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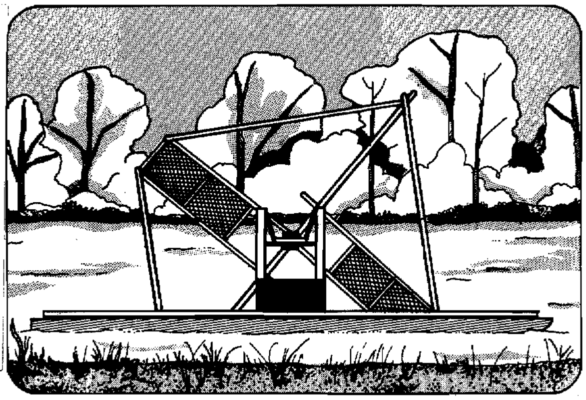
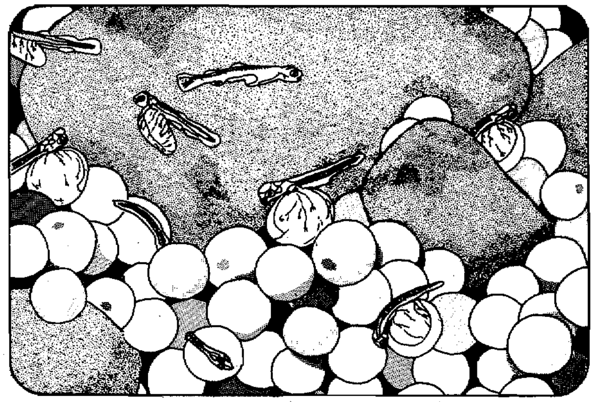
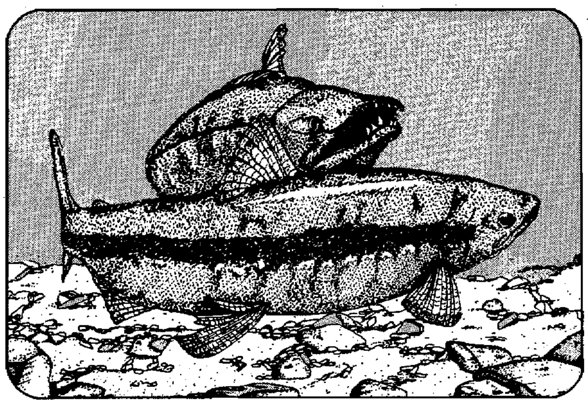
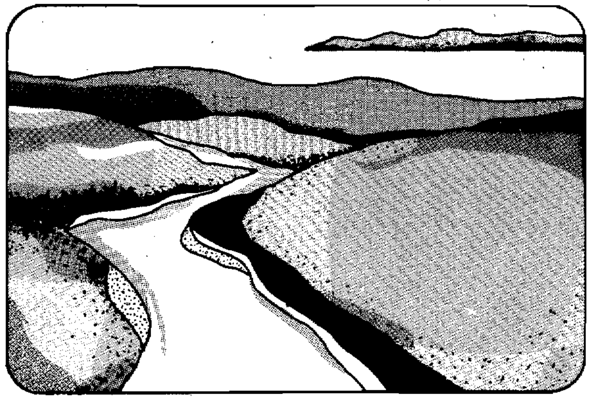

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SUSITNA HYDRO AQUATIC STUDIES

TASK 14 SUPPORT TECHNICAL REPORT

HYDROLOGICAL INVESTIGATIONS AT SELECTED LOWER SUSITNA RIVER STUDY SITES

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1.0 OBJECTIVES OF STUDY

The primary objective of this study was to provide hydraulic support to the Task 14 lower river Resident and Juvenile Habitat (RJHAB) modelling study. Correspondingly, the specific objectives of the study were: 1) to evaluate the response of stage and streamflow at Task 14 study sites to changes in mainstem discharge, 2) to describe the general characteristics of each Task 14 study site, 3) to describe the initial and controlling breaching discharges for each Task 14 study site, and 4) to describe the backwater conditions present within each Task 14 study site as a function of mainstem discharge.

2.0 METHODS

2.1 Site Selection

The Task 14 study sites are presented in Table 1 and Figure 1. These study sites were selected by Task 14 study personnel to meet the specific objectives of Task 14. Refer to the Task 14 summary report for the criteria used to select these study sites.

2.2 Field Data Collection

Stage, discharge, and channel geometry data were collected at each study site to evaluate the effect that mainstem discharge has on stage, streamflow, and backwater. Specific methods used in the field collection of these data are described below.

2.2.1 Stage

Stage data (water surface elevations) were obtained from staff gage measurements and surveyed water surface elevations. The specific procedures for obtaining stage data are presented in the ADF&G procedures manual (ADF&G 1984). Water surface elevations (WSEL) were determined from staff gage observations and surveys and are relative to the temporary bench mark (TBM) established for each study site. Because each TBM was assigned an elevation of 100.00 (feet), the resultant water surface elevations are relative to 100.00 feet and are not "true water surface elevations" tied into project datum.

Table 1. Task 14 study sites supported by the Physical Description Support Program.

Study Site	River Mile
Hooligan Side Channel	35.2
Eagle's Nest Side Channel	36.2
Kroto Slough Head	36.3
Rolly Creek	39.0
Bear Bait Side Channel	42.9
Last Chance Side Channel	44.4
Rustic Wilderness Side Channel	59.5
Caswell Creek	63.0
Island Side Channel [1]	63.2
Mainstem West Bank Side Channel[1]	74.4
Goose 2 Side Channel	74.8
Circular Side Channel[1]	75.3
Sauna Side Channel[1]	79.8
Sucker Side Channel	89.5
Beaver Dam Slough and Side Channel	86.3
Sunset Side Channel[1]	86.9
Sunrise Side Channel	87.0
Birch Creek	88.4
Trapper Creek Side Channel[1]	91.6

[1] These side channel study sites were also included in the Task 36 study.

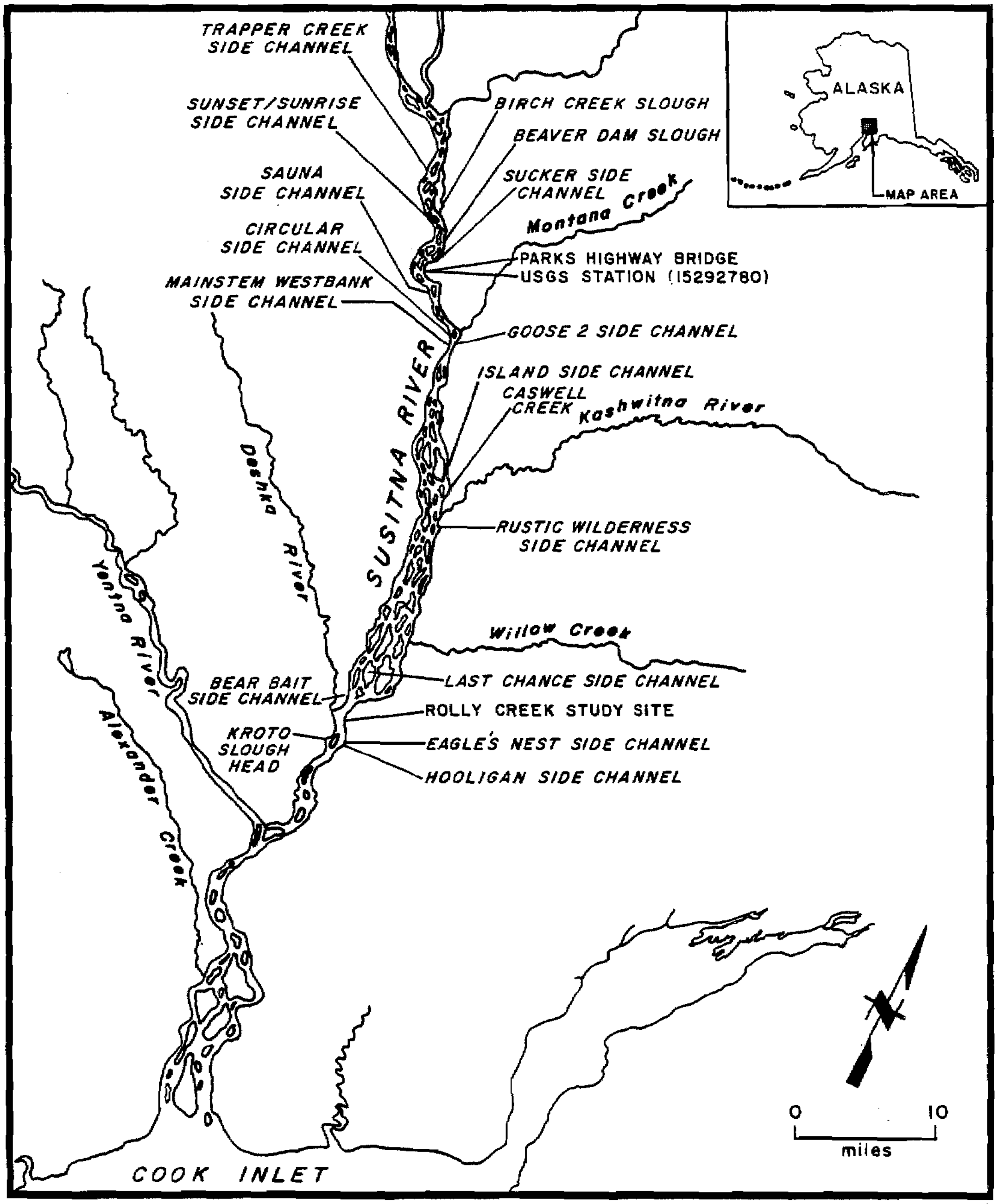


Figure 1. Task 14 study site locations.

2.2.2 Streamflow

Streamflow measurements were collected from streamflow stations located within each of the study sites. These streamflow stations were located on selected RJHAB modelling transects. Standard USGS streamflow techniques employing either Price AA or Pygmy flow meters were used to obtain the streamflow (discharge) measurements. In order to develop rating curves, stage measurements were also obtained at the time of each streamflow measurement. Specific procedures utilized in obtaining streamflow measurements are described in the ADF&G procedures manual (ADF&G 1984).

2.2.3 Channel Geometry

Thalweg and cross section profiles were determined at each Task 14 study site.

2.2.3.1 Thalweg Profile

Thalweg profiles were determined for each of the Task 14 study sites. These thalweg profiles represent the "best" determination of the channel thalweg by the visual assessment of field crews. Surveying for the development of the thalweg profile began at either the mouth of the side channel or the first hydraulic control downstream of the study site. The thalweg survey continued upstream to the first hydraulic control above the study site or to the head of the side channel or side slough.

Thalweg data were collected using the standard surveying techniques of differential leveling with significant morphological features selected as thalweg points (i.e., riffles, pools). At each of the thalweg points (or stations), the streambed elevation, water surface elevation, and distance between thalweg points was determined. All thalweg elevations are relative to the assigned elevation of the TBM established at each study site (100.00 ft).

When applicable, cross section profile data were also used to develop the thalweg profiles. The lowest elevation obtained from a cross section profile was compared to the thalweg elevation obtained at the cross section. When a difference in elevation occurred between the thalweg and cross section profile, the elevation from the cross section was used. The greatest difference in elevation detected was 0.3 ft.

Specific procedures for the collection of thalweg survey data are presented in the ADF&G procedures manual (ADF&G 1984).

2.2.3.2 Cross Section Profile

Cross sectional profiles were determined for each staff gage location within every Task 14 study site using the standard surveying techniques of differential leveling. Streambed elevations, water surface elevations, and horizontal distances from bank headpins were obtained for each cross sectional profile. Specific survey techniques and procedures used in the collection of cross sectional data are presented in the ADF&G Procedures Manual (ADF&G, 1984).

2.3 Data Analysis

2.3.1 Stage and Streamflow

Water surface elevation (WSEL) data obtained at each staff gage location were plotted against corresponding mean daily Susitna River discharge as determined by the United States Geological Survey (USGS) from their Sunshine gaging station (USGS 15292780). Due to the distance of several study sites from the Sunshine gaging station, several mainstem discharge values were determined from a time lag analysis provided by E.W. Trihey & Associates (see Attachment A).

For each plot, a least squares regression equation was calculated when sufficient data were available. At several gage sites, more than one function was evident on a plot as illustrated by a change in the slope of the line drawn between the data points. For these cases, separate regression equations were calculated for each function. These regression equations enable estimates of water surface elevation to be determined from the range of USGS mainstem discharge values included in the plots.

Water surface elevations (WSEL) obtained from staff gages located at each streamflow measurement station were also plotted against the corresponding measured study site streamflow data (Q_{sc}). Several of the plots have more than one function as illustrated by a change in the slope of the line drawn between the data points. Under these cases, a least squares equation is included for each function when sufficient data was available. These regression equations enable an estimate of streamflow from observed water surface elevation data.

Plots of measured streamflow (Q_{sc}) versus mean daily mainstem discharge (Q_{ms}) at the USGS Sunshine gaging station (USGS 15292780) were also developed. These plots include a least squares regression equation for each function. These equations enable site streamflow to be estimated from mean, daily mainstem discharge values (USGS 15292780).

2.3.2 Initial Breaching and Controlling Discharges

The breaching phenomenon has been partitioned into two discharge events; an initial breaching discharge and controlling breaching discharge event.

2.3.2.1 Initial Breaching Discharges

The mainstem discharge at Sunshine (USGS 15292780) required to initially overtop the head portions of each Task 14 study site is referred to as the "initial breaching discharge". This discharge was determined by field observations, aerial photographs, and stage/discharge relationships established for the site and is referenced to mean daily discharges as recorded at Sunshine.

2.3.2.2 Controlling Breaching Discharge

As progressively higher levels of mainstem discharge overtop the head portion of the study site the hydraulic conditions of the site become governed by mainstem discharge. The mainstem discharge at which the hydraulics become governed by mainstem discharge is referred to as the controlling breaching discharge.

To determine the controlling breaching discharge of each study site, the water surface elevation versus mainstem discharge plots were evaluated to identify changes in the relationship between stage and mainstem discharge from base flow conditions (unbreached condition) to the controlled breached condition. The base flow or unbreached condition is generally characterized in these plots as having minimal change in stage (WSEL) over a relatively large range of mainstem discharge whereas the controlled breached condition is generally characterized by larger changes in stage (WSEL) over corresponding increases in mainstem discharges. The initial point where stage begins to increase in proportion to corresponding increases in mainstem discharge is the controlling discharge.

Stage data is not always available at the point that the hydraulic condition is initially controlled by mainstem discharge. Therefore, a combined interpretation of stage data from each staff gage location in the study site, as well as a knowledge of the initial breaching discharge, are used to arrive at controlling breaching discharges.

2.3.3 Backwater

A generic analysis of backwater was performed for each study site utilizing available stage and channel geometry data. For the purposes of this report, a backwater area is defined as a water surface having the same or very similar water surface elevation between two or more points of measurement. Backwater was not strictly evaluated on the basis of water velocity.

To determine backwater conditions for six study sites (Island, Mainstem West Bank, Circular, Sauna, Sunset and Trapper Creek Side Channels) a table of the 1984 stage data for each study site was formatted to allow comparisons of water surface elevations over corresponding mainstem discharges for each of the staff gage locations in the study site. These six side channels were also included in the Task 36 modelling study and each consisted of several stage monitoring stations allowing a comparison of water surface elevations. The thalweg profile for the study site was also used to estimate the linear extent of the backwater at each study site where applicable.

2.3.4 Channel Geometry

Channel geometry data collected in support of Task 14 included both thalweg and cross sectional profile data.

2.3.4.1 Thalweg Profile

Thalweg profiles consist of a series of streambed and water surface elevations determined for the deepest part of the stream channel, at the time of the survey, traversing the length of the study site. Water surface elevations were determined by adding the water depth at the thalweg point to the elevation surveyed for the thalweg point. Water was not always present at the time of the thalweg survey, and therefore may be absent from the thalweg profile. When available, streamflow were measured on the same date as the thalweg survey. In some instances, streamflow measurements could not be obtained due to low flow conditions and the flow was estimated. In either case, flows are indicated on the thalweg profile figure.

Streambed gradients were determined for each thalweg by dividing the difference between the thalweg elevation of the downstream portion of the thalweg profile and the thalweg elevation of the upstream portion, by the distance between these two points.

2.3.4.2 Cross Section Profile

Cross section profiles consist of a series of elevations perpendicular to the stream channel, beginning from the left bank (looking upstream) and continuing to the right bank, including all major changes in channel topography. As such, cross section data collected in this study were graphed as streambed elevations versus horizontal distance.

Cross sectional profiles are used to support modelling studies and to assist in determining the hydraulic conditions governing the study site. They were also used to assist in determination of the lowest channel elevation in developing thalweg profiles.

3.0 RESULTS

3.1 Hooligan Side Channel (RM 35.2)

3.1.1 Site Description

Hooligan Side Channel is located on the east bank of the main channel of the Susitna River at river mile 35.2 and is part of a side channel network (Figure 1). It is approximately 1.3 miles in length and is separated from the mainstem by a large vegetated island. The head of Hooligan Side Channel connects directly to the mainstem Susitna River whereas the mouth adjoins a side channel network. Breaching flows occurring in Hooligan Side Channel result from overtopping of the head directly by the main channel Susitna River. Prior to breaching, flow in this side channel is greatly reduced although several large pools remain.

During the 1984 open water field season the study site selected for Hooligan Side channel was located in the upper portion of the side channel (Figure 2). Stage was monitored at one location and streamflow was measured at this stage monitoring station (Figure 3). Channel geometry data obtained from Hooligan Side Channel includes cross section and thalweg profiles. A cross section profile was obtained from the stage monitoring station and a thalweg profile was determined for that portion of the side channel that included the study site continuing upstream to the head of the side channel.

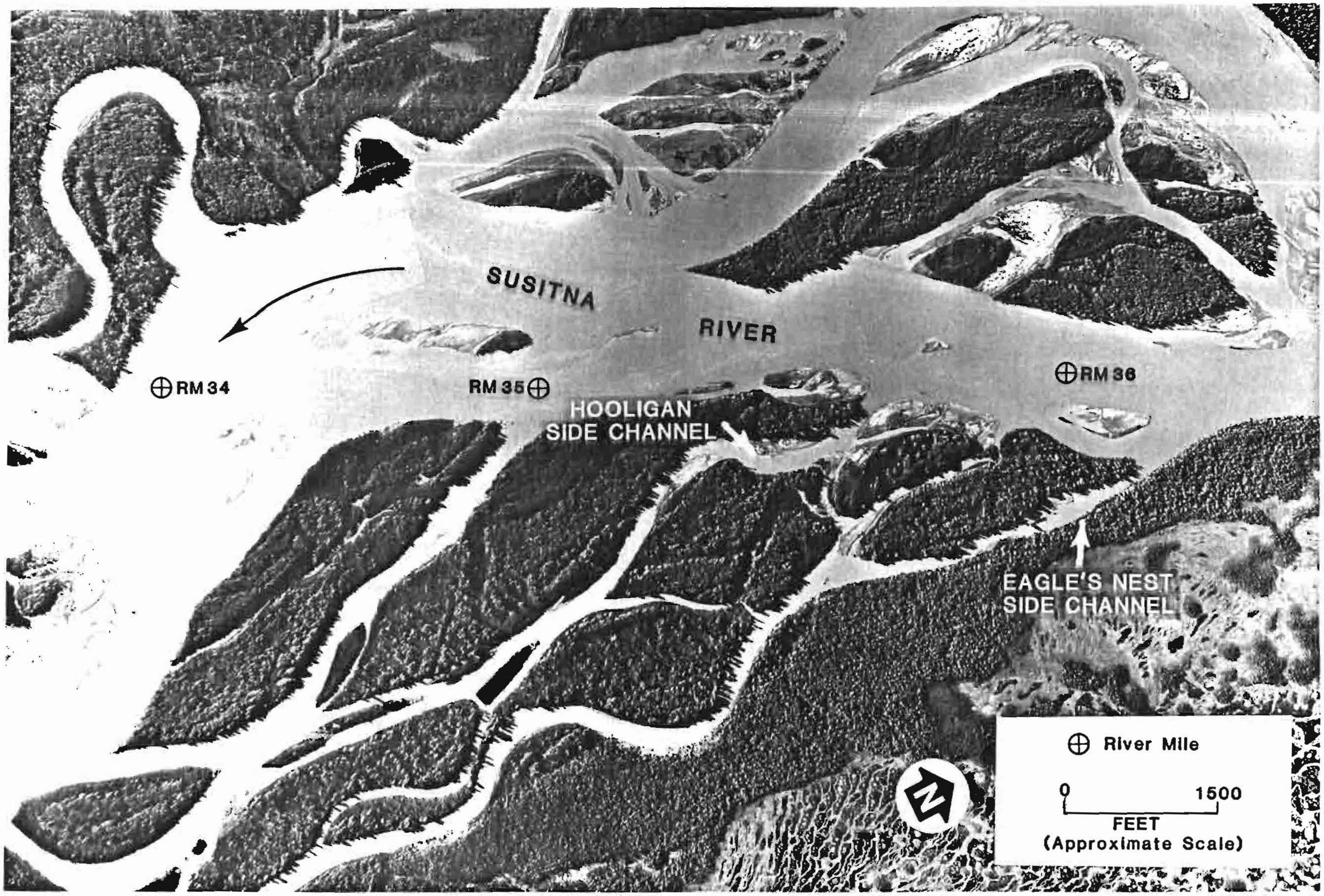


Figure 2. Overview of Hooligan (RM 35.2) and Eagle's Nest Side Channel (RM 36.2).

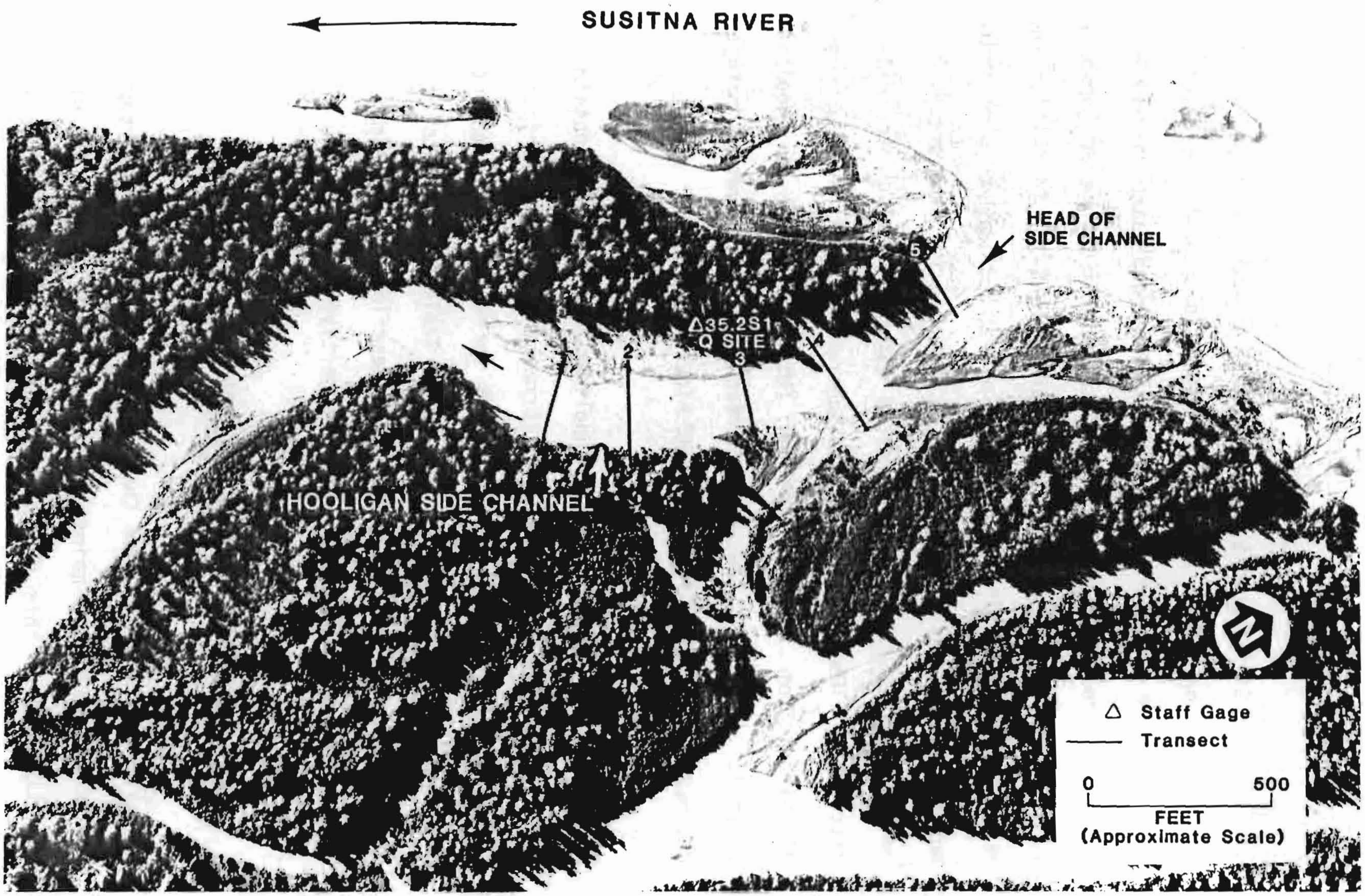


Figure 3. Location of Hooligan Side Channel study site (RM 35.2).

3.1.2 Stage/Discharge Relationship

In Hooligan Side Channel, measurements of water surface elevation were obtained at one stage monitoring station located 50 feet upstream from Transect 3 of the Task 14 study site. Recorded water surface elevations and the corresponding mean daily mainstem discharge at Sunshine (USGS 15292780) are presented in Attachment Table B-1. An initial review of this water surface elevation versus mainstem discharge plot indicated a substantial amount of scatter in the data. A lag time analysis was used to convert ten mean daily mainstem discharge values to instantaneous discharges. The instantaneous discharges reflect the lag time of the discharge from Sunshine Station (USGS 15292780) to Hooligan Side Channel. A plot of the water surface elevations versus mainstem discharges is presented in Attachment Figure E-1.

Measurements of streamflow in Hooligan Side Channel obtained at the stage monitoring station and the corresponding water surface elevations and mainstem discharges at Sunshine including instantaneous time lag discharges are presented in Attachment Table B-1. Plots of streamflow versus water surface elevation and streamflow versus mainstem discharge are presented in Figures 4 and 5, respectively.

3.1.3 Mainstem Breaching and Controlling Discharges

Breaching of Hooligan Side Channel is the result of overtopping of the head directly by the mainstem Susitna River. Field observations noted that the head of this side channel was barely breached at a mean daily

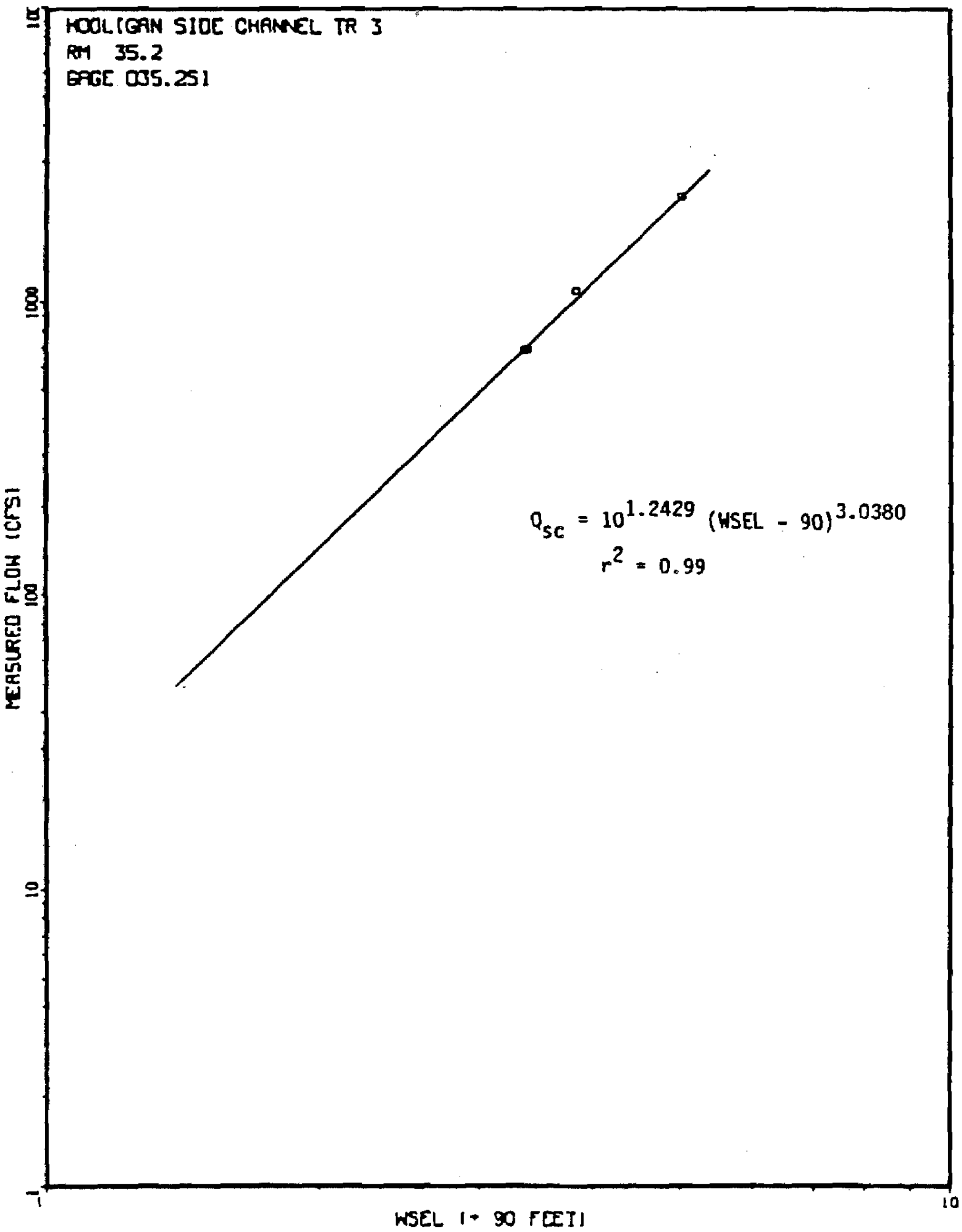


Figure 4. Hooligan Side Channel streamflow versus WSEL rating curve from Q site located 50 feet upstream from transect 3.

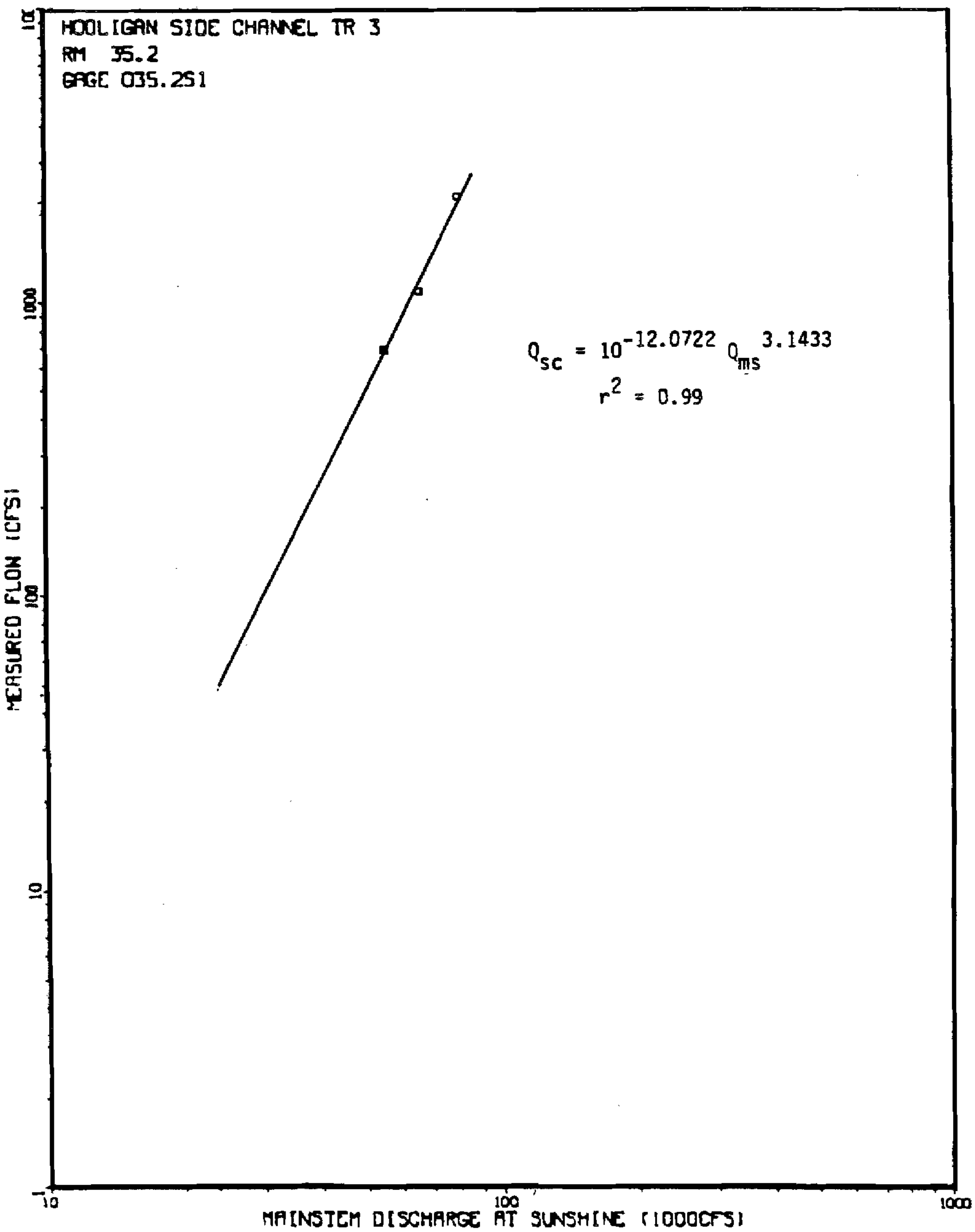


Figure 5. Hooligan Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve from Q site located 50 feet upstream from transect 3.

mainstem discharge of 23,500 cfs and dry at 22,700 cfs (Table 2). The mainstem discharge of 23,100 cfs is the suggested initial breaching discharge although this side channel may be initially breached at some discharge between 22,700 cfs and 23,500 cfs.

To evaluate the influence of mainstem discharge on the hydraulics of this side channel, a comparison of the rating curves developed for the streamflow station was performed (Figure 6). Due to limited stage data collected near the breaching flow, it was not possible to precisely determine the point at which the channel hydraulics are governed by the mainstem. The stage/discharge relationship depicted in Figure 6 was developed from available field data and from the experience gained at other sites. Using this analysis the controlling discharge was estimated at 23,500 cfs.

According to the water surface elevation versus streamflow rating curve (Figure 4), a side channel streamflow of 48.6 cfs has been estimated to occur at a mainstem discharge of 23,500 cfs. This estimated flow is slightly higher than the streamflow estimate (46.5 cfs) derived from the streamflow versus mainstem discharge rating curves (Figure 5) at a mainstem discharge of 23,500 cfs. Table 3 summarizes the estimates of flow as determined from the rating curves applicable above the controlling mainstem discharges.

Table 2. A comparison of 1984 observations used to determine the initial breaching mainstem discharge at Task 14 study sites.

Location	RM	Date	Head Condition	USGS Mean, Daily Discharge at Sunshine (cfs)	Source of Observation
Hooligan	35.2	840912	Dry	22,700	Field Observation
Side Channel		840911	Barely Breached	23,500	Field Observation
Eagle's Nest	36.2	840926	Breached	19,000	Field Observation
Side Channel		841009	Breached	15,000	Field Observation
		831025	Dry	13,900	Aerial Photograph
Kroto Slough	36.3	840829	Breached	47,600	Field Observation
		840907	Dry	25,900	Field Observation
		830906	Breached	36,600	Aerial Photography
		840531	Dry	31,000	Field Observation
Bear Bait	42.9	840907	Dry	25,900	Field Observation
Side Channel		840724	Breached	55,200	Field Observation
		830906	Breached	36,600	Aerial Photograph
Last Chance	44.4	840912	Barely Breached	22,700	Field Observation
Side Channel		840911	Almost Breached	23,500	Field Observation
		830916	Dry	22,000	Aerial Photograph
Rustic Wilderness	59.5	841001	Almost Breached	18,700	Field Observation
Side Channel		840917	Barely Breached	20,400	Field Observation
		830916	Breached	22,000	Aerial Photograph
Island	63.2	840915	Dry	22,300	Field Observation
Side Channel		840831	Breached	38,000	Field Observation
		830906	Barely Breached	36,600	Aerial Photograph
Mainstem West Bank	74.4	840930	Dry	17,800	Field Observation
Side Channel		840926	Barely Breached	19,000	Field Observation
		830916	Breached	22,000	Aerial Photograph
		841001	Dry	18,700	Field Observation
Goose 2	74.8	840902	Barely Breached	32,000	Field Observation
Side Channel		840913	Dry	22,700	Field Observation
		830906	Breached	36,600	Aerial Photograph
Circular	75.3	840830	Breached	40,800	Field Observation
Side Channel		840902	Dry	32,000	Field Observation
		830906	Breached	36,600	Aerial Photograph
		930916	Dry	22,000	Aerial Photograph
Sauna	79.8	840830	Barely Breached	40,800	Field Observation
Side channel		840914	Dry	24,000	Field Observation
		830906	Almost Breached	36,600	Aerial Photograph
Sucker	84.5	840914	Dry	24,000	Field Observation
Side Channel		840901	Barely Breached	35,000	Field Observation
		840902	Barely Breached	32,000	Field Observation
		830906	Breached	36,600	Aerial Photograph
		830916	Dry	22,000	Aerial Photograph
Beaver Dam	86.3	840822	Breached	54,300	Field Observation
Side Channel		840818	Dry	45,400	Field Observation
		840829	Breached	47,600	Field Observation
		830906	Dry	36,600	Aerial Photograph
		830827	Breached	58,800	Aerial Photograph

Table 2 (Continued).

Location	RM	Date	Head Condition	USGS Mean, Daily Discharge at Sunshine (cfs)	Source of Observation
Sunset Side Channel	86.9	840902	Barely Breached	32,000	Field Observation
		830906	Breached	36,600	Aerial Photograph
		830916	Dry	22,000	Aerial Photograph
Sunrise Side Channel	87.0	840818	Breached	45,400	Field Observation
		840902	Dry	32,000	Field Observation
		840906	Breached	36,600	Aerial Photograph
		840916	Dry	22,000	Aerial Photograph
Birch Creek Slough	88.4	840812	Barely Breached	54,100[1]	Field Observation
		840713	Dry	52,000[1]	Field Observation
		840822	Barely Breached	54,200[1]	Field Observation
		830827	Breached	58,800	Aerial Photograph
		840727	Barely Breached	57,900[1]	Aerial Photograph
Trapper Side Channel	91.6	840822	Breached	54,300	Field Observation
		840911	Dry	23,500	Field Observation
		830906	Breached	36,600	Aerial Photograph
		830916	Dry	22,000	Aerial Photograph

1 Instantaneous mainstem discharge value.

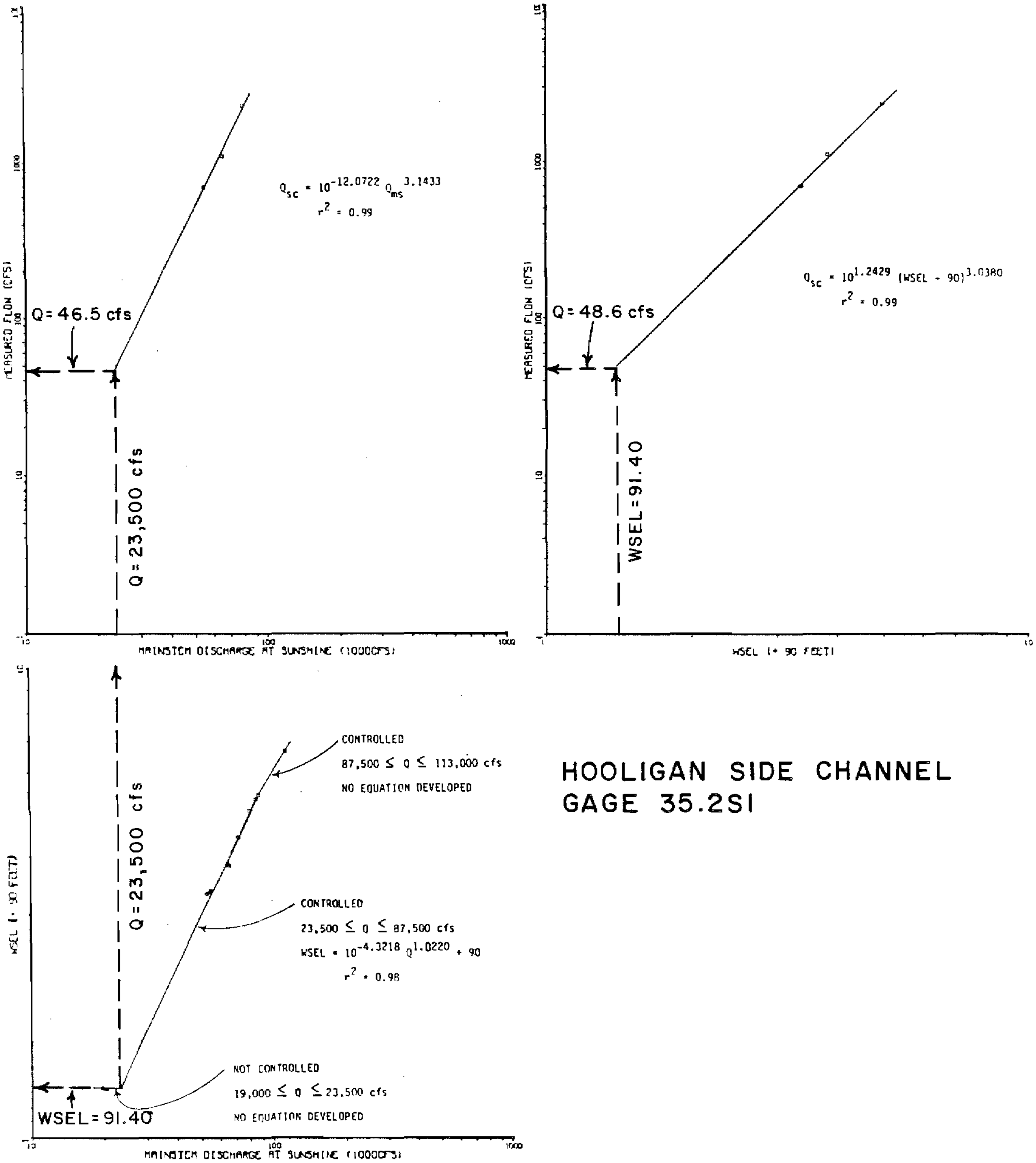


Figure 6. Comparison of rating curves for Hooligan Side Channel Q site located 50 feet upstream from transect 3.

Table 3. A comparison of streamflow estimates determined from equations developed from water surface elevation versus flow and flow versus mainstem discharge rating curves for the controlling discharge.

Site	Controlling[a] Discharge	Rating Curve Flow Estimate (cfs) at Controlling Discharge: WSEL vs Streamflow	Rating Curve Flow Estimate (cfs) at Controlling Discharge: Streamflow vs Q_{ms}
Hooligan Side Channel	23,500	48.6	46.5
Eagle's Nest Side Channel	15,000	--[b]	--[b]
Kroto Slough Head	38,000	55.4	67.3
Bear Bait Side Channel	--[d]	--[b]	--[b]
Last Chance Side Channel	24,000	--[b]	1.3
Rustic Wilderness Side Channel	20,400	--[b]	--[b]
Island Side Channel	35,000	43.5	68.8
Mainstem West Bank Side Channel	19,600	5.7[c]	5.7[c]
Goose 2 Side Channel	32,000	26.3	21.7
Circular Side Channel	36,000	26.8	26.8
Sauna Side Channel	38,000	22.5	19.9
Sucker Side Channel	29,000		
TR2		10.0	10.2
TR5		24.5	12.1
Beaver Dam Side Channel	47,600	7.1	6.2
Beaver Dam Slough	--[d]	--[b]	--[b]
Sunset Side Channel	32,000	45.8	41.4
Sunrise Side Channel	36,000	29.2	21.1
Birch Creek Slough	--[d]	--[b]	--[b]
Trapper Creek Side Channel	44,000	31.4[c]	31.4[c]

[a] The controlling discharge is the mean, daily mainstem discharge at Sunshine (USGS 15292780) required to govern the hydraulic characteristics of side channel and side slough habitats.

[b] Insufficient information is available to estimate streamflow at the controlling discharge.

[c] These stream flow values are actual measurements of discharge and are not estimated values.

[d] Insufficient information is available to determine the controlling discharge.

3.1.4 Channel Geometry

3.1.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Hooligan Side Channel during a non-breaching mainstem discharge of 19,600 cfs and a side channel flow estimated to be less than 1 cfs. The thalweg survey data are presented in Attachment Table C-1 with the resultant thalweg profile being presented in Attachment Figure C-1. The thalweg profile extends from the head of the side channel downstream to 350 feet below transect 1. The streambed gradient for the portion of Hooligan Side Channel included in the thalweg profile was 8.9 feet/mile.

3.1.4.2 Cross Section Profile

Cross sectional data were obtained at the only stage monitoring station located in Hooligan Side Channel during the 1984 open water season. The stage monitoring station was located approximately 50 feet upstream of transect 3 (Attachment Figure C-1). The cross sectional data are presented in Attachment Table D-1 with the resulting cross section presented in Attachment Figure D-1.

3.1.5 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure C-1) data, an area of backwater was not observed to occur in the Hooligan Side Channel study site. Pooling was observed to occur between transects 2 and 5 during non-breaching mainstem discharges. This pooling is a result of the hydraulic control located between transects 1 and 2.

The Hooligan Side Channel study site was located near the upper portion of the side channel (refer to Section 3.1.1 of this memorandum) therefore observations of backwater occurring at the mouth of the side channel were not obtained in 1984.

3.2 Eagle's Nest Side Channel (RM 36.2)

3.2.1 Site Description

Eagle's Nest Side Channel is located on the east bank of the main channel of the Susitna River at river mile 36.2. It is approximately three miles in length and is separated from the mainstem by a network of side channels and vegetated islands. The head and mouth of the side channel connect directly to the mainstem Susitna River. Breaching of this side channel results from overtopping of the head directly by the mainstem Susitna River. During the 1984 open water field season the study site selected for Eagle's Nest Side Channel was 496 feet in length and was located in the upper portion of the side channel (Figure 2). Stage was monitored at one location and streamflow was measured at this stage monitoring station (Figure 7). Channel geometry data obtained from the side channel included cross section and thalweg profiles. A cross section profile was obtained at the stage monitoring station and a

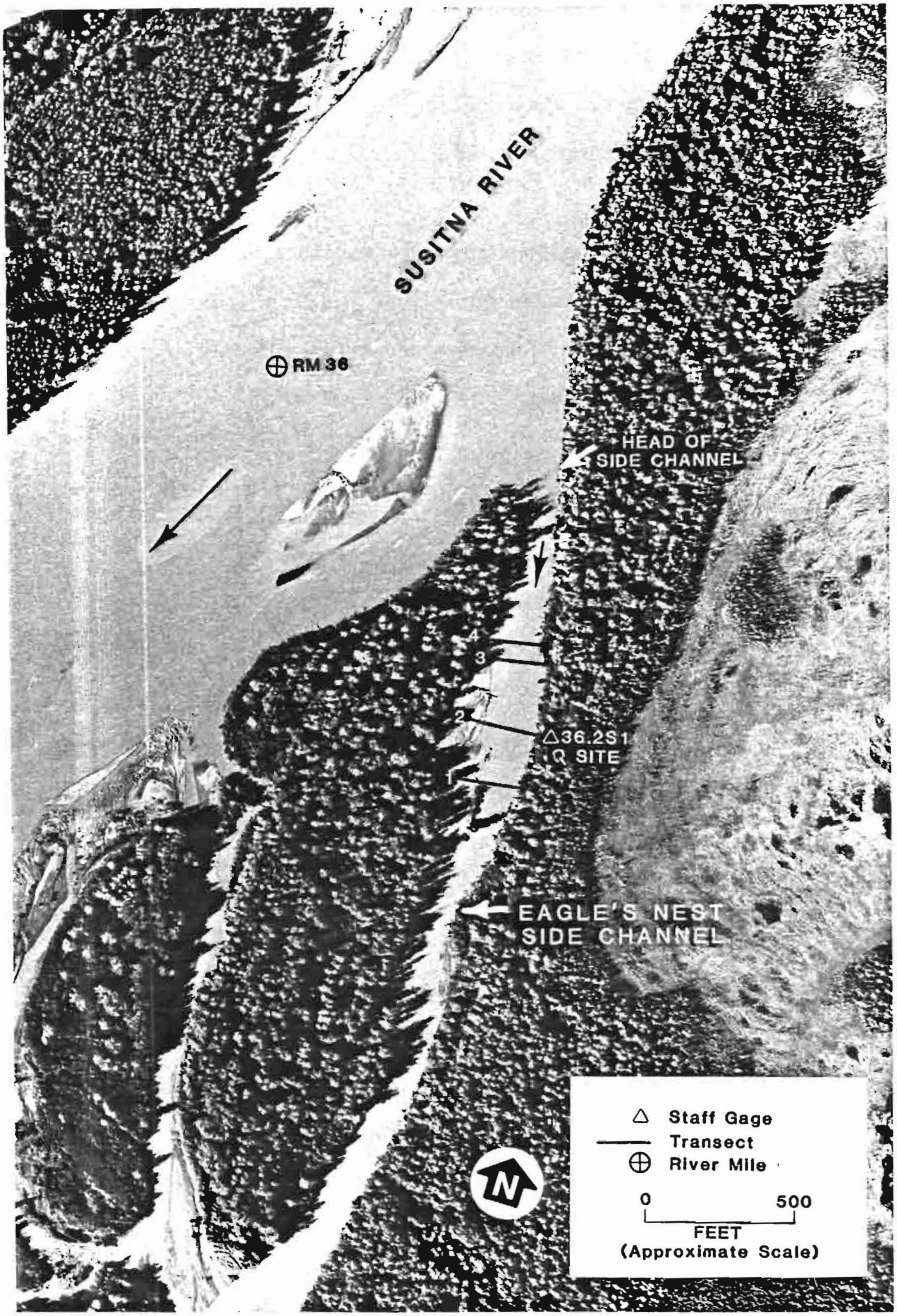


Figure 7. Location of Eagle's Nest Side Channel study site (RM 36.2).

thalweg profile was determined for that portion of the side channel beginning at the study site and continuing upstream to the head.

3.2.2 Stage/Discharge Relationship

Measurements of the water surface elevations obtained at the stage monitoring station in Eagle's Nest Side Channel and the mean daily mainstem discharge at Sunshine (USGS 15292780) corresponding to the date of the stage measurement are presented in Attachment Table B-1. A plot of these water surface elevations versus mainstem discharges is presented in Attachment Figure E-2.

In Eagle's Nest Side Channel only one measurement of streamflow was obtained at the stage monitoring station (Figure 7). The streamflow measurements obtained at this side channel and the corresponding water surface elevations are presented in Attachment Table B-1. Due to the lack of streamflow measurements, water surface elevation versus flow and flow versus mainstem discharge rating curves were not developed.

3.2.3 Mainstem Breaching and Controlling Discharges

The breaching of Eagle's Nest Side Channel occurs from overtopping of the head directly by the mainstem Susitna River. This side channel has been observed breached at a mainstem discharge of 15,000 cfs (Table 2). During this field observation approximately 0.5 ft of water was observed flowing over the head. A review of aerial photographs of the side channel indicated that the head was dry at a mainstem discharge of 13,600 cfs. From the field observations an initial breaching discharge of 14,000 cfs has been selected for this side channel although the head may actually be initially breached at a mainstem discharge between 13,600 cfs and 15,000 cfs.

Stage data was not collected at mainstem discharges below 15,000 cfs. The lack of stage data precludes an evaluation of baseflow (unbreached) hydraulics of this side channel. From the stage data presented in the water surface elevation versus mainstem discharge plot (Attachment Figure E-2) it is estimated that the hydraulics of this side channel are controlled at a mainstem discharge of approximately 15,000 cfs.

3.2.4 Channel Geometry

3.2.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Eagle's Nest Side Channel during a breaching mainstem discharge of 19,000 cfs and a measured side channel flow of 21.2 cfs. The survey data are presented in Attachment Table C-2 with the resultant thalweg profile presented in Attachment Figure C-2. The thalweg profile includes the study site and extends 450 feet upstream of transect 4. The streambed gradient for the portion of Eagle's Nest Side Channel included in the thalweg profile was 8.9 feet/mile.

3.2.4.2 Cross Section Profile

Cross sectional data were recorded at the only stage monitoring station located in Eagle's Nest Side Channel. This stage monitoring station was located on transect 2. The cross sectional data are presented in Attachment Table D-2 with the resulting cross section presented in Attachment Figure D-2.

3.2.5 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure C-2) data, an area of backwater was not observed to occur in the Eagle's Nest Side Channel study site. A large pool exists on the upper portion of the study site during non-breaching mainstem discharges as a result of the hydraulic control located between transects 2 and 3. As with Hooligan Side Channel, the Eagle's Nest Side Channel study site was located in the upper portion of the side channel (refer to section 3.2.1 of this report) therefore observations of backwater occurring at the mouth of the side channel were not obtained in 1984.

3.3 Kroto Slough Head (RM 36.3)

3.3.1 Site Description

Kroto Slough is located on the west bank of the main channel of the Susitna River at river mile 36.3 (Figure 8). The slough consists of a

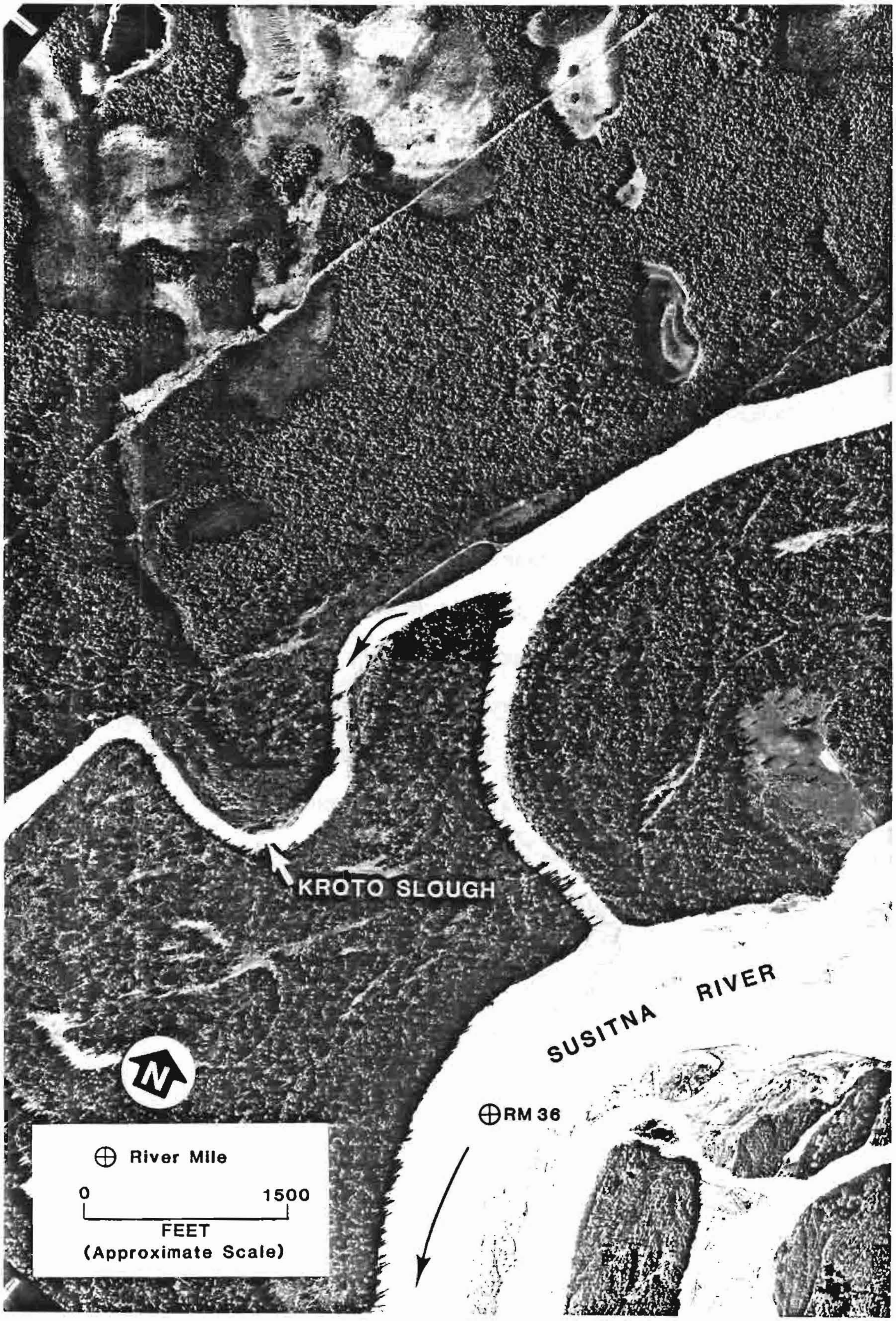


Figure 8. Overview of Kroto Slough Head (RM 36.3).

meandering channel approximately 7.8 miles in length. The mouth of the slough adjoins the Yentna River approximately 1.7 miles upstream from the mouth of the Yentna River. The head of Kroto Slough connects with a side channel of the Susitna River. Breaching flows occurring in Kroto Slough result from overtopping of the head by the adjoining side channel. Prior to breaching, flow in Kroto Slough is greatly reduced and the channel consists of a series of pools. During the 1984 open water field season the Kroto Slough study site was located in the upper portion of the slough.

Stage was monitored at one location in Kroto Slough and streamflow was measured at this stage monitoring station (Figure 9). Channel geometry data obtained from Kroto Slough included a cross section and thalweg profile. The cross section profile was obtained at the stage monitoring station and the thalweg was determined for that portion of the slough from the study site upstream to the head.

3.3.2 Stage/Discharge Relationship

Measurements of water surface elevations in Kroto Slough were obtained at the stage monitoring station which was located at transect 2 of the study site. The recorded water surface elevations and the corresponding mean daily mainstem discharge at Sunshine (USGS 15292780) are presented in Attachment Table B-1. A plot of the water surface elevations versus mainstem discharge is presented in Attachment Figure E-3. A time lag analysis was applied to three of the mainstem discharges and the

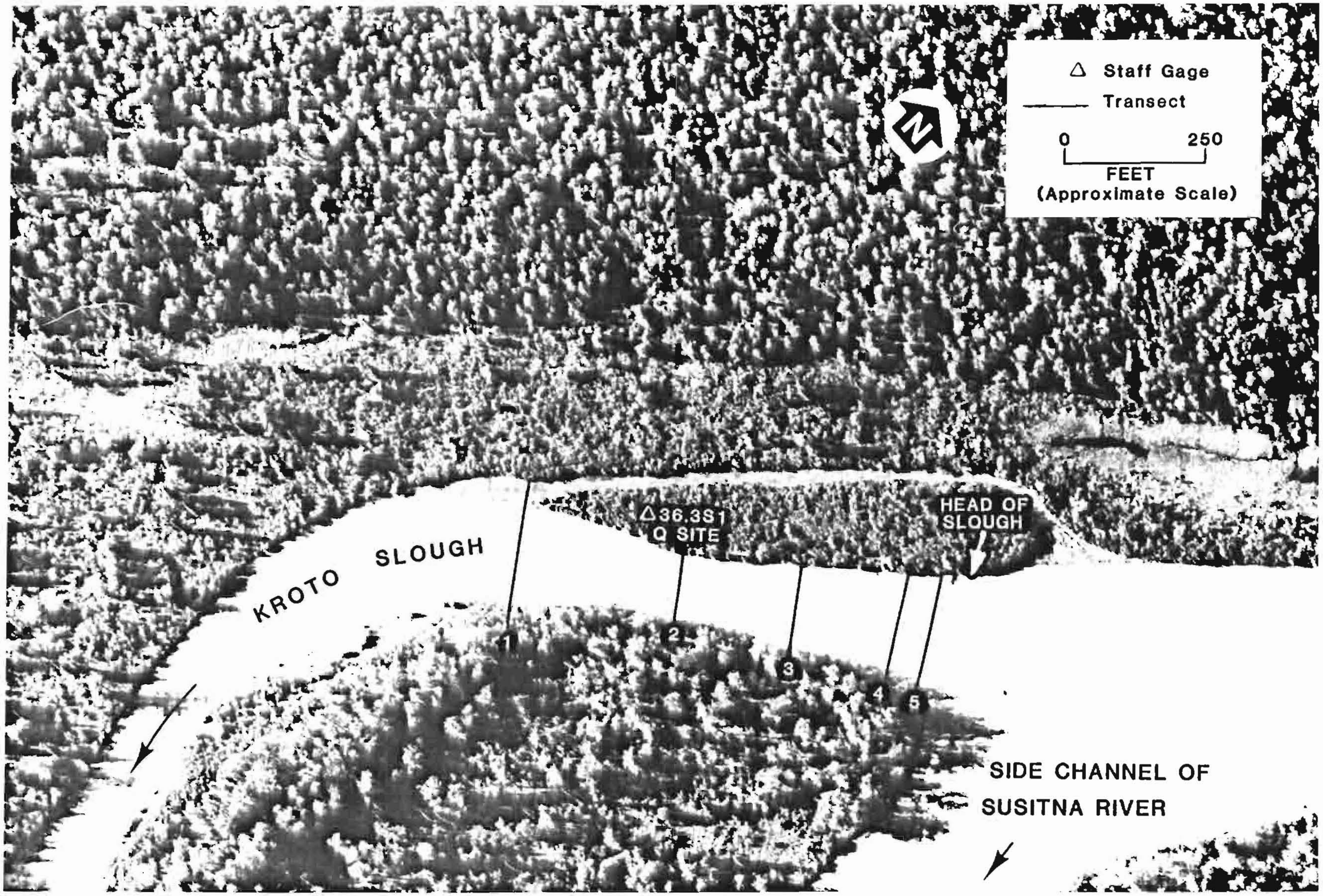


Figure 9. Location of Kroto Slough Head study site (RM 36.3).

resulting instantaneous mainstem discharges, rather than the mean daily discharges, are included in the water surface elevation versus mainstem discharge plot.

Streamflow measurements obtained in Kroto Slough at the stage monitoring station and corresponding water surface elevations are presented in Attachment Table B-1. A plot of the streamflow and water surface elevations was developed and is presented in Figure 10. Also streamflow data plotted against mainstem discharge is presented in Figure 11.

3.3.3 Mainstem Breaching and Controlling Discharges

Insufficient field data is available to determine precisely the breaching and controlling discharge for Kroto Slough. Recorded field observations indicated that the channel was breached at 36,600 cfs and non-breached at 31,000 cfs (Table 2). No additional information is available at discharges between 31,000 and 36,600 cfs.

To estimate the controlling discharge it was assumed that the stage/discharge relationship (Attachment Figure E-3) for the non-breached condition was nearly horizontal. This assumption is based on field observations and from reviewing data collected at other side channel study sites. A controlling discharge, of 38,000 cfs, was estimated from the stage/discharge curve as the point of intersection of the assumed non-breached condition and determined breached conditions of the stage/discharge relationship. It is also estimated that the initial

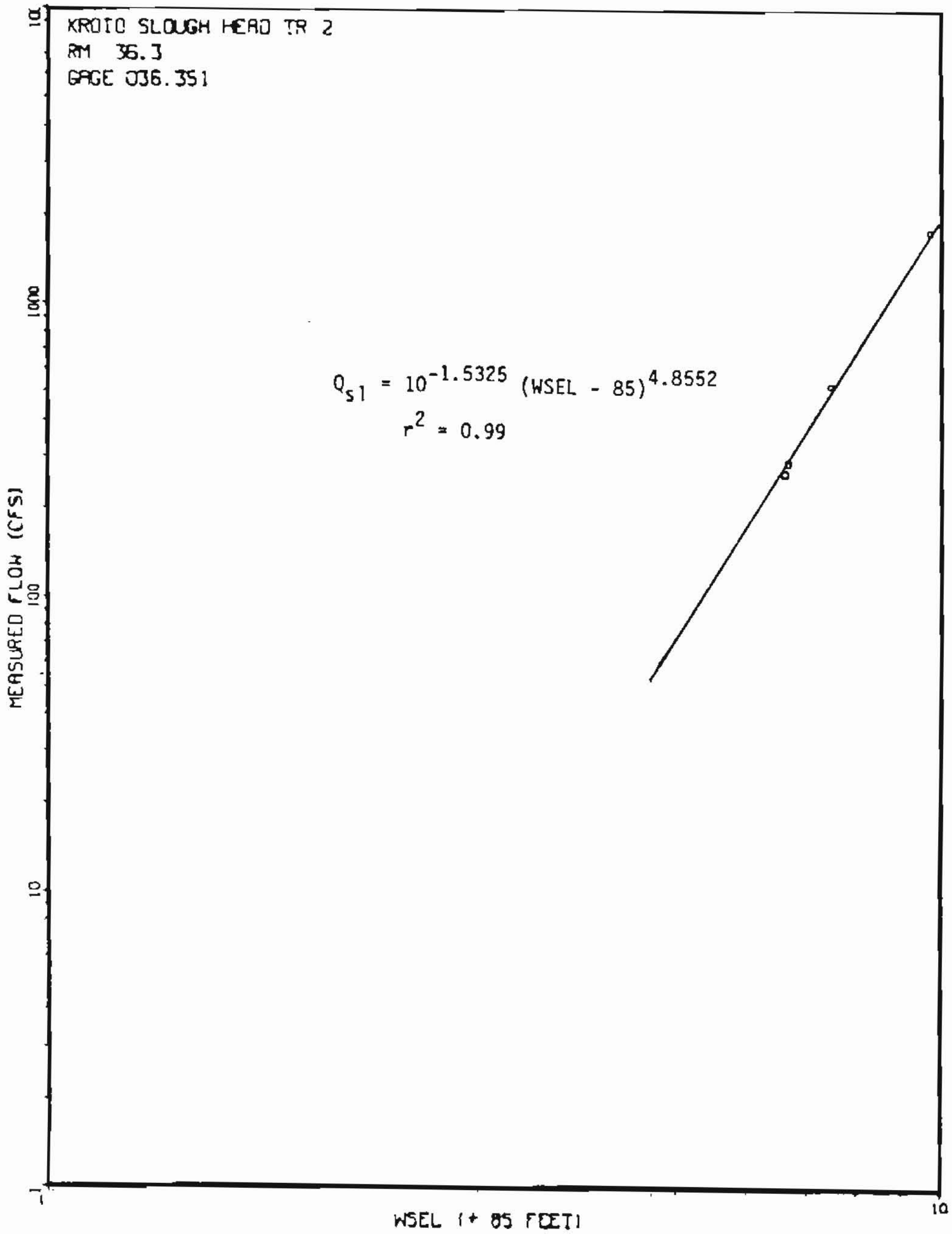


Figure 10. Kroto Slough Head streamflow versus WSEL rating curve at transect 2 Q Site.

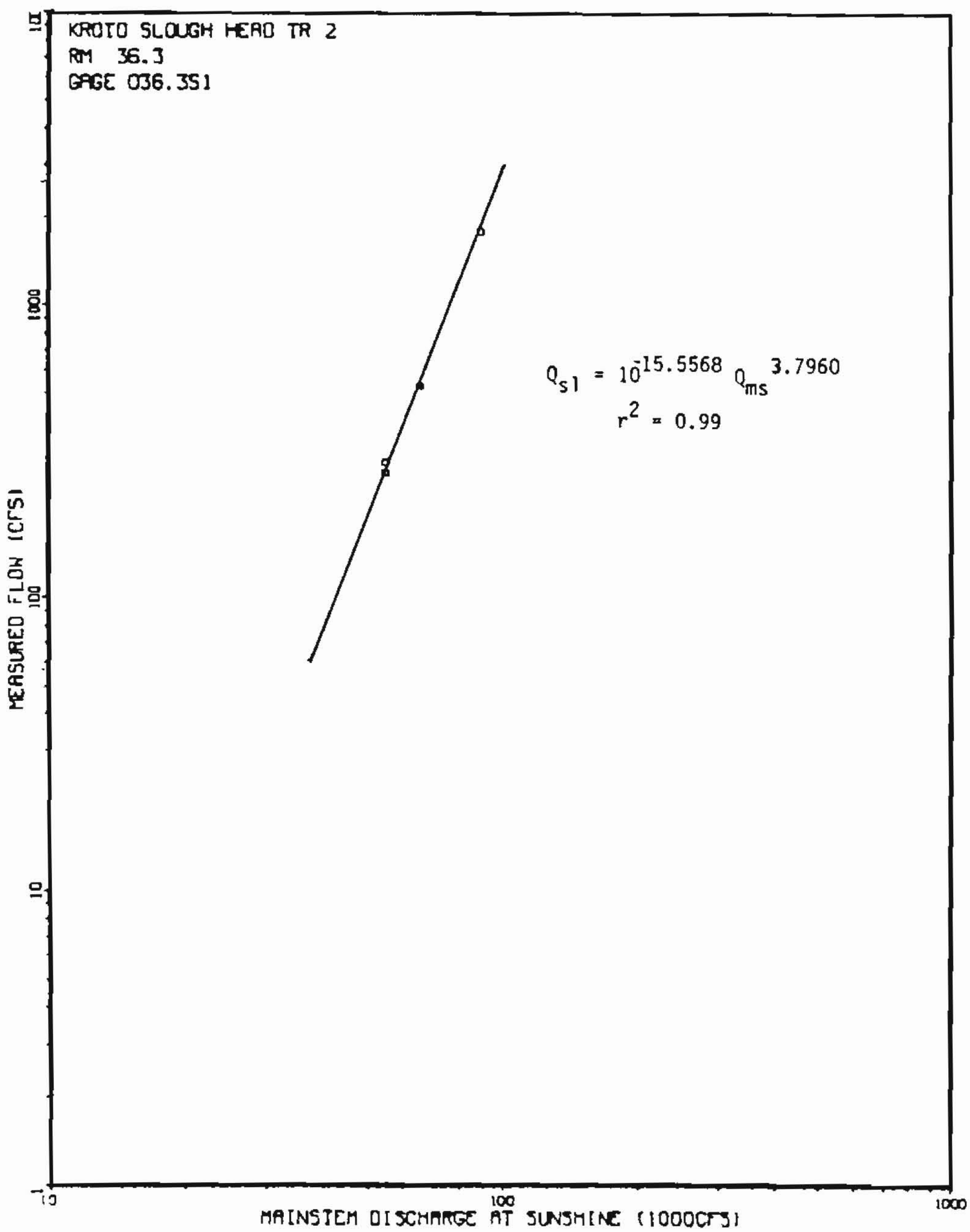


Figure 11. Kroto Slough Head streamflow versus mainstem discharge (cfs) at Sunshine Station (USGS 15292780) rating curve at transect 2 Q site.

breaching discharge should occur at approximately 2,000 cfs below the controlling discharge, or at 36,000 cfs.

The rating curves developed for Kroto Slough were compared to evaluate the influence of mainstem discharge on the hydraulic condition of the slough (Figure 12) Using the equation developed for the water surface elevation versus streamflow rating curve at transect 2, a streamflow of 56.6 cfs was estimated to occur at the controlling discharge of 38,000 cfs. This streamflow estimate is less than the flow estimate of 67.3 cfs which was determined using the flow versus mainstem discharge rating curve.

3.3.4 Channel Geometry

3.3.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Kroto Slough during a non-breaching mainstem discharge of 19,600 cfs and an estimated slough flow of less than 1 cfs. The survey data are presented in Attachment Table C-3, with the resultant thalweg profile presented in Attachment Figure C-3. The thalweg profile includes the study site and the portion of the slough extending from the head downstream 300 feet below transect 1. The streambed gradient for the portion of Kroto Slough included in the thalweg profile was 7.0 feet/mile.

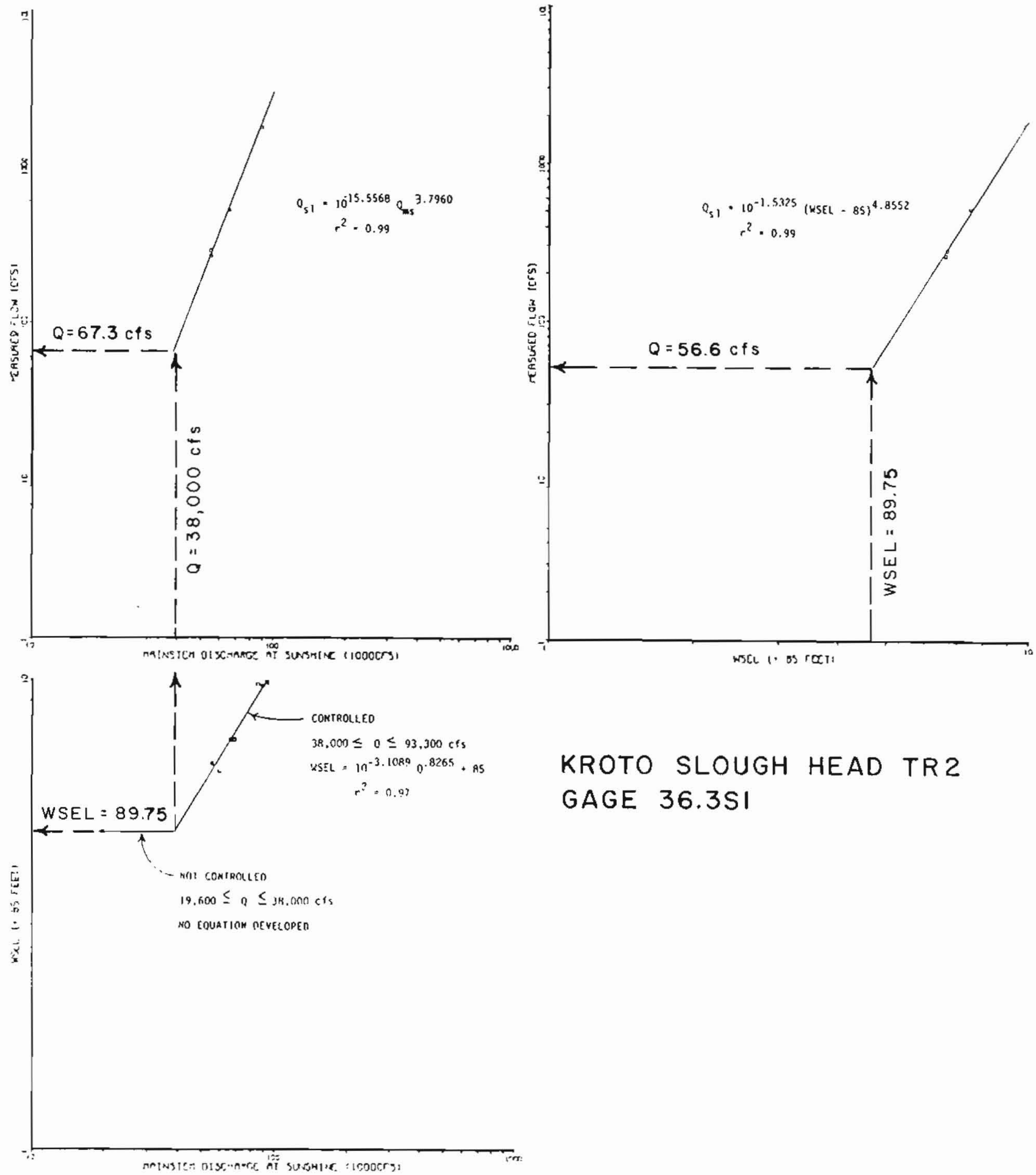


Figure 12. Comparison of rating curves for Kroto Slough Head at transect 2 Q Site.

3.3.4.2 Cross Section Profile

Cross sectional data were recorded at the only stage monitoring station located in Kroto Slough. This stage monitoring station was located on transect 2. The cross sectional data are presented in Attachment Table D-3 with the resulting cross section presented in Attachment Figure D-3.

3.3.5 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure D-3) data, an area of backwater was not observed to occur in the Kroto Slough Head study site. The Kroto Slough Head study site was located near the head of the slough which is approximately 7.8 miles in length (refer to Section 3.3 of this report). Field observations were limited to the study site therefore observations of backwater occurring in the area of the slough mouth were not obtained in 1984.

3.4 Rolly Creek (RM 39.0)

3.4.1 Site Description

Rolly Creek is a small tributary located on the east bank of the main channel of the Susitna River at river mile 39.0. This tributary is fed by an unnamed lake and flows westerly 6.4 miles before emptying into the Susitna River. Rolly Creek is a slow, meandering stream that drains a large low lying area.

During the 1984 open water field season the study site selected for Rolly Creek was located approximately 0.7 miles upstream from its mouth (Figure 13).

Stage was monitored at one location in Rolly Creek and streamflow was measured at this stage monitoring station (Figure 14). Channel geometry data obtained at this study site included a cross sectional profile at the stage monitoring station and a thalweg profile developed for the portion of the channel that included the study site.

3.4.2 Stage/Discharge Relationship

Measurements of water surface elevation and streamflow obtained at the stage monitoring station which was located on transect 2 in Rolly Creek and the corresponding mean daily mainstem discharge (USGS 15292780) are presented in Attachment Table B-1. Because these water surface elevations were independent of mainstem discharge, water surface elevations versus mainstem discharge plots were not developed. A water surface elevation versus flow rating curve was also not developed due to the extensive backwater influence.

3.4.3 Channel Geometry

3.4.3.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Rolly Creek during a mainstem discharge of 17,700 cfs and a measured

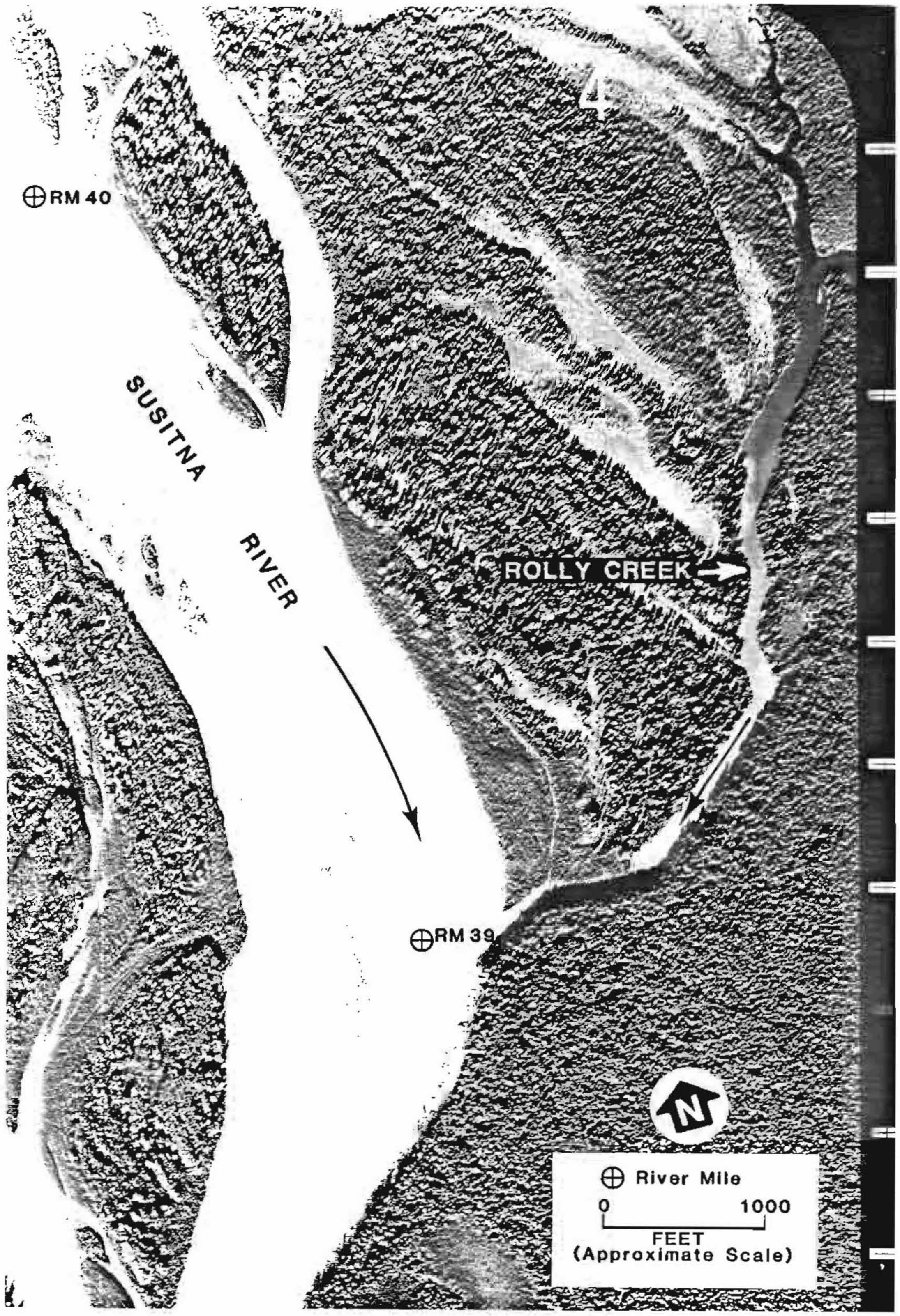


Figure 13. Overview of Rolly Creek (RM 39.0).

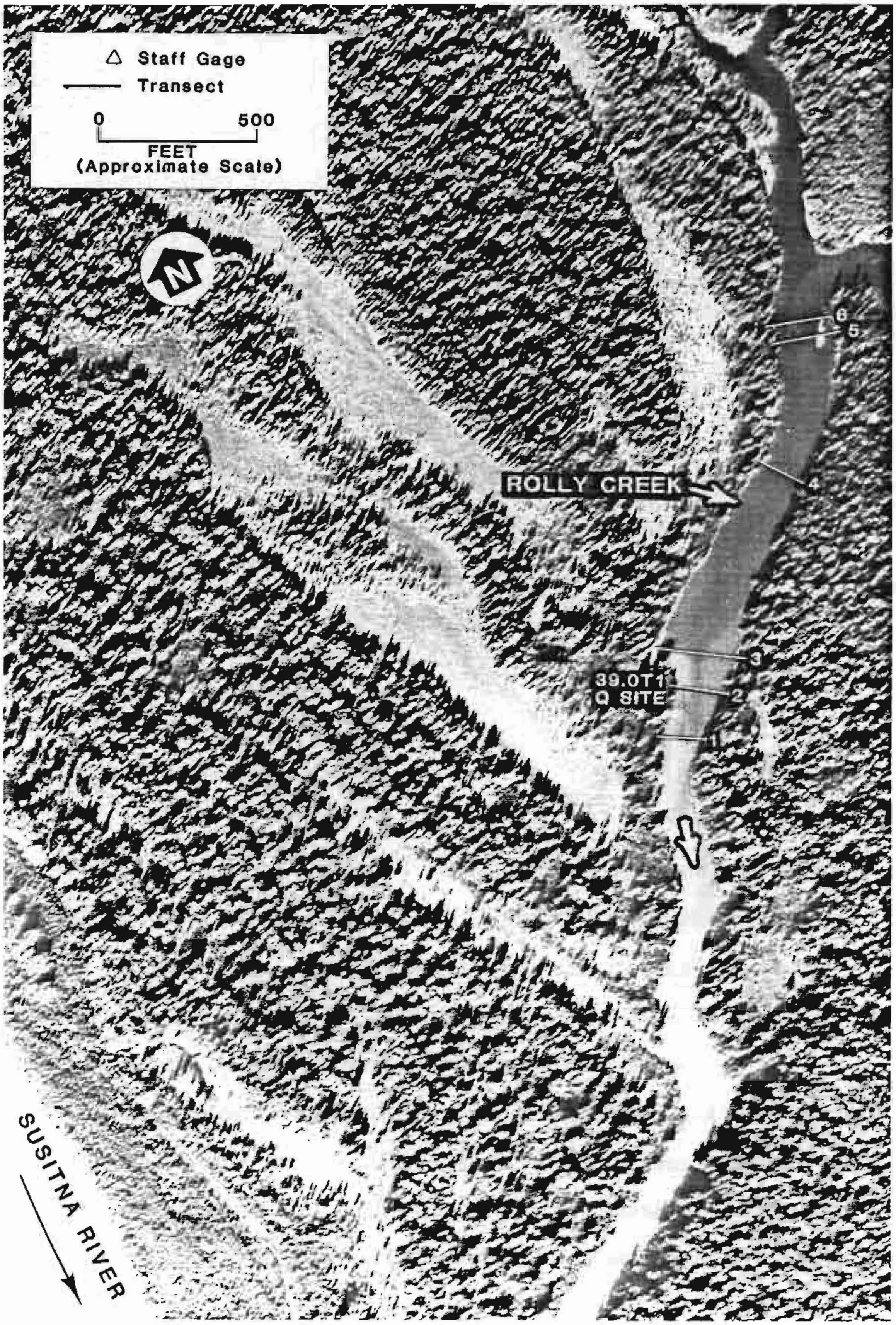


Figure 14. Location of Rolly Creek study site (RM 39.0).

tributary streamflow of 10.9 cfs. The survey data are presented in Attachment Table C-4 with the resultant thalweg profile presented in Attachment Figure C-4. The thalweg profile extends from transect 6 of the study site downstream approximately 75 feet below transect 1. The streambed gradient for the portion of the tributary included in the thalweg profile was 5.5 feet/mile.

3.4.3.2 Cross Section Profile

Cross section data were recorded at the only stage monitoring station located in Rolly Creek. This stage monitoring station was located on transect 2 (Figure 14). The cross sectional data are presented in Attachment Table D-4 with the resulting cross section presented in Attachment Figure D-4.

3.4.4 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure C-4) data a backwater area was observed to extend at least 3,750 feet from the tributary mouth at a mainstem discharge of 52,500 cfs. This backwater influence was determined from a review of the streamflow measurements obtained at transect 2 and presented in Attachment Table B-1. Field observations have indicated that backwater occurs in Rolly Creek mouth area throughout medium and high mainstem discharges although insufficient information is available to precisely determine the extent of backwater for this tributary.

3.5 Bear Bait Side Channel (RM 42.9)

3.5.1 Site Description

Bear Bait Side Channel is located on the west bank of the main channel of the Susitna River at river mile 42.9. It is approximately three miles in length and empties into the Deshka River approximately 0.6 miles upstream from the mouth of the Deshka River. The head of Bear Bait Side Channel connects directly to the main channel Susitna River. Breaching occurs when the head is overtopped by the main channel Susitna River. Prior to breaching, the upper portion of the side channel consists of a series of isolated pools.

During the 1984 open water field season the study site selected for Bear Bait Side Channel was located in the upper portion of the side channel (Figure 15). Stage was monitored at one location and streamflow was measured at this stage monitoring station (Figure 16). Channel geometry data obtained from Bear Bait Side Channel included a cross section and thalweg profile. A cross section profile was obtained at the stage monitoring station and a thalweg profile was developed for that portion of the side channel that included the study area continuing upstream to the head of the side channel.

3.5.2 Stage/Discharge Relationship

Measurements of water surface elevation were obtained in Bear Bait Side Channel at the stage monitoring station located on transect 2. Recorded

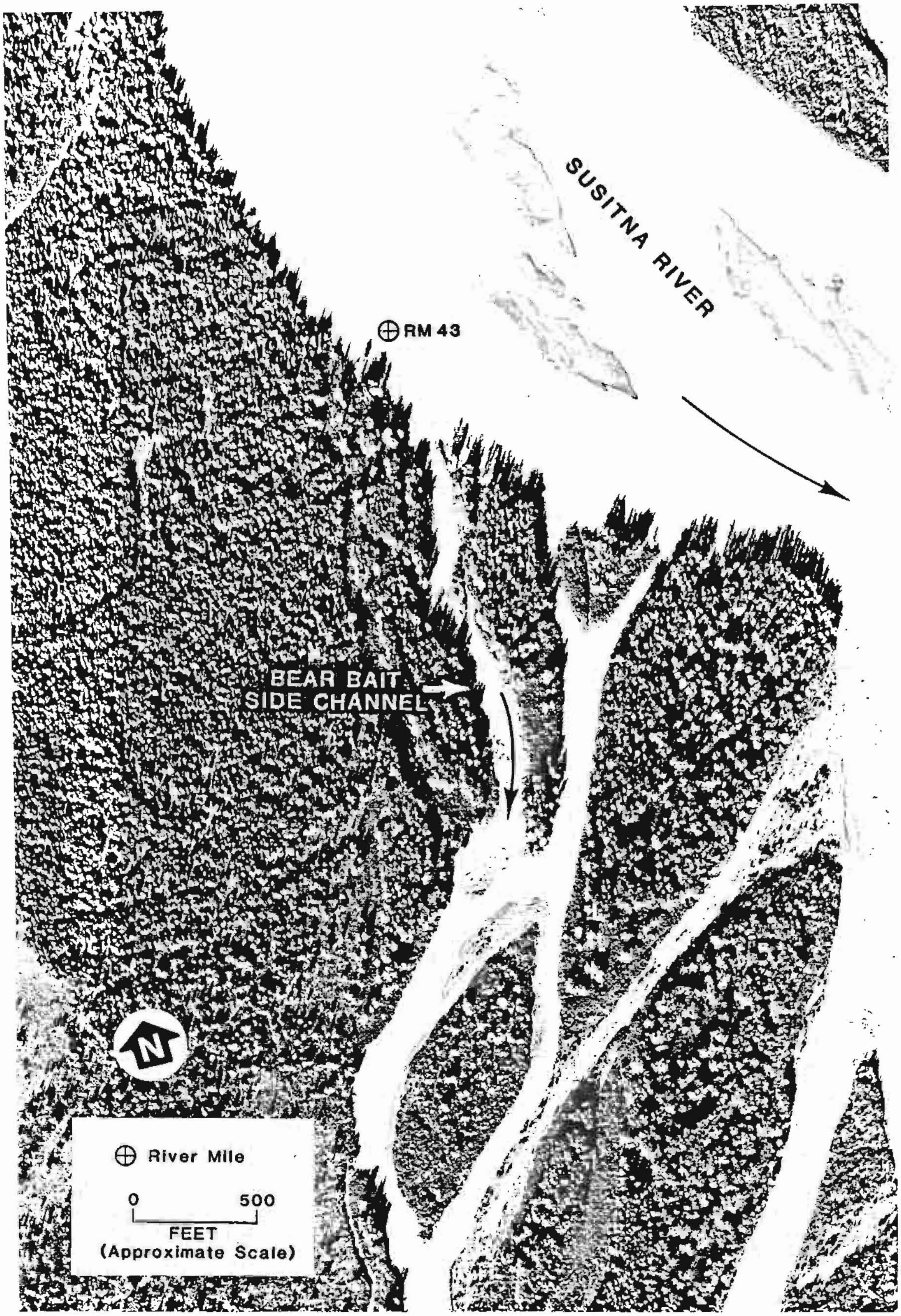


Figure 15. Overview of Bear Bait Side Channel (RM 42.9).

