backwater extends upstream throughout the site (Figure II-20). Flow begins entering the channel over the gravel bar at 23,000 cfs but is not significant enough to change the stage-discharge relationship for the site.

Site 138.7L: The mainstem channel shape is constant throughout the range of available data (Figure II-21).

Site 139.0L: Flow is maintained throughout the study site at discharges below 12,000 cfs. Above 12,000 cfs, the gravel bar separating the channel from the mainstem is overtopped. This overtopping discharge is reflected by a change in the WSEL versus Q relationship in Figure II-22.

Site 139.4L: The mainstem channel shape is constant throughout the range of available data (Figure II-23).

Site 147.1L: This large side channel is controlled by the mainstem at discharges greater than 5,000 cfs. Like site 136.0L, the side channel is not influenced by overflow channels or cross flow from the mainstem, even at high discharges. The relationships between site flow, mainstem discharge, and water surface elevation are valid throughout the mainstem range of 5,000 to 35,000 cfs (Figure II-24).

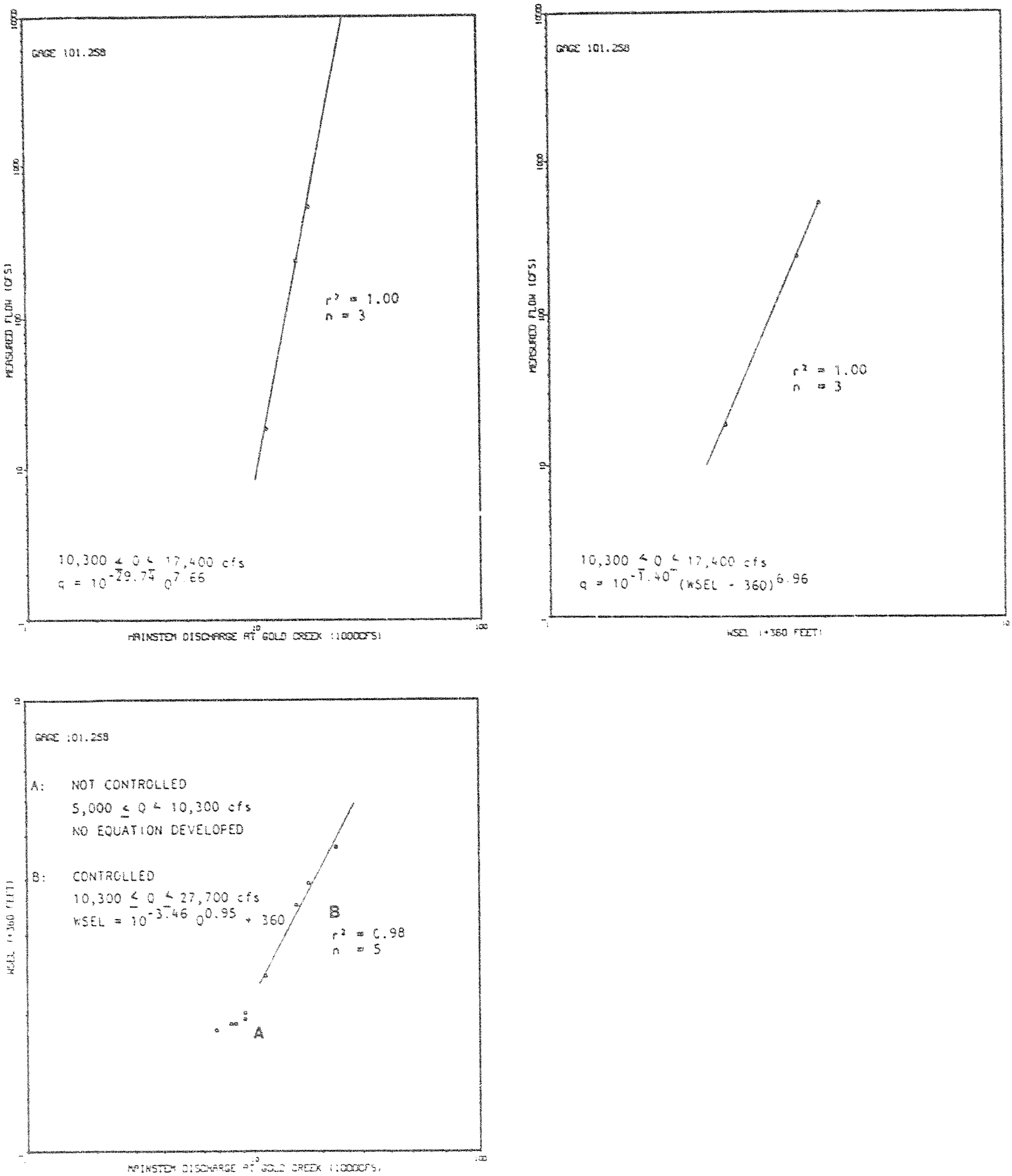



Figure II-3. Pelationships between mainstem discharge, site flow and water surface elevation for cross section 8 at site 101.2R.

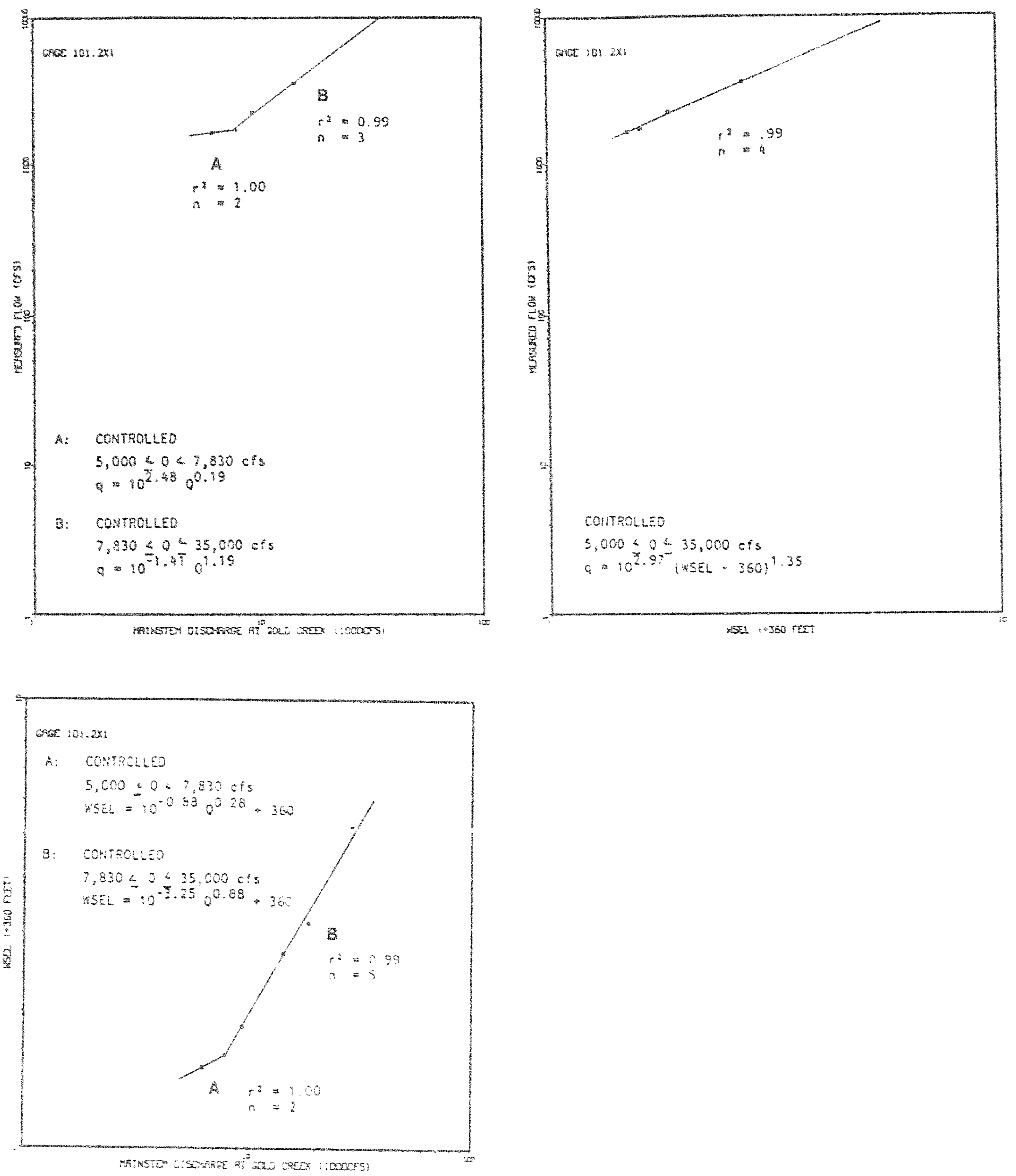



Figure II-4. Relationships between mainstem discharge, site flow and water surface elevation for cross section 1 at site 101.5L.

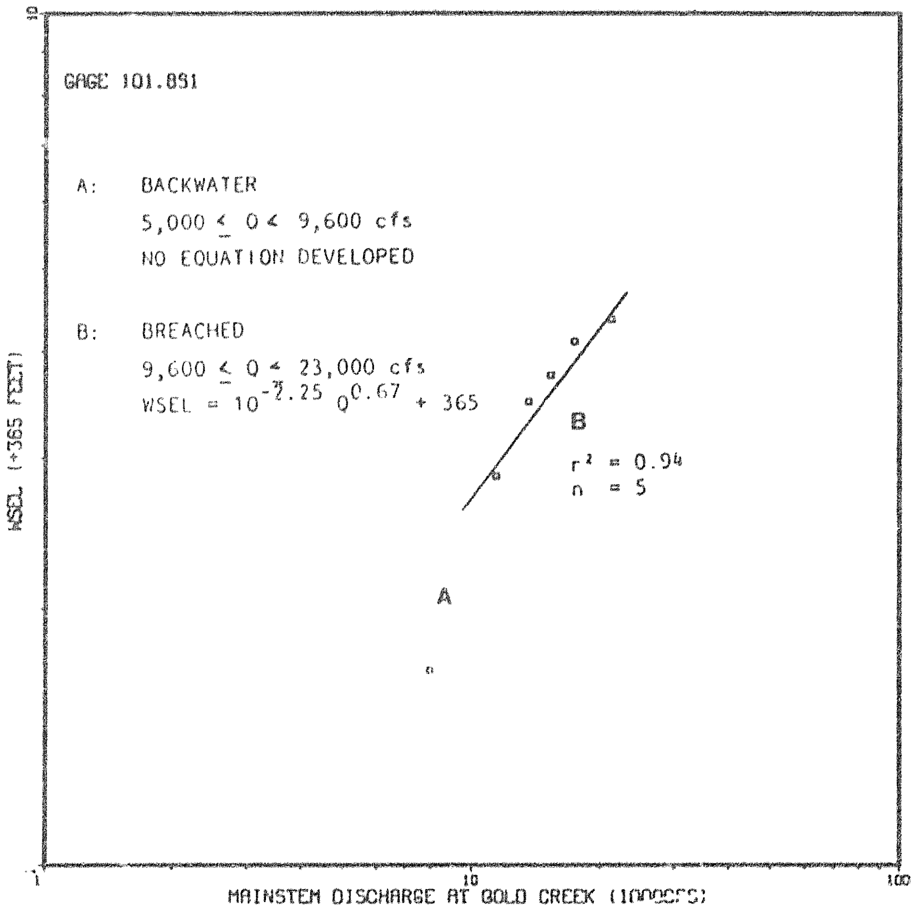
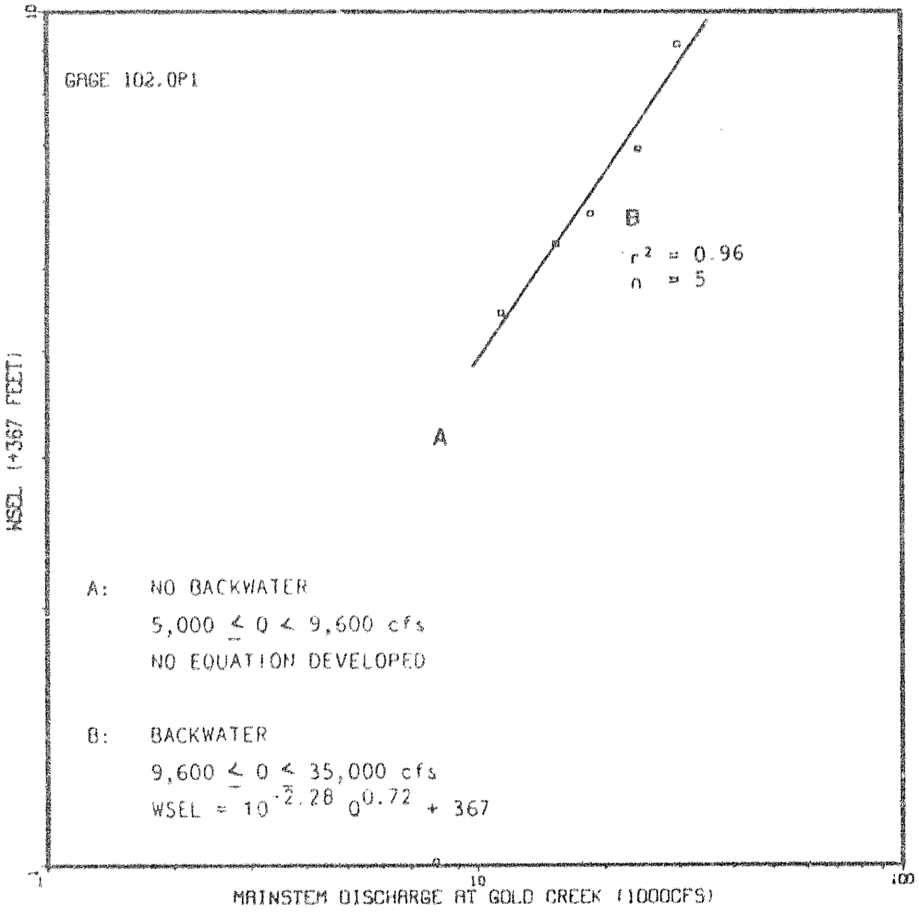



Figure II-5. Stage discharge curves for cross sections 1, 3 and 4 at site 101.7L.



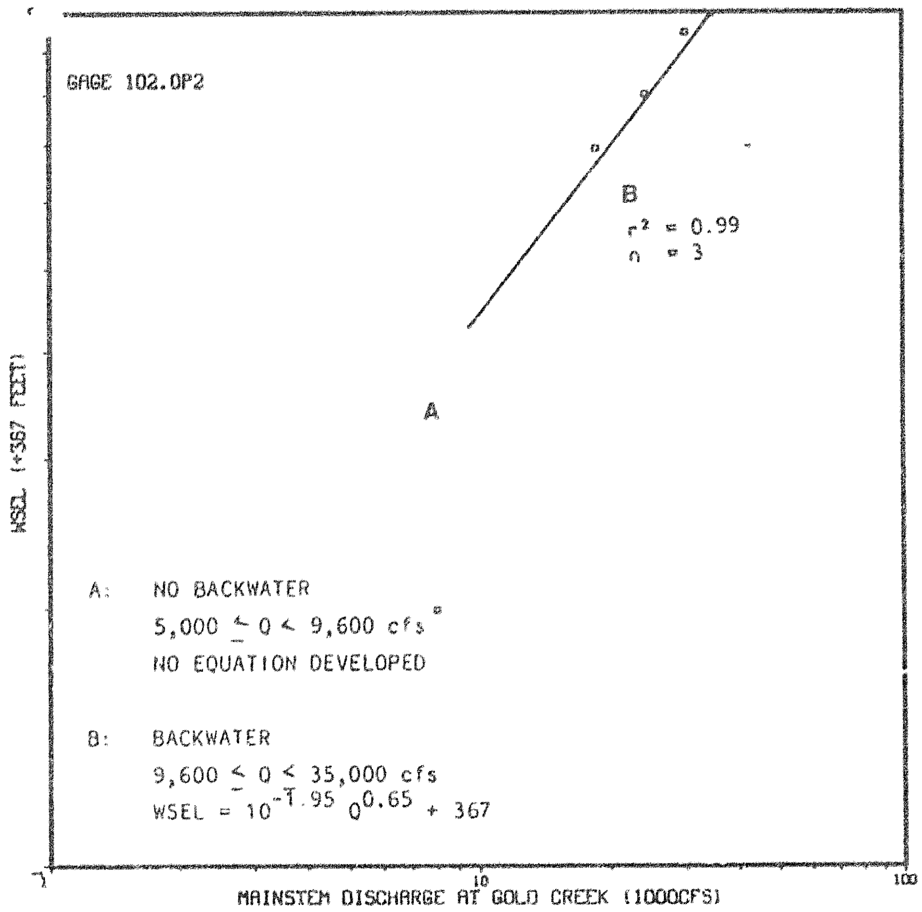




Figure II-5. Stage discharge curves for cross sections 1, 3 and 4 at site 101.7L.

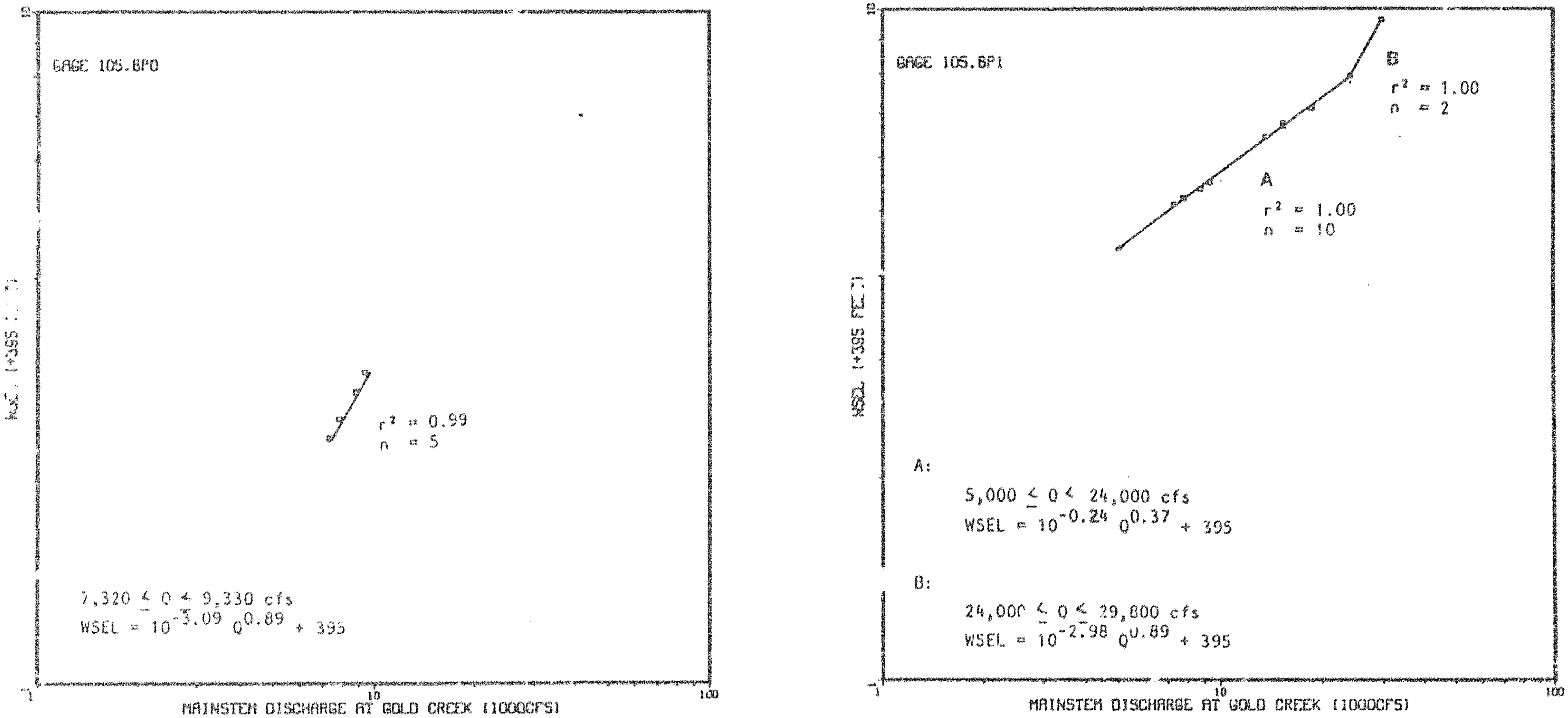
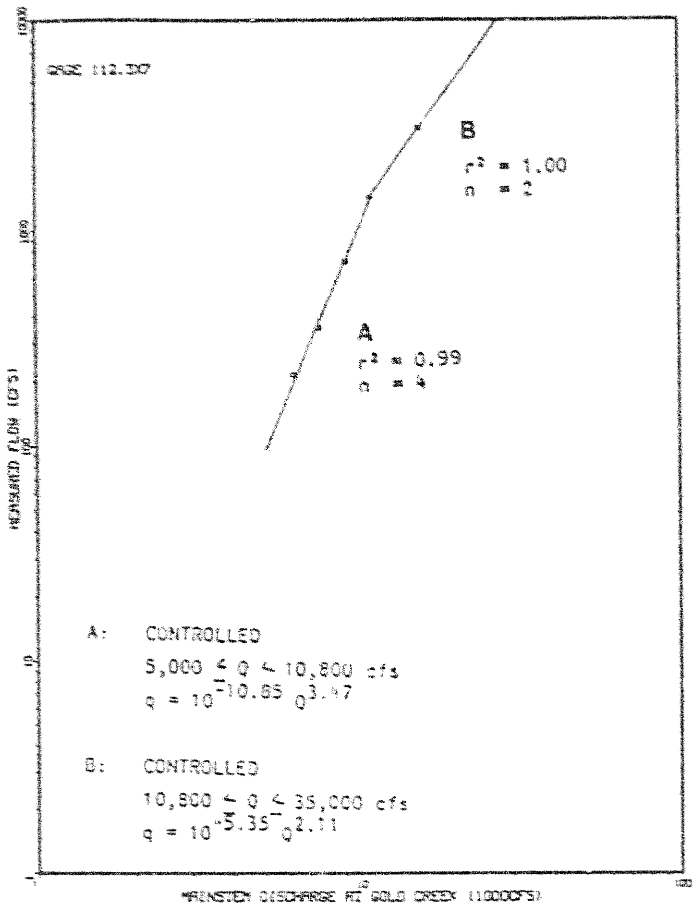
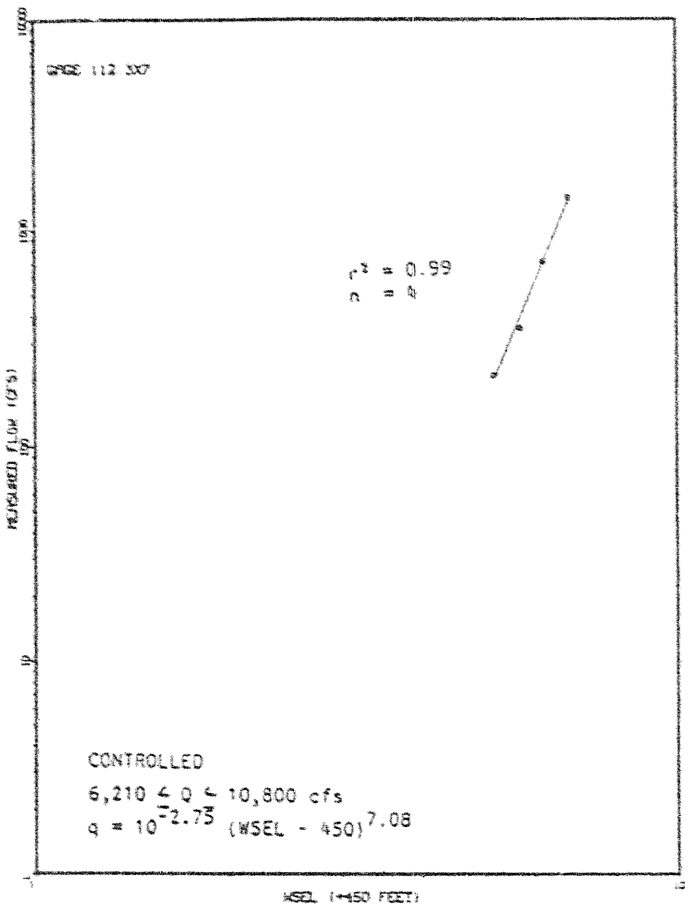



Figure II-6. Stage discharge curves for cross sections 1 and 4 at site 105.8L.



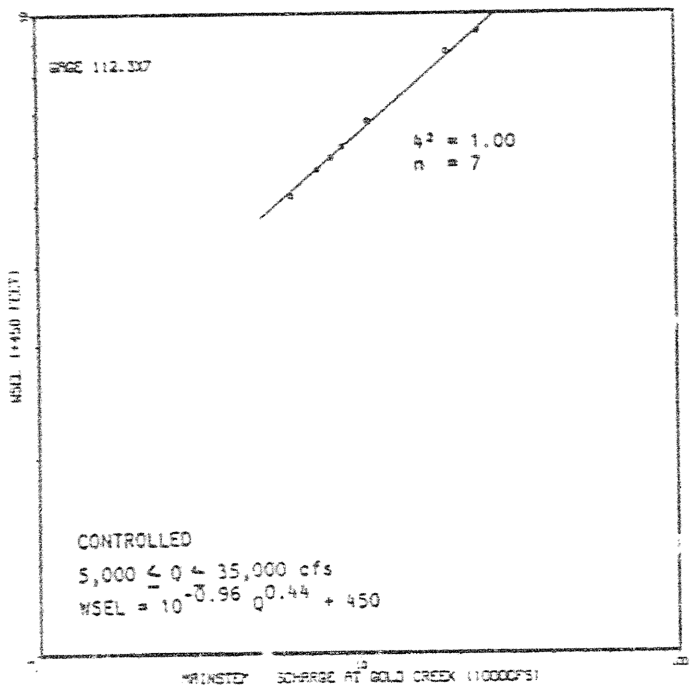




Figure II-7. Relationships between mainstem discharge, site flow and water surface elevation for cross section 7 at site 112.6L.

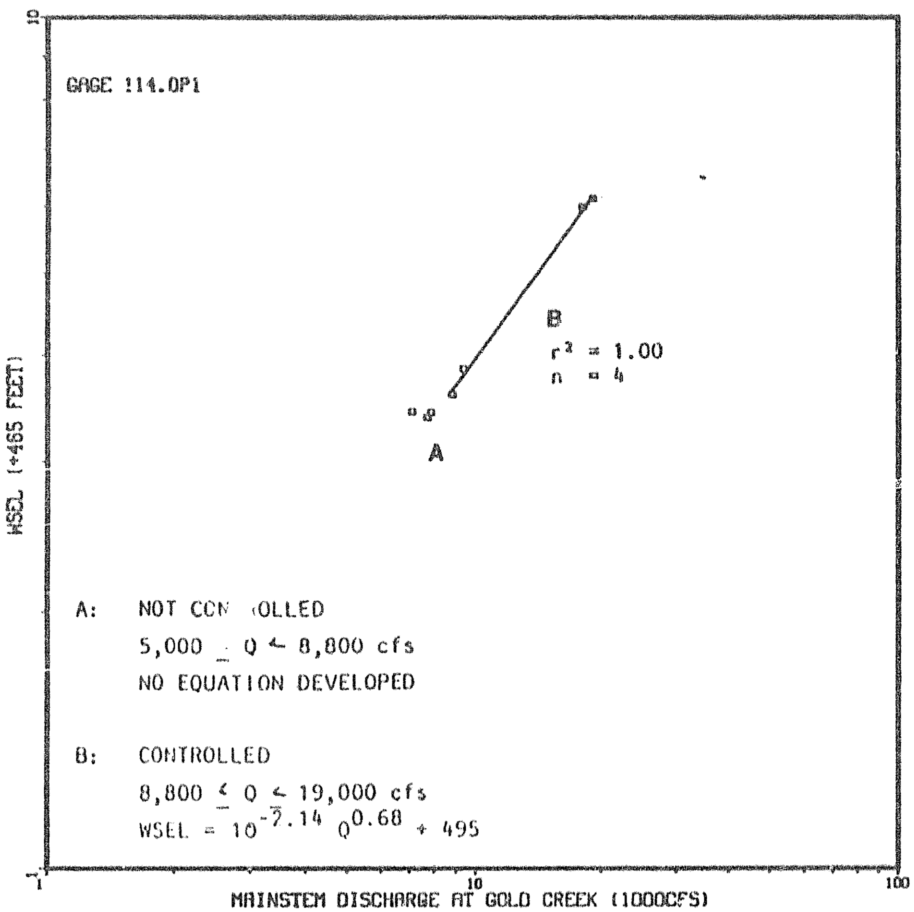



Figure II-8. Stage discharge curve for cross section 2 at site 114.1R.

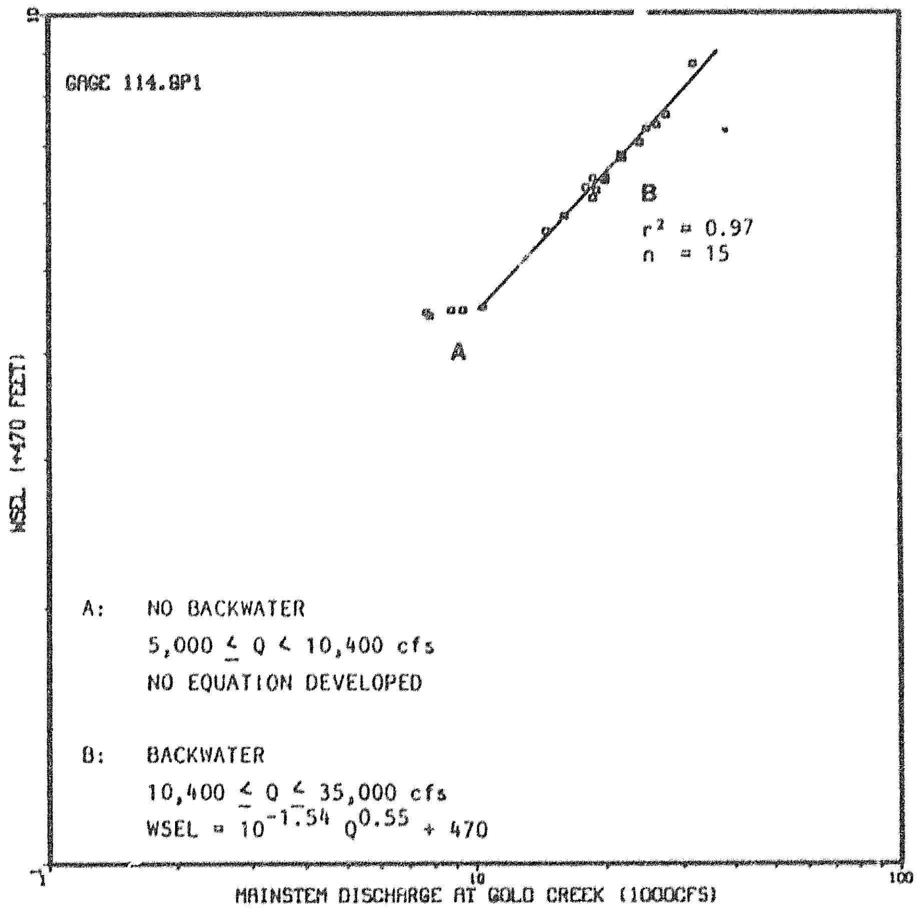



Figure II-9. Stage discharge curve for cross section 1 at site 115.0R.

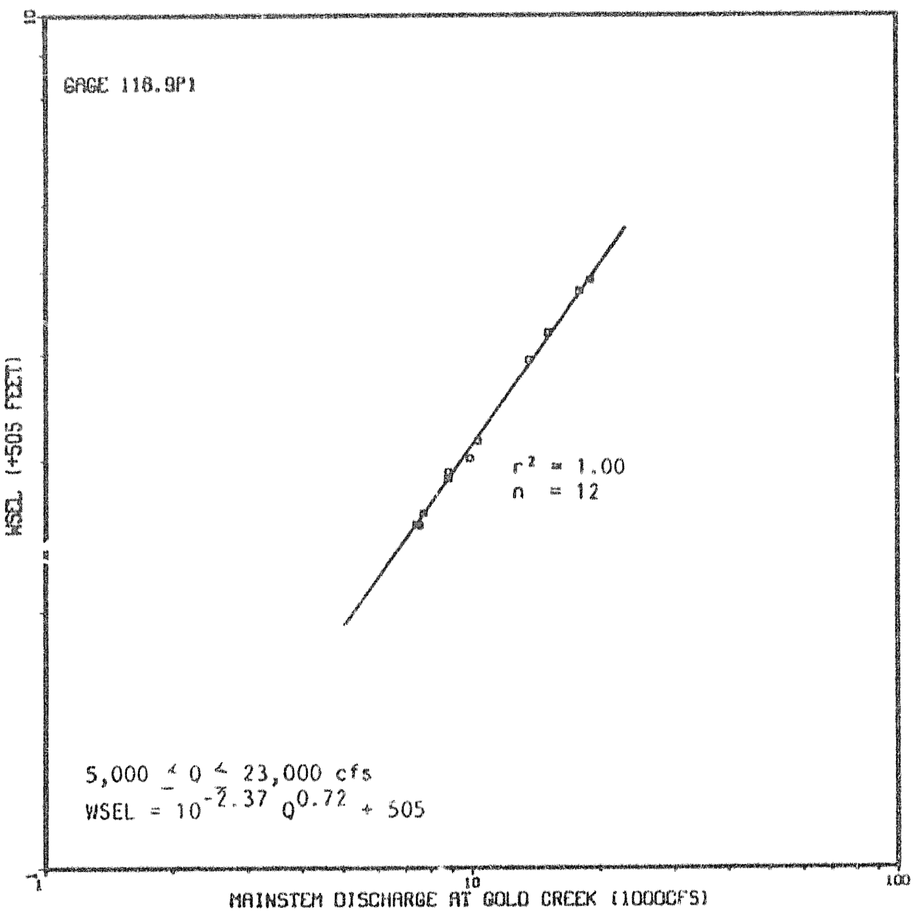



Figure II-10. Stage discharge curve for cross section 2 at site 118.9L.

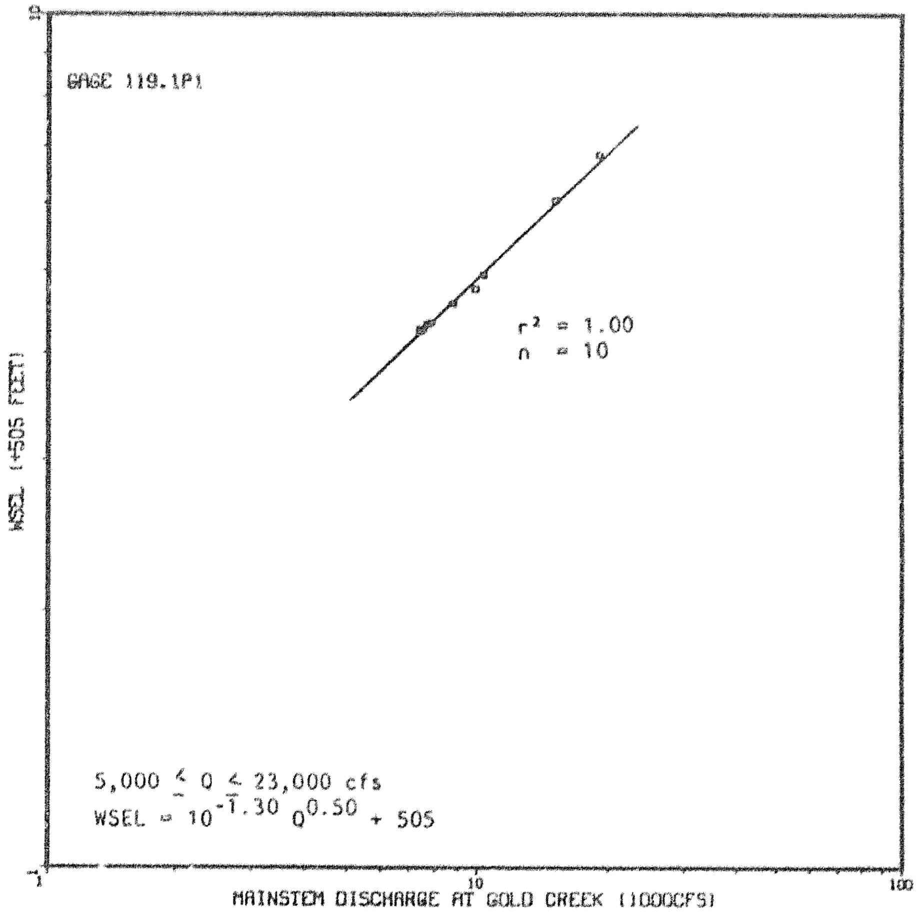
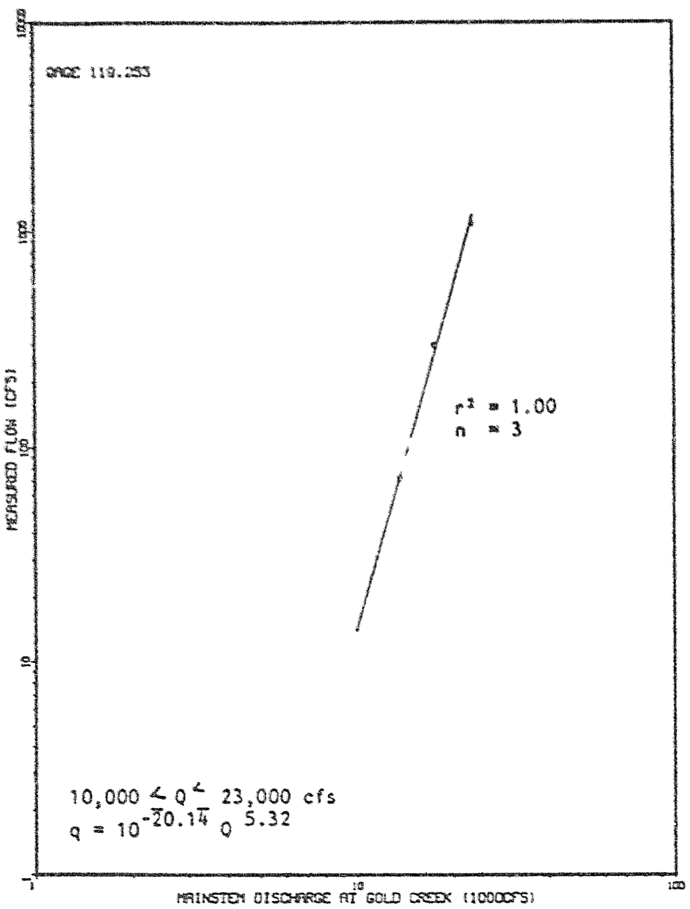
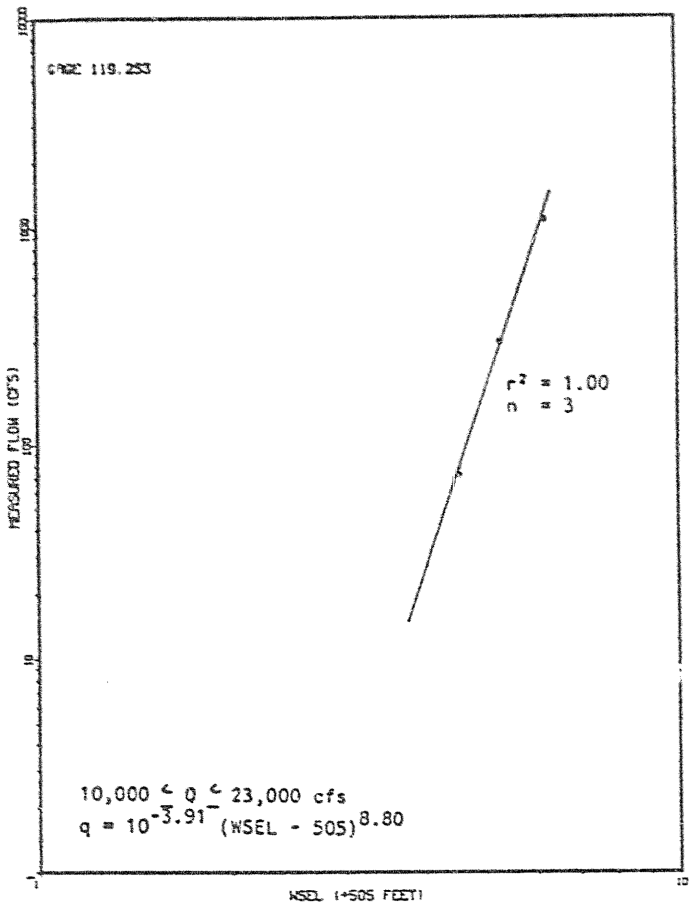



Figure II-11. Stage discharge curve for cross section 2 at site 119.1L.



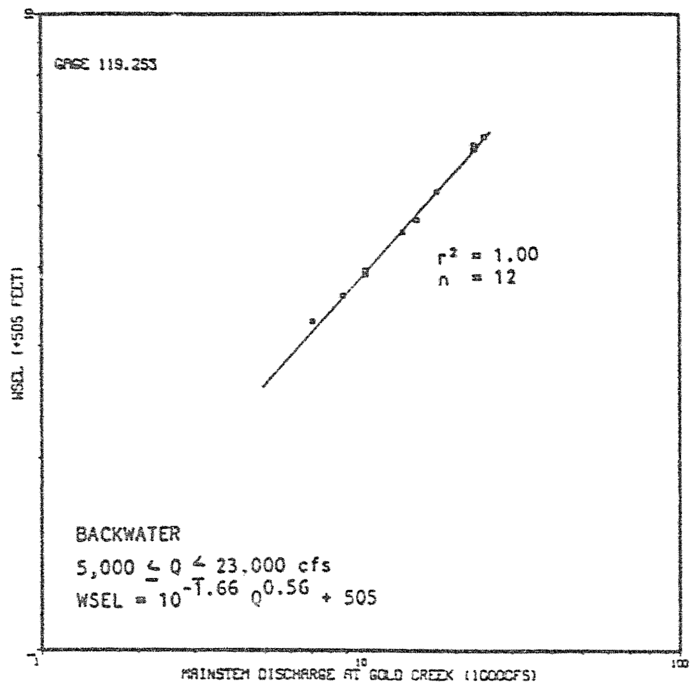




Figure II-12. Relationships between mainstem discharge, site flow and water surface elevation for cross section 3 at site 119.2R.

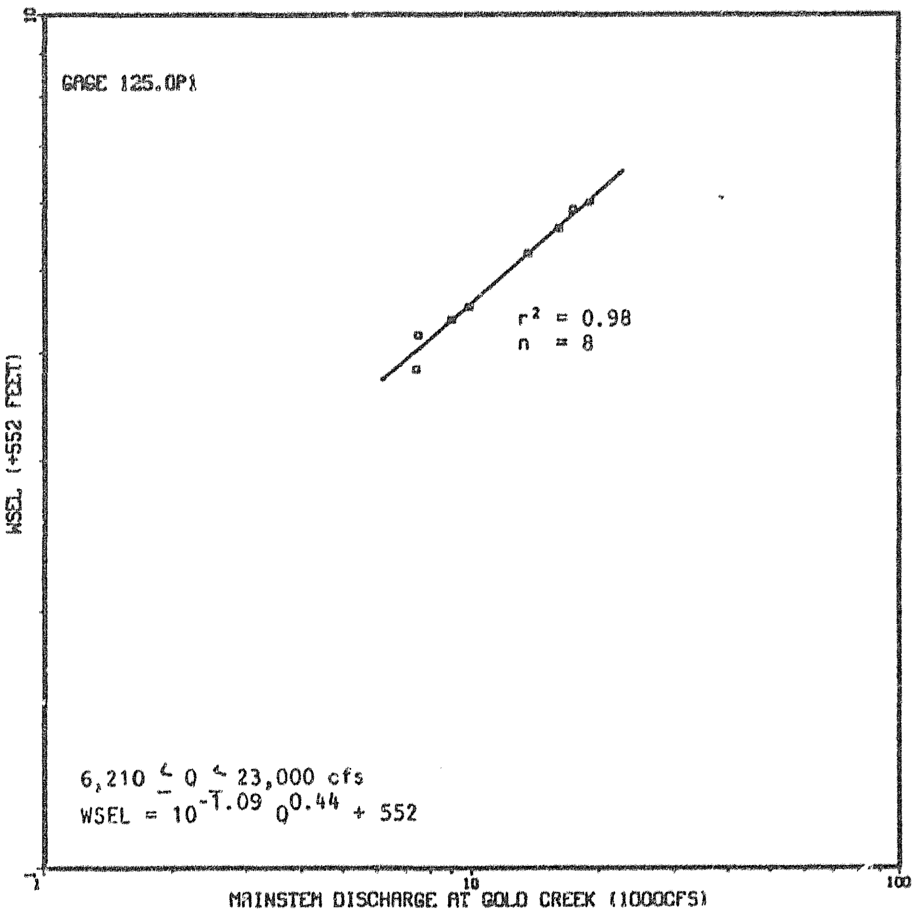



Figure II-13. Stage discharge curve for cross section 1 and relationships between mainstem discharge, site flow and water surface elevation for cross section 2 at site 125.2R.

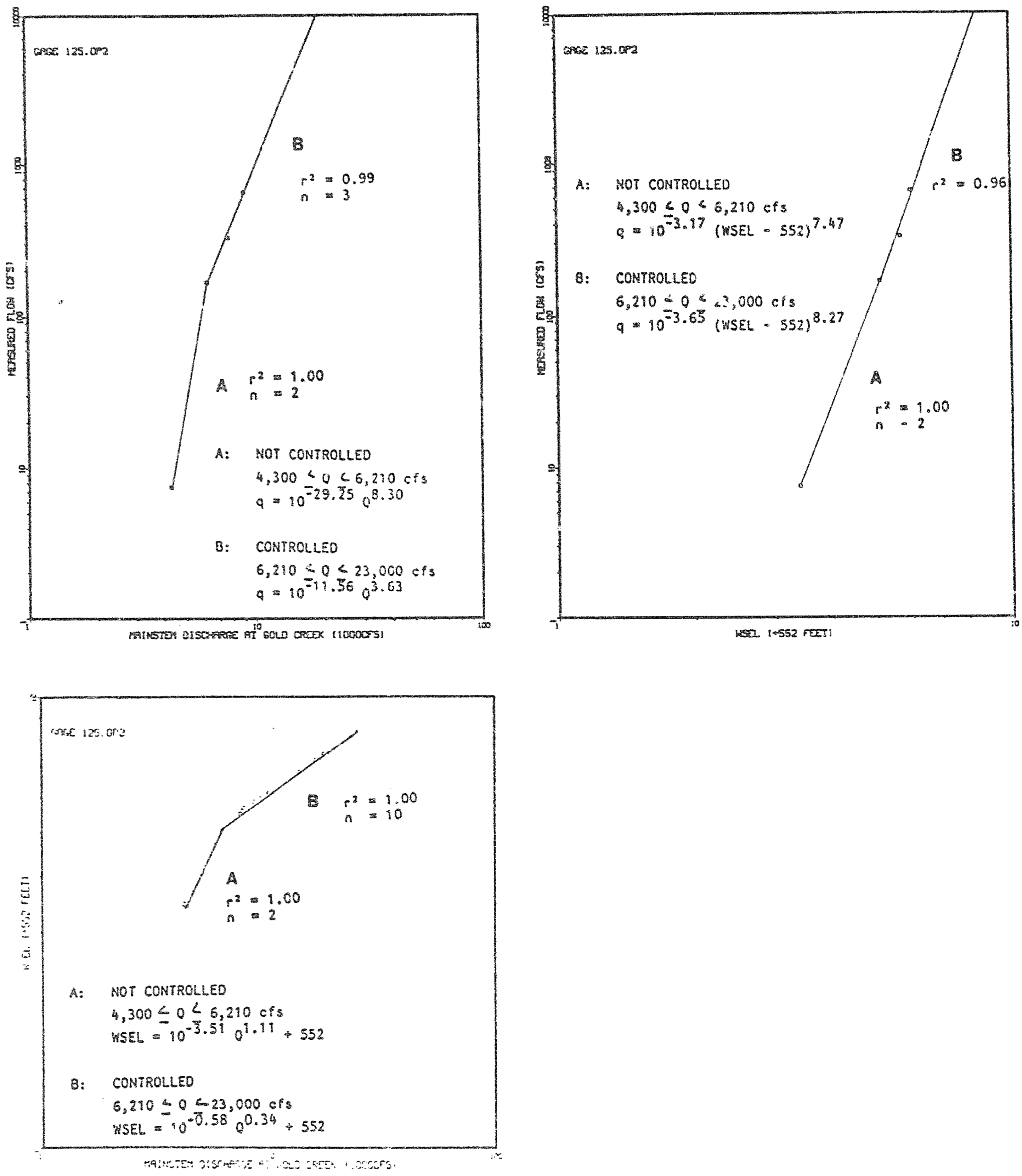



Figure II-13. Stage discharge curve for cross section 1 and relationships between mainstem discharge, site flow and water surface elevation for cross section 2 at site 125.2R.

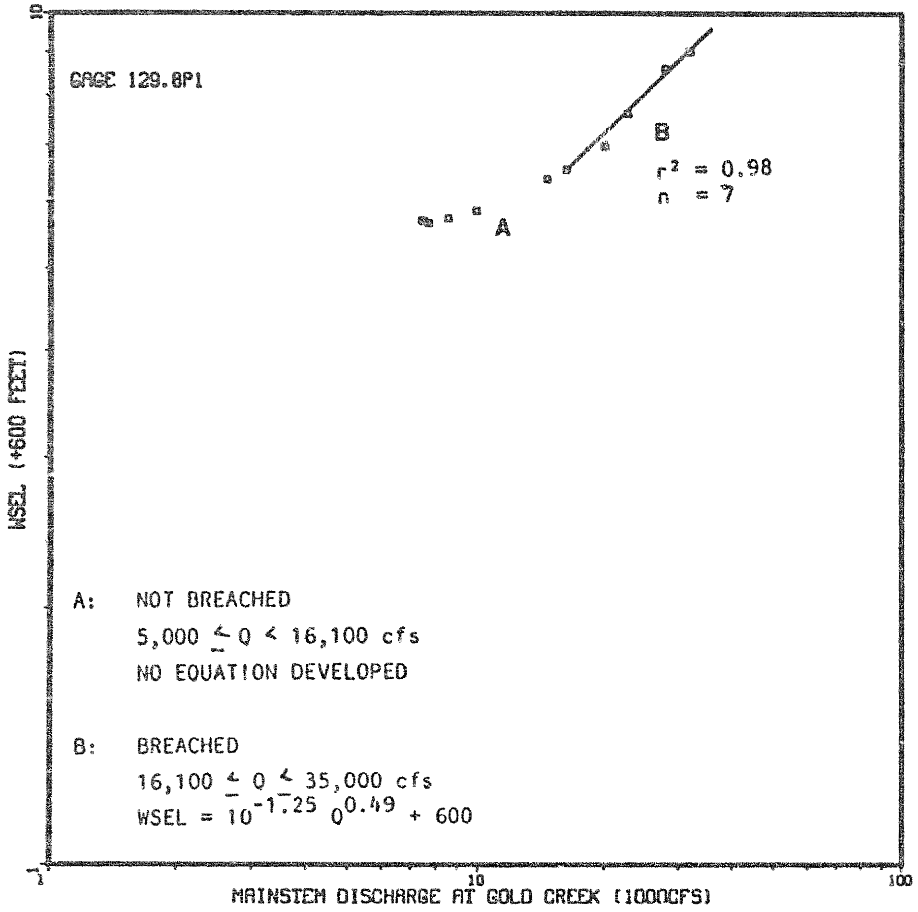



Figure II-14. Stage discharge curve for cross section 2 at site 130.2R.

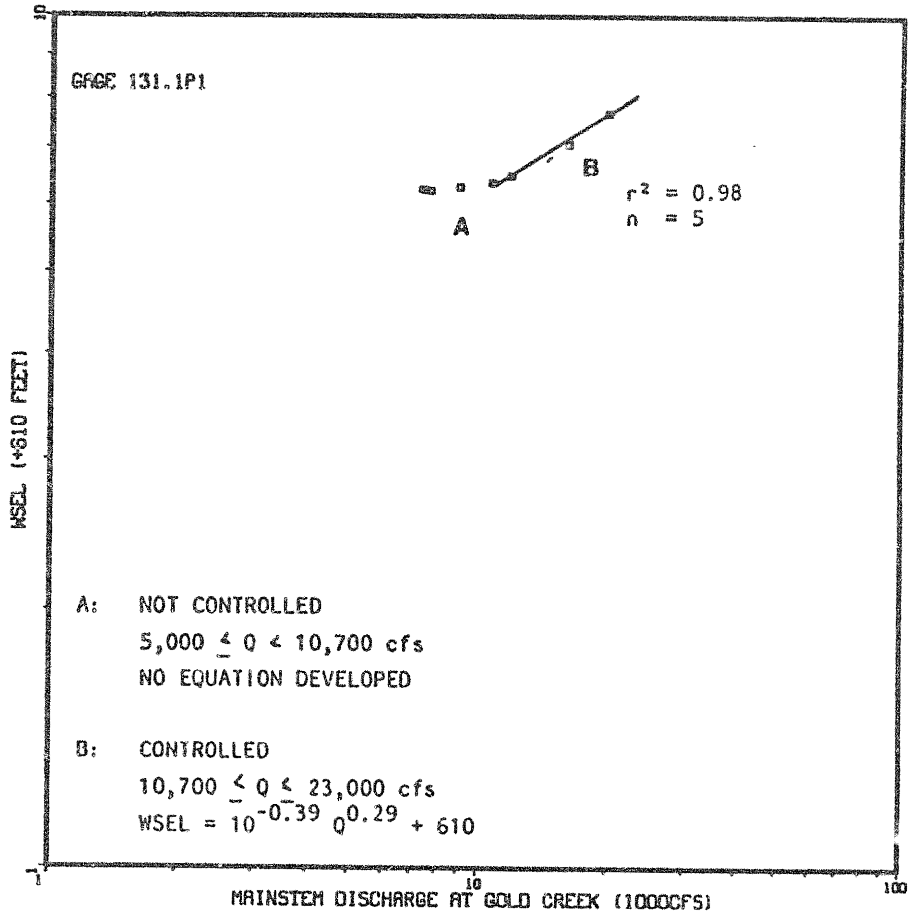
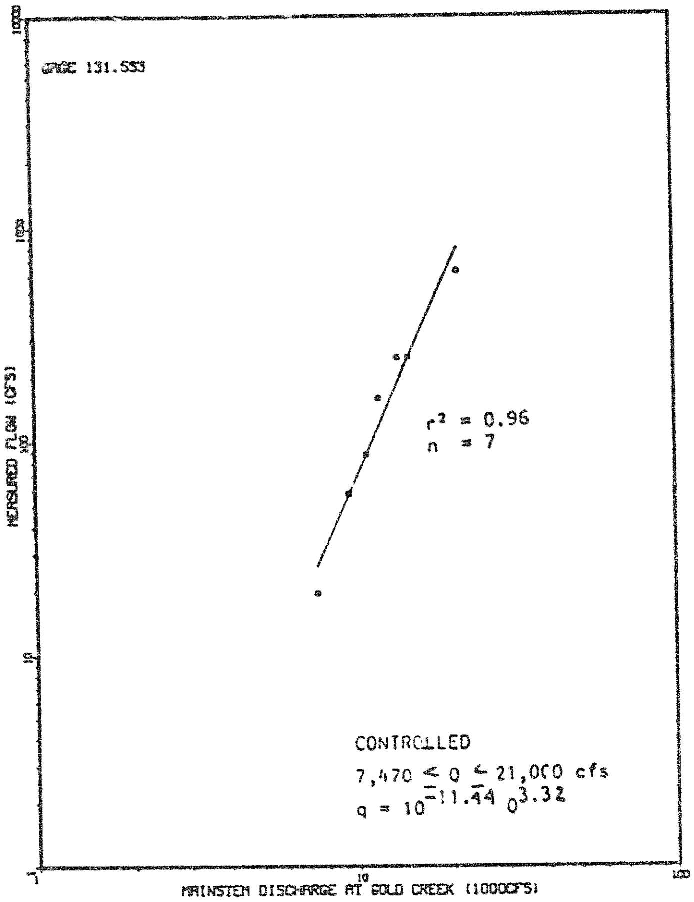
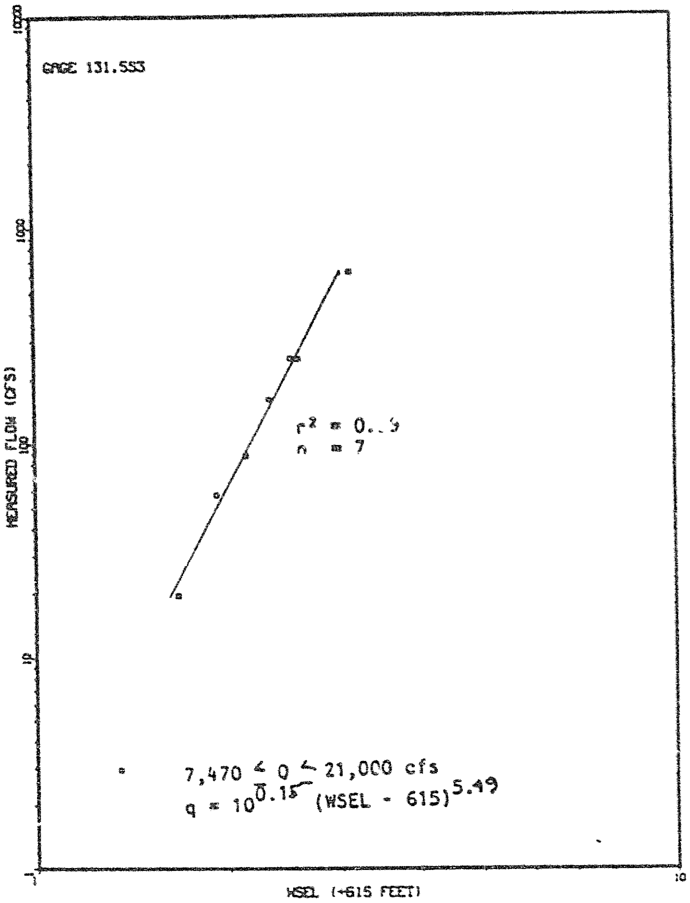



Figure II-15. Stage discharge curve for cross sections 1 and 3 at site 131.3L.



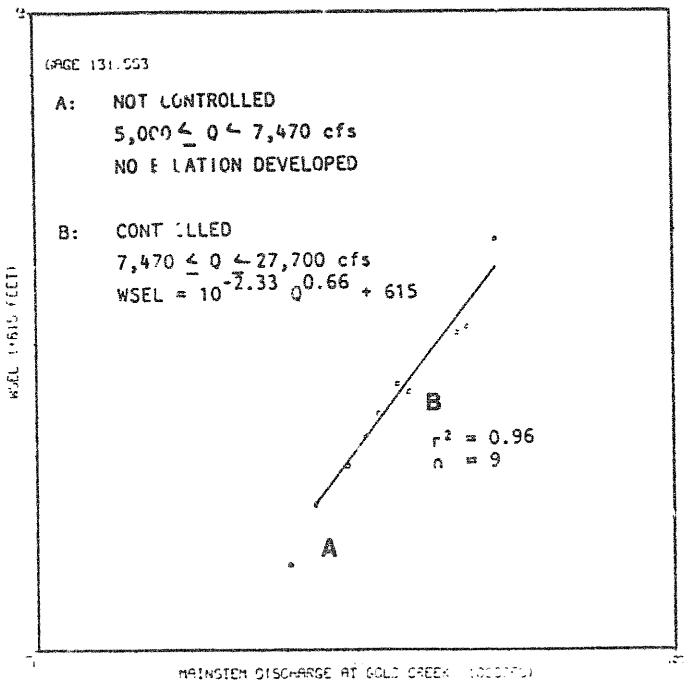




Figure II-16. Relationships between mainstem discharge, site flow and water surface elevation for cross section 3 at site 131.7L.

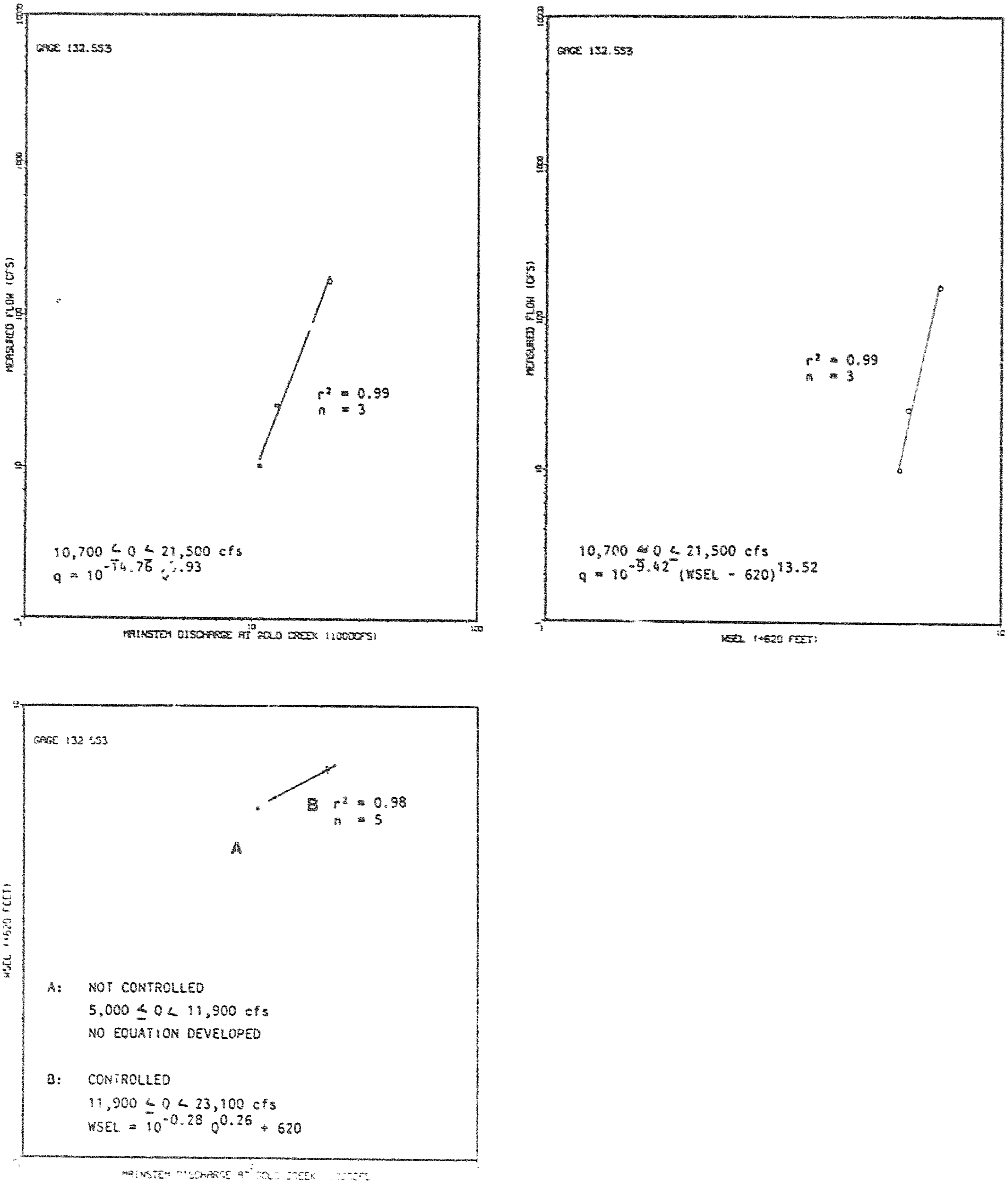



Figure II-17. Relationships between mainstem discharge, site flow and water surface elevation for cross section 4 at site 132.6L.

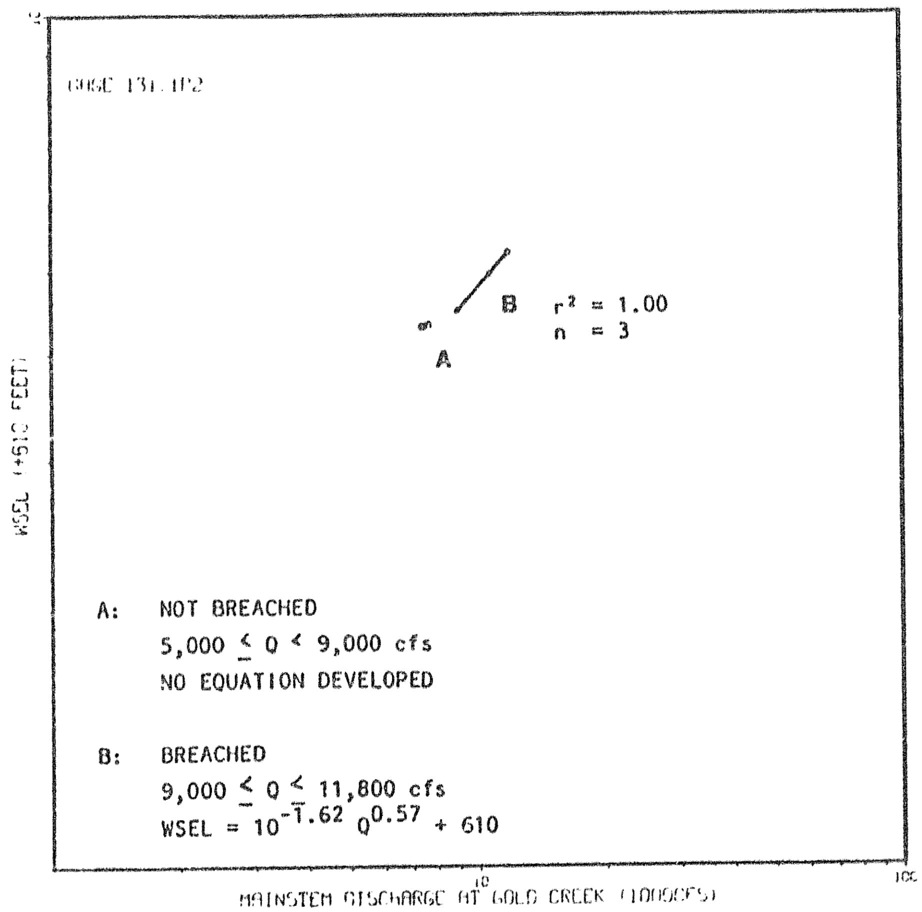



Figure II-15. Stage discharge curve for cross sections 1 and 3 at site 131.3L.

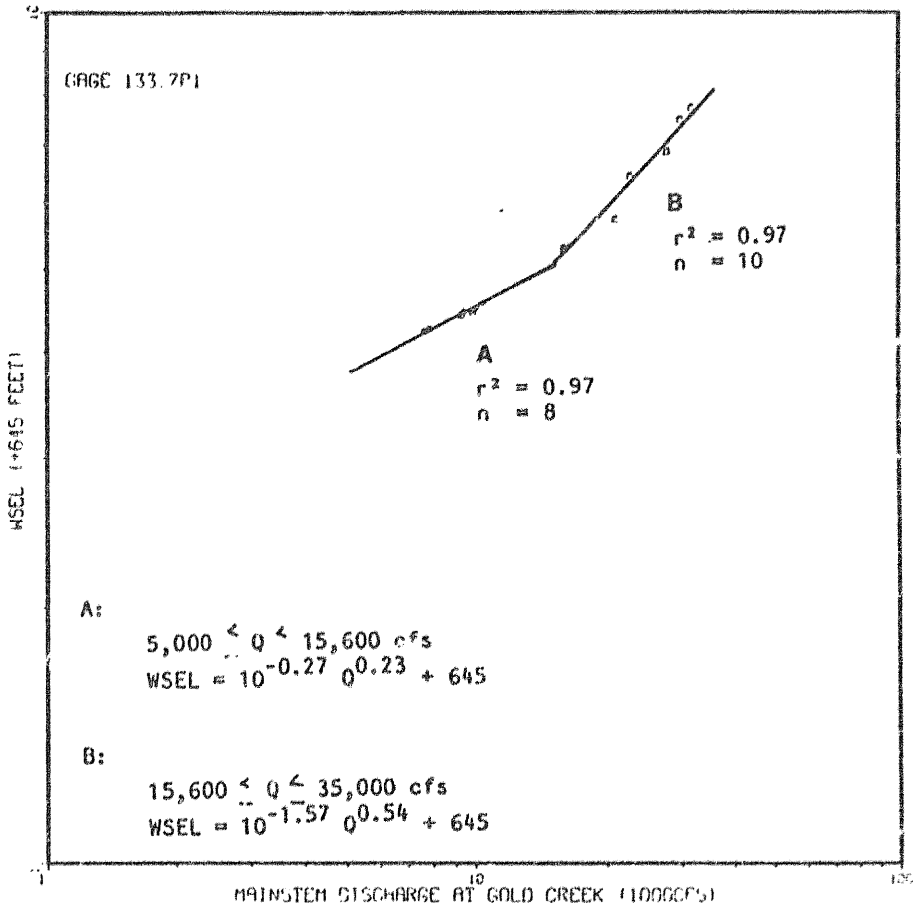
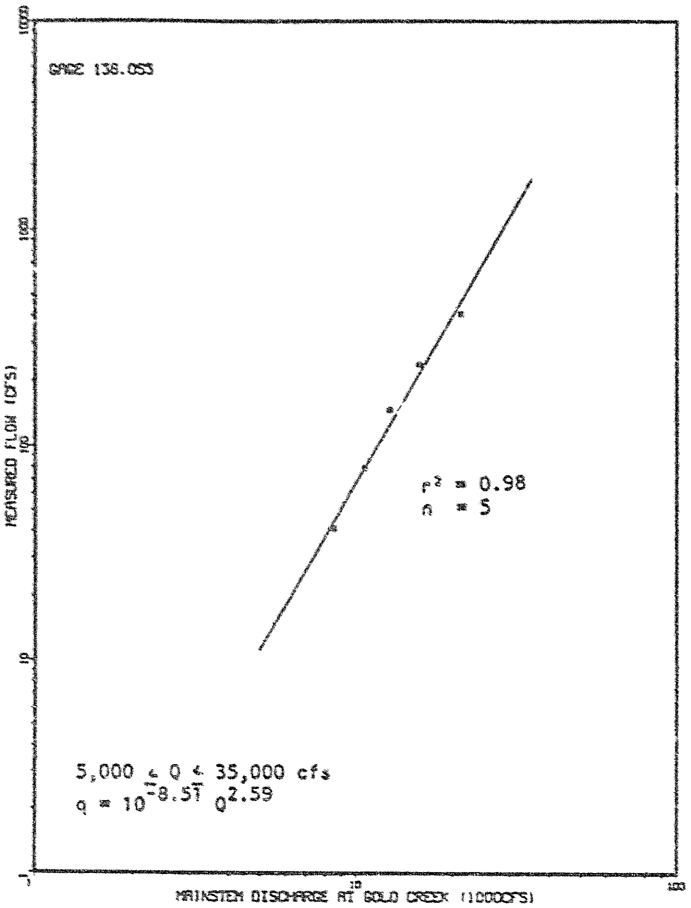
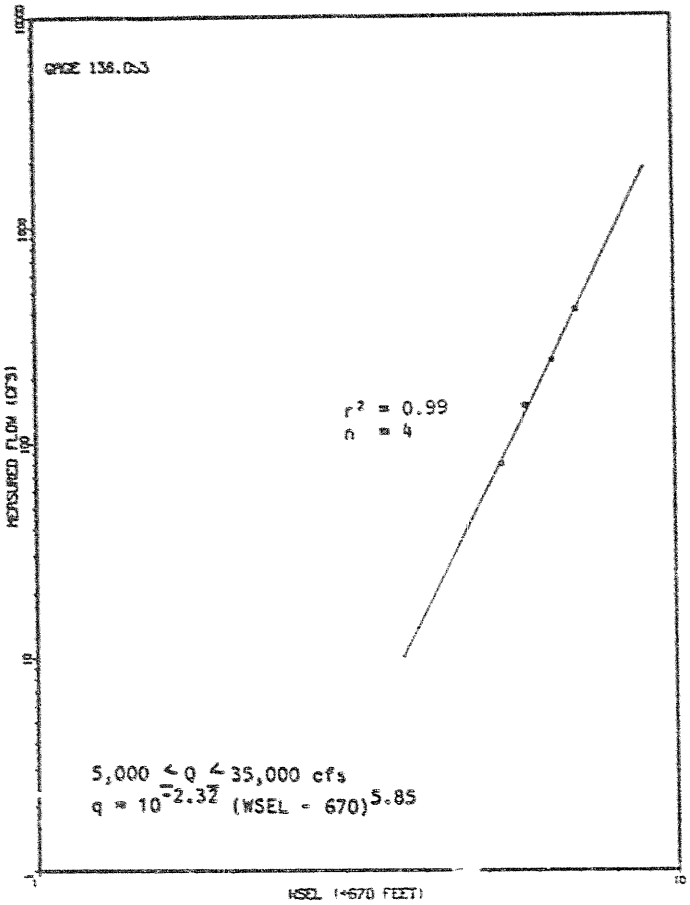



Figure II-18. Stage discharge curve for cross section 3 at site 133.8R.



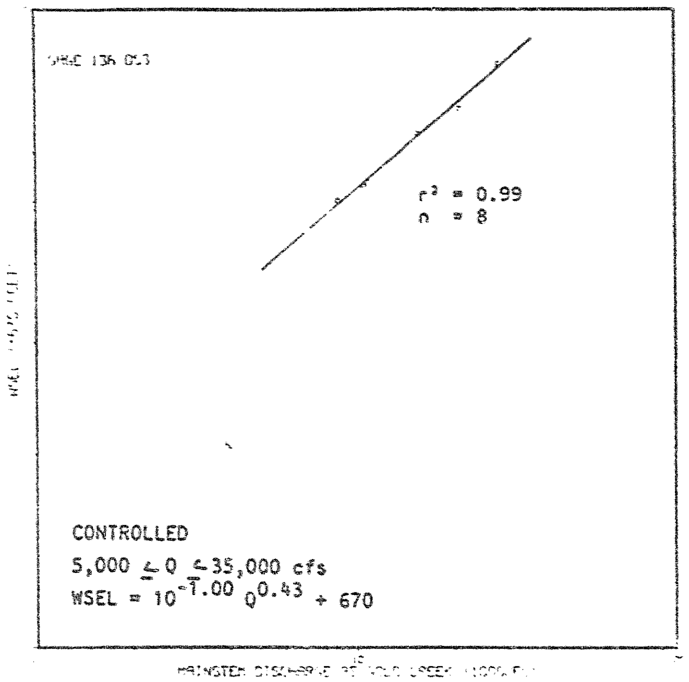
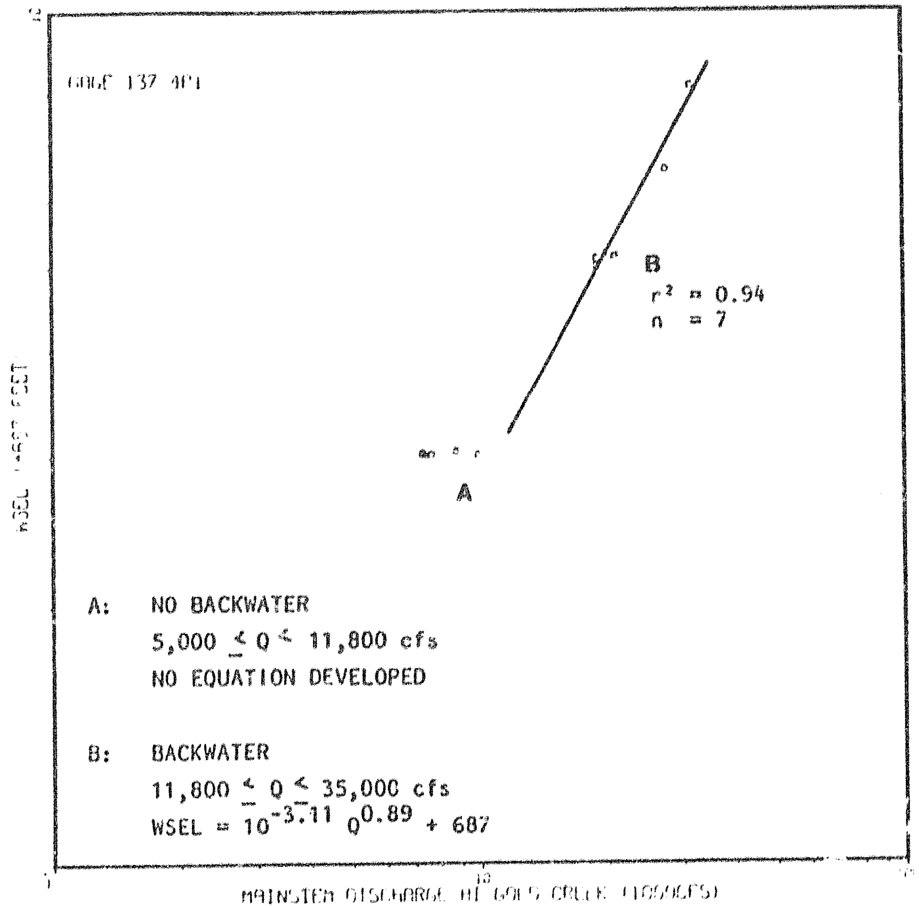




Figure II-19. Relationships between mainstem discharge, site flow and water surface elevation for cross section 4 at site 136.0L.



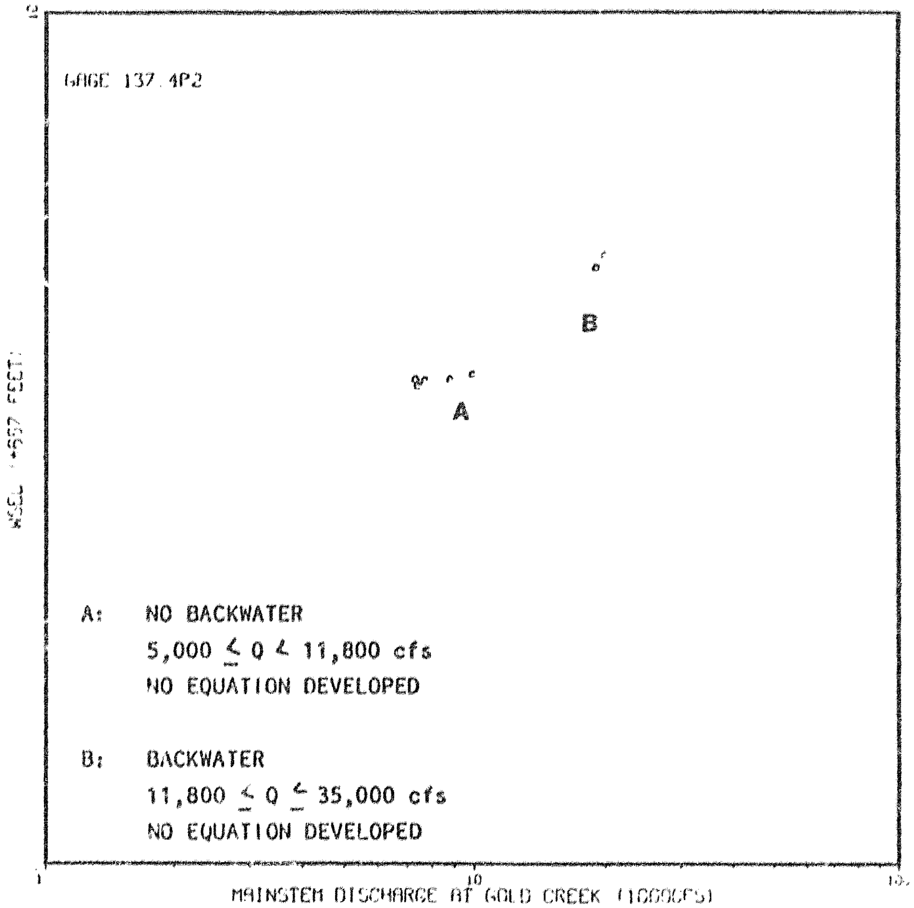




Figure II-20. Stage discharge curves for cross sections 1 and 2 at site 137.5R.

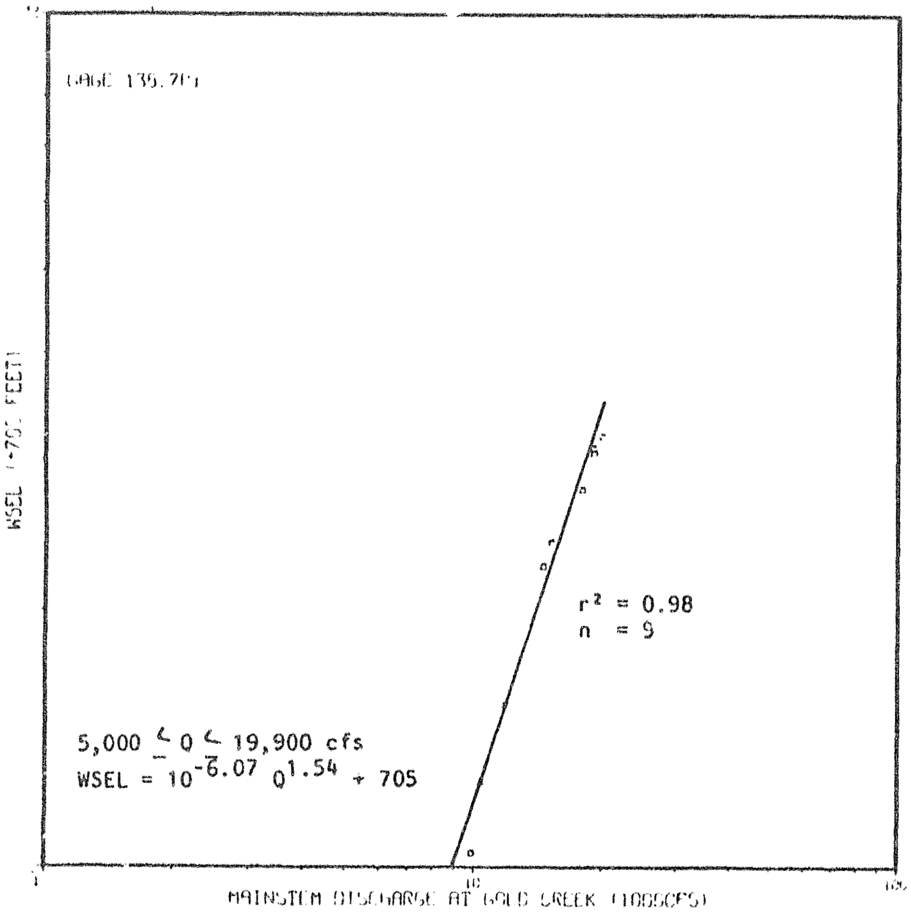



Figure II-21. Stage discharge curve for cross section 2 at site 138.7L.

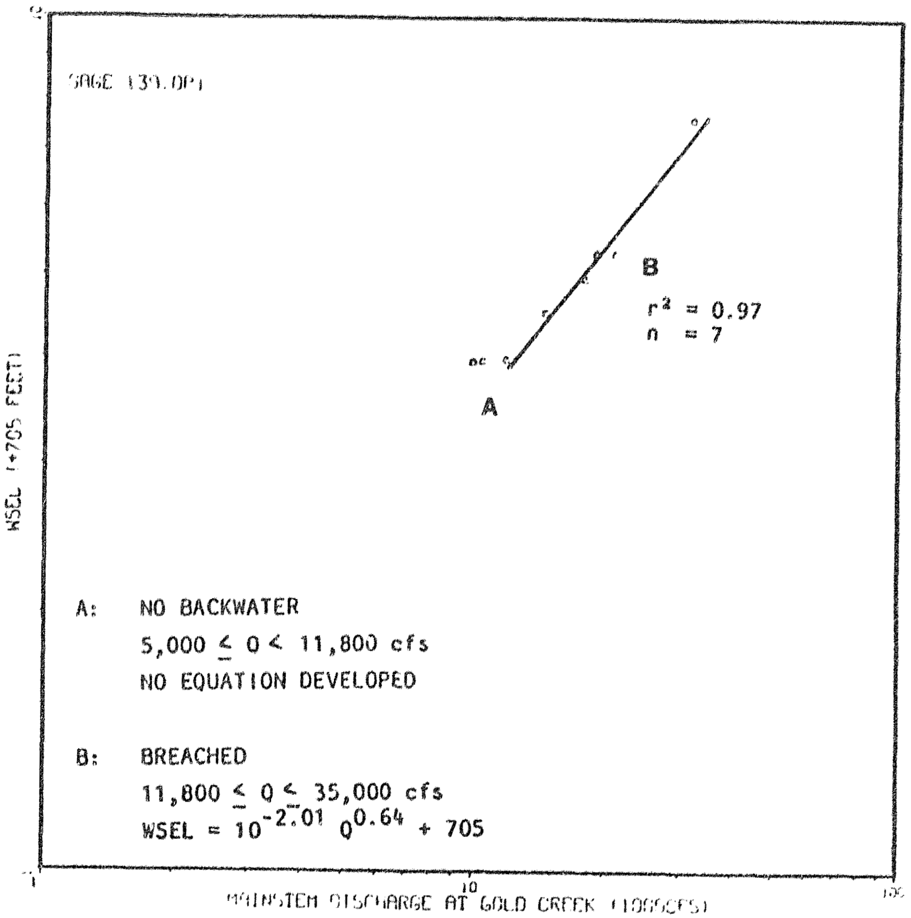



Figure II-22. Stage discharge curve for cross section 2 at site 139.0L.

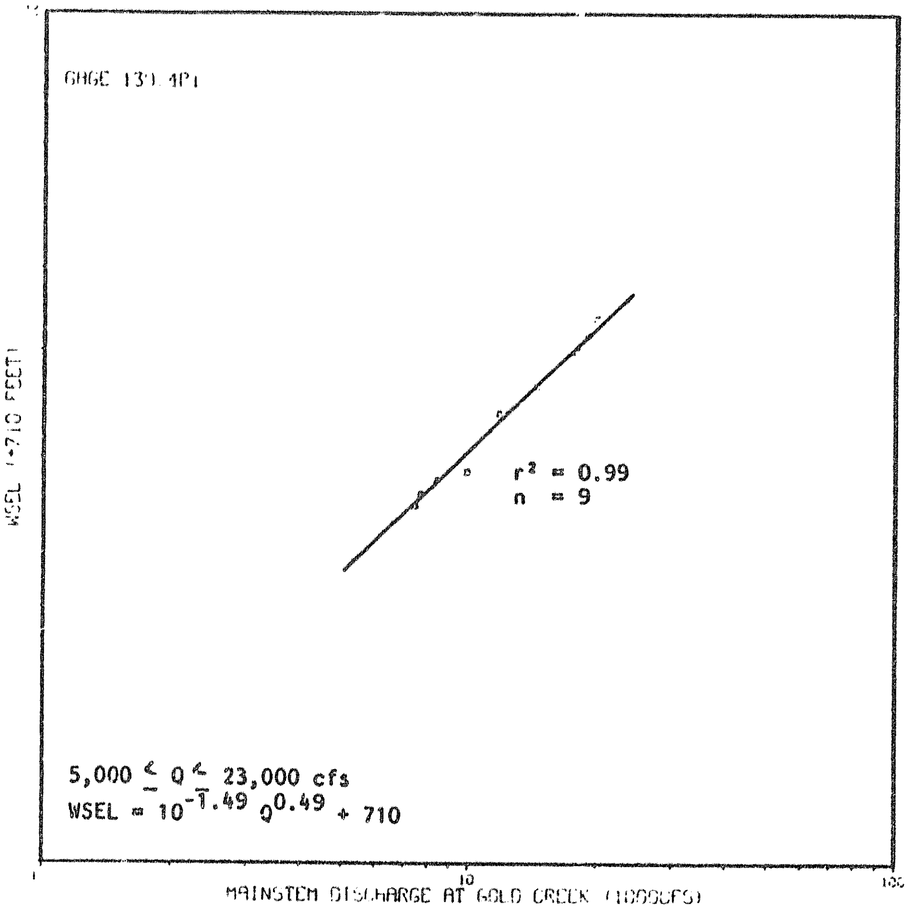



Figure II-23. Stage discharge curve for cross section 2 at site 139.4L.

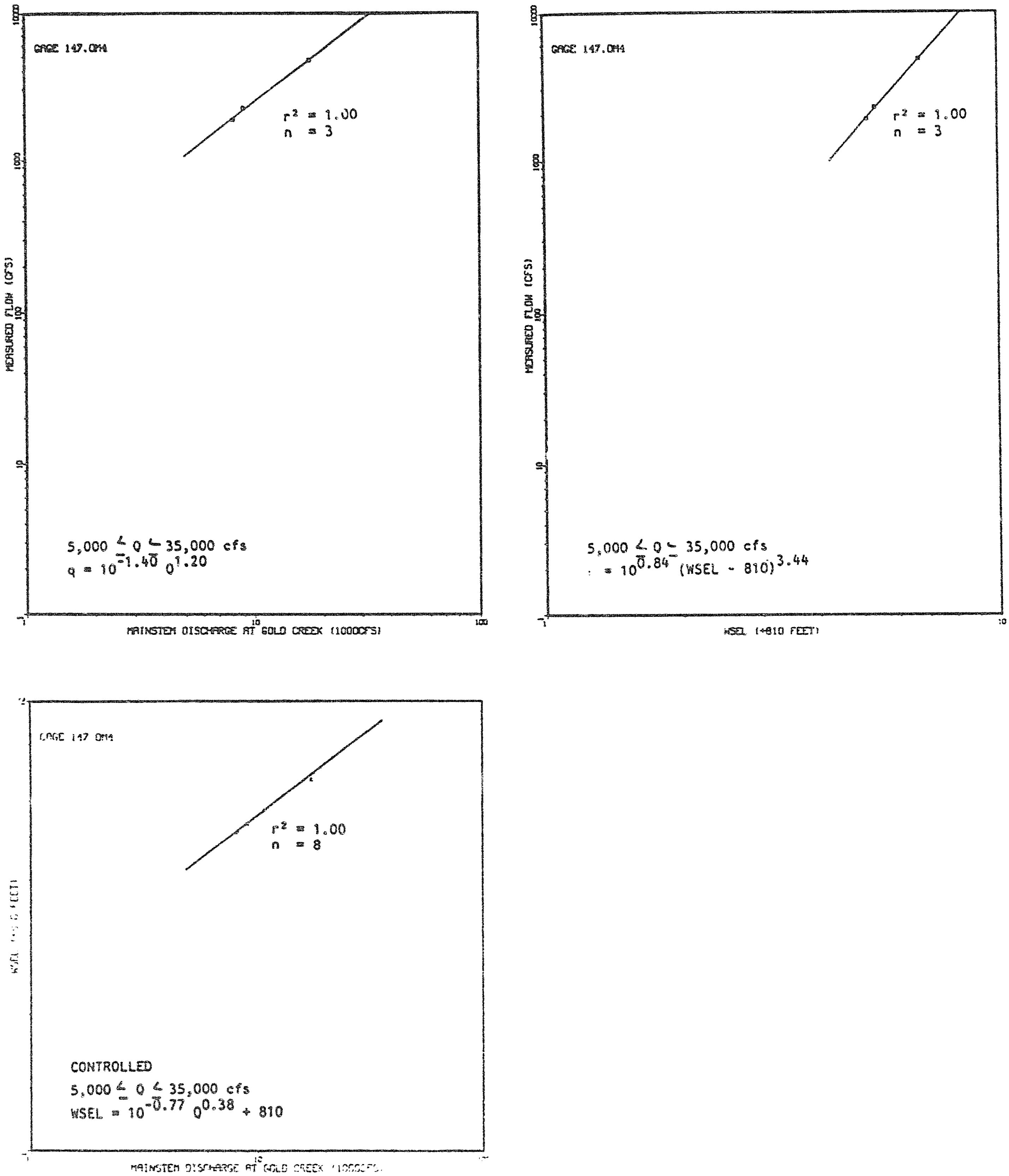



Figure II-24. Relationships between mainstem discharge, site flow and water surface elevation for cross section 4 at site 147.1L.

## DISCUSSION

The relationships between site flow and middle river discharge were developed for mainstem controlled conditions at each study site. High regression coefficients and general knowledge of the sites indicate the relationships expressed as logarithmic regression equations are reliable over the range of mainstem discharge for which data are available. Inspection of aerial photography and familiarity with the sites provided sufficient evidence of flow conditions outside the range of available field data to extend the relationship somewhat beyond the range of available field data.

Pretty exciting!
A blow by blow
description of selected
sites is provided

# PART III

# CALIBRATION AND APPLICATION OF IFG HYDRAULIC MODELS

## INTRODUCTION

The middle river modeling analysis may be viewed as consisting of three steps. The initial step involved the collection and analysis of biologic data to determine the seasonal distribution of fish by species and life phase within middle river habitats and to identify the behavioral responses (or preferences) of life phase to physical habitat variables. This work was principally conducted by ADF&G Su Hydro during the 1982 and 1983 field seasons (Schmidt et al. 1984, Estes and Vincent-Lang 1984).

Second, the study sites are established which represent typical habitats and sufficient field data are collected to describe anticipated changes in physical habitat conditions due to streamflow alterations. With regard to the middle river modeling studies, hydraulic simulation models are extensively used to forecast anticipated changes in depths and velocities. Calibration and application of these hydraulic models is the subject of this section of the middle river modeling (MRM) report.

The third step involves the application of habitat suitability criteria (developed in Step 1) in combination with the calibrated hydraulic models to simulate the response of fish habitat to incremental changes in depth and velocity. This analysis is facilitated by using the IFG HABTAT model which is capable of evaluating other habitat variables such as substrate composition and cover. Habitat response to streamflow variations is portrayed by an index called weighted usable area (WUA). WUA forecast are presented for juvenile chinook at each study site in this section of the report but will be discussed in a subsequent report by EWT&A.

Two different hydraulic models were applied in the MRM studies - the IFG-2 and IFG-4. Selection of one hydraulic model over the other depends on three considerations. These include (1) the level of resolution of the aquatic habitat microhabitat desired (2) the level of effort available for commitment to field data collection and (3) site-specific considerations. The IFG-2 model is a water surface profile program (step backwater model) which is based on uniform flow theory. It is most applicable to stream reaches with relatively mild gradient and uniform cross section (gradually varied flow conditions). The IFG-4 model is an empirical model based on regime theory and regression analysis. It provides greater latitude for application to stream reaches with non-uniform gradient and irregular cross section (rapidly varied flow conditions). One or two sets of field data are recommended for calibration of the IFG-2 model, whereas a minimum of three data sets are recommended to calibrate the IFG-4 model.

Both IFG hydraulic models are based on the assumption that steady flow conditions exist within a rigid stream channel. Streamflow is defined as "steady" if the depth of flow and velocity at a specific location remains constant throughout the time interval under consideration. This definition is commonly accepted to mean that the discharge remains constant through the study site during the time interval required to collect a set of calibration data. A stream channel is "rigid" if it (1) does not change shape during the time period required to collect all sets of calibration data, and (2) does not change shape while conveying natural streamflows of the magnitude to be simulated (Trihey 1980).

Prior to initiating the 1984 MRM studies, approximately 130 side channel or mainstem locations were selected as candidate study sites by EWT&A based on examination of aerial photography. Side channels and side sloughs at which habitat models had been developed by ADF&G Su Hydro prior to 1984 were excluded from the site selection process. Each candidate study site was classified into one of eleven habitat categories according to the habitat transformation it underwent as the mainstem discharge decreased from 23,000 cfs to 9,000 cfs (Table III-1). This approach to study site selection was chosen because a notable transition is expected to occur in existing mainstem and side channel habitat as a result of project induced changes in the natural flow regime of the middle river. A total of eight study sites were selected for detailed hydraulic analysis in 1984 (Table III-2 and Figure III-1).

Table III-2. Types of hydraulic models applied at 1984 middle river modeling sites for rearing chinook. Sites are identified by river mile and orientation to the river bank looking upstream (L=left; R=right).

| Site | Type of Model |
|---|---|
| 101.2R | 7 cross section IFG-4 |
| 101.5L | 5 cross section IFG-2 |
| 112.6L | 9 cross section IFG-2 |
| 119.2R | 5 cross section IFG-2 |
| 131.7L | 7 cross section IFG-4 |
| 132.6L | 9 cross section IFG-4 |
| 136.0L | 6 cross section IFG-4 |
| 147.1L | 6 cross section IFG-2 |

Table III-1. Description of Habitat Transformation Categories

| Category | Description |
|---|---|
| 0 | Tributary mouth habitats that persist as tributary mouth habitat at a lower flow. |
| I | Upland slough and side slouth habitats that persist as the same habitat type at a lower flow. |
| II | Side channel habitats that transform to side slough habitats at a lower flow and possess upwelling which appears to persist throughout winter. |
| III | Side channel habitats that transform to side slough habitats at a lower flow but do not appear to possess upwelling that persists throughout winter. |
| IV | Side channel habitats that persist as side channel habitats at a lower flow. |
| V | Indistinct mainstem or side channel areas that transform into distinct side channels at a lower flow. |
| VI | Indistinct mainstem or side channel habitats that persist as indistinct areas at a lower flow. |
| VII | Indistinct mainstem or side channel areas that transform to side slough habitats at a lower flow and possess upwelling which appears to persist throughout winter. |
| VIII | Indistinct mainstem or side channel habitats flow which transform to side slough habitats at a lower flow but do not appear to possess upwelling which persists throughout winter. |
| IX | Any water course that is wetted that dewaters or consists of isolated pools without habitat value at a lower flow. |
| X | Mainstem habitats that persist as mainstem habitat at a lower flow. |

* Habitats were based on a reference flow of 23,000 cfs

Source: Aaserude et al. 1985.

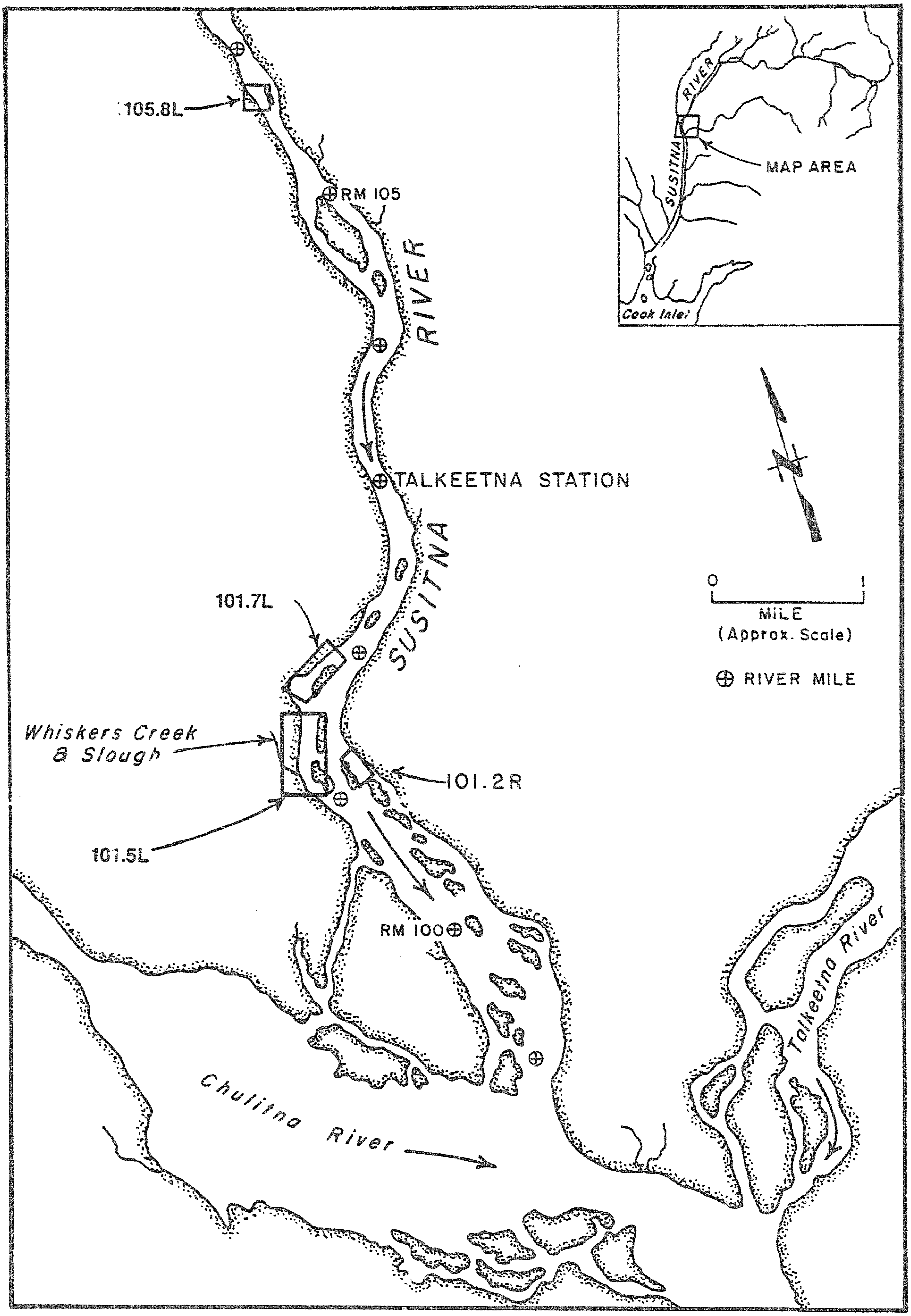



Figure III-1. Middle river IFG and DIHAB modeling sites.

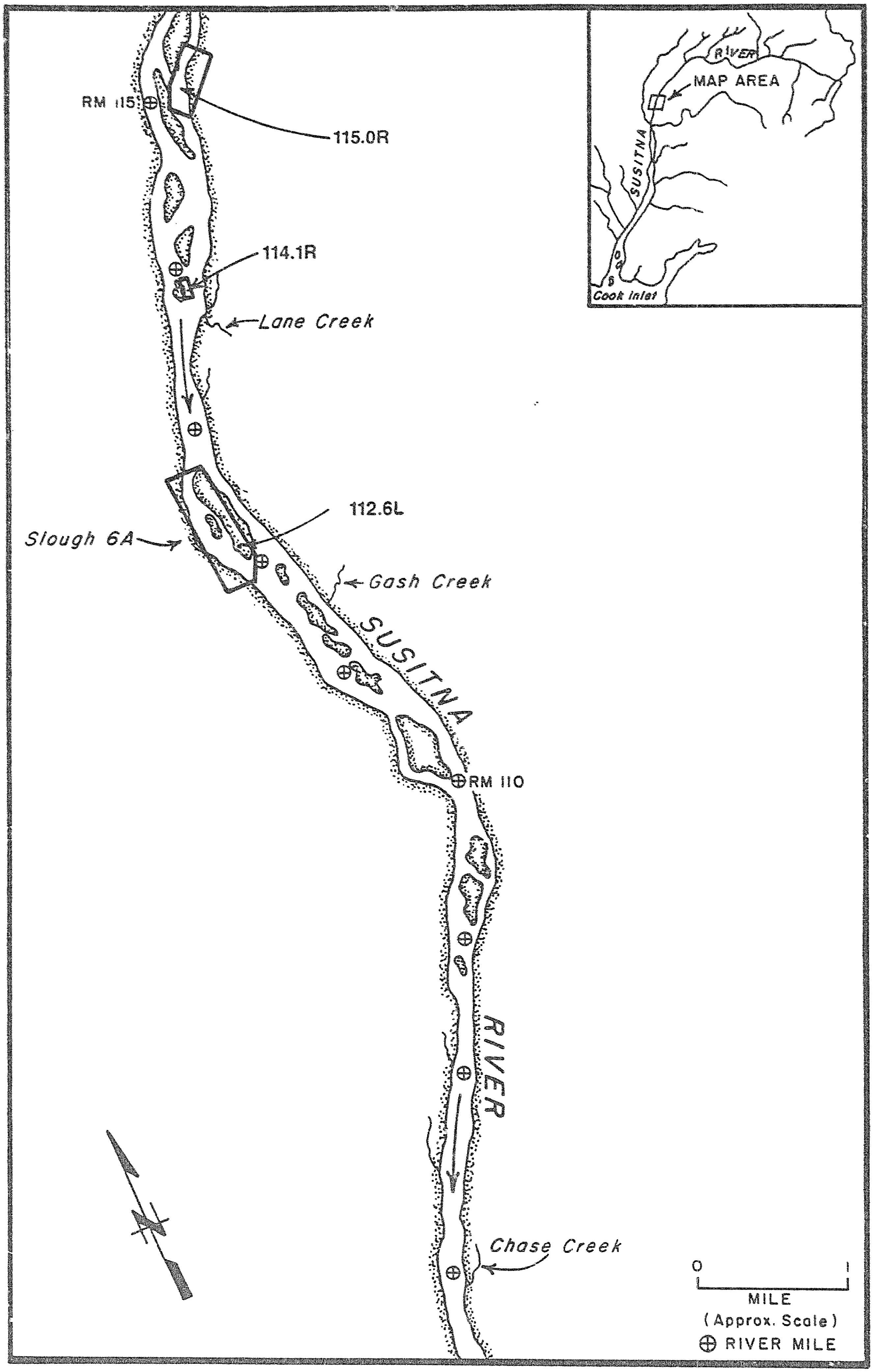



Figure III-1. Middle river IFG and DIHAB modeling sites.

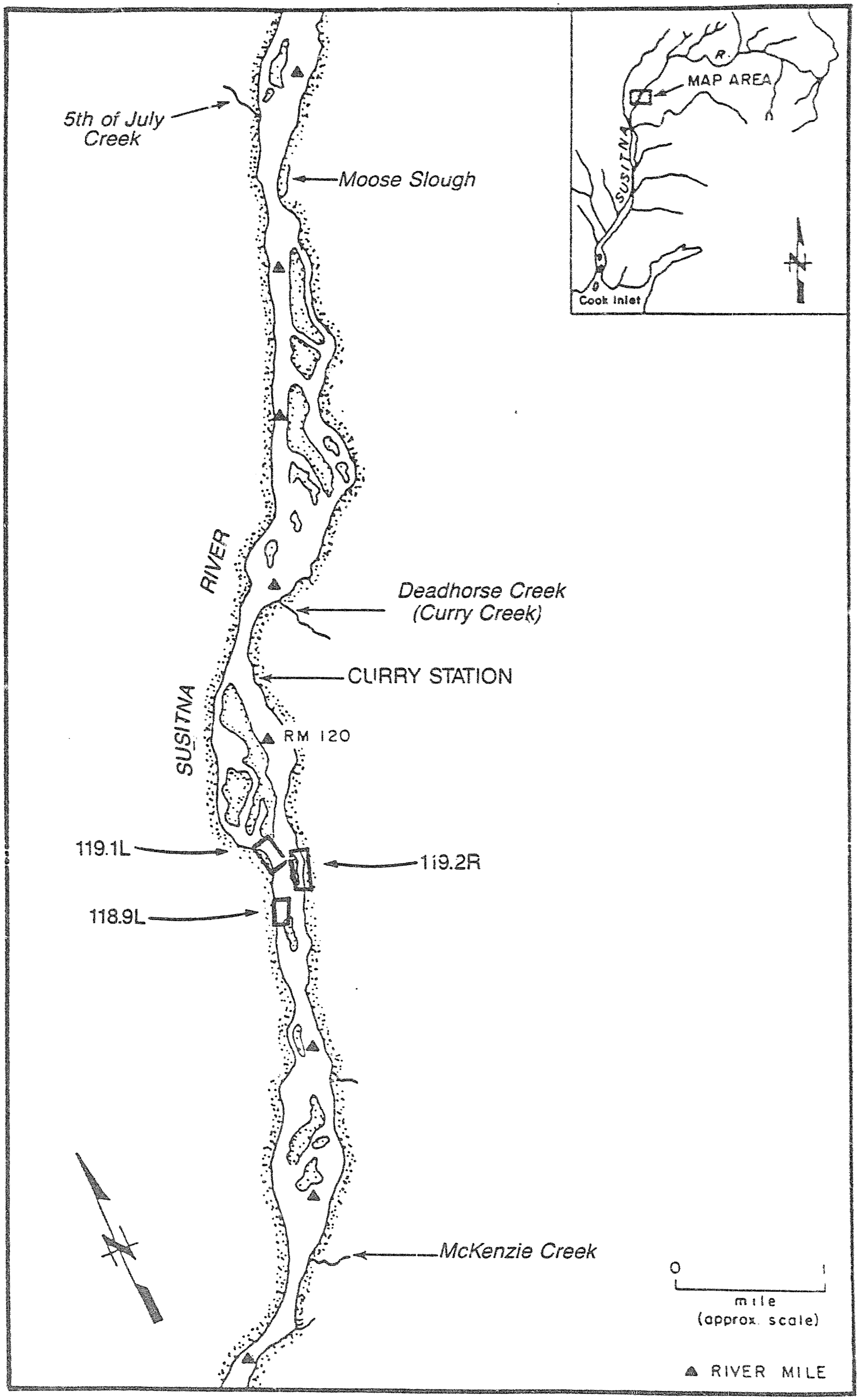



Figure III-1. Middle river IFG and DIHAB modeling sites.

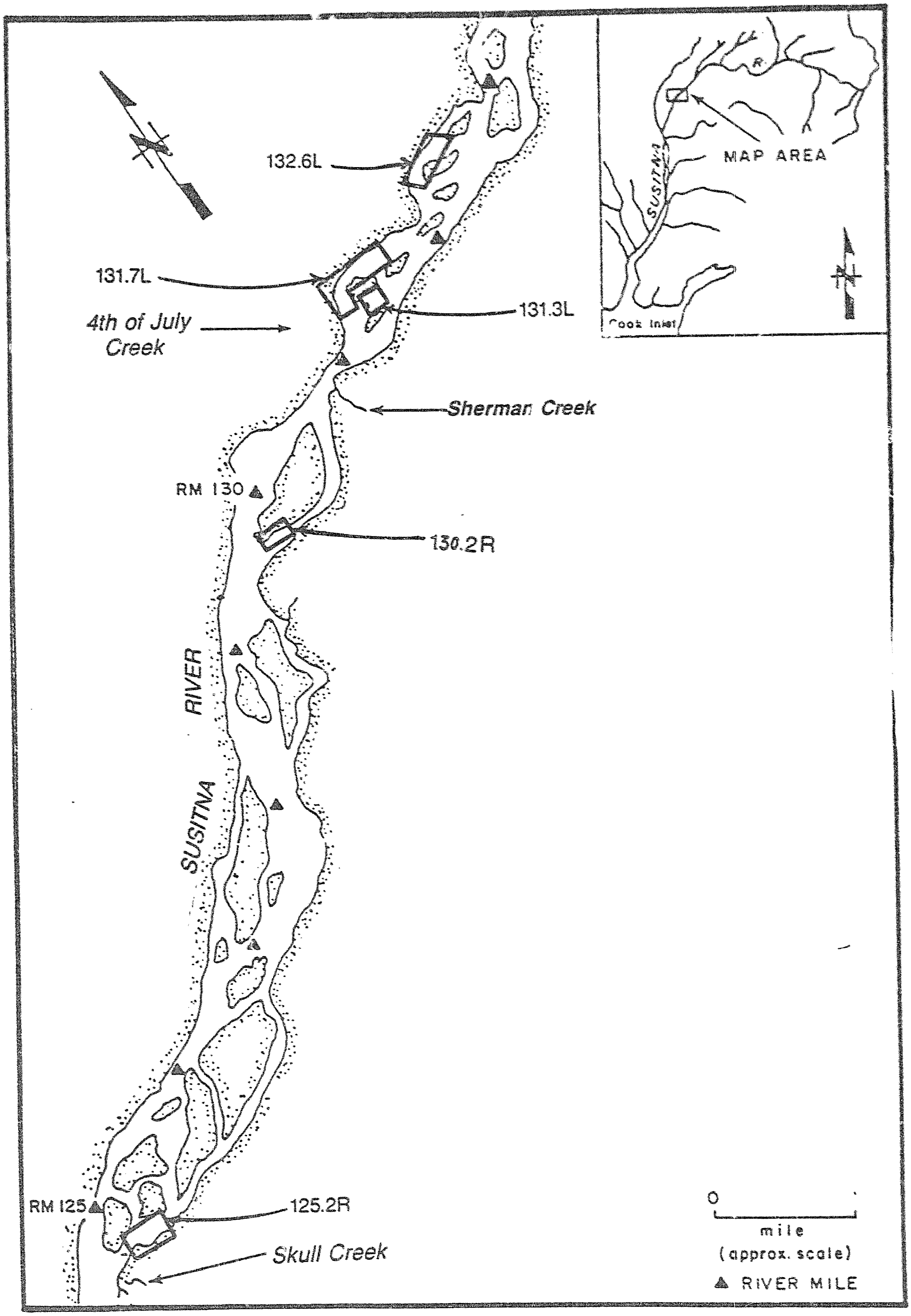



Figure III-1. Middle river IFG and DIHAB modeling sites.

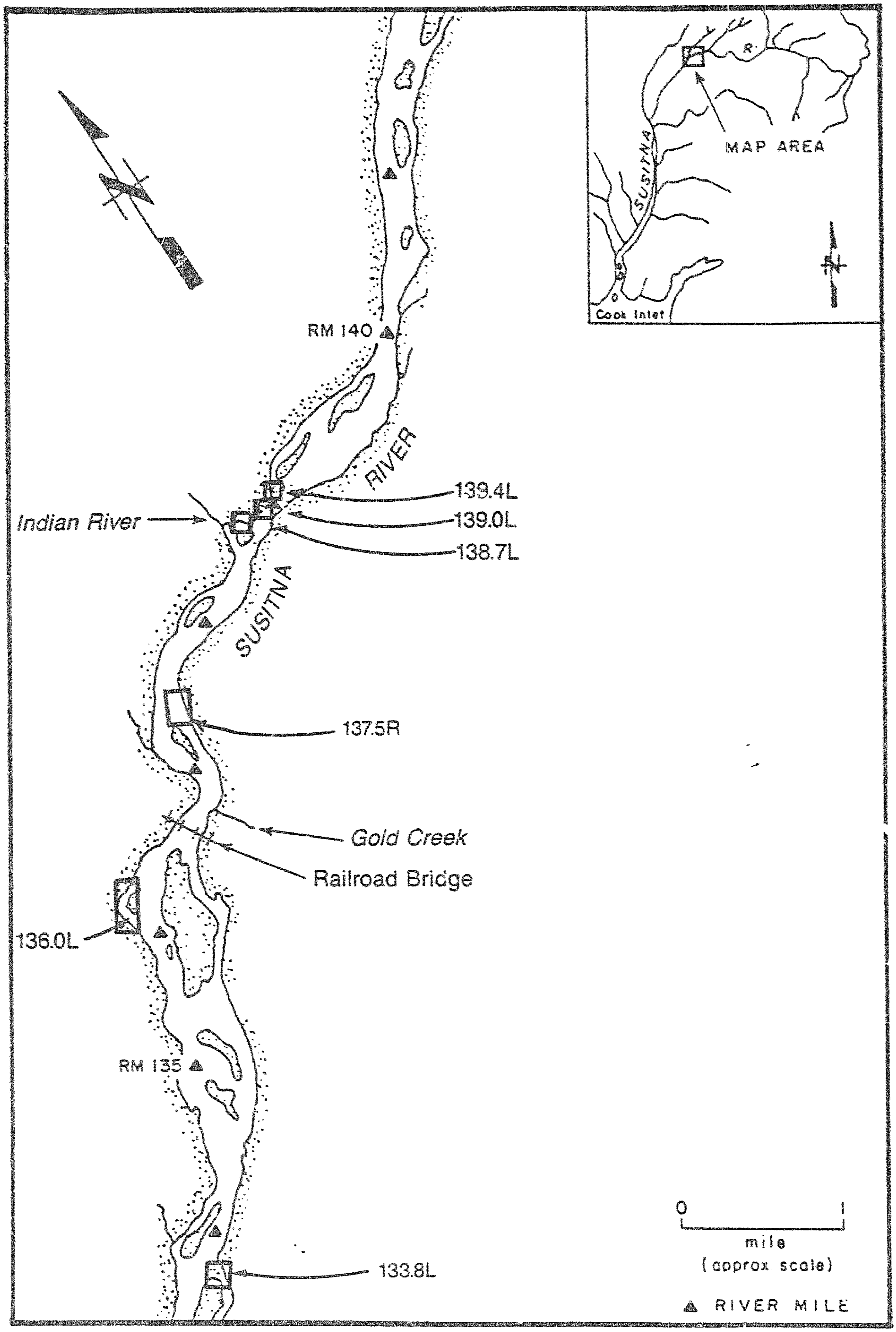



Figure III-1. Middle river IFG and DIHAB modeling sites.

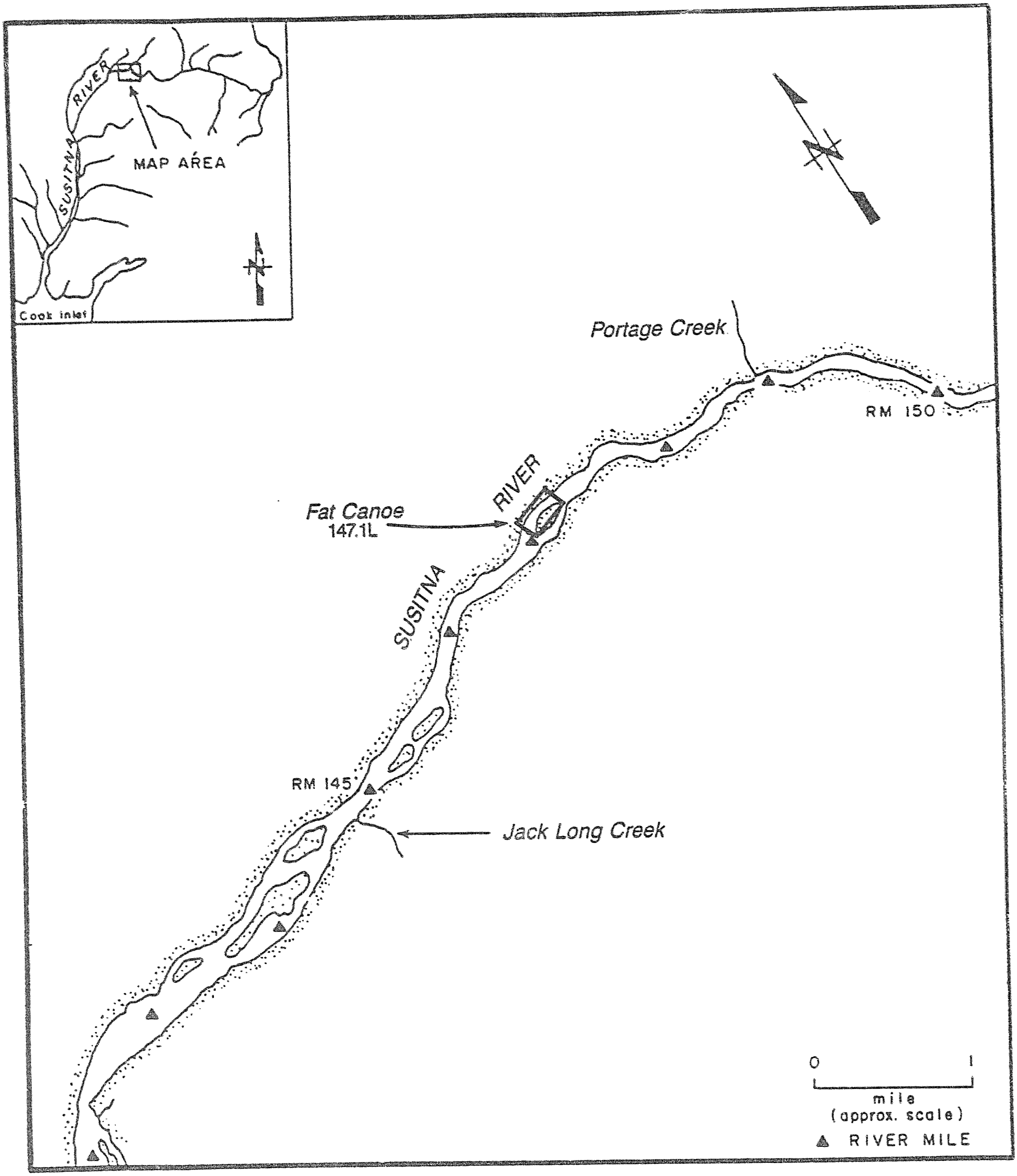



Figure III-1. Middle river IFG and DIHAB modeling sites.

Habitat categories that were well represented by existing models were not studied further during the 1984 field season.

## METHODS

Site Installation and Data Collection: A varying number of cross sections and staff gages were installed at each study site to describe pools, riffles, and runs. Cross sections were also positioned at the transitions between riffles and pools.

Methods for installing staff gages are described in Part II of this report and the FY84 ADF&G Su Hydro Aquatic Studies Procedures Manual. Cross section profiles were determined for each cross section with a level and survey rod. Horizontal distances between headpins were measured to the nearest 1.0 ft by stadia survey or measuring tapes. Streambed elevations were measured to the nearest 0.1 ft using differential leveling techniques. In conjunction with the cross section survey, the water surface elevation was determined at the left and right waters edge, and depth of flow was measured at a minimum of three points on each cross section.

Substrate composition and the associated cover value were visually estimated and recorded across each transect. Substrate composition was classified using the criteria presented in Table III-3 (Estes and Vincent-Lang 1984). Cover was described using a two-digit code following Schmidt et al. (1984), in which the first digit refers to the cover type and the second digit identifies the percent cover (Table III-4). The presence of upwelling groundwater was visually determined at each cross section during October 1984 and April 1985.

Table III-3. Substrate code classification.

| Substrate | Visually Estimated Particle Size | Classification |
|---|---|---|
| Silt | | 1 |
| | | 2 |
| Sand | | 3 |
| | | 4 |
| Small Gravel | 1/8-1" | 5 |
| | | 6 |
| Large Gravel | 1-3" | 7 |
| | | 8 |
| Rubble | 3-5" | 9 |
| | | 10 |
| Cobble | 5-10" | 11 |
| | | 12 |
| Boulder | >10" | 13 |

Table III-4. Cover Code Classification.

| COVER | CODE | PERCENT COVER | CODE |
|---|---|---|---|
| silt, sand | 1 | 0-5 | .1 |
| emergent vegetation | 2 | 6-25 | .2 |
| aquatic vegetation | 3 | 26-50 | .3 |
| 1-3" gravel | 4 | 51-75 | .4 |
| 3-5" rubble | 5 | 76-100 | .5 |
| > 5" cobble, boulder | 6 | | |
| debris | 7 | | |
| overhanging riparian vegetation | 8 | | |
| undercut bank | 9 | | |

The IFG-4 hydraulic model requires that the water surface elevation be identified for each cross section at which no flow occurs. This elevation is called the stage of zero flow and generally corresponds to the streambed elevation in riffles and runs and the downstream hydraulic control for pools. The stage of zero flow is not required when applying the IFG-2 model.

Thus at all IFG-4 sites, the stage of zero flow at each cross section within the study site was determined from the surveyed streambed profile. Streambed elevations of hydraulic controls downstream of the study sites were estimated for use in the model calibration procedures.

Depth and velocity information necessary for model calibration were collected at each site using a Marsh-McBirney or Price AA velocity meter and a top-setting wading rod. Water depth was measured to the nearest 0.05 foot and velocities were measured to 0.1 feet per second. These measurements were classified as either "calibration" or "shoreline" data. Calibration data were collected for use with the IFG-4 model at the smaller study sites and were obtained at verticals across an entire cross section. Shoreline data were collected at the larger study sites and were obtained at verticals on that portion of the cross section extending from each bank out into the channel until either the depth or velocity was limiting to field personnel. Shoreline data were used in the IFG-2 model to provide high resolution along the channel margins where fish habitat might exist. Depths and velocities used in the mid channel cells of the model were estimated from cross section and water surface profiles and apportionment of discharge using the continuity equation.

General Techniques for Hydraulic Model Calibration: Calibration of the IFG-4 model was undertaken following recommended IFG guidelines (Main 1978 and Milhous et al. 1984) as supplemented by Trihey and Hilliard (1984). Guidelines suggested by Trihey and Hilliard include:

1. Forecasting depths and velocities for streamflows representing the anticipated extrapolation limits of the calibrated model during the initial calibration runs.

2. Visual examination of water surface profile plots for each calibration discharge as well as the streamflows representing the upper and lower extrapolation limits of the model.

   If the observed and predicted water surface profiles do not agree, or the forecast water surface profiles for the upper and lower extrapolation flows appear unreasonable (i.e. water flowing uphill or conflicting with the slope of the calibration profile) the following procedures were completed through an iterative process.

   a. Examine the stage of zero flow to see that it has been correctly defined.

   b. Check that cross section coordinates have been correctly calculated and transferred to the IFG-4 input deck.

   c. Check that the right and left bank water surface elevations have been properly used to provide a horizontal water surface across the cross section. If a large discrepancy exists between right and left bank water surface elevations, adjust the streambed elevations to cause a horizontal water surface elevation to exist.

d. Adjust the calculated water surface elevations at each cross section within the following limits to provide more realistic forecasts of water surface profiles for the extrapolation flows:

   flat gradient ± 0.02 ft

   steep gradient ± 0.05 ft

e. If steps a through d do not result in reliable water surface profiles for the extrapolation flows, it is quite possible the stage discharge relationship is non-linear, and more reliable hydraulic simulations will result from high and low flow models used in combination rather than one model to simulate the entire flow range of interest. Therefore, separate the field data into two subsets and develop two hydraulic models following the guidelines and procedures described above. Is this [illegible] 2

3. After reasonable water surface profiles are forecast by model, review the velocity adjustment factors (VAF's) in accordance with the IFG guidelines.

While reviewing the VAF's, measured velocities were adjusted ±0.10 ft/sec in low velocity areas or ±10 percent if in excess of 2 ft/sec, and extremely small non-zero velocities (.01 to .05 ft/sec) or abnormally large Manning's "n" values (.1 to .9) were assigned to pool and shoreline areas where zero velocity was reported in order to improve the predictive capability of the IFG-4 model over the range of extrapolation flows.

Calibration of IFG-2 models also followed recommended IFG guidelines and was supplemented by procedures developed by EWT&A to utilize the shoreline depth and velocity data collected over a wide range of flows and the well-defined rating curves developed for several cross sections in the study site. The primary approach in calibrating IFG-2 models was adjustment of Manning's "n" values for each cell along the cross section until predicted shoreline velocities and water surface profiles agreed with the field data.

Required input data for an IFG-2 model includes the water surface elevations at the downstream cross section (Cross section 1) for each streamflow to be simulated. These elevations were obtained from the stage-discharge relationship developed for this cross section (refer to Section II). Stage-discharge curves developed at the other cross sections in the study site provided target water surface elevations with which to compare forecast water surface profiles. If the model predicted a low water surface elevation at a particular transect, the Manning "n" values were increased. Decreasing Manning "n" values dropped the water surface elevation.

Once the desired water surface profile was attained for the calibration flow(s), the distribution of velocities across each cross section was compared with the available field observations. Plots of observed versus predicted velocities were used to identify cells where an adjustment in the Manning "n" value for individual cells was required. If individual "n" values were significantly altered in this process, the water surface elevation deviated from the target water surface elevation.

Manning "n" values generally decrease with an increase in discharge, a result of streambed roughness having a reduced effect on retarding flow as depth of flow increases. The IFG-2 model accepts n-modifiers to account for this principle (Milhous et al. 1984). To maintain the characteristic shape of the velocity distribution pattern across the cross section (i.e., the general trend of high mid channel and low shoreline velocity areas), all "n" values at the cross section were multiplied by a constant factor; greater than 1.0 to raise the water surface elevation, and less than 1.0 to lower it. Typical n-modifier values ranged from 1.02 for low flows to 0.60 for extremely high flows. The apparent skew between n-modifiers for high and low flows exists because most calibration data were collected during low flow conditions and therefore "n" values do not require much adjustment to simulate low flows hydraulic conditions as they do to reproduce high flow observations.

A single IFG-2 model was not always adequate to reliably predict both low and high flow hydraulic conditions. This was primarily due to interaction between channel geometry and flow that altered the stage-discharge relationship such as the overtopping of gravel bars, or transformation of a riffle-pool sequence to a run. The need for two models was evidenced by unrealistic velocity distributions, especially along the shorelines, between high and low flow forecasts.

<u>General Techniques for Hydraulic Model Verification</u>: The quality of each calibrated IFG-4 or IFG-2 hydraulic model was evaluated at two levels. Level one is a qualitative assessment of the models overall performance with regard to four evaluation criteria. Each model was given a numeric rating depending upon its degree of compliance with each criteria. Numeric ratings were assigned through a comparison of model performance with criteria, or through professional judgment. Application of professional judgment requires: an understanding of open channel hydraulics, familiarity with the study site, experience with the model, and knowledge of how the model will be used in the habitat analysis.

Numeric ratings assigned model performance for each of the four criteria may be either 0, 1 or 2 as defined below. The overall score, calculated by summing the numeric ratings for the four criteria, was used to indicate the overall quality of the calibrated models according to the following scale:

[illegible]

| | |
|---|---|
| Excellent | 8 (maximum possible score) |
| Good | 7 |
| Acceptable | 5-6 |
| Unacceptable | <5; or zero for any evaluation category |

[illegible] rating to define quality of calibration in models ? ?

Is this a repeat of a manual ?

# LEVEL ONE EVALUATION FOR IFG MODELS

Criteria 1: How well does the model conform to the IFG and EWT&A calibration guidelines?:

a. Plot water surface profiles, stage of zero flow, and streambed profile. Are they reasonable? To be reasonable, water must flow downhill; an increase in discharge should cause the pool/riffle sequence to drown out and the water surface profile to become more uniform in gradient; a decrease in discharge should cause the water surface profile to more distinctly reflect changes in stream bed gradient and riffle/pool profiles.

b. Examine water surface elevations forecast by the calibrated model. Are the predicted water surface elevations over a broad range of discharges coincident with the stage-discharge curves for each site?

c. Compare predicted depths and velocities at the calibration flows to field data. Do the predicted discharges agree with the discharges measured in the field for each cross section (IFG-4 model only)? Are the predicted velocities realistic? Are there more than few outliers for the extrapolated flows?

Rating:

2 = A model that can forecast both water surface elevations and velocities accurately.

1 = A model that can define water surface elevations and velocities accurately at the calibration flows but may not be able to reliably define both WSEL and velocities near the limits of the extrapolation range.

0 = A model that cannot accurately reproduce depths or velocities at the calibration flow.

Criteria 2: How well does the extrapolation range of the calibrated model conform to the desired range?

Subreaches of the overall extrapolation range of the calibrated model are rated excellent, good, acceptable or not acceptable depending upon the degree to which predicted water surface elevations coincide with the stage-discharge curve and VAF's coincide with IFG guidelines.

The first assumption made in this evaluation is that accurate stage-discharge curves are available for several cross sections in the study site. The ability to evaluate the forecasting capabilities of the model improve with an increasing number of well-defined stage discharge curves for the study site. By reviewing aerial photography and incorporating field experience it can be determined whether there is sufficient change in local channel geometry or flow patterns (such as other channels becoming overtopped at higher mainstem discharges) that may cause a significant change in the slope of the stage-discharge relationship above the range of available data.

Ratings:

2 = A model that can forecast water surface elevations coincident with the stage-discharge curve while retaining VAF's between 0.9 and 1.1 throughout the entire extrapolation range.

1 = A model that can forecast either VAF's or water surface elevations within the extrapolation range.

0 = A model that cannot forecast acceptable WSEL's or VAF's within the defined extrapolation range.

Criteria 3: Are the hydraulic models appropriately calibrated for the species and life stage being considered?

Study sites established to evaluate a particular species or life stage may not accurately represent microhabitat conditions important to another species or life stage. For example a good rearing site may not be an acceptable spawning site due to substrate composition or absence of upwelling. Carefully review the microhabitat characteristics of the study site in reference to life history requirements of the species or life stage being evaluated. Cross sections are properly located to accurately define the channel morphology which is of importance to the species and/or life stage of interest and that a sufficient number of verticals are included at each cross section to provide an accurate description of depth and velocity distribution.

Ratings:

2 = A model that provides sufficient precision in its hydraulic forecasts to be applied to both adult and juvenile life stages with an equally high level of confidence.

1 = A model that can provide a high level of precision for evaluating the life stage for which the study site was primarily established, but hydraulic forecasts are only considered "acceptable" for other species/life stages. Had cross sections and verticals within the study site been laid out differently, additional data collected, or a separate hydraulic model calibrated, a "2" rating would have been possible.

0 = Insufficient data were collected to calibrate the hydraulic model in the flow range of interest for the species/life stages to be evaluated.

Criteria 4: How well does the range of forecast depths and velocities compare with the depth and velocity suitability criteria?

Even though the model may not accurately reproduce depths or velocities from a hydraulic viewpoint, the erroneously predicted depths and velocities may occur within a range of values for which suitability indices are not sensitive. These ranges are unique to the particular set of habitat suitability criteria being applied. In general, hydraulic models for juveniles should accurately define low velocity areas (  0.8 ft/sec), but need not be as accurate when velocities exceed 2 ft/sec. Depths of flow greater than 0.15 ft need only be approximate and are of little consequence in steep-sided channels where an error in the water surface elevation will not cause a notable change in top width. Hydraulic models for spawners should accurately define velocities up to 2 ft/sec, and depths up tc 1.0 ft.

Ratings:

2 = The hydraulic model provides accurate forecasts of depths and velocities present in the study site throughout the full ranges of depths and velocities for which suitability criteria are defined.

1 = Hydraulic forecasts are sufficiently accurate to describe the order of magnitude of the suitability index and therefore will result in a reliable habitat model even though the precision of the hydraulic forecasts are questionable.

0 = The hydraulic model is incapable of accurately identifying the order of magnitude of the habitat suitability index.

## LEVEL TWO EVALUATION FOR IFG MODELS

Level two evaluation criteria were applied when the calibrated IFG-2 or IFG-4 models were not assigned an excellent rating during the level one evaluation. These analytical techniques can also be incorporated as additional steps in recommended model calibration procedures for other studies using the IFG hydraulic models.

The best method of evaluating the predictive capabilities of the hydraulic models would be to collect additional data sets near the limits of the extrapolation range that are not used in the calibration procedure and then compared with the model predictions. This method can seldom be applied, however. The analytical procedure which follows has been suggested by Wilmott (1981) for use with geographic models which face similar problems when evaluating differences between observed and predicted data.

IFG-4 Model:

A visual comparison is made between scatter plots of the observed and predicted depths and velocities at all cross sections for each calibration flow. A quantitative assessment can be made by computing several statistics which describe the differences between observed and predicted values. Pearson's Product-Moment Correlation Coefficient (r), Coefficient of Determination ($r^2$), the slope (b) and intercept (a) of a least squares regression between observed and predicted values have usually been reported as reliable measures of a model's predictive capabilities. Willmott (1981) has suggested computing additional statistics to better evaluate the predictive capability of the model. These variables include the systematic and unsystematic components of the root mean square error

$$RMSE_S = [N^{-1} \sum_{i=1}^{N} ((a + bO_i) - O_i)^2]^{0.5}$$

and

$$RMSE_U = [N^{-1} \sum_{i=1}^{N} (P_i - (a + bO_i))^2]^{0.5}$$

as well as the total root mean square error

$$RMSE = [N^{-1} \sum_{i=1}^{N} (P_i - O_i)^2]^{0.5}$$

where:

$i = 1,2,.........n$ (sample size of the number of predicted cells)

$O$ = Observed or field measured data

$P$ = Model predicted data.

"If RMSE is all, or largely composed of $RMSE_U$" states Willmott, "perhaps the model is as good as it can be without major reworking." An index of agreement (d) may also be calculated to determine the degree to which a model's predictions are error free. The index of agreement is computed by

$$d = 1 - \frac{\sum_{i=1}^{N} (P_i - O_i)^2}{\sum_{i=1}^{N} [\ P_i - O \ + \ O_i - O\ ]^2}$$

The value of d varies between 0.0 and 1.0 where a computed value of 1.0 indicates perfect agreement between the observed and predicted observations, and 0.0 denotes complete disagreement.

IFG-2 Model:

A visual comparison can be made of the observed and predicted velocity distribution plots for the IFG-2 models, where most of the observed data was obtained near the shoreline. In general, cells in the IFG-2 model do not coincide with verticals where field measurements were made, but rather with distinct changes in channel geometry, roughness, or habitat suitability. A representative velocity distribution "shape" was developed for each cross section, using calibration flow data, which typically extended the full width of the channel.

Where only shoreline data was available, the horizontal velocity distribution was modeled after either measured values obtained at a similarly shaped cross section at the site where a complete data set was available, or by simply estimating a mid-channel velocity distribution based on the channel geometry (i.e., the highest velocities should correspond to the deepest portion of the channel). This is a reliable method, since cross-sectional area and discharge are fixed and therefore the average channel velocity is defined.

Applying the IFG-2 model at discharges other than the calibration flow produces velocity distributions similar in shape to that of the calibration flow. When inconsistencies between field data and predicted velocities occurred at high flows, a second model was developed. Generally, the high flow model predicts velocity profiles that are steeper near the water's edge than the corresponding low flow models.

<u>General Techniques for Hydraulic Model Application</u>: The calibrated hydraulic models were linked with the IFG HABTAT model to forecast WUA for juvenile chinook as a function of streamflow. Habitat suitability criteria (Curves) for each physical habitat variable sued in the HABTAT model were derived from field observations of juvenile chinook in side channel and side slough areas (Schmidt et al. 1984) as described by Trihey et al. 1985. The suitability criteria applied for juvenile chinook are summarized in Figures III-2, 3, 4 and Table III-5.

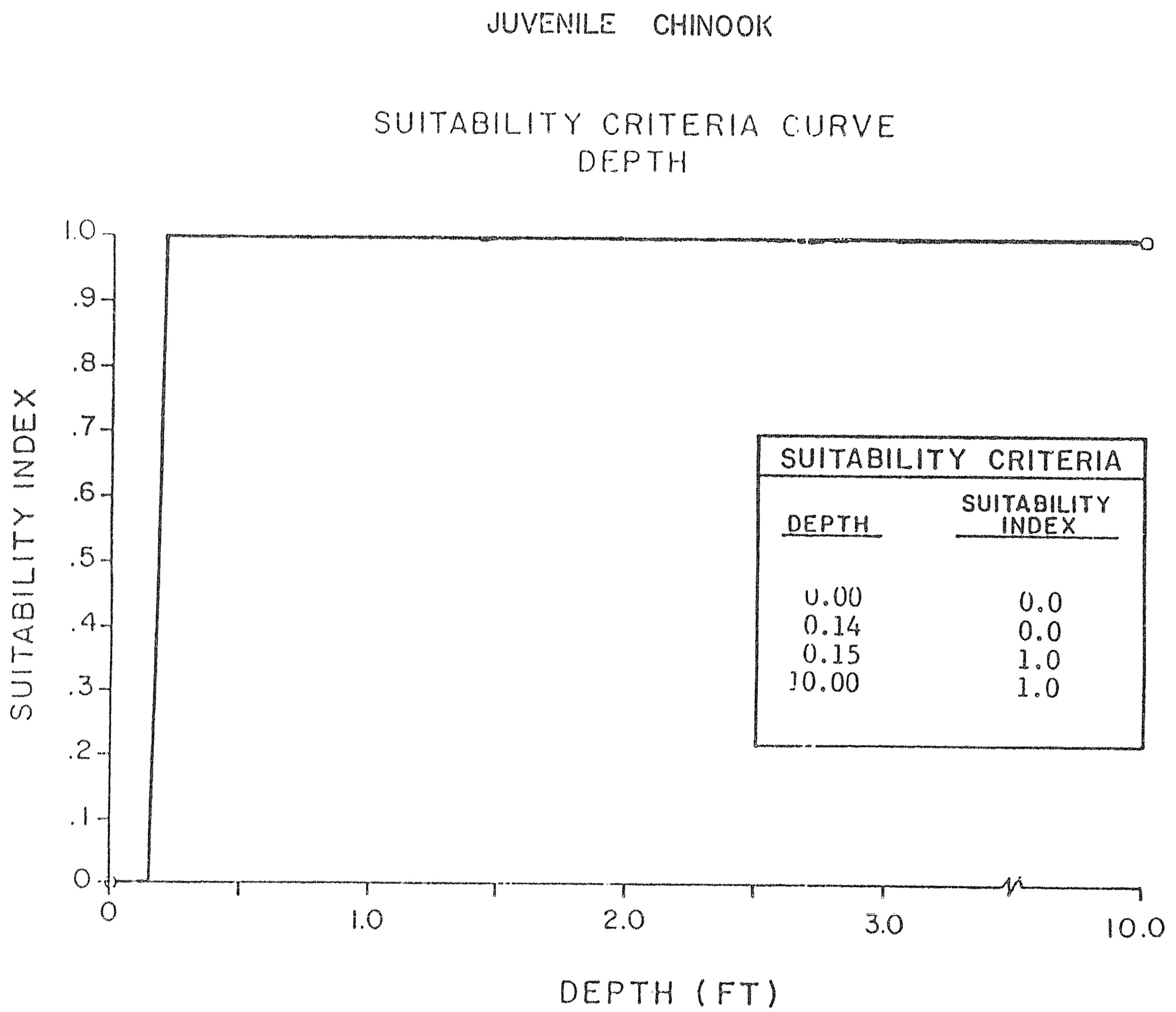



Figure III-2. Juvenile chinook salmon suitability criteria for depth applicable to clear and turbid water habitats. Source: Schmidt et al. 1984.

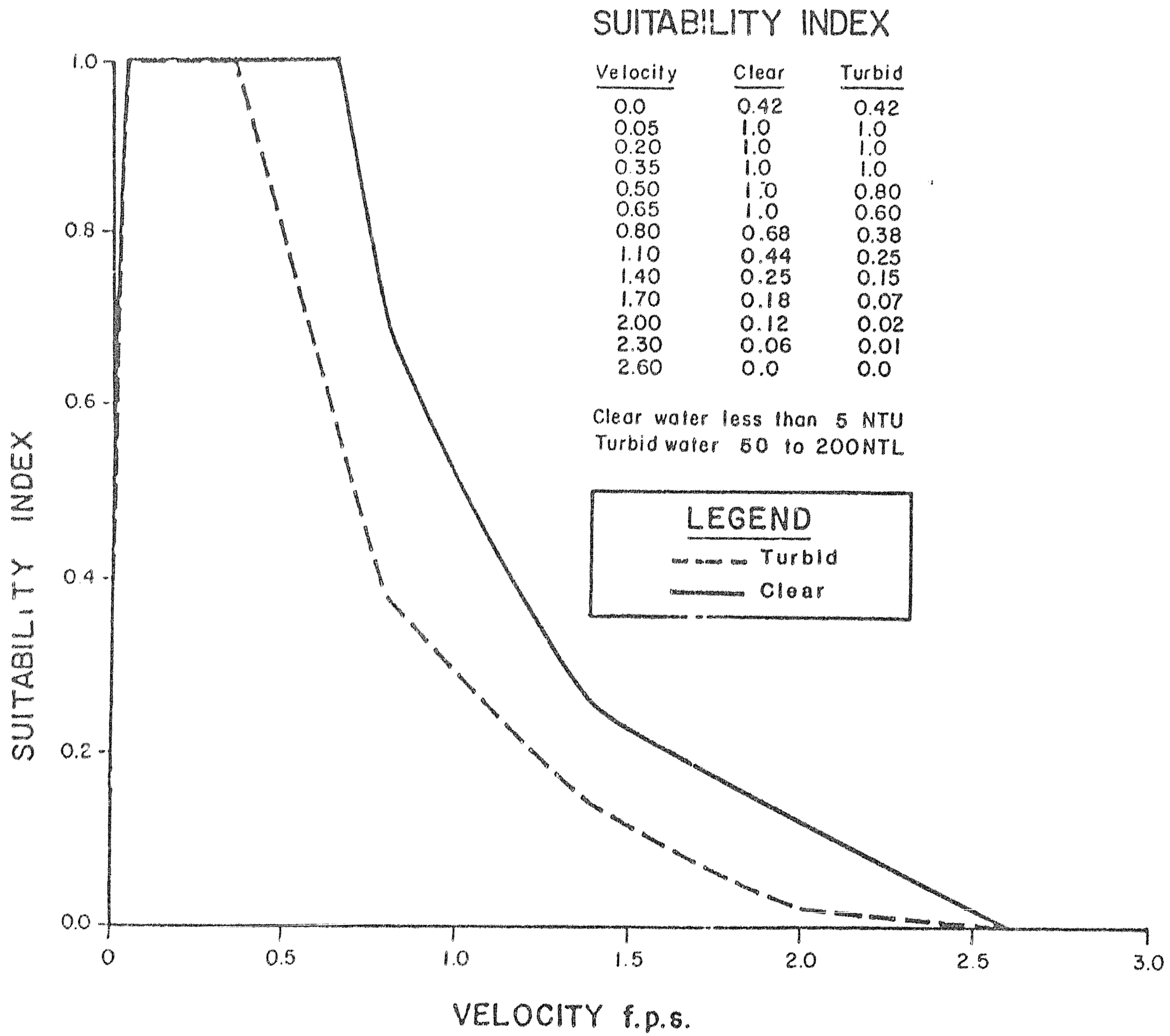



Figure III-3. Juvenile chinook salmon suitability criteria for velocity applicable to clear and turbid water habitats. Source: Schmidt et al. 1984, EWT&A and WCC 1985.

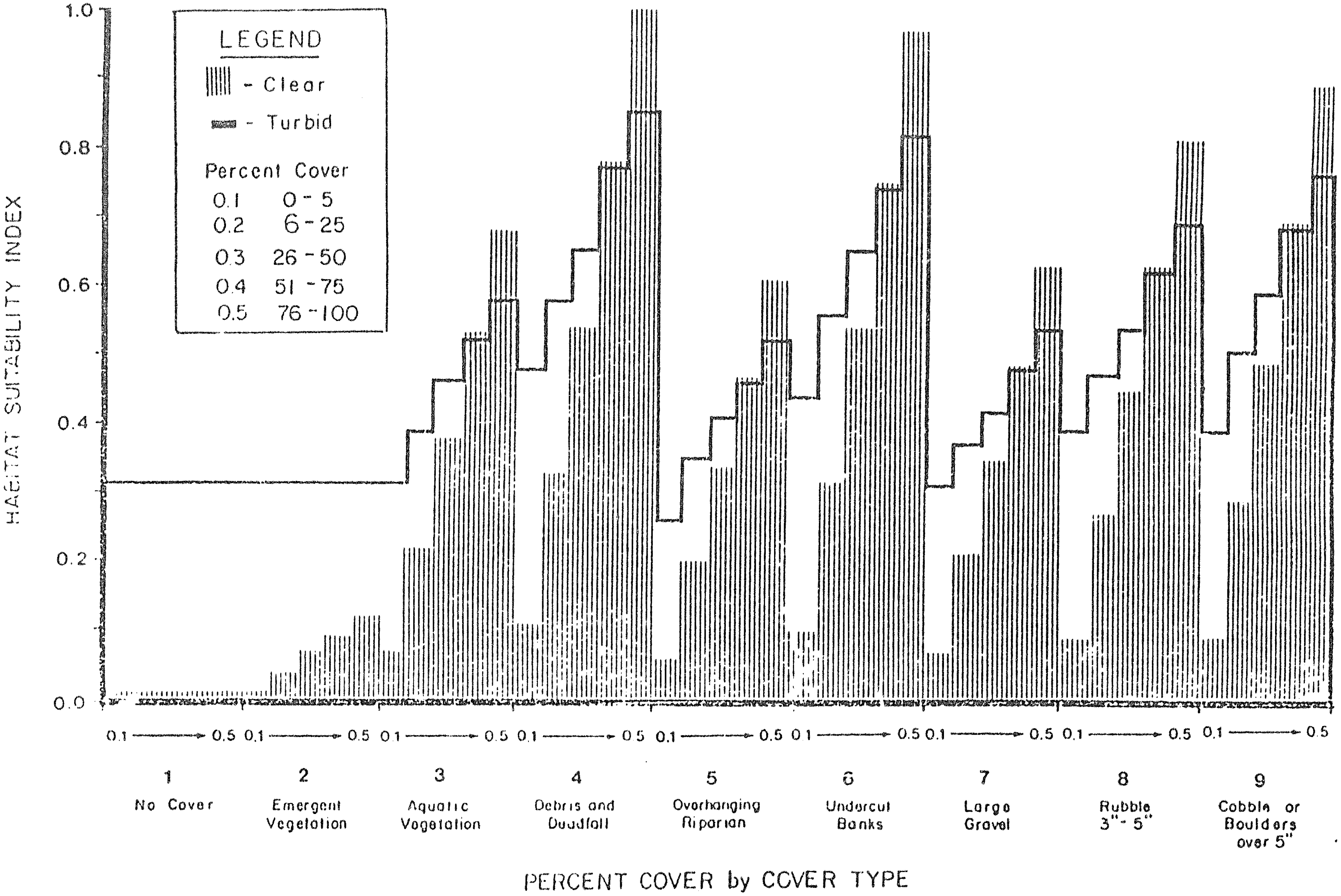



Figure III-4. Cover suitability criteria recommended for use in modeling juvenile chinook habitat under clear and turbid water conditions. Sources: Schmidt et al. 1984. EWT&A and WCC 1985.

Table III-5. Cover suitability criteria recommended for use in modeling juvenile chinook habitat under clear and turbid water conditions. Sources: Schmidt et al, EWT&A and WCC 1985.

| Percent Cover | No Cover | Emergent Veg. | Aquatic Veg. | Debris & Deadfall | Overhanging Riparian | Undercut Banks | Large Gravel | Rubble 3"-5" | Cobble or Boulders <5" |
|---|---|---|---|---|---|---|---|---|---|
| Clear Water (ADF&G) | | | | | | | | | |
| 0-5% | 0.01 | 0.01 | 0.07 | 0.11 | 0.06 | 0.10 | 0.07 | 0.09 | 0.09 |
| 6-25% | 0.01 | 0.04 | 0.22 | 0.33 | 0.20 | 0.32 | 0.21 | 0.27 | 0.29 |
| 26-50% | 0.01 | 0.07 | 0.39 | 0.56 | 0.34 | 0.54 | 0.35 | 0.45 | 0.49 |
| 51-75% | 0.01 | 0.09 | 0.53 | 0.78 | 0.47 | 0.75 | 0.49 | 0.63 | 0.69 |
| 76-100% | 0.01 | 0.12 | 0.68 | 1.00 | 0.61 | 0.97 | 0.63 | 0.81 | 0.89 |
| Turbid Water (EWT&A)[1] | | | | | | | | | |
| 0-5% | 0.31 | 0.31 | 0.31 | 0.48 | 0.26 | 0.44 | 0.31 | 0.39 | 0.39 |
| 6-25% | 0.31 | 0.31 | 0.39 | 0.58 | 0.35 | 0.56 | 0.37 | 0.47 | 0.51 |
| 26-50% | 0.31 | 0.31 | 0.46 | 0.67 | 0.41 | 0.65 | 0.42 | 0.54 | 0.59 |
| 51-75% | 0.31 | 0.31 | 0.52 | 0.77 | 0.46 | 0.74 | 0.48 | 0.62 | 0.68 |
| 76-100% | 0.31 | 0.31 | 0.58 | 0.85 | 0.52 | 0.82 | 0.54 | 0.69 | 0.76 |

[1] Multiplication factors: 0-5% - 4.38%; 6-25% - 1.75; 26-50% - 1.20; 51-75% - 0.98; 76-100% - 0.85

Of particular interest are the separate suitability criteria for velocity and cover which apply under clear and turbid water conditions. Clear water habitats occur in side channel areas conveying base flows derived from groundwater or tributary inflow when the side channel is not breached by the turbid waters of the mainstem. The mainstem discharge at which the transition from clear to turbid water occurs depends on the streambed elevation at the head of the side channel relative to the water surface elevation of the mainstem. Water surface elevation versus mainstem discharge and site flow versus mainstem discharge relationships described in Section II of this report were used to determine at which site flows the clear or turbid water velocity and cover criteria were to be applied.

Within the HABTAT model the study site is comprised of a matrix of cells, each possessing flow-dependent hydraulic variables obtained from the calibrated models. Since the top width of the study site responds to incremental changes in streamflow, the total number of wetted cells and their cumulative surface area also vary with flow.

The HABTAT program evaluates the utility of each cell at a specified flow by calculating a joint preference factor, which in this study was defined as the product of the individual suitability values associated with the prevailing velocity, depth and cover conditions. Weighted usable area is calculated for each cell by multiplying its surface area by the joint preference factor. The WUA for the study site is the sum of the individual cell WUAs. When plotted as a function of discharge, the study site WUA indicates the site specified response of fish habitat to changes in flow. WUA is expressed in units of square feet per 1,000 linear feet of stream.

Total wetted surface area and WUA curves for juvenile chinook were obtained at the eight hydraulic modeling sites corresponding to a range of mainstem discharge from 5,000 to 35,000 cfs at Gold Creek. Surface area and WUA values for site flows outside the recommended extrapolation range of the hydraulic models were estimated using trend analysis and professional judgement. Instances where this was necessary are documented in Table B-6.

A time series plot of available juvenile chinook habitat was also developed for each site by interfacing a synthesized record of site flows during the 1984 rearing season (May 20 to September 15) with the WUA versus site flow function. The resulting figures enable evaluation of habitat conditions on a site-by-site basis over the summer growth period.

## RESULTS

### Site 101.2R

Site Description: This site is located 2.2 miles above the confluence of Chulitna River on the east bank of the Susitna River (Plate III-1). the study reach is 1,500 ft and varies from 350 ft wide in the lower half of the site to 250 ft wide in the upper half. Cross sections 1, 3, 4 and 9 describe the shallow, high velocity areas while cross sections 7 and 8 represent a deep, slow velocity area (Figure III-5). Cross section 6 separates the two areas. Cross sections 2 and 5 describe the small right channel and did not extend across the main channel as the hydraulic conditions at adjacent cross sections were similar. Cross sections 3 and 4 extend across a small backwater channel

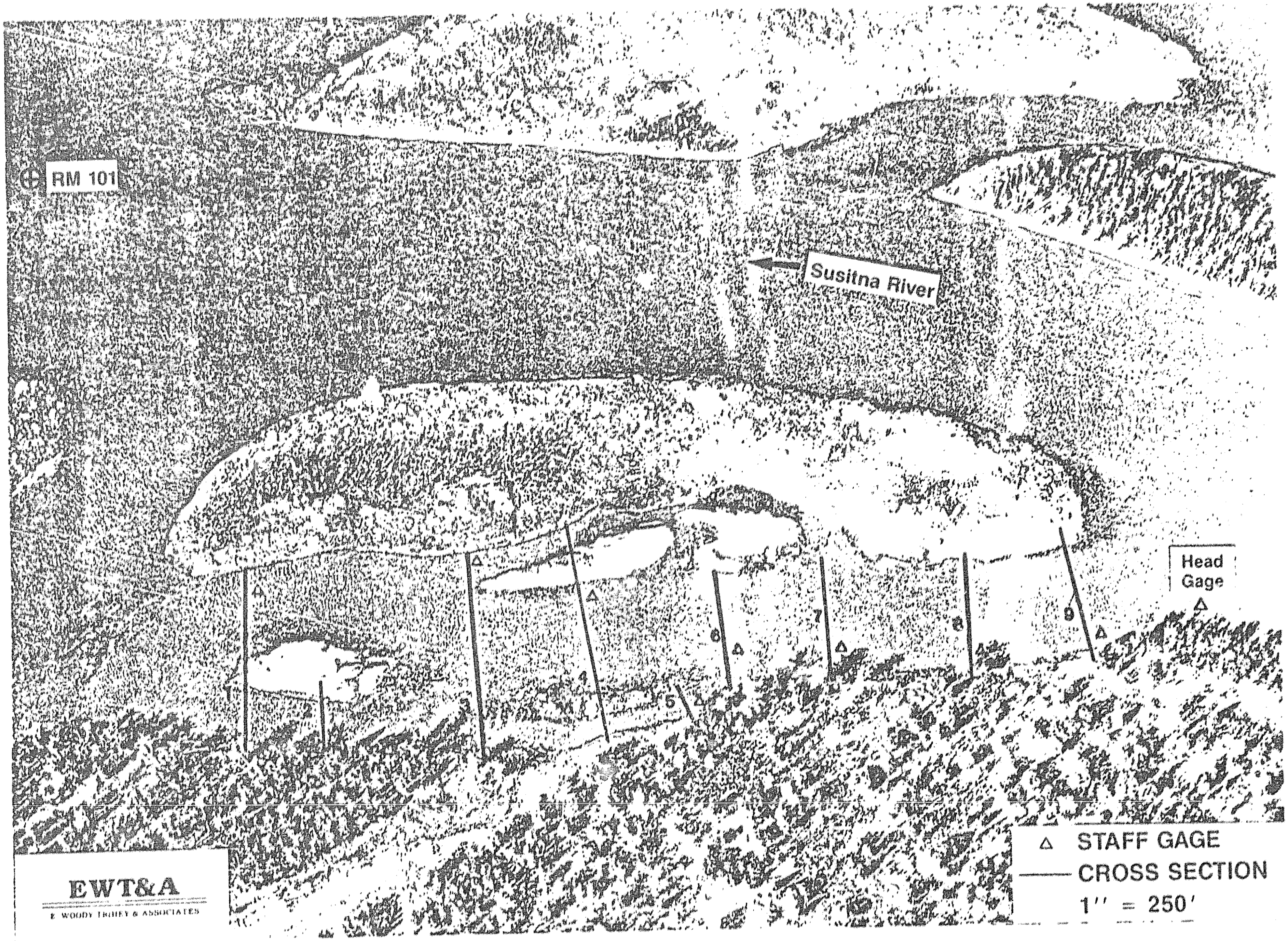



Plate III-1. Modeling site 101.2R on June 1, 1982 at mainstem discharge: 23,000cfs.

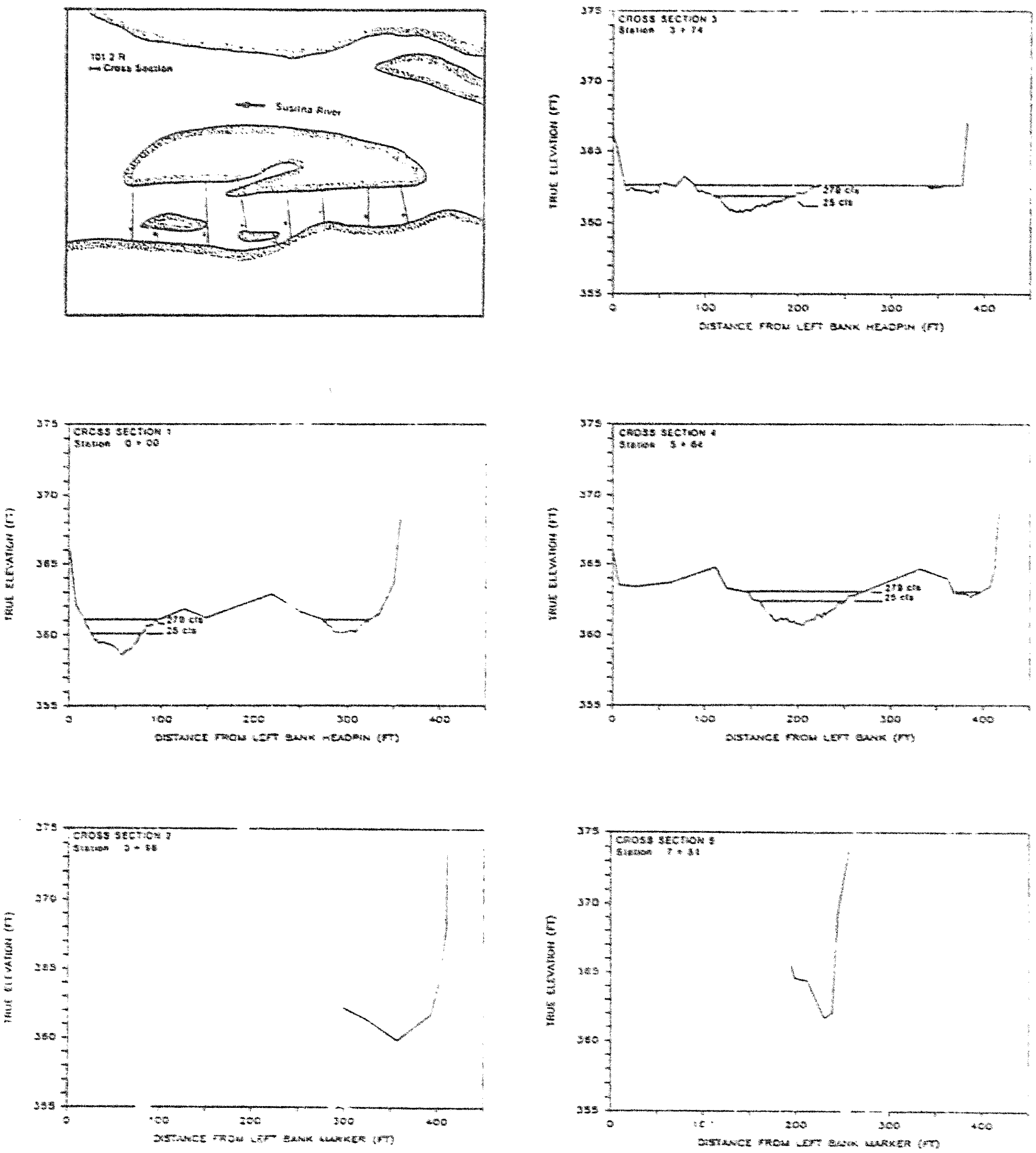



Figure III-5. Cross sections for 101.2R study site depicting water surface elevations at calibration discharges of 25 and 279 cfs.

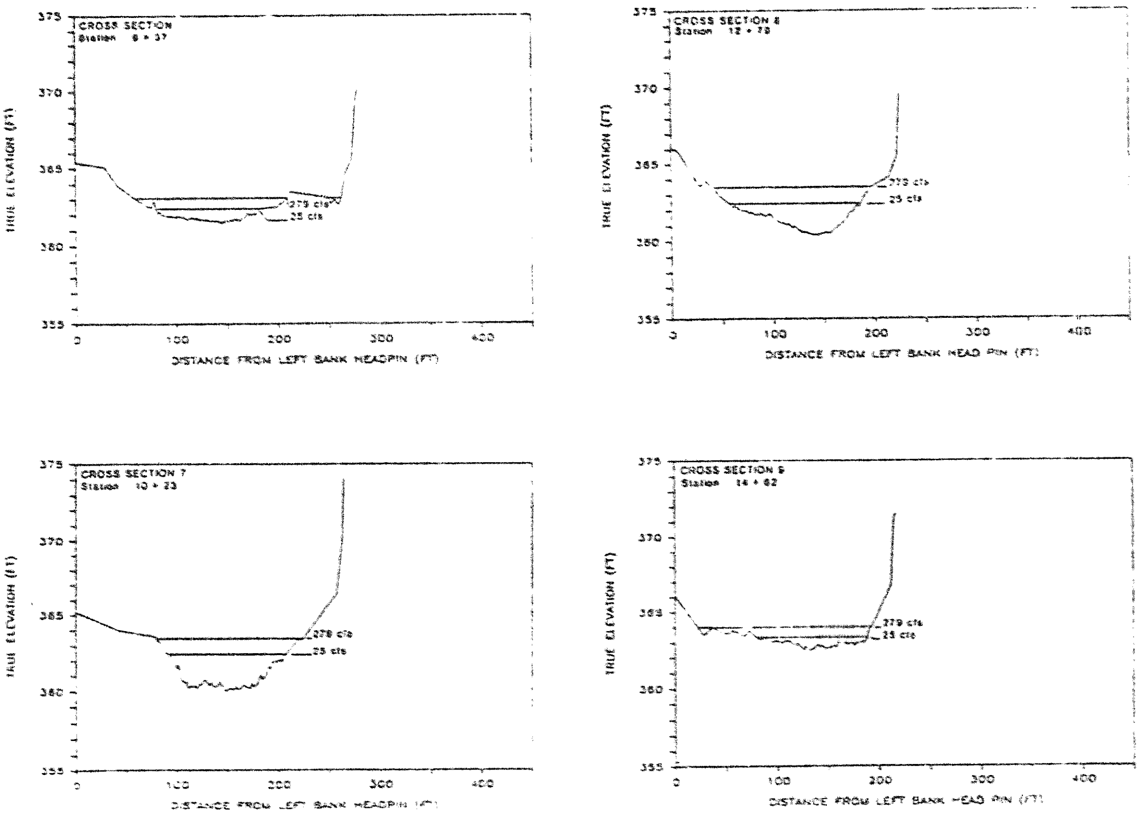



Figure III-5. Cross sections for 101.2R study site depictin water surface elevations at calibration discharges of 25 and ?79 cfs.

along the left bank. Substrate is mainly cobble and large gravel throughout the site with a layer of silt in the left channel. Cover is available predominately from the rubble and cobble substrate present with some debris present.

The vegetated gravel bar along the left bank and across the channel head breaches at 9,200 cfs. Below 9,200 cfs, the site is ponded and only the wetted area near cross section one is connected to the mainstem. The right channel breaches at 14,000 cfs. Site flows of 10 and 0 cfs correspond to mainstem discharges of 10,400 and 7,400 cfs. At 23,000 cfs (mainstem), site flow exceeds 600 cfs.

This study site was selected to represent side channels that become dewatered at low discharges. Upwelling was suspected to maintain low baseline flow conditions and the site appeared to have potentially good rearing habitat although no previous utilization has been documented. An IFG-4 model was selected because of the non-uniform flow conditions present and the channel size.

Chum salmon adults have been observed to use the site but no redds were detected. Some juvenile chinook salmon have been observed in the site. Access to the site is difficult below 9,200 cfs. Passage upstream of cross section 1 is not possible in the unbreached condition.

Calibration: Table III-6 lists the data used to calibrate the hydraulic model for this site. Depth and velocity measurements were made across each cross section at every calibration flow. Because cross sections 2 and 5 do not extend across the main channel, they were not included in the hydraulic model.

Table III-6. Hydraulic data available to calibrate the IFG-4 model for site 101.2R.

| Date | Flow (cfs) | Discharge (cfs) |
|---|---|---|
| 840830 | 265 | 15,300 |
| 840903 | 25 | 11,200 |

The hydraulic model was established to describe the depths and velocities in the main channel. At discharges greater than 14,000 cfs, flow entered the right channel. The water surface elevations in the main and right channels differed across cross sections 1 through 5. The streambed elevations were raised in the right channel to maintain a horizontal water surface elevation across a cross section (Figure III-6). The backwater area at the mouth of the left channel also had different water surface elevations than the main channel. The streambed elevations in the left channel were also raised to maintain horizontal water surface elevations at cross sections 3 and 4. Observed and predicted water surface profiles from the calibrated model are shown in Figure III-7. The extrapolation limits are also plotted. The IFG-4 model was calibrated with respect to depth by making comparisons between the stage-flow curves and the model predicted water surface elevations. The comparison made at the discharge cross section is illustrated in Figure III-8; similar comparisons were made at each cross section.

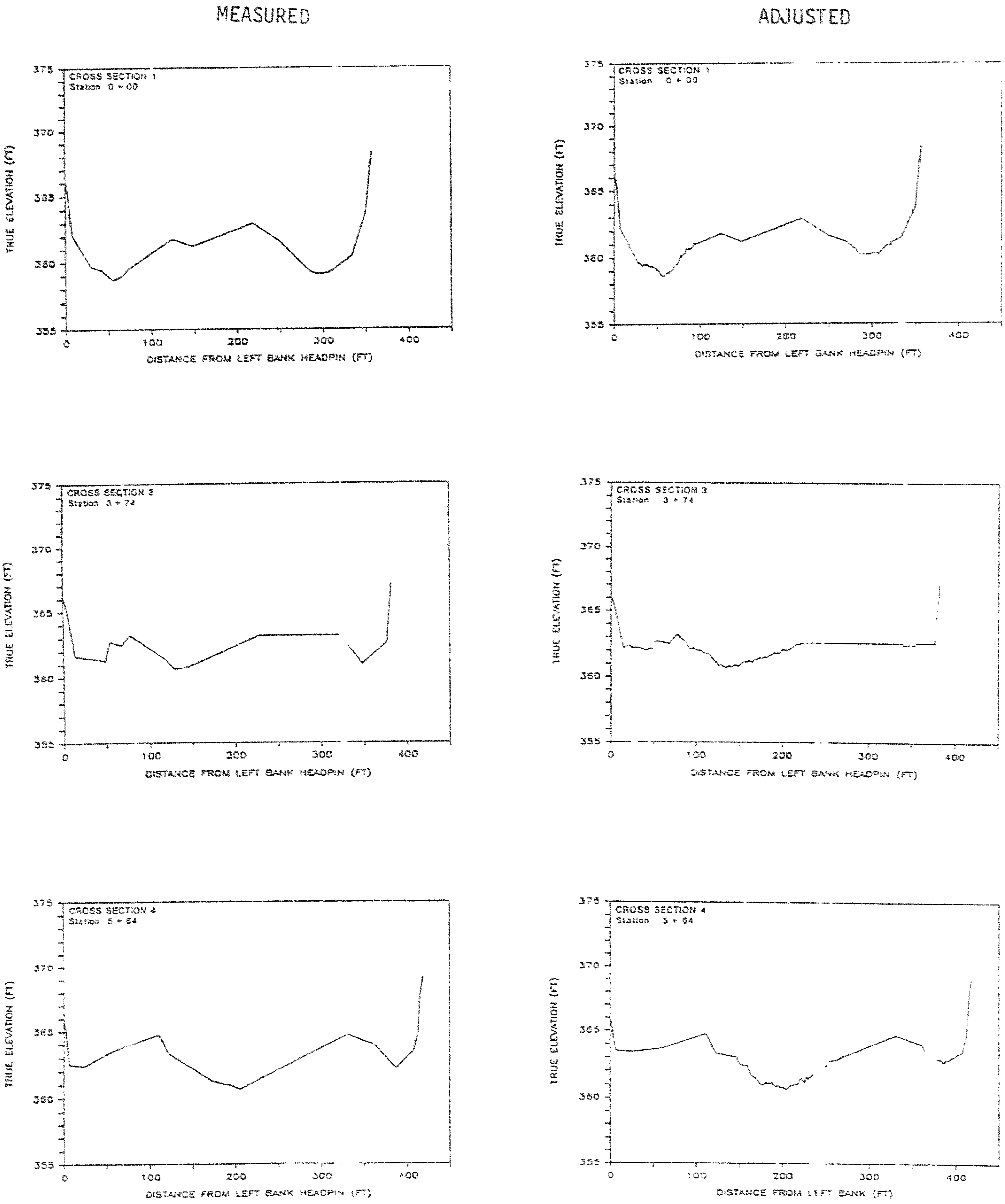



Figure III-6. Comparison between measured and adjusted cross sections 1, 3, and 4 at 101.2R study site.

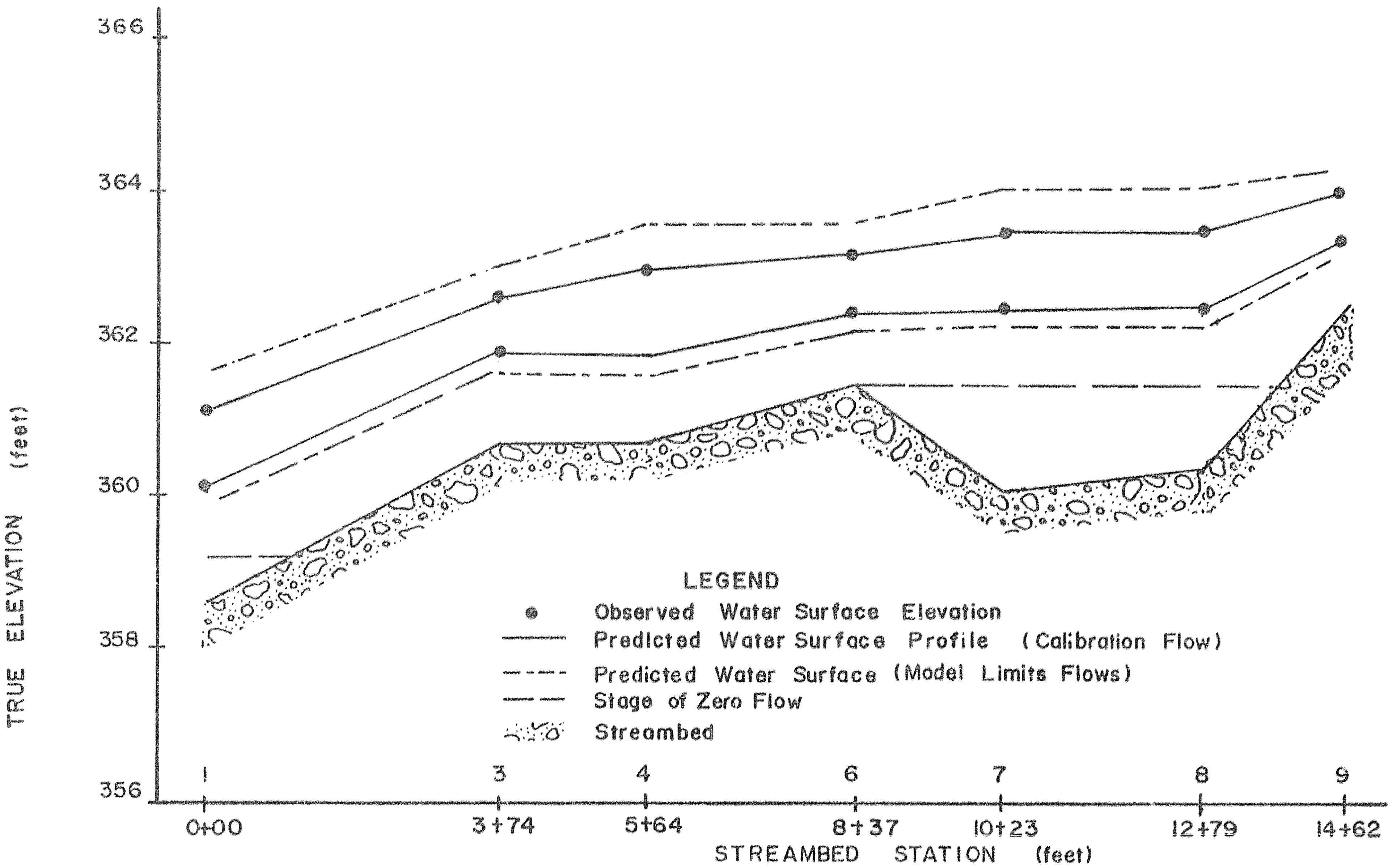



Figure III-7. Comparison of observed and predicted water surface profiles from calibrated hydraulic model at 101.2R study site.

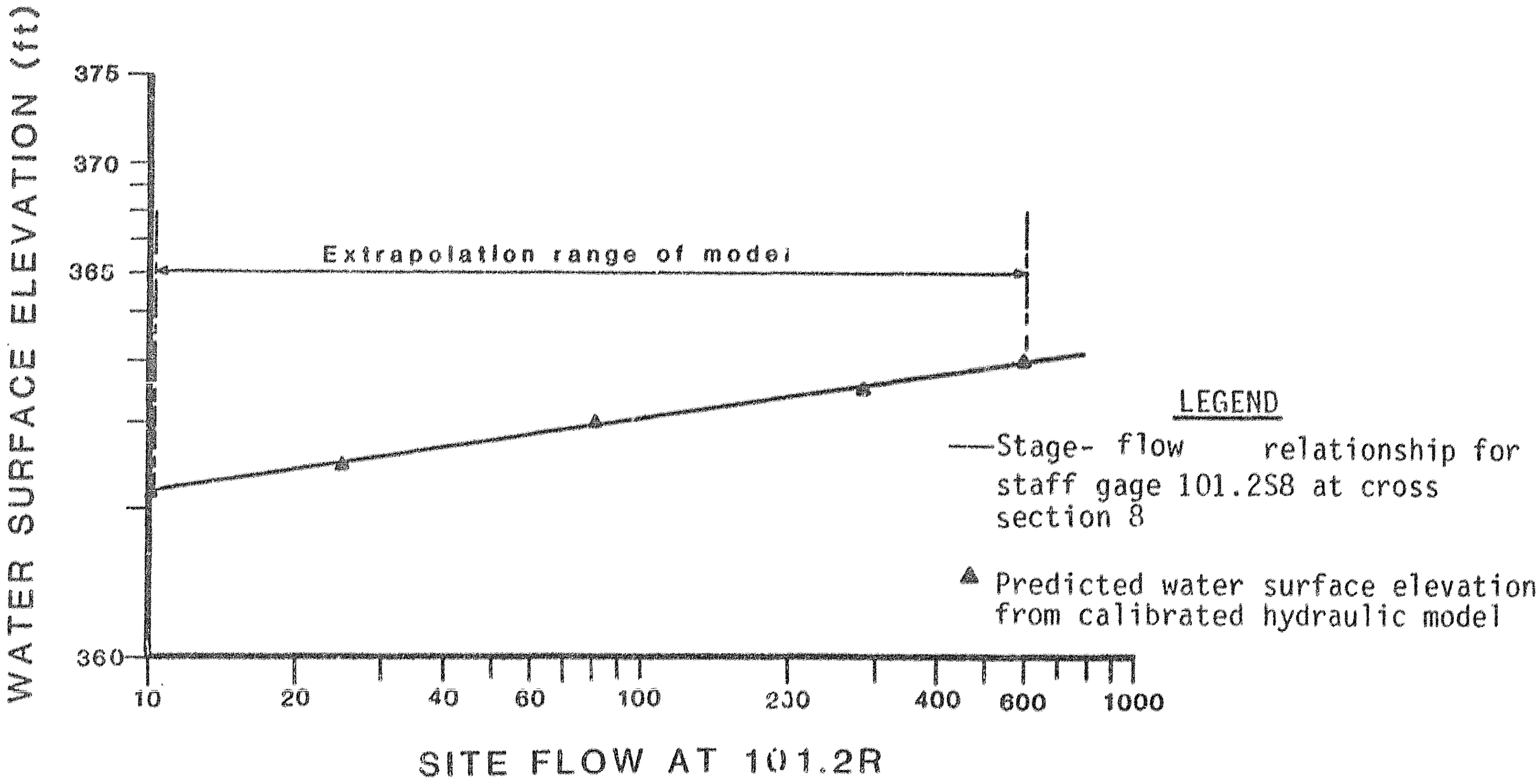
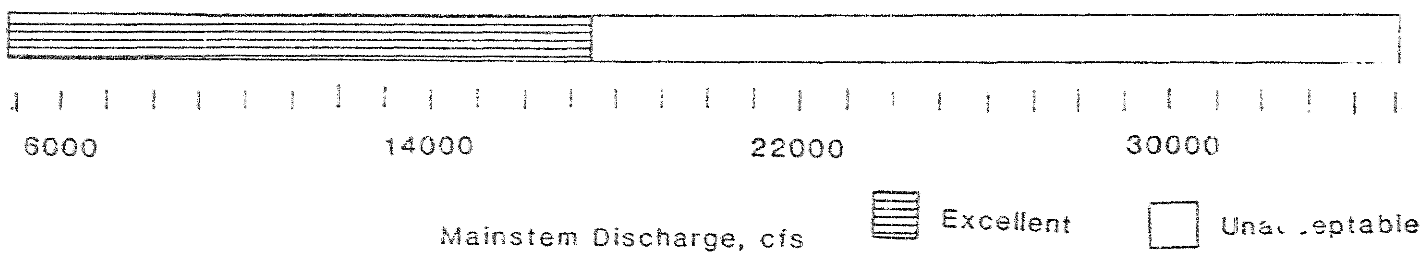



Figure III-8. Comparison between water surface elevations forecast by the calibrated hydraulic model and the stage-flow relationship for 101.2R cross section 8.

Verification: An analytical analysis was made to compare the predictive capabilities of the model. Scatter plots comparing the observed and predicted depths and velocities (Figure B-2.1) indicate the model is capable of accurately predicting hydraulic data. Statistical tests were also made and the results summarized in Table B-5.

Application: An excellent rating was assigned from 9,200 to 17,600 cfs mainstem discharge. From 9,200 to 10,300 cfs, the baseline flow is estimated to be 10 cfs. Between discharges of 10,300 to 17,600 cfs, the site flow ranges from 10 to 600 cfs. As discussed in Part II of this report, there is a change in the flow versus stage relationship changes as the gravel bar which separates the main and right channels becomes overtopped. Because there is no data available to describe exactly how this change affects the flow-stage relationship, the upper limit of the excellent rating was set to be 17,600 cfs. The predictive capabilities also break down so it is no longer reliable above 17,600 cfs (600 cfs site flow).




Total surface area and WUA curves for study site 101.2R are provided in Figure III-9. These curves are plotted to the same vertical scale, representing square feet per thousand feet of stream reach. A comparison of the two curves indicates the relative proportion of the wetted surface area containing rearing habitat for juvenile chinook at various mainstem discharges.

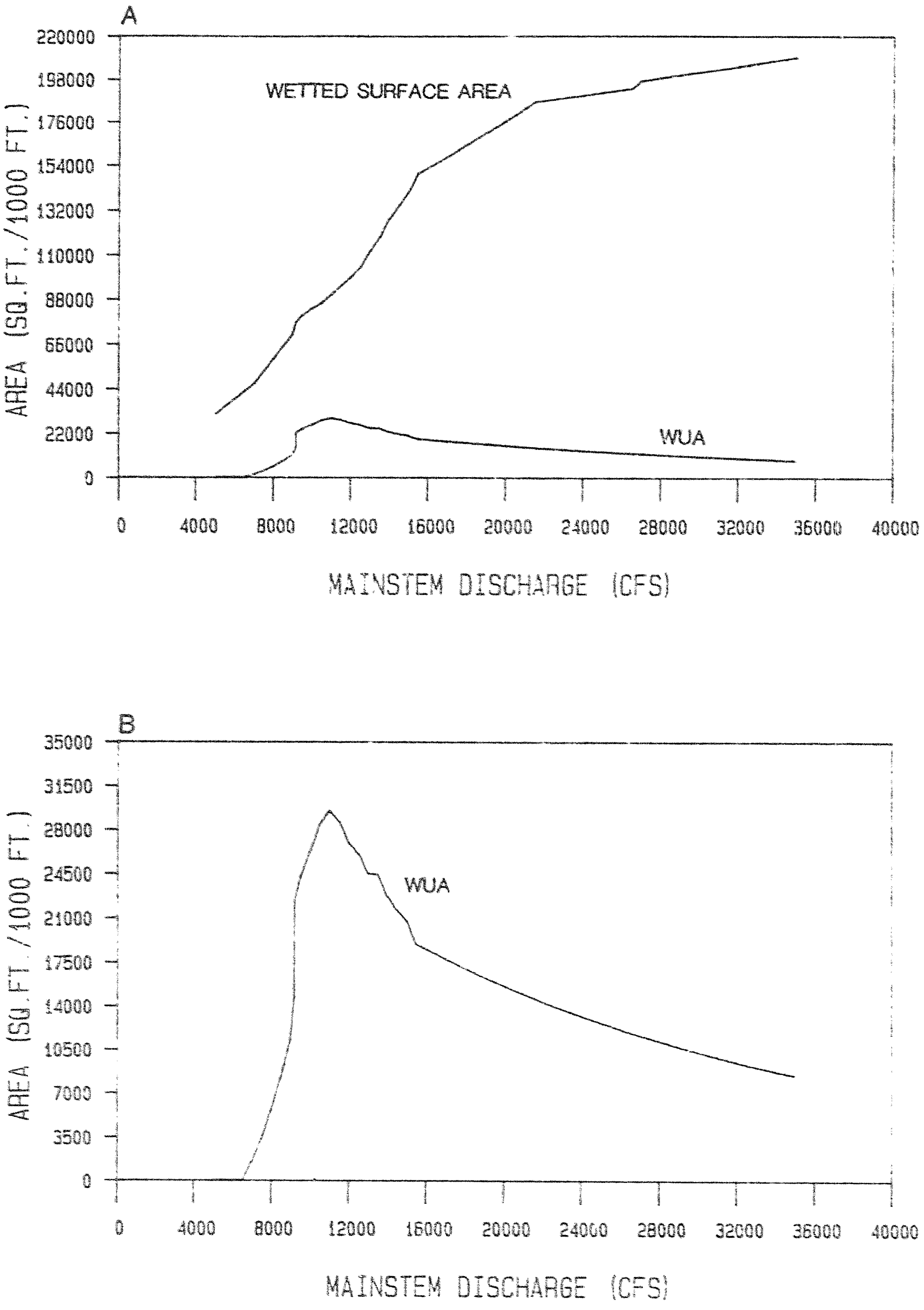



Figure III-9. Projections of gross surface area and WUA of juvenile chinook salmon habitat as a function of discharge for the 101.2R modeling site.

Rearing habitat for juvenile chinook in the side channel is maximized at mainstem discharges in the vicinity of 11,000 cfs. The sharp rise in WUA which occurs near 9,000 cfs is caused by the site being breached and the associated increase in turbidity which provides additional cover value for juvenile chinook.

The WUA curve is also plotted in Figure III-9b at an expanded vertical scale to accent the response of rearing habitat to incremental changes in discharge. The presence of turbid water and the distribution of water velocity are the primary determinants of the WUA response curve at this site. Although much of the site exists as riffle-run habitat, the channel gradient is low enough that water velocities do not become limiting to juvenile chinook until mainstem discharges exceed 16,000 cfs. The large vegetated gravel bar which separates the side channel from the mainstem and another large gravel bar in the lower portion of the study site which is exposed at low flows does not provide for any appreciable increase in rearing habitat at higher flows due to the low cover value of their sand and gravel substrates. Nevertheless, in relation to flow conveyance, this study site possesses fairly good habitat for juvenile chinook in the lower flow ranges (Figure III-9a).

The WUA forecasts were obtained using the HABTAT model linked with the IFG-4 model previously described in this site discussion. Because of the limited extrapolation range of this particular IFG-4 model the WUA and surface area curves were estimated for mainstem discharges less than 9,200 cfs and greater than 16,000 cfs.

The wetted surface area of the channel were estimated for discharges of 5,100 and 7,400 cfs using digitized measurements obtained from aerial photography, as described in Klinger-Kingsley (1985). These estimates, 31,600 and 46,500 sq ft/1,000 ft, were assigned to discharges of 5,000 and 7,000 cfs. Low turbidity habitat suitability criteria were used to forecast juvenile chinook WUA at 9,200 cfs (breaching flow for this side channel) and the amount of rearing habitat available under non-breached conditions was assumed to decline to zero at a constant rate between this discharge and 6,500 cfs. This assumption is supported by numerous field observations of clear standing water which is cut off from the mainstem. Although still contributing to total wetted surface area, clear ponded water provides progressively less suitable habitat for juvenile chinook as mainstem flows recede.

At mainstem discharges exceeding 16,000 cfs (the upper extrapolation limit of the IFG-4 model), estimates of the wetted surface area at 23,000 and 27,000 cfs were also obtained from aerial photography. Surface areas associated with discharges between 16,000 cfs and 27,000 cfs were interpolated. Surface area estimates for discharges greater tan 27,000 cfs were obtained by trend analysis; exponentially extending the surface area curve to a maximum of 210,000 sq ft/1,000 ft at 35,000 cfs.

The WUA curve for juvenile chinook was assumed to decay exponentially above 16,000 cfs. This trend is evident at other middle river side channel for which high flow hydraulic models are available. In addition extension of the WUA curve beyond 16,000 cfs using this technique does not appear inconsistent with the rate of decline forecast by the calibrated model for discharges less than 16,000 cfs. Additional information is provided in Table B-6.1.

Time series WUA and site flow plots are presented in Figure III-10a and b. Low site flows during late May and early September, corresponding to mainstem discharges of 9,000 to 13,000 cfs, resulted in comparatively high rearing habitat forecasts for these periods. High site flows during the intervening months produced low habitat forecasts.

Site 101.5L

Site Description: This site is located 2.2 miles above the confluence of the Chulitna River on the west bank of the Susitna River (Plate III-2). The study reach is 3,100 ft long and 430 ft wide. A large backwater area is present throughout the lower half of the site for the entire discharge range (5,000 to 35,000 cfs). One cross section describes the backwater area; a second describes the transition between low and high velocity areas. Three cross sections define the deep, fast area in the upper half of the study reach (Figure III-2). Cobble and rubble substrate predominate throughout the site. A thick layer of sand exists along the right bank of the mouth. The available cover is provided by large substrate with less than 25 percent considered acceptable.

This study site was selected to represent large side channels which remain side channels from 5,000 to 35,000 cfs. An IFG-2 model was selected because of the large size of the channel and its uniform shape. In addition, field reconnaissance indicated that rearing habitat was limited to the stream bank margins, and a limited amount of data would therefore be adequate to simulate channel hydraulics with an IFG-2 model.

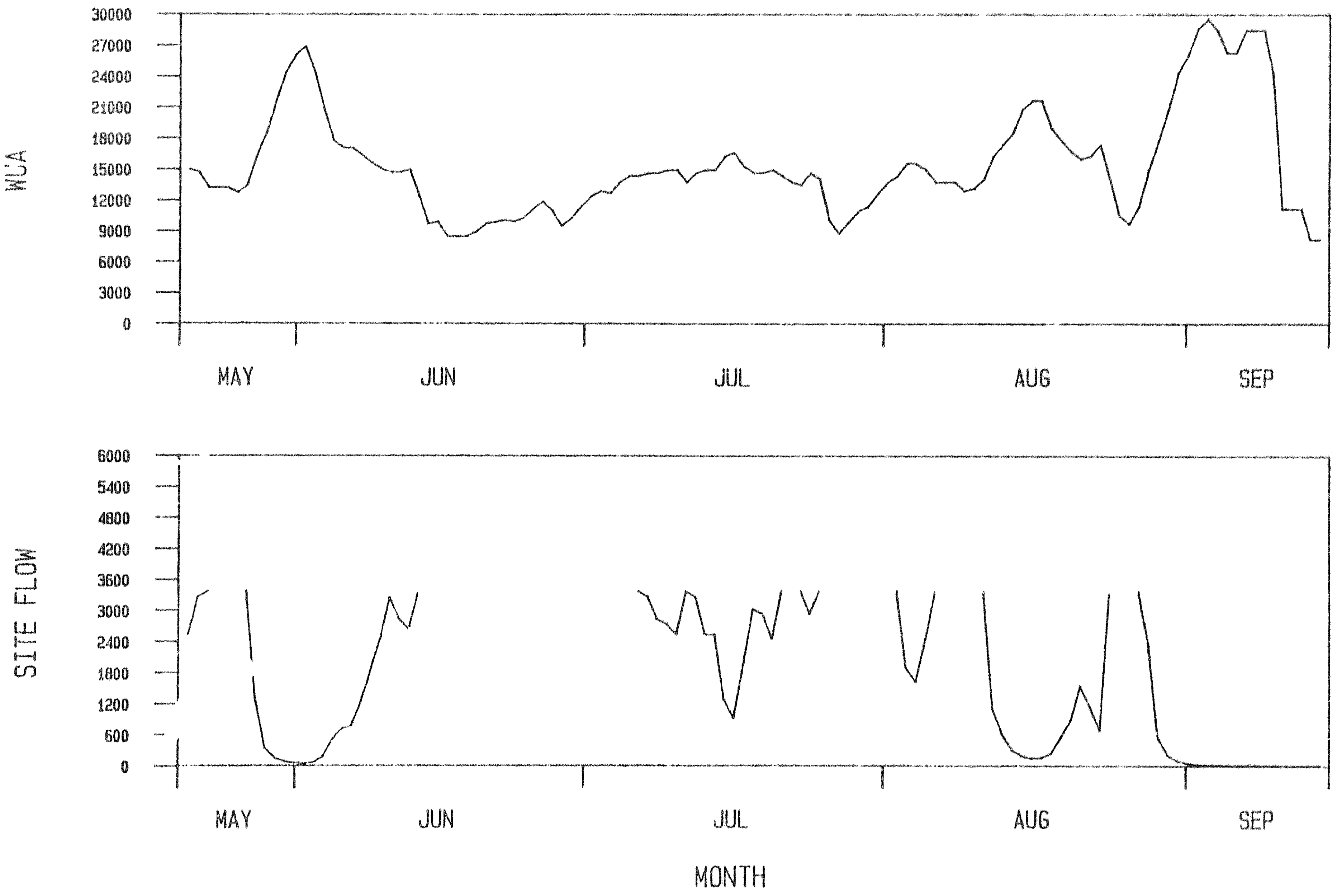



Figure III-10. Time series plots of juvenile chinook salmon WUA as a function of discharge from May 20 to September 15, 1984 for 101.2R modeling site.

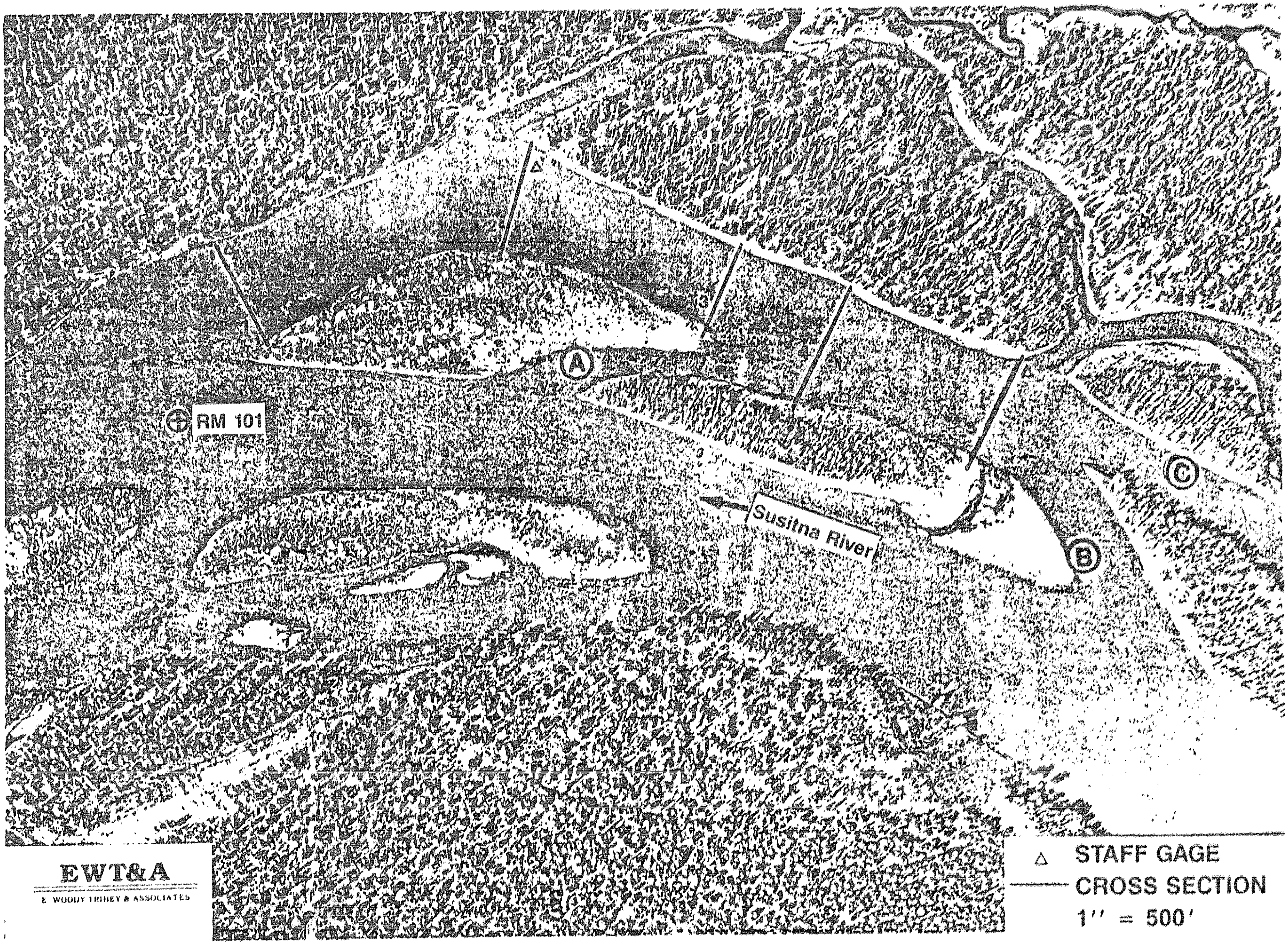



Plate III-2. Modeling site 101.5L on June 1, 1982 at mainstem discharge: 23,000 cfs.

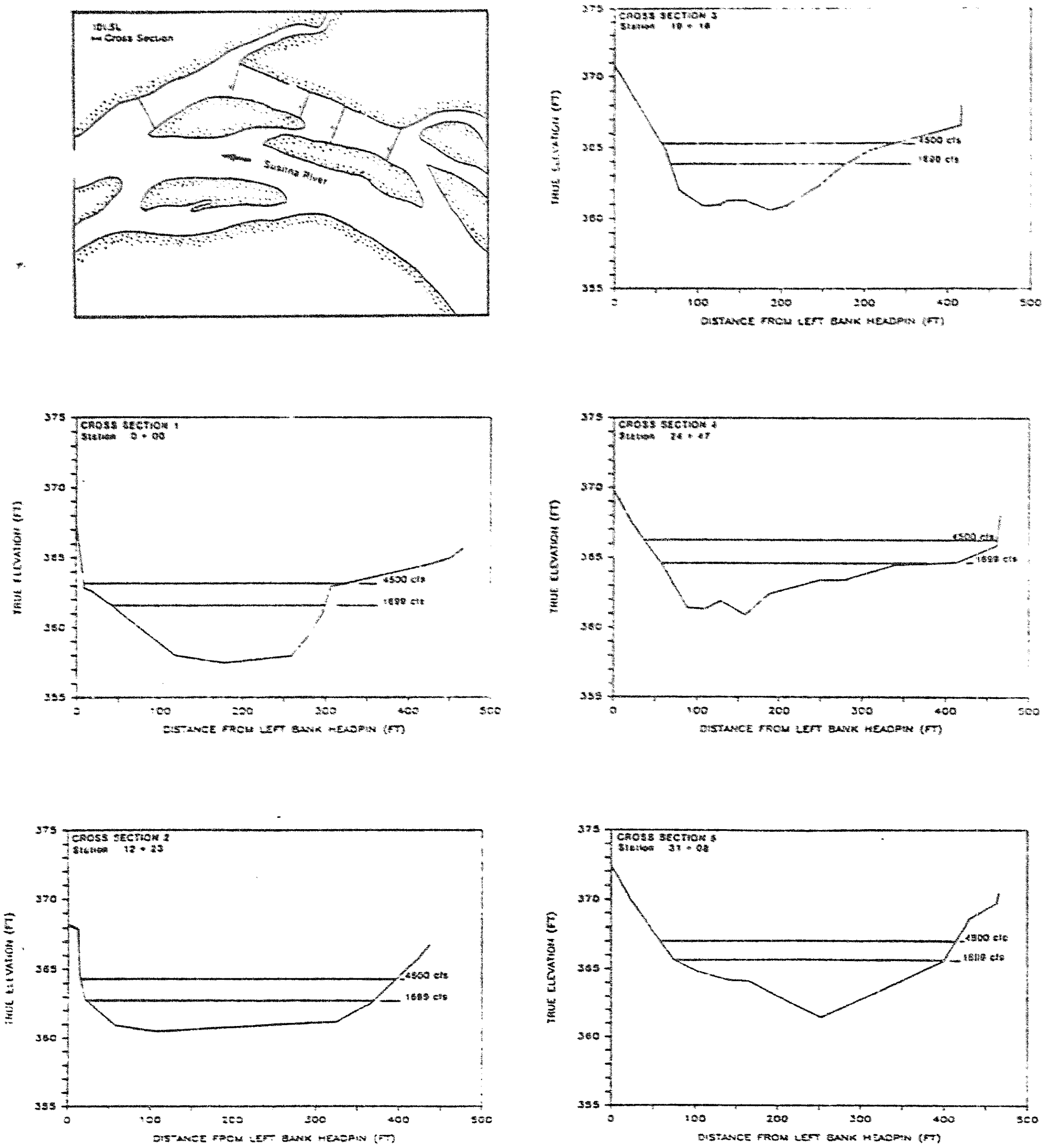



Figure III-11. Cross sections for 101.¯L study site depicting water surface elevations at calibration discharges of 1696 and 4500 cfs.

Channels B and C convey mainstem flow at all discharges and 10,000 cfs, respectively. Channel A becomes active at 12,000 cfs and redirects less than ten percent of the flow from the side channel to the mainstem. Site flows of 6,030, 2,400 and 1,640 cfs correspond to mainstem discharges of 23,000, 10,400 and 7,400 cfs respectively.

Spawning salmon have not been observed in the side channel. Juvenile chinook, coho and sockeye salmon have been identified in the site. The large backwater area at the mouth eliminates any access difficulty, and the deep channel allows passage throughout the site at all discharges.

Calibration: The data available to model the site included level surveys for cross sections 1, 2, and 5; rating curves developed by ADF&G at cross sections 2 and 5 (Estes and Vincent-Lang, 1984); and the hydraulic data summarized in Table III-7. Cross sections 3 and 4 were developed from the discharge measurement notes.

Table III-7. Hydraulic data available to calibrate the IFG-2 model for site 101.5L.

| Date | Flow (cfs) | Discharge (cfs) | Calibration Cross Section(s) | Type* |
|---|---|---|---|---|
| 841012 | 1622 | 6210 | 4 | D |
| 841001 | 1696 | 7830 | 5 | D |
| | | | 1, 2 | S |
| 840911 | 2213 | 9330 | 3 | D |
| 940921 | 2250 | 11,400 | 1, 2, 5 | S |

Table III-7 (Continued).

| | | | | |
|---|---|---|---|---|
| 940831 | 3530 | 14,300** | 3 | D |
| 840820 | 4500 | 18,500 | 1, 2, 5 | S |

* D = Discharge measurements (includes mid channel and shoreline measurements)
S = Shoreline measurements (does not include mid channel measurements)
** = Adjusted to instantaneous discharge

Two models were required to accurately describe the site for mainstem discharges of 5,000 to 35,000 cfs. Velocity profiles for site flows of 1,696 and 2,250 cfs at cross sections 1, 2, and 5 were similar. However, to simulate the velocity distribution across the channel at a site flow of 4,500 cfs required a different set of Manning's "n" values. Velocities increased gradually with distance from the water's edge at low flows, but rose quickly and approached maximum channel velocity much closer to shore at high flows.

The velocity profiles for the two measured flows at cross section 3 were very similar and represented low and medium flows through the site. Only low flow data were available for cross section 4.

In calibrating the two models with respect to depth, predicted water surface elevations at cross sections 2 and 5 were compared to the corresponding elevations calculated from the rating curves. Water surface elevations for cross sections 3 and 4 were checked by comparing the predicted top widths with the top widths determined from the discharge measurements. Water surface profiles based on IFG-2 output for the calibration flows of 1,696, 2,250, and 4,500 cfs and for the flows corresponding to discharges of 5,000 and 35,000 cfs are shown in Figure III-12. Observed water surface elevations and rating curve water surface elevations are also shown.

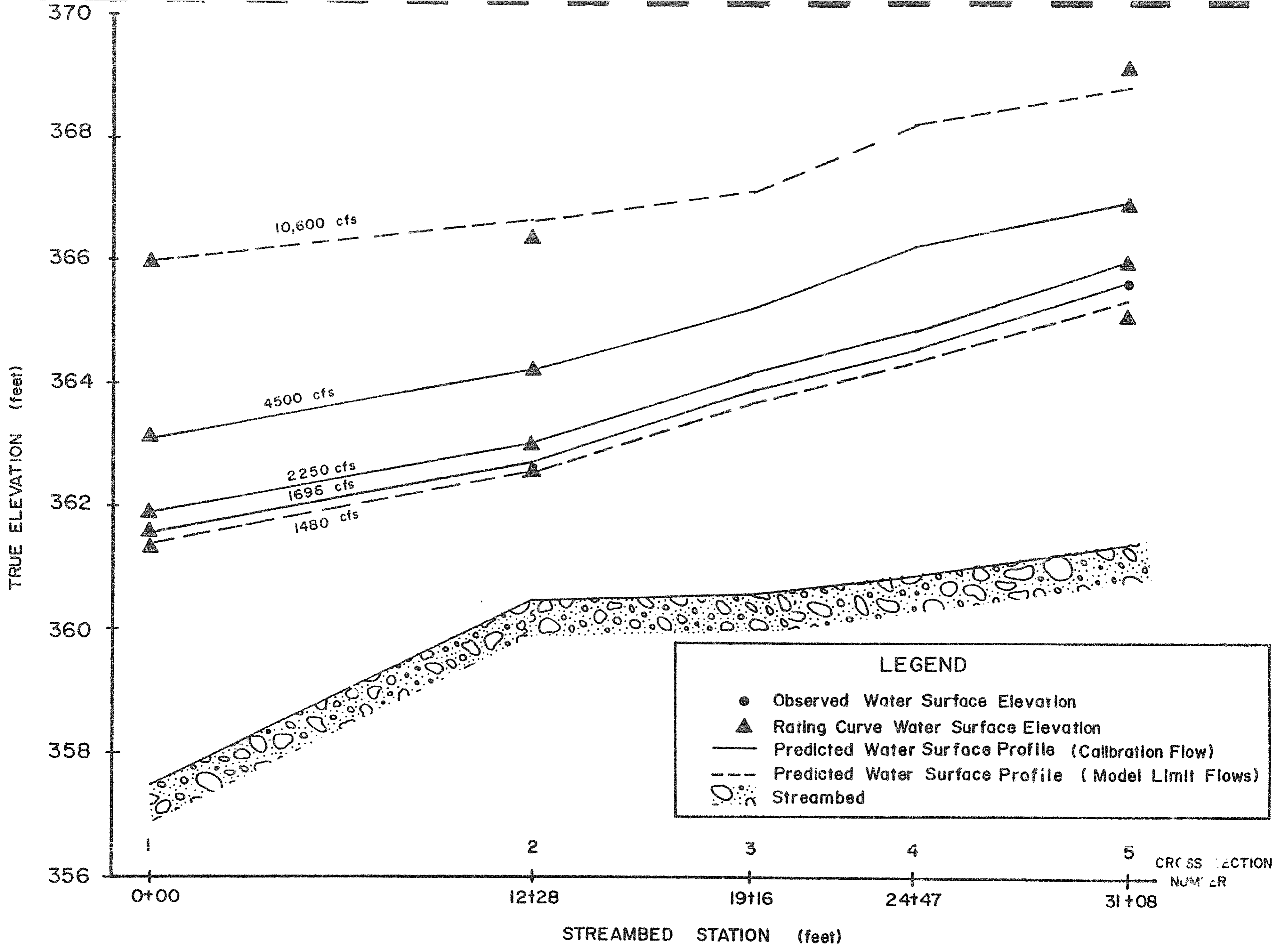
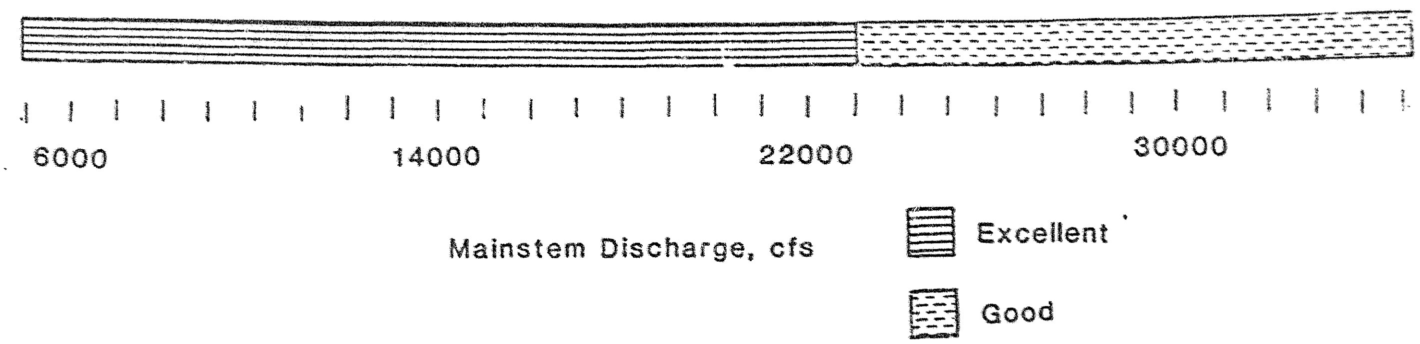



Figure III-12. Comparison of observed and predicted water surface profiles from calibrated model at 101.5L study site.

Verification: Figures B-2.2 and B-2.3 show velocity profiles produced by the two IFG-2 models at cross section 5 for calibration flows of 1,696 and 4,500 cfs. The observed shoreline velocities for those flows are also plotted. The figures demonstrate that the set of "n" values that produces the proper velocity profile at the low flow does not accurately produce that of the high flow, and vice versa.

Application: The low flow IFG-2 model represents site conditions for mainstem discharges up to 10,600 cfs while the high flow model is applicable to mainstem discharges greater than 10,600 cfs. This breakpoint corresponds to a site flow of 2,500 cfs. By utilizing all available site information, including aerial photography, channel geometry and field experience, the limits for which the models can be considered excellent extend beyond the range of available data. The models were extrapolated beyond the data range to 5,000 cfs on the lower end of the low flow model and 23,000 cfs for the upper end of the high flow model. At 23,000 cfs, the channel geometry suggests that the total flow loss through the overflow channel is less than ten percent. Because this outflow is minor, the upper model limit was extrapolated from 23,000 to 35,000 cfs. However the overall rating for the high flow model for the mainstem range of 23,000 to 35,000 cfs was considered good, rather than excellent. The total wetted surface area and juvenile chinook WUA curves for the study site are presented in Figure III-13. In this figure the WUA and surface area curves are plotted to the same scale and expressed in identical units; i.e., square feet per 1,000 feet of stream. A comparison of the two curves gives an indication of the proportion of the study site which contains rearing habitat.

The application ranges and ratings are summarized below in the bar chart.




Site 101.5L is distinguished by a comparatively narrow range of juvenile chinook WUA for mainstem discharges between 5,000 and 35,000 cfs, suggesting that areas suitable for chinook raring are generally recruited and lost at comparable rates. Most of the rearing habitat is located in a narrow band along the right shoreline where velocities are not limiting (Williams 1985).

The response of the WUA curve to variations in mainstem discharge is diagrammed in Figure III-13 which is plotted on an expanded vertical scale. The increase in WUA forecasts associated with lower mainstem discharges reflect the influence of lower velocities. The WUA forecasts associated with lower flows at this site reflect the combined effect of overtopping discharges (in both overflow and secondary feeder channels) and the channel geometry on nearshore velocities. At higher flows the small increases observed in juvenile chinook habitat are due to the progressive development of a low-velocity backwater area at the lower end of the study site. The significance of these changes in habitat potential in response to streamflow, however, becomes relatively insignificant when viewed in relation to the wetted surface area of the side channel.

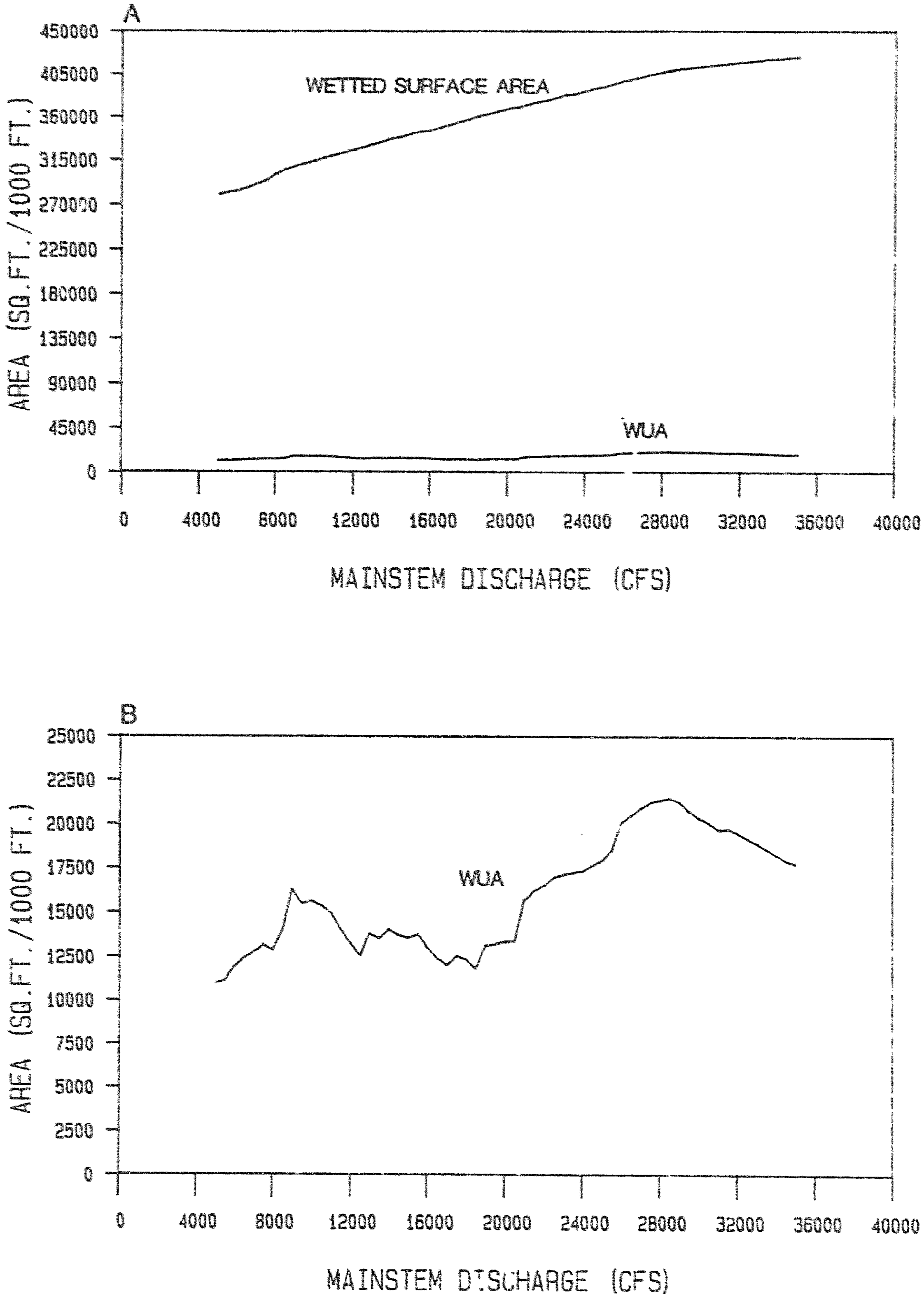



Figure III-13. Projections of gross surface area and WUA of juvenile chinook salmon habitat as a funtion of discharge for the 101.5L modeling site.

WUA were forecast using low- and high-flow IFG-2 models linked with the HABTAT model to account for flow-dependent variations in shoreline velocity distribution. The side channel conveys turbid water at mainstem discharge less than 5,000 cfs. Therefore WUA for juvenile chinook was forecast using only turbid water habitat suitability criteria. Application of low and high flow WUA models resulted in separate WUA functions which were joined together to form the single habitat response curve presented in Figure III-13. This was accomplished by overlapping the WUA forecasts from the low and high flow models and choosing a discharge value which would effect the smoothest transition from one habitat response curve to the other. The selected value was 8,500 cfs (Table B-6.2).

The time series plot of WUA for juvenile chinook bears a strong resemblance to the daily streamflow record at the site for the May 20 to September 15, 1984 period (Figure III-14). Site flows during this period typically vary between 4,000 and 8,000 cfs, accompanied by changes in habitat potential ranging from 12,000 to 22,000 sq ft/1,000 ft. The seasonal variability of WUA is small. With the exception of a few high flow periods, site flows and juvenile chinook habitat at site 101.5L show a remarkable degree of temporal stability during the rearing season.

Site 112.6L

Site Description: This site is located approximately 2 miles downstream of Lane Creek on the west bank of the Susitna River (Plate III-3). The study reach is 4,100 ft long and varies between 500 and 700 ft wide. Eight cross

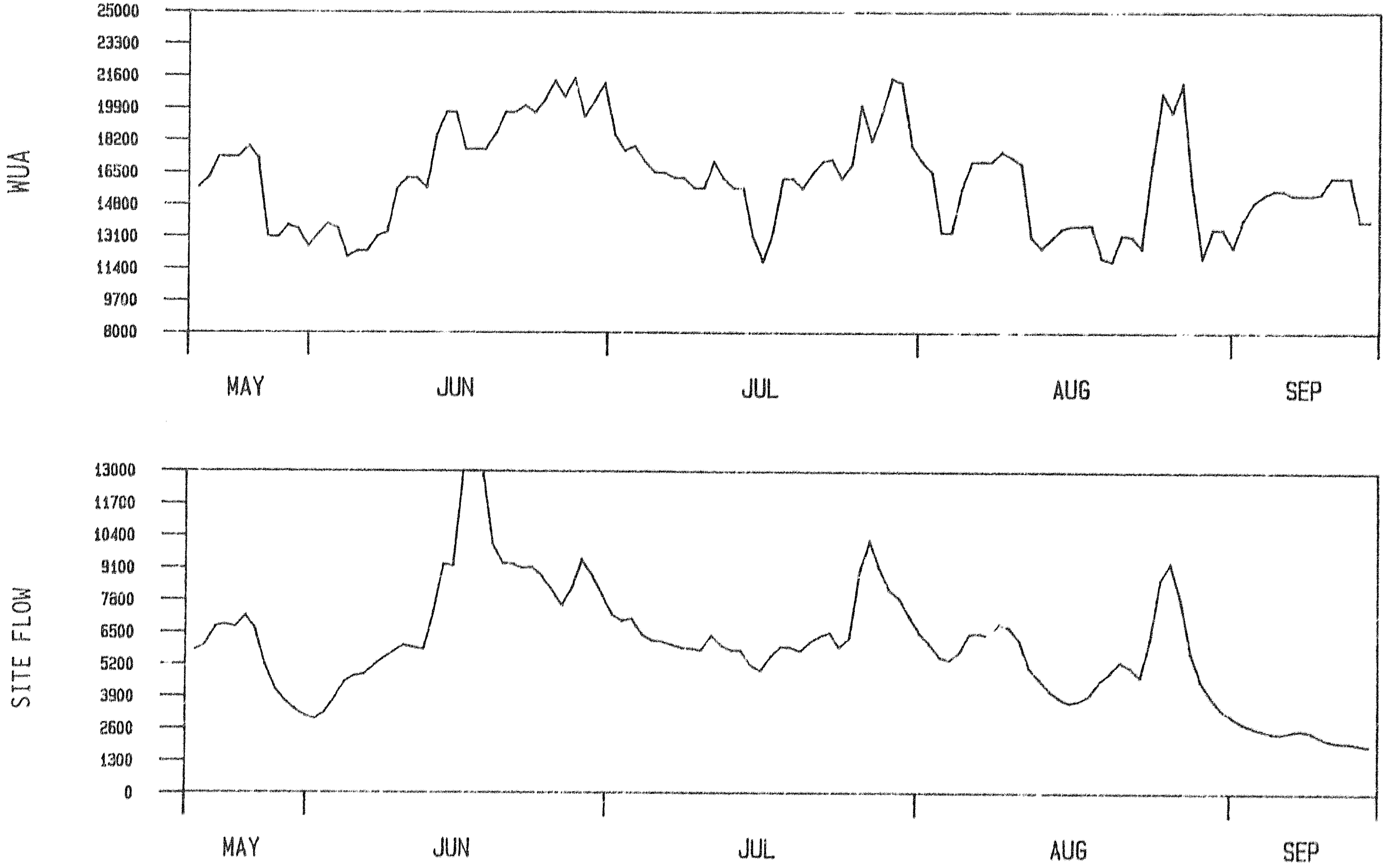



Figure III-14. Time series plots of juvenile chinook salmon WUA as a function of discharge from May 20 to September 15, 1984 for 101.5L modeling site.

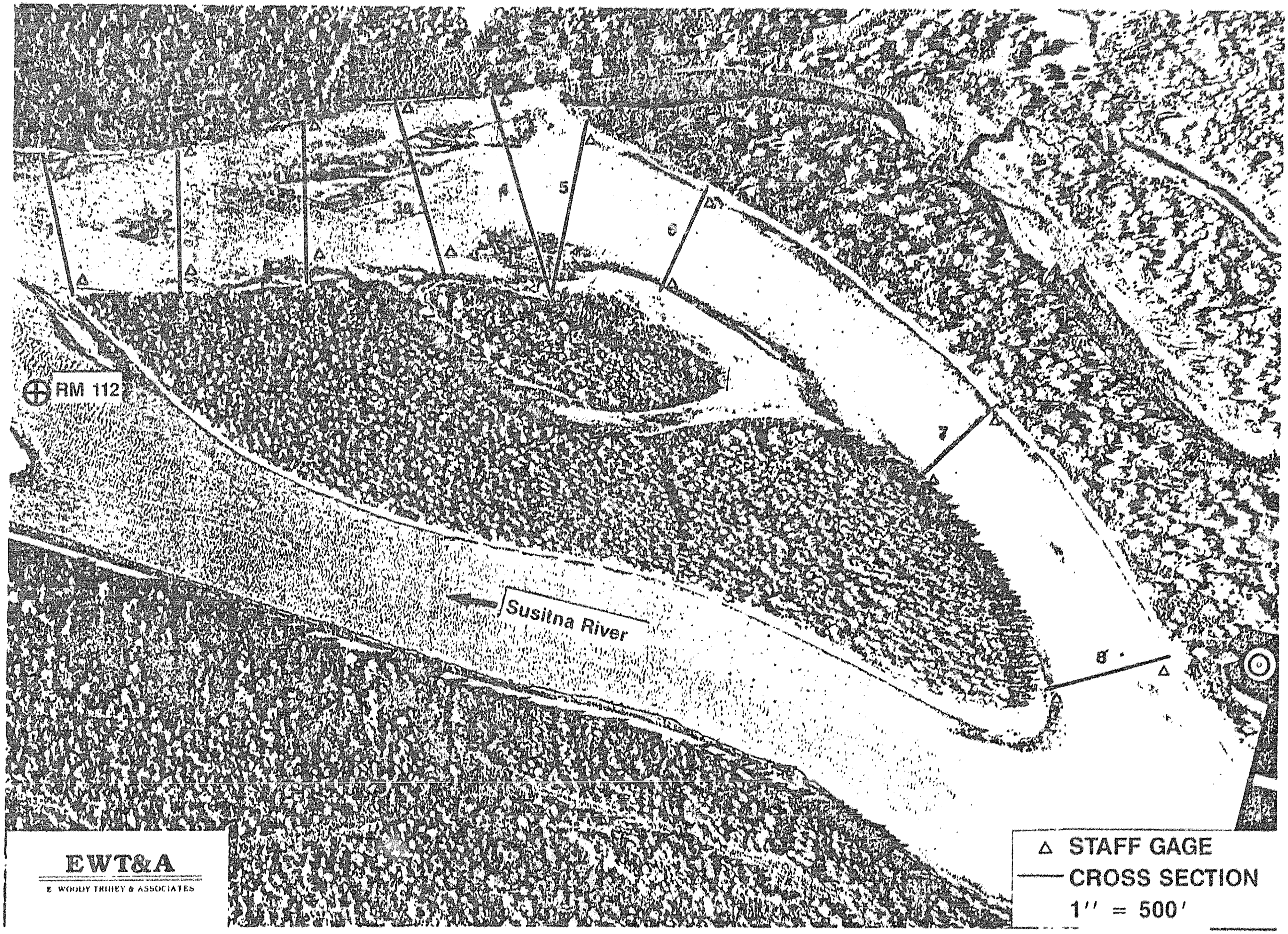



Plate III-3. Modeling site 112.6L on September 6, 1983 at a mainstem discharge: 16,000 cfs.

sections were initially established during high mainstem discharges occurring in early August: cross sections 1, 2, 5, 6 and 7 describe low velocity areas; 3, 4 and 8 define high velocity areas. As flows receded during the fall, cross section 4 was relocated and an additional cross section, 3A, was added to better describe the shallow, high velocity area midway through the site (Figure III-15). Substrate composition is cobble and rubble with layers of silt and sand found in pool areas and in the backwater area located at the mouth. The large substrate provides cover, with less than 50 percent considered acceptable.

The side channel is breached at mainstem discharges greater than 5,000 cfs. The overflow channel along the right bank conveys side channel flow at discharges above 20,000 cfs. Pool and riffle sequences dominate the site below 10,000 cfs, and a gravel bar below the confluence of Slough 6A is exposed. At discharges above 10,000 cfs, the channel becomes a large run. Flows of 7,130, 1,230 and 377 cfs correspond to mainstem discharges of 23,000, 10,400 and 7,400 cfs.

This large study site was selected to represent large side channels which reduce to small side channels at low discharges. An IFG-2 model was selected because of the large size of the channel. Field reconnaissance indicated that rearing habitat was limited to streambank margins at high discharges, and a limited amount of data would therefore be adequate to simulate channel hydraulics with an IFG-2 model.

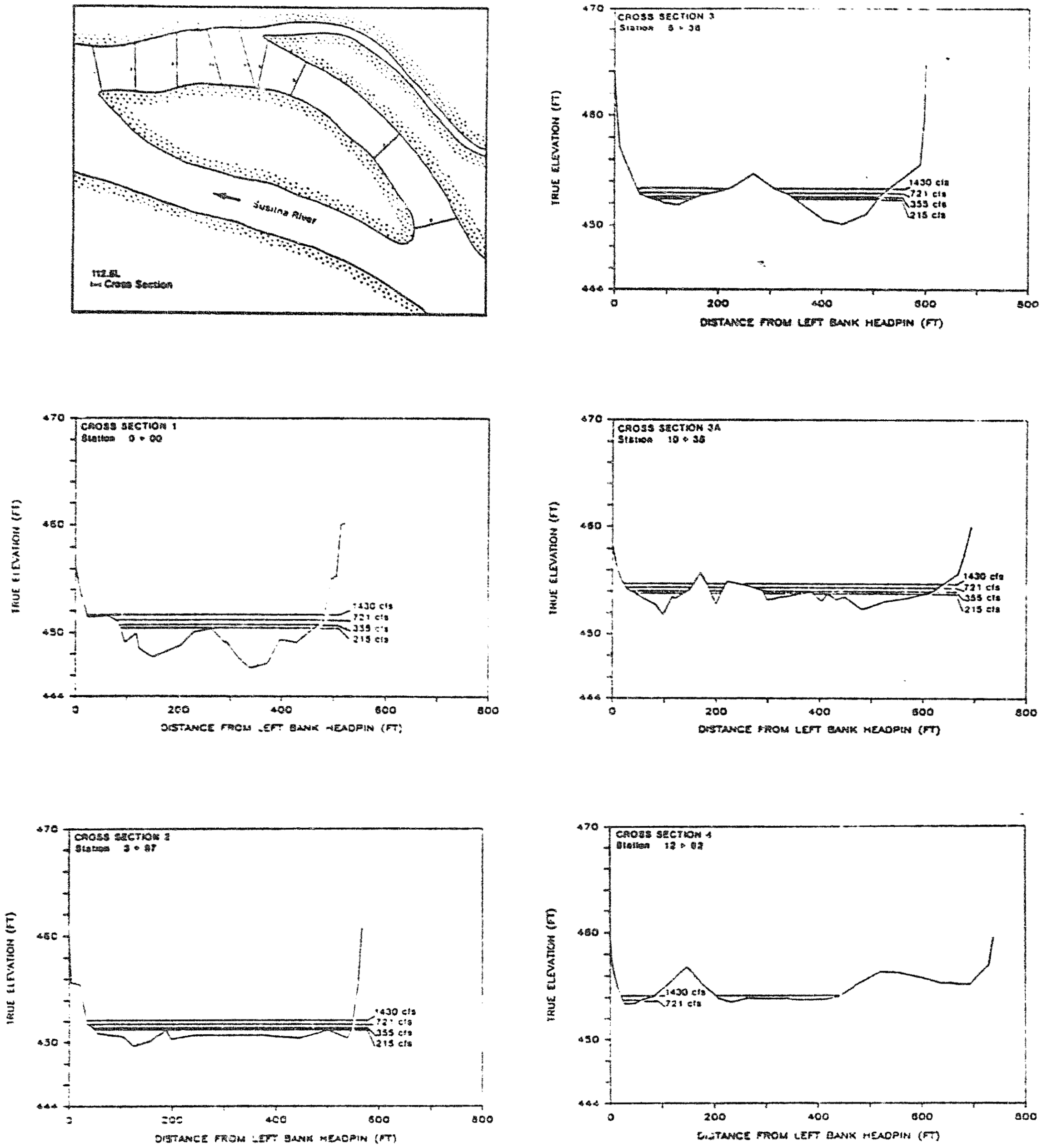



Figure III-15. Cross sections for 112.6L study site depicting water surface elevations at calibration discharges of 215, 355, 721, and 1430 cfs.

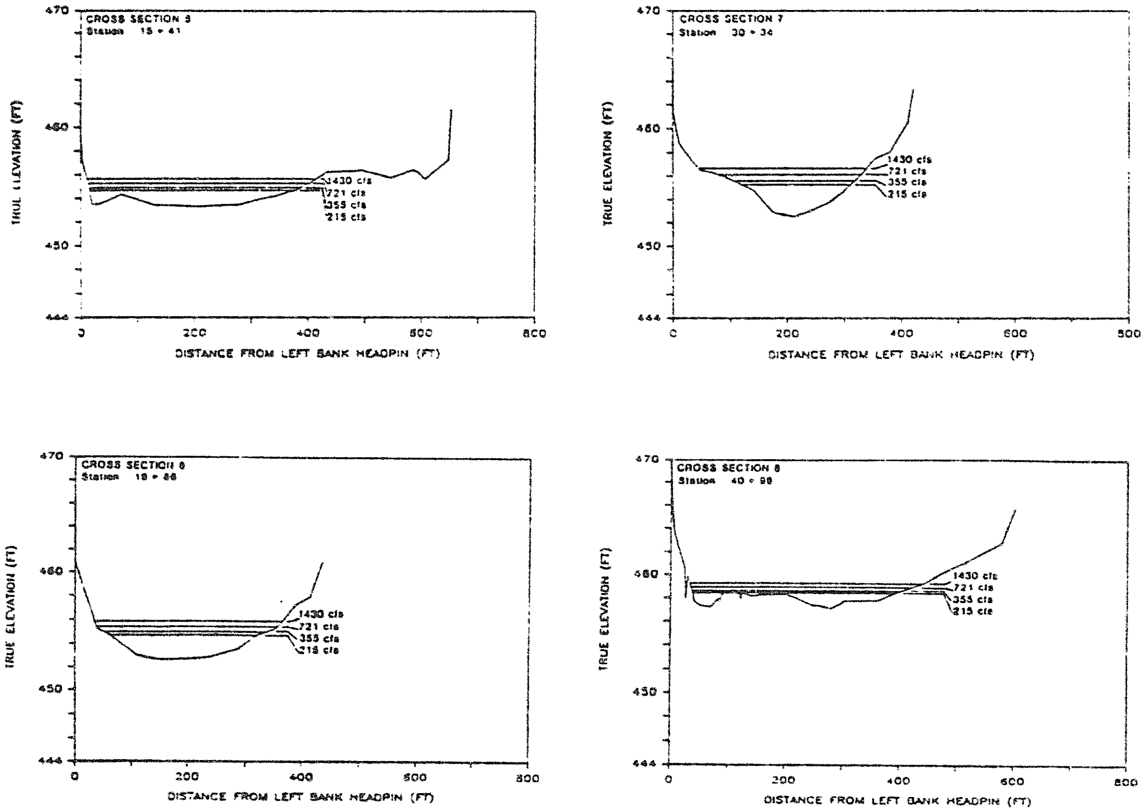



Figure III-15. Cross sections for 112.6L study site depicting water surface elevations at calibration discharges of 215, 355, 721 and 1430 cfs.

Salmon have not been observed spawning in the site. Chinook fry have been observed using the channel particularly below the confluence of Slough 6A. Access to and passage through the site are not problems in this side channel.

Calibration: The data available to model the site consisted of level surveys for all nine cross sections and the hydraulic data summarized in Table III-8.

Table III-8. Hydraulic data available to calibrate the IFG-2 model for site 112.6L.

| Date | Flow (cfs) | Discharge (cfs) | Calibration Cross Section(s) | Type* |
|---|---|---|---|---|
| 841012 | 215 | 6210 | 7 | D |
| 840930 | 355 | 7500 | 6, 8 | D |
| | | | 1,2,3,3A,4,5,7 | S |
| 840913 | 721 | 9000 | 7 | D |
| 840904-05 | 1430 | 10,800 | 8 | D |
| | | | 1,2,3,3A,4,5,6,7 | S |
| 840830 | 2980 | 15,300 | 6 | D |
| 840822 | 4820 | 19,100 | 1,2,3,4,5,6,7,8 | S |

* D = Discharge measurements (includes mid channel and shoreline measurements).
S = Shoreline measurements (does not include mid channel measurements).

The IFG-2 model requires a horizontal water surface at each cross section. Field observations of this site indicated that this did not always occur. Of the several staff gages installed at each cross section, only data from the gage which best represented the largest portion of flow was used to calculate the target water surface elevations in the calibration process.

Adjustments were made to cross section survey data to create a horizontal water surface elevation at some cross sections. Observed depths for the calibration flow of 355 cfs (site flow) were plotted with the cross section survey data. Cross sections 2, 3, 3A,4 and 8 did not have horizontal water surface elevations and were modified as follows: where the plotted water surface elevation was lower than the representative water surface elevation, the streambed was raised by the difference in the two water surface elevations. Conversely, the streambed was lowered where the plotted water surface elevation was higher than the representative water surface elevation. Only cross sections 2 and 8 w~~as~~ere adjusted significantly along the left bank (Figure III-16).

Well-defined rating curves based on mainstem flow were adopted for seven of the nine cross sections. Data collected at cross section 3A and the new cross section 4 was insufficient to develop a good rating curve. Therefore these cross sections were calibrated with velocities only.

Overtopping of the gravel bar in the lower reach during high flow events causes a transformation in the velocity distribution across the site, and thus two hydraulic models were required.

In calibrating the models with respect to depth, predicted water surface elevations at all cross sections except 3A and 4 were compared to the corresponding elevations calculated from the rating curves. Water surface

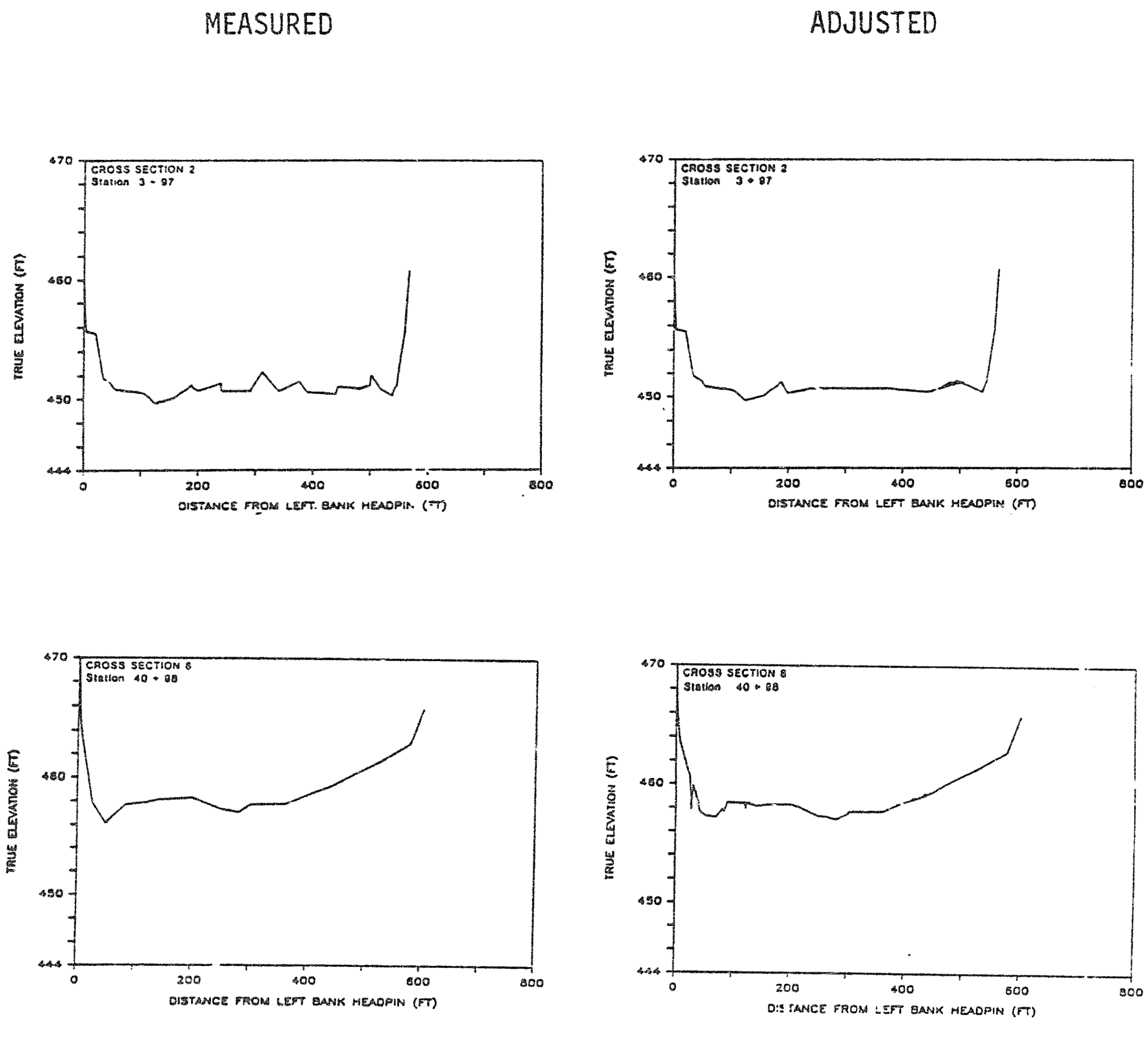



Figure III-16. Comparison between measured and adjusted cross sections 2 and 8 at 112.6L study site.

profiles based on IFG-2 output for the calibration flows and the flows corresponding to 5,000 and 35,000 cfs are shown in Figure III-17. Observed water surface elevations are also shown for the calibration flows, and rating curve water surface elevations are shown for the model limit flows.