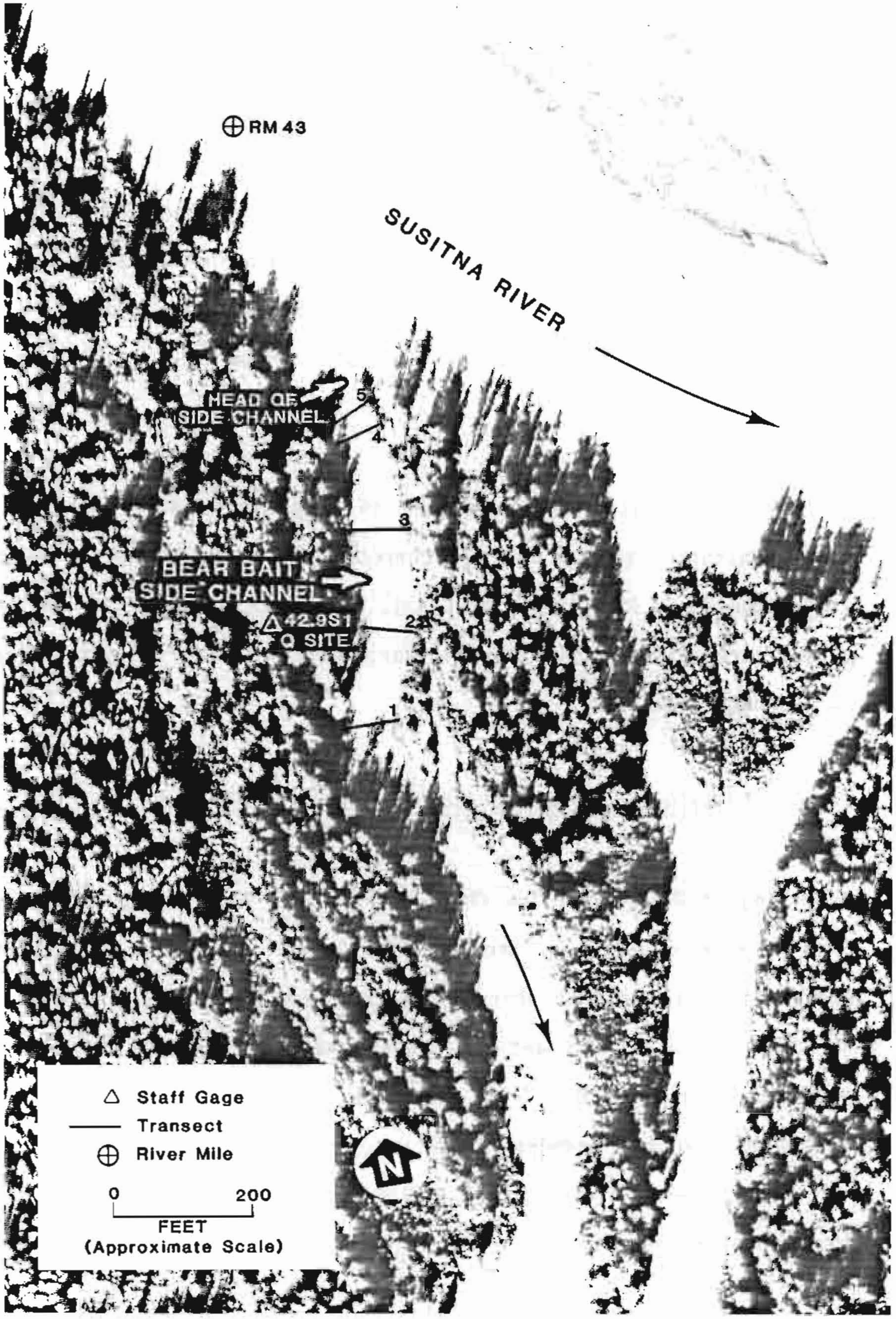


Figure 16. Location of Bear Bait Side Channel study site (RM 42.9).

water surface elevations along with the mean daily mainstem discharge at Sunshine (USGS 15292780) corresponding to the date of the stage measurement are presented in Attachment Table B-1. Three water surface elevations recorded on August 13, and 26, 1984 were evaluated using a time lag analysis. The resulting instantaneous mainstem discharges were substituted for the mean daily mainstem discharges. Plots of these water surface elevations versus mainstem discharge are presented in Attachment Figure E-4.

Measurements of streamflow recorded in Bear Bait Side Channel at the stage monitoring station and the corresponding water surface elevations are presented in Attachment Table B-1. Plots of water surface elevation versus streamflow and mainstem discharge versus streamflow are presented in Figures 17 and 18.

3.5.3 Mainstem Breaching and Controlling Discharges

Breaching of Bear Bait Side Channel occurs by overtopping of the side channel head directly by the mainstem Susitna River. Based on field observations and aerial photography the head of the side channel was breached at 36,600 cfs and non-breached at 25,900 cfs (Table 2). No additional information from the site is available for mainstem discharges ranging between 25,900 cfs and 36,600 cfs. Insufficient information is available to determine the initial breaching discharge for this side channel.

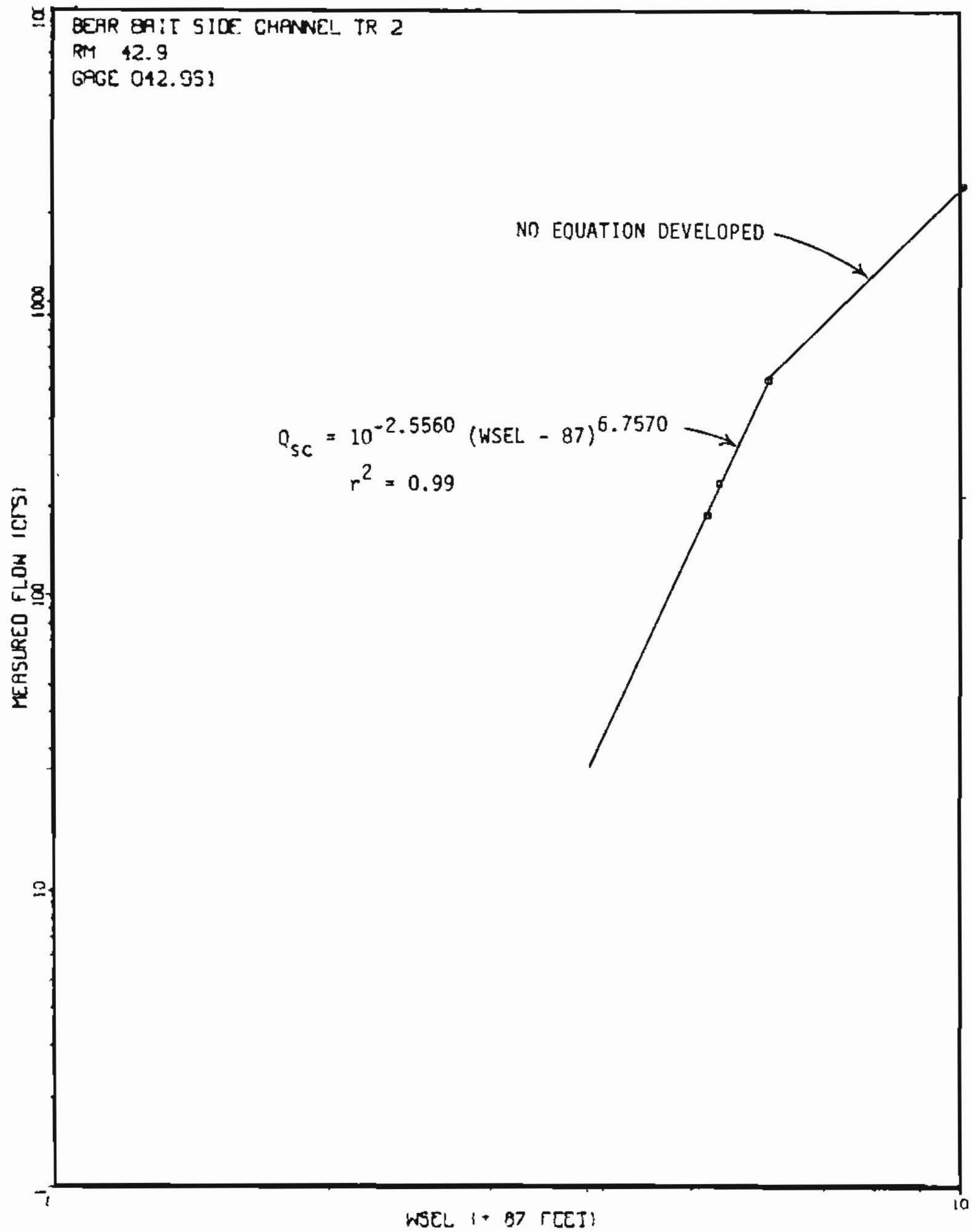


Figure 17. Bear Bait Side Channel streamflow versus WSEL rating curve at transect 2 Q Site.

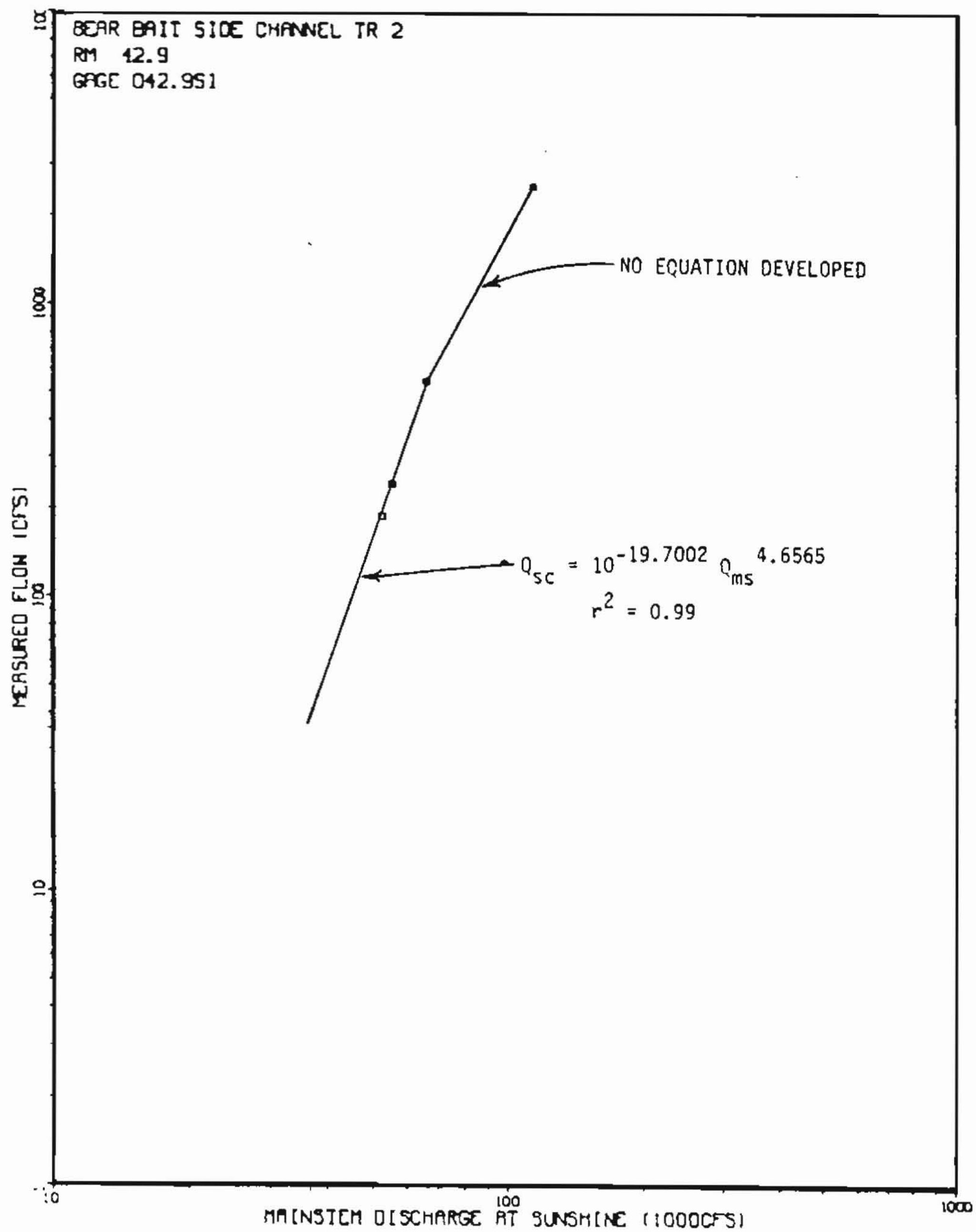


Figure 18. Bear Bait Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 2 Q Site.

Limited stage data is available to evaluate the controlling discharge. A single stage observation was obtained for the non-breached conditions (Attachment Table B-1). This low flow stage observation suggests that substantial scour of the channel has occurred at the site as a result of the August 26 high flow event. Due to this scour this stage observation is not representative of base flow conditions when compared to the stage observations obtained for the breached conditions. It is because of a lack of information defining the breached discharge and baseflow conditions for this side channel a controlling discharge for Bear Bait Side Channel has not been determined. A comparison of the rating curves for the streamflow station was not developed.

3.5.4 Channel Geometry

3.5.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Bear Bait Side Channel during a non-breaching mainstem discharge of 18,300 cfs and an estimated side channel streamflow of less than 1 cfs. The survey data are presented in Attachment Table C-5 with the resultant thalweg profile presented in Attachment Figure C-5. The thalweg profile extends from the head of the side channel downstream to approximately 50 feet below transect 1. The streambed gradient for the portion of the side channel included in the thalweg profile was 1.9 feet/mile.

3.5.4.2 Cross Section Profile

Cross section data were recorded at the only stage monitoring station located in Bear Bait Side Channel. This stage monitoring station was located on transect 2 (Figure 16). The cross sectional data are presented in Attachment Table D-5 with the resulting cross section presented in Attachment Figure D-5.

3.5.5 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure C-5) data a backwater area was observed not to occur in the Bear Bait Side Channel study site. The Bear Bait Side Channel study site is located in the upper portion of the side channel (see Section 3.5.1 of this report) therefore field observations of backwater occurring in the vicinity of the side channel mouth were not obtained in 1984.

3.6 Last Chance Side Channel (RM 44.4)

3.6.1 Site Description

Last Chance Side Channel is located in the Delta Island complex on the east bank of the west channel of the Susitna River at river mile 44.4. The side channel is approximately 1.1 miles in length and is separated from the mainstem by a large vegetated island. The head of Last Chance

Side Channel adjoins a small side channel which is connected to the mainstem Susitna River. Last Chance Side Channel empties directly into the mainstem Susitna River. Breaching flows in Last Chance Side Channel result from overtopping of the head by the adjoining small side channel. Prior to breaching flow is minimal with only a few pools remaining in the upper portion of the channel.

During the 1984 open water field season the study site selected at Last Chance Side Channel was located in the upper portion of the side channel (Figure 19). Stage was monitored at one location and streamflow was measured at this stage monitoring station (Figure 20). Channel geometry data obtained at Last Chance Side Channel include a cross section profile and a thalweg profile. A cross section profile was obtained for the stage monitoring station and the thalweg profile was determine for that portion of the side channel that included the study site and continued upstream to the head of the side channel.

3.6.2 Stage/Discharge Relationship

Measurements of water surface elevation obtained at the stage monitoring station at Last Chance Side Channel and the mean, daily mainstem discharges at Sunshine (USGS 15292780) corresponding to the date of the stage measurement are presented in Attachment Table B-1. Five stage measurements recorded on July 26, August 25, or August 27, 1984, were evaluated using a lag time analysis. For each of the observations, the lag time instantaneous mainstem discharge was substituted for the mean

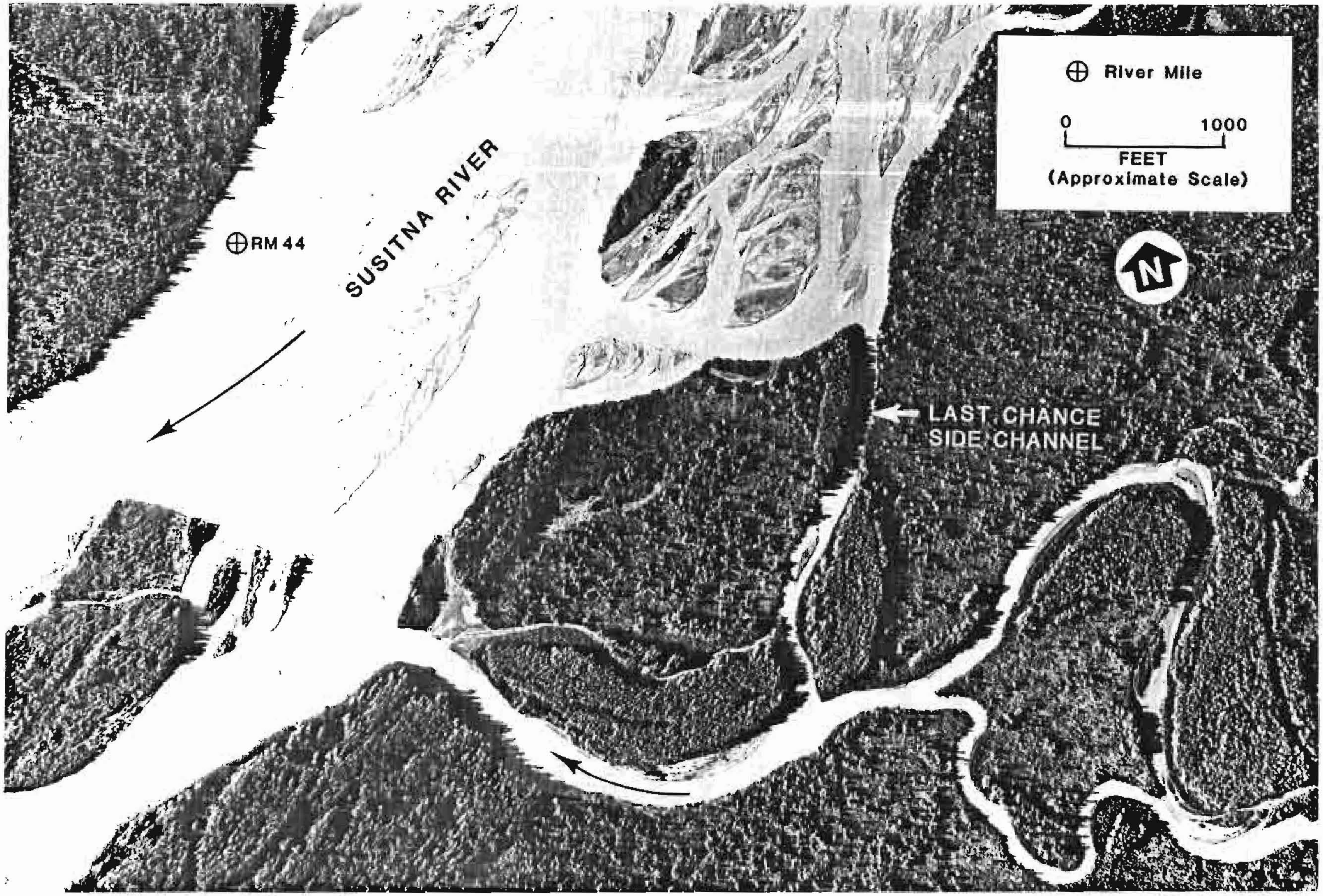


Figure 19. Overview of Last Chance Side Channel (RM 44.4).

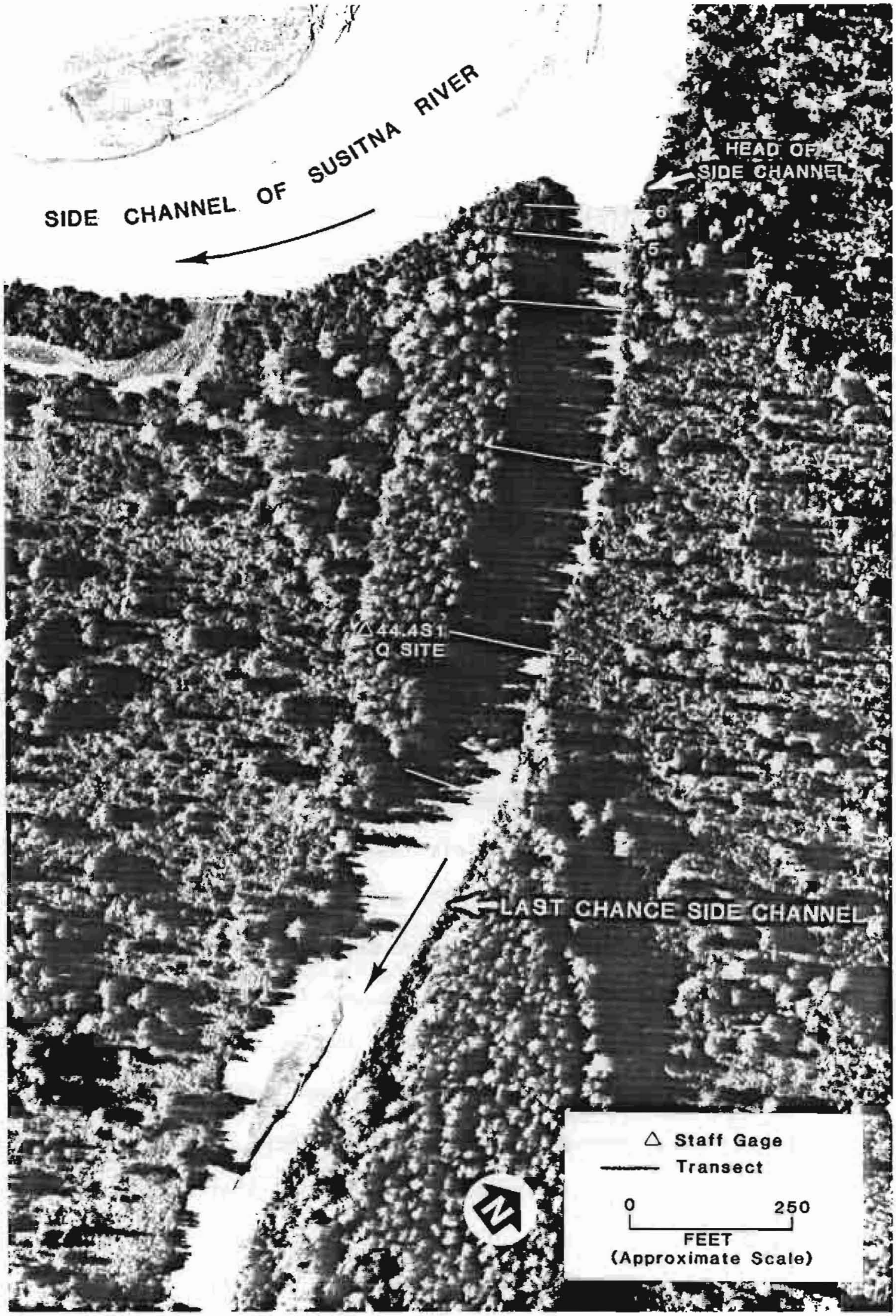


Figure 20. Location of Last Chance Side Channel study site (RM 44.4).

daily discharge. A plot of these water surface elevations versus mainstem discharge are presented in Attachment Figure E-5.

Measurements of streamflow obtained at the stage monitoring station in Last Chance Side Channel and the corresponding water surface elevations are presented in Attachment Table B-1. A plot of these streamflows and the corresponding water surface elevations are presented in Figure 21. A plot of streamflow and mainstem discharge was also developed and is presented in Figure 22.

3.6.3 Mainstem Breaching and Controlling Discharges

Breaching of Last Chance Side Channel results from overtopping of the head by an adjoining side channel and not directly by the mainstem Susitna River. A field observation recorded on September 12 indicated that the head of the side channel was "barely" breached at a mean daily mainstem discharge of 22,700 cfs (Table 2). On September 11 a field observation noted that at 23,500 cfs the head was "almost breached" (Table 2). The discrepancy between the two field observations (22,700 cfs and 23,500 cfs) is probably because these values are mean daily discharge values and not instantaneous values. Because the time of day was not noted when these two field observations were recorded, the instantaneous discharge occurring during these observations cannot be determined. Since the hydrograph of Sunshine Station was declining on September 11 (mean daily discharge = 23,500 cfs) and stabilizing on September 12 (mean daily discharge = 22,700 cfs), the September 12

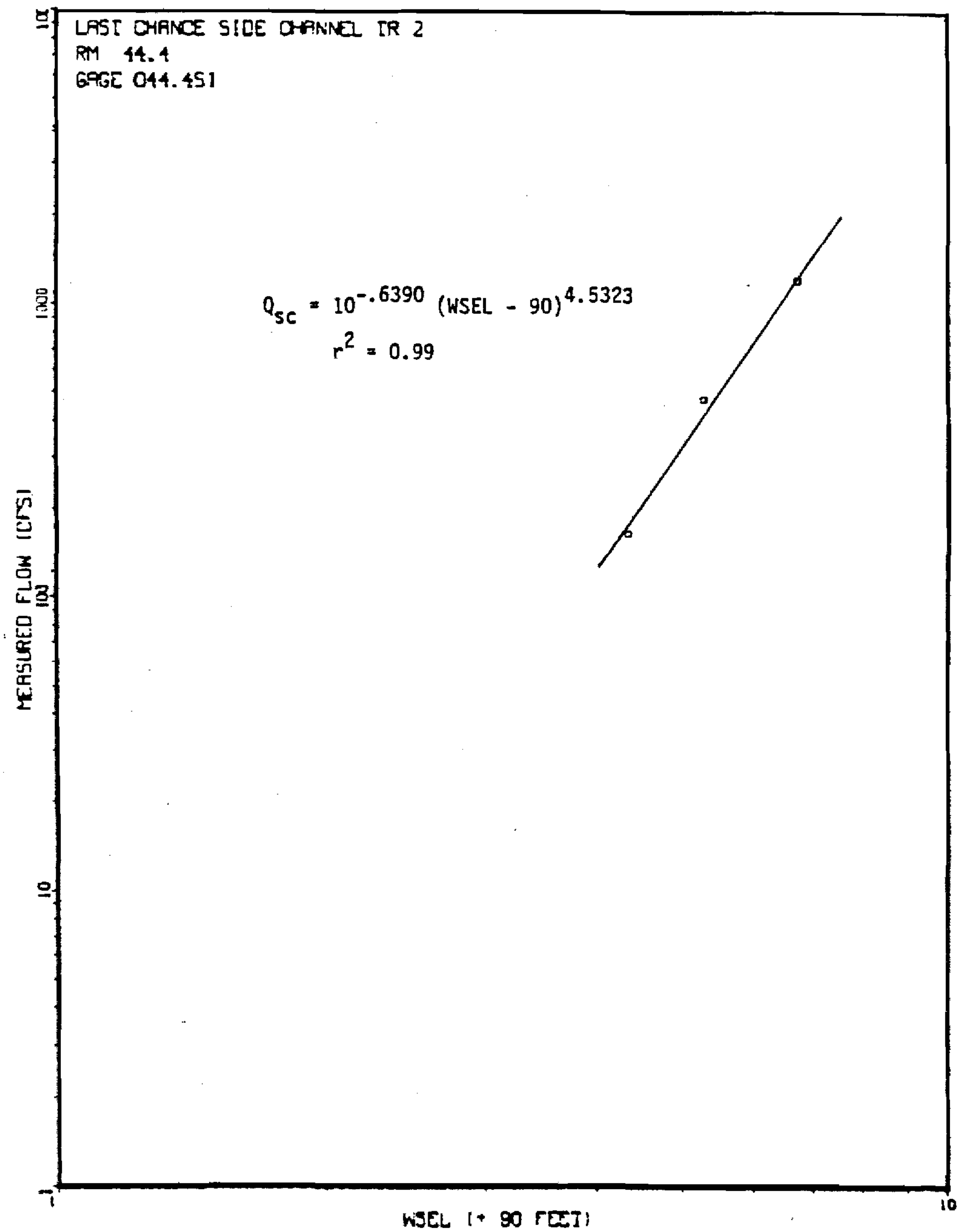


Figure 21. Last Chance Side Channel streamflow versus WSEL rating curve at transect 2 Q Site.

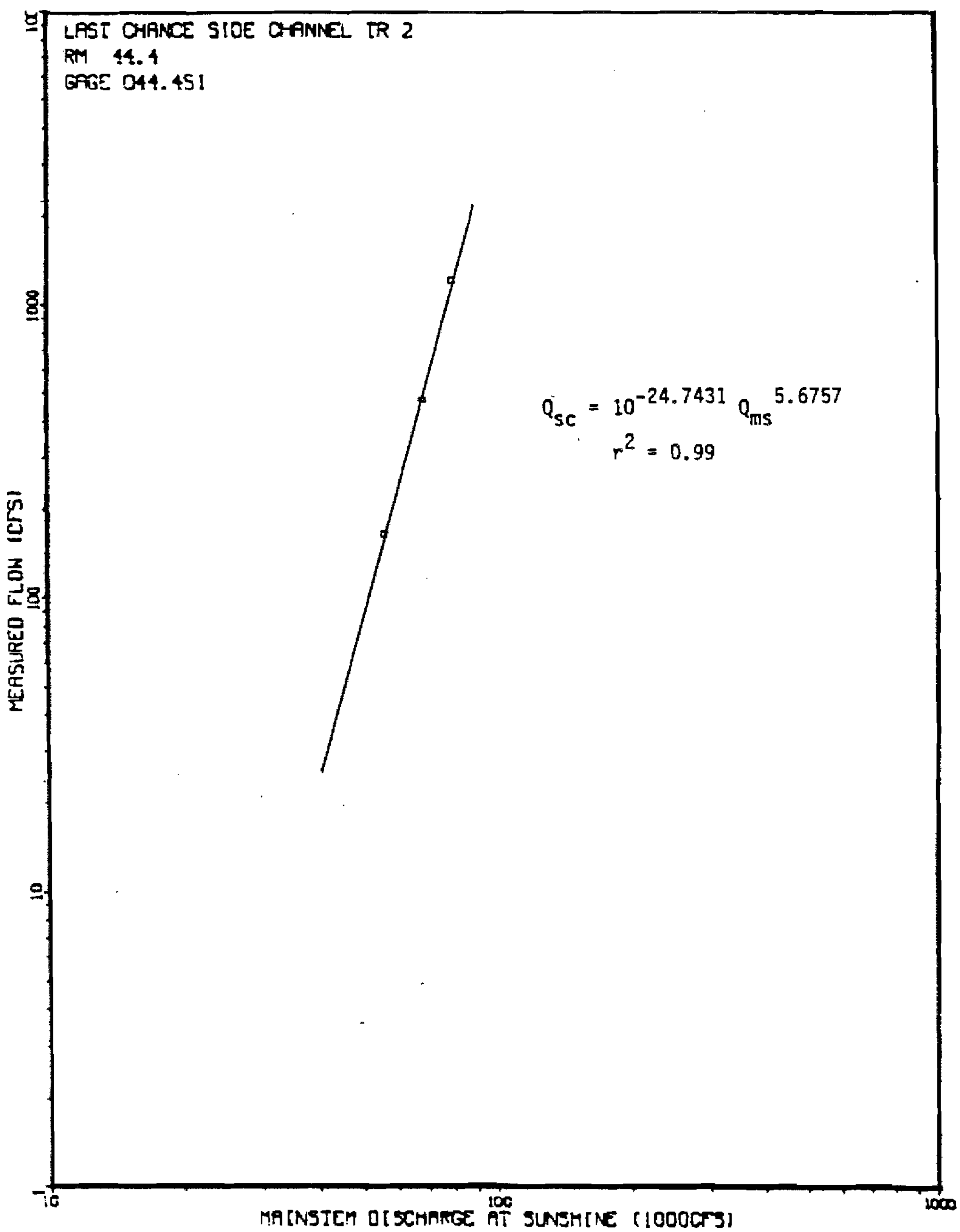


Figure 22. Last Chance Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 2 Q Site.

observation is considered to be the most reliable. The suggested initial breaching discharge is therefore 22,700 cfs. An aerial photograph shows that Last Chance Side Channel was dry at a mainstem discharge of 22,000 cfs.

The stage data obtained at Last Chance Side Channel is limited to observations corresponding to mainstem discharges of 48,100 cfs and greater. Because no stage data was recorded during unbreached periods, the controlling breaching discharge cannot be precisely determined. However, experience at other sites indicates that the controlling discharge for a site is generally 1,000 to 2,000 cfs greater than its breaching discharge. The controlling discharge for Last Chance Side Channel is estimated at approximately 24,000 cfs.

A comparison of the rating curves developed for the streamflow station (transect 2) was not possible due to insufficient stage data. This lack of stage data also prevented the development of a regression equation to estimate the water surface elevation corresponding to the controlling discharge.

3.6.4 Channel Geometry

3.6.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Last Chance Side Channel during a non-breaching mainstem discharge of 18,300 cfs and an estimated side channel streamflow of less than 1 cfs.

The survey data are presented in Attachment Table C-6 with the resultant thalweg profile presented in Attachment Figure C-6. The thalweg profile extends from the head of the side channel and continues downstream approximately 60 feet below transect 1. The streambed gradient for the portion of the side channel included in the thalweg profile was 10.1 feet/mile.

3.6.4.2 Cross Section Profile

Cross section data were recorded at the only stage monitoring station located in Last Chance Side Channel. This stage monitoring station was located on transect 2. The cross sectional data are presented in Attachment Table D-6 with the resulting cross section presented in Attachment Figure D-6.

3.6.5 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure C-6) data, a backwater area was observed not to occur in the Last Chance Side Channel study site. As with several side channel study sites, the study site for Last Chance Side Channel was located in the upper portion of the side channel (see Section 3.6.1 of this report). Field observations were limited to the study site of this side channel, therefore, backwater observations occurring in the side channel mouth area were not obtained in 1984.

3.7 Rustic Wilderness Side Channel (RM 59.5)

3.7.1 Site Description

Rustic Wilderness Side Channel is located on the east bank of the main channel of the Susitna River at river mile 59.5. It is approximately 7.2 miles in length and is separated from the mainstem by a complex network of islands and channels. The head of Rustic Wilderness Side Channel connects to a side channel of the mainstem Susitna River. The mouth connects with the east channel of the Susitna River at the upper end of the Delta Islands. Breaching flows occurring in Rustic Wilderness Side Channel result from overtopping of the head by the adjoining side channel. Prior to breaching, the channel is substantially dewatered and flow is greatly reduced. During the 1984 open water field season the study site selected for Rustic Wilderness Side Channel was located in the upper portion of the side channel (Figure 23). Stage was monitored at one location and stream flow was measured at this stage monitoring station (Figure 24). Channel geometry data obtained from Rustic Wilderness Side Channel included cross section and thalweg profiles. The cross section profile was obtained from the stage monitoring station and the thalweg profile was determined for that portion of the side channel that included the study site continuing upstream to the head of the side channel.

3.7.2 Stage/Discharge Relationship

Measurements of water surface elevations obtained at the stage monitoring station (transect 4) in Rustic Wilderness Side Channel and the

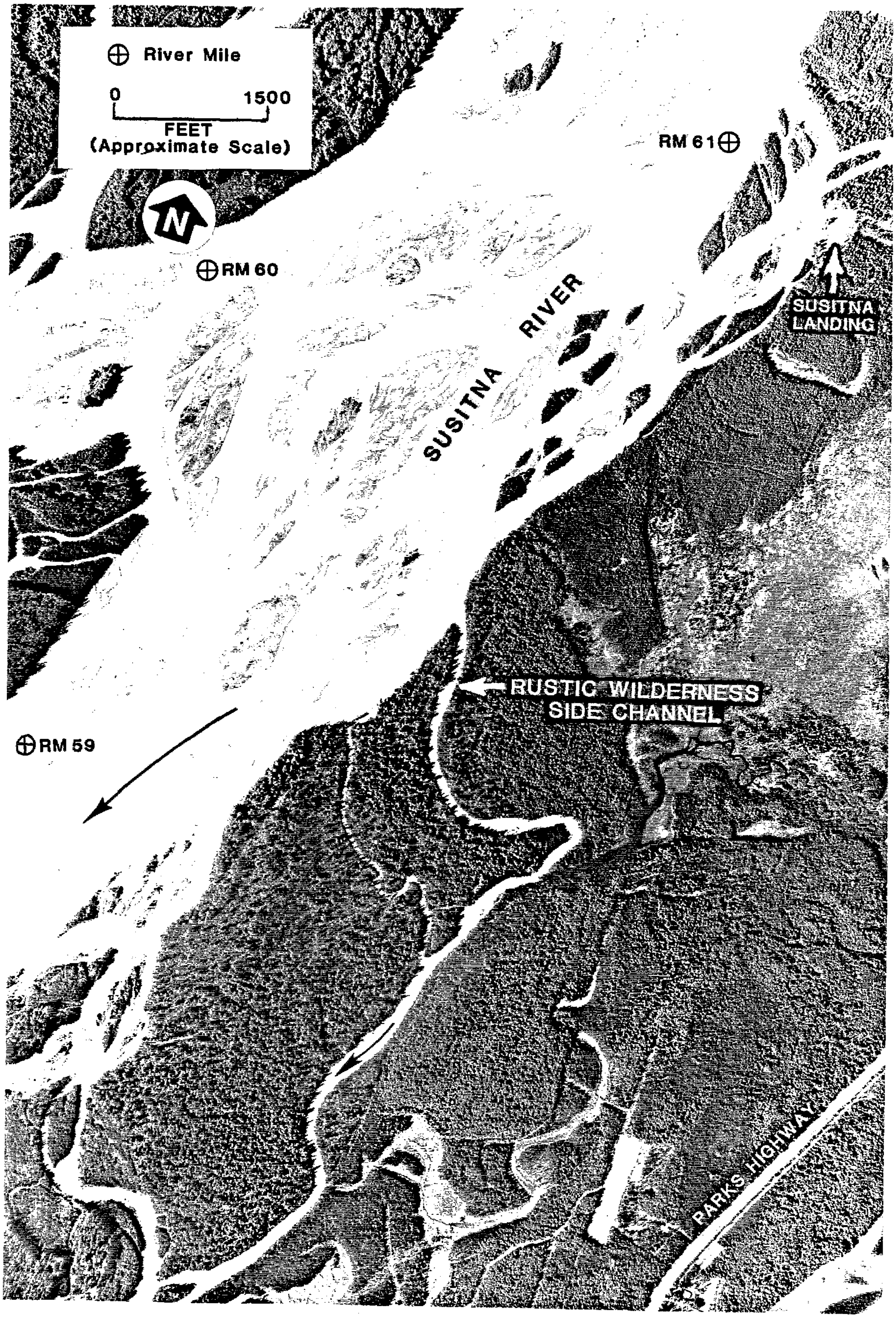


Figure 23. Overview of Rustic Wilderness Side Channel (RM 59.5).

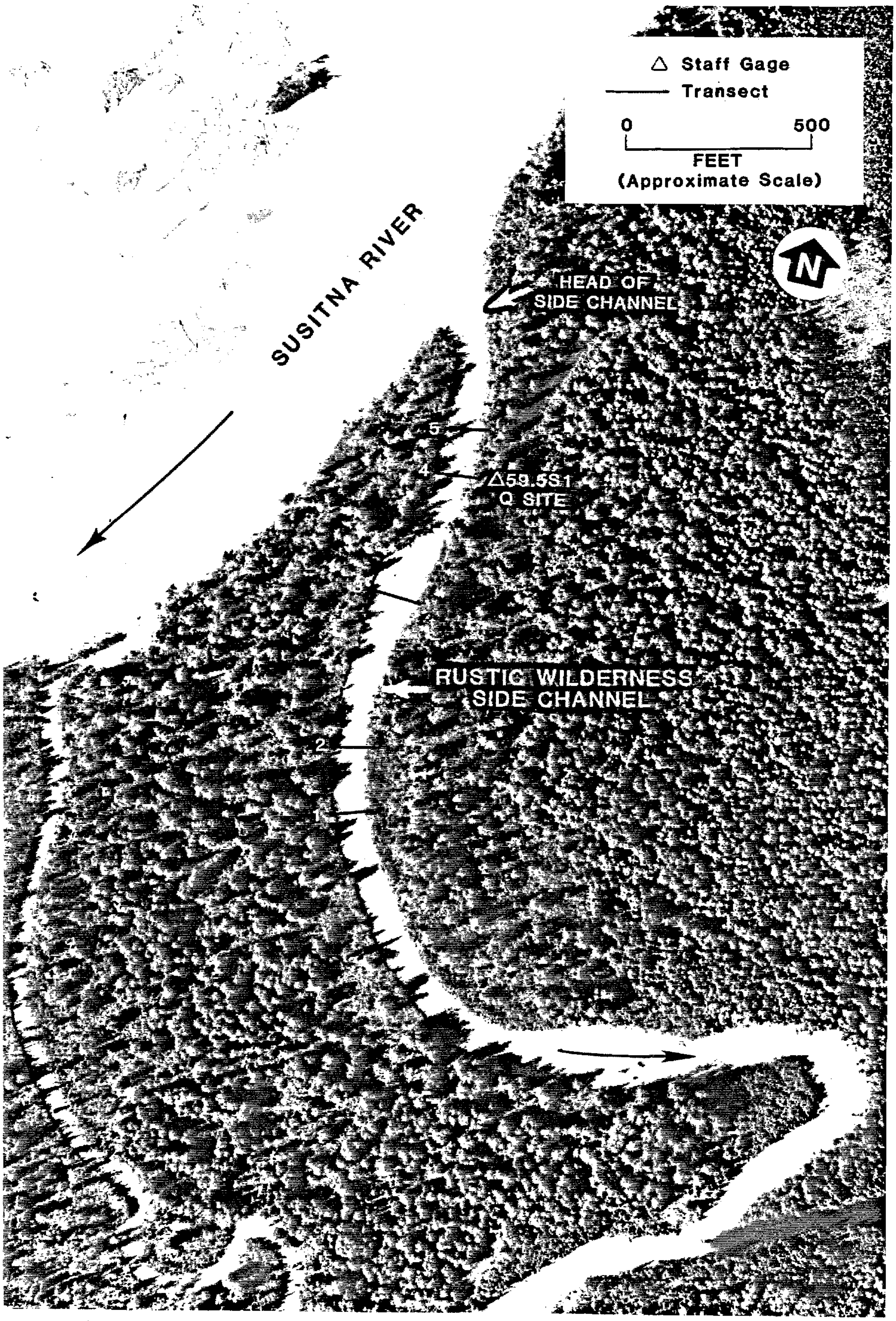


Figure 24. Location of Rustic Wilderness Side Channel study site (RM 59.5).

corresponding mean daily mainstem discharge at Sunshine (USGS 15292780) are presented in Attachment Table B-1. A water surface elevation obtained on August 12 was evaluated using a time lag analysis resulting in a corresponding instantaneous mainstem discharge. A plot of these water surface elevations versus mainstem discharges are presented in Attachment Figure E-6.

Measurements of streamflow obtained at the stage monitoring site and the corresponding water surface elevations and mainstem discharges are presented in Attachment Table B-1. A rating curve of streamflows versus water surface elevations was developed and is presented in Figure 25. The streamflow data was also plotted against mean daily mainstem discharge as a rating curve (Figure 26).

3.7.3 Mainstem Breaching and Controlling Discharges

At mean daily mainstem discharges of 20,400 cfs and 18,700 cfs the head of Rustic Wilderness Side Channel has been observed as "barely" breached and "almost" breached, respectively (Table 2). The mean daily discharge of 20,400 cfs was within 100 cfs of the instantaneous value and the mean daily discharge of 18,700 cfs was equal to the instantaneous value. Based on these field observations an initial breaching discharge of 19,000 cfs was chosen.

From a review of the water surface elevation versus mainstem discharge rating curve presented in Attachment Figure E-6 the hydraulics of this

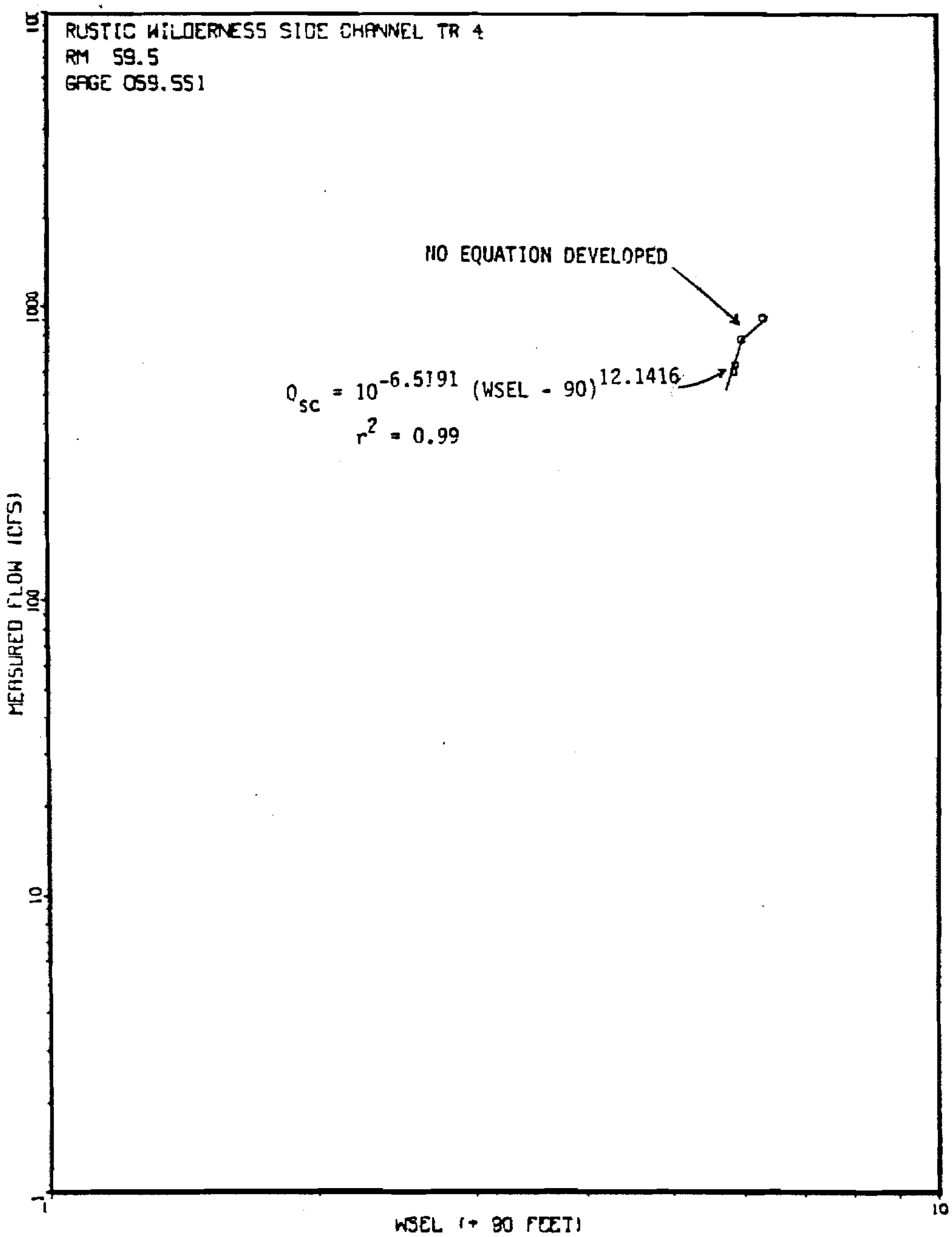


Figure 25. Rustic Wilderness Side Channel streamflow versus WSEL rating curve at transect 4 Q Site.

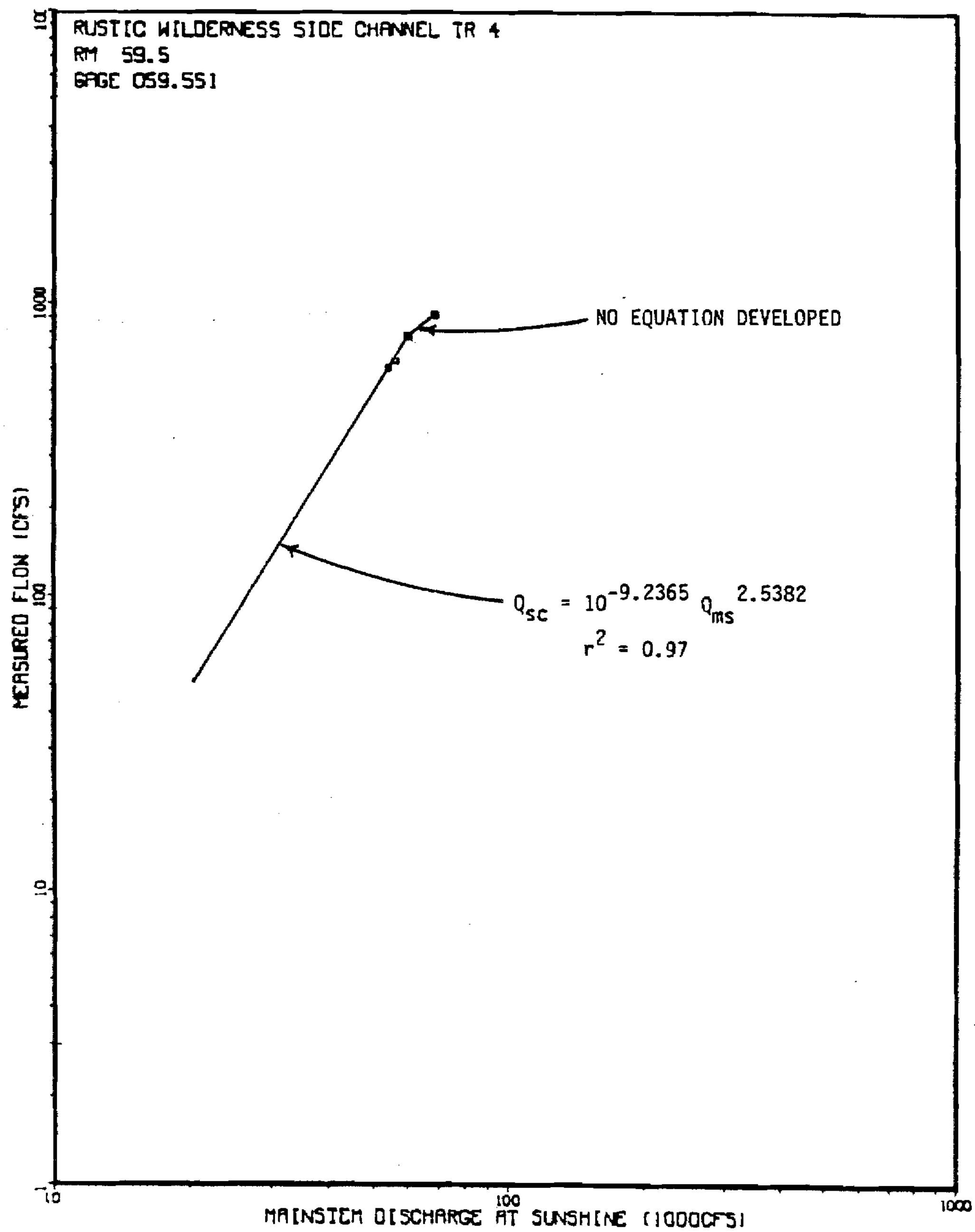


Figure 26. Rustic Wilderness Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 4 Q Site.

side channel appear to be controlled at mainstem discharge of 20,400 cfs.

The lack of data between 20,400 cfs and 38,000 cfs precludes the ability to develop a comparison of rating curves for Rustic Wilderness Side Channel.

3.7.4 Channel Geometry

3.7.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Rustic Wilderness Side Channel during a non-breaching mainstem discharge of 17,700 cfs and an estimated side channel streamflow of less than 1 cfs. The survey data are presented in Attachment Table C-7 with the resultant thalweg profile presented in Attachment Figure C-7. The thalweg profile extends from the head of the side channel and continues downstream approximately 650 feet below transect 1. The streambed gradient for the portion of the side channel included in the thalweg profile was 8.7 feet/mile.

3.7.4.2 Cross Section Profile

Cross section data were recorded at the only stage monitoring station located in Rustic Wilderness Side Channel. This stage monitoring station was located in transect 4. The cross sectional data are presented in Attachment Table D-7 with the resulting cross section presented in Attachment Figure D-7.

3.7.5 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure C-7) data, a backwater area was observed not to occur in the Rustic Wilderness Side Channel study site. The study site was limited to the upper portion of the side channel (see Section 3.7 of this report) and observations of backwater at the side channel mouth were not obtained in 1984.

3.8 Caswell Creek (RM 63.0)

3.8.1 Site Description

Caswell Creek is a small tributary approximately six miles in length which drains Caswell Lake. Caswell Creek empties into an eastern channel of the Susitna River at river mile 63.0. Except during periods of low streamflow conditions a backwater area exists in the lower portion of the creek. The study area in Caswell Creek during the 1984 open water field season was located in the lower portion of the creek approximately 700 feet upstream from the mouth (Figure 27).

At Caswell Creek stage and streamflow were monitored at one location (Figure 28). Channel geometry data obtained from Caswell Creek included a cross section profile obtained at the stage monitoring station and a

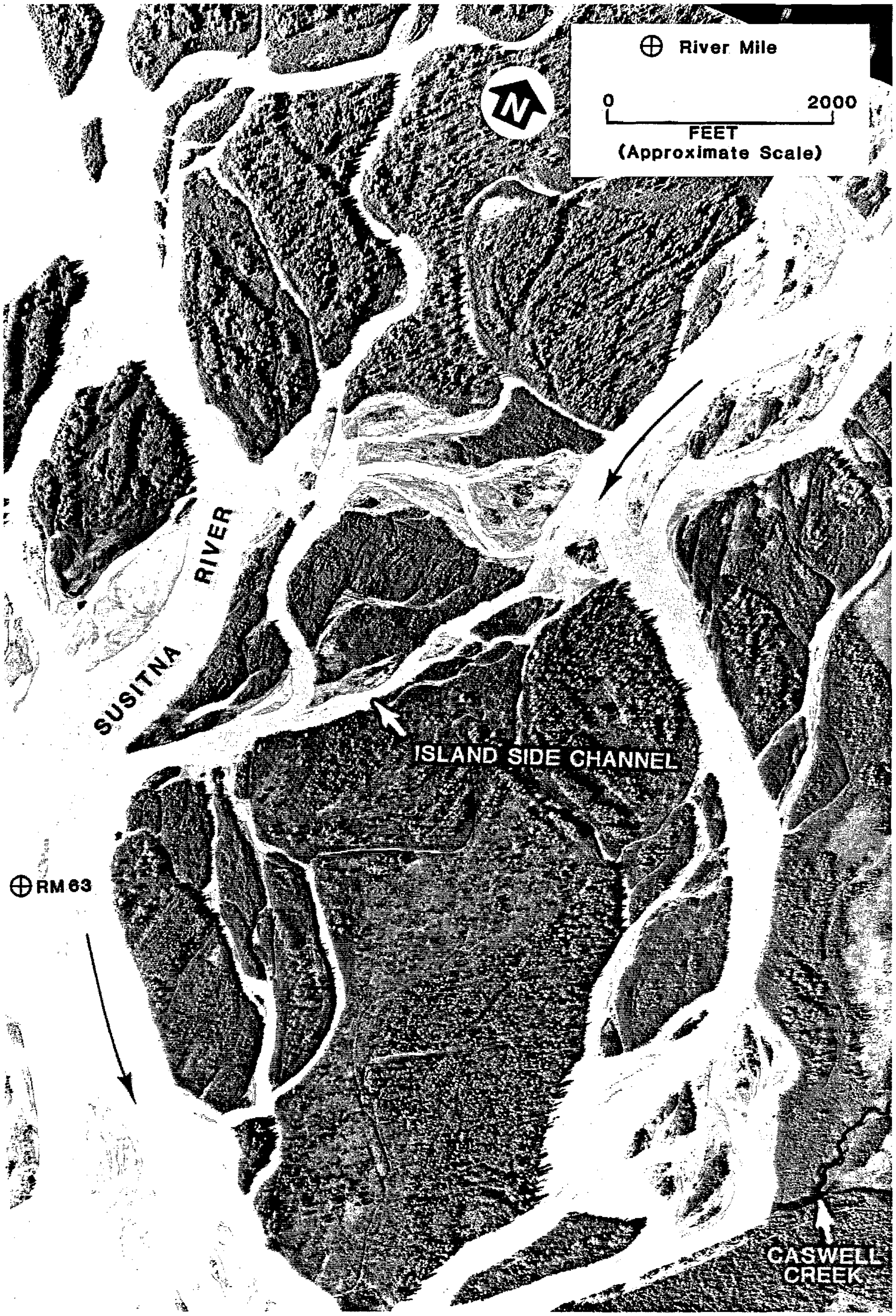


Figure 27. Overview of Caswell Creek (RM 63.0) and Island Side Channel (RM 63.2).

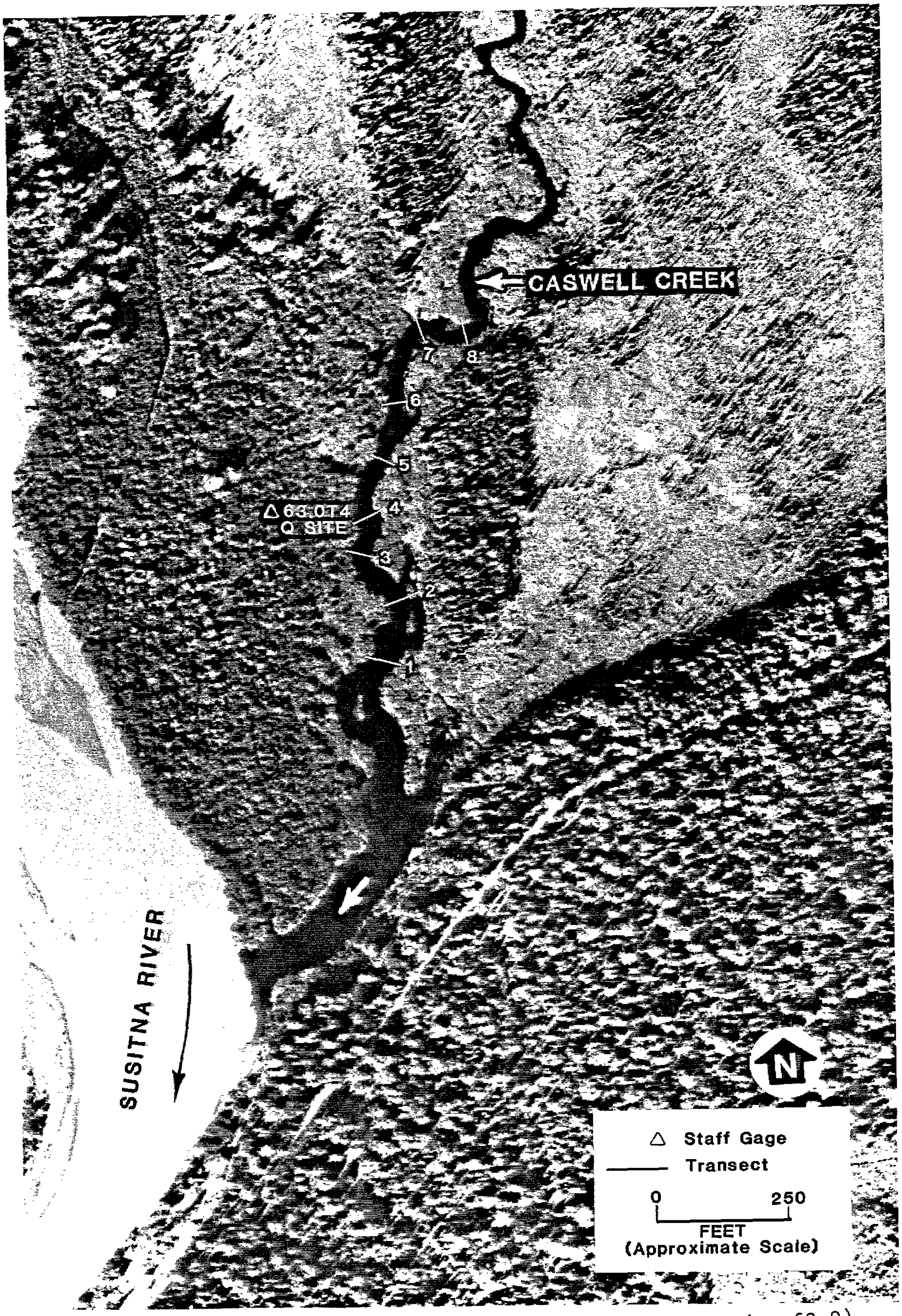


Figure 28. Location of Caswell Creek study site (RM 63.0)

thalweg profile. The thalweg profile was developed for that portion of the channel which included the study site and continued downstream to the mouth of the creek.

3.8.2 Stage/Discharge Relationship

Measurements of water surface elevation in Caswell Creek were obtained at the stage monitoring station located on transect 4 of the study site (Attachment Table B-1). Measurements of streamflow obtained at the stage monitoring station, the corresponding water surface elevation, and the corresponding mainstem discharge (USGS 15292780) are presented in Attachment Table B-1. A plot of streamflow and water surface elevations was not developed due to backwater conditions caused by mainstem Susitna River discharge.

3.8.3 Channel Geometry

3.8.3.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Caswell Creek during a mainstem discharge of 14,900 cfs and a measured tributary streamflow of 27.5 cfs. The survey data for the thalweg profile are presented in Attachment Table C-8 with the resultant thalweg profile presented in Attachment Figure C-8. The thalweg profile includes the Caswell Creek study site extending downstream 775 feet below transect 1 and upstream approximately 300 feet above transect 7.

The streambed gradient for the portion of the tributary included in the thalweg profile is 10.8 feet/mile.

3.8.3.2 Cross Section Profile

Cross section data were recorded at the only stage monitoring station located in Caswell Creek. This stage monitoring station was located on transect 4. The cross sectional data are presented in Attachment Table D-8 with the resultant cross section presented in Attachment Figure D-8.

3.8.4 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure C-8) data, mainstem discharge has been found to have a significant influence on backwater in Caswell Creek. The streamflow measurements obtained from Caswell Creek indicate backwater extended at least to transect 4, approximately 1,026 feet, at a mainstem discharge of 55,100 cfs. Although field observations indicate backwater occurs in Caswell Creek during medium and high mainstem discharge insufficient data is available to precisely determine the extent of backwater over the 1984 range of mainstem discharges.

3.9 Island Side Channel (RM 63.2)

3.9.1 Site Description

Island Side Channel is located between the main channel of the Susitna River and a large side channel that parallels the eastern bank at river mile 63.2. This side channel is located downstream of a braided, vegetated floodplain and is not directly connected to the main channel Susitna River. It is approximately 0.7 miles in length with both the mouth and head portions adjoining side channel networks. Breaching flows in this side channel result from overtopping of the head by an adjoining larger side channel. Prior to breaching, side channel flow is greatly reduced with a series of pools remaining.

During the 1984 open water field season, the study site selected for Island Side Channel was located in the lower portion of the side channel (Figure 27). Stage was monitored at eight locations in the side channel with streamflow being measured at two of these stage monitoring stations (Figure 29). Cross section survey data were obtained at each stage monitoring station. Survey data for the development of a thalweg profile were collected for that portion of the side channel beginning at the confluence of the adjoining side channel and terminating at the first hydraulic control above the study site.

3.9.2 Stage/Discharge Relationship

Measurements of water surface elevations obtained at each stage monitoring station located in Island Side Channel along with the mean daily mainstem discharges at Sunshine (USGS 15292780) corresponding to the date of the stage measurements are presented in Attachment Table B-1. Plots of these water surface elevations versus mainstem discharges are presented in Attachment Figures E-7 to E-14.

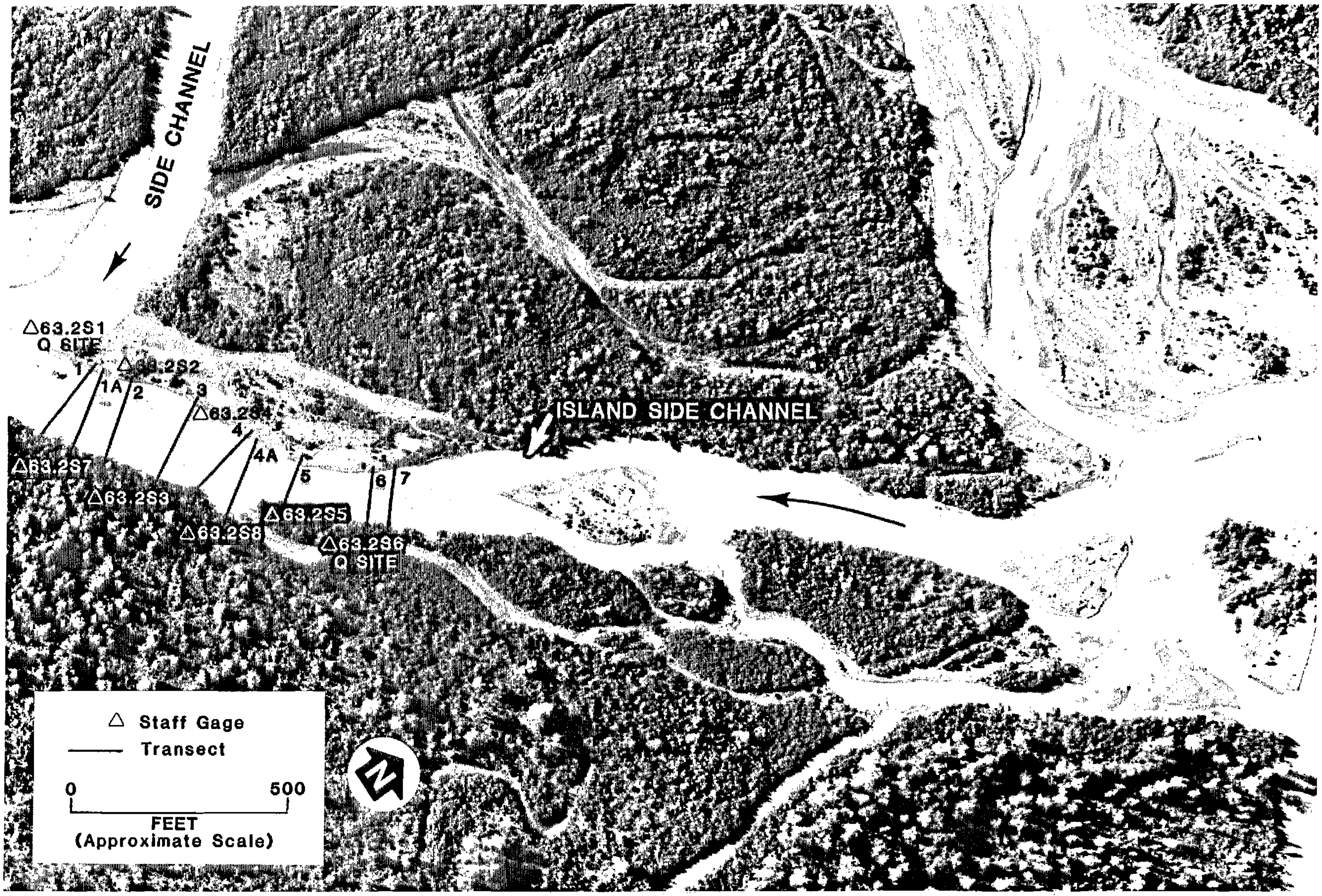


Figure 29. Location of Island Side Channel study site (RM 63.2).

Measurements of streamflow were obtained at the stage monitoring stations located on modelling transects 1 and 6. These measurements of streamflow and the corresponding water surface elevations and mainstem discharges (USGS 15292780) are presented in Attachment Table B-1. Plots of these streamflows versus water surface elevations developed as rating curves are presented in Figures 30 and 31. In addition, the streamflow data was plotted against mean daily mainstem discharge as rating curves (Figures 32 and 33).

3.9.3 Mainstem Breaching and Controlling Discharges

Breaching of Island Side Channel is the result of overtopping of the head by an adjoining side channel. Based on aerial photograph interpretation (Table 2), the lowest mainstem discharge that has been observed to breach this side channel is 36,600 cfs (USGS 15292780).

Based on a review of Attachment Figure E-14, it has been determined that at mainstem discharges exceeding 35,000 cfs the hydraulics within this side channel are directly controlled by mainstem discharge. Following 35,000 cfs the water surface elevation at transect 6 increases dramatically with corresponding increases in mainstem discharge. The controlling discharge of 35,000 cfs is lower than the observed breaching discharge of 36,600 cfs as determined from aerial photography indicating that this side channel initially breaches below a mainstem discharge of 35,000 cfs. Insufficient field data is available to determine precisely the initial breaching discharge for Island Side Channel. The initial

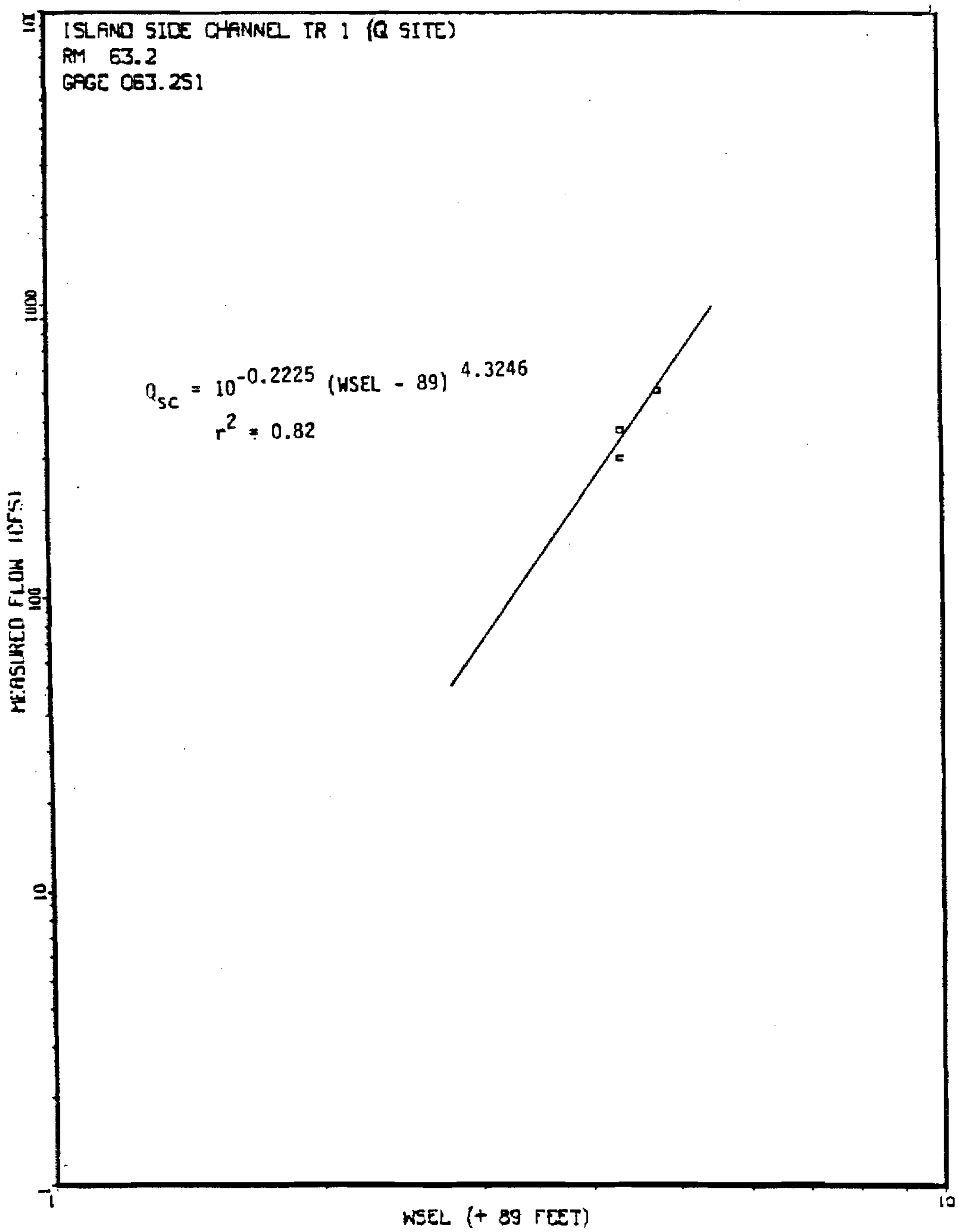


Figure 30. Island Side Channel streamflow versus WSEL rating curve at transect 1 Q Site.

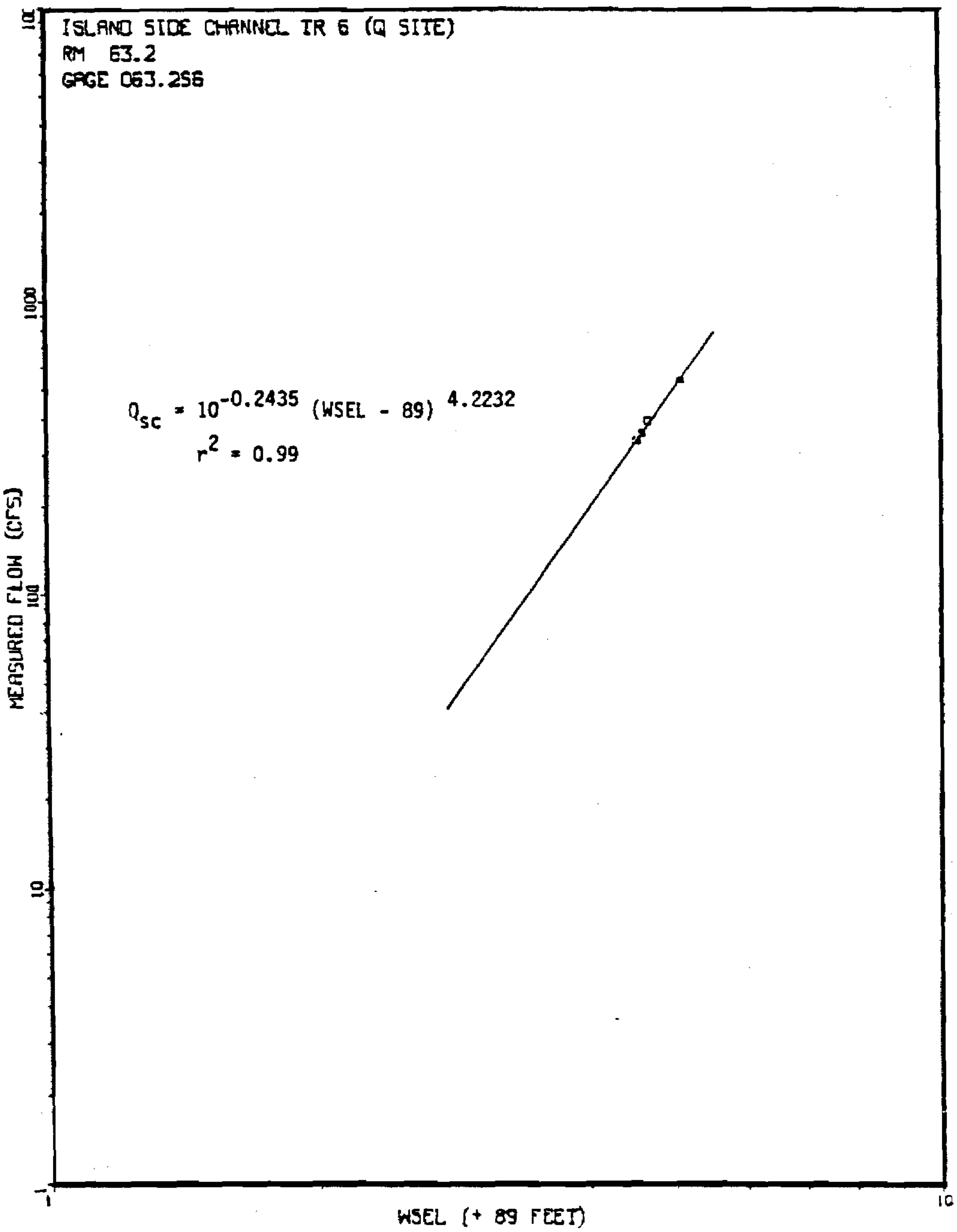


Figure 31. Island Side Channel streamflow versus WSEL rating curve at transect 6 Q Site.

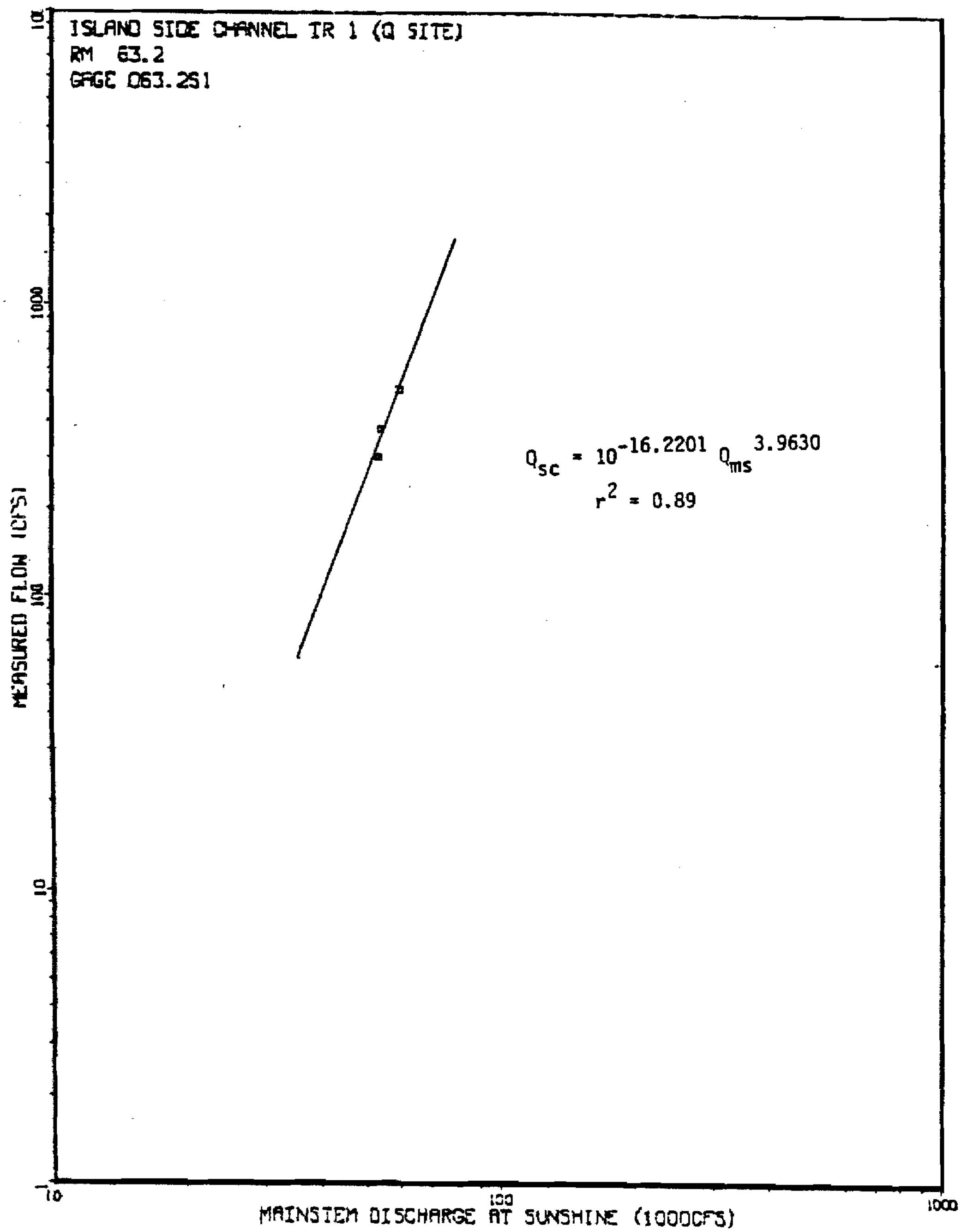


Figure 32. Island Side Channel streamflow versus mainstem discharge at Sunshine (USGS 15292780) rating curve at transect 1 Q Site.

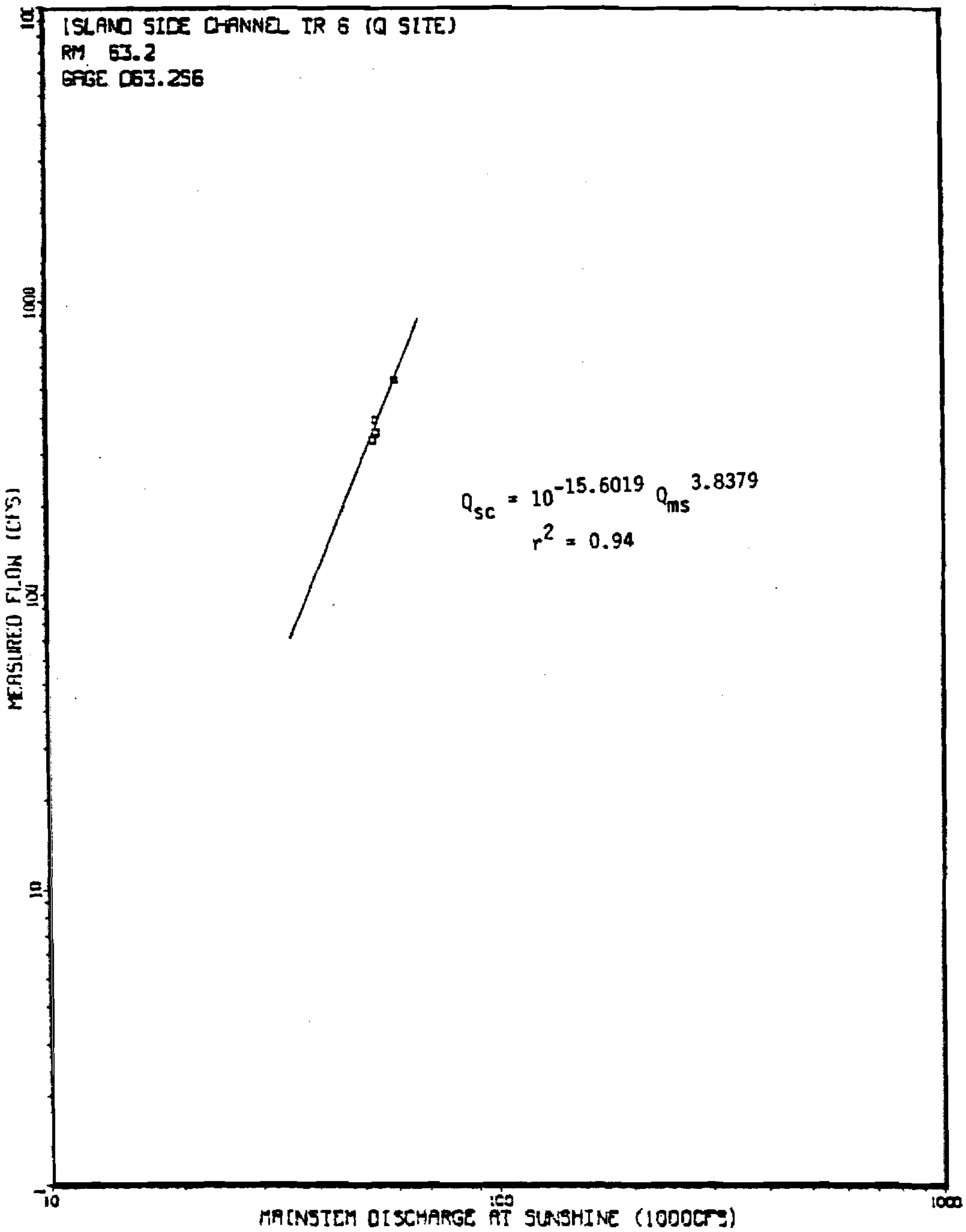


Figure 33. Island Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 6 Q Site.

breaching discharge for this side channel has been estimated as occurring approximately 1,000 cfs below the controlling discharge, or at 34,000 cfs. To evaluate the influence mainstem discharge has on the hydraulic conditions of this side channel, a comparison of the rating curves for transect 6 (Figure 34) was performed. Transect 6 is one of the two streamflow stations located at this side channel with the other being transect 1. Transect 6 was used for this comparison as the stage versus streamflow relationship is better defined for this transect than it is at transect 1 under both the breached and unbreached conditions.

A side channel streamflow of 43.5 cfs has been estimated to occur at the controlling discharge of 35,000 cfs at transect 6 as determined from the stage versus streamflow rating curve (Figure 31). This estimated flow is lower than the streamflow estimate derived from the Transect 6 streamflow versus mainstem discharge rating curve (68.8 cfs) presented in Figure 33 for the mainstem discharge of 35,000 cfs. A similar comparison between flow estimates at transect 1 shows the stage versus streamflow rating curve to yield 47.3 cfs and the streamflow versus mainstem discharge rating to yield 61.4 cfs. Measurements of streamflow in the 30,000-41,000 cfs range of mainstem discharge are necessary to validate this relationship.

Table 3 summarizes the estimates of flow as determined from the rating curves for controlling mainstem discharges.

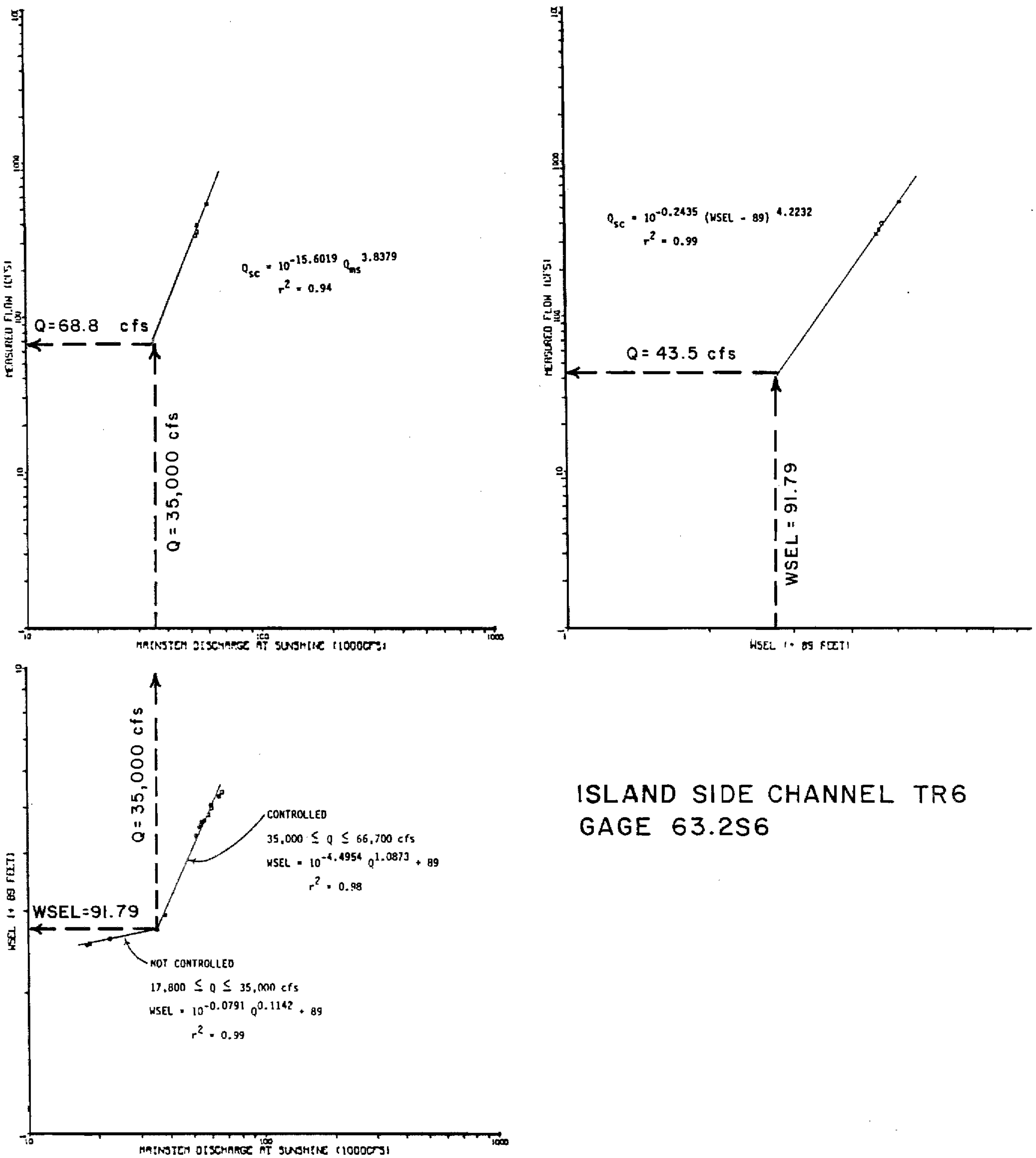


Figure 34. Comparison of rating curves for Island Side Channel transect 6 Q Site.

3.9.4 Channel Geometry

3.9.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Island Side Channel during a non-breaching mainstem discharge of 17,800 cfs when the side channel flow was estimated to be less than 1.0 cfs. The survey data are presented in Attachment Table C-9 with the resultant thalweg profile being presented in Attachment Figure C-9. The thalweg profile extends from the mouth of the side channel to a point approximately 100 feet beyond the first hydraulic control upstream of the study site, approximately 1,500 feet upstream of the mouth of the side channel. Based on the thalweg profile, the gradient within the thalweg profile is 15.6 feet/mile.

3.9.4.2 Cross Section Profile

Cross sectional data were recorded at each of the eight transects located in Island Side Channel during the 1984 open water season. The cross sectional data are presented in Attachment Table D-9 to D-16 with the resulting cross section profiles presented in Attachment Figures D-9 to D-16.

3.9.5 Backwater

Based on a comparison of available 1984 stage (Table 4) and channel geometry data (Attachment Figure C-9), an area of backwater extends

Table 4. A comparison of water surface elevations from Task 14 staff gages located within Island Side Channel.