Verification: Figures B-2.4 and B-2.5 show velocity profiles produced by the two IFG-2 models at cross section 3 for calibration flows of 355 and 4,820 cfs. The observed velocities for those flows are also plotted. The figures demonstrate that the set of "n" values that produces the proper velocity profile at the low flow does not accurately produce that of the high flow, and vice versa.

Application: The low flow model describes depths and velocities present in the channel for mainstem discharges up to 10,000 cfs. The high flow model is applicable to site flows corresponding to mainstem discharges greater than 10,000 cfs. The transition from low to high flow model occurs at a site flow of 1,070 cfs. Limits for the excellent quality rating were expanded from the limits defined by available data to the mainstem range of 5,000 to 35,000 cfs. Cross sections 3A and 4 describe a riffle area at low flows which becomes a run at higher discharges. Because of the limited data available to calibrate these cross sections at high flows, the high velocities are projected throughout the entire extrapolation range. Because these cross sections represent only about 10 percent of the total area of the site, and actual velocities at the high flow are probably beyond the usable range on the suitability curve, the overall model rating was not reduced from excellent.

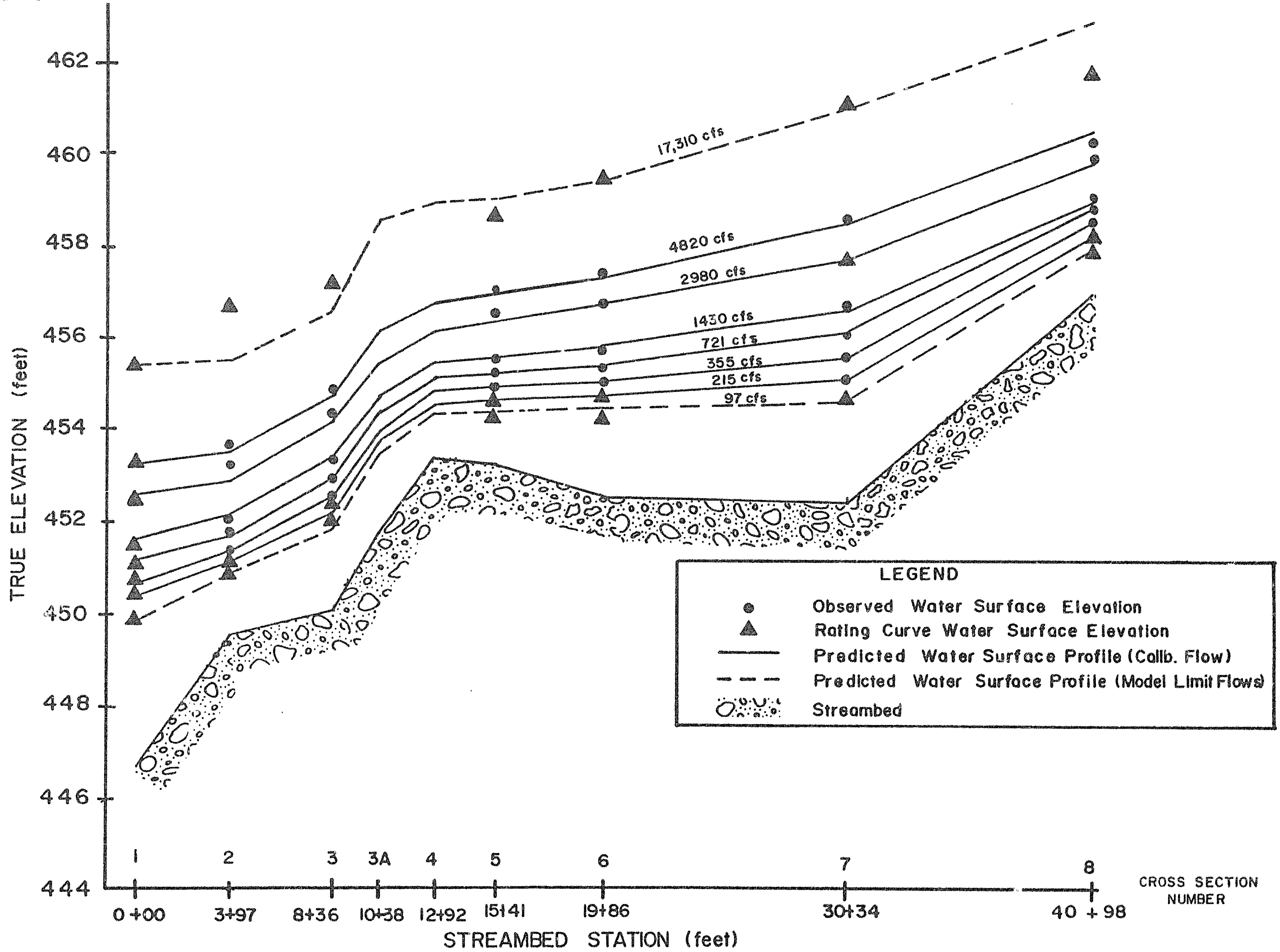
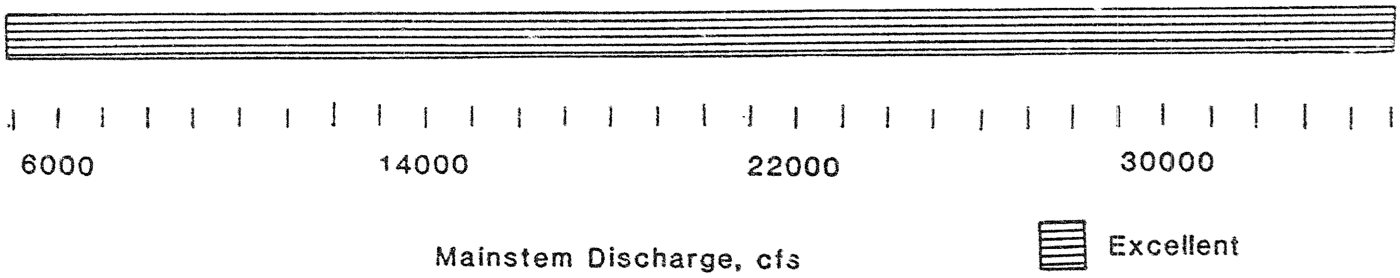



Figure III-17. Comparison of observed and predicted water surface profiles from calibrated models at 112.6L study site.

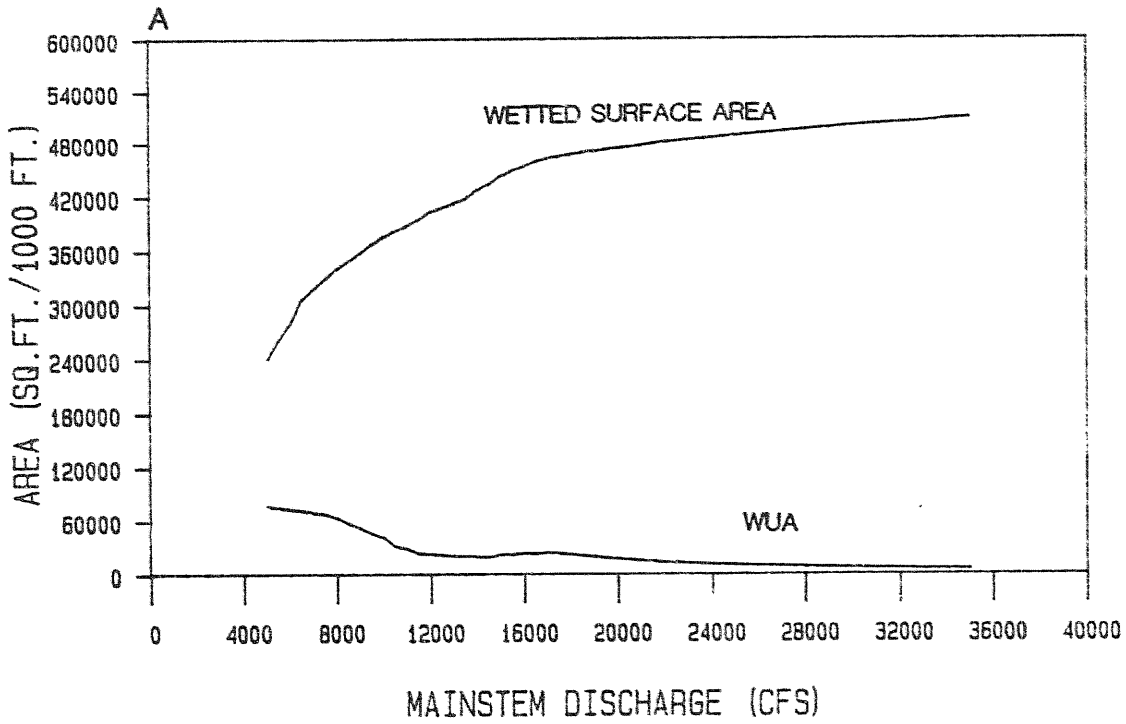
The application ranges and ratings are summarized below in the bar chart.




In Figure III-18a total wetted surface area and juvenile chinook WUA are presented per 1,000 feet of stream at the same scale. Figure III-18b is plotted at an expanded vertical scale.

At discharges below 8,000 cfs the side channel conveys less than 10 percent of the total mainstem discharge and contains an extensive amount of low velocity turbid water habitat. Hence the WUA indices for juvenile chinook are quite large. Williams (1985) demonstrated that the shoreline area within Side Channel 6A possessing suitable chinook rearing velocities is five times greater at 13,500 cfs than at 33,000 cfs. Further, the wetted surface area possessing suitable velocities more than doubles as discharge decreases from 13,500 to 8,000 cfs.

The WUA response curve plotted in Figure III-18 accents the precipitous decline in habitat potential which accompanies the increase in mainstem discharge above 8,000 cfs. The secondary WUA peak, occurring near 16,000 cfs, results from the overtopping of a large mid-channel gravel bar in the lower portion of the study site. At higher discharges, velocities increase throughout the site, decreasing its value to juvenile chinook.



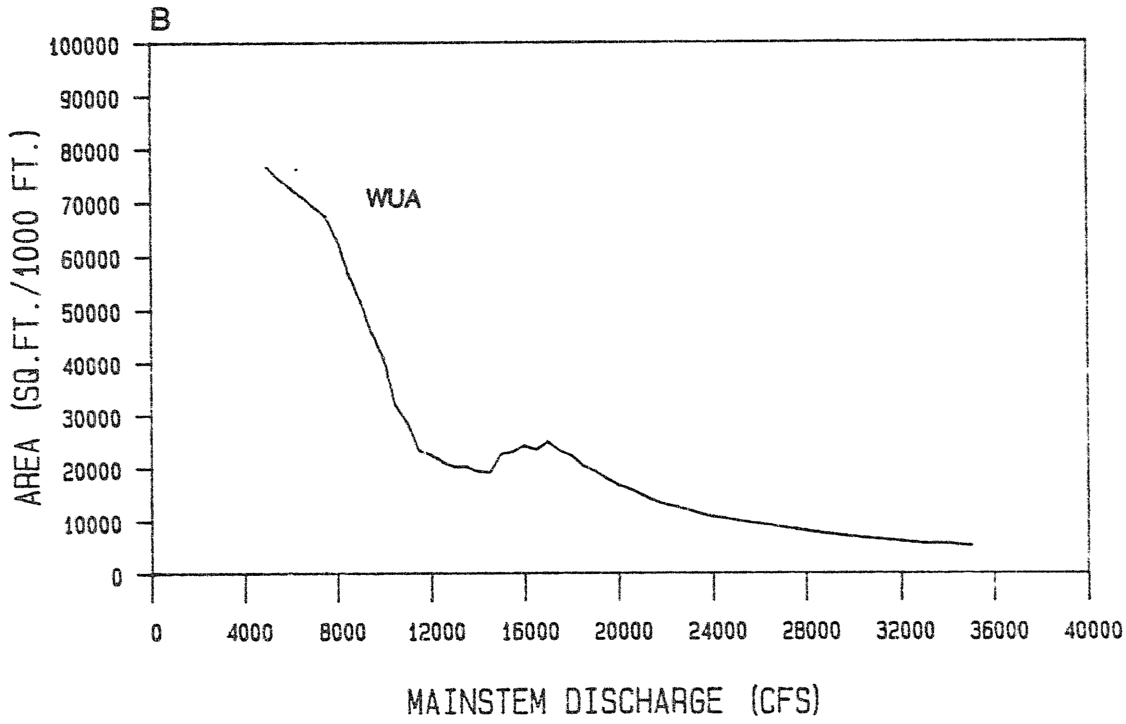




Figure III-18. Projections of gross surface area and WUA of juvenile chinook salmon habitat as a function of discharge for the 112.6L modeling site.

WUA indices were forecast using low-and high-flow IFG-2 models linked with the HABTAT model. Because this side channel remains breached at mainstem discharges less than 5,000 cfs, turbid water suitability criteria were used for all habitat simulations. Separate WUA response curves were forecast using the high and low flow HABTAT models. The single habitat response curve presented in as Figure III-18a was developed by overlapping the WUA forecasts from the low and high flow models then averaging corresponding WUA values within the area of overlap to obtain a smooth transition (Table B-6.3).

Time series plots of the 1984 site flow and WUA indices reflect considerable variation in habitat potential (Figure III-19).

Site 119.2R

Site Description: This site is approximately 1.5 miles below Curry Station on the east bank of the Susitna River (Plate III-4). The study reach encompasses the entire side channel which is 1,800 ft long and 180 ft wide. Three cross sections were established to define the deep, low velocity area at the mouth and two cross sections to define the shallower, faster velocity area near the head of the channel (Figure III-20). A large backwater area is present at all flows and extends from the mouth up to cross section 3. Upwelling and groundwater seepage occur near cross sections 3 and 4 along the right bank. A small tributary enters from the right bank above cross section 3. Substrate varies from cobble and rubble at the upper two cross sections to silt in the backwater area. Riprap from the railroad is present along the right side of the channel and provides 5 to 25 percent acceptable cover.

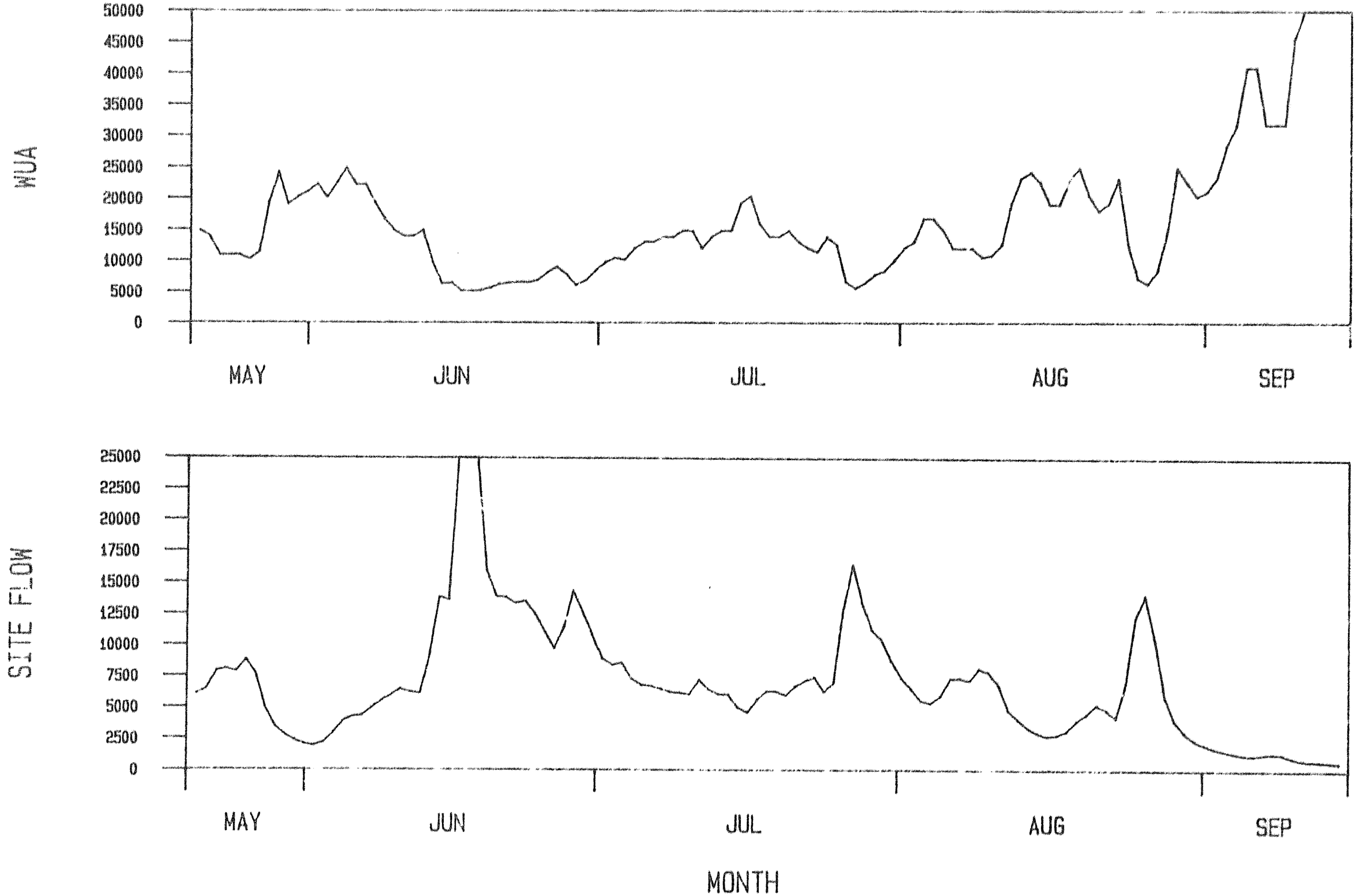



Figure III-19. Time series plots of juvenile chinook salmon WUA as a function of discharge from May 20 to September 15, 1984 for 112.6 modeling site.

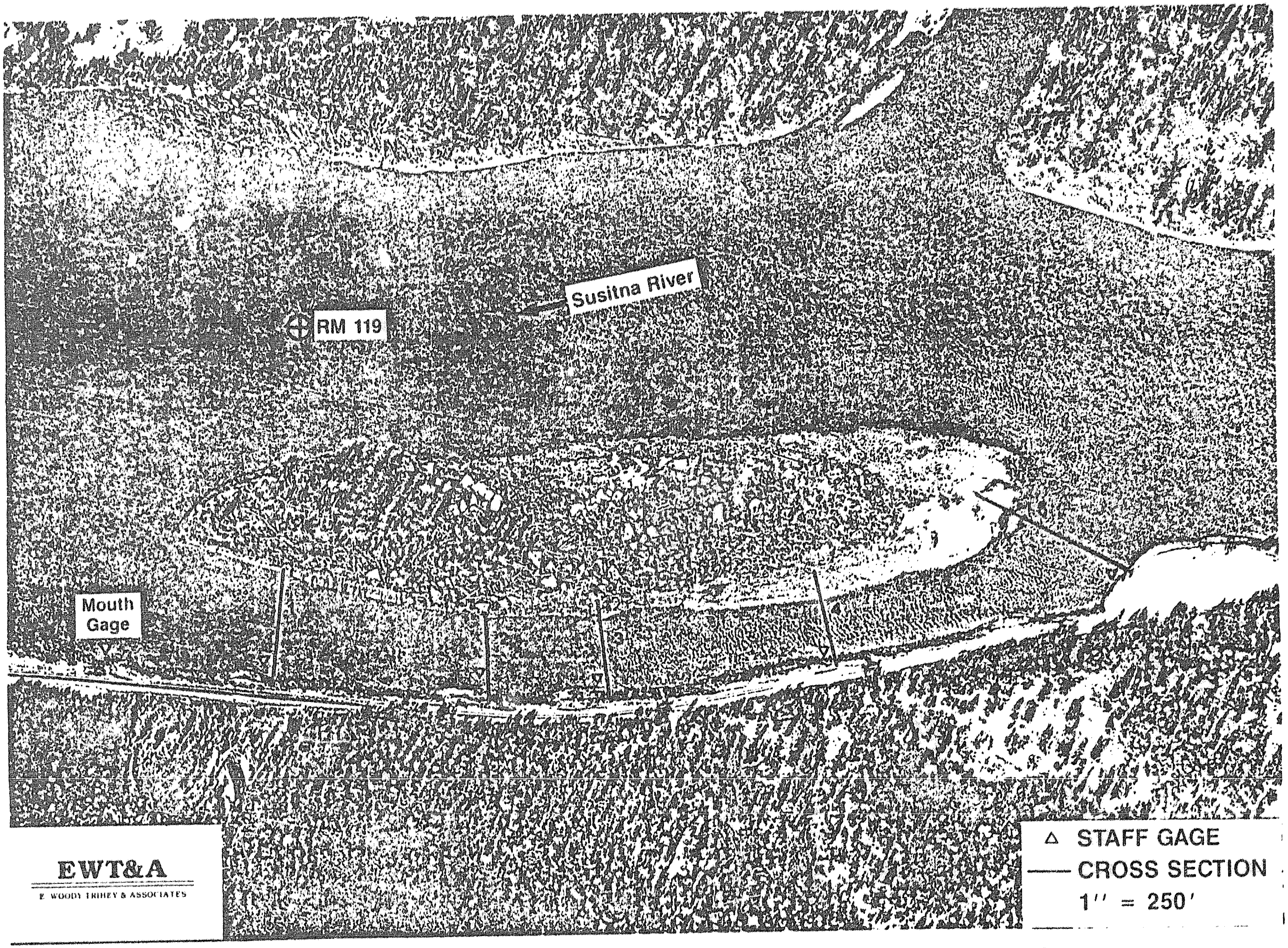



Plate III-4. Modeling site 119.2R on June 1, 1982 at mainstem discharge: 23,000 cfs.

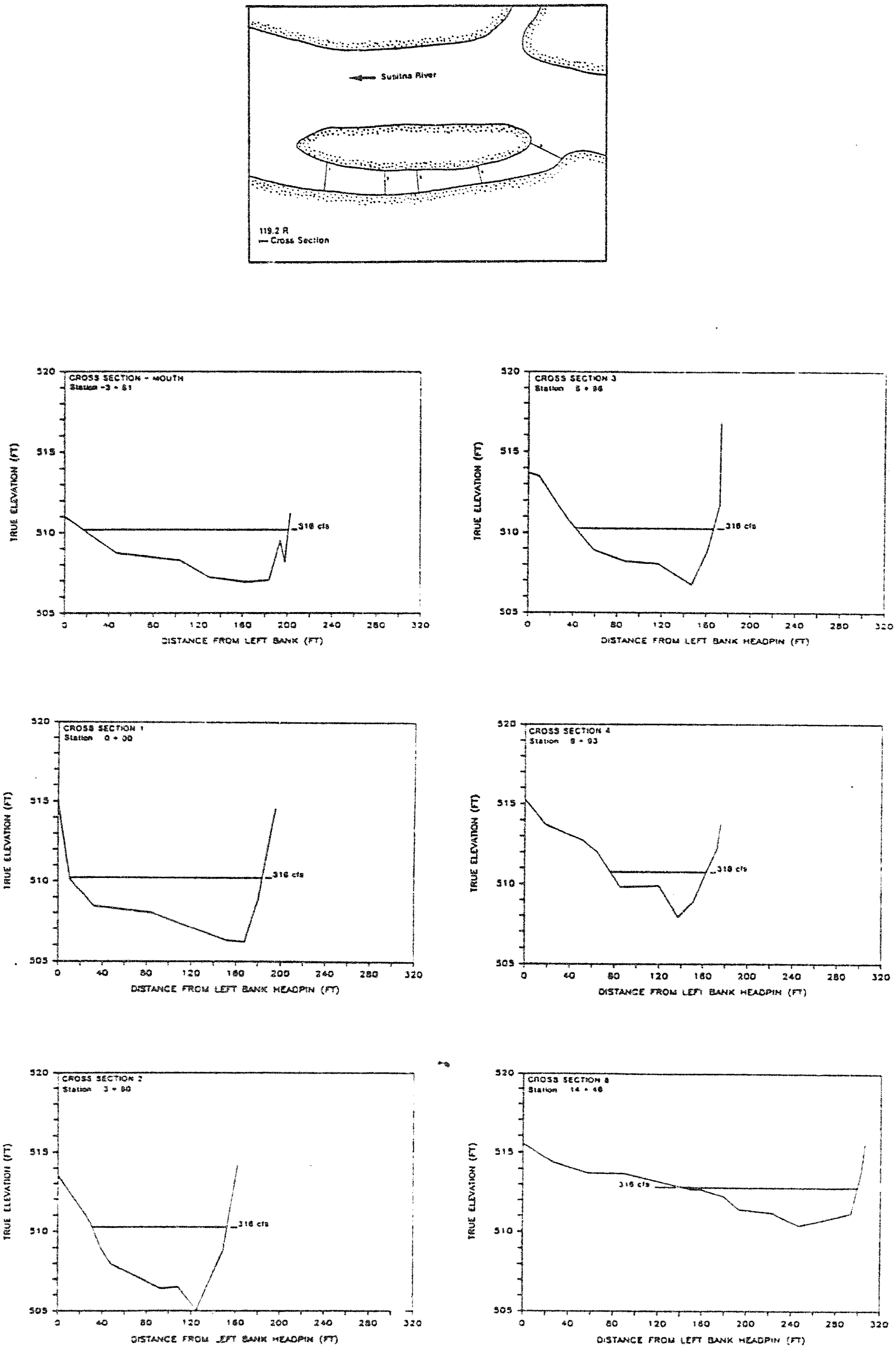



Figure III-20. Cross sections for 119.2R study site dc, ;cting water surface elevations at calibration discharge of 316 cfs.

The side channel is breached by the mainstem at 10,000 cfs. Below 10,000 cfs, cross sections 4 and 5 are dry; the backwater area at the lower end of the site persists even at 5,000 cfs. Above 23,000 cfs, the left bank becomes inundated and the site is a large run. Site flows of 1,180, 10 and 0 cfs correspond to mainstem discharges of 23,000, 10,400 and 7,400 cfs respectively.

This small side channel was selected to represent channels with high velocities at the head and low velocities at the mouth. An IFG-2 model was selected because of the limited data available.

Spawning salmon have not been observed in the side channel. Small numbers of juvenile chinook and sockeye salmon were identified in the site. The large backwater area at the mouth eliminates any access difficulty into the site. Passage through the site is possible below cross section 3 in unbreached conditions.

Calibration: The data available to model the site consisted of level surveys for all cross sections and the hydraulic data summarized in Table III-9.

Table III-9. Hydraulic data available to the calibrate IFG-2 model for site 119.2R.

| Date | Flow (cfs) | Discharge (cfs) | Calibration Cross Section(s) | Type* |
|---|---|---|---|---|
| 840831 | 71 | 13,600 | 3 | D |
| 840819 | 316 | 17,400 | 1,2,3,4,5 | D |

Table III-9 (Continued).

| | | | | |
|---|---|---|---|---|
| 840824 | 1090 | 22,700 | 3 | D |

* D = Discharge measurements (includes mid channel and shoreline measurements)
S = Shoreline measurements (does not include mid channel measurements)

The streambed elevations shifted from August to September due to the high flows in the mainstem. Because most of the data was taken before the high flow event, the cross section elevatinos used in the hydraulic model were adjusted to agree with the discharge measurements (Figure III-21).

A velocity profile was developed for each cross section, based on the site flow of 316 cfs. Velocities associated with the other two flows were available only at cross section 3. Velocities predicted by the model were judged to be reasonable throughout the application range of 10,000 to 23,000 cfs (mainstem) based on channel geometry.

To calibrate the model with respect to depth, comparisons were made between observed and model predicted water surface elevations. Water surface profiles based on IFG-2 output for the three calibration flows and for the flows corresponding to discharges of 10,000 and 23,000 cfs are shown in Figure III-22. Observed water surface elevations for the calibration flows and rating curve water surface elevations for the model limit flows are also shown.

Verification: One model adequately reproduces the velocities over the range of available data (Figure B-2.6).

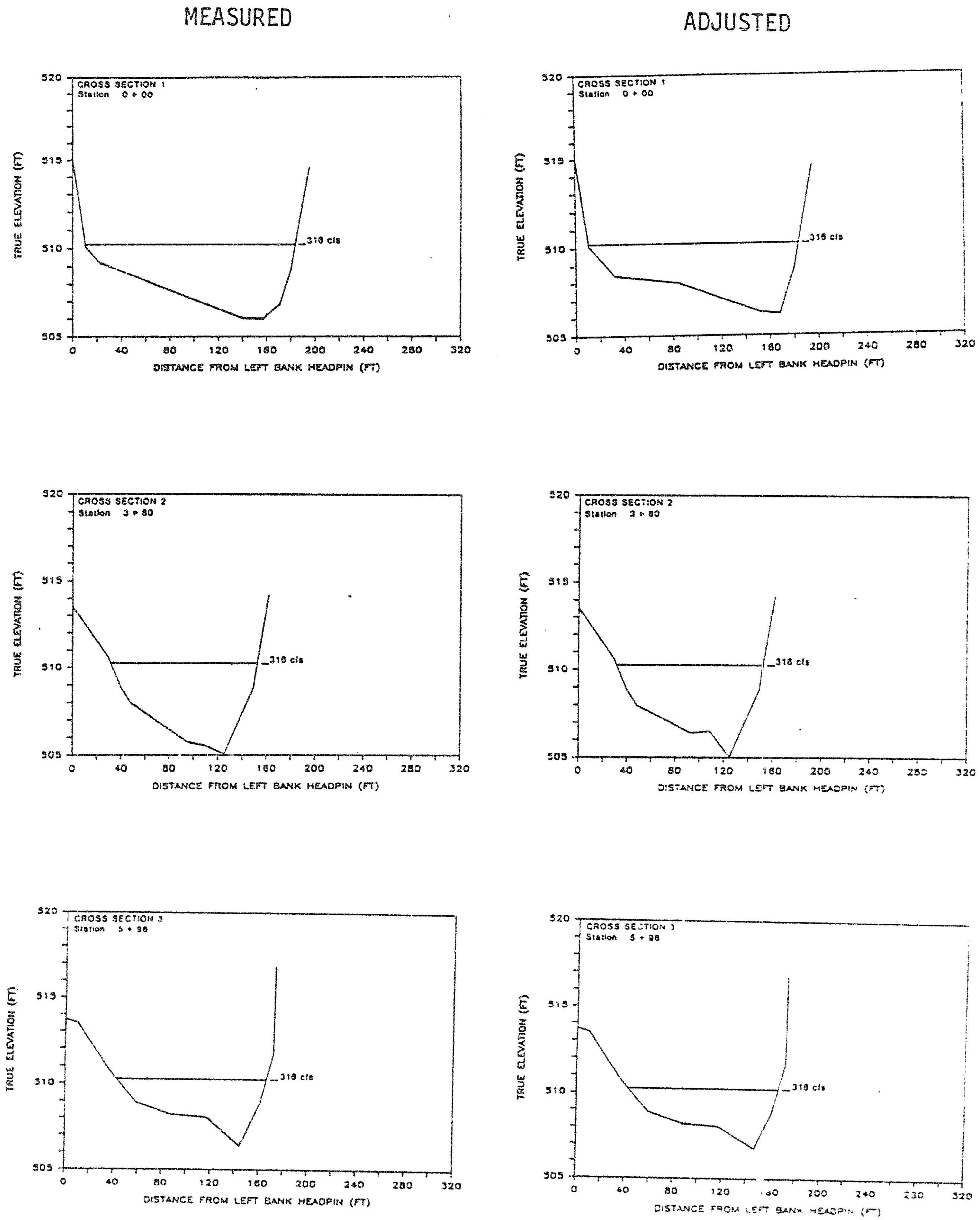



Figure III-21. Comparison of measured and adjusted cross sections 1, 2, and 3 at 119.2R study site.

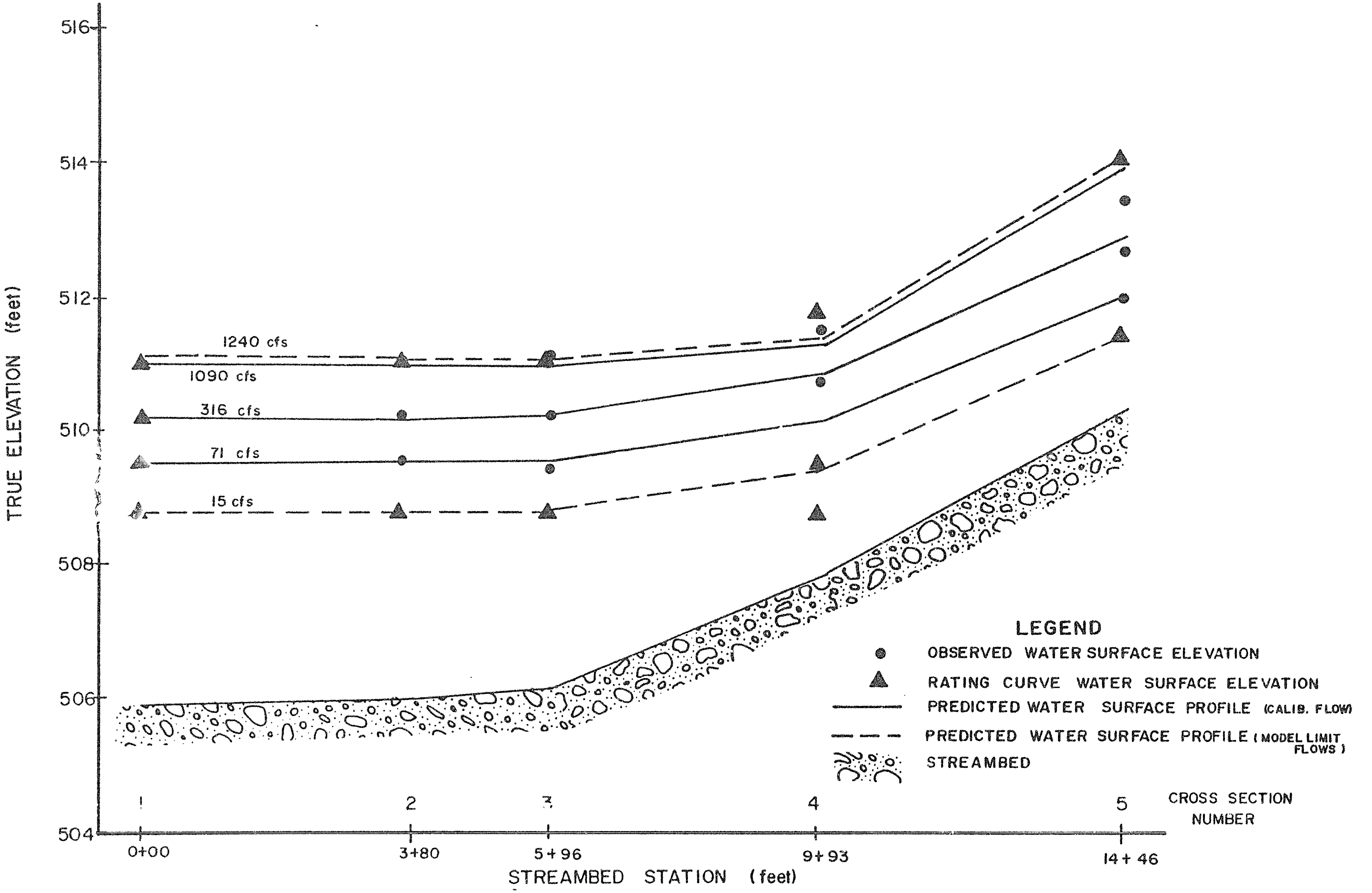
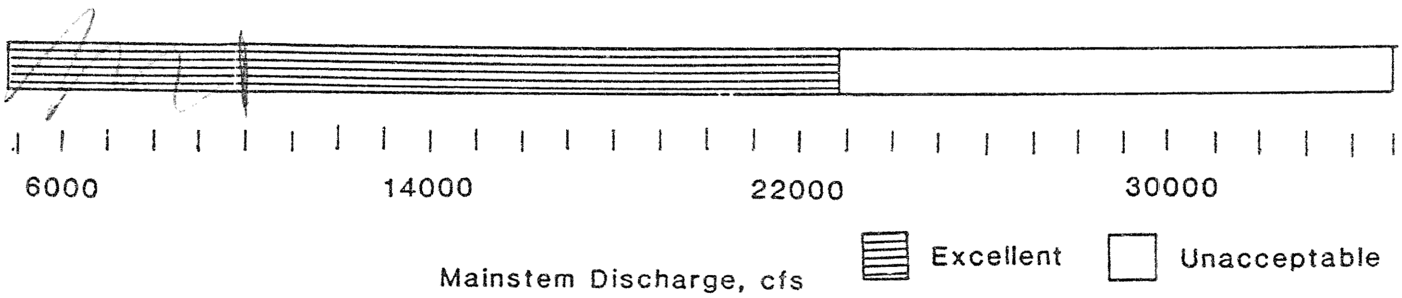



Figure III-22. Comparison of observed and predicted water surface profiles from calibrated model at 119.2R study site.

Application: The IFG-2 model was assigned an excellent rating for site flows of 15 to 1,240 cfs, corresponding to mainstem discharges of 10,000 to 23,000 cfs. At very high mainstem discharges, the site's flow regime changes dramatically. The large volume of water flowing through the site drowns out the backwater area, and the silty, vegetated left bank becomes inundated. The distribution of predicted velocities at the upper cross sections become unrealistic at flows above 23,000 cfs. Therefore, an unacceptable rating was assigned to the mainstem range of 23,000 to 35,000 cfs.

The application range and ratings are summarized below in the bar chart.




The wetted surface area and juvenile chinook WUA curves are presented in Figure III-23a. Both curves are plotted to the same scale and expressed in identical units; i.e., square feet per 1,000 feet of stream. The greatest proportion of the wetted surface area provides rearing habitat for juvenile chinook at mainstem discharges between 10,000 and 12,000 cfs.

The WUA curve plotted in Figure III-23b at an expanded vertical scale accents the rapid increase in rearing habitat associated with this site breaching near 10,000 cfs. This marked increase is attributed to turbid mainstem water entering the site and significantly increasing the cover value afforded juvenile chinook. As mainstem discharge increases beyond 13,000 cfs

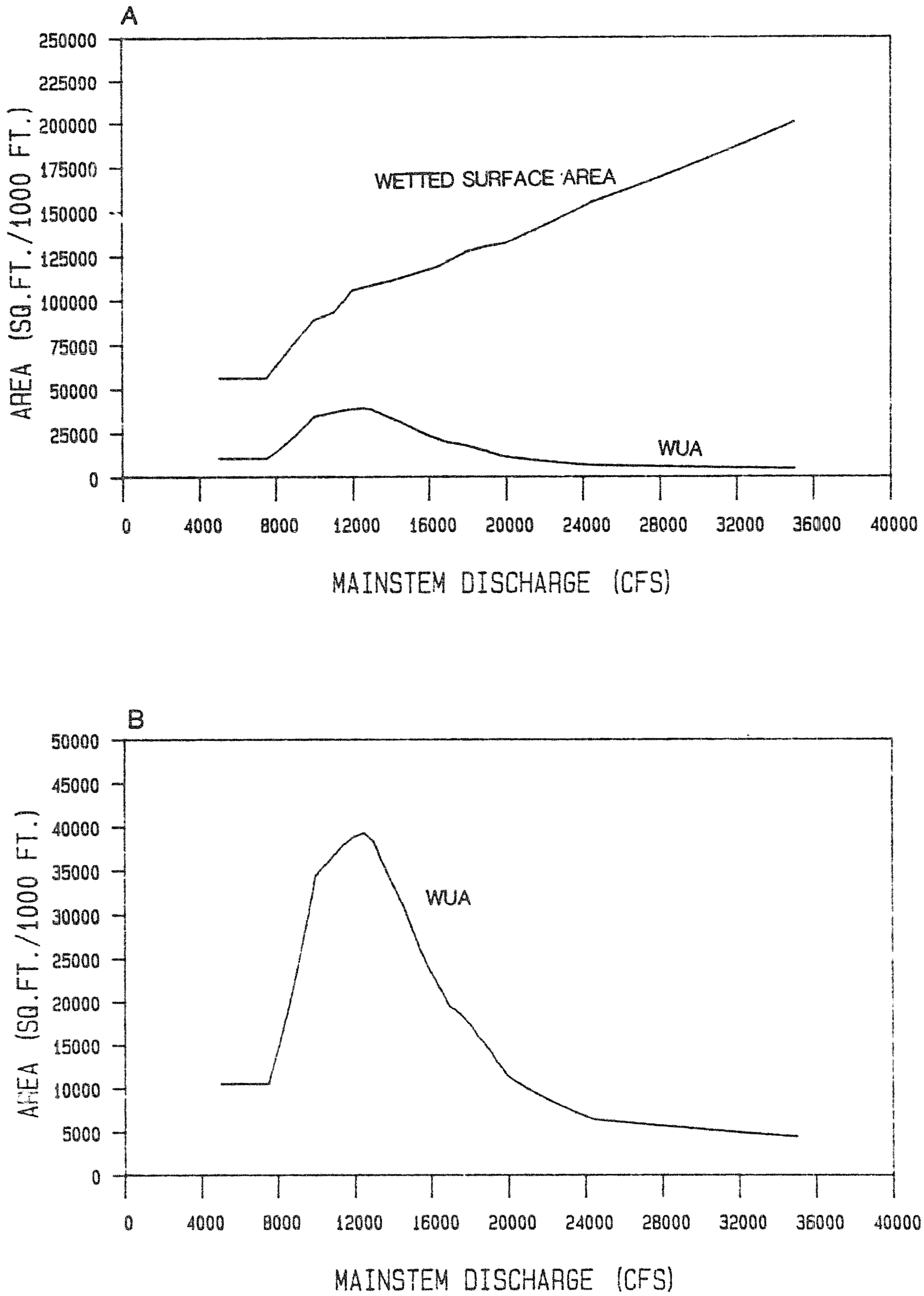



Figure III-23. Projections of gross surface area and WUA of juvenile chinook salmon habitat as a function of discharge for the 119.2 modeling site.

velocities begin to reduce the rearing potential at this site. Above 24,000 cfs available rearing habitat is restricted to shoreline margins where sufficient object cover is available to retard velocity.

Because the extrapolation range of the hydraulic model was limited to a range of mainstem discharges from 10,000 to 22,000 cfs, it was necessary to estimate wetted surface areas and juvenile chinook WUA beyond the extrapolation limits of the hydraulic model. The wetted surface area was determined by digitizing enlarged air photographs obtained at mainstem discharges of 5,100, 7,400 and 10,600 cfs. The surface area measurements at 5,100 and 7,400 cfs were the same. The ratio of the digitized surface area at 10,600 cfs to that forecast by the hydraulic model at the same flow was .47. This ratio was used to adjust the digitized surface areas from the 5,100 cfs and 7,400 cfs photography before using these surface areas to extent the forecast surface area curve from 10,000 cfs to 5,000 cfs.

Juvenile chinook WUA estimates for unbreached conditions are based on the assumption that rearing habitat potential declines at a constant range as mainstem discharge declines from the breaching flow of 10,000 to 7,400 cfs. The percentage of the total wetted surface area providing potential rearing habitat at 7,400 cfs was assumed to be roughly half, the proportion of clear water habitat present immediately preceding breaching. WUA values for mainstem discharges between 7,400 and 10,000 were linearly interpolated. Since wetted surface area remained constant as mainstem discharge declined from 7,400 to 5,100 cfs, WUA for juvenile chinook was assumed to remain constant.

An exponential decay function was used to extend the WUA curve beyond the upper extrapolation range of the calibrated hydraulic model. The decay function selected reproduced a habitat response trend evident to other middle river side channel sites. The surface area curve was extended from 22,000 cfs to 35,000 cfs using a positive exponential function. Both the surface area and WUA curves should be applied with discretion in the 23,000 to 35,000 cfs range even though Figure III-23 indicates errors associated with these curves would be insignificant. Table B-6.4 contains further detail regarding the synthesis of surface area and WUA response curves for this site.

Time series plots of WUA and average daily site flow (Figure III-24) indicate fairly low habitat potential for juvenile chinook exist at this site during mid-summer, but comparatively high WUA indices are associated with early summer and fall site flows. Rearing habitat is maximized at this site when the mainstem discharges range between 10,000 and 14,000 cfs (Figure III-23a), associated with typical mid-summer discharges (20,000 to 25,000 cfs). Hence, the time series plot, Figure III-24, reflects greater fluctuations in juvenile chinook habitat at this site than is evident for other side channel study sites during the open water season.

Site 131.7L

Site Description: This site is located directly above the confluence of Fourth of July Creek along the west bank of the Susitna River (Plate III-5). The study reach is 1,900 ft long and ranges from 250 ft wide in the lower half of the site to 400 ft in the upper half. Three cross sections define the

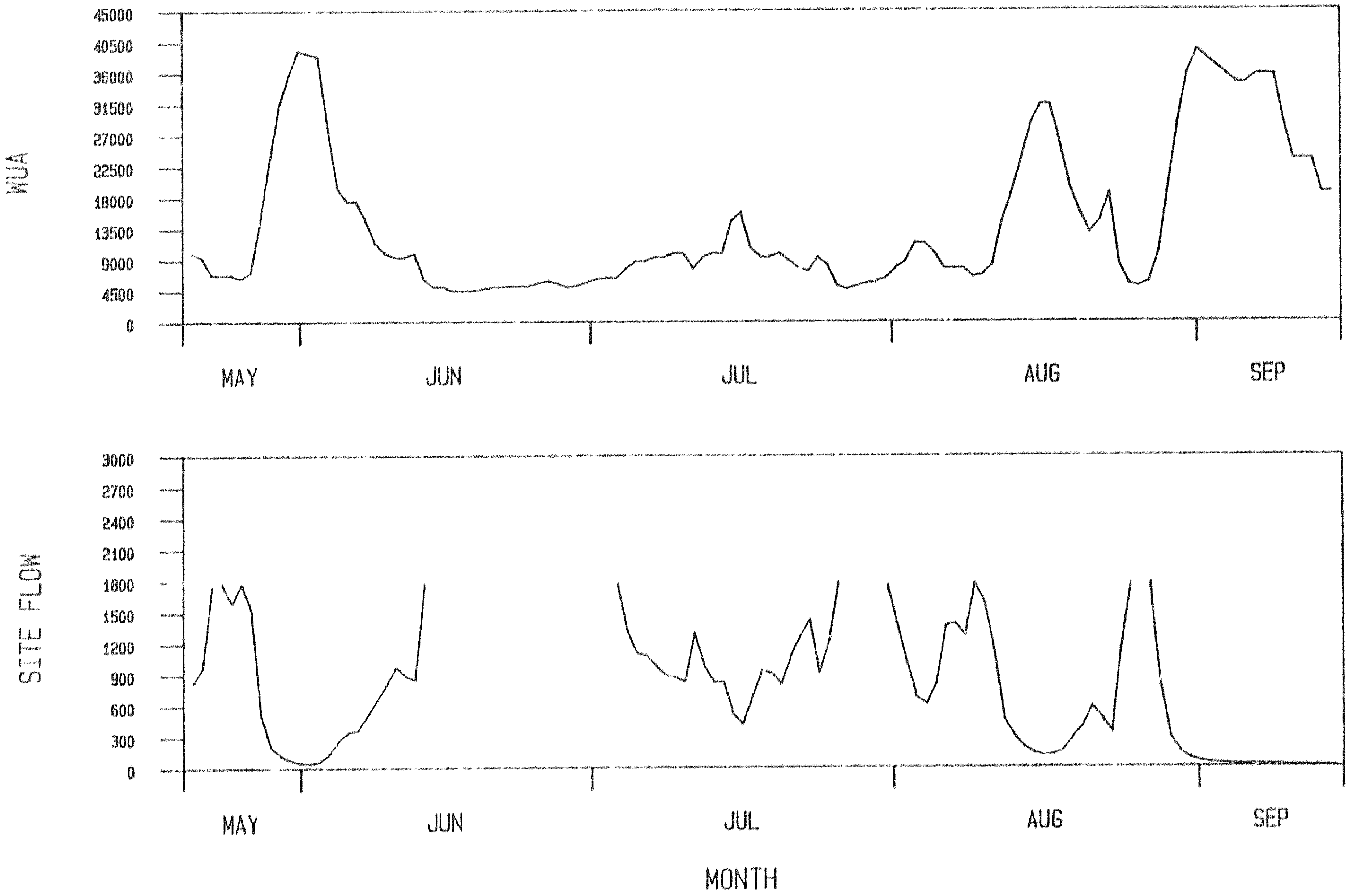



Figure III-24. Time series plots of juvenile chinook salmon WUA as a function of discharge from May 20 to September 15, 1984 for 119.2R modeling site.

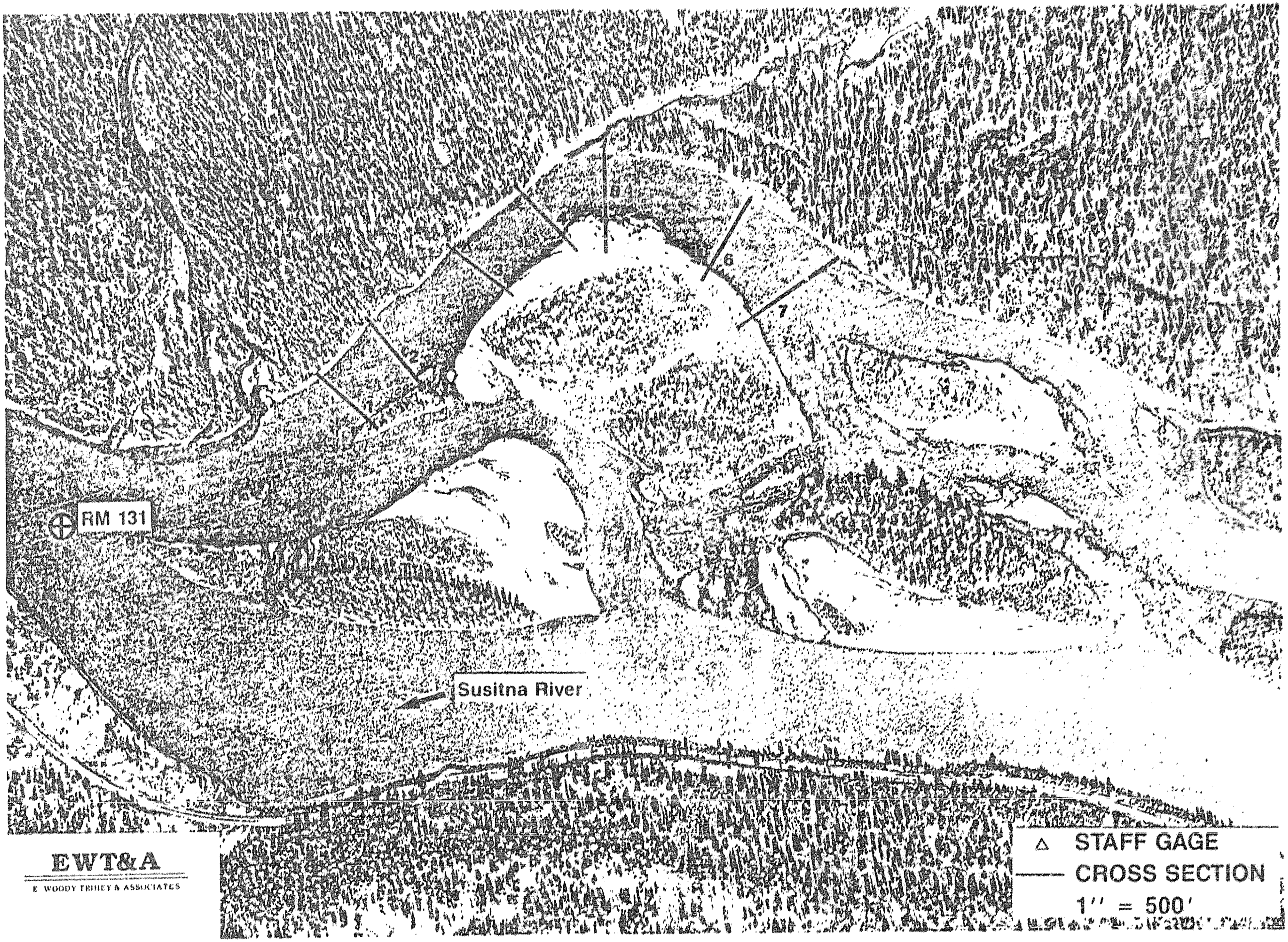



Plate III-5. Modeling site 131.7L on June 1, 1982 at mainstem discharge: 23,000 cfs.

deep, low velocity area sand two cross sections describe the shallow faster velocity areas. Two cross sections were established in the transition areas below low and high velocity areas (Figure III-25). Cobble and rubble are the principle substrates found in the lower half of the site with gravel and rubble substrate being predominate in the upper half. Silt and sand deposits exist in pool areas and backwater zones. Cover is provided by the larger substrate and by two debris zones found in the site.

Three channels (A, B and C on Plate III-6) convey mainstem flow into the site at mainstem discharges of 5,000, 10,000 and 14,500 cfs. Site flows greater than 800, 79 and 15 cfs correspond to mainstem discharges of 23,000, 10,400 and 7,400 cfs.

This study site was selected to represent side channels that remain side channels for a broad range of discharges. Upwelling was suspected to maintain baseline flows and the site appeared to have good rearing habitat. An IFG-4 model was selected because of the non-uniform flow conditions and channel size.

Chum salmon have been observed spawning in the site. Juvenile chinook fry rear in the channel. Access to and passage through the site are not limited at any flow.

<u>Calibration</u>: To calibrate the IFG-4 model for the site, four data sets were collected at each cross section (Table III-10).

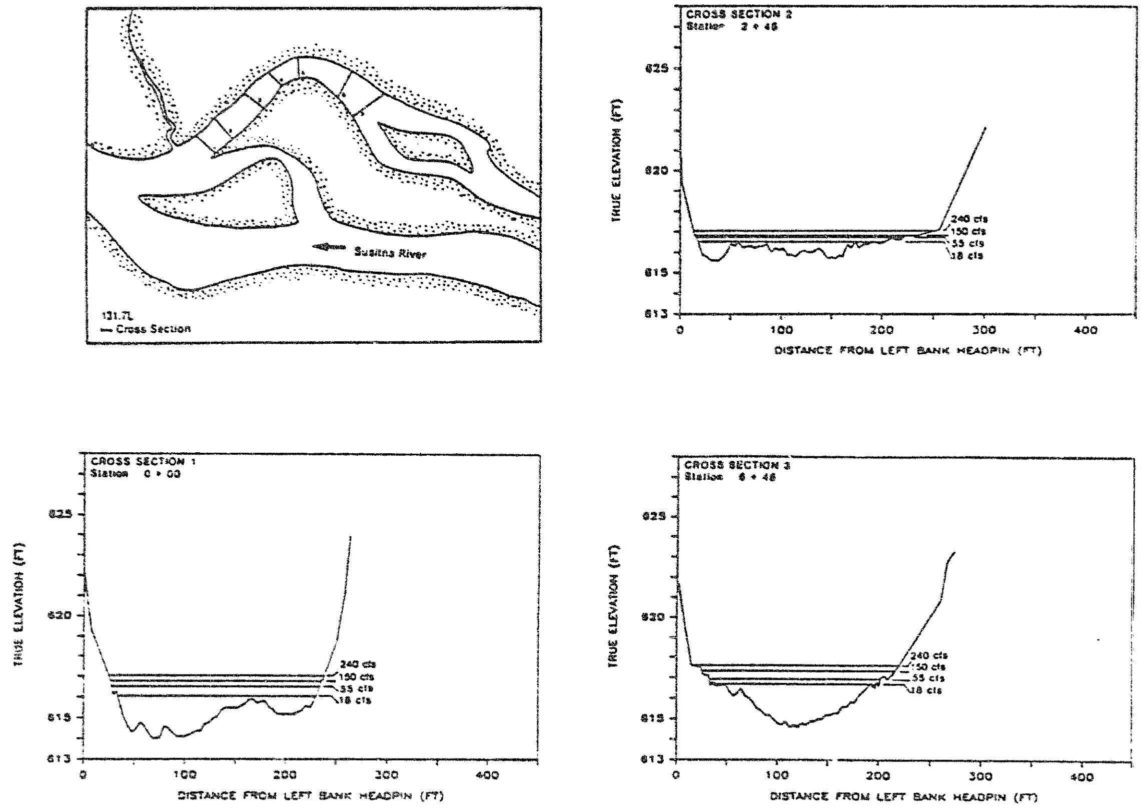



Figure III-25. Cross sections for 131.7L study site depicting water surface elevations at calibration discharges of 18, 55, 150, and 240 cfs.

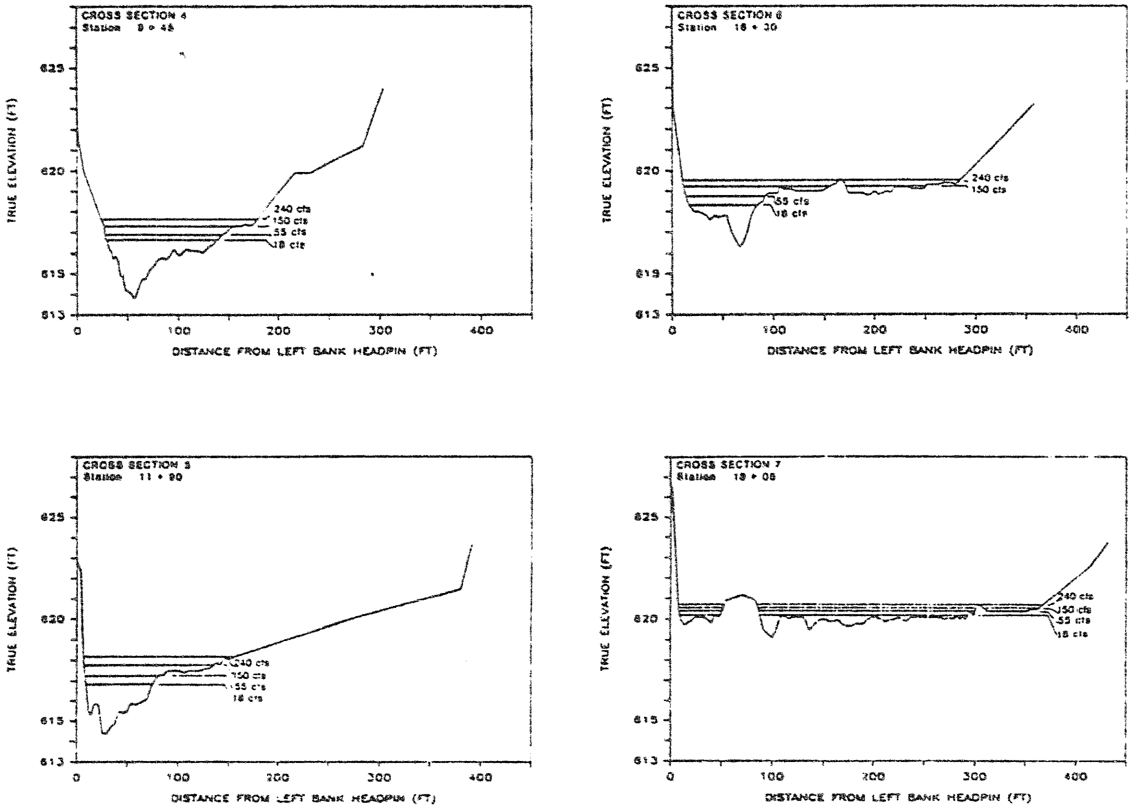



Figure III-25. Cross sections for 131.7L study site depicting water surface elevations at calibration discharges of 1?, 55, 150, and 240 cfs.

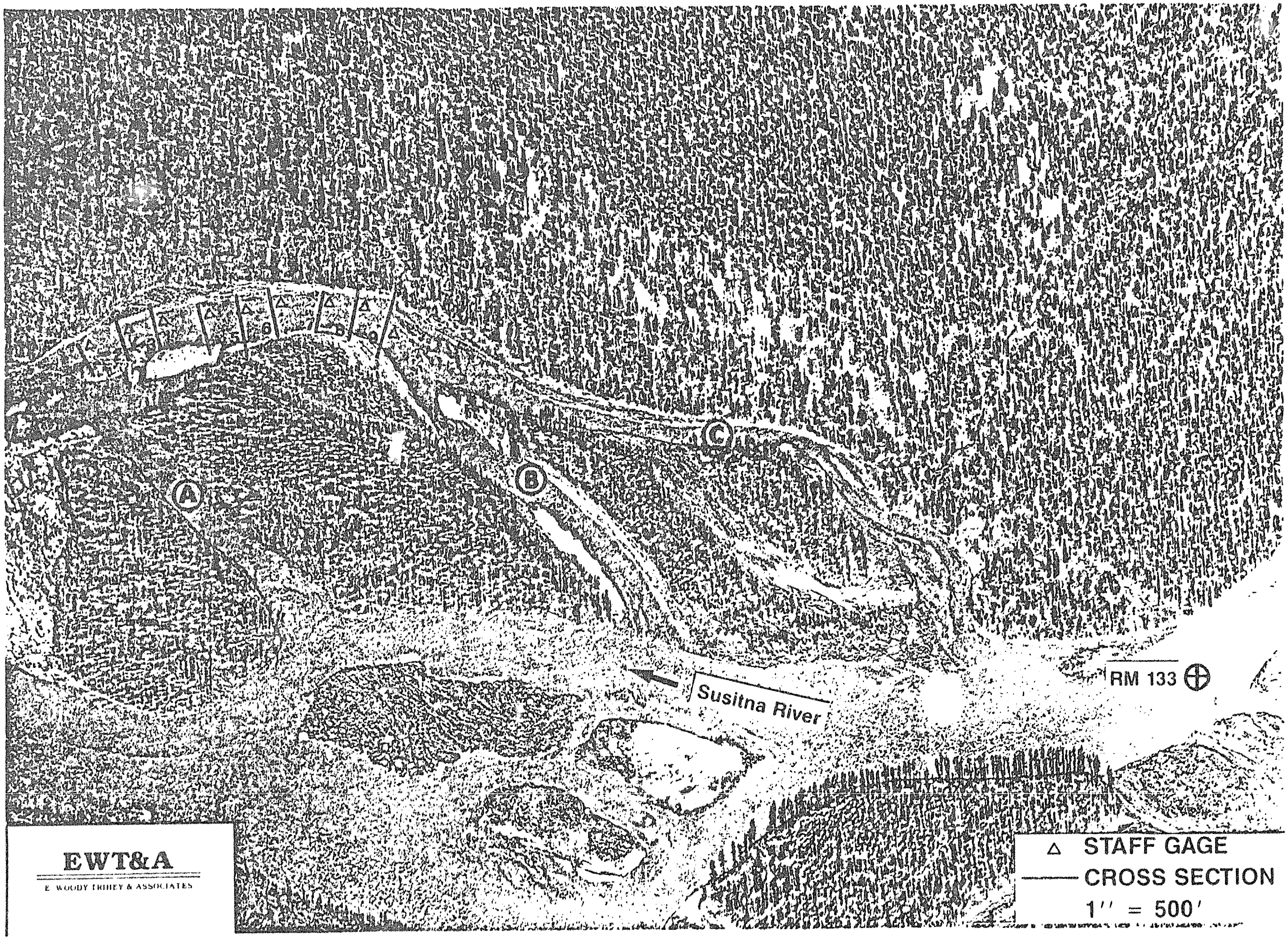



Plate III-6. Modeling site 132.6L on June 1, 1982 at mainstem discharge: 23,000 cfs.

Table III-10. Hydraulic data available to calibrate the IFG-4 model for site 131.7L.

| Date | Flow (cfs) | Discharge (cfs) |
|---|---|---|
| 840927 | 18 | 7470 |
| 840919 | 55 | 9390 |
| 840902 | 157 | 11800 |
| 840817 | 250 | 14800 |

The input data required a stage of zero flow value to be assigned to each cross section. A large riffle area below the study site controlled the stage of zero at cross section one. Because a streambed profile was not surveyed for the site, the stage of zero flow was estimated during the iterative calibration process.

Horizontal water surface elevations were not maintained across three cross sections in the site. At cross section 2, the backwater area along the left bank had a lower water surface than the main channel and was raised to maintain a horizontal water surface. Along the right bank at cross sections 6 and 7, a shoal area raised the water surface to higher elevations than the main channel. The streambed was lowered at both cross sections to maintain a horizontal water surface across both cross sections. Also, along the left bank at cross section 7 was a backwater area which had a lower water surface than the main channel. These streambed elevations were also raised (Figure III-26).

A plot depicting the observed and predicted water surface profiles for the calibration flows as well as profiles for the extrapolation limits is shown in Figure III-27. Above 600 cfs, the reliability of the stage and velocity predictions decrease.

To calibrate the IFG-4 model with respect to stage, comparisons were made between the WSEL vs. q curve and the model predicted water surface elevations (Figure III-28). Similar comparisons were made at each cross section however, only the discharge cross section is shown here.

The performance of the calibrated model can be evaluated by comparing the observed and predicted water surface elevations, discharges and velocity adjustment factors (Table B-4.2). The difference in observed and predicted water surface elevations is generally less than 0.03 ft. The largest difference in observed and predicted discharges is 5 percent. The velocity adjustment factors range from 0.92 to 1.04, which indicates the models are suitably calibrated.

Verification: Figure B-2.7 are the scatter plots of observed and predicted depths and velocities. A reliable hydraulic model should be able to predict the same depth of velocity as observed in the field. The one-to-one relationship demonstrates the model is predicting accurately. The results of the statistical tests are shown in Table B-5. For both depth and velocity

MEASURED ADJUSTED

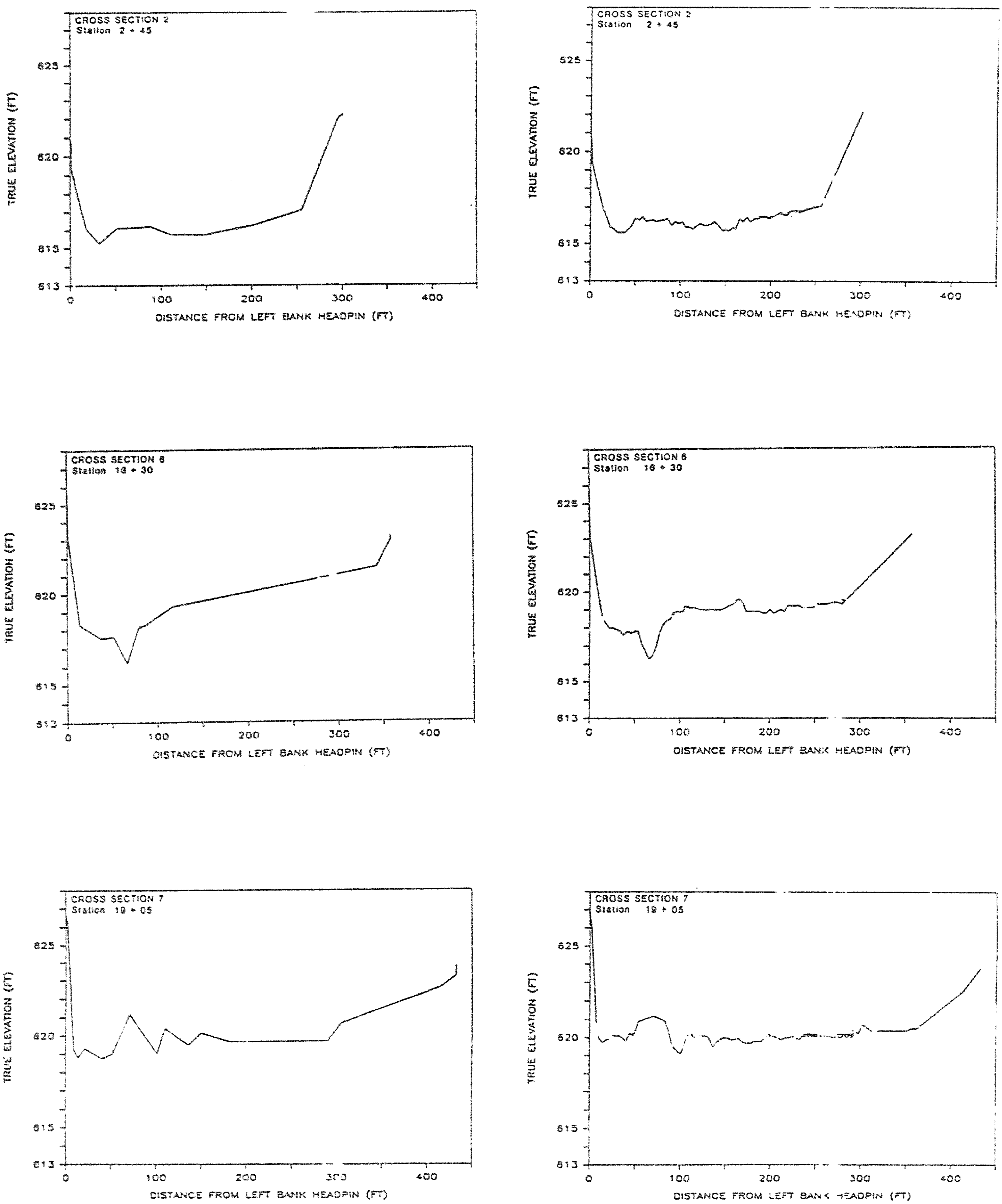



Figure III-26. Comparison between measured and adjusted cross sections 2, 6, and 7 at 131.7L study site.

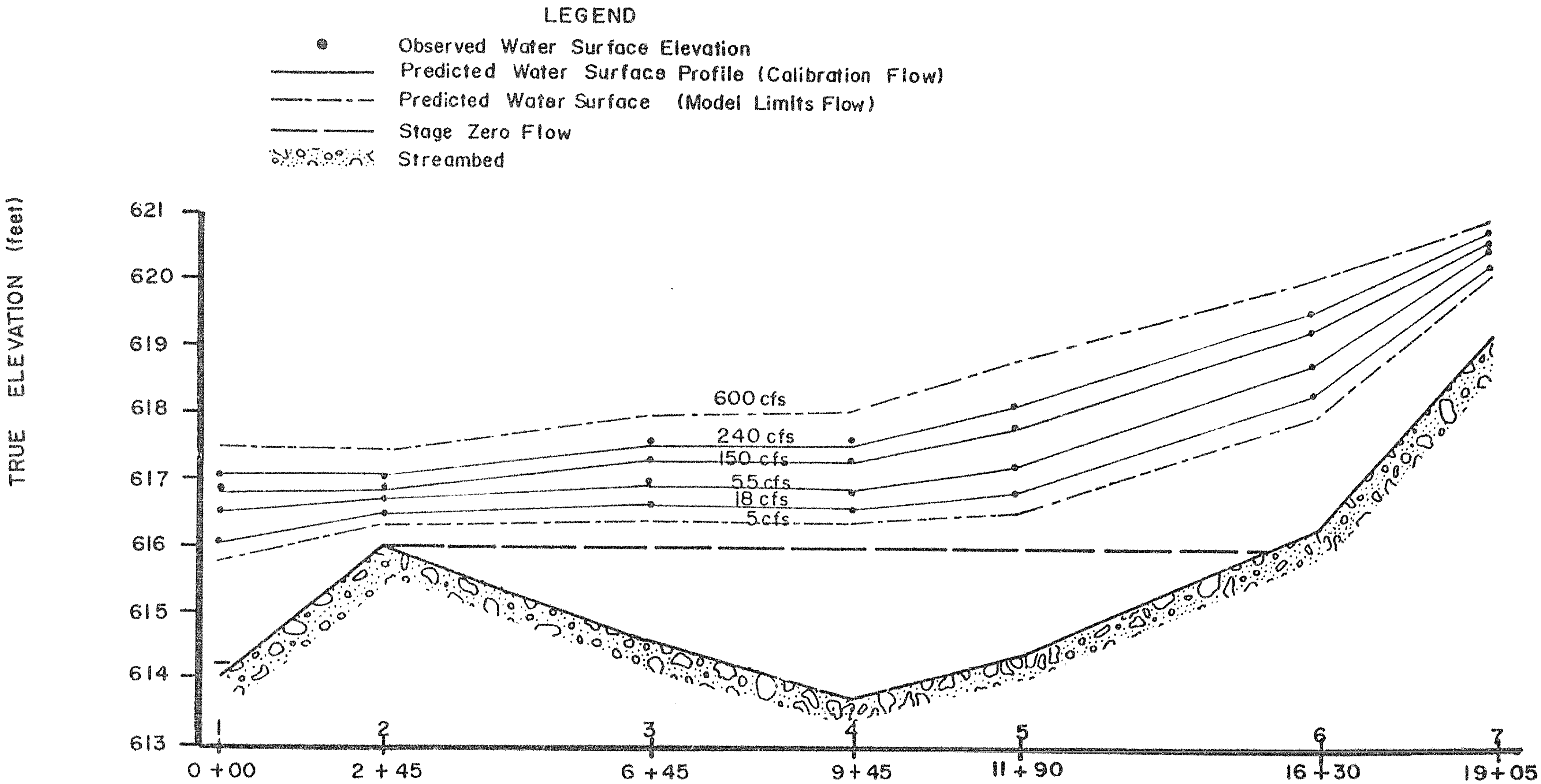



Figure III-27. Comparison of observed and predicted water surface profiles from calibrated hydraulic model at 131.7L study site.

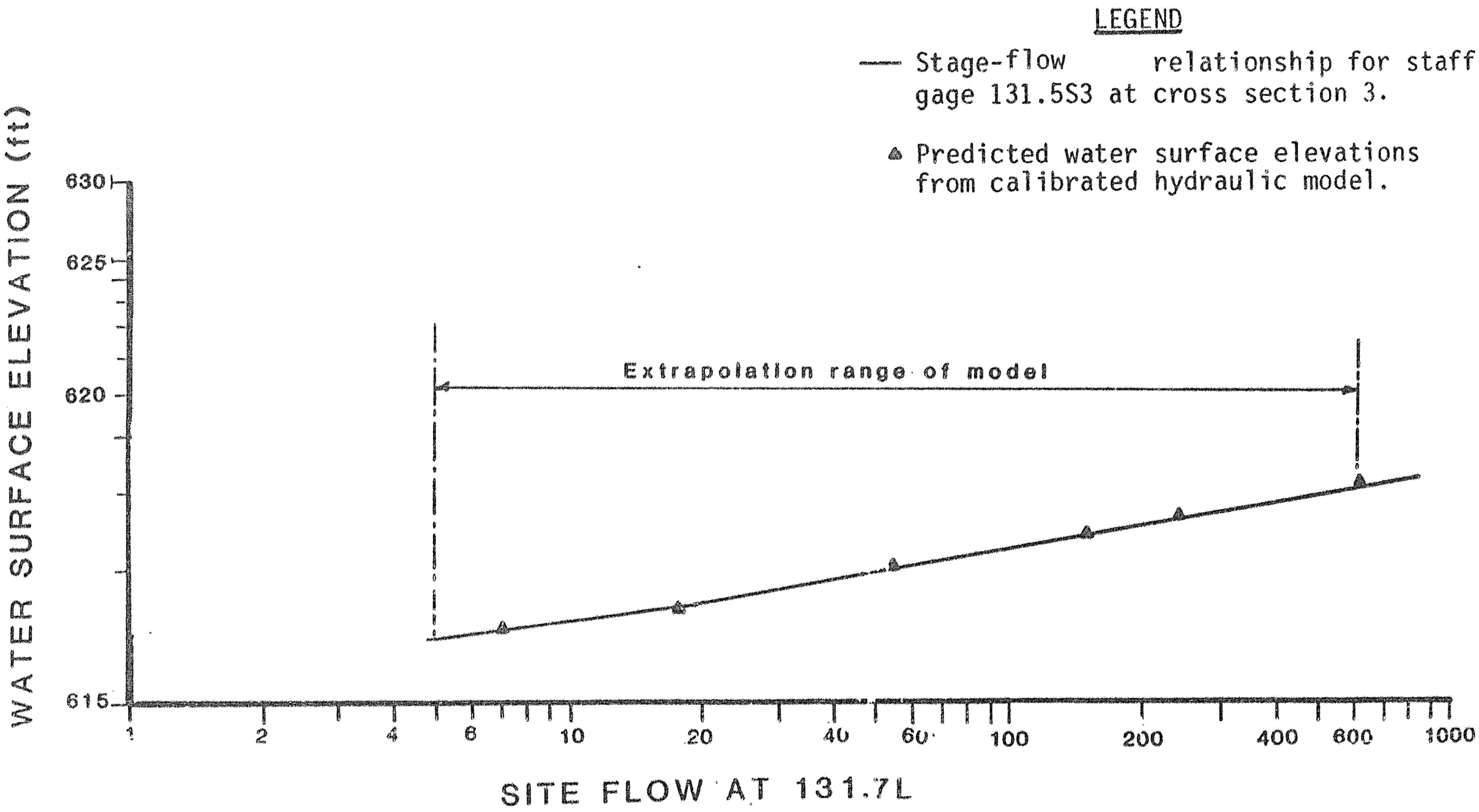



Figure III-28. Comparison between water surface elevations forecast by the calibrated hydraulic model and the stage-flow relationship for 131.7L cross section 3.

comparison, the $RMSE_U$ is nearly equal to the RMSE, an indication the model is good. The index of agreement is 0.99 for depth and velocity another indication how well the model is predicting.

Application: The breaching discharge for the site was estimated at 5,000 cfs, and the channel flow becomes controlled by the mainstem at about 7,400 cfs. Baseline flow conditions of 5, 10 and 15 cfs occur at 5,000, 6,000, and 7,000 cfs mainstem, respectively. Above 7,400 cfs, an IFG-4 model was calibrated for site flows of 15 to 600 cfs (7,400 to 19,300 cfs mainstem), an excellent rating was assigned. An overall rating of unacceptable was assigned to the model between 19,300 and 35,000 cfs.

The application range and ratings are summarized below in the bar chart.

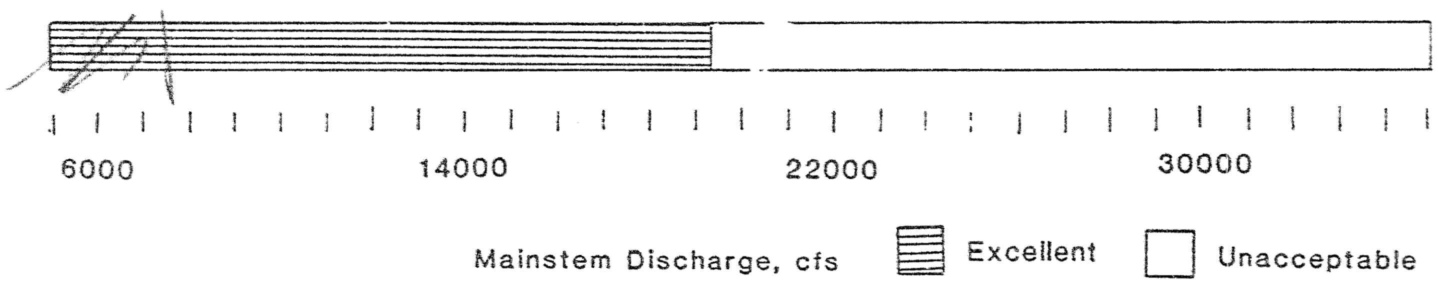



Figure III-29a provide surface area and WUA response curves for this site. Because this side channel conveys mainstem water at 5,000 cfs only turbid water suitability criteria were used for juvenile chinook. The pronounced increase in WUA indices as mainstem discharge increases from 5,000 to 8,000 cfs (Figure III-29b) is associated with a rapid increase in wetted area possessing suitable rearing velocities rather than a change from clear to turbid water habitat discussed at other study sites.

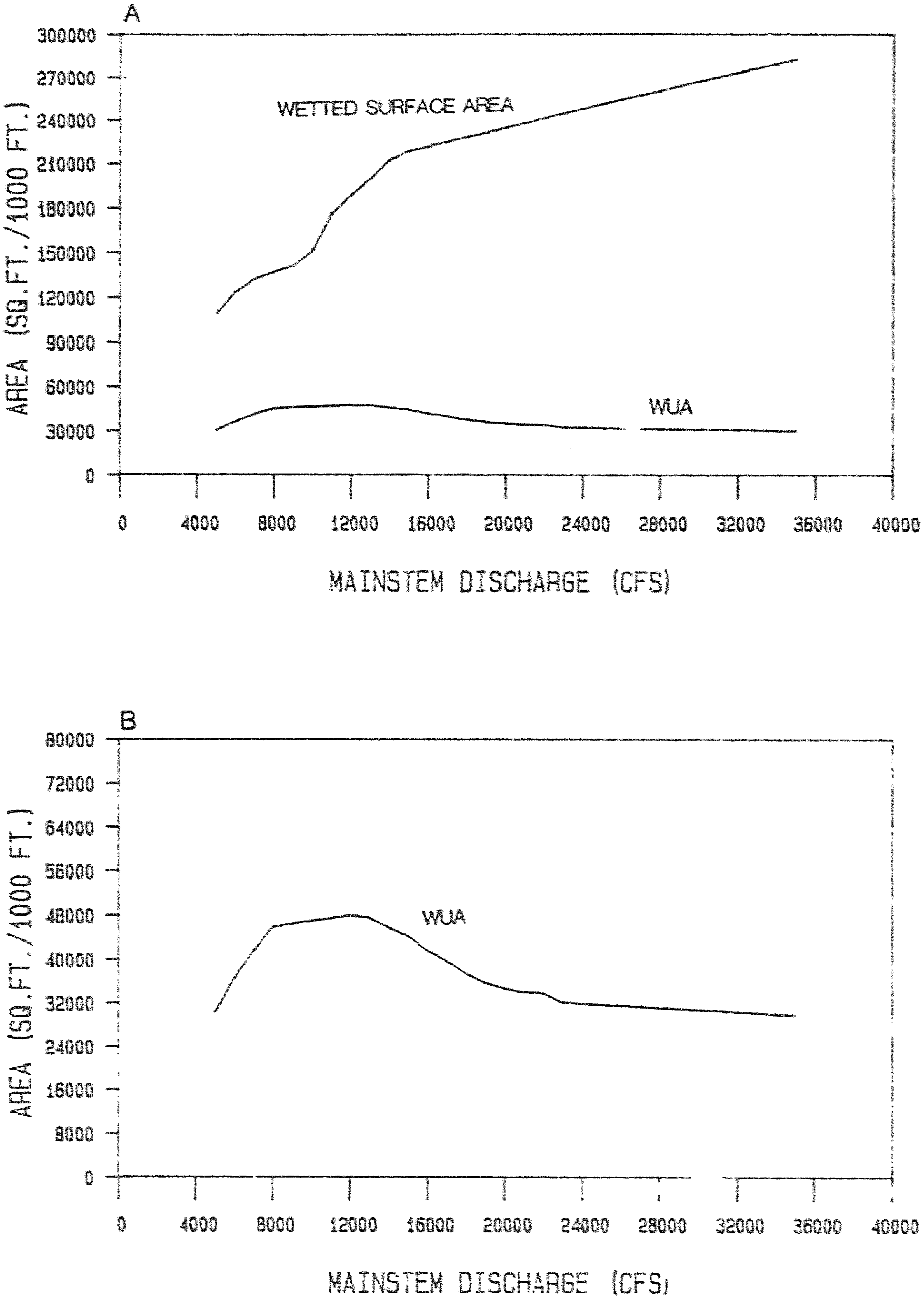



Figure III-29. Projections of gross surface area and WUA of juvenile chinook salmon habitat as a function of discharge for the 131.7L modeling site.

An extensive gravel bar located on the inside of the bend and near the head of this site (Plate III-5) exerts the greatest influence on the shape of the WUA curve at this site. As mainstem discharge increases above 5,000 cfs a large shallow riffle develops which provides juvenile chinook significant amounts of rearing habitat. At higher flows this shoal area is characterized by unsuitably high water velocities and the site's habitat potential diminishes accordingly.

The WUA and surface area response curves for this site were forecast using the HABTAT model linked to an IFG-4 hydraulic model calibrated for a range of mainstem discharge from 5,000 cfs to 23,000 cfs. A constant rate of change was assumed to exist for both curves as mainstem discharges increased to 35,000 cfs (Table B-6.5).

Time series plots (Figure III-30) indicates juvenile chinook habitat within the side channel remains relatively constant during the mid-summer months, however fairly large variations in habitat potential exist between mid-summer and late spring or early autumn habitat forecasts. Another notable feature of this site is the high levels of rearing habitat provided during the rearing period relative to other study sites.

Site 132.6L

Site Description: This site is located in the channel immediately upstream of 131.7L on the west bank of the Susitna River (Plate III-6). The study reach is 1,140 ft long and ranges from 140 ft wide at the mouth to 180 ft wide at the upper end of the study reach. Cross sections 1, 3 and 9 define the fast,

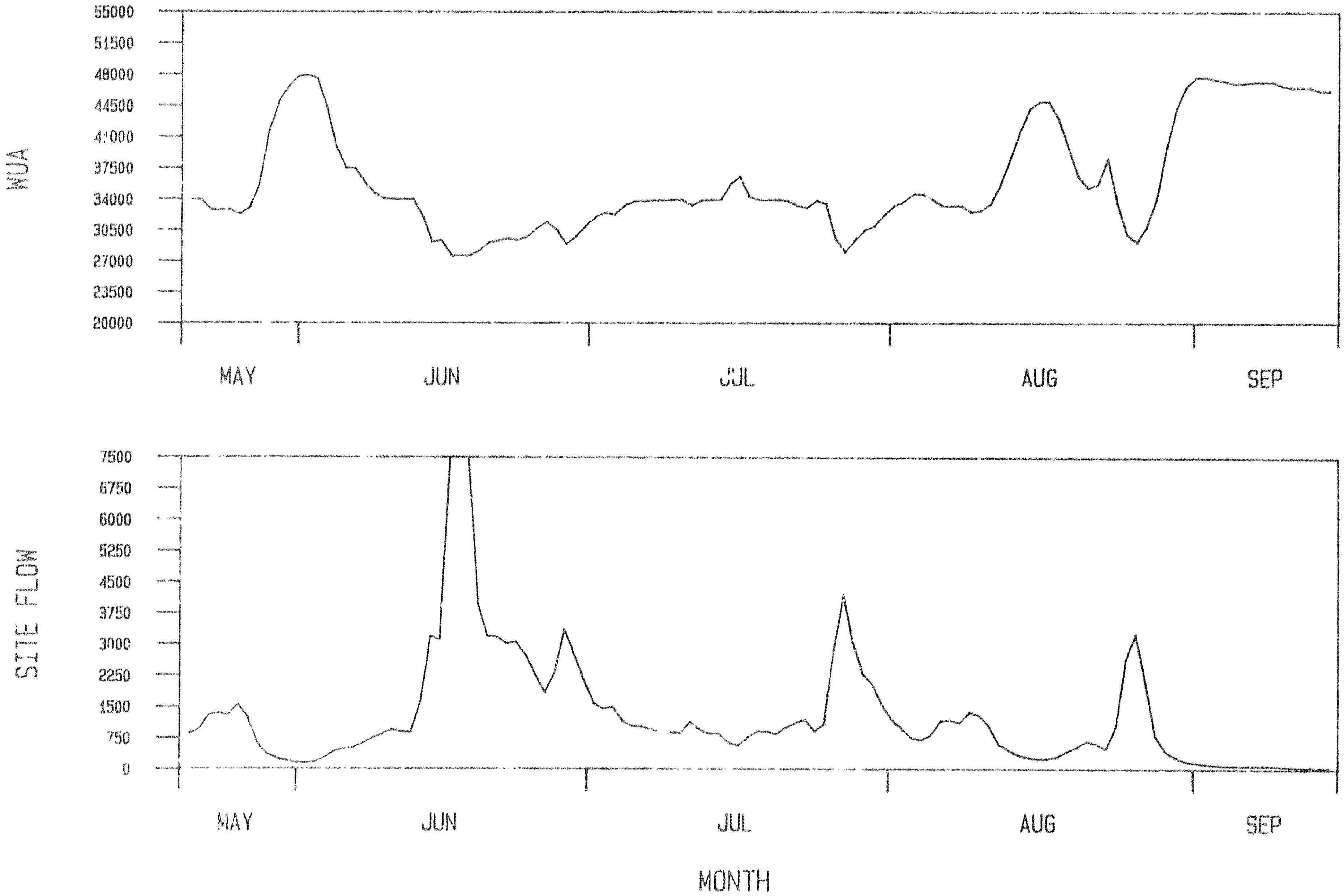



Figure III-30. Time series plots of juvenile chinook salmon WUA as a function of discharge from May 20 to September 15, 1984 for 131.7L modeling site.

shallow areas. Cross sections 2 and 4-8 describe the deep, slow velocity areas. A small backwater area is present on the left bank of cross section 9 (Figure III-31). Silt and sand substrate is predominant throughout the deep area while cobble and rubble substrate is generally found in the shallow areas. Vegetation, including horsetails, lines the eft bank of the channel providing some cover.

Channels B and C breach at mainstem discharges of 10,000 and 14,500 cfs. Below 10,000 cfs, the water is ponded and eventually dries up. An overflow channel along the right ba conveys site flow at 25,000 cfs and redirects a small percentage of flow from the site to Channel A. A backwater area is present from the mouth up through cross section 2 at mainstem discharges greater than 23,100 cfs.

This site was selected to represent small side channels that remain small throughout a large range of discharges. An IFG-4 model was selected because of the small channel size and th non-uniform channel conditions.

No adult salmon have been observed in the site. However, a large number of chinook juvenile rear in the site. Access to and passage through the site are not possible below 10,000 cfs.

Calibration: To calibrate the IFG-4 model for this site, two data sets were collected at each cross section and are summarized in the following table.

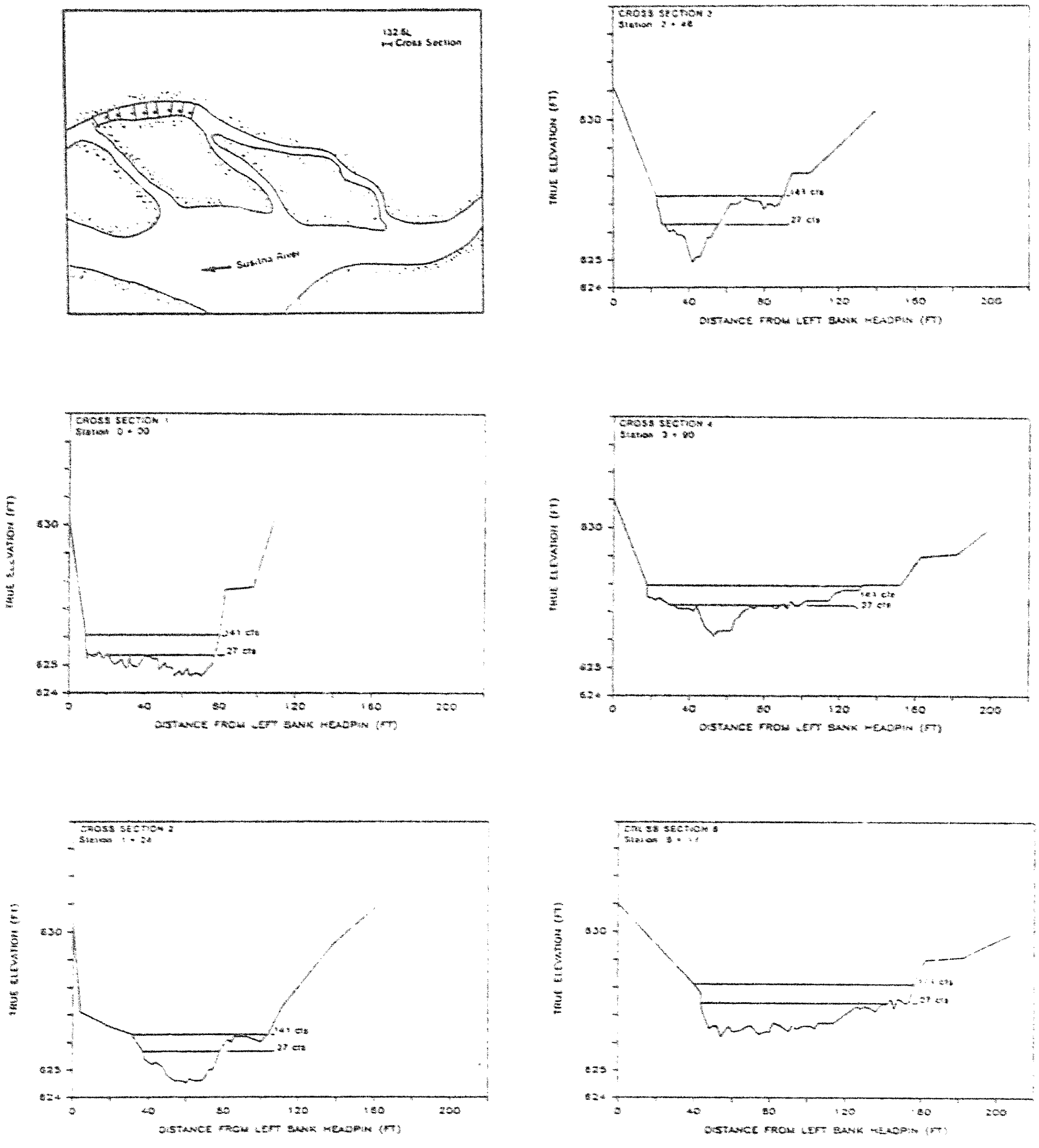



Figure III-31. Cross sections for 132.6L study site depicting water surface elevations at calibration discharges of 27 and 141 cfs.

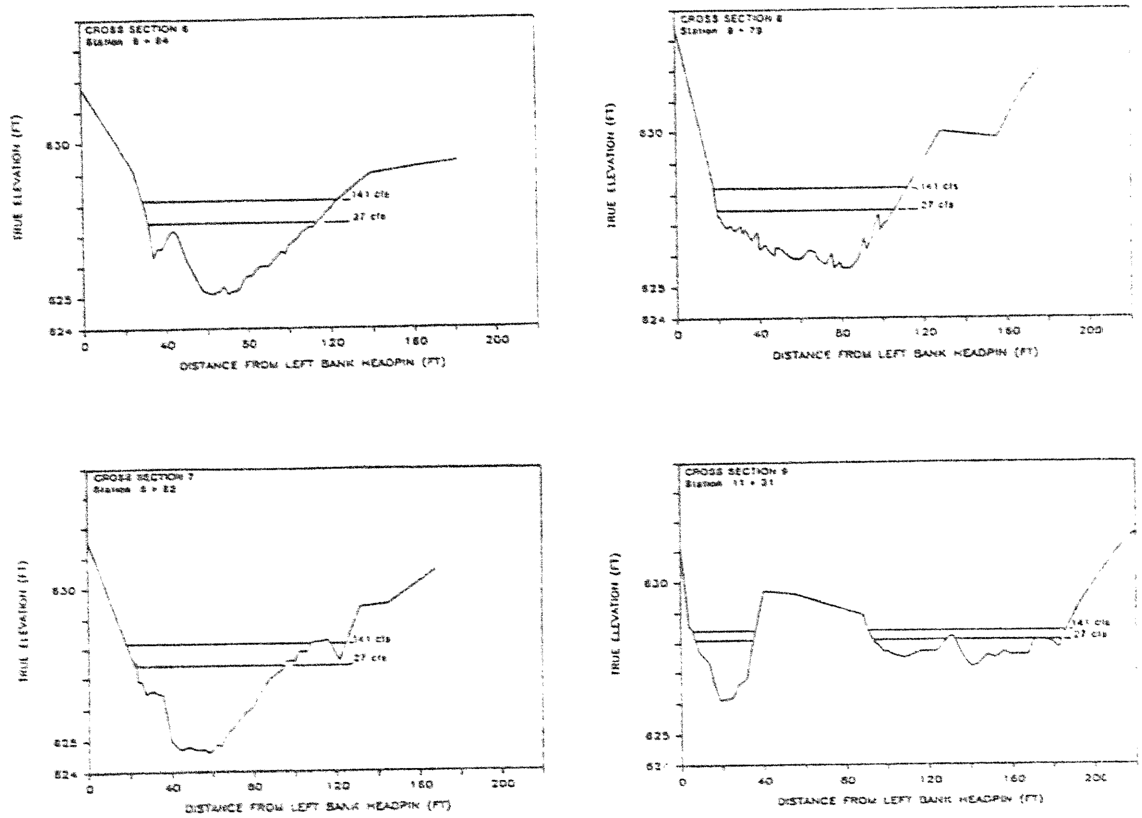



Figure III-31. Cross sections for 132.6L study site depicting water surface elevations at calibration discharges of 27 and 141 cfs.

Table III-11. Hydraulic data available to calibrate the IFG-4 model for site 132.6L.

| Date | Flow (cfs) | Discharge (cfs) |
|---|---|---|
| 940901 | 27 | 12,700 |
| 840708 | 141 | 21,500 |

A horizontal water surface elevation did not occur at cross section 9 due to the small backwater area on the left side of the channel. The streambed elevations in this area were raised so that the left and main channel water surfaces had the same elevation (Figure III-32).

A plot depicting the observed and predicted water surface profiles for the calibration flows as well as profiles for the extrapolation limits is shown in Figure III-33. Because only two data sets are used in the model, the predicted water surface elevations are equal to the observed elevations. THe depth and velocity predictions above a site flow of 300 cfs begin to breakdown; thereby setting 300 cfs as the upper limit of the model.

The IFG-4 model was calibrated using the previous described guidelines. Figure III-34 shows a comparison between the WSEL vs q curve and the model predicted water surface elevations for each cross section in the site, similar comparisons were made but shown here only for the discharge cross section.

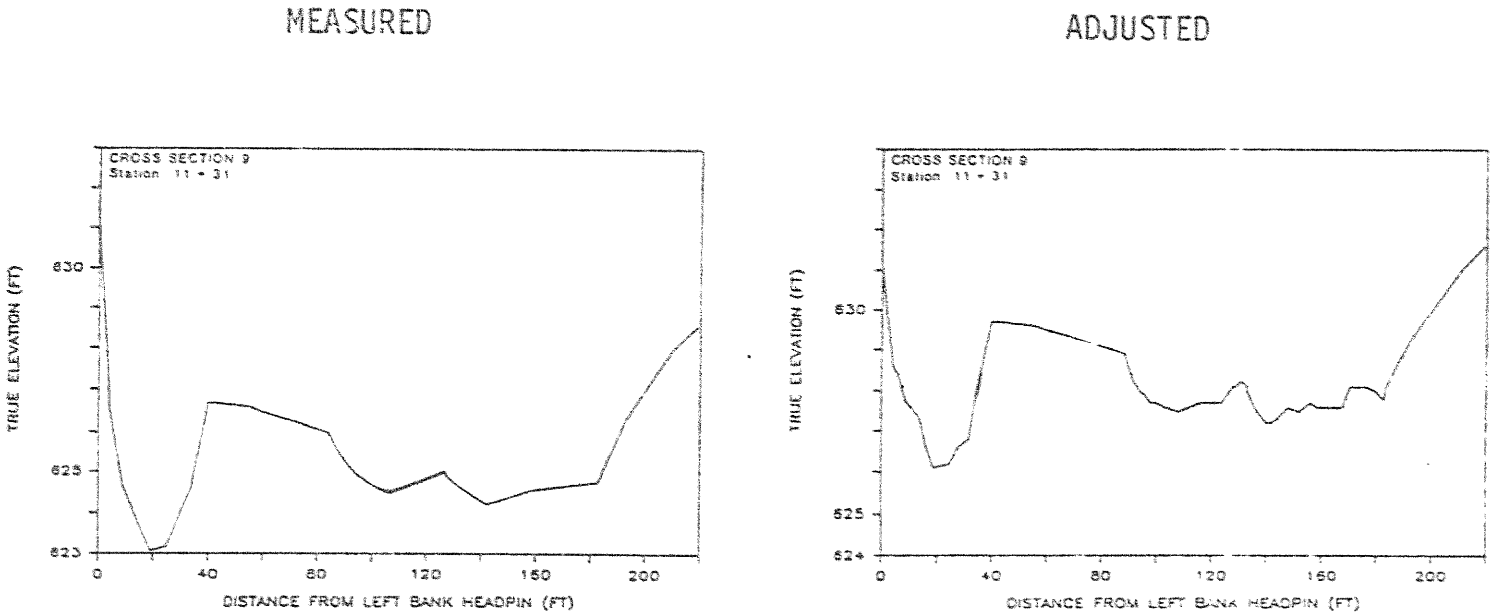



Figure III-32. Comparison between measured and adjusted cross section 9 at 132.6L study site.

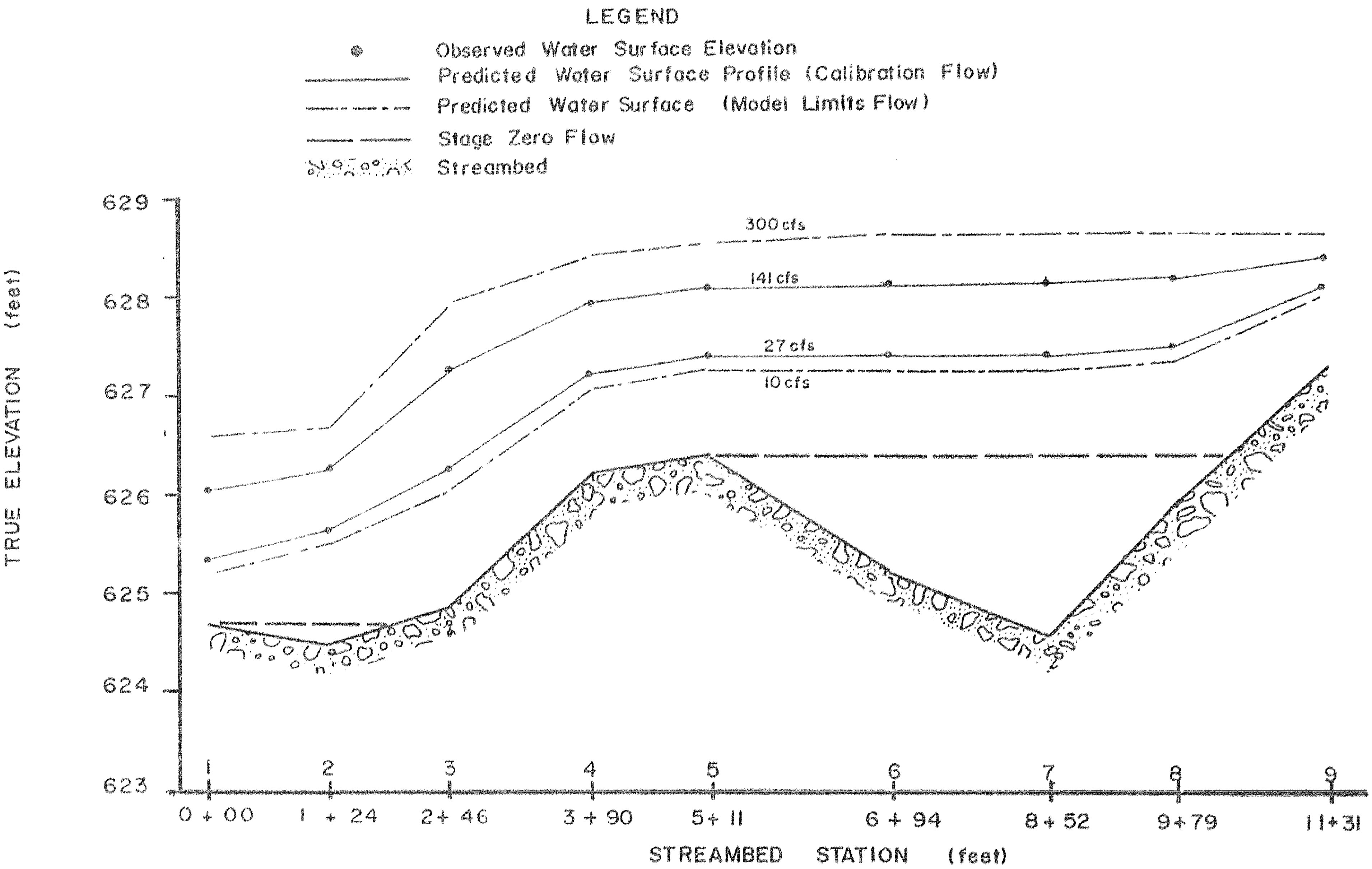



Figure III-33. Comparison of observed and predicted water surface profiles from calibrated hydraulic model at 132.6L study site.

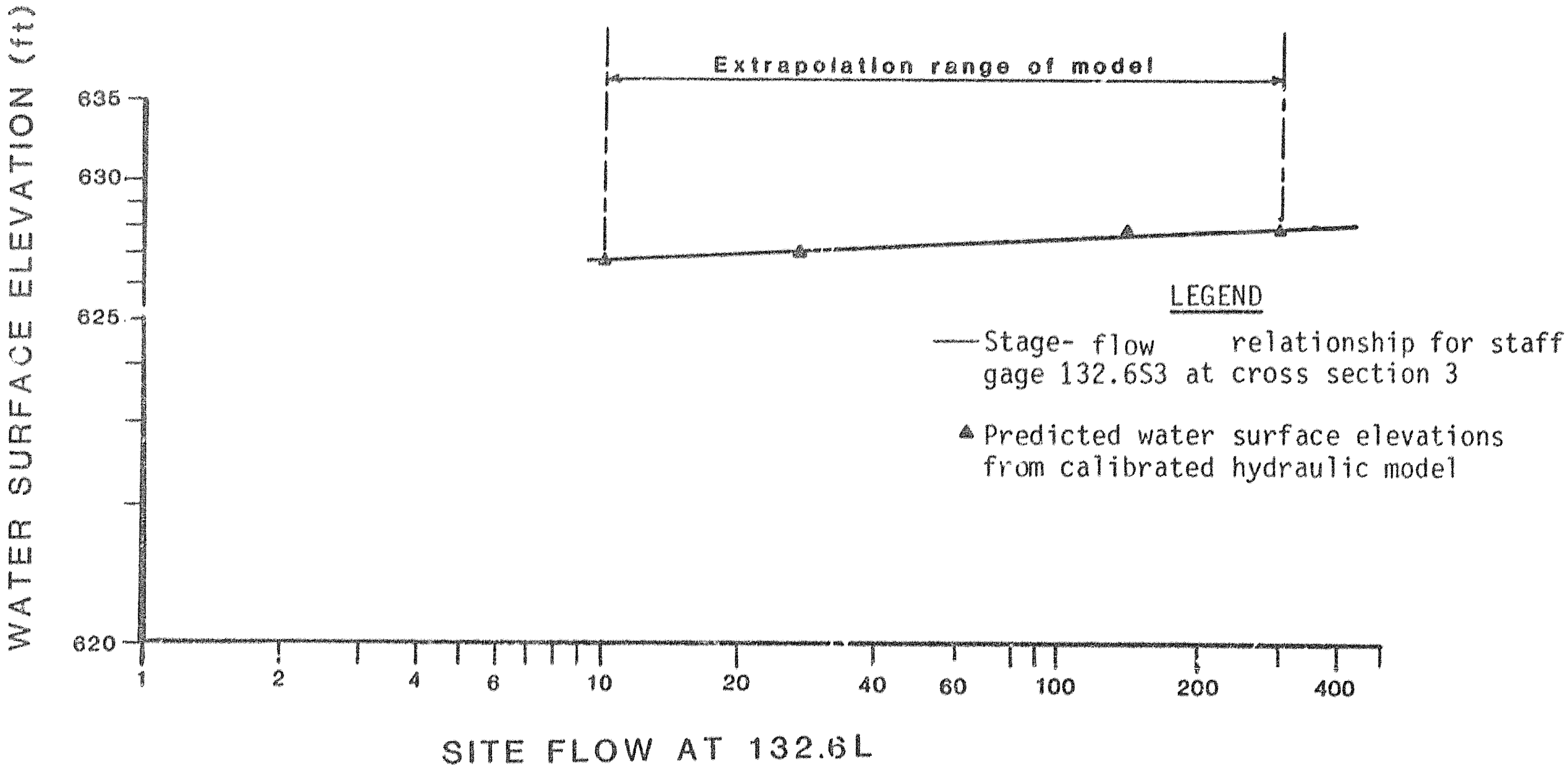


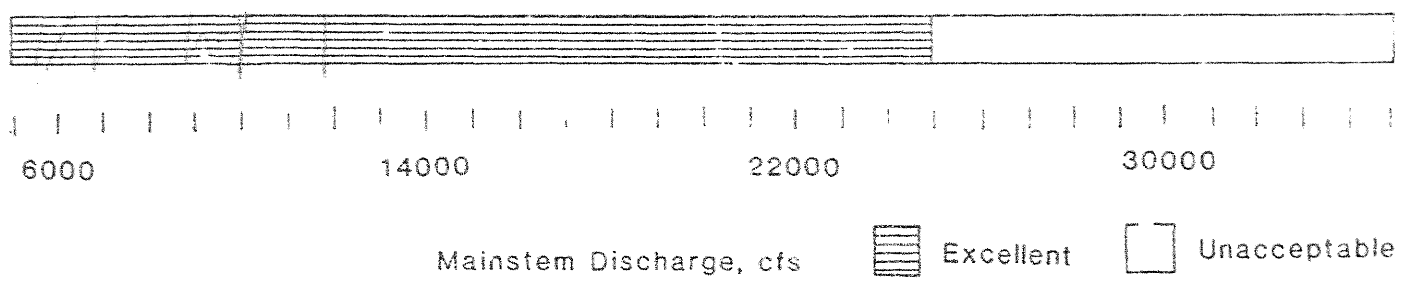

Figure III-34. Comparison between water surface elevations forecast by the calibrated hydraulic model and the stage- flow relationship for 132.6L cross section 3.

The calibrated model can be evaluated by comparing the observed and predicted water surface elevations, discharges and velocity adjustment factors (Table B-4.3). There is no difference in observed and predicted water surface elevations. The predicted discharges vary greatly from the mean at cross sections 1 and 8 as did the actual field measurements. The velocity adjustment factors ranged from 0.87 to 1.02.

Verification: Scatterplots (Figure B-2.8) and statistical tests (Table B-5) were made to compare the observed and predicted depths and velocities for th two point hydraulic model. The IFG-4 model is based on regression analysis and a two point regression connects both points. False precision is implied with a nearly perfect one-to-one relationship in the scatterplots and with the index of agreement (0.99).

Application: Site 132.6L breaches at 10,000 cfs and is controlled at 11,900 cfs mainstem. Baseline flow is estimated as 10 cfs for discharges below 10,000 cfs. For site flows of 10 to 17 cfs (10,000 to 11,900 cfs mainstem), the model is not able to forecast velocities accurately, reducing the rating for this flow range from excellent to good. The site was assigned an excellent rating for the 17 to 300 cfs range (11,900 to 25,000 cfs mainstem). Above 25,000 cfs the model was assigned an unacceptable rating.

The application range and ratings are summarized below in the bar chart.



The surface area and juvenile chinook WUA curves for site 132.6L are plotted to the same vertical scale in Figure III-35a, with the WUA curve replotted to an enlarged scale in Figure III-35. In both figures surface area and WUA are expressed as square feet per 1,000 feet of side channel. A comparison of the two curves indicates the ratio between WUA and surface area is approximately 0.3 at 12,000 cfs declining toward 0.1 at 25,000 cfs.

This study site is breached at a mainstem discharge of 10,000 cfs and dewaters as mainstem flow continues to decline. The associated rapid decline in both wetted surface area and WUA is evident in Figure III-35. The juvenile chinook WUA curve drops suddenly when the side channel transforms from the breached to non-breached condition at 10,000 cfs. This is attributable to the site flow clearing thereby eliminating the cover value previously afforded juvenile chinook by turbid water. As mainstem discharge declines toward 5,000 cfs, both the wetted surface area and WUA approach zero.

The surface area and habitat response curves were forecast with the HABTAT model and IFG-4 hydraulic model which had been calibrated for mainstem discharges between 10,000 and 30,000 cfs. For mainstem discharges between 30,000 and 35,000 both curves were extended using exponential functions as indicated in Table B-6.6.

For mainstem discharges less than the breaching flow of 10,000 cfs surface area and WUA estimates were obtained by using clear water criteria for juvenile chinook at 9,000 and 10,000 cfs to determine the magnitude of change in WUA attributable to the site flow clearing then reviewing air photo

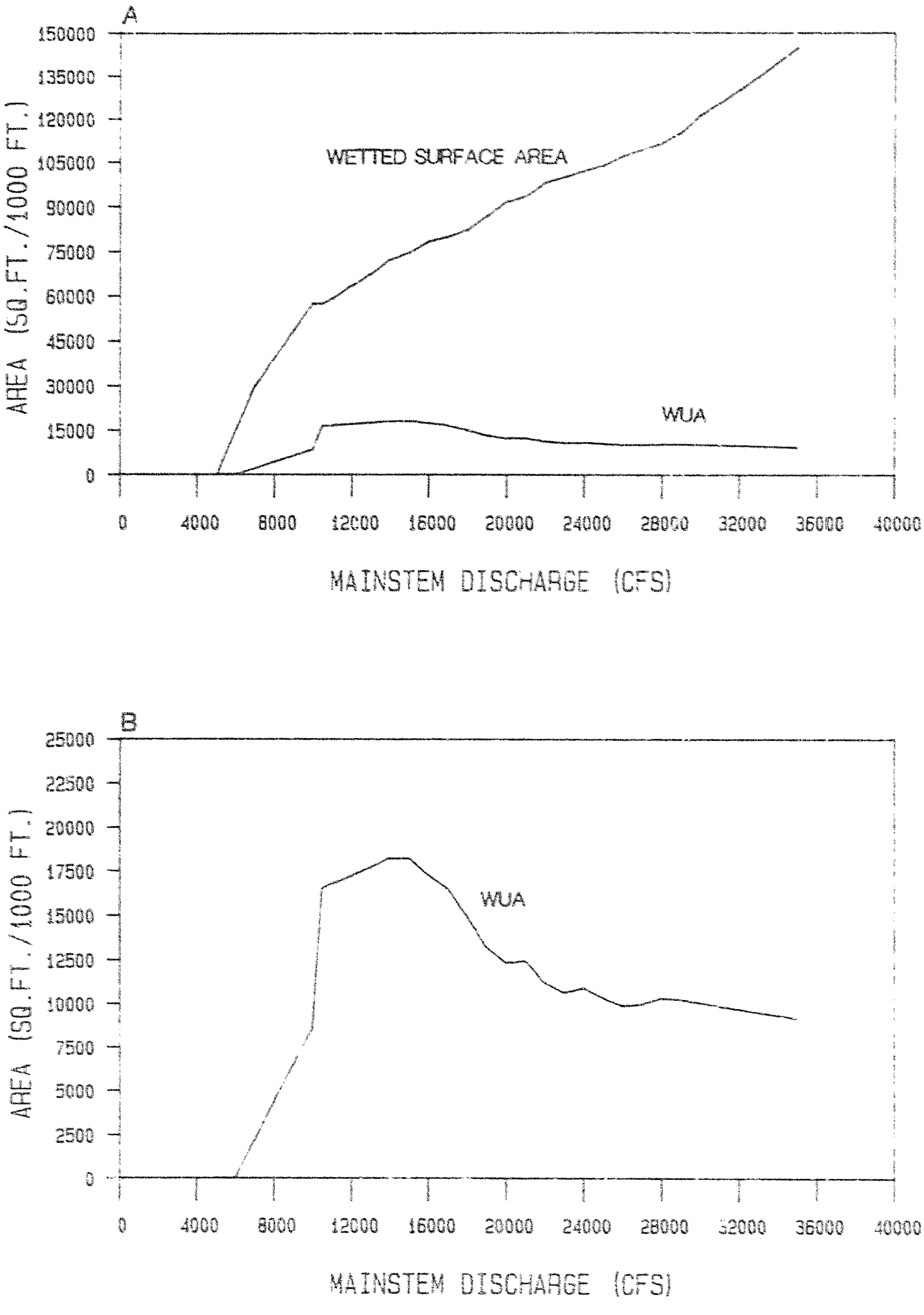



Figure III-35. Projections of gross surface area and WUA of juvenile chinook salmon habitat as a function of discharge for the 132.6L modeling site.

enlargements. At 7,400 cfs clear ponded water exists and the 5,100 cfs photography indicates the site is nearly dry. Digitized surface area measurements of ponded water connected to the mainstem at 7,400 and 5,100 cfs were used as a basis for interpolating surface areas between discharges of 10,000 and 5,000 cfs. WUA was assumed to decrease to zero at a constant rate through this range.

Time series analysis of 1984 site flow and juvenile chinook WUA are presented as Figure III-36. Rearing potential was fairly stable throughout mid-summer 1984 with notable increases being apparent in late spring and early fall when mainstem discharges were approximately half their mid-summer level.

Site 136.0L

Site Description: This site is located approximately 1 mile downstream of Gold Creek along the west bank of the Susitna River (Plate III-7). The study reach is 580 ft long and 80 ft wide with steep banks. Slough 14 enters the channel 20 ft above the study site. Cross sections 1-4 and 6 define shallow high velocity areas while cross section 5 represents a deep, slower velocity area (Figure III-37). The substrate varies from cobble and rubble to gravel throughout the site. Debris and log jams are present along the right bank and provide cover.

The channel has been observed breached at mainstem discharges as low as 5,000 cfs. At moderate to high discharges, the channel appears to be a run. Site flows of 593, 77 and 32 cfs corresponds to mainstem discharges of 23,000, 10,400 and 7,400 cfs.