Date	TR 1	TR 1A	TR 2	TR 3	TR 4	TR 4A	TR 5	TR 6	Mainstem Discharge
840930	90.86	90.93	90.88	91.23	91.56	91.56	91.57	91.54	17,800
840927	---	---	---	---	---	---	91.57	91.56	18,300
840915	---	---	---	---	---	---	91.59	91.62	22,300
840919	---	91.37	91.33	---	---	---	---	---	28,400
840901	---	91.69	91.68	91.70	91.71	91.77	91.73	91.75	35,000
840831	91.90	91.93	91.89	91.90	91.90	91.94	91.94	91.95	38,000
840719	93.13	---	---	---	---	---	---	93.36	51,600
840712	93.33	---	---	---	---	---	---	93.67	54,100
840725	93.33	93.46	93.41	93.44	93.62	93.52	93.56	93.55	56,100
840725	93.54	93.56	93.52	93.48	---	93.66	---	93.61	56,100
840725	---	---	---	93.55	---	---	---	93.70	56,100
840704	93.55	---	---	---	---	---	---	93.84	58,600
840811	93.77	---	---	---	---	---	---	94.08	60,000
840811	---	---	---	---	---	---	---	94.08	60,000
840801	93.73	93.75	93.74	93.79	93.89	93.93	93.98	94.00	60,300
840626	93.95	---	---	---	---	---	---	94.30	64,800
840626	---	---	---	---	---	---	---	94.31	64,800
840807	94.17	94.16	94.16	94.24	94.34	94.31	94.44	94.40	66,700

through the study site to a point at least 1,100 feet upstream from the mouth of Island Side Channel at a mainstem discharge of 35,000 to 38,000 cfs. During mainstem discharges of 56,100 cfs to 66,700 cfs, the backwater area decreases and only extends 570 feet from the mouth. This area of backwater results from the large side channel located at the mouth of Island Side Channel. Similar water surface elevations found to occur at transects 1-2 and 4-6 at a mainstem discharge of 17,800 cfs are a result of pooling and not backwater.

3.10 Mainstem West Bank Side Channel (RM 74.4)

3.10.1 Site Description

Mainstem West Bank Side Channel is located on the west bank of the main channel Susitna River at river mile 74.4 (Figure 35). This side channel is approximately 2.2 miles in length with both the mouth and head of the side channel directly connected to the Susitna River. Two heads are located approximately 1.5 miles upstream of the study site which connect this side channel to the mainstem. At the study site, the side channel is confined on the west by a steep bank and on the east by a well vegetated island which separates it from the mainstem. The upper portion of the side channel above the study site is separated from the mainstem by a network of side channels and well vegetated islands. Within the study site, a minor channel is located on the east bank of the side channel. During nonbreached conditions, the side channel consists of a series of pools and small riffles. Groundwater provides the major contribution of flow prior to breaching of the head.

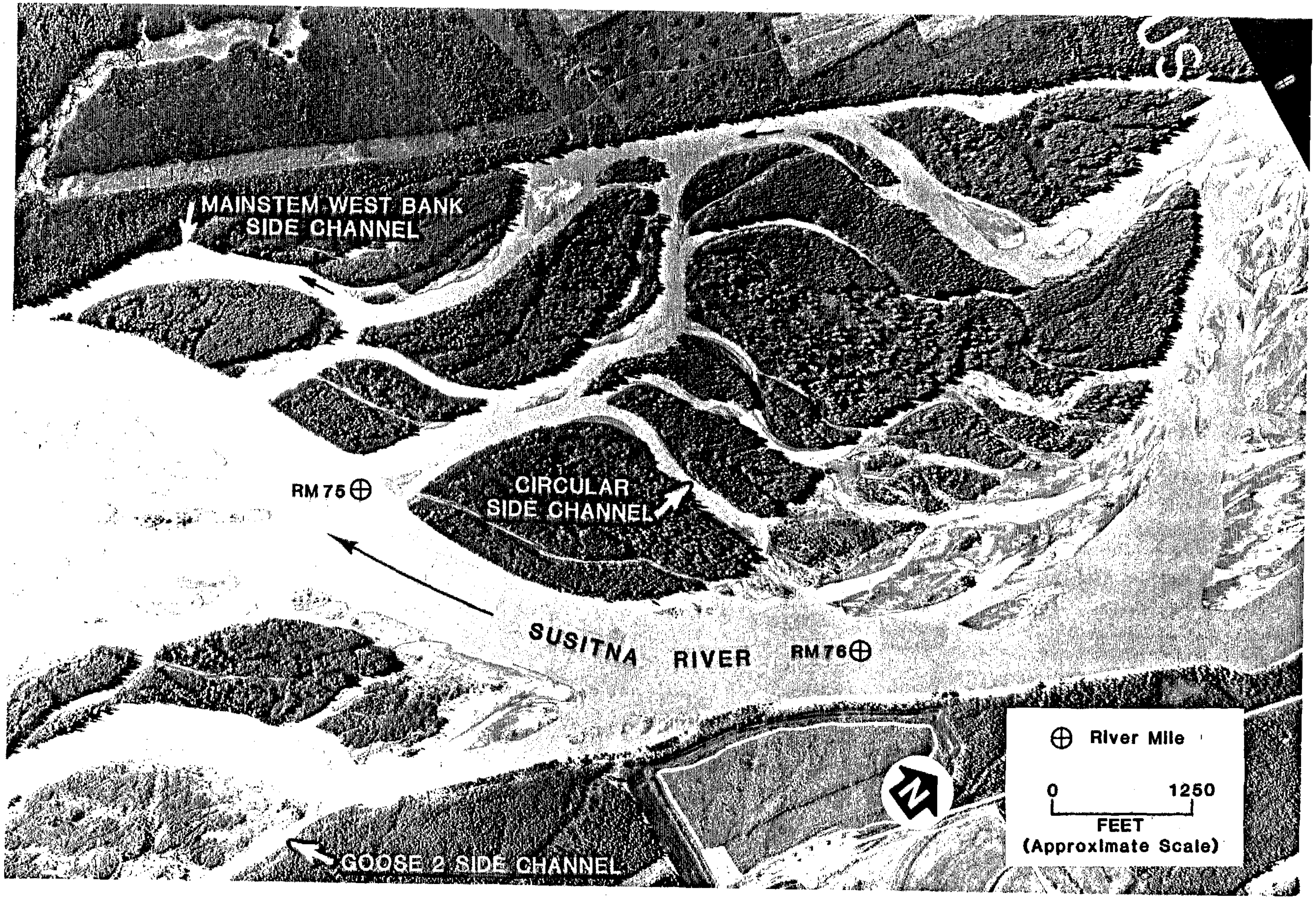


Figure 35. Overview of Mainstem West Bank Side Channel (RM 74.4) and Circular Side Channel (RM 75.3).

During the 1984 open water field season, the study site within this side channel was located in the lower portion of the side channel. Stage was monitored at seven locations, with streamflow measurements collected at only one of these stage monitoring stations (Figure 36). Cross section survey data were collected at each stage monitoring station. In addition, survey data for the development of a thalweg profile were collected from the first hydraulic control downstream of the study site to the first hydraulic control above the study site and through a portion of a minor channel on the east bank.

3.10.2 Stage/Discharge Relationship

Measurements of water surface elevation obtained at each stage monitoring station located in Mainstem West Bank Side Channel along with the mean daily mainstem discharges (USGS 15292780) corresponding to the date of the stage measurements are presented in Attachment Table B-1. Plots of these water surface elevations versus mainstem discharge are presented in Attachment Figures E-15 to E-21.

Measurements of streamflow were obtained at one stage monitoring station located on transect 1. The streamflow measurements and corresponding water surface elevations and mainstem discharges at Sunshine (USGS 15292780) are presented in Attachment Table B-1.

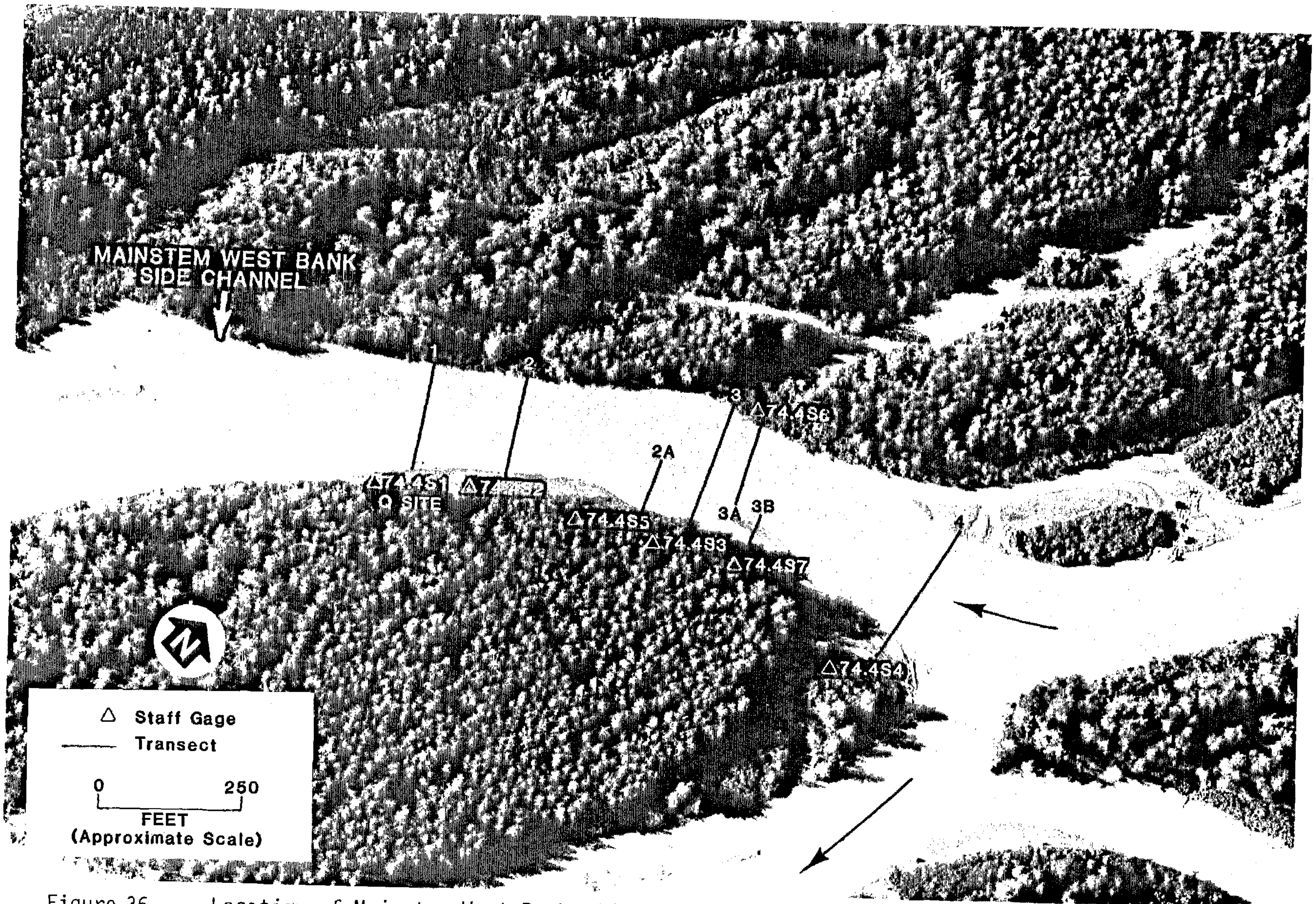


Figure 36. Location of Mainstem West Bank Side Channel study site (RM 74.4).

A rating curve of the streamflow measurements and water surface elevations is presented in Figure 37. A rating curve of the streamflow data plotted against mean daily mainstem discharge is presented in Figure 38.

3.10.3 Mainstem Controlling and Breaching Discharges

Breaching of Mainstem West Bank Side Channel occurs as the result of the mainstem Susitna River overtopping at least one of the two side channel heads located approximately 1.5 miles upstream of the study site. Based on field observations, the side channel has been observed to be barely breached at a mainstem discharge of 19,000 cfs and dry at 18,700 cfs (Table 2). Based on these field observations an initial breaching discharge of 19,000 cfs has been selected for this side channel.

To evaluate the influence mainstem discharge has on the hydraulic condition of this side channel, a comparison of the rating curves for transect 1 was performed (Figure 39). Based on a review of the stage versus mainstem discharge rating curve presented in Figure 39, it has been determined that at mainstem discharges greater than 19,600 cfs the hydraulics within this side channel are directly controlled by mainstem discharge. This results from the breaching of one of the two heads of the side channel. The site flow that occurs at 19,600 cfs was measured to be 5.7 cfs (Attachment Table B-1). Table 3 summarizes the comparison of flow estimates determined from rating curve equations for the controlling mainstem discharge of 19,600 cfs.

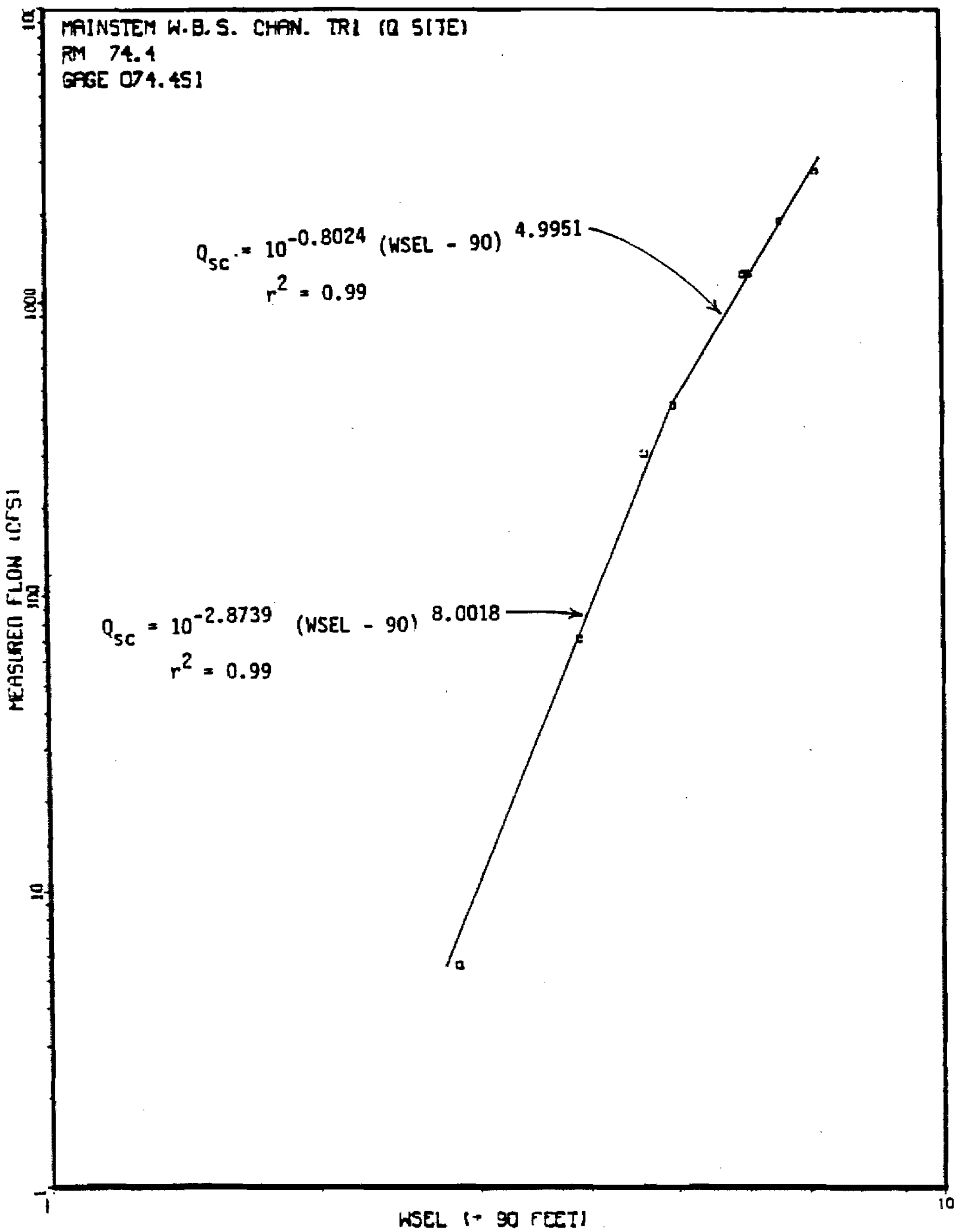


Figure 37. Mainstem West Bank Side Channel streamflow versus WSEL rating curve at transect 1 Q Site.

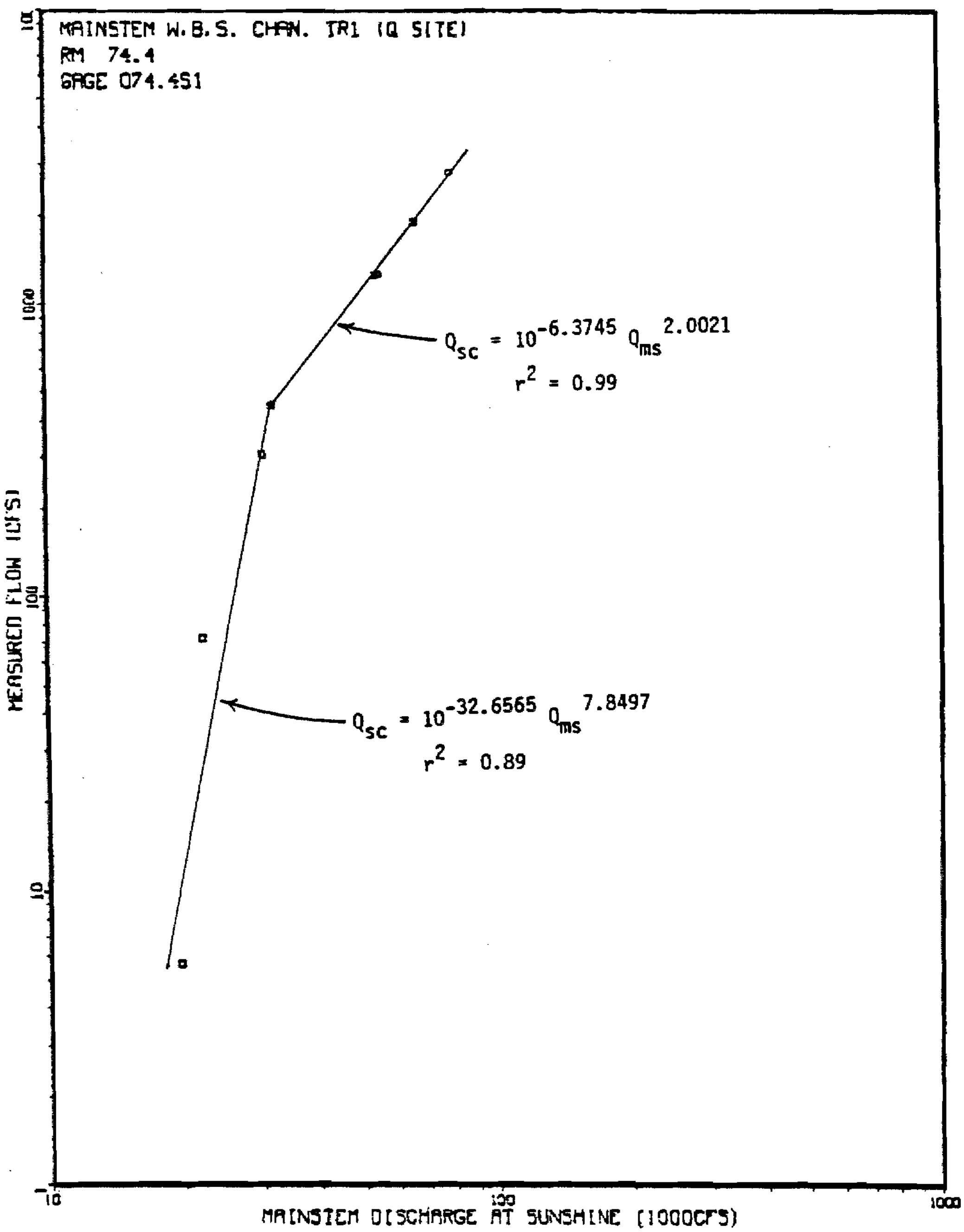


Figure 38. Mainstem West Bank Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 1 Q Site.

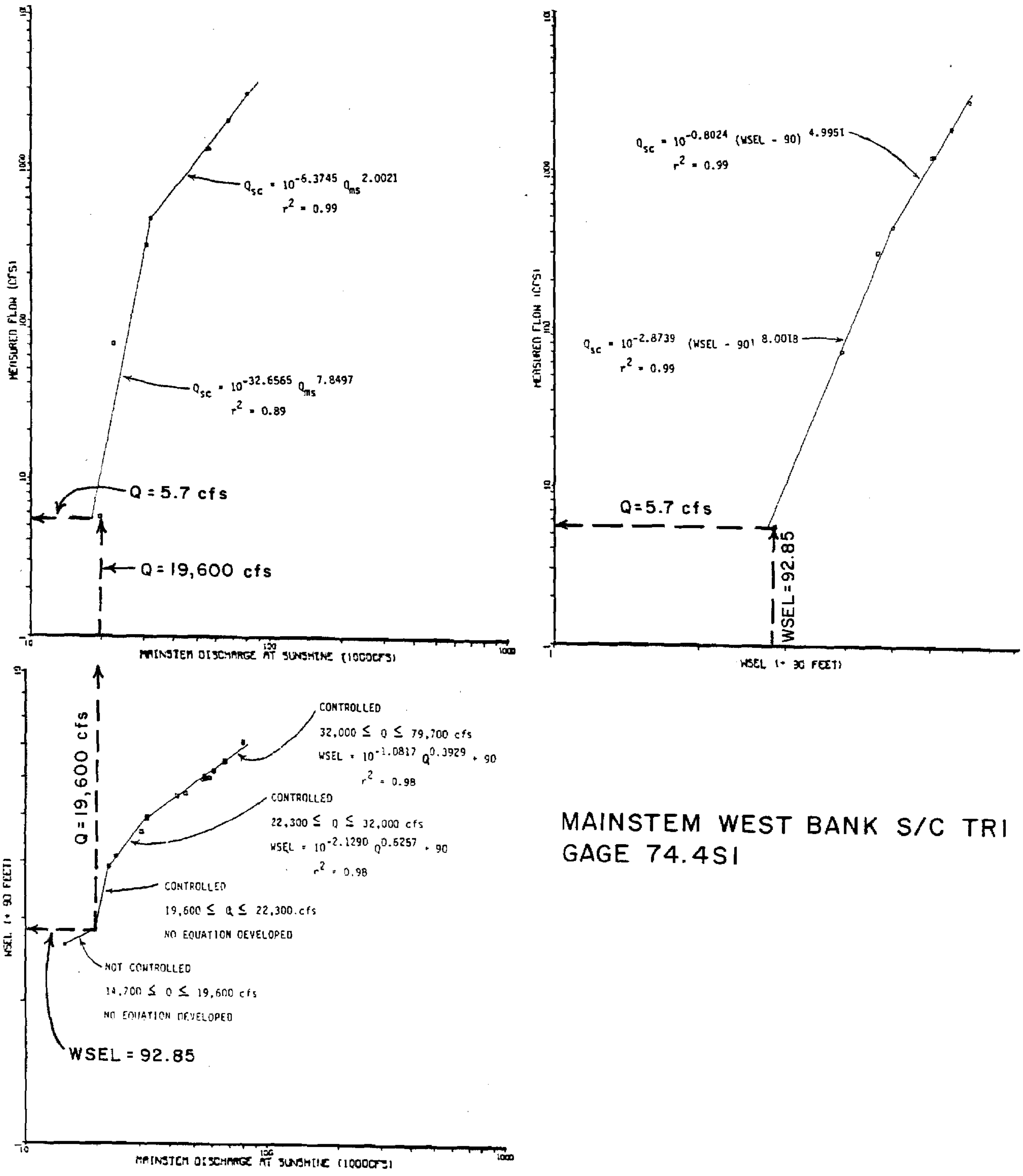


Figure 39. Comparison of rating curves for Mainstem West Bank Side Channel transect 1 Q Site.

At mainstem discharges of both 22,000 cfs and 32,000 cfs, the stage versus streamflow relationship for transect 1 and several of the remaining transects was determined to change. These changes are illustrated by changes in the slope of the line in each of the stage versus mainstem discharge rating curves for these transects (Attachment Figures E-15 to E-21). Based on field observations these changes are assumed to result from channel geometry and the diversion of flow through a small side channel, located upstream of transect 4, away from Mainstem West Bank side channel.

3.10.4 Channel Geometry

3.10.4.1 Thalweg Profile

The thalweg profile of Mainstem West Bank was surveyed during a non-breaching mainstem discharge of 14,700 cfs while the site flow was estimated to be less than 1 cfs. Two channels were surveyed; the main side channel and a smaller channel located on the east bank near the upper portion of the study site. The thalweg of the main channel was surveyed from a pool located approximately 329 ft downstream of transect 1 and continued through the study site to a point approximately 210 ft above transect 4. The survey data for the main channel thalweg profile are presented in Attachment Table C-10 with the resultant thalweg profile being presented in Attachment Figure C-10. The gradient within the thalweg profile was 12.3 feet/mile.

The smaller channel thalweg survey began on transect 2 and continued upstream approximately 600 ft including transects 2A, 3, and 3B. The survey data for this thalweg profile are presented in Attachment Table C-10 with the resultant thalweg profile presented in Attachment Figure C-10.

3.10.4.2 Cross Section Profile

Cross sectional profiles were determined at each of the seven staff gage locations in Mainstem West Bank Side Channel. Four of these cross sections extended across the entire study site (transects 1, 2, 3 and 4) whereas two of the transects (transects 2A and 3B) crossed only the east bank minor channel and one (transect 3A) crossed only the main channel of the study site. The data obtained for these cross sections are presented in Attachment Tables D-17 to D-23. These resultant cross section profiles are presented in Attachment Figures D-17 to D-23.

3.10.5 Backwater

Based on Table 5 and field observations, backwater did not occur in the study site throughout the 1984 sampling period. Similar water surface elevations occurring for transects 1-3 are the result of pooling and not backwater. The study site for Mainstem West Bank Side Channel was located a substantial distance upstream from the mouth of the side channel. A backwater area was observed throughout the majority of the 1984 field season at the mouth of this side channel but insufficient information is available to precisely determine the extent of backwater.

Table 5. A comparison of water surface elevations from Task 14 staff gages located within Mainstem West Bank Side Channel.

Date	TR 1	TR 2	TR 2A	TR 3	TR 3A	TR 3B	TR 4	Mainstem Discharge
841010	92.64	92.63	---	93.03	93.05	---	94.63	14,700
841001	---	---	---	---	93.37	---	---	18,700
840925	92.85	---	---	---	93.51	---	---	19,600
840915	93.90	93.74	---	93.80	94.04	---	---	22,300
840914	94.12	94.13	---	94.18	94.44	---	95.83	24,000
840903	---	---	94.90	94.97	95.21	95.06	96.39	29,000
840920	94.62	94.64	94.67	94.70	94.93	---	96.16	30,500
840902	94.94	94.98	94.99	95.04	95.29	---	96.46	32,000
840902	94.97	95.00	---	95.08	95.32	---	96.54	32,000
840817	95.49	95.60	---	---	---	---	97.22	42,500
840815	95.56	95.64	---	95.92	---	---	97.30	46,000
840724	96.02	---	---	---	---	---	---	55,200
840723	95.98	96.07	---	96.36	---	---	97.67	56,100
840712	95.96	---	---	---	---	---	---	54,100
840711	96.01	96.06	---	96.39	---	---	97.50	55,100
840711	96.08	96.09	---	---	---	---	97.70	55,100
840721	96.02	96.09	---	96.44	---	---	97.62	57,700
840721	96.03	96.14	---	---	---	---	---	57,700

Table 5 (Continued).

Date	TR 1	TR 2	TR 2A	TR 3	TR 3A	TR 3B	TR 4	Mainstem Discharge
840801	96.22	96.31	---	96.67	---	---	97.90	60,300
840801	96.24	96.32	---	---	---	---	---	60,300
840810	96.49	96.54	---	96.81	---	---	97.86	66,400
840810	96.54	96.62	---	96.94	---	---	98.19	66,400
840807	96.49	96.51	---	96.81	---	---	97.97	66,700
840827	97.14	---	---	---	---	---	---	79,700
840827	97.19	---	---	---	---	---	---	79,700

3.11 Goose 2 Side Channel (RM 74.8)

3.11.1 Site Description

Goose 2 Side Channel is approximately 1.4 miles in length and is located on the east bank of the Susitna River at river mile 74.8 (Figure 40). This portion of the Susitna River is considerably braided and both the head and mouth of Goose 2 are connected to side channels. An extensive log jam exists at the head of the Goose 2 side channel which may influence the flow of water during an overtopping of the head. Goose 2 is separated from a network of small channels by a well vegetated island on its west bank and is confined on its east bank by a high, terraced wall.

Breaching flows occurring in Goose 2 result from overtopping of the head from the adjoining side channel. Prior to breaching of Goose 2, streamflow is minimal with the channel substantially dewatered and composed of isolated pools.

During the 1984 open water field season the study site selected for Goose 2 Side Channel was located in the upper portion of the side channel. Stage was monitored at one location and streamflow was measured at this stage monitoring station (Figure 41). Channel geometry data obtained from Goose 2 Side Channel included cross section and thalweg profiles. A cross section was obtained at the stage monitoring station and a thalweg profile was determined for the portion of the side

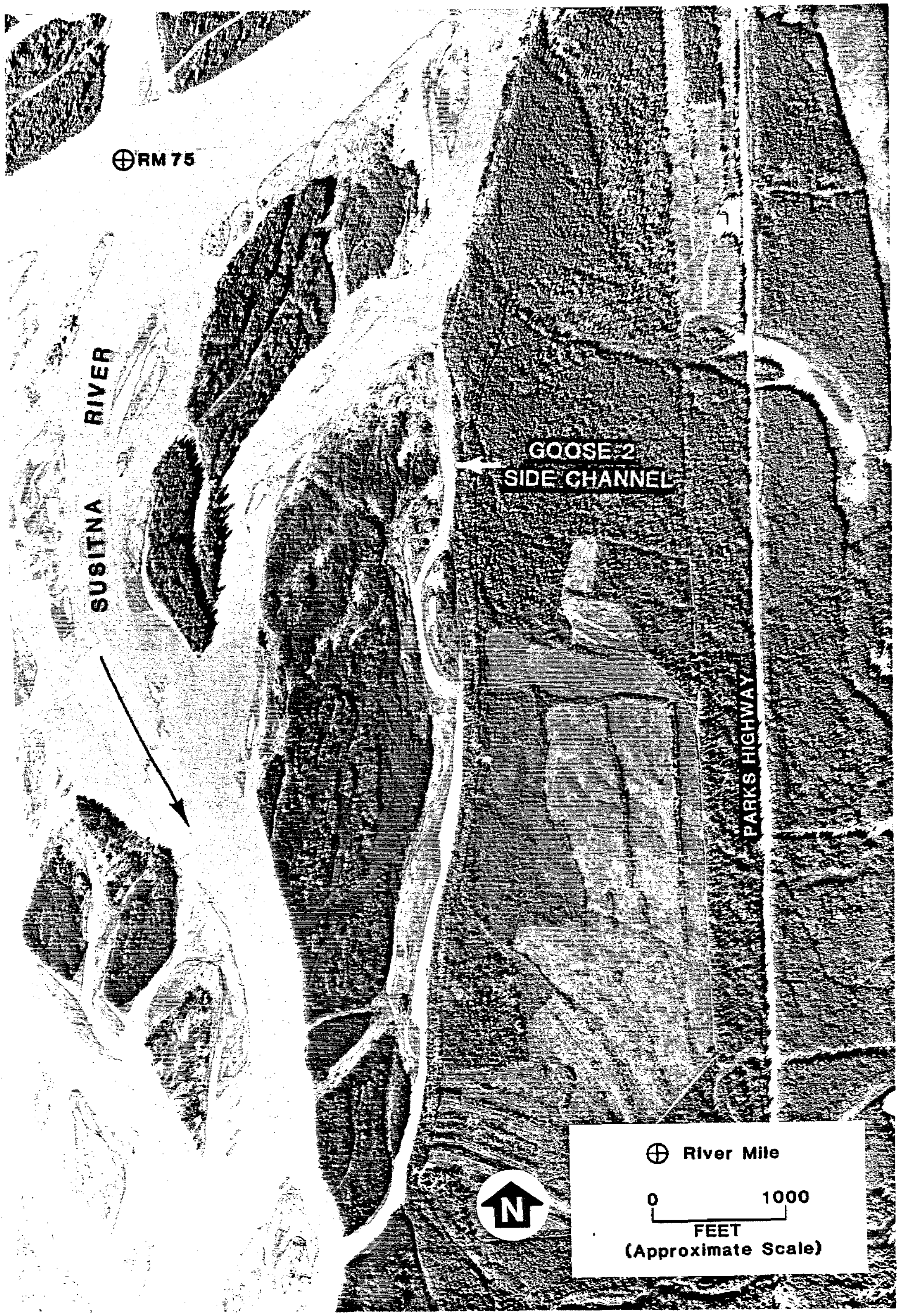


Figure 40. Overview of Goose 2 Side Channel (RM 74.8).

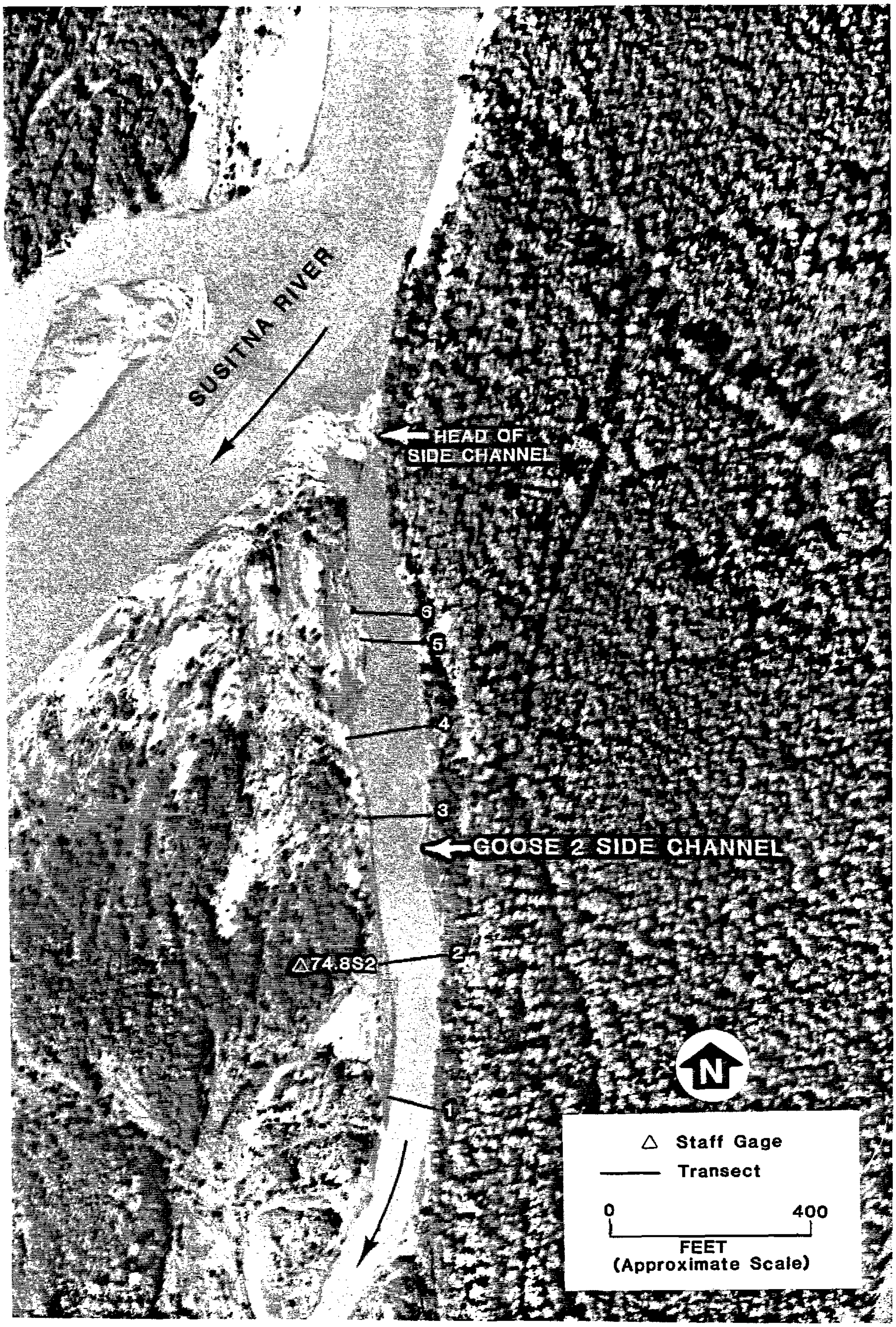


Figure 41. Location of Goose 2 Side Channel study site (RM 74.8).

channel including the study site and continuing upstream to the head of the side channel.

3.11.2 Stage/Discharge Relationship

Measurements of water surface elevations obtained at the stage monitoring station located in Goose 2 Side Channel are presented in Attachment Table B-1 along with the mean daily mainstem discharge (USGS 15292780) corresponding to the date of the stage measurement. A plot of these water surface elevations versus mainstem discharge are presented in Attachment Figure E-22.

Measurements of streamflow in Goose 2 Side Channel were obtained at one stage monitoring station (Figure 41) which was located on transect 2 of the study sites. These measurements of streamflow and the corresponding water surface elevation and mainstem discharge (USGS 15292780) are presented in Attachment Table B-1. A plot of these streamflow and water surface elevations was developed as a rating curve to estimate streamflow from observed water surface elevations and is presented in Figure 42. The streamflow data was also plotted against mainstem discharge as a rating curve to estimate streamflow from mainstem discharge (Figure 43).

3.11.3 Mainstem Breaching and Controlling Discharges

Breaching of Goose 2 Side Channel results from overtopping of the head by a side channel and not directly by the mainstem Susitna River. This

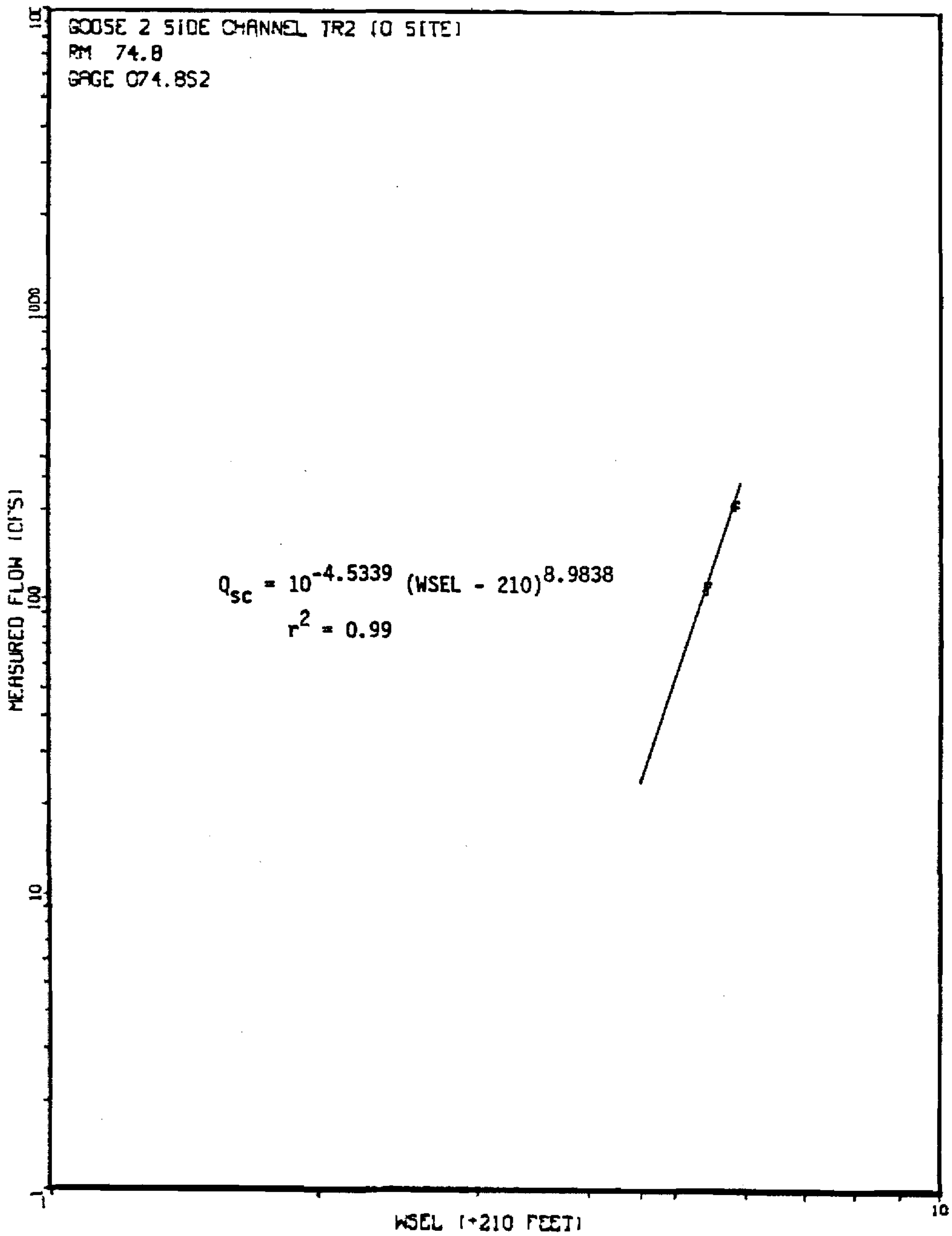


Figure 42. Goose 2 Side Channel streamflow versus WSEL rating curve at transect 2 Q Site.

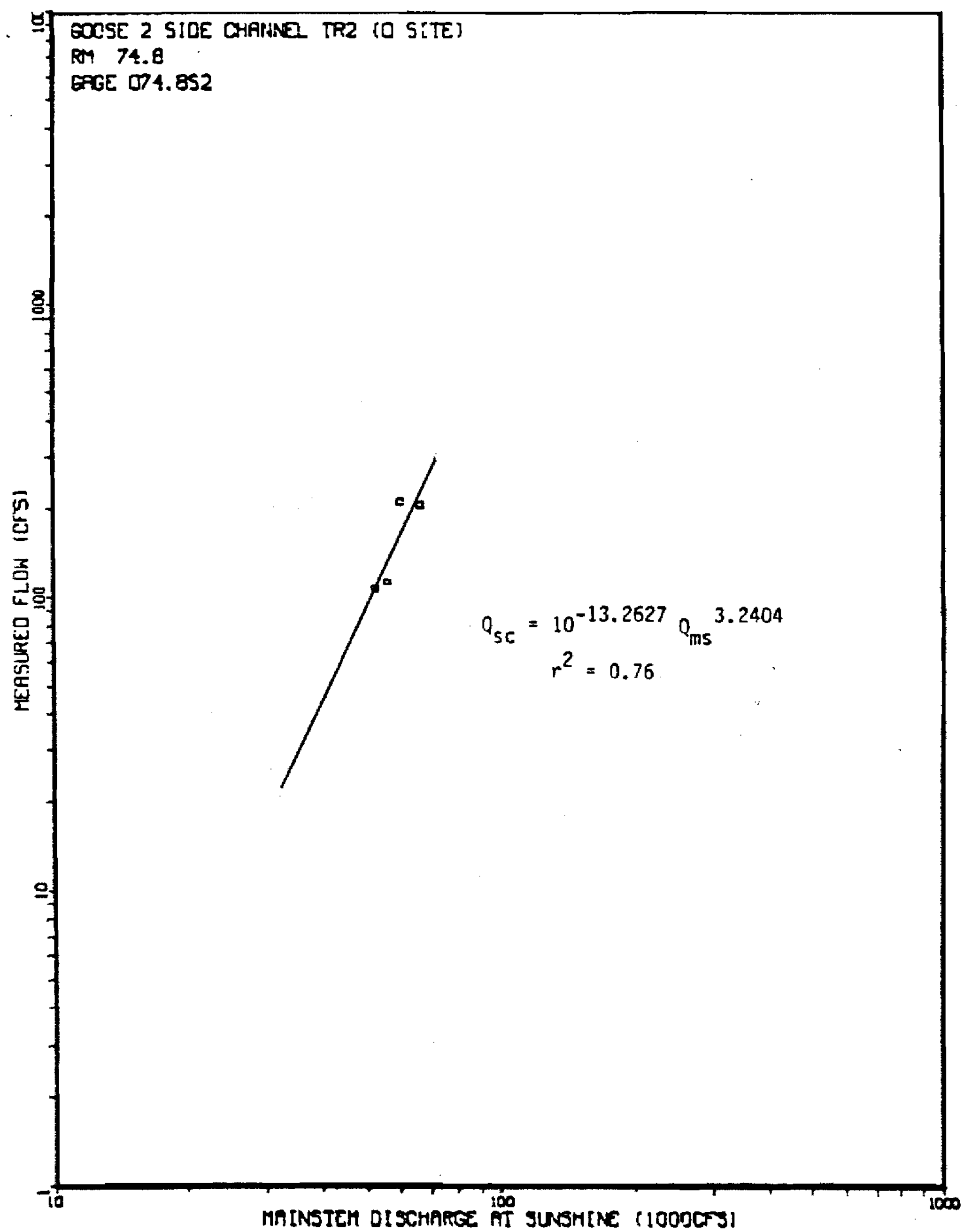


Figure 43. Goose 2 Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 2 Q Site.

side channel was observed as "barely" breached at a mainstem discharge of 32,000 cfs and dry at 22,700 cfs (Table 2). Assuming that the site is "barely" breached at 32,000 cfs it can be inferred that the site is likely initially breached at a discharge less than 32,000 cfs. Therefore, a mainstem discharge of 30,000 cfs has been estimated as the initial breaching discharge.

Insufficient stage data is available to precisely determine the controlling breaching discharge for this side channel. However, based on the assumption that the side channel is initially breached at approximately 30,000 cfs and from a review of the stage/discharge relationship (Attachment Figure E-22) a controlling discharge of 32,000 cfs is estimated for this side channel.

The rating curves developed at the Goose 2 Side Channel streamflow station were compared to evaluate the influence of mainstem discharge on the hydraulics of the side channel (Figure 44). Using 32,000 cfs as the controlling discharge a streamflow estimate of 26.3 cfs was obtained using the flow versus water surface elevation rating curve (Figure 42). This estimate is higher than the flow estimate (21.7 cfs) determined from the flow versus mainstem discharge rating curve (Figure 43).

3.11.4 Channel Geometry

3.11.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Goose 2 Side Channel during a non-breaching mainstem discharge of 19,600

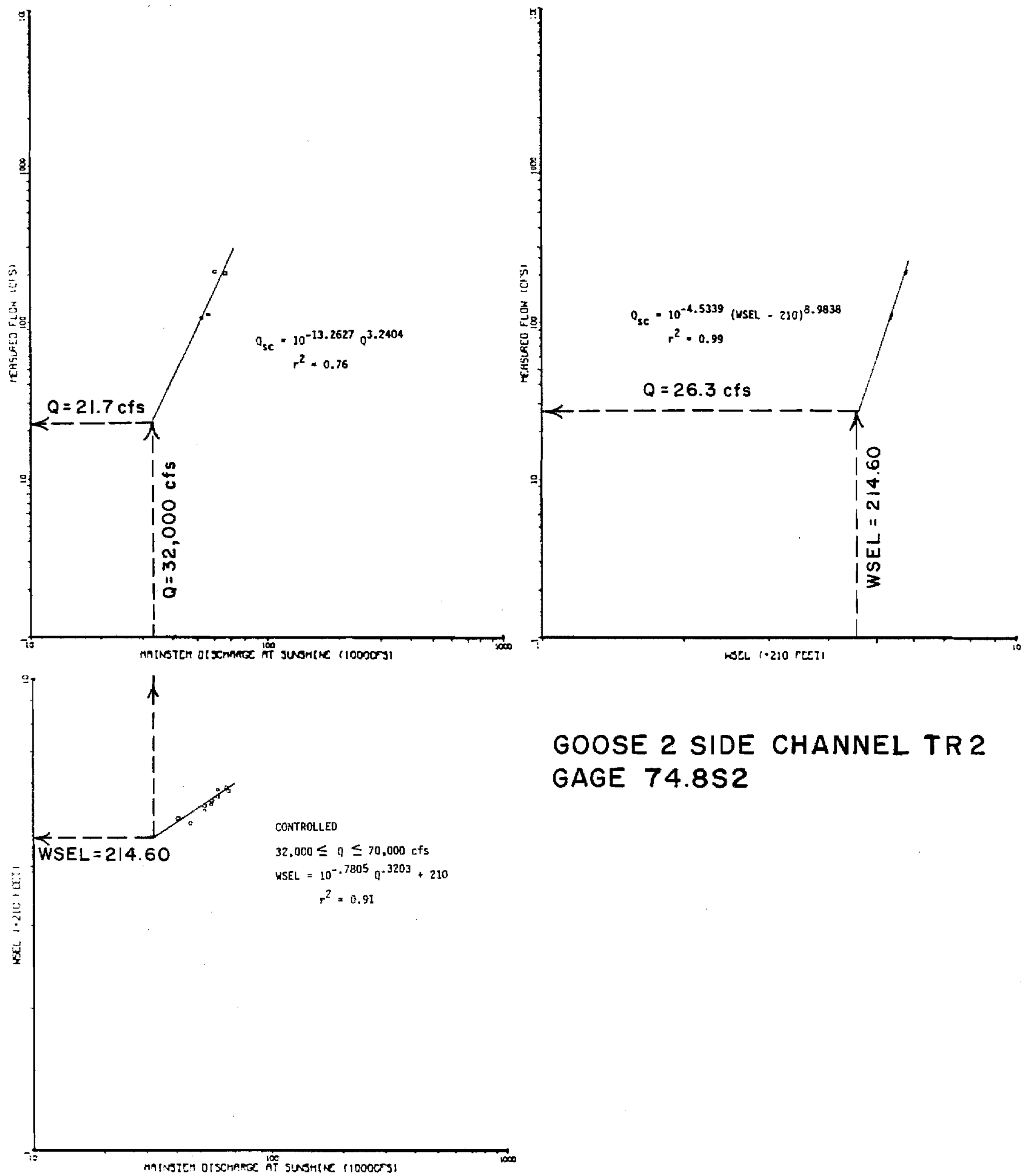


Figure 44. Comparison of rating curves for Goose 2 Side Channel transect 2 Q Site.

cfs and an estimated streamflow of less than 1 cfs. The survey data for the thalweg profile are presented in Attachment Table C-11 with the resultant thalweg profile presented in Attachment Figure C-11. The thalweg profile includes the head of the side channel continuing downstream to approximately 500 feet below transect 1. The streambed gradient for the portion of the side channel included in the thalweg profile was 9.2 feet/mile.

3.11.4.2 Cross Section Profile

Cross section data were recorded at the only stage monitoring station located in Goose 2 Side Channel. This stage monitoring station was located on transect 2 (Attachment Figure C-11). The cross sectional data are presented in Attachment Table D-24 with the resultant cross section presented in Attachment Figure D-24.

3.11.5 Backwater

Based on available 1984 stage (Attachment Table B-1) and channel geometry (Attachment Figure C-11) data, a backwater area was observed not to occur in the Goose 2 Side Channel study site. The study site for Goose 2 Side Channel was located in the upper portion of the side channel (see Section 3.10.1 of this report). The field observations for 1984 at Goose 2 Side Channel were limited to the study site therefore backwater observations occurring in the side channel mouth area were not obtained in 1984.

3.12 Circular Side Channel (RM 75.3)

3.12.1 Site Description

Circular Side Channel is located on the west bank of the Susitna River at river mile 75.3 (Figure 35). It is approximately 0.9 miles long and is separated from the mainstem by a large well vegetated island. Both the mouth and head of this side channel are connected to the mainstem Susitna River. An extensive backwater area has been observed to occur in the lower portion of the study site. A network of small channels at the head provide mainstem flow into the site after breaching. Prior to breaching, flow is greatly reduced and the channel is composed of large pools connected by small riffles.

During the 1984 open water field season, the study site within Circular Side Channel was located in the upper half of the side channel. Stage was monitored at six locations within the study site with streamflow measurements being collected at two of these stage monitoring stations (Figure 45). Stage was also monitored at the head of the side channel. Cross section survey data were collected at each of the stage monitoring stations except the stage monitoring station at the head. Survey data for the development of a thalweg profile were collected beginning at the first hydraulic control located downstream of the study site and was continued to the head of the side channel.

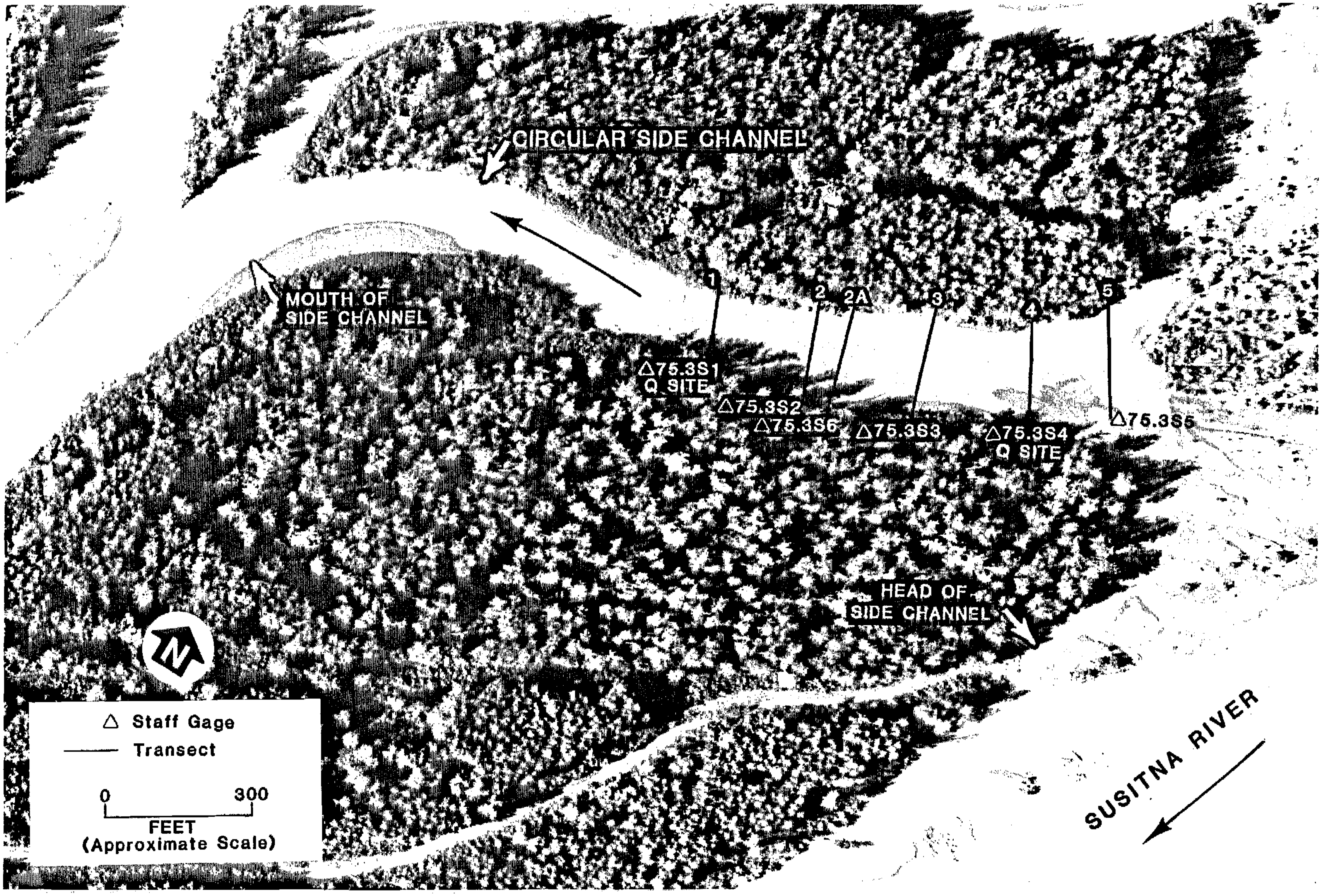


Figure 45. Location of Circular Side Channel study site (RM 75.3).

3.12.2 Stage/Discharge Relationship

Measurements of water surface elevations at each stage monitoring station located in Circular Side Channel along with the mean daily mainstem discharges (USGS 15292780) corresponding to the date of the stage measurements are presented in Attachment Table B-1. Plots of these water surface elevations versus mainstem discharges are presented in Attachment Figures E-23 to E-29. For transect 4 a gap exists between the lines depicting the nonbreached and breached condition. This gap is assumed to be the result of channel scour from the August 26 flood event.

Measurements of streamflow in Circular Side Channel were obtained at two stage monitoring stations located on transects 1 and 4 (Figure 45). These measurements of streamflows and the corresponding water surface elevations and mainstem discharges (USGS 15292780) are presented in Attachment Table B-1. Plots of streamflows versus water surface elevations developed as rating curves are presented in Figures 46 and 47. Rating curves of the streamflow data plotted against mainstem discharge are presented in Figures 48 and 49.

3.12.3 Mainstem Breaching and Controlling Discharges

Breaching of Circular Side Channel is the result of direct overtopping of the head by the mainstem Susitna River. Insufficient field data is available to determine precisely the initial breaching and controlling discharge for Circular Side Channel. Field observations and a review of

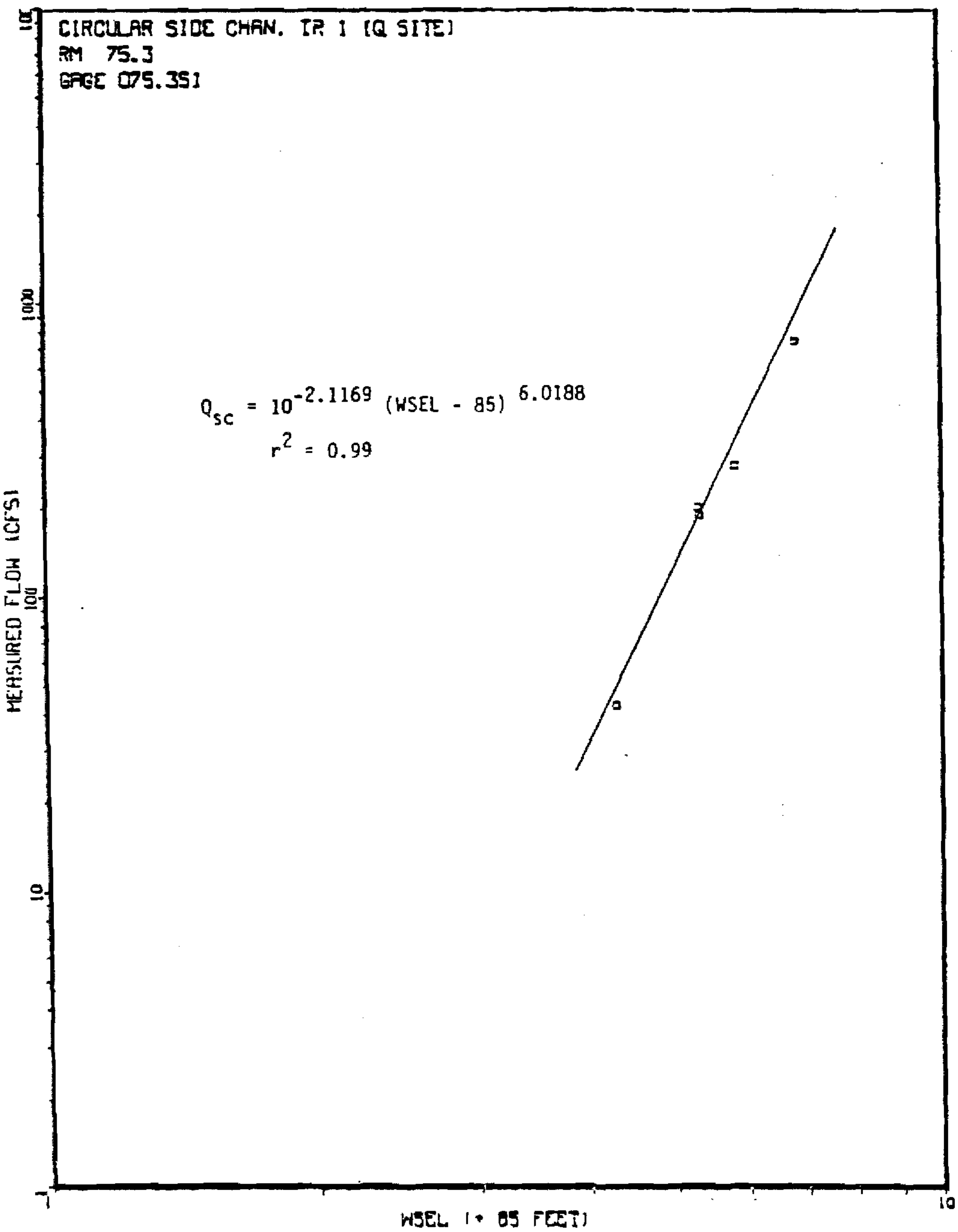


Figure 46. Circular Side Channel streamflow versus WSEL rating curve at transect 1 Q Site.

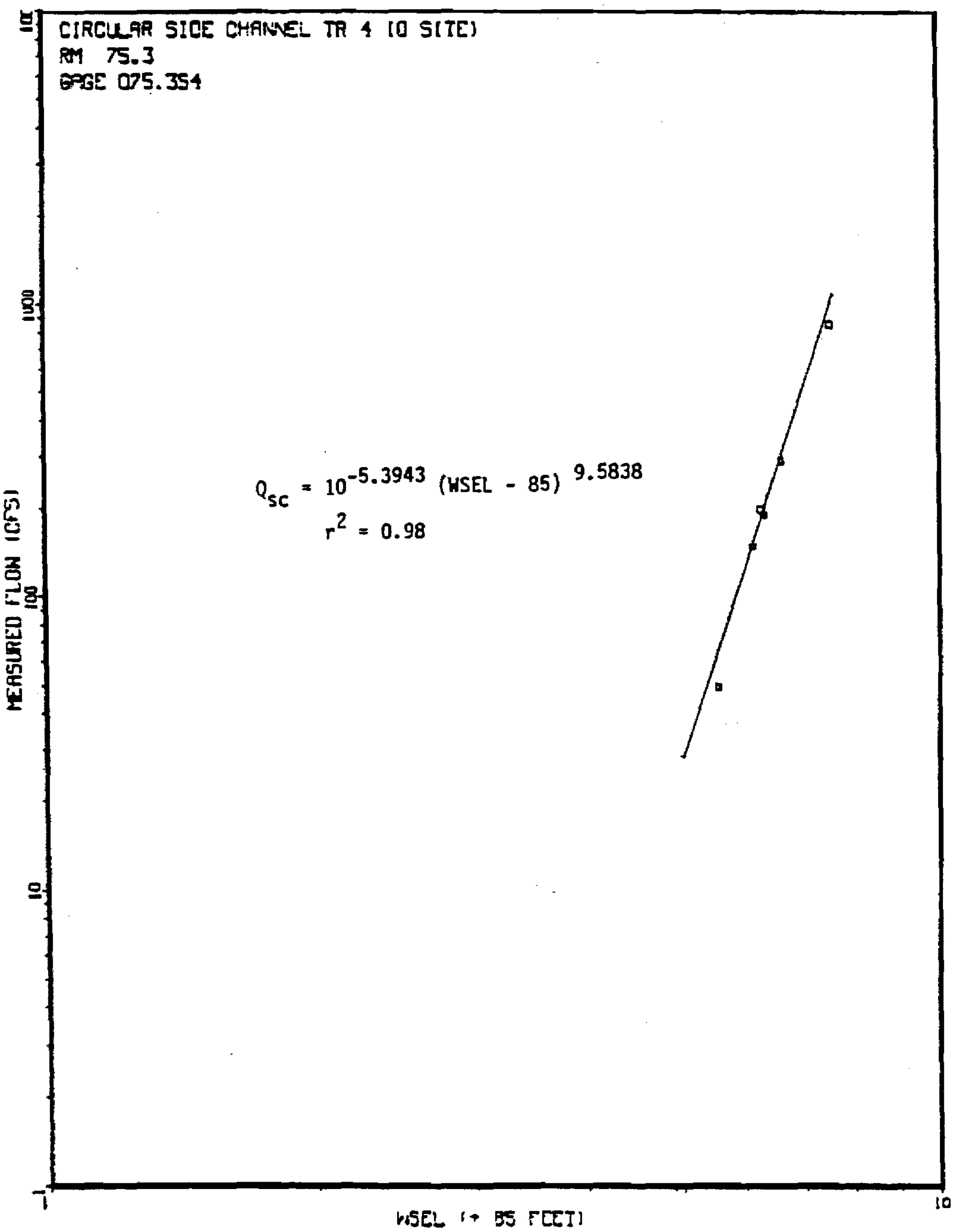


Figure 47. Circular Side Channel streamflow versus WSEL rating curve at transect 4 Q Site.

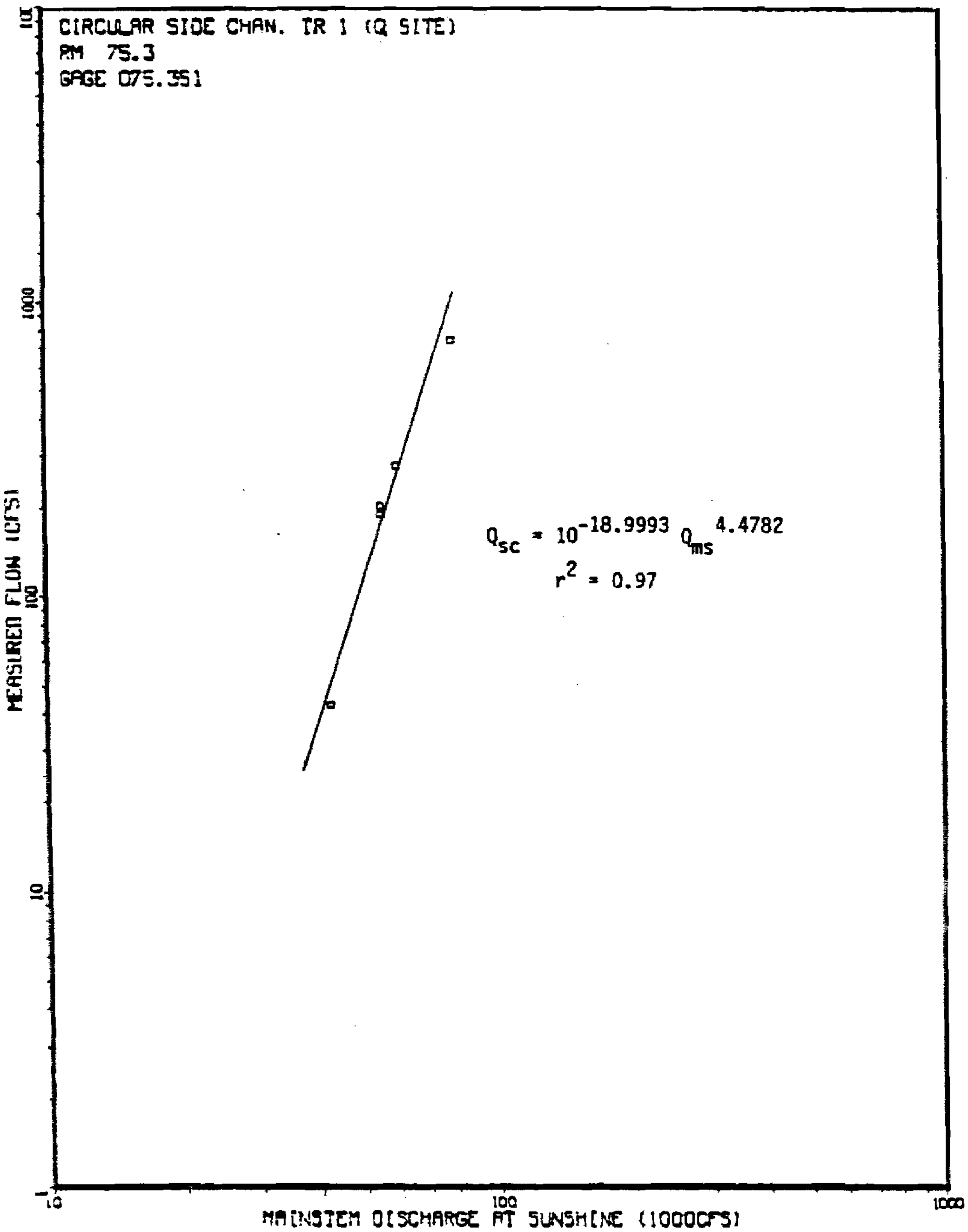


Figure 48. Circular Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 1 Q Site.

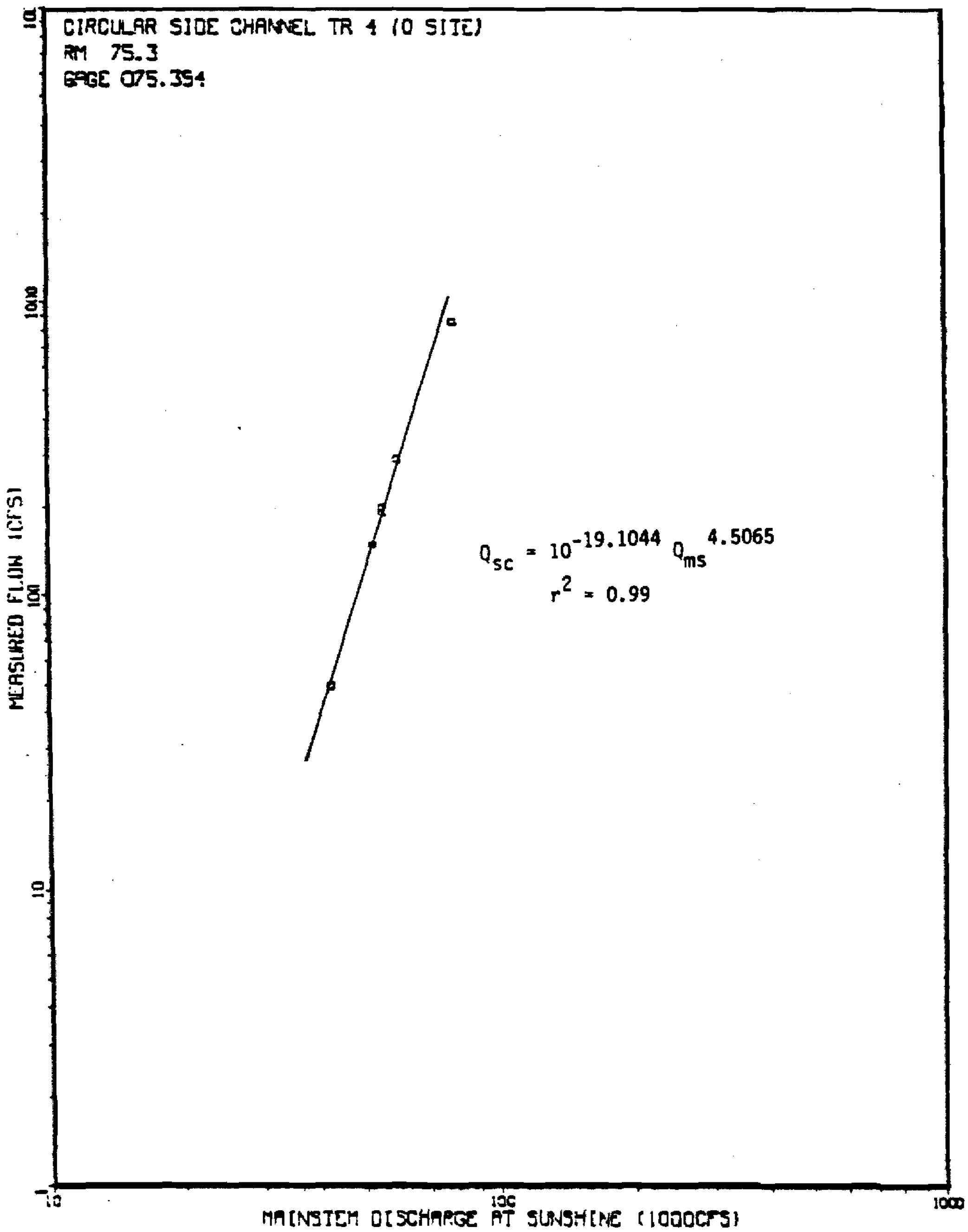


Figure 49. Circular Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 4 Q Site.

aerial photographs indicate the head of the side channel to be breached at 36,600 cfs and dry at 32,000 cfs (Table 2). A field observation at 35,000 cfs found the side channel flowing clear indicating a nonbreached condition although the side channel head was not observed at the time. Upon close inspection of the aerial photograph at a breaching discharge of 36,600 cfs the side channel was observed flowing turbid (Pers. Comm. 1984 Bill Ashton; R&M Consultants) indicating a controlled hydraulic condition. Based on this information a controlling discharge of 36,000 cfs is estimated for Circular Side Channel. The initial breaching discharge of the site is estimated to also be 36,000 cfs based on the field observations.

To evaluate the influence mainstem discharge has on the hydraulic condition of this side channel, a comparison of the rating curves for transect 4 was performed (Figure 50). Although two streamflow stations were located in Circular Side Channel (transects 1 and 4), transect 4 was selected for this comparison as it had a greater range of stage observations than transect 1 and was a better defined rating curve. The site flow that occurs at a mainstem discharge of 36,000 cfs has been estimated to be 26.8 cfs based on stage versus streamflow rating curve for transect 4 (Figure 47). The estimate of 26.8 cfs is the same as the estimate of streamflow derived from the transect 4 streamflow versus mainstem discharge rating curve (Figure 49). Table 3 summarizes a comparison of streamflow estimates determined from equations developed from both rating curves for controlling mainstem discharges for transects 1 and 4.

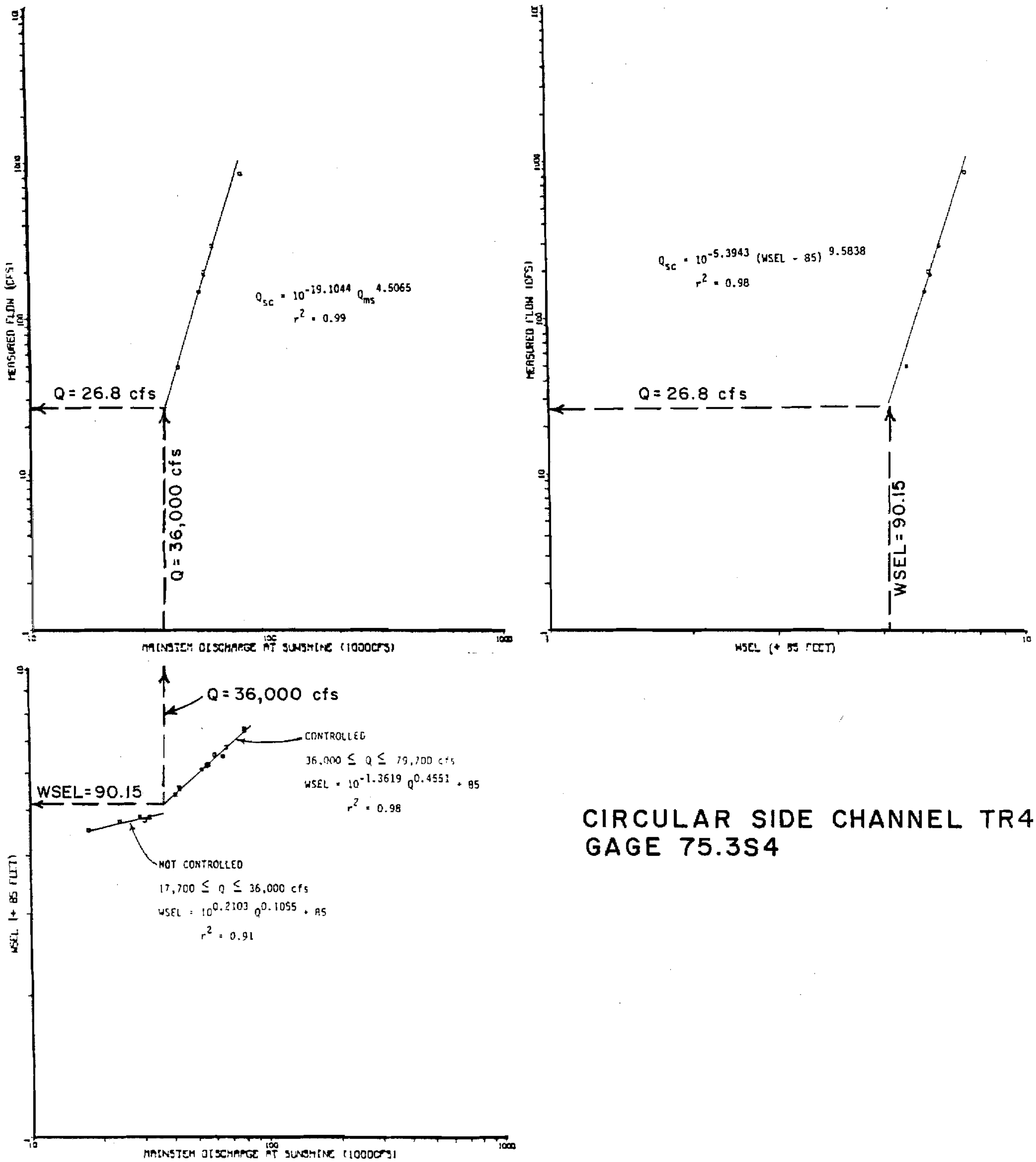


Figure 50. Comparison of rating curves for Circular Side Channel at transect 4 Q Site.

3.12.4 Channel Geometry

3.12.4.1 Thalweg Profile

Survey data for the development of the thalweg profile of Circular Side Channel was determined during a mainstem discharge of 14,700 cfs (USGS 15292780) when the side channel flow was estimated to be less than 1 cfs. The thalweg survey extended approximately 2,800 feet beginning at the confluence of Circular Side Channel with another side channel and continuing to the head of the side channel. Survey data used to develop the thalweg profile are presented in Attachment Table C-12 with the resultant thalweg profile being presented in Attachment Figure C-12. The gradient within the thalweg profile is 14.3 feet/mile.

3.12.4.2 Cross Section Profile

Cross section data were obtained at each of the six transect locations within the study site. Survey data from these cross sections are presented in Attachment Tables D-25 to D-30 with the resultant cross sectional profiles being presented in Attachment Figures D-25 to D-30.

3.12.5 Backwater

Based on available stage data (Table 6) and a review of the thalweg profile for Circular Side Channel, backwater has not been observed to occur during non-breaching mainstem discharges.

Table 6. A comparison of water surface elevations from Task 14 staff gages located within Circular Side Channel.

Date	TR 1	TR 2	TR 2A	TR 3	TR 4	TR 5	Mainstem Discharge
841010	---	---	88.06	---	---	89.04	14,700
841009	---	---	---	---	---	89.10	15,000
840928	---	---	---	---	89.54	89.55	17,700
840914	---	---	---	89.45	89.72	89.73	24,000
840903	---	---	88.69	89.55	89.85	89.84	29,000
940920	87.87	---	88.67	89.50	89.77	89.76	30,500
940902	---	---	88.70	89.56	89.84	---	32,000
840830	89.10	89.27	89.33	90.06	90.40	---	40,800
840817	89.25	89.27	89.41	90.17	90.57	---	42,500
840817	89.28	89.30	---	90.20	90.60	---	42,500
840724	90.26	90.26	90.28	90.60	91.25	91.32	55,200
840724	90.26	---	90.31	90.67	91.26	91.32	55,200
840724	90.29	---	---	---	91.26	---	55,200
840724	90.30	---	---	---	91.29	---	55,200
840724	90.30	---	---	---	91.30	---	55,200
840710	---	---	---	90.51	91.13	---	52,500
840803	90.23	90.21	90.26	90.62	91.24	---	54,700
840803	90.24	---	---	---	---	---	54,700
840723	90.31	---	---	90.64	91.26	---	56,100
840811	90.81	90.77	---	91.01	91.58	---	60,000
840811	---	---	---	---	91.59	---	60,000

Table 6 (Continued).

Date	TR 1	TR 2	TR 2A	TR 3	TR 4	TR 5	Mainstem Discharge
840706	90.70	---	---	90.92	---	---	63,600
840706	90.70	---	---	---	---	---	63,600
840706	90.72	---	---	---	---	---	63,600
840824	90.78	90.80	90.81	91.03	91.54	---	64,800
840824	90.78	---	---	---	91.56	---	64,800
840626	90.99	---	---	91.15	---	---	64,800
840626	91.00	---	---	91.21	---	---	64,800
840807	91.24	91.19	91.18	91.32	91.83	---	66,700
840827	91.75	---	---	---	92.43	---	79,700
840827	91.82	---	---	---	92.49	---	79,700

At a mainstem discharge of 42,500 cfs, backwater has been determined to extend slightly past transect 2. At breaching mainstem discharges of 55,200 to 66,700 cfs, an area of backwater was found to occur upstream to a point approximately 90 feet above transect 2A. Insufficient stage data is available to describe the extent of backwater for mainstem discharges exceeding 66,700 cfs.

3.13 Sauna Side Channel (RM 79.8)

3.13.1 Site Description

Sauna Side Channel is located on the west bank of the Susitna River at river mile 79.8 (Figure 51). It is approximately 0.2 miles long. The mouth and head of the side channel are connected to the same larger side channel of the mainstem Susitna River. For the most part, Sauna Side Channel is confined on the west by a high bank and on the east by a large sparsely vegetated gravel bar. A smaller side channel enters just below the head of Sauna Side Channel on its west bank. This side channel conducts flow to the study site during high mainstem discharges, but dewaters before the head of Sauna Side Channel becomes unbreached. Breaching flows result from overtopping of the side channel that adjoins the head on the east bank of Sauna Side Channel. Prior to breaching, the channel is composed of two large interconnected pools whose water levels are maintained from ground water seepage originating from the vicinity of the head. An extensive log jam exists at the head of Sauna Side Channel that likely influences the flow into this side channel.

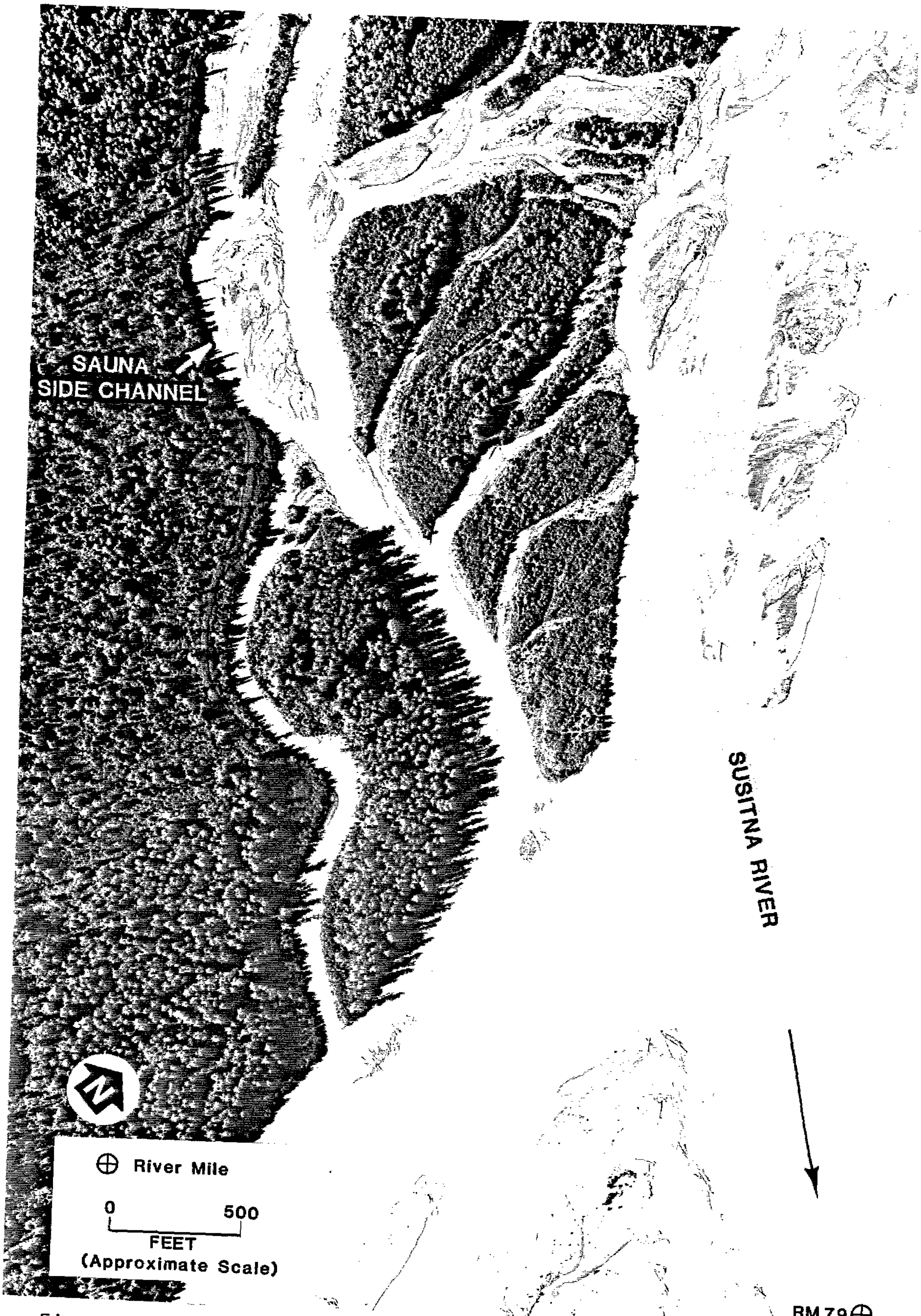


Figure 51. Overview of Sauna Side Channel (RM 79.8).

During the 1984 open water field season, the study site within this side channel was approximately 500 feet in length and was located approximately 2,000 feet from where the mouth of the larger side channel confluences with the mainstem. Stage was monitored at four locations with streamflow being measured at one of these stage monitoring stations (Figure 52). Cross section survey data were collected at each of the stage monitoring stations. Survey data for the development of a thalweg profile were collected beginning at the mouth and ending at the head of the side channel.

3.13.2 Stage/Discharge Relationship

Water surface elevations obtained at each of the stage monitoring stations located in Sauna Side Channel along with the mean daily mainstem discharge (USGS 15292780) corresponding to the date of the stage measurement are presented in Attachment Table B-1. Plots of these water surface elevations versus mainstem discharges are presented in Attachment Figures E-31 to E-33.

Measurements of streamflow in Sauna Side Channel were obtained at one stage monitoring station located on transect 2. These measurements of streamflow and the corresponding water surface elevations and mainstem discharges (USGS 15292780) are presented in Attachment Table B-1. A plot of these streamflows versus water surface elevations was developed as a rating curve and is presented in Figure 53. In addition, the streamflow data plotted against mainstem discharge is presented in Figure 54.

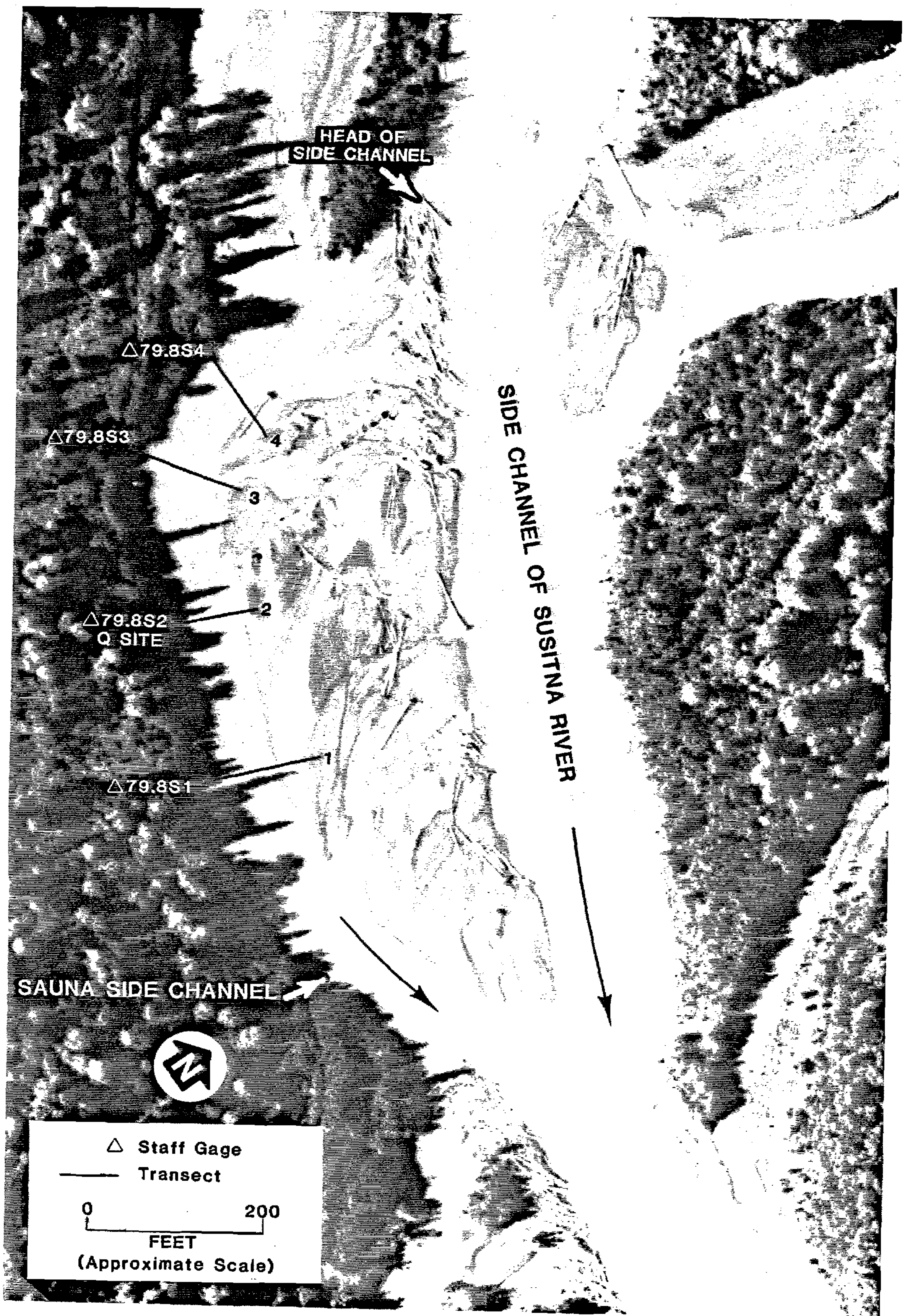


Figure 52. Location of Sauna Side Channel study site (RM 79.8).