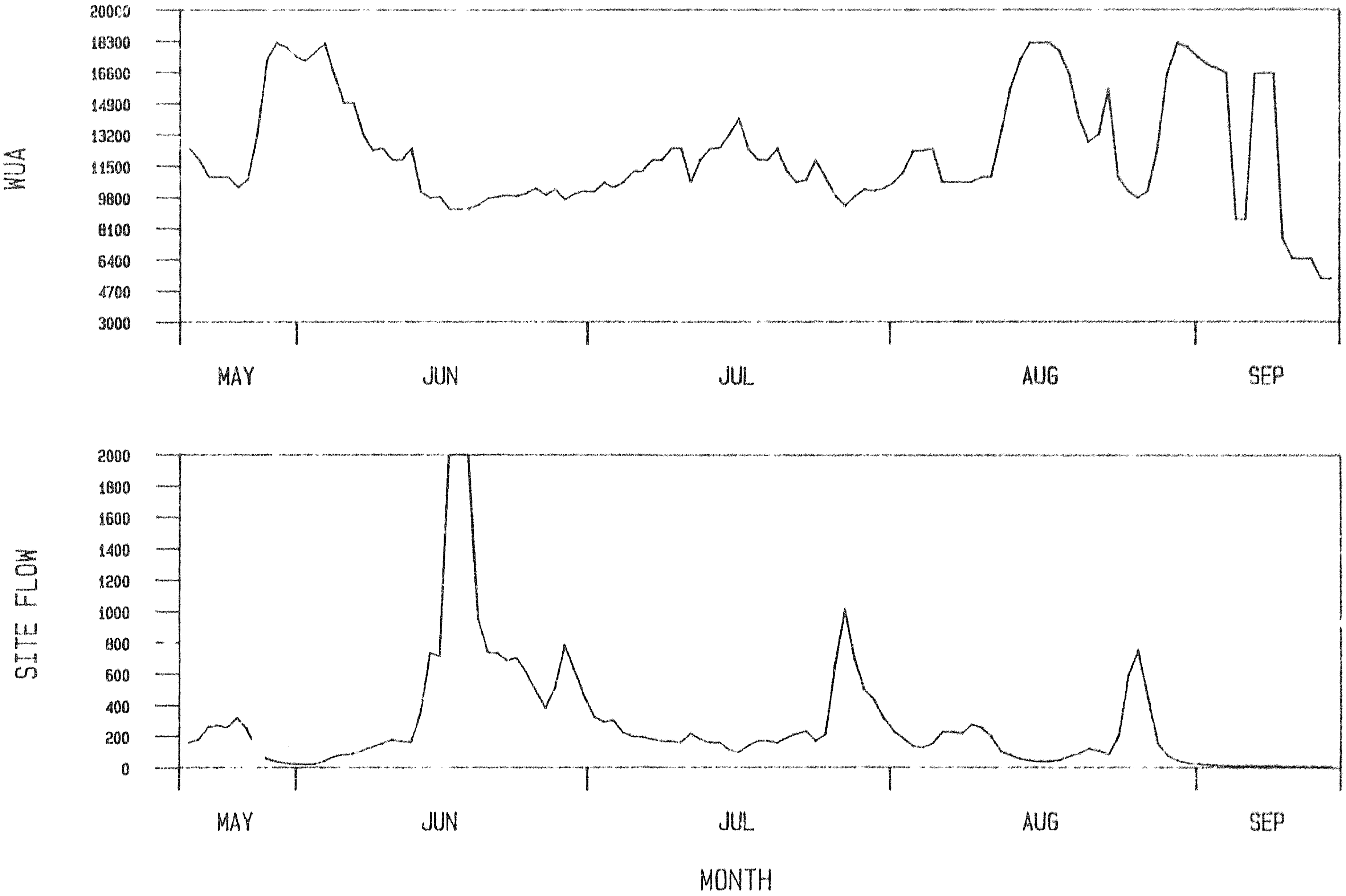



Figure III-36. Time series plots of juvenile chinook salmon WUA as a function of discharge from May 20 to September 15, 1984 for 132.6L modeling site.

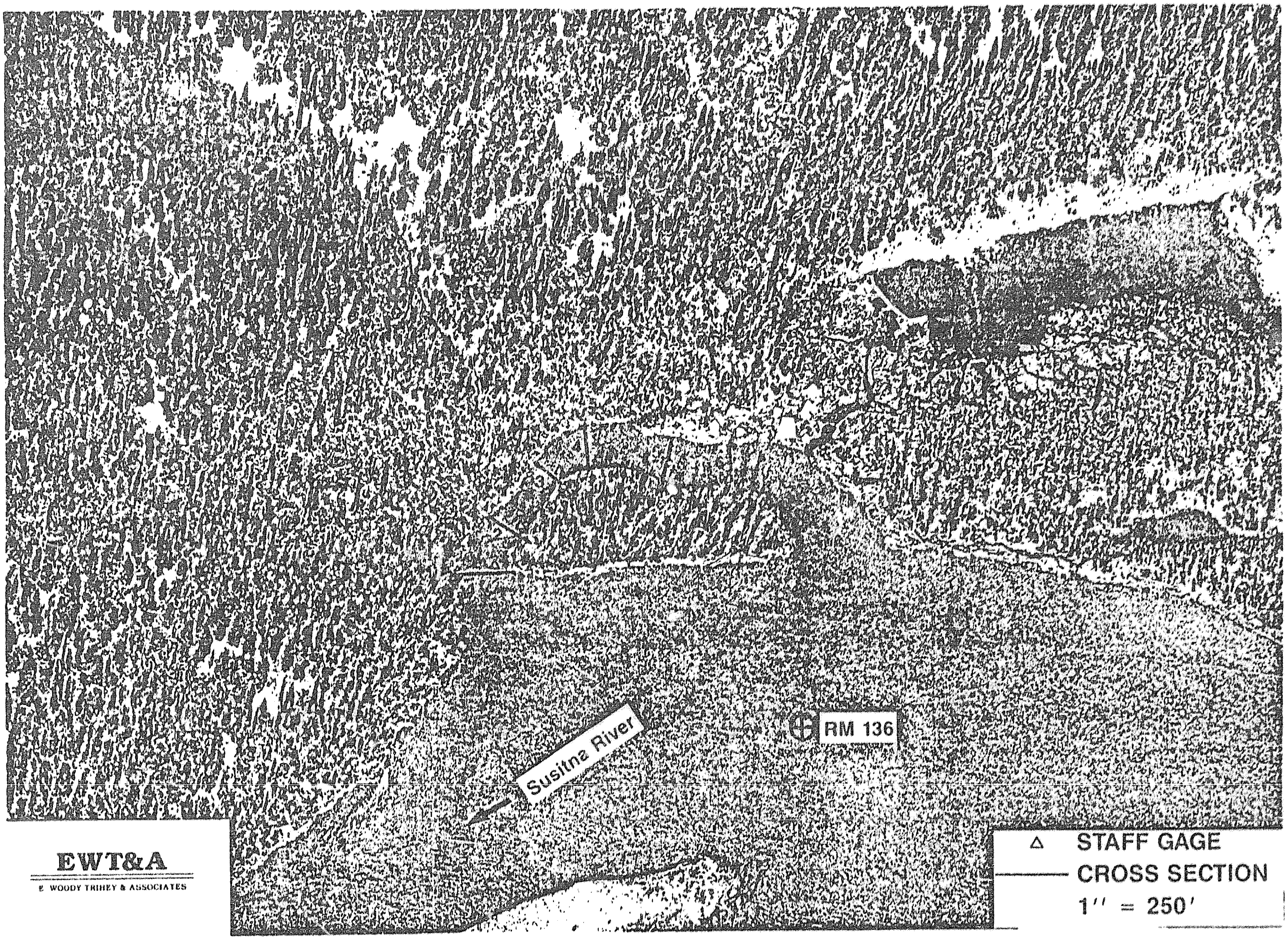



Plate III-7. Modeling site 136.0L on June 1, 1982 at mainstem discharge: 23,000 cfs.

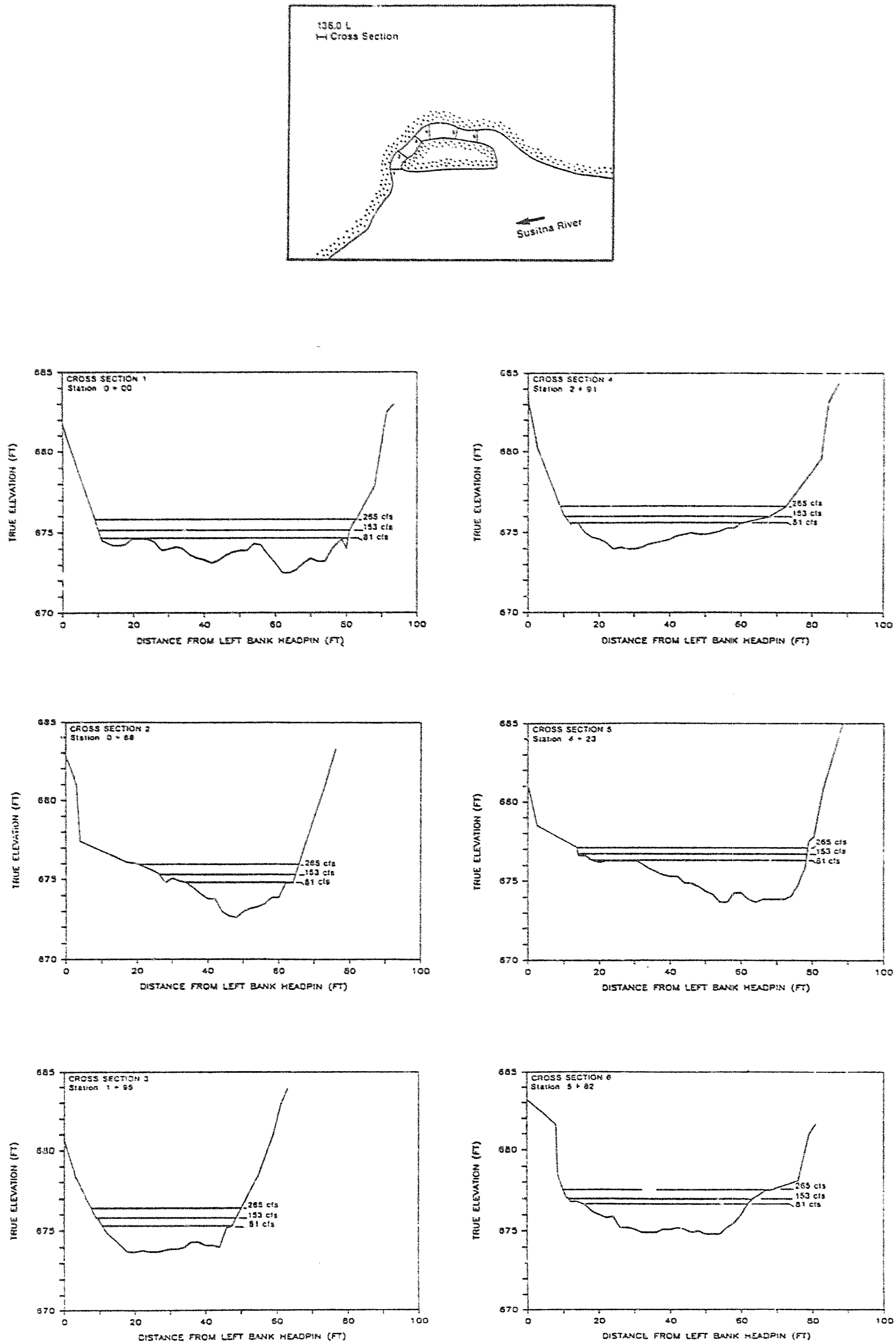



Figure III-37. Cross sections for 136.0L study site depicting water surface elevations at calibration discharges of 81, 153 and 265 cfs.

This small study site was selected to represent small side channels that remain side channels. An IFG-4 model was selected because of the size of the channel.

Relatively few coho and chum spawners have been observed in the site. Juvenile chinook were caught in the side channel. Access into and passage through the site are not limited throughout the entire range of discharges (5,000 to 35,000 cfs).

Calibration: In order to calibrate the IFG-4 model for this site, three data sets were collected at each cross section (Table III-12).

Table III-12. Hydraulic data available to calibrate the IFG-4 model for site 136.0L.

| Date | Flow (cfs) | Discharge (cfs) |
|---|---|---|
| 840909 | 81 | 10600 |
| 840901 | 153 | 12700 |
| 840818 | 265 | 15600 |

No unique problems were encountered at this site following the calibration guideline. A plot depicting the observed and predicted water surface profiles for the calibration flows as well as profiles for the extrapolation limits is shown in Figure III-38. To calibrate the IFG-4 model with respect to stage, comparisons were made between the WSEL vs q curve and the model predicted

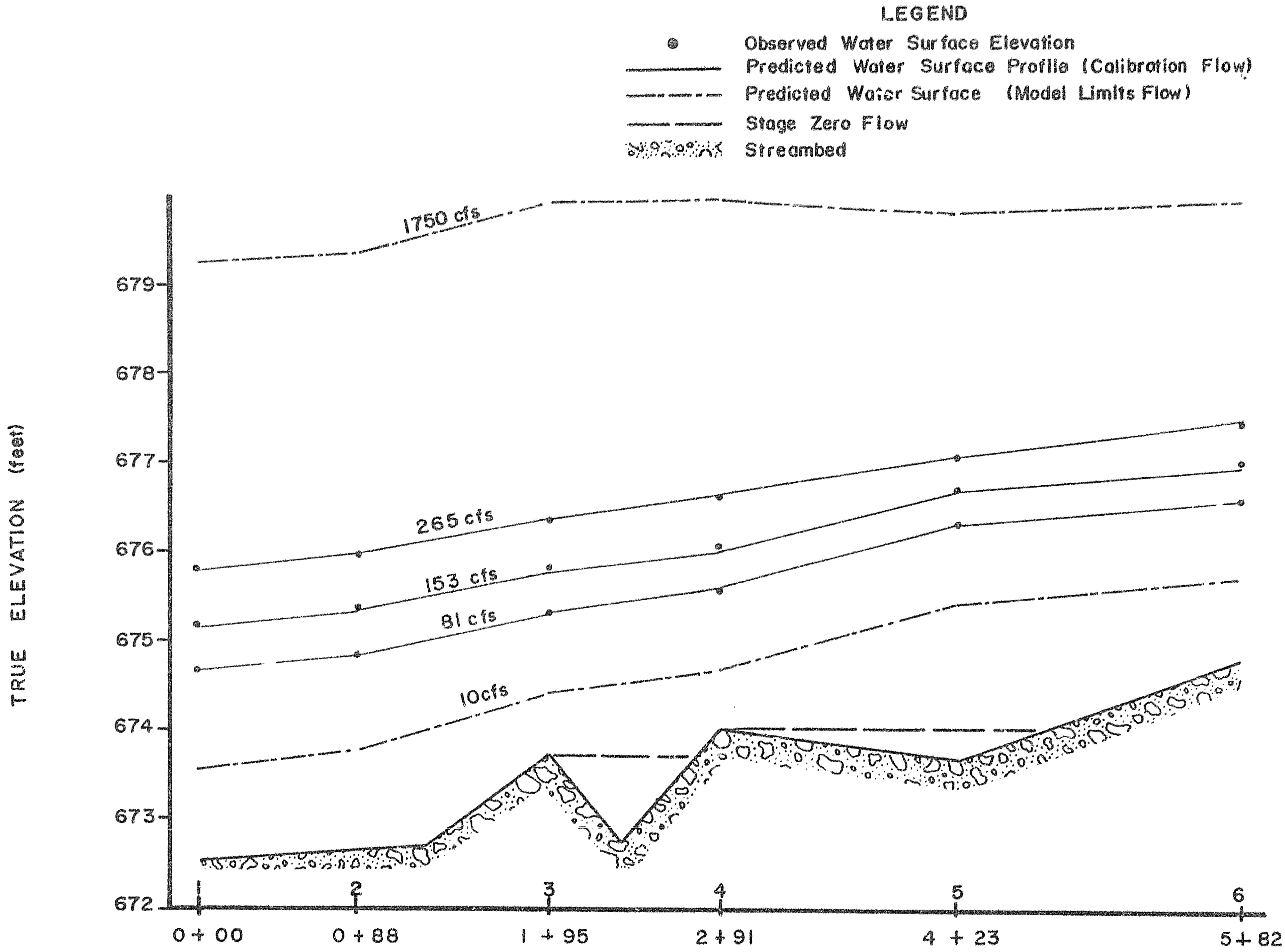


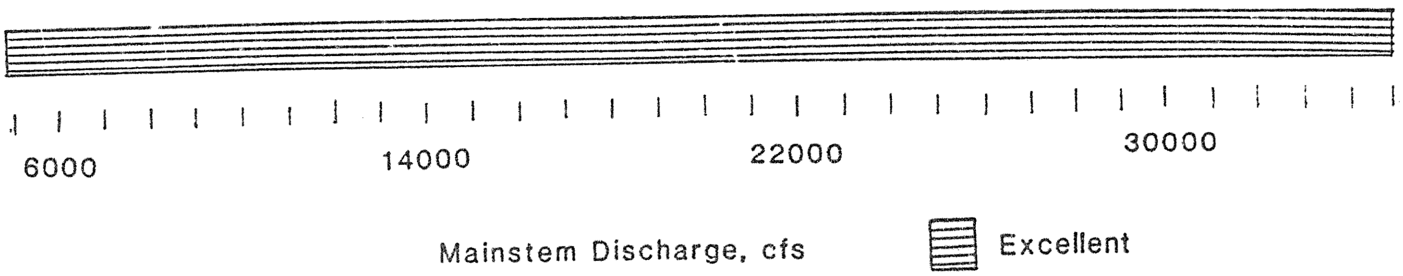

Figure III-38. Comparison of observed and predicted water surface profiles from calibrated model at 136.0L study site.

water surface elevations (Figure III-39). Similar comparisons were made at each cross section however, only the discharge cross section is shown here.

The performance of the calibrated model is evident by comparing the observed and predicted water surface elevations, discharges and velocity adjustment factors (Table B-4.4). The difference in observed and predicted water surface elevations is usually 0.02 ft. The largest difference in observed and predicted discharge is 3 percent. The velocity adjustment factors range from 0.99 to 1.01, nearly a perfect correlation.

<u>Verification</u>: The scatterplots of observed and predicted depths and velocities are shown in Figure B-2.9. There appears to be more scatter in the depths than velocities but a one-to-one relationship can be observed from the plot. The results of the statistical tests are shown in Table B-5. Both depth and velocity comparisons of the $RMSE_U$ is nearly equal to the RMSE (.167 compared to .170 and .157 compared to .165). The index of agreement for both variables is 0.99, indications of how well the hydraulic model is predicting depth.

<u>Application</u>: An excellent rating was assigned for site flows of 10 to 1,750 cfs corresponding to 5,000 to 35,000 cfs mainstem, as shown below in the bar chart.



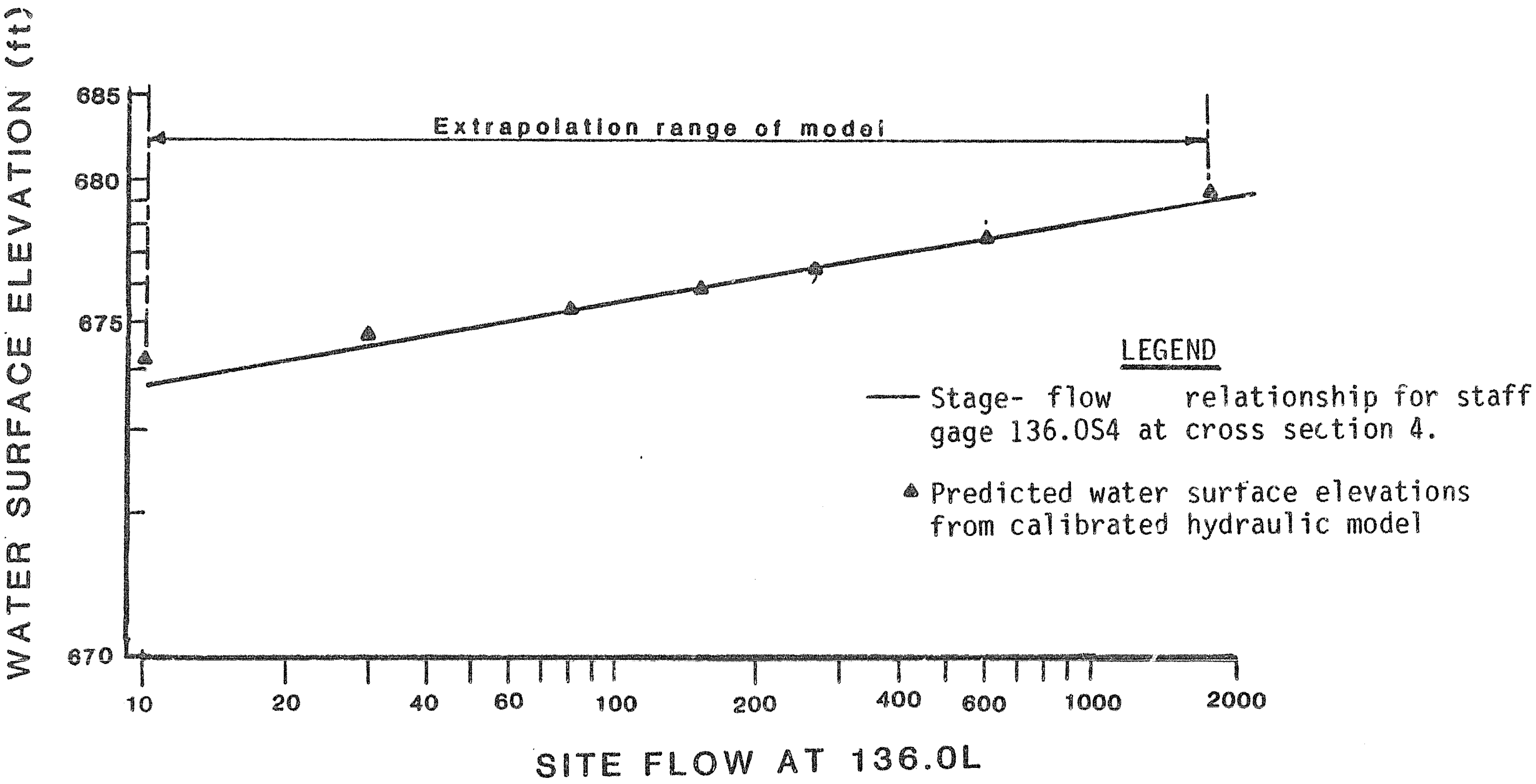



Figure III-39. Comparison between water surface elevations forecast by the calibrated hydraulic model and the stage- flow relationship for 136.0L cross section 4.

Total wetted surface area and WUA forecasts are provided for a mainstem discharge between 5,000 and 35,000 cfs (Figure III-41a and b). In the first figure both curves are plotted using a common vertical scale and are expressed in the same units. An eight fold increase in the vertical scale is used with Figure III-41b. Both the surface area and WUA curves for this site were forecast using an IFG-4 hydraulic model calibrated for mainstem discharges ranging from 5,000 to 35,000 cfs.

Five of the six cross sections established at this small, high gradient side channel were located in riffle zones. The channel cross section lacks the gently sloped stream banks and gravel bars associated with other side channels. Consequently, velocities throughout this site tend to exceed those preferred by juvenile chinook salmon. Hence the rearing habitat potential steadily decreases between 5,000 and 18,000 cfs, but remains at nearly the same level through 35,000 cfs. This is primarily attributed to the large amount of shoreline debris and undercut banks which exist at this site. When this habitat response curve is compared to WUA curves for other sites, it is apparent that this site provides less rearing habitat on a per 1,000 ft basis than most other side channels. However, because the surface area of this side channel is also small, the proportion of the study site possessing suitable chinook habitat is actually greater than the proportion of some of the larger side channels.

The influence of shoreline debris and undercut banks on the temporal stability of chinook raring habitat at this site is evident in the time series plots presented as Figure III-42. Despite the rather erratic pattern of daily site

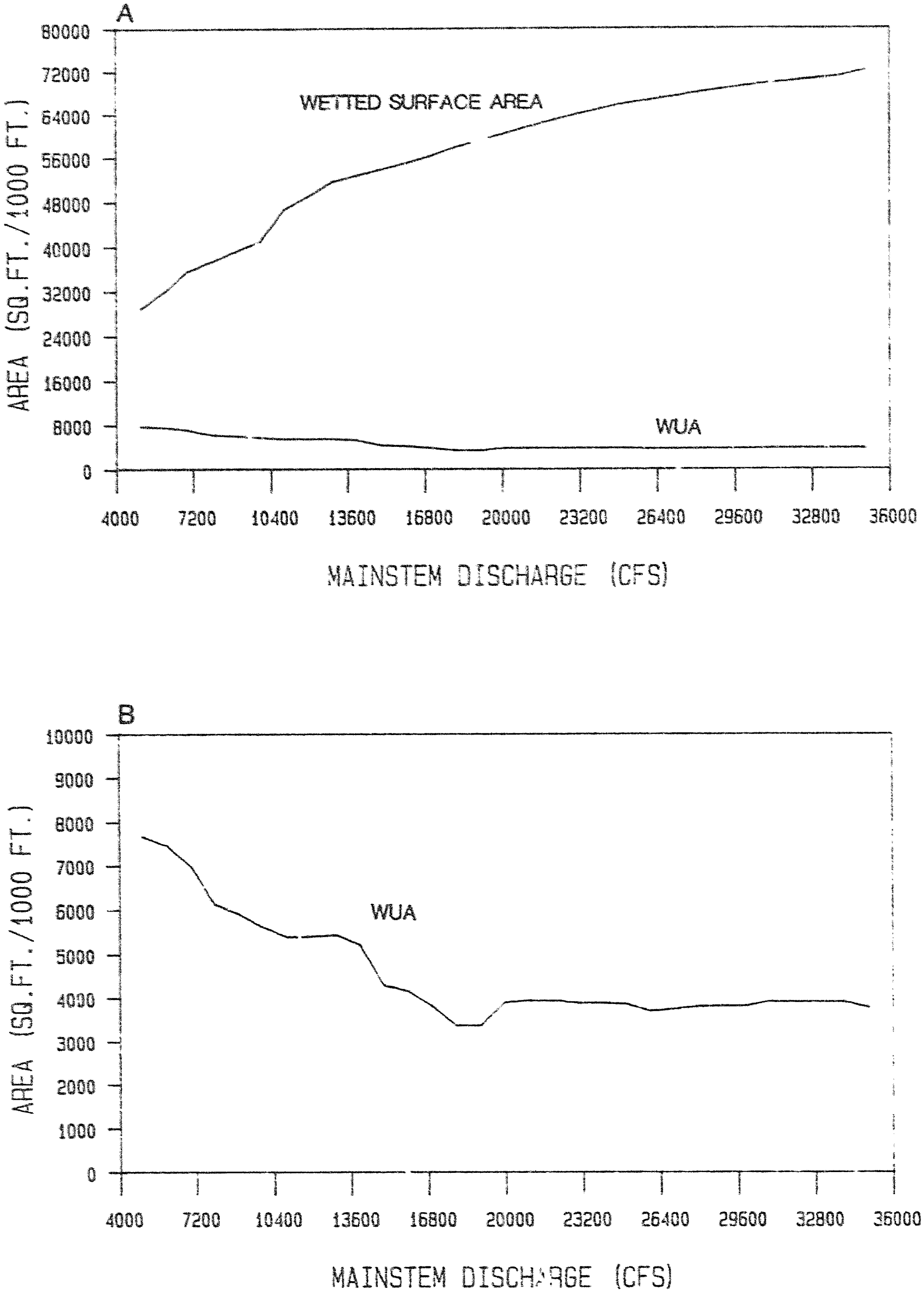



Figure III-41. Projections of gross surface area and WUA of juvenile chinook salmon habitat as a function of discharge for the 136.0L modeling site.

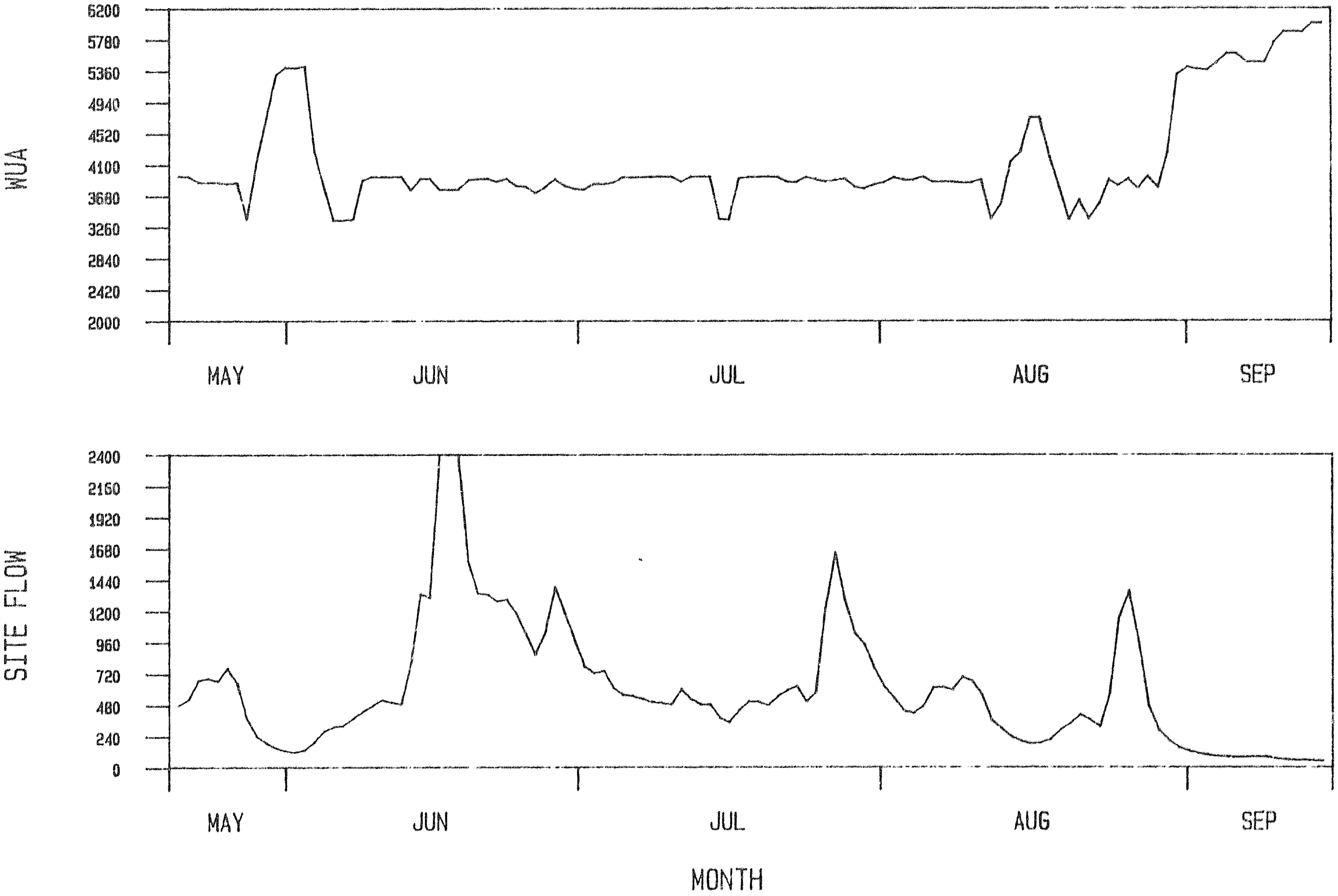



Figure III-42. Time series plots of juvenile chinook salmon WUA as a function of discharge from May 20 to September 15, 1984 for 136.0L modeling site.

flows, corresponding WUA indices are notably stable. Although low early summer and fall streamflows result in an increased habitat potential, this increase is not as pronounced as that which occurs at other side channel sites.

## Site 147.1L

Site Description: This site is located on the left of Fat Canoe Island on the west bank of the Susitna River (Plate III-8). The study reach extends the entire length of the site (1,780 ft) and ranges from 350 ft wide at the mouth to 250 ft wide at the head. Six cross sections were established to define the deep, fast velocities in the channel (Figure III-43). The substrate is large cobble and boulder with a thick layer of sand along the right bank of the lower three cross sections. The available cover is provided by the large substrate.

The side channel has been observed breached at discharges as low as 5,000 cfs. Site flows of 6,670, 2,470 and 1,710 cfs correspond to mainstem discharges of 23,000, 10,400 and 7,400 cfs, respectively. This large study site was selected to represent large side channels that remain side channels at low mainstem discharges. An IFG-2 model was selected because of the large size of the channel and its uniform shape. Previous reconnaissance to the site indicated that rearing habitat was limited to the right streambank margin and a limited amount of data would be required to model this site with an IFG-2 model. Shoreline velocities were collected along both streambank margins.

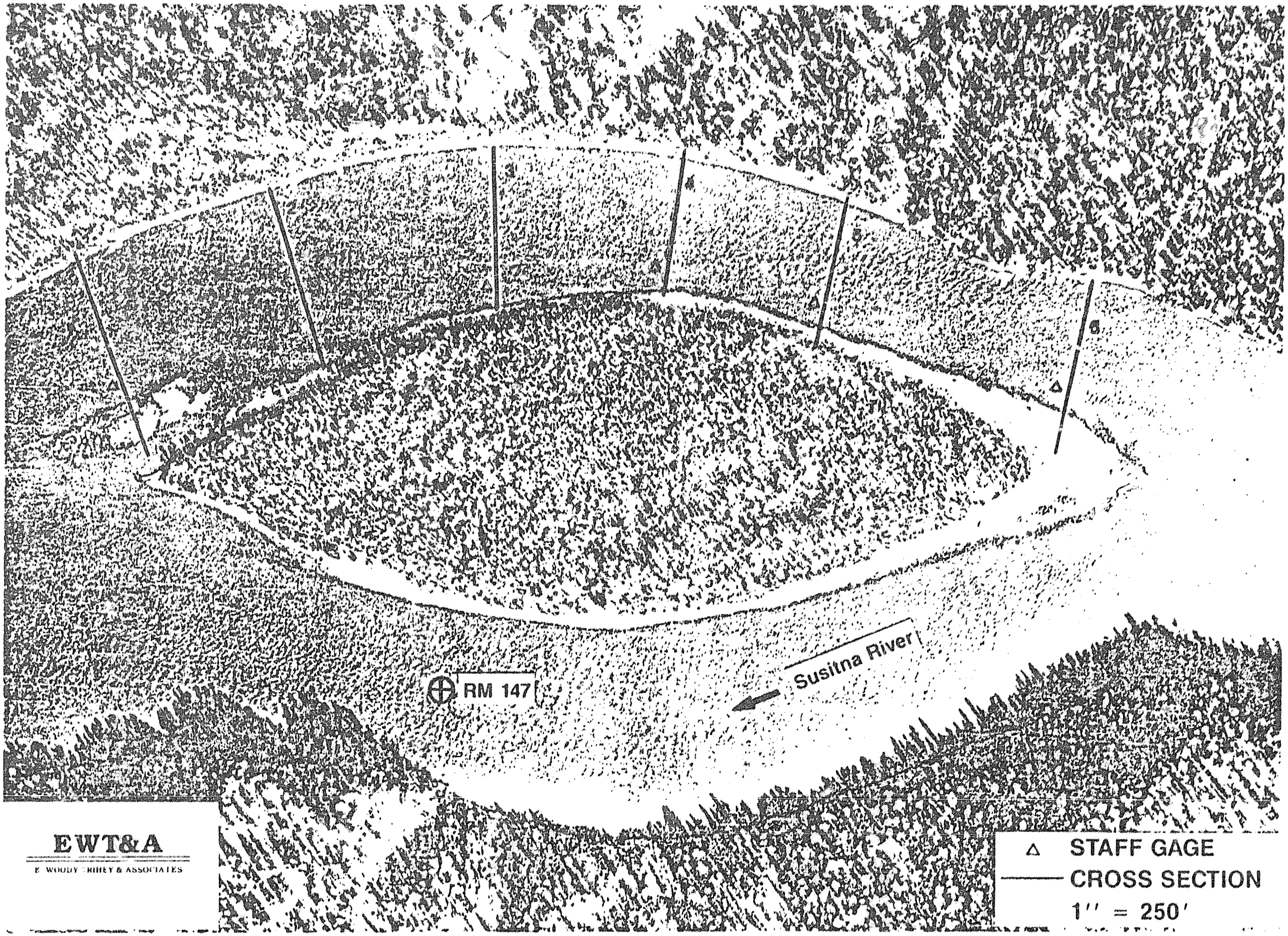





Plate III-8. Modeling site 147.1L on June 1, 1984 at mainstem discharge: 23,000 cfs.

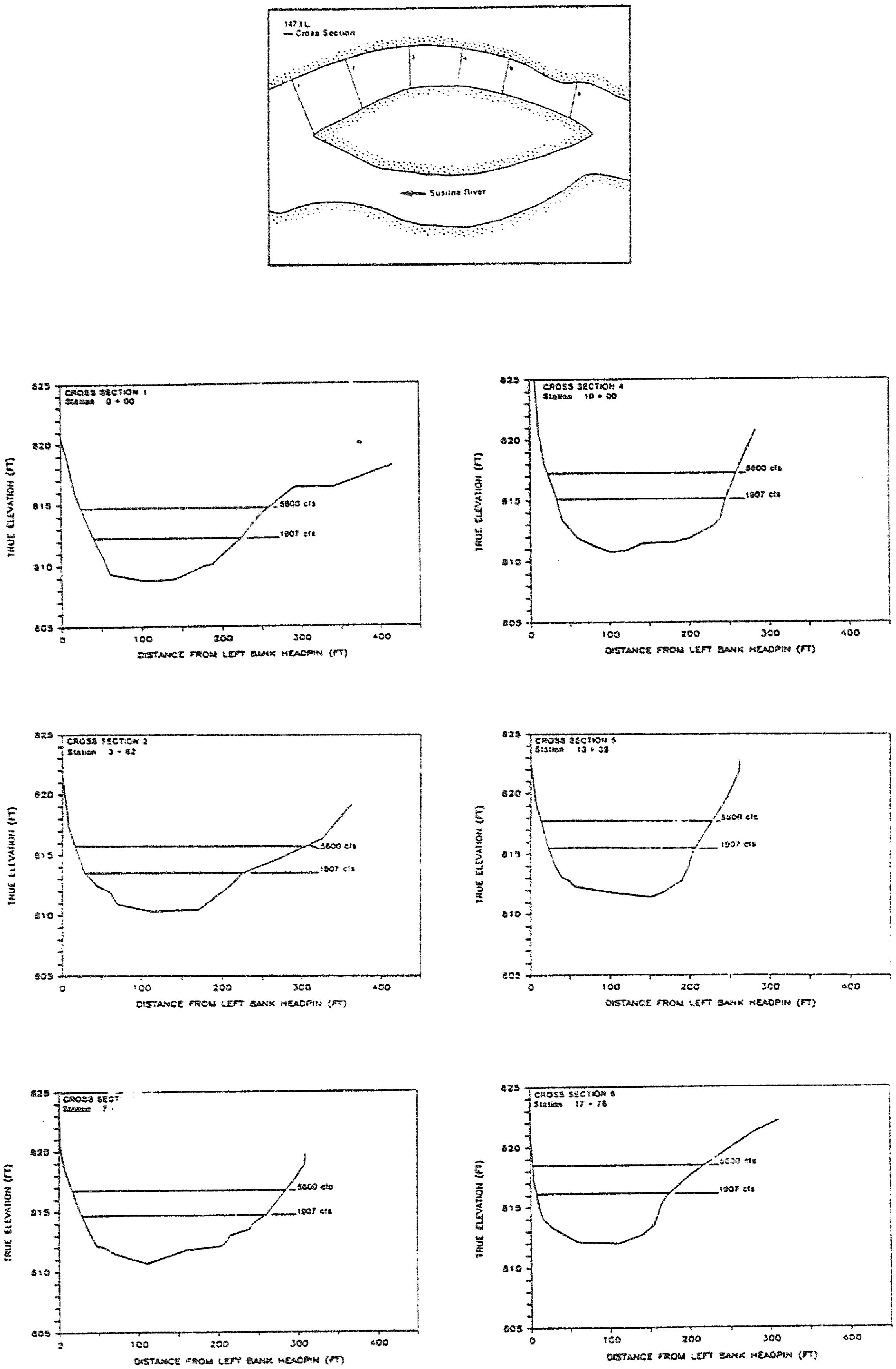



Figure III-43. Cross sections for 147.1L study site depicting water surface elevations at calibration discharges of 1907 and 5600 cfs.

Adult salmon have not been observed at the site however some juveniles were observed along the right bank.

Calibration: The data available to model the site included level surveys for all six cross sections and the hydraulic data summarized in Table III-13.

Table III-13. Hydraulic data available to calibrate the IFG-2 model for site 147.1L.

| Date | Flow (cfs) | Discharge (cfs) | Calibration Cross Sections | Type* |
|---|---|---|---|---|
| 840917 | 1907 | 8130 | 2,4<br>1,3,5 | D<br>S |
| 840913 | 2154 | 9000 | 4 | D |
| 940907 | 2650 | 10,700 | 1,2,3,4,5,6 | S |
| 840829 | 4742 | 17,400 | 5 | D |
| 840828 | 5300 | 19,000** | 1,2,3,4,5,6 | S |
| 840821 | 5600 | 20,000** | 1,2,3,4,5,6 | S |

* D = Discharge measurements (includes mid channel and shoreline measurements).
S = Shoreline measurements (does not include mid channel measurements)
** = Adjusted to instantaneous discharge

Two models were required to simulate side channel hydraulics over the mainstem range of 5,000 to 35,000 cfs. This is mainly due to the increasing proportion of side channel conveyance in the shelf area along the right bank at high flows. Velocity profiles were developed at each cross section based on the site flows of 1,907 and 5,600 cfs for the low and high flows hydraulic models, respectively. In calibrating the two models with respect to depth, predicted water surface elevations at cross sections 2 through 6 were compared to water surface elevations calculated from the rating curves over a wide range of flows. Water surface profiles based on IFG-2 output for the calibration flows of 1,907; 2,154; 2,650; 4,742; and 5,300 cfs and for the flows corresponding to mainstem discharges of 5,000 and 35,000 cfs are shown in Figure III-44. Observed water surface elevations for the calibration flows and rating curve water surface elevations for the model limit flows are also shown.

Verification: Figures B-2.9 and B-2.10 show velocity profiles produced by the two IFG-2 models at cross section 2 for calibration flows of 1,907 and 5,600 cfs. The observed velocities for those flows are also plotted. The figures demonstrate that the set of "n" values that produces the proper velocity profile at the low flow does not accurately produce that of the high flow, and vice versa.

Application: The low flow model represents site conditions for mainstem discharges up to 13,500 cfs, while the high flow model is applicable for mainstem discharges greater than 13,500 cfs. This breakpoint corresponds to a site flow of 3,500 cfs. Limits for which the models can be considered excellent exceed the range of available stage information. Models were extrapolated beyond the data range down to 5,000 cfs in the low flow model, and up to 35,000 cfs in the high flow model. The overall rating for both models is excellent.

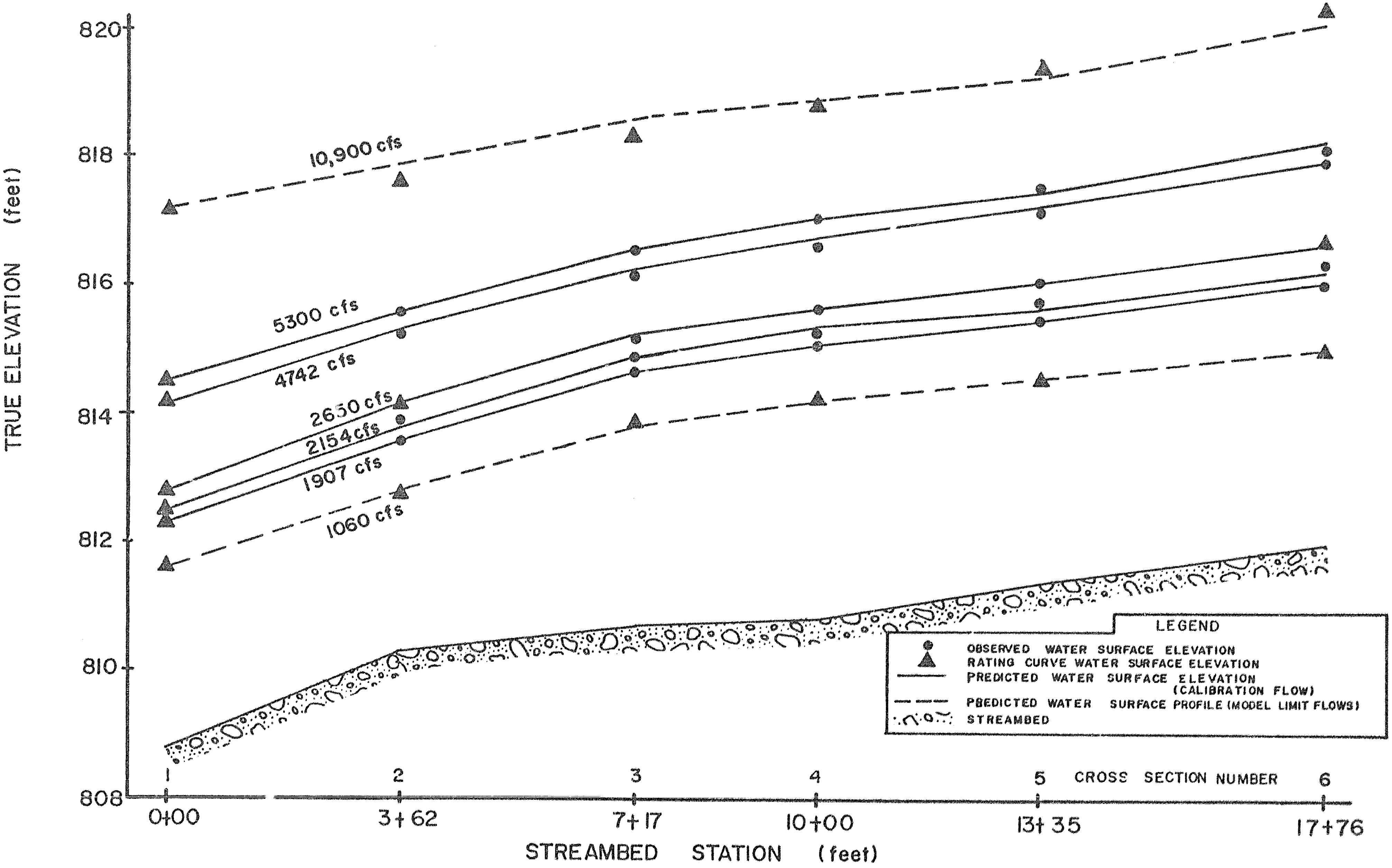
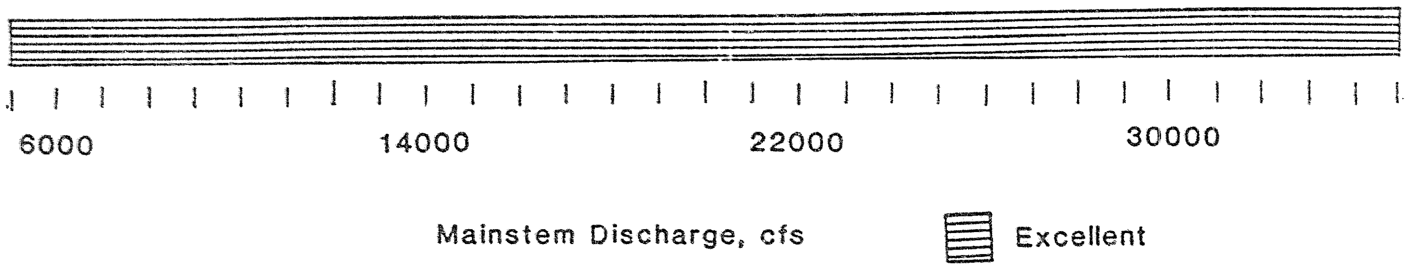



Figure III-44. Comparison of observed and predicted water surface profiles from calibrated model at 147.1L study site.

The application range and ratings are summarized below in the bar chart.




The wetted surface area and juvenile chinook WUA response functions for this study site, shown in Figure III-45a and b may be considered fairly representative of mainstem channel areas. The ratio of juvenile chinook WUA to surface area at this site is very low. Williams (1985) demonstrated that suitable rearing areas in large side channels of the middle river are primarily confined to nearshore zones, due to high (non-suitable) velocities existing elsewhere in the channels. Figure III-45b indicates a slight increase in juvenile chinook WUA with increasing discharge. However when viewed in perspective with wetted surface area, juvenile chinook WUA may be considered relatively constant between 5,000 and 35,000 cfs.

The surface area and WUA response functions were forecast using the high and low flow IFG-2 models previously described and the HABTAT model. Because this large side channel conveys mainstem water at discharges well below 5,000 cfs, only turbid water suitability criteria were used. The separate WUA curves forecast by the high and low flow models were similar within the range of overlap and intersected between 20,000 and 21,000 cfs. Therefore, WUA predicted by the low flow model was used for discharges of up to 20,500 cfs; above this discharge the high flow model was used.

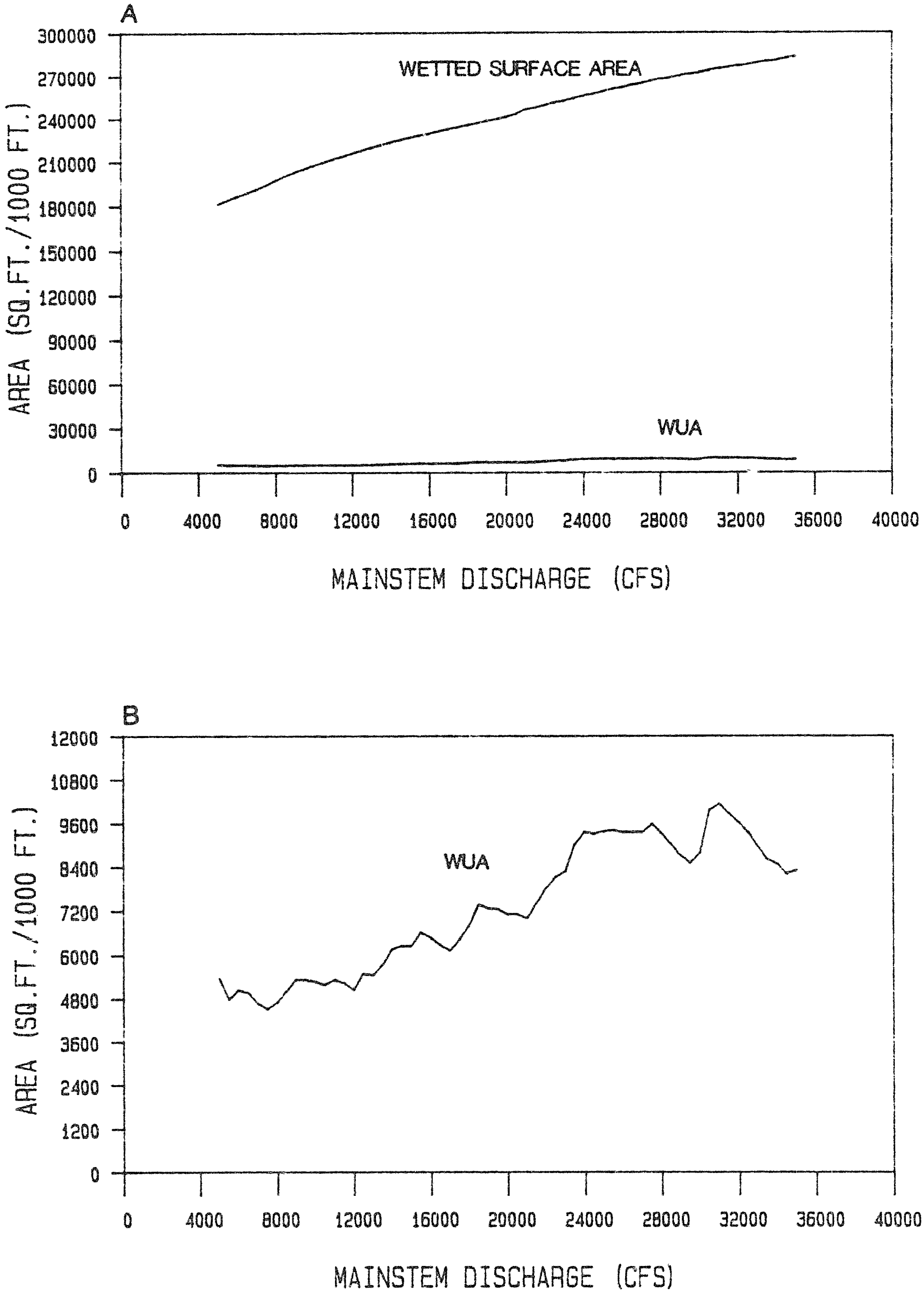



Figure III-45. Projections of gross surface area and WUA of juvenile chinook salmon habitat as a function of discharge for the 147.1L modeling site.

Because of its large size and low breaching discharge, the site flow hydrograph strongly resembles that for the mainstem throughout the open water season (Figure III-46). The time series plot for juvenile chinook WUA responds little to streamflow fluctuation because of the relatively constant amount of shoreline habitat that exist. A similar time series response is evident for the 136.0L site where rearing habitat is also restricted to shoreline margins because of unsuitable mid channel velocities.

A microhabitat
analysis is WUA
retaining – The form
changes when it is
extrapolated to
Macrohabitat

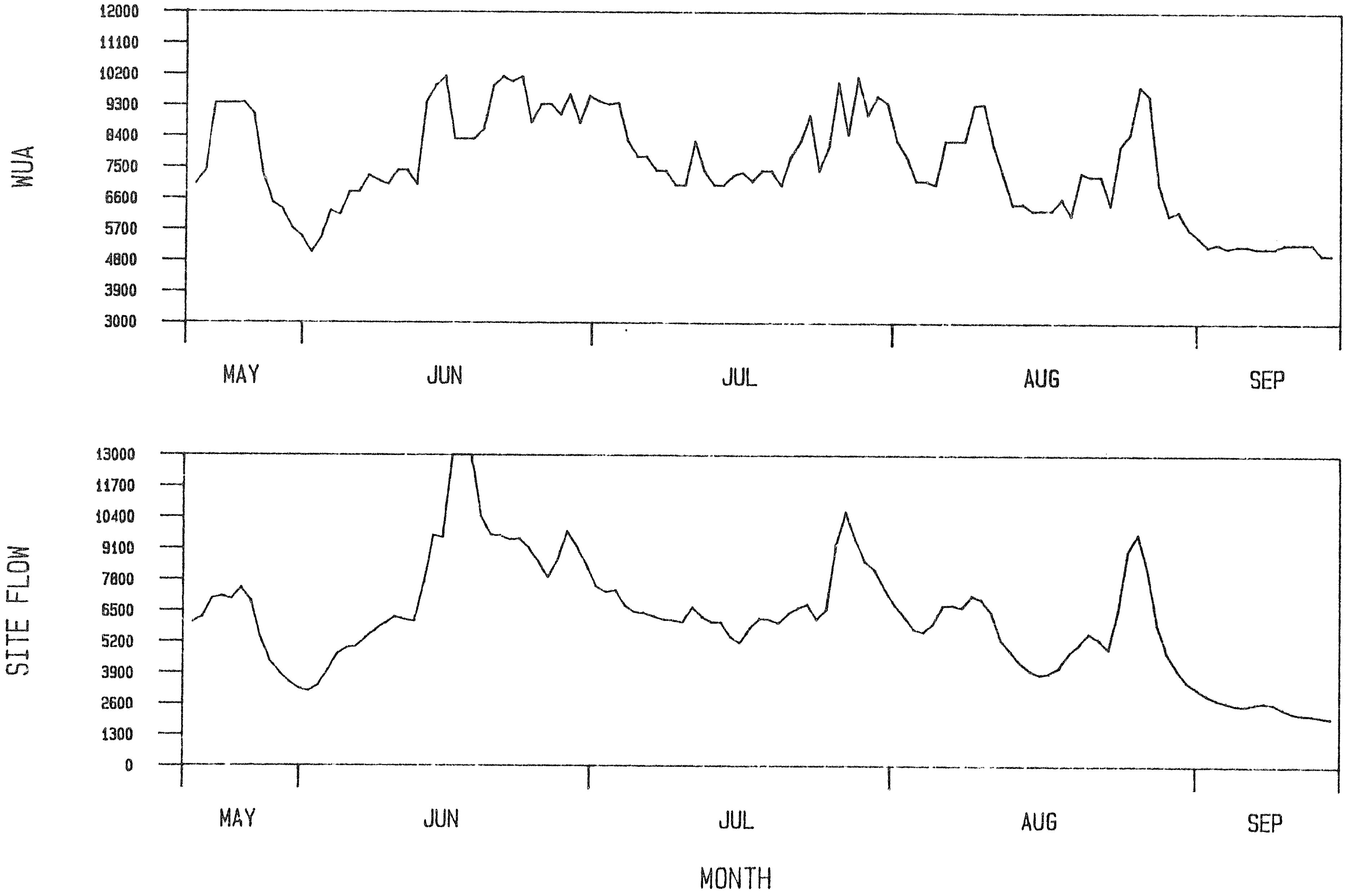



Figure III-46. Time series plots of juvenile chinook salmon WUA as a function of discharge from May 20 to September 15, 1984 for 147.1L modeling site.

## REFERENCES


Aaserude, R.J., J. Thiele, and D. Trudgen. 1985. Categorization of aquatic habitats in the Talkeetna-to-Devil Canyon segment of the Susitna River, Alaska. Preliminary draft report. E. Woody Trihey and Associates and Arctic Environmental Information and Data Center, University of Alaska, Fairbanks. Alaska Power Authority. Susitna Hydroelectric Project. 1 vol.

Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies. 1984. Procedures Manual, May 1983 - June 1984. Final draft. Report for Alaska Power Authority, Anchorage, AK 131 pp.

Barrett, B.M., F.M. Thompson, and S.N. Wick. 1984. Report No. 1. Adult anadromous fish investigations, May - October 1983. Susitna Hydro Aquatic Studies, Alaska Department of Fish and Game. Report for Alaska Power Authority, Anchorage, AK. Document 1450. 1 vol.

Bovee, K.D. 1982. A guide to stream habitat analysis using the instream flow incremental methodology. U.S. Fish and Wildlife Service. Instream Flow Information Paper No. 12. 1 vol.

E. Woody Trihey and Associates and Woodward-Clyde Consultants. 1985. Instream flow relationships report. Volume 1. Working draft. Alaska Power Authority. Susitna Hydroelectric Project. 1 vol.

Klinger-Kingsley, S. 1985. Response of aquatic habitat surface areas to mainstem discharge in the Talkeetna-to-Devil Canyon reach of the Susitna River, Alaska. Draft report. E. Woody Trihey and Associates. Alaska Power Authority. Susitna Hydroelectric Project. 1 vol.

Main, R. 1978. IFG-4 program user's manual. U.S. Fish and Wildlife Service. 45 pp.

Milhous, R.T., D.L. Wegner, and T. Waddle. 1984. Users guide to the Physical Habitat Simulation System. U.S. Fish and Wildlife Service. Instream Flow Information Paper 11. FWS/OBS - 81/43 Revised. 475 pp.

Schmidt, D.C., et al. 1984. Report No. 2. Resident and juvenile anadromous fish investigations (May - October 1983). Susitna Hydro Aquatic Studies, Alaska Department of Fish and Game. Report for Alaska Power Authority, Anchorage, AK. Document 1784. 1 vol.

Steward, III, C.R. (In preparation). Middle river aquatic habitat report. E Woody Trihey and Associates. Draft Report. Alaska Power Authority. Susitna Hydroelectric Project. 1 vol.

______. 1985. Suitability criteria recommended for use in IFR habitat modeling studies of the middle Susitna River. E. Woody Trihey and Associates, Anchorage, AK. Technical memorandum. 11 pp.

Trihey, E.W. 1979. The IFG incremental methodology. Pages 24-44 in G.L. Smith, ed. Workshop in instream flow habitat criteria and modeling. Colorado Water Resources Research Institute, Colorado State University, Fort Collins, CO. Information Series No. 40.

______. 1980. Field data reduction and coding procedures for use with the IFG-2 and IFG-4 hydraulic simulation models. Instream Flow Service Group. U.S. Fish and Wildlife Service, Fort Collins, CO.

Trihey, E.W., and N.D. Hilliard. 1984. Supplemental guidelines for calibrating the IFG-4 hydraulic model. In Bredthauer, S.R., chairman. Alaska's Water: A critical resource. Proceedings of the Alaska Section, American Water Resources Association. Institute of Water Resources, University of Alaska. Fairbanks, Alaska. Report 1WR 106. 1 vol.

Williams, S. 1985. The influence of project flows on hydraulic aspects of mainstem and side channel rearing habitats in the middle river for the period May 20 to September 15. E. Woody Trihey and ASsociates, Technical Memorandum.

Wilmott, C.J. 1981. On the validation of models, physical geography 2. V.H. Winston and Sons. p. 184-194.

# SUMMARY OF HYDRAULIC CONDITIONS AND HABITAT FORECASTS AT 1984 MIDDLE RIVER STUDY SITES

DRAFT REPORT

Appendix A
Summary of site-specific data collected to develop relationships between mainstem discharge, site flow and water surface elevation

Prepared for:

ALASKA POWER AUTHORITY

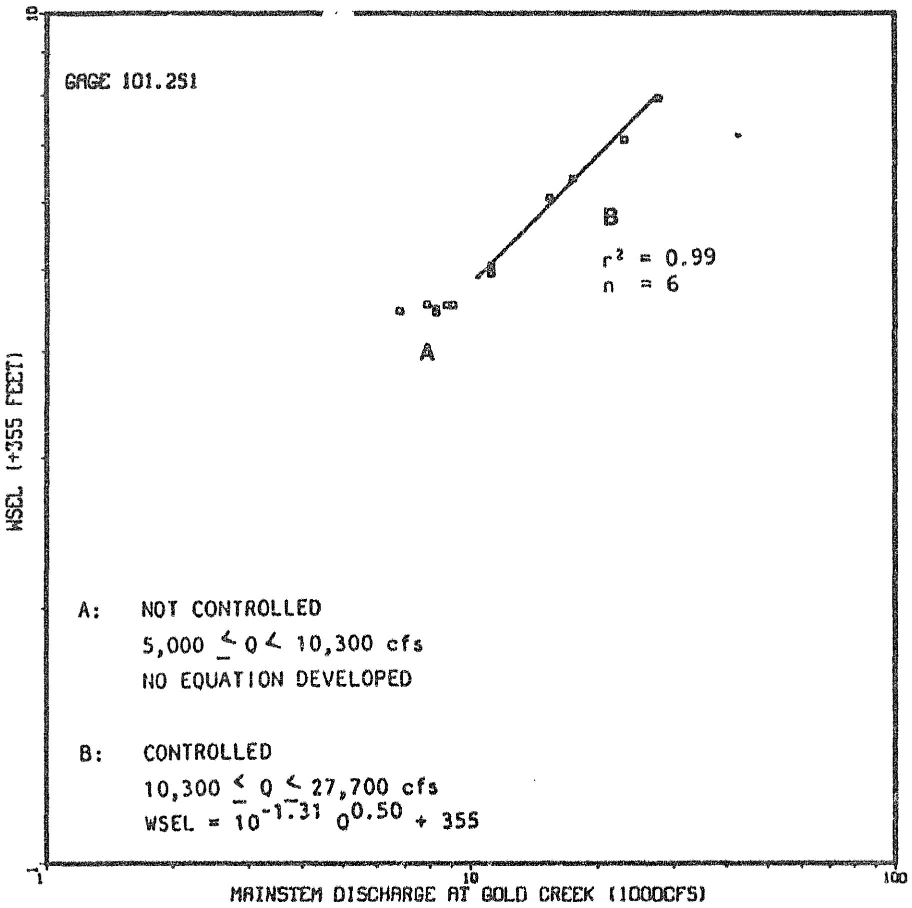
Prepared by:

N. Diane Hilliard
Shelley Williams
E. Woody Trihey
R. Curt Wilkinson
Cleveland R. Steward, III

May 1985

## APPENDIX FIGURES

## APPENDIX TABLES



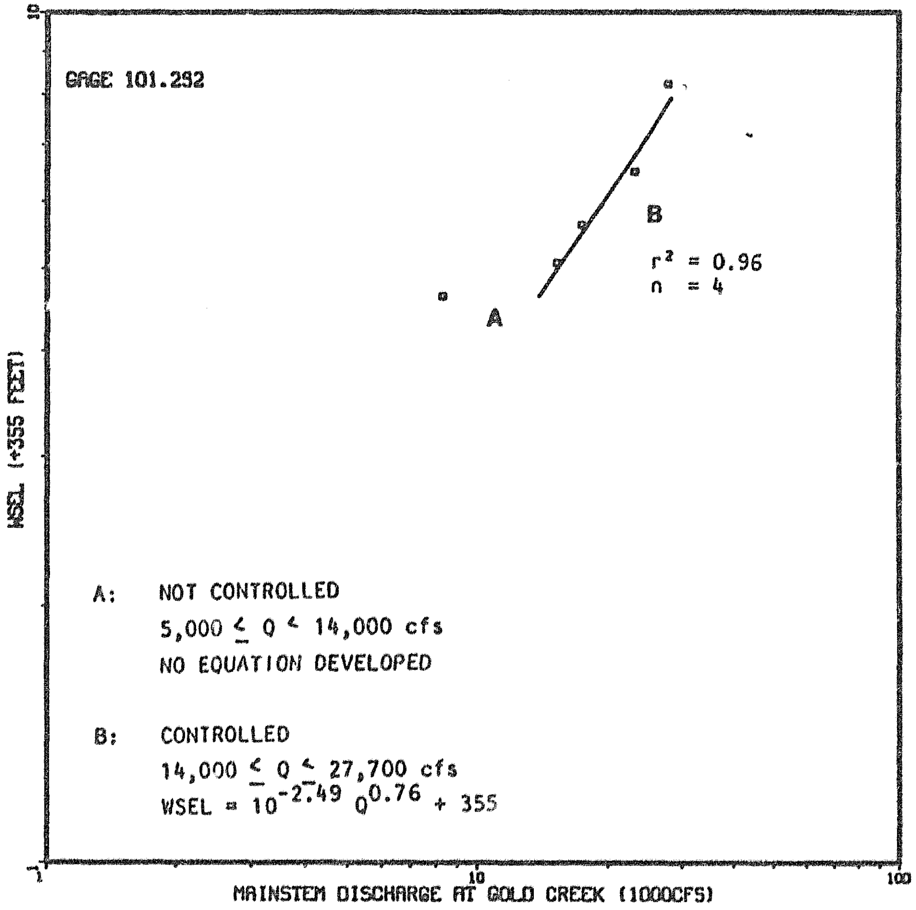
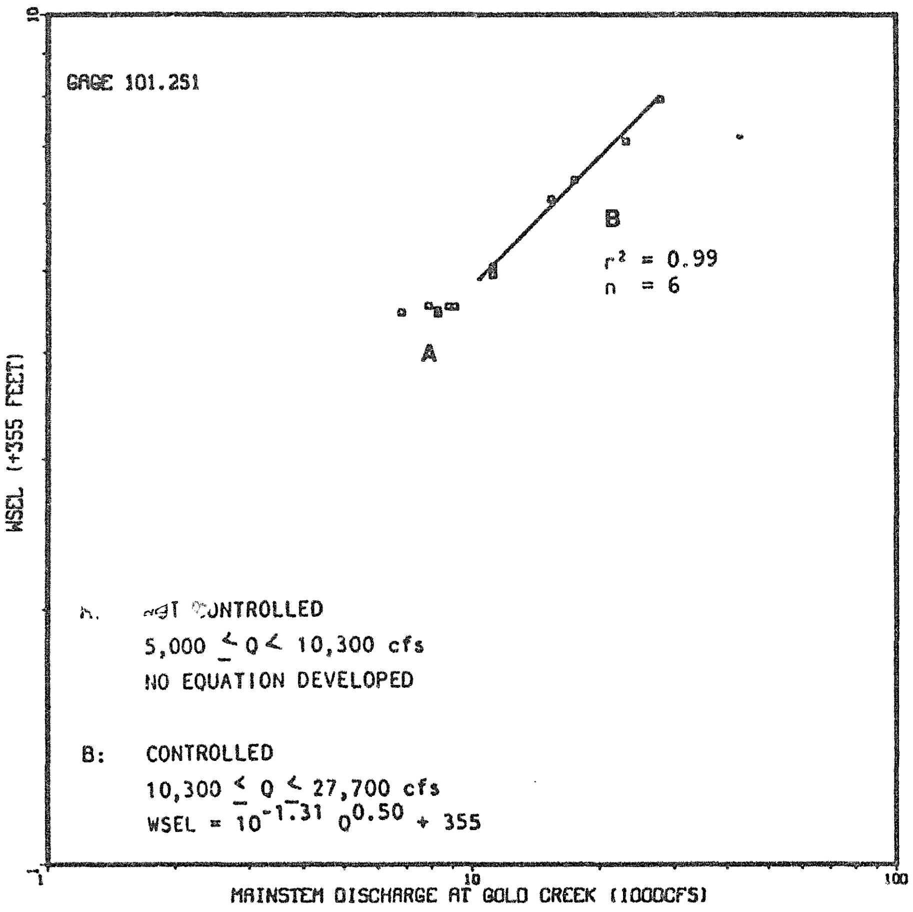




Figure A-1.1 Stage discharge curves for cross sections 1, 3, 4, 6, 7 and 9 at site 101.2R.



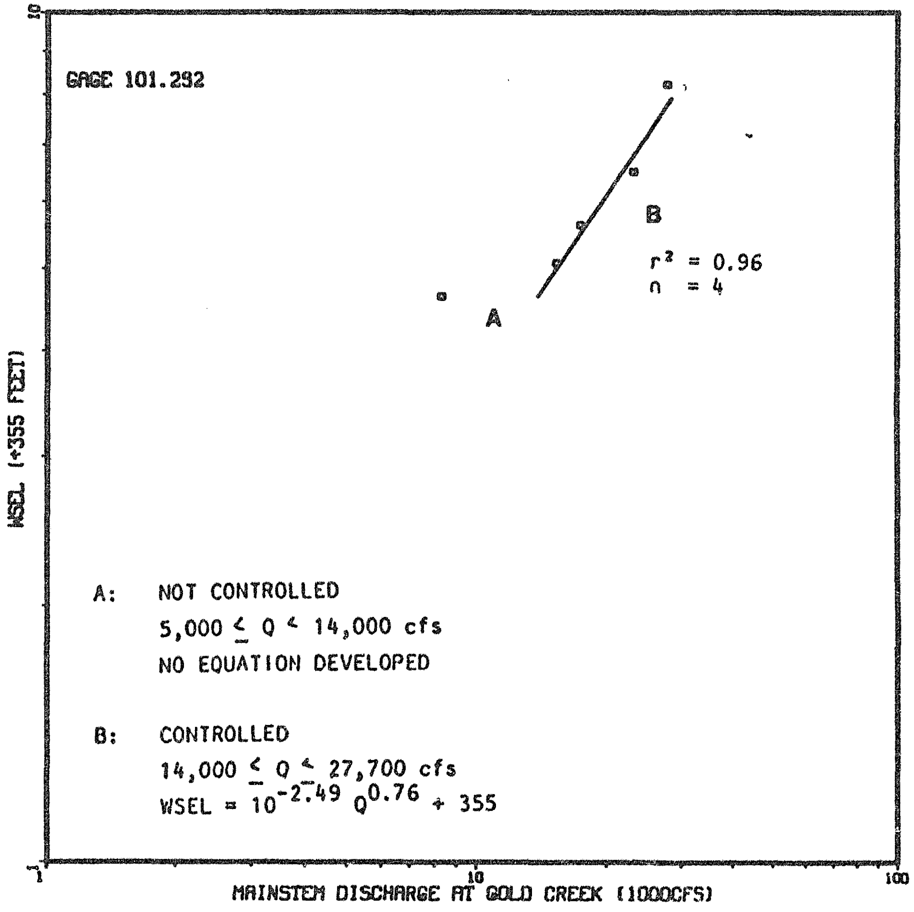
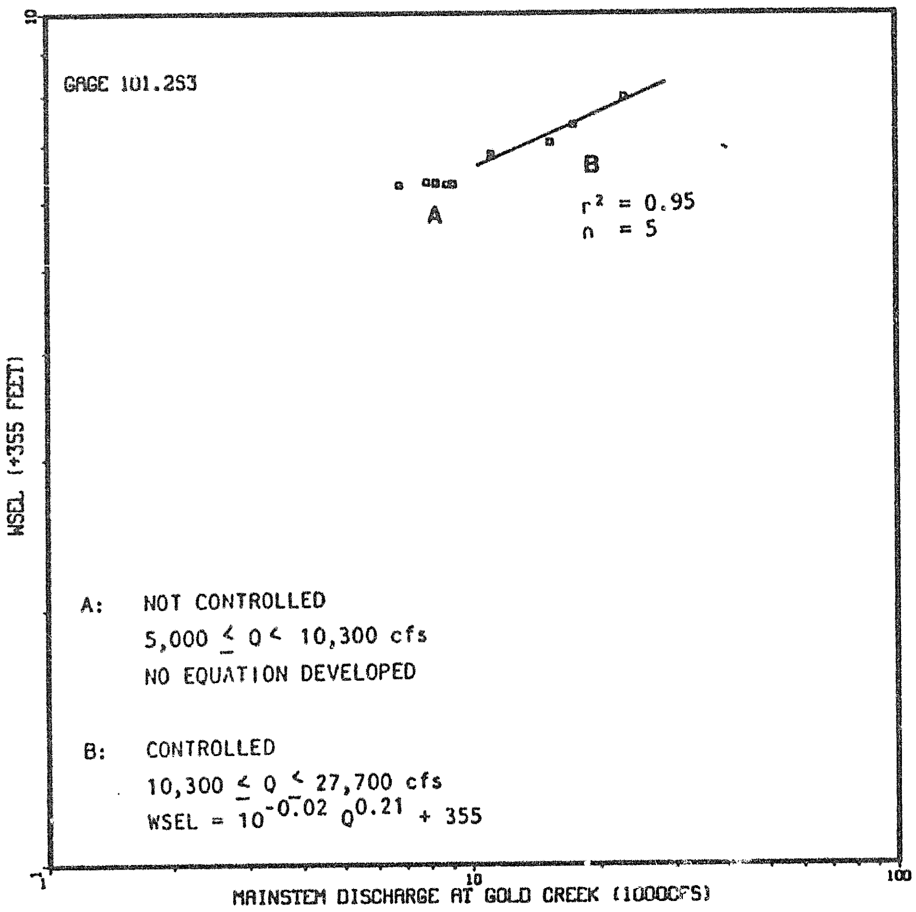




Figure A-1.1 Stage discharge curves for cross sections 1, 3, 4, 6, 7 and 9 at site 101.2R.



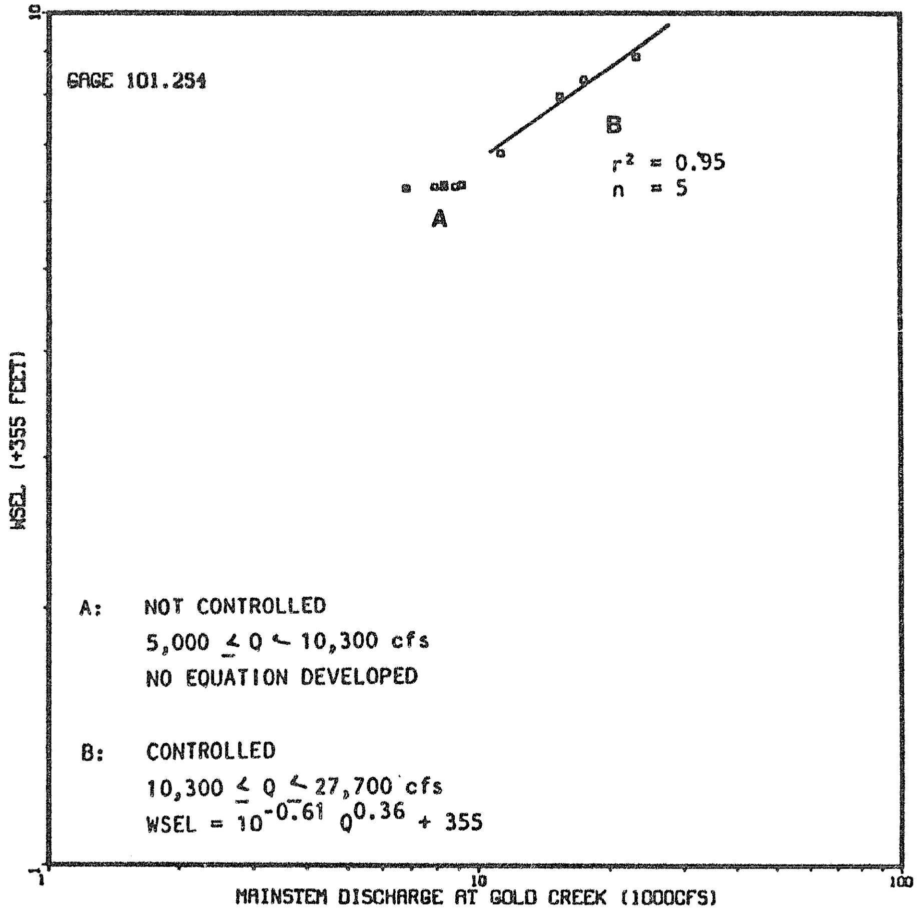
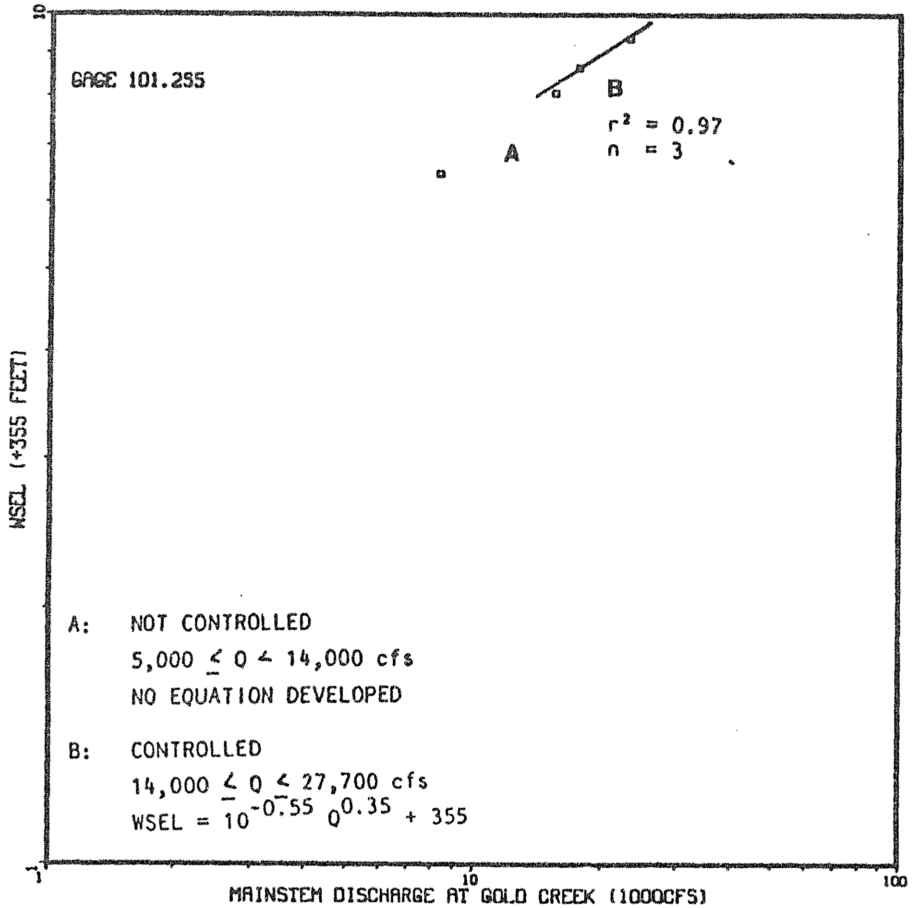




Figure A-1.1 Stage discharge curves for cross sections 1, 3, 4, 6, 7 and 9 at site 101.2R.



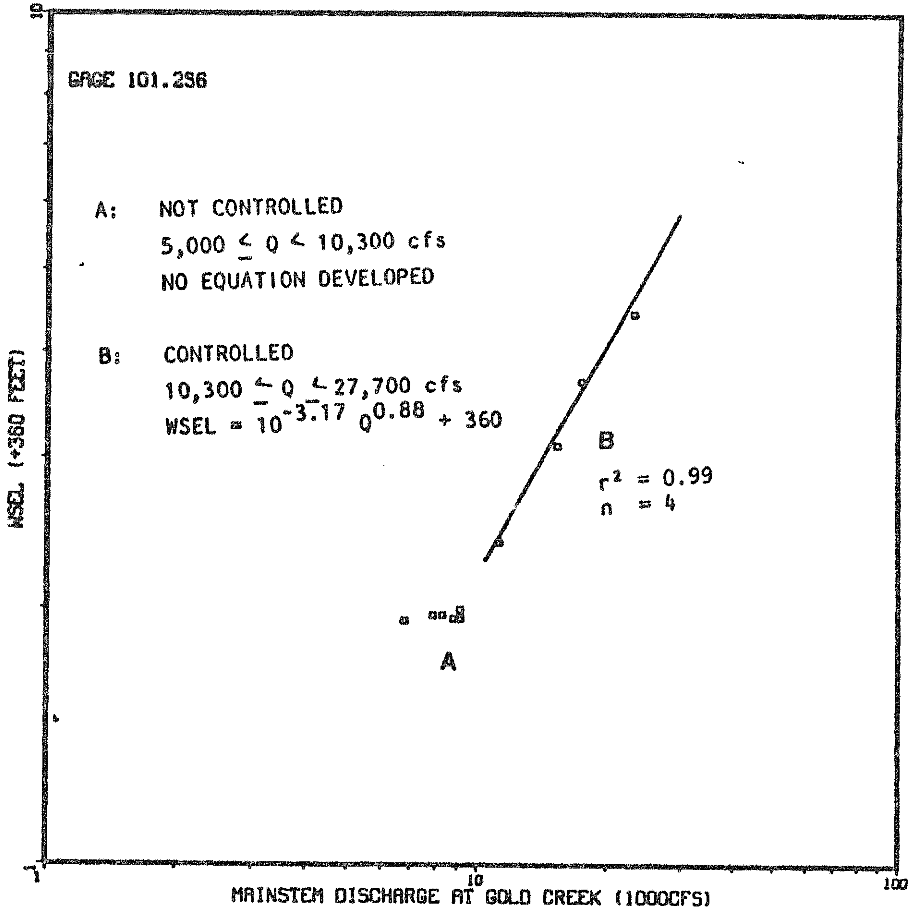
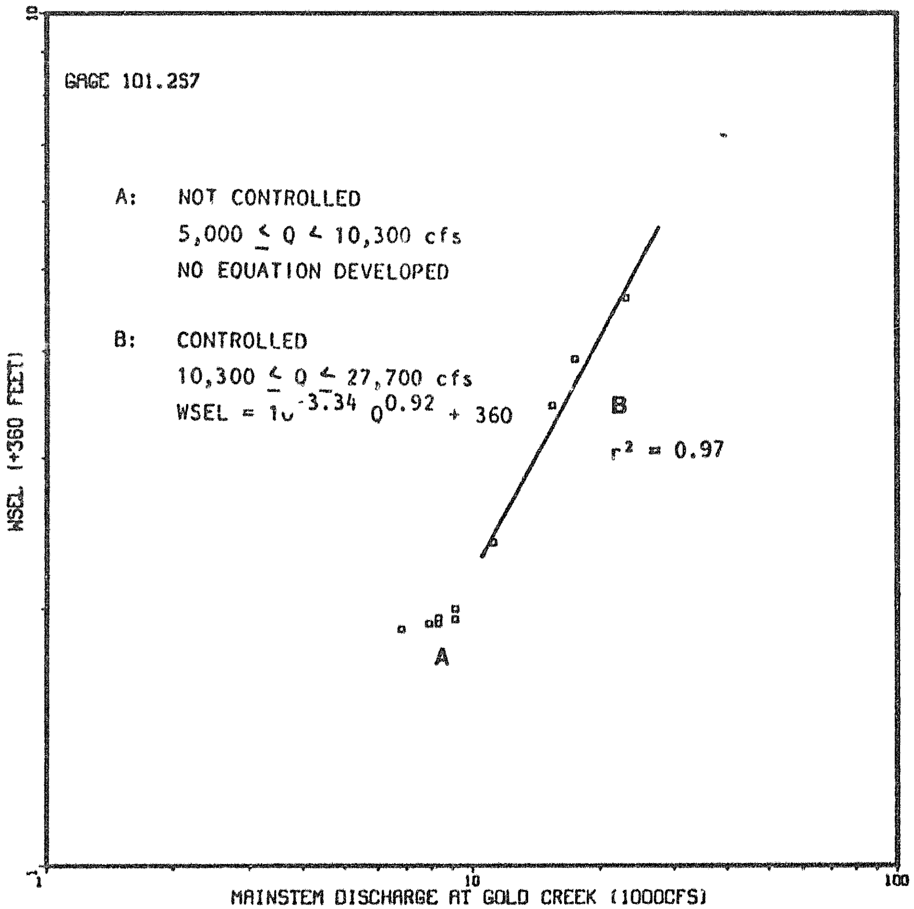




Figure A-1.1 Stage discharge curves for cross sections 1, 3, 4, 6, 7 and 9 at site 101.2R.



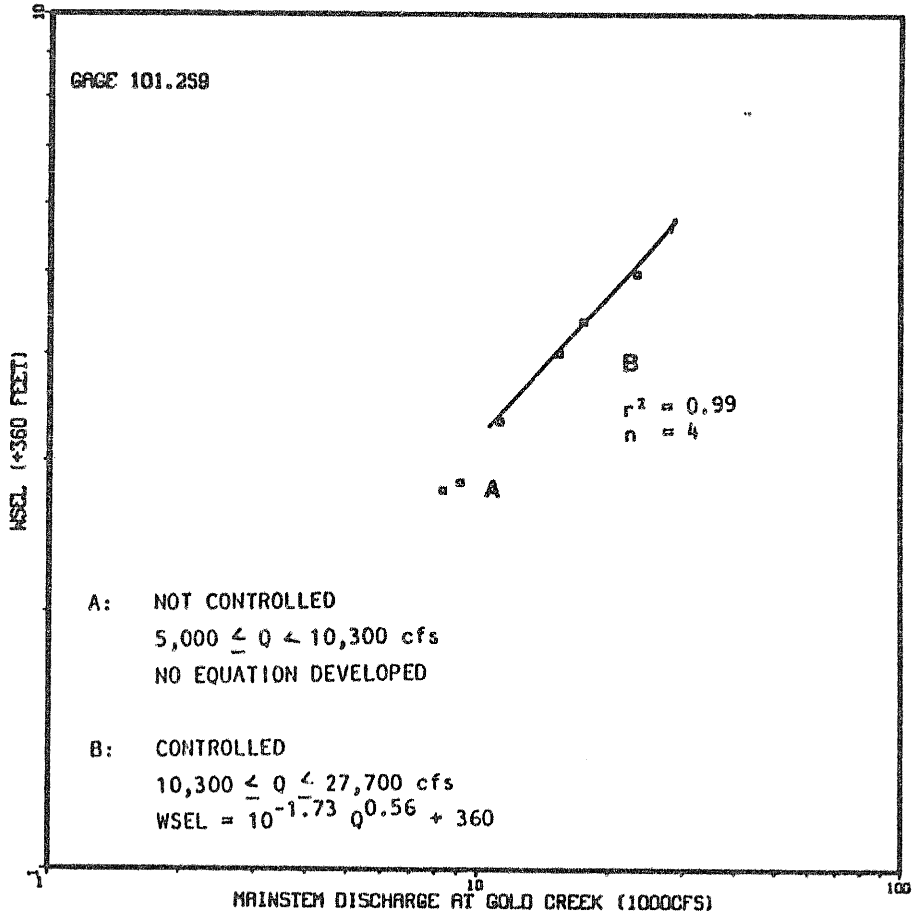




Figure A-1.1 Stage discharge curves for cross sections 1, 3, 4, 6, 7 and 9 at site 101.2R.

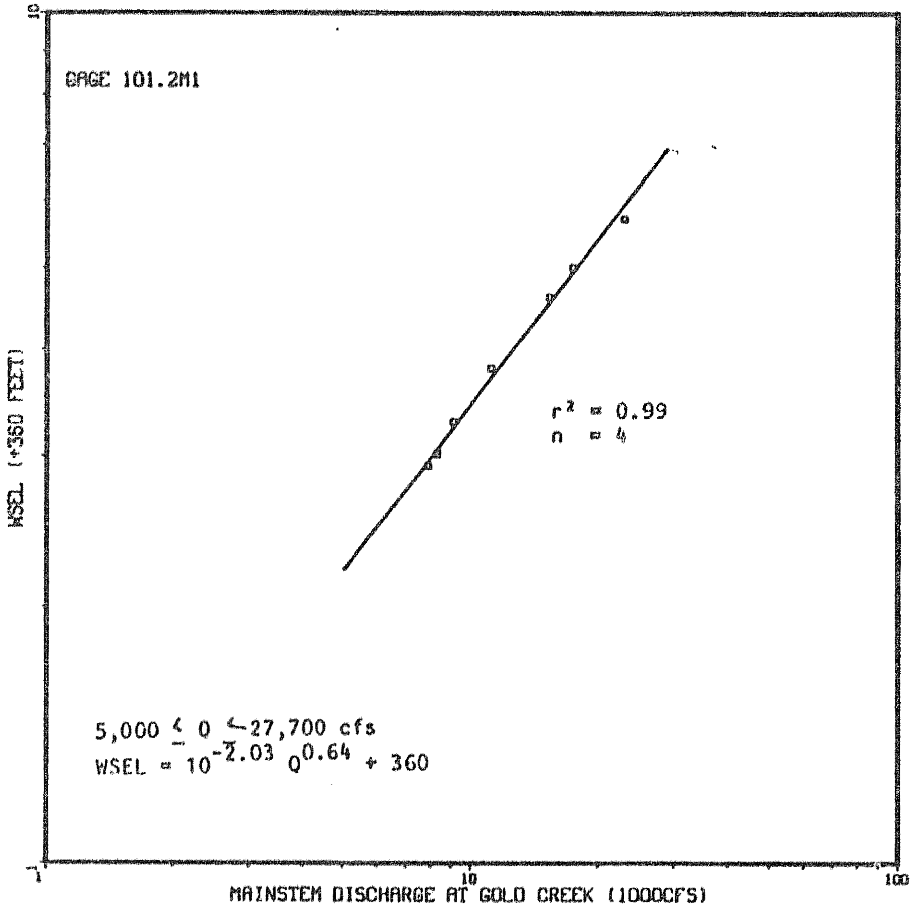
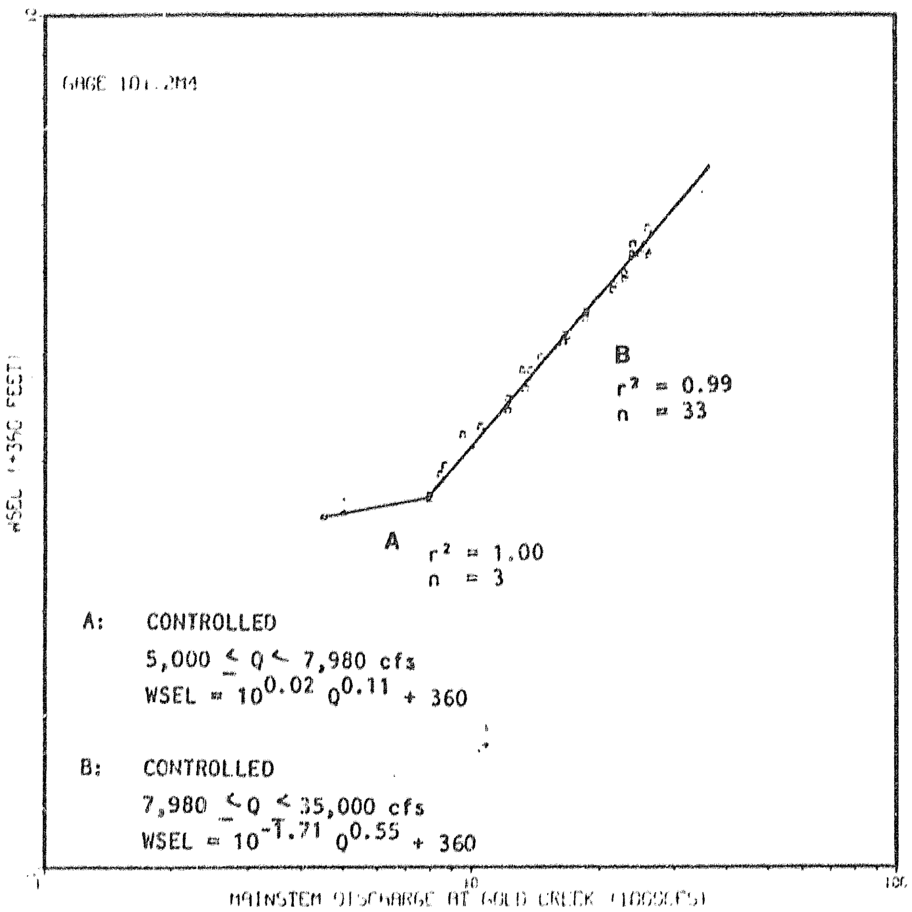



Figure A-1.1 Stage discharge curves for cross sections 1, 3, 4, 6, 7 and 9 at site 101.2R.



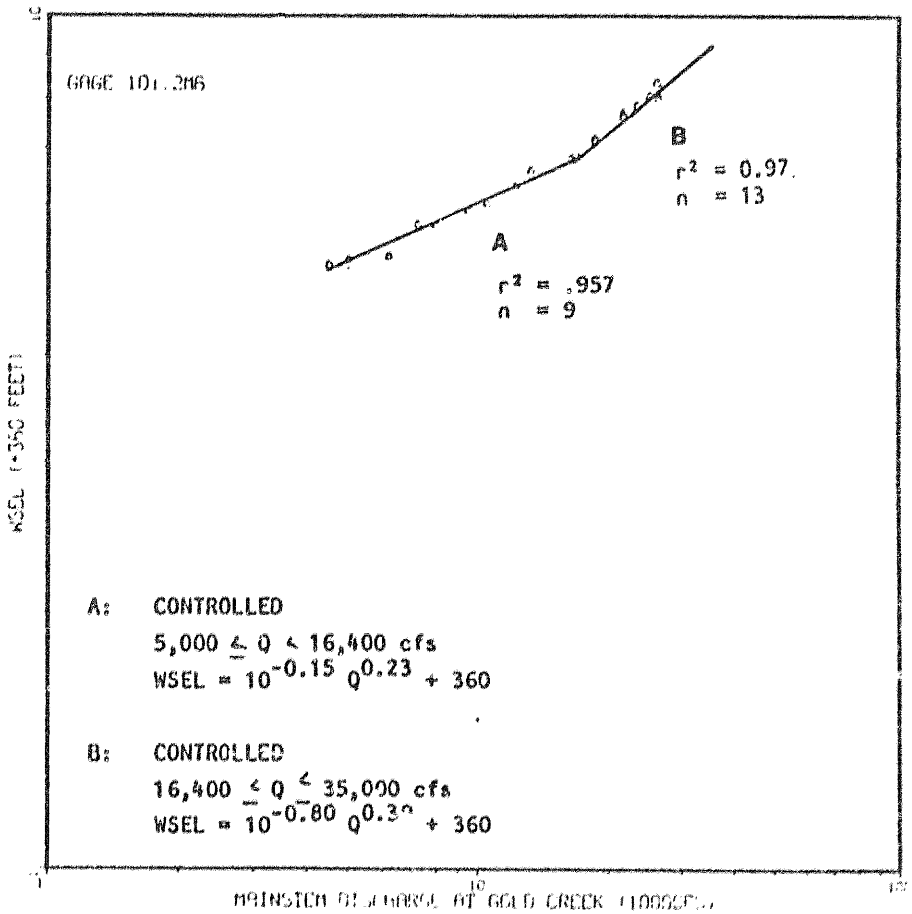
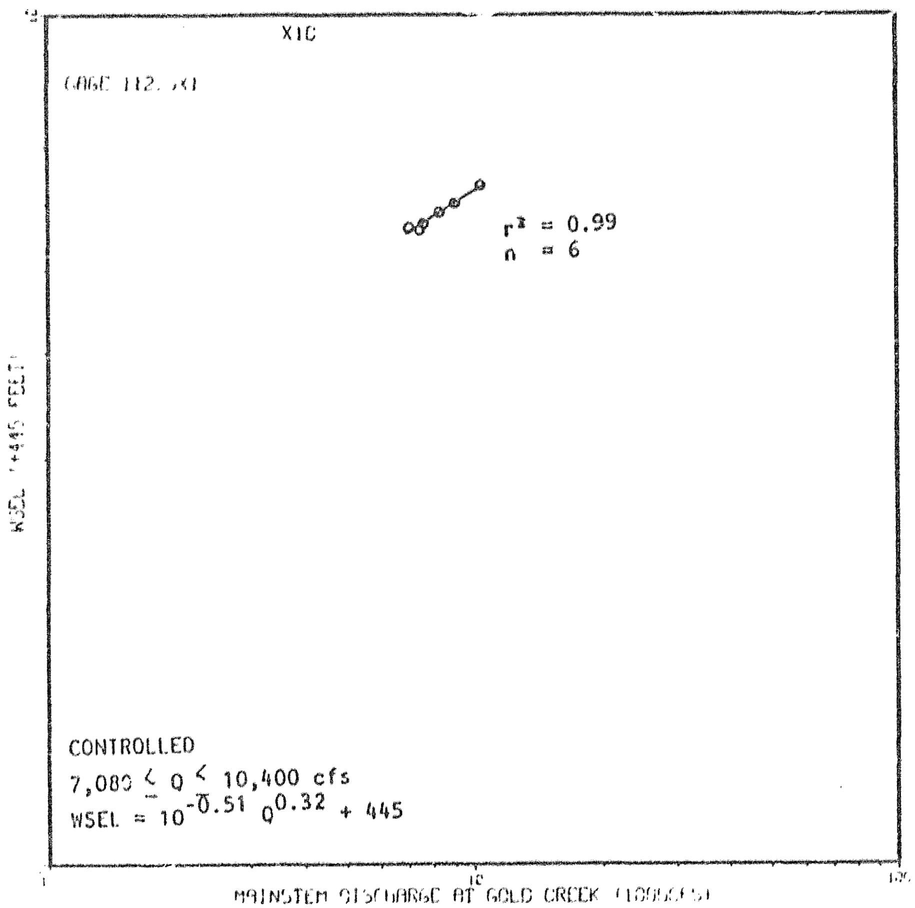




Figure A-1.2 Stage discharge curves for cross sections 2 and 5 at site 101.5L.



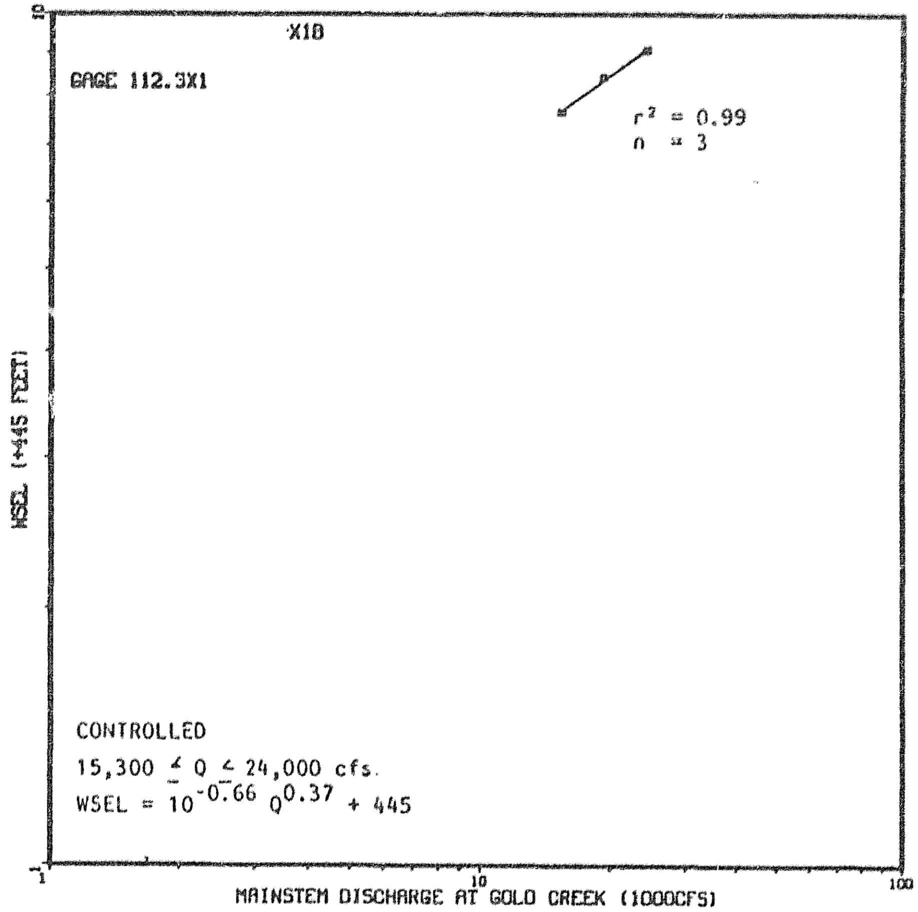
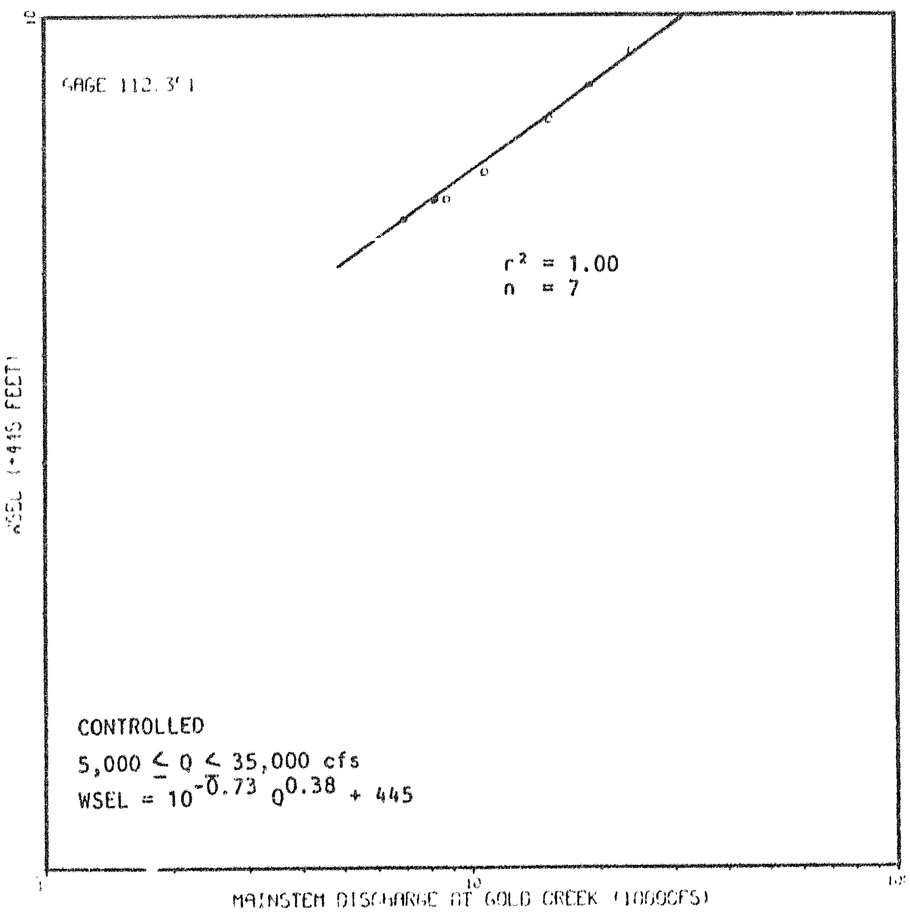




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



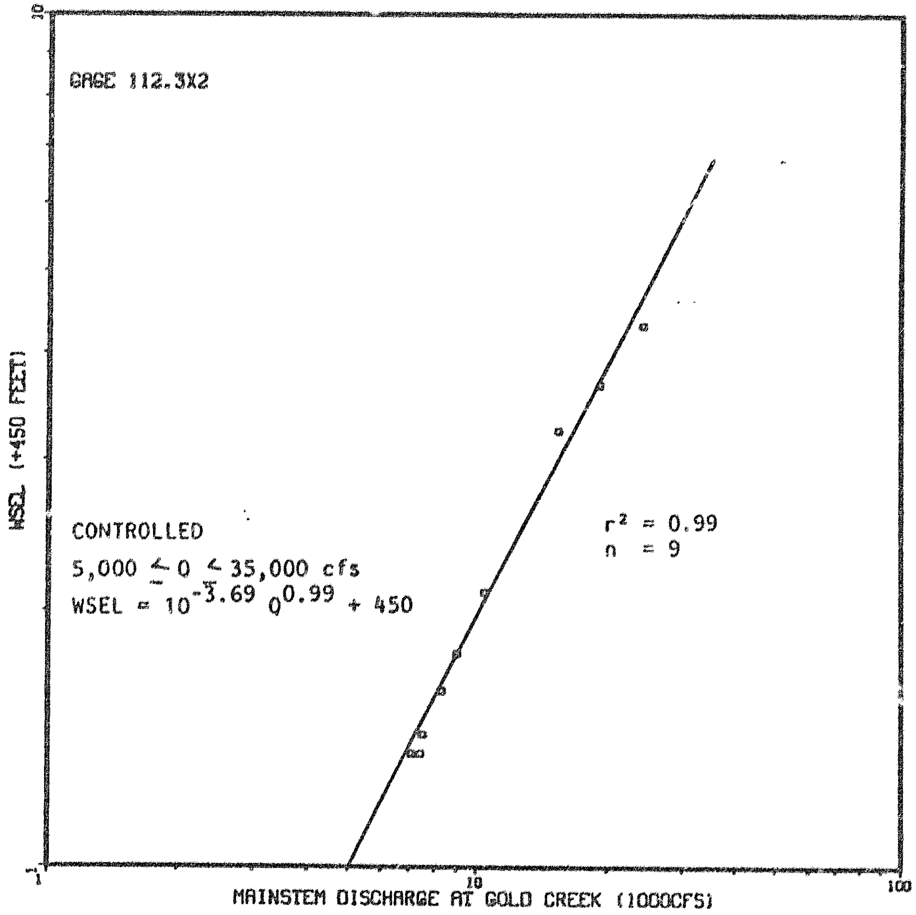
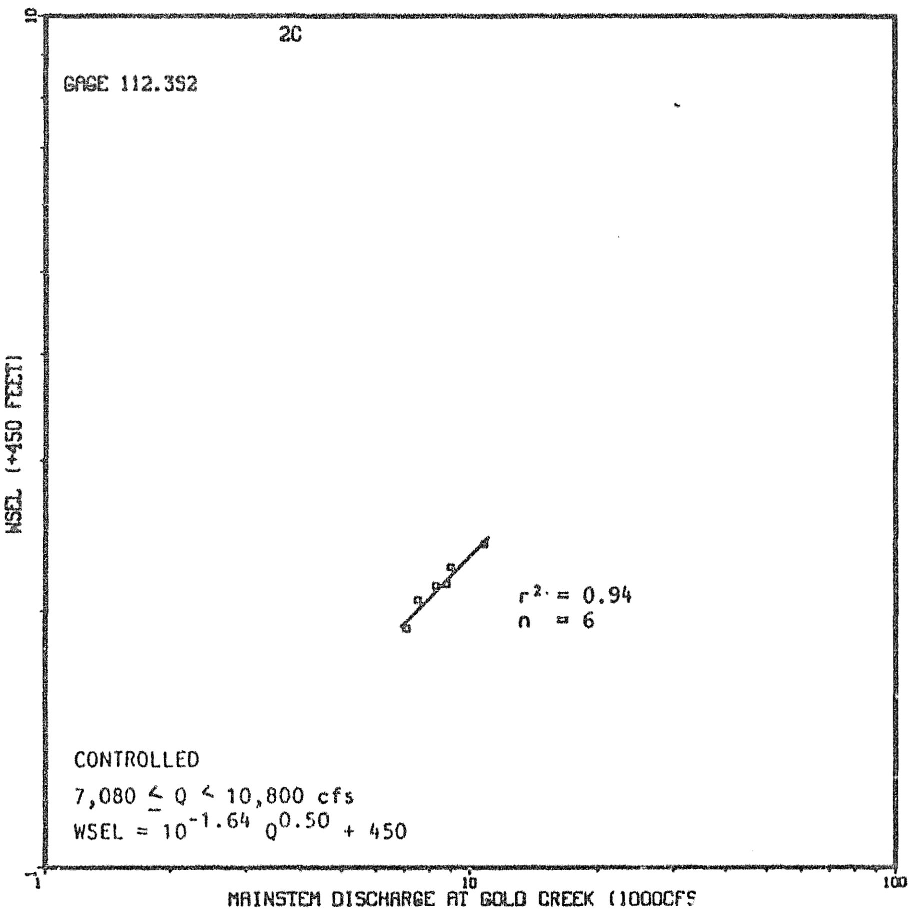




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



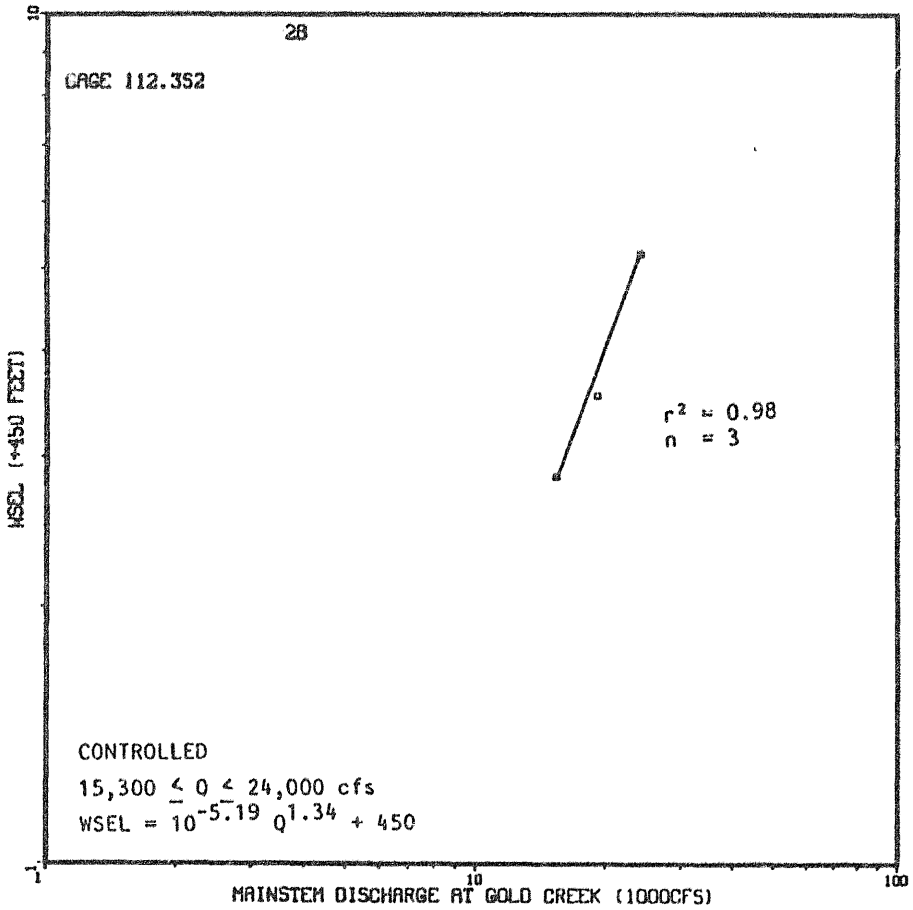
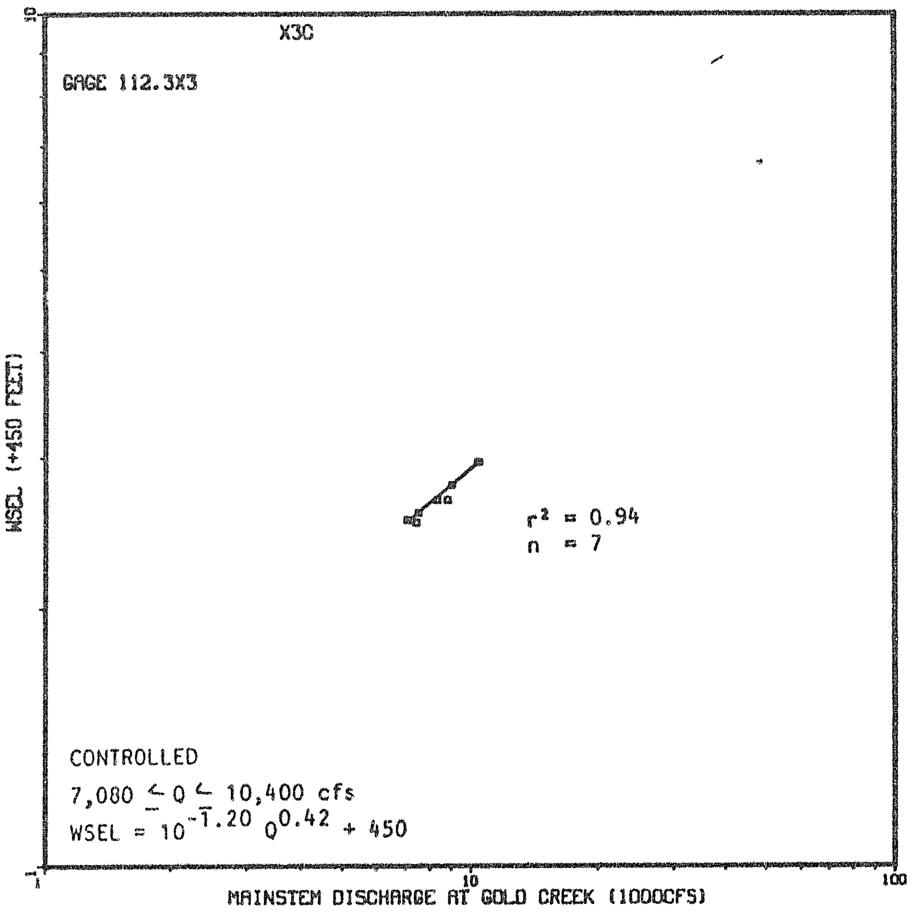




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



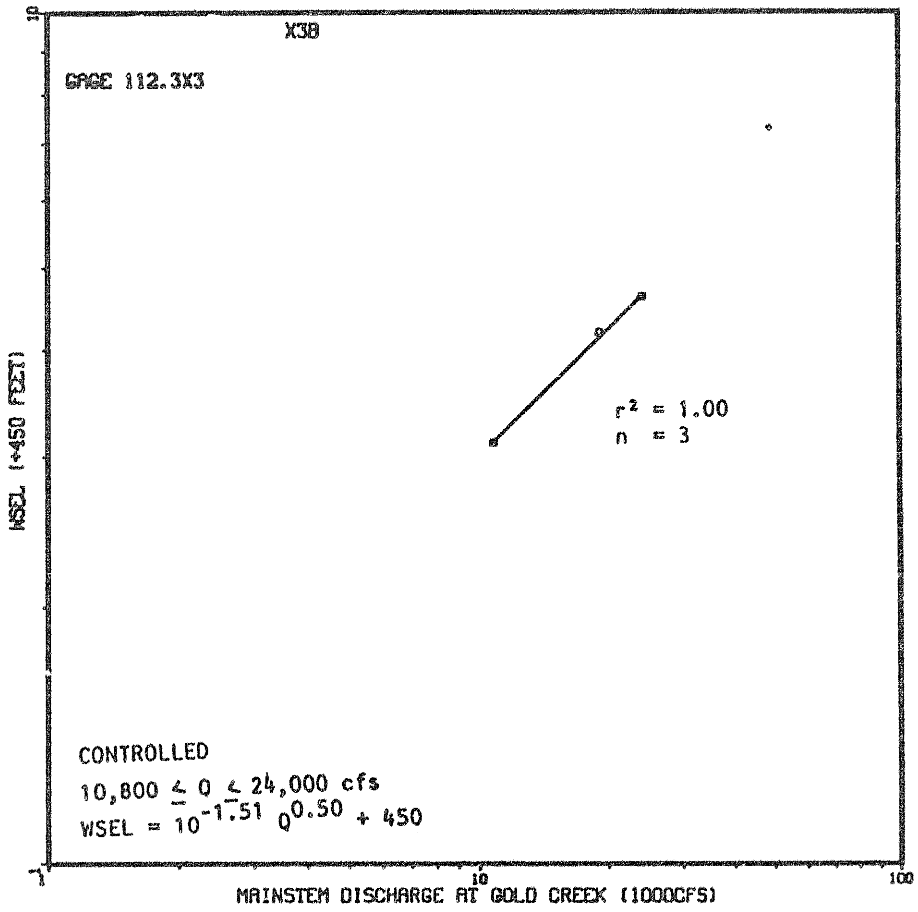
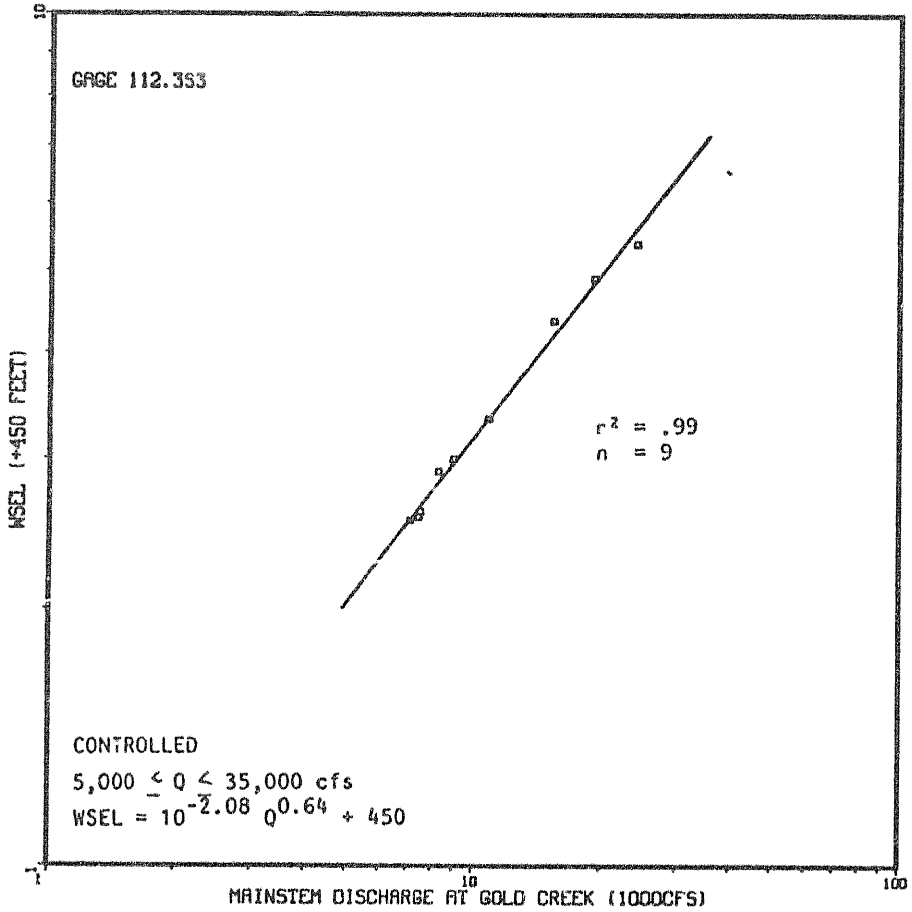




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



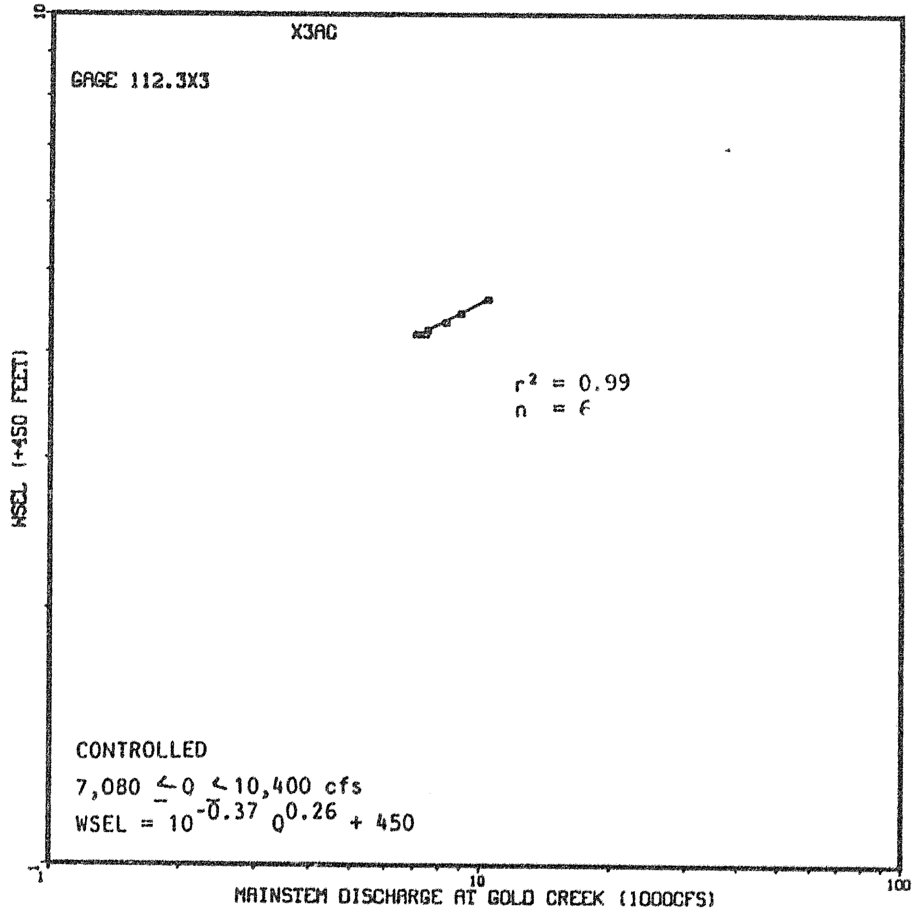
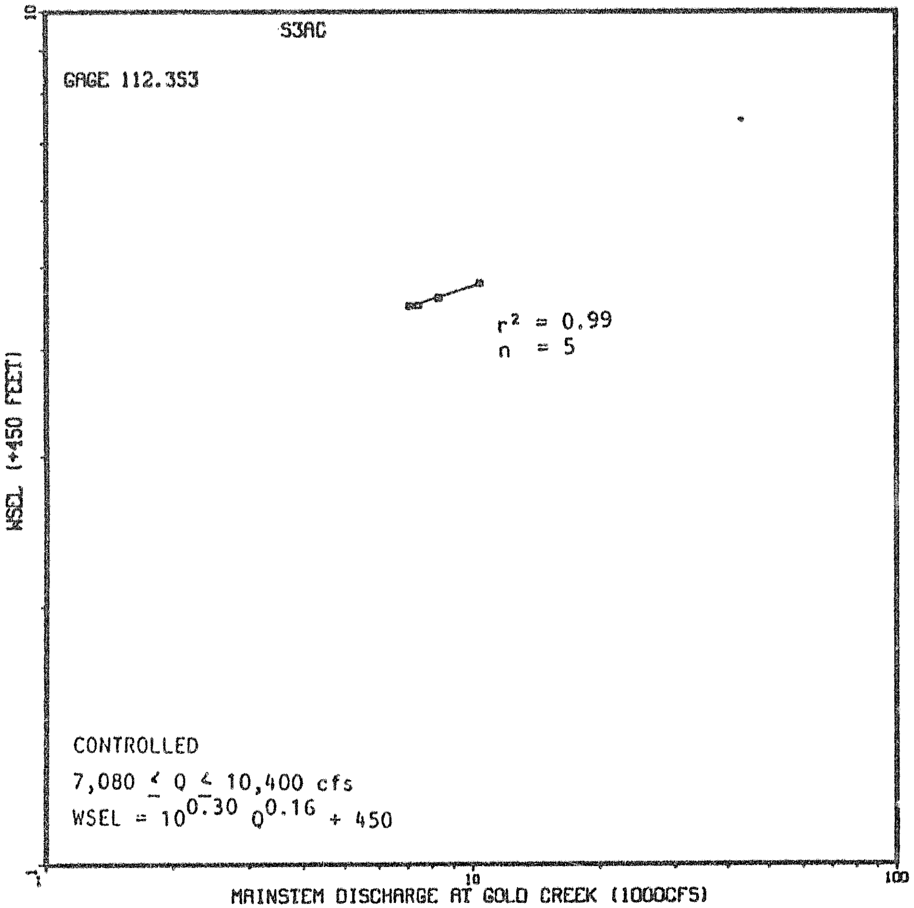




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



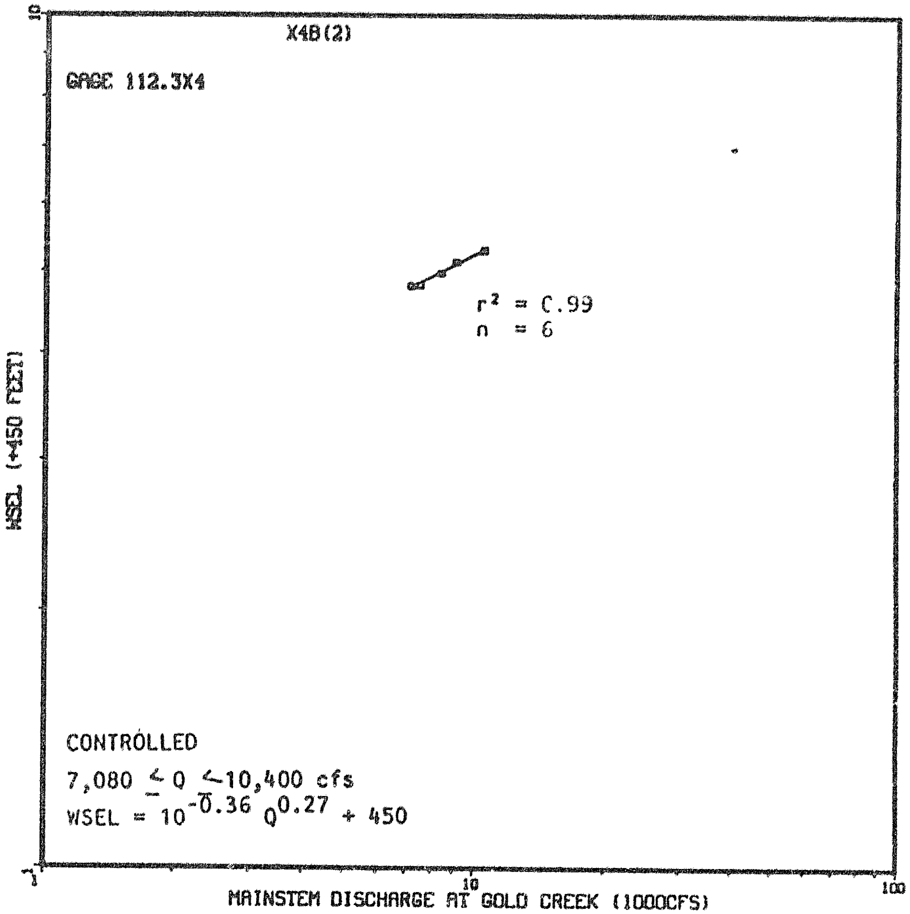




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.