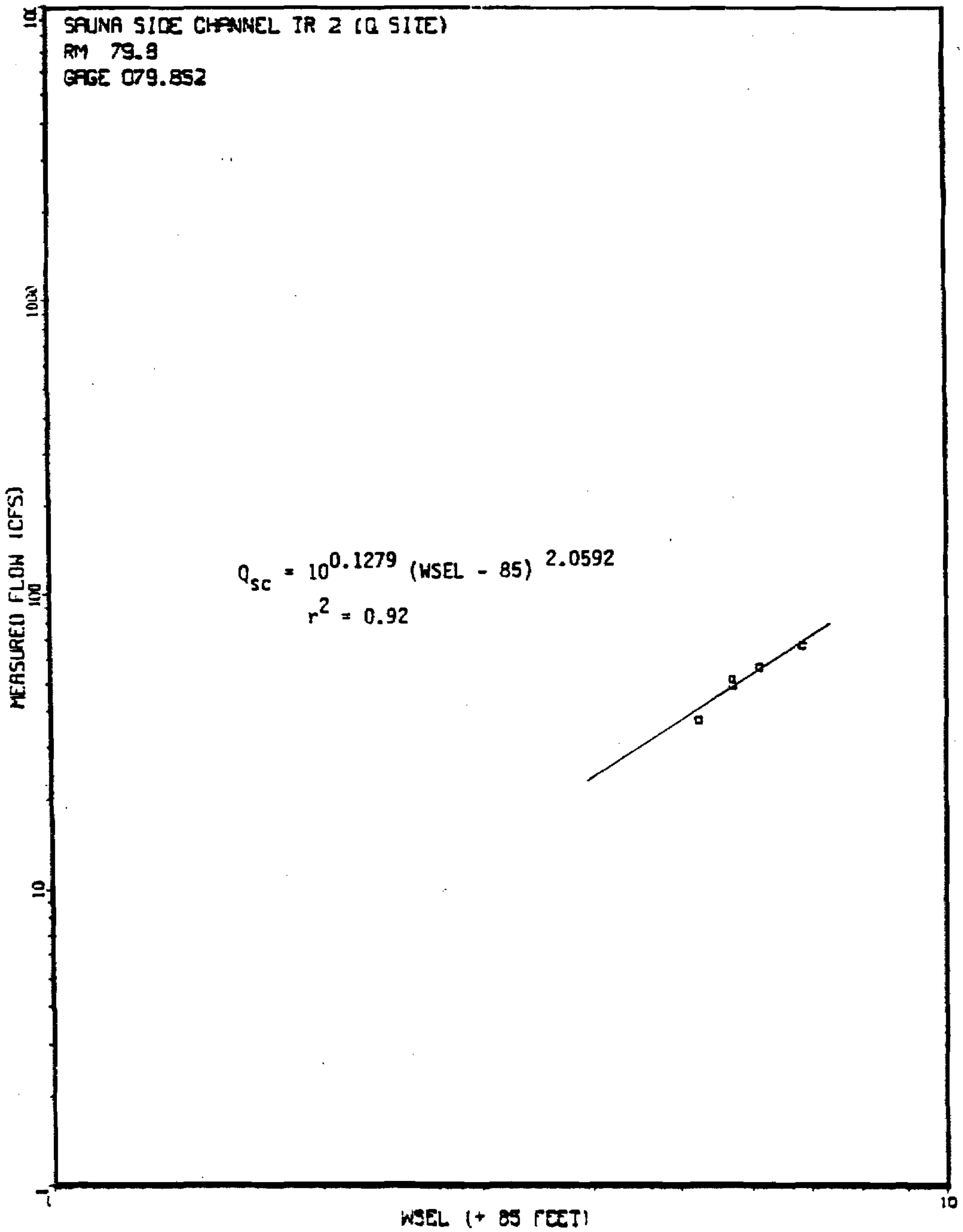


Figure 53. Sauna Side Channel streamflow versus WSEL rating curve at transect 2 Q Site.

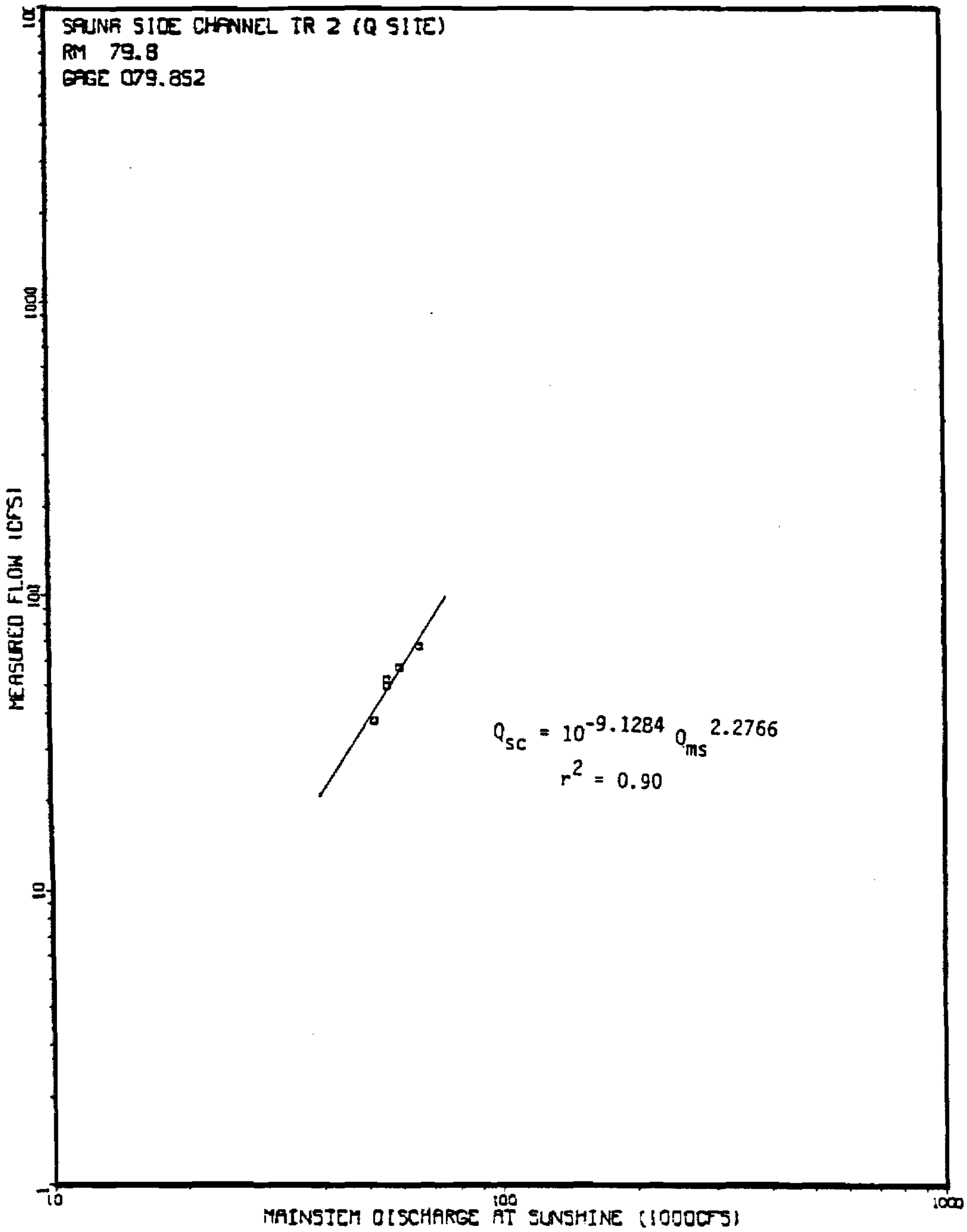


Figure 54. Sauna Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 2 Q Site.

3.13.3 Mainstem Breaching and Controlling Discharges

Breaching of Sauna Side Channel is the result of overtopping of the head by the adjoining side channel. Insufficient field data is available to determine precisely the initial breaching and controlling discharges for Sauna Side Channel. Field observations and a review of aerial photographs indicate the head of the side channel to be "barely" breached at 40,800 cfs and "almost" breached at 36,600 cfs (Table 2).

Although the lowest discharge at which the mainstem was observed to breach Sauna Side Channel was 40,800 cfs, a controlling discharge of 38,000 cfs is estimated for this channel. This controlling discharge was estimated by assuming that the stage/discharge relationship (Attachment Figure E-31 to E-33) for the nonbreached condition was nearly horizontal. This assumption is made because of the lack of nonbreached stage observations (1 observation only) and is considered reasonable based on observations and stage data collected at this site. The controlling discharge is scaled from the curve as the point of intersection (38,000 cfs) of the nonbreached limb of the stage/discharge relationship. The initial breaching discharge is estimated to occur at 37,000 cfs based on field observations and assuming the site initially breaches within 1,000-2,000 cfs of the controlling discharge as observed at other side channel sites.

To evaluate the influence mainstem discharge has on the hydraulics of Sauna Side Channel, a comparison of the rating curves for the streamflow station at transect 2 was performed (Figure 55). A side channel flow of

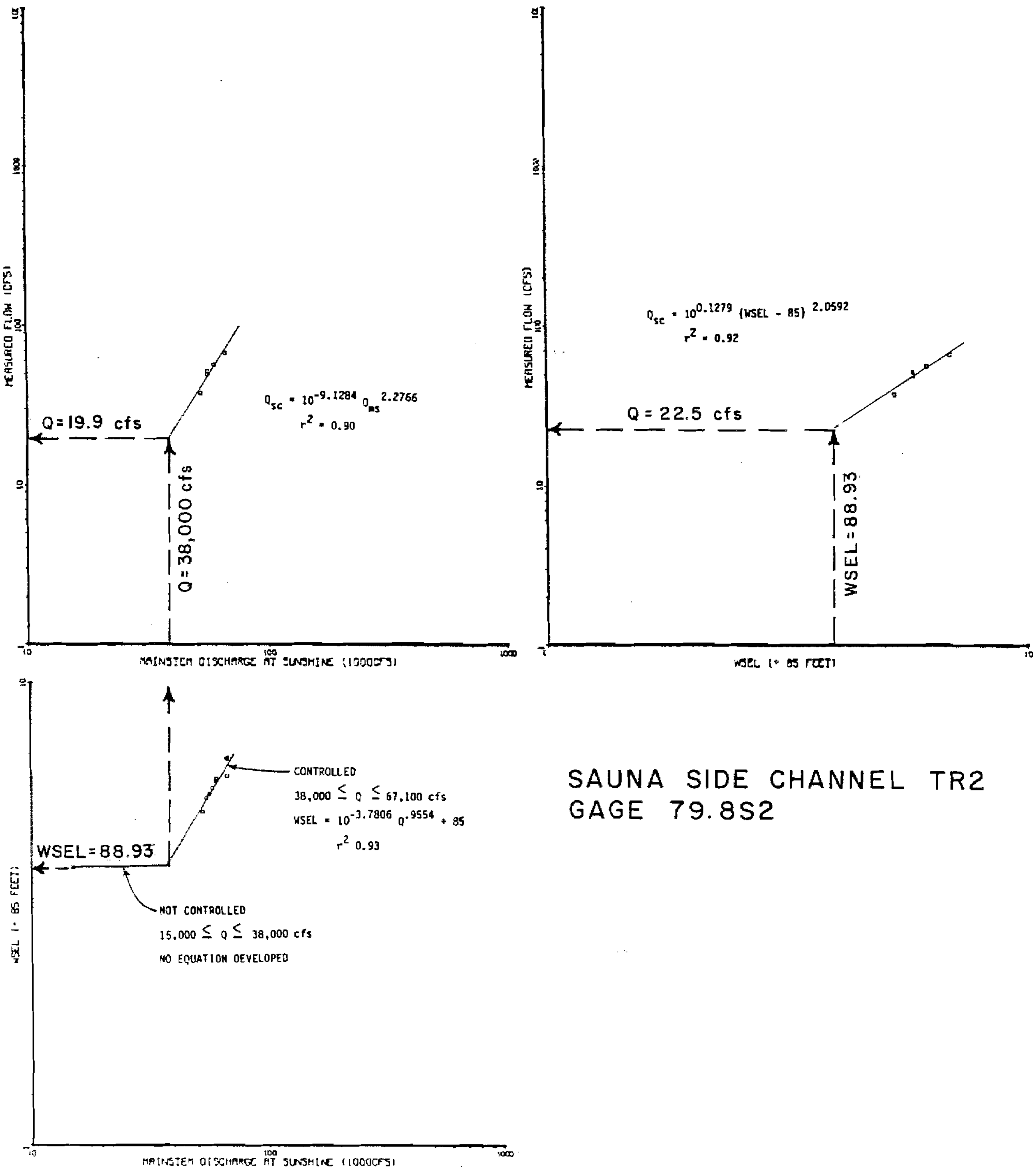


Figure 55. Comparison of rating curves for Sauna Side Channel transect 2 Q Site.

22.5 cfs has been estimated to occur at the controlling discharge of 38,000 cfs as derived from the stage versus streamflow rating curve. This compares to a streamflow estimate of 19.9 cfs determined from the streamflow versus mainstem discharge rating curve. Table 3 summarizes comparisons of streamflow estimates determined from transect 2 rating curves for controlling mainstem discharges of Sauna Side Channel.

3.13.4 Channel Geometry

3.13.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were collected at Sauna Side Channel during a mainstem discharge at Sunshine (USGS 15292780) of 15,000 cfs when the flow within the study site was estimated to be less than 1 cfs. The thalweg survey extended approximately 1,450 feet beginning at the mouth of the side channel continuing upstream through the study site terminating at the head of the side channel. The survey data used to develop the thalweg profile are presented in Attachment Table C-13 with the resultant thalweg profile being presented in Attachment Figure C-13. A gradient of 10.4 ft/mi was determined for the thalweg profile.

3.13.4.2 Cross Section Profile

Survey data for the development of cross sectional profiles were obtained at each of the four transects located in Sauna Side Channel.

The survey data are presented in Attachment Tables D-31 to D-34 with the resultant cross sectional profiles being presented in Attachment Figures D-31 to D-34.

3.13.5 Backwater

Based on a review of the 1984 stage data (Table 7) and the thalweg figure for Sauna Side Channel (Attachment Figure C-13), it has been estimated that backwater does not occur in Sauna Side Channel during non-breaching mainstem discharges.

During breaching discharges of 54,600 to 56,700 cfs, an area of backwater was observed to occur throughout the Sauna Side Channel study site. At mainstem discharges exceeding 56,700 cfs, insufficient stage data is available to determine the extent of backwater.

3.14 Sucker Side Channel (RM 84.5)

3.14.1 Site Description

Sucker Side Channel is located on the east bank of the Susitna River at river mile 84.5. This side channel is symmetrical in shape and approximately 0.7 miles in length. Sucker Side Channel is part of a network of other side channels that braid through a complex of well vegetated islands. The head of Sucker Side Channel adjoins another side channel whereas the mouth connects to a channel of the mainstem Susitna

Table 7. A comparison of water surface elevations from Task 14 staff gages located within Sauna Side Channel.

Date	TR 1	TR 2	TR 3	TR 4	Mainstem Discharge
841009	88.75	89.00	88.90	89.02	15,000
840928	---	---	---	89.02	17,700
840914	---	---	---	89.02	24,000
840830	---	---	---	89.39	40,800
840817	89.15	---	---	89.29	42,500
840710	---	90.24	---	---	52,500
840823	90.63	90.61	90.64	90.65	54,600
840723	---	90.71	90.66	90.69	56,100
840723	90.70	90.73	90.72	90.69	56,100
840723	90.72	90.73	90.75	---	56,100
840802	90.73	90.75	90.75	90.79	56,700
840721	---	90.91	---	---	57,700
840828	---	91.09	---	---	59,900
840828	---	91.13	---	---	59,900
840706	---	91.18	---	---	63,600
840810	---	91.83	---	---	66,400
840810	---	91.85	---	---	66,400
840807	---	91.26	---	---	66,700
840625	---	91.82	---	---	67,100
840625	---	91.86	---	---	67,100

River. Breaching results from overtopping of the head by the adjoining side channel.

Prior to breaching, flow in the side channel is minimal and generally results from bank seepage. During high mainstem discharge a backwater area was observed in the lower portion of the side channel.

During the 1984 open water field season the study site was located in the lower portion of the side channel (Figure 56). Stage measurements were collected at two locations in Sucker Side Channel with streamflow measurements obtained at each of the two stage monitoring stations (Figure 57). Channel geometry data obtained for Sucker Side Channel include cross section and thalweg profiles. Cross Section profiles were obtained at each stage monitoring location. The thalweg profile was determined from the mouth of the side channel continuing upstream to the first hydraulic control above the study site.

3.14.2 Stage/Discharge Relationship

In Sucker Side Channel measurements of water surface elevations were obtained at stage monitoring stations located at transects 2 and 5. Recorded water surface elevations and the mean daily mainstem discharge (USGS 15292780) corresponding to the date of the stage measurement are presented in Attachment Table B-1. Plots of these water surface elevations versus mainstem discharge are presented in Attachment Figures E-34 and E-35.

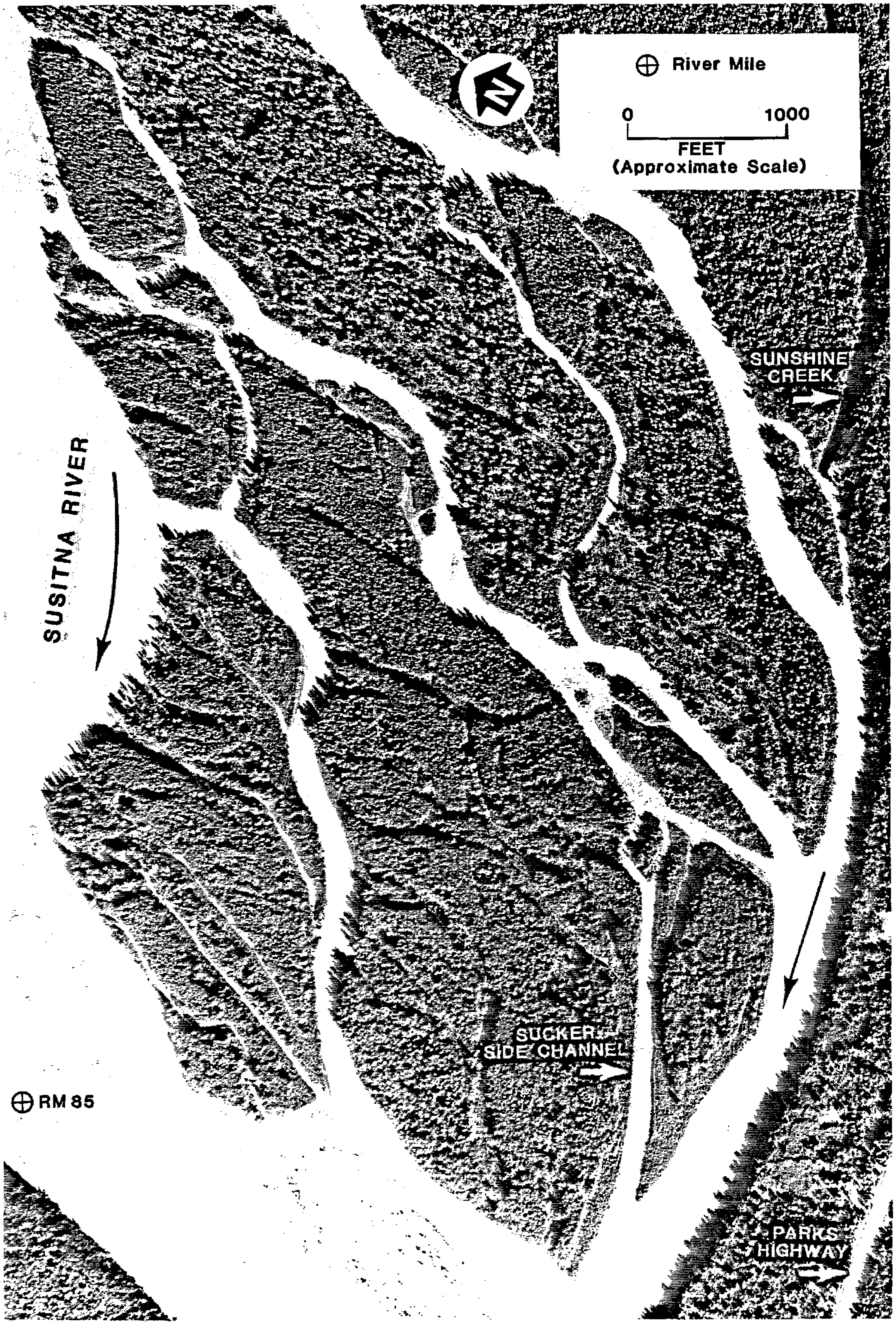


Figure 56. Overview of Sucker Side Channel (RM 84.5).

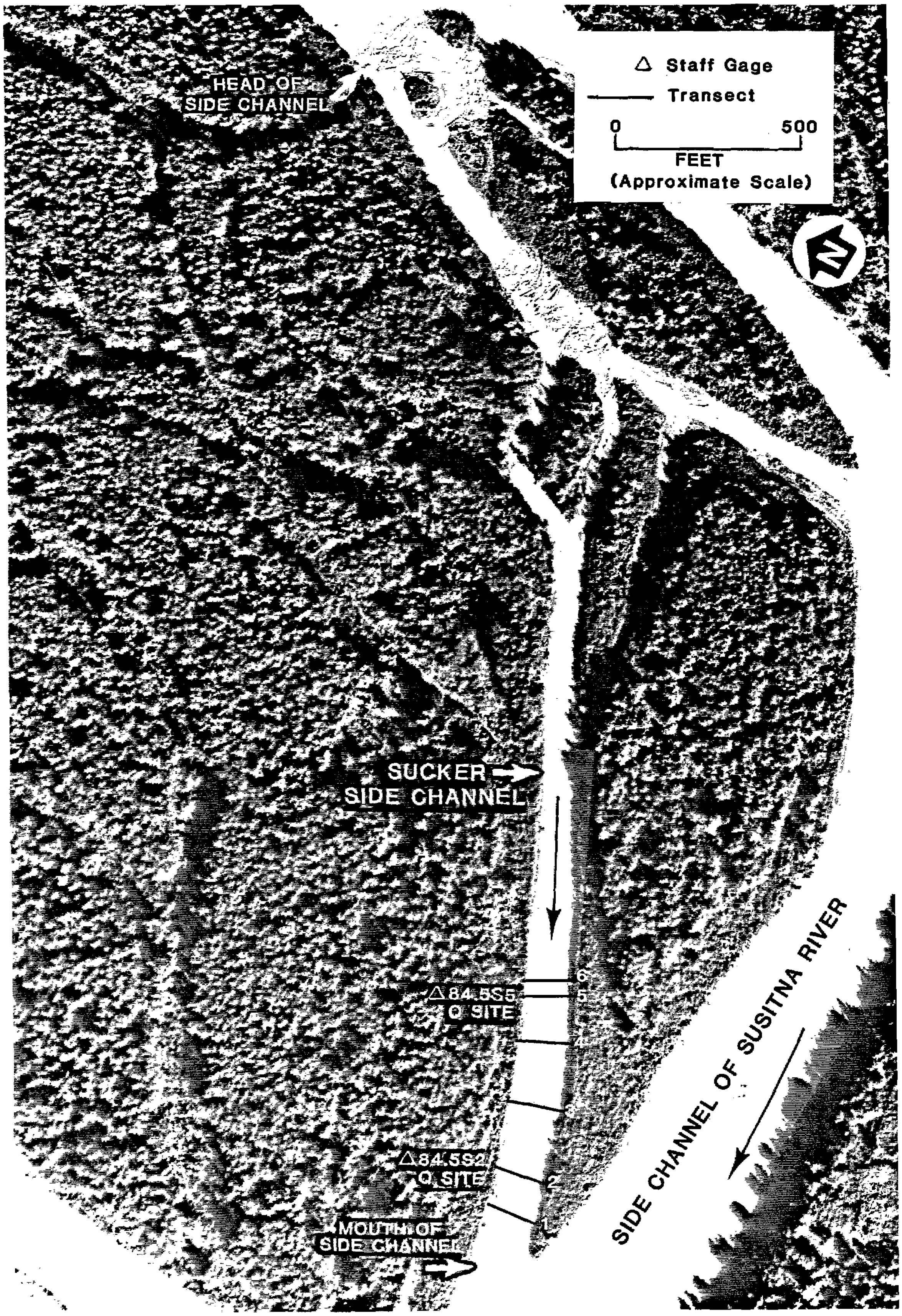


Figure 57. Location of Sucker Side Channel study site (RM 84.5).

Measurements of streamflow in Sucker Side Channel obtained at two stage monitoring stations and the corresponding water surface elevation and mainstem discharge (USGS 15292780) are presented in Attachment Table B-1. Plots of these streamflow and water surface elevations were developed as rating curves to estimate streamflow from observed water surface elevations (Figures 58 and 59). The streamflow data was also plotted against mainstem discharge as rating curves to estimate streamflow from mainstem discharge (Figures 60 and 61).

3.14.3 Mainstem Breaching and Controlling Discharges

Breaching of Sucker Side Channel results from overtopping of the head by the adjoining side channel. Insufficient field data is available to precisely determine the initial breaching and controlling discharges for Sucker Side Channel. Field observations indicated that the channel was barely breached at 32,000 cfs and non-breached at 24,000 cfs. No additional site information is available at mainstem discharges ranging between 32,000 and 24,000 cfs. A controlling discharge of 29,000 cfs, was estimated by assuming that the stage/discharge relationship (Attachment Figures E-34 and E-35) for the non-breached condition was nearly horizontal. This assumption was based on observations and data recorded at this site. The controlling discharge is estimated from the curve as the point of intersection (29,000 cfs) of the non-breached and controlled (breached) conditions of the stage/discharge relationship. The initial breaching discharge of this side channel is estimated as occurring at approximately 1,500 cfs below the controlling discharge, or at 27,500 cfs.

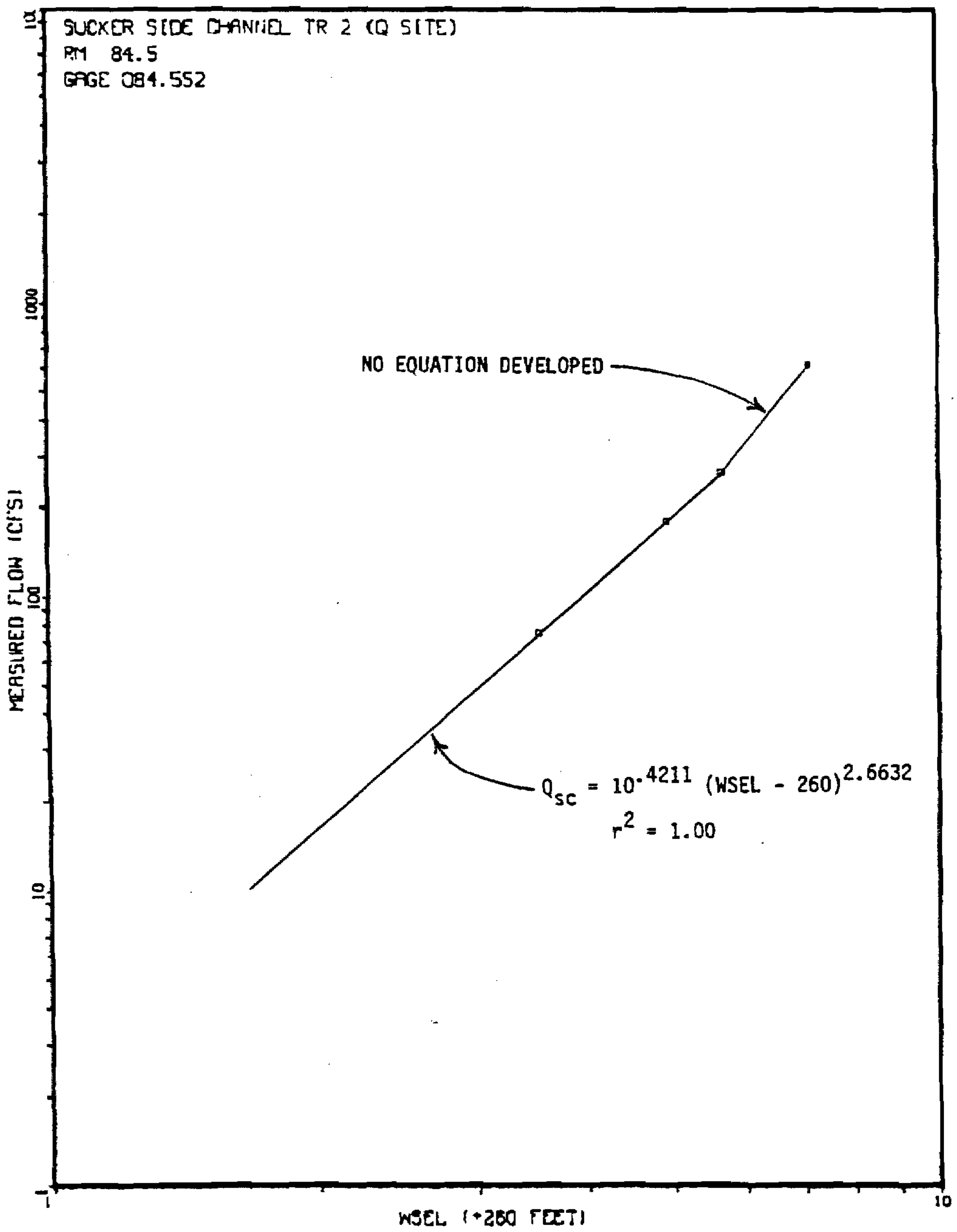


Figure 58. Sucker Side Channel streamflow versus WSEL rating curve at transect 2 Q Site.

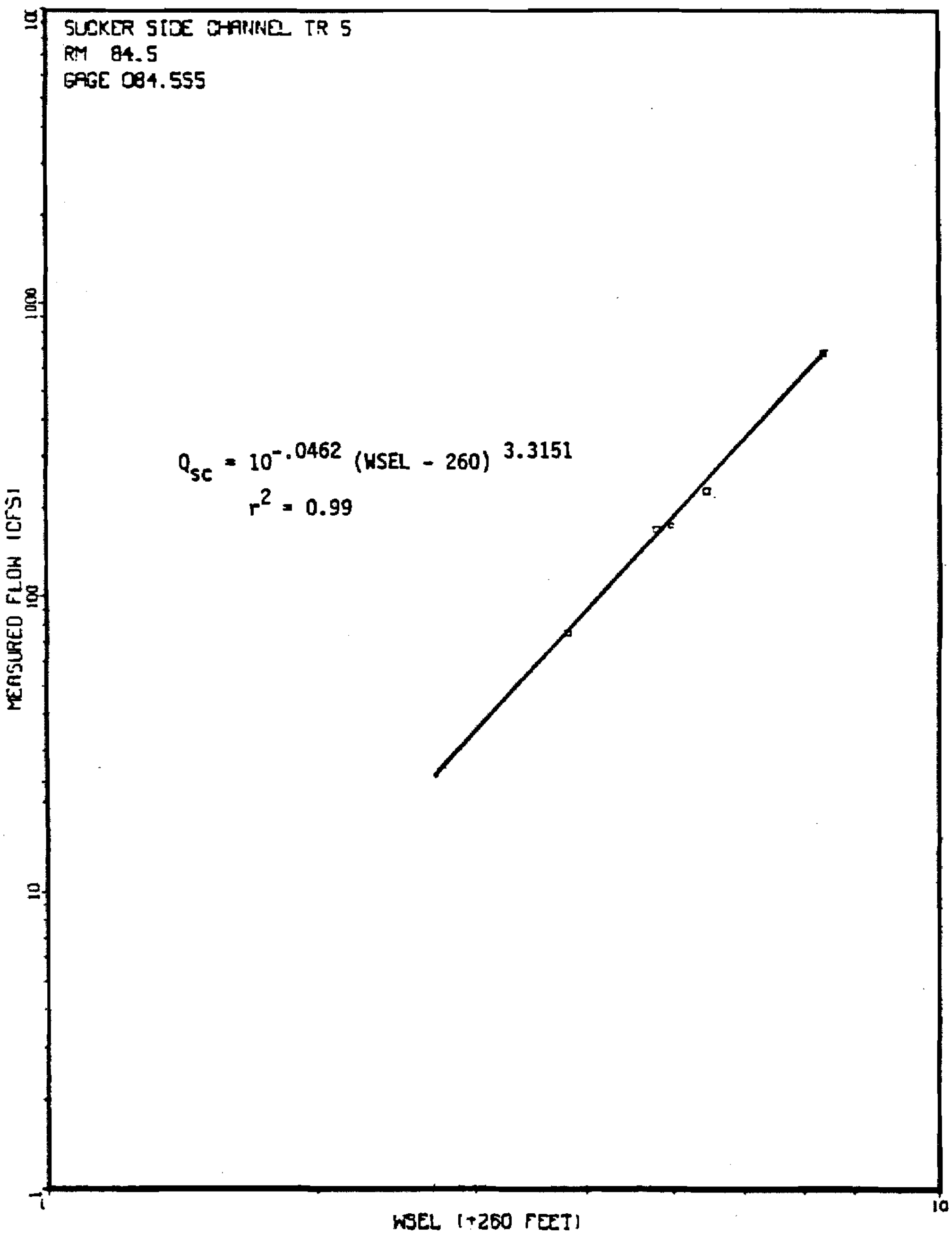


Figure 59. Sucker Side Channel streamflow versus WSEL rating curve at transect 5 Q Site.

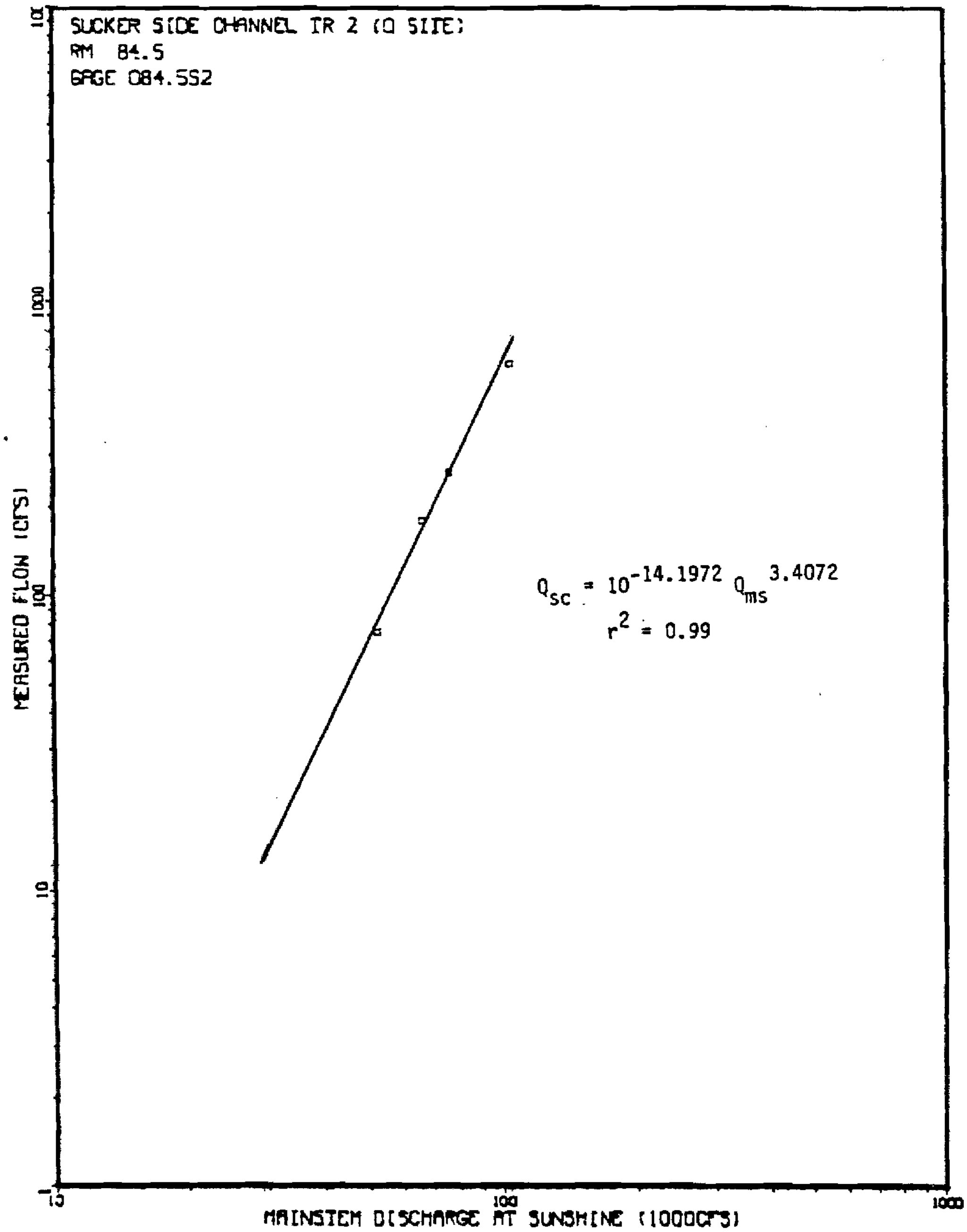


Figure 60. Sucker Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 2 Q Site.

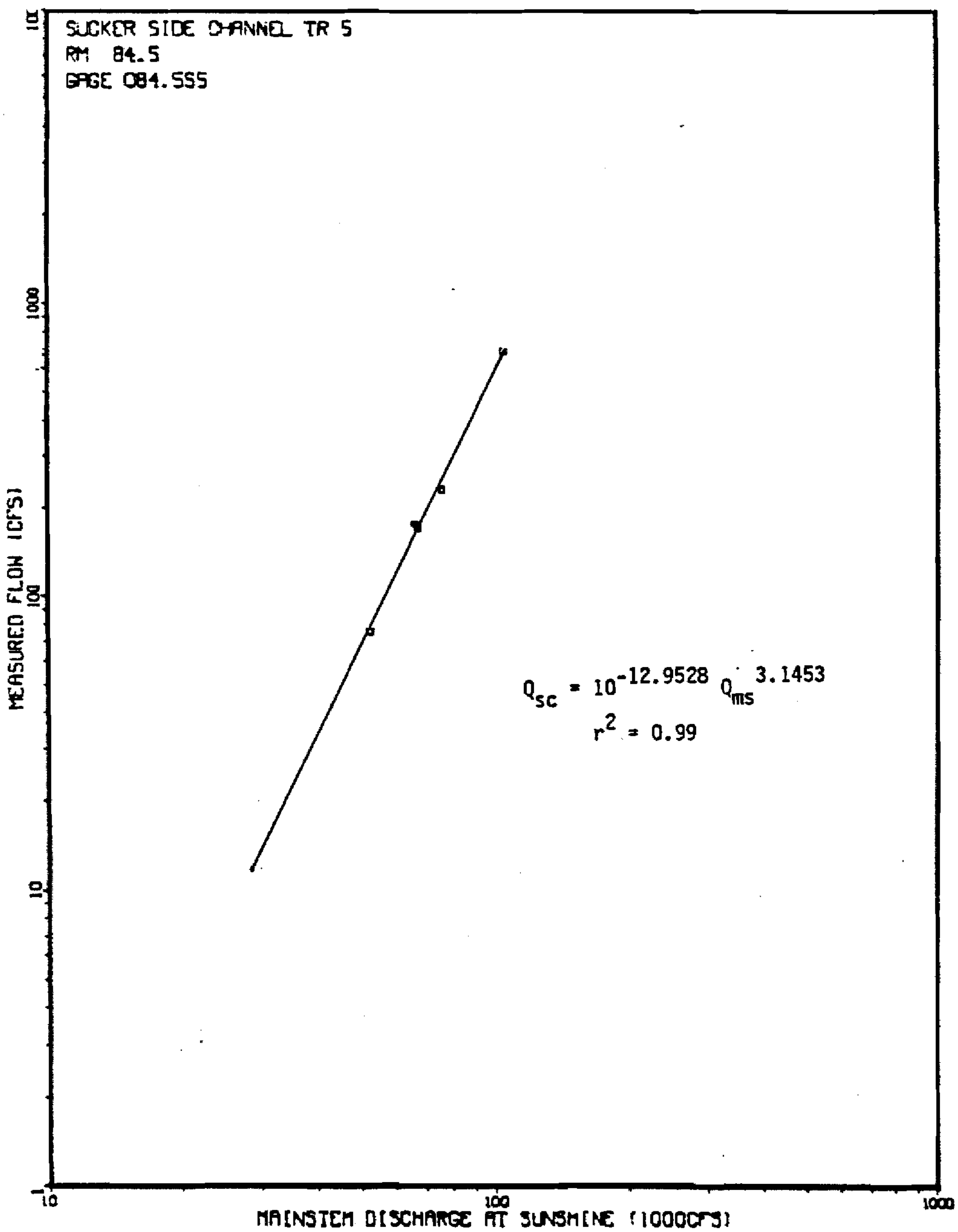


Figure 61. Sucker Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 5 Q Site.

To evaluate the influence of mainstem discharge on the hydraulics of this side channel a comparison of the rating curves for each of the streamflow stations was performed (Figures 62 and 63). At transect 2 streamflow estimates of 10.0 cfs and 10.2 cfs were determined from the flow versus water surface elevation and flow versus mainstem discharge rating curves, respectively. At transect 5 streamflow estimates of 24.5 cfs and 12.1 cfs were determined from the flow versus water surface elevation and flow versus mainstem discharge rating curves, respectively.

3.14.4 Channel Geometry

3.14.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained at Sucker Side Channel during a non-breaching mainstem discharge of 19,000 cfs and an estimated side channel streamflow of less than 1 cfs. The survey data for the thalweg profile are presented in Attachment Table C-14 with the resultant thalweg profile presented in Attachment Figure C-14. This thalweg profile extended from the mouth of the side channel upstream approximately 1,300 feet above transect 6. The streambed gradient for that portion of the side channel included in the thalweg profile was 7.2 feet/mile.

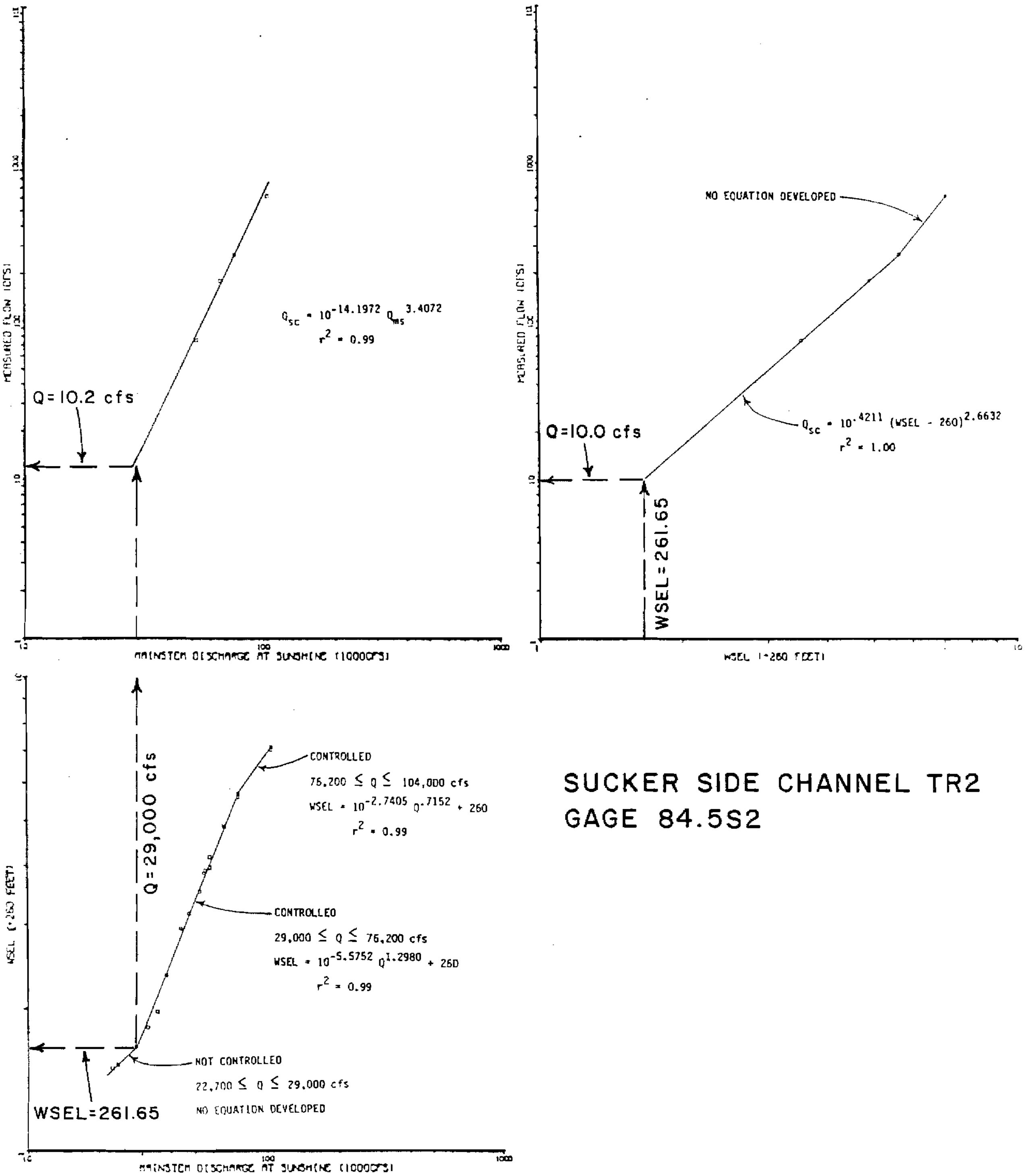
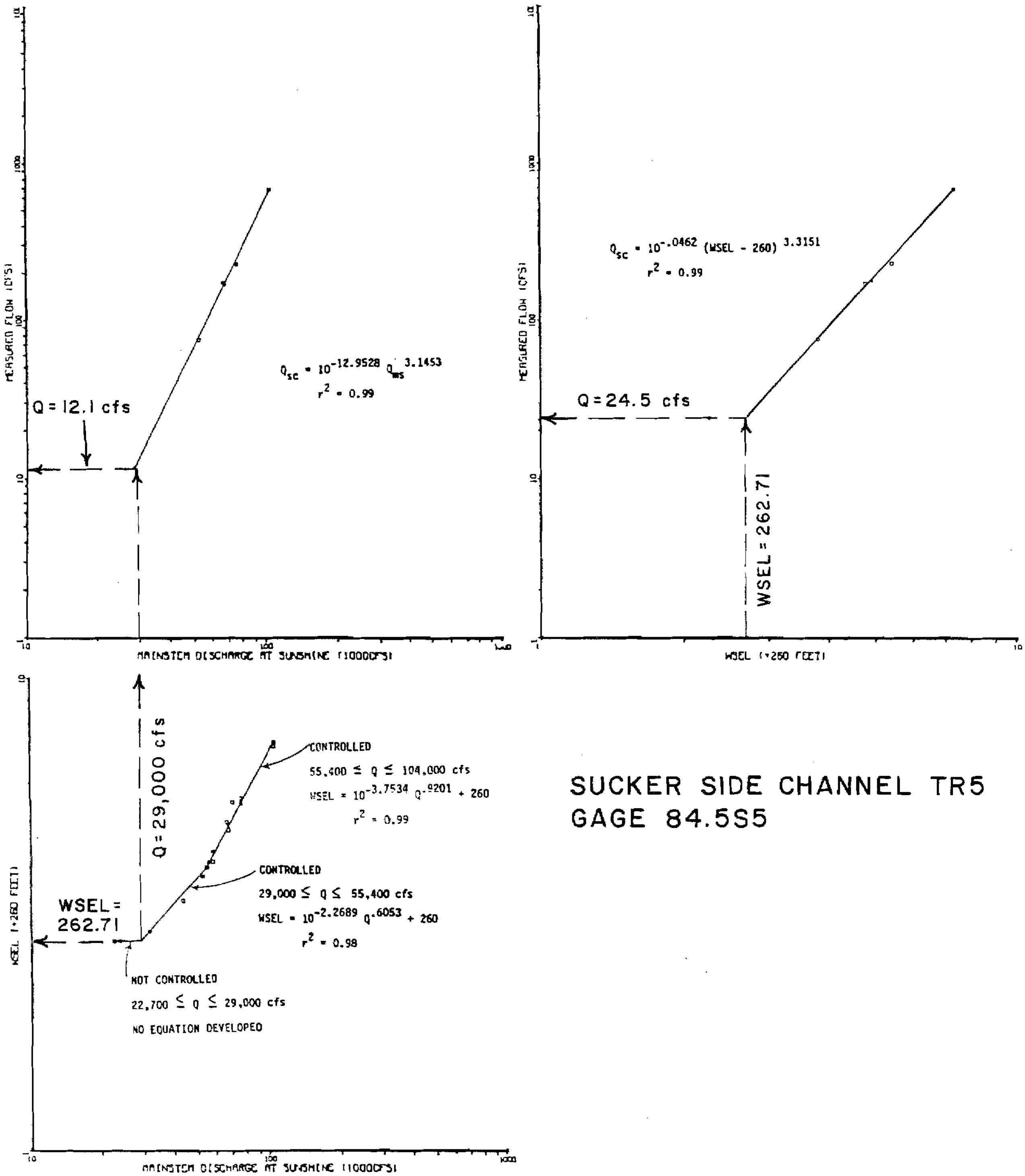


Figure 62. Comparison of rating curves for Sucker Side Channel transect 2 Q Site.



SUCKER SIDE CHANNEL TR5
GAGE 84.5S5

Figure 63. Comparison of rating curves for Sucker Side Channel transect 5 Q Site.

3.14.4.2 Cross Section Profile

Cross section data were recorded at each of the two stage monitoring stations located within the side channel. These stage monitoring stations are located on transects 2 and 5 (Attachment Figure C-14). The cross sectional data are presented in Attachment Tables D-35 and D-36 with the resultant cross sections presented in Attachment Figures D-35 and D-36.

3.14.5 Backwater

Based on a comparison of 1984 stage data (Attachment Table B-1), a backwater area extends through the study site approximately 750 feet during mainstem discharges ranging from 66,400 to 76,200 cfs. Insufficient information is available to precisely determine the extent of backwater occurring in the side channel although field observations indicate that backwater occurred in the side channel mouth area throughout the majority of the 1984 field season.

3.15 Beaver Dam Slough and Side Channel (RM 86.3)

3.15.1 Site Description

Beaver Dam Slough and Side Channel are located on the east bank of the Susitna River at river mile 86.3. Both the slough and side channel are separated from the main channel Susitna River by a large side channel.

This side channel adjoins the head and mouth of Beaver Dam Side Channel, and the head of Beaver Dam Slough. The mouth of Beaver Dam Slough empties directly into Beaver Dam Side Channel. A substantial backwater area was observed to occur in Beaver Dam Slough.

During the 1984 open water field season the study site in Beaver Dam Slough was located near the mouth of the slough (Figure 64). The study site in Beaver Dam Side Channel included that portion of the side channel located downstream of the side channel/slough confluence (Figure 65).

Stage was monitored at one location in both the slough and side channel study sites. Streamflow measurements were obtained at each of these stage monitoring stations. Channel geometry data were obtained at both the sloughs and side channel study sites. Cross sections were obtained at each stage monitoring station. Thalweg profiles were surveyed through both the slough and side channel study sites.

3.15.2 Stage/Discharge Relationship

Measurements of water surface elevations obtained at each stage monitoring station located in Beaver Dam Slough and Beaver Dam Side Channel and the mean daily mainstem discharge (USGS 15292780) corresponding to the date of the stage measurement are presented in Attachment Table B-1. Plots of these water surface elevations versus mainstem discharge are presented in Attachment Figures E-36 - E-38.

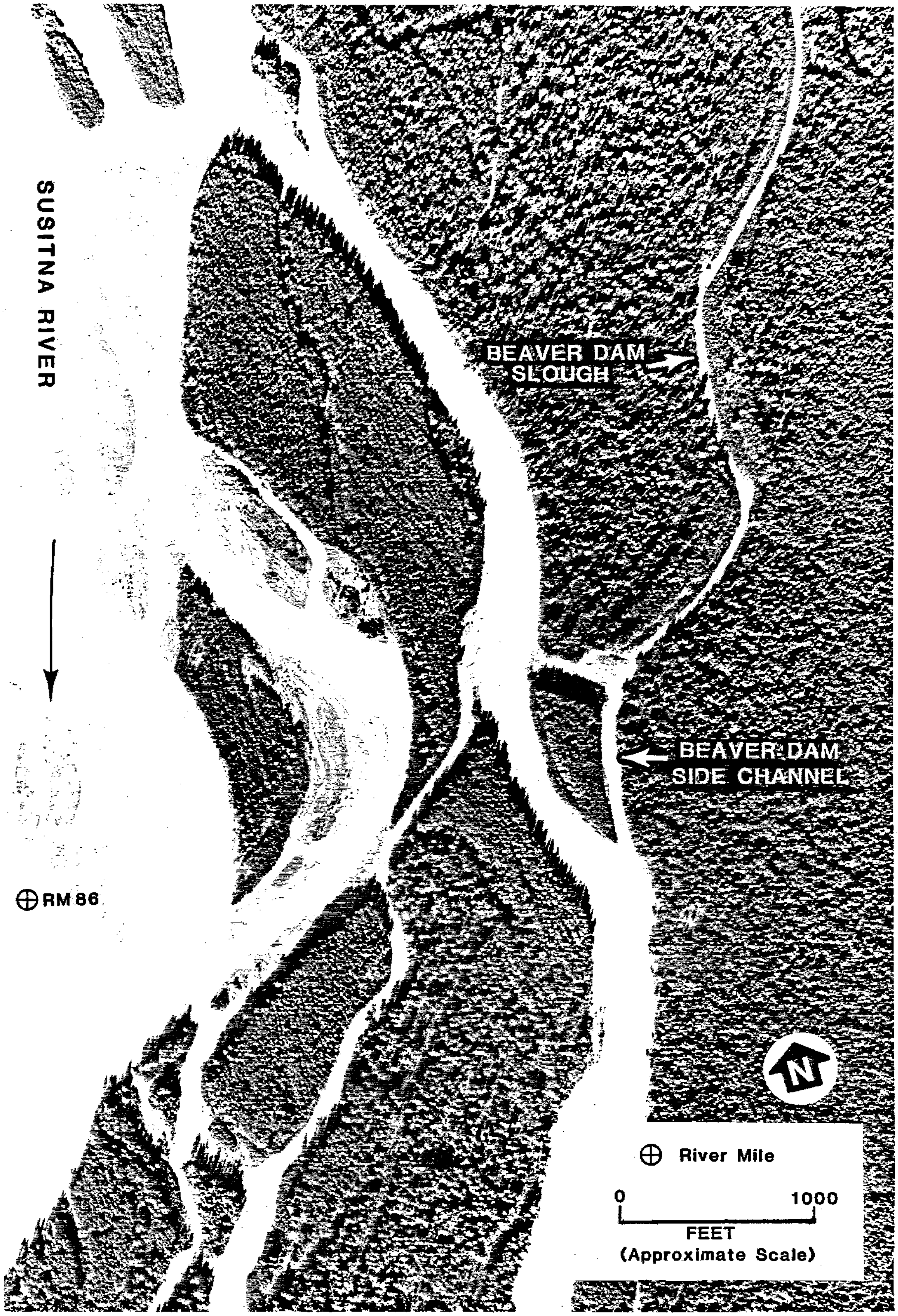


Figure 64. Overview of Beaver Dam Slough (RM 86.3) and Beaver Dam Side Channel (RM 86.3).

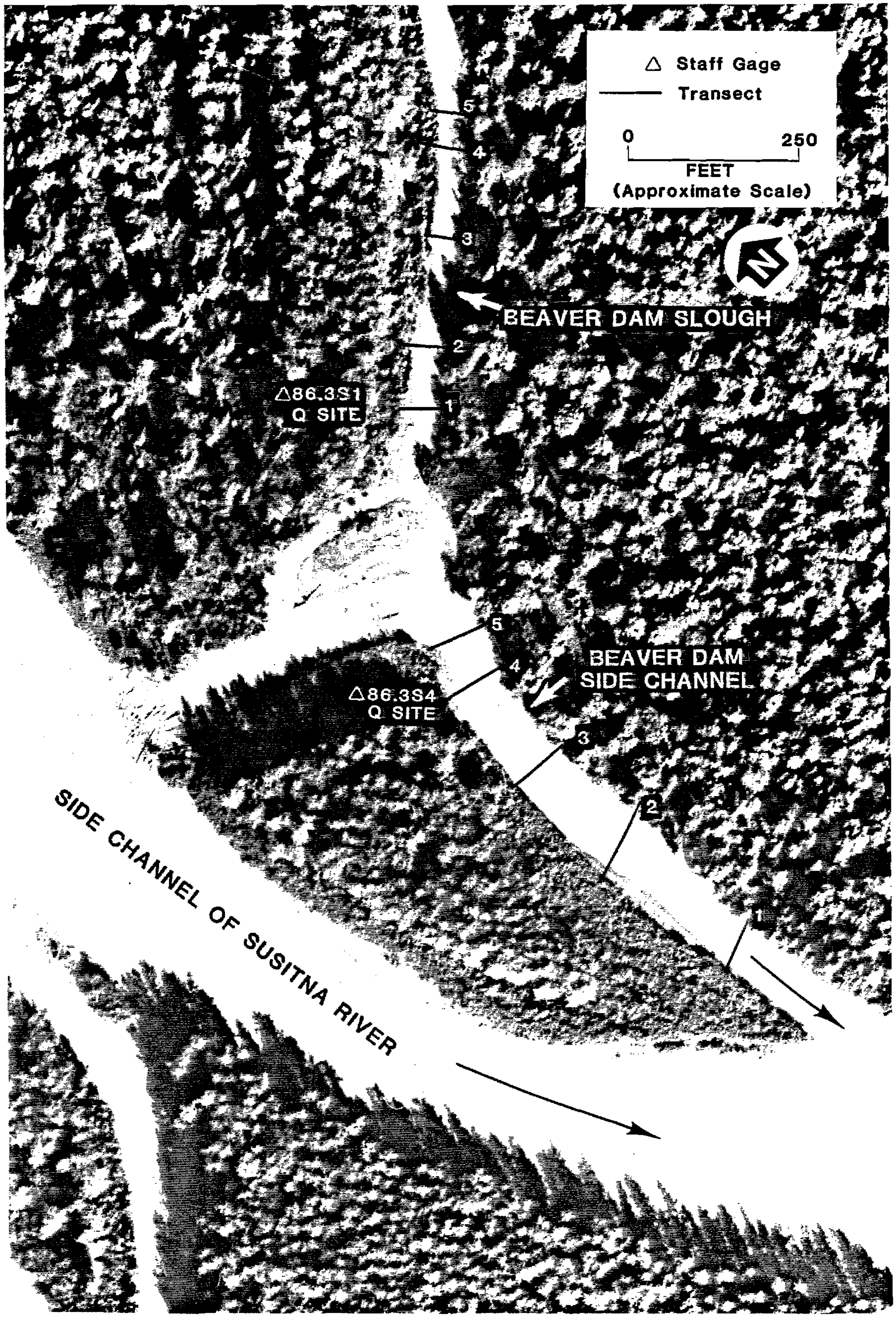


Figure 65. Location of Beaver Dam Slough and Beaver Dam Side Channel study site (RM 86.3).

Measurements of streamflow were obtained at the stage monitoring stations located at the slough transect 1 and at the side channel transect 4. These measurements of streamflow and the corresponding water surface elevation and mainstem discharge (USGS 15292780) are presented in Attachment Table B-1. A plot of the streamflow and water surface elevations were developed as a rating curve for Beaver Dam Side Channel to estimate streamflow from observed water surface elevations and is presented in Figure 66. The streamflow data for the side channel was also plotted against mainstem discharge as a rating curve to estimate streamflow from mainstem discharge (Figures 67). Due to backwater conditions water surface elevation versus flow and flow versus mainstem discharge rating curves were not developed for Beaver Dam Slough.

3.15.3 Mainstem Breaching and Controlling Discharges

Breaching of Beaver Dam Side Channel is the result of overtopping of the head by the adjoining side channel. Beaver Dam Slough was not observed overtopped in 1984. The head of the side channel was observed breached at a mainstem discharge of 47,600 cfs and dry at 45,400 cfs. The head was observed to be more than initially breached at a mainstem discharge of 47,600 cfs. Therefore, the initial overtopping of the side channel, (breaching discharge) is estimated to occur at approximately 46,000 cfs. Based on the breaching observation information and a review of the stage data presented in Attachment Figure E-37, the mainstem discharge of 47,600 cfs has been chosen as the controlling discharge. Attachment

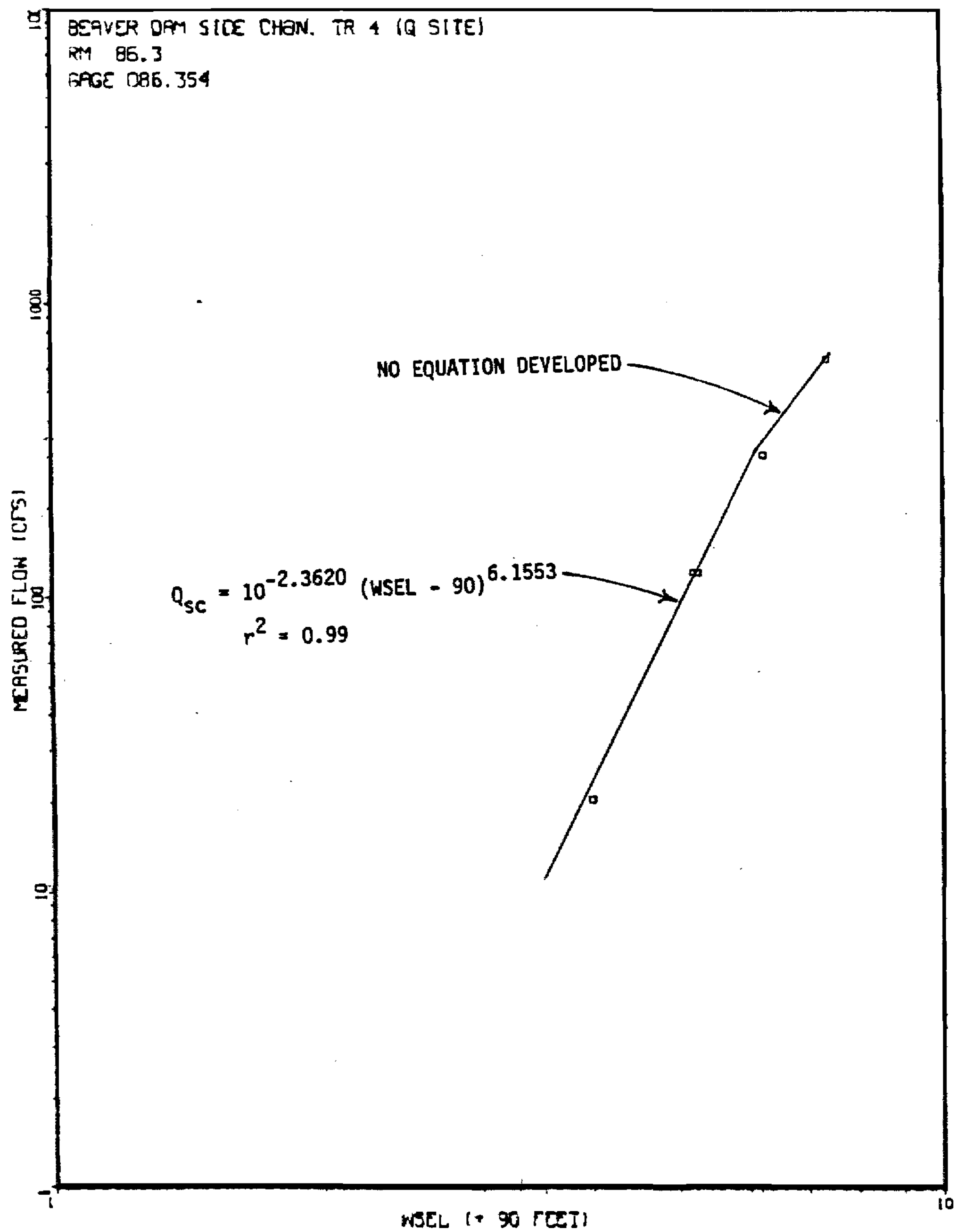


Figure 66. Beaver Dam Side Channel streamflow versus WSEL rating curve at transect 4 Q Site.

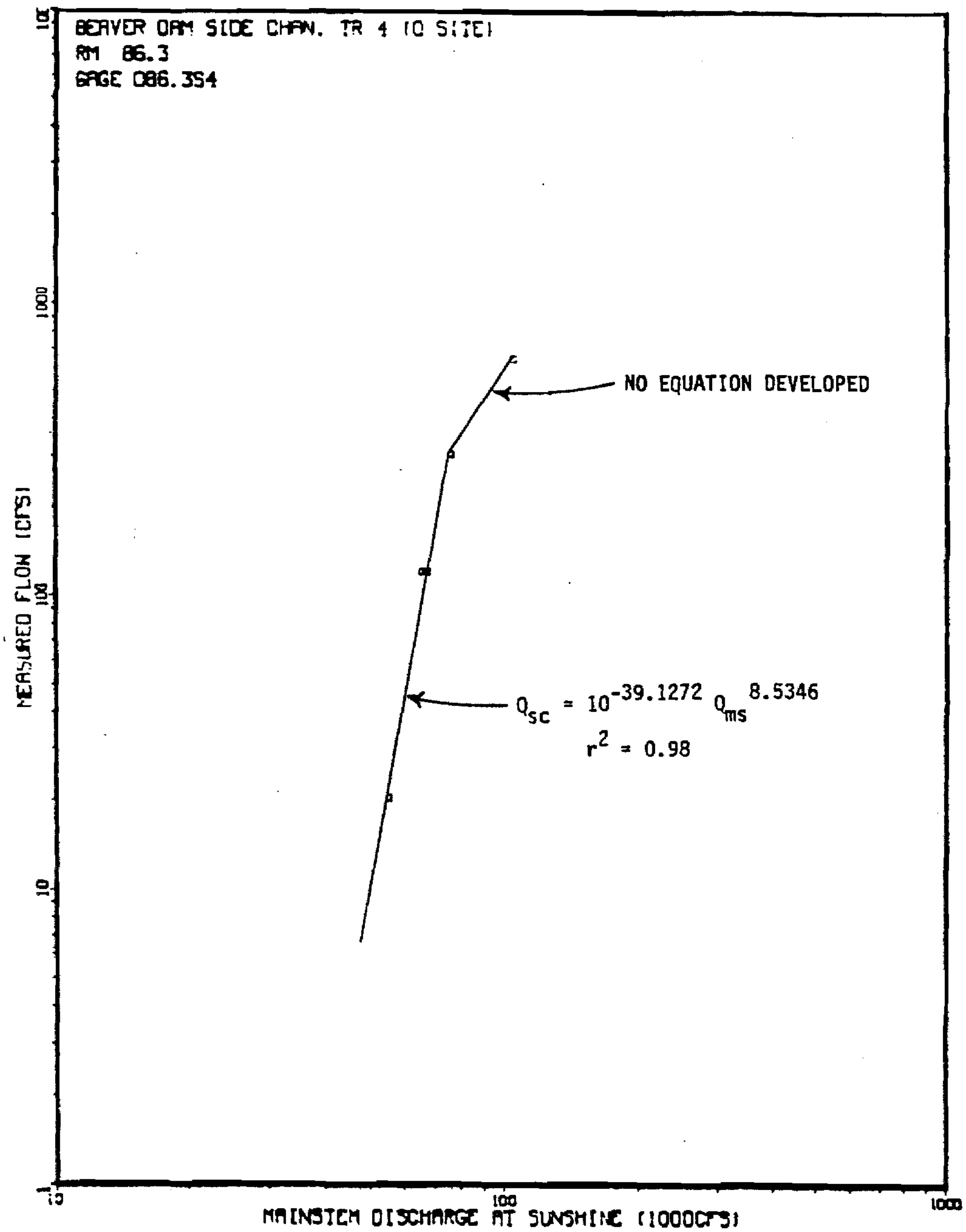


Figure 67. Beaver Dam Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 4 Q Site.

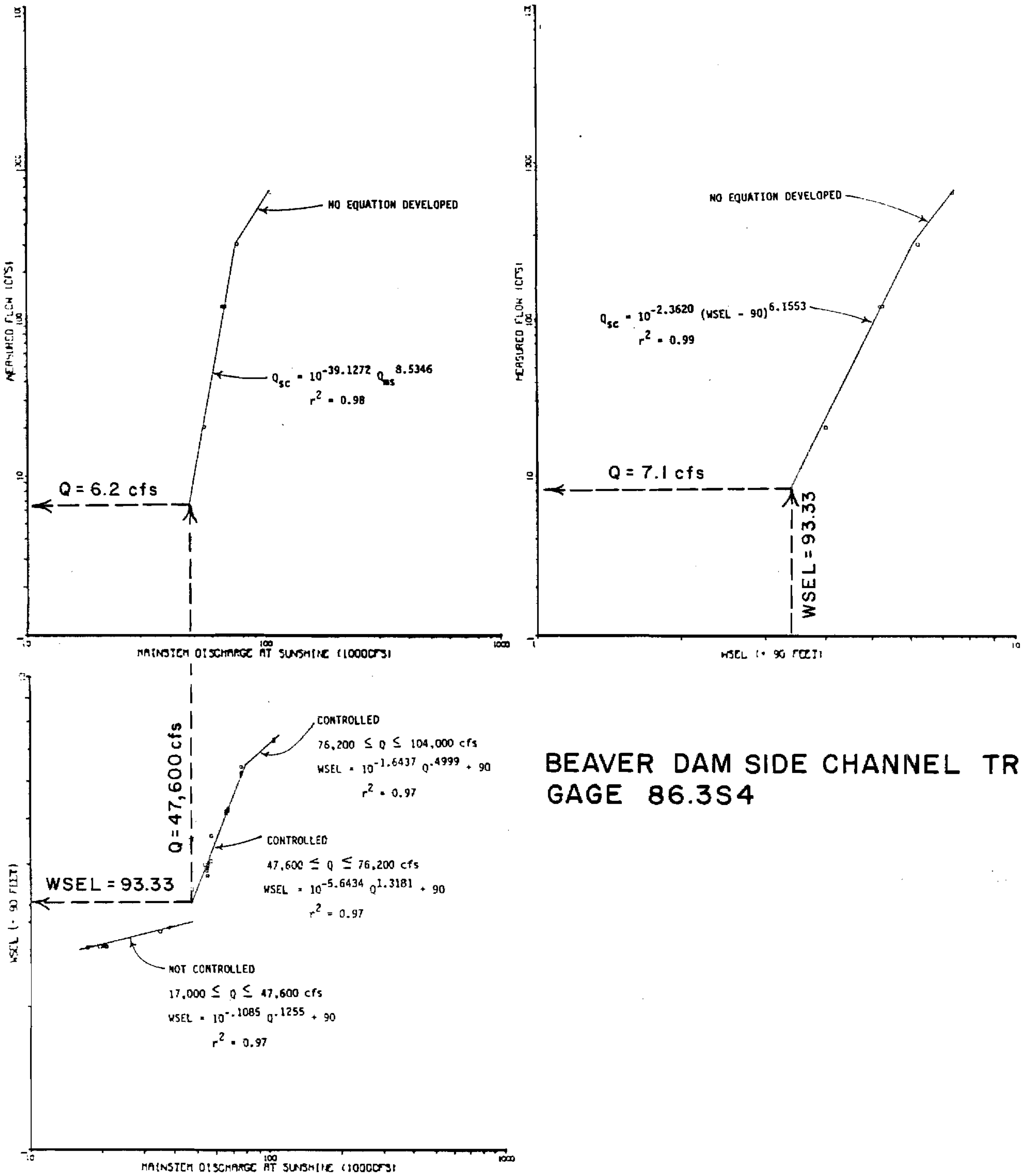
Figure E-37 shows that the lines depicting the base flow condition and the breached condition do not intersect. The gap between these lines is evidence that scour has probably occurred as a result of the August 26 flood event.

A comparison of the rating curves developed for the side channel is presented in Figure 68. Using the controlling discharge of 47,600 cfs a streamflow estimate of 7.1 cfs was derived from the flow versus water surface elevation rating curve. This flow estimate is very similar to the streamflow estimate of 6.2 cfs derived from the flow versus mainstem discharge rating curve.

3.15.4 Channel Geometry

3.15.4.1 Thalweg Profile

Survey data for the development of thalweg profiles were obtained for both Beaver Dam Slough and Side Channel during a non-breaching mainstem discharge of 19,600 cfs. Streamflow was measured to be 0.7 cfs and 0.5 cfs during these thalweg profiles for Beaver Dam Slough and Side Channel, respectively. The survey data for these thalweg profiles are presented in Attachment Tables C-15 and C-16 with the resultant thalweg profiles presented in Attachment Figures C-15 and C-16. At Beaver Dam Slough the thalweg profile extended from the mouth of the slough continuing upstream above transect 5 approximately 940 feet. For Beaver Dam Side Channel the thalweg profile extended from the mouth of the side



BEAVER DAM SIDE CHANNEL TR 4
GAGE 86.3S4

Figure 68. Comparison of rating curves for Beaver Dam Side Channel transect 4 Q Site.

channel upstream to the head of the side channel. The streambed gradient for that portion of Beaver Dam Slough included in the thalweg survey was 10.1 feet/mile. The streambed gradient for Beaver Dam Side Channel as determined by the thalweg profile was 13.5 feet/mile.

3.15.4.2 Cross Section Profile

Cross section data were recorded at each of the stage monitoring stations located in Beaver Dam Slough and Side Channel. These stage monitoring stations were located on transects 1 and 4 of Beaver Dam Slough and Side Channel, respectively. The cross sectional data are presented in Attachment Tables D-37 and D-38 with the resultant cross sections presented in Attachment Figures D-37 and D-38.

3.15.5 Backwater

Based on field observations on August 23 a backwater area extended at least 150 feet upstream from the sloughs mouth at a mainstem discharge of 54,600 cfs. Beaver Dam Slough was not observed breached in 1984. Increases in stage in the slough in 1984 resulted from an intrusion of water from Beaver Dam Side Channel entering the mouth of the slough. Backwater is estimated to occur in Beaver Dam Slough subsequent to breaching of Beaver Dam Side Channel or at 47,600 cfs (the controlling discharge for Beaver Dam Side Channel).

Field observations for Beaver Dam Side Channel indicate that backwater occurs in the mouth area of this side channel during medium to high mainstem discharges. The precise extent of backwater and associated mainstem discharge to create the backwater has not been determined for this side channel due to insufficient data.

3.16 Sunset Side Channel (RM 86.9)

3.16.1 Site Description

Sunset Side Channel is located on the east bank of the Susitna River at river mile 86.9. It is approximately 1.1 miles in length and is separated from the main channel Susitna River on the west by a network of vegetated islands and side channels. The channel is confined on the east by a high cut bank. Prior to breaching, the side channel is composed of a sequence of pools and riffles. During this period, flow is maintained by groundwater seepage and upwelling. Subsequent to breaching, flows up to 3,900 cfs have been measured.

During the 1984 open water field season, the study site within Sunset Side Channel was located in the lower portion of the side channel and was approximately 1,500 feet in length (Figure 69). Stage was monitored at seven locations with streamflow measurements being obtained at one of these stage monitoring stations (Figure 70). Cross section survey data were collected at all stage monitoring stations whereas survey data for the development of a thalweg profile were collected from the first control below the study site to the first control above the study site.

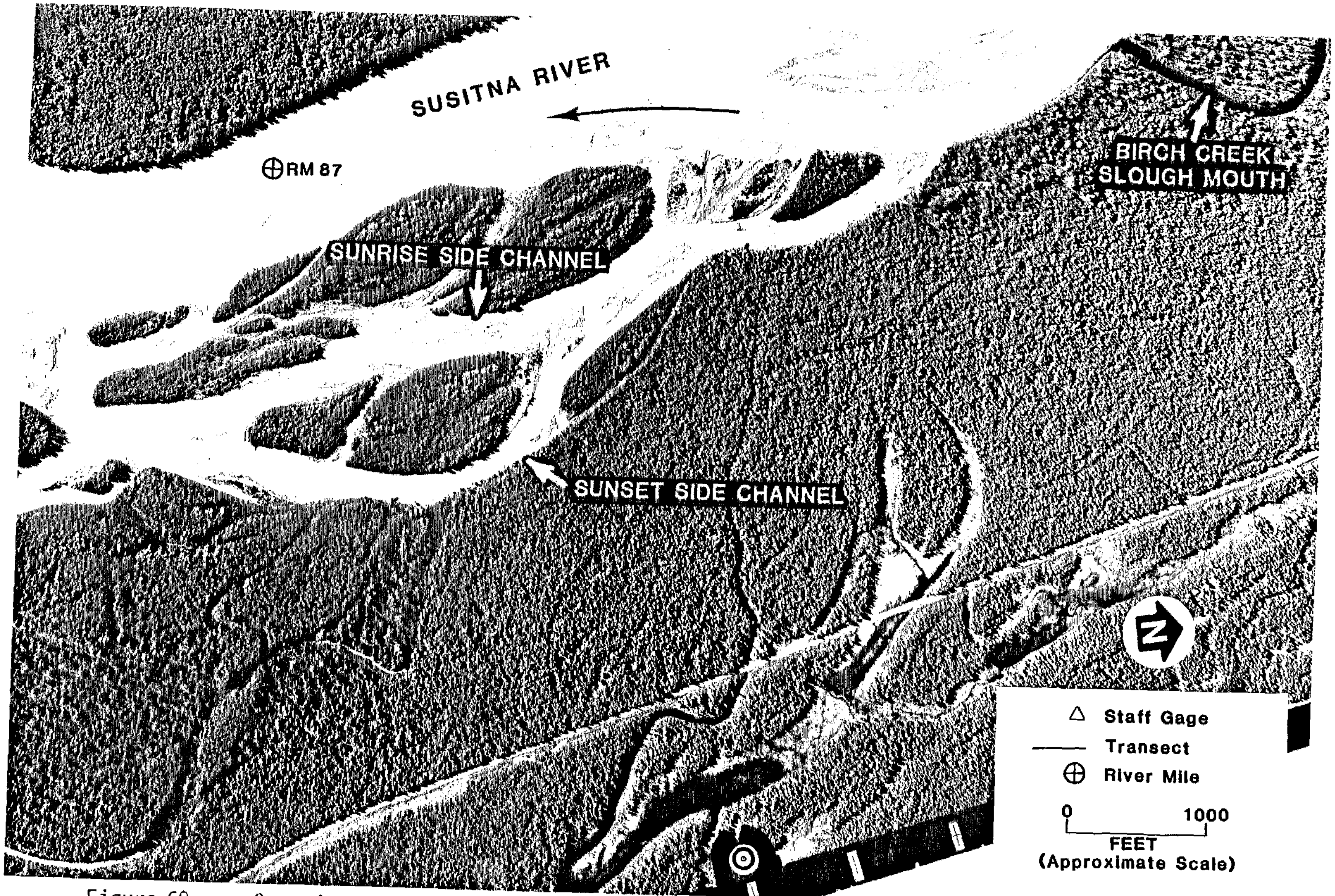


Figure 69. Overview of Sunset Side Channel and Sunrise Side Channel study sites (RM 86.9 and RM 87.0).

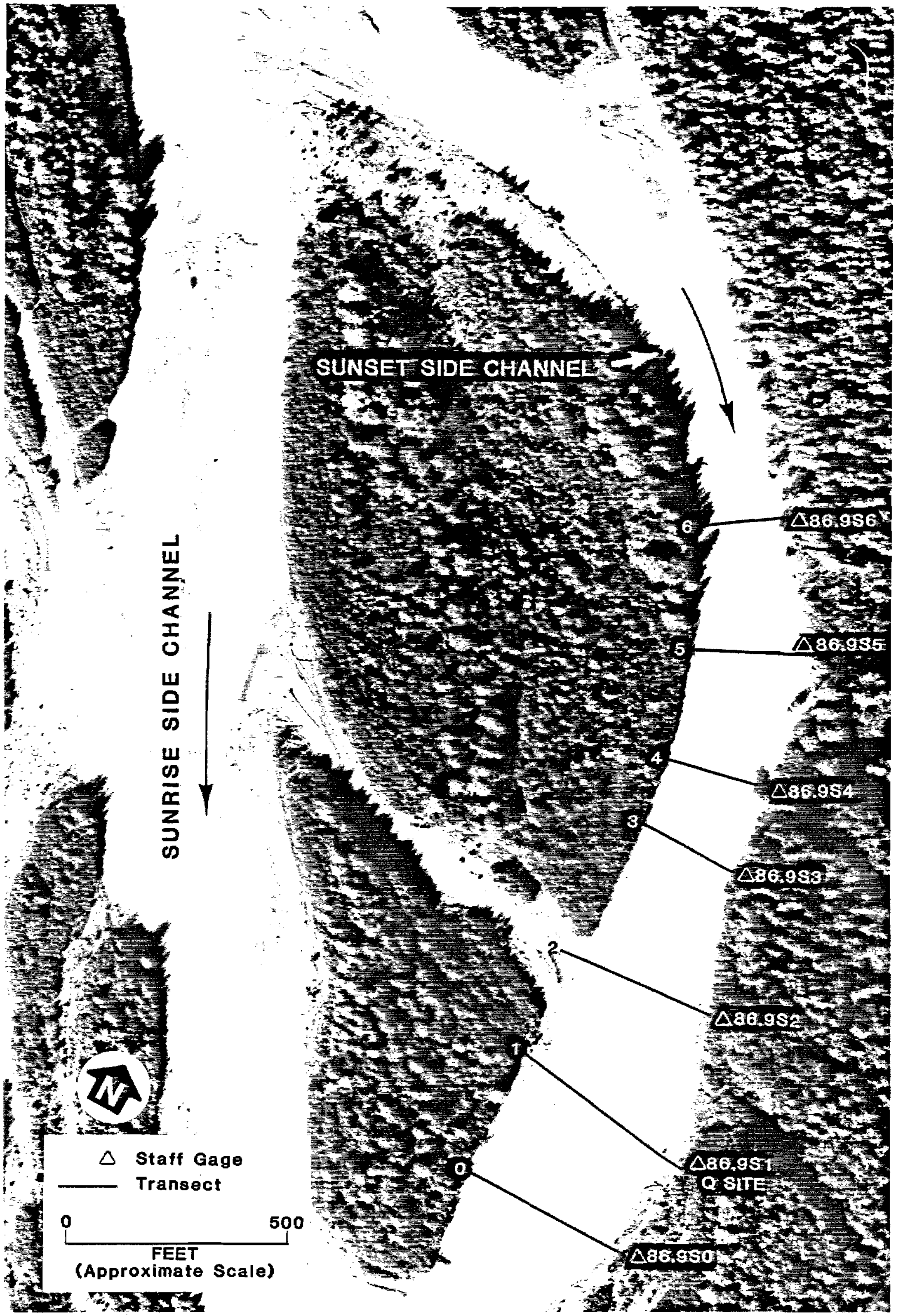


Figure 70. Location of Sunset Side Channel study site (RM 86.9).

3.16.2 Stage/Discharge Relationship

Measurements of water surface elevations obtained at each stage monitoring station located in Sunset Side Channel along with the mean daily mainstem discharges at Sunshine (USGS 15292780) corresponding to the date of the stage measurements are presented in Attachment Table B-1. Plots of these water surface elevations versus mainstem discharges are presented in Attachment Figures E-39 to E-45.

Measurements of streamflow in Sunset Side Channel were obtained at one stage monitoring station which was located on transect 1. These measurements of streamflow and the corresponding water surface elevations and mainstem discharges are presented in Attachment Table B-1. A plot of these streamflows and water surface elevations developed as a rating curve is presented in Figure 71. These streamflow data plotted against mainstem discharge as a rating curve are presented in Figure 72.

3.16.3 Mainstem Breaching and Controlling Discharges

Breaching of Sunset Side Channel results from the direct overtopping of the head of the side channel by the mainstem Susitna River. Based on field observations and aerial photography this side channel was found to be "barely" breached at 32,000 cfs and dry at 22,000 cfs. A review of the stage data presented in the transect 1 (streamflow station) water surface elevation versus mainstem discharge plot (Attachment Figure E-40) indicates that the hydraulics of Sunset Side Channel become

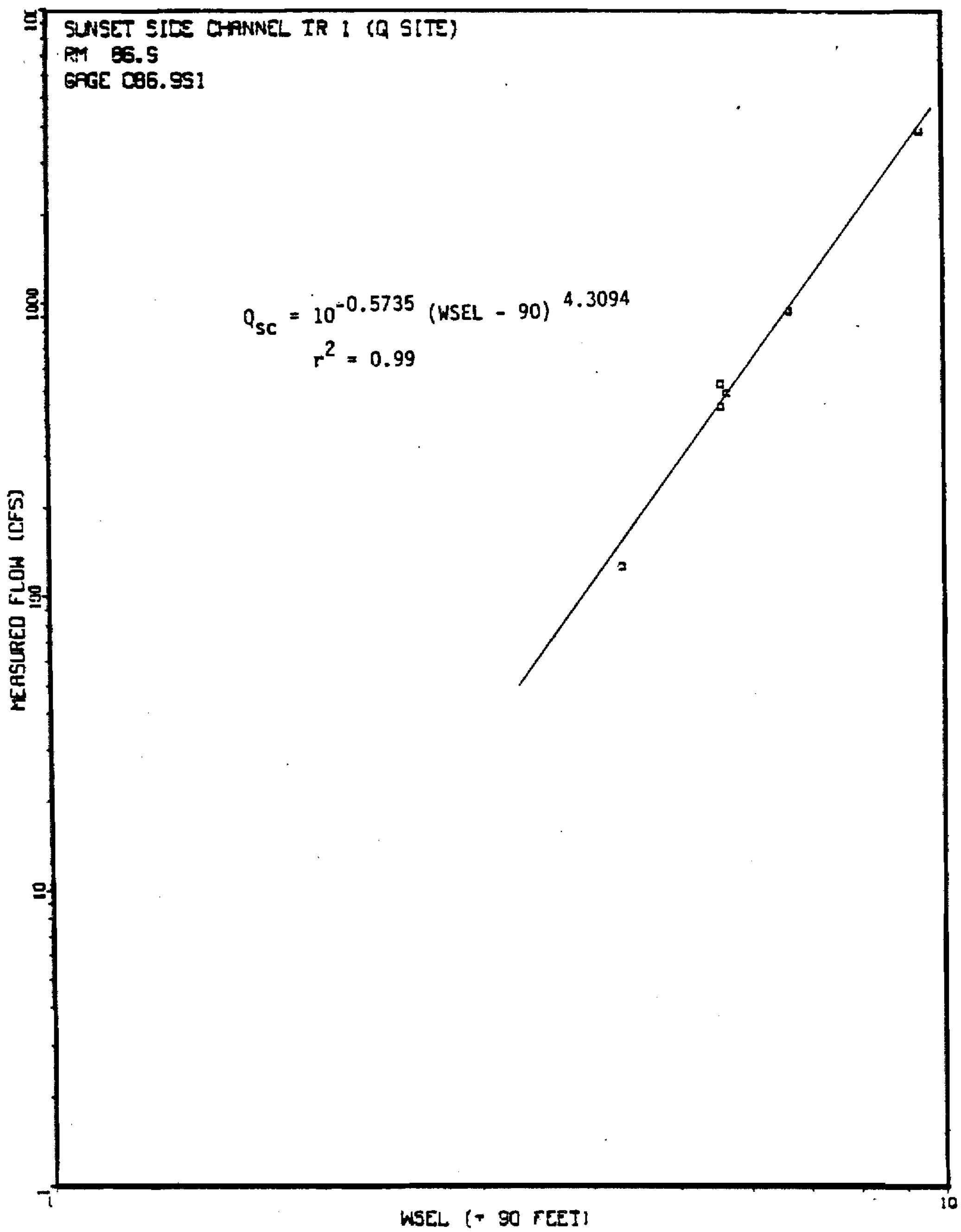


Figure 71. Sunset Side Channel streamflow versus WSEL rating curve at transect 1 Q Site.

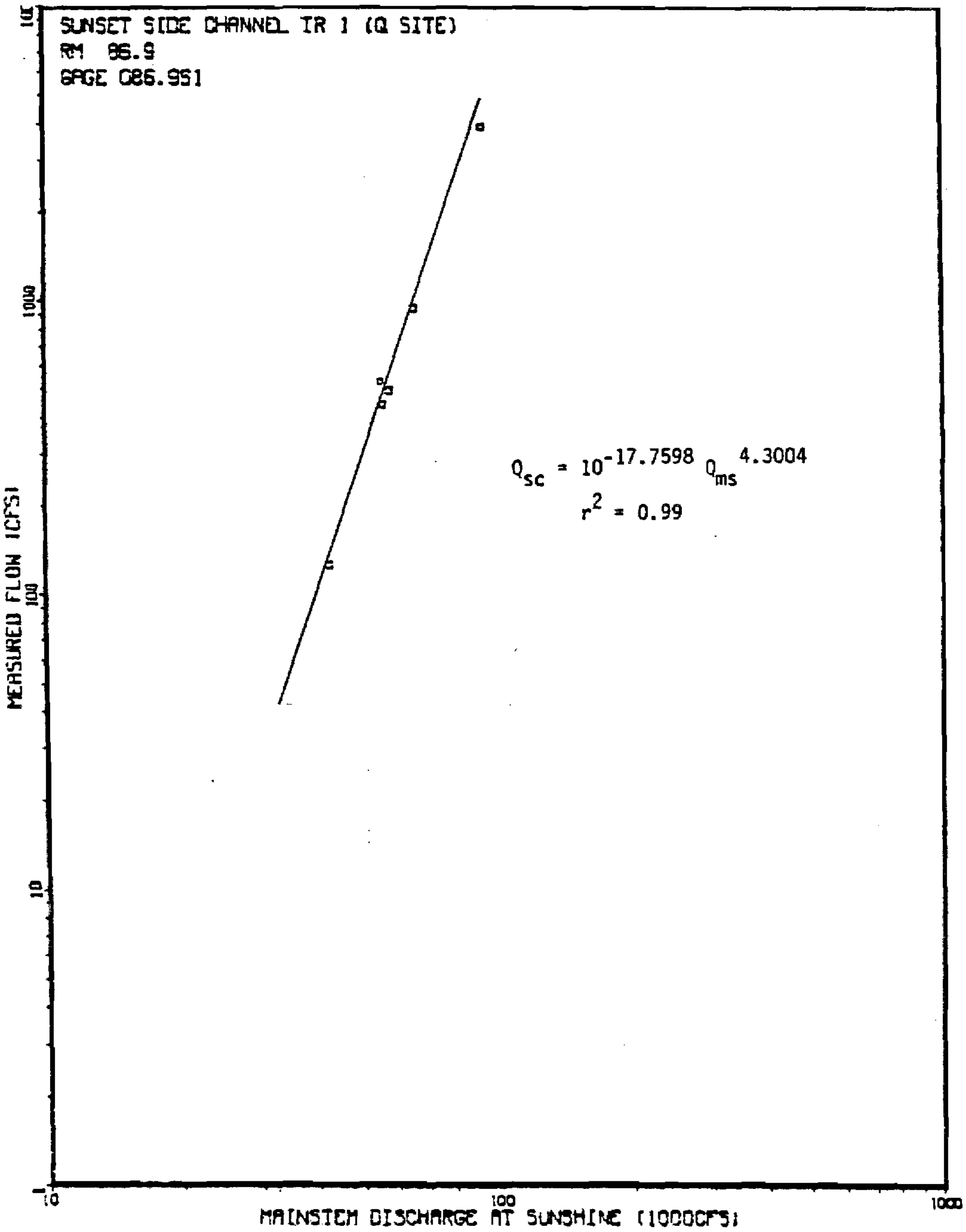


Figure 72. Sunset Side Channel streamflow versus mainstem discharge at Sunshine (USGS 15292780) rating curve at transect 1 Q Site.

controlled by the mainstem at a discharge of 32,000 cfs. Based on this controlling discharge and the limited field observations an initial breaching discharge of 31,000 cfs has been estimated for this side channel.

A comparison of the transect 1 rating curves (Figure 73) has been developed to evaluate the influence mainstem discharge has on the hydraulics of Sunset Side Channel. At the controlling discharge of 32,000 cfs, flow in this side channel has been estimated to be 45.8 cfs. This compares to an estimated flow of 41.4 cfs derived from the flow versus mainstem discharge rating curve. Table 3 summarizes the comparisons of flow estimates determined from equations developed from rating curves for controlling mainstem discharges for transect 1.

3.16.4 Channel Geometry

3.16.4.1 Thalweg Profile

Survey data for the development of a thalweg profile were obtained in Sunset Side Channel at a mainstem discharge of 17,400 cfs while site flow was estimated to be 1 cfs. The thalweg profile extended upstream from approximately 400 feet below the mouth of the side channel through the study site to a point 2,500 feet into the side channel. The survey data used to develop the thalweg profile are presented in Attachment Table C-17 with the resultant thalweg profile being presented in Attachment Figure C-17. Based on this thalweg profile, a gradient of 9.5 feet/mile was determined for the Sunset Side Channel.

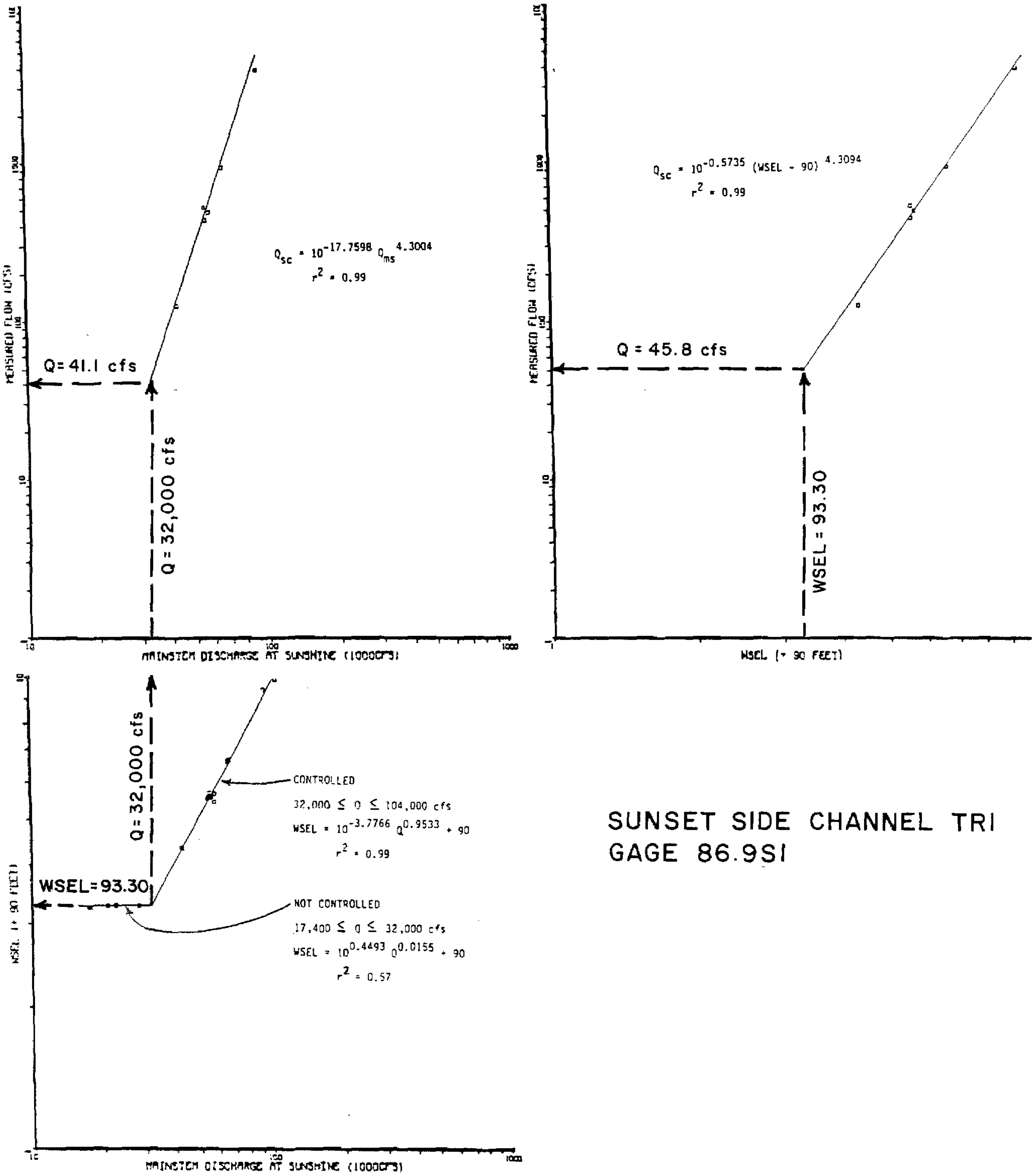


Figure 73. Comparison of rating curves for Sunset Side Channel transect 1 Q Site.

3.16.4.2 Cross Section Profile

Cross section survey data were obtained at each of the seven transects located in Sunset Side Channel. The survey data are presented in Attachment Table D-39 to D-45 with the resultant cross section profiles being presented in Attachment Figures D-39 to D-45.

3.16.5 Backwater

Based on available stage data (Table 8) and channel geometry data (Attachment Figure C-17), a backwater area does not occur in the side channel during unbreached conditions.

At breaching mainstem discharges ranging from 56,000-66,700 cfs, an area of backwater is estimated to extend upstream approximately 1,100 feet from the beginning of the thalweg profile to a point between transects 1 and 2. Above 66,700 cfs, insufficient stage data is available to determine the extent of backwater in Sunset Side Channel.

3.17 Sunrise Side Channel (RM 87.0)

3.17.1 Site Description

Sunrise Side Channel is located on the west bank of the Susitna River at river mile 87.0. It is approximately 0.5 miles long and is separated from the mainstem by vegetated islands (Figure 69).

Table 8. A comparison of water surface elevations from Task 14 staff gages located within Sunset Side Channel.

Date	TR 0	TR 1	TR 2	TR 3	TR 4	TR 5	TR 6	Mainstem Discharge
841005	---	---	---	93.74	---	94.75	94.74	16,500
840929	92.70	93.27	93.81	---	---	94.76	94.75	17,400
840930	---	93.27	93.79	93.69	94.11	94.75	94.75	17,800
840916	---	93.29	93.81	93.87	94.11	94.76	94.76	21,000
840912	---	93.29	93.81	93.78	94.29	94.78	---	22,700
840913	---	93.30	---	---	---	---	---	22,700
840914	---	---	93.81	93.87	94.31	---	---	24,000
840919	---	93.29	93.80	93.87	94.31	94.76	94.76	28,400
840902	---	---	---	---	---	---	94.88	32,000
840817	---	94.34	---	94.93	95.01	95.99	95.97	42,500
840816	---	---	---	95.02	95.10	96.06	96.05	44,000
840822	95.54	95.53	95.71	95.86	95.93	96.66	96.62	54,300
840803	95.60	95.58	95.68	95.95	95.93	96.72	96.69	54,700
840709	---	95.59	---	---	95.92	---	---	55,400
840709	---	95.69	95.94	96.01	96.08	96.79	---	55,400
840723	---	95.58	---	---	---	---	---	56,100
840723	95.58	95.58	95.64	95.85	95.95	96.65	---	56,100
840721	---	95.45	---	---	---	---	---	57,700
840722	95.09	95.67	95.76	95.86	95.96	96.68	96.64	57,800
840722	95.62	---	95.78	95.94	95.98	96.68	96.65	57,800

Table 8 (Continued).

Date	TR 0	TR 1	TR 2	TR 3	TR 4	TR 5	TR 6	Mainstem Discharge
840808	---	96.63	---	---	---	---	---	65,900
840808	96.67	96.67	---	96.86	96.89	97.31	97.21	65,900
840807	96.68	96.69	---	96.89	96.96	97.36	97.29	66,700
840825	---	99.42	---	---	---	---	---	93,300
840826	---	99.88	---	---	---	---	---	104,000

Breaching of this side channel by the mainstem results in substantial flow in the side channel whereas prior to breaching the channel is substantially dewatered. During high mainstem discharges a backwater area forms in the vicinity of the mouth.

During the 1984 open water field season the study site selected for Sunrise Side Channel was located in the lower portion of the side channel. Stage was monitored at one location with streamflow measurements obtained at this stage monitoring station (Figure 74). Channel geometry data obtained include both cross section and thalweg profiles. A cross section was surveyed at the stage monitoring station and a thalweg profile was determined from the mouth of the side channel continuing upstream to the first hydraulic control above the study site.

3.17.2 Stage/Discharge Relationship

Measurements of water surface elevations obtained at the stage monitoring station located in Sunrise Side Channel along with the mean daily mainstem discharge (USGS 15292780) corresponding to the date of stage measurement are presented in Attachment Table B-1. A plot of these water surface elevations versus mainstem discharge are presented in Attachment Figures E-46.

Measurements of streamflow in Sunrise Side Channel were obtained at the stage monitoring station which is located on transect 4. These measurements of streamflow and the corresponding water surface elevation and

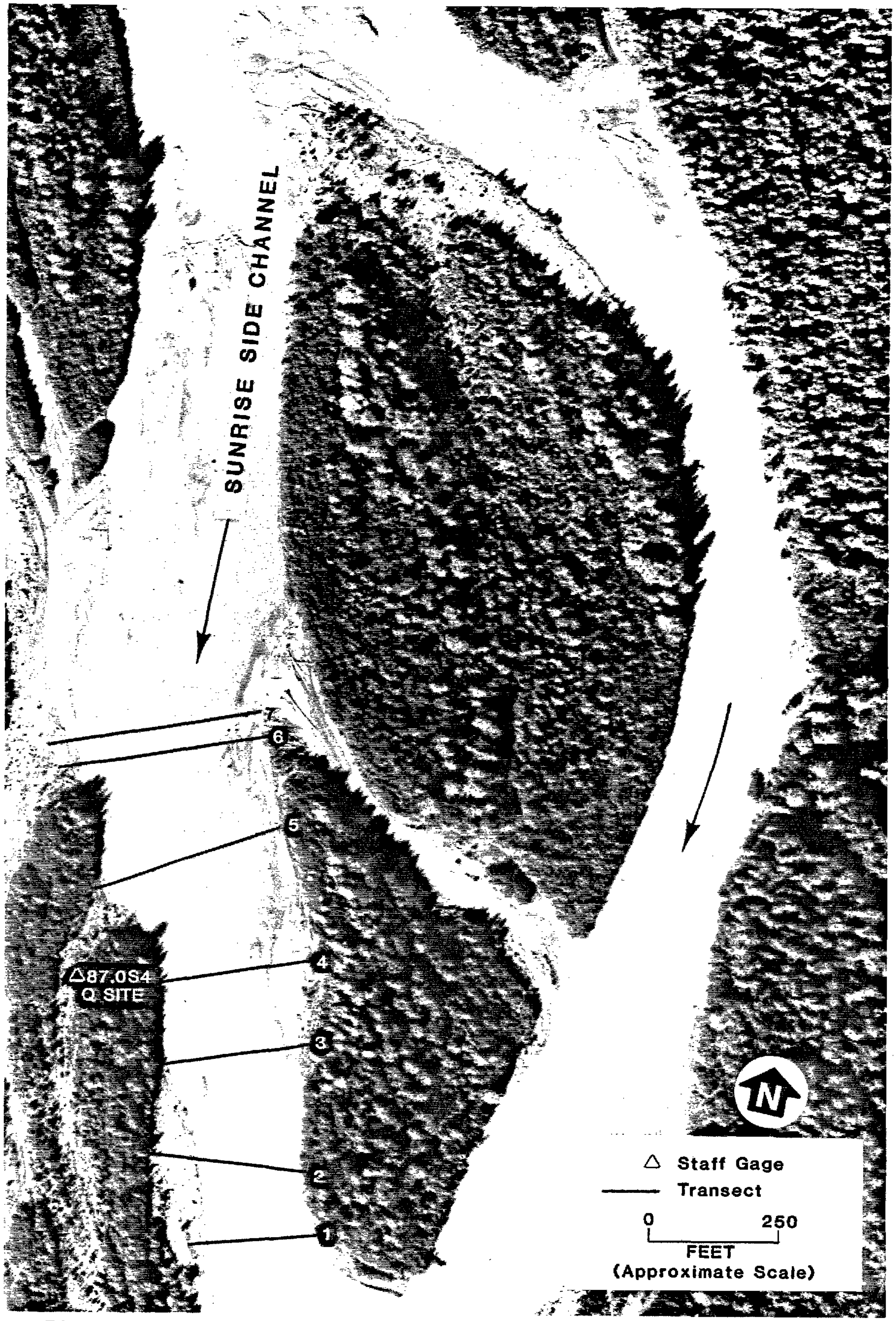


Figure 74. Location of Sunrise Side Channel study site (RM 87.0).

mainstem discharge (USGS 15292780) are presented in Attachment Table B-1. A plot of these streamflow and water surface elevations was developed as a rating curve to estimate streamflow from observed water surface elevations (Figure 75).

The streamflow data was also plotted against mainstem discharge as a rating curve to estimate streamflow from mainstem discharge (Figure 76).

3.17.3 Mainstem Breaching and Controlling Discharges

Breaching of Sunrise Side Channel is the result of overtopping of the head directly by the mainstem Susitna River. The lowest mainstem discharge observed to overtop the head of this side channel is 36,600 cfs and was determined from a review of aerial photographs (Table 2). At 36,600 cfs a substantial volume of water overtopped the head. At a discharge of 32,000 cfs the head of the side channel was observed dry. An estimated initial breaching discharge of 34,300 cfs was chosen and is an average of the breaching discharge of 36,600 cfs and the dry observation occurring at 32,000 cfs.

An absence of stage data below 45,400 cfs precludes the precise determination of a controlling discharge for Sunrise Side Channel. Assuming the estimated breaching discharge of 34,300 cfs is correct and that a controlling discharge is usually within 2,000 cfs of the breaching discharge, a controlling discharge of 36,000 cfs has been estimated for this side channel. Additional stage data, primarily

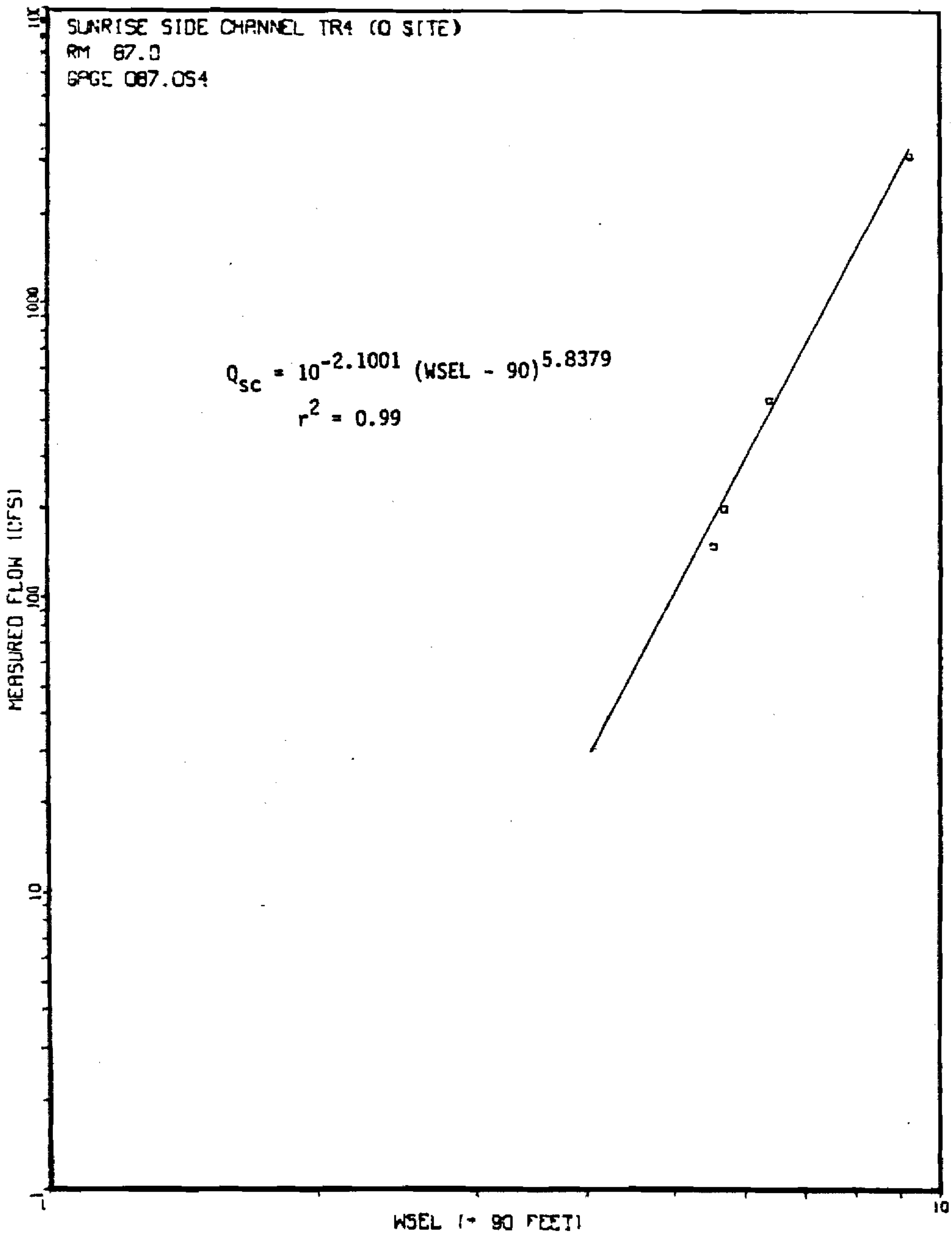


Figure 75. Sunrise Side Channel streamflow versus WSEL rating curve at transect 4 Q Site.

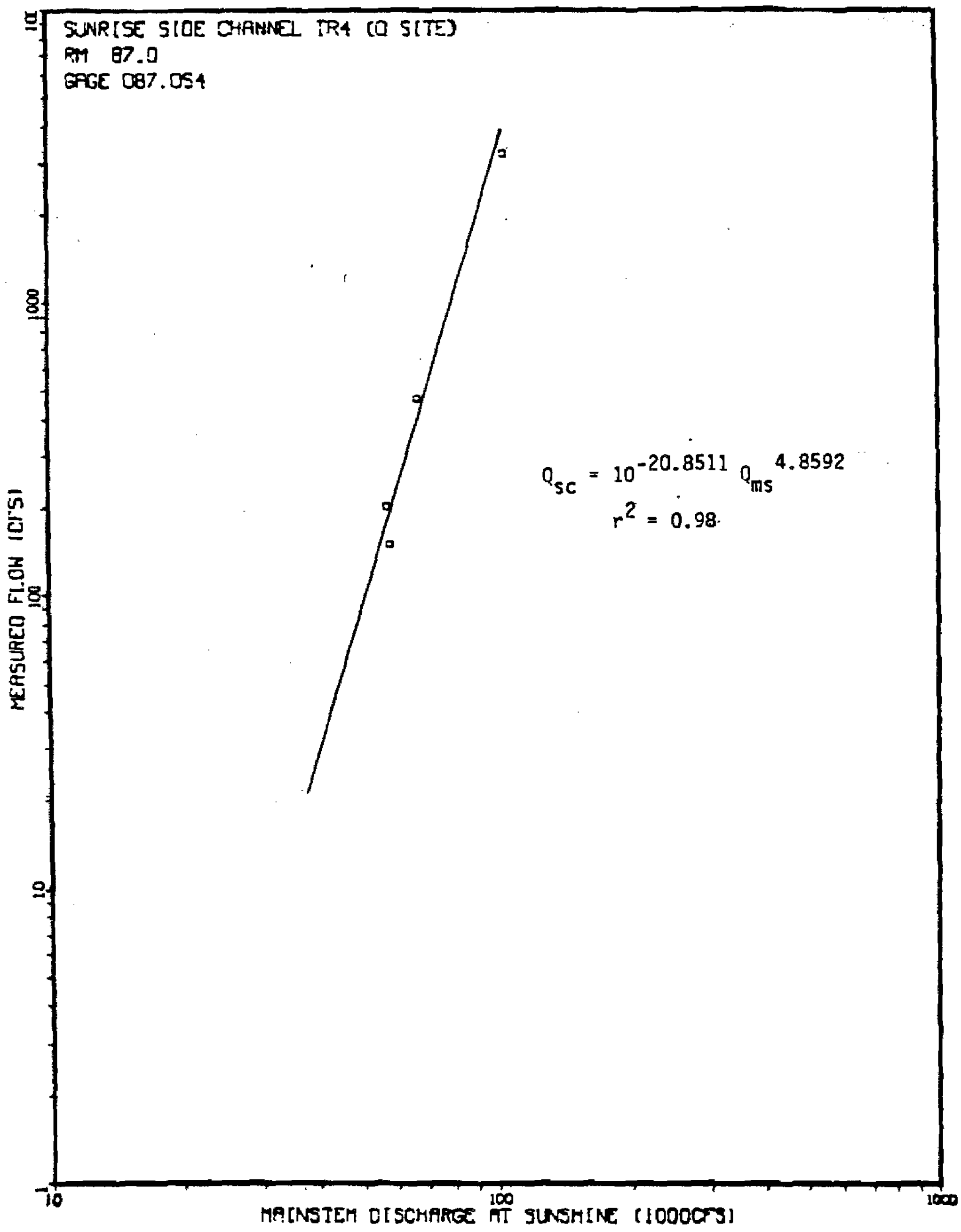


Figure 76. Sunrise Side Channel streamflow versus mainstem discharge at Sunshine (USGS 15292780) rating curve at transect 4 Q Site.

during a non-breached condition, is necessary to precisely determine the controlling discharge for Sunshine Side Channel.

A comparison of the rating curves developed from transect 4 is presented in Figure 77. At the estimated controlling discharge of 36,000 cfs a streamflow of 29.2 cfs was estimated from the flow versus water surface elevation rating curve. This compares to 21.1 cfs determined from the flow versus mainstem discharge rating curve.

3.17.4 Channel Geometry

3.17.4.1 Thalweg Profile

Survey data for the development of a thalweg profile for Sunrise Side Channel was obtained during a non-breaching mainstem discharge of 19,000 cfs and an estimated side channel streamflow of less than 1 cfs. The survey data for this thalweg profile are presented in Attachment Table C-18 with the resultant thalweg profile presented in Attachment Figure C-18. This thalweg profile extended from the mouth of the side channel upstream to approximately 520 feet above transect 6. The streambed gradient of the side channel included in the thalweg profile was 16.0 feet/mile.

3.17.4.2 Cross Section Profile

Cross section data were recorded at the stage monitoring station located in Sunrise Side Channel. This stage monitoring station was located on

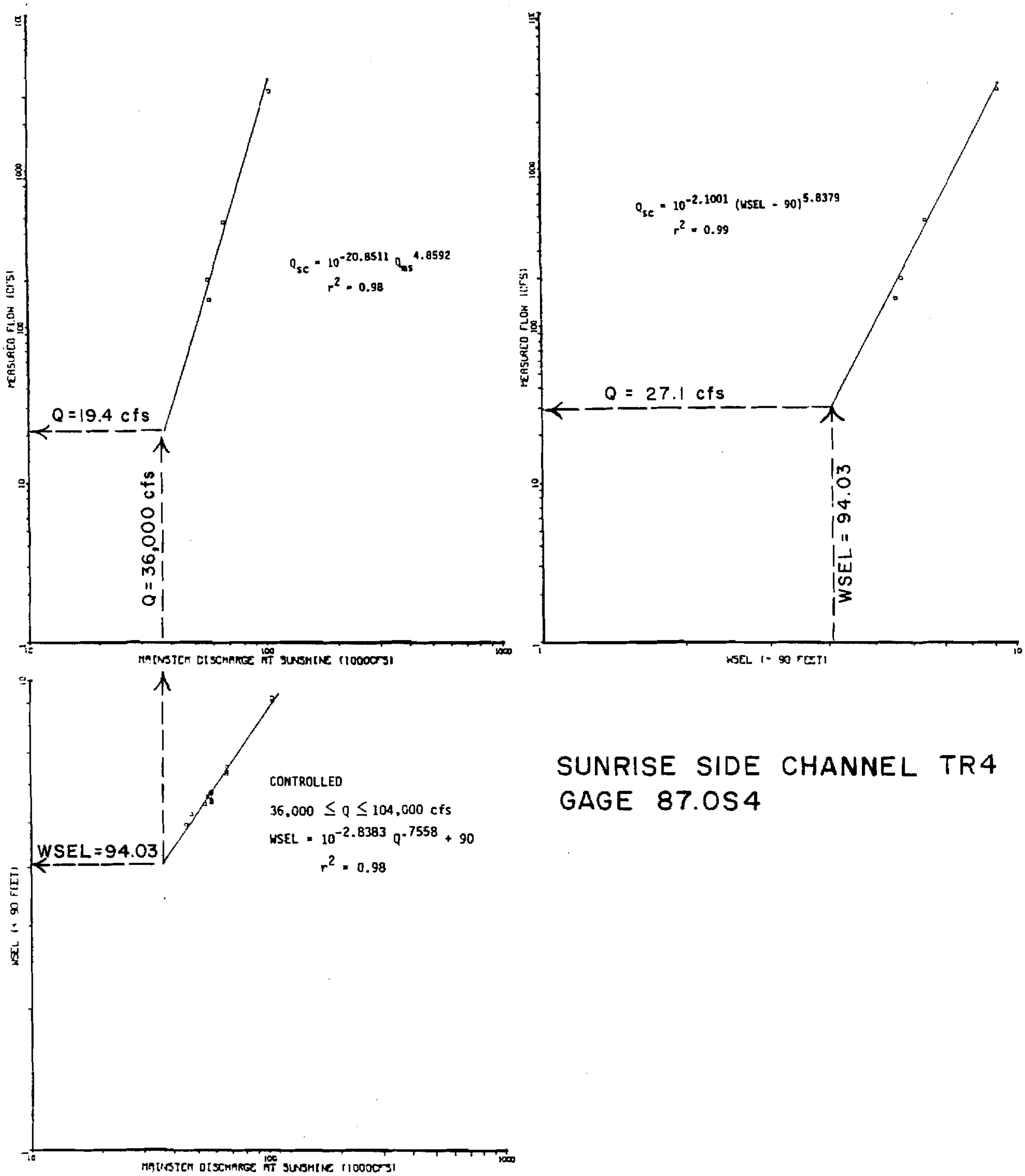


Figure 77. Comparison of rating curves for Sunrise Side Channel transect 4 Q Site.

transect 4 (Attachment Figure C-18). The cross sectional data are presented in Attachment Table D-46 with the resultant cross section presented in Attachment Figure D-46.

3.17.5 Backwater

Field observations indicate backwater was restricted to the mouth area of the side channel and the lower portion of the study site and occurred during medium to high mainstem discharges. Due to the limited 1984 stage data (Attachment Table B-1), the precise determination of the occurrence and the extent of backwater for Sunrise Side Channel was not possible.

3.18 Birch Creek Slough (RM 88.4)

3.18.1 Site Description

Birch Creek Slough is located on the east bank of the Susitna River at river mile 88.4 This slough is approximately 5 miles long with Birch Creek joining the slough about 1 mile upstream of Birch Creek Slough mouth. A road crosses the slough approximately 0.2 miles below the slough head through which breaching flow is restricted by a 24 inch diameter culvert. The culvert was observed to be substantially plugged by debris throughout the 1984 field season and served to control breaching mainstem water into the slough. Prior to breaching streamflow is maintained by Birch Creek with the slough upstream of Birch Creek consisting of a series of isolated pools. Backwater was observed to occur in the lower portion of Birch Creek Slough except during periods of low mainstem discharge (Figure 78).

During the 1984 open water field season the study site in Birch Creek Slough was located approximately 0.3 miles downstream from the slough/creek confluence and approximately 0.7 miles upstream from the slough mouth. Stage was monitored at three locations and streamflow was measured at one of these stage monitoring stations (Figure 79). Channel geometry data obtained for the site included both cross section and thalweg profiles. Cross sections were obtained at each stage monitoring station with the exception of the head staff gage site. The thalweg profile was determined for only the portion of the slough that included the study site.

3.18.2 Stage/Discharge Relationship

Measurements of water surface elevations obtained at the stage monitoring stations located in Birch Creek Slough are presented in Attachment Table B-1. Birch Creek is located upstream of the slough study site. Plots of water surface elevation versus mainstem discharge for the stage monitoring stations located downstream of Birch Creek were not developed due to the influence of Birch Creek upon the stage observations. The water surface elevation versus mainstem discharge plot for the Birch Creek head stage monitoring station is presented in Attachment Figure E-47. Measurements of streamflow in Birch Slough were obtained at the stage monitoring station located on transect 6. These measurements of

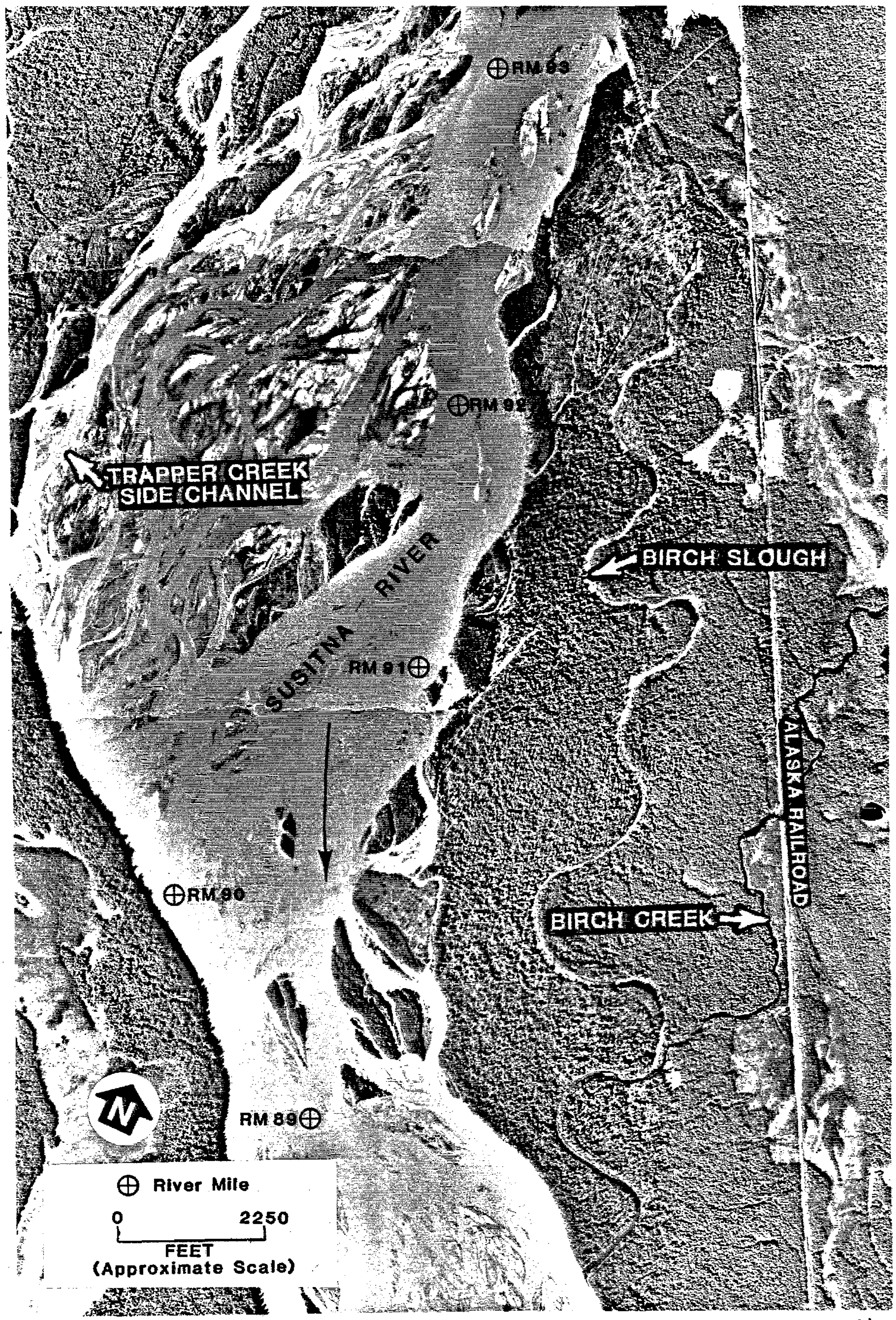


Figure 78. Overview of Birch Creek Slough study site (RM 88.4).

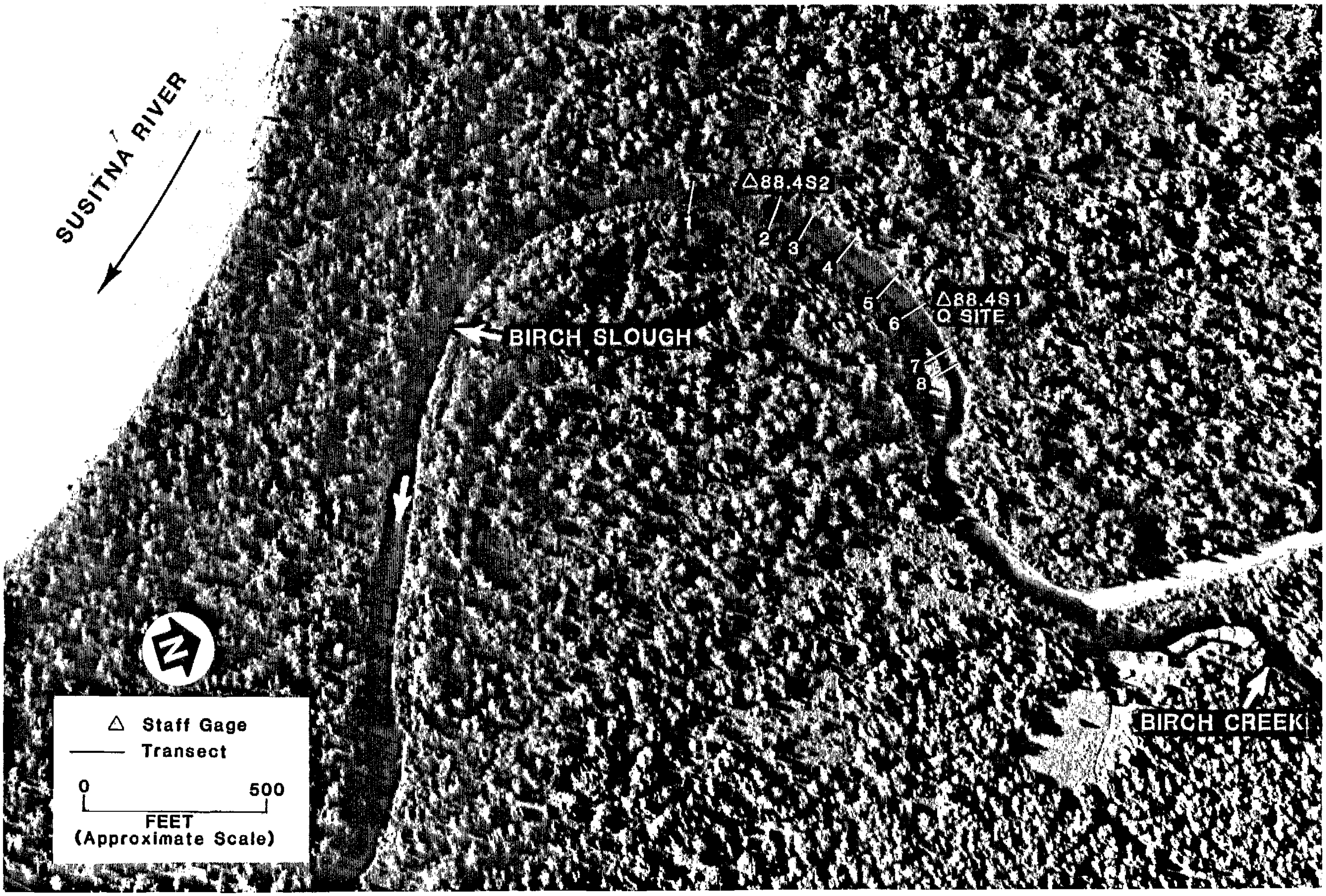


Figure 79. Location of Birch Creek Slough study site (RM 88.4).

streamflow and the corresponding water surface elevation are presented in Attachment Table B-1. A plot of the streamflow and water surface elevations was developed as a rating curve to estimate streamflow from observed water surface elevations (Figure 80).

3.18.3 Mainstem Breaching and Controlling Discharges

Breaching of Birch Creek Slough results from overtopping of the head by the mainstem Susitna River. Based on field observations presented in Table 2, Birch Creek Slough has been described as "barely" breached at a mean daily mainstem discharge of 52,900 cfs, 54,300 cfs and 57,800 cfs. The instantaneous mainstem discharges at the time of these observations are 54,100 cfs, 54,200 cfs and 57,900 cfs, respectively. The mean daily discharge of 57,800 cfs and the corresponding instantaneous discharge of 57,900 cfs are USGS estimates occuring during a period when the USGS gaging station was non-functional. The head of the slough is primarily a silt bar subject to erosion and deposition. A discharge of 54,100 cfs has been selected as the initial breaching discharge, due to the unstable nature of the berm at the head. Initial breaching discharge may fluctuate resülting from shifting of the substrate during high flow events.

A review of the water surface elevation versus mainstem discharge data recorded at transects 2 and 6 (Attachment Table B-1) indicate that the hydraulics of Birch Slough are substantially influenced by Birch Creek. Because of the influence of Birch Creek, a relationship between mainstem discharge and stage at transects 2 and 6 cannot be determined (both

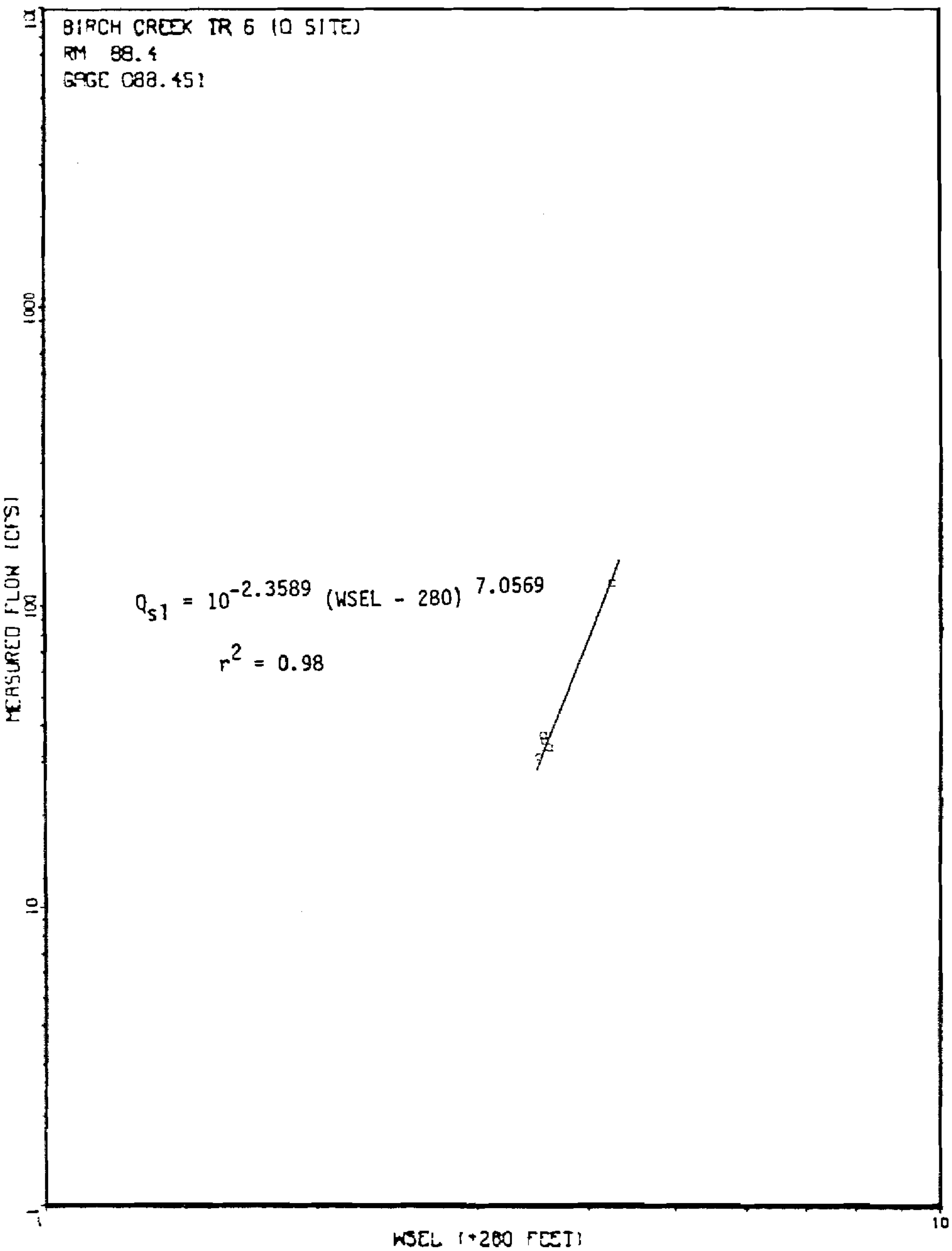


Figure 80 Birch Creek Slough streamflow versus WSEL rating curve at transect 6 Q Site.

transects are located downstream of Birch Creek). The controlling discharge cannot be determined from the available data due to the contribution of Birch Creek to streamflow in the slough.

3.18.4 Channel Geometry

3.18.4.1 Thalweg Profile

Survey data for the development of a thalweg profile for Birch Creek Slough was obtained during a non-breaching mainstem discharge of 18,300 cfs and measured slough flow of 34.0 cfs. The flow in the slough was contributed primarily by Birch Creek. The survey data for this thalweg profile are presented in Attachment Table C-19 with the resultant thalweg profile presented in Attachment Figure C-19. This thalweg profile extended from the mouth of the slough upstream to approximately 700 feet above transect 6. The streambed gradient of the slough included in the thalweg profile was 4.9 feet/mile.

3.18.4.2 Cross Section Profile

Cross section data were recorded at the two stage monitoring stations located in Birch Creek Slough. These stage monitoring stations corresponded to transects 2 and 6 (Attachment Figure C-19). The cross sectional data are presented in Attachment Tables D-47 and D-48 with the resultant cross sections presented in Attachment Figures D-47 and D-48.

3.18.5 Backwater

During the 1984 open water field season the study site selected for Birch Creek Slough was located approximately 0.7 miles upstream from the mouth of the slough (see Section 3.14.1 of this report). Based on available 1984 stage and channel geometry data a precise backwater analysis is not possible due to the location of the study site. Field observations indicate, however, backwater occurs at the mouth of the slough during all but low mainstem discharge.

3.19 Trapper Creek Side Channel (RM 91.6)

3.19.1 Site Description

Trapper Creek Side Channel is located on the west bank of the Susitna River and is approximately 5.0 miles in length. It is separated from the mainstem Susitna River by a complex of sand bars, small channels, and vegetated islands. The head portion of this side channel is located in a complex of small channels and vegetated islands making it difficult to identify the origin of breaching flows (Figure 81). Depending upon mainstem discharge, the mouth of Trapper Creek Side Channel is also difficult to identify due to the presence of several intersecting small channels. At low mainstem discharges, the mouth of Trapper Creek Side Channel appears to extend downstream to river mile 90.3. Breaching flows in Trapper Creek Side Channel result from the overtopping of several overflow channels located throughout the upper portion of the side channel. Prior to breaching, streamflow in Trapper Creek Side

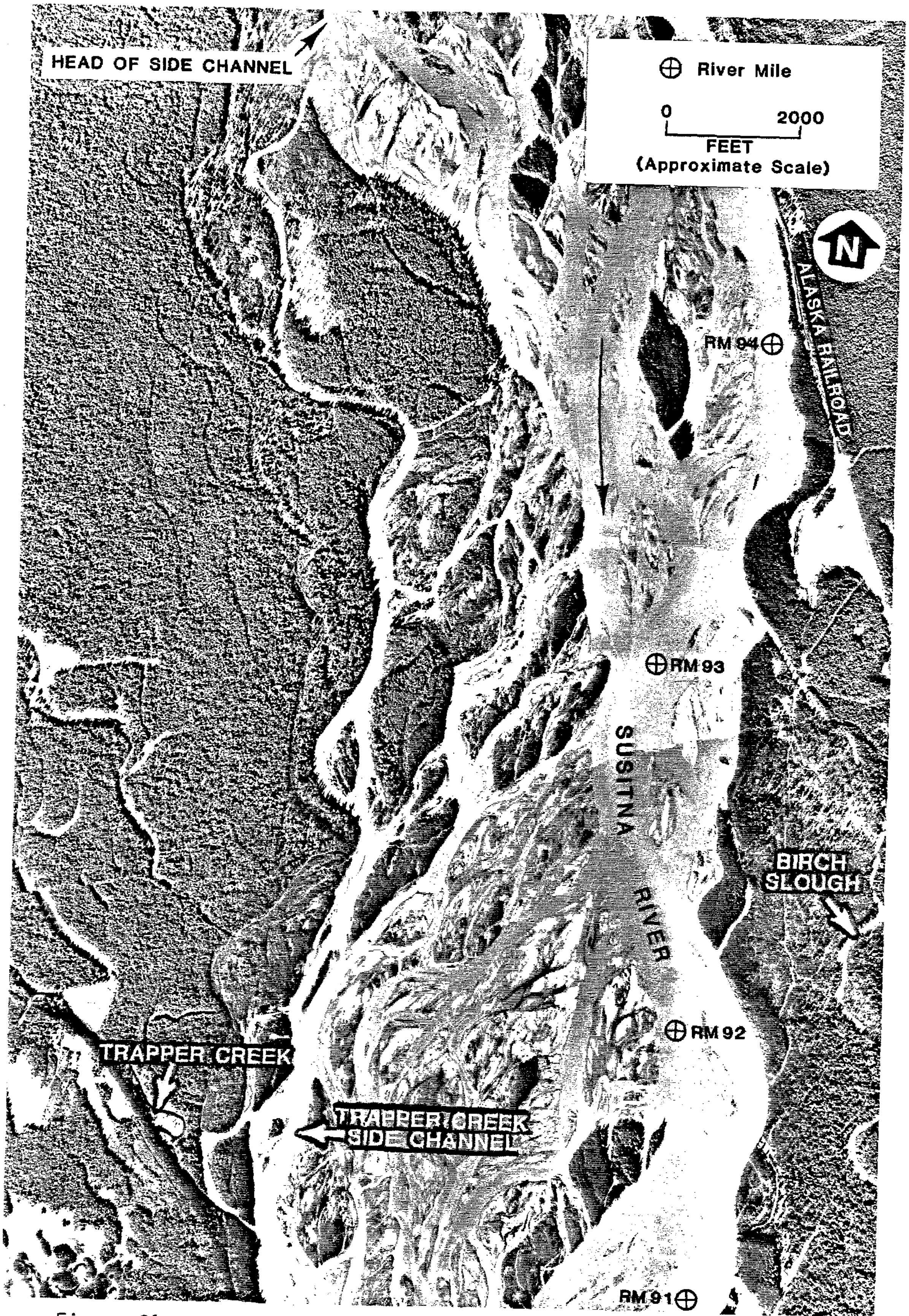


Figure 81. Overview of Trapper Creek Side Channel study site (RM 91.6).

Channel, is principally due to Cache Creek and ground water occurring in the upper reach of the side channel.

During the 1984 open water field season, the study site selected for Trapper Creek Side Channel was located in the lower portion of the side channel (Figure 82). Stage was monitored at four locations and streamflow was measured at one of these stage monitoring stations. Survey data for the development of cross section profiles was obtained from each stage monitoring station. Survey data for the development of a thalweg profile was obtained for only that portion of the side channel that included the study site.

3.19.2 Stage/Discharge Relationship

Measurements of water surface elevations obtained at each stage monitoring station located in Trapper Creek Side Channel along with mean daily mainstem discharges (USGS 15292780) corresponding to the date of the stage measurements are presented in Attachment Table B-1. Plots of these water surface elevations versus mainstem discharge are presented in Attachment Figures E-48 to E-51.

Measurements of streamflow in Trapper Creek Side Channel were obtained at one stage monitoring station located on transect 4. Measurements of streamflow and corresponding water surface elevations and mainstem discharges (USGS 15292780) are presented in Attachment Table B-1. A plot of these streamflows and water surface elevations developed as a rating curve is presented in Figure 83. The streamflow data was also

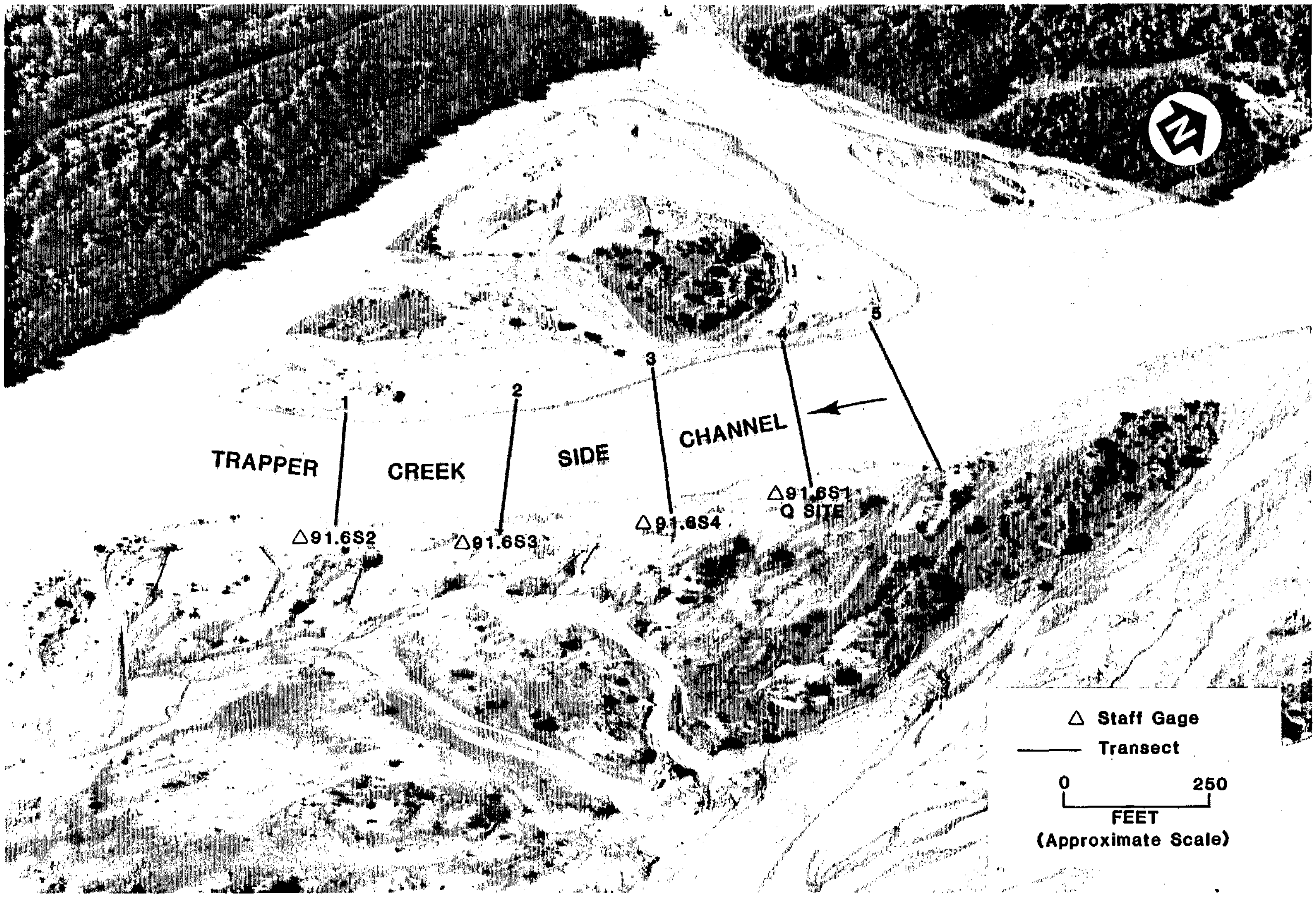


Figure 82. Location of Trapper Creek Side Channel study site (RM 91.6).

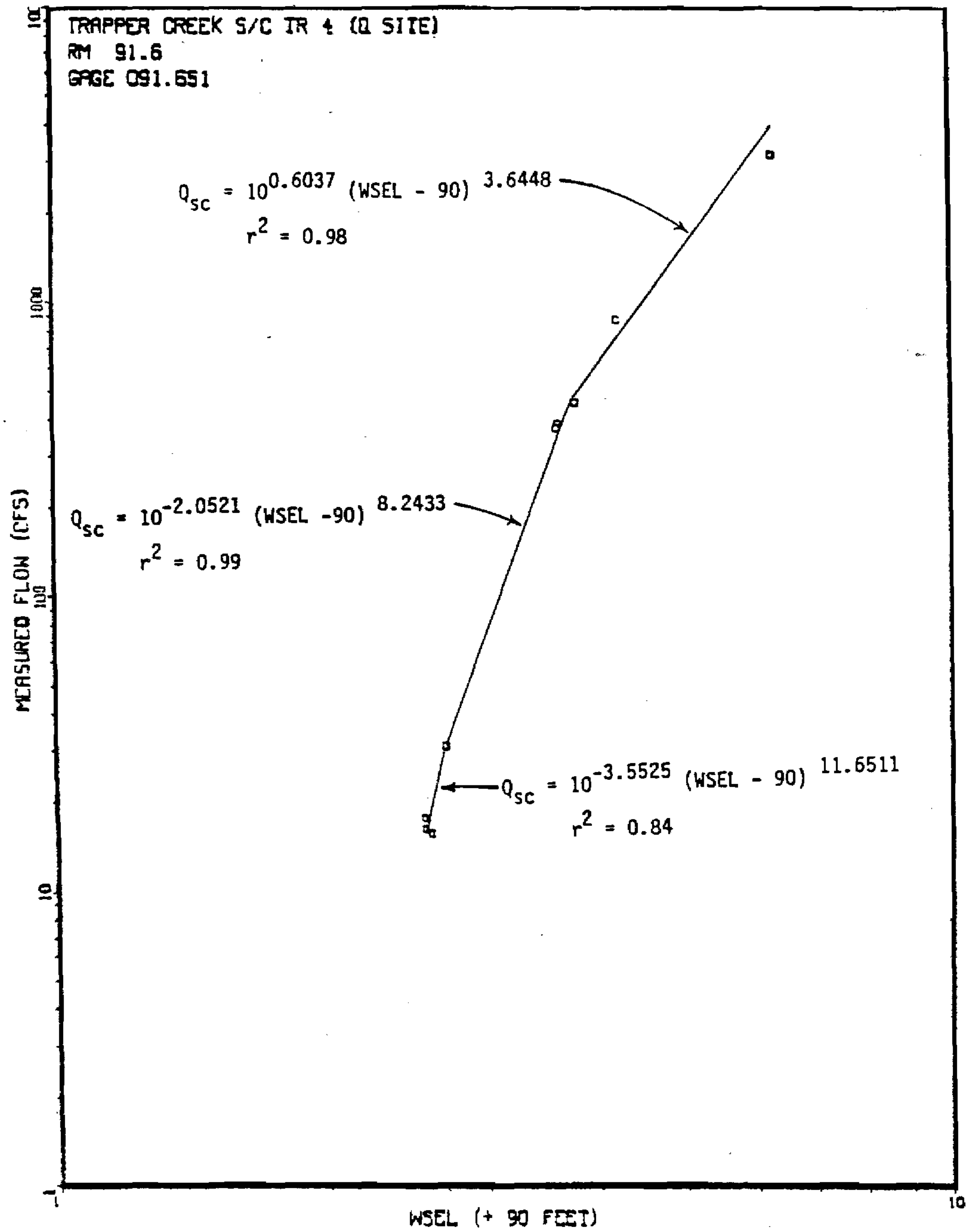


Figure 83. Trapper Creek Side Channel streamflow versus WSEL rating curve at transect 4 Q Site.

plotted against mainstem discharge as a rating curve and is presented in Figure 84.

3.19.3 Mainstem Breaching and Controlling Discharges

Breaching of Trapper Creek Side Channel is the result of the direct overtopping of the head of the side channel by the mainstem Susitna River. Based on aerial photography (Table 2), this side channel has been observed to be breached at a mainstem discharge as low as 36,600 cfs. The controlling mainstem discharge has been estimated from inspection of the stage versus mainstem discharge rating curve for transect 4 (Attachment Figure E-51) to be 44,000 cfs. The mainstem discharge of 44,000 cfs was chosen because it is the point of intersection of the lines depicting the base flow unbreached condition and the breached condition observed at the streamflow station. This relationship is also presented in the water surface elevation versus mainstem discharge plots for transects 2 and 3 (Attachment Figures E-49 and E-50). Figure 85 illustrates a comparison of transect 4 rating curves that was developed to evaluate the influence mainstem discharge has on the hydraulics of Trapper Creek Side Channel. At a mainstem discharge of 44,000 cfs streamflow was measured to be 31.4 cfs.

The substantial differences in mainstem discharge between the lowest observed breaching discharge (36,600 cfs) and the estimated controlling discharge (44,000 cfs) is suspect. Based on observations from other study sites the initial breaching and controlling discharge are usually

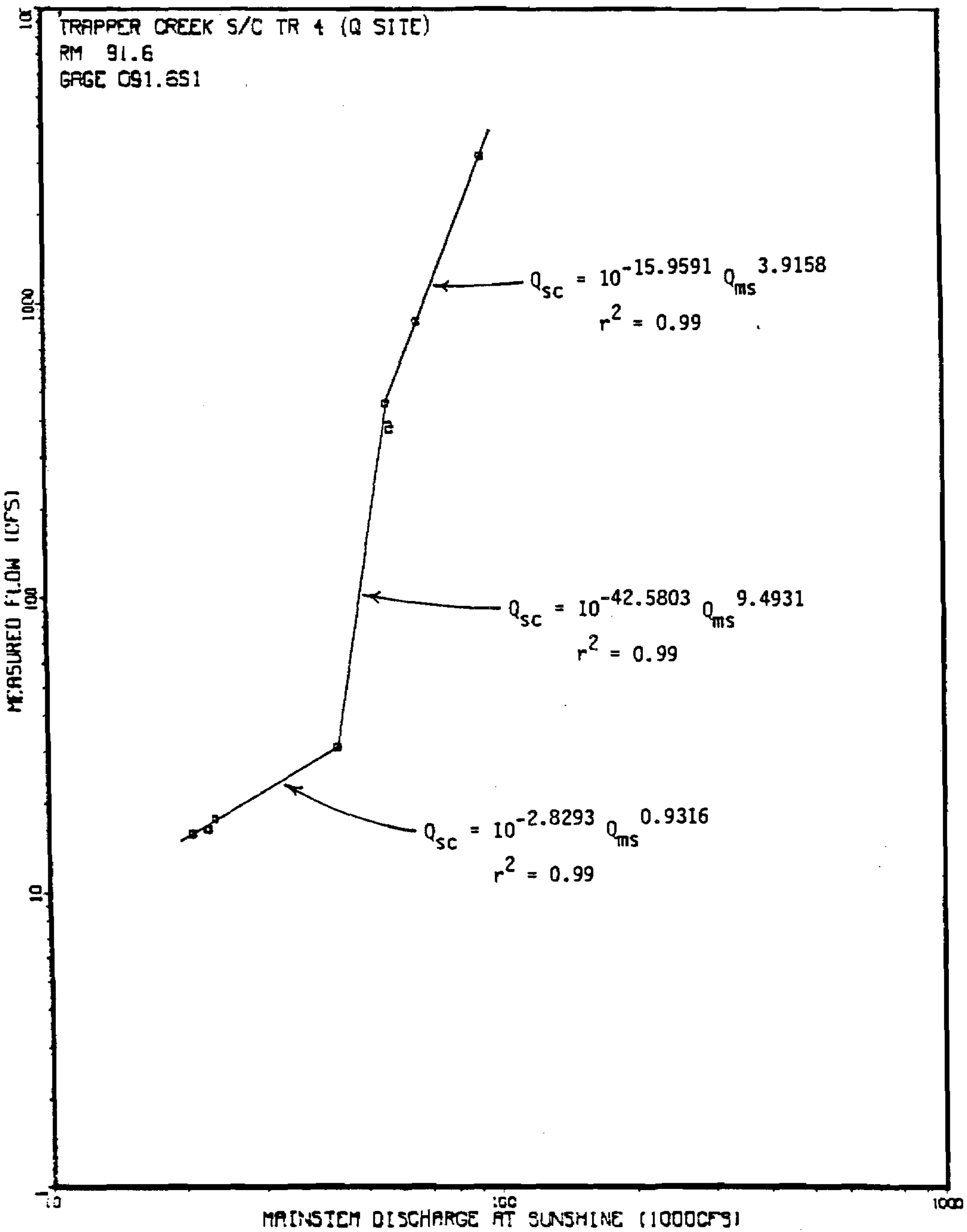


Figure 84. Trapper Creek Side Channel streamflow versus mainstem discharge at Sunshine Station (USGS 15292780) rating curve at transect 4 Q Site.

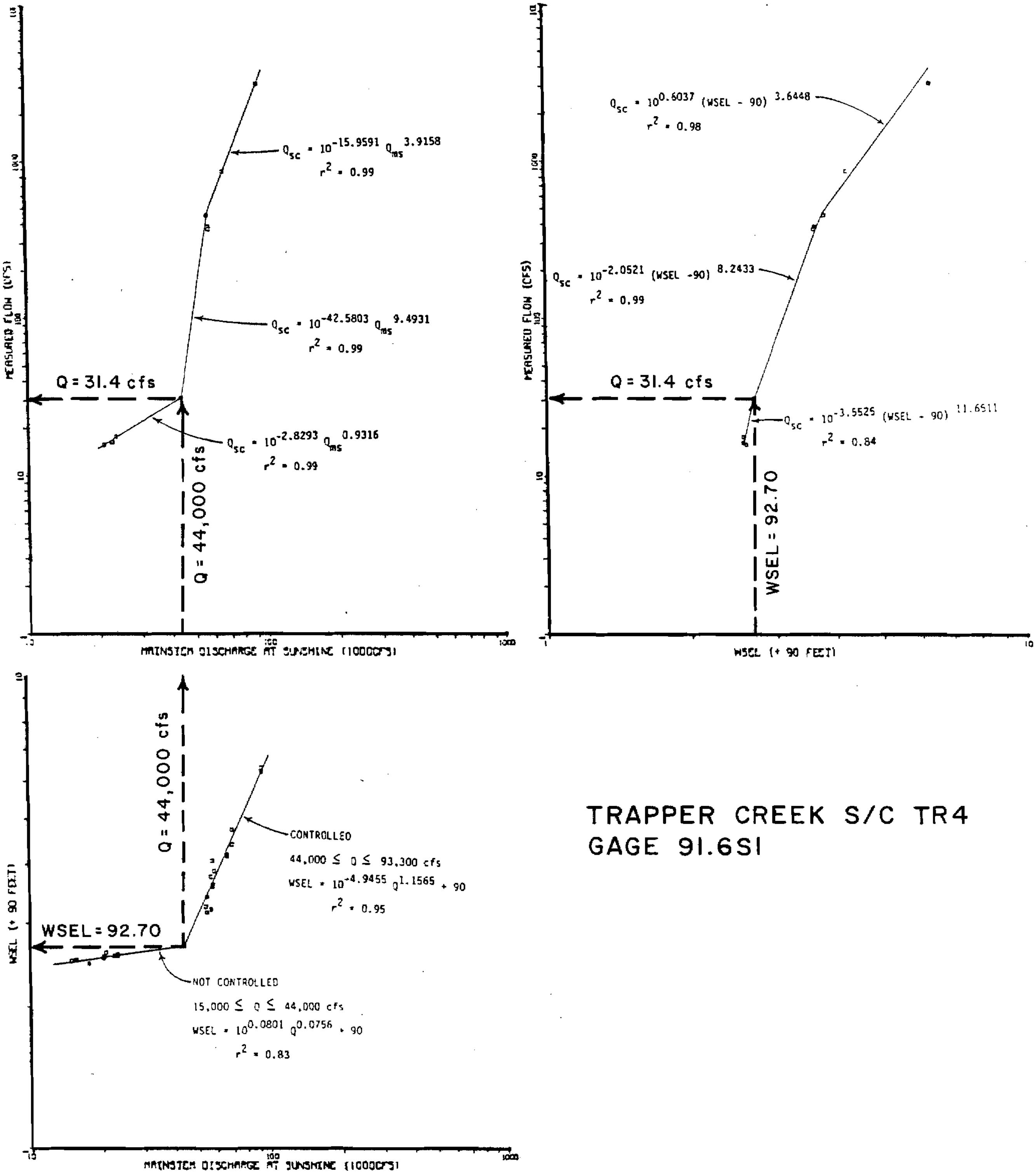


Figure 85. Comparison of rating curves for Trapper Creek Side Channel Transect 4 Q Site.

similar. The breaching observation corresponding to 36,600 cfs was determined from a 1983 aerial photograph. Based on the stage/discharge relationships for the nonbreached and breached condition presented in Attachment Figures E-48 to E-51 the initial breaching and controlling discharges for this side channel appear to be similar. Assuming the initial breaching discharge is less than and occasionally equal to the controlling discharge, an initial breaching is estimated to be 43,000 cfs.

3.19.4 Channel Geometry

3.19.4.1 Thalweg Profile

Survey data for the development of a thalweg profile was obtained from Trapper Creek Side Channel during a mainstem Susitna River discharge of 22,700 cfs and a measured side channel flow of 16.4 cfs. The thalweg profile began approximately 150 feet downstream of the first control below the study site and extended upstream, through the study site, approximately 1,600 feet. The survey data used to construct the thalweg profile are presented in Attachment Table C-20 with the resultant thalweg profile being presented in Attachment Figure C-20. Based on this thalweg profile, a streambed gradient of of 12.1 feet/mile was determined.

3.19.4.2 Cross Section Profile

Cross section survey data was obtained at each of the four transects located in Trapper Creek Side Channel. The survey data used to construct these cross sections are presented in Attachment Tables D-49 to D-52. The resultant cross section profiles are presented in Attachment Figures D-49 to D-52.

3.19.5 Backwater

Based on stage (Table 9) and channel geometry (Attachment Figure C-20) data, an area of backwater has not been observed in Trapper Creek Side Channel during both non-breaching and breaching mainstem discharges. At mainstem discharges ranging from 15,700 to 22,700 cfs, pooling was observed at transects 1, 2 and 3 resulting from the hydraulic control located approximately 373 feet downstream from transect 1.

Table 9. A comparison of water surface elevations from Task 14 staff gages located within Trapper Creek Side Channel.

Date	TR 1	TR 2	TR 3	TR 4	Mainstem Discharge
841009	---	---	92.12	92.50	15,000
841006	91.92	91.90	92.14	92.51	15,700
840930	91.93	91.92	92.14	92.47	17,800
840917	91.95	91.93	92.19	92.53	20,400
840924	91.94	91.93	92.17	92.55	20,400
840918	91.95	91.95	92.18	92.60	20,900
840913	91.97	91.95	92.16	92.56	22,700
840911	---	---	92.14	92.56	23,500
840911	---	---	---	92.58	23,500
840816	92.34	92.00	92.15	92.70	44,000
840822	92.76	92.51	92.82	93.27	54,300
840803	92.93	92.69	93.02	93.18	54,700
840803	---	---	---	93.42	54,700
840708	---	---	---	93.78	57,100
840819	92.90	92.69	93.04	93.23	57,200
840721	93.11	92.96	93.22	93.63	57,700
840721	93.15	93.00	93.32	94.08	57,700
840722	93.06	92.89	93.26	93.61	57,800
840722	---	---	---	93.62	57,800

Table 9 (Continued).

Date	TR 1	TR 2	TR 3	TR 4	Mainstem Discharge
840707	---	---	---	93.89	58,800
840707	---	---	---	93.89	58,800
840807	93.75	93.66	94.06	94.18	66,700
840807	93.76	93.68	94.08	94.21	66,700
840624	---	---	---	94.41	70,100
840624	---	---	---	94.75	70,100
840825	---	---	---	96.28	93,300
840825	---	---	---	96.42	93,300

4.0 SUMMARY

The stage, discharge, and channel geometry data presented in this technical report is the result of field investigations conducted from May to October, 1984. During this period, mean daily Susitna River discharge at the USGS Sunshine gaging station (USGS 15292780) ranged from a low of 6,000 cfs in May to a high of 104,000 cfs in August. A review of the hydrograph developed from mean daily discharges recorded at Sunshine for the period of record (Figure 86) shows that daily flow during the 1984 open water field season generally followed previous years trends.

Based on evaluation of stage data collected at each study site during both the nonbreached and breached hydraulic conditions mainstem discharge was found to influence the hydraulic conditions of each of the Task 14 side channel and slough study sites. At Island, Circular, Sunset, Beaver Dam, Rustic Wilderness and Trapper Creek Side Channels sufficient data were obtained for the development of rating curves describing the relationship between mainstem discharge and study site water surface elevations during the unbreached hydraulic condition. This portion of the water surface elevation versus mainstem discharge rating curve is characterized by a regression line having little or no slope over incremental increases of mainstem discharge. Due to limited data, however, the portion of the rating curve for the non-breached condition has not been firmly established for any of these sites.

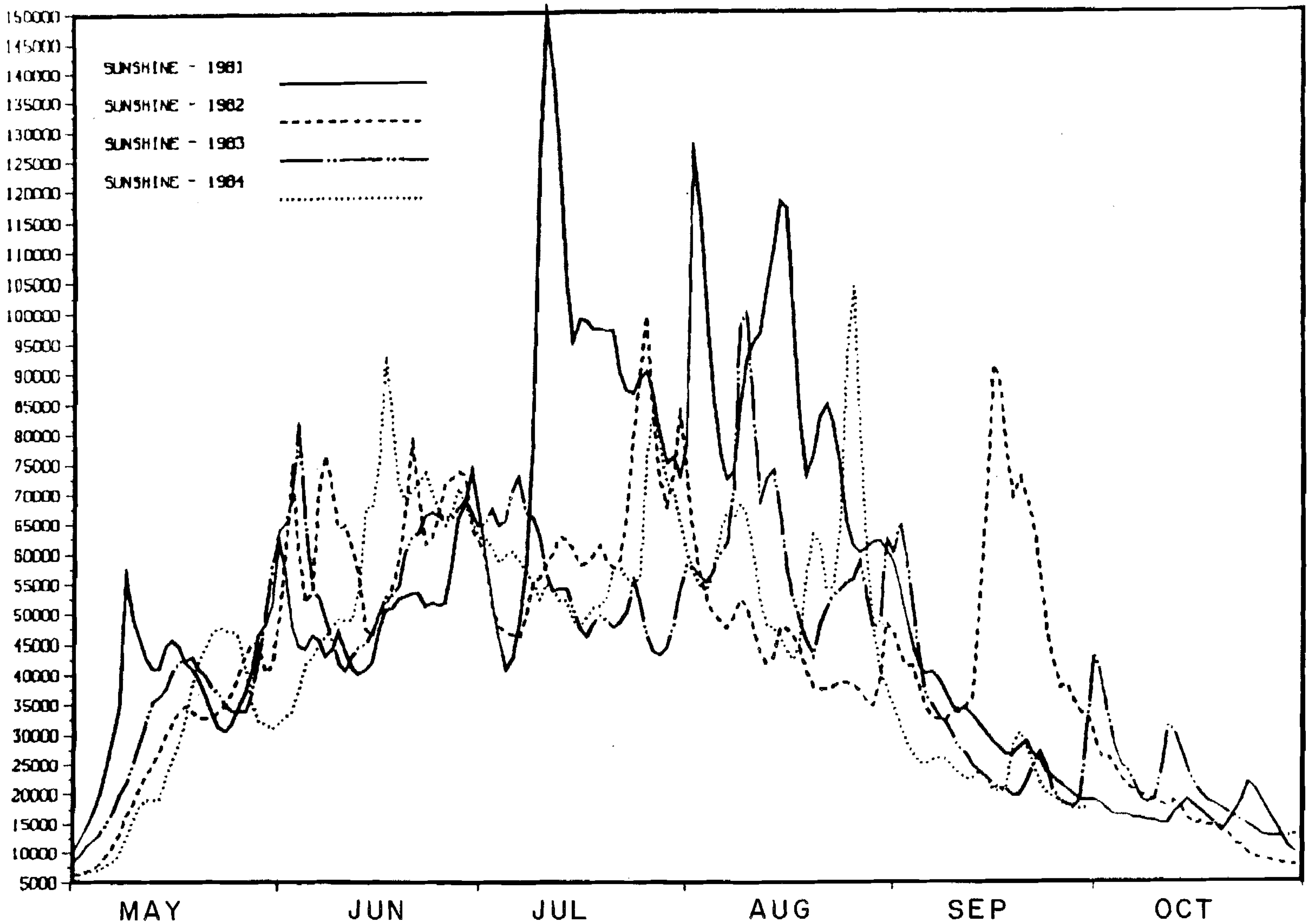


Figure 86. Susitna River hydrograph for May-October 1981,1982, 1983 and 1984 at Sunshine Station (USGS 15292780).

The determination of initial breaching discharges for each study site proved to be difficult as only limited observations were available which could be used to determine when study site breaching initially occurred. The range of mainstem discharge which afforded these observations, subsequent to study site selection, only occurred during a brief period in late August and early September during which time mainstem discharge decreased rapidly. As a result, the initial breaching discharges presented in this report are a compilation of field observations and reviews of aerial photographs. Aerial photography, however, does not always allow the resolution necessary for determining when the head of a study site is initially breached. A summary of the initial breaching discharges determined for the Task 14 study sites is presented in Table 10.

As progressively higher mainstem discharges overtop the head of the study site, the hydraulic conditions of the study site become controlled by mainstem discharge. The point at which this occurs is termed the controlling breaching discharge and is reflected on the water surface elevation versus mainstem discharge rating curves as a definite change in slope of the regression line. The non-breached conditions are usually reflected in these curves as having regression lines which are nearly horizontal or, in some instances, having a slight slope. Once the hydraulics of the study site become directly controlled by mainstem discharge the slope of the line dramatically changes due to the influence of mainstem discharge.

Table 10. Initial breaching discharges, controlling discharges and streamflow estimates corresponding to controlling discharges for the 1984 Task 14 study sites.

Location	River Mile	Initial Breaching Discharges	Crontrolling Breaching Discharges	Estimated Streamflow (cfs) at Controlling Discharge: WSEL vs Flow	Estimated Streamflow (cfs) at Controlling Discharge: Flow vs Q_{MS}
Hooligan Side Channel	35.2	23,100	23,500	46.5	48.6
Eagle's Nest Side Channel	36.2	14,000	15,000	--	--
Kroto Slough Head	36.3	36,000	38,000	55.4	67.3
Bear Bait Side Channel	42.9	25,900-36,600[a]	--[a]	--[b]	--[b]
Last Chance Side Channel	44.4	22,700	24,000	--[b]	1.3
Rustic Wilderness Side Channel	59.5	19,000	20,400	--[b]	--[b]
Island Side Channel	63.2	34,000	35,000	43.5	68.8
Mainstem West Bank Side Channel	74.4	19,000	19,600	5.7[c]	5.7[c]
Goose 2 Side Channel	74.8	30,000	32,000	26.3	21.7
Circular Side Channel	75.3	36,000	36,000	26.8	26.8
Sauna Side Channel	79.8	37,000	38,000	22.5	19.9
Sucker Side Channel	84.5	27,500	29,000		
TR2				10.0	10.2
TR5				24.5	12.1
Beaver Dam Side Channel	86.3	46,000	47,600	7.1	6.2
Beaver Dam Slough	86.3	--[a]	--[a]	--[b]	--[b]
Sunset Side Channel	86.9	31,000	32,000	45.8	41.4
Sunrise Side Channel	87.0	34,300	36,000	29.2	21.1
Birch Creek Slough	88.4	54,100	--[d]	--[d]	--[d]
Trapper Creek Side Channel	91.6	44,000	44,000	31.4[c]	31.4[c]

[a] Insufficient information is available to determine initial breaching and controlling discharge.

[b] Insufficient information is available to estimate streamflow at the controlling discharge.

[c] These streamflow values are actual measurements of discharge and are not estimated values.

[d] Birch Creek tributary influence precludes the determination.

In most water surface elevation versus mainstem discharge rating curves, the lines defining the non-breached and breached controlled conditions intersect. Several gage sites, however, exhibited a gap in elevation between the nonbreached and controlled conditions. This is speculated to result from changes in channel geometry. A high flow event (104,000 cfs) occurred on August 26 which could have caused such channel movement. Field observations have noted that the character of the side channel morphology (gravel substrate) at each study site is susceptible to movement.

The information derived from the rating curves and the intial breaching information were used to determine the controlling discharges presented in Table 10. These controlling discharges are the best determination of the controlling mainstem discharges based on available data collected to date.

Because of the distances between the Sunshine gaging station and certain lower river study sites, a lag time curve was developed to analyze the travel time required for a flood wave to move from the Sunshine gaging station to the Susitna gaging station. Using this analysis, several water surface elevations presented in Attachment Table B-1 were evaluated for time lag. Time lag analysis was applied for those study sites located a substantial distance downstream of the Sunshine Station for periods of high flow events. A further discussion of the lag time curve development is found in Attachment A.

Thalweg profiles were developed for each of the Task 14 study sites. These thalweg profiles included that portion of the channel included in the study site only. From these thalwegs the gradient of the streambed for the study site was estimated and the thalwegs were used in determining extent of backwater when sufficient stage data were available. Table 11 summarizes the thalweg gradient for each study site.

Backwater areas were found to occur at several of the Task 14 study sties. The most apparent backwater areas were located at Caswell, Rolly and Birch Creeks, and Beaver Dam Slough. At Caswell Creek, Rolly Creek and Beaver Dam Slough backwater was reflected in the streamflow measurements. At several of the remaining study sites the stage data was too limited to precisely determine the extent of backwater. Also many study sites were located near the head of the side channel or slough precluding a backwater analysis. Six Task 14 side channel study sites were also included in the Task 36 study (Island, Mainstem West Bank, Circular, Sauna, Sunset and Trapper Creek Side Channels). Due to the nature of the Task 36 study several stage monitoring stations were located in these side channels allowing a comparison of water surface elevations throughout the study site. A comparison of water surface elevations enabled a general backwater evaluation of these six side channels. A summary of the extent of backwater as determined by stage observations for these six side channels as well as the range of mainstem discharges corresponding to the occurrence of backwater is presented with the summary of thalweg gradients in Table 11.

Table 11. Summary of the extent of backwater and corresponding mainstem discharge for Task 14 study sites.

Location	RM	Extent of Backwater on Study Site Thalweg (ft)	Mainstem Discharge (cfs)	Gradient (ft/mi)	Head Condition
Hooligan Side Channel	35.2	N/A[a]	---	8.9	---
Eagle's Nest Side Channel	36.2	N/A[a]	---	8.9	---
Kroto Slough Head	36.3	N/A[a]	---	7.0	---
Rolly Creek	39.0	3,750	52,500	5.5	Tributary
Bear Bait Side Channel	42.9	N/A[a]	---	1.9	---
Last Chance Side Channel	44.4	N/A[a]	---	10.1	---
Rustic Wilderness Side Channel	59.5	N/A[a]	---	8.7	---
Caswell Creek	63.0	1,026	55,100[b]	10.8	Tributary
Island Side Channel	63.2	1,100 570	35,000-38,000 56,100-66,700	15.6	Breached Breached
Mainstem West Bank Side Channel	74.4	N/A	N/A	12.3	Breached
Goose 2 Side Channel	74.8	N/A[a]	---	9.2	---
Circular Side Channel	75.3	1,141 1,300	42,500 55,200-66,700	14.3	Breached Breached
Sauna Side Channel	79.8	Throughout study site (1,027 feet)	54,600-56,000	10.4	Breached
Sucker Side Channel	84.5	Throughout study site (750 feet)	66,400-76,200	7.2	Breached
Beaver Dam Slough	86.3	N/A[b] 150	47,600 54,600	10.1	Non-Breached Non-Breached
Beaver Dam Side Channel	86.3	N/A[c]	---	13.5	---

[a] Backwater was not present at study site.
[b] Insufficient data available to determine upstream extent of backwater at higher mainstem discharges.
[c] Insufficient data available to determine occurrence and extent of backwater.

Table 11 (Continued).

Location	RM	Extent of Backwater on Study Site Thalweg (ft)	Mainstem Discharge (cfs)	Gradient (ft/mi)	Head Condition
Sunset Side Channel	86.9	1100	56,000-66,700	9.5	Breached
Sunrise Side Channel	87.0	N/A[b]	---	16.0	---
Birch Creek	88.4	N/A[b]	---	4.9	---
Trapper Creek Side Channel	91.6	N/A[a]	---	12.1	N/A

[a] Backwater was not present at study site.
[b] Insufficient data available to determine occurrence and extent of backwater.

5.0 GLOSSARY

Backwater Area - A reach of stream with reduced or no velocity and a rise in stage resulting from a hydraulic or physical barrier. Backwater areas in habitats adjacent to the Susitna River usually are due to an increase in mainstem discharge and occur at the mouth of or within a side channel or slough.

Breaching - The overtopping of the head of a side channel or side slough by the mainstem river.

Controlling Discharge - The mainstem discharge at Sunshine (USGS 15292780) required to breach the upstream end of the side channel or side slough and govern the hydraulic characteristics within a side channel or side slough.

Cross Section Profile - A survey of the vertical section of a channel bottom taken at right angles to a survey line resulting in a ground/streambed profile.

Discharge - Discharge is defined as the volume rate of flow of water passing a specific location at a specific period in time, expressed as cubic feet per second (cfs). For the purpose of this report "discharge" will refer specifically to mainstem flow.

Flow - The movement of a volume of water from place to place. See Discharge and Streamflow.

Gaging Station - A location which has been established for monitoring stage, flow and/or discharge.

Gradient - Rate of change in vertical elevation per unit horizontal distance.

Head - The upstream end or point of origin of a lotic water body.

Initial Breaching Discharge - The mainstem discharge at Gold Creek which represents the initial point when mainstem water begins to enter the head of a side channel/side slough.

Mainstem - Consists of those portions of the Susitna River that normally convey water throughout the year. Both single and multiple channel reaches are included in this habitat category. Groundwater and tributary inflow appear to be inconsequential contributors to the overall characteristics of mainstem habitat. Mainstem habitat is typically characterized by high water velocities and well armored streambeds. Substrates generally consist of boulder and cobble size materials with interstitial spaces filled with a grout-like mixture of small gravels and glacial sands. Suspended sediment concentrations and turbidity are high during summer due to the influence of glacial melt-water. Discharges recede in early fall and the mainstem clears appreciably in October. An ice cover forms on the river in late November or December.

Mean Daily Discharge - The computed mean mainstem discharge per 24 hour period for a USGS gaging station.

Mouth - The downstream confluence of a lotic water body with another water body.

Observed Data - Values derived through a visual estimate or evaluation.

Rating Curve - A curve representing a simple relation between two variables to be used to determine values of the dependent variable as a function of the independent variable. The rating curves developed using project measurements of stage and discharge consist of discharge rating curves and stage rating curves. The discharge rating curves are used to determine streamflow as a function of mainstem discharge and streamflow as a function of water surface elevation. The stage rating curves are used to determine stage (water surface elevation) as a function of mainstem discharge.

Side Channel - Consists of those portions of the Susitna River that normally convey water during the open water season but become appreciably dewatered during periods of low mainstem discharge. Side channels may exist either in well defined overflow channels or in poorly defined water courses flowing through partially submerged gravel bars and islands along the margins of the mainstem river. Side channel streambed elevations are typically lower than the mean monthly water surface elevations of the mainstem Susitna River observed during June, July, and August. Side channels are characterized by shallower depths, lower velocities and smaller streambed materials than the adjacent mainstem river.

Side Slough - Those channels located between the edge of the floodplain and the mainstem and side channels of the Susitna River. It is usually separated from the mainstem and/or side channels by well vegetated bars. An exposed alluvial berm often separates the head of the slough from mainstem discharge or side channel flows. The controlling streambed/bank elevations at the upstream end of the side sloughs are slightly less than the water surface elevations of the mean monthly discharges of the mainstem Susitna River observed for June, July, and August. At intermediate and low-discharge periods, the side sloughs convey clear water from small tributaries and/or upwelling groundwater. These clear water inflows are essential contributors to the existence of this habitat type. The water surface elevation of the Susitna River generally causes a backwater to extend well up into the slough from its lower end. Even though this substantial backwater exists, the sloughs function hydraulically very much like small stream systems and several hundred feet of the slough channel often conveys water independent of mainstem backwater effects. At high discharges the water surface elevations of the mainstem river is sufficient to overtop the upper end of the slough. Surface water temperatures in the side sloughs during summer months are principally a function of air temperature, solar radiation, and the temperature of the local runoff.

Staff Gage - A non-recording staff, marked in graduations of hundredths of feet, used to monitor stage through observation.

Stage - The height of the water surface above an established datum plane. Stage can be converted to true water surface elevation if the observations are converted into project datum.

Streamflow - Same as discharge but refers specifically to side channel, slough and tributary flow whereas discharge denotes in the mainstem. See Discharge.

Thalweg Profile - A longitudinal profile that describes the streambed elevation of the deepest portion of mainstem, tributary, slough or other riverine habitats.

WSEL - Abbreviation for water surface elevation.

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8.0 LITERATURE CITED

Alaska Department of Fish and Game (ADF&G). 1984. Su Hydro Aquatic Studies (May 1983 - June 1984) Procedures Manual. Final Draft. Prepared for Alaska Power Authority Anchorage, Alaska.

U.S. Geological Survey (USGS). 1978. Surface water records of Cook Inlet Basin, Alaska, through September 1975. Open-file Report 78-498 (basic data).

______. 1982. Water Resources Data for Alaska: Water Year 1981. USGS Water Data Report AK-81-1. Anchorage, Alaska.

______. 1983. Water Resources Data for Alaska: Water Year 1982. USGS Water Data Report AK-82-1. Anchorage, Alaska.

______. 1984. Water Provisional Summary of 1984 Water Resources Data for Alaska.

9.0 ATTACHMENTS

ATTACHMENT A

TIME LAG ANALYSIS FOR THE LOWER SUSITNA RIVER BASIN

Stage and discharge values in the lower Susitna River can range considerably during a 24 hour period as evidenced by inspection of the Sunshine Station hydrograph (USGS 15292780). This is particularly true for peaking discharge periods resulting from storm events. To develop correlations for rating curves of stage and streamflow data between specific side channels and the mainstem during peaking mainstem discharge events the use of instantaneous mainstem discharge values is necessary.

To obtain instantaneous mainstem discharge values at sites that are some distance downstream from the reference gaging station requires an assessment of the basin lag time. Lag time is the time required for a flood wave to move down a drainage basin from the gaging station to the study site.

To evaluate instantaneous site specific measurements of stage and discharge at study sites during high flow events it is necessary to determine the magnitude of the flood wave and the time of day the wave influenced the site specific measurements. To determine the discharge represented by the flood wave requires an assessment of the velocity (v) of the wave;

$$v = x/t$$

where

x = distance from reference gage to site

t = time required for flood wave to travel from the reference gage to the site.

To assess the velocity of several flood waves, the hydrographs for Sunshine and Susitna Stations were analyzed (USGS 15292780 and 15294350, respectively). Four peak events of varying magnitude that could be clearly distinguished in both hydrographs were selected for analysis. The objective was to determine the time it took for each flood wave to travel the 58.1 miles between gaging stations. The following values were obtained from the USGS (Larry Leveen, pers. comm., 1/31/85).

Date	Type of Event	Sunshine Discharge	Time	Susitna Discharge	Time
July 27	Peak	86,900	0900	135,000	2330
August 19-20	Peak	64,000	2300	150,000	1600
August 26	Peak	114,000	0300	171,000	1400
September 14-15	Peak	24,500	1030	54,500	2400

From these values, flood wave velocities were calculated.