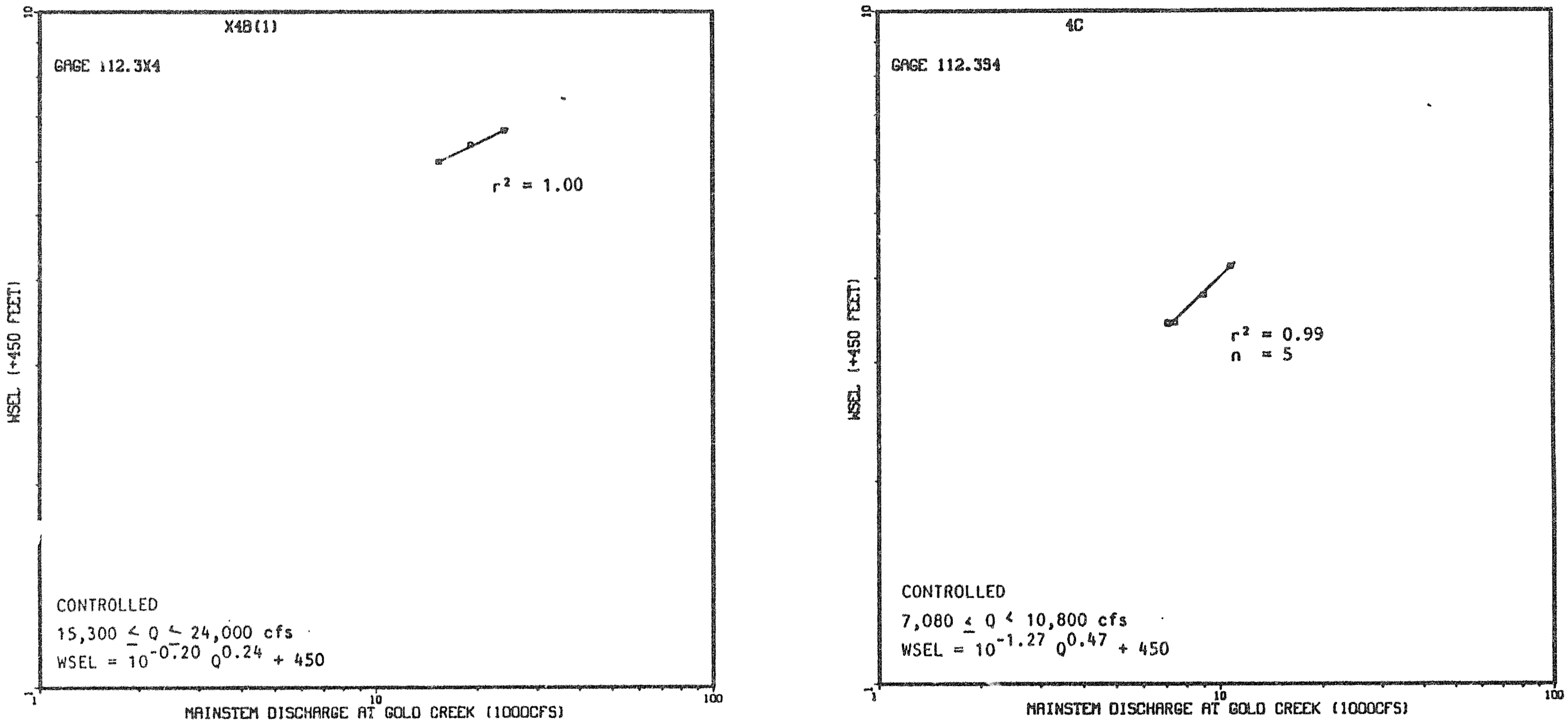
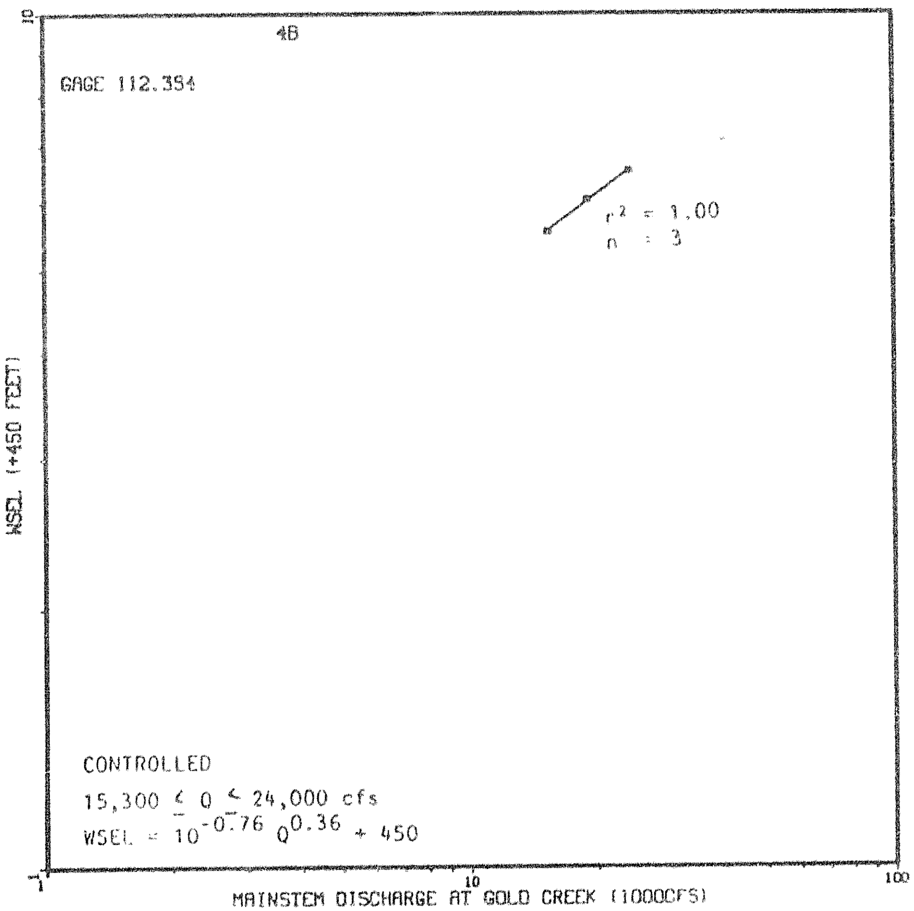



Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



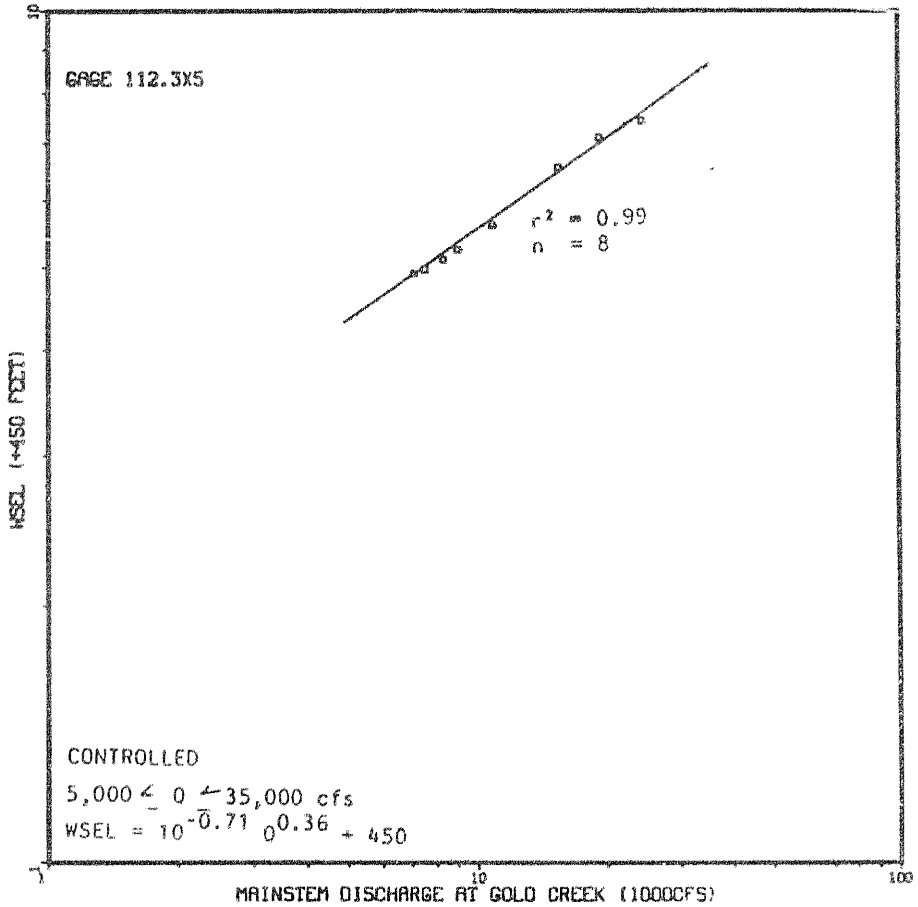
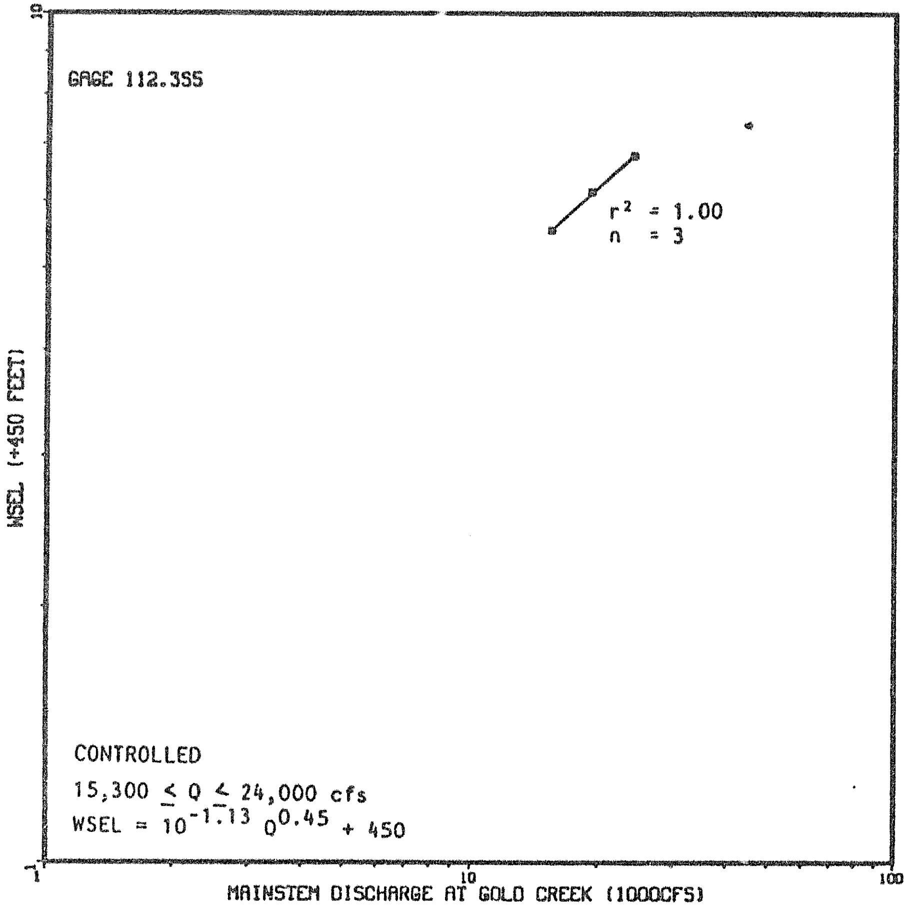




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



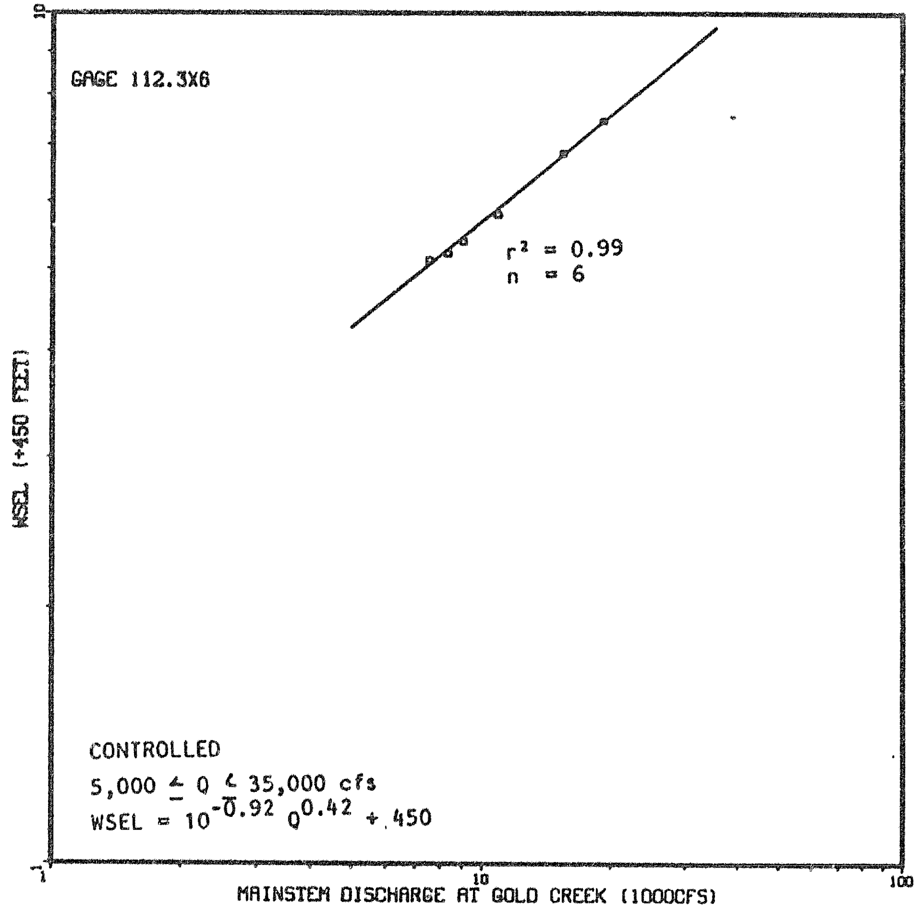
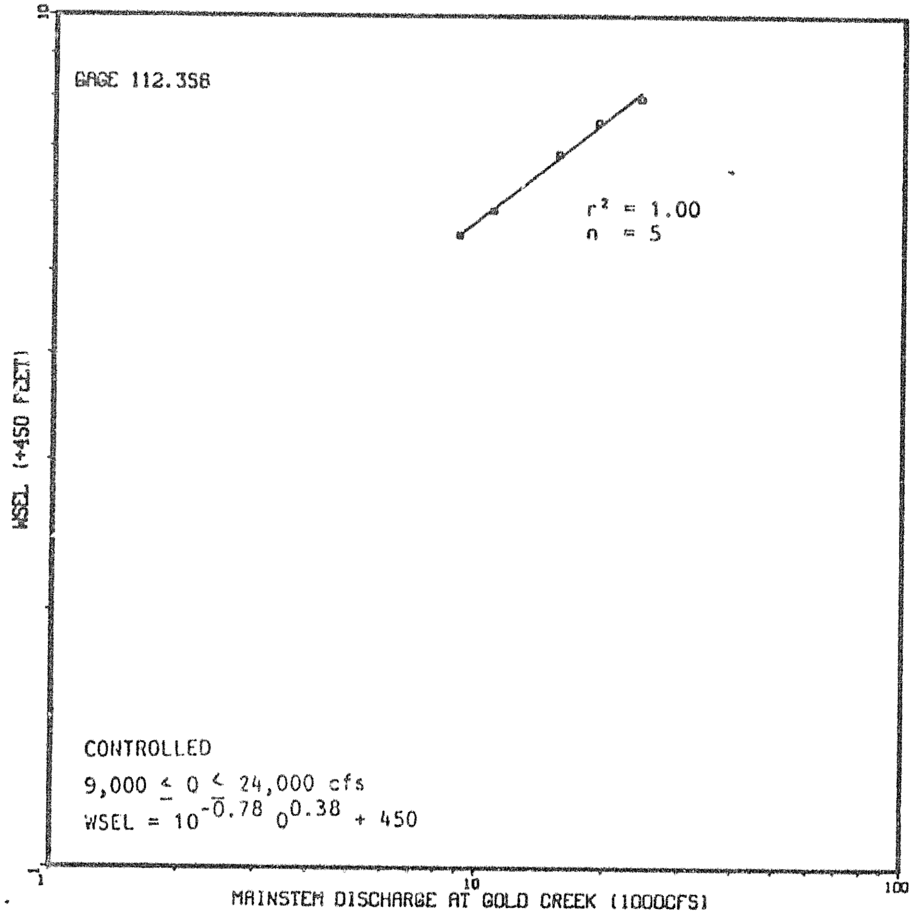




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



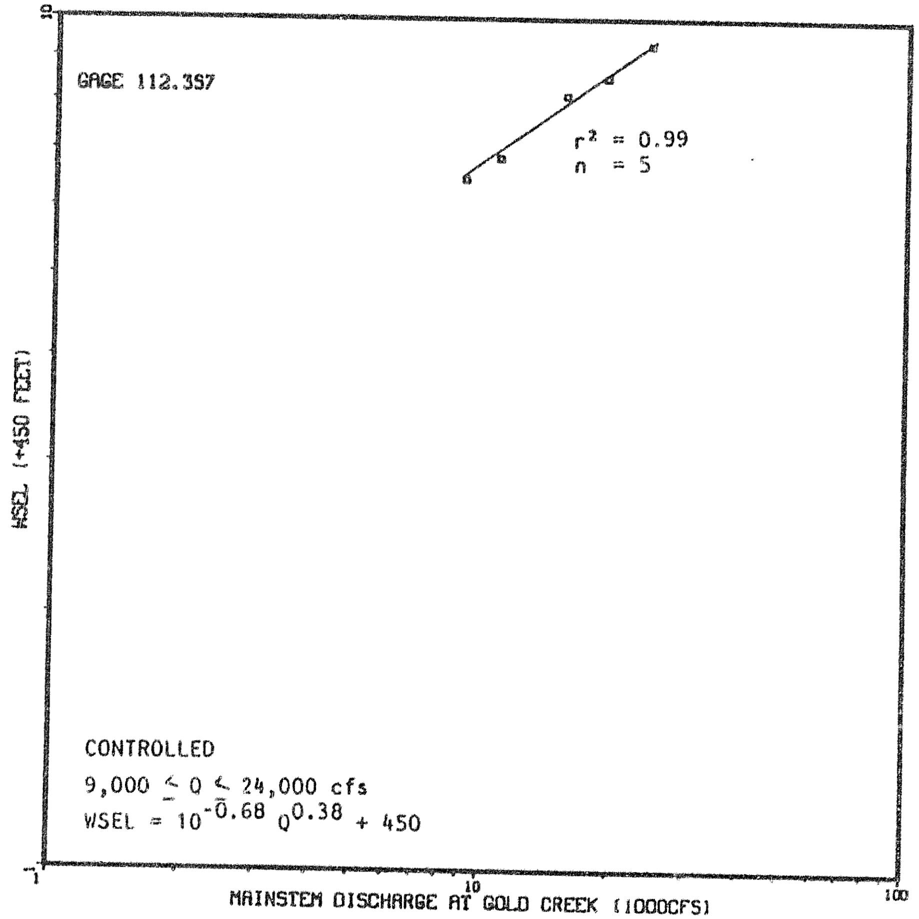
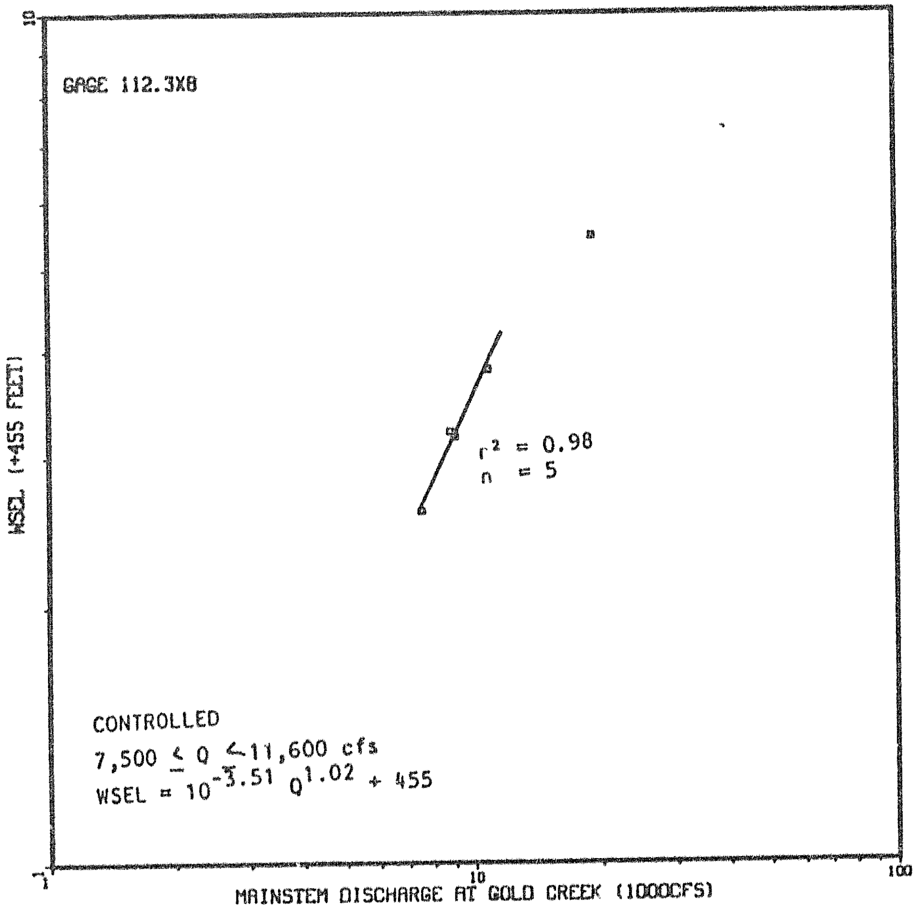




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



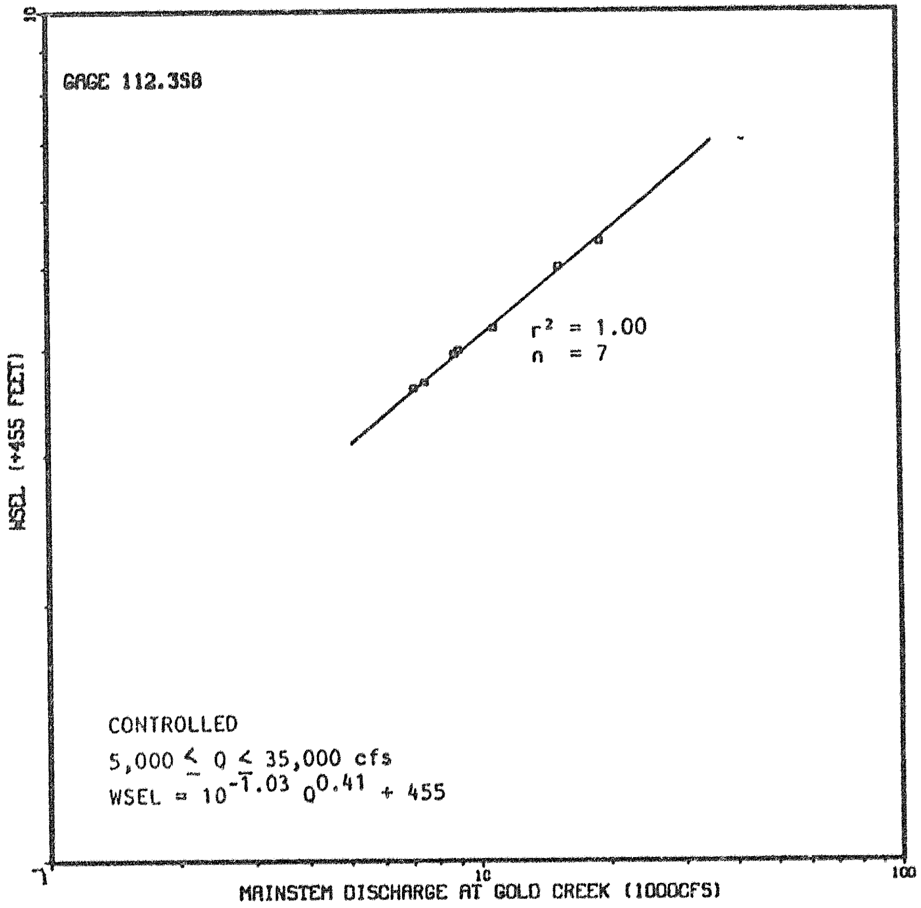
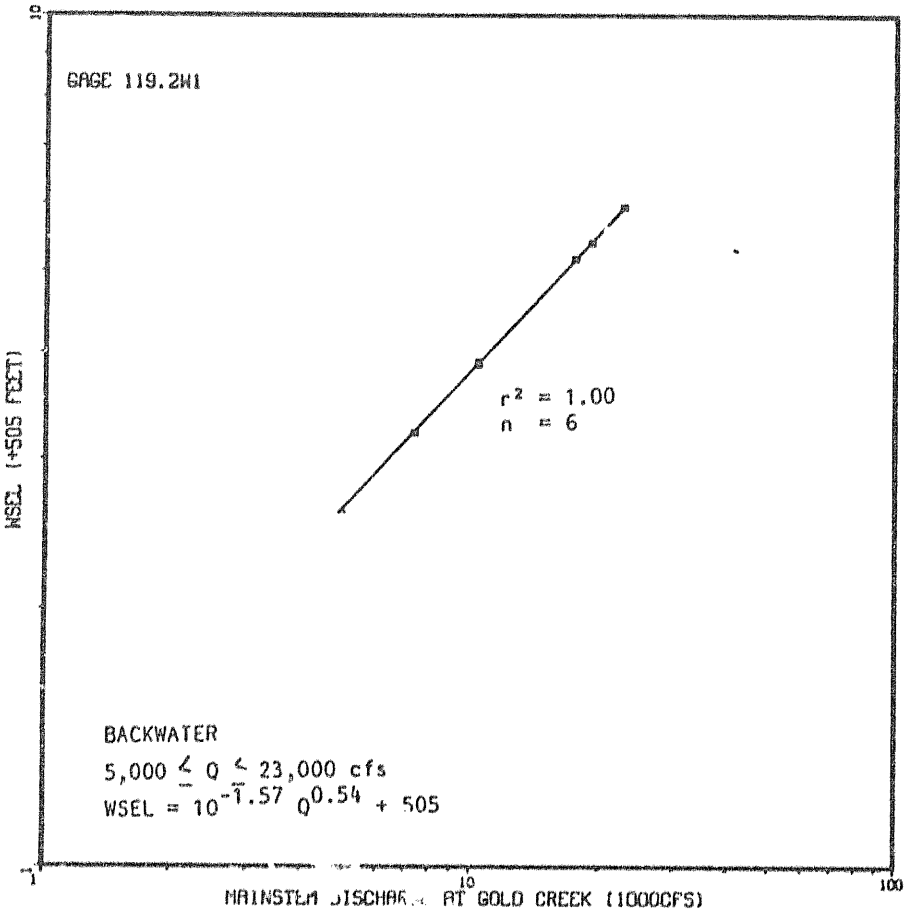




Figure A-1.3 Stage discharge curves for cross sections 1, 2, 3, 3a, 4, 5, 6 and 8 at site 112.6L.



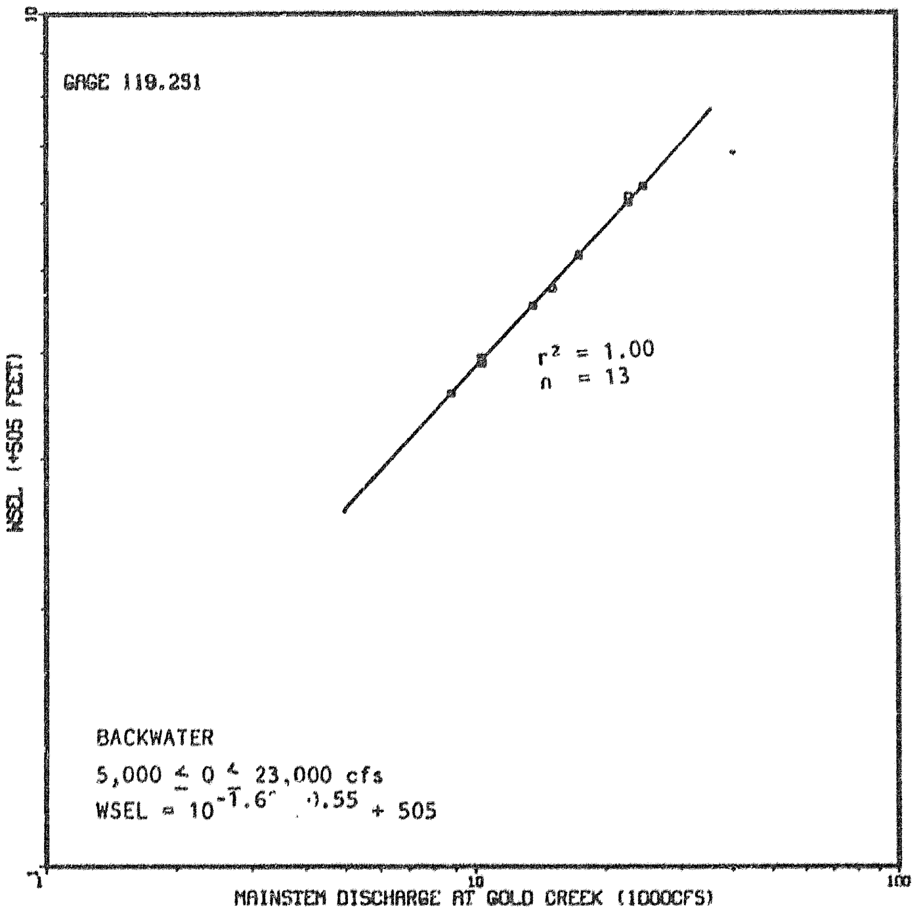
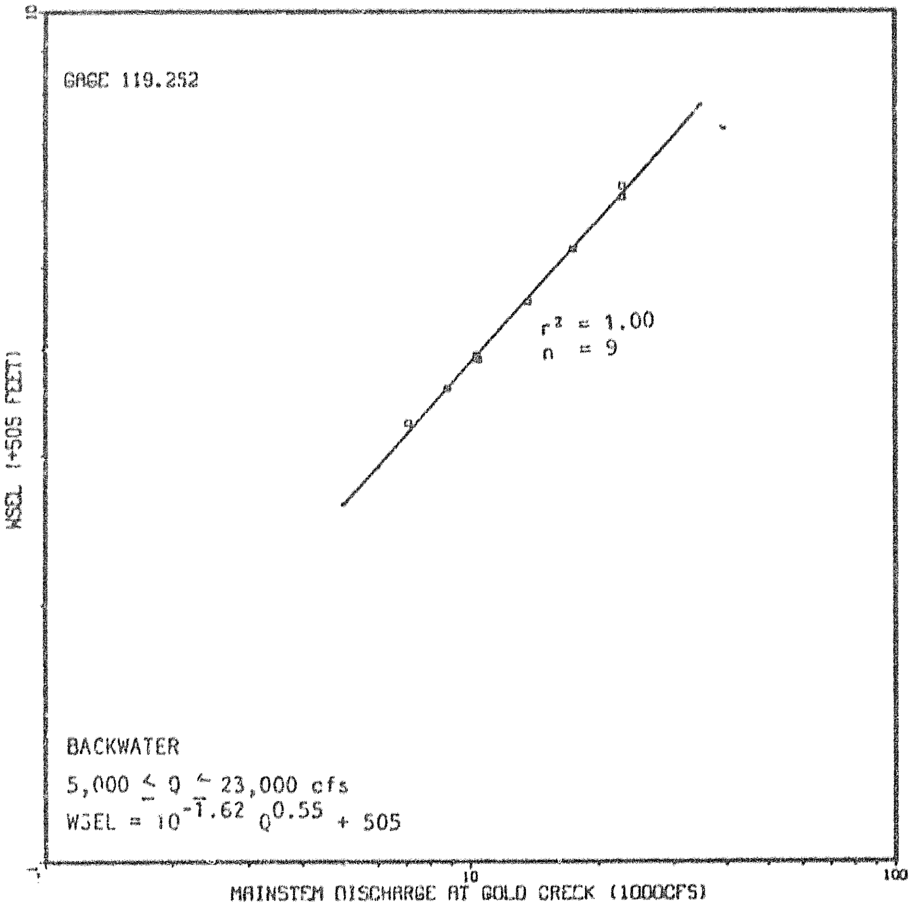




Figure A.1.4 Stage discharge curves for cross sections 1, 2, 4 and 5 at site 119.2R.



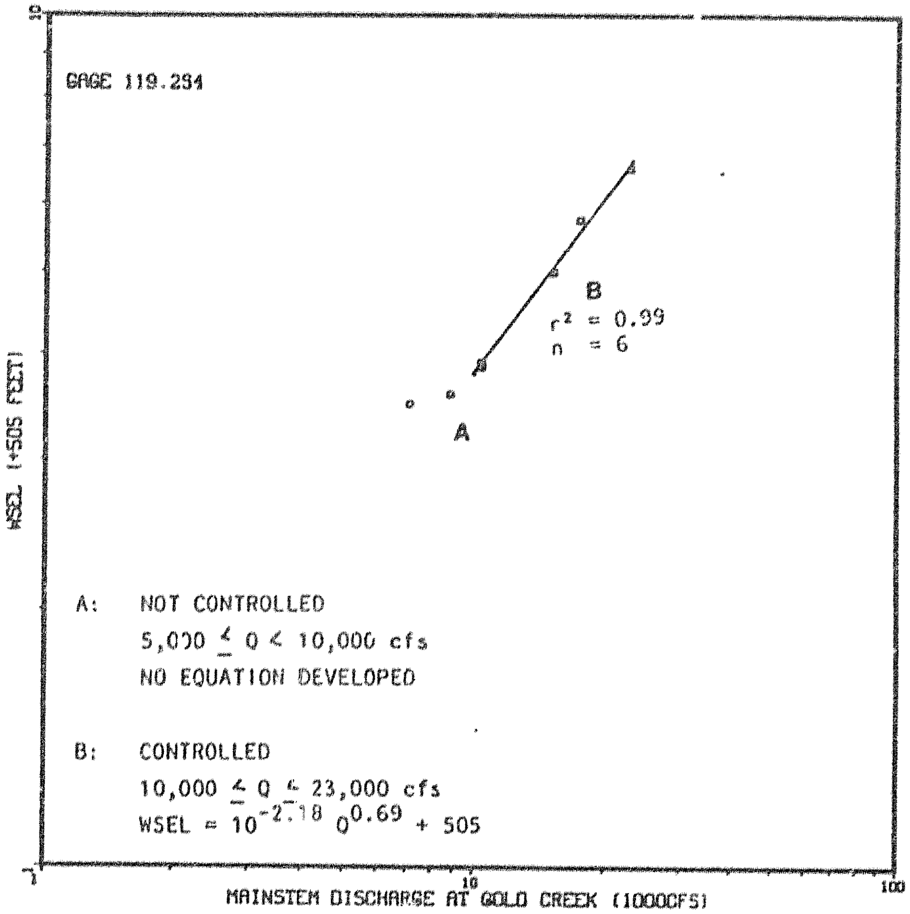




Figure A-1.4 Stage discharge curves for cross sections 1, 2, 4 and 5 at site 119.2R.

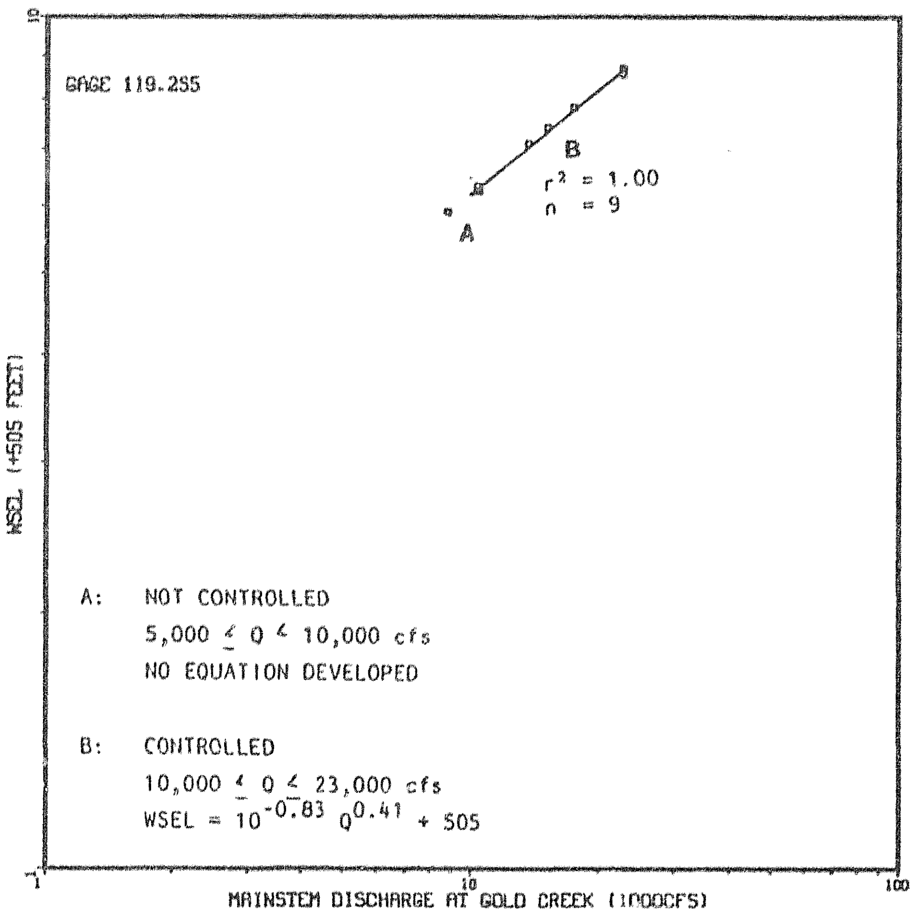
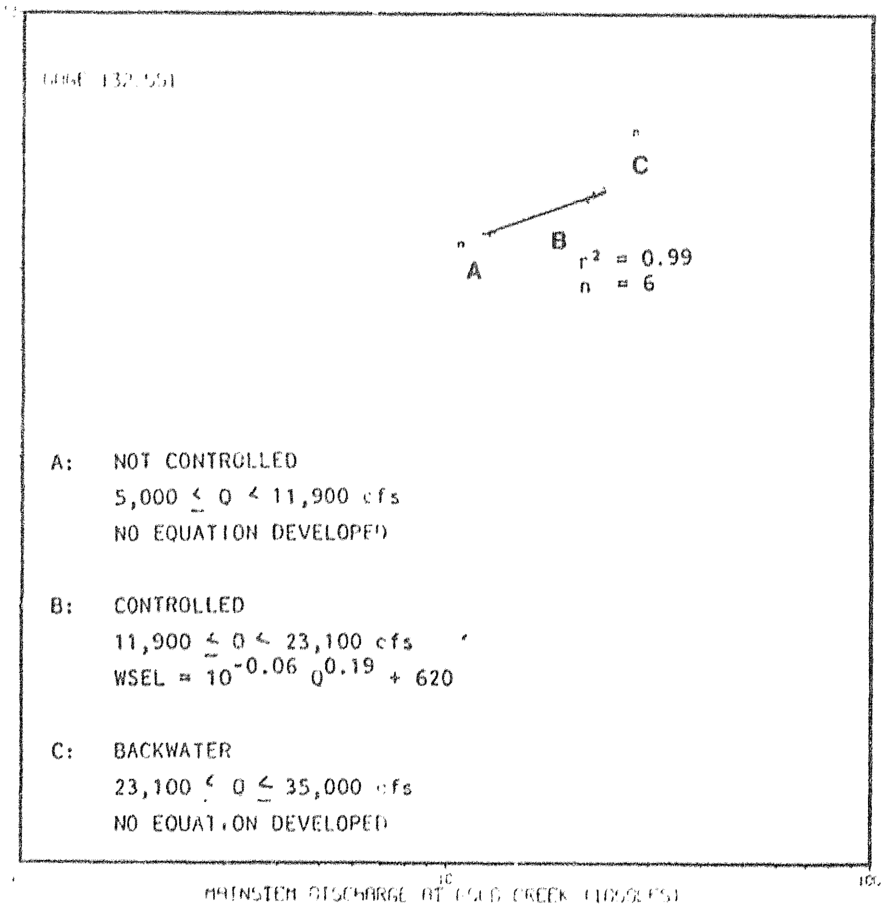



Figure A-1.[illegible] Stage discharge curves for cross sections 1, 2, 4 and 5 at site 119.2R.



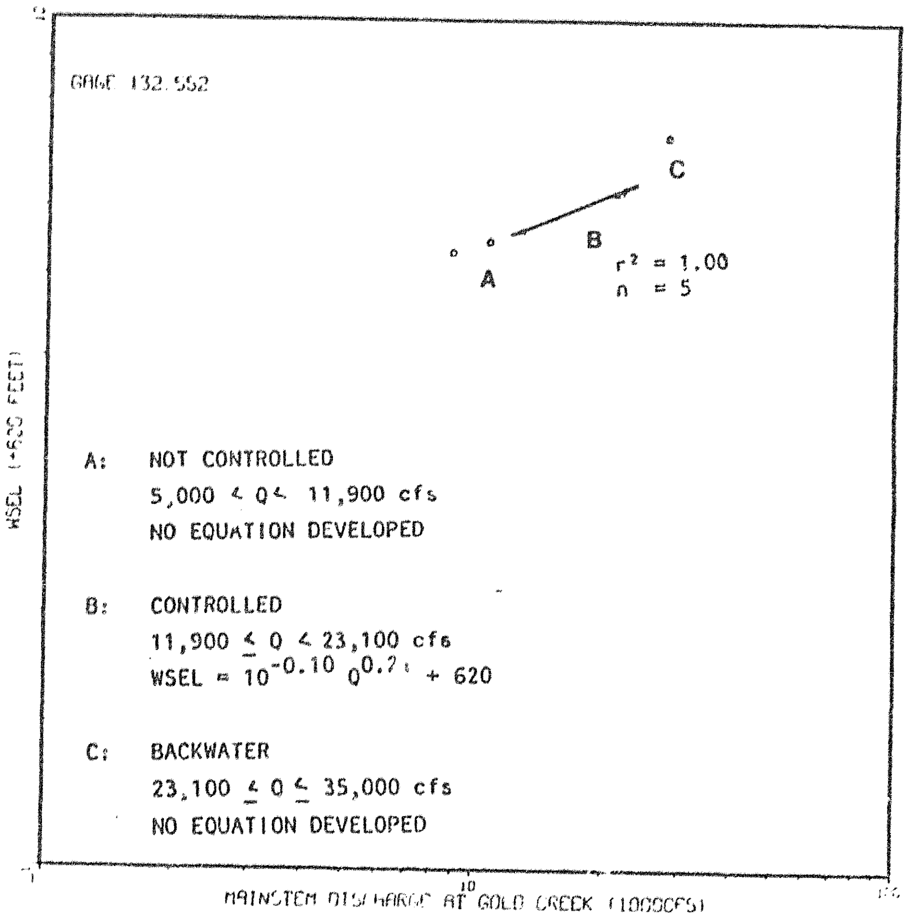
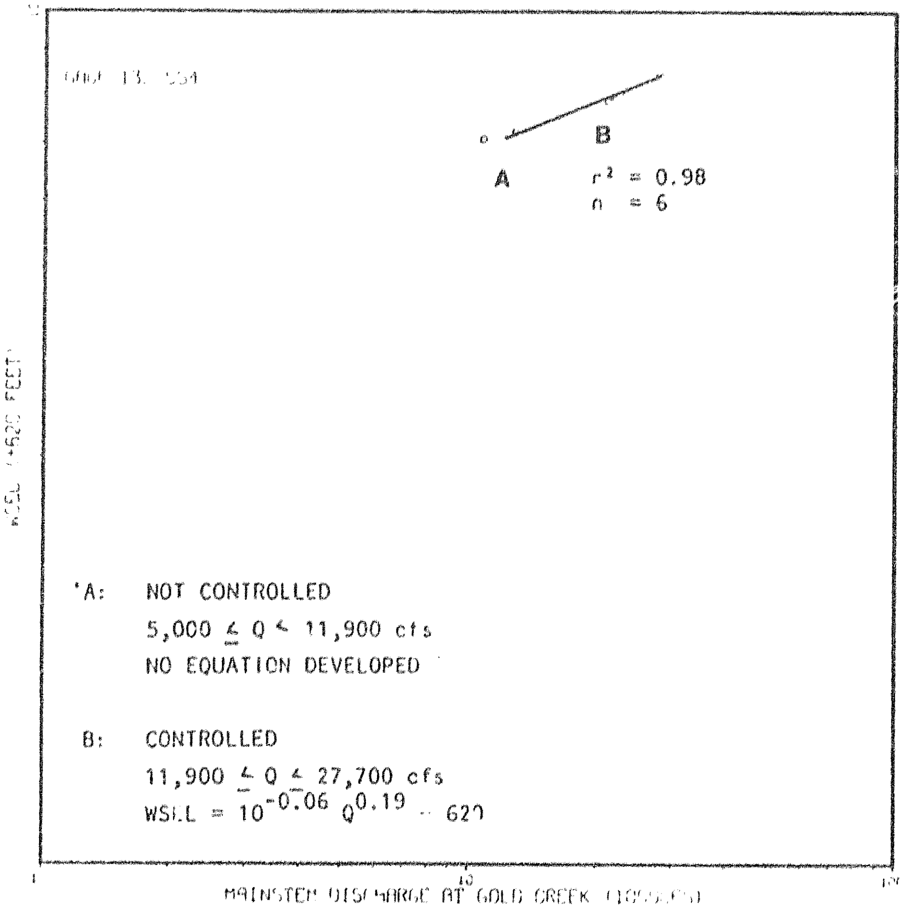




Figure A-1.5 Stage discharge curves for cross sections 1, 2, 4, 5, 6, 7, 8 and 9 at site 132.6L.



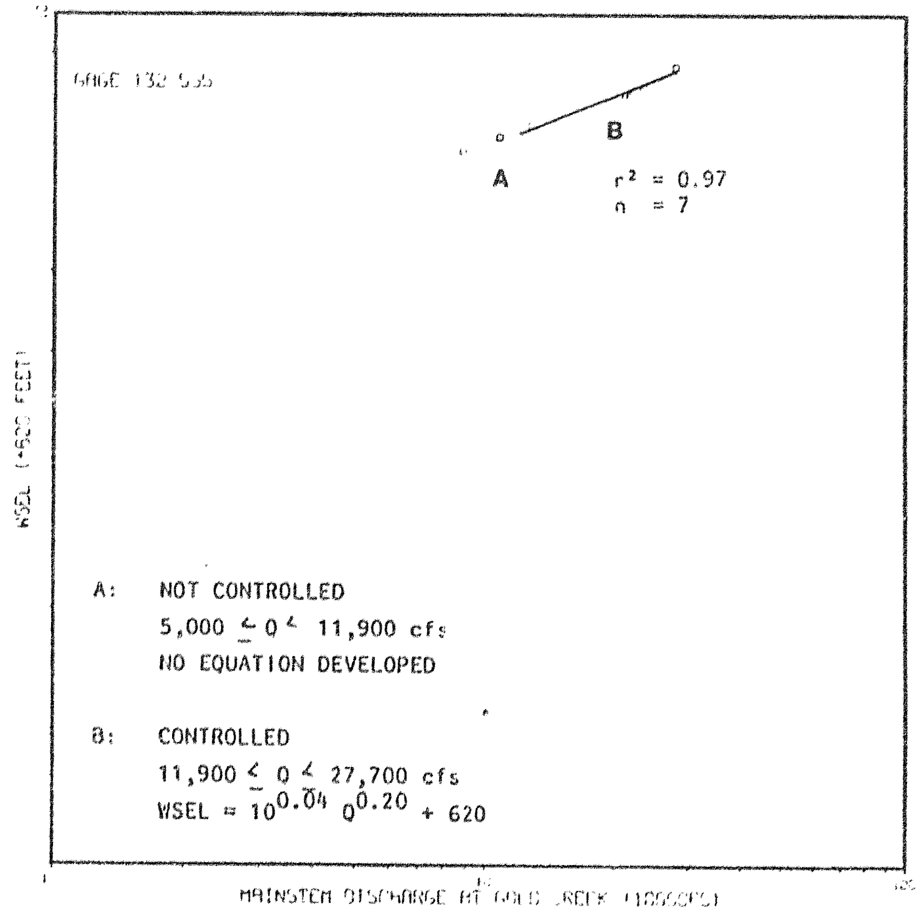
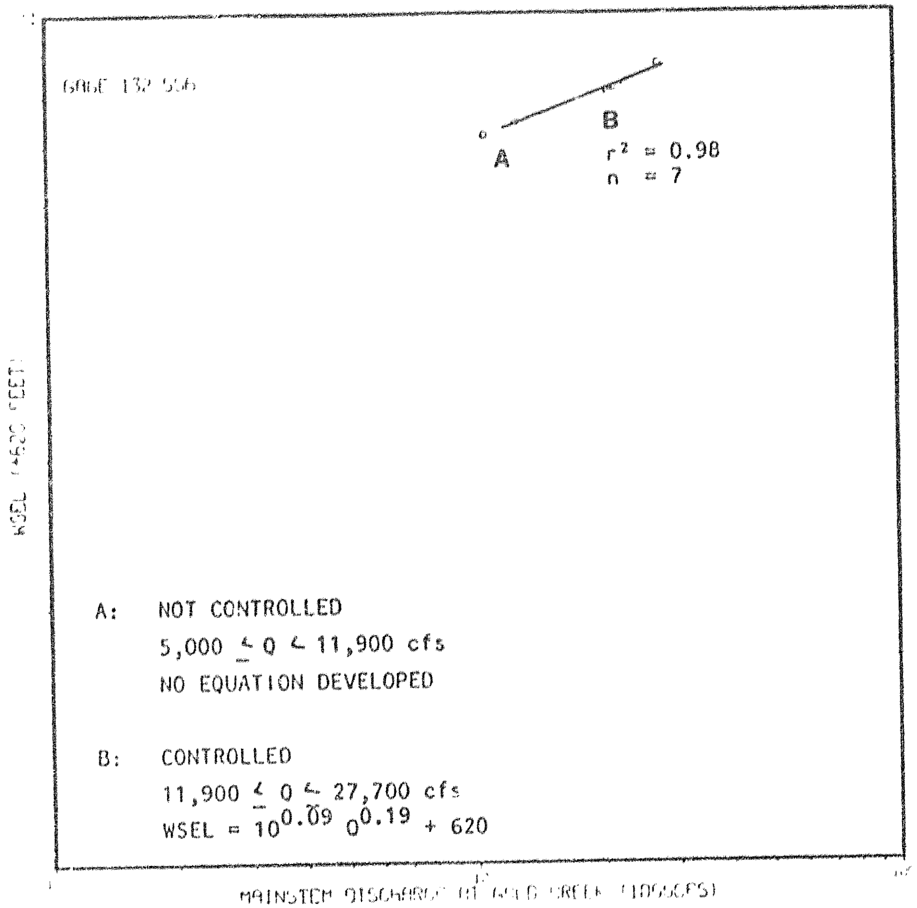




Figure A-1.5 Stage discharge curves for cross sections 1, 2, 4, 5, 6, 7, 8 and 9 at site 132.6L.



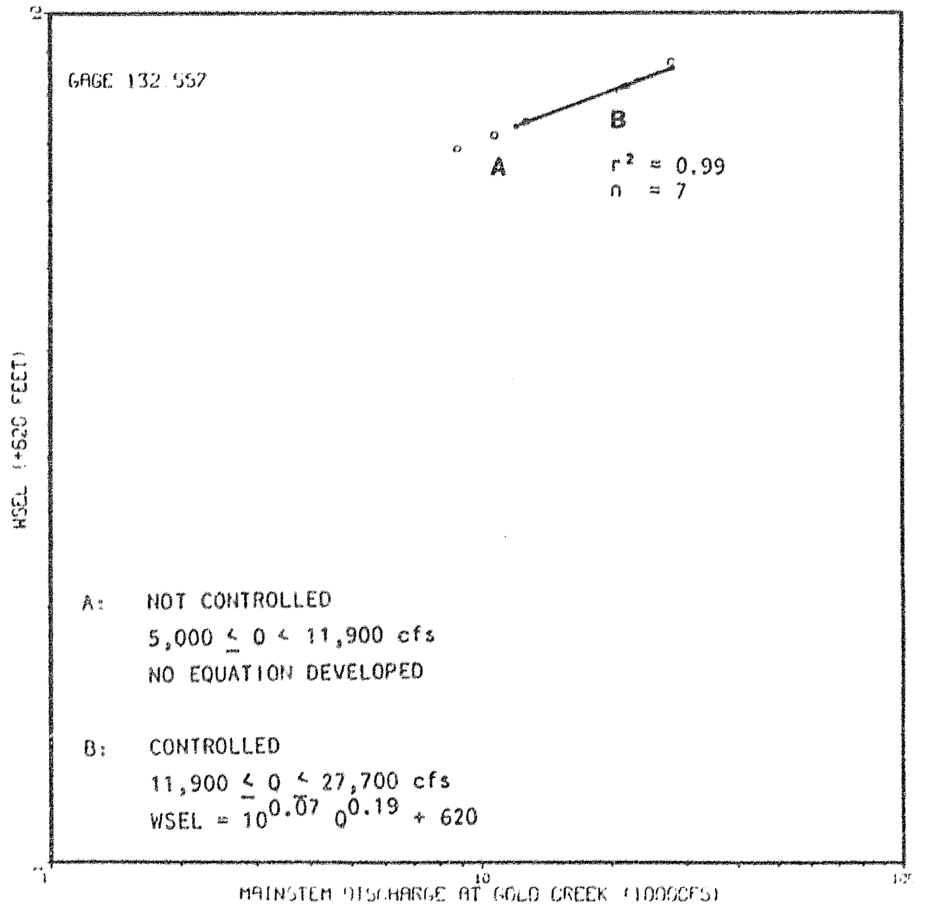
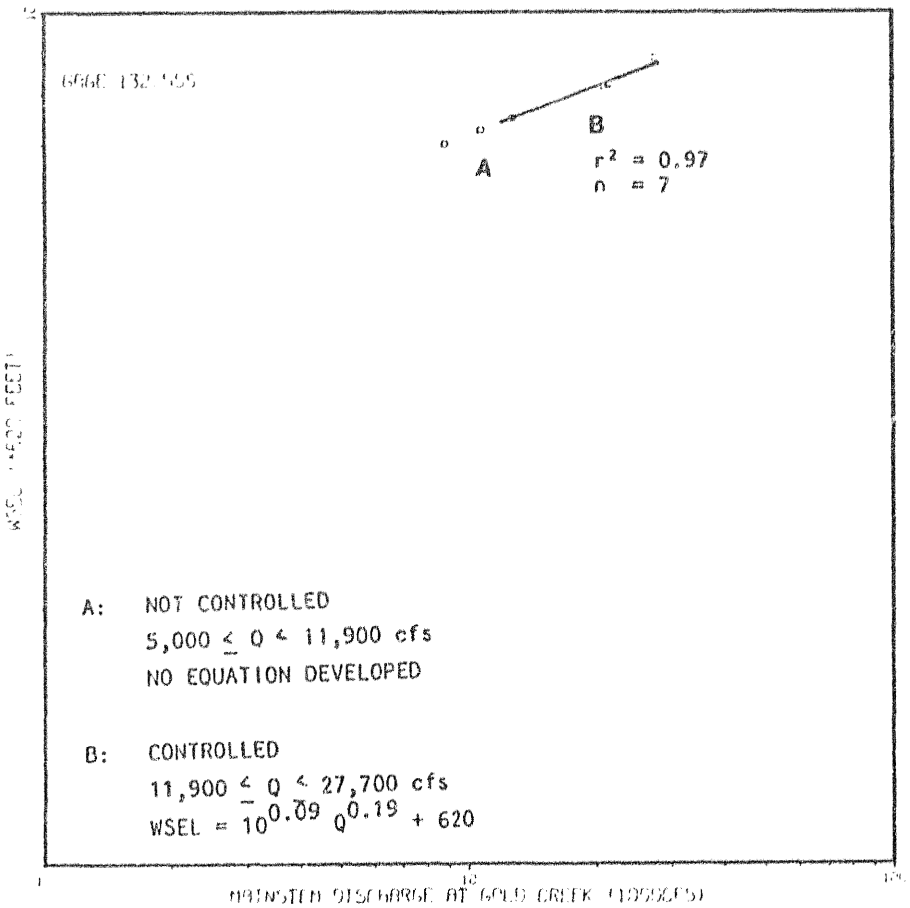




Figure A-1.5 Stage discharge curves for cross sections 1, 2, 4, 5, 6, 7, 8 and 9 at site 132.6L.



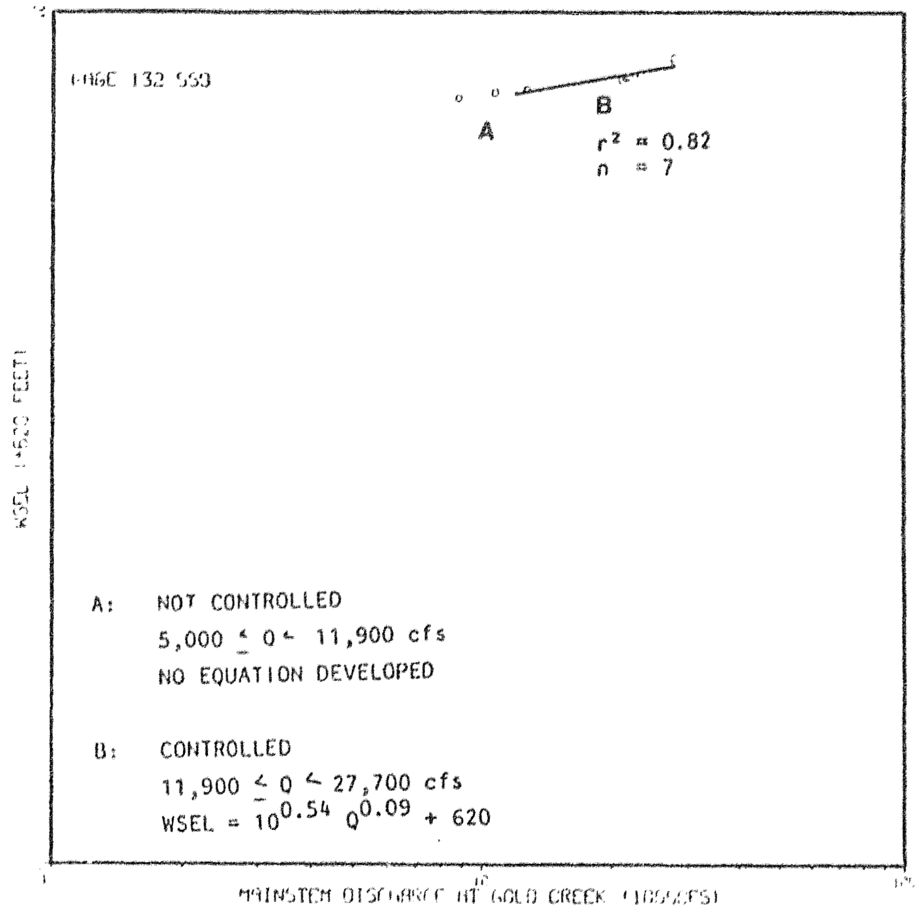
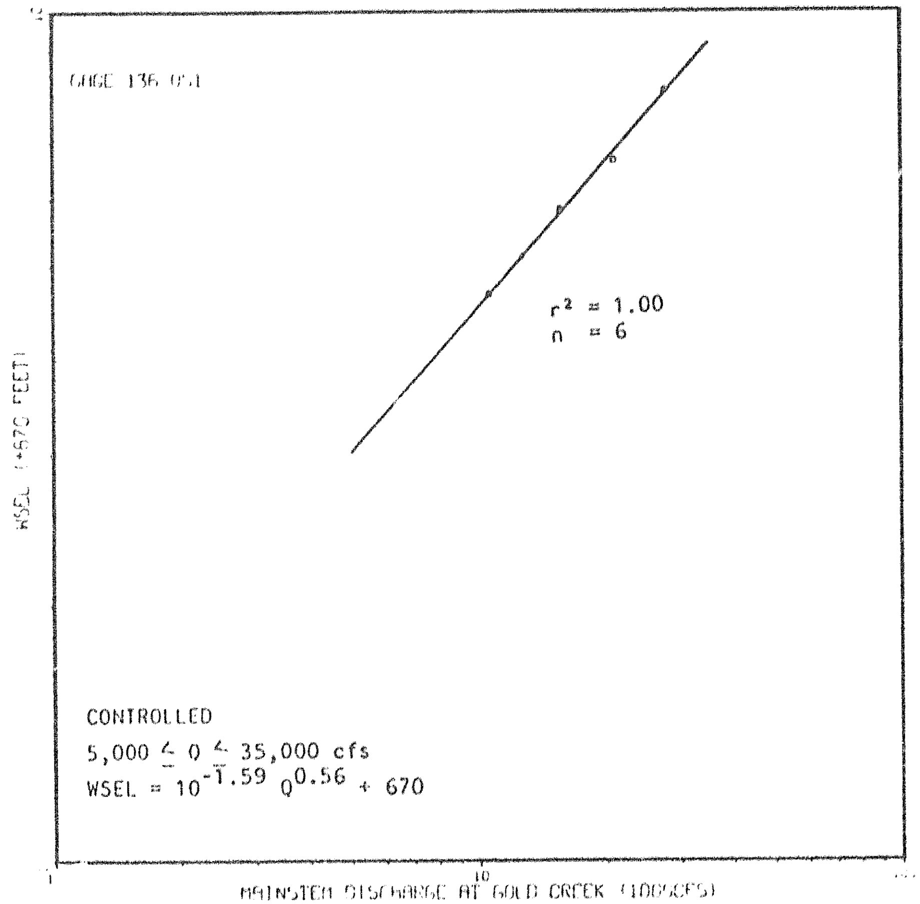




Figure A-1.5 Stage discharge curves for cross sections 1, 2, 4, 5, 6, 7, 8 and 9 at site 132.6L.



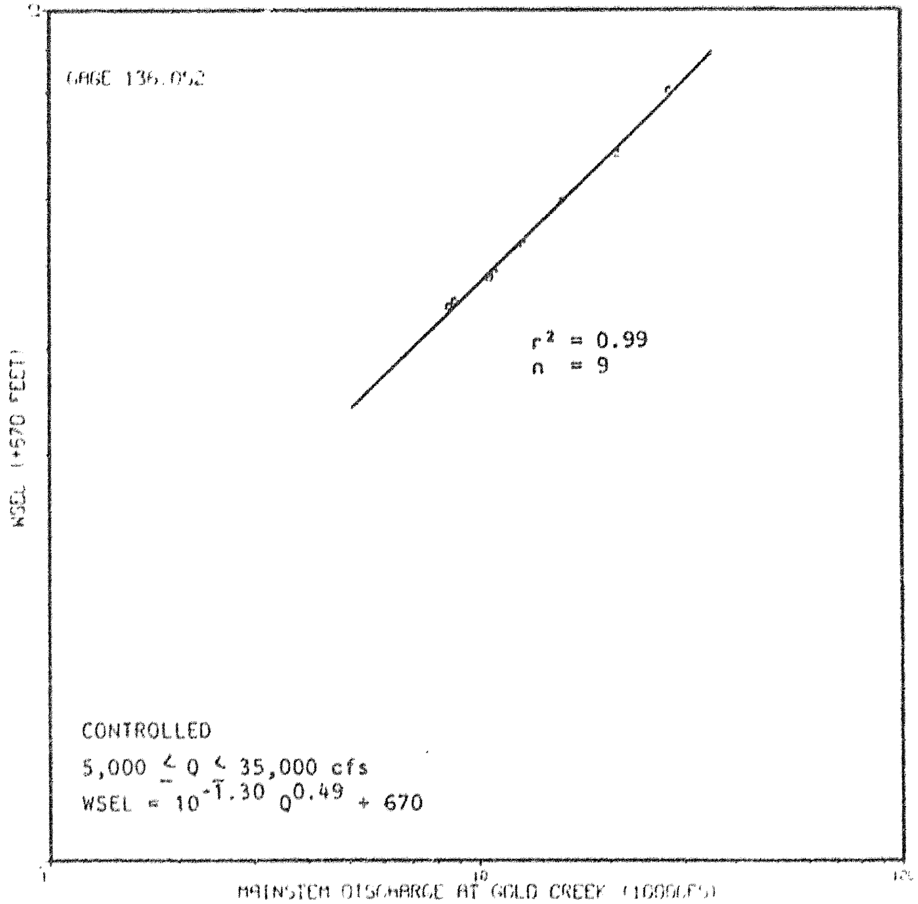
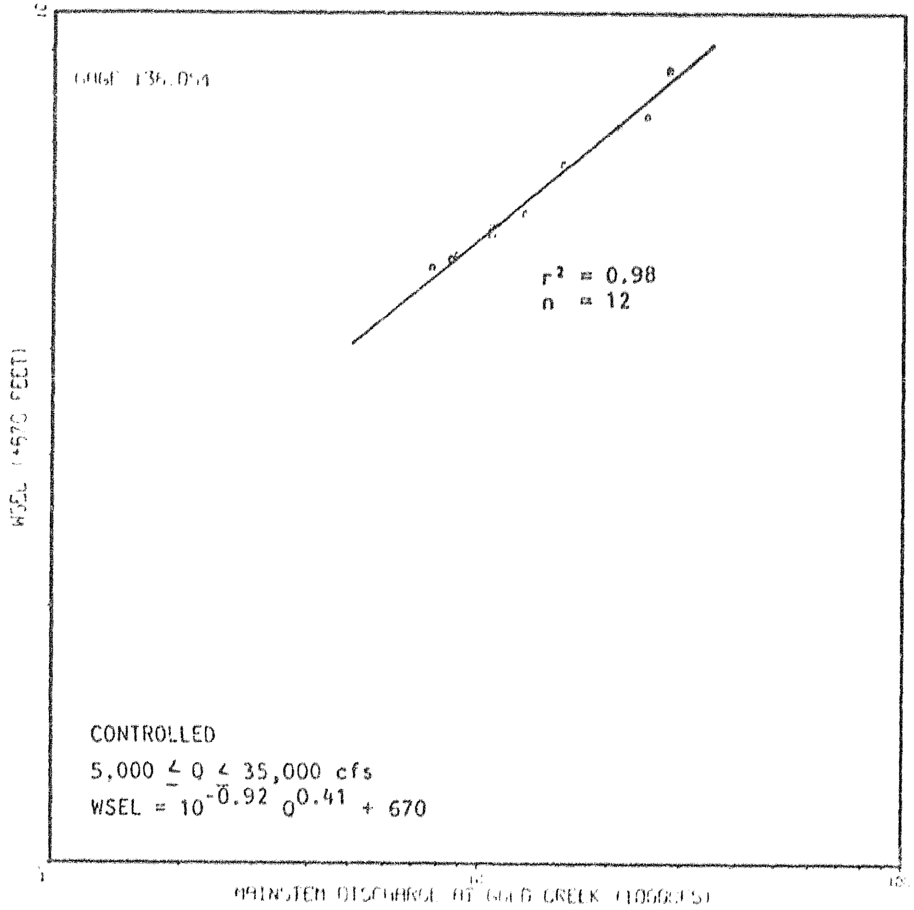




Figure A-1.6 Stage discharge curves for cross sections 1, 2, 3, 5 and 6 at site 136.0L.



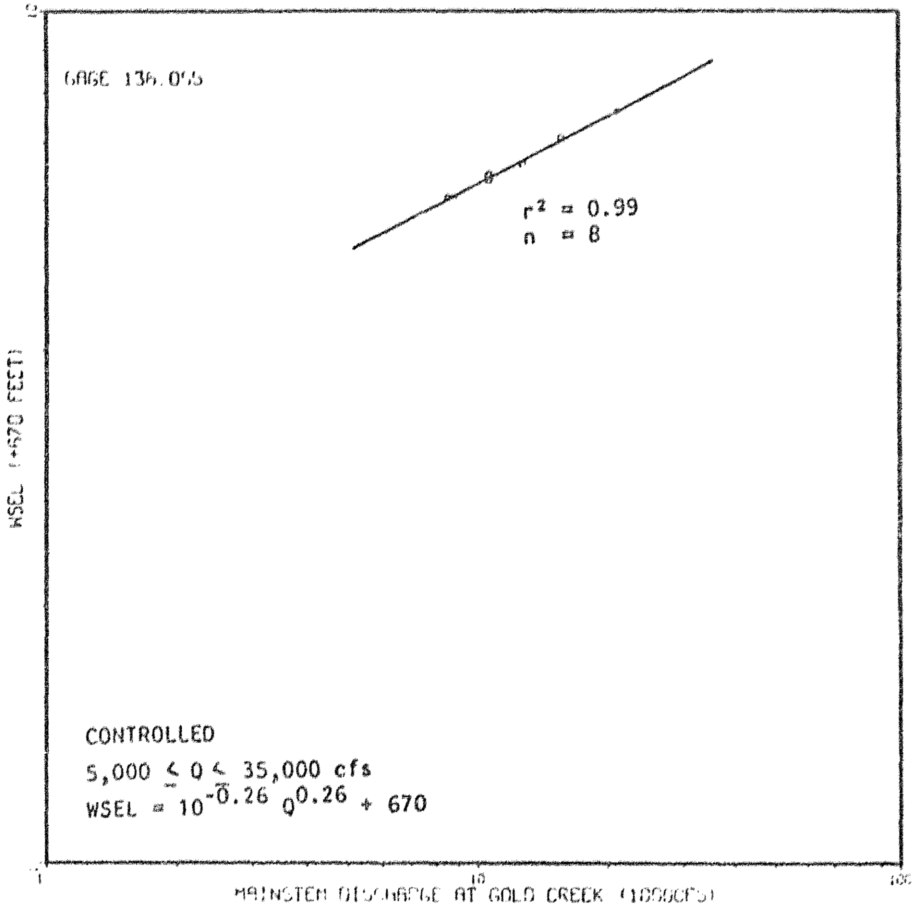




Figure A-1.6 Stage discharge curves for cross sections 1, 2, 3, 5 and 6 at site 136.0L.

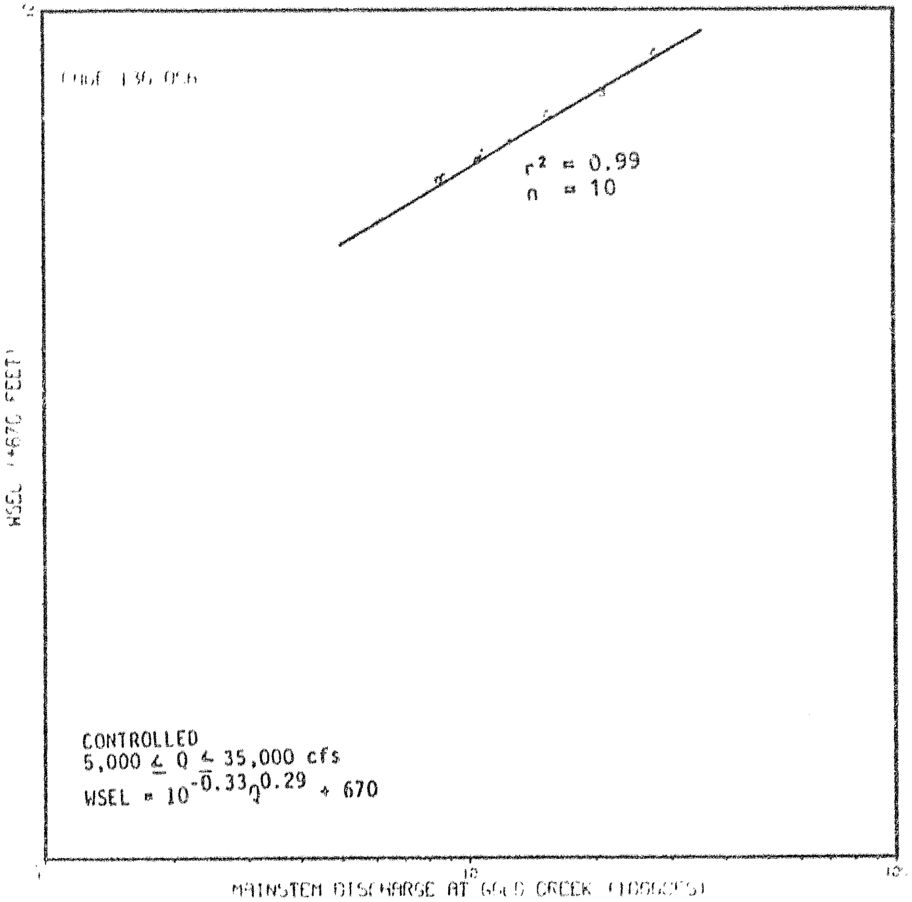



Figure A-1.6 Stage discharge curves for cross sections 1, 2, 3, 5 and 6 at site 136.0L.

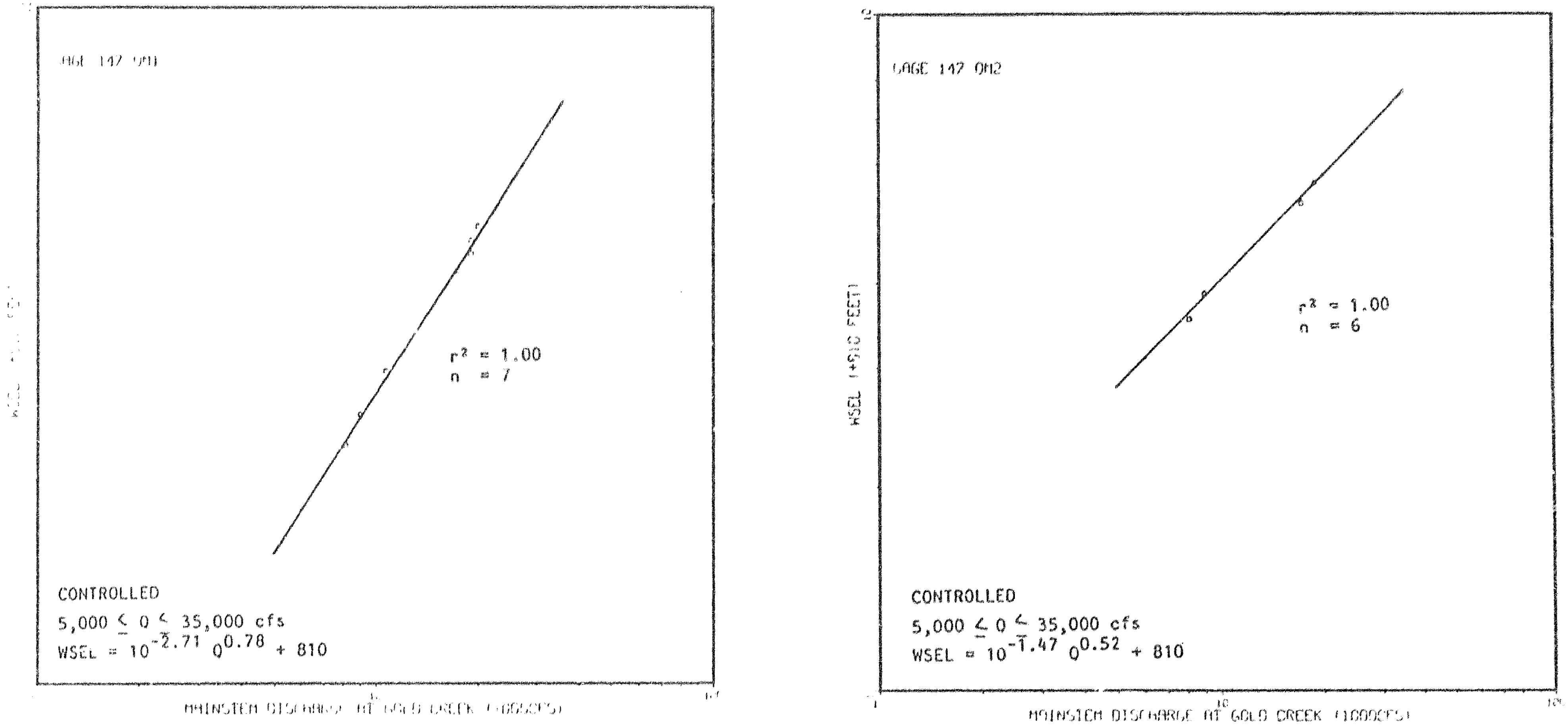



Figure A-1.7 Stage discharge curves for cross sections 1, 2, 3, 5 and 6 at site 147.1L.

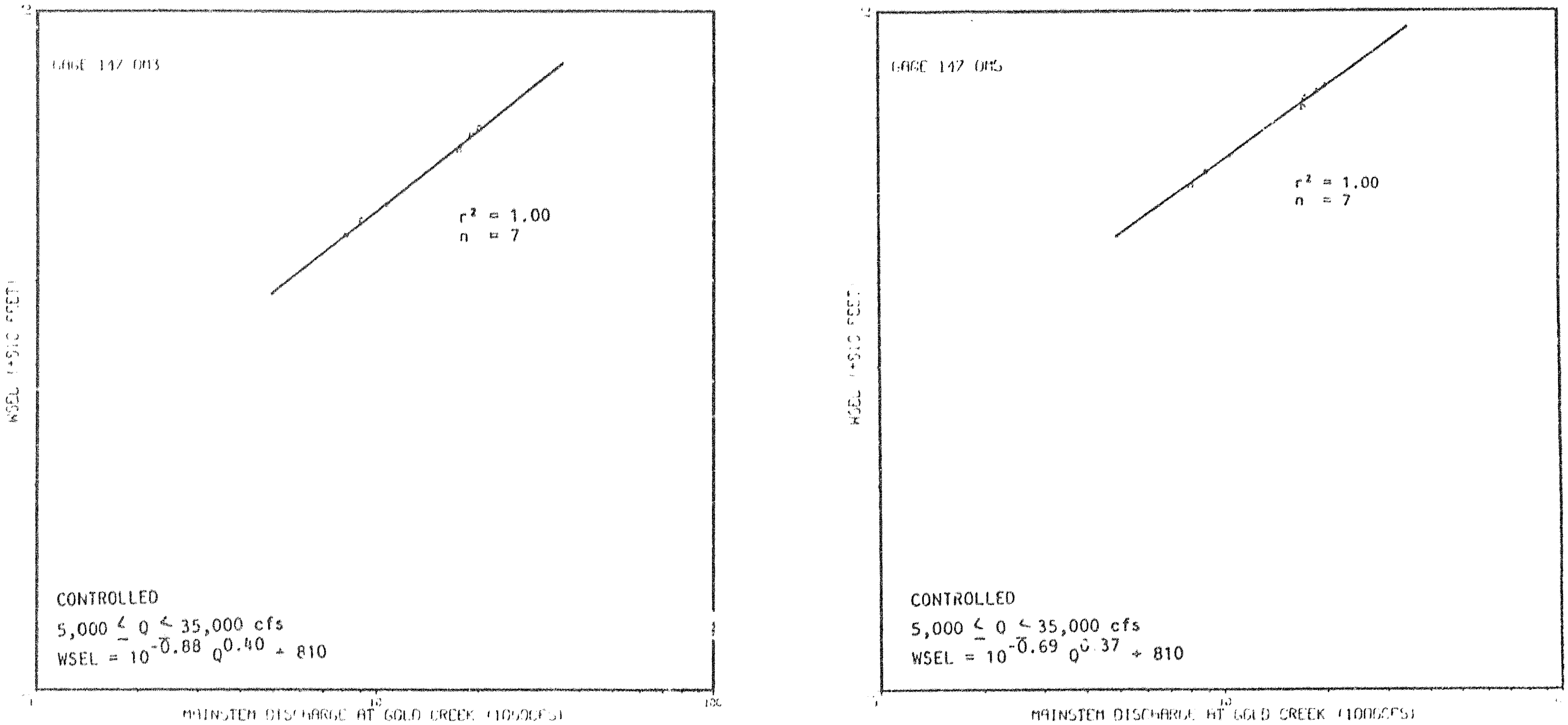



Figure A-1.7 Stage discharge curves for cross sections 1, 2, 3, 5 and 6 at site 147.1L.

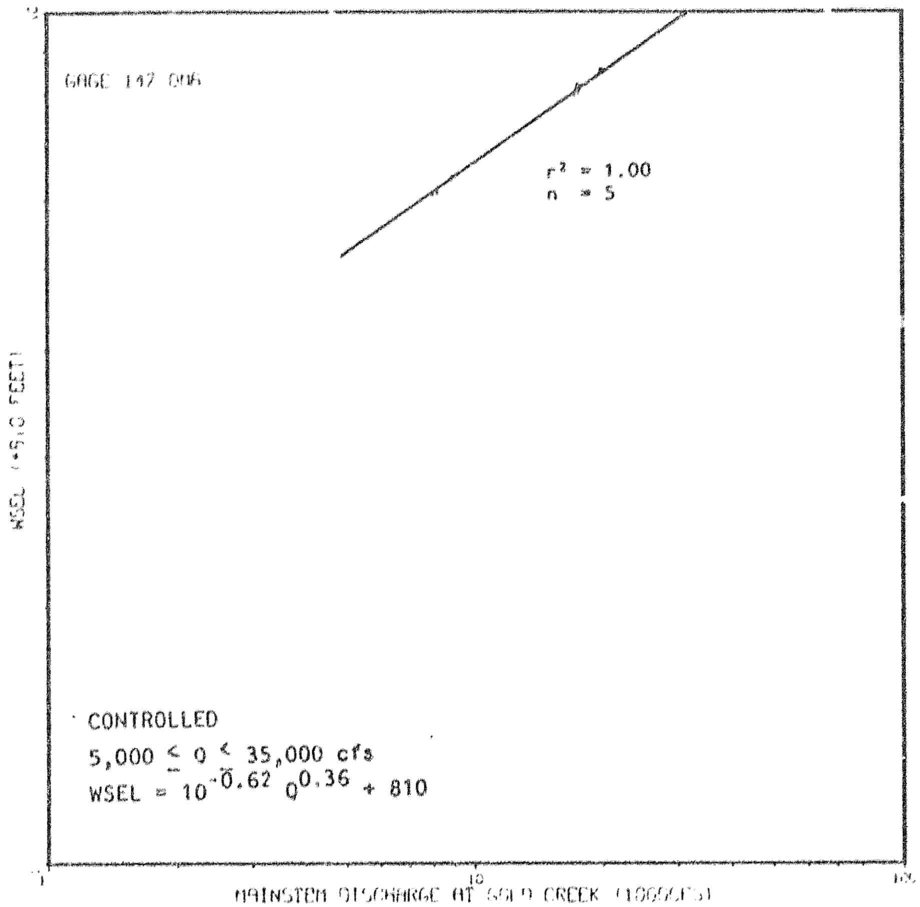



Figure A-1.7 Stage discharge curves for cross sections 1, 2, 3, 5 and 6 at site 147.1L.

Table A-1.1 Summary of site-specific data collected for rating curve analysis at R.M. 101.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 101.2S1 | Cross Section 1 | 841006 | 1200 | 359.47 | | 6,780 |
| | | 840925 | 1300 | 359.55 | 0 | 7,890 |
| | | 840924 | 1310 | 359.46 | | 8,290 |
| | | 840924 | 1300 | 359.50 | | 8,290 |
| | | 840914 | 1815 | 359.54 | | 8,800 |
| | | 840912 | 1640 | 359.54 | | 9,080 |
| | | 840903 | 1310 | 359.[illegible]5 | 25 | 11,200 |
| | | 840903 | 1535 | 360.07 | | 11,200 |
| | | 840830 | 1150 | 361.08 | 280 | 15,300 |
| | | 840829 | 1712 | 361.41 | | 17,400 |
| | | 840808 | 1255 | 362.10 | | 23,000 |
| | | 840827 | 1605 | 362.95 | | 27,700 |
| 101.2S2 | Cross Section 2 | 840924 | | 359.64 | | 8,290 |
| | | 840830 | 1240 | 360.08 | .8 | 15,300 |
| | | 840829 | 1806 | 360.62 | | 17,400 |
| | | 840808 | 1400 | 361.49 | | 23,000 |
| | | 840327 | 1607 | 363.22 | | 27,700 |
| 101.2S3 | Cross Section 3 | 841006 | 1200 | 361.28 | | 6,780 |
| | | 840925 | 1416 | 361.33 | 0 | 7,890 |
| | | 840924 | 1300 | 361.31 | | 8,290 |
| | | 840924 | 1320 | 361.33 | | 8,290 |
| | | 840914 | 1815 | 361.29 | | 8,800 |

Table A-1.1 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 101.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 101.2S3 | Cross Section 3 | 840912 | 1600 | 361.29 | | 9,080 |
| (cont.) | | 840912 | | 361.31 | | 9,080 |
| | | 840903 | 1525 | 361.80 | | 11,200 |
| | | 840903 | 1350 | 361.83 | 25 | 11,200 |
| | | 840830 | 1445 | 362.05 | 286 | 15,300 |
| | | 840829 | 1715 | 362.40 | | 17,400 |
| | | 840808 | 1250 | 362.97 | | 23,000 |
| 101.2S4 | Cross Section 4 | 841006 | 1155 | 361.23 | | 6,780 |
| | | 840925 | 1407 | 361.26 | .2 | 7,890 |
| | | 840924 | 1325 | 361.26 | | 8,290 |
| | | 840924 | | 361.30 | | 8,290 |
| | | 840914 | 1820 | 361.26 | | 8,800 |
| | | 840912 | 1515 | 361.28 | | 9,080 |
| | | 840912 | | 361.30 | | 9,080 |
| | | 840903 | 1422 | 361.85 | 27 | 11,200 |
| | | 840830 | 1627 | 362.97 | 270 | 15,300 |
| | | 840830 | 1606 | 362.98 | 270 | 15,300 |
| | | 840829 | 1718 | 363.34 | | 17,400 |
| | | 840808 | 1245 | 363.88 | | 23,000 |
| 101.2S5 | Cross Section 5 | 840924 | | 361.49 | | 8,290 |
| | | 840830 | 1638 | 363.08 | 0 | 15,300 |
| | | 840829 | 1647 | 363.65 | | 17,400 |
| | | 840808 | 1355 | 364.36 | | 23,000 |

Table A-1.1 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 101.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 101.2S6 | Cross Section 6 | 841006 | 1150 | 361.93 | | 6,780 |
| | | 840925 | 1340 | 361.96 | .1 | 7,890 |
| | | 840924 | 1330 | 361.96 | | 8,290 |
| | | 840914 | 1830 | 361.94 | | 8,800 |
| | | 840912 | 1336 | 361.94 | | 9,080 |
| | | 840912 | 1345 | 361.99 | | 9,080 |
| | | 840903 | 1452 | 362.39 | 26 | 11,200 |
| | | 840830 | 1700 | 363.10 | 273 | 15,300 |
| | | 840829 | 1646 | 363.69 | | 17,400 |
| | | 840808 | 1350 | 364.44 | | 23,000 |
| 101.2S7 | Cross Section 7 | 841006 | 1145 | 361.89 | | 6,780 |
| | | 840925 | 1345 | 361.92 | .4 | 7,890 |
| | | 840924 | 1335 | 361.92 | | 8,290 |
| | | 840924 | | 361.95 | | 8,290 |
| | | 840912 | 1308 | 361.94 | 0 | 9,080 |
| | | 840912 | 1315 | 362.00 | | 9,080 |
| | | 840903 | 1525 | 362.39 | 19 | 11,200 |
| | | 840830 | 1800 | 363.46 | 255 | 15,300 |
| | | 840829 | 1640 | 363.92 | | 17,400 |
| | | 840808 | 1215 | 364.62 | | 23,000 |
| 101.2S8 | Cross Section 8 | 841006 | 1145 | 361.84 | | 6,780 |
| | | 840925 | 1315 | 361.90 | 1.1 | 7,890 |
| | | 840924 | 1340 | 361.90 | | 8,290 |

Table A-1.1 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 101.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 101.2S8 (cont.) | Cross Section 8 | 840912 | 1239 | 361.95 | | 9,080 |
| | | 840912 | 1245 | 362.01 | | 9,080 |
| | | 840903 | 1605 | 362.41 | | 11,200 |
| | | 840903 | | 362.43 | 19 | 11,200 * |
| | | 840903 | 1605 | 362.45 | | 11,200 |
| | | 840830 | 1750 | 363.50 | 236 | 15,300 |
| | | 840829 | 1542 | 363.92 | 533 | 17,400 |
| | | 840808 | 1210 | 364.71 | | 23,000 |
| 101.2S9 | Cross Section 9 | 840924 | 1350 | 362.77 | | 8,290 |
| | | 840912 | 1145 | 362.83 | | 9,080 |
| | | 840903 | 1605 | 363.34 | 21 | 11,200 |
| | | 840830 | 1832 | 364.01 | 269 | 15,300 |
| | | 840829 | 1818 | 364.37 | | 17,400 |
| | | 840808 | 1200 | 364.97 | | 23,000 |
| 101.2M1 | Head | 840925 | 1300 | 362.93 | | 7,890 |
| | | 840924 | | 363.02 | | 8,290 |
| | | 840924 | 1400 | 363.03 | | 8,290 |
| | | 840912 | 1130 | 363.30 | | 9,080 |
| | | 840903 | 1700 | 363.81 | | 11,200 |
| | | 840830 | 1830 | 364.62 | | 15,300 |
| | | 840829 | 1633 | 365.01 | | 17,400 |
| | | 840808 | 1200 | 365.72 | | 23,000 |

* Average of two separate WSEL observations.

Table A-1.2 Summary of site-specific data collected for rating curve analysis at R.M. 101.5L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 101.2X1 | Cross Section 1 | 841012 | | 361.50 | 1622 | 6,210 |
| | | 841001 | | 361.60 | 1696 | 7,830 |
| | | 840911 | | 361.85 | 2213 | 9,330 |
| | | 840831 | | 362.70 | 3530 | 14,300 * |
| | | 840820 | | 363.17 | | 18,500 |
| | | 840825 | | 365.20 | | 28,900 |
| 101.2X2 ** | Cross Section 2 | 831103 | 1525 | 362.57 | | 4,500 |
| | | 831027 | 1655 | 362.60 | | 5,020 |
| | | 821012 | 1633 | 362.73 | | 7,950 |
| | | 841002 | | 362.70 | | 7,980 |
| | | 821009 | 1030 | 362.89 | | 8,440 |
| | | 821007 | 1415 | 362.96 | | 8,640 |
| | | 831011 | 1445 | 363.22 | | 9,520 |
| | | 830916 | 0940 | 363.29 | | 10,500 |
| | | 820822 | 1630 | 363.44 | | 12,200 |
| | | 830911 | 1010 | 363.55 | | 12,200 |
| | | 820823 | 1124 | 363.47 | | 12,300 |
| | | 831001 | 1505 | 363.83 | | 13,200 |
| | | 820909 | 1250 | 363.64 | | 13,400 |
| | | 820813 | 1420 | 363.70 | | 13,600 |
| | | 820927 | 1825 | 363.83 | | 13,800 |

* Instantaneous discharge estimated from time lag analysis.
** Same location as 1982 and 1983 gage 101.2M4.

Table A-1.2 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 101.5L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 101.2X2 ** (cont.) | Cross Section 2 | 820903 | 1545 | 363.97 | | 14,600 |
| | | 820831 | | 364.07 | | 16,000 |
| | | 820807 | 1347 | 364.13 | | 16,500 |
| | | 820808 | 1950 | 364.22 | | 16,600 |
| | | 830529 | 1045 | 364.14 | | 17,000 |
| | | 830720 | 1835 | 364.40 | | 18,600 |
| | | 830722 | 1850 | 364.45 | | 18,600 |
| | | 830720 | 0900 | 364.49 | | 18,600 |
| | | 830822 | 1220 | 364.76 | | 21,600 |
| | | 830805 | 1635 | 364.82 | | 21,700 |
| | | 830619 | 1125 | 364.90 | | 23,000 |
| | | 830619 | 1830 | 364.99 | | 23,000 |
| | | 830617 | 1142 | 364.95 | | 23,300 |
| | | 830621 | 1730 | 365.24 | | 24,000 |
| | | 820920 | 1450 | 365.39 | | 24,000 |
| | | 830807 | 1450 | 365.25 | | 25,000 |
| | | 820715 | 1110 | 365.38 | | 25,600 |
| | | 830808 | 1920 | 365.63 | | 26,000 |
| | | 830703 | 1645 | 365.22 | | 26,200 |
| | | 830706 | 1405 | 365.27 | | 26,300 |
| | | 830828 | 1052 | 365.53 | | 26,600 |

** Same location as 1982 and 1983 gage 101.2M4.

Table A-1.2 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 101.5L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 101.2X3 *** | Cross Section 5 | 831103 | 1520 | 365.11 | | 4,500 |
| | | 831027 | 1650 | 365.19 | | 5,020 |
| | | 841012 | | 365.23 | | 6,210 |
| | | 831020 | 1645 | 365.71 | | 7,230 |
| | | 841002 | | 365.70 | | 7,980 |
| | | 831011 | 1441 | 365.92 | | 9,520 |
| | | 830916 | 1020 | 366.03 | | 10,500 |
| | | 830911 | 0930 | 366.33 | | 12,200 |
| | | 831001 | 1530 | 366.60 | | 13,200 |
| | | 830716 | 1145 | 366.82 | | 16,400 |
| | | 830529 | 1045 | 366.85 | | 17,000 |
| | | 830720 | 1830 | 367.16 | | 18,600 |
| | | 830722 | 1825 | 367.23 | | 18,600 |
| | | 830822 | 1255 | 367.64 | | 21,600 |
| | | 830805 | 1630 | 367.72 | | 21,700 |
| | | 830619 | 1120 | 367.68 | | 23,000 |
| | | 830617 | 1735 | 367.86 | | 23,300 |
| | | 830807 | 1455 | 368.07 | | 2[illegible]000 |
| | | 830808 | 1900 | 368.36 | | 26,000 |
| | | 830703 | | 368.02 | | 26,200 |
| | | 830706 | 1400 | 368.11 | | 26,300 |
| | | 830828 | 1055 | 368.24 | | 26,600 |

*** Same location as 1983 gage 101.2M6.

Table A-1.3 Summary of site-specific data collected for rating curve analysis at R.M. 101.7L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 101.8S1 | Cross Section 1 | 841002 | | 366.69 | | 7,980 |
| | | 840921 | 1547 | 367.86 | | 11,400 |
| | | 840831 | 1126 | 368.49 | | 13,600 |
| | | 840830 | 1530 | 368.75 | | 15,300 |
| | | 840829 | 1530 | 369.11 | | 17,400 |
| | | 840713 | 1315 | 369.36 | | 21,200 |
| 102.0P1 | Cross Section 3 | 841002 | | 368.21 | | 7,980 |
| | | 840921 | 1640 | 371.43 | | 11,400 |
| | | 840830 | 1200 | 372.35 | | 15,300 |
| | | 840820 | | 372.80 | | 18,500 |
| | | 840810 | 1600 | 373.92 | | 24,000 |
| | | 840825 | 1525 | 376.15 | | 29,800 |
| 102.0P2 | Cross Section 4 | 841002 | | 368.99 | | 7,980 |
| | | 840820 | | 373.91 | | 18,500 |
| | | 840810 | 1600 | 375.00 | | 24,000 |
| | | 840825 | 1525 | 376.45 | | 29,800 |

Table A-1.4 Summary of site-specific data collected for rating curve analysis at R.M. 105.8L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
| --- | --- | --- | --- | --- | --- | --- |
| 105.6P0 | Cross Section 1 | 840928 | 1230 | 397.31 | | 7,320 |
| | | 841001 | 1520 | 397.47 | | 7,830 |
| | | 840914 | 1600 | 397.70 | | 8,800 |
| | | 840914 | 1606 | 397.71 | | 8,800 |
| | | 840911 | 1500 | 397.90 | | 9,330 |
| 105.6P1 | Cross Section 4 | 840928 | 1200 | 400.11 | | 7,320 |
| | | 841001 | 1617 | 400.22 | | 7,830 |
| | | 841001 | 1520 | 400.23 | | 7,830 |
| | | 840914 | 1600 | 400.38 | | 8,800 |
| | | 840911 | 1430 | 400.51 | | 9,330 |
| | | 840831 | 1210 | 401.43 | | 13,600 |
| | | 840830 | 1330 | 401.68 | | 15,300 |
| | | 840830 | 1330 | 401.74 | | 15,300 |
| | | 840820 | 1715 | 402.10 | | 18,500 |
| | | 840810 | 1155 | 402.94 | | 24,000 |
| | | 840825 | 1609 | 404.62 | | 29,800 |

Table A-1.5 Summary of site-specific data collected for rating curve analysis at R.M. 112.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 112.3X1C | Cross Section 1 | 841005 | 1500 | 450.60 | | 7,080 |
| (Low Flow) | Left Bank | 840929 | 1555 | 450.60 | | 7,410 |
| | | 840930 | 1546 | 450.66 | | 7,500 |
| | | 840916 | | 450.84 | | 8,280 |
| | | 840913 | | 451.00 | | 9,000 |
| | | 840905 | 0830 | 451.31 | | 10,400 |
| 112.3Y1B | Cross Section 1 | 840830 | | 452.67 | | 15,300 |
| (High Flow) | Left Bank | 840822 | 1230 | 453.42 | | 19,100 |
| | | 840810 | | 454.06 | | 24,000 |
| 112.3S1 | Cross Section 1 | 841005 | 1500 | 450.75 | | 7,080 |
| | Right Bank | 840916 | | 450.96 | | 8,280 |
| | | 840914 | 1520 | 451.08 | | 8,800 |
| | | 840904 | | 451.54 | | 10,800 |
| | | 840830 | | 452.54 | | 15,300 |
| | | 840822 | 1248 | 453.28 | | 19,100 |
| | | 840810 | | 454.06 | | 24,000 |

Table A-1.5 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 112.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 112.3X2 | Cross Section 2 Left Bank | 841005 | 1500 | 451.36 | | 7,080 |
| | | 840929 | 1600 | 451.36 | | 7,410 |
| | | 840930 | 1540 | 451.43 | | 7,500 |
| | | 840916 | | 451.61 | | 8,280 |
| | | 840913 | | 451.78 | | 9,000 |
| | | 840905 | | 452.10 | | 10,400 |
| | | 840830 | | 453.25 | | 15,300 |
| | | 840822 | 1330 | 453.67 | | 19,100 |
| | | 840810 | | 454.31 | | 24,000 |
| 112.3S2C (Low Flow) | Cross Section 2 Right Bank | 841005 | 1500 | 451.91 | | 7,080 |
| | | 840930 | 1540 | 452.06 | | 7,500 |
| | | 840916 | | 452.14 | | 8,280 |
| | | 840914 | 1620 | 452.15 | | 3,800 |
| | | 840913 | 1700 | 452.25 | | 9,000 |
| | | 840904 | | 452.40 | | 10,800 |
| 112.3S2B (High Flow) | Cross Section 2 Right Bank | 840830 | | 452.85 | | 15,300 |
| | | 840822 | 1300 | 453.55 | | 19,100 |
| | | 840810 | | 455.22 | | 24,000 |

Table A-1.5 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 112.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 112.3X3C | Cross Section 3 | 841005 | 1500 | 452.54 | | 7,080 |
| (Low Flow) | Left Bank | 840929 | 1605 | 452.52 | | 7,410 |
| | | 840930 | 1512 | 452.59 | | 7,500 |
| | | 840916 | | 452.68 | | 8,280 |
| | | 840914 | 1620 | 452.68 | | 8,800 |
| | | 840913 | | 452.79 | | 9,000 |
| | | 840905 | | 452.97 | | 10,400 |
| 112.3X3B | Cross Section 3 | 840904 | | 453.12 | | 10,800 |
| (High Flow) | Left Bank | 840822 | 1352 | 454.20 | | 19,100 |
| | | 840810 | | 454.62 | | 24,000 |
| 112.3S3 | Cross Section 3 | 841005 | 1500 | 452.54 | | 7,080 |
| | Right Bank | 840929 | 1640 | 452.56 | | 7,410 |
| | | 840930 | 1534 | 452.60 | | 7,500 |
| | | 840916 | | 452.90 | | 8,280 |
| | | 840913 | 1700 | 453.00 | | 9,000 |
| | | 840904 | | 453.35 | | 10,800 |
| | | 840830 | | 454.37 | | 15,300 |
| | | 840822 | 1352 | 454.91 | | 19,100 |
| | | 840810 | 1540 | 455.39 | | 24,000 |

Table A-1.5 (cont.) Summary site-specific data collected for rating curve analysis at R.M. 112.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 112.3X3AC | Cross Section 3A | 841005 | 1500 | 454.21 | | 7,080 |
| | Left Bank | 840929 | 1610 | 454.21 | | 7,410 |
| | | 840930 | 1430 | 454.26 | | 7,500 |
| | | 840916 | | 454.35 | | 8,280 |
| | | 840913 | | 454.46 | | 9,000 |
| | | 840905 | | 454.63 | | 10,400 |
| 112.3S3AC | Cross Section 3A | 841005 | 1500 | 454.51 | | 7,080 |
| | Right Bank | 840929 | 1620 | 454.52 | | 7,410 |
| | | 840916 | | 454.60 | | 8,280 |
| | | 840916 | | 454.61 | | 8,280 |
| | | 840905 | | 454.79 | | 10,400 |
| 112.3X4B (2) | Cross Section 4 | 841005 | 1500 | 454.81 | | 7,080 |
| (Low Flow) | Left Bank | 840929 | 1615 | 454.82 | | 7,410 |
| | | 840916 | | 454.98 | | 8,280 |
| | | 840913 | 1700 | 455.14 | | 9,000 |
| | | 840905 | | 455.30 | | 10,400 |
| | | 840905 | | 455.31 | | 10,400 |
| 112.3X4B (1) | Cross Section 4 | 840830 | | 456.00 | | 15,300 |
| (Low Flow) | Left Bank | 840822 | 1430 | 456.36 | | 19,100 |
| | | 840810 | | 456.67 | | 24,000 |

Table A-1.5 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 112.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 112.3S4C | Cross Section 4 | 841005 | 1500 | 453.42 | | 7,080 |
| (Low Flow) | Right Bank | 841005 | 1522 | 453.43 | | 7,080 |
| | | 840929 | 1635 | 453.43 | | 7,410 |
| | | 840913 | 1700 | 453.77 | | 9,000 |
| | | 840904 | | 454.17 | | 10,800 |
| 112.3S4B | Cross Section 4 | 840830 | | 455.56 | | 15,300 |
| (High Flow) | Right Bank | 840822 | 1330 | 456.06 | | 19,100 |
| | | 840810 | | 456.54 | | 24,000 |
| 112.3X5 | Cross Section 5 | 841005 | 1500 | 454.92 | | 7,080 |
| | Left Bank | 840930 | 1320 | 454.97 | | 7,500 |
| | | 840916 | | 455.11 | | 8,280 |
| | | 840913 | 1700 | 455.25 | | 9,000 |
| | | 840904 | | 455.61 | | 10,800 |
| | | 840830 | | 456.56 | | 15,300 |
| | | 840822 | 1445 | 457.10 | | 19,100 |
| | | 840810 | | 457.43 | | 24,000 |
| 112.3S5 | Cross Section 5 | 840830 | | 455.56 | | 15,300 |
| | Right Bank | 840822 | 1350 | 456.16 | | 19,100 |
| | | 840810 | | 456.80 | | 24,000 |

Table A-1.5 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 112.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 112.3X6 | Cross Section 6 | 840930 | 1130 | 455.13 | | 7,500 |
| | Left Bank | 840916 | | 455.22 | | 8,280 |
| | | 840913 | 1700 | 455.39 | | 9,000 |
| | | 840904 | | 455.80 | | 10,800 |
| | | 840830 | | 456.83 | | 15,300 |
| | | 840822 | 1510 | 457.47 | | 19,100 |
| 112.3S6 | Cross Section 6 | 840913 | 1700 | 455.53 | | 9,000 |
| | Right Bank | 840904 | | 455.91 | | 10,800 |
| | | 840830 | | 456.87 | | 15,300 |
| | | 840822 | 1420 | 457.49 | | 19,100 |
| | | 840810 | | 457.98 | | 24,000 |
| 112.3X7 | Cross Section 7 | 841012 | | 455.17 | 215 | 6,210 |
| | Left Bank | 840930 | 1030 | 455.70 | 355 | 7,500 |
| | | 840916 | | 455.94 | | 8,280 |
| | | 840913 | 1700 | 456.19 | 721 | 9,000 |
| | | 840904 | | 456.79 | 1430 | 10,800 |
| | | 840830 | | | 2980 | 15,300 |
| | | 840822 | 1540 | 458.70 | | 19,100 |
| | | 840810 | | 459.36 | | 24,000 |

Table A-1.5 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 112.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 112.3S7 | Cross Section 7 Right Bank | 841012 | | | 215 | 6,210 |
| | | 840930 | | | 355 | 7,500 |
| | | 840913 | | 456.47 | 721 | 9,000 |
| | | 840904 | | 456.85 | 1450 | 10,800 |
| | | 840830 | | 458.13 | 2980 | 15,300 |
| | | 840822 | 1445 | 458.52 | | 19,100 |
| | | 840810 | | 459.31 | | 24,000 |
| 112.3X8 | Cross Section 8 Left Bank | 840930 | 1018 | 457.59 | | 7,500 |
| | | 840914 | 1515 | 458.21 | | 8,800 |
| | | 840913 | 1700 | 458.17 | | 9,000 |
| | | 840904 | 1109 | 458.79 | | 10,800 |
| | | 840904 | 1048 | 458.80 | | 10,800 |
| | | 840822 | 1625 | 460.45 | | 19,100 |
| 112.3S8 | Cross Section 8 Right Bank | 841005 | 1505 | 458.60 | | 7,080 |
| | | 840930 | | 458.66 | | 7,500 |
| | | 840914 | 1515 | 458.95 | | 8,800 |
| | | 840913 | 1700 | 458.99 | | 9,000 |
| | | 840904 | | 459.24 | | 10,800 |
| | | 840830 | | 460.01 | | 15,300 |
| | | 840822 | 1500 | 460.36 | | 19,100 |

Table A-1.6 Summary of site-specific data collected for rating curve analysis at R.M. 114.1R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 114.0P1 | Cross Section 2 | 841005 | 1130 | 468.44 | | 7,080 |
| | | 840926 | 1153 | 468.39 | | 7,680 |
| | | 841001 | 1447 | 468.43 | | 7,830 |
| | | 840914 | 1650 | 468.60 | | 8,800 |
| | | 840911 | 1240 | 468.87 | | 9,330 |
| | | 840823 | 1200 | 471.00 | | 17,900 |
| | | 840812 | | 471.14 | | 19,000 |

Table A-1.7 Summary of site-specific data collected for rating curve analysis at R.M. 115.0R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 114.9P1 | Cross Section 1 | 840926 | 1300 | 474.46 | | 7,680 |
| | | 841001 | | 474.41 | | 7,830 |
| | | 840914 | 1540 | 474.48 | | 8,800 |
| | | 840911 | 1145 | 474.48 | | 9,330 |
| | | 840920 | 1120 | 474.52 | | 10,400 |
| | | 840816 | 1353 | 475.55 | | 14,500 |
| | | 830526 | 1830 | 475.77 | | 16,000 |
| | | 840823 | 1425 | 476.23 | | 17,900 |
| | | 830720 | 1305 | 476.06 | | 18,600 |
| | | 830715 | 1330 | 476.39 | | 18,600 |
| | | 830611 | 1930 | 476.19 | | 19,000 |
| | | 830613 | 1155 | 476.35 | | 19,900 |
| | | 830612 | 1830 | 476.40 | | 20,000 |
| | | 830803 | 1245 | 476.81 | | 21,600 |
| | | 830805 | 1435 | 476.74 | | 21,700 |
| | | 830806 | 1933 | 477.04 | | 23,800 |
| | | 830824 | 1530 | 477.31 | | 24,700 |
| | | 830808 | 1134 | 477.38 | | 26,000 |
| | | 830825 | 1115 | 477.58 | | 27,400 |
| | | 830826 | 1755 | 478.70 | | 31,700 |

Table A-1.8 Summary of site-specific data collected for rating curve analysis at R.M. 118.9L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 118.9P1 | Cross Section 2 | 841004 | 1720 | 507.53 | | 7,380 |
| | | 840930 | | 507.52 | | 7,500 |
| | | 840926 | 1528 | 507.61 | | 7,680 |
| | | 840914 | 1500 | 507.86 | | 8,800 |
| | | 840914 | 1300 | 507.91 | | 8,800 |
| | | 840910 | 1735 | 508.02 | | 9,890 |
| | | 840922 | 1414 | 508.16 | | 10,300 |
| | | 840831 | 1300 | 508.94 | | 13,600 |
| | | 840815 | 1400 | 509.24 | | 15,100 |
| | | 840815 | 1415 | 509.25 | | 15,100 |
| | | 840823 | 1645 | 509.76 | | 17,900 |
| | | 840812 | 1500 | 509.90 | | 19,000 |

Table A-1.9 Summary of site-specific data collected for rating curve analysis at R.M. 119.1L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 119.1P1 | Cross Section 2 | 841004 | | 509.25 | | 7,380 |
| | | 841004 | 1645 | 509.27 | | 7,380 |
| | | 840930 | 1655 | 509.27 | | 7,500 |
| | | 840926 | 1708 | 509.33 | | 7,680 |
| | | 841001 | 1000 | 509.35 | | 7,830 |
| | | 840914 | 1111 | 509.58 | | 8,800 |
| | | 840910 | 1810 | 509.76 | | 9,890 |
| | | 840922 | | 509.94 | | 10,300 |
| | | 840815 | | 511.05 | | 15,100 |
| | | 840812 | | 511.83 | | 19,000 |

Table A-1.10 Summary of site-specific data collected for rating curve analysis at R.M. 119.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 119.2W1 | Mouth | 840928 | | 508.23 | | 7,320 |
| | | 840906 | | 508.89 | | 10,300 |
| | | 840922 | 1523 | 508.92 | | 10,300 |
| | | 840819 | 1045 | 510.19 | | 17,400 |
| | | 840812 | | 510.41 | | 19,000 |
| | | 840824 | 1029 | 510.95 | | 22,700 |
| 119.2S1 | Cross Section 1 | 840914 | 1330 | 508.58 | | 8,800 |
| | | 840906 | | 508.88 | | 10,300 |
| | | 840906 | | 508.89 | | 10,300 |
| | | 840922 | 1515 | 508.93 | | 10,300 |
| | | 840922 | 1520 | 508.95 | | 10,300 |
| | | 840905 | 1805 | 508.89 | 0 | 10,400 |
| | | 840831 | 1514 | 509.54 | | 13,600 |
| | | 840815 | | 509.76 | | 15,100 |
| | | 840819 | 1045 | 510.20 | 317 | 17,400 |
| | | 840819 | 1215 | 510.22 | | 17,400 |
| | | 840824 | 1030 | 511.00 | | 22,700 |
| | | 840824 | 1225 | 511.11 | | 22,700 |
| | | 840809 | | 511.27 | | 24,500 |