Date	Time (hrs)	Velocity (ft/sec)	Sunshine Q (cfs)
July 27	14.5	5.88	86,900
August 19-20	17.0	5.01	64,000
August 26	11.0	7.75	114,000
September 14-15	37.5	2.27	24,500

A logarithmic regression relationship was developed between flood wave velocity and discharge at Sunshine Station. This equation is as follows:

$$V = 10^{-3.086} Q^{0.785}, \ r^2 = 0.996.$$

Attachment Table A-1 provides a tabulation of the distance in miles that a flood wave of a given magnitude will travel in a given time interval for the lower Susitna River. Attachment Figure A-1 provides a graphic representation of the data presented in Attachment Table A-1. To determine the instantaneous mainstem discharge occurring at a study site, the following procedure was used:

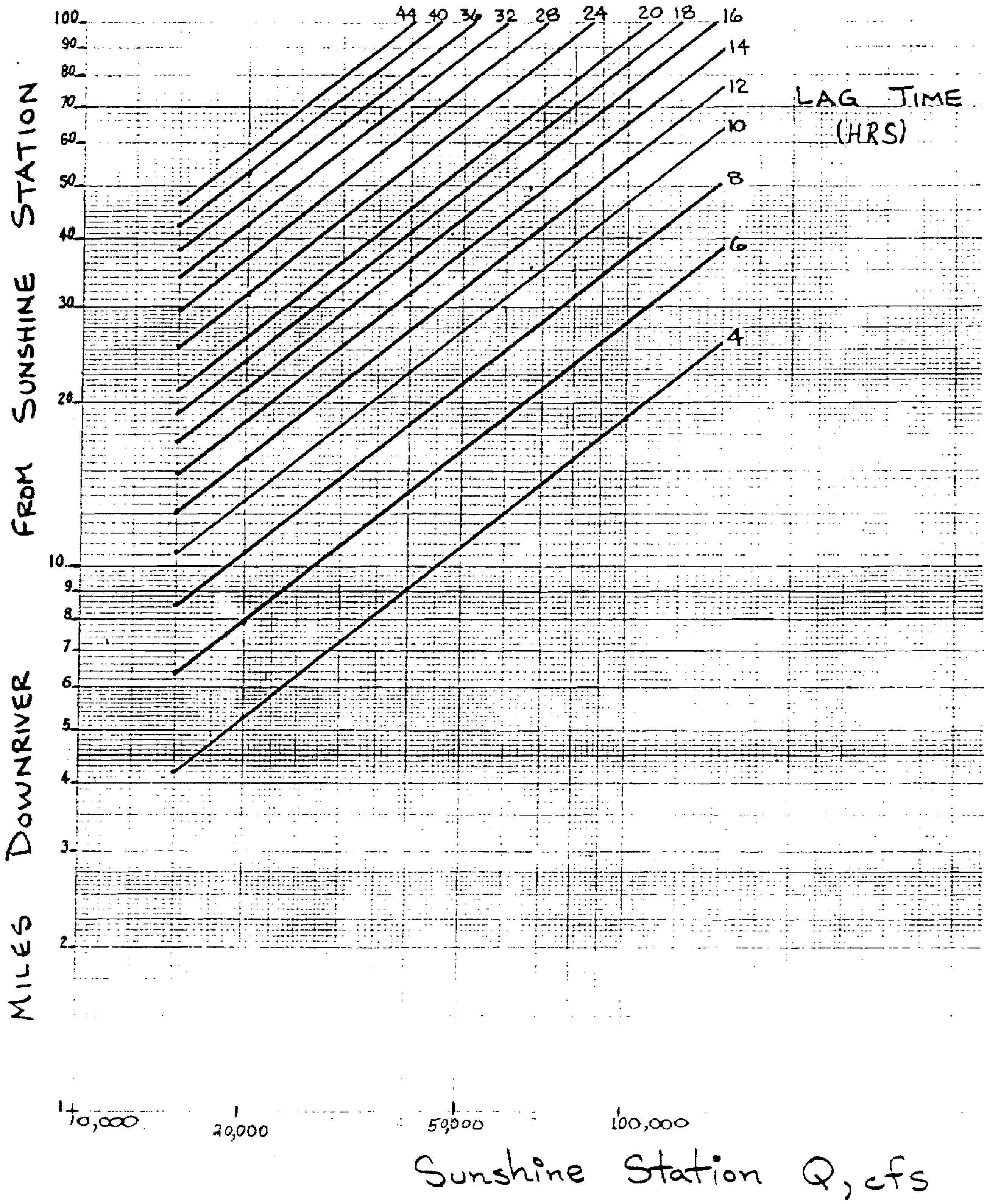
1) the instantaneous mainstem discharge at Sunshine was determined corresponding to the time of day for a site specific stage observation;

2) the distance of the study site from the Sunshine station was determined;

3) the instantaneous mainstem discharge and the distance were plotted in Attachment Figure A-1 to determine the lag time of the flood wave;

Attachment Table A-1. Distance in miles that a flood wave of a given magnitude will travel in a given time.

Lag Time (Hours)	Magnitude of Flood Wave (cfs) 15,000	20,000	30,000	40,000	60,000	80,000	90,000	100,000	150,000
4	4.2	5.3	7.3	9.1	12.5	15.7	17.2	18.7	25.7
6	6.4	7.9	10.8	13.7	18.8	23.5	25.8	28.1	38.6
8	8.5	10.6	14.5	18.2	25.0	31.4	34.4	37.4	51.4
10	10.6	13.2	18.2	22.8	31.3	39.2	43.0	46.8	64.3
12	12.7	15.9	21.8	27.3	37.6	47.1	51.6	56.1	77.1
14	14.9	18.5	25.4	31.9	43.8	54.9	60.3	65.5	90.0
16	17.0	21.2	29.1	36.4	50.1	62.8	68.9	74.8	102.8
18	19.1	23.8	32.7	41.0	56.4	70.6	77.5	84.2	115.7
20	21.2	26.4	36.4	45.6	62.6	78.5	86.1	93.5	128.5
24	25.5	31.7	43.6	54.7	75.1	94.2	103.3	112.2	154.2
28	29.7	37.0	50.9	63.8	87.7	109.9	120.5	130.9	179.9
32	34.0	42.3	58.2	72.9	100.2	125.6	137.7	149.6	205.0
36	38.2	47.6	65.4	82.0	112.7	141.3	154.9	168.3	231.3
40	42.5	52.9	72.7	91.1	125.2	157.0	172.2	187.0	257.1
44	46.7	58.2	80.8	100.2	137.8	172.7	189.4	205.7	282.8



Attachment Figure A- 1. Lower Susitna River Basin lag times referenced to Sunshine Station (USGS 15292780).

4) the lag time was subtracted from the time of the stage observation to yield the time of day the flow wave was measured at the Sunshine station. The instantaneous mainstem discharge at Sunshine station for this revised time is the discharge corresponding to the site specific stage measurement.

ATTACHMENT B

Attachment Table B-1. Comparison of water surface elevations and streamflow, measured at Task 14 study sites, to mean daily mainstem discharge (cfs) at Sunshine (USGS 15292780).

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Hooligan Side Channel TR 3	840925	1710	91.28		19,600
(035.2S1 at RM 35.2)	840917	1040	91.27		20,400
	840725	1600	93.33		53,300[a]
	840711	1200	93.36	688.5	55,100
	840724	1050	93.39	696.4	55,200
	840829	1330	93.35		55,400[a]
	840808	1330	93.87		64,700[a]
	840808	1220	93.83		65,200[a]
	840808	1106	93.83	1087.5	65,600[a]
	840828	1245	94.40		71,900[a]
	840825	1340	95.00	2288.0	80,300[a]
	840825	1600	95.28		85,300[a]
	840825	1710	95.39		87,500[a]
	840826	1430	96.68		113,000[a]

[a] Discharge value is instantaneous and was determined using a time lag analysis.

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Eagles Nest Side Channel TR 2	841009	1630	90.13		15,000
(036.2S1 at RM 36.2)	840928	1530	90.28		17,700
	840926	1250	90.41		19,000
	840926	1350	90.41	21.2	19,000
	840917	1115	90.48		20,400

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Kroto Slough Head TR 2	840925	1225	89.74		19,600
(036.3S1 at RM 36.3)	840711	1600	91.65	290.6	55,100
	840724	1345	91.60	268.1	55,200
	840724	1530	91.61		55,200
	840829	1400	91.40		59,100[a/]
	840808	1520	92.44	530.0	65,900
	840808	1600	92.44		65,900
	840808	1655	92.47		65,900
	840809	1100	92.44		68,300
	840727	1300	94.77		85,500[a/]
	840825	1835	94.69	1771.6	89,700[a/]
	840825	2020	94.82		93,300
	840825	2110	94.90		93,300

[a/] Discharge value is instantaneous and was determined using a time lag analysis.

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Rolly Creek TR 2	841011	1530	92.36		14,200
(039.0T1 at RM 39.0)	840928	1605	93.31		17,700
	840928	1540	93.32	10.9	17,700
	840830	1500	93.96		40,800
	840815	1800	93.87		46,000
	840813	1730	94.41		48,100
	840710	1510	94.71	2.9	52,500
	840724	0939	94.89		55,200
	840809	1001	95.70		68,300
	840809	1001	95.73		68,300
	840730	1600	96.34		70,500
	840826	1600	96.04		104,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Bear Bait Side Channel TR 2	840927	1110	88.50		18,300
(042.9S1 at RM 42.9)	840813	1330	91.95		48,800[a]
	840710	1215	92.21	188.9	52,500
	840724	1611	92.36	242.6	55,200
	840724	1645	92.39		55,200
	840731	1200	93.15		64,900
	840808	1811	93.08	547.3	65,900
	840826	1700	96.86		110,000[a]
	840826	1400	97.08	2512.4	113,000[a]

[a] Discharge value is instantaneous and was determined using a time lag analysis.

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Last Chance Side Channel TR 2	840813	1400	93.36		48,100
(044.4S1 at RM 44.4)	840725	1150	94.33	165.4	56,100
	840725	1220	94.33		56,100
	840809	1220	95.26	476.2	68,300
	840809	1244	95.28		68,300
	840726	1430	95.37		70,500[a]
	840726	1430	95.40		70,500[a]
	840827	1250	96.67		86,200[a]
	840827	1030	96.71	1219.6	87,900[a]
	840825	1630	96.72		89,700[a]

[a] Discharge value is instantaneous and was determined using a time lag analysis.

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Rustic Wilderness Side Channel TR 4	840928	1140	92.83		17,700
(059.5S1 at RM 59.5)	840930	1500	92.81		17,800
	841001	1230	92.85		18,700
	840917	1450	92.94		20,400
	840831	1400	94.83		38,000
	840712	1645	95.84	607.4	54,100
	840812	1230	95.87		54,800[a/]
	840725	1508	95.86	642.3	56,100
	840828	1650	95.91		59,900
	840828	1425	95.95		59,900
	840828	1510	95.96	781.6	59,900
	840809	1615	96.29	921.2	68,300
	840809	1700	96.30		68,300
	840729	1430	96.49		71,900

[a/] Discharge value is instantaneous and was determined using a time lag analysis.

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Caswell Creek TR 4 (Q Site)	841009	1140	93.58	27.5	15,000
(063.0T4 at RM 63.0)	841001		93.43		18,700
	840926		93.39		19,000
	840915		93.38		22,300
	840818	1500	94.89		45,400
	840719	1330	95.48		51,600
	840711	1530	95.85	11.9	55,100
	840724	1100	95.57		55,200
	840802	1430	95.80		56,700
	840706	1400	96.21		60,400
	840626	1420	96.47		64,800

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Island Side Channel TR 1 (Q Site)	840930		90.86		17,800
(063.2S1 at RM 63.2)	840831	1300	91.90		38,000
	840719	1215	93.13		51,600
	840712	1530	93.33	379.0	54,100
	840725	1300	93.33	303.0	53,500 [a]
	840725	2010	93.54		56,100
	840704	1150	93.55		58,600
	840811	1630	93.77	515.0	60,000
	840801	1430	93.73		60,300
	840626	1500	93.95		64,800
	840807	1325	94.17		66,700

[a] Discharge value is instantaneous and was determined using a time lag evaluation.

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Island Side Channel TR 1A	840930		90.93		17,800
(063.2S7 at RM 63.2)	840919	1200	91.37		28,400
	840901	1330	91.69		35,000
	840831		91.93		38,000
	840725	1745	93.46		56,100
	840725	1940	93.56		56,100
	840801		93.75		60,300
	840807	1325	94.16		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Island Side Channel TR 2	840930		90.88		17,800
(063.2S2 at RM 63.2)	840919	1210	91.33		28,400
	840901		91.68		35,000
	840831		91.89		38,000
	840725	1710	93.41		56,100
	840725	1935	93.52		56,100
	840801		93.74		60,300
	840807	1325	94.16		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Island Side Channel TR 3	840930		91.23		17,800
(063.2S3 at RM 63.2)	840901		91.70		35,000
	840831		91.90		38,000
	840725	1550	93.44		56,100
	840725	1500	93.48		56,100
	840725	1900	93.55		56,100
	840801		93.79		60,300
	840807	1325	94.24		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Island Side Channel TR 4	840930		91.56		17,800
(063.2S4 at RM 63.2)	840901	1500	91.71		35,000
	840831		91.90		38,000
	840725	1850	93.62		56,100
	840801		93.89		60,300
	840807	1325	94.34		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Island Side Channel TR 4A	840930		91.56		17,800
(063.2S8 at RM 63.2)	840901		91.77		35,000
	840831		91.94		38,000
	840725	1400	93.52		56,100
	840725	1830	93.66		56,100
	840801		93.93		60,300
	840807	1325	94.31		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Island Side Channel TR 5	840930		91.57		17,800
(063.2S5 at RM 63.2)	840927		91.57		18,300
	840915		91.59		22,300
	840901		91.73		35,000
	840831		91.94		38,000
	840725	1300	93.56		56,100
	840801		93.98		60,300
	840807	1325	94.44		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Island Side Channel TR 6 (Q Site)	840930		91.54		17,800
(063.2S6 at RM 63.2)	840927	1400	91.56		18,300
	840915		91.62		22,300
	840901	1300	91.75		35,000
	840831	1230	91.95		38,000
	840719		93.36		51,600
	840712	1130	93.67	394.9	54,100
	840725	1220	93.55	337.7	53,600[a]
	840725	1620	93.61	359.5	54,200[a]
	840725	1915	93.70		56,100
	840704		93.84		58,600
	840811	1150	94.08	543.0	60,000
	840811	1425	94.08		60,000
	840801		94.00		60,300
	840626	1520	94.30		64,800
	840626	1520	94.31		64,800
	840807		94.40		66,700

[a] Discharge value is instantaneous and was determined using a time lag evaluation.

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Mainstem W\B S. Chan. TR1 (Q Site)	841010	1430	92.64	.5	14,700
(074.4S1 at RM 74.4)	840925	1005	92.85	5.7	19,600
	840915	1110	93.90	73.1	22,300
	840914		94.12		24,000
	840920	1450	94.62	309.9	30,500
	840902		94.94		32,000
	840902	1231	94.97	449.6	32,000
	840817		95.49		42,500
	840815		95.56		46,000
	840712	1050	95.96	1260.0	54,100
	840711	1130	96.01		55,100
	840711	1130	96.08		55,100
	840724	1600	96.02	1267.0	55,200
	840723	1950	95.98		56,100
	840721		96.02		57,700
	840721		96.03		57,700
	840801		96.22		60,300
	840801		96.24		60,300
	840810	1745	96.49		66,400
	840810	1445	96.54	1910.0	66,400
	840807	1205	96.49		66,700
	840827	1240	97.14		79,700
	840827	1010	97.19	2814.1	79,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Mainstem West Bank Side Chan. TR 2	841010		92.63		14,700
(074.4S2 at RM 74.4)	840915		93.74		22,300
	840914		94.13		24,000
	840920	1535	94.64		30,500
	840902		94.98		32,000
	840902	1503	95.00		32,000
	840817		95.60		42,500
	840815		95.64		46,000
	840711	1215	96.06		55,100
	840711	1215	96.09		55,100
	840723	1950	96.02		56,100
	840723	1950	96.07		56,100
	840721		96.09		57,700
	840721		96.14		57,700
	840801		96.31		60,300
	840801		96.32		60,300
	840810	1805	96.54		66,400
	840810	1805	96.62		66,400
	840807	1205	96.51		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Mainstem West Bank Side Chan. TR 2A	840903	1230	94.90		29,000
(074.4S5 at RM 74.4)	840920		94.67		30,500
	840902		94.99		32,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Mainstem West Bank Side Chan. TR 3 (074.4S3 at RM 74.4)	841010		93.03		14,700
	840915		93.80		22,300
	840914		94.18		24,000
	840903		94.97		29,000
	840920	1323	94.70		30,500
	840902	1604	95.04		32,000
	840902		95.08		32,000
	840815		95.92		46,000
	840711	1300	96.39		55,100
	840723	1950	96.36		56,100
	840721		96.44		57,700
	840801		96.67		60,300
	840810	1805	96.81		66,400
	840810	1805	96.94		66,400
	840807	1205	96.81		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Mainstem West Bank Side Chan. TR 3A	841010		93.05		14,700
(074.4S6 at RM 74.4)	841001	1120	93.37		18,700
	840925	1210	93.51		19,600
	840915		94.04		22,300
	840914		94.44		24,000
	840903	1100	95.21		29,000
	840920	1248	94.93		30,500
	840902	1628	95.29		32,000
	840902		95.32		32,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Mainstem West Bank Side Chan. TR 3B (074.4S7 at RM 74.4)	840903		95.06		29,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Mainstem West Bank Side Chan. TR 4	841010	1430	94.63		14,700
(074.4S4 at RM 74.4)	840914	1145	95.83		24,000
	840903		96.39		29,000
	840920	1239	96.16		30,500
	840902	1845	96.49		32,000
	840902	1715	96.54		32,000
	840817		97.22		42,500
	840815		97.30		46,000
	840711	1400	97.50		55,100
	840711	1400	97.70		55,100
	840723	1950	97.67		56,100
	840721	1215	97.62		57,700
	840801	1601	97.90		60,300
	840810	1810	97.86		66,400
	840810	1810	98.19		66,400
	840807	1205	97.97		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Goose 2 Side Channel TR 2 (Q Site)	840902	1933	214.66		32,000
(074.8S2 at RM 74.8)	840830	1200	215.07		40,800
	840815	1105	214.96		46,000
	840710	1720	215.38	108.0	52,500
	840720	1115	215.27		52,600
	840723	1530	215.42	114.0	56,100
	840802	1140	215.51		56,700
	840705	1030	215.63		59,800
	840828	1155	215.82	213.8	59,900
	840626	1200	215.87		64,800
	840810	1650	215.78	209.0	66,400

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Circular Side Chan. TR 1 (Q Site)	840920	0855	87.87	.5	30,500
(075.3S1 at RM 75.3)	840830	1700	89.10		40,800
	840817	1700	89.25		42,500
	840817	1740	89.28	43.1	42,500
	840803		90.23		54,700
	840803		90.24		54,700
	840724	1855	90.26		55,200
	840724	1855	90.26		55,200
	840724	1140	90.29	204.2	55,200
	840724	1225	90.30	191.0	55,200
	840724	1330	90.30		55,200
	840723		90.31		56,100
	840811	1250	90.81	281.4	60,000
	840706		90.70		60,400
	840706		90.70		60,400
	840706		90.72		60,400
	840824	1235	90.78		64,800
	840824	1235	90.78		64,800
	840626	1045	90.99		64,800
	840626	1045	91.00		64,800
	840807	1245	91.24		66,700
	840827	1800	91.75		79,700
	840827	1615	91.82	745.5	79,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Circular Side Channel TR 2	840830		89.27		40,800
(075.3S2 at RM 75.3)	840817		89.27		42,500
	840817	1830	89.30		42,500
	840803		90.21		54,700
	840724	1905	90.26		55,200
	840811	1225	90.77		60,000
	840824	1230	90.80		64,800
	840807	1245	91.19		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Circular Side Channel TR 2A	841010		88.06		14,700
(075.3S6 at RM 75.3)	840903		88.69		29,000
	840920	0930	88.67		30,500
	840902		88.70		32,000
	840830		89.33		40,800
	840817	1940	89.41		42,500
	840803		90.26		54,700
	840724	1905	90.28		55,200
	840724	1600	90.31		55,200
	840824	1230	90.81		64,800
	840807	1245	91.18		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Circular Side Channel TR 3	840914	1330	89.45		24,000
(075.3S3 at RM 75.3)	840903		89.55		29,000
	840920	0946	89.50		30,500
	840902	1904	89.56		32,000
	840830	1445	90.06		40,800
	840817	1545	90.17		42,500
	840817	1923	90.20		42,500
	840710	1455	90.51		52,500
	840803	1105	90.62		54,700
	840724	1200	90.67		55,200
	840724	1910	90.60		55,200
	840723	1645	90.64		56,100
	840811	1225	91.01		60,000
	840706	1100	90.92		60,400
	840824	1225	91.03		64,800
	840626	1040	91.15		64,800
	840626	1040	91.21		64,800
	840807	1245	91.32		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Circular Side Channel TR 4 (Q Site)	840928	1610	89.54		17,700
(075.3S4 at RM 75.3)	840914		89.72		24,000
	840903		89.85		29,000
	840920	1010	89.77	.5	30,500
	840902		89.84		32,000
	840830		90.40		40,800
	840817		90.57		42,500
	840817	1740	90.60	49.6	42,500
	840710	1415	91.13	150.0	52,500
	840803		91.24		54,700
	840724	1330	91.25	200.2	55,200
	840724	1910	91.26		55,200
	840724	1015	91.29	192.5	55,200
	840724	1105	91.30		55,200
	840723		91.26		56,100
	840811	1220	91.58		60,000
	840811	1105	91.59	295.0	60,000
	840824	1220	91.54		64,800
	840824	1220	91.56		64,800
	840807	1245	91.83		66,700
	840827	1555	92.43		79,700
	840827	1425	92.49	860.0	79,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Circular Side Channel TR 5	841010		89.04		14,700
(075.3S5 at RM 75.3)	841009		89.10		15,000
	840928		89.55		17,700
	840914		89.73		24,000
	840903		89.84		29,000
	840920	1020	89.76		30,500
	840724	1500	91.32		55,200
	840724	1915	91.32		55,200

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Circular Side Channel Head	840710	1600	91.81		52,500
(075.3H3 at RM 75.3)	840723	1520	92.00		56,100
	840624	1515	92.99		70,100

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sauna Side Channel TR 1	841009		88.75		15,000
(079.8S1 at RM 79.8)	840817	1030	89.15		42,500
	840823	1550	90.63		54,600
	840723		90.70	54.0	56,100
	840723	1300	90.72		56,100
	840802		90.73		56,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sauna Side Channel TR 2 (Q Site)	841009		89.00		15,000
(079.8S2 at RM 79.8)	840710	1040	90.24	37.8	52,500
	840823	1500	90.61		54,600
	840723	1200	90.71	52.0	56,100
	840723	1215	90.73	50.0	56,100
	840723	1220	90.73		56,100
	840802	1645	90.75		56,700
	840721	1545	90.91		57,700
	840828	1055	91.09		59,900
	840828	0925	91.13	57.6	59,900
	840706	1515	91.18		60,400
	840810	1350	91.83		66,400
	840810	1255	91.85	67.5	66,400
	840807		91.26		66,700
	840625	1600	91.82		67,100
	840625	1600	91.86		67,100

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sauna Side Channel TR 3	841009		88.90		15,000
(079.8S3 at RM 79.8)	840823	1510	90.64		54,600
	840723	1540	90.66		56,100
	840723		90.72	55.0	56,100
	840723	1414	90.75		56,100
	840802		90.75		56,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sauna Side Channel TR 4	841009		89.02		15,000
(079.8S4 at RM 79.8)	840928	1045	89.02		17,700
	840914	1700	89.02		24,000
	840830		89.39		40,800
	840817		89.29		42,500
	840823	1510	90.65		54,600
	840723		90.69	45.0	56,100
	840723	1625	90.69		56,100
	840802	1510	90.79		56,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sucker Side Channel TR 2 (Q Site)	840913		261.50		22,700
(084.5S2 at RM 84.5)	840914	1110	261.52		24,000
	840902		261.83		32,000
	840901	1700	261.97		35,000
	840831	1845	262.35		38,000
	840816		262.94		44,000
	840816		262.95		44,000
	840829	1755	263.16		47,600
	840710	1045	263.52	75.2	52,500
	840823	1235	263.85		54,600
	840709	1052	263.90		55,400
	840805		264.16		57,700
	840805		264.18		57,700
	840722		263.95		57,800
	840722		263.97		57,800
	840810	1320	264.84		66,400
	840810	1020	264.89	181.2	66,400
	840625	1445	264.81		67,100
	840726	1310	265.58		76,200
	840726	1310	265.64	263.6	76,200
	840726	1450	265.70		76,200
	840826	1805	267.01		104,000
	840826	1645	267.08	619.0	104,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sucker Side Channel TR 5	840913	1715	262.77		22,700
(084.5S5 at RM 84.5)	840914	1210	262.78		24,000
	840902	1136	262.91		32,000
	840816		263.38		44,000
	840710	1525	263.82	76.7	52,500
	840823	1150	264.00		54,600
	840709		264.09		55,400
	840805		264.32		57,700
	840722		264.11		57,800
	840810	0900	264.97	177.0	66,400
	840625	1500	264.88		67,100
	840627	1100	264.78	172.6	67,200
	840726	1035	265.42		76,200
	840726	1025	265.44	231.0	76,200
	840726	1115	265.47		76,200
	840726	1245	265.58		76,200
	840826	1630	267.21		104,000
	840826	1350	267.34	682.9	104,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Beaver Dam Slough TR 1 (Q Site)	840929	1420	92.84		17,400
(086.3S1 at RM 86.3)	840925	1645	92.85	.7	19,600
	840917	1125	92.84		20,400
	840916	1305	92.83	.7	21,000
	840914	1540	92.85		24,000
	840901	1315	93.14		35,000
	840831		93.22		38,000
	840829	1210	93.62		47,600
	840804		94.08		53,900
	840804	1220	94.08		53,900
	840823	1055	94.00		54,600
	840724		93.84		55,200
	840724		93.85		55,200
	840709	1620	93.99		55,400
	840708	1230	94.14		57,100
	840819		94.24		57,200
	840819		94.24		57,200
	840808	1930	95.20		65,900
	840625		95.28		67,100
	840627	1440	95.37	0.0	67,200
	840726	1900	96.48		76,200

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Beaver Dam Side Chan. TR 4 (Q Site)	840929		92.68		17,400
(086.3S4 at RM 86.3)	840925	1700	92.69	.5	19,600
	840917		92.70		20,400
	840916	1200	92.69	.6	21,000
	840901		92.89		35,000
	840831		92.94		38,000
	840829		93.55		47,600
	840804	1500	94.00		53,900
	840823	1015	93.89		54,600
	840823	1030	93.93		54,600
	840724		93.79		55,200
	840709		93.98		55,400
	840709	1310	94.00	20.5	55,400
	840708		94.06		57,100
	840819	1630	94.60		57,200
	840808	1920	95.12		65,900
	840808	1935	95.13		65,900
	840808	1715	95.17	122.0	65,900
	840625		95.18		67,100
	840625	1730	95.19		67,100
	840625	1315	95.21		67,100
	840627	1320	95.20		67,200
	840627	1320	95.24	122.2	67,200
	840726	1540	96.16		76,200
	840726	1715	96.23	303.8	76,200
	840726	1830	96.41		76,200
	840826	2000	97.29		104,000
	840826	1840	97.35	644.0	104,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Beaver Dam Head	840823	0950	95.38		54,600
(086.3H4 at RM 86.3)	840709	1115	95.52		55,400
	840808	1700	96.52		65,900

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sunset Side Channel TR 0	840929		92.70		17,400
(086.9S0 at RM 86.9)	840822	1600	95.54		54,300
	840803	1535	95.60		54,700
	840723	1230	95.58		56,100
	840722	1225	95.09		57,800
	840722	1650	95.62		57,800
	840808	1655	96.67		65,900
	840807	1450	96.68		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sunset Side Channel TR 1 (Q Site) (086.9S1 at RM 86.9)	840929	1440	93.27	1.0	17,400
	840930		93.27		17,800
	840916		93.29		21,000
	840912	1305	93.29	1.4	22,700
	840913	1440	93.30		22,700
	840919	0915	93.29		28,400
	840817		94.34	127.0	42,500
	840822	1600	95.53		54,300
	840803	1540	95.58		54,700
	840709	1705	95.59	533.0	55,400
	840709	1200	95.69		55,400
	840723	0940	95.58	446.0	56,100
	840723	1040	95.58		56,100
	840721	1205	95.45		57,700
	840722	1210	95.67	496.0	57,800
	840808	1625	96.63		65,900
	840808	1240	96.67	944.7	65,900
	840807	1450	96.69		66,700
	840825	1500	99.42	3895.0	93,300
	840826	0910	99.88		104,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sunset Side Channel TR 2	840929	1140	93.81		17,400
(086.9S2 at RM 86.9)	840930		93.79		17,800
	840916		93.81		21,000
	840912	1510	93.81		22,700
	840914	1500	93.81		24,000
	840919	0925	93.80		28,400
	840822	1510	95.71		54,300
	840803	1555	95.68		54,700
	840709	1300	95.94		55,400
	840723	1415	95.64		56,100
	840722	1450	95.76		57,800
	840722	1235	95.78		57,800

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sunset Side Channel TR 3	841005		93.74		16,500
(086.9S3 at RM 86.9)	840930		93.69		17,800
	840916		93.87		21,000
	840912	1510	93.78		22,700
	840914	1525	93.87		24,000
	840919	0939	93.87		28,400
	840817	1530	94.93		42,500
	840816		95.02		44,000
	840822	1440	95.86		54,300
	840803	1450	95.95		54,700
	840709	1415	96.01		55,400
	840723	1210	95.85		56,100
	840722	1950	95.86		57,800
	840722	1315	95.94		57,800
	840808	1655	96.86		65,900
	840807	1450	96.89		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sunset Side Channel TR 4	840930		94.11		17,800
(086.9S4 at RM 86.9)	840916		94.11		21,000
	840912	1505	94.29		22,700
	840914	1615	94.31		24,000
	840919	0948	94.31		28,400
	840817	1530	95.01		42,500
	840816		95.10		44,000
	840822		95.93		54,300
	840822	1440	95.93		54,300
	840803	1502	95.92		54,700
	840709	1500	96.08		55,400
	840723	1140	95.95		56,100
	840722	1820	95.96		57,800
	840722	1455	95.98		57,800
	840808	1650	96.89		65,900
	840807	1450	96.96		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sunset Side Channel TR 5	841005		94.75		16,500
(086.9S5 at RM 86.9)	840929	1140	94.76		17,400
	840930	1444	94.75		17,800
	840916	1830	94.76		21,000
	840912	1500	94.78		22,700
	840919	1000	94.76		28,400
	840817	1430	95.99		42,500
	840816	1345	96.06		44,000
	840822	1435	96.66		54,300
	840803	1545	96.72		54,700
	840709	1600	96.79		55,400
	840723	1115	96.65		56,100
	840722	1520	96.68		57,800
	840722	1930	96.68		57,800
	840808	1650	97.31		65,900
	840807	1450	97.36		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sunset Side Channel TR 6	841005		94.74		16,500
(086.9S6 at RM 86.9)	840929	1140	94.75		17,400
	840930		94.75		17,800
	840916		94.76		21,000
	840919	1030	94.76		28,400
	840902	1520	94.88		32,000
	840817	1330	95.97		42,500
	840816		96.05		44,000
	840822	1435	96.62		54,300
	840803	1545	96.69		54,700
	840722	1830	96.64		57,800
	840722	1605	96.65		57,800
	840808	1650	97.21		65,900
	840807	1450	97.29		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Sunrise Side Channel TR 4 (Q Site)	840818	1315	94.96		45,400
(087.0S4 at RM 87.0)	840829	1600	95.22		47,600
	840822	1425	95.47		54,300
	840709	1005	95.66		55,400
	840708	1700	95.68	202.8	57,100
	840708	1115	95.76		57,100
	840805		95.76		57,700
	840805		95.80		57,700
	840722		95.52		57,800
	840722	1700	95.53	150.8	57,800
	840722		95.56		57,800
	840807	1615	96.32		66,700
	840807	1420	96.38	472.0	66,700
	840625	1145	96.54		67,100
	840826	1250	99.05		104,000
	840826	1000	99.21	3220.0	104,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Birch Creek Slough TR 2	840928		283.16		17,700
(088.4S2 at RM 88.4)	840927	1635	283.20		18,300
	840916		283.16		21,000
	840720	1330	283.10		52,600
	840822	1350	283.28		54,300
	840803	1300	283.19		54,700
	840708	1710	283.19		57,100
	840722	1515	283.19		57,800
	840707	1400	283.30		58,800
	840828	1705	283.89		59,900
	840820	1430	283.31		63,300
	840808	0900	283.31		65,900

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Birch Creek TR 6 (Q Site)	840928		283.60		17,700
(088.4S1 at RM 88.4)	840927	1150	283.62	34.0	18,300
	840927	1610	283.62		18,300
	840916		283.61		21,000
	840720	1330	283.50		52,600
	840822	1355	283.67		54,300
	840803	1300	283.58		54,700
	840708	1620	283.52	31.7	57,100
	840722	1350	283.56	37.5	57,800
	840707	1400	283.57		58,800
	840828	1600	284.25	120.4	59,900
	840820	1430	283.60		63,300
	840808	0905	283.58	35.7	65,900
	840625	1650	283.91		67,100
	840623	1300	284.28		73,500

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Birch Slough Head	840713	1105	310.19		52,400
(088.4M7 at RM 88.4)	840812	1100	310.29		52,900
	840822	1300	310.19		54,300
	840722	1225	310.37		57,800
	840807	1315	311.04		66,700
	840622	1440	311.52		72,000

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Trapper Creek S/C TR 1	841006		91.92		15,700
(091.6S2 at RM 91.6)	840930		91.93		17,800
	840924		91.94		20,400
	840917		91.95		20,400
	840918	1710	91.95		20,900
	840913	1000	91.97		22,700
	840816	1735	92.34		44,000
	840822	1210	92.76		54,300
	840803	1600	92.93		54,700
	840819	1110	92.90		57,200
	840721	1650	93.11		57,700
	840721	1510	93.15		57,700
	840722	1135	93.06		57,800
	840807		93.75		66,700
	840807	1255	93.76		66,700

Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Trapper Creek S/C TR 2 (091.6S3 at RM 91.6)	841006		91.90		15,700
	840930		91.92		17,800
	840917		91.93		20,400
	840924		91.93		20,400
	840918	1635	91.95		20,900
	840913	1000	91.95		22,700
	840816	1715	92.00		44,000
	840822	1210	92.51		54,300
	840803	1600	92.69		54,700
	840819		92.69		57,200
	840721	1445	92.96		57,700
	840721	1710	93.00		57,700
	840722	1135	92.89		57,800
	840807		93.66		66,700
	840807	1255	93.68		66,700

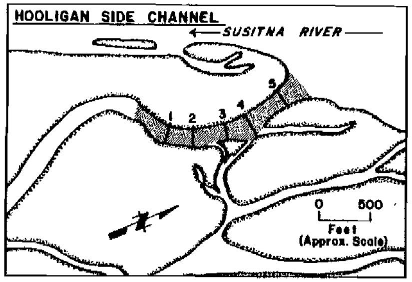
Attachment Table B-1. continued

Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Trapper Creek S/C TR 3	841009		92.12		15,000
(091.6S4 at RM 91.6)	841006		92.14		15,700
	840930		92.14		17,800
	840924		92.17		20,400
	840917		92.19		20,400
	840918	1600	92.18		20,900
	840913	1000	92.16		22,700
	840911	1510	92.14		23,500
	840816	1625	92.15		44,000
	840822	1205	92.82		54,300
	840803	1600	93.02		54,700
	840819		93.04		57,200
	840721	1220	93.22		57,700
	840721	1530	93.32		57,700
	840722	1135	93.26		57,800
	840807		94.06		66,700
	840807	1255	94.08		66,700

Attachment Table B-1. continued

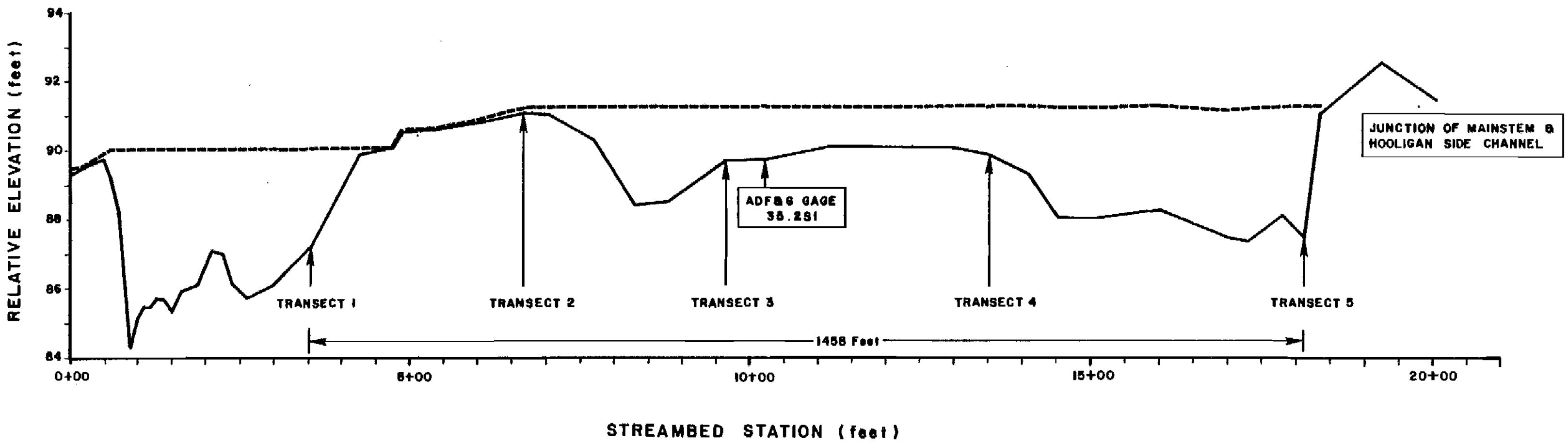
Location	Date	Time	WSEL (ft)	Streamflow (cfs)	Mainstem Discharge (cfs)
Trapper Creek S/C TR 4 (Q Site)	841009		92.50		15,000
(091.6S1 at RM 91.6)	841006		92.51		15,700
	840930		92.47		17,800
	840917		92.53		20,400
	840924		92.55		20,400
	840918	1625	92.60	15.9	20,900
	840913	1000	92.56	16.4	22,700
	840911	1150	92.56	17.8	23,500
	840911	1400	92.58		23,500
	840816	1445	92.70	31.4	44,000
	840822	0950	93.27		54,300
	840803		93.18		54,700
	840803	1500	93.42		54,700
	840708	1130	93.78	459.0	57,100
	840819		93.23		57,200
	840721	1310	93.63	389.0	57,700
	840721	1530	94.08		57,700
	840722	0935	93.61	372.0	57,800
	840722	1020	93.62		57,800
	840707	1530	93.89		58,800
	840707	1600	93.89		58,800
	840807		94.18		66,700
	840807	1115	94.21	867.8	66,700
	840624	1120	94.41		70,100
	840624	1500	94.75		70,100
	840825	1000	96.28	3158.8	93,300
	840825	1230	96.42		93,300

ATTACHMENT C

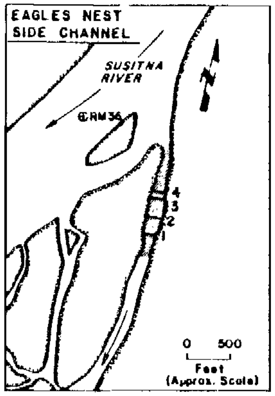


HOOLIGAN SIDE CHANNEL
THALWEG PROFILE

SURVEY DATE: 840925
WATER SURFACE ON SURVEY DATE: -----
ESTIMATED SITE FLOW: < 1.0 cfs
MAINSTEM DISCHARGE (SUNSHINE): 19,600 cfs
THALWEG GRADIENT: 8.9 feet/mile

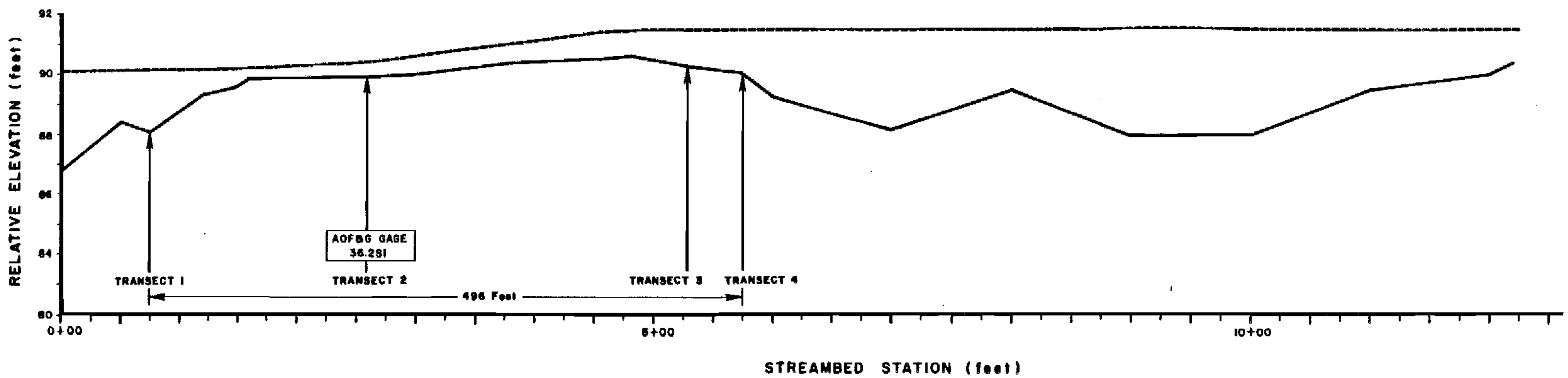


Attachment Figure C- 1. Thalweg profile of the study site at Hooligan Side Channel.

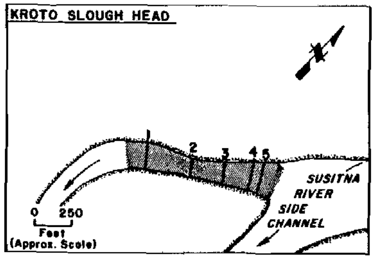


EAGLE'S NEST SIDE CHANNEL
THALWEG PROFILE

SURVEY DATE: 840926
WATER SURFACE ON SURVEY DATE: -----
MEASURED SITE FLOW: 21.2 cfs
MAINSTEM DISCHARGE (SUNSHINE): 19,000 cfs
THALWEG GRADIENT: 8.9 feet/mile

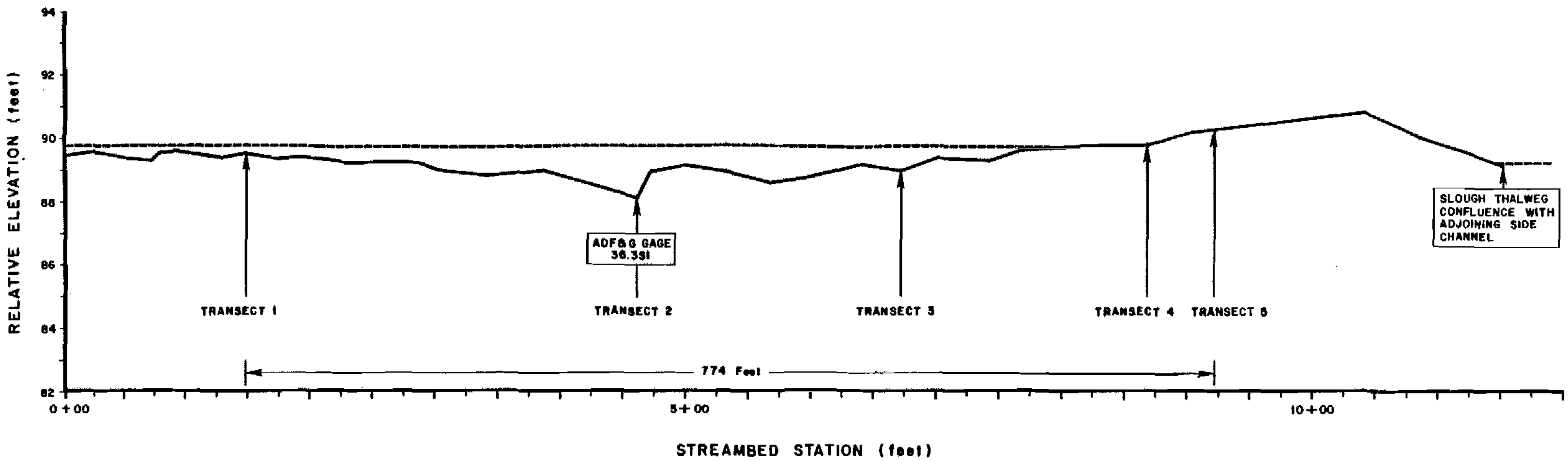


Attachment Figure C-2. Thalweg profile of the study site at Eagle's Nest Side Channel.

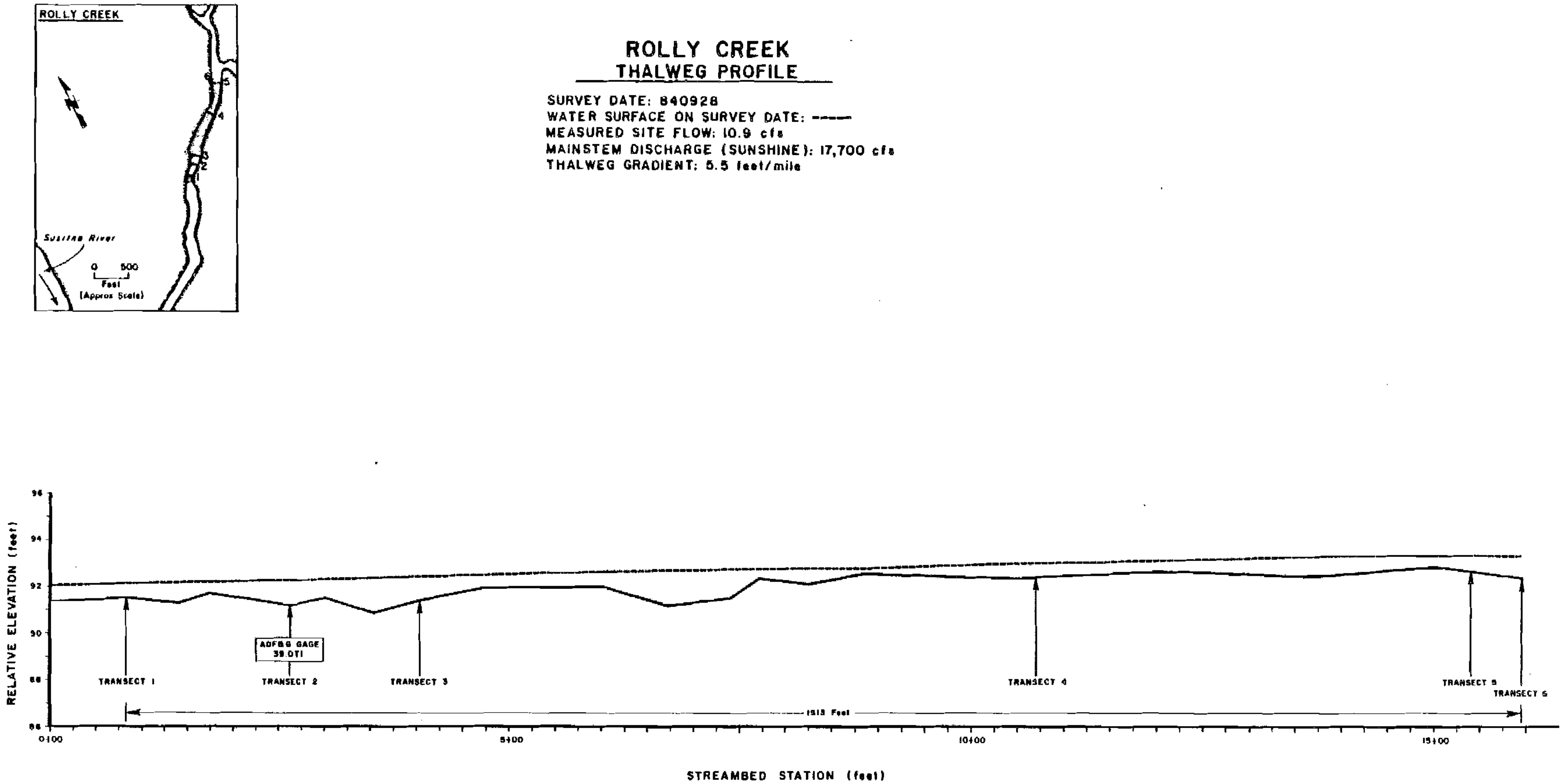


KROTO SLOUGH HEAD
THALWEG PROFILE

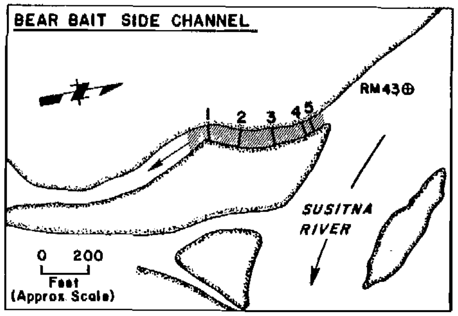
SURVEY DATE: 840925
WATER SURFACE ON SURVEY DATE: -----
MEASURED SITE FLOW: 0.0 cfs
MAINSTEM DISCHARGE (SUNSHINE): 19,600 cfs
THALWEG GRADIENT: 7.0 feet/mile



Attachment Figure C-3. Thalweg profile of the study site at Kroto Slough Head.

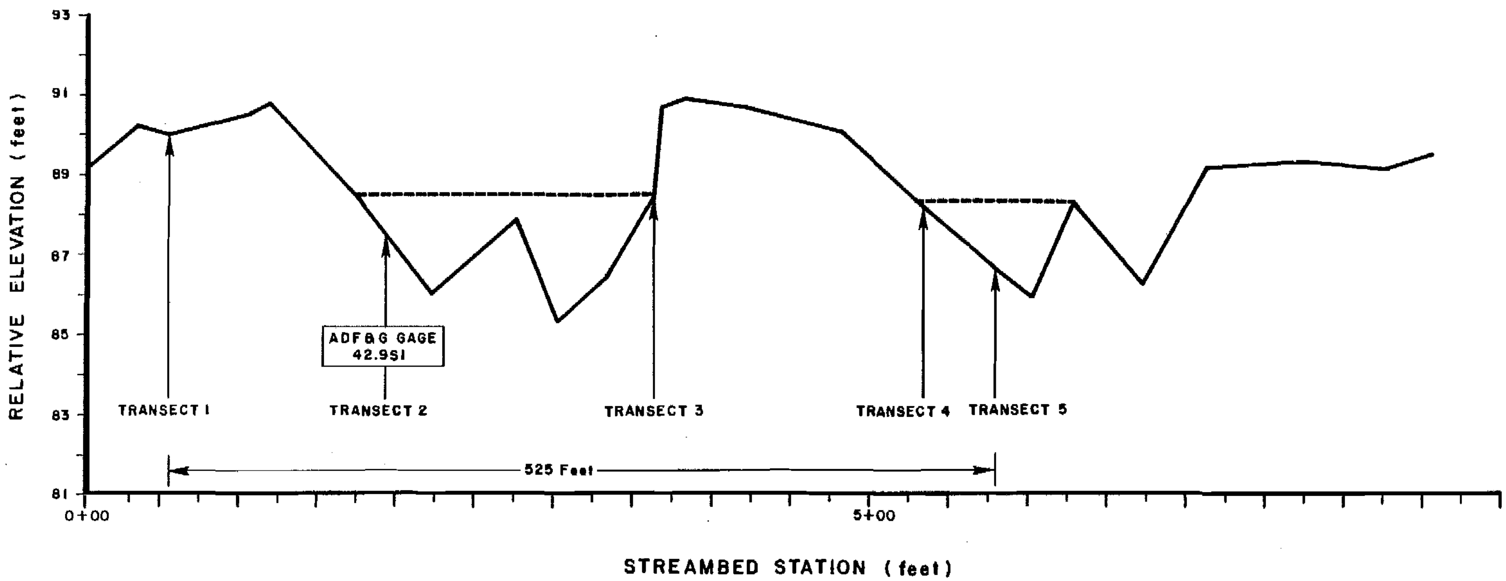


Attachment Figure C-4. Thalweg profile of the study site at Rolly Creek.

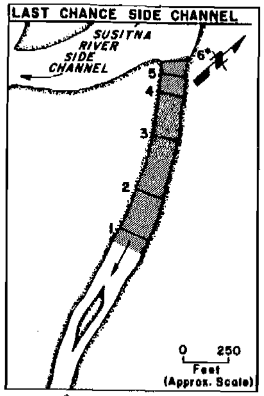


BEAR BAIT SIDE CHANNEL
THALWEG PROFILE

SURVEY DATE: 840927
WATER SURFACE ON SURVEY DATE: -----
MEASURED SITE FLOW: 0.0 cfs
MAINSTEM DISCHARGE (SUNSHINE): 18,300 cfs
THALWEG GRADIENT: 1.9 feet/mile



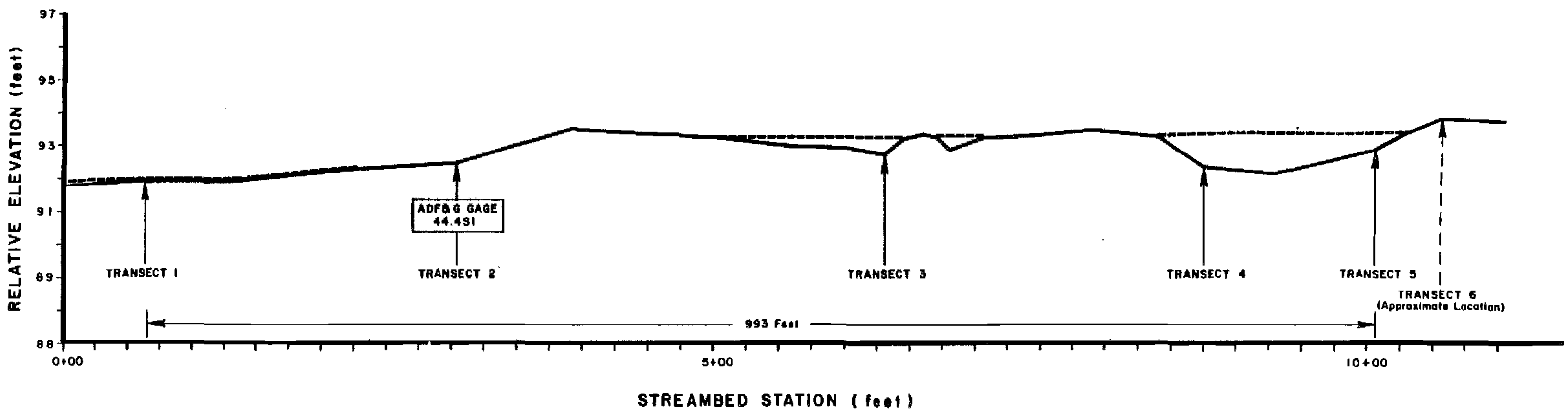
Attachment Figure C-5. Thalweg profile of the study site at Bear Bait Side Channel.



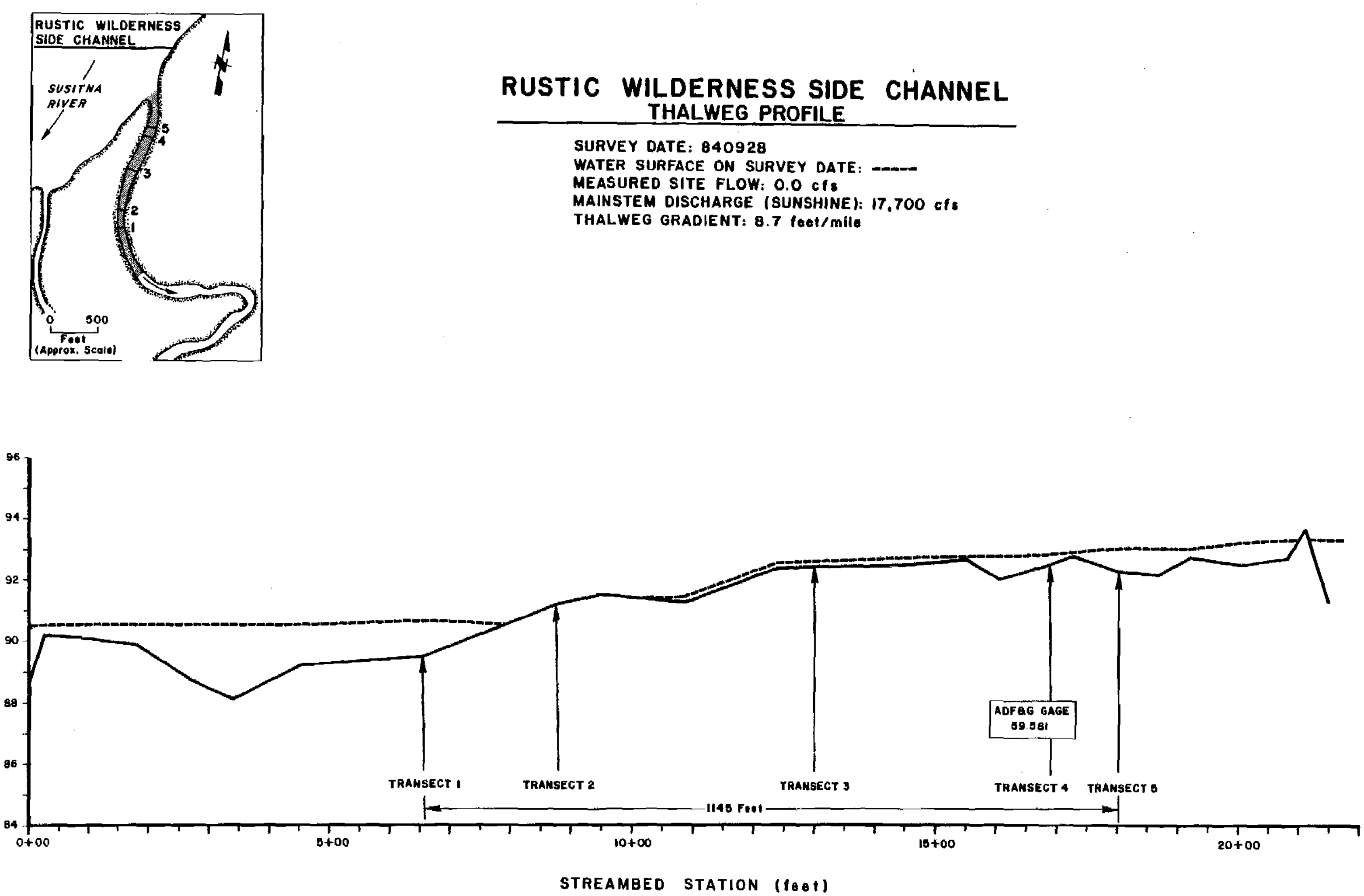
*TRANSECT 6 NOT INCLUDED IN THALWEG SURVEY

LAST CHANCE SIDE CHANNEL
THALWEG PROFILE

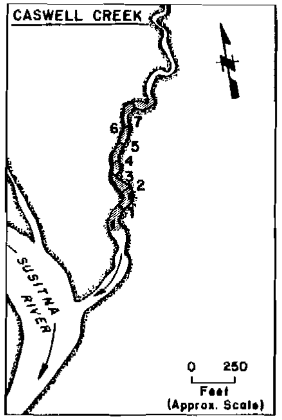
SURVEY DATE: 840927
WATER SURFACE ON SURVEY DATE: -----
MEASURED SITE FLOW: 0.0 cfs
MAINSTEM DISCHARGE (SUNSHINE): 18,300 cfs
THALWEG GRADIENT: 10.1 feet/mile



Attachment Figure C-6. Thalweg profile of the study site at Last Chance Side Channel.

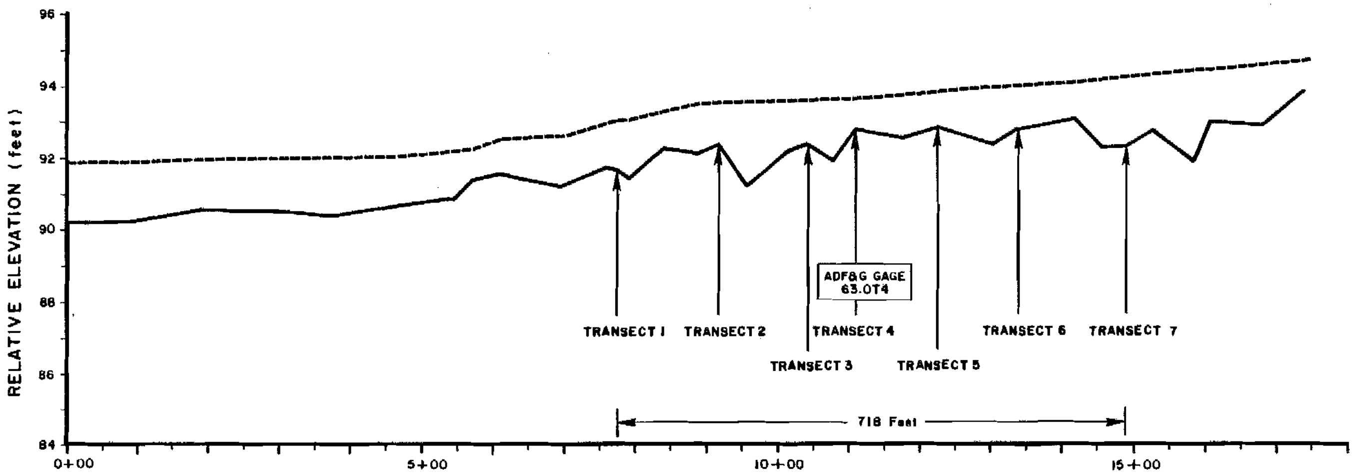


Attachment Figure C-7. Thalweg profile of the study site at Rustic Wilderness Side Channel.

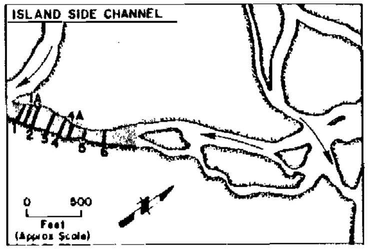


CASWELL CREEK
THALWEG PROFILE

SURVEY DATE: 841009
WATER SURFACE ON SURVEY DATE: -----
MEASURED SITE FLOW: 27.5 cfs
MAINSTEM DISCHARGE (SUNSHINE): 14,900 cfs
THALWEG GRADIENT: 10.8 feet/mile

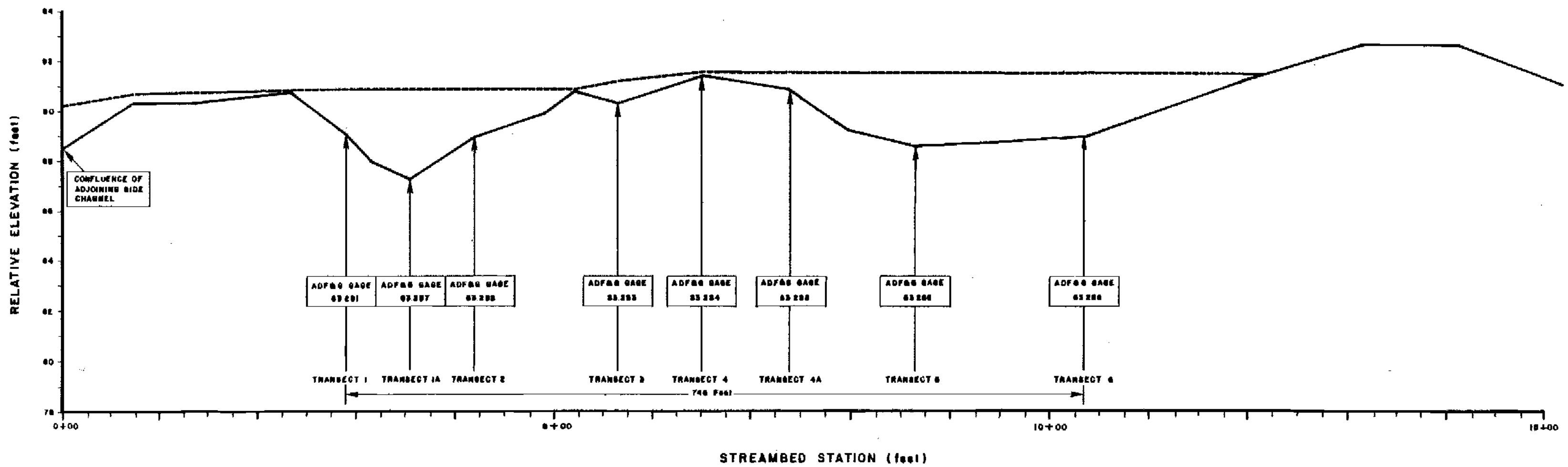


Attachment Figure C-8. Thalweg profile of the study site at Caswell Creek.

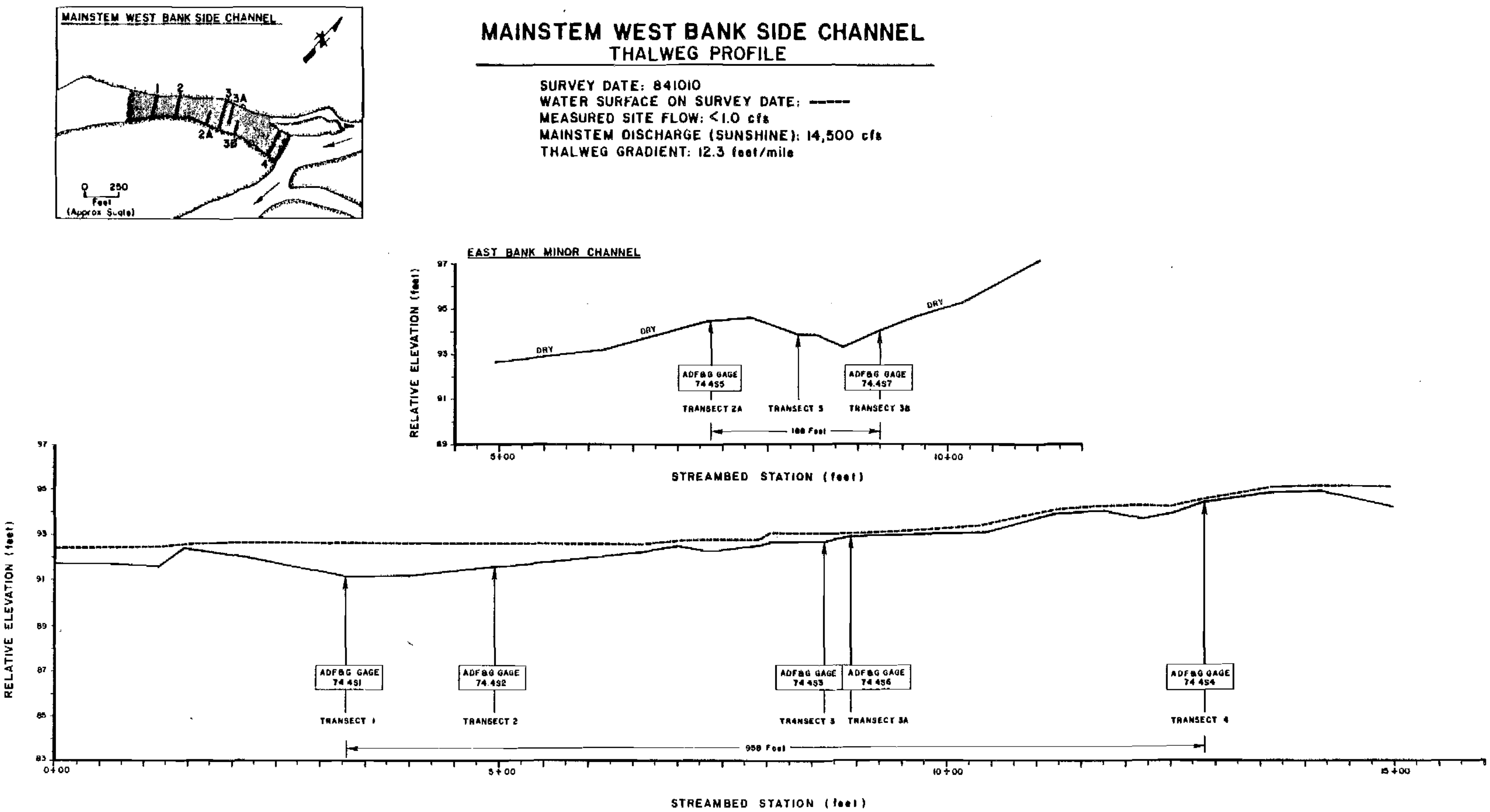


ISLAND SIDE CHANNEL
THALWEG PROFILE

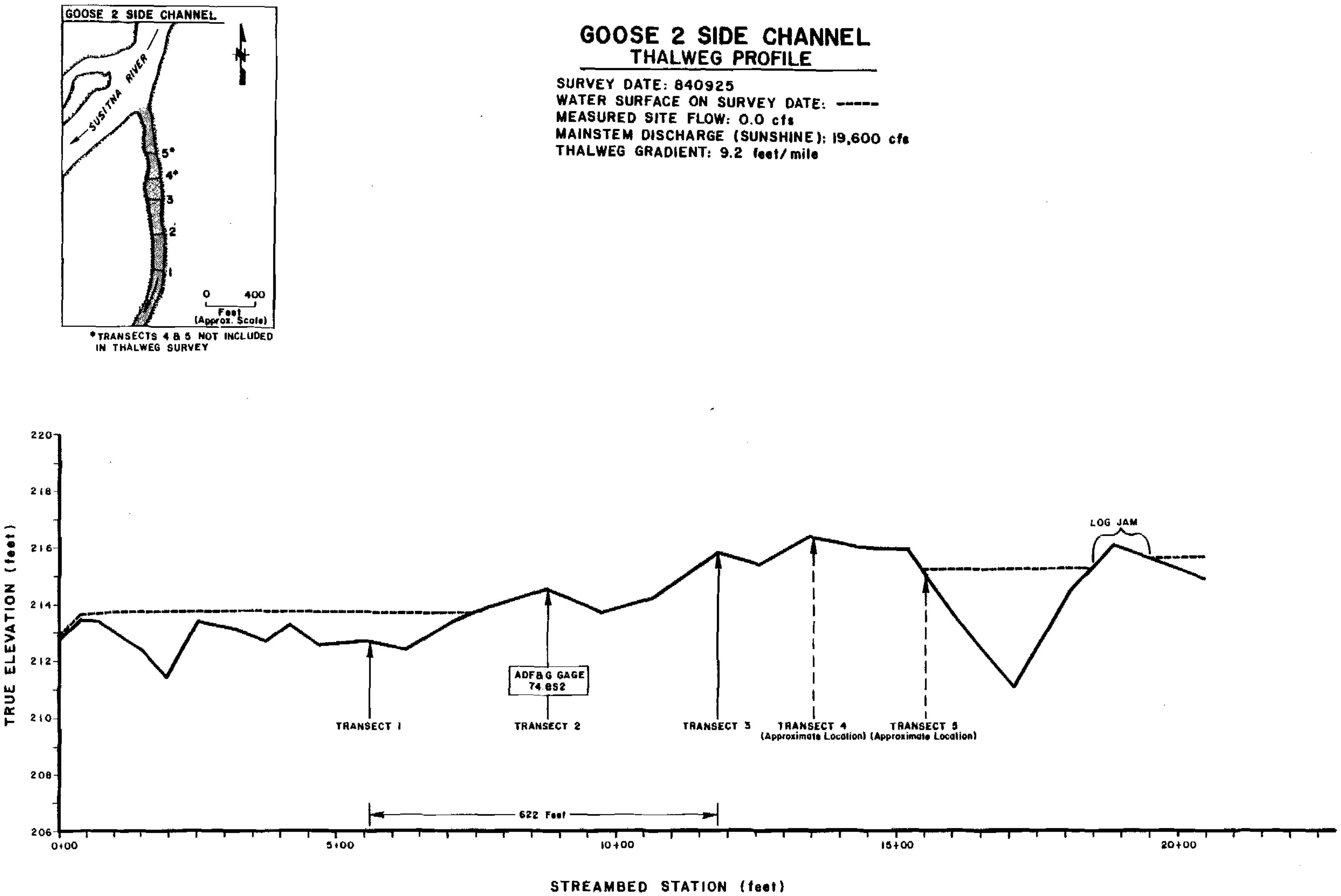
SURVEY DATE: 840930
WATER SURFACE ON SURVEY DATE: ------
ESTIMATED SITE FLOW: <1.0 cfs
MAINSTEM DISCHARGE (SUNSHINE): 17,800 cfs
THALWEG GRADIENT: 15.6 feet/mile



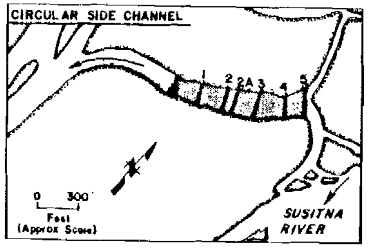
Attachment Figure C- 9. Thalweg profile of the study site at Island Side Channel.



Attachment Figure C- 10. Thalweg profile of the study site at Mainstem West Bank Side Channel.

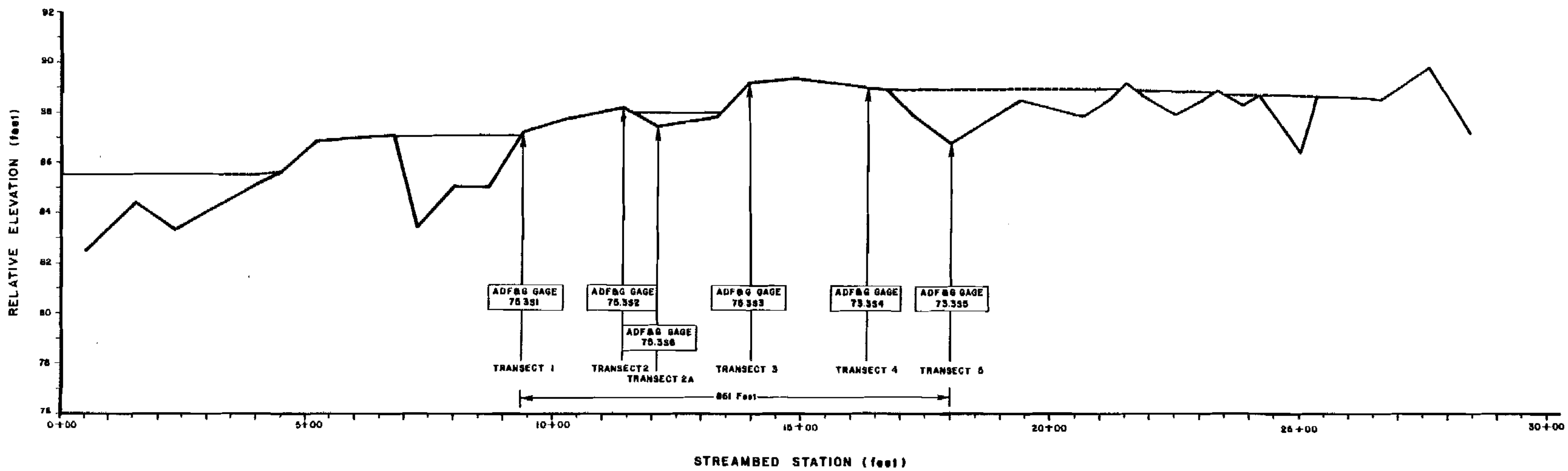


Attachment Figure C- 11. Thalweg profile of the study site at Goose 2 Side Channel.

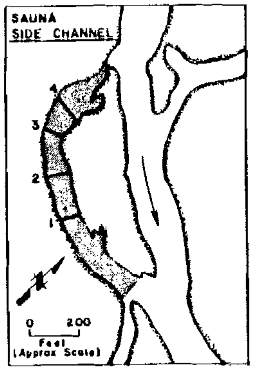


CIRCULAR SIDE CHANNEL
THALWEG PROFILE

SURVEY DATE: 841010
WATER SURFACE ON SURVEY DATE: ———
MEASURED SITE FLOW: 0.0 cfs
MAINSTEM DISCHARGE (SUNSHINE): 14,500 cfs
THALWEG GRADIENT: 14.3 feet/mile

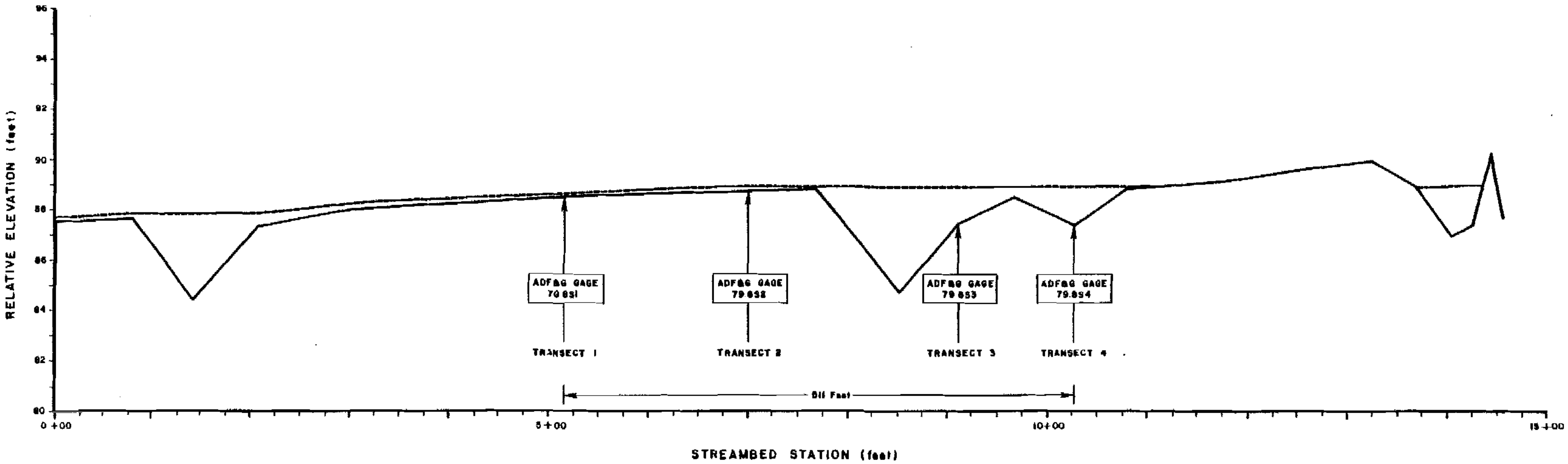


Attachment Figure C-12. Thalweg profile of the study site at Circular Side Channel.

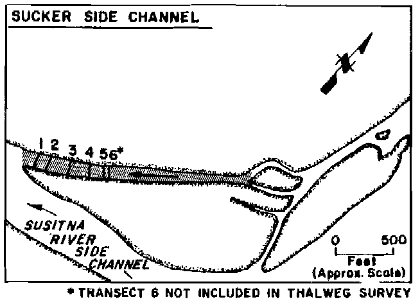


SAUNA SIDE CHANNEL
THALWEG PROFILE

SURVEY DATE: 841009
WATER SURFACE ON SURVEY DATE: -----
ESTIMATED SITE FLOW: <1.0 cfs
MAINSTEM DISCHARGE (SUNSHINE): 14,900 cfs
THALWEG GRADIENT: 10.4 feet/mile

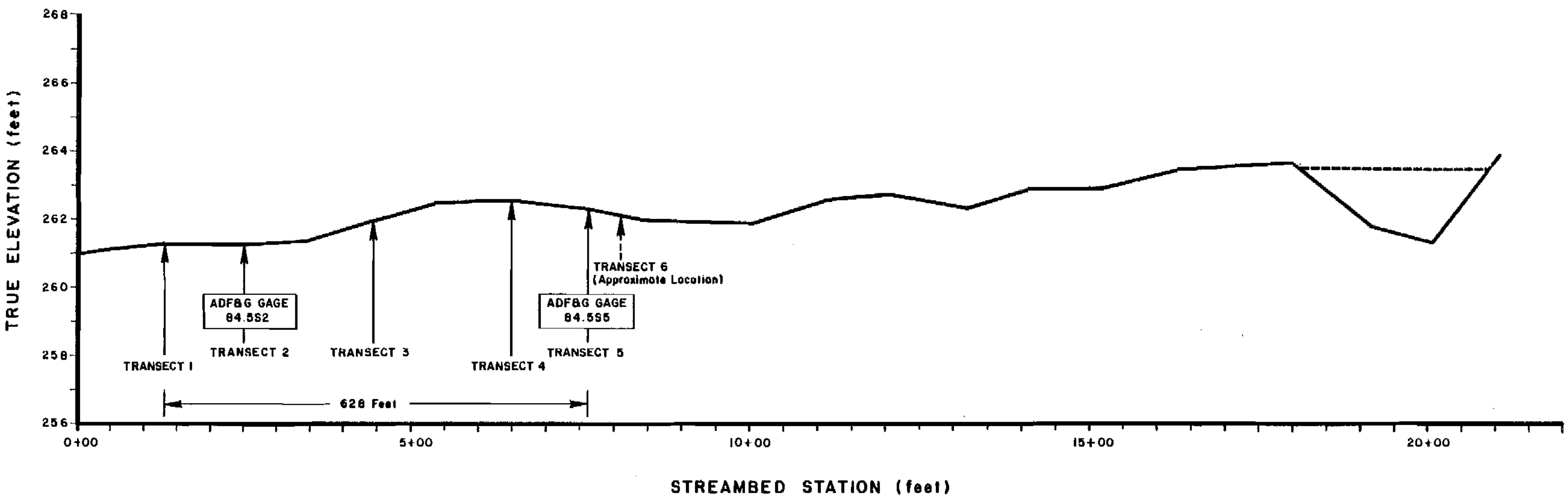


Attachment Figure C- 13. Thalweg profile of the study site at Sauna Side Channel.

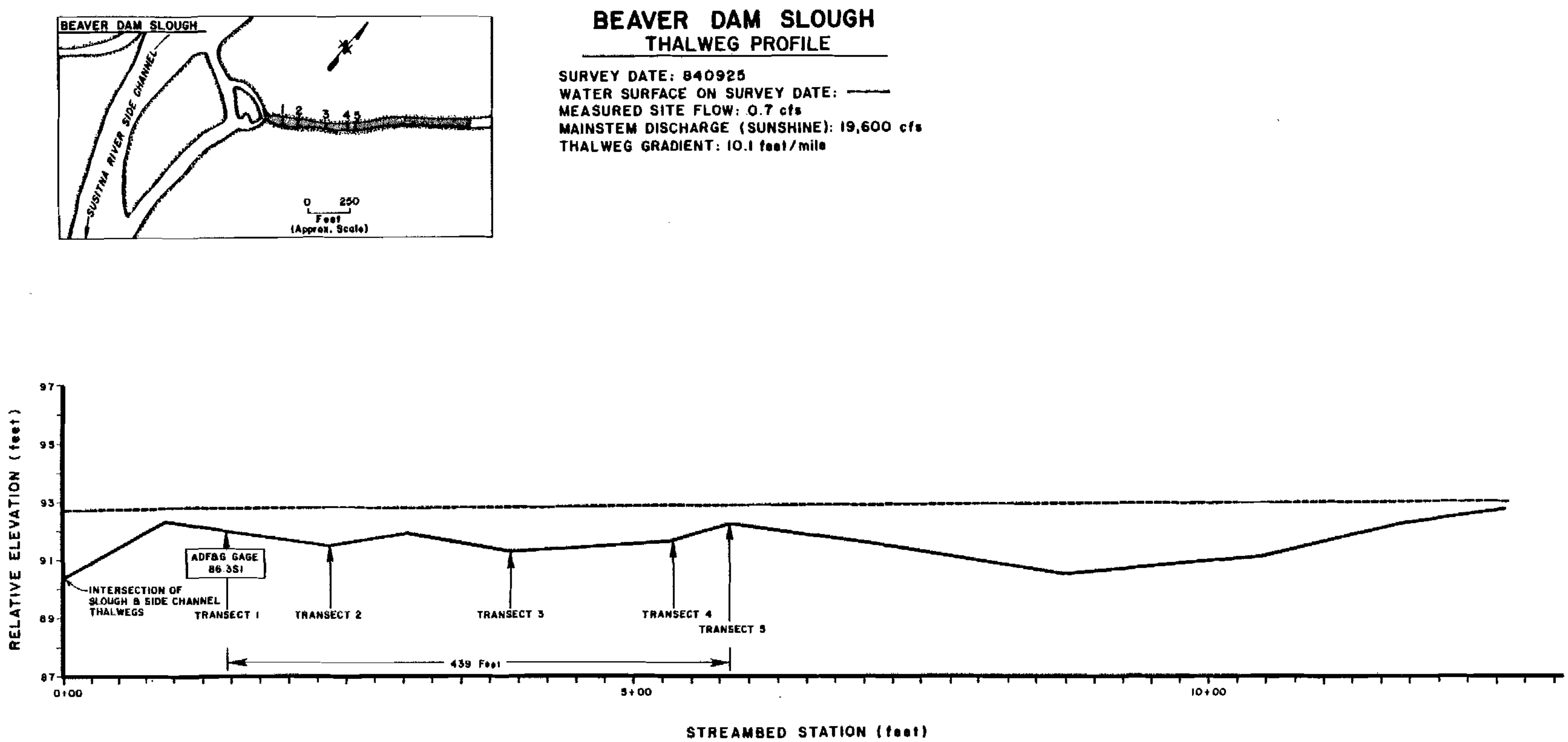


SUCKER SIDE CHANNEL
THALWEG PROFILE

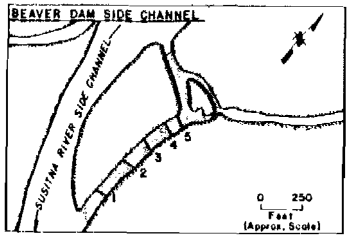
SURVEY DATE: 840926
WATER SURFACE ON SURVEY DATE: -----
MEASURED SITE FLOW: 0.0 cfs
MAINSTEM DISCHARGE (SUNSHINE): 19,000 cfs
THALWEG GRADIENT: 7.2 feet/mile



Attachment Figure C-14. Thalweg profile of the study site at Sucker Side Channel.

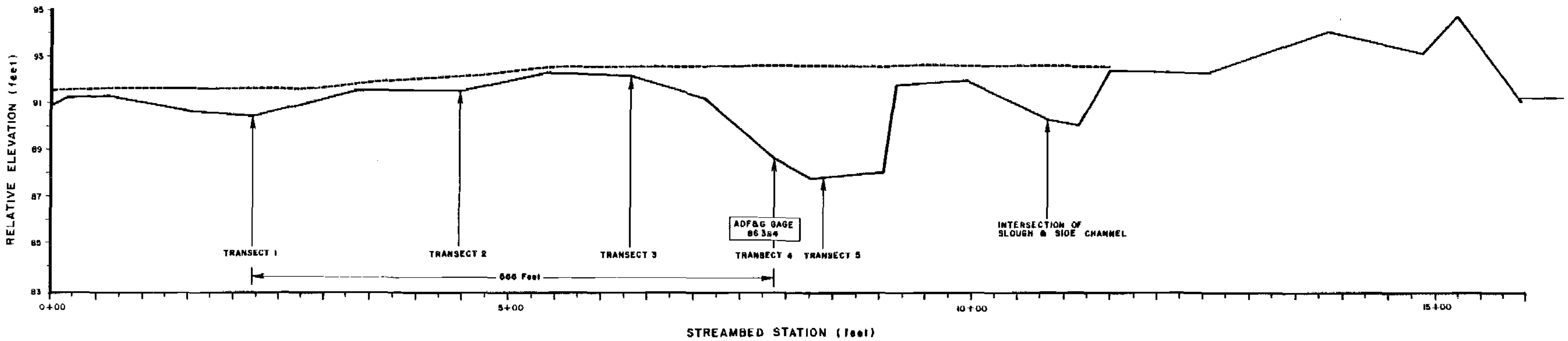


Attachment Figure C-15. Thalweg profile of the study site at Beaver Dam Slough.

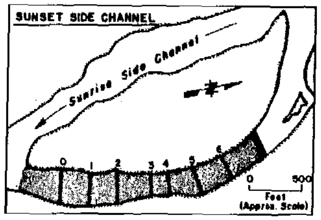


BEAVER DAM SIDE CHANNEL
THALWEG PROFILE

SURVEY DATE: 840925
WATER SURFACE ON SURVEY DATE: ——
MEASURED SITE FLOW: 0.5 cfs
MAINSTEM DISCHARGE (SUNSHINE): 19,600 cfs
THALWEG GRADIENT: 13.5 feet/mile

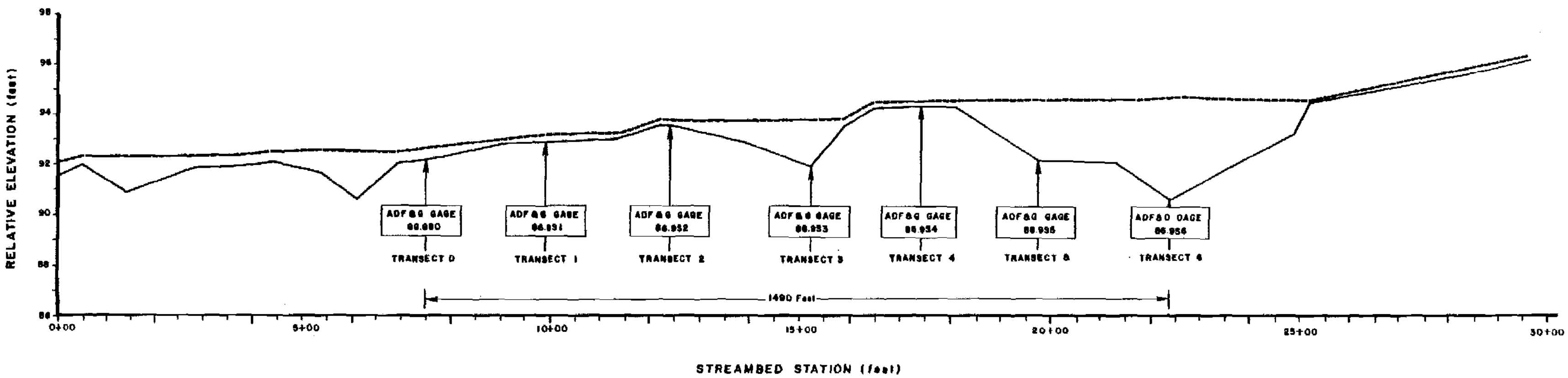


Attachment Figure C-16. Thalweg profile of the study site at Beaver Dam Side Channel.