Table A-1.10 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 119.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 119.2S2 | Cross Section 2 | 841005 | 0915 | 508.28 | | 7,080 |
| | | 840914 | 1330 | 508.60 | | 8,800 |
| | | 840906 | | 508.90 | | 10,300 |
| | | 840922 | 1500 | 508.94 | | 10,300 |
| | | 840905 | 1730 | 508.90 | 0 | 10,400 |
| | | 840831 | 1525 | 509.56 | | 13,600 |
| | | 840819 | 1335 | 510.26 | 338 | 17,400 |
| | | 840824 | 1030 | 511.05 | | 22,700 |
| | | 840824 | 1224 | 511.24 | | 22,700 |
| 119.2S3 | Cross Section 3 | 841005 | 0930 | 508.28 | | 7,080 |
| | | 840914 | 1330 | 508.60 | | 8,800 |
| | | 840906 | | 508.89 | | 10,300 |
| | | 840922 | 1500 | 508.95 | | 10,300 |
| | | 840905 | 1700 | 508.90 | 0 | 10,400 |
| | | 840831 | 1526 | 509.54 | 71 | 13,600 |
| | | 840815 | | 509.75 | | 15,100 |
| | | 840819 | 1430 | 510.27 | 300 | 17,400 |
| | | 840824 | 1112 | 511.13 | | 22,700 |
| | | 840824 | 1145 | 511.19 | 1090 | 22,700 |
| | | 840824 | 1220 | 511.24 | | 22,700 |
| | | 840809 | | 511.42 | | 24,500 |

Table A-1.10 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 119.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 119.2S4 | Cross Section 4 | 841005 | 0945 | 508.49 | | 7,080 |
| | | 840914 | 1330 | 508.59 | | 8,800 |
| | | 840906 | | 508.86 | | 10,300 |
| | | 840922 | 1510 | 508.92 | | 10,300 |
| | | 840905 | 1645 | 508.88 | .2 | 10,400 |
| | | 840815 | | 509.99 | | 15,100 |
| | | 840819 | 1330 | 510.75 | 348 | 17,400 |
| | | 840824 | 1041 | 511.61 | | 22,700 |
| 119.2S5 | Cross Section 5 | 840914 | 1330 | 510.90 | | 8,800 |
| | | 840906 | | 511.25 | | 10,300 |
| | | 840922 | 1515 | 511.33 | | 10,300 |
| | | 840905 | 1600 | 511.25 | .2 | 10,400 |
| | | 840831 | 1702 | 512.10 | | 13,600 |
| | | 840815 | | 512.43 | | 15,100 |
| | | 840819 | 1640 | 512.83 | 317 | 17,400 |
| | | 840824 | 1042 | 513.56 | | 22,700 |
| | | 840824 | 1229 | 513.70 | | 22,700 |

Table A-1.11 Summary of site-specific data collected for rating curve analysis at R.M. 125.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 125.0P1 | Cross Section 1 | 840929 | | 555.84 | | 7,410 |
| | | 840930 | 1255 | 556.21 | | 7,500 |
| | | 840913 | | 556.39 | | 9,000 |
| | | 840910 | | 556.54 | | 9,890 |
| | | 840831 | 1744 | 557.25 | | 13,600 |
| | | 840814 | | 557.61 | | 16,100 |
| | | 840819 | 1710 | 557.91 | | 17,400 |
| | | 840822 | 1440 | 558.02 | | 19,100 |
| 125.0P2 | Cross Section 2 | 841018 | 1200 | 555.39 | 8 | 4,300 |
| | | 841012 | | 557.10 | 169 | 6,210 |
| | | 840929 | | 557.50 | | 7,410 |
| | | 840930 | 1255 | 557.59 | | 7,500 |
| | | 840926 | 1921 | 557.67 | 329 | 7,680 |
| | | 840915 | 1150 | 557.86 | | 8,520 |
| | | 840913 | 1400 | 557.97 | 657 | 9,000 |
| | | 840910 | 1650 | 558.12 | | 9,890 |
| | | 840831 | 1736 | 558.82 | | 13,600 |
| | | 840814 | | 559.24 | | 16,100 |
| | | 840819 | 1700 | 559.47 | | 17,400 |
| | | 840822 | 1615 | 559.69 | | 19,100 |

Table A-1.12 Summary of site-specific data collected for rating curve analysis at R.M. 130.2R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 129.8P1 | Cross Section 2 | 841004 | 1445 | 605.71 | | 7,380 |
| | | 840927 | | 605.70 | | 7,470 |
| | | 840930 | | 605.70 | | 7,500 |
| | | 840926 | 1615 | 605.66 | | 7,680 |
| | | 840915 | 1015 | 605.74 | | 8,520 |
| | | 840910 | 1535 | 605.86 | | 9,890 |
| | | 840816 | | 606.39 | | 14,500 |
| | | 840814 | 1550 | 606.56 | | 16,100 |
| | | 840814 | | 606.57 | | 16,100 |
| | | 840821 | 1745 | 606.97 | | 19,900 |
| | | 840821 | 1745 | 606.99 | | 19,900 |
| | | 840811 | | 607.63 | | 22,500 |
| | | 840827 | 1110 | 608.60 | | 27,700 |
| | | 840826 | 1556 | 609.01 | | 31,700 |

Table A-1.13 Summary of site-specific data collected for rating curve analysis at R.M. 131.3L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 131.1P1 | Cross Sect on 3 | 840928 | | 616.26 | | 7,320 |
| | | 841004 | 1150 | 616.26 | | 7,380 |
| | | 840927 | | 616.25 | | 7,470 |
| | | 840926 | 1430 | 616.24 | | 7,680 |
| | | 840913 | 1700 | 616.29 | | 9,000 |
| | | 840907 | 1830 | 616.37 | | 10,700 |
| | | 840902 | | 616.49 | | 11,800 |
| | | 840814 | 1445 | 617.06 | | 16,100 |
| | | 840814 | | 617.07 | | 16,100 |
| | | 840821 | 1644 | 617.68 | | 19,900 |
| 131.1P2 | Cross Section 1 | 840929 | 1830 | 614.30 | | 7,410 |
| | | 840927 | | 614.31 | | 7,470 |
| | | 840926 | 1405 | 614.33 | | 7,680 |
| | | 840913 | 1730 | 614.50 | | 9,000 |
| | | 840907 | 1830 | 614.96 | | 10,700 |
| | | 840902 | | 615.26 | | 11,800 |

Table A-1.14 Summary of site-specific data collected for rating curve analysis at R.M. 131.7L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 131.5S3 | Cross Section 3 | 841012 | | 616.35 | 2.9 | 6,210 |
| | | 840927 | 1234 | 616.67 | 20 | 7,470 |
| | | 840919 | 1407 | 616.92 | 57 | 9,390 |
| | | 840907 | 1750 | 617.13 | 87 | 10,700 |
| | | 840902 | 1720 | 617.32 | 159 | 11,800 |
| | | 840831 | 1700 | 617.58 | 247 | 13,600 |
| | | 840817 | | 617.51 | 248 | 14,800 |
| | | 840828 | 1330 | 618.11 | 625 | 21,000 |
| | | 840811 | | 618.18 | | 22,500 |
| | | 840827 | 1124 | 619.38 | | 27,700 |

Table A-1.15 Summary of site-specific data collected for rating curve analysis at R.M. 132.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 132.5S1 | Cross Section 1 | 840907 | | 625.36 | | 10,700 |
| | | 840901 | 1010 | 625.52 | 29 | 12,700 |
| | | 840828 | 1146 | 626.09 | | 21,000 |
| | | 840708 | 1250 | 626.05 | 131 | 21,500 |
| | | 840707 | 1700 | 626.15 | | 21,900 |
| | | 840711 | 1500 | 626.23 | | 23,100 |
| | | 840827 | 1145 | 627.27 | | 27,700 |
| 132.5S2 | Cross Section 2 | 840914 | 1310 | 625.33 | | 8,800 |
| | | 840907 | 1500 | 625.49 | | 10,700 |
| | | 840907 | | 625.50 | | 10,700 |
| | | 840901 | 1040 | 625.65 | 28 | 12,700 |
| | | 840828 | 1147 | 626.27 | | 21,000 |
| | | 840708 | 1330 | 626.28 | 146 | 21,500 |
| | | 840707 | 1700 | 626.34 | | 21,900 |
| | | 840711 | 1500 | 626.41 | | 23,100 |
| | | 840827 | 1145 | 627.29 | | 27,700 |
| | | 840827 | 1145 | 627.31 | | 27,700 |
| 132.5S3 | Cross Section 3 | 840907 | | 625.94 | 10 | 10,700 |
| | | 840901 | 1051 | 626.28 | 27 | 12,700 |
| | | 840828 | 1206 | 627.16 | | 21,000 |
| | | 840708 | 1415 | 627.29 | 170 | 21,500 |
| | | 840707 | 1700 | 627.14 | | 21,900 |
| | | 840711 | 1505 | 627.39 | | 23,100 |

Table A-1.15 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 132.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 132.5S4 | Cross Section 4 | 840907 | 1415 | 627.08 | | 10,700 |
| | | 840901 | 1112 | 627.23 | 26 | 12,700 |
| | | 840828 | 1154 | 627.86 | | 21,000 |
| | | 840708 | 1445 | 627.95 | 150 | 21,500 |
| | | 840707 | 1700 | 627.96 | | 21,900 |
| | | 840711 | 1505 | 628.05 | | 23,100 |
| | | 840827 | 1149 | 628.47 | | 27,700 |
| 132.5S5 | Cross Section 5 | 840914 | 1335 | 626.90 | | 8,800 |
| | | 840907 | 1400 | 627.17 | | 10,700 |
| | | 840907 | | 627.19 | | 10,700 |
| | | 840901 | 1127 | 627.41 | 27 | 12,700 |
| | | 840828 | 1156 | 628.06 | | 21,000 |
| | | 840708 | 1600 | 628.10 | 136 | 21,500 |
| | | 840707 | 1700 | 628.14 | | 21,900 |
| | | 840711 | 1510 | 628.23 | | 23,100 |
| | | 840827 | 1150 | 628.67 | | 27,700 |
| | | 840827 | 1154 | 628.68 | | 27,700 |
| 132.5S6 | Cross Section 6 | 840907 | | 627.18 | | 10,700 |
| | | 840907 | 1330 | 627.19 | | 10,700 |
| | | 840901 | 1146 | 627.43 | 27 | 12,700 |
| | | 840901 | 1003 | 627.44 | 27 | 12,700 |
| | | 840828 | 1158 | 628.09 | | 21,000 |
| | | 840708 | 1635 | 628.16 | 120 | 21,500 |
| | | 840707 | 1635 | 628.16 | | 21,900 |
| | | 840711 | 1510 | 628.27 | | 23,100 |
| | | 840827 | 1153 | 628.71 | | 27,700 |

Table A-1.15 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 132.6L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 132.5S7 | Cross Section 7 | 840914 | 1345 | 626.91 | | 8,800 |
| | | 840907 | | 627.16 | | 10,700 |
| | | 840907 | 1300 | 627.17 | | 10,700 |
| | | 840901 | 1204 | 627.43 | 24 | 12,700 |
| | | 840901 | 1001 | 627.44 | 24 | 12,700 |
| | | 840828 | 1200 | 628.11 | | 21,000 |
| | | 840708 | 1700 | 628.17 | 136 | 21,500 |
| | | 840707 | | 628.20 | | 21,900 |
| | | 840711 | 1515 | 628.30 | | 23,100 |
| | | 840827 | 1156 | 628.74 | | 27,700 |
| 132.5S8 | Cross Section 8 | 840914 | 1345 | 627.00 | | 8,800 |
| | | 840907 | | 627.27 | | 10,700 |
| | | 840901 | 1000 | 627.50 | 33 | 12,700 |
| | | 840901 | | 627.51 | 33 | 12,700 |
| | | 840828 | 1202 | 628.17 | | 21,000 |
| | | 840708 | 1740 | 628.20 | 129 | 21,500 |
| | | 840707 | | 628.24 | | 21,900 |
| | | 840711 | 1515 | 628.33 | | 23,100 |
| | | 840827 | 1158 | 628.83 | | 27,700 |
| 132.5S9 | Cross Section 9 | 840914 | 1400 | 627.92 | | 8,800 |
| | | 840907 | 1200 | 628.04 | | 10,700 |
| | | 840901 | 0958 | 628.10 | 22 | 12,700 |
| | | 840901 | 1245 | 628.12 | 22 | 12,700 |
| | | 840828 | 1204 | 628.33 | | 21,000 |
| | | 840708 | 1800 | 628.40 | 149 | 21,500 |
| | | 840707 | 1700 | 628.37 | | 21,900 |
| | | 840711 | 1515 | 628.47 | | 23,100 |
| | | 840827 | 1200 | 628.84 | | 27,700 |

Table A-1.16 Summary of site-specific data collected for rating curve analysis at R.M. 133.8R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 133.7P1 | Cross Section 3 | 840926 | 1215 | 649.23 | | 7,680 |
| | | 840925 | 1735 | 649.26 | | 7,890 |
| | | 840911 | 1755 | 649.42 | | 9,330 |
| | | 840919 | 1605 | 649.46 | | 9,390 |
| | | 840910 | 1505 | 649.45 | | 9,890 |
| | | 840910 | 1830 | 649.47 | | 9,890 |
| | | 840922 | 1555 | 649.52 | | 10,300 |
| | | 840920 | 1720 | 649.57 | | 10,400 |
| | | 840814 | | 650.27 | | 16,100 |
| | | 840814 | 1150 | 650.32 | | 16,100 |
| | | 840821 | 1530 | 650.71 | | 19,100 |
| | | 840828 | 1542 | 650.72 | | 21,000 |
| | | 840824 | 1550 | 651.43 | | 22,700 |
| | | 840827 | 1245 | 651.84 | | 27,700 |
| | | 840827 | 1245 | 651.86 | | 27,700 |
| | | 840827 | 1030 | 651.98 | | 27,700 |
| | | 840825 | 1425 | 652.48 | | 29,800 |
| | | 840826 | | 652.72 | | 31,700 |

Table A-1.17 Summary of site-specific data collected for rating curve analysis at R.M. 136.0L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 136.0S1 | Cross Section 1 | 840909 | 1113 | 674.64 | 76 | 10,600 |
| | | 840901 | 1605 | 675.14 | 150 | 12,700 |
| | | 840818 | 1100 | 675.81 | 246 | 15,600 |
| | | 840818 | 1100 | 675.85 | | 15,600 |
| | | 840828 | 1724 | 676.67 | | 21,000 |
| | | 840827 | 1604 | 678.06 | | 27,700 |
| 136.0S2 | Cross Section 2 | 840915 | 1745 | 674.49 | | 8,520 |
| | | 840914 | 1100 | 674.56 | | 8,800 |
| | | 840909 | | 674.84 | | 10,600 |
| | | 840909 | 1155 | 674.88 | 80 | 10,600 |
| | | 840908 | | 674.92 | | 10,900 |
| | | 840901 | 1710 | 675.31 | 162 | 12,700 |
| | | 840818 | 1130 | 675.97 | 281 | 15,600 |
| | | 840828 | 1725 | 676.78 | | 21,000 |
| | | 840827 | 1603 | 678.04 | | 27,700 |
| 136.0S3 | Cross Section 3 | 840915 | 1520 | | | 8,520 |
| | | 840914 | 1130 | 675.02 | | 8,800 |
| | | 840909 | 1228 | 675.31 | 79 | 10,600 |
| | | 840909 | | 675.32 | | 10,600 |
| | | 840908 | | 675.36 | | 10,900 |
| | | 840901 | 1750 | 675.77 | 149 | 12,700 |
| | | 840818 | 1145 | 676.39 | 241 | 15,600 |
| | | 840828 | 1610 | 676.99 | 413 | 21,000 |
| | | 840827 | 1608 | 678.21 | | 27,700 |

Table A-1.17 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 136.0L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 136.0S4 | Cross Section 4 | 841003 | 1645 | 675.03 | | 7,680 |
| | | 840915 | 1745 | 675.15 | | 8,520 |
| | | 840914 | 1145 | 675.21 | | 8,800 |
| | | 840909 | | 675.48 | | 10,600 |
| | | 840909 | 1340 | 675.61 | 88 | 10,600 |
| | | 840908 | | 675.61 | | 10,900 |
| | | 840901 | 1800 | 675.82 | 154 | 12,700 |
| | | 840818 | 1324 | 676.65 | 253 | 15,600 |
| | | 840828 | 1622 | 677.36 | 413 | 21,000 |
| | | 840811 | 1815 | 677.56 | | 24,500 |
| | | 840827 | 1615 | 678.54 | | 27,700 |
| | | 840827 | 1616 | 678.60 | | 27,700 |
| 136.0S5 | Cross Section 5 | 840915 | 1745 | 676.04 | | 8,520 |
| | | 840914 | 1200 | 676.05 | | 8,800 |
| | | 840909 | | 676.33 | | 10,600 |
| | | 840909 | 1405 | 676.43 | 79 | 10,600 |
| | | 840908 | | 676.38 | | 10,900 |
| | | 840901 | 1830 | 676.61 | 153 | 12,700 |
| | | 840818 | 1330 | 677.10 | 273 | 15,600 |
| | | 840828 | 1700 | 677.62 | | 21,000 |

Table A-1.17 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 136.0L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 136.0S6 | Cross Section 6 | 840915 | 1745 | 676.30 | | 8,520 |
| | | 840914 | 1215 | 676.35 | | 8,800 |
| | | 840909 | 1440 | 676.63 | 84 | 10,600 |
| | | 840909 | | 676.64 | | 10,600 |
| | | 840909 | 1440 | 676.67 | | 10,600 |
| | | 840908 | | 676.78 | | 10,900 |
| | | 840901 | 1900 | 676.97 | 154 | 12,700 |
| | | 840818 | 1400 | 677.53 | 288 | 15,600 |
| | | 840828 | 1730 | 677.96 | | 21,000 |
| | | 840827 | 1617 | 678.91 | | 27,700 |

Table A-1.18 Summary of site-specific data collected for rating curve analysis at R.M. 137.5R.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 137.4P1 | Cross Section 1 | 840928 | | 690.03 | | 7,320 |
| | | 840929 | 1540 | 690.02 | | 7,410 |
| | | 841003 | 1600 | 690.02 | | 7,680 |
| | | 840914 | 1230 | 690.05 | | 8,800 |
| | | 840910 | 1335 | 690.02 | | 9,890 |
| | | 840902 | | 690.22 | | 11,800 |
| | | 840812 | 1630 | 692.02 | | 19,000 |
| | | 840812 | 1630 | 692.13 | | 19,000 |
| | | 840821 | 1509 | 692.19 | | 19,900 |
| | | 840828 | 1749 | 692.15 | | 21,000 |
| | | 840828 | 1751 | 692.17 | | 21,000 |
| | | 840827 | 1545 | 693.52 | | 27,700 |
| | | 840826 | 1500 | 695.16 | | 31,700 |
| 137.4P2 | Cross Section 2 | 840928 | | 690.71 | | 7,320 |
| | | 840929 | 1540 | 690.64 | | 7,410 |
| | | 841003 | 1600 | 690.70 | | 7,680 |
| | | 840914 | 1230 | 690.71 | | 8,800 |
| | | 840910 | 1335 | 690.76 | | 9,890 |
| | | 840812 | 1630 | 692.01 | | 19,000 |
| | | 840812 | 1650 | 692.02 | | 19,000 |
| | | 840821 | 1508 | 692.19 | | 19,900 |

Table A-1.19 Summary of site-specific data collected for rating curve analysis at R.M. 138.7L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 138.7P1 | Cross Section 2 | 840910 | 1325 | 706.04 | | 9,890 |
| | | 840920 | 1642 | 706.26 | | 10,400 |
| | | 840902 | | 706.55 | | 11,800 |
| | | 840816 | 1450 | 707.25 | | 14,500 |
| | | 840815 | 1535 | 707.40 | | 15,100 |
| | | 840823 | 1500 | 707.77 | | 17,900 |
| | | 840812 | 1230 | 708.06 | | 19,000 |
| | | 840812 | | 708.10 | | 19,000 |
| | | 840821 | 1502 | 708.20 | | 19,900 |

Table A-1.20 Summary of site-specific data collected for rating curve analysis at R.M. 139.0L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 139.0P1 | Cross Section 2 | 840910 | 1320 | 708.96 | | 9,390 |
| | | 840920 | 1328 | 708.97 | | 10,400 |
| | | 840902 | | 708.99 | | 11,800 |
| | | 840816 | 1430 | 709.53 | | 14,500 |
| | | 840823 | 1218 | 709.96 | | 17,900 |
| | | 840812 | 1410 | 710.31 | | 19,000 |
| | | 840812 | | 710.33 | | 19,000 |
| | | 840828 | 1817 | 710.31 | | 21,000 |
| | | 840826 | 1447 | 712.62 | | 31,700 |

Table A-1.21 Summary of site-specific data collected for rating curve analysis at R.M. 139.4L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 139.4P1 | Cross Section 2 | 840929 | 1610 | 712.63 | | 7,410 |
| | | 841003 | 1310 | 712.72 | | 7,680 |
| | | 840918 | 1707 | 712.83 | | 8,370 |
| | | 840910 | 1300 | 712.89 | | 9,890 |
| | | 840902 | | 713.38 | | 11,800 |
| | | 840816 | 1512 | 713.64 | | 14,500 |
| | | 840823 | 1100 | 714.00 | | 17,900 |
| | | 840812 | 1545 | 714.18 | | 19,000 |
| | | 840821 | 1458 | 714.38 | | 19,900 |

Table A-1.22 Summary of site-specific data collected for rating curve analysis at R.M. 147.1L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 147.0M1 | Cross Section 1 | 840917 | | 812.25 | | 8,130 |
| | | 840913 | 0930 | 812.50 | | 9,000 |
| | | 840907 | 1312 | 812.90 | | 10,700 |
| | | 840829 | 1600 | 814.08 | | 17,400 |
| | | 840813 | | 814.33 | | 19,000 |
| | | 840828 | 1910 | 814.53 | | 19,000 * |
| | | 840821 | 1150 | 814.75 | | 20,000 * |
| 147.0M2 | Cross Section 2 | 840917 | | 813.54 | | 8,130 |
| | | 840913 | 0930 | 813.87 | | 9,000 |
| | | 840829 | 1600 | 815.25 | | 17,400 |
| | | 840813 | | 815.36 | | 17,600 |
| | | 840828 | 1922 | 815.63 | | 19,000 * |
| | | 840821 | 1210 | 815.77 | | 20,000 * |
| 147.0M3 | Cross Section 3 | 840917 | | 814.67 | | 8,130 |
| | | 840913 | 0930 | 814.92 | | 9,000 |
| | | 840907 | 1250 | 815.19 | | 10,700 |
| | | 840829 | 1600 | 816.24 | | 17,400 |
| | | 840813 | | 816.34 | | 17,600 |
| | | 840828 | 1940 | 816.59 | | 19,000 * |
| | | 840821 | 1225 | 816.74 | | 20,000 * |

* Instantaneous discharge estimated from time lag analysis.

Table A-1.22 (cont.) Summary of site-specific data collected for rating curve analysis at R.M. 147.1L.

| Staff Gage Number | Location within site | Date | Time | WSEL (ft) | Flow (cfs) | Discharge (cfs) |
|---|---|---|---|---|---|---|
| 147.0M4 | Cross Section 4 | 840917 | | 815.12 | 1860 | 8,130 |
| | | 840913 | 0930 | 815.34 | 2236 | 9,000 |
| | | 840907 | 1233 | 815.72 | | 10,700 |
| | | 840829 | 1600 | 816.69 | 4740 | 17,400 |
| | | 840813 | | 816.89 | | 17,600 |
| | | 840828 | 1950 | 817.09 | | 19,000 * |
| | | 840821 | 1235 | 817.24 | | 20,000 * |
| | | 840709 | 1230 | 817.46 | | 21,400 |
| 147.0M5 | Cross Section 5 | 840917 | | 815.54 | | 8,130 |
| | | 840913 | 0930 | 815.80 | | 9,000 |
| | | 840907 | 1220 | 816.13 | | 10,700 |
| | | 840829 | 1600 | 817.20 | | 17,400 |
| | | 840813 | | 817.44 | | 17,600 |
| | | 840828 | 2000 | 817.61 | | 19,000 * |
| | | 840821 | 1247 | 817.76 | | 20,000 * |
| 147.0M6 | Cross Section 6 | 840917 | | 816.13 | | 8,130 |
| | | 840913 | 0930 | 816.38 | | 9,000 |
| | | 840829 | 1600 | 818.00 | | 17,400 |
| | | 840813 | | 818.18 | | 17,600 |
| | | 840821 | 1256 | 818.51 | | 20,000 * |

* Instantaneous discharge estimated from time lag analysis.

# SUMMARY OF HYDRAULIC CONDITIONS

# AND HABITAT FORECASTS AT

# 1984 MIDDLE RIVER STUDY SITES

DRAFT REPORT

Appendix B
Data supporting calibration and application
of IFG hydraulic models

Prepared for:

ALASKA POWER AUTHORITY

Prepared by:

N. Diane Hilliard
Shelley Williams
E. Woody Trihey
R. Curt Wilkinson
Cleveland R. Steward, III

May 1985

## APPENDIX FIGURES

## APPENDIX TABLES

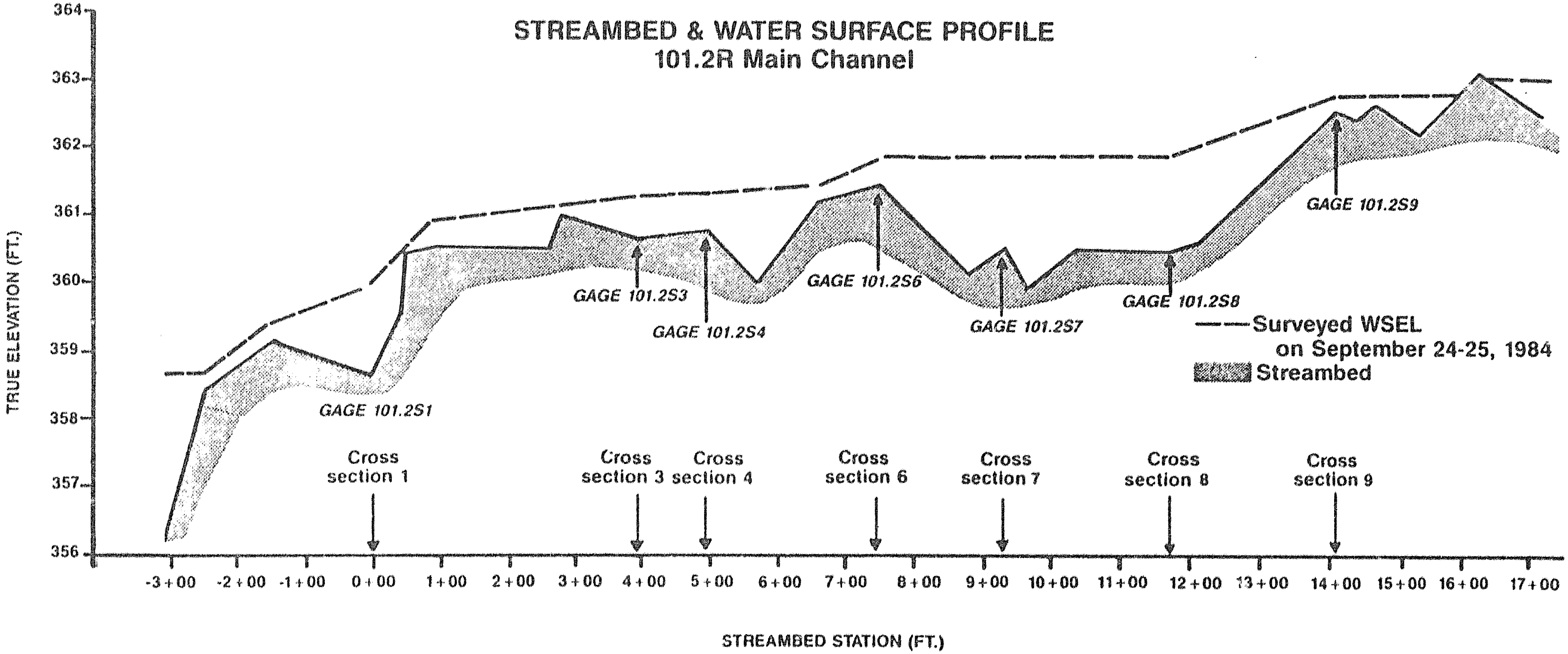



Figure B-1.1 Streambed profile at site 101.2R - main channel.

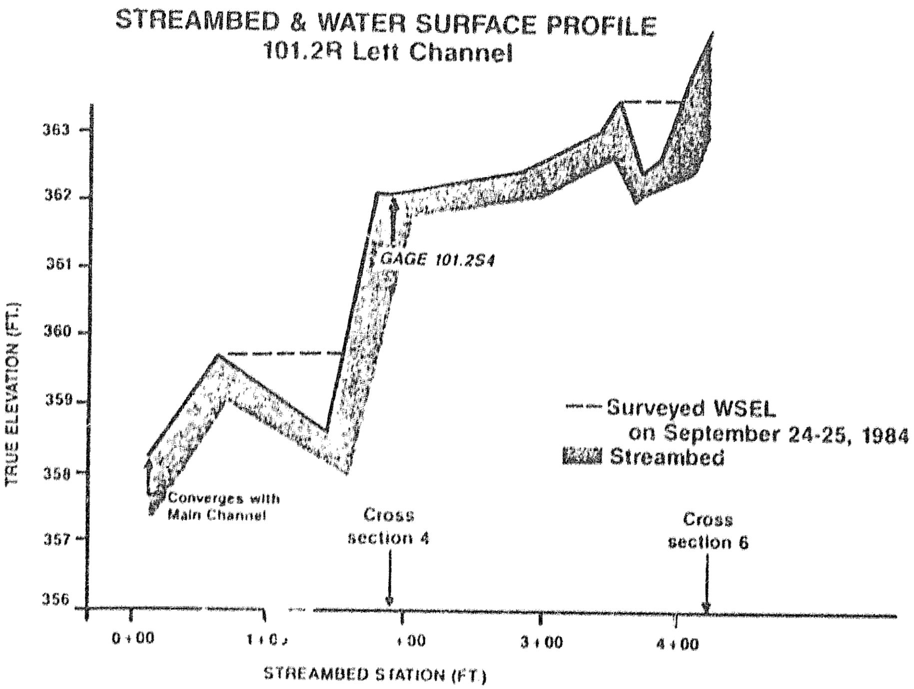



Figure B-¹.2 Streambed profile at site 101.2R - left channel.

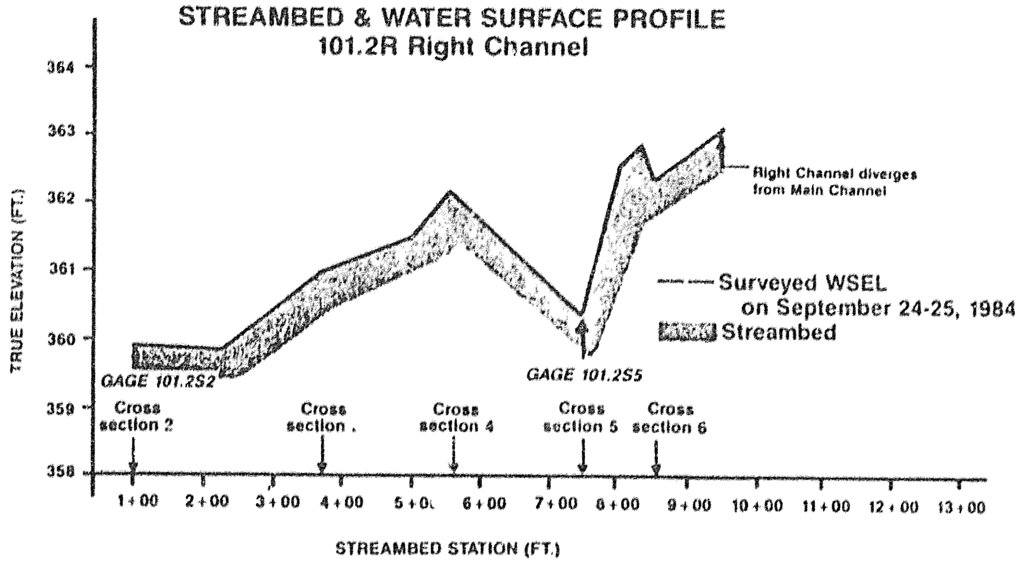



Figure B-1.3 Streambed profile at site 101.2R - right channel.

Table B-1.1. Streambed profile at site 101.2R main channel; surveyed on August 24-25, 1984 (TBM ID: R&M LRX-6 LB 1980).

| Streambed Station (ft) | Streambed Elevation (ft) | WSEL (ft) | Comments |
|---|---|---|---|
| -3+05 | 356.15 | 358.67 | Pool |
| -2+45 | 358.44 | 358.67 | Riffle |
| -1+45 | 359.17 | 359.45 | Riffle |
| 0+00 | 358.68 | 359.55 | Cross section 1 - SG 101.2S1 |
| 0+43 | 359.52 | 360.45 | Transition |
| 0+50 | 360.49 | 360.50 | Transition |
| 0+88 | 360.56 | 360.95 | |
| 2+60 | 360.51 | 361.17 | Pool |
| 2+80 | 361.01 | 361.19 | Pool |
| 3+93 | 360.69 | 361.33 | Cross section 3 - SG 101.2S3 |
| 5+95 | 360.81 | 361.26 | Cross section 4 - SG 101.2S4 |
| 6+70 | 360.01 | 361.40 | Pool |
| 7+63 | 361.24 | 361.58 | Riffle |
| 8+50 | 361.48 | 361.96 | Cross section 6 - SG 101.2S6 |
| 9+80 | 360.14 | 361.96 | Pool |
| 10+33 | 360.45 | 361.92 | Cross section 7 - SG 101.2S7 |
| 10+65 | 359.91 | 361.92 | Pool |
| 11+40 | 360.51 | 361.92 | Riffle |
| 12+75 | 360.49 | 361.90 | Cross section 8 - SG 101.2S8 |
| 13+15 | 360.62 | 362.05 | Pool |
| 15+10 | 362.54 | 362.79 | Cross section 9 - SG 101.2S9B |
| 15+43 | 362.44 | 362.79 | Pool |
| 15+70 | 362.67 | 362.80 | Transition |
| 16+38 | 362.22 | 362.80 | Pool |
| 17+15 | 363.13 | DRY | |
| 18+25 | 362.47 | 363.05 | |

Table B-1.2. Streambed profile at site 101.2R left channel; surveyed on August 24-25, 1984 (TBM ID: R&M LRX-6 LB 1980).

| Streambed Station (ft) | Streambed Elevation (ft) | WSEL (ft) | Comments |
|---|---|---|---|
| 0+20 | 358.24 | 359.50 | Left channel converges with main channel |
| 1+25 | 359.75 | 359.70 | Pool |
| 2+78 | 358.64 | 360.20 | Pool |
| 3+53 | 362.13 | DRY | |
| 3+78 | 362.13 | DRY | Cross section 3 - SG 101.2S3 |
| 5+65 | 362.48 | DRY | Cross section 4 - SG 101.2S4 |
| 6+78 | 363.07 | DRY | |
| 6+88 | 362.25 | DRY | |
| 7+13 | 363.52 | DRY | |
| 7+50 | 362.49 | DRY | |
| 7+70 | 362.68 | DRY | |
| 8+13 | 363.86 | DRY | |
| 8+45 | 364.59 | DRY | Cross section 6 - SG 101.2S6 |

Table B-1.3. Streambed profile at site 101.2R right channel; surveyed on August 24-25, 1984 (TBM ID: R&M LRX-6 LB 1980).

| Streambed Station (ft) | Streambed Elevation (ft) | WSEL (ft) | Comments |
|---|---|---|---|
| 0+00 | | | Cross section 1 |
| 0+96 | 359.92 | DRY | Cross section 2 - SG 101.2S2 |
| 2+29 | 359.88 | DRY | |
| 3+71 | 36[illegible].08 | DRY | Cross section 3 |
| 5+01 | 361.52 | DRY | |
| 5+55 | 362.15 | DRY | |
| 5+62 | 362.17 | DRY | Cross section 4 |
| 7+51 | [illegible]0.37 | 362.05 | Cross section 5 - SG 101.2S5, Pool |
| 8+06 | 362.57 | DRY | |
| 8+31 | 362.87 | DRY | |
| 8+56 | 362.33 | DRY | |
| 9+56 | 363.11 | DRY | Diverges from main channel |

Table B-2.1 Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 0.0 | 366.10 | 1 | 8.4 | LB Headpin |
| Station 0+00 | 2.0 | 365.60 | 1 | 8.4 | Top of bank |
| | 8.0 | 362.10 | 7 | 4.3 | Bottom of bank |
| | 16.6 | 361.10 | 7 | 4.3 | |
| | 18.0 | 360.80 | 7 | 4.3 | |
| | 20.0 | 360.60 | 7 | 4.3 | |
| | 22.0 | 360.40 | 7 | 4.3 | |
| | 24.0 | 360.10 | 7 | 4.3 | |
| | 26.0 | 359.90 | 7 | 4.3 | |
| | 28.0 | 359.60 | 7 | 4.3 | |
| | 30.0 | 359.70 | 7 | 4.3 | LWE |
| | 32.0 | 359.40 | 7 | 4.3 | |
| | 34.0 | 359.50 | 7 | 4.3 | |
| | 36.0 | 359.50 | 7 | 4.3 | |
| | 38.0 | 359.50 | 7 | 4.3 | |
| | 40.0 | 359.40 | 7 | 4.3 | |
| | 42.0 | 359.30 | 7 | 4.3 | |
| | 43.0 | 359.40 | 7 | 4.3 | |
| | 44.0 | 359.30 | 7 | 4.3 | |
| | 46.0 | 359.30 | 7 | 4.3 | |
| | 48.0 | 359.20 | 7 | 4.3 | |
| | 50.0 | 359.10 | 7 | 4.3 | |
| | 52.0 | 359.00 | 7 | 4.3 | |
| | 54.0 | 358.80 | 7 | 4.3 | |
| | 55.0 | 358.70 | 7 | 4.3 | |
| | 56.0 | 358.60 | 7 | 4.3 | |
| | 58.0 | 358.60 | 7 | 4.3 | |
| | 60.0 | 358.80 | 7 | 4.3 | |
| | 62.0 | 358.90 | 7 | 4.3 | |
| | 64.0 | 358.90 | 7 | 4.3 | |
| | 65.0 | 359.00 | 7 | 4.3 | |
| | 66.0 | 359.00 | 7 | 4.3 | |
| | 68.0 | 359.10 | 7 | 4.3 | |
| | 70.0 | 359.30 | 7 | 4.3 | |
| | 72.0 | 359.50 | 7 | 4.3 | |
| | 73.0 | 359.50 | 7 | 4.3 | RWE |
| | 74.0 | 359.60 | 7 | 4.3 | |
| | 76.0 | 359.90 | 7 | 4.3 | |
| | 78.0 | 360.10 | 7 | 4.3 | |
| | 80.0 | 360.20 | 7 | 4.3 | |
| | 82.0 | 360.30 | 7 | 4.3 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 84.0 | 360.70 | 7 | 4.3 | |
| Station 0+00 | 86.0 | 360.60 | 7 | 4.3 | |
| (cont.) | 88.0 | 360.70 | 7 | 4.2 | |
| | 90.0 | 360.70 | 7 | 4.2 | |
| | 92.0 | 360.90 | 7 | 4.2 | |
| | 94.0 | 361.00 | 7 | 4.2 | |
| | 96.0 | 361.10 | 7 | 4.2 | |
| | 98.0 | 361.10 | 7 | 4.2 | |
| | 124.0 | 361.80 | 2 | 4.2 | |
| | 148.0 | 361.20 | 2 | 4.2 | |
| | 218.0 | 362.90 | 10 | 8.1 | |
| | 249.5 | 361.60 | 10 | 8.1 | |
| | 272.0 | 361.10 | 10 | 5.2 | |
| | 274.0 | 360.90 | 10 | 5.2 | |
| | 276.0 | 360.90 | 10 | 5.2 | |
| | 278.0 | 360.70 | 10 | 5.2 | |
| | 282.0 | 360.60 | 10 | 5.2 | |
| | 285.0 | 360.20 | 10 | 5.2 | LWE |
| | 286.0 | 360.20 | 10 | 5.2 | |
| | 290.0 | 360.20 | 10 | 5.2 | |
| | 293.0 | 360.10 | 10 | 5.2 | |
| | 294.0 | 360.20 | 10 | 5.2 | |
| | 298.0 | 360.20 | 10 | 5.2 | |
| | 302.0 | 360.30 | 10 | 5.2 | |
| | 306.0 | 360.30 | 10 | 5.2 | |
| | 308.0 | 360.20 | 10 | 5.2 | RWE |
| | 310.0 | 360.40 | 10 | 5.2 | |
| | 314.0 | 360.70 | 10 | 5.2 | |
| | 318.0 | 360.90 | 10 | 5.2 | |
| | 322.0 | 360.90 | 10 | 5.2 | |
| | 323.0 | 361.10 | 10 | 5.2 | |
| | 334.0 | 361.50 | 1 | 5.2 | Bottom of bank |
| | 350.0 | 363.70 | 1 | 5.2 | |
| | 357.0 | 368.30 | 1 | 8.3 | RB Headpin |
| Cross Section 2 | 297.5 | 362.25 | 7 | 5.2 | Top of LB stake |
| Station 0+98 | 323.5 | 361.35 | 7 | 5.2 | |
| | 356.5 | 359.86 | 8 | 5.2 | |
| | 393.0 | 361.74 | 8 | 5.2 | |
| | 401.0 | 363.77 | 1 | 8.3 | |
| | 409.5 | 367.97 | 1 | 8.3 | Top of bank |
| | 410.0 | 373.68 | 1 | 8.3 | RB Headpin |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3 | 0.0 | 366.20 | 1 | 8.4 | LB Headpin |
| Station 3+74 | 5.0 | 365.00 | 1 | 2.1 | Top of bank |
| | 14.0 | 362.20 | 1 | 1.1 | |
| | 16.0 | 362.20 | 1 | 1.1 | |
| | 20.0 | 362.40 | 1 | 1.1 | |
| | 24.0 | 362.20 | 1 | 1.1 | |
| | 28.0 | 362.20 | 1 | 1.1 | |
| | 32.0 | 362.20 | 1 | 1.1 | |
| | 36.0 | 362.10 | 1 | 1.1 | |
| | 40.0 | 362.00 | 1 | 1.1 | |
| | 44.0 | 362.10 | 1 | 1.1 | |
| | 46.0 | 362.20 | 1 | 1.1 | |
| | 48.0 | 362.00 | 1 | 1.1 | |
| | 49.0 | 362.30 | 1 | 1.1 | |
| | 50.0 | 362.60 | 1 | 1.1 | |
| | 54.0 | 362.70 | 1 | 1.1 | |
| | 67.0 | 362.50 | 9 | 5.2 | |
| | 77.0 | 363.20 | 8 | 5.2 | |
| | 87.5 | 362.60 | 8 | 5.3 | |
| | 90.0 | 362.30 | 8 | 5.3 | |
| | 92.0 | 362.10 | 8 | 5.3 | |
| | 96.0 | 362.20 | 8 | 5.3 | |
| | 100.0 | 362.00 | 8 | 5.3 | |
| | 104.0 | 362.00 | 8 | 5.3 | |
| | 108.0 | 361.80 | 8 | 5.3 | |
| | 114.0 | 361.70 | 8 | 5.3 | |
| | 116.0 | 361.70 | 8 | 5.2 | |
| | 118.0 | 361.40 | 8 | 5.2 | |
| | 120.0 | 361.30 | 8 | 5.2 | LWE |
| | 122.0 | 361.10 | 8 | 5.2 | |
| | 124.0 | 361.10 | 8 | 5.2 | |
| | 126.0 | 360.80 | 8 | 5.2 | |
| | 128.0 | 361.00 | 8 | 5.2 | |
| | 130.0 | 360.80 | 8 | 5.2 | |
| | 132.0 | 360.80 | 8 | 5.2 | |
| | 134.0 | 360.70 | 8 | 5.2 | |
| | 136.0 | 360.80 | 8 | 5.2 | |
| | 136.5 | 360.70 | 8 | 5.2 | |
| | 138.0 | 360.90 | 8 | 5.2 | |
| | 140.0 | 360.70 | 8 | 5.2 | |
| | 142.0 | 360.80 | 8 | 5.2 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3 | 144.0 | 360.90 | 8 | 5.2 | |
| Station 3+74 | 146.0 | 360.90 | 8 | 5.2 | |
| (cont.) | 148.0 | 360.80 | 8 | 5.2 | |
| | 150.0 | 360.90 | 8 | 5.2 | |
| | 152.0 | 361.00 | 8 | 5.2 | |
| | 154.0 | 361.10 | 8 | 5.2 | |
| | 156.0 | 361.20 | 8 | 5.2 | |
| | 158.0 | 361.10 | 8 | 5.2 | |
| | 160.0 | 361.20 | 8 | 5.2 | |
| | 162.0 | 361.30 | 8 | 5.2 | RWE |
| | 164.0 | 361.10 | 8 | 5.2 | |
| | 166.0 | 361.20 | 8 | 5.2 | |
| | 168.0 | 361.30 | 8 | 5.2 | |
| | 170.0 | 361.30 | 8 | 5.2 | |
| | 172.0 | 361.40 | 8 | 5.2 | |
| | 174.0 | 361.50 | 8 | 5.2 | |
| | 176.0 | 361.40 | 8 | 5.2 | |
| | 178.0 | 361.50 | 8 | 5.2 | |
| | 180.0 | 361.50 | 8 | 5.2 | |
| | 182.0 | 361.50 | 8 | 5.2 | |
| | 184.0 | 361.60 | 8 | 5.2 | |
| | 186.0 | 361.70 | 8 | 5.2 | |
| | 188.0 | 361.70 | 8 | 5.2 | |
| | 189.5 | 361.80 | 8 | 5.2 | |
| | 192.0 | 361.80 | 8 | 5.2 | |
| | 196.0 | 361.80 | 8 | 5.2 | |
| | 200.0 | 362.10 | 8 | 5.2 | |
| | 204.0 | 362.00 | 8 | 5.2 | |
| | 208.0 | 362.10 | 8 | 5.2 | |
| | 212.0 | 362.30 | 8 | 5.2 | |
| | 216.0 | 362.50 | 8 | 5.2 | |
| | 220.0 | 362.50 | 8 | 5.2 | |
| | 224.0 | 362.60 | 8 | 5.2 | |
| | 227.0 | 362.60 | 10 | 5.2 | |
| | 322.0 | 362.60 | 10 | 4.2 | |
| | 339.0 | 362.60 | 10 | 4.2 | |
| | 340.0 | 362.40 | 10 | 4.2 | |
| | 344.0 | 362.40 | 10 | 4.2 | |
| | 347.5 | 362.50 | 10 | 4.2 | |
| | 352.0 | 362.40 | 10 | 4.2 | |
| | 356.0 | 362.60 | 10 | 4.2 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3 | 376.5 | 362.60 | 8 | 7.2 | Bottom of bank |
| Station 3+74 | 381.0 | 366.50 | 1 | 9.4 | Top of bank |
| (cont.) | 381.5 | 367.10 | 1 | 9.4 | RB Headpin |
| Cross Section 4 | 0.0 | 366.10 | 1 | 8.3 | LB Headpin |
| Station 5+64 | 3.0 | 364.90 | 1 | 2.2 | Top of bank |
| | 7.0 | 363.50 | 10 | 5.3 | |
| | 23.0 | 363.40 | 10 | 5.2 | |
| | 62.0 | 363.70 | 2 | 8.4 | Bottom of bank |
| | 111.0 | 364.80 | 2 | 5.2 | |
| | 123.0 | 363.30 | 10 | 5.3 | |
| | 147.0 | 363.00 | 10 | 5.3 | |
| | 151.0 | 362.50 | 10 | 5.3 | |
| | 155.0 | 362.40 | 10 | 5.3 | |
| | 159.0 | 362.40 | 10 | 5.3 | |
| | 163.0 | 361.90 | 10 | 5.3 | |
| | 164.0 | 361.70 | 10 | 5.3 | |
| | 166.0 | 361.60 | 10 | 5.3 | |
| | 168.0 | 361.50 | 10 | 5.3 | |
| | 170.0 | 361.40 | 10 | 5.3 | |
| | 172.0 | 361.30 | 8 | 5.3 | LWE |
| | 174.0 | 361.10 | 8 | 5.3 | |
| | 176.0 | 361.00 | 8 | 5.3 | |
| | 178.0 | 361.00 | 8 | 5.3 | |
| | 180.0 | 361.10 | 8 | 5.3 | |
| | 182.0 | 361.20 | 8 | 5.3 | |
| | 184.0 | 361.10 | 8 | 5.3 | |
| | 186.0 | 361.10 | 7 | 5.3 | |
| | 188.0 | 361.20 | 7 | 5.3 | |
| | 190.0 | 361.00 | 7 | 5.3 | |
| | 192.0 | 360.90 | 7 | 5.3 | |
| | 194.0 | 360.90 | 7 | 5.3 | |
| | 196.0 | 361.00 | 10 | 5.3 | |
| | 198.0 | 360.80 | 10 | 5.3 | |
| | 200.0 | 360.80 | 10 | 5.3 | |
| | 202.0 | 360.80 | 10 | 5.3 | |
| | 204.0 | 360.70 | 10 | 5.3 | |
| | 206.0 | 360.70 | 10 | 5.3 | |
| | 208.0 | 360.90 | 10 | 5.3 | |
| | 210.0 | 361.00 | 10 | 5.3 | |
| | 212.0 | 361.00 | 10 | 5.3 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 4 | 214.0 | 361.10 | 10 | 5.3 | |
| Station 5+64 | 216.0 | 361.10 | 10 | 5.3 | |
| (cont.) | 218.0 | 361.10 | 10 | 5.3 | |
| | 220.0 | 361.40 | 10 | 5.3 | |
| | 222.0 | 361.50 | 10 | 5.3 | |
| | 224.0 | 361.30 | 10 | 5.3 | |
| | 226.0 | 361.30 | 10 | 5.3 | RWE |
| | 228.0 | 361.60 | 10 | 5.3 | |
| | 230.0 | 361.40 | 10 | 5.3 | |
| | 232.0 | 361.60 | 10 | 5.3 | |
| | 234.0 | 361.70 | 10 | 5.3 | |
| | 236.0 | 361.80 | 10 | 5.3 | |
| | 238.0 | 361.80 | 10 | 5.3 | |
| | 240.0 | 361.90 | 10 | 5.3 | |
| | 243.0 | 362.30 | 10 | 5.3 | |
| | 247.0 | 362.20 | 10 | 5.3 | |
| | 251.0 | 362.40 | 10 | 5.3 | |
| | 255.0 | 362.80 | 10 | 6.3 | |
| | 259.0 | 362.80 | 10 | 6.3 | |
| | 263.0 | 362.90 | 10 | 6.3 | |
| | 266.2 | 363.00 | 10 | 6.3 | |
| | 331.0 | 364.70 | 12 | 5.2 | |
| | 362.0 | 364.00 | 10 | 5.2 | |
| | 369.0 | 363.00 | 10 | 5.2 | |
| | 383.0 | 362.90 | 10 | 5.3 | |
| | 387.0 | 362.70 | 10 | 5.3 | |
| | 389.0 | 362.90 | 10 | 5.3 | |
| | 391.0 | 362.90 | 10 | 5.3 | |
| | 393.0 | 362.90 | 10 | 5.3 | |
| | 394.0 | 363.00 | 10 | 5.3 | |
| | 408.0 | 363.50 | 2 | 5.2 | |
| | 413.0 | 364.80 | 1 | 9.3 | Bottom of bank |
| | 416.0 | 368.00 | 1 | 8.4 | Top of bank |
| | 419.0 | 369.10 | 1 | 8.4 | RB Headpin |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 5 | 194.0 | 365.52 | 1 | 1.1 | Top of sand bar |
| Station 7+51 | 198.0 | 364.56 | 1 | 1.1 | |
| | 207.0 | 364.40 | 1 | 1.1 | |
| | 211.5 | 364.43 | 1 | 1.1 | |
| | 230.0 | 361.65 | 1 | 1.1 | |
| | 238.5 | 362.10 | 1 | 1.1 | Bottom of cut bank |
| | 244.0 | 369.17 | 1 | 1.1 | Top of cut bank |
| | 256.0 | 373.72 | 1 | 1.1 | RB Headpin |
| Cross Section 6 | 0.0 | 365.40 | 1 | 5.2 | LB Headpin |
| Station 8+37 | 29.0 | 365.10 | 2 | 5.2 | |
| | 42.0 | 363.90 | 10 | 5.2 | |
| | 62.0 | 362.90 | 10 | 5.3 | |
| | 66.0 | 362.80 | 10 | 5.3 | |
| | 70.0 | 362.60 | 10 | 5.3 | |
| | 74.0 | 362.40 | 10 | 5.3 | |
| | 78.0 | 363.00 | 10 | 5.3 | |
| | 80.0 | 362.30 | 10 | 5.3 | |
| | 82.0 | 362.10 | 10 | 5.3 | |
| | 84.0 | 362.20 | 10 | 5.3 | |
| | 86.0 | 362.00 | 10 | 5.3 | |
| | 88.0 | 362.00 | 10 | 5.3 | LWE |
| | 90.0 | 361.90 | 10 | 5.3 | |
| | 92.0 | 361.90 | 10 | 5.3 | |
| | 94.0 | 361.90 | 10 | 5.3 | |
| | 96.0 | 361.90 | 10 | 5.3 | |
| | 98.0 | 361.80 | 10 | 5.3 | |
| | 100.0 | 361.90 | 10 | 5.3 | |
| | 102.0 | 361.90 | 10 | 5.3 | |
| | 104.0 | 361.90 | 10 | 5.3 | |
| | 106.0 | 361.80 | 10 | 5.3 | |
| | 108.0 | 361.90 | 10 | 5.3 | |
| | 110.0 | 361.70 | 8 | 5.3 | |
| | 112.0 | 361.70 | 8 | 5.3 | |
| | 114.0 | 361.80 | 8 | 5.3 | |
| | 116.0 | 361.90 | 8 | 5.3 | |
| | 118.0 | 361.70 | 8 | 5.3 | |
| | 120.0 | 361.80 | 8 | 5.3 | |
| | 122.0 | 361.70 | 8 | 5.3 | |
| | 12[illegible].0 | 361.70 | 8 | 5.3 | |
| | 126.0 | 361.70 | 8 | 5.3 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 6 | 128.0 | 361.60 | 8 | 5.3 | |
| Station 8+37 | 129.0 | 361.70 | 8 | 5.3 | |
| (cont.) | 130.0 | 361.70 | 8 | 5.3 | |
| | 132.0 | 361.60 | 8 | 5.3 | |
| | 134.0 | 361.60 | 8 | 5.3 | |
| | 136.0 | 361.60 | 8 | 5.3 | |
| | 138.0 | 361.60 | 8 | 5.3 | |
| | 140.0 | 361.60 | 8 | 5.3 | |
| | 142.0 | 361.60 | 8 | 5.3 | |
| | 144.0 | 361.50 | 8 | 5.3 | |
| | 146.0 | 361.60 | 8 | 5.3 | |
| | 148.0 | 361.60 | 8 | 5.3 | |
| | 150.0 | 361.60 | 8 | 5.3 | |
| | 152.0 | 361.60 | 8 | 5.3 | |
| | 154.0 | 361.70 | 8 | 5.3 | |
| | 155.0 | 361.60 | 8 | 5.3 | |
| | 156.0 | 361.70 | 8 | 5.3 | |
| | 158.0 | 361.70 | 8 | 5.3 | |
| | 160.0 | 361.70 | 8 | 5.3 | |
| | 162.0 | 361.60 | 8 | 5.3 | |
| | 164.0 | 361.70 | 8 | 5.3 | |
| | 166.0 | 361.80 | 8 | 5.3 | |
| | 168.0 | 361.90 | 8 | 5.3 | |
| | 170.0 | 362.10 | 8 | 5.3 | |
| | 172.0 | 362.00 | 8 | 5.3 | |
| | 173.5 | 362.00 | 8 | 5.3 | RWE |
| | 176.0 | 362.10 | 8 | 5.3 | |
| | 178.0 | 362.00 | 8 | 5.3 | |
| | 180.0 | 362.30 | 8 | 5.3 | |
| | 182.0 | 362.40 | 8 | 5.3 | |
| | 186.0 | 362.40 | 8 | 5.3 | |
| | 190.0 | 362.50 | 8 | 5.3 | |
| | 194.0 | 362.50 | 8 | 5.3 | |
| | 198.0 | 362.50 | 8 | 5.3 | |
| | 202.0 | 362.70 | 8 | 5.3 | |
| | 206.0 | 362.90 | 8 | 5.3 | |
| | 209.0 | 363.10 | 8 | 5.2 | |
| | 211.5 | 363.50 | 10 | 5.2 | |
| | 248.5 | 363.10 | 10 | 5.2 | |
| | 250.0 | 363.00 | 10 | 5.2 | |
| | 252.0 | 362.70 | 10 | 5.2 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 6 | 254.0 | 362.90 | 10 | 5.2 | |
| Station 8+37 | 256.0 | 363.00 | 10 | 5.2 | |
| (cont.) | 258.0 | 362.70 | 10 | 7.2 | |
| | 260.0 | 362.70 | 10 | 7.2 | |
| | 262.0 | 363.10 | 10 | 7.2 | |
| | 266.0 | 364.70 | 10 | 7.2 | |
| | 272.0 | 365.60 | 2 | 9.3 | |
| | 276.0 | 369.60 | 1 | 8.4 | |
| | 278.0 | 370.20 | 1 | 8.4 | RB Headpin |
| Cross Section 7 | 0.0 | 365.20 | 1 | 5.1 | LB Headpin |
| Station 10+23 | 43.0 | 364.00 | 2 | 5.2 | |
| | 79.0 | 363.60 | 10 | 5.2 | |
| | 80.0 | 363.40 | 10 | 5.2 | |
| | 82.0 | 363.30 | 10 | 5.2 | |
| | 84.0 | 363.20 | 10 | 5.2 | |
| | 86.0 | 362.90 | 10 | 5.2 | |
| | 90.0 | 362.50 | 10 | 5.2 | |
| | 92.0 | 362.50 | 10 | 5.2 | |
| | 94.0 | 362.30 | 10 | 5.2 | |
| | 96.0 | 362.00 | 10 | 5.2 | |
| | 98.0 | 361.90 | 10 | 5.2 | LWE |
| | 100.0 | 361.50 | 10 | 5.2 | |
| | 102.0 | 361.80 | 10 | 5.2 | |
| | 104.0 | 360.80 | 10 | 5.2 | |
| | 106.0 | 360.70 | 10 | 5.2 | |
| | 108.0 | 360.60 | 10 | 5.2 | |
| | 110.0 | 360.60 | 10 | 5.2 | |
| | 112.0 | 360.20 | 10 | 5.2 | |
| | 114.0 | 360.40 | 10 | 5.2 | |
| | 115.0 | 360.40 | 10 | 5.2 | |
| | 116.0 | 360.30 | 10 | 5.2 | |
| | 118.0 | 360.40 | 10 | 5.2 | |
| | 120.0 | 360.20 | 10 | 5.2 | |
| | 122.0 | 360.50 | 10 | 5.2 | |
| | 124.0 | 360.50 | 10 | 5.2 | |
| | 126.0 | 360.70 | 10 | 5.2 | |
| | 128.0 | 360.80 | 10 | 5.2 | |
| | 130.0 | 360.60 | 10 | 5.2 | |
| | 132.0 | 360.40 | 10 | 5.2 | |
| | 134.0 | 360.70 | 10 | 5.2 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 7 | 136.0 | 360.30 | 10 | 5.2 | |
| Station 10+23 | 140.0 | 360.40 | 10 | 5.2 | |
| (cont.) | 141.0 | 360.50 | 10 | 5.2 | |
| | 142.0 | 360.70 | 10 | 5.2 | |
| | 144.0 | 360.50 | 10 | 5.2 | |
| | 148.0 | 360.00 | 10 | 5.2 | |
| | 151.0 | 360.20 | 10 | 5.2 | |
| | 152.0 | 360.20 | 10 | 5.2 | |
| | 156.0 | 360.10 | 10 | 5.2 | |
| | 158.0 | 360.40 | 10 | 5.2 | |
| | 160.0 | 360.10 | 10 | 5.2 | |
| | 164.0 | 360.30 | 10 | 5.2 | |
| | 166.0 | 360.50 | 10 | 5.2 | |
| | 168.0 | 360.30 | 10 | 5.2 | |
| | 172.0 | 360.20 | 10 | 5.2 | |
| | 174.0 | 360.60 | 10 | 5.2 | |
| | 176.0 | 360.30 | 10 | 5.2 | |
| | 180.0 | 360.60 | 10 | 5.2 | |
| | 182.0 | 361.10 | 10 | 5.2 | |
| | 184.0 | 360.80 | 10 | 5.2 | RWE |
| | 188.0 | 361.10 | 10 | 5.2 | |
| | 190.0 | 361.60 | 10 | 5.2 | |
| | 192.0 | 361.50 | 10 | 5.2 | |
| | 194.0 | 361.90 | 10 | 5.2 | |
| | 196.0 | 361.90 | 10 | 5.2 | |
| | 198.0 | 362.00 | 10 | 5.2 | |
| | 200.0 | 362.00 | 10 | 5.2 | |
| | 202.0 | 362.10 | 10 | 5.2 | |
| | 203.0 | 361.90 | 2 | 5.2 | |
| | 204.0 | 362.10 | 2 | 5.2 | |
| | 206.0 | 362.40 | 2 | 5.2 | |
| | 208.0 | 362.50 | 2 | 5.2 | |
| | 210.0 | 362.70 | 2 | 5.2 | |
| | 214.0 | 363.00 | 2 | 5.2 | |
| | 218.0 | 363.40 | 2 | 5.2 | |
| | 222.0 | 363.40 | 2 | 5.2 | |
| | 224.0 | 363.50 | 2 | 5.1 | |
| | 256.5 | 366.40 | 1 | 9.4 | Bottom of cut bank |
| | 262.0 | 370.00 | 1 | 8.4 | Top of bank |
| | 264.0 | 374.10 | 1 | 8.4 | RB Headpin |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 8 | 0.0 | 366.10 | 1 | 8.2 | LB Headpin |
| Station 12+79 | 7.0 | 365.90 | 4 | 1.1 | |
| | 27.0 | 363.60 | 2 | 1.1 | |
| | 34.0 | 363.90 | 2 | 1.1 | |
| | 40.0 | 363.50 | 2 | 1.1 | |
| | 42.0 | 363.40 | 2 | 1.1 | |
| | 44.0 | 363.20 | 2 | 1.1 | |
| | 48.0 | 362.90 | 2 | 5.1 | |
| | 52.0 | 362.70 | 2 | 5.1 | |
| | 54.0 | 362.60 | 7 | 5.1 | |
| | 56.0 | 362.50 | 7 | 5.1 | |
| | 60.0 | 362.20 | 7 | 5.1 | |
| | 62.0 | 362.30 | 7 | 5.1 | |
| | 64.0 | 362.20 | 7 | 5.1 | |
| | 66.0 | 362.10 | 7 | 5.1 | |
| | 68.0 | 362.00 | 7 | 5.1 | |
| | 70.0 | 362.00 | 7 | 5.1 | |
| | 72.0 | 362.00 | 7 | 5.1 | |
| | 73.4 | 361.90 | 7 | 5.1 | |
| | 74.0 | 362.00 | 11 | 5.1 | LWE |
| | 76.0 | 361.80 | 11 | 5.1 | |
| | 78.0 | 361.90 | 11 | 5.1 | |
| | 80.0 | 361.80 | 11 | 5.1 | |
| | 82.0 | 361.70 | 11 | 5.1 | |
| | 84.0 | 361.70 | 11 | 5.1 | |
| | 88.0 | 361.80 | 11 | 5.1 | |
| | 92.0 | 361.60 | 11 | 5.1 | |
| | 96.0 | 361.80 | 11 | 5.1 | |
| | 100.0 | 361.50 | 11 | 5.1 | |
| | 104.0 | 361.30 | 11 | 5.1 | |
| | 108.0 | 361.20 | 11 | 5.1 | |
| | 112.0 | 361.10 | 11 | 5.1 | |
| | 116.0 | [illegible]1.10 | 11 | 5.1 | |
| | 118.0 | [illegible].90 | 11 | 5.1 | |
| | 120.0 | 360.[illegible] | 11 | 5.1 | |
| | 121.5 | 361.00 | 11 | 5.1 | |
| | 124.0 | 360.80 | 11 | 5.1 | |
| | 128.0 | 360.60 | 11 | 5.1 | |
| | 132.0 | 360.60 | 11 | 5.1 | |
| | 136.0 | 360.50 | 11 | 5.1 | |
| | 140.0 | 360.40 | 11 | 5.1 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 10i.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 8 | 144.0 | 360.40 | 11 | 5.1 | |
| Station 12+79 | 145.0 | 360.50 | 11 | 5.1 | |
| (cont.) | 148.0 | 360.50 | 11 | 5.1 | |
| | 152.0 | 360.60 | 11 | 5.1 | |
| | 156.0 | 360.50 | 11 | 5.1 | |
| | 160.0 | 360.80 | 11 | 5.1 | |
| | 164.0 | 361.00 | 11 | 5.1 | |
| | 168.0 | 361.20 | 11 | 5.1 | |
| | 172.0 | 361.50 | 11 | 5.1 | |
| | 176.0 | 361.90 | 11 | 5.1 | |
| | 178.0 | 361.90 | 11 | 5.1 | |
| | 179.0 | 362.00 | 12 | 5.1 | RWE |
| | 180.0 | 362.20 | 12 | 5.1 | |
| | 182.0 | 362.30 | 12 | 5.1 | |
| | 184.0 | 362.20 | 12 | 5.2 | |
| | 188.0 | 362.80 | 12 | 5.2 | |
| | 192.0 | 363.10 | 12 | 5.2 | |
| | 196.0 | 363.50 | 12 | 5.2 | |
| | 213.5 | 364.10 | 12 | 5.1 | |
| | 221.5 | 365.50 | 1 | 9.4 | |
| | 224.0 | 369.60 | 1 | 8.4 | RB Headpin |
| Cross Section 9 | 0.0 | 366.10 | 12 | 5.2 | LB Headpin |
| Station 14+62 | 27.5 | 363.50 | 12 | 5.3 | |
| | 36.5 | 364.00 | 12 | 5.3 | |
| | 40.0 | 363.90 | 12 | 5.3 | |
| | 44.0 | 363.70 | 12 | 5.3 | |
| | 48.0 | 363.60 | 12 | 5.3 | |
| | 52.0 | 363.60 | 12 | 5.3 | |
| | 56.0 | 363.80 | 12 | 5.3 | |
| | 60.0 | 363.70 | 12 | 5.3 | |
| | 64.0 | 363.50 | 12 | 5.3 | |
| | 68.0 | 363.40 | 12 | 5.3 | |
| | 72.0 | 363.80 | 12 | 5.3 | |
| | 80.0 | 363.30 | 12 | 5.3 | |
| | 82.0 | 363.20 | 12 | 5.3 | |
| | 84.0 | 363.20 | 12 | 5.3 | |
| | 88.0 | 363.30 | 12 | 5.3 | |
| | 92.0 | 363.10 | 12 | 5.3 | |
| | 94.0 | 363.00 | 12 | 5.3 | |
| | 96.0 | 363.10 | 12 | 5.3 | |

Table B-2.1 (cont.) Cross section elevations, substrate and cover data at site 101.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 9 | 100.0 | 363.10 | 12 | 5.3 | |
| Station 14+62 | 104.0 | 363.00 | 12 | 5.3 | |
| (cont.) | 108.0 | 363.10 | 12 | 5.3 | |
| | 112.0 | 363.10 | 12 | 5.3 | |
| | 116.0 | 362.90 | 12 | 5.3 | |
| | 119.5 | 362.80 | 12 | 5.3 | LWE |
| | 120.0 | 363.00 | 12 | 5.3 | |
| | 124.0 | 362.70 | 12 | 5.3 | |
| | 127.5 | 362.50 | 10 | 5.3 | |
| | 128.0 | 362.80 | 10 | 5.3 | |
| | 132.0 | 362.50 | 10 | 5.3 | |
| | 136.0 | 362.60 | 10 | 5.3 | |
| | 140.0 | 362.90 | 10 | 5.3 | |
| | 142.0 | 362.70 | 10 | 5.3 | |
| | 144.0 | 362.80 | 10 | 5.3 | |
| | 148.0 | 362.60 | 10 | 5.3 | |
| | 152.0 | 362.70 | 10 | 5.3 | |
| | 156.0 | 362.80 | 10 | 5.3 | |
| | 158.0 | 362.70 | 10 | 5.3 | |
| | 160.0 | 363.00 | 10 | 5.3 | |
| | 162.0 | 363.00 | 10 | 5.3 | |
| | 166.0 | 363.00 | 10 | 5.3 | |
| | 168.0 | 362.90 | 10 | 5.3 | |
| | 170.0 | 362.90 | 10 | 5.3 | |
| | 174.0 | 363.00 | 10 | 5.3 | |
| | 176.0 | 362.80 | 10 | 5.3 | |
| | 178.0 | 363.00 | 10 | 5.3 | |
| | 182.0 | 363.00 | 10 | 5.3 | RWE |
| | 184.0 | 363.10 | 10 | 5.3 | |
| | 186.0 | 363.00 | 10 | 5.3 | |
| | 188.0 | 363.20 | 10 | 5.3 | |
| | 190.0 | 363.80 | 10 | 5.3 | |
| | 192.4 | 364.00 | 10 | 5.3 | |
| | 197.0 | 364.60 | 10 | 4.2 | |
| | 212.0 | 366.80 | 1 | 9.4 | |
| | 215.0 | 371.30 | 1 | 8.4 | |
| | 216.5 | 371.50 | 1 | 8.4 | RB Headpin |

Date of survey: Sept. 12, 1984.
Reference elevation: R&M LRX-6 1980.

Table B-2.2 Cross section elevations, substrate and cover data at site 101.5L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 0.0 | 367.60 | 1 | 8.2 | LB Headpin |
| Station 0+00 | 10.0 | 362.80 | 1 | 8.2 | |
| | 19.0 | 362.60 | 1 | 8.2 | |
| | 42.0 | 361.60 | 1 | 8.2 | LWE |
| | 119.0 | 358.00 | 7 | 5.2 | |
| | 176.0 | 357.50 | 7 | 5.2 | |
| | 259.0 | 358.00 | 7 | 5.2 | |
| | 278.0 | 359.30 | 7 | 5.2 | |
| | 297.0 | 361.10 | 7 | 5.2 | |
| | 301.0 | 361.30 | 7 | 5.2 | RWE |
| | 307.0 | 363.00 | 7 | 5.2 | |
| | 317.0 | 363.10 | 7 | 5.2 | |
| | 429.0 | 364.60 | 1 | 8.1 | |
| | 451.0 | 365.00 | 1 | 8.1 | |
| | 467.0 | 365.70 | 1 | 8.1 | RB Headpin |
| Cross Section 2 | 0.0 | 368.20 | 1 | 8.2 | LB Headpin |
| Station 12+23 | 12.0 | 367.90 | 1 | 8.2 | Top of bank |
| | 14.0 | 364.60 | 1 | 8.2 | |
| | 21.0 | 362.80 | 1 | 8.2 | LWE |
| | 58.0 | 360.90 | 1 | 8.2 | |
| | 104.0 | 360.50 | 10 | 5.2 | |
| | 251.0 | 361.00 | 10 | 5.2 | |
| | 288.0 | 361.10 | 10 | 5.2 | |
| | 325.0 | 361.20 | 10 | 5.2 | |
| | 367.0 | 362.60 | 10 | 5.2 | RWE |
| | 425.0 | 365.90 | 8 | 4.1 | |
| | 437.0 | 366.80 | 1 | 8.1 | RB Headpin |
| Cross Section 3* | 0.0 | 370.80 | 1 | 8.2 | LB Headpin |
| Station 19+16 | 62.0 | 364.80 | 12 | 6.2 | |
| | 78.0 | 362.00 | 12 | 6.2 | |
| | 106.0 | 360.90 | 10 | 5.2 | |
| | 126.0 | 361.00 | 10 | 5.2 | |
| | 136.0 | 361.30 | 10 | 5.2 | |
| | 156.0 | 361.30 | 10 | 5.2 | |
| | 186.0 | 360.60 | 10 | 5.2 | |

Table B-2.2 (cont.) Cross section elevations, substrate and cover data at site 101.5L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3* | 206.0 | 360.90 | 10 | 5.2 | |
| Station 19+16 | 246.0 | 362.30 | 10 | 5.2 | |
| (cont.) | 276.0 | 363.80 | 1 | 8.1 | |
| | 306.0 | 364.80 | 1 | 8.1 | |
| | 416.0 | 366.60 | 1 | 8.1 | Next to HP |
| | 417.0 | 368.00 | 1 | 8.1 | RB Headpin |
| Cross Section 4* | 0.0 | 369.80 | 1 | 8.2 | LB Headpin |
| Station 24+47 | 21.0 | 367.50 | 1 | 8.2 | |
| | 58.0 | 364.50 | 12 | 6.2 | |
| | 88.0 | 361.40 | 10 | 5.2 | |
| | 108.0 | 361.30 | 10 | 5.2 | |
| | 128.0 | 361.90 | 10 | 5.2 | |
| | 158.0 | 360.90 | 10 | 5.2 | |
| | 188.0 | 362.40 | 10 | 5.2 | |
| | 218.0 | 362.90 | 10 | 5.2 | |
| | 248.0 | 363.40 | 10 | 5.2 | |
| | 278.0 | 363.40 | 10 | 5.2 | |
| | 338.0 | 364.50 | 8 | 4.1 | |
| | 413.0 | 364.70 | 8 | 4.1 | |
| | 461.0 | 365.90 | 8 | 4.1 | |
| | 466.0 | 368.10 | 1 | 8.1 | RB Headpin |
| Cross Section 5 | 0.0 | 372.40 | 1 | 8.2 | LB Headpin |
| Station 31+08 | 24.0 | 369.90 | 1 | 8.2 | |
| | 74.0 | 365.70 | 1 | 8.2 | LWE |
| | 103.0 | 364.80 | 12 | 6.2 | |
| | 140.0 | 364.20 | 10 | 5.2 | |
| | 165.0 | 364.10 | 10 | 5.2 | |
| | 252.0 | 361.40 | 10 | 5.2 | |
| | 344.0 | 364.00 | 10 | 5.2 | |
| | 399.0 | 365.60 | 10 | 5.2 | RWE |
| | 430.0 | 368.60 | 8 | 4.1 | |
| | 463.0 | 369.70 | 1 | 8.1 | |
| | 466.0 | 370.50 | 1 | 8.1 | RB Headpin |

Date of survey: Oct. 2, 1984.
Reference elevation: R&M Alcap 101.2W1 LB 1982.

* Cross section not surveyed but determined from discharge measurement.

Table B-2.3 Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 0.0 | 456.36 | 1 | 1.1 | LB Headpin |
| Station 0+00 | 1.0 | 456.20 | 1 | 1.1 | |
| | 10.0 | 453.90 | 1 | 1.1 | |
| | 11.0 | 453.66 | 8 | 5.1 | |
| | 20.0 | 452.10 | 8 | 5.1 | |
| | 23.0 | 451.46 | 9 | 5.2 | |
| | 40.0 | 451.50 | 9 | 5.2 | |
| | 60.0 | 451.60 | 9 | 5.2 | |
| | 63.0 | 451.57 | 9 | 5.2 | |
| | 80.0 | 451.10 | 9 | 5.2 | |
| | 85.0 | 450.86 | 9 | 5.2 | LWE |
| | 97.0 | 449.08 | 9 | 5.2 | |
| | 100.0 | 449.20 | 9 | 5.2 | |
| | 119.0 | 449.91 | 9 | 5.3 | |
| | 120.0 | 449.70 | 9 | 5.3 | |
| | 125.0 | 448.48 | 9 | 5.3 | |
| | 149.0 | 447.70 | 9 | 5.3 | |
| | 150.0 | 447.70 | 9 | 5.3 | |
| | 180.0 | 448.30 | 9 | 5.3 | |
| | 200.0 | 448.70 | 9 | 5.3 | |
| | 202.0 | 448.71 | 11 | 5.3 | |
| | 230.0 | 450.03 | 9 | 5.2 | |
| | 260.0 | 450.30 | 9 | 5.2 | |
| | 264.0 | 450.32 | 7 | 4.1 | |
| | 290.0 | 449.00 | 7 | 4.2 | |
| | 293.0 | 449.12 | 3 | 1.1 | |
| | 315.0 | 447.66 | 3 | 1.1 | |
| | 337.0 | 446.74 | 9 | 5.2 | |
| | 340.0 | 446.70 | 9 | 5.2 | |
| | 370.0 | 447.10 | 9 | 5.2 | |
| | 374.0 | 447.22 | 9 | 5.2 | |
| | 397.0 | 449.34 | 8 | 5.2 | |
| | 400.0 | 449.30 | 8 | 5.2 | |
| | 428.0 | 449.04 | 9 | 5.2 | |
| | 440.0 | 449.50 | 9 | 5.2 | |
| | 462.5 | 450.35 | 9 | 5.2 | |
| | 480.0 | 451.00 | 9 | 5.2 | |
| | 480.5 | 450.97 | 9 | 5.2 | RWE |
| | 495.0 | 455.12 | 1 | 1.1 | |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 505.0 | 455.36 | 1 | 1.1 | |
| Station 0+00 | 513.5 | 460.08 | 1 | 1.1 | |
| (cont.) | 520.5 | 460.24 | 1 | 1.1 | RB Headpin |
| Cross Section 2 | 0.0 | 459.95 | 3 | 1.1 | LB Headpin |
| Station 3+97 | 1.0 | 458.90 | 3 | 1.1 | |
| | 4.0 | 455.70 | 3 | 1.1 | |
| | 21.0 | 455.50 | 3 | 1.1 | |
| | 35.0 | 451.75 | 9 | 5.2 | |
| | 47.0 | 451.37 | 9 | 5.2 | LWE |
| | 55.0 | 450.87 | 9 | 5.3 | |
| | 75.0 | 450.70 | 9 | 5.3 | |
| | 95.0 | 450.60 | 9 | 5.3 | |
| | 106.0 | 450.46 | 9 | 5.3 | |
| | 115.0 | 450.10 | 9 | 5.3 | |
| | 124.0 | 449.65 | 9 | 5.3 | |
| | 135.0 | 449.80 | 9 | 5.3 | |
| | 157.0 | 450.10 | 9 | 5.3 | |
| | 160.0 | 450.20 | 9 | 5.3 | |
| | 170.0 | 450.60 | 9 | 5.3 | |
| | 180.0 | 450.90 | 9 | 5.3 | |
| | 187.0 | 451.25 | 9 | 5.3 | |
| | 190.0 | 451.00 | 9 | 5.3 | |
| | 198.0 | 450.30 | 9 | 5.3 | |
| | 239.0 | 450.70 | 9 | 5.3 | |
| | 240.0 | 450.70 | 9 | 5.3 | |
| | 290.0 | 450.70 | 9 | 5.3 | |
| | 311.0 | 450.70 | 9 | 5.3 | |
| | 340.0 | 450.70 | 9 | 5.3 | |
| | 376.0 | 450.70 | 9 | 5.3 | |
| | 390.0 | 450.60 | 9 | 5.3 | |
| | 440.0 | 450.40 | 9 | 5.3 | |
| | 444.0 | 450.40 | 8 | 5.3 | |
| | 480.0 | 450.90 | 8 | 5.3 | |
| | 500.0 | 451.20 | 8 | 5.3 | |
| | 502.0 | 451.20 | 8 | 5.3 | |
| | 520.0 | 450.80 | 8 | 5.3 | |
| | 539.0 | 450.40 | 9 | 5.3 | |
| | 540.0 | 450.50 | 9 | 5.3 | |
| | 545.0 | 451.10 | 9 | 5.3 | |
| | 547.0 | 451.30 | 9 | 5.3 | RWE |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 2 | 550.0 | 452.30 | 9 | 5.3 | |
| Station 3+97 | 560.0 | 455.60 | 3 | 1.1 | |
| (cont.) | 567.0 | 460.78 | 3 | 1.1 | RB Headpin |
| Cross Section 3 | 0.0 | 463.77 | 3 | 1.1 | LB Headpin |
| Station 8+36 | 1.0 | 463.10 | 3 | 1.1 | |
| | 10.0 | 457.11 | 3 | 1.1 | Bottom of cut bank |
| | 48.0 | 452.80 | 9 | 5.3 | LWE |
| | 50.0 | 452.80 | 9 | 1.1 | |
| | 70.0 | 452.40 | 9 | 5.3 | |
| | 90.0 | 452.10 | 9 | 5.3 | |
| | 94.0 | 452.00 | 9 | 5.2 | |
| | 110.0 | 451.90 | 9 | 5.2 | |
| | 121.0 | 451.80 | 9 | 5.2 | |
| | 130.0 | 452.00 | 9 | 5.2 | |
| | 150.0 | 452.40 | 9 | 5.2 | |
| | 169.0 | 452.80 | 9 | 5.2 | RWE |
| | 170.0 | 452.80 | 9 | 5.2 | |
| | 200.0 | 453.10 | 9 | 5.2 | |
| | 223.0 | 453.40 | 9 | 5.2 | |
| | 230.0 | 453.60 | 9 | 5.2 | |
| | 267.0 | 454.71 | 7 | 4.3 | |
| | 309.0 | 453.27 | 9 | 5.3 | |
| | 310.0 | 453.30 | 9 | 5.3 | |
| | 335.0 | 452.80 | 9 | 5.3 | LWE |
| | 340.0 | 452.60 | 9 | 5.3 | |
| | 370.0 | 451.60 | 9 | 5.3 | |
| | 400.0 | 450.60 | 9 | 5.3 | |
| | 403.0 | 450.46 | 9 | 5.3 | |
| | 420.0 | 450.30 | 9 | 5.3 | |
| | 438.0 | 450.11 | 12 | 6.3 | |
| | 440.0 | 450.10 | 12 | 6.3 | |
| | 460.0 | 450.50 | 12 | 6.3 | |
| | 480.0 | 450.90 | 12 | 6.3 | |
| | 485.0 | 450.95 | 9 | 5.3 | |
| | 500.0 | 451.90 | 9 | 5.3 | |
| | 516.0 | 452.86 | 12 | 6.3 | RWE |
| | 520.0 | 453.00 | 12 | 6.3 | |
| | 589.0 | 455.57 | 12 | 1.1 | |
| | 596.0 | 459.72 | 1 | 1.1 | Edge of vegetation |
| | 598.5 | 464.73 | 1 | 1.1 | RB Headpin |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3A | 0.0 | 458.34 | 9 | 5.3 | LB Headpin |
| Station 10+38 | 1.0 | 458.10 | 9 | 5.3 | |
| | 11.0 | 455.94 | 9 | 5.3 | |
| | 20.0 | 454.90 | 9 | 5.3 | |
| | 27.0 | 454.21 | 9 | 5.3 | LWE |
| | 40.0 | 453.90 | 9 | 5.3 | |
| | 51.0 | 453.56 | 9 | 5.3 | |
| | 60.0 | 453.30 | 9 | 5.3 | |
| | 80.0 | 452.80 | 9 | 5.3 | |
| | 83.0 | 452.74 | 9 | 5.3 | |
| | 98.0 | 451.82 | 9 | 5.3 | |
| | 100.0 | 452.00 | 9 | 5.3 | |
| | 116.0 | 453.54 | 9 | 5.3 | |
| | 120.0 | 453.30 | 9 | 5.3 | |
| | 149.0 | 454.23 | 9 | 5.3 | RWE |
| | 150.0 | 454.30 | 9 | 5.3 | |
| | 169.0 | 455.82 | 9 | 5.2 | |
| | 179.0 | 454.92 | 9 | 5.2 | LWE |
| | 180.0 | 454.90 | 9 | 5.2 | |
| | 199.0 | 452.79 | 9 | 5.2 | |
| | 220.0 | 455.00 | 9 | 5.2 | |
| | 223.0 | 454.96 | 9 | 5.2 | RWE |
| | 255.0 | 454.60 | 9 | 5.2 | |
| | 289.0 | 454.10 | 9 | 5.3 | LWE |
| | 290.0 | 454.10 | 9 | 5.3 | |
| | 299.0 | 453.20 | 9 | 5.3 | |
| | 325.0 | 453.50 | 9 | 5.3 | |
| | 330.0 | 453.50 | 9 | 5.3 | |
| | 370.0 | 453.90 | 9 | 5.3 | |
| | 384.0 | 454.00 | 9 | 5.3 | |
| | 403.0 | 453.10 | 9 | 5.3 | |
| | 410.0 | 453.50 | 9 | 5.3 | |
| | 416.0 | 453.60 | 9 | 5.3 | |
| | 432.0 | 453.22 | 9 | 5.3 | |
| | 446.0 | 453.49 | 9 | 5.3 | |
| | 450.0 | 453.40 | 9 | 5.3 | |
| | 481.0 | 452.36 | 9 | 5.3 | |
| | 490.0 | 452.50 | 9 | 5.3 | |
| | 529.0 | 453.11 | 9 | 5.3 | |
| | 530.0 | 453.10 | 9 | 5.3 | |
| | 570.0 | 453.40 | 9 | 5.3 | |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3A | 589.0 | 453.62 | 9 | 5.3 | |
| Station 10+38 | 610.0 | 453.90 | 9 | 5.3 | |
| (cont.) | 621.0 | 454.11 | 9 | 5.3 | RWE |
| | 669.0 | 455.79 | 9 | 5.3 | |
| | 670.0 | 456.00 | 9 | 5.3 | |
| | 679.0 | 457.34 | 9 | 5.3 | |
| | 693.5 | 460.06 | 9 | 5.3 | RB Headpin |
| Cross Section 4 | 0.0 | 459.33 | 9 | 5.3 | LB Headpin |
| Station 12+92 | 1.0 | 458.80 | 9 | 5.3 | |
| | 5.0 | 456.97 | 9 | 5.3 | |
| | 13.0 | 455.20 | 9 | 5.3 | LWE |
| | 15.0 | 454.90 | 9 | 5.3 | |
| | 27.0 | 453.40 | 9 | 5.3 | |
| | 30.0 | 453.40 | 9 | 5.3 | |
| | 47.0 | 453.49 | 9 | 5.3 | |
| | 60.0 | 453.80 | 9 | 5.3 | |
| | 86.0 | 454.20 | 9 | 5.3 | |
| | 90.0 | 454.40 | 9 | 5.3 | |
| | 110.0 | 455.20 | 9 | 5.2 | RWE |
| | 148.0 | 456.89 | 9 | 5.2 | |
| | 177.0 | 455.22 | 9 | 5.2 | LWE |
| | 200.0 | 454.30 | 9 | 5.2 | |
| | 208.0 | 453.92 | 9 | 5.3 | |
| | 230.0 | 453.58 | 12 | 6.3 | |
| | 260.0 | 453.90 | 12 | 6.3 | |
| | 262.0 | 453.94 | 9 | 5.3 | |
| | 290.0 | 453.90 | 9 | 5.3 | |
| | 320.0 | 453.90 | 9 | 5.3 | |
| | 341.0 | 453.93 | 9 | 5.3 | |
| | 350.0 | 453.80 | 9 | 5.3 | |
| | 380.0 | 453.80 | 9 | 5.3 | |
| | 408.0 | 453.85 | 9 | 5.3 | |
| | 410.0 | 453.80 | 9 | 5.3 | |
| | 440.0 | 454.10 | 9 | 5.3 | |
| | 446.0 | 454.25 | 9 | 5.3 | |
| | 470.0 | 455.00 | 9 | 5.3 | |
| | 472.0 | 455.13 | 7 | 4.3 | RWE |
| | 520.0 | 456.36 | 7 | 4.2 | |
| | 556.0 | 456.26 | 7 | 4.2 | |
| | 570.0 | 456.10 | 7 | 4.2 | |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 4 | 600.0 | 455.80 | 7 | 4.2 | |
| Station 12+92 | 630.0 | 455.40 | 7 | 4.2 | |
| (cont.) | 636.0 | 455.27 | 7 | 4.2 | |
| | 650.0 | 455.30 | 7 | 4.2 | |
| | 670.0 | 455.20 | 7 | 4.2 | |
| | 690.0 | 455.20 | 7 | 4.2 | |
| | 693.0 | 455.19 | 3 | 1.1 | |
| | 710.0 | 456.10 | 3 | 1.1 | |
| | 729.0 | 456.99 | 3 | 1.1 | |
| | 730.0 | 457.30 | 3 | 1.1 | |
| | 738.0 | 459.56 | 3 | 1.1 | RB Headpin |
| Cross Section 5 | 0.0 | 459.26 | 3 | 8.3 | LB Headpin |
| Station 15+41 | 1.0 | 458.60 | 3 | 8.3 | |
| | 3.0 | 457.19 | 3 | 8.3 | |
| | 10.0 | 455.90 | 3 | 8.3 | |
| | 14.0 | 455.11 | 3 | 1.1 | LWE |
| | 20.0 | 453.50 | 9 | 5.2 | |
| | 31.0 | 453.54 | 9 | 5.2 | |
| | 40.0 | 453.70 | 9 | 5.2 | |
| | 70.0 | 454.32 | 9 | 5.2 | |
| | 100.0 | 453.90 | 9 | 5.2 | |
| | 130.0 | 453.40 | 9 | 5.3 | |
| | 160.0 | 453.40 | 9 | 5.3 | |
| | 195.0 | 453.30 | 9 | 5.3 | |
| | 200.0 | 453.30 | 9 | 5.3 | |
| | 240.0 | 453.40 | 9 | 5.3 | |
| | 277.0 | 453.47 | 9 | 5.3 | |
| | 280.0 | 453.50 | 9 | 5.3 | |
| | 310.0 | 453.90 | 9 | 5.3 | |
| | 318.0 | 453.97 | 9 | 5.3 | |
| | 340.0 | 454.20 | 9 | 5.3 | |
| | 370.0 | 454.60 | 9 | 5.3 | |
| | 380.0 | 454.71 | 9 | 5.3 | |
| | 400.0 | 455.30 | 9 | 5.3 | |
| | 405.0 | 455.38 | 9 | 5.2 | RWE |
| | 433.0 | 456.26 | 9 | 5.2 | |
| | 440.0 | 456.30 | 9 | 5.2 | |
| | 490.0 | 456.40 | 9 | 5.2 | |
| | 491.0 | 456.43 | 9 | 5.2 | |
| | 510.0 | 456.20 | 9 | 5.2 | |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 5 | 545.0 | 455.76 | 9 | 5.2 | |
| Station 15+41 | 570.0 | 456.20 | 9 | 5.2 | |
| (cont.) | 580.0 | 456.40 | 9 | 5.2 | |
| | 586.0 | 456.46 | 9 | 5.2 | |
| | 595.0 | 456.20 | 9 | 5.2 | |
| | 607.0 | 455.66 | 3 | 1.1 | |
| | 610.0 | 455.80 | 3 | 1.1 | |
| | 630.0 | 456.60 | 3 | 1.1 | |
| | 648.0 | 457.30 | 3 | 1.1 | |
| | 653.0 | 461.50 | 3 | 1.1 | RB Headpin |
| Cross Section 6 | 0.0 | 460.88 | 1 | 1.1 | LB Headpin |
| Station 19+86 | 1.0 | 460.80 | 1 | 7.2 | |
| | 20.0 | 457.87 | 1 | 7.2 | |
| | 30.0 | 456.50 | 1 | 7.2 | |
| | 38.0 | 455.26 | 9 | 7.2 | LWE |
| | 40.0 | 455.20 | 9 | 7.2 | |
| | 60.0 | 454.70 | 9 | 7.2 | |
| | 80.0 | 454.07 | 9 | 5.2 | |
| | 110.0 | 453.00 | 9 | 5.2 | |
| | 114.0 | 452.99 | 9 | 5.2 | |
| | 140.0 | 452.70 | 9 | 5.2 | |
| | 154.0 | 452.64 | 9 | 5.2 | |
| | 180.0 | 452.70 | 9 | 5.2 | |
| | 220.0 | 452.80 | 9 | 5.2 | |
| | 240.0 | 452.92 | 9 | 5.2 | |
| | 260.0 | 453.20 | 9 | 5.2 | |
| | 284.0 | 453.51 | 9 | 5.2 | |
| | 290.0 | 453.70 | 9 | 5.2 | |
| | 315.0 | 454.57 | 9 | 5.2 | |
| | 320.0 | 454.70 | 9 | 5.2 | |
| | 350.0 | 455.20 | 9 | 5.2 | |
| | 355.0 | 455.34 | 9 | 5.2 | RWE |
| | 370.0 | 456.20 | 9 | 5.2 | |
| | 390.0 | 457.32 | 9 | 5.2 | |
| | 414.0 | 457.97 | 9 | 5.2 | |
| | 435.0 | 460.90 | 9 | 5.2 | RB Headpin |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 7 | 0.0 | 466.59 | 12 | 9.3 | LB Headpin |
| Station 30+34 | 1.0 | 461.31 | 12 | 9.3 | |
| | 10.0 | 459.10 | 12 | 9.3 | |
| | 11.0 | 458.81 | 12 | 5.3 | |
| | 20.0 | 458.20 | 12 | 5.3 | |
| | 40.0 | 457.00 | 12 | 5.3 | |
| | 46.0 | 456.59 | 12 | 5.3 | |
| | 50.0 | 456.50 | 12 | 5.3 | |
| | 60.0 | 456.40 | 12 | 5.3 | |
| | 70.0 | 456.30 | 12 | 5.3 | |
| | 80.0 | 456.10 | 12 | 5.3 | |
| | 90.0 | 455.95 | 12 | 6.3 | LWE |
| | 110.0 | 455.50 | 12 | 6.3 | |
| | 140.0 | 454.80 | 12 | 6.3 | |
| | 143.0 | 454.68 | 9 | 5.3 | |
| | 175.0 | 452.90 | 9 | 5.3 | |
| | 180.0 | 452.80 | 9 | 5.3 | |
| | 208.0 | 452.54 | 12 | 6.3 | |
| | 210.0 | 452.50 | 12 | 6.3 | |
| | 238.0 | 452.97 | 9 | 5.3 | |
| | 240.0 | 453.00 | 12 | 6.3 | |
| | 270.0 | 453.70 | 9 | 5.3 | |
| | 271.0 | 453.71 | 9 | 5.3 | |
| | 298.0 | 454.67 | 9 | 5.2 | |
| | 300.0 | 454.80 | 9 | 5.3 | |
| | 320.0 | 455.70 | 9 | 5.2 | |
| | 326.0 | 456.04 | 9 | 5.2 | RWE |
| | 330.0 | 456.20 | 9 | 5.2 | |
| | 350.0 | 457.40 | 9 | 5.2 | |
| | 354.0 | 457.55 | 12 | 6.2 | |
| | 370.0 | 457.90 | 12 | 6.2 | |
| | 379.5 | 458.08 | 12 | 6.2 | |
| | 390.0 | 458.90 | 12 | 6.2 | |
| | 410.0 | 460.50 | 12 | 6.2 | |
| | 411.0 | 460.56 | 12 | 6.2 | |
| | 421.0 | 463.38 | 12 | 6.2 | RB Headpin |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 8 | 0.0 | 470.80 | 1 | 8.2 | Bottom of cut bank |
| Station 40+98 | 1.0 | 469.10 | 1 | 8.2 | |
| | 3.0 | 465.81 | 1 | 9.2 | |
| | 7.0 | 463.60 | 1 | 8.3 | |
| | 10.0 | 463.10 | 1 | 8.3 | |
| | 25.0 | 460.70 | 1 | 8.3 | |
| | 27.0 | 457.86 | 9 | 5.3 | LWE |
| | 30.0 | 459.90 | 9 | 5.3 | |
| | 38.0 | 458.60 | 9 | 5.3 | |
| | 40.0 | 458.20 | 9 | 5.3 | |
| | 42.0 | 457.70 | 9 | 5.3 | |
| | 50.0 | 457.40 | 9 | 5.3 | |
| | 52.0 | 457.30 | 9 | 5.3 | |
| | 70.0 | 457.20 | 9 | 5.3 | |
| | 80.0 | 457.80 | 9 | 5.3 | |
| | 82.0 | 457.90 | 9 | 5.3 | |
| | 85.0 | 457.72 | 9 | 5.2 | |
| | 90.0 | 458.40 | 9 | 5.2 | |
| | 91.0 | 458.50 | 9 | 5.2 | |
| | 110.0 | 458.40 | 9 | 5.2 | |
| | 120.0 | 458.40 | 9 | 5.2 | |
| | 122.0 | 457.94 | 7 | 4.3 | |
| | 124.0 | 458.40 | 7 | 4.3 | |
| | 141.0 | 458.15 | 7 | 4.3 | |
| | 160.0 | 458.30 | 7 | 4.3 | |
| | 164.0 | 458.30 | 7 | 4.3 | |
| | 200.0 | 458.35 | 9 | 5.3 | |
| | 220.0 | 458.00 | 9 | 5.3 | |
| | 248.0 | 457.38 | 9 | 5.3 | |
| | 260.0 | 457.30 | 9 | 5.3 | |
| | 280.0 | 457.07 | 9 | 5.3 | |
| | 300.0 | 457.60 | 9 | 5.3 | |
| | 302.0 | 457.74 | 9 | 5.3 | |
| | 360.0 | 457.80 | 9 | 5.3 | |
| | 362.0 | 457.82 | 9 | 5.3 | |
| | 380.0 | 458.20 | 9 | 5.3 | |
| | 400.0 | 458.60 | 9 | 5.3 | |
| | 410.0 | 458.75 | 9 | 5.3 | RWE |
| | 430.0 | 459.10 | 9 | 5.3 | |
| | 437.0 | 459.20 | 9 | 5.3 | |

Table B-2.3 (cont.) Cross section elevations, substrate and cover data at site 112.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 8 | 450.0 | 459.50 | 9 | 5.3 | |
| Station 40+98 | 460.0 | 459.80 | 9 | 5.3 | |
| (cont.) | 470.0 | 460.10 | 9 | 5.3 | |
| | 524.0 | 461.39 | 9 | 5.2 | |
| | 579.0 | 462.90 | 9 | 5.2 | |
| | 580.0 | 463.00 | 9 | 5.2 | |
| | 602.5 | 465.83 | 9 | 5.2 | RB Headpin |

Date of survey: Sept. 16, 1984.
Reference elevation: R&M LRX-16 RB 1980.

Table B-2.4 Cross section elevations, substrate and cover data at site 119.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section | 0.0 | 511.00 | 1 | 7.1 | Bottom of bank |
| at Mouth | 47.0 | 508.71 | 1 | 7.1 | |
| Station -3+51 | 104.0 | 508.25 | 1 | 7.1 | LWE |
| | 130.0 | 507.20 | 1 | 7.1 | |
| | 163.0 | 506.91 | 1 | 7.1 | |
| | 184.0 | 507.05 | 1 | 7.1 | |
| | 194.0 | 509.55 | 1 | 7.1 | |
| | 198.0 | 508.15 | 12 | 9.1 | RWE |
| | 203.0 | 511.23 | 12 | 9.1 | Half way up bank |
| Cross Section 1 | 0.0 | 514.94 | 1 | 8.2 | LB Headpin |
| Station 0+00 | 10.5 | 510.12 | 1 | 7.1 | |
| | 26.0 | 508.92 | 1 | 7.1 | LWE |
| | 32.0 | 508.40 | 1 | 7.1 | |
| | 84.0 | 508.00 | 1 | 7.1 | |
| | 152.0 | 506.30 | 1 | 7.1 | |
| | 168.0 | 506.20 | 1 | 7.1 | |
| | 180.0 | 508.83 | 1 | 7.1 | RWE |
| | 195.0 | 514.63 | 1 | 8.3 | RB Headpin |
| Cross Section 2 | 0.0 | 513.53 | 1 | 8.2 | LB Headpin |
| Station 3+80 | 29.5 | 510.56 | 1 | 5.1 | |
| | 39.5 | 508.89 | 1 | 5.1 | LWE |
| | 48.5 | 507.94 | 3 | 6.1 | |
| | 76.0 | 507.00 | 3 | 6.1 | |
| | 92.0 | 506.40 | 3 | 6.1 | |
| | 108.0 | 506.50 | 4 | 6.1 | |
| | 125.0 | 505.03 | 4 | 6.1 | |
| | 149.0 | 508.85 | 13 | 5.2 | RWE |
| | 162.0 | 514.21 | 13 | 5.2 | RB Headpin |
| Cross Section 3 | 0.0 | 513.69 | 3 | 8.2 | LB Headpin |
| Station 5+96 | 10.0 | 513.48 | 3 | 8.2 | |
| | 36.5 | 510.73 | 11 | 8.1 | |
| | 59.0 | 508.90 | 11 | 5.2 | LWE |
| | 87.5 | 508.20 | 11 | 5.2 | |
| | 117.0 | 508.04 | 11 | 5.2 | |
| | 147.0 | 506.75 | 11 | 5.2 | |
| | 161.0 | 508.87 | 11 | 5.2 | RWE |
| | 172.0 | 511.73 | 11 | 5.2 | |
| | 173.0 | 516.86 | 11 | 8.4 | RB Headpin |

Table B-2.4 (cont.) Cross section elevations, substrate and cover data at site 119.2R.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 4 | 0.0 | 515.26 | 11 | 8.1 | LB Headpin |
| Station 9+93 | 18.5 | 513.71 | 11 | 8.1 | |
| | 52.0 | 512.71 | 11 | 5.2 | |
| | 65.0 | 511.98 | 11 | 5.2 | |
| | 85.0 | 509.82 | 11 | 5.2 | |
| | 120.0 | 509.90 | 11 | 6.2 | LWE |
| | 137.0 | 507.90 | 11 | 6.2 | RWE |
| | 151.0 | 508.86 | 11 | 6.3 | |
| | 173.0 | 512.28 | 11 | 6.3 | |
| | 176.0 | 513.79 | 11 | 8.4 | RB Headpin |
| Cross Section 5 | 0.0 | 515.52 | 3 | 6.2 | LB Headpin |
| Station 14+46 | 27.5 | 514.36 | 3 | 6.2 | |
| | 57.5 | 513.72 | 11 | 6.2 | |
| | 90.0 | 513.68 | 8 | 6.2 | |
| | 149.0 | 512.72 | 10 | 6.2 | |
| | 158.0 | 512.72 | 10 | 6.2 | |
| | 179.5 | 512.27 | 10 | 6.3 | |
| | 193.5 | 511.42 | 10 | 6.3 | |
| | 223.0 | 511.21 | 10 | 6.3 | LWE |
| | 246.5 | 510.42 | 10 | 6.2 | |
| | 293.5 | 511.21 | 10 | 6.2 | RWE |
| | 303.0 | 513.89 | 1 | 6.1 | |
| | 306.0 | 515.57 | 1 | 6.1 | RB Headpin |

Date of survey: Sept. 6, 1984.
Reference elevation: USGS A107 1965.

Table B-2.5 Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 0.0 | 622.20 | 1 | 8.5 | LB Headpin |
| Station 0+00 | 1.0 | 621.90 | 1 | 8.5 | Beside headpin |
| | 8.0 | 619.30 | 12 | 8.2 | |
| | 26.0 | 616.90 | 12 | 5.2 | |
| | 29.0 | 616.10 | 12 | 5.2 | LWE |
| | 32.0 | 616.30 | 12 | 5.2 | |
| | 36.0 | 615.60 | 12 | 5.2 | |
| | 40.0 | 615.00 | 12 | 1.1 | |
| | 44.0 | 614.60 | 12 | 1.1 | |
| | 48.0 | 614.30 | 12 | 1.1 | |
| | 52.0 | 614.50 | 12 | 1.1 | |
| | 56.0 | 614.80 | 12 | 1.1 | |
| | 60.0 | 614.60 | 1 | 1.1 | |
| | 64.0 | 614.30 | 1 | 1.1 | |
| | 68.0 | 614.00 | 1 | 1.1 | |
| | 72.0 | 614.00 | 1 | 1.1 | |
| | 76.0 | 614.10 | 1 | 1.1 | |
| | 80.0 | 614.60 | 1 | 1.1 | |
| | 84.0 | 614.50 | 1 | 1.1 | |
| | 88.0 | 614.30 | 1 | 1.1 | |
| | 92.0 | 614.10 | 1 | 1.1 | |
| | 96.0 | 614.10 | 1 | 1.1 | |
| | 100.0 | 614.10 | 1 | 1.1 | |
| | 104.0 | 614.20 | 1 | 1.1 | |
| | 108.0 | 614.30 | 1 | 1.1 | |
| | 112.0 | 614.40 | 1 | 1.1 | |
| | 116.0 | 614.40 | 1 | 1.1 | |
| | 120.0 | 614.70 | 1 | 1.1 | |
| | 124.0 | 614.80 | 1 | 1.1 | |
| | 128.0 | 615.00 | 1 | 1.1 | |
| | 132.0 | 615.10 | 1 | 1.1 | |
| | 136.0 | 615.40 | 1 | 1.1 | |
| | 140.0 | 615.50 | 1 | 1.1 | |
| | 144.0 | 615.50 | 1 | 1.1 | |
| | 148.0 | 615.50 | 1 | 1.1 | |
| | 152.0 | 615.50 | 1 | 1.1 | |
| | 156.0 | 615.60 | 1 | 1.1 | |
| | 160.0 | 615.70 | 1 | 1.1 | |
| | 164.0 | 615.90 | 1 | 1.1 | |
| | 168.0 | 615.90 | 1 | 1.1 | |
| | 172.0 | 615.70 | 1 | 1.1 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 176.0 | 615.80 | 1 | 1.1 | |
| Station 0+00 | 180.0 | 615.80 | 1 | 1.1 | |
| (cont.) | 184.0 | 615.50 | 1 | 1.1 | |
| | 188.0 | 615.40 | 1 | 1.1 | |
| | 192.0 | 615.20 | 1 | 1.1 | |
| | 196.0 | 615.20 | 1 | 1.1 | |
| | 200.0 | 615.20 | 1 | 1.1 | |
| | 204.0 | 615.20 | 1 | 1.1 | |
| | 208.0 | 615.20 | 1 | 1.1 | |
| | 212.0 | 615.30 | 1 | 1.1 | |
| | 216.0 | 615.40 | 1 | 1.1 | |
| | 220.0 | 615.60 | 1 | 1.1 | |
| | 224.0 | 615.50 | 1 | 1.1 | |
| | 228.0 | 615.80 | 1 | 1.1 | |
| | 232.0 | 616.20 | 1 | 1.1 | |
| | 234.0 | 616.50 | 1 | 1.1 | |
| | 236.0 | 616.90 | 1 | 1.1 | |
| | 237.0 | 616.80 | 1 | 1.1 | |
| | 251.0 | 618.80 | 1 | 8.2 | Bottom of bank |
| | 258.0 | 621.10 | 1 | 8.2 | |
| | 263.0 | 624.00 | 1 | 8.2 | RB Headpin |
| Cross Section 2 | 0.0 | 620.90 | 1 | 8.2 | LB Headpin |
| Station 2+45 | 1.0 | 620.60 | 1 | 8.2 | Beside headpin |
| | 2.0 | 619.40 | 12 | 8.2 | |
| | 14.0 | 616.90 | 12 | 5.2 | |
| | 18.0 | 616.50 | 12 | 5.2 | LWE |
| | 22.0 | 615.90 | 12 | 5.2 | |
| | 26.0 | 615.80 | 12 | 5.2 | |
| | 30.0 | 615.60 | 12 | 5.2 | |
| | 34.0 | 615.60 | 10 | 5.2 | |
| | 38.0 | 615.60 | 10 | 5.2 | |
| | 42.0 | 615.80 | 10 | 5.2 | |
| | 46.0 | 616.00 | 10 | 5.2 | |
| | 50.0 | 616.40 | 10 | 5.2 | |
| | 54.0 | 616.30 | 10 | 5.2 | |
| | 58.0 | 616.50 | 10 | 5.2 | |
| | 62.0 | 616.20 | 10 | 5.2 | |
| | 66.0 | 616.30 | 10 | 5.2 | |
| | 70.0 | 616.30 | 10 | 5.2 | |
| | 73.0 | 616.20 | 10 | 5.2 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 2 | 78.0 | 616.30 | 10 | 5.2 | |
| Station 2+45 | 81.0 | 616.30 | 10 | 5.2 | |
| (cont.) | 86.0 | 616.40 | 10 | 5.2 | |
| | 90.0 | 616.00 | 10 | 5.2 | |
| | 94.0 | 616.20 | 10 | 5.2 | |
| | 98.0 | 616.10 | 10 | 5.2 | |
| | 102.0 | 616.20 | 10 | 5.2 | |
| | 106.0 | 615.90 | 10 | 5.2 | |
| | 110.0 | 615.90 | 10 | 5.2 | |
| | 114.0 | 615.80 | 10 | 5.2 | |
| | 118.0 | 616.00 | 10 | 5.2 | |
| | 122.0 | 616.10 | 10 | 5.2 | |
| | 126.0 | 616.00 | 10 | 5.2 | |
| | 130.0 | 616.00 | 10 | 5.2 | |
| | 134.0 | 616.10 | 10 | 5.2 | |
| | 138.0 | 616.20 | 10 | 5.2 | |
| | 142.0 | 616.00 | 10 | 5.2 | |
| | 147.0 | 615.70 | 10 | 5.2 | |
| | 150.0 | 615.80 | 10 | 5.2 | |
| | 153.0 | 615.70 | 10 | 5.2 | |
| | 158.0 | 615.90 | 10 | 5.2 | |
| | 161.0 | 615.80 | 10 | 5.2 | |
| | 166.0 | 616.40 | 10 | 5.2 | |
| | 169.0 | 616.20 | 10 | 5.2 | |
| | 174.0 | 616.50 | 10 | 5.2 | |
| | 177.0 | 616.20 | 10 | 5.2 | |
| | 182.0 | 616.40 | 10 | 5.2 | |
| | 186.0 | 616.40 | 10 | 5.2 | |
| | 190.0 | 616.50 | 10 | 5.2 | |
| | 194.0 | 616.50 | 10 | 5.2 | |
| | 198.0 | 616.40 | 10 | 5.2 | |
| | 202.0 | 616.50 | 10 | 5.2 | |
| | 206.0 | 616.60 | 10 | 5.2 | |
| | 210.0 | 616.70 | 10 | 5.2 | |
| | 214.0 | 616.60 | 10 | 5.2 | |
| | 218.0 | 616.60 | 10 | 5.2 | |
| | 222.0 | 616.80 | 10 | 4.2 | |
| | 227.0 | 616.80 | 10 | 4.2 | |
| | 231.0 | 616.80 | 10 | 4.2 | |
| | 235.0 | 616.80 | 10 | 4.2 | |
| | 239.0 | 616.90 | 10 | 4.2 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 2 | 256.0 | 617.10 | 1 | 4.2 | |
| Station 2+45 | 301.0 | 622.17 | 1 | 8.2 | Beside headpin |
| (cont.) | 301.0 | 622.24 | 1 | 8.2 | RB Headpin |
| Cross Section 3 | 0.0 | 621.80 | 1 | 9.4 | LB Headpin |
| Station 6+45 | 0.0 | 621.57 | 1 | 9.4 | Beside headpin |
| | 2.0 | 621.60 | 1 | 6.1 | |
| | 15.0 | 617.60 | 1 | 6.1 | |
| | 24.0 | 617.50 | 1 | 6.2 | |
| | 26.0 | 617.20 | 1 | 6.2 | |
| | 28.0 | 617.10 | 1 | 6.2 | |
| | 30.0 | 617.10 | 1 | 6.2 | |
| | 32.0 | 617.10 | 1 | 6.2 | |
| | 34.0 | 616.60 | 12 | 6.2 | LWE |
| | 36.0 | 616.80 | 12 | 6.2 | |
| | 38.0 | 616.60 | 12 | 6.2 | |
| | 40.0 | 616.60 | 12 | 6.2 | |
| | 44.0 | 616.60 | 12 | 6.2 | |
| | 48.0 | 616.70 | 12 | 6.1 | |
| | 52.0 | 616.40 | 12 | 6.1 | |
| | 56.0 | 616.10 | 12 | 6.1 | |
| | 60.0 | 616.20 | 12 | 6.1 | |
| | 64.0 | 616.50 | 12 | 6.1 | |
| | 68.0 | 616.10 | 12 | 6.1 | |
| | 72.0 | 616.00 | 12 | 6.1 | |
| | 76.0 | 615.80 | 12 | 6.1 | |
| | 80.0 | 615.50 | 12 | 6.1 | |
| | 84.0 | 615.40 | 12 | 6.1 | |
| | 88.0 | 615.20 | 12 | 6.1 | |
| | 92.0 | 615.20 | 12 | 6.1 | |
| | 96.0 | 615.00 | 12 | 6.1 | |
| | 100.0 | 614.80 | 12 | 6.1 | |
| | 104.0 | 614.70 | 12 | 6.1 | |
| | 108.0 | 614.90 | 12 | 6.1 | |
| | 112.0 | 614.60 | 12 | 6.1 | |
| | 116.0 | 614.70 | 12 | 6.1 | |
| | 120.0 | 614.60 | 12 | 6.1 | |
| | 124.0 | 614.80 | 12 | 6.1 | |
| | 128.0 | 614.70 | 12 | 6.1 | |
| | 132.0 | 614.90 | 12 | 6.1 | |
| | 136.0 | 614.90 | 12 | 6.1 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3 | 140.0 | 615.00 | 12 | 6.1 | |
| Station 6+45 | 144.0 | 615.00 | 12 | 6.1 | |
| (cont.) | 148.0 | 615.20 | 12 | 6.1 | |
| | 152.0 | 615.20 | 12 | 6.1 | |
| | 156.0 | 615.30 | 12 | 6.1 | |
| | 160.0 | 615.30 | 12 | 6.1 | |
| | 164.0 | 615.60 | 12 | 6.1 | |
| | 168.0 | 615.60 | 12 | 6.1 | |
| | 172.0 | 615.80 | 12 | 6.1 | |
| | 176.0 | 615.80 | 12 | 7.1 | |
| | 180.0 | 616.10 | 12 | 7.1 | |
| | 184.0 | 616.30 | 12 | 7.1 | |
| | 188.0 | 616.50 | 12 | 7.1 | |
| | 192.0 | 616.70 | 1 | 7.1 | |
| | 196.0 | 616.50 | 1 | 7.1 | |
| | 198.0 | 616.80 | 1 | 7.1 | |
| | 200.0 | 616.60 | 1 | 7.1 | |
| | 202.0 | 617.00 | 1 | 7.1 | |
| | 206.0 | 617.10 | 1 | 7.1 | |
| | 208.0 | 616.90 | 1 | 7.1 | |
| | 210.0 | 617.00 | 1 | 7.1 | |
| | 212.0 | 617.10 | 1 | 7.1 | |
| | 214.0 | 617.20 | 1 | 7.1 | |
| | 216.0 | 617.40 | 1 | 7.1 | |
| | 218.0 | 617.50 | 1 | 7.1 | |
| | 260.0 | 620.90 | 1 | 8.2 | Bottom of bank |
| | 266.0 | 622.80 | 1 | 8.2 | Top of bank |
| | 273.0 | 623.11 | 1 | 8.2 | Beside headpin |
| | 273.0 | 623.30 | 1 | 8.2 | RB headpin |
| Cross Section 4 | 0.0 | 623.00 | 1 | 2.2 | LB Headpin |
| Station 9+45 | 1.0 | 621.66 | 1 | 2.2 | Beside headpin |
| | 7.0 | 620.00 | 1 | 2.2 | |
| | 25.0 | 617.50 | 1 | 6.2 | |
| | 27.0 | 617.40 | 1 | 6.2 | |
| | 28.0 | 616.70 | 12 | 6.2 | LWE |
| | 30.0 | 616.60 | 12 | 6.2 | |
| | 32.0 | 616.20 | 12 | 6.2 | |
| | 34.0 | 616.10 | 12 | 6.2 | |
| | 36.0 | 615.70 | 12 | 6.1 | |
| | 38.0 | 615.90 | 12 | 6.1 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 4 | 41.0 | 615.60 | 12 | 6.1 | |
| Station 9+45 | 43.0 | 614.90 | 11 | 6.1 | |
| (cont.) | 45.0 | 615.00 | 11 | 6.1 | |
| | 48.0 | 614.20 | 11 | 6.1 | |
| | 52.0 | 614.10 | 11 | 6.1 | |
| | 54.0 | 614.00 | 11 | 6.1 | |
| | 55.0 | 613.80 | 11 | 6.1 | |
| | 56.0 | 613.90 | 11 | 6.1 | |
| | 57.0 | 613.80 | 11 | 6.1 | |
| | 58.0 | 613.90 | 11 | 6.1 | |
| | 60.0 | 614.20 | 11 | 6.1 | |
| | 64.0 | 614.70 | 8 | 6.1 | |
| | 68.0 | 614.80 | 8 | 6.1 | |
| | 72.0 | 615.20 | 8 | 6.1 | |
| | 76.0 | 615.40 | 8 | 6.1 | |
| | 80.0 | 615.70 | 8 | 6.1 | |
| | 84.0 | 615.80 | 8 | 6.1 | |
| | 88.0 | 615.70 | 8 | 6.1 | |
| | 92.0 | 615.90 | 8 | 6.1 | |
| | 96.0 | 616.20 | 8 | 6.1 | |
| | 100.0 | 615.90 | 8 | 6.1 | |
| | 104.0 | 616.00 | 8 | 6.1 | |
| | 108.0 | 616.20 | 8 | 6.1 | |
| | 112.0 | 616.10 | 8 | 6.1 | |
| | 116.0 | 616.10 | 8 | 6.1 | |
| | 120.0 | 616.10 | 8 | 4.2 | |
| | 124.0 | 616.00 | 8 | 4.2 | |
| | 126.0 | 616.10 | 8 | 4.2 | |
| | 130.0 | 616.30 | 8 | 4.2 | |
| | 134.0 | 616.40 | 8 | 4.2 | |
| | 138.0 | 616.60 | 8 | 4.2 | |
| | 140.0 | 616.70 | 8 | 4.2 | |
| | 144.0 | 616.90 | 8 | 4.2 | |
| | 148.0 | 617.00 | 8 | 4.2 | |
| | 152.0 | 617.20 | 8 | 4.2 | |
| | 157.0 | 617.30 | 2 | 4.2 | RWE |
| | 163.0 | 617.30 | 2 | 1.1 | |
| | 167.0 | 617.40 | 2 | 1.1 | |
| | 171.0 | 617.30 | 2 | 1.1 | |
| | 175.0 | 617.40 | 2 | 1.1 | |
| | 179.0 | 617.60 | 2 | 1.1 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 4 | 216.0 | 619.90 | 2 | 1.1 | |
| Station 9+45 | 231.0 | 619.90 | 2 | 1.1 | |
| (cont.) | 283.0 | 621.20 | 2 | 1.1 | |
| | 302.5 | 623.66 | 2 | 8.1 | Beside headpin |
| | 303.0 | 623.97 | 2 | 8.1 | RB Headpin |
| Cross Section 5 | 0.0 | 622.89 | 1 | 8.4 | LB Headpin |
| Station 11+90 | 0.0 | 622.39 | 1 | 8.4 | Beside headpin |
| | 4.0 | 622.30 | 1 | 9.3 | |
| | 7.0 | 618.00 | 1 | 9.3 | |
| | 9.0 | 617.10 | 12 | 7.3 | LWE |
| | 12.0 | 615.50 | 12 | 7.3 | |
| | 14.0 | 615.30 | 12 | 7.3 | |
| | 18.0 | 615.90 | 12 | 7.3 | |
| | 22.0 | 615.80 | 12 | 5.2 | |
| | 26.0 | 614.40 | 12 | 5.2 | |
| | 30.0 | 614.40 | 12 | 5.2 | |
| | 34.0 | 614.70 | 12 | 5.2 | |
| | 38.0 | 614.90 | 10 | 5.2 | |
| | 42.0 | 615.50 | 10 | 5.2 | |
| | 46.0 | 615.40 | 10 | 5.2 | |
| | 50.0 | 615.50 | 10 | 5.2 | |
| | 54.0 | 615.90 | 10 | 5.2 | |
| | 58.0 | 615.80 | 10 | 5.2 | |
| | 62.0 | 615.90 | 10 | 5.2 | |
| | 66.0 | 616.00 | 10 | 5.2 | |
| | 70.0 | 616.10 | 10 | 5.2 | |
| | 74.0 | 616.70 | 10 | 5.2 | |
| | 78.0 | 617.10 | 8 | 5.2 | |
| | 82.0 | 617.30 | 8 | 5.2 | |
| | 86.0 | 617.30 | 8 | 5.2 | |
| | 90.0 | 617.50 | 8 | 5.2 | |
| | 94.0 | 617.50 | 8 | 5.2 | |
| | 98.0 | 617.50 | 8 | 5.2 | |
| | 102.0 | 617.50 | 8 | 5.2 | |
| | 106.0 | 617.40 | 8 | 5.2 | |
| | 110.0 | 617.50 | 8 | 5.2 | |
| | 114.0 | 617.50 | 8 | 5.2 | |
| | 118.0 | 617.50 | 8 | 5.2 | |
| | 122.0 | 617.50 | 8 | 5.2 | |
| | 126.0 | 617.60 | 8 | 5.2 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 5 | 130.0 | 617.60 | 8 | 4.2 | |
| Station 11+90 | 134.0 | 617.70 | 8 | 4.2 | |
| (cont.) | 138.0 | 617.90 | 8 | 4.2 | |
| | 142.0 | 617.80 | 8 | 4.2 | |
| | 146.0 | 618.10 | 8 | 4.2 | |
| | 150.0 | 618.10 | 8 | 4.2 | |
| | 154.0 | 618.10 | 8 | 4.2 | |
| | 156.0 | 618.20 | 8 | 4.2 | |
| | 276.0 | 620.10 | 1 | 4.2 | |
| | 380.0 | 621.50 | 1 | 8.1 | |
| | 391.0 | 623.42 | 1 | 8.1 | Beside headpin |
| | 391.0 | 623.69 | 1 | 8.1 | RB Headpin |
| Cross Section 6 | 0.0 | 628.02 | 1 | 8.4 | LB Headpin |
| Station 16+30 | 0.0 | 627.74 | 1 | 8.4 | Beside headpin |
| | 1.0 | 623.10 | 8 | 8.4 | |
| | 11.0 | 619.40 | 8 | 5.2 | |
| | 14.0 | 618.70 | 8 | 5.2 | LWE |
| | 17.0 | 618.30 | 8 | 5.2 | |
| | 20.0 | 618.10 | 8 | 5.2 | |
| | 22.0 | 618.00 | 8 | 5.2 | |
| | 26.0 | 618.00 | 8 | 5.2 | |
| | 30.0 | 617.90 | 8 | 5.2 | |
| | 34.0 | 617.80 | 8 | 5.2 | |
| | 37.0 | 617.60 | 8 | 5.2 | |
| | 42.0 | 617.80 | 8 | 5.2 | |
| | 46.0 | 617.70 | 8 | 5.2 | |
| | 50.0 | 617.80 | 8 | 5.2 | |
| | 54.0 | 617.80 | 8 | 5.2 | |
| | 58.0 | 617.10 | 8 | 5.2 | |
| | 62.0 | 616.70 | 8 | 5.2 | |
| | 66.0 | 616.30 | 8 | 5.2 | |
| | 70.0 | 616.50 | 8 | 5.2 | |
| | 74.0 | 617.00 | 8 | 5.2 | |
| | 78.0 | 617.80 | 8 | 5.2 | |
| | 82.0 | 618.20 | 7 | 5.2 | |
| | 86.0 | 618.40 | 7 | 5.2 | |
| | 90.0 | 618.50 | 6 | 5.2 | |
| | 92.0 | 618.80 | 6 | 5.2 | |
| | 96.0 | 618.90 | 6 | 5.2 | |
| | 98.0 | 618.90 | 6 | 5.3 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 6 | 104.0 | 618.90 | 6 | 5.3 | |
| Station 16+30 | 106.0 | 619.20 | 6 | 5.3 | |
| (cont.) | 110.0 | 619.10 | 6 | 5.3 | |
| | 114.0 | 619.10 | 6 | 5.3 | |
| | 117.0 | 619.10 | 6 | 5.3 | RWE |
| | 122.0 | 619.00 | 6 | 5.3 | |
| | 126.0 | 619.00 | 6 | 5.3 | |
| | 130.0 | 619.00 | 6 | 5.3 | |
| | 138.0 | 619.00 | 6 | 5.3 | |
| | 146.0 | 619.00 | 6 | 5.3 | |
| | 151.0 | 619.10 | 6 | 5.3 | |
| | 154.0 | 619.20 | 6 | 5.3 | |
| | 162.0 | 619.40 | 6 | 5.3 | |
| | 166.0 | 619.60 | 6 | 5.3 | |
| | 170.0 | 619.40 | 6 | 5.3 | |
| | 174.0 | 618.90 | 6 | 5.3 | |
| | 178.0 | 618.90 | 6 | 5.3 | |
| | 182.0 | 618.90 | 6 | 5.3 | |
| | 188.0 | 618.90 | 6 | 5.3 | |
| | 192.0 | 618.80 | 6 | 5.3 | |
| | 196.0 | 618.80 | 6 | 5.3 | |
| | 200.0 | 619.00 | 6 | 5.3 | |
| | 204.0 | 618.80 | 6 | 5.3 | |
| | 208.0 | 618.90 | 6 | 5.3 | |
| | 212.0 | 619.00 | 6 | 5.3 | |
| | 216.0 | 618.90 | 6 | 5.3 | |
| | 220.0 | 619.20 | 6 | 5.3 | |
| | 224.0 | 619.20 | 6 | 5.3 | |
| | 228.0 | 619.20 | 6 | 5.3 | |
| | 232.0 | 619.20 | 6 | 5.3 | |
| | 236.0 | 619.10 | 6 | 5.3 | |
| | 240.0 | 619.10 | 6 | 5.3 | |
| | 244.0 | 619.10 | 6 | 5.2 | |
| | 246.0 | 619.10 | 6 | 5.2 | |
| | 248.0 | 619.10 | 6 | 5.2 | |
| | 252.0 | 619.30 | 6 | 5.2 | |
| | 256.0 | 619.30 | 6 | 5.2 | |
| | 260.0 | 619.30 | 6 | 5.2 | |
| | 264.0 | 619.30 | 6 | 5.2 | |
| | 268.0 | 619.40 | 6 | 5.2 | |
| | 272.0 | 619.40 | 6 | 5.2 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 6 | 276.0 | 619.40 | 6 | 5.2 | |
| Station 16+30 | 280.0 | 619.30 | 6 | 5.2 | |
| (cont.) | 284.0 | 619.50 | 6 | 5.2 | |
| | 342.0 | 622.40 | 1 | 5.2 | |
| | 358.0 | 622.92 | 1 | 8.2 | Beside headpin |
| | 358.0 | 623.17 | 1 | 8.2 | RB Headpin |
| Cross Section 7 | 0.0 | 626.66 | 1 | 5.2 | LB Headpin |
| Station 19+05 | 2.0 | 626.21 | 1 | 5.2 | Beside headpin |
| | 8.0 | 620.40 | 1 | 5.2 | |
| | 10.0 | 620.00 | 8 | 5.2 | |
| | 14.0 | 619.70 | 8 | 5.2 | |
| | 18.0 | 619.90 | 8 | 5.2 | |
| | 20.0 | 619.90 | 8 | 5.2 | |
| | 24.0 | 620.10 | 8 | 5.2 | |
| | 28.0 | 620.10 | 8 | 5.2 | |
| | 32.0 | 620.10 | 8 | 5.2 | |
| | 36.0 | 620.00 | 8 | 5.2 | |
| | 40.0 | 619.80 | 8 | 5.2 | |
| | 44.0 | 620.20 | 8 | 5.2 | |
| | 48.0 | 620.10 | 8 | 5.2 | |
| | 51.0 | 620.40 | 6 | 5.2 | LWE |
| | 54.0 | 620.90 | 6 | 5.2 | |
| | 71.0 | 621.20 | 8 | 5.3 | |
| | 84.0 | 620.90 | 8 | 5.2 | |
| | 88.0 | 620.20 | 8 | 5.2 | |
| | 92.0 | 619.50 | 8 | 5.2 | |
| | 96.0 | 619.30 | 8 | 5.2 | |
| | 100.0 | 619.10 | 8 | 4.2 | |
| | 104.0 | 619.50 | 8 | 4.2 | |
| | 108.0 | 620.10 | 8 | 4.2 | |
| | 112.0 | 620.20 | 8 | 4.2 | |
| | 116.0 | 620.00 | 8 | 4.2 | |
| | 120.0 | 620.10 | 8 | 4.2 | |
| | 124.0 | 620.10 | 8 | 4.2 | |
| | 128.0 | 620.10 | 8 | 4.2 | |
| | 132.0 | 620.00 | 6 | 5.2 | |
| | 136.0 | 619.50 | 6 | 5.2 | |
| | 140.0 | 619.70 | 6 | 5.2 | |
| | 144.0 | 619.90 | 6 | 5.2 | |
| | 148.0 | 620.00 | 6 | 5.2 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 7 | 152.0 | 620.00 | 6 | 5.2 | |
| Station 19+05 | 156.0 | 619.90 | 6 | 5.2 | |
| (cont.) | 160.0 | 619.90 | 6 | 5.2 | |
| | 164.0 | 620.00 | 6 | 5.2 | |
| | 168.0 | 619.80 | 6 | 5.2 | |
| | 172.0 | 619.70 | 6 | 5.2 | |
| | 176.0 | 619.70 | 6 | 5.2 | |
| | 178.0 | 619.70 | 6 | 5.2 | |
| | 182.0 | 619.80 | 6 | 5.2 | |
| | 186.0 | 619.80 | 6 | 5.2 | |
| | 190.0 | 619.80 | 6 | 5.2 | |
| | 194.0 | 620.00 | 6 | 5.2 | |
| | 198.0 | 620.10 | 6 | 5.2 | |
| | 202.0 | 620.10 | 6 | 6.2 | |
| | 208.0 | 620.00 | 6 | 6.2 | |
| | 212.0 | 619.90 | 6 | 6.2 | |
| | 216.0 | 620.00 | 6 | 6.2 | |
| | 220.0 | 620.00 | 6 | 6.2 | |
| | 224.0 | 620.10 | 6 | 6.2 | |
| | 228.0 | 620.00 | 6 | 6.2 | |
| | 232.0 | 619.90 | 6 | 6.2 | |
| | 236.0 | 620.10 | 6 | 6.2 | |
| | 240.0 | 620.10 | 6 | 6.2 | |
| | 244.0 | 620.10 | 6 | 6.2 | |
| | 248.0 | 620.10 | 6 | 6.2 | |
| | 254.0 | 620.10 | 6 | 6.2 | |
| | 258.0 | 620.10 | 6 | 6.2 | |
| | 262.0 | 620.10 | 6 | 6.2 | |
| | 266.0 | 620.10 | 6 | 6.2 | |
| | 270.0 | 620.00 | 6 | 6.2 | |
| | 274.0 | 620.10 | 6 | 6.2 | |
| | 278.0 | 620.00 | 6 | 6.2 | |
| | 282.0 | 620.20 | 6 | 6.2 | |
| | 285.0 | 620.00 | 6 | 6.2 | |
| | 288.0 | 620.20 | 6 | 6.2 | |
| | 290.0 | 620.00 | 6 | 6.2 | |
| | 294.0 | 620.40 | 6 | 6.2 | RWE |
| | 298.0 | 620.20 | 6 | 6.2 | |
| | 302.0 | 620.70 | 6 | 5.2 | |
| | 305.0 | 620.70 | 6 | 5.2 | |
| | 311.0 | 620.40 | 6 | 5.2 | |

Table B-2.5 (cont.) Cross section elevations, substrate and cover data at site 131.7L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 7 | 315.0 | 620.40 | 6 | 5.2 | |
| Station 19+05 | 319.0 | 620.40 | 6 | 5.2 | |
| (cont.) | 323.0 | 620.40 | 6 | 5.2 | |
| | 327.0 | 620.40 | 6 | 5.2 | |
| | 331.0 | 620.40 | 6 | 5.2 | |
| | 335.0 | 620.40 | 6 | 5.2 | |
| | 339.0 | 620.40 | 6 | 5.2 | |
| | 343.0 | 620.40 | 6 | 5.2 | |
| | 347.0 | 620.40 | 6 | 5.2 | |
| | 351.0 | 620.40 | 6 | 5.2 | |
| | 355.0 | 620.50 | 6 | 5.2 | |
| | 359.0 | 620.50 | 6 | 5.2 | |
| | 362.0 | 620.50 | 6 | 5.2 | |
| | 367.0 | 620.70 | 6 | 5.2 | |
| | 414.0 | 622.60 | 10 | 5.2 | |
| | 432.0 | 623.26 | 10 | 8.4 | Beside headpin |
| | 432.0 | 623.83 | 10 | 8.4 | RB Headpin |

Date of survey: Sept. 27, 1984.
Reference elevation: R&M Alcap 131.1S1 RB 1982.