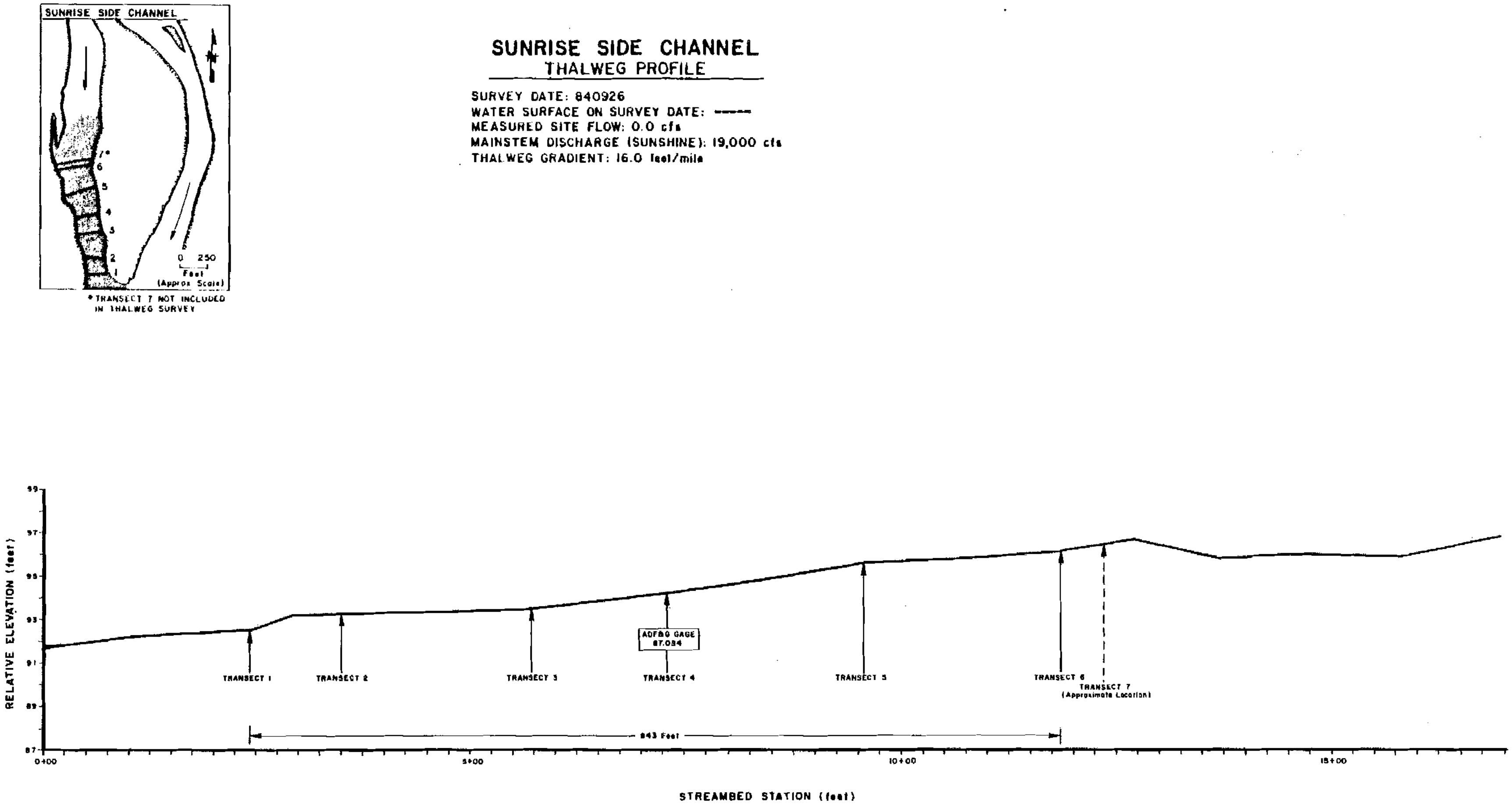


SUNSET SIDE CHANNEL
THALWEG PROFILE

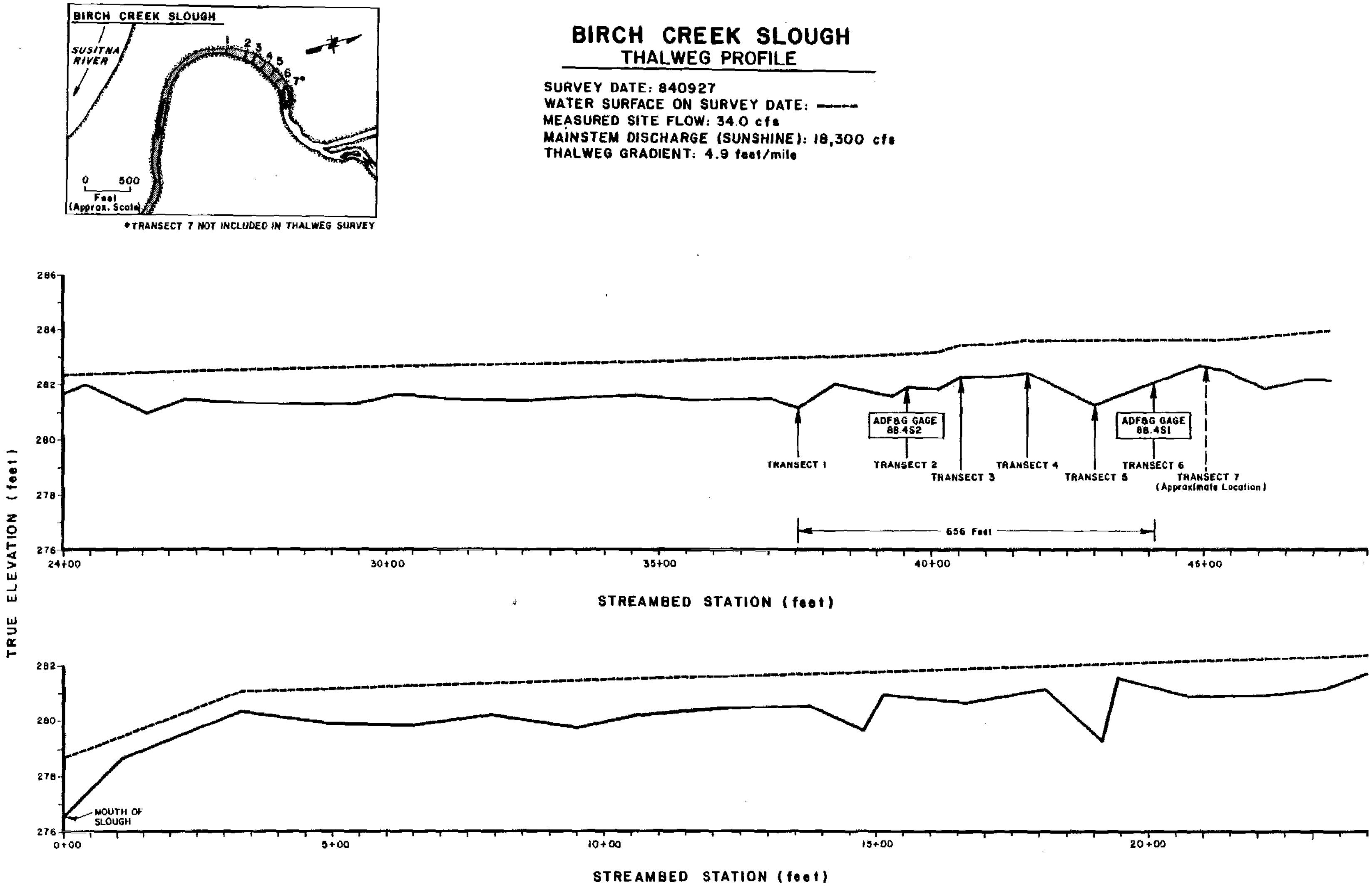
SURVEY DATE: 840929
WATER SURFACE ON SURVEY DATE: ———
MEASURED SITE FLOW: 1.01 cfs
MAINSTEM DISCHARGE (SUNSHINE): 17,400 cfs
THALWEG GRADIENT: 9.5 feet/mile



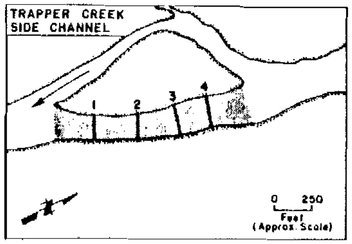
Attachment Figure C- 17. Thalweg profile of the study site at Sunset Side Channel.



Attachment Figure C- 18. Thalweg profile of the study site at Sunrise Side Channel.

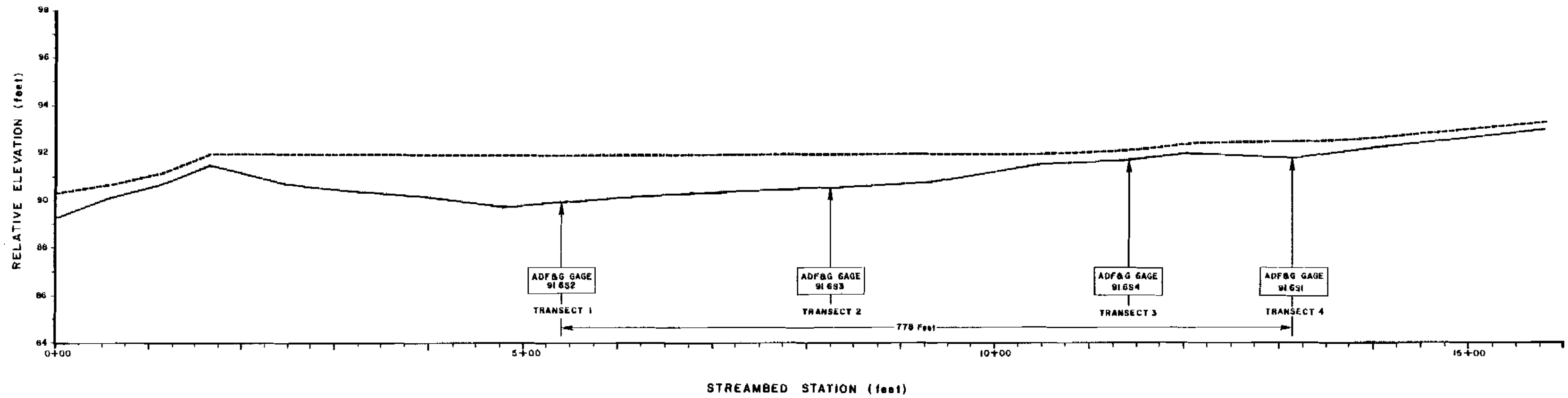


Attachment Figure C-19. Thalweg profile of the study site at Birch Creek Slough.



TRAPPER CREEK SIDE CHANNEL
THALWEG PROFILE

SURVEY DATE: 840913
WATER SURFACE ON SURVEY DATE: -----
MEASURED SITE FLOW: 16.4 cfs
MAINSTEM DISCHARGE (SUNSHINE): 22,700 cfs
THALWEG GRADIENT: 12.1 feet/mile



Attachment Figure C-20. Thalweg profile of the study site at Trapper Creek Side Channel.

Attachment Table C-1. Thalweg profile data obtained at Hooligan Side Channel (RM 35.2).

Date: 840925
Time Start: 1420 End: 1640

Gage No.: 35.2S1B
Gage Reading Start: 1.50 End: 1.50

Site Flow: 0.0 (cfs)[a]
USGS Discharge: 19,600 (cfs)[b]

TBM: ADF&G 30.2S1 LB 840711

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
0+00	89.31	89.46	
0+20	89.53	89.57	
0+48	89.77	89.92	
0+60	89.20	90.04	
0+72	88.26	90.04	
0+88	84.27	90.05	
0+99	85.11	90.07	
1+09	85.46	90.04	
1+19	85.46	90.05	
1+29	85.72	90.05	
1+39	85.67	90.05	
1+51	85.34	90.03	
1+64	85.89	90.01	
1+89	86.09	90.03	
2+09	87.06	90.06	
2+27	86.98	90.03	
2+39	86.17	90.06	
2+61	85.72	90.04	
3+00	86.14	90.04	
3+54	87.22	90.04	Transect 1
4+26	89.86	90.03	
4+73	90.05	90.13	
4+89	90.54	90.63	
5+35	90.60	90.65	

[a] Estimated streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-1 (Continued).

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[a] (ft)	DESCRIPTION
6+00	90.83	90.88	
6+67	91.10	91.25	Transect 2
7+02	91.06	91.23	
7+71	90.35	91.30	
8+32	88.43	91.28	
8+79	88.55	91.27	
9+62	89.74	91.27	Transect 3 staff gage 35.2S1
10+21	89.73	91.29	
11+21	90.15	91.27	
12+97	90.07	91.26	
13+53	88.92	91.26	Transect 4
14+10	88.35	91.27	
14+53	88.07	91.27	
15+00	88.03	91.29	
16+00	88.28	91.31	
17+00	87.51	91.20	
17+30	87.38	91.27	
17+80	88.15	91.28	
18+12	87.48	91.28	Transect 5
18+35	91.11	91.26	
19+25	92.57	DRY	
20+04	91.51	DRY	Junction with mainstem

[a] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-2. Thalweg profile data obtained at Eagle's Nest Side Channel (RM 36.2)

Date: 840926
Time Start: 1050 End: 1230

Gage No.: 36.2S1C
Gage Reading Start: 0.52 End: 0.52

Site Flow: 21.2 (cfs)[a]
USGS Discharge: 19,000 (cfs)[b]

TBM: ADF&G 36.2S1 LB 840917

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
0+00	86.81	90.12	
0+50	88.42	90.11	
0+76	88.06	90.12	Transect 1
1+20	89.34	90.18	
1+47	89.56	90.20	
1+61	89.85	90.23	
2+59	89.87	90.40	Transect 2 staff gage 36.2S1
3+00	90.02	90.65	
3+80	90.42	91.02	
4+54	90.54	91.44	
4+80	90.64	91.46	
5+28	90.28	91.52	Transect 3
5+72	90.08	91.50	Transect 4
6+00	89.28	91.54	
7+00	88.19	91.54	
8+00	89.51	91.55	
9+00	87.99	91.57	
10+00	88.02	91.56	
11+00	89.49	91.53	
12+00	90.03	91.56	
12+20	90.39	91.53	

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-3. Thalweg profile data obtained at Kroto Slough Head (RM 36.3).

Date: 840925
Time Start: 1000 End: 1150

Gage No.: 36.3S1C
Gage Reading Start: 0.72 End: 0.73

Site Flow: 0.0[a]
USGS Discharge: 19,600 (cfs)[b]

TBM: ADF&G 36.3S1 LB 840711

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
0+00	89.46	89.76	
0+10	89.55	89.75	
0+23	89.60	89.74	
0+50	89.40	89.76	
0+70	89.31	89.77	
0+77	89.55	89.77	
0+91	89.59	89.79	
1+00	89.56	89.75	
1+10	89.52	89.72	
1+27	89.42	89.78	
1+47	89.56	89.76	Transect 1
1+73	89.36	89.75	
1+88	89.42	89.74	
2+11	89.35	89.75	
2+30	89.22	89.74	
2+57	89.27	89.75	
2+86	89.25	89.75	
3+00	89.03	89.75	
3+40	88.85	89.76	
3+83	88.98	89.74	
4+60	88.16	89.76	Transect 2 staff gage 36.3S1
4+70	88.95	89.75	
5+00	89.14	89.76	
5+30	88.98	89.74	

a Estimated streamflow at time of the thalweg measurement.

b Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

c Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-3 (Continued).

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[a] (ft)	DESCRIPTION
5+65	88.60	89.76	
5+90	88.71	89.75	
6+14	88.90	89.76	
6+40	89.19	89.75	
6+70	88.94	89.74	Transect 3
7+00	89.36	89.75	
7+41	89.26	89.74	
7+68	89.61	89.77	
8+15	89.76	89.77	
8+60	89.79	DRY	
8+66	89.80	DRY	Transect 4
9+01	90.20	DRY	
9+21	90.29	DRY	Transect 5
10+41	90.84	DRY	
10+83	90.04	DRY	
11+18	89.63	DRY	
11+51	89.16	89.21	Junction with side channel

[a] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-4. Thalweg profile data obtained at Rolly Creek (RM 39.0).

Date: 840928
Time Start: 1155 End: 1330

Gage No.: 39.0T1C
Gage Reading Start: 1.17 End: 1.16

Site Flow: 10.9 (cfs)[a]
USGS Discharge: 17,700 (cfs)[b]

TBM: ADF&G 39.0T1 LB 840710

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
0+00	91.35	92.05	
0+82	91.54	92.12	Transect 1
1+40	91.29	92.18	
1+74	91.72	92.21	
2+62	91.18	92.30	Transect 2 staff gage 39.0T1
3+00	91.49	92.35	
3+54	90.84	92.43	
4+02	91.39	92.44	Transect 3
4+74	91.96	92.50	
5+74	91.99	92.63	
6+00	92.00	92.62	
6+72	91.17	92.65	
7+40	91.51	92.70	
7+71	92.36	92.71	
8+27	92.13	92.78	
8+88	92.58	92.78	
9+00	92.54	92.83	
9+80	92.41	92.93	
10+56	92.37	93.02	
10+70	92.42	93.02	Transect 4
11+60	92.59	93.15	
12+00	92.65	93.17	
12+74	92.58	93.21	
13+70	92.44	93.29	
15+00	92.90	93.38	
15+40	92.66	93.37	Transect 5
15+95	92.39	93.35	Transect 6

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-5. Thalweg profile data obtained at Bear Bait Side Channel (RM 42.9).

Date: 840927
Time Start: 1030 End: 1200

Gage No.: 42.9S1
Gage Reading Start: Dry End: Dry

Site Flow: 0.0 (cfs)[a]
USGS Discharge: 18,300 (cfs)[b]

TBM: ADF&G 42.9S1 LB 840710

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
0+00	89.22	DRY	
0+33	90.22	DRY	
0+52	89.99	DRY	Transect 1
1+03	90.53	DRY	
1+17	90.81	DRY	
1+72	88.49	88.51	
1+90	87.44	88.49	Transect 2 staff gage 42.9S1
2+20	86.01	88.50	
2+75	87.89	88.49	
3+00	85.34	88.51	
3+30	86.38	88.49	
3+58	88.48	88.50	Transect 3
3+65	90.68	DRY	
3+80	90.94	DRY	
4+21	90.71	DRY	
4+80	90.03	DRY	
5+28	88.30	88.32	Transect 4
5+77	86.66	88.34	Transect 5
6+00	85.92	88.32	
6+27	88.25	88.27	
6+70	86.27	DRY	
7+10	89.17	DRY	
7+70	89.32	DRY	
8+23	89.15	DRY	
8+54	89.53	DRY	

[a] Estimated streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-6. Thalweg profile data obtained at Last Chance Side Channel (RM 44.4).

Date: 840927
Time Start: 1300 End: 1430

Gage No.: 44.4S1
Gage Reading Start: Dry End: Dry

Site Flow: 0.0 (cfs)[a]
USGS Discharge: 18,300 (cfs)[b]

TBM: ADF&G 44.4S1 LB 840725 USGS

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
0+00	91.78	91.97	
0+63	91.94	91.99	Transect 1
1+30	91.96	92.01	
2+27	92.34	92.38	
3+04	92.57	DRY	Transect 2 staff gage 44.4S1
3+93	93.58	DRY	
5+00	93.26	93.28	
6+60	93.03	93.28	
6+00	92.97	93.27	
6+32	92.76	93.26	Transect 3
6+46	93.24	93.28	
6+63	93.36	DRY	
6+71	93.27	93.29	
6+81	92.88	93.28	
7+07	93.23	93.26	
7+40	93.26	DRY	
7+90	93.48	DRY	
8+40	93.29	93.31	
8+77	92.41	93.35	Transect 4
9+30	92.15	93.36	
10+06	92.91	93.36	Transect 5
10+31	93.37	93.39	
10+56	93.80	DRY	Transect 6
11+06	93.67	DRY	

[a] Estimated streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-7. Thalweg profile data obtained at Rustic Wilderness Side Channel (RM 59.5).

Date: 840928
Time Start: 1020 End: 1300

Gage No.: 59.5S1B
Gage Reading Start: Dry End: Dry

Site Flow: 0.0 (cfs)[a]
USGS Discharge: 17,700 (cfs)[b]

TBM: ADF&G 59.5S1 RB 840712

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
0+00	88.61	90.55	
0+26	90.24	90.54	
0+83	90.19	90.55	
1+86	89.90	90.55	
2+69	88.82	90.56	
3+42	88.15	90.55	
4+53	89.24	90.55	
6+52	89.54	90.74	Transect 1
7+74	90.45	90.56	
8+74	91.24	DRY	Transect 2
9+52	91.56	DRY	
10+84	91.28	92.09	
12+35	92.42	92.61	
12+98	92.46	92.61	Transect 3
13+82	92.48	92.67	
14+53	92.56	92.81	
15+50	92.67	92.83	
16+07	92.11	92.82	
16+86	92.57	92.83	Transect 4 staff gage 59.5S1
17+22	92.78	93.00	
17+97	92.32	93.05	Transect 5
18+65	92.21	93.02	
19+17	92.76	93.01	
20+00	92.49	93.32	
20+77	92.73	93.28	
21+08	93.67	DRY	
21+44	91.34	93.33	

[a] Estimated streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-8. Thalweg profile data obtained at Caswell Creek (RM 63.0).

Date: 841009
Time Start: 0930 End: 1140

Gage No.: 63.0T4A
Gage Reading Start: 1.16 End: 1.16

Site Flow: 27.5 (cfs)[a]
USGS Discharge: 14,900 (cfs)[b]

TBM: ADF&G Caswell Cr. TR 4 LB 840711

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	90.24	91.86	
00+85	90.21	91.82	
01+90	90.57	91.96	
02+86	90.48	91.91	
03+75	90.38	92.00	
04+59	90.64	91.96	
05+45	90.85	92.14	
05+72	91.35	92.21	
06+11	91.55	92.48	
06+96	91.18	92.59	
07+60	91.73	92.93	
07+74	91.63	93.01	Transect 1
07+92	91.41	92.98	
08+41	92.23	93.26	
08+87	92.10	93.46	
09+17	92.32	93.47	Transect 2
09+56	91.17	93.47	
10+12	92.13	93.53	
10+43	92.36	93.58	Transect 3
10+79	91.87	93.58	
11+11	92.76	93.57	Transect 4 staff gage 63.0T4
11+75	92.53	93.73	
12+25	92.78	93.78	Transect 5
13+02	92.33	93.91	
13+39	92.73	93.87	Transect 6
14+19	93.06	94.03	
14+56	92.24	94.14	

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-8 (Continued).

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[a] (ft)	DESCRIPTION
14+92	92.25	94.19	Transect 7
15+29	92.70	94.25	
15+85	91.85	94.38	
16+08	92.96	94.40	
16+83	92.85	94.54	
17+39	93.81	94.66	

[a] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-9. Thalweg profile data obtained at Island Side Channel (RM 63.2).

Date: 840930
Time Start: 1000 End: 1115

Gage No.: 63.2S6B
Gage Reading Start: Dry End: Dry

Site Flow: 1.0 (cfs)[a]
USGS Discharge: 17,800 (cfs)[b]

TBM: ADF&G Island TBM RB 1984

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	88.47	90.22	
00+73	90.27	90.73	
01+38	90.30	90.75	
02+34	90.70	90.82	
02+90	89.10	90.86	Transect 1 staff gage 63.2S1
03+15	87.97	90.89	
03+54	87.30	90.93	Transect 1A staff gage 63.2S7
04+22	89.00	90.88	Transect 2 staff gage 63.2S2
04+90	89.79	90.89	
05+20	90.80	90.87	
05+67	90.30	91.23	Transect 3 staff gage 63.2S3
06+50	91.40	91.56	Transect 4 staff gage 63.2S4
07+38	90.91	91.56	Transect 4A staff gage 63.2S8
07+97	89.22	91.56	
08+64	88.60	91.57	Transect 5 staff gage 63.2S5
09+37	88.72	91.55	
10+37	89.02	91.54	Transect 6 staff gage 63.2S6
11+94	91.22	91.54	
13+15	92.65	DRY	
14+13	92.64	DRY	
15+18	91.07	92.22	

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-10. Thalweg profile data obtained at Mainstem West Bank Side Channel.

Date: 841010
Time Start: 1235 End: 1415

Gage No.: 74.4S1B
Gage Reading Start: Dry End: Dry

Site Flow: 1.0 (cfs)[a]
USGS Discharge: 14,700 (cfs)[b]

TBM: ADF&G Mainstem West Bank TBM RB 840915

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	91.73	92.43	Begin main channel
00+64	91.71	92.44	
01+18	91.59	92.46	
01+46	92.43	92.61	
02+18	91.99	92.62	
03+29	91.10	92.64	Transect 1 staff gage 74.4S1
03+98	91.25	92.62	
04+95	91.60	92.63	Transect 2 staff gage 74.4S2
05+74	91.88	92.63	
06+58	92.25	92.62	
07+00	92.50	92.76	
07+38	92.37	92.79	
07+90	92.51	92.78	
08+06	92.78	93.04	
08+64	92.71	93.03	Transect 3 staff gage 74.4S3
09+07	93.00	93.05	Transect 3A staff gage 74.4S6
09+84	93.08	93.29	
10+44	93.10	93.46	
11+18	93.90	94.10	
11+78	94.12	94.34	
12+19	93.74	94.34	
12+52	94.09	94.32	
12+87	94.52	94.63	Transect 4 staff gage 74.4S4
13+56	94.90	95.15	
14+17	95.04	95.25	
14+97	94.32	95.28	End main channel

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-10 (Continued).

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
04+95	92.64	DRY	Begin east channel
06+14	93.16	DRY	
07+36	94.50	DRY	Transect 2A staff gage 74.4S5
07+82	94.63	DRY	
08+33	93.90	DRY	Transect 3
08+56	93.86	DRY	
08+84	93.28	DRY	
09+24	93.90	DRY	Transect 3B staff gage 74.4S7
09+61	94.60	DRY	
10+19	95.36	DRY	
11+02	97.16	DRY	Begin east channel

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-11. Thalweg profile data obtained at Goose 2 Side Channel (RM 79.8).

Date: 840925
Time Start: 1000 End: 1300

Gage No.: 74.8S2B
Gage Reading Start: Dry End: Dry

Site Flow: 0.0 (cfs)[a]
USGS Discharge: 19,600 (cfs)[b]

TBM: GOOSE 2 TR2 RB 1984

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	212.00	212.90	
00+05	212.89	213.00	
00+37	213.49	213.60	
00+72	213.42	213.73	
01+50	212.41	213.70	
01+95	211.40	213.62	
02+50	213.41	213.69	
03+19	213.10	213.68	
03+71	212.70	213.69	
04+16	213.31	213.71	
04+69	212.59	213.69	
05+60	212.71	213.69	Transect 1
06+24	212.40	213.69	
07+09	213.41	213.68	
07+72	213.92	DRY	
08+77	214.53	DRY	Transect 2 staff gage 74.8S2
09+73	213.72	DRY	
10+66	214.23	DRY	
11+82	215.85	DRY	Transect 3
12+53	215.40	DRY	
13+45	216.39	DRY	
14+38	216.00	DRY	
15+21	215.93	DRY	
15+99	213.75	215.27	
17+08	211.10	215.27	
18+08	214.49	215.27	
18+84	216.16	DRY	
20+46	214.91	215.74	Junction with mainstem

[a] Estimated streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-12. Thalweg profile data obtained at Circular Side Channel (RM 75.3).

Date: 841010
Time Start: 0900 End: 1140

Gage No.: 75.351B
Gage Reading Start: Dry End: Dry

Site Flow: 0.0 (cfs)[a]
USGS Discharge: 14,500 (cfs)[b]

TBM: ADF&G Circular TBM RB 840824

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	82.57	85.52	
00+53	82.52	85.51	
01+54	84.44	85.54	
02+35	83.36	85.52	
04+02	85.17	85.50	
04+50	85.64	85.66	
05+21	86.87	DRY	
06+80	87.15	DRY	
07+26	83.46	87.16	
07+97	85.12	87.16	
08+70	85.10	87.14	
09+39	87.30	DRY	Transect 1 staff gage 75.3S1
10+34	87.86	DRY	
11+41	88.32	DRY	Transect 2 staff gage 74.3S2
12+10	87.52	88.06	Transect 2A staff gage 74.3S6
13+29	87.88	88.08	
13+95	89.30	DRY	Transect 3 staff gage 75.3S3
14+90	89.48	DRY	
16+33	89.13	DRY	Transect 4 staff gage 75.3S4
16+70	89.04	DRY	
17+20	88.04	89.04	
18+00	86.90	89.04	Transect 5 staff gage 74.3S5
19+37	88.61	89.05	
20+65	88.00	89.17	
21+14	88.63	89.14	
21+51	89.35	DRY	
21+82	88.85	89.06	
22+49	88.13	89.07	
22+98	88.62	89.04	
23+34	89.08	DRY	
23+84	88.53	88.93	

[a] Estimated streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-12 (Continued).

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[a] (ft)	DESCRIPTION
24+17	88.93	DRY	
24+70	87.47	88.90	
25+00	86.64	88.90	
25+32	88.84	88.94	
25+95	88.86	DRY	
26+62	88.76	DRY	
27+56	90.06	DRY	

[a] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-13. Thalweg profile data obtained at Sauna Side Channel (RM 79.8).

Date: 841009
Time Start: 1320 End: 1500

Gage No.: 79.8S2B
Gage Reading Start: Dry End: Dry

Site Flow: 1.0 (cfs)[a]
USGS Discharge: 15,000 (cfs)[b]

TBM: ADF&G Sauna TBM LB 840823

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	87.49	87.67	
00+79	87.68	87.87	
01+43	84.44	87.84	
02+09	87.43	87.86	
03+05	88.06	88.28	
03+99	88.31	88.51	
05+16	88.60	88.75	Transect 1 staff gage 79.8S1
06+21	88.70	88.90	
06+99	88.83	89.00	Transect 2 staff gage 78.8S2
07+68	88.87	89.00	
08+54	84.79	88.99	
09+09	87.48	88.90	Transect 3 staff gage 79.8S3
09+68	88.57	88.92	
10+27	87.50	89.02	Transect 4 staff gage 79.8S4
10+80	88.94	89.00	
11+76	89.20	DRY	
12+59	89.74	DRY	
13+25	90.00	DRY	
13+69	88.98	DRY	
14+06	87.01	89.16	
14+28	87.56	89.02	
14+45	90.33	DRY	
14+57	87.79	88.84	Junction with side channel

[a] Estimated streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-14. Thalweg profile data obtained at Sucker Side Channel (RM 84.5).

Date: 840926
Time Start: 1120 End: 1250

Gage No.: 84.5S2C
Gage Reading Start: Dry End: Dry

Site Flow: 0.0 (cfs)[a]
USGS Discharge: 19,000 (cfs)[b]

TBM: ADF&G Sucker TBM LB 840823

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	261.03	DRY	
00+52	261.15	DRY	
01+32	261.29	DRY	Transect 1
02+49	261.25	DRY	Transect 2 staff gage 84.5S2
03+43	261.37	DRY	
04+43	261.96	DRY	Transect 3
05+40	261.48	DRY	
06+48	262.53	DRY	Transect 4
07+60	262.29	DRY	Transect 5 staff gage 84.5S5
08+46	261.96	DRY	
10+05	261.91	DRY	
11+12	262.58	DRY	
12+04	262.74	DRY	
13+17	262.28	DRY	
14+12	262.89	DRY	
15+20	262.94	DRY	
16+36	263.54	DRY	
17+97	263.66	DRY	
19+25	261.80	263.46	
20+05	261.37	263.46	
21+03	263.88	DRY	

a Estimated streamflow at time of the thalweg measurement.

b Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

c Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-15. Thalweg profile data obtained at Beaver Dam Slough (RM 86.3).

Date: 840925
Time Start: 1540 End: 1640

Gage No.: 86.3S1C
Gage Reading Start: 1.42 End: 1.42

Site Flow: 0.68 (cfs)[a]
USGS Discharge: 19,600 (cfs)[b]

TBM: ADF&G Beaver Dam TBM RB 840914

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	90.36	92.70	
00+91	92.29	92.81	
01+45	92.00	92.83	Transect 1 staff gage 86.3S1
02+36	21.47	92.83	Transect 2
03+07	91.96	92.84	
03+94	91.30	92.84	Transect 3
05+34	91.66	92.90	Transect 4
05+83	92.27	92.89	Transect 5
07+22	91.49	92.92	
08+72	90.54	92.94	
10+47	91.17	92.91	
11+66	92.29	92.89	
12+57	92.80	93.07	

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-16. Thalweg profile data obtained at Beaver Dam Side Channel (RM 86.3).

Date: 840925
Time Start: 1350 End: 1646

Gage No.: 86.3S4D
Gage Reading Start: 1.35 End: 1.35

Site Flow: 0.47 (cfs)[a]
USGS Discharge: 19,600 (cfs)[b]

TBM: ADF&G Beaver Dam TBM RB 840914

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	90.93	91.51	
00+18	91.25	91.55	
00+63	91.34	91.64	
01+51	90.70	91.65	
02+21	90.48	91.66	Transect 1
02+78	91.04	91.66	
03+38	91.60	91.91	
04+48	91.60	92.25	Transect 2
05+42	92.40	92.63	
06+32	92.29	92.66	Transect 3
07+13	91.25	92.69	
07+87	88.74	92.68	Transect 4 staff gage 86.3S4
08+28	87.88	92.70	
09+05	88.15	92.67	
09+18	91.85	92.77	
09+95	92.06	92.72	
10+83	90.42	92.76	
11+16	90.18	92.72	
11+50	92.55	92.66	
12+56	92.42	DRY	
13+84	94.15	DRY	
14+87	93.23	DRY	
15+25	94.83	DRY	
15+92	91.19	DRY	

a Measured streamflow at time of the thalweg measurement.

b Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

c Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-17. Thalweg profile data obtained at Sunset Side Channel (RM 86.9).

Date: 840929
Time Start: 1140 End: 1430

Gage No.: 86.9S1C
Gage Reading Start: 0.47 End: 0.47

Site Flow: 1.01 (cfs)[a]
USGS Discharge: 17,400 (cfs)[b]

TBM: ADF&G Sunset TBM LB 840822

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	91.59	92.08	
00+52	91.99	92.31	
01+41	90.92	92.31	
02+81	91.92	92.29	
03+70	91.98	92.39	
04+43	92.15	92.57	
05+37	91.67	92.61	
06+13	90.65	92.53	
06+95	92.15	92.58	
07+48	92.30[d]	92.70	Transect 0 staff gage 86.9S0
09+12	92.92	93.18	
09+89	92.60[d]	93.26	Transect 1 staff gage 86.9S1
11+34	93.08	93.34	
12+18	93.60	93.85	
12+39	93.40[d]	93.79	Transect 2 staff gage 86.9S2
13+91	92.97	93.85	
15+24	92.01	93.83	Transect 3 staff gage 86.9S3
15+90	93.60	93.86	
16+45	94.34	94.60	
17+40	94.20[d]	94.62	Transect 4 staff gage 86.9S4
18+06	94.40	94.69	
19+78	92.30	94.71	Transect 5 staff gage 86.9S5
21+34	92.20	94.72	
22+38	90.60[d]	94.82	Transect 6 staff gage 86.9S6

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

[d] Thalweg elevation determined at each thalweg point from cross section profiles from the hydraulic model rather than from the original thalweg survey.

Attachment Table C-17 (Continued).

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[a] (ft)	DESCRIPTION
23+72	92.07	94.73	
24+88	93.33	94.73	
25+21	94.57	94.74	
26+45	95.04	95.20	
28+31	95.75	95.91	
29+64	96.32	96.48	

[a] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-18. Thalweg profile data obtained at Sunrise Side Channel (RM 87.0).

Date: 840926
Time Start: 1530 End: 1640

Gage No.: 87.0S4C
Gage Reading Start: Dry End: Dry

Site Flow: 0.0 (cfs)[a]
USGS Discharge: 19,000 (cfs)[b]

TBM: ADF&G Sunrise S.C. TR4 RB 1984

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	91.69	91.81	
01+09	92.26	DRY	
02+42	92.54	DRY	Transect 1
02+97	93.21	DRY	
03+50	93.26	DRY	Transect 2
04+82	93.38	DRY	
05+73	93.47	DRY	Transect 3
07+32	94.22	DRY	Transect 4 staff gage 87.0S4
08+39	94.87	DRY	
09+57	95.63	DRY	Transect 5
10+75	95.79	DRY	
11+86	96.17	DRY	Transect 6
12+70	96.68	DRY	
13+71	95.84	DRY	
14+54	96.01	DRY	
15+83	95.89	DRY	
16+95	96.83	DRY	

[a] Estimated streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-19. Thalweg profile data obtained at Birch Creek Slough (RM 88.4).

Date: 840927
Time Start: 1115 End: 1540

Gage No.: 88.4S1B
Gage Reading Start: 1.31 End: 1.31

Site Flow: 34.0 (cfs)[a]
USGS Discharge: 18,300 (cfs)[b]

TBM: R&M Consultants Birch Creek 89.3 S1 LB 1982

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
00+00	276.59	278.76	
01+08	278.67	279.45	
03+29	280.34	281.07	
05+00	279.91	281.16	
06+47	279.81	281.25	
07+91	280.18	281.33	
09+52	279.74	281.38	
10+57	280.19	281.45	
12+31	280.40	281.53	
13+78	280.48	281.68	
14+77	279.61	281.77	
15+12	280.88	281.78	
16+62	280.63	281.85	
18+11	281.09	281.84	
19+15	279.26	282.04	
19+43	281.52	282.04	
20+72	280.86	282.17	
22+14	280.90	282.30	
23+23	281.15	282.38	
24+40	282.00	282.38	
25+52	280.99	282.49	
26+31	281.49	282.50	
27+57	281.36	282.57	
29+42	281.36	282.66	
30+25	281.67	282.73	
31+14	281.53	282.77	
32+39	281.43	282.78	

[a] Measured streamflow at time of the thalweg measurement.

[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-19 (Continued).

STATION (ft)	THALWEG ELEVATION (ft)	WSEL[a] (ft)	DESCRIPTION
33+51	281.55	282.92	
34+60	281.66	282.92	
35+60	281.47	282.98	
37+01	281.56	283.14	
37+53	281.18	283.04	Transect 1
38+21	282.03	283.09	
39+25	281.64	283.15	
39+56	281.91	283.13	Transect 2 staff gage 88.4S2
40+13	281.88	293.23	
40+55	282.31	283.31	Transect 3
41+13	282.35	283.48	
41+76	282.46	283.66	Transect 4
42+97	281.27	283.57	Transect 5
44+09	282.06	283.62	Transect 6 staff gage 88.4S1
44+93	282.70	283.62	
45+38	282.54	283.69	
46+13	281.84	283.75	
46+88	282.20	283.90	
47+27	282.16	283.97	

[a] Water surface elevation determined at each thalweg point during survey of thalweg profile.

Attachment Table C-20. Thalweg profile data obtained at Trapper Creek Side Channel (RM 91.6).

Date: 840913
Time Start: 1000 End: 1224

Gage No.: 91.6S1C
Gage Reading Start: 0.72 End: 0.72

Site Flow: 16.4 (cfs)[a]
USGS Discharge: 22,700 (cfs)[b]

TBM: ADF&G Trapper TBM RB 840822

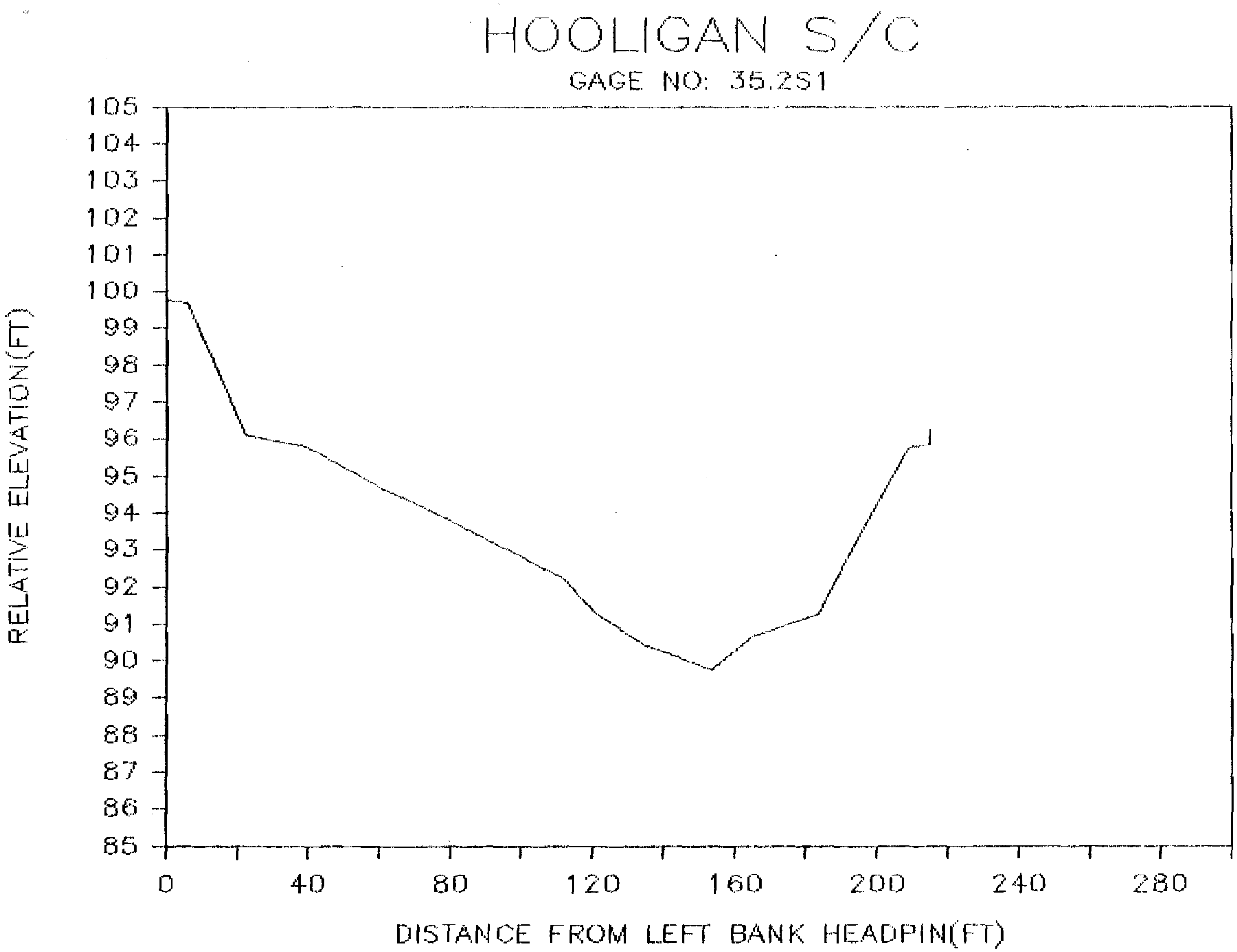
STATION (ft)	THALWEG ELEVATION (ft)	WSEL[c] (ft)	DESCRIPTION
0+00	89.36	90.29	
0+55	90.07	90.62	
1+08	90.61	91.09	
1+66	91.49	91.94	
2+44	90.71	91.96	
3+32	90.39	91.96	
4+10	90.11	91.95	
4+82	89.79	91.96	
5+39	90.00	91.96	Transect 1 staff gage 91.6S2
6+23	90.21	91.96	
7+23	90.42	91.95	
8+25	90.60	91.98	Transect 2 staff gage 91.6S3
9+29	90.79	91.98	
10+42	91.47	91.98	
11+42	91.70	92.15	Transect 3 staff gage 91.6S4
12+08	92.04	92.43	
13+17	91.80	92.54	Transect 4 staff gage 91.6S1
14+01	92.25	92.62	
15+81	92.98	93.31	

[a] Measured streamflow at time of the thalweg measurement.

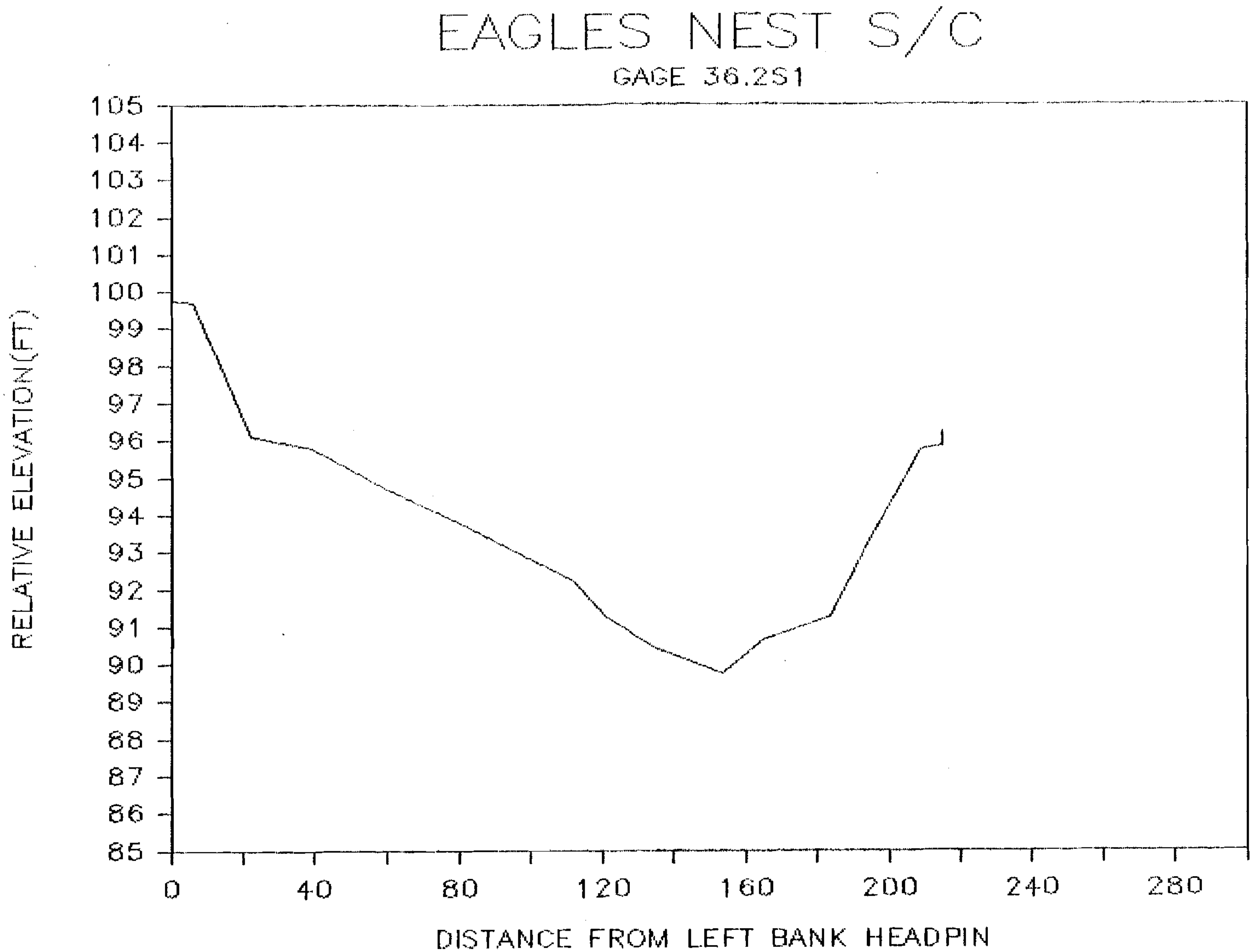
[b] Mean daily mainstem discharge at Sunshine USGS gaging station (15292780) corresponding to date of thalweg measurement.

[c] Water surface elevation determined at each thalweg point during survey of thalweg profile.

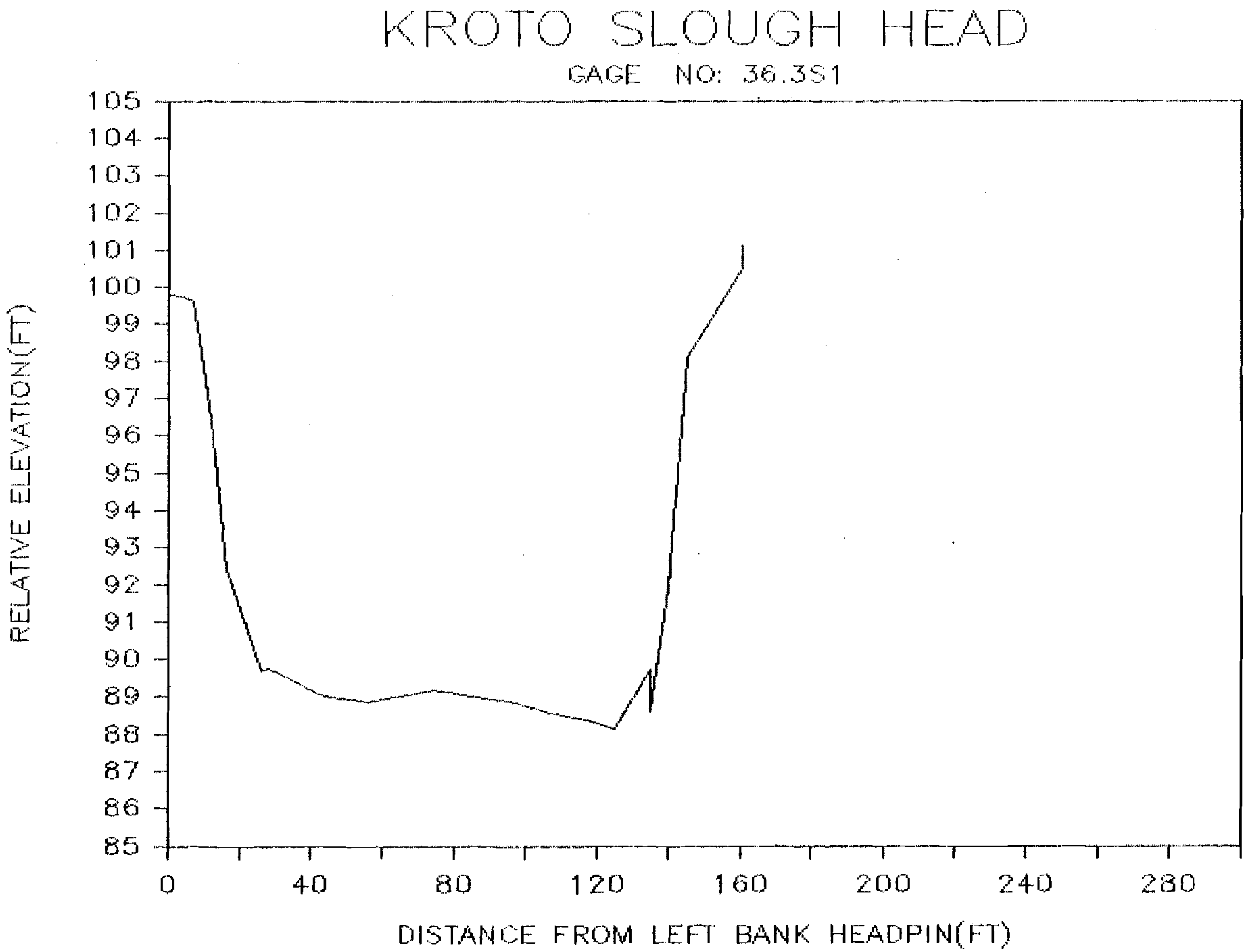
ATTACHMENT D



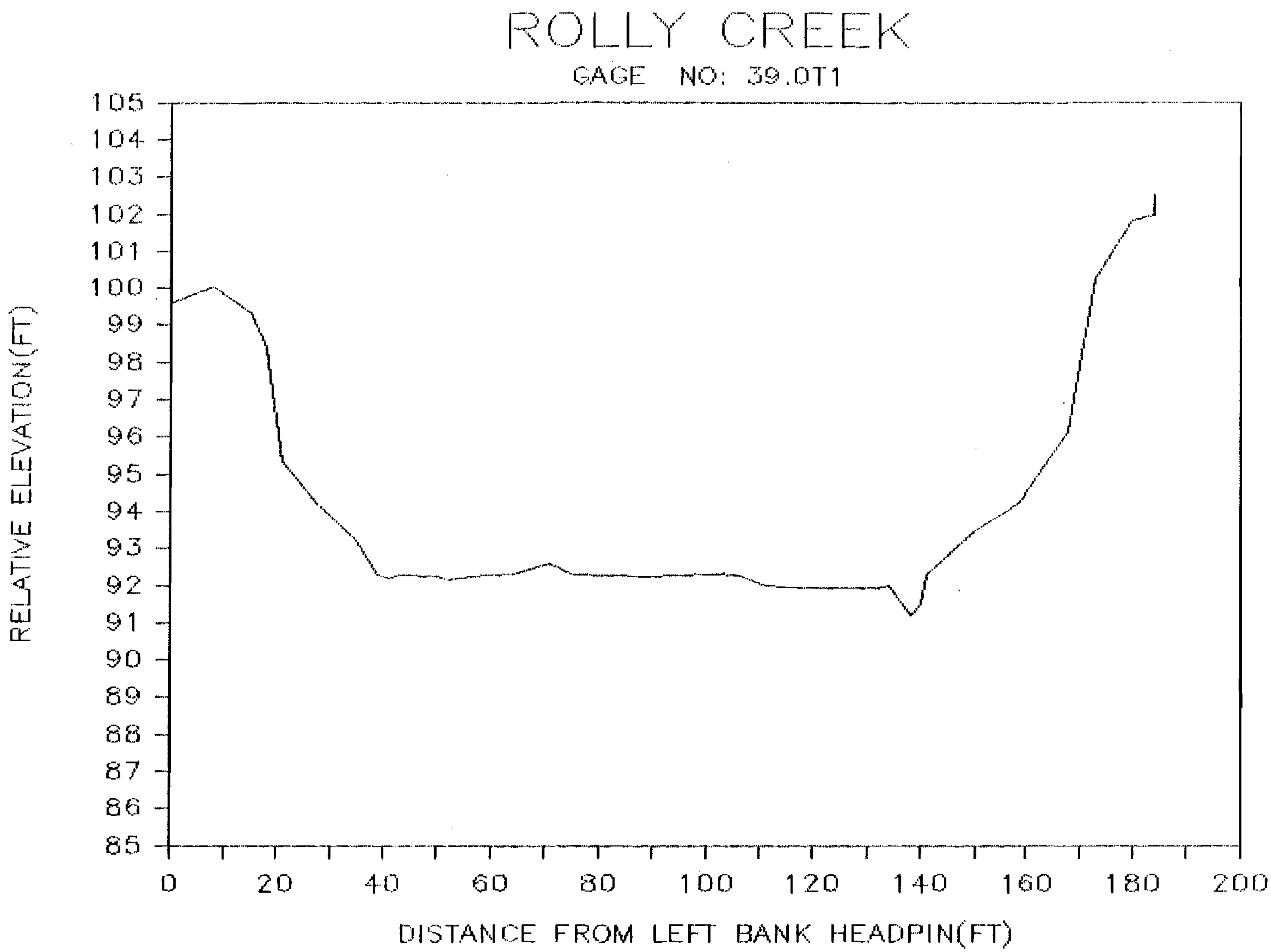
Attachment Figure D-1. Cross sectional profile obtained 50 feet upstream of transect 3 at Hooligan Side Channel.



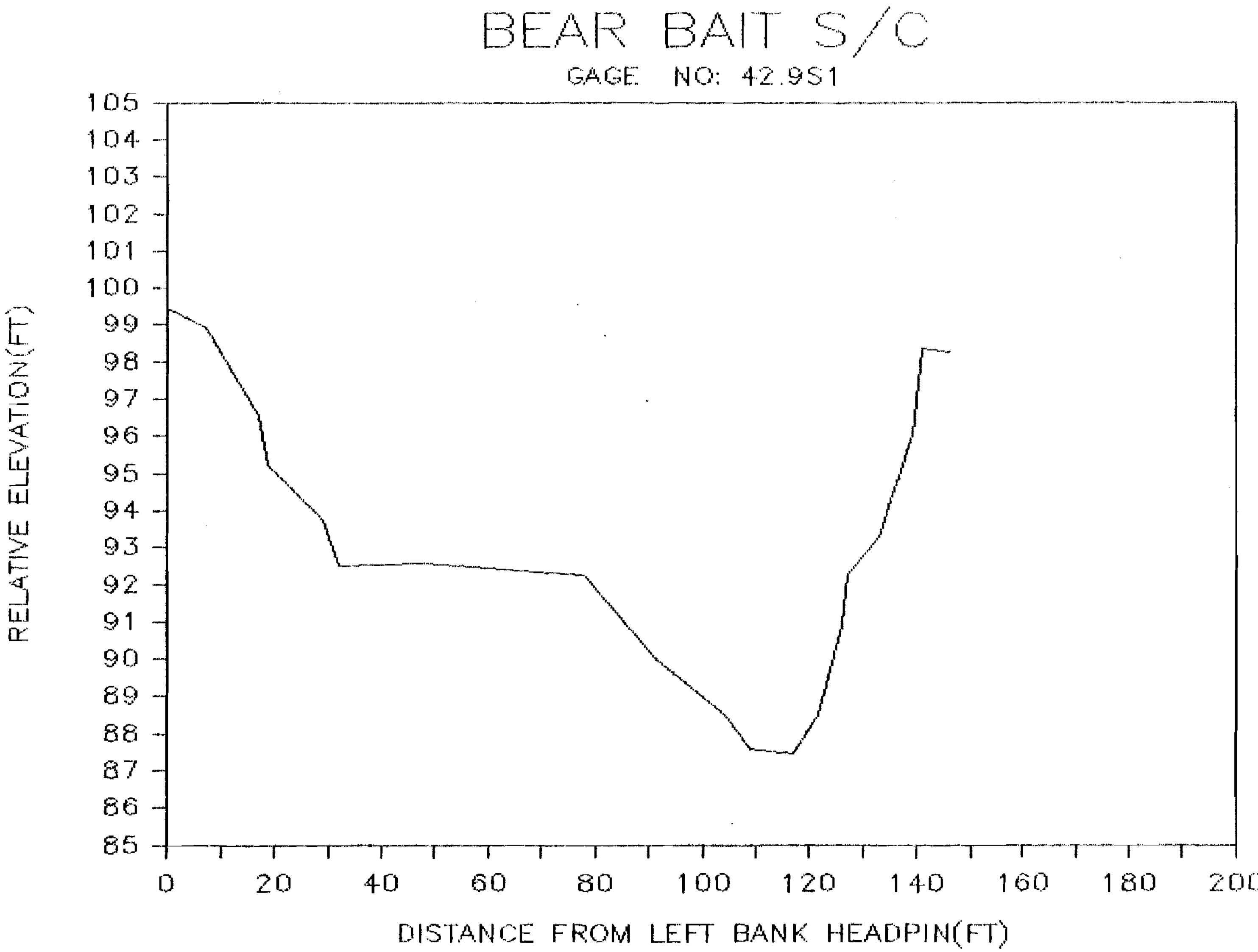
Attachment Figure D-2. Cross sectional profile obtained at transect 2 of Eagle's Nest Side Channel.



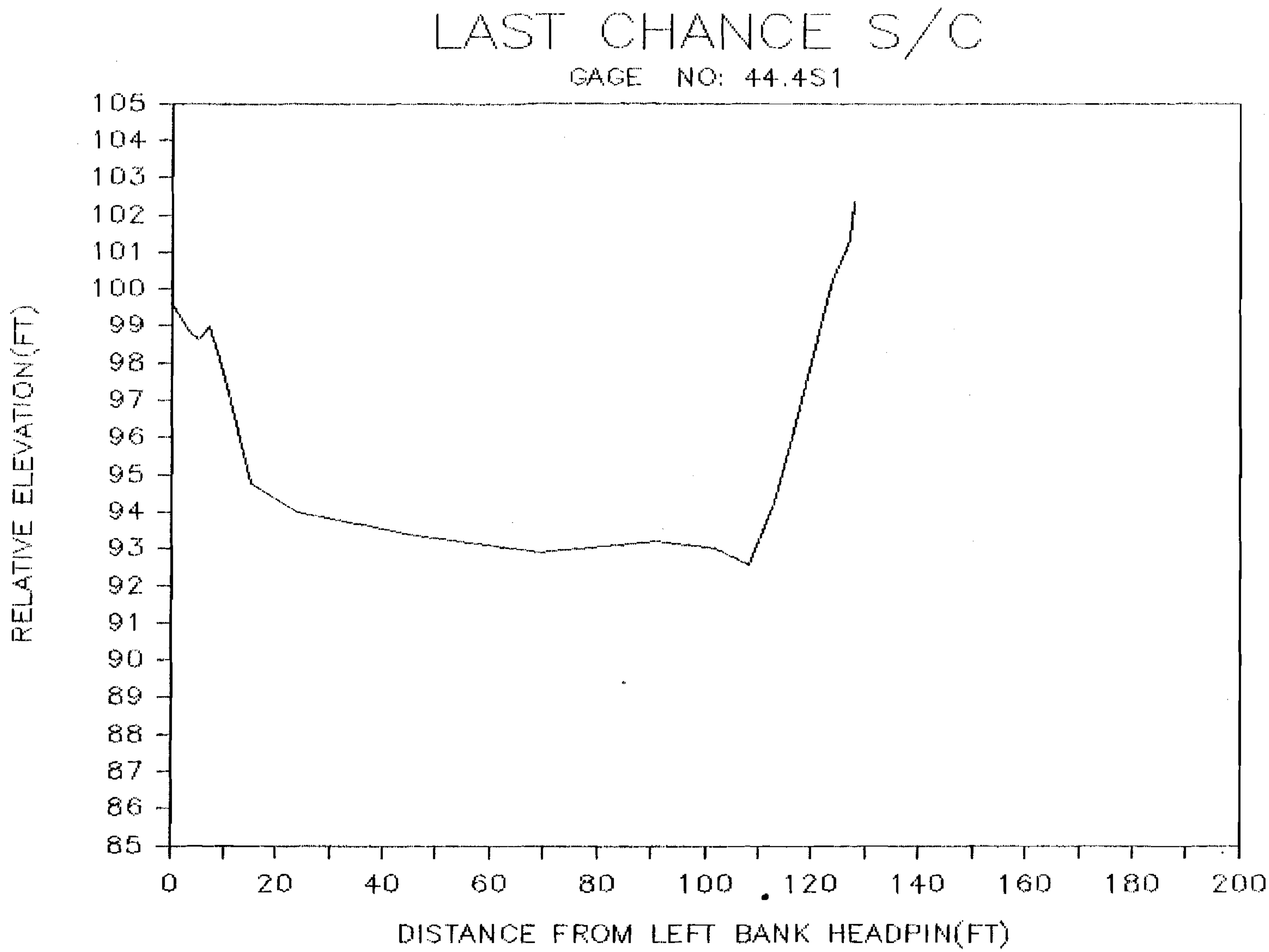
Attachment Figure D-3. Cross sectional profile obtained at transect 2 of Kroto Slough Head.



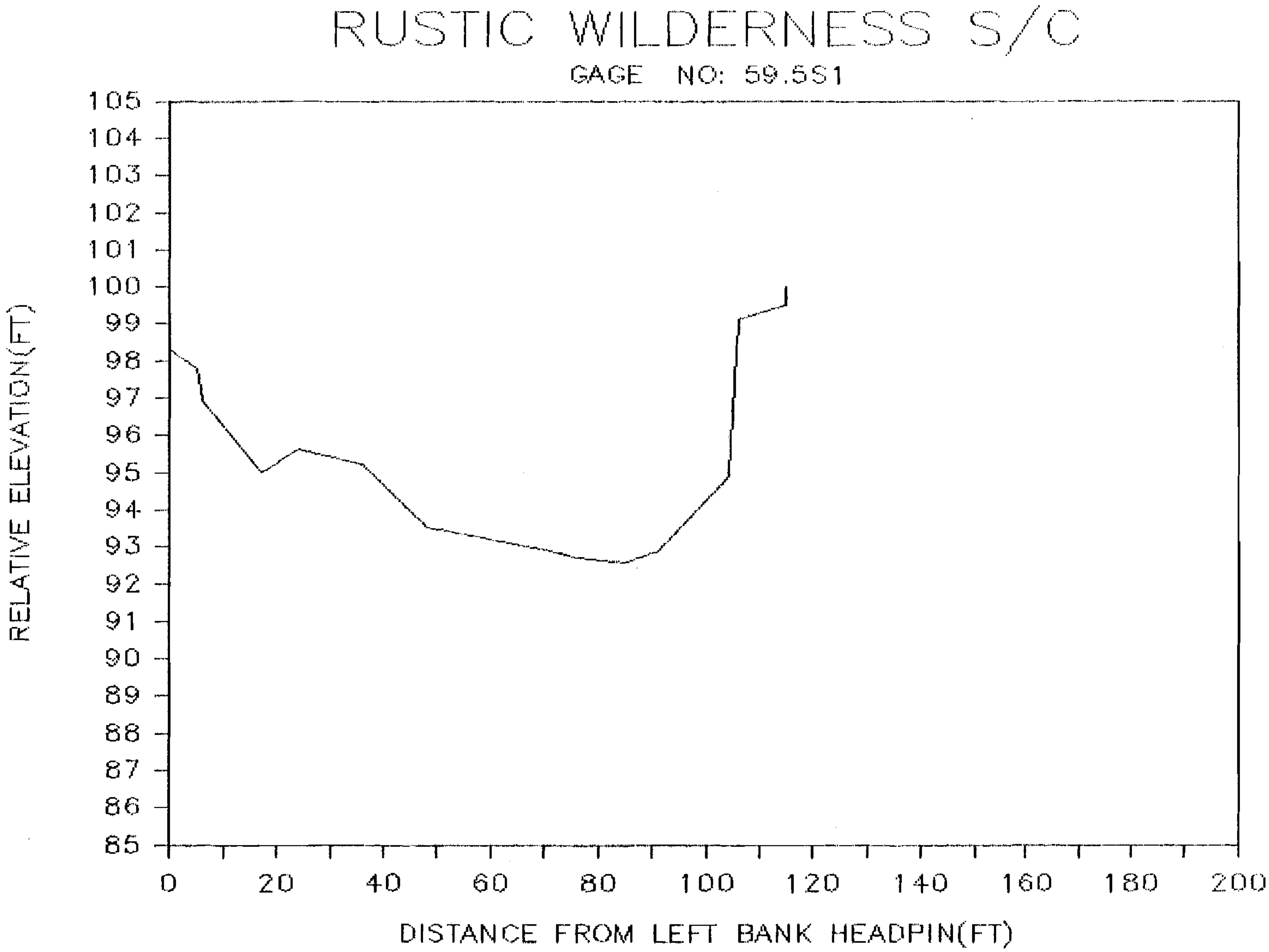
Attachment Figure D-4. Cross sectional profile obtained at transect 2 of Rolly Creek.



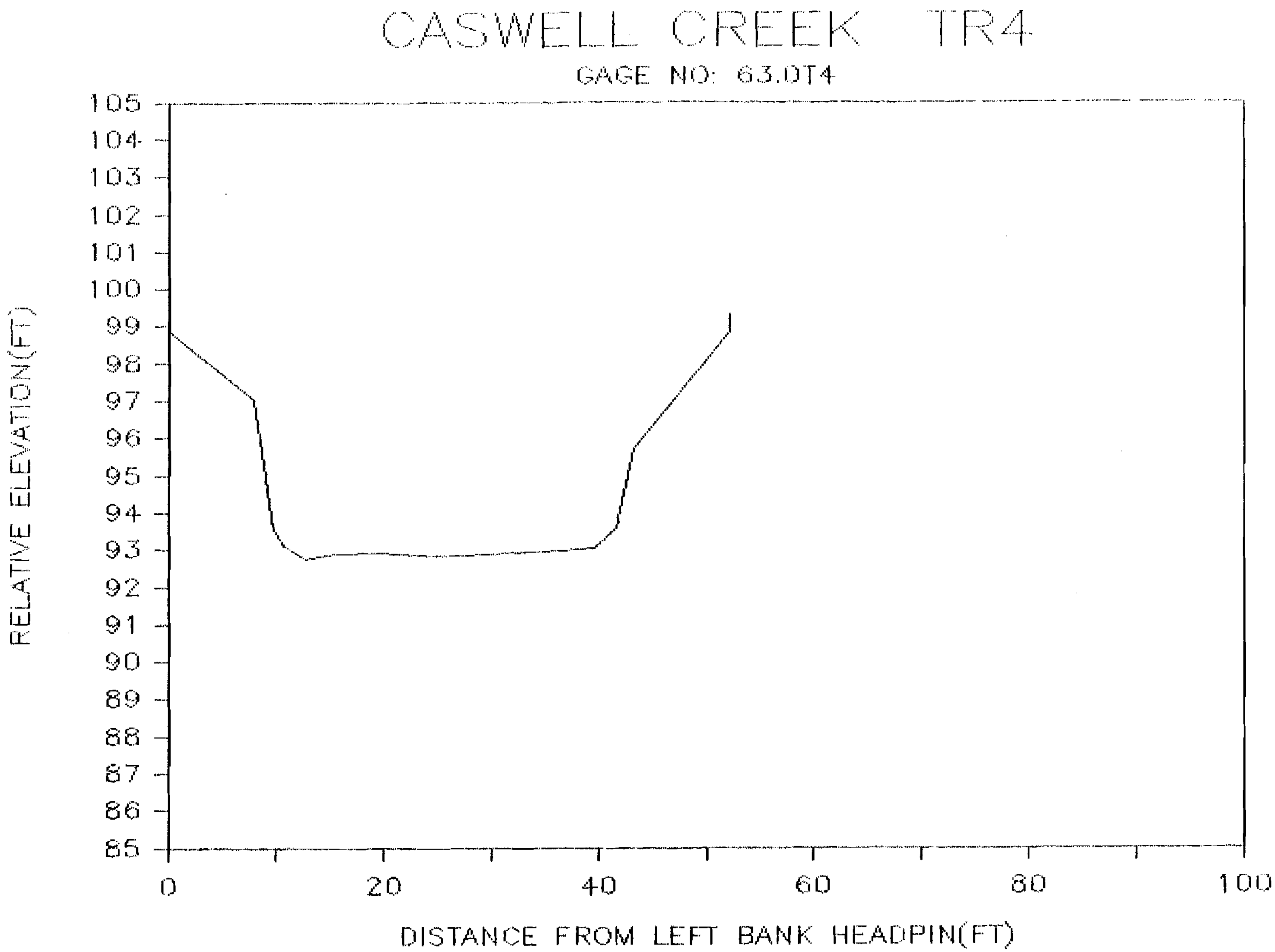
Attachment Figure D- 5. Cross sectional profile obtained at transect 2 of Bear Bait Side Channel.



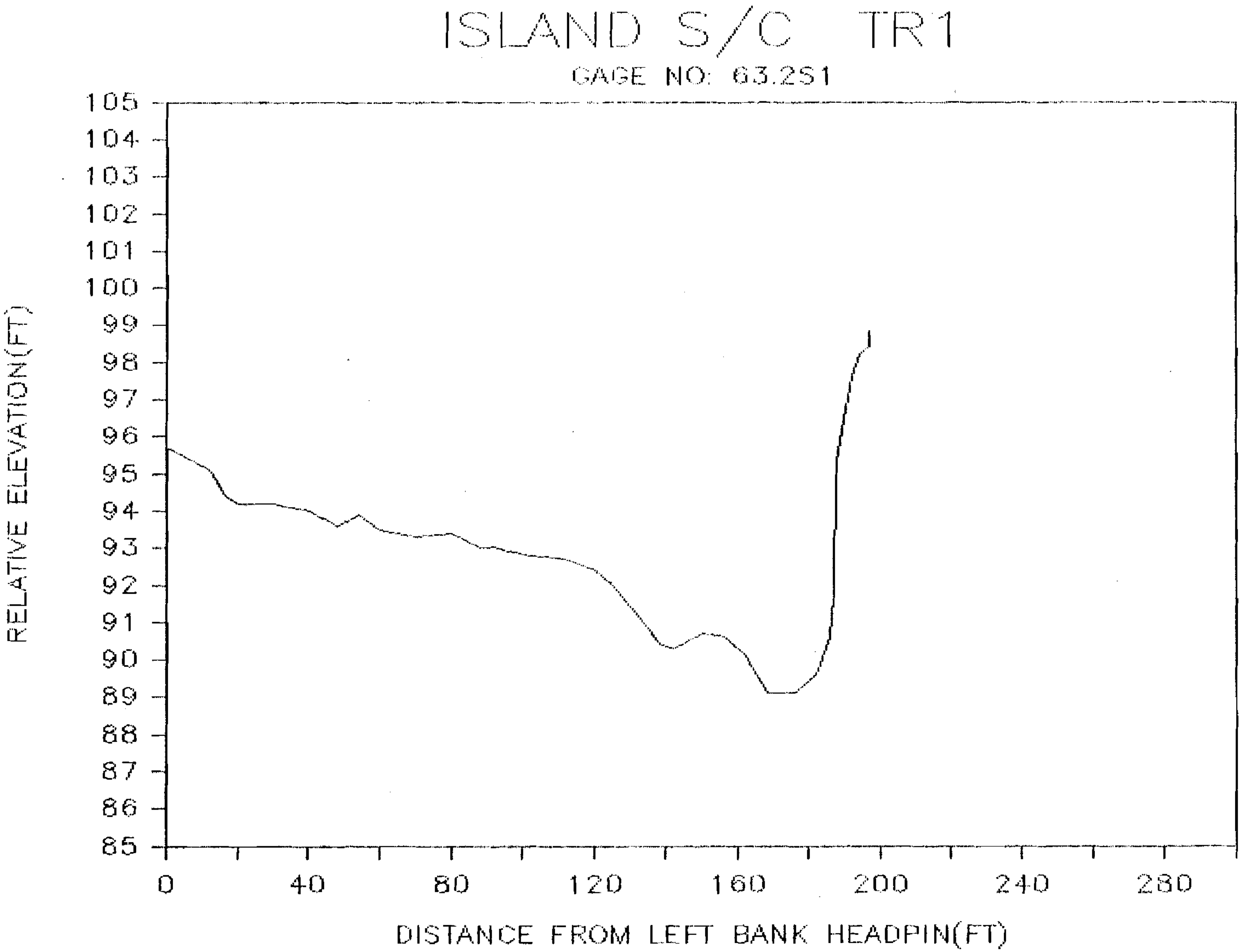
Attachment Figure D-6. Cross sectional profile obtained at transect 2 of Last Chance Side Channel.



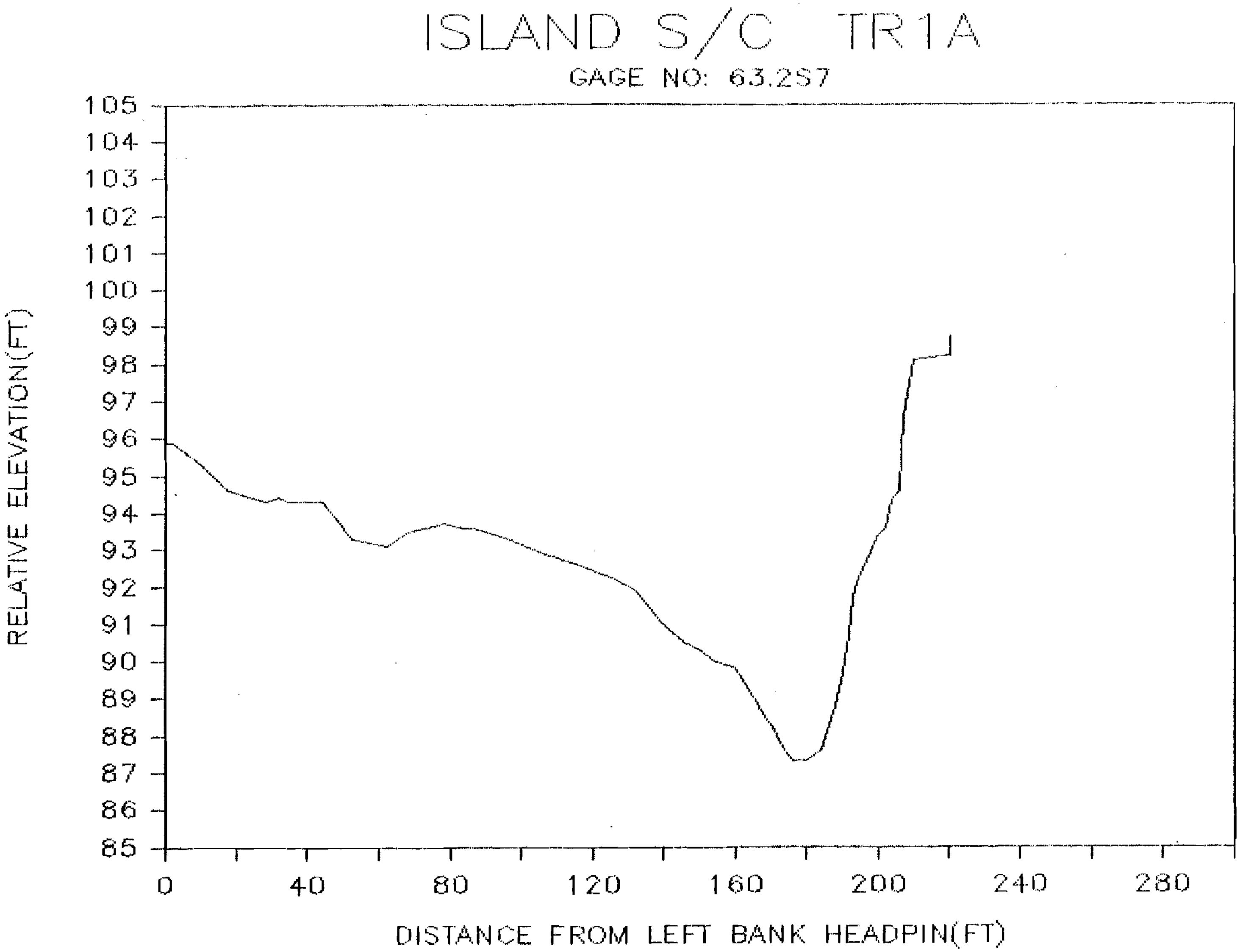
Attachment Figure D-7. Cross sectional profile obtained at transect 4 of Rustic Wilderness Side Channel.



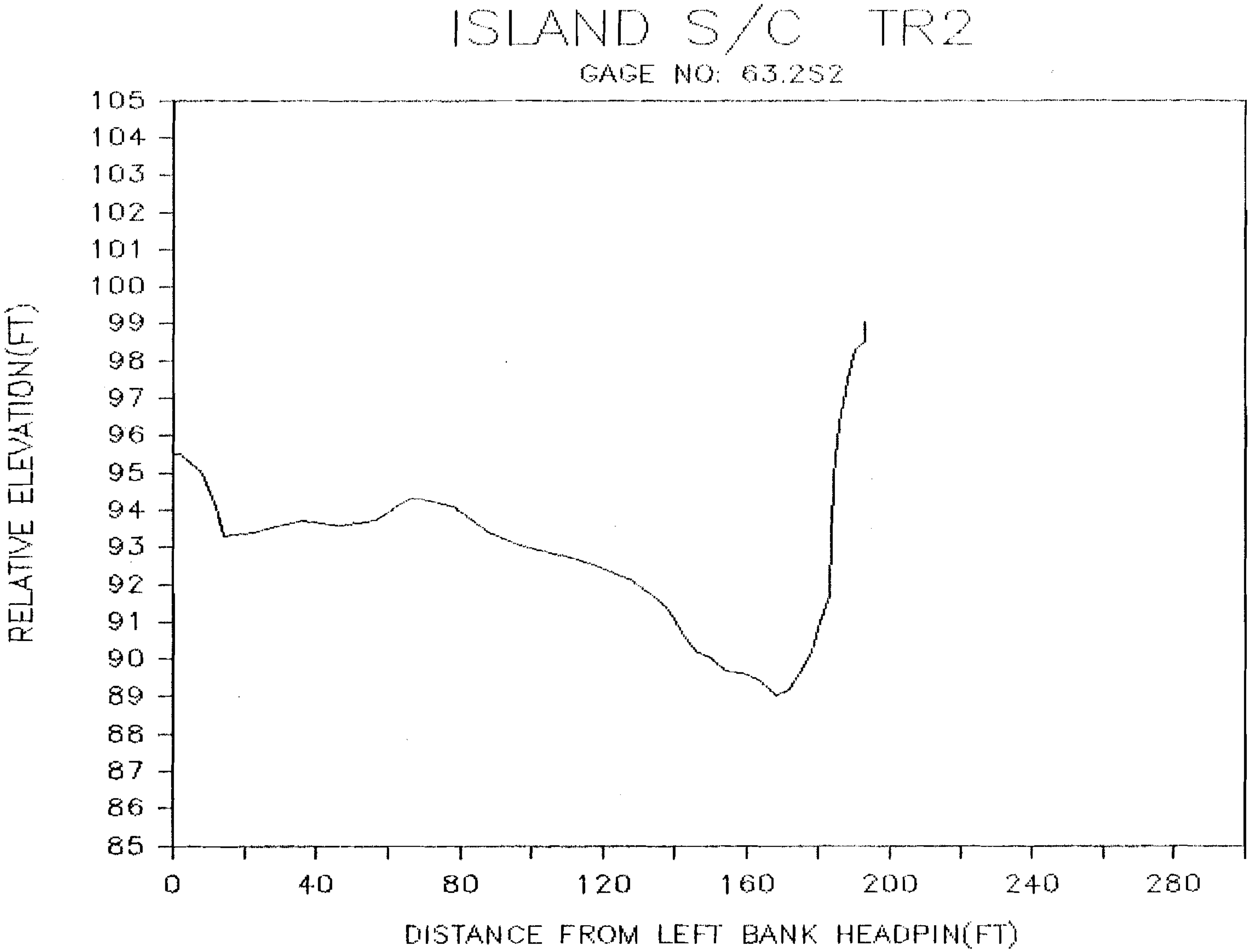
Attachment Figure D- 8. Cross sectional profile obtained at transect 4 of Caswell Creek.



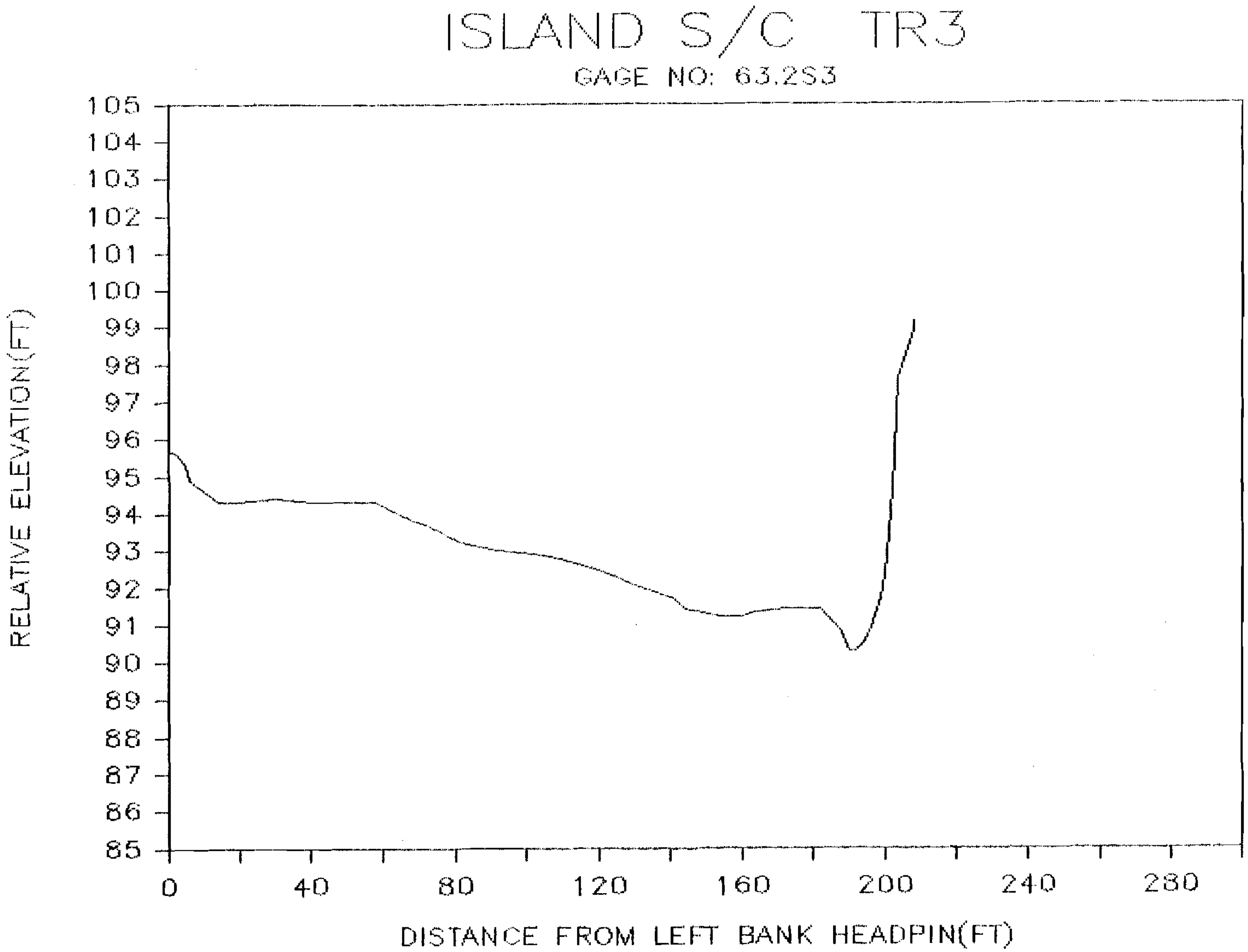
Attachment Figure D-9. Cross sectional profile obtained at transect 1 of Island Side Channel.



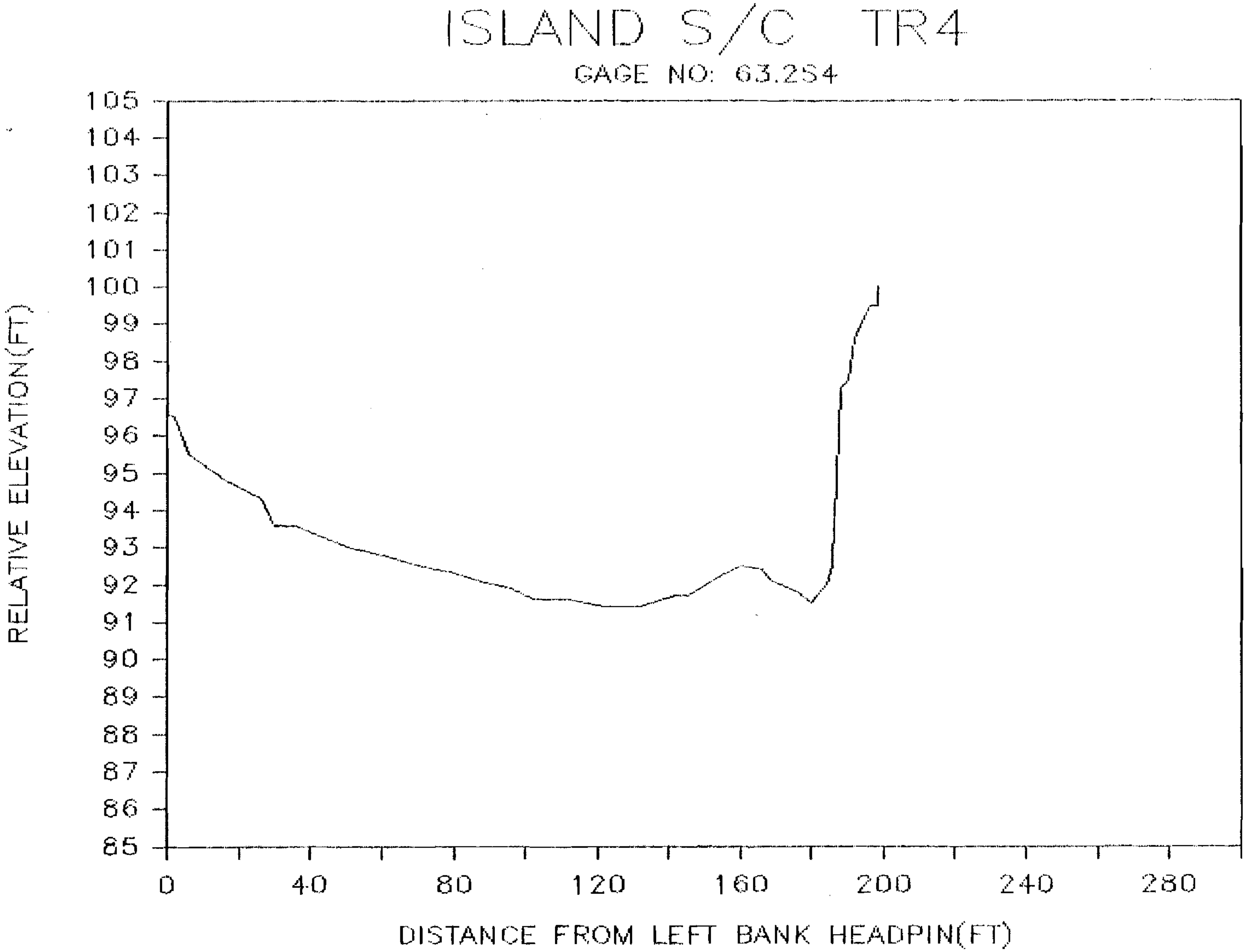
Attachment Figure D-10. Cross sectional profile obtained at transect 1A of Island Side Channel.