Table B-2.6 Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 0.0 | 630.20 | 1 | 2.5 | LB Headpin |
| Station 0+00 | 8.7 | 626.10 | 1 | 2.5 | |
| | 9.0 | 625.50 | 1 | 2.5 | |
| | 9.3 | 625.50 | 1 | 2.5 | |
| | 9.5 | 625.20 | 10 | 5.2 | |
| | 10.0 | 625.40 | 10 | 5.2 | |
| | 12.0 | 625.30 | 10 | 5.2 | |
| | 14.0 | 625.30 | 10 | 5.2 | |
| | 16.0 | 625.50 | 10 | 5.2 | |
| | 18.0 | 625.20 | 10 | 5.2 | LWE |
| | 20.0 | 625.40 | 10 | 5.2 | |
| | 21.0 | 625.30 | 10 | 5.2 | |
| | 24.0 | 625.00 | 10 | 5.2 | |
| | 28.0 | 625.20 | 10 | 5.3 | |
| | 29.0 | 625.00 | 10 | 5.3 | |
| | 31.0 | 624.80 | 10 | 5.3 | |
| | 32.0 | 625.30 | 10 | 5.3 | |
| | 33.0 | 625.00 | 10 | 5.3 | |
| | 36.0 | 624.90 | 10 | 5.3 | |
| | 39.0 | 625.20 | 10 | 5.3 | |
| | 40.0 | 625.30 | 10 | 5.3 | |
| | 43.0 | 625.30 | 10 | 5.3 | |
| | 44.0 | 625.20 | 10 | 5.3 | |
| | 47.0 | 625.20 | 10 | 5.3 | |
| | 48.0 | 624.80 | 10 | 5.3 | |
| | 51.0 | 625.10 | 10 | 5.3 | |
| | 52.0 | 624.90 | 10 | 5.3 | |
| | 55.0 | 624.90 | 10 | 5.3 | |
| | 56.0 | 624.60 | 10 | 5.3 | |
| | 59.0 | 624.80 | 10 | 5.3 | |
| | 60.0 | 624.60 | 10 | 5.2 | |
| | 63.0 | 624.90 | 10 | 5.2 | |
| | 64.0 | 624.60 | 10 | 5.2 | |
| | 67.0 | 624.70 | 10 | 5.2 | |
| | 68.0 | 624.70 | 10 | 5.2 | |
| | 70.0 | 624.60 | 10 | 5.2 | |
| | 72.0 | 624.70 | 10 | 5.2 | |
| | 74.0 | 624.90 | 10 | 5.2 | |
| | 76.0 | 625.00 | 10 | 2.2 | RWE |
| | 77.8 | 625.50 | 10 | 2.2 | |
| | 78.0 | 625.50 | 10 | 2.2 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 80.0 | 626.10 | 10 | 2.2 | |
| Station 0+00 | 83.0 | 627.70 | 1 | 8.3 | Top of bank |
| (cont.) | 98.0 | 627.80 | 1 | 8.3 | |
| | 109.0 | 630.20 | 1 | 8.3 | RB Headpin |
| Cross Section 2 | 0.0 | 630.30 | 1 | 2.5 | LB Headpin |
| Station 1+24 | 4.0 | 627.10 | 1 | 9.3 | Bottom of bank |
| | 18.5 | 626.60 | 1 | 5.2 | |
| | 31.5 | 626.30 | 1 | 5.3 | |
| | 32.0 | 626.20 | 1 | 5.3 | |
| | 34.0 | 626.00 | 1 | 5.3 | |
| | 36.0 | 625.80 | 1 | 5.3 | |
| | 37.0 | 625.70 | 1 | 5.3 | LWE |
| | 38.0 | 625.40 | 1 | 5.3 | |
| | 40.0 | 625.30 | 1 | 5.3 | |
| | 42.0 | 625.20 | 1 | 5.3 | |
| | 44.0 | 625.30 | 10 | 5.3 | |
| | 46.0 | 625.20 | 10 | 5.3 | |
| | 48.0 | 625.10 | 10 | 5.3 | |
| | 50.0 | 624.80 | 10 | 5.3 | |
| | 52.0 | 624.70 | 10 | 5.2 | |
| | 54.0 | 624.60 | 10 | 5.2 | |
| | 56.0 | 624.60 | 10 | 5.2 | |
| | 58.0 | 624.60 | 10 | 5.2 | |
| | 60.0 | 624.50 | 10 | 5.2 | |
| | 62.0 | 624.70 | 10 | 5.2 | |
| | 64.0 | 624.60 | 10 | 5.2 | |
| | 66.0 | 624.60 | 10 | 5.2 | |
| | 68.0 | 624.60 | 10 | 5.2 | |
| | 70.0 | 624.70 | 10 | 5.3 | |
| | 72.0 | 625.00 | 10 | 5.3 | |
| | 74.0 | 625.00 | 10 | 5.3 | |
| | 76.0 | 625.30 | 10 | 5.3 | RWE |
| | 78.0 | 625.70 | 10 | 5.3 | |
| | 80.0 | 625.90 | 10 | 5.3 | |
| | 82.0 | 626.10 | 10 | 5.3 | |
| | 84.0 | 626.00 | 10 | 5.2 | |
| | 86.0 | 626.20 | 10 | 5.2 | |
| | 88.0 | 626.20 | 10 | 5.2 | |
| | 90.0 | 626.20 | 10 | 5.2 | |
| | 92.0 | 626.20 | 10 | 5.2 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 2 | 96.0 | 626.10 | 10 | 5.2 | |
| Station 1+24 | 100.0 | 626.00 | 10 | 5.2 | |
| (cont.) | 104.0 | 626.30 | 10 | 5.2 | |
| | 111.5 | 627.30 | 1 | 5.1 | Top of bank |
| | 139.0 | 629.60 | 1 | 5.1 | |
| | 161.0 | 630.90 | 1 | 5.1 | RB Headpin |
| Cross Section 3 | 0.0 | 631.16 | 1 | 2.5 | LB Headpin |
| Station 2+46 | 8.5 | 629.80 | 1 | 2.5 | |
| | 23.0 | 627.30 | 1 | 2.5 | |
| | 23.5 | 626.90 | 8 | 5.2 | |
| | 24.0 | 626.90 | 8 | 5.2 | |
| | 26.0 | 626.30 | 8 | 5.2 | |
| | 28.0 | 626.20 | 8 | 5.3 | |
| | 30.0 | 626.00 | 8 | 5.3 | LWE |
| | 32.0 | 626.10 | 8 | 5.3 | |
| | 34.0 | 625.90 | 8 | 5.3 | |
| | 36.0 | 625.90 | 8 | 5.3 | |
| | 38.0 | 625.80 | 8 | 5.3 | |
| | 40.0 | 625.30 | 8 | 5.3 | |
| | 42.0 | 624.90 | 8 | 5.3 | |
| | 44.0 | 625.10 | 8 | 5.3 | |
| | 46.0 | 625.10 | 8 | 5.3 | |
| | 48.0 | 625.40 | 8 | 5.3 | |
| | 50.0 | 625.80 | 8 | 5.3 | |
| | 52.0 | 625.80 | 8 | 5.3 | |
| | 54.0 | 626.10 | 8 | 5.3 | RWE |
| | 58.0 | 626.50 | 1 | 5.2 | |
| | 62.0 | 627.00 | 1 | 5.2 | |
| | 66.0 | 627.00 | 1 | 5.2 | |
| | 70.0 | 627.20 | 1 | 5.2 | |
| | 74.0 | 627.10 | 1 | 5.2 | |
| | 78.0 | 627.10 | 1 | 5.2 | |
| | 80.0 | 626.80 | 1 | 5.2 | |
| | 82.0 | 627.00 | 1 | 5.2 | |
| | 84.0 | 627.00 | 1 | 5.2 | |
| | 86.0 | 626.90 | 1 | 5.2 | |
| | 88.0 | 627.00 | 1 | 5.2 | |
| | 90.0 | 627.30 | 1 | 5.2 | |
| | 90.3 | 627.30 | 1 | 5.2 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3 | 95.0 | 628.10 | 1 | 5.1 | |
| Station 2+46 | 104.4 | 628.10 | 1 | 5.1 | |
| (cont.) | 139.5 | 630.25 | 1 | 5.1 | RB Headpin |
| Cross Section 4 | 0.0 | 631.00 | 1 | 2.5 | LB Headpin |
| Station 3+90 | 17.6 | 628.00 | 1 | 2.3 | |
| | 18.0 | 627.50 | 8 | 2.3 | Bottom of bank |
| | 20.0 | 627.50 | 8 | 2.3 | |
| | 22.0 | 627.40 | 8 | 5.3 | |
| | 24.0 | 627.50 | 8 | 5.3 | |
| | 30.0 | 627.20 | 8 | 5.3 | |
| | 32.0 | 627.20 | 8 | 5.3 | |
| | 34.0 | 627.10 | 8 | 5.3 | |
| | 36.0 | 627.10 | 8 | 5.3 | |
| | 38.0 | 627.10 | 8 | 5.3 | |
| | 40.0 | 627.10 | 8 | 5.3 | LWE |
| | 42.0 | 627.00 | 8 | 5.3 | |
| | 44.0 | 627.20 | 8 | 5.3 | |
| | 46.0 | 626.80 | 8 | 5.3 | |
| | 48.0 | 626.50 | 8 | 5.3 | |
| | 50.0 | 626.30 | 8 | 5.2 | |
| | 51.0 | 626.30 | 8 | 5.2 | |
| | 53.0 | 626.10 | 8 | 5.2 | |
| | 55.0 | 626.30 | 8 | 5.2 | |
| | 57.0 | 626.30 | 8 | 5.2 | |
| | 59.0 | 626.30 | 8 | 5.2 | |
| | 61.0 | 626.30 | 8 | 5.2 | |
| | 62.0 | 626.30 | 8 | 5.3 | |
| | 64.0 | 626.70 | 8 | 5.3 | |
| | 66.0 | 626.80 | 8 | 5.3 | |
| | 68.0 | 627.00 | 8 | 5.3 | |
| | 70.8 | 627.10 | 10 | 5.3 | RWE |
| | 72.0 | 627.20 | 10 | 5.3 | |
| | 74.0 | 627.10 | 10 | 5.3 | |
| | 76.0 | 627.20 | 10 | 5.3 | |
| | 78.0 | 627.20 | 10 | 5.3 | |
| | 80.0 | 627.20 | 10 | 5.3 | |
| | 84.0 | 627.20 | 10 | 5.3 | |
| | 86.0 | 627.10 | 10 | 5.3 | |
| | 88.0 | 627.20 | 10 | 5.3 | |
| | 90.0 | 627.30 | 10 | 5.3 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 4 | 92.0 | 627.10 | 10 | 5.3 | |
| Station 3+90 | 94.0 | 627.40 | 10 | 5.3 | |
| (cont.) | 96.0 | 627.20 | 10 | 5.3 | |
| | 98.0 | 627.20 | 10 | 5.2 | |
| | 102.0 | 627.40 | 10 | 5.2 | |
| | 106.0 | 627.40 | 10 | 5.2 | |
| | 110.0 | 627.40 | 10 | 5.2 | |
| | 114.0 | 627.40 | 10 | 5.2 | |
| | 118.0 | 627.70 | 10 | 5.2 | |
| | 122.0 | 627.80 | 10 | 5.1 | |
| | 124.0 | 627.80 | 10 | 5.1 | |
| | 126.0 | 627.80 | 10 | 5.1 | |
| | 128.0 | 627.80 | 10 | 5.1 | |
| | 130.0 | 627.80 | 1 | 5.1 | |
| | 132.0 | 628.00 | 1 | 5.1 | |
| | 152.0 | 628.00 | 1 | 5.1 | |
| | 162.5 | 629.00 | 1 | 5.1 | |
| | 182.0 | 629.10 | 1 | 5.1 | |
| | 199.0 | 630.00 | 1 | 5.1 | RB Headpin |
| Cross Section 5 | 0.0 | 631.00 | 1 | 2.5 | LB Headpin |
| Station 5+11 | 40.0 | 628.10 | 1 | 3.2 | |
| | 43.5 | 627.80 | 1 | 3.2 | Top of bank |
| | 44.0 | 627.15 | 10 | 3.2 | LWE |
| | 46.0 | 626.80 | 10 | 3.2 | |
| | 48.0 | 626.50 | 10 | 5.2 | |
| | 50.0 | 626.60 | 10 | 5.2 | |
| | 52.0 | 626.60 | 10 | 5.2 | |
| | 54.0 | 626.20 | 10 | 5.2 | |
| | 56.0 | 626.40 | 10 | 5.2 | |
| | 58.0 | 626.60 | 10 | 5.2 | |
| | 60.0 | 626.40 | 10 | 5.2 | |
| | 62.0 | 626.40 | 10 | 5.2 | |
| | 66.0 | 626.50 | 10 | 5.2 | |
| | 68.0 | 626.60 | 10 | 5.2 | |
| | 70.0 | 626.60 | 10 | 5.2 | |
| | 74.0 | 626.30 | 10 | 5.2 | |
| | 78.0 | 626.40 | 10 | 5.2 | |
| | 80.0 | 626.40 | 10 | 5.2 | |
| | 82.0 | 626.70 | 10 | 5.2 | |
| | 86.0 | 626.60 | 10 | 5.2 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 5 | 90.0 | 626.40 | 10 | 5.2 | |
| Station 5+11 | 92.0 | 626.60 | 10 | 5.2 | |
| (cont.) | 94.0 | 626.50 | 10 | 5.2 | |
| | 98.0 | 626.60 | 10 | 5.2 | |
| | 102.0 | 626.60 | 10 | 5.2 | |
| | 104.0 | 626.50 | 10 | 5.2 | |
| | 106.0 | 626.70 | 10 | 5.2 | |
| | 110.0 | 626.70 | 10 | 5.2 | |
| | 114.0 | 626.70 | 10 | 5.2 | |
| | 116.0 | 626.80 | 10 | 5.2 | |
| | 118.0 | 626.90 | 10 | 5.2 | |
| | 122.0 | 627.10 | 10 | 5.2 | |
| | 124.0 | 627.19 | 10 | 6.1 | RWE |
| | 126.0 | 627.30 | 10 | 6.1 | |
| | 128.0 | 627.20 | 10 | 6.1 | |
| | 130.0 | 627.30 | 10 | 6.1 | |
| | 134.0 | 627.20 | 10 | 6.1 | |
| | 136.0 | 627.10 | 10 | 6.1 | |
| | 138.0 | 627.30 | 10 | 5.1 | |
| | 140.0 | 627.40 | 10 | 5.1 | |
| | 142.0 | 627.40 | 10 | 5.1 | |
| | 144.0 | 627.60 | 10 | 5.1 | |
| | 146.0 | 627.20 | 10 | 5.1 | |
| | 148.0 | 627.60 | 10 | 5.1 | |
| | 150.0 | 627.50 | 10 | 1.1 | |
| | 152.0 | 627.40 | 10 | 1.1 | Bottom of bank |
| | 154.0 | 627.50 | 10 | 1.1 | |
| | 156.0 | 628.10 | 10 | 1.1 | |
| | 162.5 | 629.00 | 1 | 1.1 | Top of bank |
| | 182.0 | 629.10 | 1 | 5.1 | |
| | 210.0 | 630.00 | 1 | 5.1 | RB Headpin |
| Cross Section 6 | 0.0 | 631.80 | 1 | 2.5 | LB Headpin |
| Station 6+94 | 25.0 | 629.10 | 1 | 2.3 | |
| | 29.0 | 628.20 | 1 | 2.3 | |
| | 30.0 | 628.00 | 1 | 2.3 | LWE |
| | 32.0 | 627.40 | 1 | 2.2 | |
| | 34.0 | 626.30 | 11 | 2.2 | |
| | 36.0 | 626.60 | 11 | 5.2 | |
| | 38.0 | 626.60 | 11 | 5.2 | |
| | 42.0 | 627.10 | 8 | 5.2 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 6 | 44.0 | 627.20 | 8 | 5.2 | |
| Station 6+94 | 46.0 | 627.00 | 8 | 5.1 | |
| (cont.) | 50.0 | 626.20 | 10 | 5.1 | |
| | 54.0 | 625.70 | 10 | 5.1 | |
| | 56.0 | 625.40 | 10 | 5.1 | |
| | 58.0 | 625.20 | 11 | 5.1 | |
| | 62.0 | 625.10 | 11 | 5.1 | |
| | 66.0 | 625.20 | 11 | 5.1 | |
| | 68.0 | 625.40 | 11 | 5.1 | |
| | 70.0 | 625.10 | 11 | 5.1 | |
| | 72.5 | 625.20 | 1 | 5.1 | |
| | 74.0 | 625.20 | 1 | 5.1 | |
| | 76.0 | 625.30 | 1 | 5.1 | |
| | 78.0 | 625.60 | 1 | 5.1 | |
| | 80.0 | 625.70 | 1 | 5.1 | |
| | 82.0 | 625.70 | 1 | 5.1 | |
| | 84.0 | 625.90 | 1 | 5.1 | |
| | 86.0 | 626.00 | 1 | 5.1 | |
| | 88.0 | 626.00 | 1 | 5.1 | |
| | 90.0 | 626.00 | 1 | 1.1 | |
| | 92.0 | 626.20 | 1 | 1.1 | |
| | 94.0 | 626.30 | 1 | 1.1 | |
| | 96.0 | 626.50 | 1 | 1.1 | |
| | 98.0 | 626.40 | 1 | 1.1 | |
| | 100.0 | 626.70 | 1 | 1.1 | |
| | 102.0 | 626.80 | 1 | 1.1 | |
| | 104.0 | 626.90 | 1 | 1.1 | |
| | 106.0 | 627.10 | 1 | 1.1 | RWE |
| | 108.0 | 627.20 | 1 | 1.1 | |
| | 110.0 | 627.30 | 1 | 1.1 | |
| | 112.0 | 627.30 | 1 | 1.1 | |
| | 114.0 | 627.50 | 1 | 1.1 | |
| | 116.0 | 627.60 | 1 | 1.1 | |
| | 118.0 | 627.80 | 1 | 1.1 | |
| | 120.0 | 627.90 | 1 | 1.1 | |
| | 122.0 | 628.10 | 1 | 1.1 | |
| | 124.0 | 628.20 | 1 | 1.1 | |
| | 139.0 | 629.00 | 1 | 1.1 | |
| | 160.0 | 629.20 | 1 | 8.2 | |
| | 181.5 | 629.40 | 1 | 8.2 | RB Headpin |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 7 | 0.0 | 631.60 | 1 | 2.5 | LB Headpin |
| Station 8+52 | 18.2 | 628.20 | 1 | 2.2 | |
| | 20.0 | 627.90 | 1 | 2.1 | |
| | 22.0 | 627.60 | 1 | 6.2 | |
| | 22.6 | 627.40 | 1 | 6.2 | |
| | 23.5 | 627.60 | 1 | 6.2 | |
| | 24.0 | 626.90 | 1 | 6.2 | LWE |
| | 26.0 | 626.90 | 1 | 6.2 | |
| | 28.0 | 626.50 | 1 | 6.2 | |
| | 30.0 | 626.60 | 1 | 5.2 | |
| | 32.0 | 626.60 | 1 | 5.2 | |
| | 34.0 | 626.50 | 1 | 5.2 | |
| | 36.0 | 626.50 | 1 | 5.2 | |
| | 40.0 | 625.00 | 1 | 5.2 | |
| | 44.0 | 624.70 | 1 | 5.2 | |
| | 48.0 | 624.80 | 1 | 5.2 | |
| | 52.0 | 624.70 | 1 | 5.2 | |
| | 56.0 | 624.70 | 1 | 5.2 | |
| | 58.0 | 624.60 | 1 | 5.2 | |
| | 60.0 | 624.70 | 1 | 5.2 | |
| | 62.0 | 624.90 | 1 | 5.2 | |
| | 64.0 | 624.80 | 1 | 5.2 | |
| | 66.0 | 625.10 | 1 | 5.2 | |
| | 68.0 | 625.30 | 1 | 5.2 | |
| | 70.0 | 625.40 | 1 | 1.1 | |
| | 72.0 | 625.60 | 1 | 1.1 | |
| | 74.0 | 625.70 | 1 | 1.1 | |
| | 76.0 | 625.90 | 1 | 1.1 | |
| | 78.0 | 626.00 | 1 | 1.1 | |
| | 80.0 | 626.10 | 1 | 1.1 | |
| | 82.0 | 626.40 | 1 | 1.1 | |
| | 84.0 | 626.60 | 1 | 1.1 | |
| | 86.0 | 626.80 | 1 | 1.1 | |
| | 88.0 | 627.00 | 1 | 1.1 | |
| | 90.0 | 627.10 | 1 | 1.1 | |
| | 92.0 | 627.20 | 1 | 1.1 | RWE |
| | 94.0 | 627.30 | 1 | 1.1 | |
| | 96.0 | 627.60 | 1 | 1.1 | |
| | 98.0 | 627.60 | 1 | 1.1 | |
| | 100.0 | 627.60 | 1 | 1.1 | |
| | 102.0 | 627.90 | 1 | 1.1 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 7 | 104.0 | 627.90 | 1 | 1.1 | |
| Station 8+52 | 106.0 | 627.90 | 1 | 1.1 | |
| (cont.) | 108.0 | 628.20 | 1 | 1.1 | |
| | 116.0 | 628.30 | 1 | 1.1 | |
| | 121.5 | 627.60 | 1 | 1.1 | |
| | 131.5 | 629.40 | 2 | 1.1 | |
| | 145.0 | 629.50 | 1 | 5.1 | |
| | 168.5 | 630.60 | 1 | 5.1 | RB Headpin |
| Cross Section 8 | 0.0 | 633.40 | 1 | 2.5 | LB Headpin |
| Station 9+79 | 18.0 | 628.20 | 1 | 7.2 | |
| | 20.0 | 627.30 | 1 | 7.2 | |
| | 21.0 | 627.30 | 1 | 7.2 | LWE |
| | 22.0 | 627.10 | 1 | 7.2 | |
| | 24.0 | 626.90 | 1 | 5.2 | |
| | 26.0 | 627.00 | 1 | 5.2 | |
| | 28.0 | 626.80 | 11 | 5.2 | |
| | 31.0 | 627.00 | 11 | 5.2 | |
| | 32.0 | 626.70 | 11 | 5.2 | |
| | 33.0 | 626.90 | 11 | 5.2 | |
| | 36.0 | 626.50 | 11 | 5.2 | |
| | 39.0 | 626.80 | 11 | 5.2 | |
| | 40.0 | 626.20 | 11 | 5.2 | |
| | 43.0 | 626.40 | 11 | 5.2 | |
| | 44.0 | 626.20 | 11 | 5.2 | |
| | 47.0 | 626.00 | 11 | 5.2 | |
| | 48.0 | 626.30 | 11 | 5.2 | |
| | 51.0 | 626.20 | 11 | 5.3 | |
| | 52.0 | 626.10 | 11 | 5.3 | |
| | 56.0 | 625.90 | 11 | 5.3 | |
| | 60.0 | 625.90 | 11 | 5.3 | |
| | 64.0 | 626.20 | 11 | 5.3 | |
| | 67.0 | 626.10 | 11 | 5.3 | |
| | 68.0 | 625.90 | 11 | 5.3 | |
| | 72.0 | 625.70 | 11 | 5.2 | |
| | 75.0 | 626.10 | 11 | 5.2 | |
| | 76.0 | 625.60 | 11 | 5.2 | |
| | 79.0 | 625.80 | 11 | 5.2 | |
| | 80.0 | 625.60 | 1 | 5.1 | |
| | 83.0 | 625.60 | 1 | 5.1 | |
| | 84.0 | 625.60 | 1 | 1.1 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 8 | 88.0 | 625.90 | 1 | 1.1 | |
| Station 9+79 | 91.0 | 626.60 | 1 | 1.1 | |
| (cont.) | 92.0 | 626.20 | 1 | 1.1 | |
| | 95.0 | 626.60 | 1 | 1.1 | |
| | 96.0 | 627.00 | 1 | 1.1 | |
| | 98.0 | 627.40 | 1 | 1.1 | |
| | 99.0 | 626.80 | 1 | 1.1 | RWE |
| | 100.0 | 627.00 | 1 | 1.1 | |
| | 102.0 | 627.10 | 1 | 1.1 | |
| | 103.0 | 627.20 | 1 | 1.1 | |
| | 105.7 | 627.50 | 1 | 1.1 | |
| | 128.0 | 630.00 | 3 | 1.1 | |
| | 155.0 | 629.80 | 3 | 4.1 | |
| | 168.0 | 631.40 | 3 | 4.1 | |
| | 178.0 | 632.20 | 3 | 4.1 | RB Headpin |
| Cross Section 9 | 0.0 | 631.10 | 1 | 2.5 | LB Headpin |
| Station 11+31 | 4.0 | 628.60 | 1 | 2.5 | |
| | 6.0 | 628.40 | 1 | 2.5 | |
| | 9.0 | 627.70 | 1 | 2.3 | LWE |
| | 12.0 | 627.50 | 1 | 2.1 | |
| | 14.0 | 627.30 | 1 | 2.1 | |
| | 16.0 | 626.70 | 1 | 7.1 | |
| | 19.0 | 626.10 | 11 | 7.1 | |
| | 25.0 | 626.20 | 11 | 7.1 | |
| | 28.0 | 626.60 | 11 | 7.1 | |
| | 32.0 | 626.80 | 11 | 7.1 | |
| | 34.0 | 627.70 | 1 | 5.2 | RWE |
| | 36.0 | 628.40 | 1 | 5.2 | |
| | 40.0 | 629.70 | 1 | 5.2 | |
| | 55.0 | 629.60 | 1 | 5.2 | |
| | 84.0 | 629.00 | 1 | 5.2 | |
| | 88.5 | 628.90 | 1 | 5.2 | |
| | 90.8 | 628.40 | 1 | 5.2 | |
| | 92.0 | 628.20 | 1 | 5.2 | |
| | 94.0 | 628.00 | 8 | 5.2 | LWE |
| | 96.0 | 627.90 | 8 | 5.2 | |
| | 98.0 | 627.70 | 8 | 5.2 | |
| | 100.0 | 627.70 | 8 | 5.2 | |
| | 103.0 | 627.60 | 8 | 5.2 | |
| | 108.0 | 627.50 | 8 | 5.2 | |

Table B-2.6 (cont.) Cross section elevations, substrate and cover data at site 132.6L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 9 | 112.0 | 627.60 | 8 | 5.2 | |
| Station 11+31 | 116.0 | 627.70 | 8 | 5.2 | |
| (cont.) | 120.0 | 627.70 | 8 | 5.3 | |
| | 124.0 | 627.70 | 8 | 5.3 | |
| | 127.0 | 628.00 | 8 | 5.3 | RWE |
| | 130.0 | 628.20 | 8 | 5.3 | |
| | 132.0 | 628.20 | 8 | 5.3 | LWE |
| | 134.0 | 627.90 | 8 | 5.3 | |
| | 136.0 | 627.60 | 8 | 5.3 | |
| | 140.0 | 627.20 | 8 | 5.3 | |
| | 142.0 | 627.20 | 8 | 5.3 | |
| | 144.0 | 627.30 | 8 | 5.3 | |
| | 148.0 | 627.60 | 8 | 4.2 | |
| | 152.0 | 627.50 | 8 | 4.2 | |
| | 156.0 | 627.70 | 8 | 4.2 | |
| | 158.5 | 627.60 | 8 | 5.2 | RWE |
| | 164.0 | 627.60 | 8 | 5.2 | |
| | 168.0 | 627.60 | 8 | 5.2 | |
| | 170.6 | 628.10 | 8 | 5.2 | |
| | 176.0 | 628.10 | 8 | 5.2 | |
| | 180.0 | 628.00 | 8 | 5.2 | |
| | 183.0 | 627.80 | 5 | 8.3 | |
| | 184.0 | 628.20 | 5 | 8.3 | |
| | 186.0 | 628.40 | 5 | 8.3 | |
| | 193.0 | 629.30 | 5 | 8.3 | |
| | 210.5 | 631.00 | 5 | 8.3 | |
| | 219.0 | 631.60 | 5 | 8.3 | RB Headpin |

Date of survey: Sept. 7, 1984.
Reference elevation: R&M Alcap 131.1S1 RB 1982.

Table B-2.7 Cross section elevations, substrate and cover data at site 136.0L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 0.0 | 681.70 | 1 | 8.3 | LB Headpin |
| Station 0+00 | 1.0 | 681.00 | 12 | 8.3 | |
| | 9.0 | 675.90 | 12 | 6.2 | |
| | 11.0 | 674.50 | 12 | 6.2 | LWE |
| | 14.0 | 674.20 | 12 | 7.1 | |
| | 16.0 | 674.20 | 12 | 7.1 | |
| | 18.0 | 674.30 | 12 | 7.1 | |
| | 19.5 | 674.60 | 12 | 7.1 | RWE |
| | 23.0 | 674.60 | 12 | 7.1 | |
| | 25.0 | 674.50 | 2 | 7.1 | LWE |
| | 26.0 | 674.40 | 2 | 7.1 | |
| | 28.0 | 673.90 | 1 | 7.1 | |
| | 30.0 | 674.00 | 1 | 7.2 | |
| | 32.0 | 674.10 | 1 | 7.2 | |
| | 34.0 | 674.00 | 1 | 7.2 | |
| | 36.0 | 673.60 | 1 | 7.2 | |
| | 38.0 | 673.40 | 1 | 7.2 | |
| | 40.0 | 673.30 | 1 | 7.2 | |
| | 42.0 | 673.10 | 1 | 7.2 | |
| | 44.0 | 673.30 | 10 | 7.2 | |
| | 46.0 | 673.60 | 10 | 7.2 | |
| | 48.0 | 673.80 | 10 | 7.2 | |
| | 50.0 | 673.90 | 10 | 7.2 | |
| | 52.0 | 673.90 | 10 | 7.2 | |
| | 54.0 | 674.30 | 10 | 7.2 | |
| | 56.0 | 674.20 | 12 | 7.2 | |
| | 58.0 | 673.60 | 12 | 7.2 | |
| | 60.0 | 673.10 | 12 | 7.2 | |
| | 62.0 | 672.50 | 12 | 7.2 | |
| | 64.0 | 672.50 | 6 | 7.2 | |
| | 66.0 | 672.70 | 6 | 7.2 | |
| | 68.0 | 673.10 | 6 | 7.2 | |
| | 70.0 | 673.40 | 6 | 7.2 | |
| | 72.0 | 673.20 | 1 | 7.2 | |
| | 74.0 | 673.20 | 1 | 7.2 | |
| | 76.0 | 674.00 | 1 | 7.2 | |
| | 78.7 | 674.60 | 1 | 8.2 | RWE |
| | 80.0 | 674.00 | 8 | 8.2 | |
| | 80.9 | 675.10 | 8 | 8.2 | |
| | 82.0 | 675.60 | 8 | 8.2 | |
| | 82.8 | 675.80 | 8 | 8.2 | |

Table B-2.7 (cont.) Cross section elevations, substrate and cover data at site 136.0L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 88.0 | 677.90 | 1 | 8.2 | Bottom of bank |
| Station 0+00 | 91.5 | 682.50 | 1 | 8.4 | Top of bank |
| (cont.) | 93.5 | 683.00 | 1 | 8.4 | RB Headpin |
| Cross Section 2 | 0.0 | 682.84 | 1 | 8.5 | LB Headpin |
| Station 0+88 | 3.0 | 681.00 | 1 | 9.4 | Top of bank |
| | 4.0 | 677.40 | 1 | 9.4 | |
| | 17.0 | 676.10 | 12 | 4.1 | |
| | 20.0 | 676.00 | 12 | 4.2 | |
| | 22.0 | 675.80 | 12 | 4.2 | |
| | 24.0 | 675.60 | 12 | 4.2 | |
| | 26.0 | 675.40 | 12 | 4.2 | |
| | 28.0 | 674.80 | 12 | 4.2 | |
| | 30.0 | 675.10 | 12 | 4.2 | |
| | 32.0 | 674.90 | 12 | 4.2 | |
| | 34.0 | 674.77 | 12 | 4.2 | LWE |
| | 36.0 | 674.50 | 12 | 7.2 | |
| | 38.0 | 674.10 | 12 | 7.2 | |
| | 40.0 | 673.80 | 12 | 7.2 | |
| | 42.0 | 673.80 | 12 | 7.2 | |
| | 44.0 | 673.00 | 12 | 7.2 | |
| | 46.0 | 672.70 | 12 | 7.2 | |
| | 48.0 | 672.60 | 10 | 7.2 | |
| | 50.0 | 673.00 | 10 | 7.2 | |
| | 52.0 | 673.20 | 10 | 7.2 | |
| | 54.0 | 673.30 | 10 | 7.2 | |
| | 56.0 | 673.50 | 10 | 7.2 | |
| | 58.0 | 673.90 | 10 | 7.2 | |
| | 60.0 | 673.90 | 10 | 7.2 | |
| | 62.0 | 674.80 | 10 | 7.2 | |
| | 64.0 | 674.80 | 1 | 8.2 | RWE |
| | 73.0 | 681.00 | 1 | 8.4 | |
| | 76.0 | 683.30 | 1 | 8.4 | |
| | 78.5 | 684.91 | 1 | 8.4 | RB Headpin |
| Cross Section 3 | 0.0 | 680.63 | 1 | 5.3 | LB Headpin |
| Station 1+95 | 3.0 | 678.50 | 10 | 4.2 | |
| | 9.0 | 675.80 | 10 | 4.2 | |
| | 10.0 | 675.60 | 10 | 4.2 | |
| | 12.0 | 674.90 | 12 | 4.2 | |
| | 14.0 | 674.50 | 12 | 4.2 | |

Table B-2.7 (cont.) Cross section elevations, substrate and cover data at site 136.0L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3 | 16.0 | 674.10 | 12 | 7.2 | |
| Station 1+95 | 18.0 | 673.70 | 8 | 7.2 | |
| (cont.) | 20.0 | 673.70 | 8 | 7.2 | |
| | 22.0 | 673.80 | 8 | 7.2 | |
| | 24.0 | 673.70 | 8 | 7.2 | |
| | 26.0 | 673.70 | 8 | 7.2 | |
| | 28.0 | 673.80 | 8 | 7.2 | |
| | 30.0 | 673.90 | 8 | 7.2 | |
| | 32.0 | 673.90 | 6 | 7.2 | |
| | 34.0 | 674.00 | 6 | 7.2 | |
| | 36.0 | 674.30 | 6 | 7.2 | |
| | 38.0 | 674.30 | 6 | 7.2 | |
| | 40.0 | 674.10 | 6 | 7.2 | |
| | 42.0 | 674.10 | 6 | 7.2 | |
| | 44.0 | 674.00 | 1 | 7.2 | |
| | 46.0 | 675.20 | 1 | 7.2 | |
| | 47.5 | 675.30 | 1 | 7.2 | RWE |
| | 55.0 | 678.50 | 1 | 7.2 | |
| | 59.0 | 681.00 | 1 | 8.5 | |
| | 61.0 | 682.80 | 1 | 8.5 | Top of bank |
| | 63.0 | 683.86 | 1 | 8.5 | RB Headpin |
| Cross Section 4 | 0.0 | 683.16 | 1 | 8.4 | LB Headpin |
| Station 2+91 | 2.5 | 680.30 | 1 | 7.4 | |
| | 7.5 | 677.50 | 12 | 6.3 | Bottom of bank |
| | 10.0 | 676.10 | 12 | 6.3 | |
| | 12.0 | 675.50 | 12 | 6.3 | |
| | 12.5 | 675.59 | 12 | 6.3 | LWE |
| | 14.0 | 675.60 | 12 | 6.3 | |
| | 16.0 | 675.00 | 12 | 4.1 | |
| | 18.0 | 674.70 | 12 | 4.1 | |
| | 20.0 | 674.60 | 10 | 4.1 | |
| | 22.0 | 674.40 | 10 | 4.1 | |
| | 24.0 | 674.00 | 10 | 4.1 | |
| | 26.0 | 674.10 | 10 | 4.1 | |
| | 28.0 | 674.00 | 10 | 4.1 | |
| | 30.0 | 674.00 | 10 | 4.1 | |
| | 32.0 | 674.10 | 10 | 4.1 | |
| | 34.0 | 674.30 | 10 | 4.1 | |
| | 36.0 | 674.40 | 10 | 4.1 | |
| | 38.0 | 674.50 | 10 | 4.1 | |

Table B-2.7 (cont.) Cross section elevations, substrate and cover data at site 136.0L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 4 | 40.0 | 674.60 | 10 | 4.1 | |
| Station 2+91 | 42.0 | 674.80 | 8 | 4.1 | |
| (cont.) | 44.0 | 674.90 | 8 | 4.1 | |
| | 46.0 | 675.00 | 8 | 4.1 | |
| | 48.0 | 674.90 | 8 | 4.1 | |
| | 50.0 | 674.90 | 8 | 4.1 | |
| | 52.0 | 675.00 | 8 | 4.1 | |
| | 54.0 | 675.10 | 8 | 4.1 | |
| | 56.0 | 675.30 | 8 | 4.1 | |
| | 58.0 | 675.30 | 8 | 4.1 | |
| | 60.0 | 675.60 | 8 | 4.1 | |
| | 62.0 | 675.70 | 6 | 4.1 | |
| | 64.0 | 675.80 | 6 | 7.2 | |
| | 66.0 | 675.90 | 6 | 7.2 | |
| | 68.0 | 676.00 | 6 | 7.2 | |
| | 68.5 | 676.10 | 1 | 7.2 | |
| | 72.3 | 676.60 | 1 | 7.2 | |
| | 82.5 | 679.60 | 1 | 8.4 | Bottom of bank |
| | 84.5 | 683.16 | 1 | 8.4 | Top of bank |
| | 87.5 | 684.41 | 1 | 8.4 | RB Headpin |
| Cross Section 5 | 0.0 | 681.10 | 2 | 8.4 | LB Headpin |
| Station 4+23 | 2.5 | 678.50 | 2 | 8.4 | |
| | 13.7 | 677.10 | 6 | 6.1 | |
| | 14.0 | 676.60 | 6 | 6.1 | |
| | 16.0 | 676.60 | 6 | 6.1 | |
| | 17.0 | 676.35 | 6 | 6.1 | LWE |
| | 18.0 | 676.30 | 6 | 6.1 | |
| | 20.0 | 676.20 | 6 | 6.1 | |
| | 22.0 | 676.30 | 6 | 6.1 | RWE |
| | 24.0 | 676.30 | 6 | 6.1 | |
| | 26.0 | 676.30 | 6 | 6.1 | |
| | 28.0 | 676.30 | 6 | 6.1 | LWE |
| | 30.5 | 676.30 | 10 | 6.1 | |
| | 32.0 | 676.10 | 10 | 6.1 | |
| | 34.0 | 675.80 | 10 | 6.1 | |
| | 36.0 | 675.60 | 13 | 8.2 | |
| | 38.0 | 675.40 | 13 | 8.2 | |
| | 40.0 | 675.30 | 13 | 8.2 | |
| | 42.0 | 675.30 | 13 | 8.2 | |
| | 44.0 | 674.90 | 13 | 8.2 | |
| | 46.0 | 674.90 | 13 | 8.2 | |

Table B-2.7 (cont.) Cross section elevations, substrate and cover data at site 136.0L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 5 | 48.0 | 674.70 | 13 | 8.2 | |
| Station 4+23 | 50.0 | 674.40 | 13 | 8.2 | |
| (cont.) | 52.0 | 674.20 | 13 | 8.2 | |
| | 54.0 | 673.70 | 13 | 8.2 | |
| | 56.0 | 673.70 | 12 | 8.2 | |
| | 58.0 | 674.30 | 12 | 8.2 | |
| | 60.0 | 674.30 | 12 | 8.2 | |
| | 62.0 | 673.90 | 12 | 8.2 | |
| | 64.0 | 673.70 | 12 | 8.2 | |
| | 66.0 | 673.90 | 12 | 8.2 | |
| | 68.0 | 673.90 | 12 | 8.2 | |
| | 70.0 | 673.90 | 12 | 8.2 | |
| | 72.0 | 673.90 | 12 | 8.2 | |
| | 74.0 | 674.10 | 12 | 8.2 | |
| | 76.0 | 674.80 | 1 | 8.2 | |
| | 78.0 | 675.90 | 1 | 8.2 | |
| | 79.0 | 677.50 | 1 | 8.2 | |
| | 79.8 | 677.70 | 1 | 8.2 | |
| | 80.5 | 677.80 | 1 | 8.4 | |
| | 83.0 | 680.82 | 1 | 8.4 | RWE |
| | 89.0 | 685.40 | 1 | 8.4 | |
| | 91.0 | 686.10 | 1 | 8.4 | RB Headpin |
| Cross Section 6 | 0.0 | 683.23 | 1 | 8.5 | LB Headpin |
| Station 5+82 | 8.0 | 681.60 | 1 | 9.5 | Top of bank |
| | 8.5 | 678.50 | 10 | 9.5 | |
| | 10.0 | 677.50 | 10 | 4.2 | |
| | 11.0 | 677.00 | 10 | 4.2 | |
| | 11.5 | 677.00 | 10 | 4.2 | |
| | 12.0 | 676.80 | 10 | 4.2 | |
| | 14.0 | 676.80 | 10 | 4.2 | |
| | 16.0 | 676.60 | 11 | 4.2 | LWE |
| | 18.0 | 676.20 | 11 | 4.2 | |
| | 20.0 | 676.00 | 11 | 4.2 | |
| | 22.0 | 675.80 | 11 | 4.2 | |
| | 24.0 | 675.90 | 11 | 4.2 | |
| | 26.0 | 675.20 | 11 | 4.2 | |
| | 28.0 | 675.20 | 10 | 4.2 | |
| | 30.0 | 675.10 | 10 | 4.2 | |
| | 32.0 | 674.90 | 10 | 4.2 | |
| | 34.0 | 674.90 | 10 | 4.2 | |

Table B-2.7 (cont.) Cross section elevations, substrate and cover data at site 136.0L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 6 | 36.0 | 674.90 | 10 | 4.2 | |
| Station 5+82 | 38.0 | 675.10 | 10 | 4.2 | |
| (cont.) | 40.0 | 675.10 | 10 | 4.2 | |
| | 42.0 | 675.20 | 10 | 4.2 | |
| | 44.0 | 675.10 | 10 | 4.2 | |
| | 46.0 | 674.90 | 10 | 4.2 | |
| | 48.0 | 675.00 | 10 | 4.2 | |
| | 50.0 | 674.80 | 10 | 4.2 | |
| | 52.0 | 674.80 | 10 | 4.2 | |
| | 54.0 | 674.80 | 10 | 4.2 | |
| | 56.0 | 675.20 | 10 | 4.1 | |
| | 58.0 | 675.50 | 10 | 4.1 | |
| | 60.0 | 676.00 | 10 | 4.1 | |
| | 62.0 | 676.70 | 6 | 4.1 | RWE |
| | 63.3 | 677.00 | 6 | 4.1 | |
| | 65.0 | 677.20 | 6 | 4.1 | |
| | 67.0 | 677.50 | 6 | 4.1 | |
| | 68.0 | 677.50 | 6 | 4.1 | |
| | 76.0 | 678.10 | 1 | 7.3 | Bottom of bank |
| | 79.0 | 681.00 | 1 | 9.5 | Top of bank |
| | 81.0 | 681.70 | 1 | 9.5 | RB Headpin |

Date of survey: Sept. 9, 1984.
Reference elevation: R&M Alcap 136.5Q3 LB 1982.

Table B-2.8 Cross section elevations, substrate and cover data at site 147.1L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 1 | 0.0 | 820.50 | 1 | 8.5 | LB Headpin |
| Station 0+00 | 8.5 | 818.60 | 1 | 8.5 | |
| | 17.0 | 816.00 | 1 | 8.2 | |
| | 38.5 | 812.50 | 9 | 5.2 | LWE |
| | 51.0 | [illegible].80 | 9 | 5.2 | |
| | 61.0 | 809.30 | 9 | 5.2 | |
| | 70.0 | 809.20 | 9 | 5.2 | |
| | 100.0 | 808.80 | 9 | 5.2 | |
| | 140.0 | 808.90 | 9 | 5.2 | |
| | 177.0 | 810.00 | 9 | 5.2 | |
| | 187.0 | 810.10 | 9 | 5.2 | |
| | 196.0 | 810.70 | 9 | 5.2 | |
| | 213.0 | 811.70 | 9 | 5.2 | |
| | 223.0 | 812.20 | 9 | 5.2 | RWE |
| | 250.0 | 814.30 | 1 | 5.2 | |
| | 292.0 | 816.40 | 1 | 5.2 | |
| | 340.0 | 816.40 | 1 | 5.2 | |
| | 415.0 | 818.20 | 1 | 8.3 | RB Headpin |
| Cross Section 2 | 0.0 | 821.50 | 1 | 8.5 | LB Headpin |
| Station 3+62 | 8.0 | 817.40 | 1 | 8.5 | |
| | 27.0 | 813.70 | 12 | 6.3 | LWE |
| | 35.0 | 813.10 | 10 | 5.2 | |
| | 43.0 | 812.50 | 10 | 5.2 | |
| | 60.0 | 811.90 | 10 | 5.2 | |
| | 70.0 | 810.90 | 10 | 5.2 | |
| | 110.0 | 810.30 | 10 | 5.2 | |
| | 170.0 | 810.50 | 10 | 5.2 | |
| | 200.0 | 812.00 | 10 | 5.2 | |
| | 208.0 | 812.40 | 10 | 5.2 | |
| | 216.0 | 81[illegible].90 | 10 | 5.2 | |
| | 223.0 | 813.50 | 10 | 5.2 | RWE |
| | 277.0 | 814.90 | 12 | 6.2 | |
| | 326.0 | 816.40 | 12 | 6.2 | |
| | 346.0 | 818.00 | 12 | 8.1 | |
| | 362.0 | 819.20 | 1 | 8.3 | RB Headpin |
| Cross Section 3 | 0.0 | 822.40 | 1 | 8.4 | LB Headpin |
| Station 7+17 | 1.5 | 820.50 | 1 | 8.4 | |
| | 7.0 | 818.60 | 1 | 8.4 | |
| | 27.0 | 814.90 | 12 | 6.3 | LWE |

Table B-2.8 (cont.) Cross section elevations, substrate and cover data at site 147.1L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 3 | 39.0 | 813.20 | 10 | 5.2 | |
| Station 7+17 | 48.0 | 812.10 | 10 | 5.2 | |
| (cont.) | 57.0 | 812.00 | 10 | 5.2 | |
| | 70.0 | 811.50 | 10 | 5.2 | |
| | 110.0 | 810.70 | 10 | 5.2 | |
| | 160.0 | 811.80 | 10 | 5.2 | |
| | 202.0 | 812.10 | 10 | 5.2 | |
| | 209.0 | 812.40 | 10 | 5.2 | |
| | 214.0 | 813.00 | 10 | 5.2 | |
| | 238.0 | 813.50 | 10 | 5.2 | |
| | 241.0 | 813.80 | 10 | 5.2 | |
| | 249.0 | 814.30 | 10 | 5.2 | |
| | 259.0 | 814.70 | 10 | 5.2 | RWE |
| | 295.0 | 817.60 | 9 | 5.2 | |
| | 308.5 | 818.90 | 9 | 5.2 | |
| | 309.0 | 819.80 | 1 | 8.2 | RB Headpin |
| Cross Section 4 | 0.0 | 830.00 | 1 | 8.5 | LB Headpin |
| Station 10+00 | 11.0 | 820.70 | 9 | 5.3 | |
| | 18.0 | 818.00 | 9 | 5.3 | |
| | 32.5 | 815.30 | 9 | 6.2 | LWE |
| | 40.0 | 813.40 | 9 | 6.2 | |
| | 60.0 | 811.90 | 9 | 6.2 | |
| | 80.0 | 811.30 | 9 | 6.2 | |
| | 100.0 | 810.80 | 9 | 6.2 | |
| | 120.0 | 810.90 | 9 | 6.2 | |
| | 140.0 | 811.50 | 9 | 6.2 | |
| | 180.0 | 811.60 | 9 | 6.2 | |
| | 200.0 | 811.90 | 9 | 6.2 | |
| | 220.0 | 812.60 | 9 | 6.2 | |
| | 230.0 | 812.90 | 9 | 6.2 | |
| | 238.0 | 813.50 | 9 | 6.2 | |
| | 245.0 | 815.20 | 9 | 6.2 | RWE |
| | 266.0 | 818.50 | 12 | 6.2 | |
| | 282.0 | 820.80 | 1 | 8.5 | RB Headpin |
| Cross Section 5 | 0.0 | 822.40 | 9 | 5.4 | LB Headpin |
| Station 13+35 | 6.0 | 819.40 | 9 | 5.4 | |
| | 22.5 | 815.60 | 9 | 6.3 | LWE |
| | 30.5 | 814.10 | 9 | 6.3 | |
| | 39.0 | 813.10 | 9 | 6.3 | |

Table B-2.8 (cont.) Cross section elevations, substrate and cover data at site 147.1L.

| Location Within Site | Hor Dist (ft) | Bed Elev (ft) | Sub | Cov | Comments |
|---|---|---|---|---|---|
| Cross Section 5 | 48.0 | 812.80 | 9 | 6.3 | |
| Station 13+35 | 56.0 | 812.30 | 9 | 6.3 | |
| (cont.) | 100.0 | 811.80 | 9 | 6.3 | |
| | 150.0 | 811.40 | 9 | 6.3 | |
| | 165.0 | 811.80 | 9 | 6.3 | |
| | 189.0 | 812.80 | 9 | 6.3 | |
| | 198.0 | 813.90 | 9 | 6.3 | |
| | 201.0 | 814.70 | 12 | 6.3 | |
| | 206.0 | 815.50 | 12 | 6.3 | RWE |
| | 245.0 | 819.60 | 1 | 8.2 | |
| | 261.0 | 821.90 | 1 | 8.5 | Beside headpin |
| | 261.0 | 822.87 | 1 | 8.5 | RB Headpin |
| Cross Section 6 | 0.0 | 820.90 | 12 | 6.3 | LB Headpin |
| Station 17+76 | 4.0 | 817.20 | 12 | 6.3 | |
| | 8.0 | 816.13 | 12 | 6.3 | LWE |
| | 12.0 | 814.70 | 12 | 6.3 | |
| | 16.0 | 814.00 | 12 | 6.3 | |
| | 24.0 | 813.50 | 12 | 6.3 | |
| | 27.0 | 813.30 | 12 | 6.3 | |
| | 60.0 | 812.10 | 12 | 6.3 | |
| | 110.0 | 812.00 | 12 | 6.3 | |
| | 140.0 | 812.70 | 12 | 6.3 | |
| | 155.0 | 813.50 | 12 | 6.3 | |
| | 160.0 | 814.30 | 12 | 6.3 | |
| | 165.0 | 815.30 | 12 | 6.3 | |
| | 172.0 | 816.30 | 12 | 6.3 | RWE |
| | 201.0 | 817.70 | 12 | 6.3 | |
| | 255.0 | 820.20 | 12 | 6.2 | |
| | 281.0 | 821.30 | 12 | 6.4 | |
| | 311.0 | 822.20 | 12 | 6.3 | RB Headpin |

Date of survey: Sept. 17, 1984.
Reference elevation: R&M LRX-60 LB 1980.

Table B-3.1 IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 1 | 0.0 | 0.00 | 0.00 |
| Station 0+[illegible] | 2.0 | 0.00 | 0.00 |
| | 8.0 | 0.00 | 0.00 |
| | 16.6 | 0.00 | 0.00 |
| | 18.0 | 0.60 | 0.00 |
| | 20.0 | 1.05 | 0.00 |
| | 22.0 | 2.20 | 0.00 |
| | 24.0 | 2.00 | 0.00 |
| | 26.0 | 2.30 | 0.10 |
| | 28.0 | 2.30 | 0.40 |
| | 30.0 | 2.40 | 0.60 |
| | 32.0 | 2.38 | 0.50 |
| | 34.0 | 2.35 | 0.55 |
| | 36.0 | 2.50 | 0.70 |
| | 38.0 | 2.70 | 0.70 |
| | 40.0 | 2.85 | 0.50 |
| | 42.0 | 3.00 | 0.55 |
| | 43.0 | 3.25 | 0.60 |
| | 44.0 | 3.30 | 0.65 |
| | 46.0 | 3.50 | 0.60 |
| | 48.0 | 3.40 | 0.70 |
| | 50.0 | 3.35 | 0.80 |
| | 52.0 | 3.40 | 0.70 |
| | 54.0 | 3.50 | 0.60 |
| | 55.0 | 3.35 | 0.65 |
| | 56.0 | 3.10 | 0.70 |
| | 58.0 | 3.05 | 0.70 |
| | 60.0 | 2.85 | 0.70 |
| | 62.0 | 2.80 | 0.75 |
| | 64.0 | 2.32 | 0.65 |
| | 65.0 | 2.08 | 0.60 |
| | 66.0 | 2.10 | 0.55 |
| | 68.0 | 2.20 | 0.50 |
| | 70.0 | 1.60 | 0.35 |
| | 72.0 | 1.45 | 0.25 |
| | 73.0 | 1.37 | 0.20 |
| | 74.0 | 1.30 | 0.10 |
| | 76.0 | 1.35 | 0.00 |
| | 78.0 | 1.20 | 0.00 |
| | 80.0 | 1.20 | 0.00 |
| | 82.0 | 1.25 | 0.00 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 1 | 84.0 | 1.15 | 0.00 |
| Station 0+00 | 86.0 | 1.00 | 0.00 |
| (cont.) | 88.0 | 0.70 | 0.00 |
| | 90.0 | 0.50 | 0.00 |
| | 92.0 | 0.25 | 0.00 |
| | 94.0 | 0.00 | 0.00 |
| | 96.0 | 0.00 | 0.00 |
| | 98.0 | 0.00 | 0.00 |
| | 124.0 | 0.00 | 0.00 |
| | 148.0 | 0.00 | 0.00 |
| | 218.0 | 0.00 | 0.00 |
| | 249.5 | 0.00 | 0.00 |
| | 272.0 | 0.00 | 0.00 |
| | 274.0 | 0.05 | 0.00 |
| | 276.0 | 0.05 | 0.00 |
| | 278.0 | 0.05 | 0.00 |
| | 282.0 | 0.05 | 0.00 |
| | 285.0 | 0.10 | 0.00 |
| | 286.0 | 1.10 | 0.00 |
| | 290.0 | 0.10 | 0.00 |
| | 293.0 | 0.10 | 0.00 |
| | 294.0 | 0.05 | 0.00 |
| | 298.0 | 0.05 | 0.00 |
| | 302.0 | 0.05 | 0.00 |
| | 306.0 | 0.05 | 0.00 |
| | 308.0 | 0.03 | 0.00 |
| | 310.0 | 0.03 | 0.00 |
| | 314.0 | 0.03 | 0.00 |
| | 318.0 | 0.03 | 0.00 |
| | 322.0 | 0.00 | 0.00 |
| | 323.0 | 0.00 | 0.00 |
| | 334.0 | 0.00 | 0.00 |
| | 350.0 | 0.00 | 0.00 |
| Cross Section 3 | 0.0 | 0.00 | 0.00 |
| Station 3+74 | 5.0 | 0.00 | 0.00 |
| | 14.0 | 0.03 | 0.00 |
| | 16.0 | 0.03 | 0.00 |
| | 20.0 | 0.03 | 0.00 |
| | 24.0 | 0.03 | 0.00 |
| | 28.0 | 0.03 | 0.00 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 3 Station 3+74 (cont.) | 32.0 | 0.03 | 0.00 |
| | 36.0 | 0.03 | 0.00 |
| | 40.0 | 0.05 | 0.00 |
| | 44.0 | 0.05 | 0.00 |
| | 46.0 | 0.05 | 0.00 |
| | 48.0 | 0.05 | 0.00 |
| | 49.0 | 0.05 | 0.00 |
| | 50.0 | 0.00 | 0.00 |
| | 54.0 | 0.00 | 0.00 |
| | 67.0 | 0.00 | 0.00 |
| | 77.0 | 0.00 | 0.00 |
| | 87.5 | 0.00 | 0.00 |
| | 90.0 | 0.60 | 0.00 |
| | 92.0 | 0.90 | 0.00 |
| | 96.0 | 1.00 | 0.00 |
| | 100.0 | 1.00 | 0.00 |
| | 104.0 | 1.00 | 0.00 |
| | 108.0 | 1.80 | 0.00 |
| | 114.0 | 1.75 | 0.00 |
| | 116.0 | 2.05 | 0.00 |
| | 118.0 | 2.00 | 0.20 |
| | 120.0 | 2.00 | 0.25 |
| | 122.0 | 2.20 | 0.54 |
| | 124.0 | 2.40 | 0.59 |
| | 126.0 | 2.35 | 0.59 |
| | 128.0 | 2.35 | 0.74 |
| | 130.0 | 2.35 | 0.54 |
| | 132.0 | 2.30 | 0.59 |
| | 134.0 | 2.30 | 0.64 |
| | 136.0 | 2.30 | 0.69 |
| | 136.5 | 2.30 | 0.69 |
| | 138.0 | 2.30 | 0.69 |
| | 140.0 | 2.30 | 0.49 |
| | 142.0 | 2.25 | 0.69 |
| | 144.0 | 2.25 | 0.85 |
| | 146.0 | 2.25 | 0.70 |
| | 148.0 | 2.20 | 0.60 |
| | 150.0 | 2.25 | 0.60 |
| | 152.0 | 2.25 | 0.65 |
| | 154.0 | 2.25 | 0.60 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 3 Station 3+74 (cont.) | 156.0 | 2.30 | 0.60 |
| | 158.0 | 1.88 | 0.55 |
| | 160.0 | 1.90 | 0.50 |
| | 162.0 | 2.00 | 0.50 |
| | 164.0 | 2.30 | 0.45 |
| | 166.0 | 2.20 | 0.45 |
| | 168.0 | 2.25 | 0.50 |
| | 170.0 | 2.30 | 0.35 |
| | 172.0 | 2.40 | 0.30 |
| | 174.0 | 2.20 | 0.30 |
| | 176.0 | 2.00 | 0.20 |
| | 178.0 | 2.05 | 0.20 |
| | 180.0 | 2.10 | 0.15 |
| | 182.0 | 1.90 | 0.10 |
| | 184.0 | 1.70 | 0.10 |
| | 186.0 | 1.65 | 0.00 |
| | 188.0 | 1.60 | 0.00 |
| | 189.5 | 1.55 | 0.00 |
| | 192.0 | 1.50 | 0.00 |
| | 196.0 | 1.50 | 0.00 |
| | 200.0 | 0.95 | 0.00 |
| | 204.0 | 0.65 | 0.00 |
| | 208.0 | 0.55 | 0.00 |
| | 212.0 | 0.45 | 0.00 |
| | 216.0 | 0.10 | 0.00 |
| | 220.0 | 0.10 | 0.00 |
| | 224.0 | 0.00 | 0.00 |
| | 227.0 | 0.00 | 0.00 |
| | 322.0 | 0.00 | 0.00 |
| | 339.0 | 0.00 | 0.00 |
| | 340.0 | 0.20 | 0.00 |
| | 344.0 | 0.20 | 0.00 |
| | 347.5 | 0.15 | 0.00 |
| | 352.0 | 0.10 | 0.00 |
| | 356.0 | 0.00 | 0.00 |
| | 376.5 | 0.00 | 0.00 |
| | 381.0 | 0.00 | 0.00 |
| | 381.5 | 0.00 | 0.00 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 4 Station 5+64 | 0.0 | 0.00 | 0.00 |
| | 3.0 | 0.00 | 0.00 |
| | 7.0 | 0.00 | 0.00 |
| | 23.0 | 0.00 | 0.00 |
| | 62.0 | 0.00 | 0.00 |
| | 111.0 | 0.00 | 0.00 |
| | 123.0 | 0.00 | 0.00 |
| | 147.0 | 0.00 | 0.00 |
| | 151.0 | 0.30 | 0.00 |
| | 155.0 | 1.05 | 0.00 |
| | 159.0 | 1.10 | 0.00 |
| | 163.0 | 1.90 | 0.00 |
| | 164.0 | 2.00 | 0.00 |
| | 166.0 | 2.10 | 0.20 |
| | 168.0 | 2.10 | 0.15 |
| | 170.0 | 1.80 | 0.25 |
| | 172.0 | 1.85 | 0.35 |
| | 174.0 | 1.90 | 0.35 |
| | 176.0 | 1.95 | 0.50 |
| | 178.0 | 2.00 | 0.40 |
| | 180.0 | 2.20 | 0.67 |
| | 182.0 | 2.10 | 0.50 |
| | 184.0 | 2.10 | 0.60 |
| | 186.0 | 2.10 | 0.70 |
| | 188.0 | 2.00 | 0.70 |
| | 190.0 | 2.00 | 0.60 |
| | 192.0 | 1.97 | 0.70 |
| | 194.0 | 1.90 | 0.77 |
| | 196.0 | 1.87 | 0.75 |
| | 198.0 | 1.85 | 0.85 |
| | 200.0 | 1.88 | 0.67 |
| | 202.0 | 2.00 | 0.90 |
| | 204.0 | 2.05 | 0.90 |
| | 206.0 | 2.10 | 0.80 |
| | 208.0 | 2.05 | 0.70 |
| | 210.0 | 2.00 | 0.65 |
| | 212.0 | 2.00 | 0.60 |
| | 214.0 | 2.05 | 0.70 |
| | 216.0 | 1.90 | 0.60 |
| | 218.0 | 1.80 | 0.47 |
| | 220.0 | 1.50 | 0.40 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 4 Station 5+64 (cont.) | 222.0 | 1.40 | 0.40 |
| | 224.0 | 1.50 | 0.15 |
| | 226.0 | 1.61 | 0.12 |
| | 228.0 | 1.63 | 0.20 |
| | 230.0 | 1.55 | 0.20 |
| | 232.0 | 1.55 | 0.20 |
| | 234.0 | 1.55 | 0.00 |
| | 236.0 | 1.22 | 0.00 |
| | 238.0 | 1.15 | 0.00 |
| | 240.0 | 1.00 | 0.00 |
| | 243.0 | 1.10 | 0.00 |
| | 247.0 | 0.80 | 0.00 |
| | 251.0 | 0.60 | 0.00 |
| | 255.0 | 0.20 | 0.00 |
| | 259.0 | 0.20 | 0.00 |
| | 263.0 | 0.00 | 0.00 |
| | 266.2 | 0.00 | 0.00 |
| | 331.0 | 0.00 | 0.00 |
| | 362.0 | 0.00 | 0.00 |
| | 369.0 | 0.00 | 0.00 |
| | 383.0 | 0.00 | 0.00 |
| | 387.0 | 0.20 | 0.00 |
| | 389.0 | 0.00 | 0.00 |
| | 391.0 | 0.00 | 0.00 |
| | 393.0 | 0.00 | 0.00 |
| | 394.0 | 0.00 | 0.00 |
| | 408.0 | 0.00 | 0.00 |
| | 413.0 | 0.00 | 0.00 |
| | 416.0 | 0.00 | 0.00 |
| | 419.0 | 0.00 | 0.00 |
| Cross Section 6 Station 8+37 | 0.0 | 0.00 | 0.00 |
| | 29.0 | 0.00 | 0.00 |
| | 42.0 | 0.00 | 0.00 |
| | 62.0 | 0.00 | 0.00 |
| | 66.0 | 0.75 | 0.00 |
| | 70.0 | 1.20 | 0.00 |
| | 74.0 | 0.95 | 0.00 |
| | 78.0 | 1.25 | 0.00 |
| | 80.0 | 1.23 | 0.00 |
| | 82.0 | 1.20 | 0.00 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 6 | 84.0 | 1.20 | 0.00 |
| Station 8+37 | 86.0 | 1.20 | 0.00 |
| (cont.) | 88.0 | 1.40 | 0.20 |
| | 90.0 | 1.50 | 0.20 |
| | 92.0 | 1.60 | 0.30 |
| | 94.0 | 1.55 | 0.35 |
| | 96.0 | 1.55 | 0.30 |
| | 98.0 | 1.55 | 0.35 |
| | 100.0 | 1.47 | 0.35 |
| | 102.0 | 1.40 | 0.40 |
| | 104.0 | 1.47 | 0.40 |
| | 106.0 | 1.45 | 0.40 |
| | 108.0 | 1.50 | 0.50 |
| | 110.0 | 1.55 | 0.45 |
| | 112.0 | 1.65 | 0.55 |
| | 114.0 | 1.80 | 0.55 |
| | 116.0 | 1.70 | 0.50 |
| | 118.0 | 1.60 | 0.50 |
| | 120.0 | 1.75 | 0.55 |
| | 122.0 | 1.90 | 0.65 |
| | 124.0 | 1.67 | 0.65 |
| | 126.0 | 1.45 | 0.70 |
| | 128.0 | 1.70 | 0.62 |
| | 129.0 | 1.80 | 0.64 |
| | 130.0 | 1.95 | 0.65 |
| | 132.0 | 1.93 | 0.67 |
| | 134.0 | 1.90 | 0.60 |
| | 136.0 | 2.00 | 0.60 |
| | 138.0 | 2.05 | 0.65 |
| | 140.0 | 2.00 | 0.65 |
| | 142.0 | 1.95 | 0.65 |
| | 144.0 | 1.90 | 0.60 |
| | 146.0 | 1.85 | 0.60 |
| | 148.0 | 1.90 | 0.52 |
| | 150.0 | 2.05 | 0.55 |
| | 152.0 | 1.70 | 0.55 |
| | 154.0 | 1.40 | 0.60 |
| | 155.0 | 1.50 | 0.49 |
| | 156.0 | 1.55 | 0.37 |
| | 158.0 | 1.60 | 0.37 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 6 | 160.0 | 1.45 | 0.36 |
| Station 8+37 | 162.0 | 1.30 | 0.35 |
| (cont.) | 164.0 | 1.50 | 0.40 |
| | 166.0 | 1.70 | 0.48 |
| | 168.0 | 1.50 | 0.30 |
| | 170.0 | 1.35 | 0.35 |
| | 172.0 | 1.45 | 0.20 |
| | 173.5 | 1.55 | 0.10 |
| | 176.0 | 1.50 | 0.10 |
| | 178.0 | 1.40 | 0.00 |
| | 180.0 | 1.43 | 0.00 |
| | 182.0 | 1.45 | 0.00 |
| | 186.0 | 1.25 | 0.00 |
| | 190.0 | 1.15 | 0.00 |
| | 194.0 | 1.00 | 0.00 |
| | 198.0 | 0.70 | 0.00 |
| | 202.0 | 0.42 | 0.00 |
| | 206.0 | 0.10 | 0.00 |
| | 209.0 | 0.00 | 0.00 |
| | 211.5 | 0.00 | 0.00 |
| | 248.5 | 0.00 | 0.00 |
| | 250.0 | 0.00 | 0.00 |
| | 252.0 | 0.00 | 0.00 |
| | 254.0 | 0.00 | 0.00 |
| | 256.0 | 0.00 | 0.00 |
| | 258.0 | 0.25 | 0.00 |
| | 260.0 | 0.15 | 0.00 |
| | 262.0 | 0.00 | 0.00 |
| | 266.0 | 0.00 | 0.00 |
| | 272.0 | 0.00 | 0.00 |
| | 276.0 | 0.00 | 0.00 |
| | 278.0 | 0.00 | 0.00 |
| Cross Section 7 | 0.0 | 0.00 | 0.00 |
| Station 10+23 | 43.0 | 0.00 | 0.00 |
| | 79.0 | 0.00 | 0.00 |
| | 80.0 | 0.00 | 0.00 |
| | 82.0 | 0.00 | 0.00 |
| | 84.0 | 0.25 | 0.00 |
| | 86.0 | 0.40 | 0.00 |
| | 90.0 | 0.65 | 0.00 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 7 | 92.0 | 0.70 | 0.00 |
| Station 10+23 | 94.0 | 0.75 | 0.00 |
| (cont.) | 96.0 | 0.75 | 0.10 |
| | 98.0 | 0.75 | 0.10 |
| | 100.0 | 0.77 | 0.10 |
| | 102.0 | 0.80 | 0.12 |
| | 104.0 | 0.75 | 0.12 |
| | 106.0 | 0.73 | 0.15 |
| | 108.0 | 0.75 | 0.15 |
| | 110.0 | 0.83 | 0.12 |
| | 112.0 | 0.70 | 0.15 |
| | 114.0 | 0.75 | 0.18 |
| | 115.0 | 0.66 | 0.11 |
| | 116.0 | 0.67 | 0.05 |
| | 118.0 | 0.68 | 0.05 |
| | 120.0 | 0.79 | 0.10 |
| | 122.0 | 0.84 | 0.08 |
| | 124.0 | 0.87 | 0.10 |
| | 126.0 | 0.90 | 0.10 |
| | 128.0 | 0.86 | 0.10 |
| | 130.0 | 0.84 | 0.15 |
| | 132.0 | 0.80 | 0.10 |
| | 134.0 | 0.83 | 0.10 |
| | 136.0 | 0.96 | 0.15 |
| | 140.0 | 1.03 | 0.20 |
| | 141.0 | 1.06 | 0.18 |
| | 142.0 | 1.10 | 0.16 |
| | 144.0 | 1.08 | 0.15 |
| | 148.0 | 1.08 | 0.12 |
| | 151.0 | 1.08 | 0.15 |
| | 152.0 | 1.02 | 0.18 |
| | 156.0 | 1.00 | 0.15 |
| | 158.0 | 0.98 | 0.13 |
| | 160.0 | 0.94 | 0.10 |
| | 164.0 | 0.93 | 0.12 |
| | 166.0 | 0.92 | 0.10 |
| | 168.0 | 0.86 | 0.10 |
| | 176.0 | 0.80 | 0.10 |
| | 180.0 | 0.80 | 0.10 |
| | 182.0 | 0.80 | 0.10 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 10'.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 7 | 184.0 | 0.80 | 0.10 |
| Station 10+23 | 188.0 | 0.70 | 0.10 |
| (cont.) | 190.0 | 0.85 | 0.10 |
| | 192.0 | 0.80 | 0.10 |
| | 194.0 | 0.70 | 0.10 |
| | 196.0 | 0.72 | 0.00 |
| | 198.0 | 0.65 | 0.00 |
| | 200.0 | 0.55 | 0.00 |
| | 202.0 | 0.50 | 0.00 |
| | 203.0 | 0.58 | 0.00 |
| | 204.0 | 0.56 | 0.00 |
| | 206.0 | 0.55 | 0.00 |
| | 208.0 | 0.53 | 0.00 |
| | 210.0 | 0.50 | 0.00 |
| | 214.0 | 0.30 | 0.00 |
| | 218.0 | 0.05 | 0.00 |
| | 222.0 | 0.05 | 0.00 |
| | 224.0 | 0.00 | 0.00 |
| | 256.5 | 0.00 | 0.00 |
| | 262.0 | 0.00 | 0.00 |
| | 264.0 | 0.00 | 0.00 |
| Cross Section 8 | 0.0 | 0.00 | 0.00 |
| Station 12+79 | 7.0 | 0.00 | 0.00 |
| | 27 0 | 0.00 | 0.00 |
| | 34.0 | 0.00 | 0.00 |
| | 40.0 | 0.00 | 0.00 |
| | 42.0 | 0.00 | 0.00 |
| | 44.0 | 0.35 | 0.00 |
| | 48.0 | 0.45 | 0.00 |
| | 52.0 | 0.65 | 0.00 |
| | 54.0 | 0.70 | 0.00 |
| | 56.0 | 0.80 | 0.10 |
| | 60.0 | 0.65 | 0.10 |
| | 62.0 | 0.66 | 0.10 |
| | 64.0 | 0.70 | 0.10 |
| | 66.0 | 0.70 | 0.10 |
| | 68.0 | 0.80 | 0.10 |
| | 70.0 | 0.83 | 0.10 |
| | 72.0 | 0.85 | 0.10 |
| | 73.4 | 0.85 | 0.15 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 8 Station 12+79 (cont.) | 74.0 | 0.83 | 0.15 |
| | 76.0 | 0.80 | 0.15 |
| | 78.0 | 0.83 | 0.15 |
| | 80.0 | 0.85 | 0.15 |
| | 82.0 | 0.80 | 0.12 |
| | 84.0 | 0.75 | 0.14 |
| | 88.0 | 0.70 | 0.15 |
| | 92.0 | 0.75 | 0.10 |
| | 96.0 | 0.80 | 0.10 |
| | 100.0 | 0.75 | 0.10 |
| | 104.0 | 0.75 | 0.10 |
| | 108.0 | 0.80 | 0.15 |
| | 112.0 | 0.80 | 0.15 |
| | 116.0 | 0.75 | 0.15 |
| | 118.0 | 0.80 | 0.15 |
| | 120.0 | 0.85 | 0.15 |
| | 121.5 | 0.92 | 0.15 |
| | 124.0 | 0.97 | 0.10 |
| | 128.0 | 0.92 | 0.10 |
| | 132.0 | 1.08 | 0.20 |
| | 136.0 | 1.03 | 0.25 |
| | 140.0 | 1.08 | 0.28 |
| | 144.0 | 0.92 | 0.28 |
| | 145.0 | 0.90 | 0.20 |
| | 148.0 | 0.88 | 0.23 |
| | 152.0 | 0.90 | 0.25 |
| | 164.0 | 0.95 | 0.35 |
| | 168.0 | 0.95 | 0.30 |
| | 172.0 | 1.00 | 0.22 |
| | 176.0 | 0.75 | 0.10 |
| | 178.0 | 0.60 | 0.10 |
| | 179.0 | 0.60 | 0.10 |
| | 180.0 | 0.50 | 0.10 |
| | 182.0 | 0.40 | 0.10 |
| | 184.0 | 0.30 | 0.10 |
| | 188.0 | 0.15 | 0.00 |
| | 192.0 | 0.50 | 0.00 |
| | 196.0 | 0.00 | 0.00 |
| | 213.5 | 0.00 | 0.00 |
| | 221.5 | 0.00 | 0.00 |
| | 224.0 | 0.00 | 0.00 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 279 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 9 | 0.0 | 0.00 | 0.00 |
| Station 14+62 | 27.5 | 0.00 | 0.00 |
| | 36.5 | 0.00 | 0.00 |
| | 40.0 | 0.00 | 0.00 |
| | 44.0 | 0.25 | 0.00 |
| | 48.0 | 0.26 | 0.00 |
| | 52.0 | 0.52 | 0.00 |
| | 56.0 | 0.40 | 0.00 |
| | 60.0 | 1.28 | 0.00 |
| | 64.0 | 1.00 | 0.00 |
| | 68.0 | 1.60 | 0.00 |
| | 72.0 | 1.74 | 0.00 |
| | 80.0 | 1.83 | 0.00 |
| | 82.0 | 1.70 | 0.00 |
| | 84.0 | 1.60 | 0.00 |
| | 88.0 | 1.55 | 0.00 |
| | 92.0 | 1.75 | 0.40 |
| | 94.0 | 1.85 | 0.00 |
| | 96.0 | 2.02 | 0.50 |
| | 100.0 | 2.22 | 0.40 |
| | 104.0 | 2.43 | 0.63 |
| | 108.0 | 2.37 | 0.62 |
| | 112.0 | 2.35 | 0.84 |
| | 116.0 | 2.40 | 0.57 |
| | 119.5 | 2.45 | 0.62 |
| | 120.0 | 2.48 | 0.68 |
| | 124.0 | 2.46 | 0.69 |
| | 127.5 | 2.44 | 0.65 |
| | 128.0 | 2.43 | 0.59 |
| | 132.0 | 2.55 | 0.69 |
| | 136.0 | 2.78 | 0.62 |
| | 140.0 | 2.75 | 0.81 |
| | 142.0 | 2.73 | 0.71 |
| | 144.0 | 2.72 | 0.65 |
| | 148.0 | [illegible] | 0.62 |
| | 152.0 | 2.13 | 0.58 |
| | 156.0 | 2.12 | 0.44 |
| | 158.0 | 2.11 | 0.39 |
| | 160.0 | 2.11 | 0.39 |
| | 162.0 | 1.95 | 0.39 |
| | 166.0 | 1.90 | 0.25 |

Table B-3.1 (cont.) IFG-4 Calibration velocities (ft/sec) at site 101.2R.

| Location Within Site | Hor Dist (ft) | Velocities at 239 cfs | Velocities at 25 cfs |
|---|---|---|---|
| Cross Section 9 | 168.0 | 1.88 | 0.25 |
| Station 14+62 | 170.0 | 1.75 | 0.25 |
| (cont.) | 174.0 | 1.76 | 0.25 |
| | 176.0 | 1.78 | 0.30 |
| | 184.0 | 1.40 | 0.20 |
| | 186.0 | 0.90 | 0.10 |
| | 188.0 | 0.45 | 0.00 |
| | 190.0 | 0.40 | 0.00 |
| | 192.4 | 0.00 | 0.00 |
| | 197.0 | 0.00 | 0.00 |
| | 212.0 | 0.00 | 0.00 |
| | 215.0 | 0.00 | 0.00 |
| | 216.5 | 0.00 | 0.00 |

Table B-3.2 IFG-4 Calibration velocities (ft/sec) at site 131.7 L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 1 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 0+00 | 1.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 8.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 26.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 29.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 32.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 36.0 | 0.20 | 0.15 | 0.10 | 0.05 |
| | 40.0 | 0.40 | 0.30 | 0.15 | 0.10 |
| | 44.0 | 0.50 | 0.40 | 0.20 | 0.09 |
| | 48.0 | 0.60 | 0.50 | 0.30 | 0.15 |
| | 52.0 | 0.65 | 0.50 | 0.30 | 0.15 |
| | 56.0 | 0.75 | 0.55 | 0.30 | 0.10 |
| | 60.0 | 0.75 | 0.60 | 0.40 | 0.20 |
| | 64.0 | 0.75 | 0.60 | 0.40 | 0.20 |
| | 68.0 | 0.70 | 0.68 | 0.40 | 0.15 |
| | 72.0 | 0.70 | 0.65 | 0.40 | 0.15 |
| | 76.0 | 0.70 | 0.62 | 0.40 | 0.20 |
| | 80.0 | 0.70 | 0.60 | 0.35 | 0.20 |
| | 84.0 | 0.70 | 0.50 | 0.30 | 0.20 |
| | 88.0 | 0.60 | 0.50 | 0.20 | 0.10 |
| | 92.0 | 0.70 | 0.45 | 0.20 | 0.10 |
| | 96.0 | 0.70 | 0.50 | 0.17 | 0.05 |
| | 100.0 | 0.65 | 0.40 | 0.15 | 0.06 |
| | 104.0 | 0.47 | 0.38 | 0.20 | 0.10 |
| | 108.0 | 0.50 | 0.40 | 0.17 | 0.10 |
| | 112.0 | 0.47 | 0.35 | 0.14 | 0.05 |
| | 116.0 | 0.50 | 0.37 | 0.13 | 0.05 |
| | 120.0 | 0.63 | 0.37 | 0.10 | 0.05 |
| | 124.0 | 0.63 | 0.37 | 0.10 | 0.05 |
| | 128.0 | 0.63 | 0.37 | 0.10 | 0.05 |
| | 132.0 | 0.35 | 0.30 | 0.12 | 0.02 |
| | 136.0 | 0.40 | 0.30 | 0.10 | 0.02 |
| | 140.0 | 0.40 | 0.28 | 0.10 | 0.02 |
| | 144.0 | 0.50 | 0.30 | 0.10 | 0.02 |
| | 148.0 | 0.50 | 0.30 | 0.11 | 0.02 |
| | 152.0 | 0.40 | 0.32 | 0.10 | 0.02 |
| | 156.0 | 0.50 | 0.35 | 0.10 | 0.02 |
| | 160.0 | 0.55 | 0.40 | 0.10 | 0.02 |
| | 164.0 | 0.55 | 0.50 | 0.07 | 0.02 |
| | 168.0 | 0.50 | 0.40 | 0.10 | 0.02 |
| | 172.0 | 0.60 | 0.35 | 0.09 | 0.02 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 1 | 176.0 | 0.65 | 0.35 | 0.13 | 0.02 |
| Station 0+00 | 180.0 | 0.50 | 0.35 | 0.15 | 0.02 |
| (cont.) | 184.0 | 0.45 | 0.35 | 0.15 | 0.02 |
| | 188.0 | 0.55 | 0.35 | 0.15 | 0.00 |
| | 192.0 | 0.50 | 0.45 | 0.15 | 0.00 |
| | 196.0 | 0.50 | 0.45 | 0.15 | 0.00 |
| | 200.0 | 0.50 | 0.45 | 0.15 | 0.00 |
| | 204.0 | 0.60 | 0.50 | 0.15 | 0.00 |
| | 208.0 | 0.65 | 0.55 | 0.15 | 0.00 |
| | 212.0 | 0.62 | 0.55 | 0.15 | 0.00 |
| | 216.0 | 0.57 | 0.50 | 0.15 | 0.00 |
| | 220.0 | 0.60 | 0.50 | 0.15 | 0.00 |
| | 224.0 | 0.50 | 0.40 | 0.15 | 0.00 |
| | 228.0 | 0.40 | 0.35 | 0.00 | 0.00 |
| | 232.0 | 0.30 | 0.20 | 0.00 | 0.00 |
| | 234.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 236.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 237.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 251.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 258.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 263.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cross Section 2 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 2+45 | 1.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 14.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 18.0 | 0.20 | 0.15 | 0.00 | 0.00 |
| | 22.0 | 0.25 | 0.15 | 0.00 | 0.00 |
| | 26.0 | 0.34 | 0.18 | 0.05 | 0.00 |
| | 30.0 | 0.40 | 0.25 | 0.05 | 0.00 |
| | 34.0 | 0.35 | 0.16 | 0.04 | 0.00 |
| | 38.0 | 0.35 | 0.16 | 0.04 | 0.00 |
| | 42.0 | 0.40 | 0.17 | 0.05 | 0.00 |
| | 46.0 | 0.45 | 0.17 | 0.05 | 0.00 |
| | 50.0 | 0.40 | 0.20 | 0.10 | 0.00 |
| | 54.0 | 0.50 | 0.25 | 0.15 | 0.00 |
| | 58.0 | 0.30 | 0.15 | 0.06 | 0.00 |
| | 62.0 | 0.50 | 0.34 | 0.19 | 0.12 |
| | 66.0 | 0.85 | 0.55 | 0.30 | 0.15 |
| | 70.0 | 1.00 | 0.70 | 0.33 | 0.12 |
| | 73.0 | 1.65 | 1.44 | 0.45 | 0.20 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 2 | 78.0 | 1.70 | 1.60 | 0.50 | 0.10 |
| Station 2+45 | 81.0 | 1.95 | 1.70 | 0.50 | 0.20 |
| (cont.) | 86.0 | 2.15 | 1.96 | 0.65 | 0.30 |
| | 90.0 | 2.25 | 2.00 | 0.75 | 0.40 |
| | 94.0 | 2.20 | 2.00 | 1.20 | 0.35 |
| | 98.0 | 2.10 | 1.85 | 1.20 | 0.54 |
| | 102.0 | 2.15 | 1.61 | 1.24 | 0.58 |
| | 106.0 | 2.00 | 1.76 | 1.27 | 0.63 |
| | 110.0 | 2.10 | 1.79 | 1.29 | 0.90 |
| | 114.0 | 2.05 | 1.80 | 1.16 | 0.65 |
| | 118.0 | 2.10 | 1.80 | 1.02 | 0.45 |
| | 122.0 | 2.35 | 1.60 | 1.00 | 0.60 |
| | 126.0 | 2.15 | 1.50 | 0.90 | 0.58 |
| | 130.0 | 2.25 | 1.50 | 1.00 | 0.60 |
| | 134.0 | 2.20 | 1.28 | 0.90 | 0.48 |
| | 138.0 | 1.64 | 1.22 | 0.75 | 0.41 |
| | 142.0 | 1.65 | 1.35 | 0.87 | 0.35 |
| | 147.0 | 1.55 | 1.40 | 0.85 | 0.33 |
| | 150.0 | 1.70 | 1.44 | 0.80 | 0.32 |
| | 153.0 | 1.75 | 1.50 | 0.80 | 0.40 |
| | 158.0 | 1.75 | 1.60 | 0.38 | 0.15 |
| | 161.0 | 1.80 | 1.63 | 0.38 | 0.15 |
| | 166.0 | 1.65 | 0.64 | 0.24 | 0.00 |
| | 169.0 | 1.75 | 0.63 | 0.24 | 0.00 |
| | 174.0 | 1.40 | 0.90 | 0.20 | 0.00 |
| | 177.0 | 1.20 | 0.80 | 0.20 | 0.00 |
| | 182.0 | 1.05 | 0.75 | 0.20 | 0.00 |
| | 186.0 | 1.25 | 0.82 | 0.21 | 0.00 |
| | 190.0 | 1.30 | 1.00 | 0.21 | 0.00 |
| | 194.0 | 1.10 | 0.87 | 0.28 | 0.00 |
| | 198.0 | 1.20 | 0.84 | 0.48 | 0.00 |
| | 202.0 | 1.15 | 0.83 | 0.20 | 0.00 |
| | 206.0 | 1.05 | 0.74 | 0.00 | 0.00 |
| | 210.0 | 1.00 | 0.68 | 0.00 | 0.00 |
| | 214.0 | 0.90 | 0.68 | 0.00 | 0.00 |
| | 218.0 | 0.65 | 0.39 | 0.00 | 0.00 |
| | 222.0 | 0.40 | 0.15 | 0.00 | 0.00 |
| | 227.0 | 0.10 | 0.00 | 0.00 | 0.00 |
| | 231.0 | 0.00 | 0.00 | 0.00 | 0.00 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 2 | 235.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 2+45 | 239.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| (cont.) | 256.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 301.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cross Section 3 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 6+45 | 2.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 15.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 24.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 26.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 28.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 30.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 32.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 34.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 36.0 | 0.10 | 0.00 | 0.00 | 0.00 |
| | 38.0 | 0.20 | 0.10 | 0.02 | 0.00 |
| | 40.0 | 0.20 | 0.10 | 0.02 | 0.00 |
| | 44.0 | 0.10 | 0.09 | 0.05 | 0.00 |
| | 48.0 | 0.23 | 0.15 | 0.05 | 0.00 |
| | 52.0 | 0.20 | 0.15 | 0.05 | 0.00 |
| | 56.0 | 0.20 | 0.15 | 0.05 | 0.00 |
| | 60.0 | 0.20 | 0.15 | 0.10 | 0.05 |
| | 64.0 | 0.25 | 0.20 | 0.10 | 0.05 |
| | 68.0 | 0.27 | 0.25 | 0.15 | 0.10 |
| | 72.0 | 0.30 | 0.20 | 0.10 | 0.05 |
| | 76.0 | 0.35 | 0.25 | 0.15 | 0.05 |
| | 80.0 | 0.35 | 0.25 | 0.15 | 0.05 |
| | 84.0 | 0.45 | 0.32 | 0.14 | 0.0[illegible] |
| | 88.0 | 0.45 | 0.32 | 0.20 | 0.10 |
| | 92.0 | 0.55 | 0.39 | 0.22 | 0.10 |
| | 96.0 | 0.65 | 0.50 | 0.26 | 0.15 |
| | 100.0 | 0.55 | 0.45 | 0.25 | 0.10 |
| | 104.0 | 0.70 | 0.50 | 0.35 | 0.15 |
| | 108.0 | 0.80 | 0.55 | 0.40 | 0.15 |
| | 112.0 | 0.80 | 0.65 | 0.40 | 0.10 |
| | 116.0 | 1.00 | 0.85 | 0.40 | 0.20 |
| | 120.0 | 1.00 | 0.75 | 0.40 | 0.20 |
| | 124.0 | 0.85 | 0.75 | 0.30 | 0.09 |
| | 128.0 | 0.90 | 0.75 | 0.35 | 0.15 |
| | 132.0 | 0.90 | 0.85 | 0.30 | 0.15 |
| | 136.0 | 1.00 | 0.90 | 0.35 | 0.15 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 3 | 140.0 | 1.00 | 0.85 | 0.40 | 0.15 |
| Station 6+45 | 144.0 | 0.85 | 0.70 | 0.40 | 0.17 |
| (cont.) | 148.0 | 0.75 | 0.65 | 0.35 | 0.15 |
| | 152.0 | 0.77 | 0.68 | 0.38 | 0.10 |
| | 156.0 | 0.85 | 0.72 | 0.35 | 0.10 |
| | 160.0 | 0.80 | 0.70 | 0.35 | 0.10 |
| | 164.0 | 0.78 | 0.70 | 0.35 | 0.08 |
| | 168.0 | 0.80 | 0.75 | 0.32 | 0.08 |
| | 172.0 | 0.65 | 0.60 | 0.30 | 0.07 |
| | 176.0 | 0.65 | 0.50 | 0.25 | 0.07 |
| | 180.0 | 0.60 | 0.50 | 0.10 | 0.00 |
| | 184.0 | 0.65 | 0.50 | 0.15 | 0.00 |
| | 188.0 | 0.65 | 0.40 | 0.10 | 0.00 |
| | 192.0 | 0.55 | 0.35 | 0.10 | 0.00 |
| | 196.0 | 0.50 | 0.30 | 0.07 | 0.00 |
| | 198.0 | 0.45 | 0.25 | 0.00 | 0.00 |
| | 200.0 | 0.50 | 0.25 | 0.00 | 0.00 |
| | 202.0 | 0.3[illegible] | 0.15 | 0.00 | 0.00 |
| | 206.0 | 0.30 | 0.12 | 0.00 | 0.00 |
| | 208.0 | 0.25 | 0.10 | 0.00 | 0.00 |
| | 210.0 | 0.20 | 0.10 | 0.00 | 0.00 |
| | 212.0 | 0.20 | 0.00 | 0.00 | 0.00 |
| | 214.0 | 0.20 | 0.00 | 0.00 | 0.00 |
| | 216.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 218.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 260.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 266.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 273.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cross Section 4 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 9+45 | 1.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 7.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 25.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 27.0 | 0.05 | 0.00 | 0.00 | 0.00 |
| | 28.0 | 0.10 | 0.05 | 0.00 | 0.00 |
| | 30.0 | 0.30 | 0.25 | 0.20 | 0.00 |
| | 32.0 | 0.55 | 0.35 | 0.25 | 0.10 |
| | 34.0 | 0.65 | 0.45 | 0.25 | 0.10 |
| | 36.0 | 0.75 | 0.50 | 0.25 | 0.10 |
| | 38.0 | 0.72 | 0.50 | 0.35 | 0.15 |
| | 41.0 | 0.81 | 0.55 | 0.45 | 0.25 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 4 | 43.0 | 0.80 | 0.60 | 0.50 | 0.30 |
| Station 9+45 | 45.0 | 1.10 | 0.90 | 0.59 | 0.25 |
| (cont.) | 48.0 | 1.30 | 1.25 | 0.72 | 0.30 |
| | 52.0 | 1.30 | 1.25 | 0.70 | 0.35 |
| | 54.0 | 1.30 | 1.25 | 0.60 | 0.35 |
| | 55.0 | 1.40 | 1.25 | 0.65 | 0.38 |
| | 56.0 | 1.42 | 1.25 | 0.68 | 0.30 |
| | 57.0 | 1.40 | 1.20 | 0.68 | 0.30 |
| | 58.0 | 1.34 | 1.28 | 0.58 | 0.25 |
| | 60.0 | 1.50 | 0.90 | 0.40 | 0.20 |
| | 64.0 | 1.40 | 0.90 | 0.43 | 0.20 |
| | 68.0 | 1.30 | 1.00 | 0.40 | 0.10 |
| | 72.0 | 1.20 | 0.80 | 0.29 | 0.10 |
| | 76.0 | 1.15 | 0.60 | 0.14 | 0.08 |
| | 80.0 | 0.55 | 0.35 | 0.10 | 0.05 |
| | 84.0 | 0.35 | 0.23 | 0.10 | 0.05 |
| | 88.0 | 0.20 | 0.13 | 0.08 | 0.04 |
| | 92.0 | 0.30 | 0.19 | 0.10 | 0.05 |
| | 96.0 | 0.60 | 0.29 | 0.13 | 0.05 |
| | 100.0 | 0.65 | 0.30 | 0.10 | 0.03 |
| | 104.0 | 1.00 | 0.40 | 0.10 | 0.05 |
| | 108.0 | 1.00 | 0.50 | 0.10 | 0.05 |
| | 112.0 | 1.10 | 0.70 | 0.18 | 0.00 |
| | 116.0 | 1.10 | 0.60 | 0.15 | 0.00 |
| | 120.0 | 0.95 | 0.60 | 0.15 | 0.00 |
| | 124.0 | 1.00 | 0.73 | 0.20 | 0.00 |
| | 126.0 | 1.00 | 0.73 | 0.20 | 0.00 |
| | 130.0 | 0.90 | 0.65 | 0.20 | 0.00 |
| | 134.0 | 0.80 | 0.50 | 0.20 | 0.00 |
| | 138.0 | 0.60 | 0.35 | 0.00 | 0.00 |
| | 140.0 | 0.45 | 0.25 | 0.00 | 0.00 |
| | 144.0 | 0.40 | 0.20 | 0.00 | 0.00 |
| | 148.0 | 0.30 | 0.00 | 0.00 | 0.00 |
| | 152.0 | 0.15 | 0.00 | 0.00 | 0.00 |
| | 157.0 | 0.05 | 0.00 | 0.00 | 0.00 |
| | 163.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 167.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 171.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 175.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 179.0 | 0.00 | 0.00 | 0.00 | 0.00 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 4 | 216.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 9+45 | 231.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| (cont.) | 283.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 303.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cross Section 5 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 11+90 | 4.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 7.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 9.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 12.0 | 0.25 | 0.20 | 0.15 | 0.00 |
| | 14.0 | 0.25 | 0.20 | 0.15 | 0.00 |
| | 18.0 | 0.25 | 0.20 | 0.15 | 0.09 |
| | 22.0 | 0.30 | 0.20 | 0.15 | 0.09 |
| | 26.0 | 1.05 | 1.00 | 0.42 | 0.20 |
| | 30.0 | 1.20 | 1.07 | 0.43 | 0.30 |
| | 34.0 | 1.35 | 1.15 | 0.60 | 0.20 |
| | 38.0 | 1.40 | 1.25 | 0.50 | 0.20 |
| | 42.0 | 1.65 | 1.15 | 0.65 | 0.25 |
| | 46.0 | 1.55 | 1.25 | 0.60 | 0.30 |
| | 50.0 | 1.75 | 1.40 | 0.60 | 0.30 |
| | 54.0 | 1.85 | 1.60 | 0.60 | 0.30 |
| | 58.0 | 1.20 | 0.88 | 0.45 | 0.25 |
| | 62.0 | 1.65 | 1.00 | 0.65 | 0.30 |
| | 66.0 | 1.40 | 0.95 | 0.60 | 0.20 |
| | 70.0 | 1.45 | 0.80 | 0.20 | 0.10 |
| | 74.0 | 1.35 | 0.75 | 0.15 | 0.10 |
| | 78.0 | 1.10 | 0.40 | 0.00 | 0.00 |
| | 82.0 | 0.90 | 0.45 | 0.10 | 0.00 |
| | 86.0 | 0.90 | 0.45 | 0.00 | 0.00 |
| | 90.0 | 0.93 | 0.50 | 0.00 | 0.00 |
| | 94.0 | 0.95 | 0.50 | 0.00 | 0.00 |
| | 98.0 | 0.95 | 0.50 | 0.00 | 0.00 |
| | 102.0 | 0.85 | 0.40 | 0.00 | 0.00 |
| | 106.0 | 0.60 | 0.30 | 0.00 | 0.00 |
| | 110.0 | 0.65 | 0.35 | 0.00 | 0.00 |
| | 114.0 | 0.48 | 0.30 | 0.00 | 0.00 |
| | 118.0 | 0.50 | 0.30 | 0.00 | 0.00 |
| | 122.0 | 0.45 | 0.20 | 0.00 | 0.00 |
| | 126.0 | 0.45 | 0.20 | 0.00 | 0.00 |
| | 130.0 | 0.50 | 0.00 | 0.00 | 0.00 |
| | 134.0 | 0.60 | 0.00 | 0.00 | 0.00 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 5 | 138.0 | 0.40 | 0.00 | 0.00 | 0.00 |
| Station 11+90 | 142.0 | 0.30 | 0.00 | 0.00 | 0.00 |
| (cont.) | 146.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 150.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 154.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 156.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 276.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 380.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 391.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cross Section 6 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 16+30 | 1.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 11.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 14.0 | 0.65 | 0.50 | 0.00 | 0.00 |
| | 17.0 | 1.20 | 1.00 | 0.45 | 0.00 |
| | 20.0 | 1.60 | 1.30 | 0.53 | 0.25 |
| | 22.0 | 1.90 | 1.60 | 0.70 | 0.40 |
| | 26.0 | 2.05 | 1.90 | 1.05 | 0.65 |
| | 30.0 | 2.00 | 1.60 | 0.90 | 0.60 |
| | 34.0 | 1.90 | 1.73 | 1.00 | 0.60 |
| | 37.0 | 1.95 | 1.67 | 1.20 | 0.60 |
| | 42.0 | 1.75 | 1.50 | 1.13 | 0.40 |
| | 46.0 | 1.70 | 1.49 | 0.92 | 0.53 |
| | 50.0 | 1.70 | 1.37 | 0.65 | 0.29 |
| | 54.0 | 1.50 | 1.32 | 0.50 | 0.30 |
| | 58.0 | 1.50 | 1.26 | 0.60 | 0.32 |
| | 62.0 | 1.35 | 0.93 | 0.59 | 0.28 |
| | 66.0 | 1.13 | 0.70 | 0.48 | 0.28 |
| | 70.0 | 1.12 | 0.84 | 0.48 | 0.26 |
| | 74.0 | 1.15 | 0.86 | 0.52 | 0.30 |
| | 78.0 | 1.00 | 0.86 | 0.48 | 0.25 |
| | 82.0 | 0.95 | 0.66 | 0.30 | 0.12 |
| | 86.0 | 1.05 | 0.68 | 0.33 | 0.00 |
| | 90.0 | 0.94 | 0.68 | 0.36 | 0.00 |
| | 92.0 | 1.20 | 0.65 | 0.00 | 0.00 |
| | 96.0 | 1.20 | 0.65 | 0.00 | 0.00 |
| | 98.0 | 1.10 | 0.55 | 0.00 | 0.00 |
| | 104.0 | 0.95 | 0.45 | 0.00 | 0.00 |
| | 106.0 | 0.90 | 0.37 | 0.00 | 0.00 |
| | 110.0 | 0.75 | 0.30 | 0.00 | 0.00 |
| | 114.0 | 0.70 | 0.30 | 0.00 | 0.00 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 6 | 117.0 | 0.55 | 0.25 | 0.00 | 0.00 |
| Station 16+30 | 122.0 | 0.50 | 0.20 | 0.00 | 0.00 |
| (cont.) | 126.0 | 0.30 | 0.13 | 0.00 | 0.00 |
| | 130.0 | 0.30 | 0.12 | 0.00 | 0.00 |
| | 138.0 | 0.06 | 0.02 | 0.00 | 0.00 |
| | 146.0 | 0.06 | 0.02 | 0.00 | 0.00 |
| | 151.0 | 0.05 | 0.03 | 0.00 | 0.00 |
| | 154.0 | 0.05 | 0.03 | 0.00 | 0.00 |
| | 162.0 | 0.05 | 0.00 | 0.00 | 0.00 |
| | 166.0 | 0.05 | 0.00 | 0.00 | 0.00 |
| | 170.0 | 0.25 | 0.00 | 0.00 | 0.00 |
| | 174.0 | 0.70 | 0.36 | 0.00 | 0.00 |
| | 178.0 | 1.30 | 0.80 | 0.00 | 0.00 |
| | 182.0 | 1.30 | 0.75 | 0.00 | 0.00 |
| | 188.0 | 1.10 | 0.70 | 0.00 | 0.00 |
| | 192.0 | 0.90 | 0.60 | 0.00 | 0.00 |
| | 196.0 | 0.80 | 0.50 | 0.00 | 0.00 |
| | 200.0 | 0.70 | 0.48 | 0.00 | 0.00 |
| | 204.0 | 0.40 | 0.35 | 0.00 | 0.00 |
| | 208.0 | 0.29 | 0.20 | 0.00 | 0.00 |
| | 212.0 | 0.24 | 0.20 | 0.00 | 0.00 |
| | 216.0 | 0.30 | 0.20 | 0.00 | 0.00 |
| | 220.0 | 0.30 | 0.23 | 0.00 | 0.00 |
| | 224.0 | 0.30 | 0.15 | 0.00 | 0.00 |
| | 228.0 | 0.50 | 0.39 | 0.00 | 0.00 |
| | 232.0 | 0.45 | 0.30 | 0.00 | 0.00 |
| | 236.0 | 0.29 | 0.20 | 0.00 | 0.00 |
| | 240.0 | 0.19 | 0.00 | 0.00 | 0.00 |
| | 244.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 246.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 248.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 252.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 256.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 260.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 264.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 268.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 272.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 276.0 | 0.00 | 0.00 | 0.00 | 0.00 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 6 | 280.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 16+30 | 284.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| (cont.) | 342.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 358.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cross Section 7 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| Station 19+05 | 2.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 8.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 10.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 14.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 18.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 20.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 24.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 28.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 32.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 36.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 40.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 44.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 48.0 | 0.07 | 0.05 | 0.03 | 0.00 |
| | 51.0 | 0.07 | 0.05 | 0.00 | 0.00 |
| | 54.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 71.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 84.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 88.0 | 0.40 | 0.22 | 0.05 | 0.00 |
| | 92.0 | 0.90 | 0.70 | 0.20 | 0.00 |
| | 96.0 | 1.30 | 0.92 | 0.55 | 0.20 |
| | 100.0 | 1.50 | 1.03 | 0.70 | 0.14 |
| | 104.0 | 1.60 | 1.13 | 0.30 | 0.10 |
| | 108.0 | 1.50 | 0.65 | 0.10 | 0.00 |
| | 112.0 | 1.55 | 0.35 | 0.10 | 0.00 |
| | 116.0 | 1.40 | 1.00 | 0.52 | 0.25 |
| | 120.0 | 1.60 | 0.74 | 0.30 | 0.00 |
| | 124.0 | 1.20 | 0.65 | 0.20 | 0.08 |
| | 128.0 | 1.50 | 0.50 | 0.15 | 0.00 |
| | 132.0 | 1.60 | 1.00 | 0.55 | 0.10 |
| | 136.0 | 1.85 | 1.65 | 1.14 | 0.75 |
| | 140.0 | 2.00 | 1.65 | 1.14 | 0.75 |
| | 144.0 | 2.00 | 1.65 | 1.13 | 0.70 |
| | 148.0 | 2.00 | 1.65 | 1.07 | 0.70 |
| | 152.0 | 2.20 | 2.00 | 1.00 | 0.70 |
| | 156.0 | 2.30 | 2.00 | 1.22 | 0.72 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 7 | 160.0 | 2.30 | 1.98 | 1.27 | 0.69 |
| Station 19+05 | 164.0 | 2.30 | 1.63 | 1.10 | 0.59 |
| (cont.) | 168.0 | 2.00 | 1.56 | 1.30 | 0.79 |
| | 172.0 | 1.80 | 1.56 | 1.17 | 0.79 |
| | 176.0 | 1.70 | 1.56 | 1.20 | 0.80 |
| | 178.0 | 1.90 | 1.70 | 1.18 | 0.50 |
| | 182.0 | 2.30 | 1.90 | 1.16 | 0.54 |
| | 186.0 | 2.20 | 2.00 | 1.15 | 0.59 |
| | 190.0 | 1.90 | 1.50 | 0.90 | 0.40 |
| | 194.0 | 1.70 | 1.05 | 0.67 | 0.30 |
| | 198.0 | 1.70 | 1.00 | 0.57 | 0.10 |
| | 202.0 | 1.80 | 1.20 | 0.10 | 0.10 |
| | 208.0 | 1.70 | 1.41 | 0.36 | 0.10 |
| | 212.0 | 1.50 | 0.95 | 0.39 | 0.10 |
| | 216.0 | 1.40 | 1.20 | 0.40 | 0.35 |
| | 220.0 | 1.40 | 1.30 | 0.50 | 0.21 |
| | 224.0 | 1.55 | 1.42 | 0.50 | 0.15 |
| | 228.0 | 1.60 | 1.45 | 0.45 | 0.20 |
| | 232.0 | 1.60 | 1.34 | 0.40 | 0.18 |
| | 236.0 | 1.74 | 1.30 | 0.55 | 0.00 |
| | 240.0 | 1.45 | 1.10 | 0.55 | 0.00 |
| | 244.0 | 1.16 | 0.95 | 0.35 | 0.00 |
| | 248.0 | 1.25 | 0.90 | 0.25 | 0.00 |
| | 254.0 | 1.25 | 0.85 | 0.10 | 0.00 |
| | 258.0 | 1.25 | 0.72 | 0.24 | 0.00 |
| | 262.0 | 1.35 | 0.65 | 0.35 | 0.00 |
| | 266.0 | 1.35 | 0.60 | 0.42 | 0.10 |
| | 270.0 | 1.28 | 0.65 | 0.35 | 0.10 |
| | 274.0 | 1.35 | 0.94 | 0.25 | 0.10 |
| | 278.0 | 1.06 | 0.95 | 0.20 | 0.10 |
| | 282.0 | 1.06 | 0.79 | 0.10 | 0.10 |
| | 285.0 | 0.80 | 0.60 | 0.26 | 0.05 |
| | 288.0 | 0.80 | 0.50 | 0.20 | 0.05 |
| | 290.0 | 0.80 | 0.40 | 0.10 | 0.00 |
| | 294.0 | 0.45 | 0.25 | 0.00 | 0.00 |
| | 298.0 | 0.45 | 0.20 | 0.00 | 0.00 |
| | 302.0 | 0.30 | 0.10 | 0.00 | 0.00 |
| | 305.0 | 0.35 | 0.10 | 0.00 | 0.00 |
| | 311.0 | 0.35 | 0.10 | 0.00 | 0.00 |
| | 315.0 | 0.65 | 0.25 | 0.00 | 0.00 |
| | 319.0 | 0.65 | 0.20 | 0.00 | 0.00 |
| | 323.0 | 0.45 | 0.25 | 0.00 | 0.00 |
| | 327.0 | 0.45 | 0.25 | 0.00 | 0.00 |
| | 331.0 | 0.30 | 0.15 | 0.00 | 0.00 |
| | 335.0 | 0.20 | 0.12 | 0.00 | 0.00 |

Table B-3.2 (cont.) IFG-4 Calibration velocities (ft/sec) at site 131.7L.

| Location Within Site | Hor Dist (ft) | Velocities at 240 cfs | Velocities at 150 cfs | Velocities at 55 cfs | Velocities at 18 cfs |
|---|---|---|---|---|---|
| Cross Section 7 | 339.0 | 0.30 | 0.10 | 0.00 | 0.00 |
| Station 19+05 | 343.0 | 0.30 | 0.10 | 0.00 | 0.00 |
| (cont.) | 347.0 | 0.10 | 0.00 | 0.00 | 0.00 |
| | 351.0 | 0.01 | 0.00 | 0.00 | 0.00 |
| | 355.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 359.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 362.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 367.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 414.0 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 432.0 | 0.00 | 0.00 | 0.00 | 0.00 |

Table B-3.3 IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 1 | 0.0 | 0.00 | 0.00 |
| Station 0+00 | 8.7 | 0.00 | 0.00 |
| | 9.0 | 0.00 | 0.00 |
| | 9.3 | 0.00 | 0.00 |
| | 9.5 | 0.00 | 0.00 |
| | 10.0 | 0.60 | 0.00 |
| | 12.0 | 0.50 | 0.00 |
| | 14.0 | 1.50 | 0.00 |
| | 16.0 | 2.10 | 0.00 |
| | 18.0 | 2.20 | 0.00 |
| | 20.0 | 2.20 | 0.00 |
| | 21.0 | 2.20 | 0.95 |
| | 24.0 | 2.00 | 1.15 |
| | 28.0 | 2.80 | 1.30 |
| | 29.0 | 2.20 | 1.60 |
| | 31.0 | 1.95 | 1.20 |
| | 32.0 | 1.80 | 1.30 |
| | 33.0 | 1.90 | 1.50 |
| | 36.0 | 2.20 | 1.32 |
| | 39.0 | 2.20 | 1.10 |
| | 40.0 | 2.20 | 1.20 |
| | 43.0 | 1.95 | 1.10 |
| | 44.0 | 1.60 | 1.10 |
| | 47.0 | 1.50 | 0.90 |
| | 48.0 | 1.40 | 0.50 |
| | 51.0 | 1.30 | 0.25 |
| | 52.0 | 1.50 | 0.30 |
| | 55.0 | 1.50 | 0.65 |
| | 56.0 | 1.60 | 0.90 |
| | 59.0 | 1.70 | 1.50 |
| | 60.0 | 1.70 | 1.30 |
| | 63.0 | 1.70 | 1.45 |
| | 64.0 | 1.50 | 1.20 |
| | 67.0 | 1.80 | 0.90 |
| | 68.0 | 2.00 | 1.10 |
| | 70.0 | 2.20 | 1.30 |
| | 72.0 | 1.90 | 1.20 |
| | 74.0 | 1.80 | 0.90 |
| | 76.0 | 1.50 | 0.50 |
| | 77.8 | 1.20 | 0.00 |
| | 78.0 | 0.90 | 0.00 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 1 | 80.0 | 0.00 | 0.00 |
| Station 0+00 | 83.0 | 0.00 | 0.00 |
| (cont.) | 98.0 | 0.00 | 0.00 |
| | 109.0 | 0.00 | 0.00 |
| Cross Section 2 | 0.0 | 0.00 | 0.00 |
| Station 1+24 | 4.0 | 0.00 | 0.00 |
| | 18.5 | 0.00 | 0.00 |
| | 31.5 | 0.00 | 0.00 |
| | 32.0 | 0.00 | 0.00 |
| | 34.0 | 0.00 | 0.00 |
| | 36.0 | 0.00 | 0.00 |
| | 37.0 | 0.00 | 0.00 |
| | 38.0 | 0.00 | 0.00 |
| | 40.0 | 0.60 | 0.20 |
| | 42.0 | 0.90 | 0.10 |
| | 44.0 | 1.20 | 0.10 |
| | 46.0 | 1.75 | 0.32 |
| | 48.0 | 2.30 | 0.60 |
| | 50.0 | 2.50 | 0.47 |
| | 52.0 | 2.70 | 0.95 |
| | 54.0 | 3.00 | 1.15 |
| | 56.0 | 3.30 | 1.20 |
| | 58.0 | 3.35 | 1.37 |
| | 60.0 | 3.40 | 1.30 |
| | 62.0 | 3.30 | 1.25 |
| | 64.0 | 3.20 | 1.30 |
| | 66.0 | 3.20 | 1.05 |
| | 68.0 | 3.20 | 0.90 |
| | 70.0 | 2.85 | 0.80 |
| | 72.0 | 2.50 | 0.80 |
| | 74.0 | 1.70 | 0.50 |
| | 76.0 | 0.90 | 0.45 |
| | 78.0 | 1.00 | 0.00 |
| | 80.0 | 0.56 | 0.00 |
| | 82.0 | 1.36 | 0.00 |
| | 84.0 | 0.21 | 0.00 |
| | 86.0 | 0.00 | 0.00 |
| | 88.0 | 0.00 | 0.00 |
| | 90.0 | 0.35 | 0.00 |
| | 92.0 | 0.68 | 0.00 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 2 Station 1+24 (cont.) | 96.0 | 0.40 | 0.00 |
| | 100.0 | 0.20 | 0.00 |
| | 104.0 | 0.00 | 0.00 |
| | 111.5 | 0.00 | 0.00 |
| | 139.0 | 0.00 | 0.00 |
| | 161.0 | 0.00 | 0.00 |
| Cross Section 3 Station 2+46 | 0.0 | 0.00 | 0.00 |
| | 8.5 | 0.00 | 0.00 |
| | 23.0 | 0.00 | 0.00 |
| | 23.5 | 0.00 | 0.00 |
| | 24.0 | 0.85 | 0.00 |
| | 26.0 | 2.20 | 0.00 |
| | 28.0 | 2.30 | 0.00 |
| | 30.0 | 2.80 | 0.64 |
| | 32.0 | 2.80 | 0.65 |
| | 34.0 | 2.80 | 0.60 |
| | 36.0 | 2.80 | 0.70 |
| | 38.0 | 3.10 | 1.50 |
| | 40.0 | 3.20 | 2.22 |
| | 42.0 | 3.30 | 3.00 |
| | 44.0 | 3.40 | 2.00 |
| | 46.0 | 3.50 | 1.55 |
| | 48.0 | 3.30 | 1.35 |
| | 50.0 | 2.20 | 0.50 |
| | 52.0 | 2.00 | 0.40 |
| | 54.0 | 1.80 | 0.00 |
| | 58.0 | 1.60 | 0.00 |
| | 62.0 | 0.40 | 0.00 |
| | 66.0 | 0.40 | 0.00 |
| | 70.0 | 0.10 | 0.00 |
| | 74.0 | 0.07 | 0.00 |
| | 78.0 | 0.85 | 0.00 |
| | 80.0 | 0.90 | 0.00 |
| | 82.0 | 0.70 | 0.00 |
| | 84.0 | 0.80 | 0.00 |
| | 86.0 | 0.50 | 0.00 |
| | 88.0 | 0.25 | 0.00 |
| | 90.0 | 0.00 | 0.00 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 3 | 90.3 | 0.00 | 0.00 |
| Station 2+46 | 95.0 | 0.00 | 0.00 |
| (cont.) | 104.4 | 0.00 | 0.00 |
| | 139.5 | 0.00 | 0.00 |
| Cross Section 4 | 0.0 | 0.00 | 0.00 |
| Station 3+90 | 17.6 | 0.00 | 0.00 |
| | 18.0 | 1.20 | 0.00 |
| | 20.0 | 1.40 | 0.00 |
| | 22.0 | 1.80 | 0.00 |
| | 24.0 | 2.00 | 0.00 |
| | 30.0 | 1.60 | 0.00 |
| | 32.0 | 1.70 | 0.00 |
| | 34.0 | 1.80 | 0.00 |
| | 36.0 | 1.80 | 0.00 |
| | 38.0 | 1.90 | 0.50 |
| | 40.0 | 2.00 | 0.40 |
| | 42.0 | 1.90 | 0.40 |
| | 44.0 | 2.00 | 0.40 |
| | 46.0 | 2.10 | 0.40 |
| | 48.0 | 2.20 | 1.00 |
| | 50.0 | 2.30 | 1.60 |
| | 51.0 | 2.40 | 1.60 |
| | 53.0 | 2.40 | 1.70 |
| | 55.0 | 2.60 | 1.75 |
| | 57.0 | 2.40 | 1.60 |
| | 59.0 | 2.30 | 1.60 |
| | 61.0 | 2.00 | 1.45 |
| | 62.0 | 2.00 | 1.15 |
| | 64.0 | 1.90 | 0.90 |
| | 66.0 | 1.80 | 0.75 |
| | 68.0 | 1.60 | 0.35 |
| | 70.8 | 1.50 | 0.70 |
| | 72.0 | 1.50 | 0.00 |
| | 74.0 | 1.60 | 0.00 |
| | 76.0 | 1.70 | 0.00 |
| | 78.0 | 1.90 | 0.00 |
| | 80.0 | 1.60 | 0.00 |
| | 84.0 | 1.40 | 0.00 |
| | 86.0 | 0.90 | 0.00 |
| | 88.0 | 0.90 | 0.00 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 4 | 90.0 | 0.90 | 0.00 |
| Station 3+90 | 92.0 | 0.90 | 0.00 |
| (cont.) | 94.0 | 0.90 | 0.00 |
| | 96.0 | 0.75 | 0.00 |
| | 98.0 | 0.60 | 0.00 |
| | 102.0 | 0.56 | 0.00 |
| | 106.0 | 0.48 | 0.00 |
| | 110.0 | 0.56 | 0.00 |
| | 114.0 | 0.30 | 0.00 |
| | 118.0 | 0.25 | 0.00 |
| | 122.0 | 0.00 | 0.00 |
| | 124.0 | 0.00 | 0.00 |
| | 126.0 | 0.00 | 0.00 |
| | 128.0 | 0.00 | 0.00 |
| | 130.0 | 0.00 | 0.00 |
| | 132.0 | 0.00 | 0.00 |
| | 152.0 | 0.00 | 0.00 |
| | 162.5 | 0.00 | 0.00 |
| | 182.0 | 0.00 | 0.00 |
| | 199.0 | 0.00 | 0.00 |
| Cross Section 5 | 0.0 | 0.00 | 0.00 |
| Station 5+11 | 40.0 | 0.00 | 0.00 |
| | 43.5 | 0.05 | 0.00 |
| | 44.0 | 0.20 | 0.00 |
| | 46.0 | 0.80 | 0.20 |
| | 48.0 | 1.10 | 0.35 |
| | 50.0 | 1.00 | 0.40 |
| | 52.0 | 1.10 | 0.35 |
| | 54.0 | 1.20 | 0.45 |
| | 56.0 | 1.30 | 0.45 |
| | 58.0 | 1.30 | 0.35 |
| | 60.0 | 1.20 | 0.40 |
| | 62.0 | 1.20 | 0.40 |
| | 66.0 | 1.20 | 0.50 |
| | 68.0 | 1.20 | 0.50 |
| | 70.0 | 1.10 | 0.55 |
| | 74.0 | 1.00 | 0.40 |
| | 78.0 | 0.90 | 0.40 |
| | 80.0 | 0.80 | 0.45 |
| | 82.0 | 0.90 | 0.50 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 5 Station 5+11 (cont.) | 86.0 | 1.00 | 0.45 |
| | 90.0 | 0.90 | 0.37 |
| | 92.0 | 0.80 | 0.40 |
| | 94.0 | 1.00 | 0.55 |
| | 98.0 | 1.20 | 0.45 |
| | 102.0 | 1.15 | 0.37 |
| | 104.0 | 1.10 | 0.36 |
| | 106.0 | 1.00 | 0.35 |
| | 110.0 | 0.90 | 0.35 |
| | 114.0 | 1.00 | 0.30 |
| | 116.0 | 1.20 | 0.40 |
| | 118.0 | 1.00 | 0.35 |
| | 122.0 | 0.90 | 0.15 |
| | 124.0 | 0.95 | 0.10 |
| | 126.0 | 0.95 | 0.00 |
| | 128.0 | 1.00 | 0.00 |
| | 130.0 | 0.90 | 0.00 |
| | 134.0 | 0.80 | 0.00 |
| | 136.0 | 0.60 | 0.00 |
| | 138.0 | 0.60 | 0.00 |
| | 140.0 | 0.50 | 0.00 |
| | 142.0 | 0.50 | 0.00 |
| | 144.0 | 0.40 | 0.00 |
| | 146.0 | 0.60 | 0.00 |
| | 148.0 | 0.50 | 0.00 |
| | 150.0 | 0.40 | 0.00 |
| | 152.0 | 0.30 | 0.00 |
| | 154.0 | 0.30 | 0.00 |
| | 156.0 | 0.00 | 0.00 |
| | 162.5 | 0.00 | 0.00 |
| | 182.0 | 0.00 | 0.00 |
| | 210.0 | 0.00 | 0.00 |
| Cross Section 6 Station 6+94 | 0.0 | 0.00 | 0.00 |
| | 25.0 | 0.00 | 0.00 |
| | 29.0 | 0.00 | 0.00 |
| | 30.0 | 0.00 | 0.00 |
| | 32.0 | 0.35 | 0.00 |
| | 34.0 | 0.50 | 0.15 |
| | 36.0 | 0.70 | 0.15 |
| | 38.0 | 0.90 | 0.15 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 6 Station 6+94 (cont.) | 42.0 | 0.90 | 0.10 |
| | 44.0 | 0.90 | 0.20 |
| | 46.0 | 0.90 | 0.25 |
| | 50.0 | 0.80 | 0.30 |
| | 54.0 | 0.85 | 0.30 |
| | 56.0 | 1.00 | 0.30 |
| | 58.0 | 1.00 | 0.30 |
| | 62.0 | 0.93 | 0.30 |
| | 66.0 | 1.00 | 0.30 |
| | 68.0 | 0.90 | 0.31 |
| | 70.0 | 0.90 | 0.32 |
| | 72.5 | 0.90 | 0.29 |
| | 74.0 | 0.90 | 0.30 |
| | 76.0 | 0.90 | 0.30 |
| | 78.0 | 0.90 | 0.30 |
| | 80.0 | 0.85 | 0.30 |
| | 82.0 | 0.90 | 0.27 |
| | 84.0 | 0.90 | 0.30 |
| | 86.0 | 0.90 | 0.30 |
| | 88.0 | 0.90 | 0.30 |
| | 90.0 | 0.90 | 0.30 |
| | 92.0 | 0.90 | 0.30 |
| | 94.0 | 0.90 | 0.20 |
| | 96.0 | 0.90 | 0.20 |
| | 98.0 | 0.80 | 0.20 |
| | 100.0 | 0.80 | 0.15 |
| | 102.0 | 0.80 | 0.15 |
| | 104.0 | 0.80 | 0.00 |
| | 106.0 | 0.60 | 0.00 |
| | 108.0 | 0.50 | 0.00 |
| | 110.0 | 0.40 | 0.00 |
| | 112.0 | 0.40 | 0.00 |
| | 114.0 | 0.30 | 0.00 |
| | 116.0 | 0.30 | 0.00 |
| | 118.0 | 0.10 | 0.00 |
| | 120.0 | 0.00 | 0.00 |
| | 122.0 | 0.00 | 0.00 |
| | 124.0 | 0.00 | 0.00 |
| | 139.0 | 0.00 | 0.00 |
| | 160.0 | 0.00 | 0.00 |
| | 181.5 | 0.00 | 0.00 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 7 | 0.0 | 0.00 | 0.00 |
| Station 8+52 | 18.2 | 0.00 | 0.00 |
| | 20.0 | 0.00 | 0.00 |
| | 22.0 | 0.00 | 0.00 |
| | 22.6 | 0.00 | 0.00 |
| | 23.5 | 0.00 | 0.00 |
| | 24.0 | 0.40 | 0.00 |
| | 26.0 | 0.20 | 0.00 |
| | 28.0 | 0.30 | 0.00 |
| | 30.0 | 0.70 | 0.00 |
| | 32.0 | 0.60 | 0.00 |
| | 34.0 | 0.60 | 0.15 |
| | 36.0 | 0.60 | 0.15 |
| | 40.0 | 0.65 | 0.15 |
| | 44.0 | 0.70 | 0.25 |
| | 48.0 | 0.85 | 0.30 |
| | 52.0 | 0.80 | 0.25 |
| | 56.0 | 1.10 | 0.35 |
| | 58.0 | 0.90 | 0.40 |
| | 60.0 | 1.10 | 0.30 |
| | 62.0 | 1.10 | 0.35 |
| | 64.0 | 1.00 | 0.35 |
| | 66.0 | 1.00 | 0.30 |
| | 68.0 | 1.00 | 0.30 |
| | 70.0 | 1.00 | 0.40 |
| | 72.0 | 1.00 | 0.25 |
| | 74.0 | 1.00 | 0.30 |
| | 76.0 | 1.00 | 0.20 |
| | 78.0 | 0.85 | 0.20 |
| | 80.0 | 0.90 | 0.10 |
| | 82.0 | 0.65 | 0.10 |
| | 84.0 | 0.60 | 0.10 |
| | 86.0 | 0.60 | 0.00 |
| | 88.0 | 0.60 | 0.00 |
| | 90.0 | 0.50 | 0.00 |
| | 92.0 | 0.50 | 0.00 |
| | 94.0 | 0.50 | 0.00 |
| | 96.0 | 0.50 | 0.00 |
| | 98.0 | 0.35 | 0.00 |
| | 100.0 | 0.30 | 0.00 |
| | 102.0 | 0.20 | 0.00 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 7 | 104.0 | 0.10 | 0.00 |
| Station 8+52 | 106.0 | 0.10 | 0.00 |
| (cont.) | 108.0 | 0.00 | 0.00 |
| | 116.0 | 0.00 | 0.00 |
| | 121.5 | 0.00 | 0.00 |
| | 131.5 | 0.00 | 0.00 |
| | 145.0 | 0.00 | 0.00 |
| | 168.5 | 0.00 | 0.00 |
| Cross Section 8 | 0.0 | 0.00 | 0.00 |
| Station 9+79 | 18.0 | 0.00 | 0.00 |
| | 20.0 | 0.00 | 0.00 |
| | 21.0 | 0.00 | 0.00 |
| | 22.0 | 0.10 | 0.00 |
| | 24.0 | 0.20 | 0.01 |
| | 26.0 | 0.30 | 0.01 |
| | 28.0 | 0.40 | 0.05 |
| | 31.0 | 0.50 | 0.10 |
| | 32.0 | 0.50 | 0.10 |
| | 33.0 | 0.60 | 0.10 |
| | 36.0 | 0.70 | 0.10 |
| | 39.0 | 0.60 | 0.10 |
| | 40.0 | 0.60 | 0.10 |
| | 43.0 | 0.60 | 0.20 |
| | 44.0 | 0.60 | 0.20 |
| | 47.0 | 0.60 | 0.20 |
| | 48.0 | 0.50 | 0.15 |
| | 51.0 | 0.60 | 0.20 |
| | 52.0 | 0.65 | 0.25 |
| | 56.0 | 0.70 | 0.25 |
| | 60.0 | 0.85 | 0.25 |
| | 64.0 | 0.90 | 0.20 |
| | 67.0 | 0.90 | 0.20 |
| | 68.0 | 0.90 | 0.20 |
| | 72.0 | 1.20 | 0.25 |
| | 75.0 | 1.30 | 0.35 |
| | 76.0 | 1.40 | 0.35 |
| | 79.0 | 1.40 | 0.30 |
| | 80.0 | 1.30 | 0.30 |
| | 83.0 | 1.30 | 0.40 |
| | 84.0 | 1.30 | 0.50 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 8 | 88.0 | 1.20 | 0.60 |
| Station 9+79 | 91.0 | 1.00 | 0.60 |
| (cont.) | 92.0 | 0.80 | 0.50 |
| | 95.0 | 0.80 | 0.50 |
| | 96.0 | 0.60 | 0.30 |
| | 98.0 | 0.60 | 0.30 |
| | 99.0 | 0.50 | 0.25 |
| | 100.0 | 0.40 | 0.20 |
| | 102.0 | 0.30 | 0.15 |
| | 103.0 | 0.20 | 0.10 |
| | 105.7 | 0.10 | 0.00 |
| | 128.0 | 0.00 | 0.00 |
| | 155.0 | 0.00 | 0.00 |
| | 168.0 | 0.00 | 0.00 |
| | 178.0 | 0.00 | 0.00 |
| Cross Section 9 | 0.0 | 0.00 | 0.00 |
| Station 11+31 | 4.0 | 0.00 | 0.00 |
| | 6.0 | 0.00 | 0.00 |
| | 9.0 | 0.27 | 0.07 |
| | 12.0 | 0.54 | 0.07 |
| | 14.0 | 0.48 | 0.07 |
| | 16.0 | 0.45 | 0.12 |
| | 19.0 | 0.35 | 0.10 |
| | 25.0 | 0.20 | 0.05 |
| | 28.0 | 0.00 | 0.00 |
| | 32.0 | 0.00 | 0.00 |
| | 34.0 | 0.00 | 0.00 |
| | 36.0 | 0.00 | 0.00 |
| | 40.0 | 0.00 | 0.00 |
| | 55.0 | 0.00 | 0.00 |
| | 84.0 | 0.00 | 0.00 |
| | 88.5 | 0.00 | 0.00 |
| | 90.8 | 0.00 | 0.00 |
| | 92.0 | 0.39 | 0.00 |
| | 94.0 | 1.20 | 0.00 |
| | 96.0 | 1.80 | 0.00 |
| | 98.0 | 1.60 | 0.25 |
| | 100.0 | 2.55 | 0.35 |
| | 103.0 | 2.40 | 0.80 |
| | 108.0 | 1.80 | 0.77 |

Table B-3.3 (cont.) IFG-4 Calibration velocities (ft/sec) at site 132.6L.

| Location Within Site | Hor Dist (ft) | Velocities at 141 cfs | Velocities at 27 cfs |
|---|---|---|---|
| Cross Section 9 Station 11+31 (cont.) | 112.0 | 1.60 | 0.77 |
| | 116.0 | 1.10 | 0.56 |
| | 120.0 | 1.00 | 0.54 |
| | 124.0 | 1.00 | 0.55 |
| | 127.0 | 1.70 | 0.35 |
| | 130.0 | 1.20 | 0.00 |
| | 132.0 | 2.30 | 0.00 |
| | 134.0 | 2.50 | 0.40 |
| | 136.0 | 2.50 | 0.55 |
| | 140.0 | 3.00 | 1.20 |
| | 142.0 | 2.70 | 1.20 |
| | 144.0 | 3.90 | 1.20 |
| | 148.0 | 3.20 | 1.20 |
| | 152.0 | 3.70 | 1.20 |
| | 156.0 | 2.45 | 0.80 |
| | 158.5 | 2.00 | 0.40 |
| | 164.0 | 0.96 | 0.30 |
| | 168.0 | 1.50 | 0.00 |
| | 170.6 | 1.00 | 0.00 |
| | 176.0 | 1.10 | 0.00 |
| | 180.0 | 1.05 | 0.00 |
| | 183.0 | 0.32 | 0.00 |
| | 184.0 | 0.00 | 0.00 |
| | 186.0 | 0.00 | 0.00 |
| | 193.0 | 0.00 | 0.00 |
| | 210.5 | 0.00 | 0.00 |
| | 219.0 | 0.00 | 0.00 |

Table B-3.4 IFG-4 Calibration velocities (ft/sec) at site 136.0L.

| Location Within Site | Hor Dist (ft) | Velocities at 265 cfs | Velocities at 153 cfs | Velocities at 81 cfs |
|---|---|---|---|---|
| Cross Section 1 | 0.0 | 0.00 | 0.00 | 0.00 |
| Station 0+00 | 1.0 | 0.00 | 0.00 | 0.00 |
| | 9.0 | 0.00 | 0.00 | 0.00 |
| | 11.0 | 0.07 | 0.03 | 0.01 |
| | 14.0 | 0.07 | 0.03 | 0.01 |
| | 16.0 | 0.07 | 0.03 | 0.01 |
| | 18.0 | 0.10 | 0.05 | 0.01 |
| | 19.5 | 0.10 | 0.05 | 0.02 |
| | 23.0 | 0.10 | 0.05 | 0.02 |
| | 25.0 | 0.10 | 0.05 | 0.02 |
| | 26.0 | 0.40 | 0.25 | 0.10 |
| | 28.0 | 0.60 | 0.45 | 0.30 |
| | 30.0 | 0.65 | 0.55 | 0.45 |
| | 32.0 | 0.73 | 0.62 | 0.45 |
| | 34.0 | 0.86 | 0.78 | 0.50 |
| | 36.0 | 0.95 | 0.75 | 0.50 |
| | 38.0 | 1.38 | 0.97 | 0.60 |
| | 40.0 | 1.54 | 1.20 | 0.92 |
| | 42.0 | 1.71 | 1.54 | 1.04 |
| | 44.0 | 1.95 | 1.73 | 1.04 |
| | 46.0 | 2.40 | 2.26 | 1.37 |
| | 48.0 | 2.39 | 2.26 | 1.75 |
| | 50.0 | 2.76 | 2.00 | 1.60 |
| | 52.0 | 3.80 | 2.57 | 2.00 |
| | 54.0 | 4.28 | 3.29 | 2.00 |
| | 56.0 | 4.42 | 3.29 | 2.20 |
| | 58.0 | 4.56 | 3.30 | 2.30 |
| | 60.0 | 4.18 | 3.42 | 2.60 |
| | 62.0 | 3.80 | 3.50 | 2.60 |
| | 64.0 | 3.20 | 2.90 | 2.65 |
| | 66.0 | 2.38 | 1.85 | 1.50 |
| | 68.0 | 1.81 | 1.30 | 1.00 |
| | 70.0 | 1.40 | 1.15 | 0.95 |
| | 72.0 | 1.50 | 1.00 | 0.75 |
| | 74.0 | 1.10 | 0.95 | 0.60 |
| | 76.0 | 1.20 | 0.87 | 0.50 |
| | 78.7 | 1.20 | 0.73 | 0.00 |
| | 80.0 | 0.70 | 0.00 | 0.00 |
| | 80.9 | 0.00 | 0.00 | 0.00 |
| | 82.0 | 0.00 | 0.00 | 0.00 |

Table B-3.4 IFG-4 Calibration velocities (ft/sec) at site 136.0L.

| Location Within Site | Hor Dist (ft) | Velocities at 265 cfs | Velocities at 153 cfs | Velocities at 81 cfs |
|---|---|---|---|---|
| Cross Section 1 | 82.8 | 0.00 | 0.00 | 0.00 |
| Station 0+00 | 88.0 | 0.00 | 0.00 | 0.00 |
| (cont.) | 91.5 | 0.00 | 0.00 | 0.00 |
| | 93.5 | 0.00 | 0.00 | 0.00 |
| Cross Section 2 | 0.0 | 0.00 | 0.00 | 0.00 |
| Station 0+88 | 3.0 | 0.00 | 0.00 | 0.00 |
| | 4.0 | 0.00 | 0.00 | 0.00 |
| | 17.0 | 0.00 | 0.00 | 0.00 |
| | 20.0 | 0.00 | 0.00 | 0.00 |
| | 22.0 | 1.00 | 0.00 | 0.00 |
| | 24.0 | 1.00 | 0.00 | 0.00 |
| | 26.0 | 1.80 | 0.00 | 0.00 |
| | 28.0 | 1.90 | 0.00 | 0.00 |
| | 30.0 | 2.00 | 1.10 | 0.00 |
| | 32.0 | 2.20 | 1.50 | 0.00 |
| | 34.0 | 2.30 | 1.80 | 0.80 |
| | 36.0 | 3.00 | 2.70 | 1.35 |
| | 38.0 | 3.20 | 2.80 | 2.20 |
| | 40.0 | 3.55 | 3.20 | 2.50 |
| | 42.0 | 4.00 | 3.50 | 2.50 |
| | 44.0 | 4.30 | 3.50 | 2.45 |
| | 46.0 | 4.30 | 3.50 | 2.40 |
| | 48.0 | 4.45 | 3.80 | 2.65 |
| | 50.0 | 4.30 | 3.50 | 2.65 |
| | 52.0 | 4.20 | 3.95 | 3.50 |
| | 54.0 | 4.10 | 3.50 | 3.10 |
| | 56.0 | 3.60 | 3.30 | 3.00 |
| | 58.0 | 3.00 | 2.50 | 1.75 |
| | 60.0 | 1.80 | 0.95 | 0.58 |
| | 62.0 | 0.80 | 0.50 | 0.20 |
| | 64.0 | 0.40 | 0.00 | 0.00 |
| | 73.0 | 0.00 | 0.00 | 0.00 |
| | 76.0 | 0.00 | 0.00 | 0.00 |
| Cross Section 3 | 0.0 | 0.00 | 0.00 | 0.00 |
| Station 1+95 | 3.0 | 0.00 | 0.00 | 0.00 |
| | 9.0 | 0.00 | 0.00 | 0.00 |
| | 10.0 | 0.30 | 0.10 | 0.00 |
| | 12.0 | 0.60 | 0.25 | 0.00 |
| | 14.0 | 1.80 | 1.10 | 0.40 |

Table B-3.4 (cont.) IFG-4 Calibration velocities (ft/sec) at site 136.0L.

| Location Within Site | Hor Dist (ft) | Velocities at 265 cfs | Velocities at 153 cfs | Velocities at 81 cfs |
|---|---|---|---|---|
| Cross Section 3 | 16.0 | 3.05 | 1.95 | 1.05 |
| Station 1+95 | 18.0 | 3.90 | 2.50 | 1.60 |
| (cont.) | 20.0 | 3.59 | 2.80 | 1.87 |
| | 22.0 | 3.60 | 2.80 | 2.12 |
| | 24.0 | 3.74 | 2.80 | 2.12 |
| | 26.0 | 4.30 | 3.00 | 2.12 |
| | 28.0 | 4.00 | 3.10 | 2.10 |
| | 30.0 | 4.07 | 3.00 | 2.02 |
| | 32.0 | 4.03 | 2.40 | 1.85 |
| | 34.0 | 4.00 | 2.80 | 1.82 |
| | 36.0 | 3.80 | 2.80 | 1.70 |
| | 38.0 | 3.60 | 3.00 | 1.85 |
| | 40.0 | 3.25 | 2.50 | 1.87 |
| | 42.0 | 2.90 | 2.60 | 1.83 |
| | 44.0 | 2.00 | 1.85 | 1.70 |
| | 46.0 | 0.80 | 0.30 | 0.15 |
| | 47.5 | 0.10 | 0.00 | 0.00 |
| | 55.0 | 0.00 | 0.00 | 0.00 |
| | 59.0 | 0.00 | 0.00 | 0.00 |
| | 61.0 | 0.00 | 0.00 | 0.00 |
| | 63.0 | 0.00 | 0.00 | 0.00 |
| Cross Section 4 | 0.0 | 0.00 | 0.00 | 0.00 |
| Station 2+91 | 2.5 | 0.00 | 0.00 | 0.00 |
| | 7.5 | 0.00 | 0.00 | 0.00 |
| | 10.0 | 0.50 | 0.00 | 0.00 |
| | 12.0 | 1.00 | 0.50 | 0.00 |
| | 12.5 | 1.00 | 0.50 | 0.00 |
| | 14.0 | 1.70 | 0.90 | 0.00 |
| | 16.0 | 1.98 | 1.70 | 1.00 |
| | 18.0 | 2.20 | 2.00 | 1.00 |
| | 20.0 | 2.60 | 2.35 | 2.20 |
| | 22.0 | 2.67 | 2.40 | 2.15 |
| | 24.0 | 2.70 | 2.40 | 2.19 |
| | 26.0 | 2.70 | 2.40 | 2.09 |
| | 28.0 | 2.60 | 2.40 | 1.92 |
| | 30.0 | 2.70 | 2.50 | 2.14 |
| | 32.0 | 2.90 | 2.70 | 2.16 |
| | 34.0 | 3.10 | 2.85 | 2.20 |
| | 36.0 | 3.20 | 3.00 | 2.25 |
| | 38.0 | 2.90 | 2.70 | 2.14 |

Table B-3.4 (cont.) IFG-4 Calibration velocities (ft/sec) at site 136.0L.

| Location Within Site | Hor Dist (ft) | Velocities at 265 cfs | Velocities at 153 cfs | Velocities at 81 cfs |
|---|---|---|---|---|
| Cross Section 4 | 40.0 | 3.20 | 3.00 | 2.25 |
| Station 2+91 | 42.0 | 3.50 | 3.00 | 2.20 |
| (cont.) | 44.0 | 3.20 | 2.90 | 2.38 |
| | 46.0 | 3.00 | 2.80 | 2.20 |
| | 48.0 | 2.95 | 2.72 | 2.47 |
| | 50.0 | 3.00 | 2.72 | 2.38 |
| | 52.0 | 3.10 | 2.84 | 2.00 |
| | 54.0 | 3.20 | 2.90 | 1.70 |
| | 56.0 | 3.17 | 2.70 | 1.65 |
| | 58.0 | 3.14 | 2.07 | 1.60 |
| | 60.0 | 1.70 | 0.90 | 0.50 |
| | 62.0 | 1.54 | 0.00 | 0.00 |
| | 64.0 | 1.45 | 0.00 | 0.00 |
| | 66.0 | 1.37 | 0.00 | 0.00 |
| | 68.0 | 1.40 | 0.00 | 0.00 |
| | 68.5 | 0.00 | 0.00 | 0.00 |
| | 72.3 | 0.00 | 0.00 | 0.00 |
| | 82.5 | 0.00 | 0.00 | 0.00 |
| | 84.5 | 0.00 | 0.00 | 0.00 |
| | 87.5 | 0.00 | 0.00 | 0.00 |
| Cross Section 5 | 0.0 | 0.00 | 0.00 | 0.00 |
| Station 4+23 | 2.5 | 0.00 | 0.00 | 0.00 |
| | 13.7 | 0.00 | 0.00 | 0.00 |
| | 14.0 | 0.00 | 0.00 | 0.00 |
| | 16.0 | 0.10 | 0.00 | 0.00 |
| | 18.0 | 0.35 | 0.15 | 0.10 |
| | 20.0 | 0.50 | 0.20 | 0.10 |
| | 22.0 | 0.75 | 0.25 | 0.10 |
| | 24.0 | 1.00 | 0.40 | 0.15 |
| | 26.0 | 1.20 | 0.60 | 0.30 |
| | 28.0 | 1.30 | 0.95 | 0.30 |
| | 30.5 | 1.40 | 1.10 | 0.30 |
| | 32.0 | 1.60 | 1.30 | 0.40 |
| | 34.0 | 2.40 | 1.45 | 0.80 |
| | 36.0 | 2.25 | 1.65 | 1.05 |
| | 38.0 | 2.10 | 1.65 | 1.00 |
| | 40.0 | 2.20 | 1.65 | 0.82 |
| | 42.0 | 2.30 | 1.70 | 1.10 |
| | 44.0 | 2.25 | 1.65 | 0.97 |
| | 46.0 | 2.20 | 1.40 | 0.95 |
| | 48.0 | 2.45 | 1.90 | 1.35 |

Table B-3.4 (cont.) IFG-4 Calibration velocities (ft/sec) at site 136.0L.

| Location Within Site | Hor Dist (ft) | Velocities at 265 cfs | Velocities at 153 cfs | Velocities at 81 cfs |
|---|---|---|---|---|
| Cross Section 5 Station 4+23 (cont.) | 50.0 | 2.70 | 1.75 | 1.00 |
| | 52.0 | 2.40 | 1.80 | 1.37 |
| | 54.0 | 2.05 | 1.70 | 1.05 |
| | 56.0 | 2.10 | 1.70 | 1.03 |
| | 58.0 | 2.15 | 1.55 | 0.95 |
| | 60.0 | 2.17 | 1.65 | 0.75 |
| | 62.0 | 2.18 | 1.75 | 1.10 |
| | 64.0 | 2.40 | 1.50 | 0.90 |
| | 66.0 | 2.75 | 1.50 | 1.10 |
| | 68.0 | 2.38 | 1.70 | 0.95 |
| | 70.0 | 2.00 | 1.48 | 1.05 |
| | 72.0 | 1.70 | 1.30 | 1.00 |
| | 74.0 | 1.40 | 1.05 | 0.40 |
| | 76.0 | 1.00 | 0.50 | 0.25 |
| | 78.0 | 0.90 | 0.40 | 0.18 |
| | 79.0 | 0.00 | 0.00 | 0.00 |
| | 79.8 | 0.00 | 0.00 | 0.00 |
| | 80.5 | 0.00 | 0.00 | 0.00 |
| | 83.0 | 0.00 | 0.00 | 0.00 |
| | 89.0 | 0.00 | 0.00 | 0.00 |
| | 91.0 | 0.00 | 0.00 | 0.00 |
| Cross Section 6 Station 5+82 | 0.0 | 0.00 | 0.00 | 0.00 |
| | 8.0 | 0.00 | 0.00 | 0.00 |
| | 8.5 | 0.00 | 0.00 | 0.00 |
| | 10.0 | 0.00 | 0.00 | 0.00 |
| | 11.0 | 0.00 | 0.00 | 0.00 |
| | 11.5 | 0.00 | 0.00 | 0.00 |
| | 12.0 | 0.00 | 0.00 | 0.00 |
| | 14.0 | 1.00 | 0.63 | 0.00 |
| | 16.0 | 1.65 | 1.20 | 0.00 |
| | 18.0 | 1.85 | 1.30 | 0.60 |
| | 20.0 | 2.58 | 1.90 | 1.30 |
| | 22.0 | 3.10 | 2.00 | 1.62 |
| | 24.0 | 3.25 | 2.20 | 1.75 |
| | 26.0 | 3.33 | 2.50 | 1.90 |
| | 28.0 | 3.36 | 2.50 | 1.80 |
| | 30.0 | 3.35 | 2.40 | 1.90 |
| | 32.0 | 3.33 | 2.70 | 1.97 |
| | 34.0 | 3.32 | 2.60 | 2.00 |
| | 36.0 | 3.31 | 2.50 | 1.85 |

Table B-3.4 (cont.) IFG-4 Calibration velocities (ft/sec) at site 136.0L.

| Location Within Site | Hor Dist (ft) | Velocities at 265 cfs | Velocities at 153 cfs | Velocities at 81 cfs |
|---|---|---|---|---|
| Cross Section 6 | 38.0 | 2.95 | 2.60 | 2.25 |
| Station 5+82 | 40.0 | 2.78 | 2.20 | 1.95 |
| (cont.) | 42.0 | 2.69 | 2.40 | 1.70 |
| | 44.0 | 2.65 | 2.30 | 1.60 |
| | 46.0 | 2.40 | 1.90 | 1.25 |
| | 48.0 | 2.40 | 2.05 | 1.10 |
| | 50.0 | 2.30 | 2.00 | 1.10 |
| | 52.0 | 2.05 | 1.40 | 0.90 |
| | 54.0 | 2.04 | 1.00 | 0.60 |
| | 56.0 | 1.90 | 1.20 | 0.55 |
| | 58.0 | 1.32 | 0.80 | 0.35 |
| | 60.0 | 0.98 | 0.00 | 0.00 |
| | 62.0 | 0.32 | 0.00 | 0.00 |
| | 63.3 | 0.00 | 0.00 | 0.00 |
| | 65.0 | 0.00 | 0.00 | 0.00 |
| | 67.0 | 0.00 | 0.00 | 0.00 |
| | 68.0 | 0.00 | 0.00 | 0.00 |
| | 76.0 | 0.00 | 0.00 | 0.00 |
| | 79.0 | 0.00 | 0.00 | 0.00 |
| | 81.0 | 0.00 | 0.00 | 0.00 |

Table B-4.1. Comparison between observed and predicted water surface elevations, discharges, and velocities for site 101.2R hydraulic model.

| Streambed Station | Water Surface Elevation | | Discharge | | Velocity |
|---|---|---|---|---|---|
| | Observed | Predicted | Observed | Predicted | Adjustment |
| (ft) | (ft) | (ft) | (cfs) | (cfs) | Factor |
| Calibration Flow 279 cfs | | | | | |
| 0+00 | 361.08 | 361.08 | 272.6 | 272.4 | 1.00 |
| 3+74 | 362.60 | 362.60 | 270.5 | 270.2 | 1.01 |
| 5+64 | 362.98 | 362.98 | 272.5 | 272.2 | .99 |
| 8+37 | 363.20 | 363.20 | 258.0 | 257.7 | .99 |
| 10+23 | 363.50 | 363.50 | 267.5 | 267.2 | .97 |
| 12+79 | 363.50 | 363.50 | 243.8 | 243.6 | 1.00 |
| 14+62 | 364.01 | 364.01 | 270.5 | 270.2 | 1.01 |
| Calibration Flow 25 cfs | | | | | |
| 0+00 | 360.07 | 360.07 | 25.1 | 25.1 | .99 |
| 3+74 | 361.83 | 361.83 | 26.7 | 26.7 | .98 |
| 5+64 | 361.85 | 361.85 | 28.9 | 28.9 | .99 |
| 8+37 | 362.36 | 362.36 | 26.5 | 26.5 | .96 |
| 10+23 | 362.95 | 362.45 | 21.9 | 21.9 | .92 |
| 12+79 | 362.45 | 362.45 | 28.4 | 28.4 | 1.00 |
| 14+62 | 363.34 | 363.34 | 23.5 | 23.5 | .96 |

Table B-4.2. Comparison between observed and predicted water surface elevations, discharges, and velocities for site 131.7L hydraulic model.

| Streambed Station (ft) | Water Surface Elevation Observed (ft) | Water Surface Elevation Predicted (ft) | Discharge Observed (cfs) | Discharge Predicted (cfs) | Velocity Adjustment Factor |
|---|---|---|---|---|---|
| Calibration Flow 240 cfs | | | | | |
| 0+00 | 617.03 | 617.01 | 230.8 | 240.0 | .98 |
| 2+45 | 617.07 | 617.05 | 253.3 | 239.5 | .98 |
| 6+45 | 617.61 | 617.56 | 221.8 | 230.6 | .97 |
| 9+45 | 617.63 | 617.56 | 227.5 | 219.1 | .99 |
| 11+90 | 618.17 | 618.12 | 242.5 | 235.8 | .98 |
| 16+30 | 619.52 | 619.50 | 250.8 | 247.1 | .98 |
| 19+05 | 620.71 | 620.69 | 259.7 | 257.3 | .99 |
| Calibration Flow 150 cfs | | | | | |
| 0+00 | 616.78 | 616.81 | 156.7 | 150.9 | 1.01 |
| 2+45 | 616.91 | 616.92 | 160.2 | 153.7 | 1.02 |
| 6+45 | 617.32 | 617.35 | 156.0 | 151.6 | 1.01 |
| 9+45 | 617.28 | 617.33 | 137.4 | 142.0 | 1.03 |
| 11+90 | 617.77 | 617.82 | 144.2 | 147.9 | 1.03 |
| 16+30 | 619.23 | 619.25 | 152.5 | 155.3 | 1.02 |
| 19+05 | 620.55 | 620.59 | 151.9 | 162.0 | 1.02 |
| Calibration Flow 55 cfs | | | | | |
| 0+00 | 616.42 | 616.41 | 57.3 | 56.1 | 1.00 |
| 2+45 | 616.69 | 616.69 | 58.4 | 56.6 | 1.04 |
| 6+45 | 616.92 | 616.97 | 61.9 | 58.8 | 1.03 |
| 9+45 | 616.86 | 616.92 | 51.0 | 53.4 | 1.03 |
| 11+90 | 617.24 | 617.26 | 49.8 | 52.3 | 1.04 |
| 16+30 | 618.73 | 618.74 | 54.5 | 54.5 | 1.01 |
| 19+05 | 620.41 | 620.39 | 62.0 | 57.1 | 1.01 |
| Calibration Flow 18 cfs | | | | | |
| 0+00 | 616.03 | 616.04 | 17.9 | 18.6 | .92 |
| 2+45 | 616.49 | 616.49 | 18.6 | 19.5 | .96 |
| 6+45 | 616.67 | 616.65 | 20.2 | 21.5 | .99 |
| 9+45 | 616.62 | 616.59 | 19.2 | 18.8 | .94 |
| 11+90 | 616.83 | 616.82 | 17.5 | 17.3 | .94 |
| 16+30 | 618.30 | 618.30 | 17.6 | 17.9 | 1.00 |
| 19+05 | 620.20 | 620.20 | 17.9 | 18.8 | .96 |

Table B-4.3. Comparison between observed and predicted water surface elevations, discharges, and velocities for site 132.6L hydraulic model.

| Streambed Station (ft) | Water Surface Elevation Observed (ft) | Water Surface Elevation Predicted (ft) | Discharge Observed (cfs) | Discharge Predicted (cfs) | Velocity Adjustment Factor |
|---|---|---|---|---|---|
| Calibration Flow 141 cfs | | | | | |
| 0+00 | 626.05 | 626.05 | 127.2 | 127.4 | 1.00 |
| 1+24 | 626.28 | 626.28 | 142.0 | 142.3 | .99 |
| 2+46 | 627.29 | 627.29 | 145.9 | 146.2 | 1.01 |
| 3+90 | 627.95 | 627.95 | 145.2 | 145.5 | 1.02 |
| 5+11 | 628.10 | 628.10 | 140.2 | 140.5 | .97 |
| 6+94 | 628.16 | 628.16 | 142.4 | 142.7 | .96 |
| 8+52 | 628.17 | 628.17 | 142.2 | 142.4 | .95 |
| 9+79 | 628.19 | 628.19 | 132.3 | 132.6 | .98 |
| 11+31 | 628.43 | 628.43 | 142.7 | 142.9 | 1.00 |
| Calibration Flow 27 cfs | | | | | |
| 0+00 | 625.33 | 625.33 | 23.1 | 23.1 | 1.00 |
| 1+24 | 625.65 | 625.65 | 27.2 | 27.2 | 1.00 |
| 2+46 | 626.28 | 626.28 | 26.5 | 26.5 | .99 |
| 3+90 | 627.23 | 627.23 | 25.1 | 25.1 | .98 |
| 5+11 | 627.41 | 627.41 | 26.4 | 26.4 | .97 |
| 6+94 | 627.43 | 627.43 | 28.0 | 28.0 | .96 |
| 8+52 | 627.43 | 627.43 | 29.2 | 29.2 | .87 |
| 9+79 | 627.52 | 627.52 | 27.6 | 27.6 | .99 |
| 11+31 | 628.09 | 628.09 | 26.5 | 26.5 | .92 |

Table B-4.4. Comparison between observed and predicted water surface elevations, discharges, and velocities for site 136.0L hydraulic model.

| Streambed Station (ft) | Water Surface Elevation Observed (ft) | Water Surface Elevation Predicted (ft) | Discharge Observed (cfs) | Discharge Predicted (cfs) | Velocity Adjustment Factor |
|---|---|---|---|---|---|
| Calibration Flow 265 cfs | | | | | |
| 0+00 | 675.81 | 675.78 | 266.4 | 266.4 | 1.00 |
| 0+80 | 675.97 | 675.94 | 268.1 | 267.3 | .99 |
| 1+95 | 676.39 | 676.37 | 274.3 | 272.4 | .99 |
| 2+91 | 676.65 | 676.61 | 273.0 | 270.3 | 1.00 |
| 4+23 | 677.10 | 677.10 | 263.0 | 266.9 | .99 |
| 5+82 | 677.53 | 677.49 | 268.4 | 264.4 | .99 |
| Calibration Flow 153 cfs | | | | | |
| 0+00 | 675.14 | 675.18 | 151.8 | 151.0 | .99 |
| 0+88 | 675.31 | 675.35 | 158.5 | 158.8 | 1.00 |
| 1+95 | 675.77 | 675.80 | 148.7 | 150.1 | 1.00 |
| 2+91 | 676.00 | 676.07 | 157.2 | 160.1 | 1.00 |
| 4+23 | 676.72 | 676.72 | 156.9 | 152.1 | 1.01 |
| 5+82 | 676.97 | 677.04 | 151.4 | 156.2 | .99 |
| Calibration Flow 81 cfs | | | | | |
| 0+00 | 674.64 | 674.62 | 78.2 | 78.3 | 1.00 |
| 0+88 | 674.82 | 674.80 | 87.1 | 86.9 | 1.00 |
| 1+95 | 675.31 | 675.30 | 75.8 | 75.3 | 1.00 |
| 2+91 | 675.61 | 675.58 | 88.3 | 87.3 | 1.01 |
| 4+23 | 676.33 | 676.33 | 78.3 | 79.3 | 1.00 |
| 5+82 | 676.64 | 676.61 | 86.6 | 84.9 | .99 |

Table B-5. Statistics evaluating predictive ability of IFG-4 hydraulic models.

| | | N | $\bar{O}$ | $\bar{P}$ | Std O | Std P | a | b | TOTAL RMSE | SYSTEM RMSE | UNSYST RMSE | d |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site 101.2R | DEP | 715 | 1.1704 | 1.1599 | 0.6114 | 0.6071 | 0.0023 | 0.9891 | 0.0957 | 0.0100 | 0.0943 | 0.9962 |
| | VEL | 715 | 0.8910 | 0.9086 | 0.6363 | 0.6012 | 0.0532 | 0.9600 | 0.1269 | 0.0361 | 0.1212 | 0.9934 |
| Site 131.7L | DEP | 900 | 1.0175 | 1.0102 | 0.6251 | 0.6130 | 0.0155 | 0.9776 | 0.1262 | 0.0173 | 0.1245 | 0.9935 |
| | VEL | 900 | 0.5370 | 0.5454 | 0.2917 | 0.2864 | 0.0186 | 0.9809 | 0.0770 | 0.0100 | 0.0755 | 0.9948 |
| Site 132.6L | DEP | 629 | 1.0732 | 1.0663 | 0.5619 | 0.5547 | 0.0157 | 0.9789 | 0.1284 | 0.0171 | 0.1273 | 0.9925 |
| | VEL | 629 | 0.8495 | 0.8882 | 0.6349 | 0.5711 | 0.0988 | 0.9291 | 0.1659 | 0.0683 | 0.1511 | 0.9884 |
| Site 136.0L | DEP | 474 | 1.5189 | 1.5127 | 0.6589 | 0.6408 | 0.0478 | 0.9644 | 0.1701 | 0.0283 | 0.1673 | 0.9887 |
| | VEL | 474 | 1.7559 | 1.7711 | 1.2827 | 1.2037 | 0.0878 | 0.9586 | 0.1647 | 0.0490 | 0.1572 | 0.9945 |

N = number of observations.
$\bar{O}$, $\bar{P}$ = mean of observed and predicted values.
Std O, Std P = standard deviation of observed and predicted values.
a, b = y-intercept and slope of least squares regression between O and P.
RMSE = root mean square error, total, systematic and unsystematic.
d = index of agreement.
* see Willmott (1981) for discussion and use of these statistics.

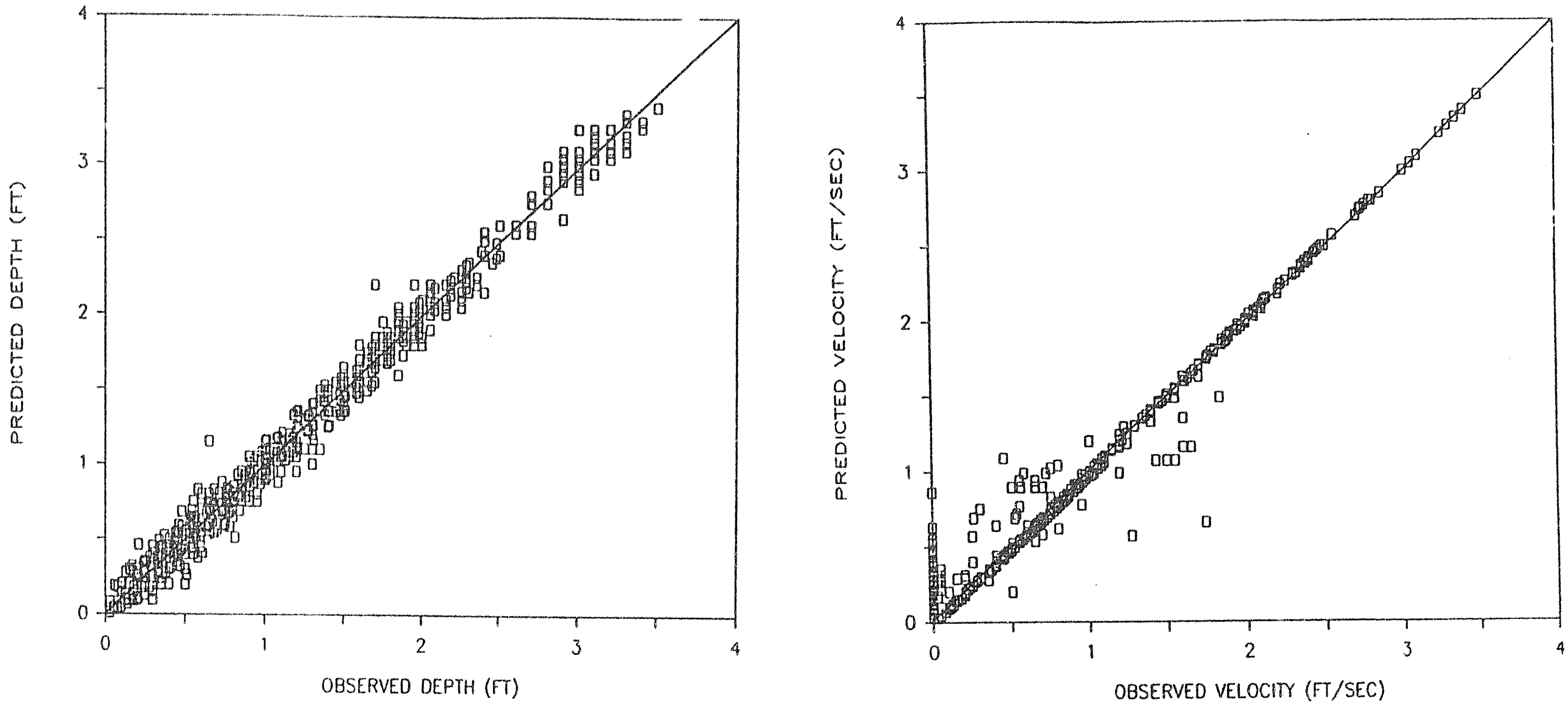



Figure B-2.1  Scatterplots of observed and predicted depths and velocities from the calibrated IFG-4 hydraulic model at 101.2R.

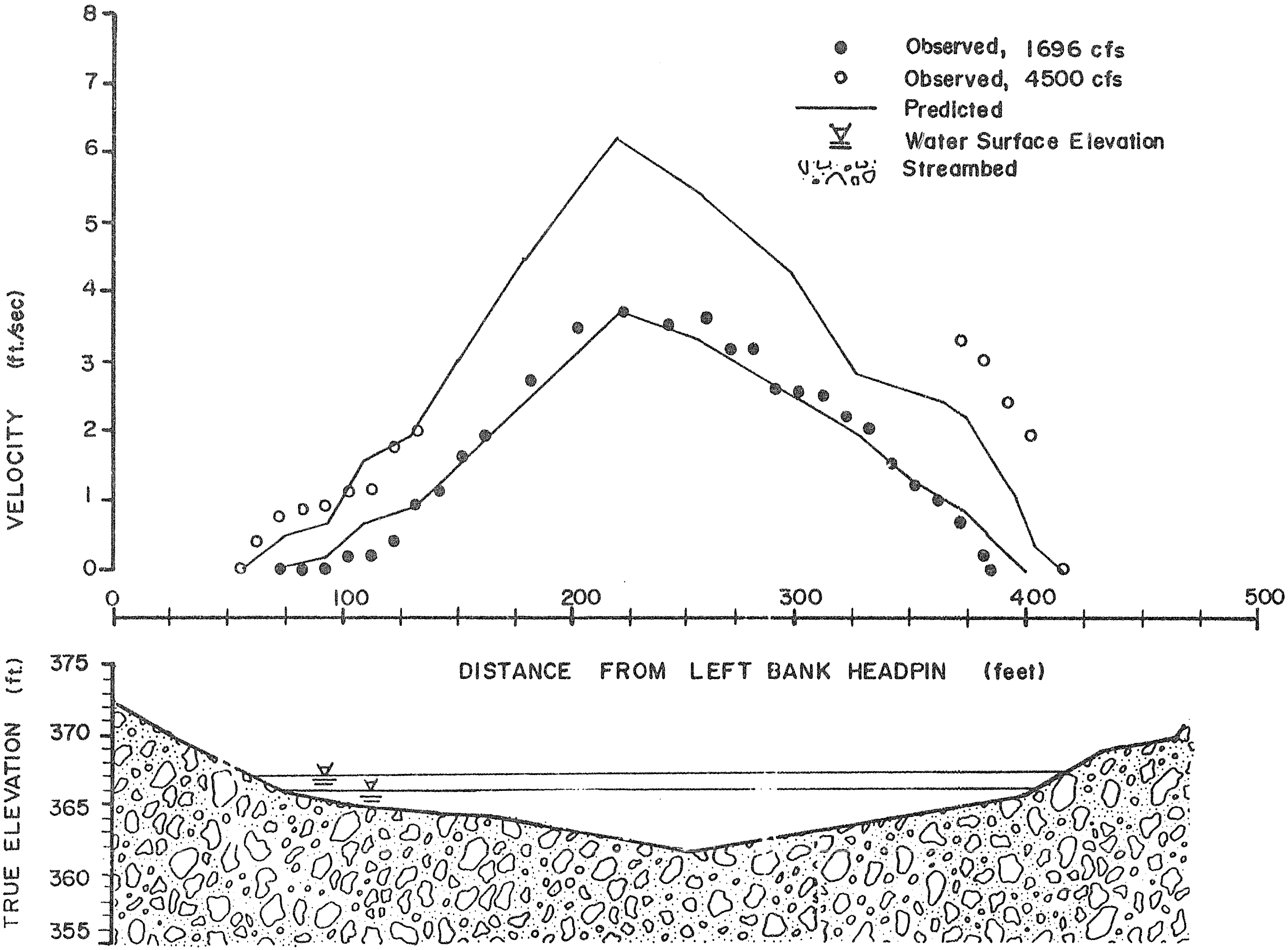



Figure B-2.2 Comparison of observed velocities and velocities predicted by low flow IFG-2 model at site 101.5L, cross section 5.

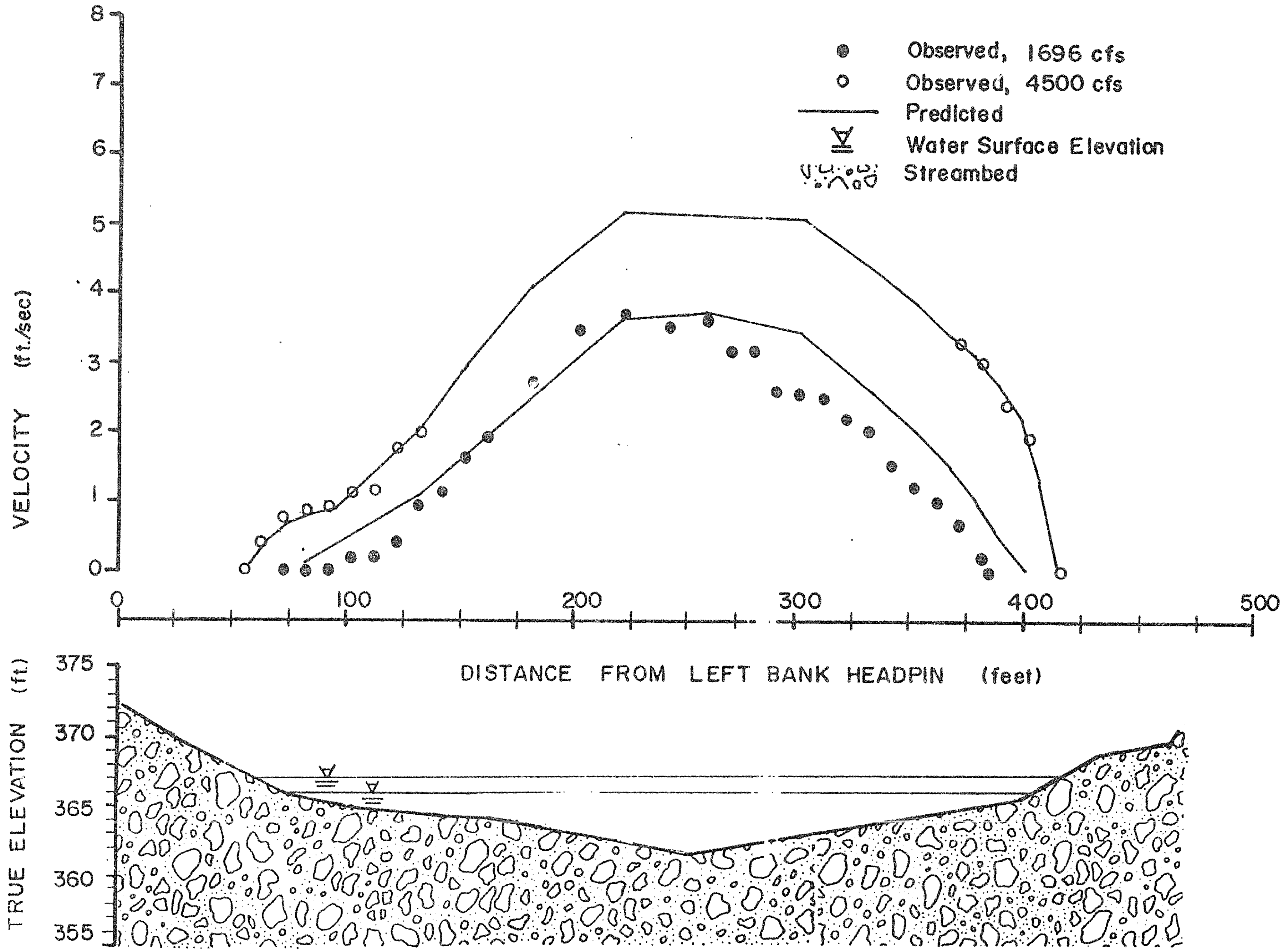



Figure B-2.3 Comparison of observed velocities and velocities predicted by high flow IFG-2 model at site 101.5L, cross section 5.

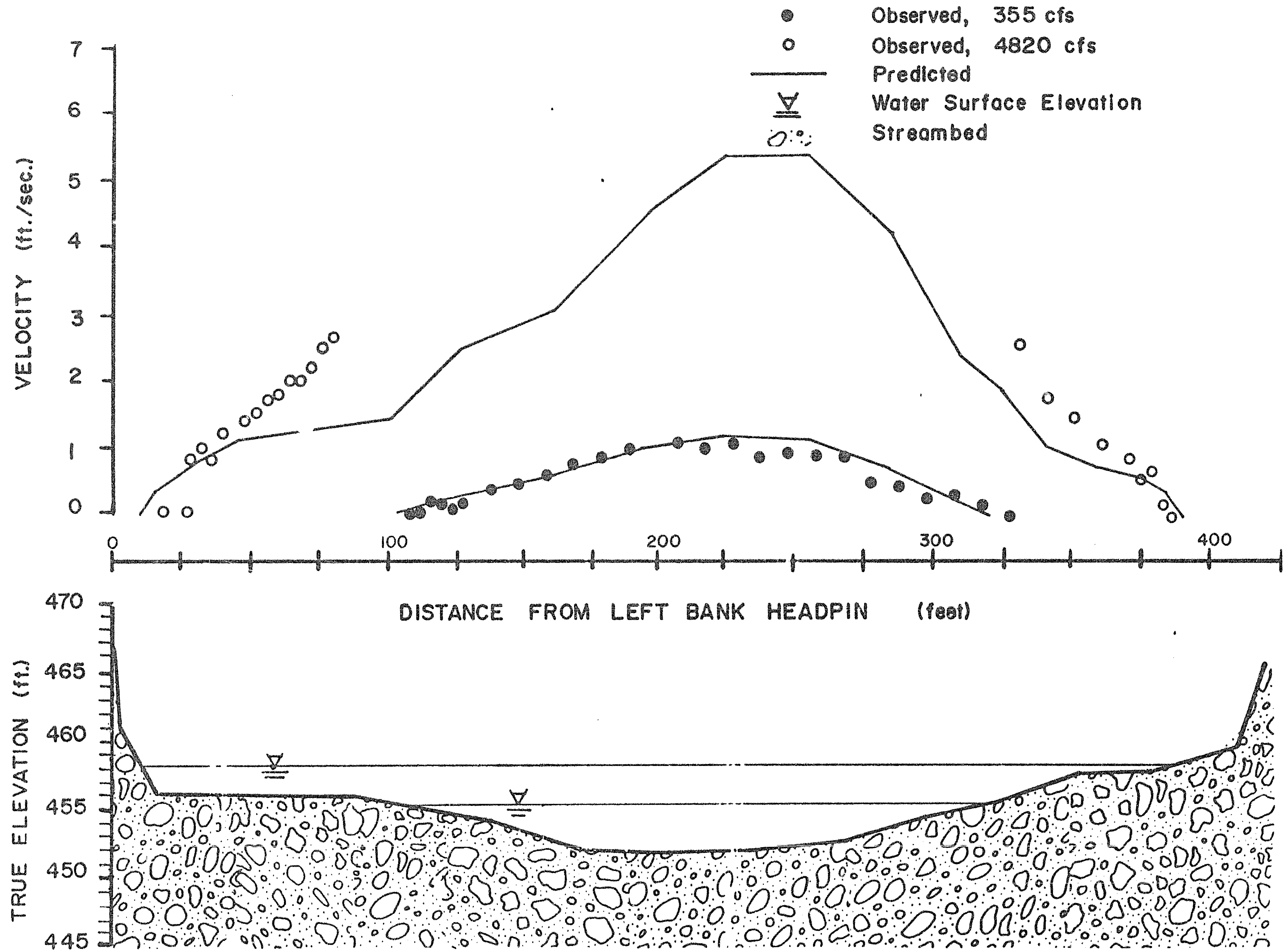



Figure B-2.4 Comparison of observed velocities and velocities predicted by low flow IFG-2 model at site 112.6L, cross section 7.

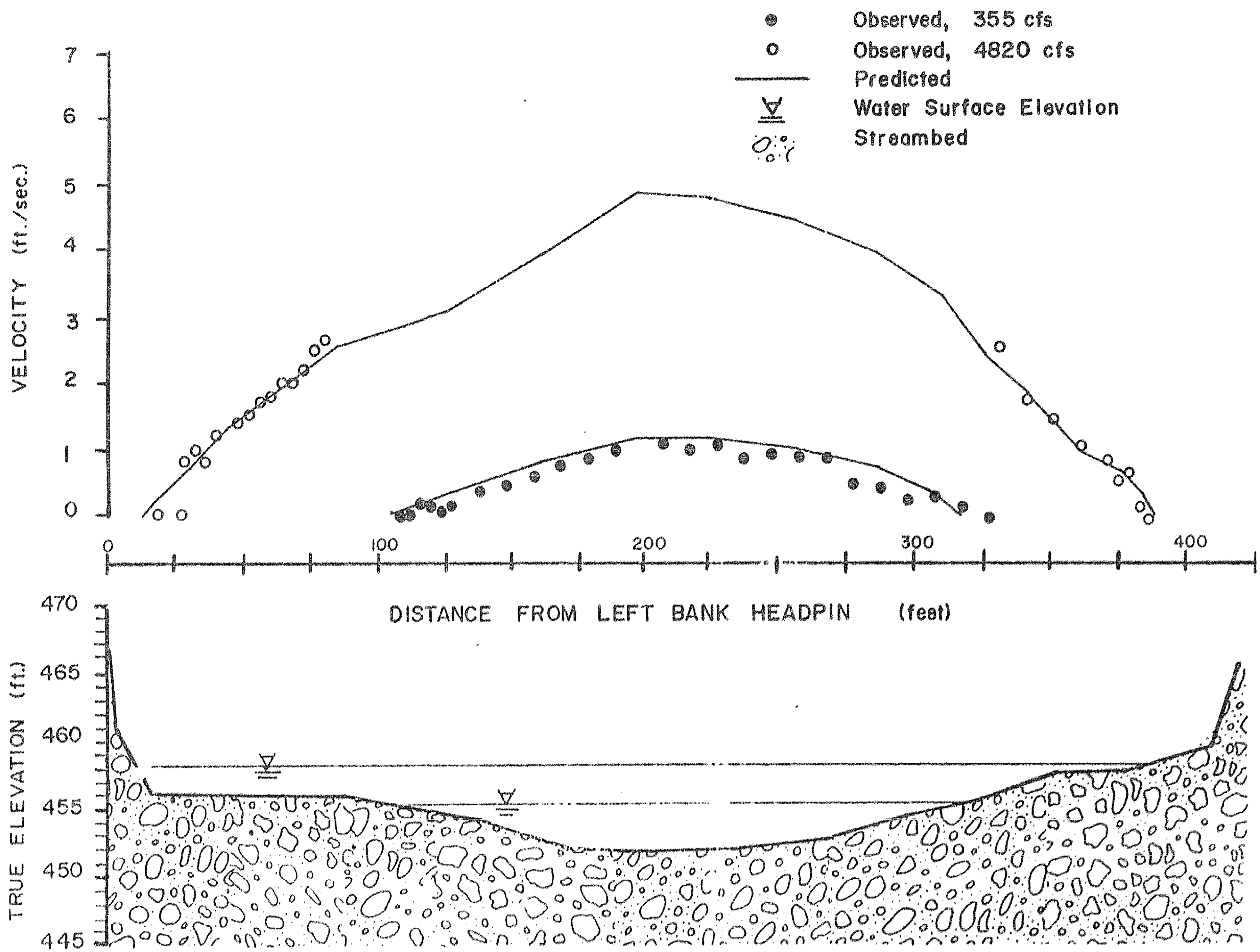



Figure B-2.5 Comparison of observed velocities and velocities predicted by high flow IFG-2 model at site 112.6L, cross section 7.

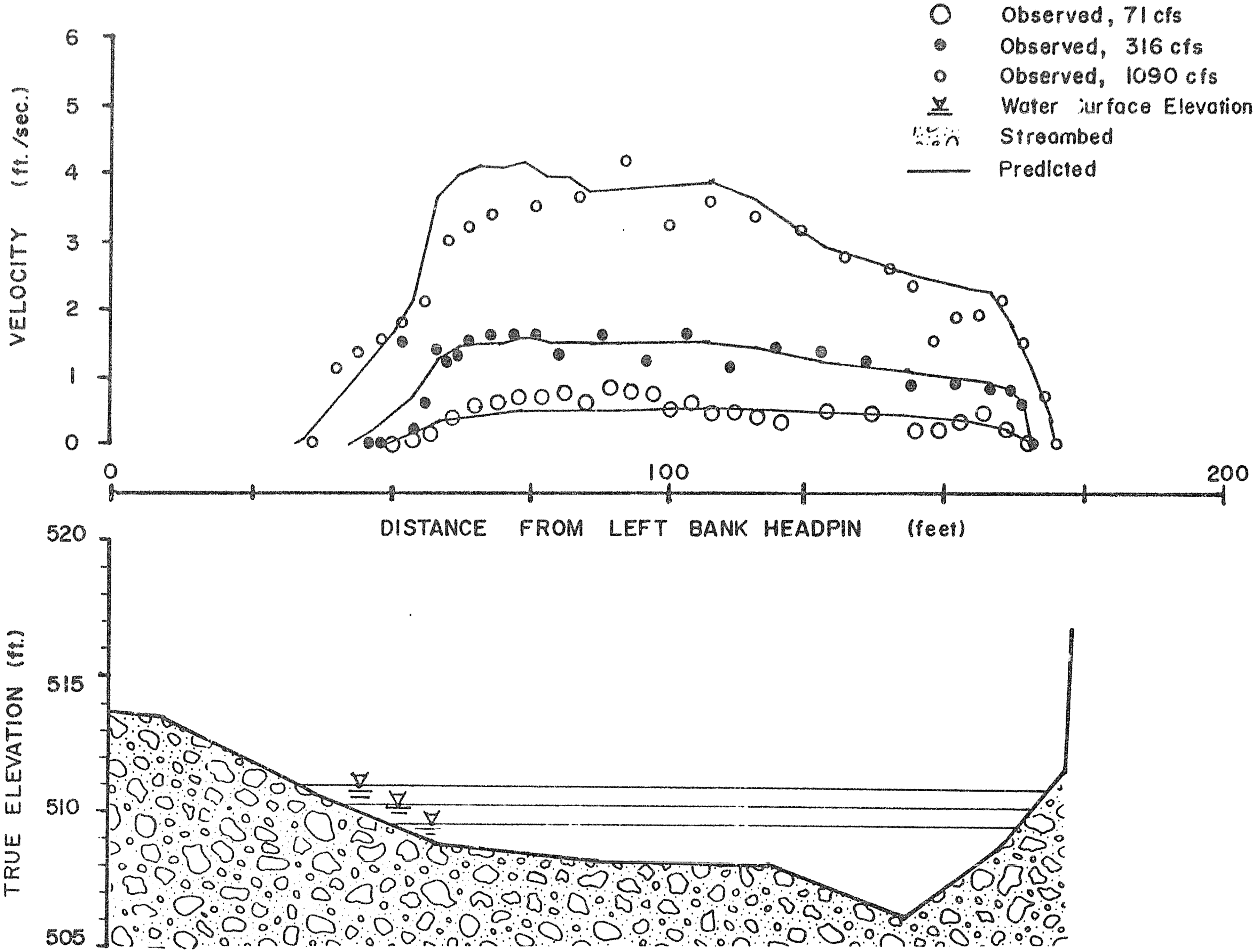



Figure B-2.6 Comparison of observed velocities and velocities predicted by IFG-2 model at site 119.2R, cross section 3.

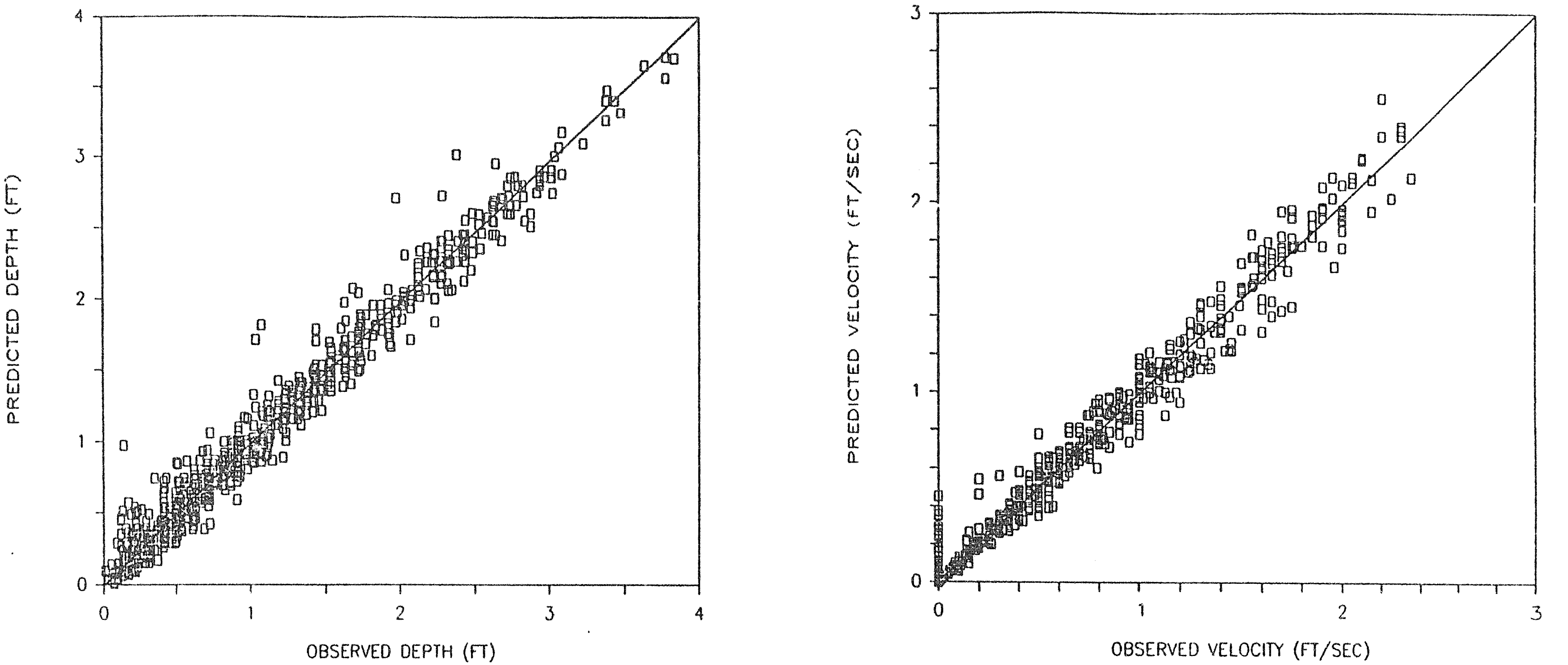



Figure B-2.7 Scatterplots of observed and predicted depths and velocities from the calibrated IFG-4 hydraulic model at 131.7L. The diagonal line in each plot represents a one-to-one relationship.

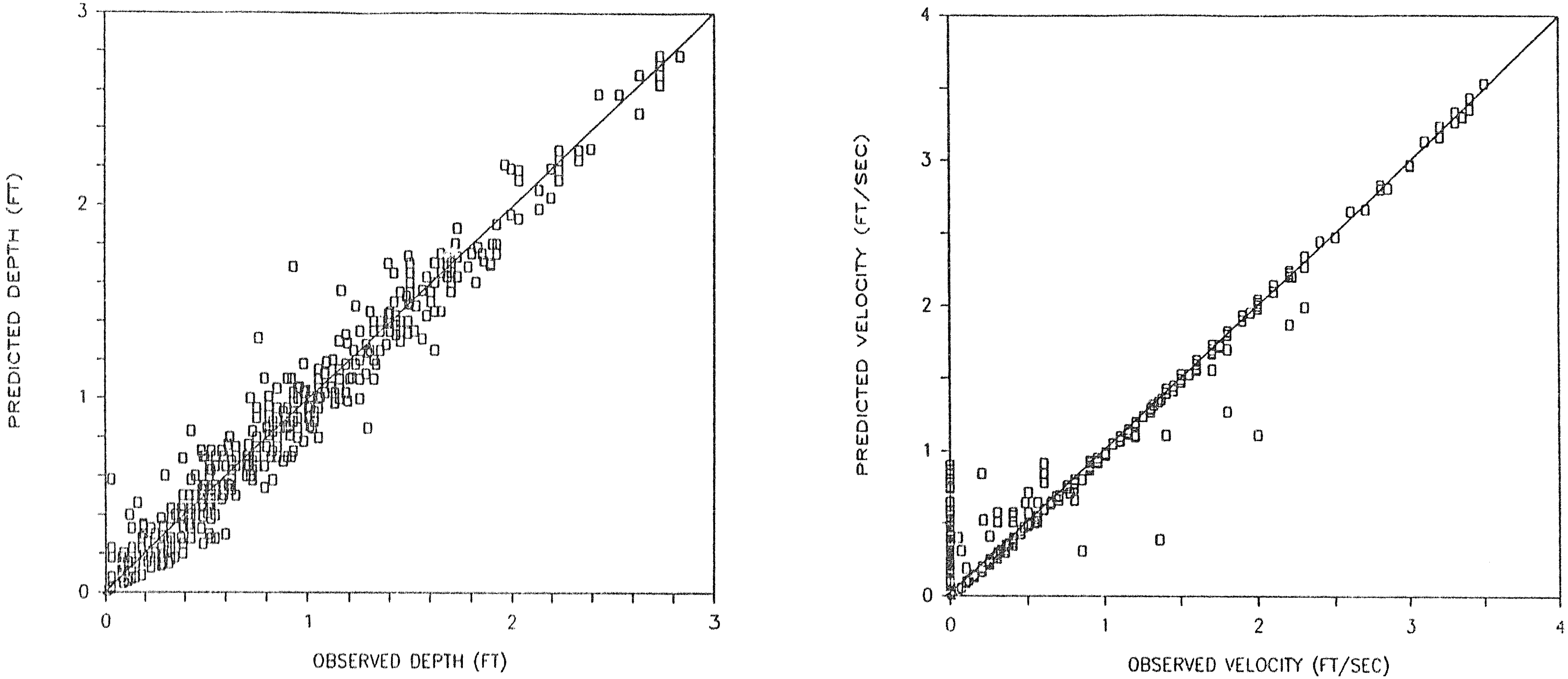
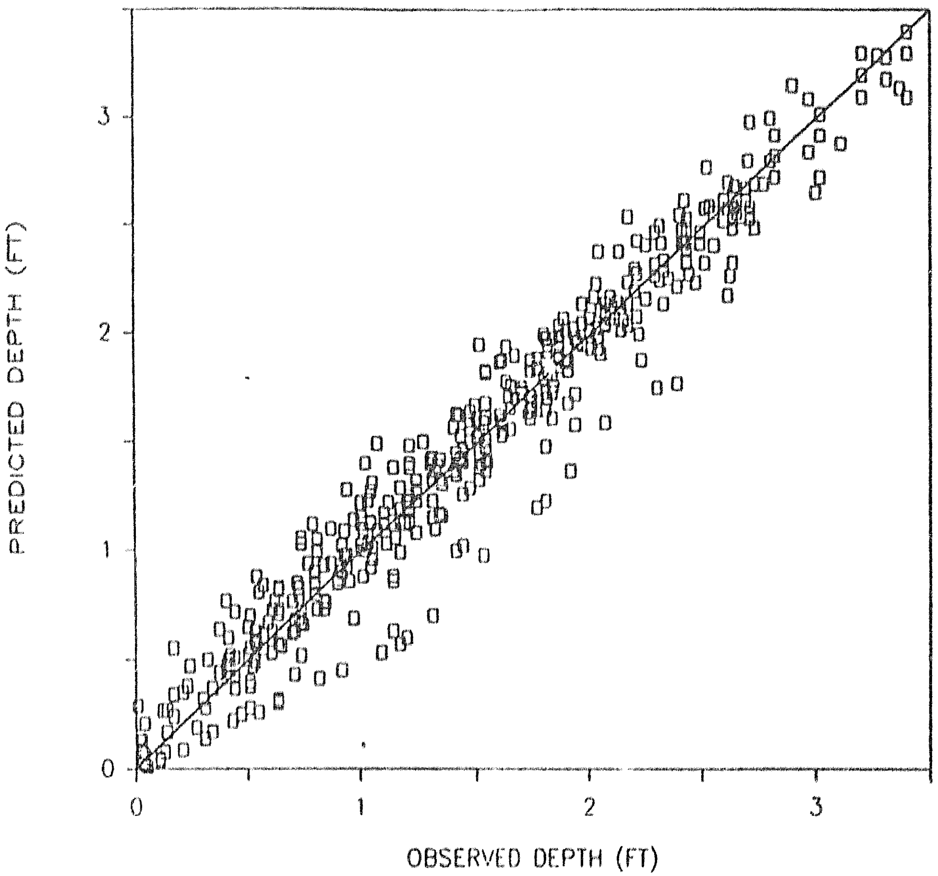



Figure B-2.8 Scatterplots of observed and predicted depths and velocities from the [illegible] calibrated IFG-4 hydraulic model at 132.6L. The diagonal line in each plot represents a one-to-one relationship.



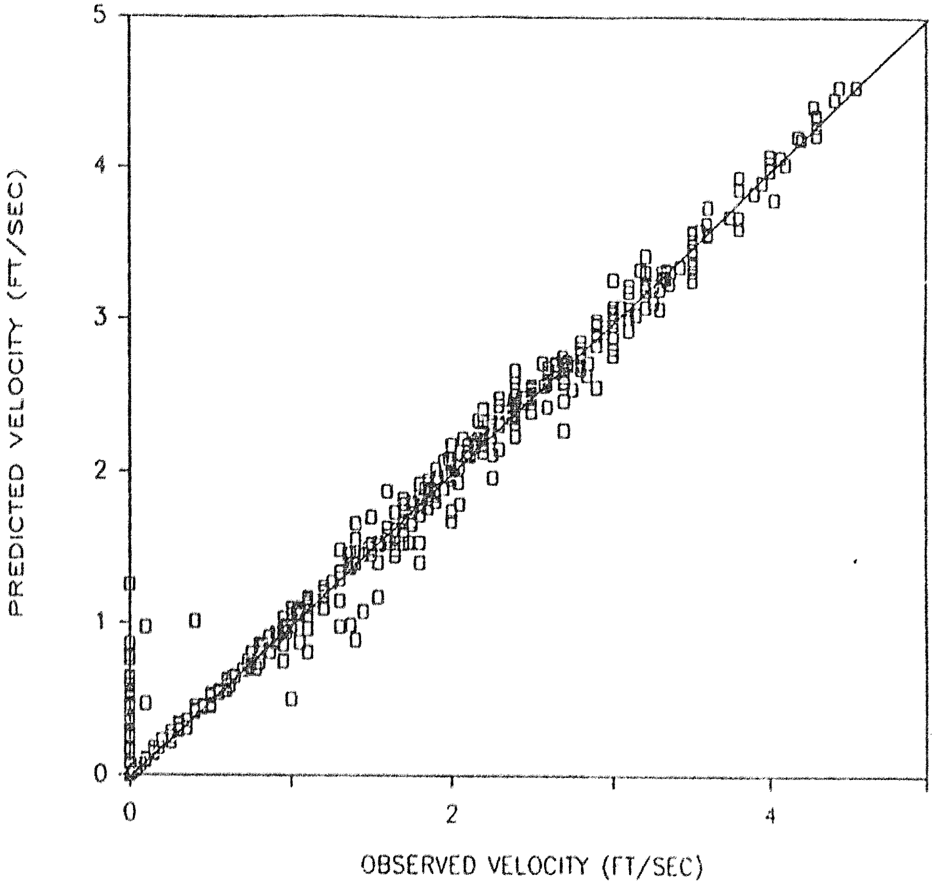




Figure B-2.9 Scatterplots of observed and predicted depths and velocities from the calibrated IFG-4 hydraulic model at 136.0L. The diagonal line in each plot represents a one-to-one relationship.

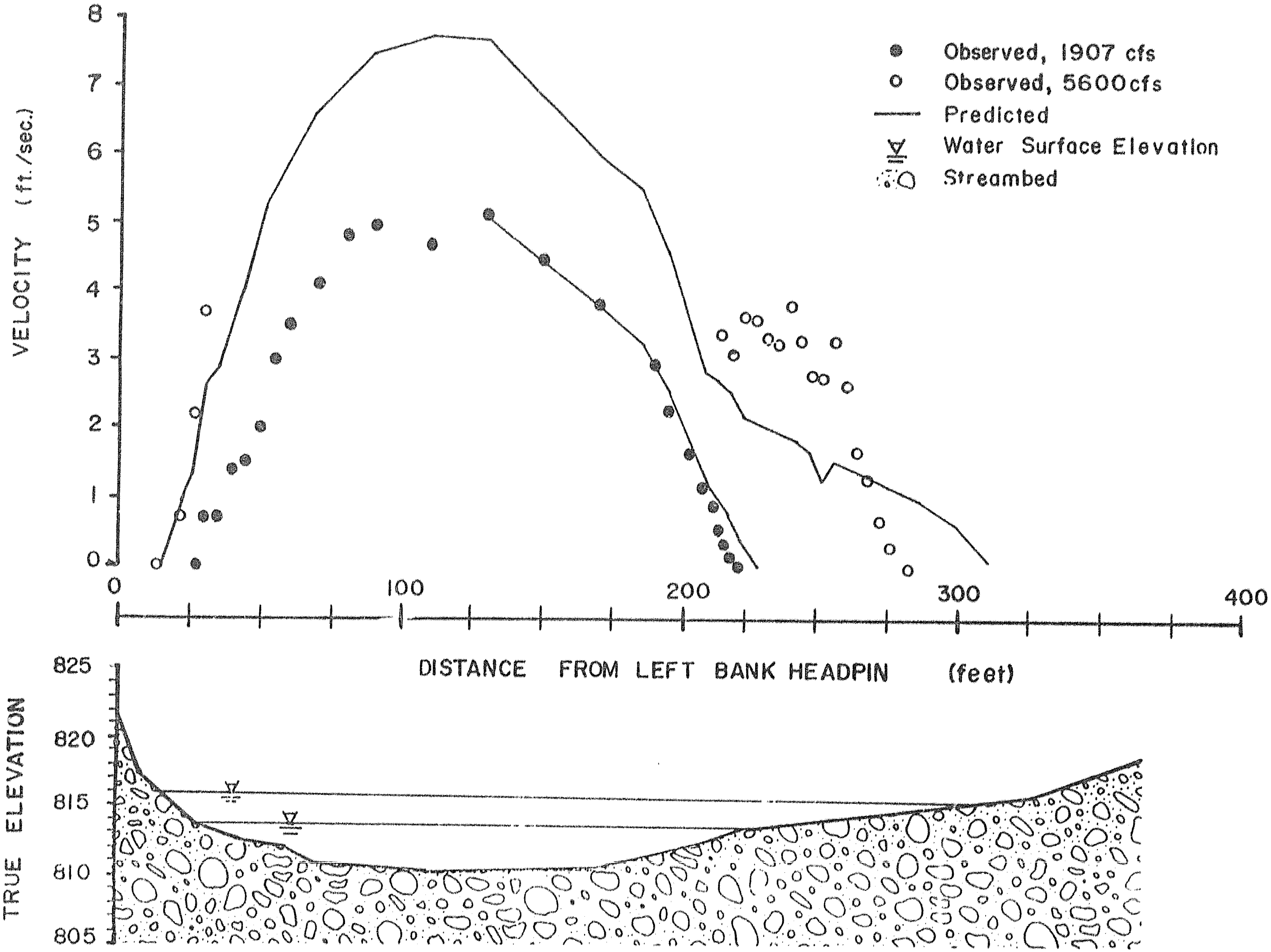



Figure B-2.10 Comparison of observed velocities and velocities predicted by high flow IFG-2 model at site 147.1L, cross section 2.

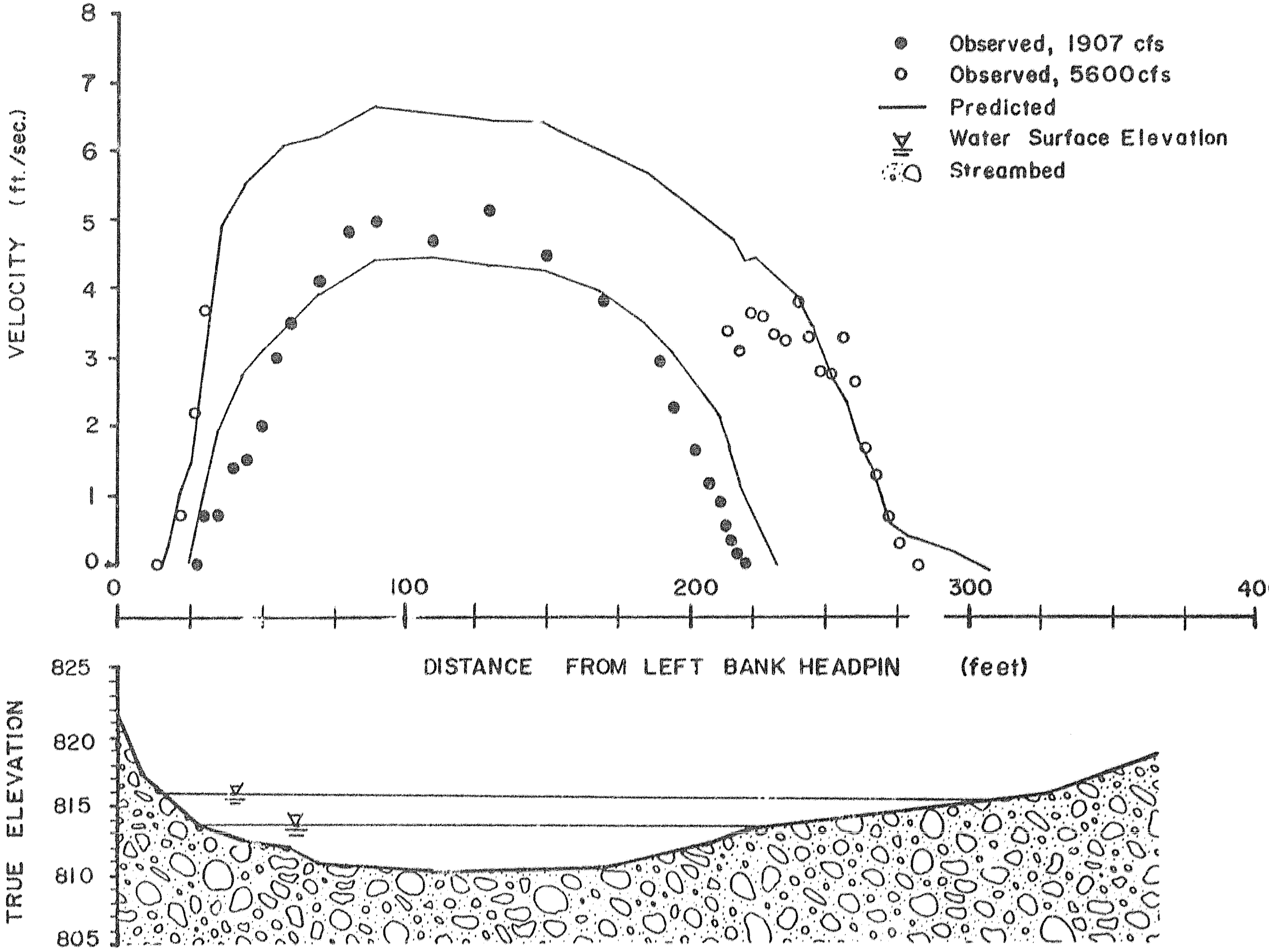



Figure B-2.11 Comparison of observed velocites and velocities predicted by high flow IFG-2 model at site 147.1L, cross section 2.

Table B-6.1. Mainstem discharge, site flow and water surface elevation (WSEL), wetted (gross) surface area and juvenile chinook weighted usable area (WUA) forecast for Site 101.1R. Rating curves are not available for the unbreached condition (<9,200 cfs); mainstem discharge versus site flow rating curve is inapplicable above 22,000 cfs. Low and high turbidity conditions are assumed for discharges below and above 9,200 cfs.

| MAINSTEM DISCHARGE (cfs) | SITE FLOW (cfs) | SITE WSEL (ft) | GROSS SURFACE AREA (sq. ft. / 1000 linear ft.) | | JUVENILE CHINOOK WUA (sq. ft. / 1000 linear ft.) | |
|---|---|---|---|---|---|---|
| 5000 | - | - | 31588 | 1 | 0 | 4 |
| 6000 | - | - | 39026 | 2 | 0 | 4 |
| 7000 | - | - | 46463 | 1 | 1471 | 2 |
| 8000 | - | - | 58631 | 2 | 5570 | 2 |
| 9000 | - | - | 70798 | 2 | 11210 | 2 |
| 10000 | 8 | 362.19 | 83712 | | 26261 | |
| 11000 | 16 | 362.40 | 90471 | | 29533 | |
| 12000 | 32 | 362.60 | 99200 | | 26931 | |
| 13000 | 59 | 362.81 | 111981 | | 24498 | |
| 14000 | 104 | 363.01 | 127928 | | 22709 | |
| 15000 | 177 | 363.22 | 140939 | | 20795 | |
| 16000 | 290 | 363.42 | 152865 | | 18577 | |
| 17000 | 463 | 363.62 | 158443 | 3 | 17791 | 5 |
| 18000 | 720 | 363.82 | 164242 | 3 | 17042 | 5 |
| 19000 | 1092 | 364.03 | 170271 | 3 | 16328 | 5 |
| 20000 | 1622 | 364.23 | 176541 | 3 | 15646 | 5 |
| 21000 | 2363 | 364.43 | 183062 | 3 | 14996 | 5 |
| 22000 | 3383 | 364.63 | 187100 | 3 | 14376 | 5 |
| 23000 | - | 364.83 | 188468 | 3 | 13783 | 5 |
| 24000 | - | 365.03 | 189847 | 3 | 13218 | 5 |
| 25000 | - | 365.22 | 191237 | 3 | 12678 | 5 |
| 26000 | - | 365.42 | 192637 | 3 | 12162 | 5 |
| 27000 | - | 365.62 | 197317 | 1 | 11670 | 5 |
| 28000 | - | 365.82 | 198766 | 3 | 11199 | 5 |
| 29000 | - | 366.02 | 200227 | 3 | 10749 | 5 |
| 30000 | - | 366.21 | 201699 | 3 | 10320 | 5 |
| 31000 | - | 366.41 | 203182 | 3 | 9909 | 5 |
| 32000 | - | 366.61 | 204678 | 3 | 9516 | 5 |
| 33000 | - | 366.80 | 206186 | 3 | 9141 | 5 |
| 34000 | - | 367.00 | 207705 | 3 | 8781 | 5 |
| 35000 | - | 367.19 | 209237 | 3 | 8452 | 5 |

1 Surface area based on aerial photography measurements
2 Interpolated value
3 Surface area at time t calculated as surface area at time t-1 raised to 1.003.
4 Site ponded
5 WUA at time t calculated as WUA at time t-1 raised to 0.998.

Table B-6.2. Mainstem discharge, site flow and water surface elevation (WSEL), wetted (gross) surface area nad juvenile chinook weighted usable area (WUA) forecast for Site 101.5L. High turbidity habitat suitability criteria were used for all discharges. The low and high flow IFG-2 models were used to forecast hydraulic conditions below and above 8,500 cfs, respectively.

| MAINSTEM DISCHARGE (cfs) | SITE FLOW (cfs) | SITE WSEL (ft) | GROSS SURFACE AREA (sq. ft. / 1000 linear ft.) | JUVENILE CHINOOK WUA (sq. ft. / 1000 linear ft.) |
|---|---|---|---|---|
| 5000 | 1466 | 361.40 | 280658 | 10944 |
| 6000 | 1570 | 361.47 | 284270 | 11895 |
| 7000 | 1664 | 361.54 | 290918 | 12764 |
| 8000 | 1784 | 361.62 | 300690 | 12870 |
| 9000 | 2056 | 361.80 | 308659 | 16262 |
| 10000 | 2333 | 361.97 | 314499 | 15600 |
| 11000 | 2616 | 362.15 | 320018 | 14928 |
| 12000 | 2905 | 362.32 | 325201 | 13222 |
| 13000 | 3198 | 362.49 | 331026 | 13783 |
| 14000 | 3496 | 362.66 | 337097 | 14000 |
| 15000 | 3798 | 362.82 | 342076 | 13521 |
| 16000 | 4105 | 362.99 | 345779 | 13030 |
| 17000 | 4415 | 363.15 | 351556 | 12000 |
| 18000 | 4729 | 363.32 | 357494 | 12323 |
| 19000 | 5047 | 363.48 | 362829 | 13110 |
| 20000 | 5368 | 363.64 | 368698 | 13338 |
| 21000 | 5692 | 363.80 | 372888 | 15676 |
| 22000 | 6019 | 363.96 | 377822 | 16513 |
| 23000 | 6349 | 364.12 | 383558 | 17116 |
| 24000 | 6683 | 364.27 | 387323 | 17335 |
| 25000 | 7019 | 364.43 | 392111 | 17920 |
| 26000 | 7357 | 364.59 | 397762 | 20112 |
| 27000 | 7699 | 364.74 | 402730 | 20922 |
| 28000 | 8043 | 364.30 | 407211 | 21382 |
| 29000 | 8389 | 365.05 | 410691 | 21240 |
| 30000 | 8738 | 365.21 | 413092 | 20348 |
| 31000 | 9090 | 365.36 | 415338 | 19664 |
| 32000 | 9443 | 365.51 | 417868 | 19455 |
| 33000 | 9799 | 365.66 | 420008 | 18859 |
| 34000 | 10156 | 365.81 | 421598 | 18207 |
| 35000 | 10516 | 365.96 | 423318 | 17731 |

Table B-6.3. Mainstem discharge, site flow and water surface elevation (WSEL), wetted (gross) surface area and juvenile chinook weighted usable area (WUA) modeled for Site 112.6L. High turbidity habitat suitability criteria were used for all discharges. The low and high flow IFG-2 models were used to forecast hydraulic conditions below and above 10,500 and 11,000 cfs, respectively. Surface area and WUA values within the range of overlap are averages of output from both IFG-2/HABTAT models.

| MAINSTEM DISCHARGE (cfs) | SITE FLOW (cfs) | SITE WSEL (ft) | GROSS SURFACE AREA (sq. ft. / 1000 linear ft.) | JUVENILE CHINOOK WUA (sq. ft. / 1000 linear ft.) | |
|---|---|---|---|---|---|
| 5000 | 96 | 449.93 | 241007 | 76512 | |
| 6000 | 181 | 450.29 | 280371 | 72545 | |
| 7000 | 310 | 450.61 | 318562 | 69149 | 1 |
| 8000 | 493 | 450.91 | 340249 | 63242 | |
| 9000 | 742 | 451.18 | 357920 | 51672 | |
| 10000 | 1069 | 451.43 | 375250 | 40909 | |
| 11000 | 1488 | 451.67 | 387719 | 28522 | |
| 12000 | 1808 | 451.90 | 402981 | 22284 | |
| 13000 | 2141 | 452.12 | 412202 | 20101 | |
| 14000 | 2504 | 452.32 | 427124 | 19212 | |
| 15000 | 2896 | 452.52 | 442689 | 22461 | |
| 16000 | 3318 | 452.71 | 453276 | 24175 | |
| 17000 | 3771 | 452.89 | 462377 | 24900 | |
| 18000 | 4255 | 453.06 | 467125 | 22166 | |
| 19000 | 4769 | 453.23 | 471074 | 19233 | |
| 20000 | 5314 | 453.39 | 474600 | 16707 | |
| 21000 | 5891 | 453.55 | 477784 | 14799 | |
| 22000 | 6498 | 453.71 | 481584 | 13045 | |
| 23000 | 7137 | 453.86 | 484249 | 11943 | |
| 24000 | 7808 | 454.00 | 486796 | 10814 | |
| 25000 | 8510 | 454.14 | 489256 | 10066 | |
| 26000 | 9244 | 454.28 | 491644 | 9368 | |
| 27000 | 10011 | 454.42 | 493951 | 8684 | |
| 28000 | 10809 | 454.55 | 496166 | 8028 | |
| 29000 | 11640 | 454.68 | 498304 | 7396 | |
| 30000 | 12503 | 454.81 | 500362 | 6855 | |
| 31000 | 13399 | 454.93 | 502333 | 6419 | |
| 32000 | 14327 | 455.05 | 503909 | 5990 | |
| 33000 | 15288 | 455.17 | 505493 | 5576 | |
| 34000 | 16282 | 455.29 | 508227 | 5530 | |
| 35000 | 17309 | 455.40 | 510083 | 5075 | |

1 Interpolated val e

Table B-6.4. Mainstem discharge,site flow and water surface elevation (WSEL), wetted (gross) surface area and juvenile chinook weighted usable area (WUA) forecast for Site 119.2R. Low and high turbidity conditions were assumed for discharges below and above 10,000 cfs. Rating curves were inapplicable in the 5-10,000 and 25-35,000 cfs discharge range.

| MAINSTEM DISCHARGE (cfs) | SITE FLOW (cfs) | SITE WSEL (ft) | GROSS SURFACE AREA (sq. ft. / 1000 linear ft.) | | JUVENILE CHINOOK WUA (sq. ft. / 1000 linear ft.) | |
|---|---|---|---|---|---|---|
| 5000 | - | - | 56282 | 1 | 10468 | 4 |
| 6000 | - | - | 56282 | 1 | 10468 | 4 |
| 7000 | - | - | 56282 | 1 | 10468 | 4 |
| 8000 | - | - | 62946 | 2 | 14239 | 2 |
| 9000 | - | - | 76275 | 2 | 23389 | 2 |
| 10000 | 15 | 508.83 | 88953 | | 34430 | |
| 11000 | 25 | 509.03 | 93316 | | 36815 | |
| 12000 | 40 | 509.23 | 105765 | | 38833 | |
| 13000 | 61 | 509.42 | 108515 | | 38365 | |
| 14000 | 90 | 509.61 | 111092 | | 33527 | |
| 15000 | 130 | 509.79 | 114256 | | 28625 | |
| 16000 | 184 | 509.96 | 117710 | | 23436 | |
| 17000 | 254 | 510.13 | 122129 | | 19443 | |
| 18000 | 344 | 510.29 | 127617 | | 17479 | |
| 19000 | 459 | 510.45 | 130593 | | 14588 | |
| 20000 | 603 | 510.61 | 132479 | | 11345 | |
| 21000 | 782 | 510.76 | 137254 | | 9960 | |
| 22000 | 1001 | 510.91 | 142216 | 3 | 8759 | 5 |
| 23000 | 1268 | 511.06 | 147374 | 3 | 7717 | 5 |
| 24000 | 1591 | 511.20 | 152734 | 3 | 6811 | 5 |
| 25000 | - | - | 157364 | 3 | 6292 | 5 |
| 26000 | - | - | 161177 | 3 | 6076 | 5 |
| 27000 | - | - | 165091 | 3 | 5868 | 5 |
| 28000 | - | - | 169108 | 3 | 5668 | 5 |
| 29000 | - | - | 173231 | 3 | 5475 | 5 |
| 30000 | - | - | 177463 | 3 | 5290 | 5 |
| 31000 | - | - | 181807 | 3 | 5112 | 5 |
| 32000 | - | - | 186267 | 3 | 4941 | 5 |
| 33000 | - | - | 190845 | 3 | 4776 | 5 |
| 34000 | - | - | 195545 | 3 | 4617 | 5 |
| 35000 | - | - | 200371 | 3 | 4464 | 5 |

1 Constant surface area based on aerial photography measurements
2 Interpolated value
3 Surface area at time t calculated as surface area at time t-1 raised to 1.001
4 WUA assumed equal to 18.6 percent of surface area
5 WUA at time t calculated as surface area at time t-1 raised to 0.993 (22-25,000 cfs) or 0.998 (25-35,000 cfs)

Table B-6.5. Mainstem discharge, site flow and water surface elevation (WSEL), wetted (gross) surface area and juvenile chinook weighted usable area (WUA) forecast for Site 131.7L. High turbidity habitat suitability criteria were used for all discharges.

| MAINSTEM DISCHARGE (cfs) | SITE FLOW (cfs) | SITE WSEL (ft) | GROSS SURFACE AREA (sq. ft. / 1000 linear ft. | JUVENILE CHINOOK WUA | |
|---|---|---|---|---|---|
| 5000 | 7 | 616.24 | 109815 | 30214 | |
| 6000 | 13 | 616.40 | 123973 | 36623 | |
| 7000 | 21 | 616.56 | 132671 | 41588 | |
| 8000 | 33 | 616.71 | 137546 | 45776 | |
| 9000 | 49 | 616.86 | 141445 | 46487 | |
| 10000 | 69 | 617.00 | 151533 | 46977 | 1 |
| 11000 | 95 | 617.13 | 176337 | 47466 | 1 |
| 12000 | 127 | 617.26 | 189058 | 47956 | |
| 13000 | 166 | 617.39 | 199945 | 47491 | |
| 14000 | 213 | 617.52 | 212707 | 45734 | |
| 15000 | 268 | 617.64 | 218480 | 44188 | |
| 16000 | 333 | 617.76 | 221802 | 41630 | |
| 17000 | 407 | 617.88 | 225003 | 39721 | |
| 18000 | 493 | 617.99 | 228212 | 37451 | |
| 19000 | 590 | 618.11 | 231356 | 35713 | |
| 20000 | 701 | 618.22 | 234829 | 34628 | |
| 21000 | 825 | 618.33 | 238209 | 33964 | |
| 22000 | 963 | 618.44 | 241542 | 33771 | |
| 23000 | 1117 | 618.54 | 244858 | 32056 | 2 |
| 24000 | 1288 | 618.65 | 248153 | 31863 | 2 |
| 25000 | 1476 | 618.75 | 251413 | 31670 | 2 |
| 26000 | 1683 | 618.86 | 254655 | 31477 | 2 |
| 27000 | 1909 | 618.96 | 257640 | 31285 | 2 |
| 28000 | 2155 | 619.06 | 260818 | 31092 | 2 |
| 29000 | 2423 | 619.16 | 263973 | 30899 | 2 |
| 30000 | 2714 | 619.26 | 267116 | 30706 | 2 |
| 31000 | 3028 | 619.36 | 270237 | 30514 | 2 |
| 32000 | 3367 | 619.45 | 273345 | 30321 | 2 |
| 33000 | 3731 | 619.55 | 276433 | 30128 | 2 |
| 34000 | 4122 | 619.64 | 279509 | 29935 | 2 |
| 35000 | 4541 | 619.74 | 282572 | 29743 | 2 |

1 Interpolated value
2 WUA at time t calculated as WUA at time t-1 raised to 0.995

Table B-6.6. Mainstem discharge, site flow and water surface elevation (WSEL), wetted (gross) surface area and juvenile chinook weighted usable area (WUA) forecast for Site 132.6L. Low and high turbidity conditions are assumed for discharges below and above 10,500 cfs. Rating curves are inapplicable below 10,500 cfs.

| MAINSTEM DISCHARGE (cfs) | SITE FLOW (cfs) | SITE WSEL (ft) | GROSS SURFACE AREA (sq. ft. / 1000 linear ft.) | | JUVENILE CHINOOK WUA (sq. ft. / 1000 linear ft.) | |
|---|---|---|---|---|---|---|
| 5000 | - | - | 0 | 1 | 0 | |
| 6000 | - | - | 14976 | 2 | 0 | |
| 7000 | - | - | 29951 | 1 | 2145 | 2 |
| 8000 | - | - | 39165 | 2 | 4290 | 2 |
| 9000 | - | - | 48378 | 2 | 6435 | 2 |
| 10000 | - | - | 57592 | 1 | 8580 | 4 |
| 10500 | 10 | 625.83 | 57592 | | 16528 | |
| 11000 | 12 | 625.90 | 59274 | | 16791 | |
| 12000 | 17 | 626.04 | 63544 | | 17214 | |
| 13000 | 24 | 626.18 | 67533 | | 17695 | |
| 14000 | 32 | 626.30 | 72391 | | 18219 | |
| 15000 | 41 | 626.42 | 74895 | | 18207 | |
| 16000 | 53 | 626.53 | 78605 | | 17264 | |
| 17000 | 67 | 626.64 | 80215 | | 16508 | |
| 18000 | 84 | 626.74 | 82569 | | 14932 | |
| 19000 | 103 | 626.84 | 87157 | | 13221 | |
| 20000 | 126 | 626.94 | 91843 | | 12328 | |
| 21000 | 152 | 627.03 | 93754 | | 12464 | |
| 22000 | 182 | 627.12 | 98212 | | 11201 | |
| 23000 | 217 | 627.21 | 100202 | | 10602 | |
| 24000 | 256 | 627.29 | 102175 | | 10896 | |
| 25000 | 300 | 627.37 | 104025 | | 10314 | |
| 26000 | 349 | 627.45 | 107262 | | 9848 | |
| 27000 | 405 | 627.52 | 109398 | | 9982 | |
| 28000 | 466 | 627.60 | 111506 | | 10300 | |
| 29000 | 534 | 627.67 | 115114 | | 10209 | |
| 30000 | 610 | 627.74 | 121236 | | 10028 | |
| 31000 | 693 | 627.81 | 125569 | 3 | 9845 | 5 |
| 32000 | 784 | 627.88 | 130071 | 3 | 9665 | 5 |
| 33000 | 884 | 627.94 | 134748 | 3 | 9490 | 5 |
| 34000 | 992 | 628.01 | 139608 | 3 | 9317 | 5 |
| 35000 | 1111 | 628.07 | 144659 | 3 | 9149 | 5 |

1 Surface area based on aerial photography measurements
2 Interpolated value
3 Surface area at time t calculated as surface area at time t-1 raised to 1.003
4 WUA assumed equal to low turbidity WUA forecast just prior to breaching
5 WUA at time t calculated as surface area at time t-1 raised to 0.998

Table B-6.7. Mainstem discharge, site flow and water surface elevation (WSEL), wetted (gross) surface area and juvenile chinook weighted usable area (WUA) forecast for Site 136.0L. High turbidity habitat suitability criteria were used for all discharges.

| MAINSTEM DISCHARGE (cfs) | SITE FLOW (cfs) | SITE WSEL (ft) | GROSS SURFACE AREA (sq. ft. / 1000 linear ft.) | JUVENILE CHINOOK WUA (sq. ft. / 1000 linear ft.) | |
|---|---|---|---|---|---|
| 5000 | 12 | 613.90 | 28854 | 7662 | |
| 6000 | 19 | 614.21 | 31895 | 7450 | |
| 7000 | 28 | 614.50 | 35668 | 6985 | |
| 8000 | 39 | 614.77 | 37446 | 6114 | |
| 9000 | 53 | 615.02 | 39268 | 5886 | 1 |
| 10000 | 69 | 615.25 | 41025 | 5592 | 1 |
| 11000 | 88 | 615.47 | 46746 | 5364 | 1 |
| 12000 | 110 | 615.68 | 49043 | 5398 | |
| 13000 | 136 | 615.87 | 51636 | 5431 | |
| 14000 | 165 | 616.07 | 52775 | 5193 | |
| 15000 | 197 | 616.25 | 53875 | 4274 | |
| 16000 | 233 | 616.42 | 54996 | 4135 | |
| 17000 | 272 | 616.59 | 56226 | 3792 | |
| 18000 | 315 | 616.76 | 57824 | 3350 | |
| 19000 | 362 | 616.92 | 59070 | 3366 | |
| 20000 | 414 | 617.07 | 60332 | 3892 | |
| 21000 | 469 | 617.22 | 61611 | 3945 | |
| 22000 | 529 | 617.37 | 62780 | 3936 | |
| 23000 | 593 | 617.51 | 63930 | 3866 | |
| 24000 | 662 | 617.65 | 65004 | 3862 | |
| 25000 | 735 | 617.78 | 65973 | 3838 | |
| 26000 | 814 | 617.91 | 66662 | 3683 | |
| 27000 | 897 | 618.04 | 67341 | 3748 | |
| 28000 | 985 | 618.17 | 68019 | 3803 | |
| 29000 | 1079 | 618.30 | 68673 | 3807 | |
| 30000 | 1177 | 618.42 | 69292 | 3817 | |
| 31000 | 1281 | 618.54 | 69854 | 3918 | |
| 32000 | 1390 | 618.65 | 70302 | 3908 | |
| 33000 | 1505 | 618.77 | 70753 | 3894 | |
| 34000 | 1626 | 618.88 | 71183 | 3894 | |
| 35000 | 1752 | 618.99 | 72227 | 3769 | |

1 Interpolated values

Table B-6.8. Mainstem discharge, site flow and water surface elevation (WSEL), wetted (gross) surface area and juvenile chinook weighted usable area (WUA) forecast for Site 147.1L. The low and high flow IFG-2 models were used to forecast hydraulic conditions below and above 21,000 cfs.

| MAINSTEM DISCHARGE (cfs) | SITE FLOW (cfs) | SITE WSEL (ft) | GROSS SURFACE AREA (sq. ft. / 1000 linear ft.) | JUVENILE CHINOOK WUA (sq. ft. / 1000 linear ft.) |
|---|---|---|---|---|
| 5000 | 1066 | 811.56 | 181538 | 5341 |
| 6000 | 1326 | 811.80 | 186579 | 5028 |
| 7000 | 1594 | 812.03 | 191465 | 4661 |
| 8000 | 1870 | 812.26 | 197141 | 4691 |
| 9000 | 2154 | 812.48 | 202683 | 5318 |
| 10000 | 2443 | 812.6[illegible] | 207274 | 5256 |
| 11000 | 2738 | 812.90 | 211652 | 5313 |
| 12000 | 3039 | 813.11 | 215714 | 5033 |
| 13000 | 3344 | 813.31 | 219556 | 5441 |
| 14000 | 3655 | 813.51 | 223252 | 6165 |
| 15000 | 3969 | 813.70 | 226416 | 6250 |
| 16000 | 4288 | 813.89 | 229353 | 6465 |
| 17000 | 4611 | 814.08 | 232410 | 6118 |
| 18000 | 4937 | 814.27 | 235319 | 6789 |
| 19000 | 5267 | 814.46 | 238268 | 7267 |
| 20000 | 5601 | 814.64 | 241216 | 7105 |
| 21000 | 5600 | 814.82 | 246363 | 6991 |
| 22000 | 6278 | 815.00 | 249457 | 7814 |
| 23000 | 6621 | 815.18 | 252493 | 8269 |
| 24000 | 6967 | 815.35 | 256136 | 9353 |
| 25000 | 7315 | 815.53 | 259098 | 9376 |
| 26000 | 7667 | 815.70 | 261926 | 9340 |
| 27000 | 8021 | 815.87 | 264711 | 9358 |
| 28000 | 8378 | 816.04 | 267970 | 9321 |
| 29000 | 8738 | 816.21 | 270159 | 8709 |
| 30000 | 9099 | 816.38 | 272314 | 8781 |
| 31000 | 9464 | 816.54 | 275056 | 10139 |
| 32000 | 9830 | 816.71 | 277122 | 9629 |
| 33000 | 10199 | 816.87 | 279054 | 8959 |
| 34000 | 10570 | 817.03 | 280941 | 8462 |
| 35000 | 10943 | 817.20 | 283400 | 8302 |