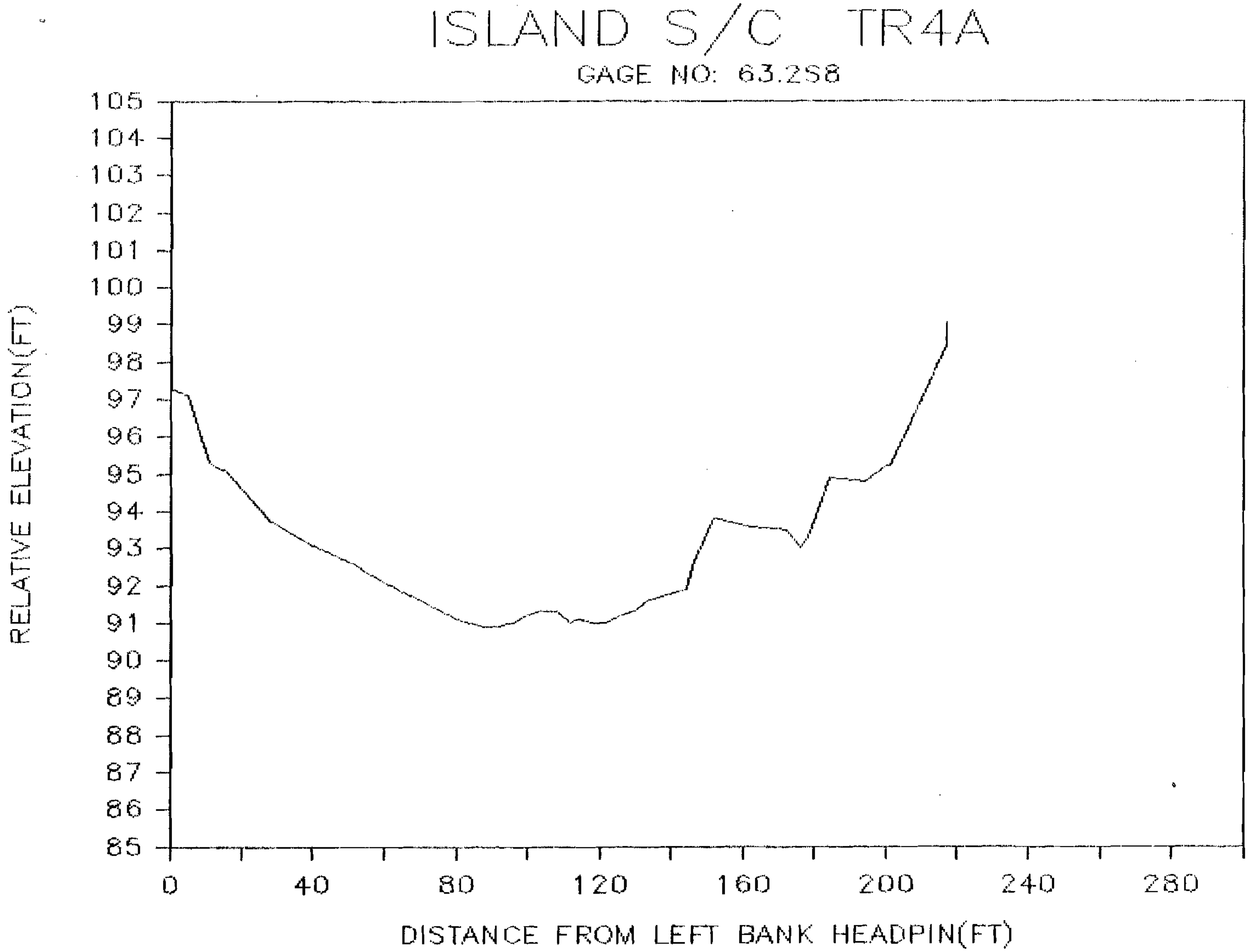
Attachment Figure D-11. Cross sectional profile obtained at transect 2 of Island Side Channel.



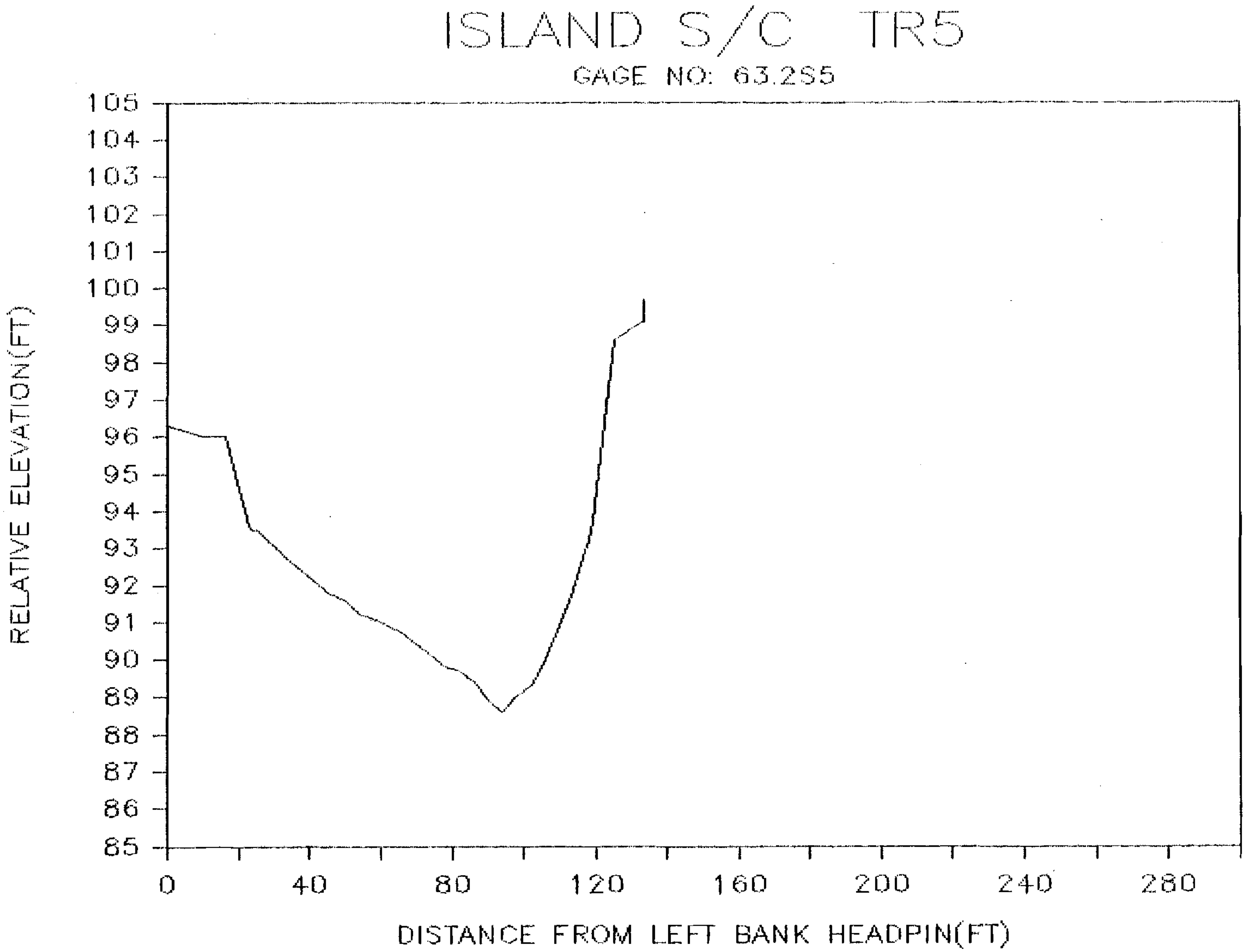
Attachment Figure D-12. Cross sectional profile obtained at transect 3 of Island Side Channel.



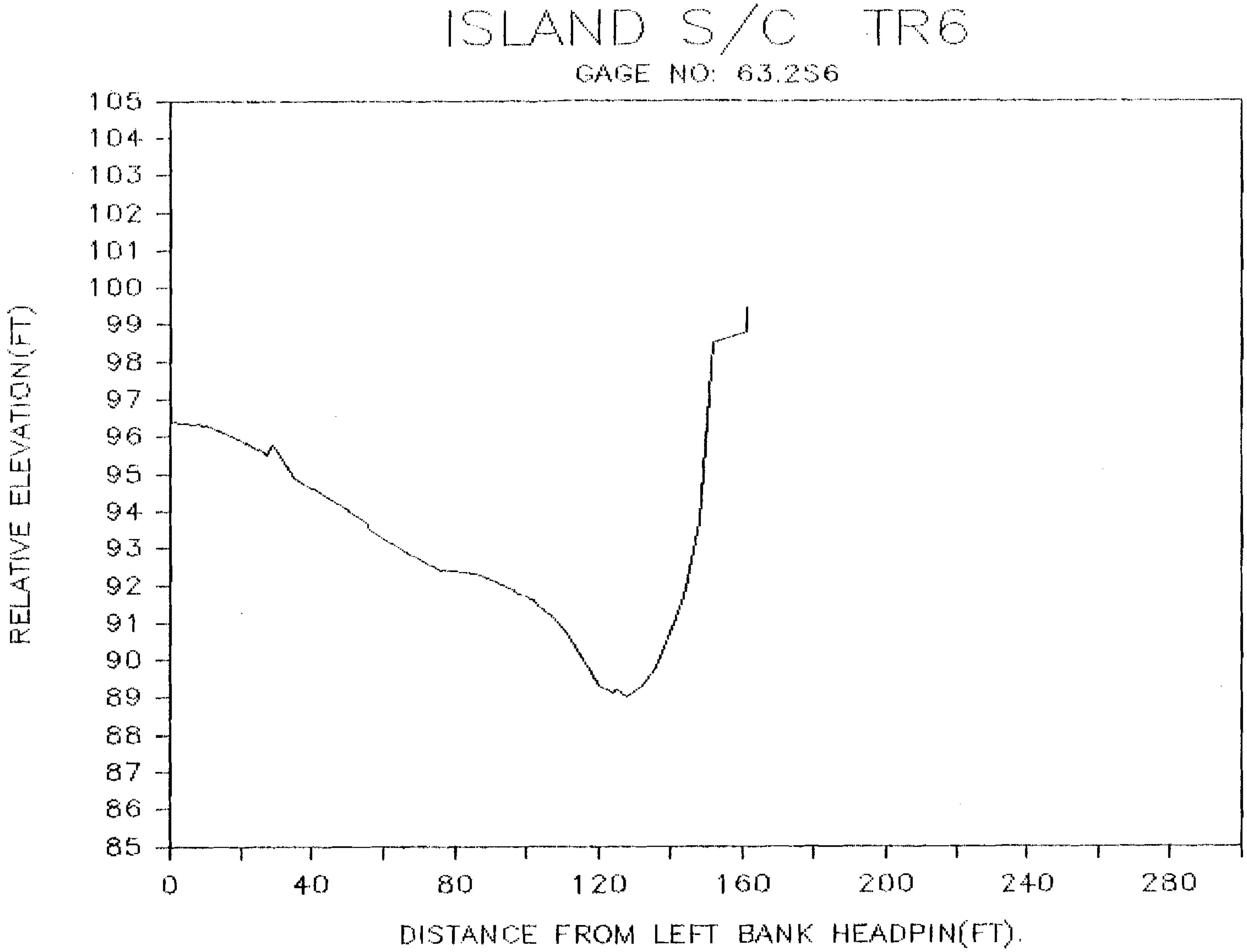
Attachment Figure D- 13. Cross sectional profile obtained at transect 4 of Island Side Channel.



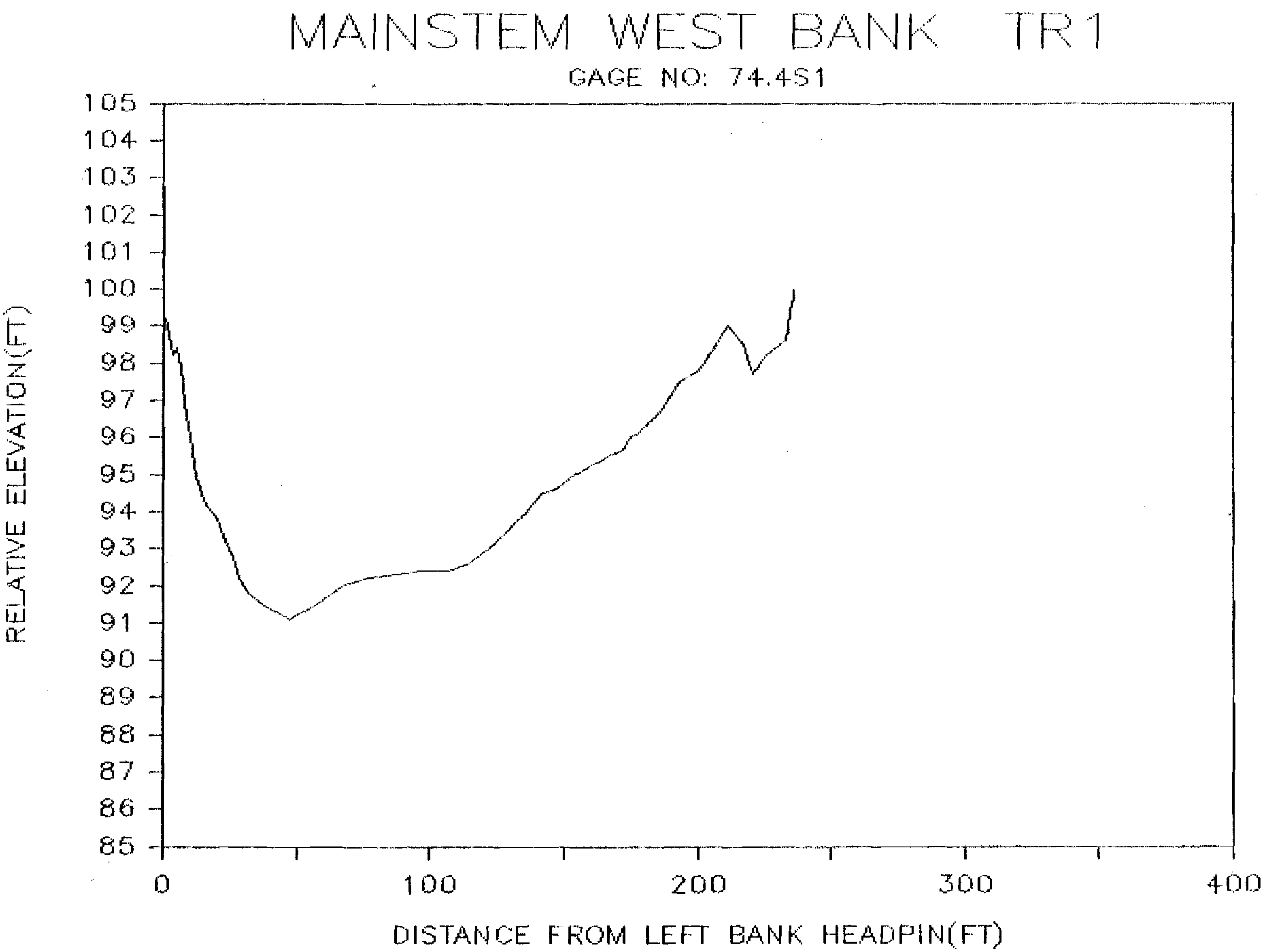
Attachment Figure D- 14. Cross sectional profile obtained at transect 4A of Island Side Channel.



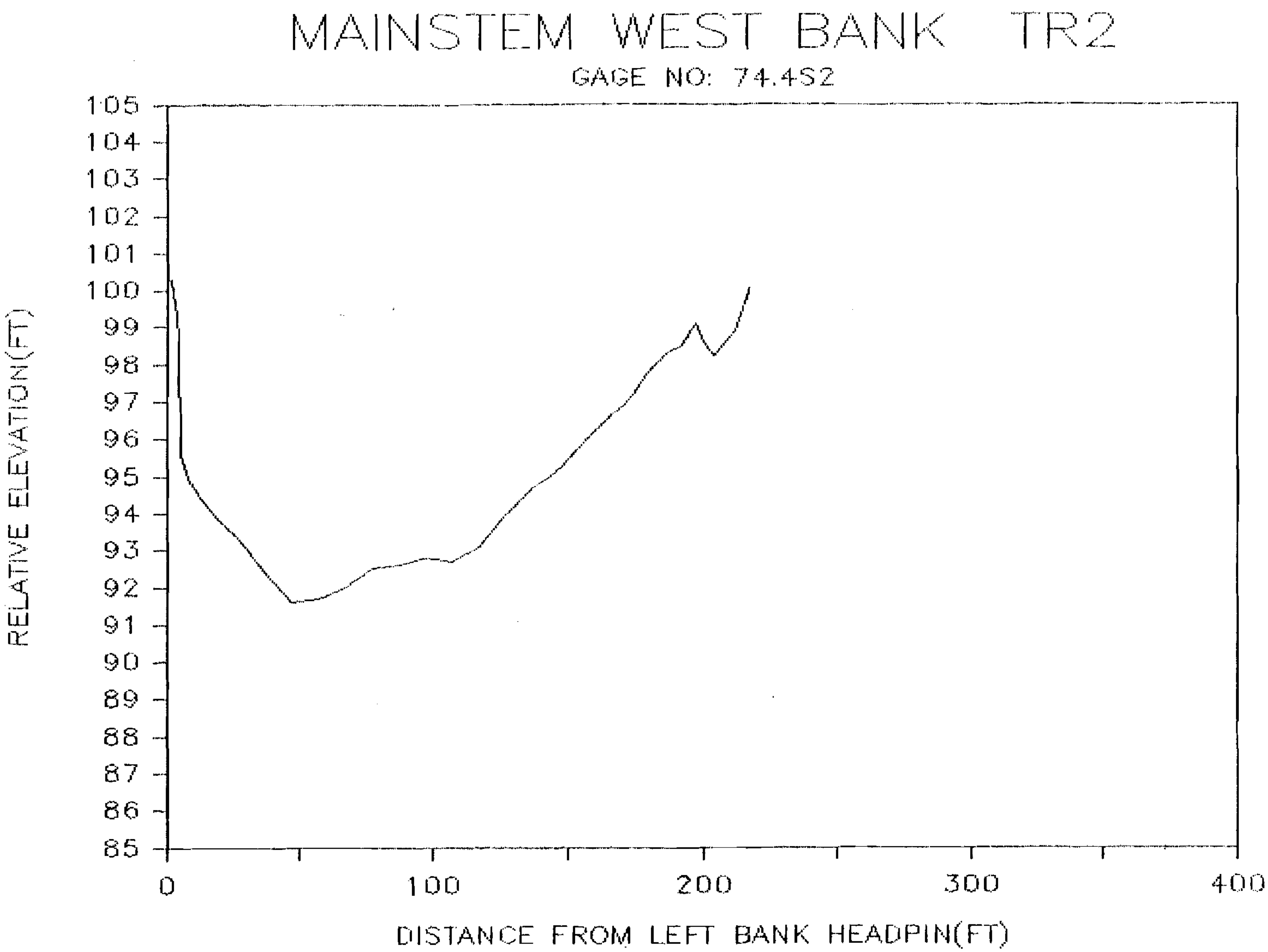
Attachment Figure D- 15. Cross sectional profile obtained at transect 5 of Island Side Channel.



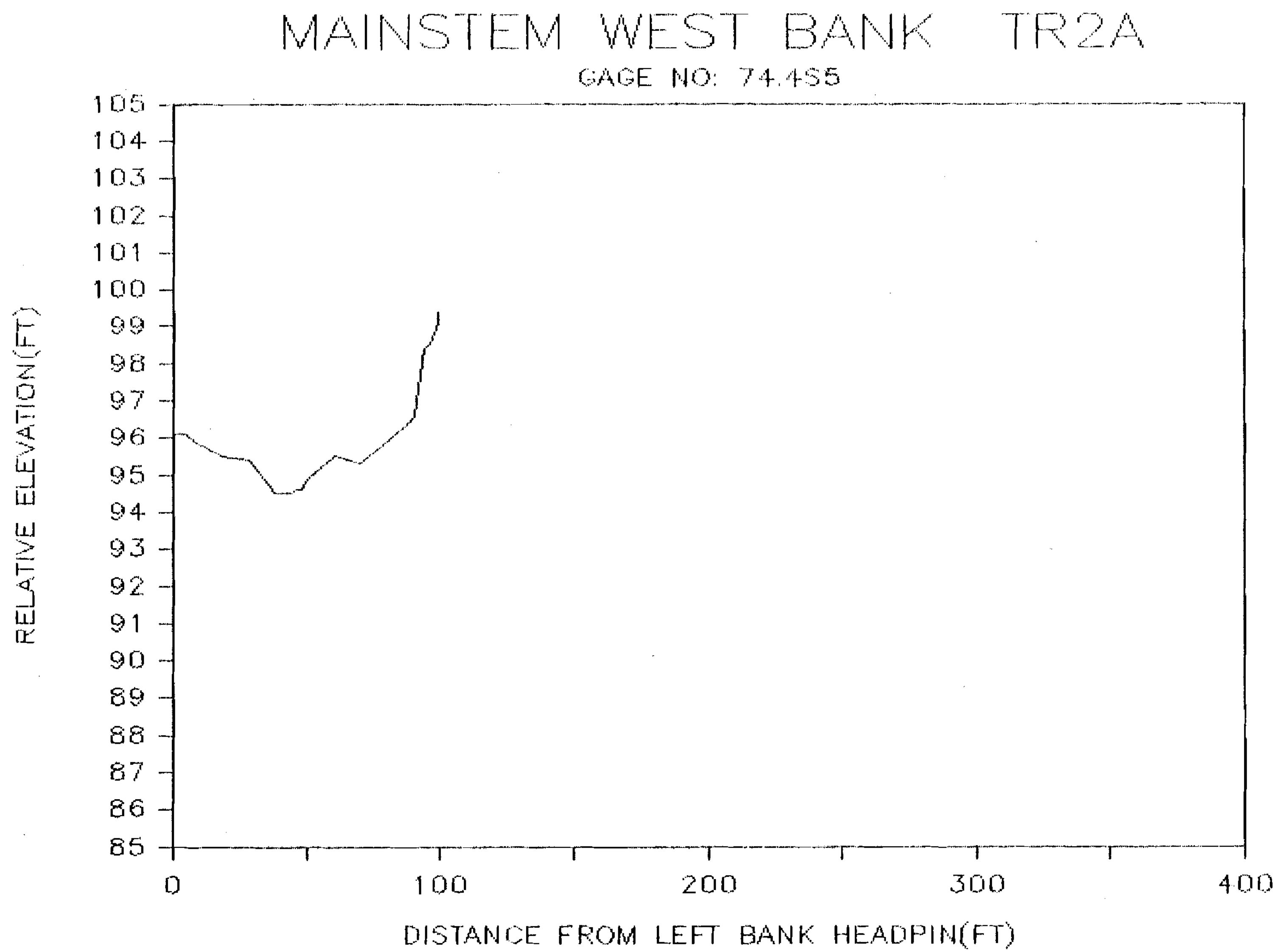
Attachment Figure D- 16. Cross sectional profile obtained at transect 6 of Island Side Channel.



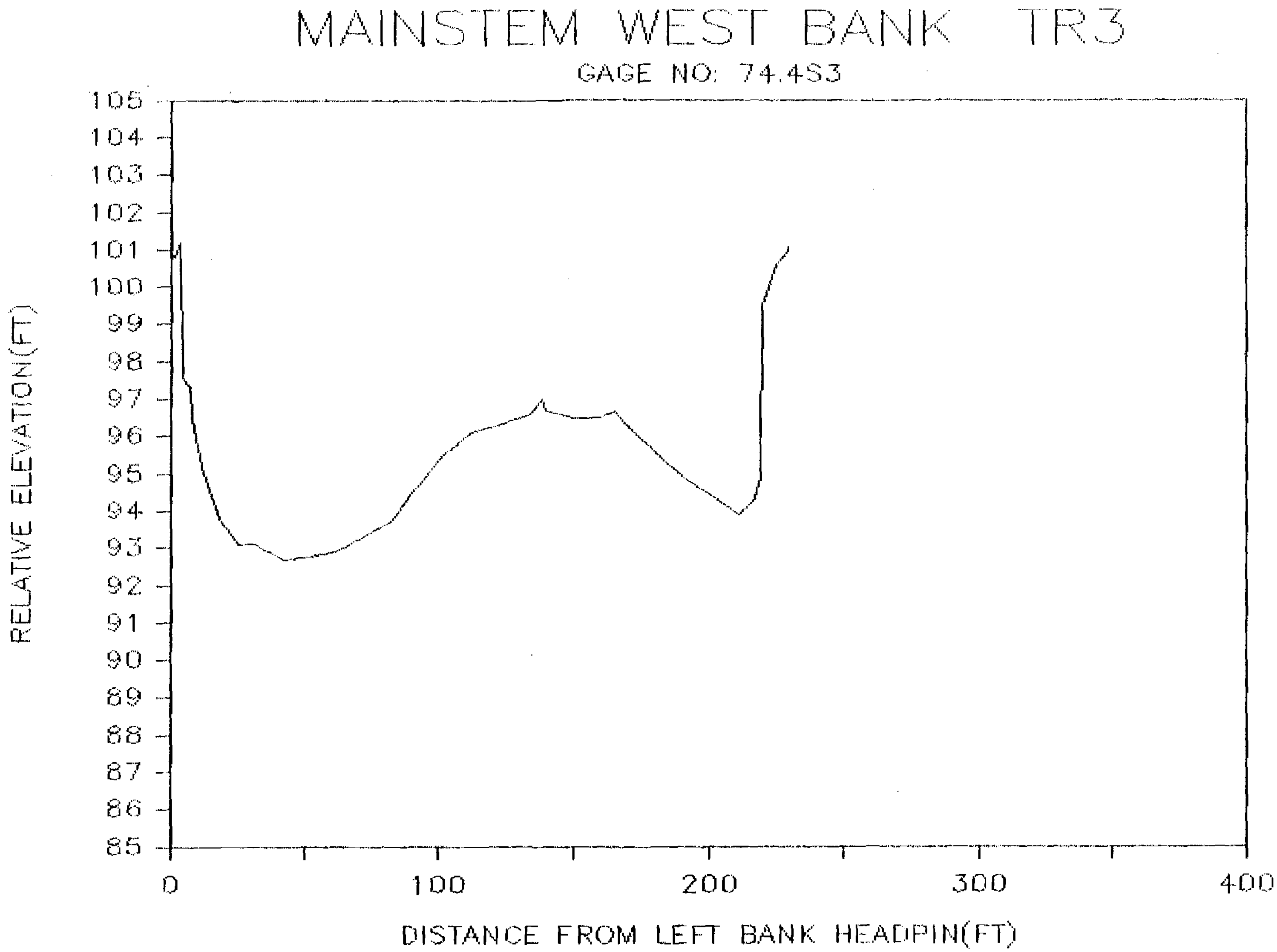
Attachment Figure D- 17. Cross sectional profile obtained at transect 1 of Mainstem West Bank Side Channel.



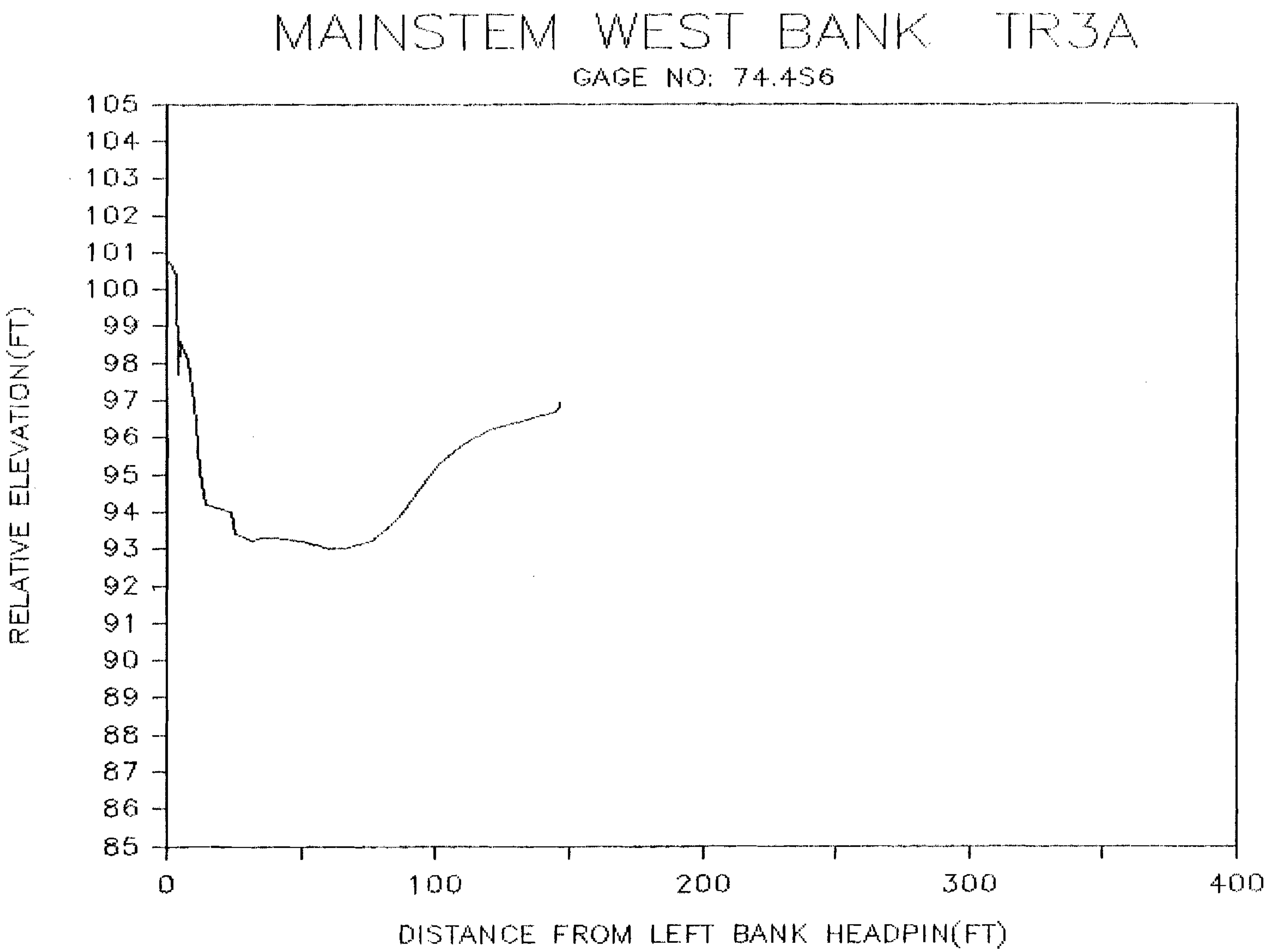
Attachment Figure D-18. Cross sectional profile obtained at transect 2 of Mainstem West Bank Side Channel.



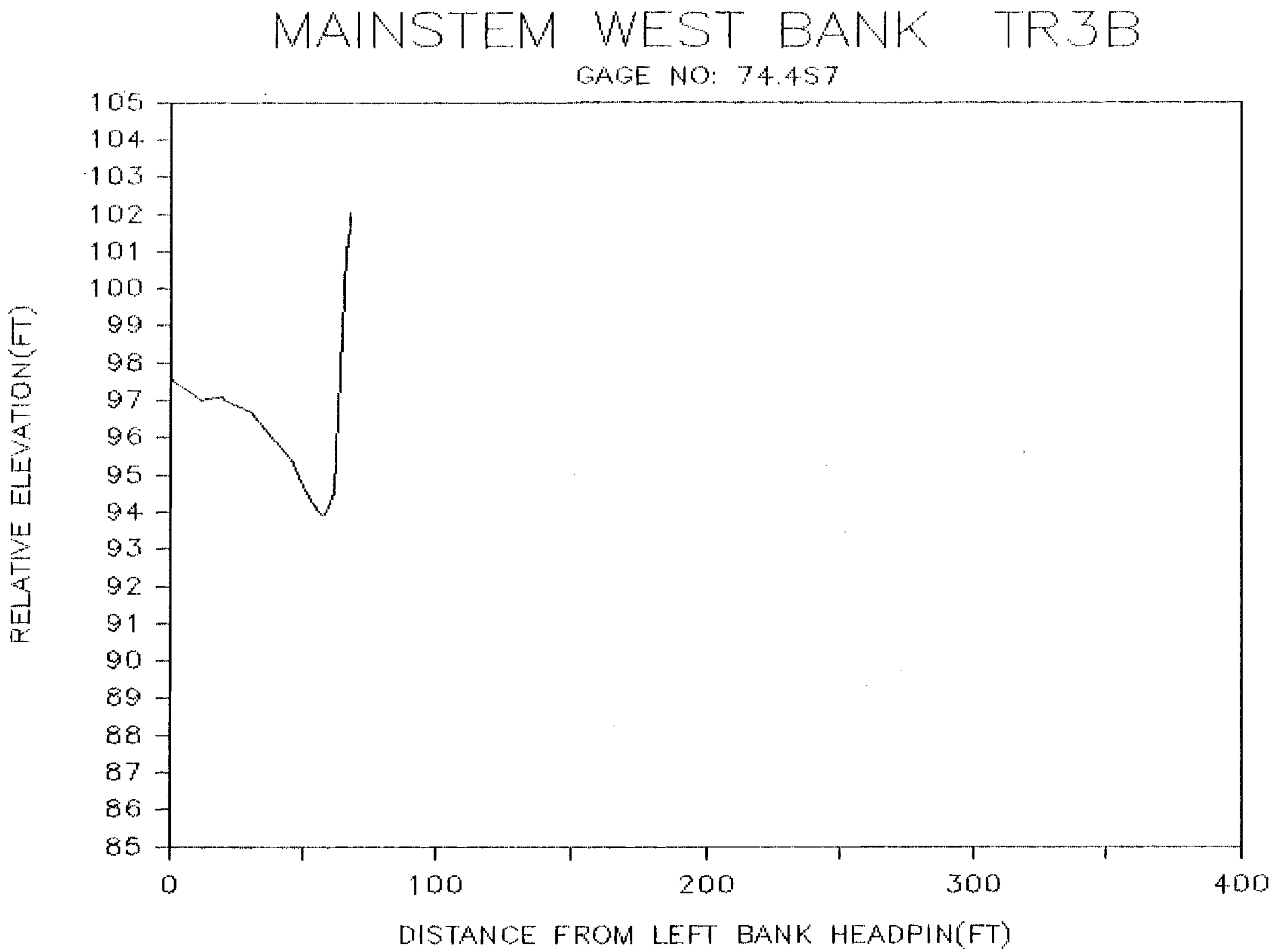
Attachment Figure D- 19. Cross sectional profile obtained at transect 2A of Mainstem West Bank Side Channel.



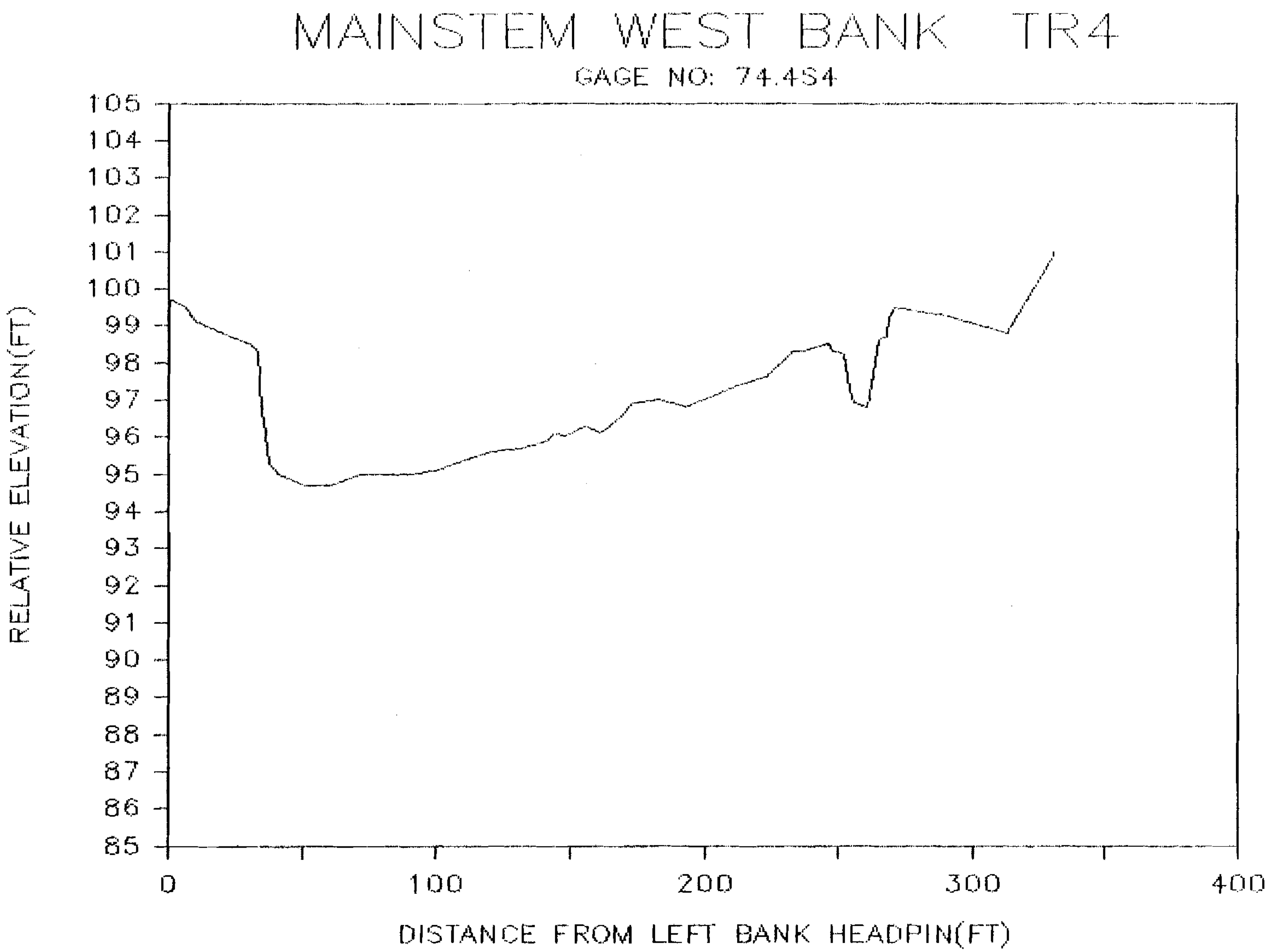
Attachment Figure D- 20. Cross sectional profile obtained at transect 3 of Mainstem West Bank Side Channel.



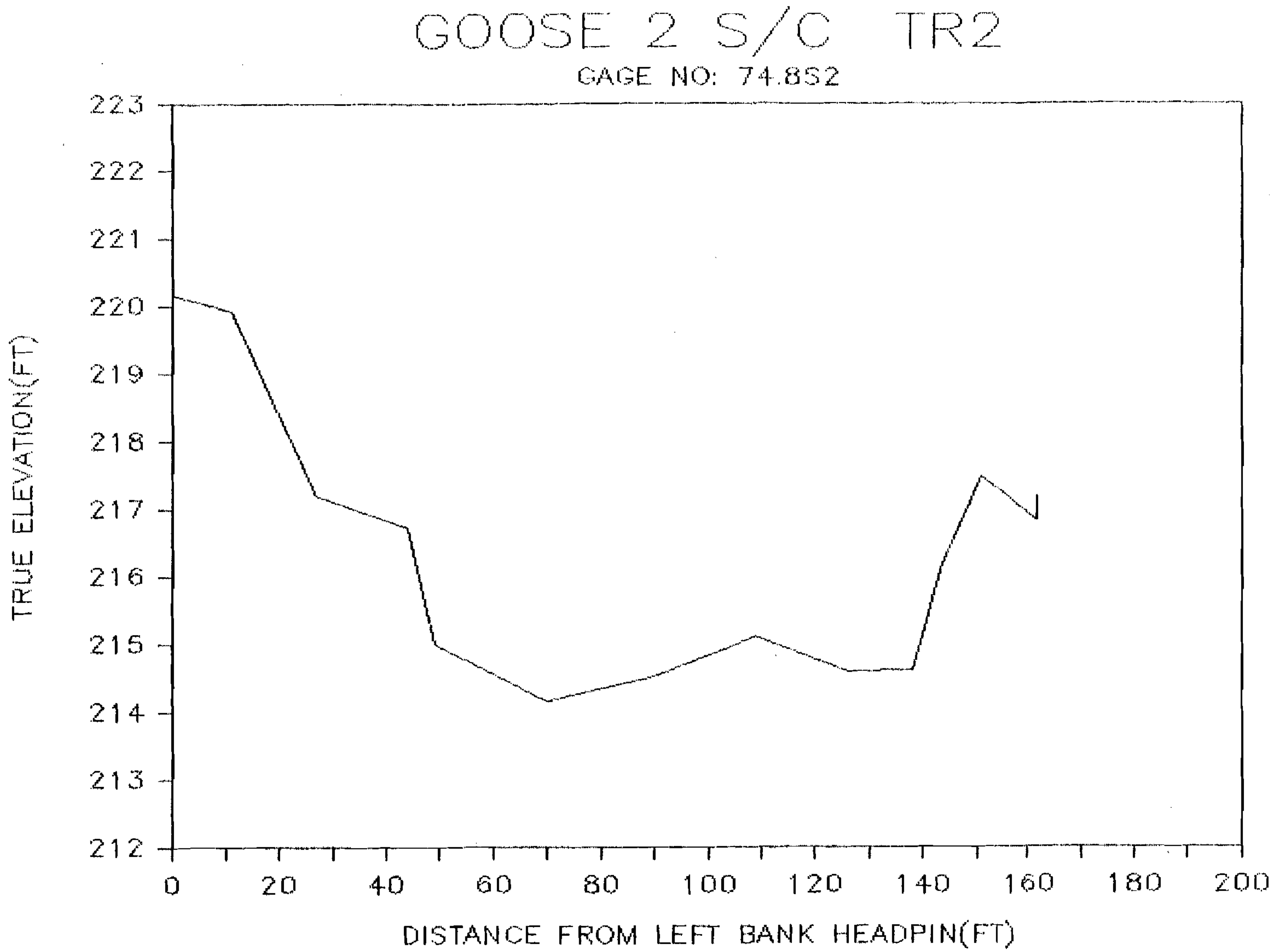
Attachment Figure D-21. Cross sectional profile obtained at transect 3A of Mainstem West Bank Side Channel.



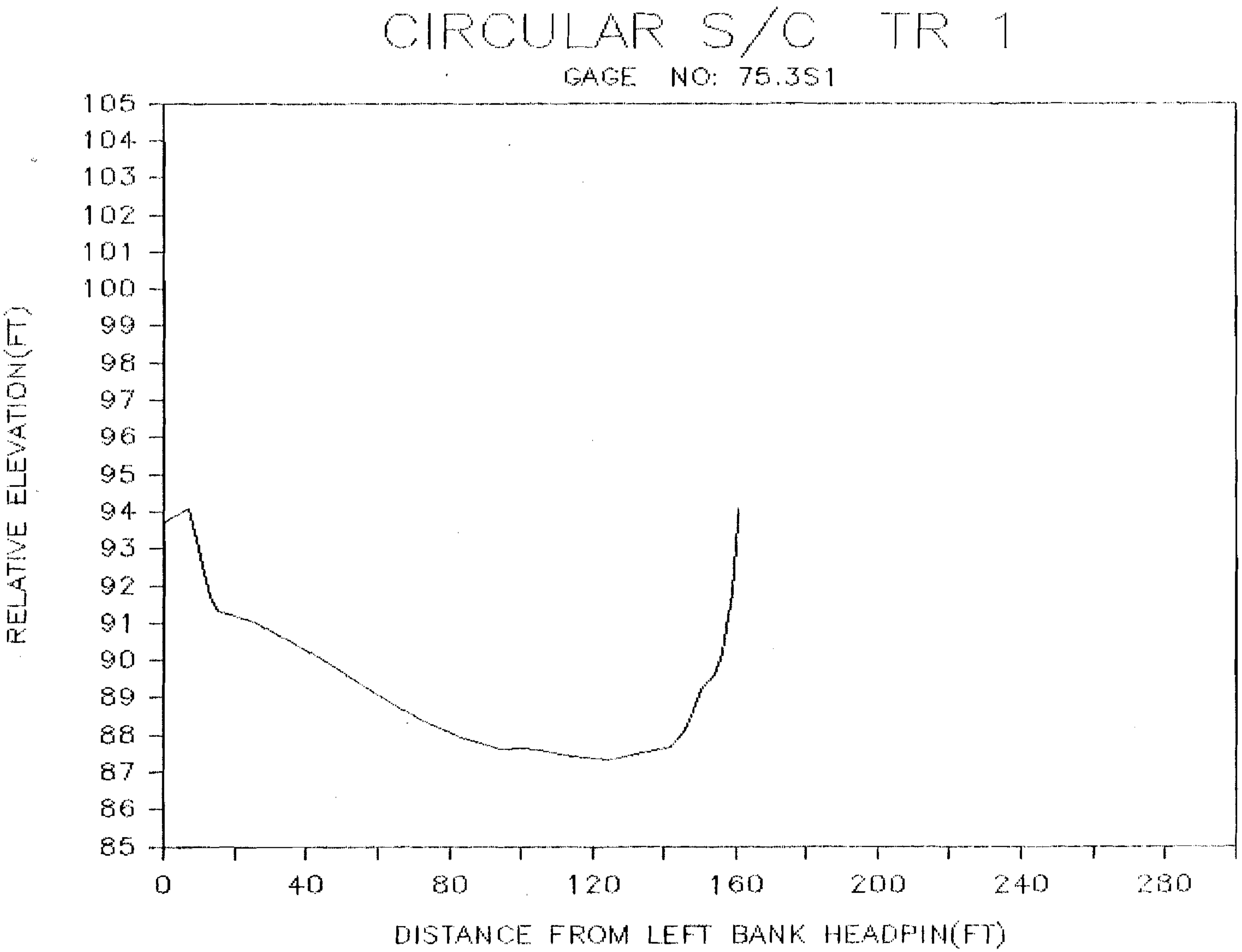
Attachment Figure D-22. Cross sectional profile obtained at transect 3B of Mainstem West Bank Side Channel.



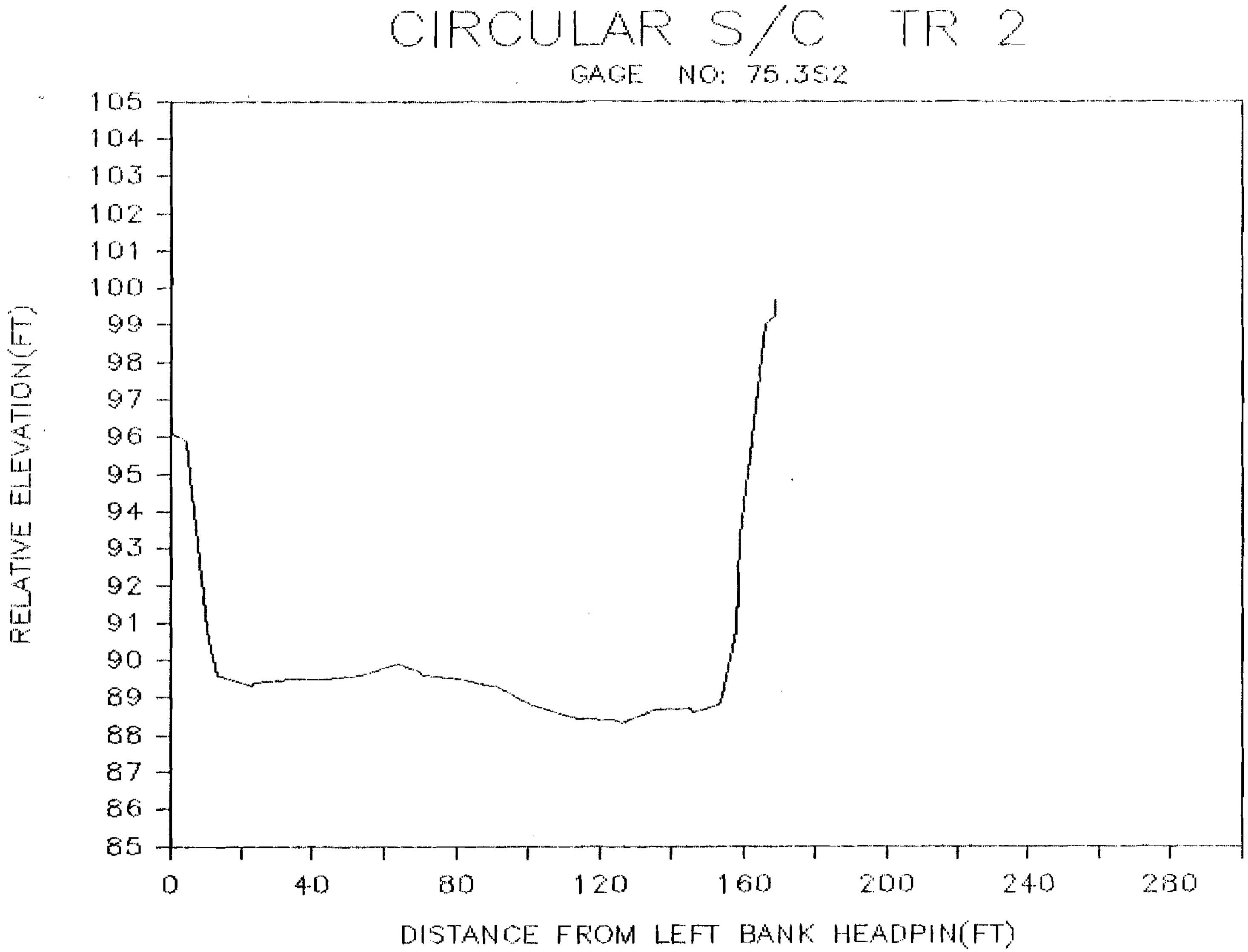
Attachment Figure D-23. Cross sectional profile obtained at transect 4 of Mainstem West Bank Side Channel.



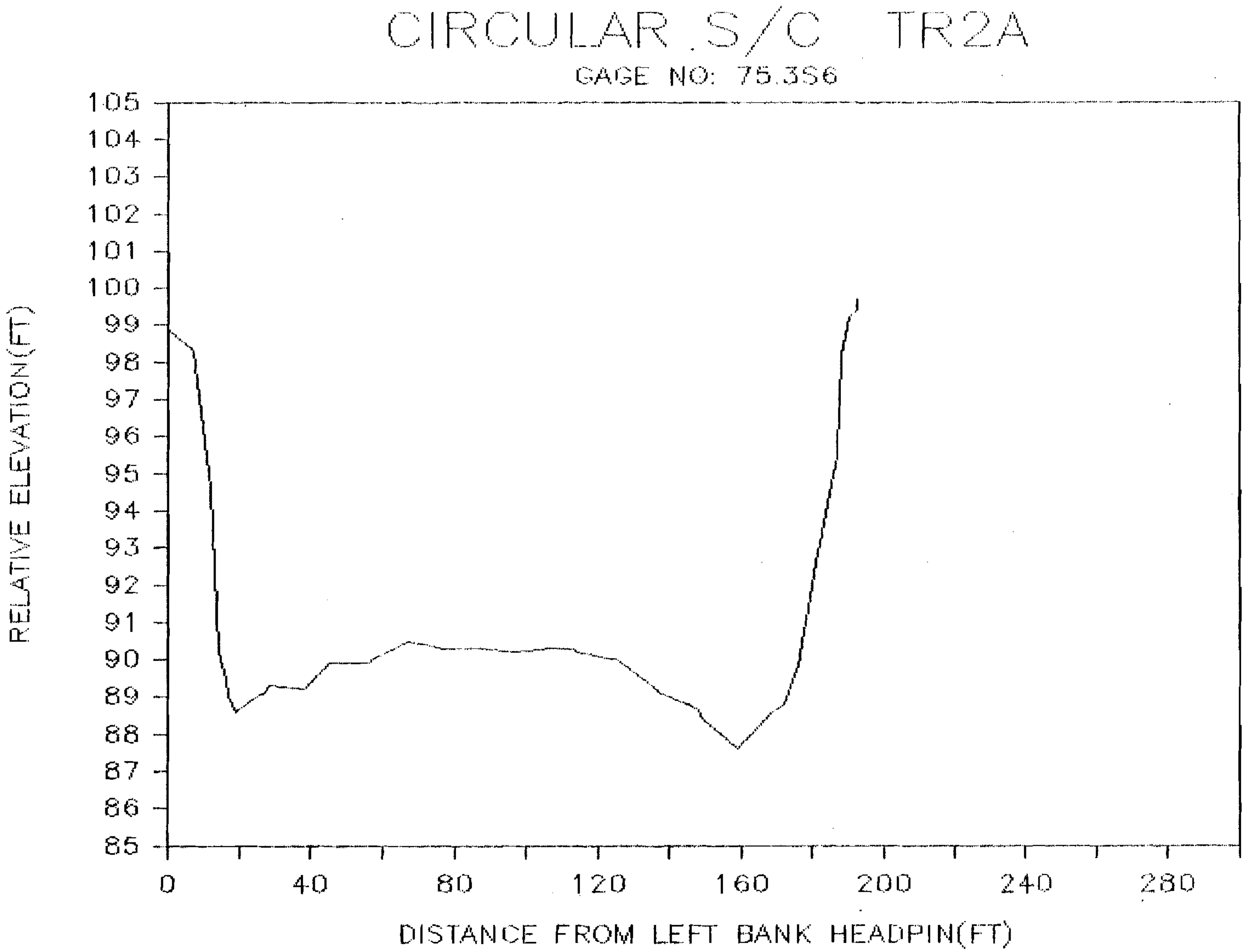
Attachment Figure D-24. Cross sectional profile obtained at transect 2 of Goose 2 Side Channel.



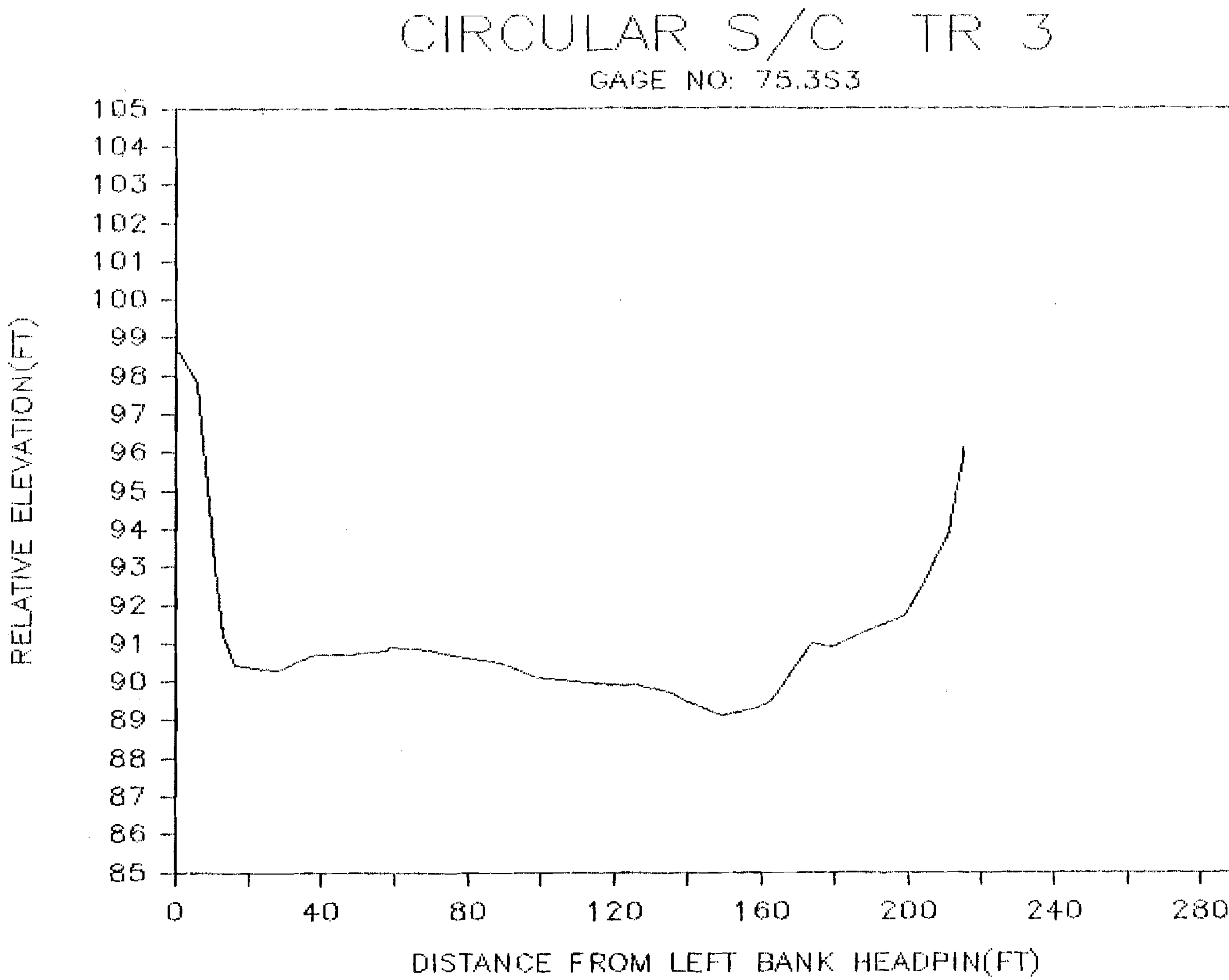
Attachment Figure D-25. Cross sectional profile obtained at transect 1 of Circular Side Channel.



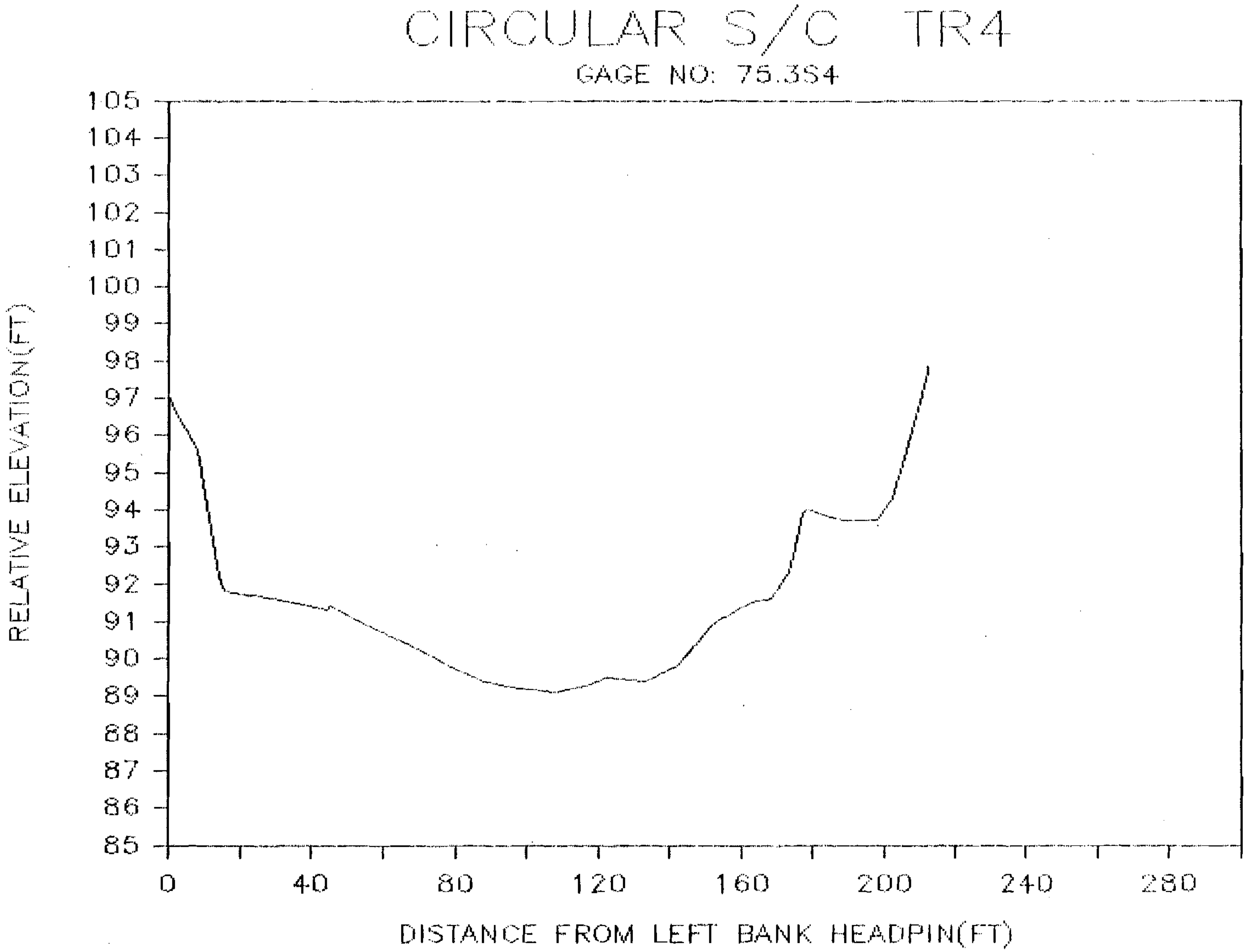
Attachment Figure D-26. Cross sectional profile obtained at transect 2 of Circular Side Channel.



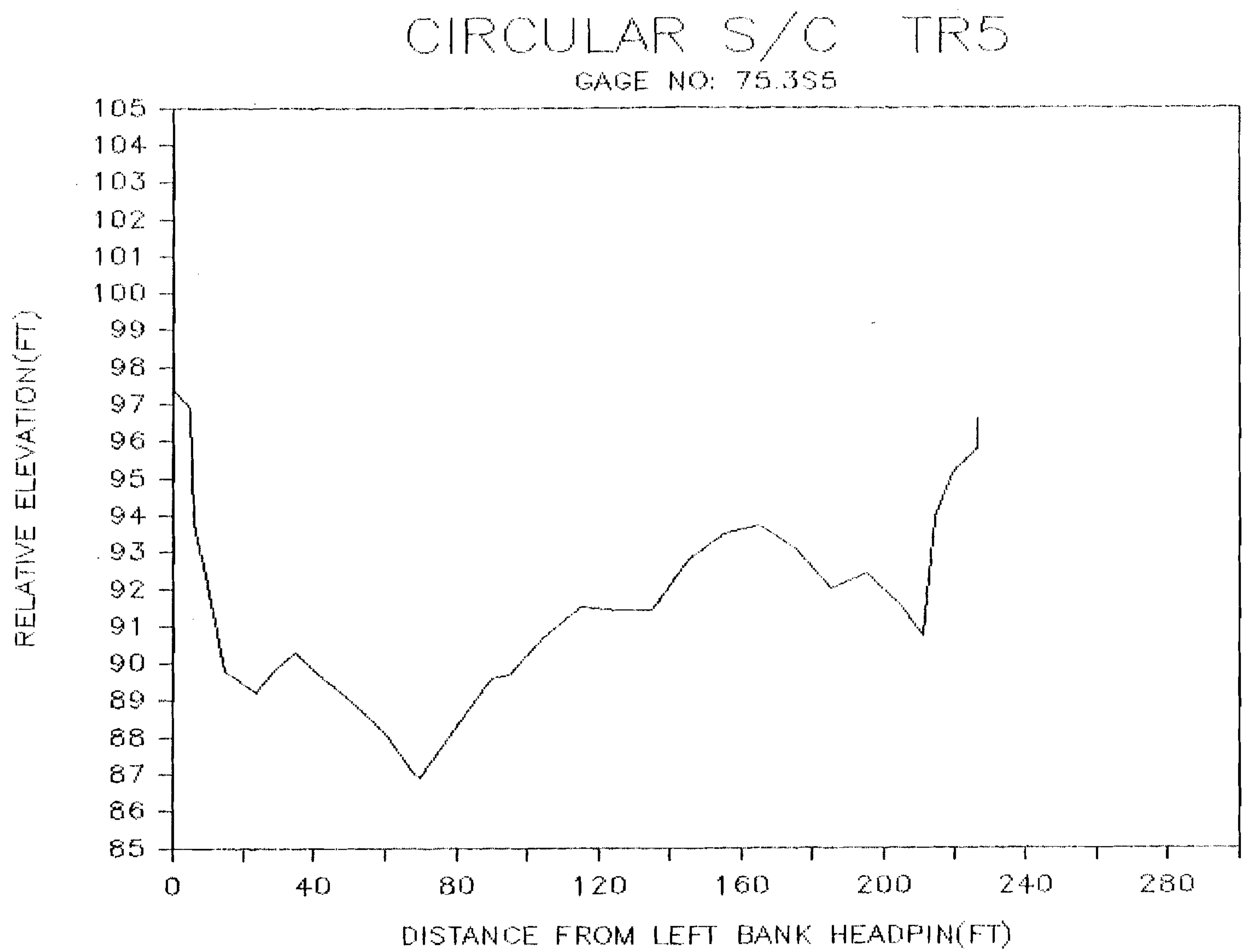
Attachment Figure D-27. Cross sectional profile obtained at transect 2A of Circular Side Channel.



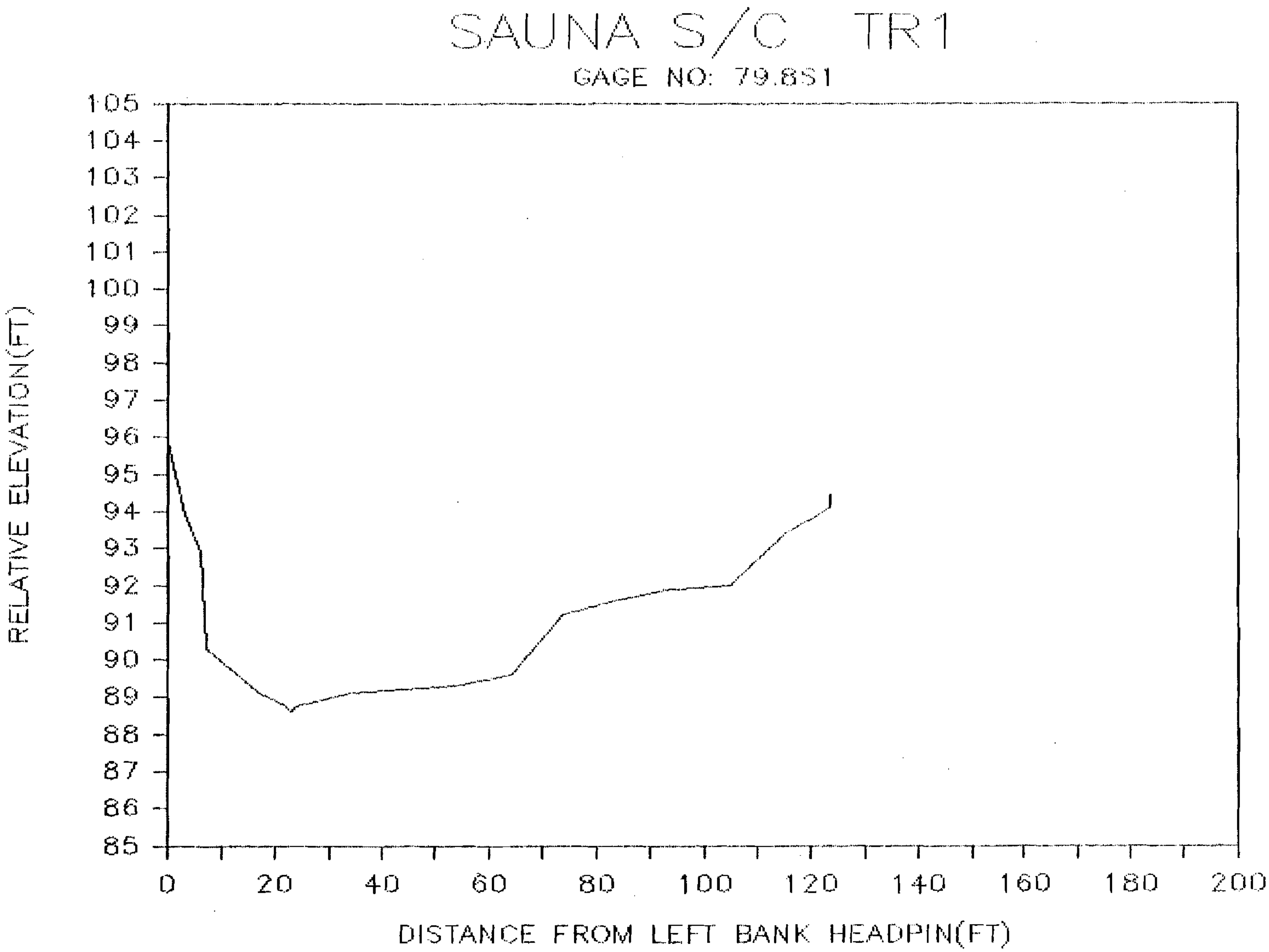
Attachment Figure D- 28. Cross sectional profile obtained at transect 3 of Circular Side Channel.



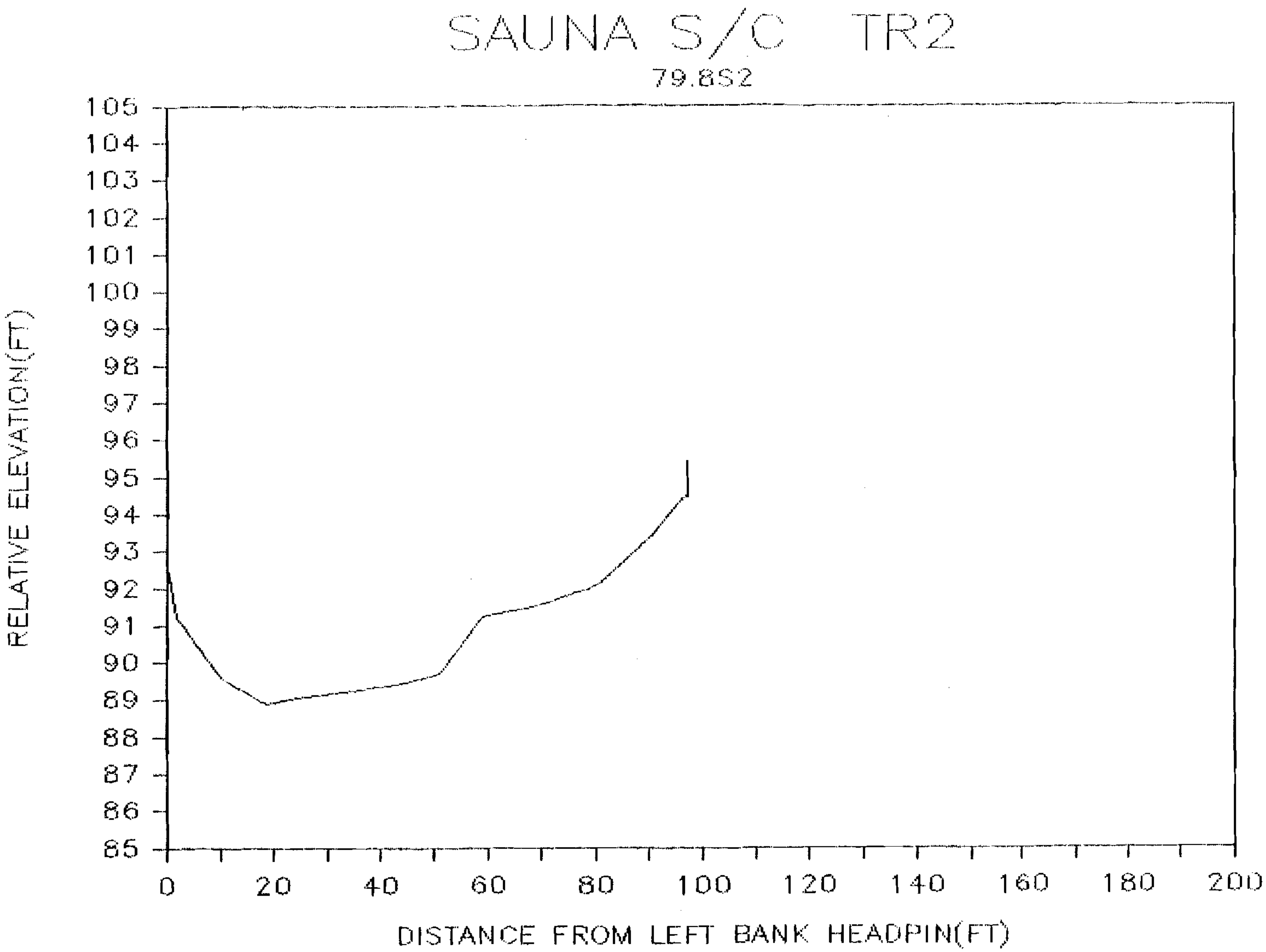
Attachment Figure D-29. Cross sectional profile obtained at transect 4 of Circular Side Channel.



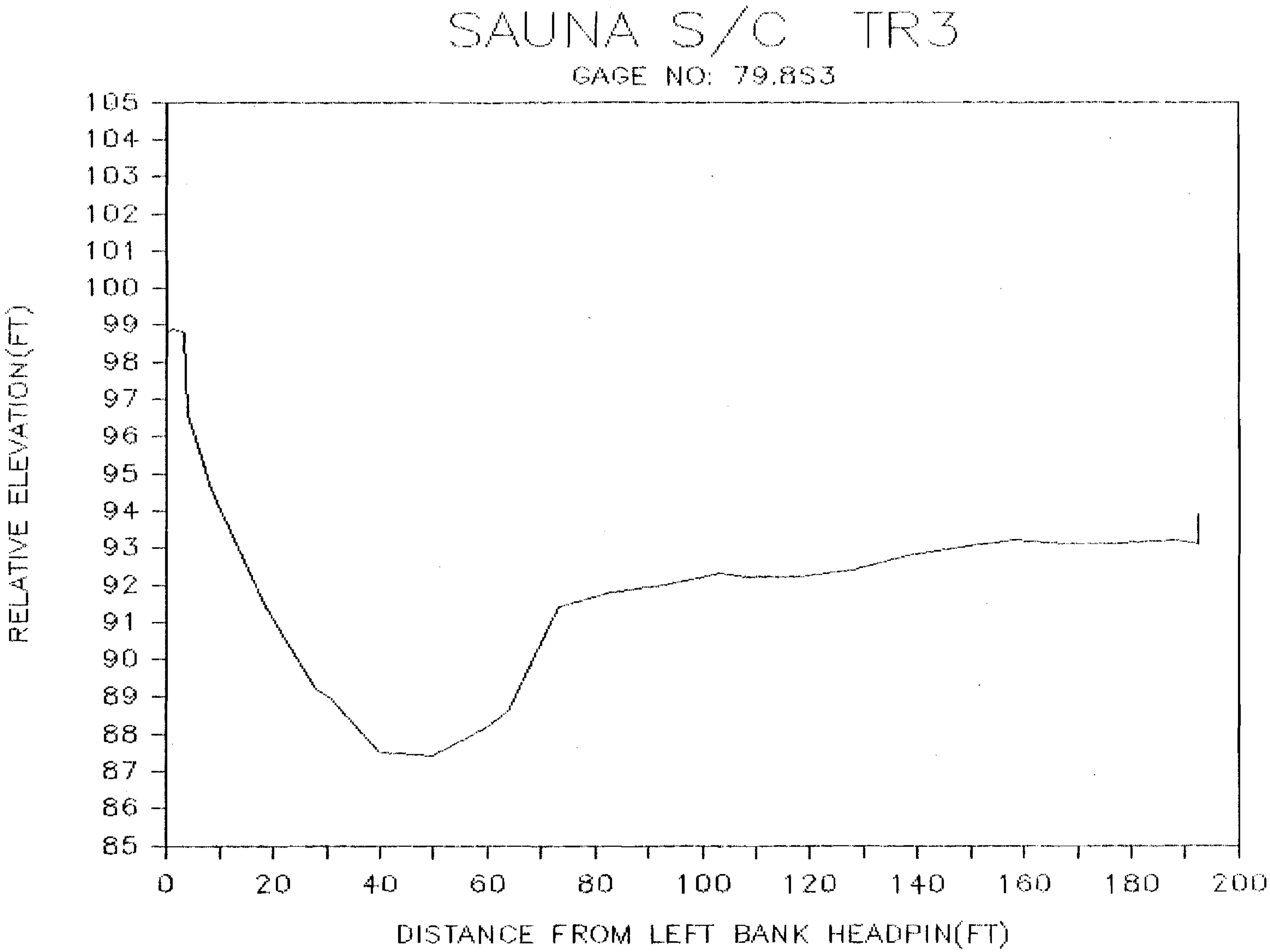
Attachment Figure D-30. Cross sectional profile obtained at transect 5 of Circular Side Channel.



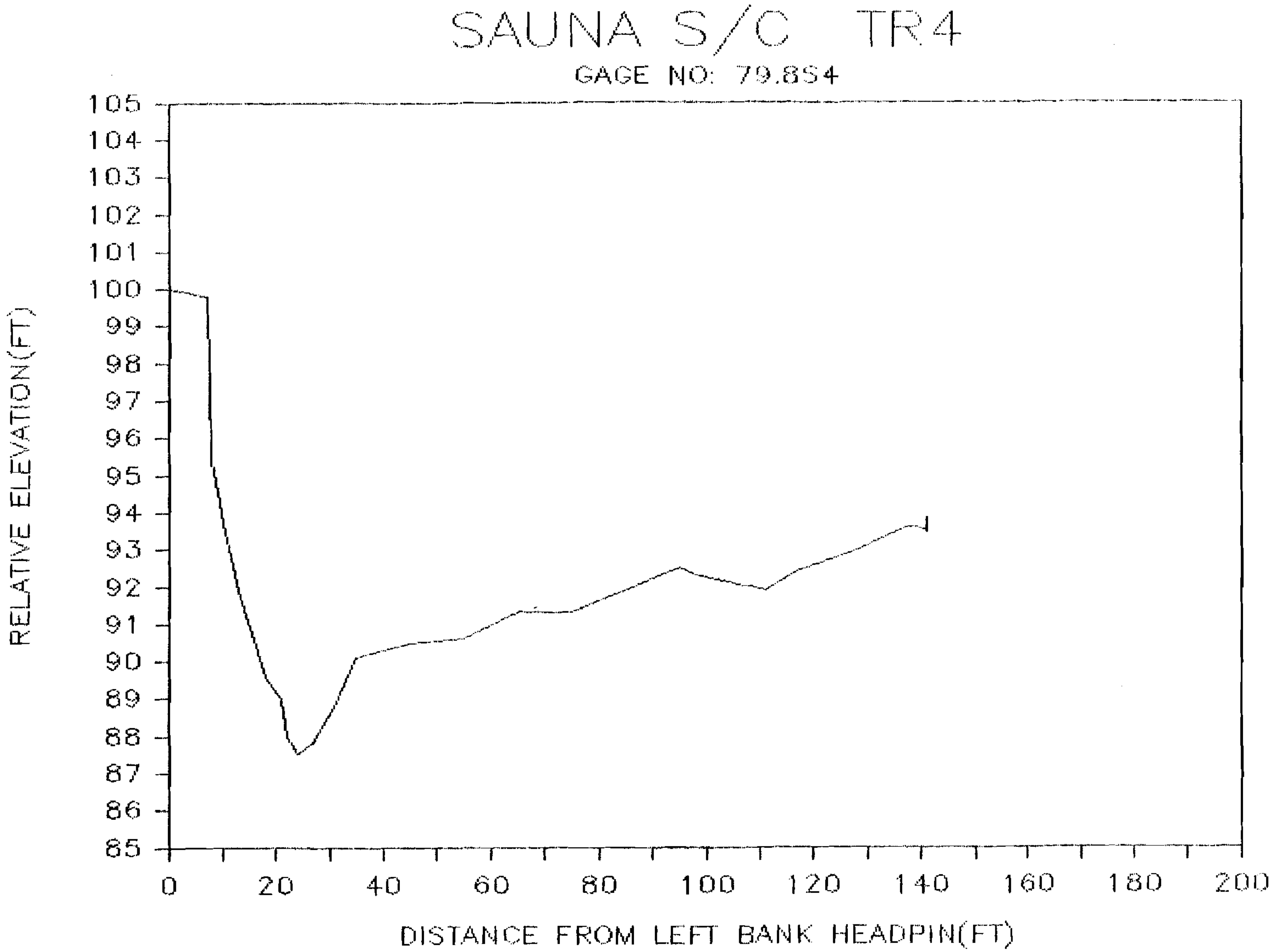
Attachment Figure D-31. Cross sectional profile obtained at transect 1 of Sauna Side Channel.



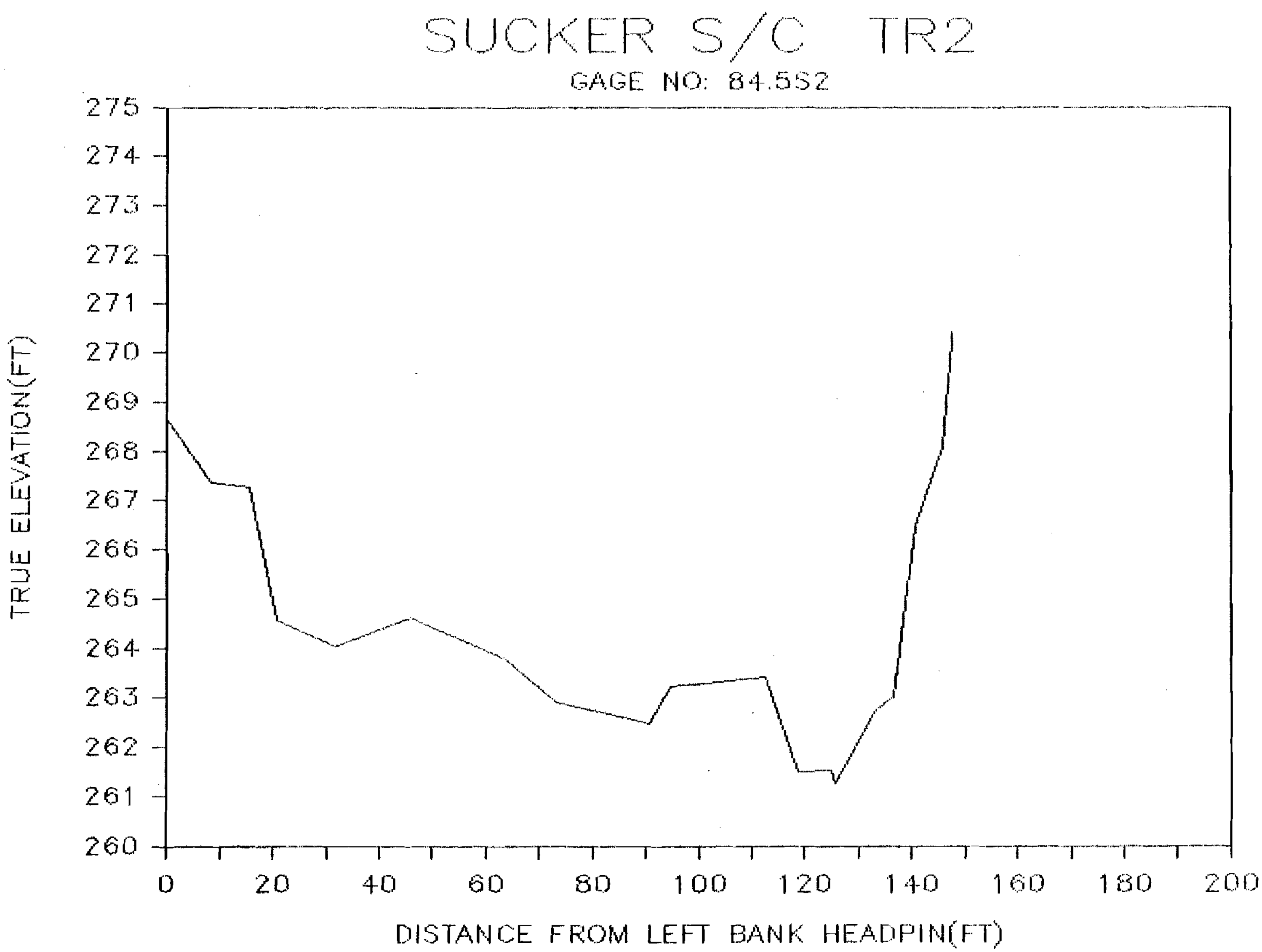
Attachment Figure D-32. Cross sectional profile obtained at transect 2 of Sauna Side Channel.



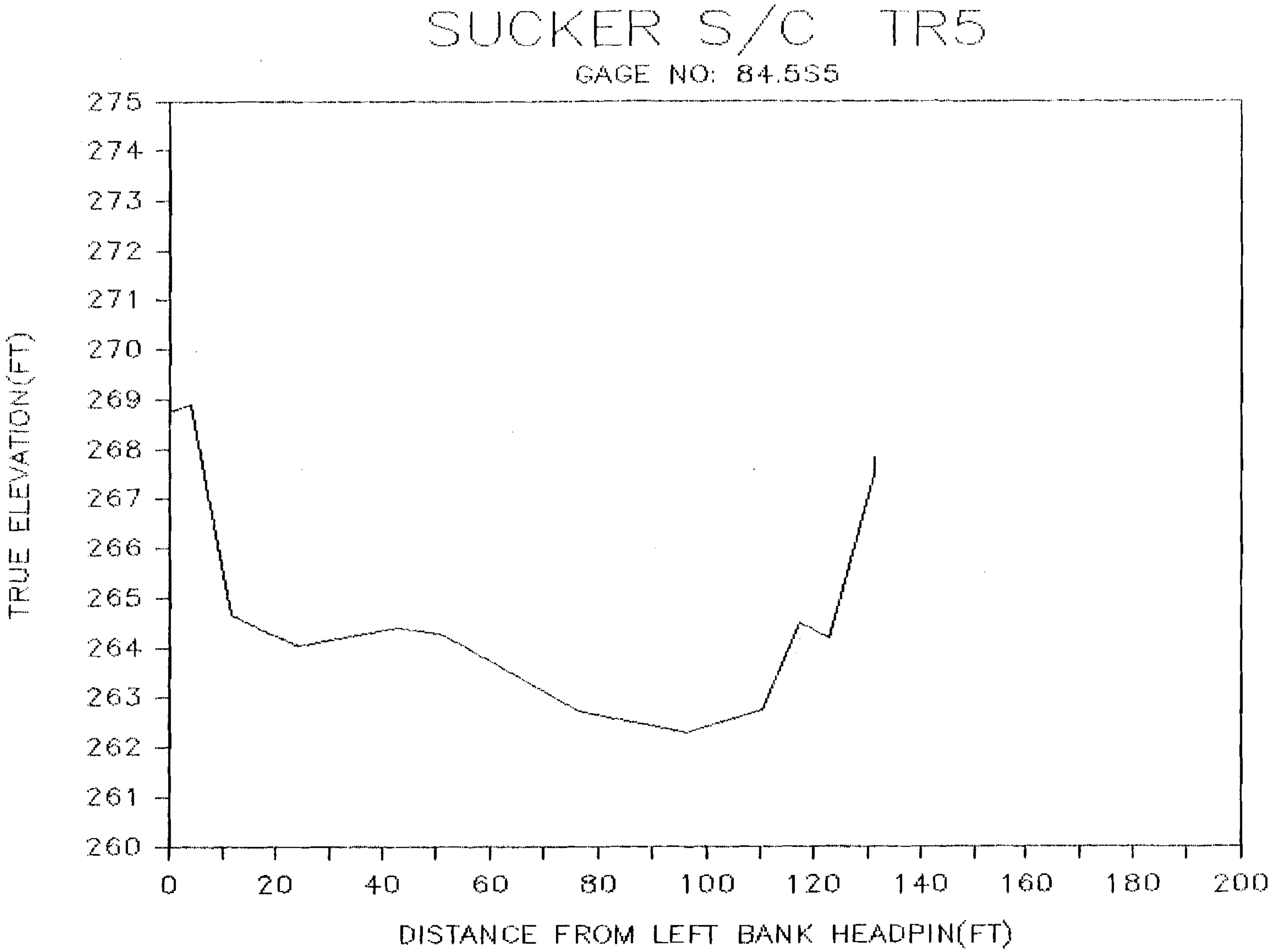
Attachment Figure D-33. Cross sectional profile obtained at transect 3 of Sauna Side Channel.



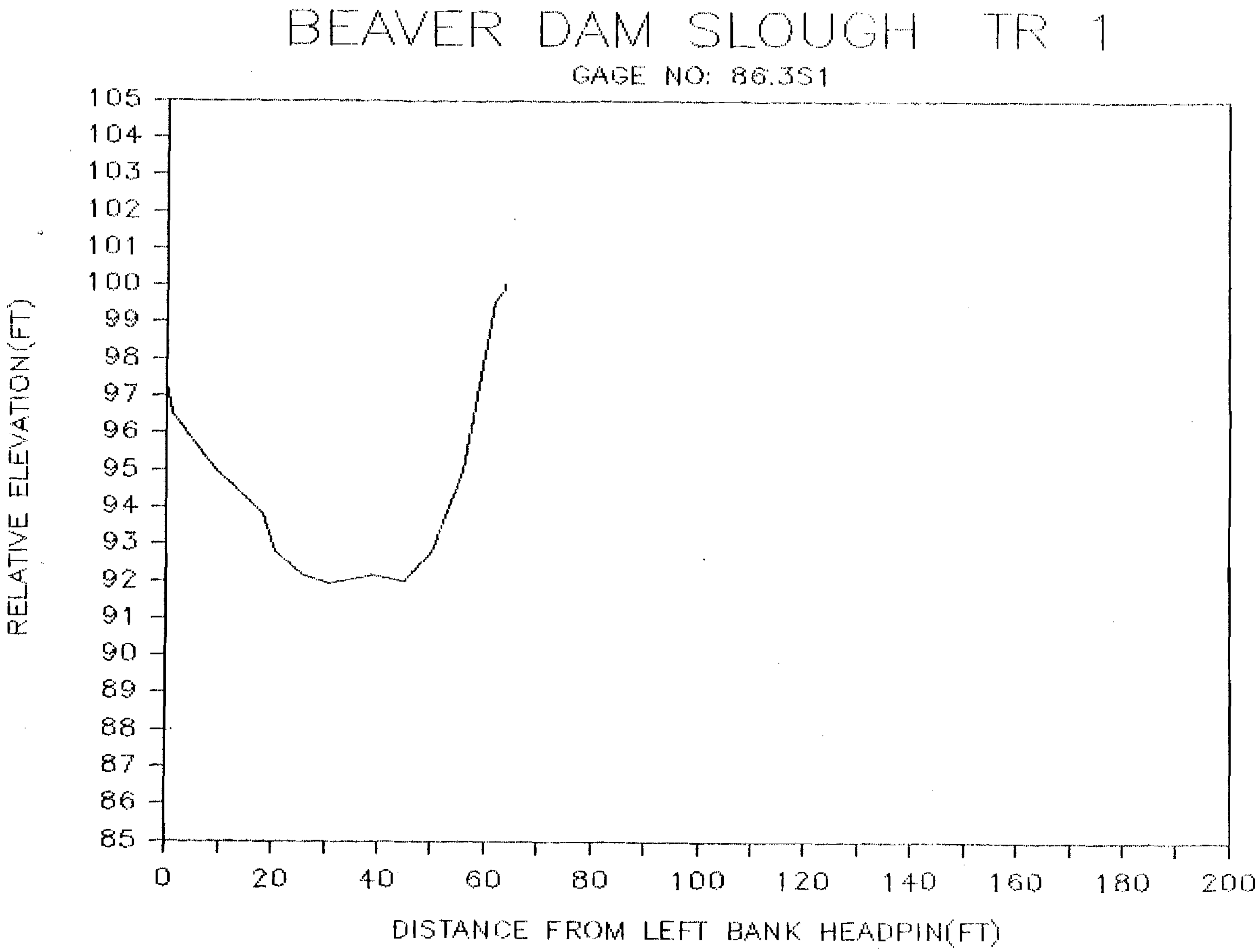
Attachment Figure D-34. Cross sectional profile obtained at transect 4 of Sauna Side Channel.



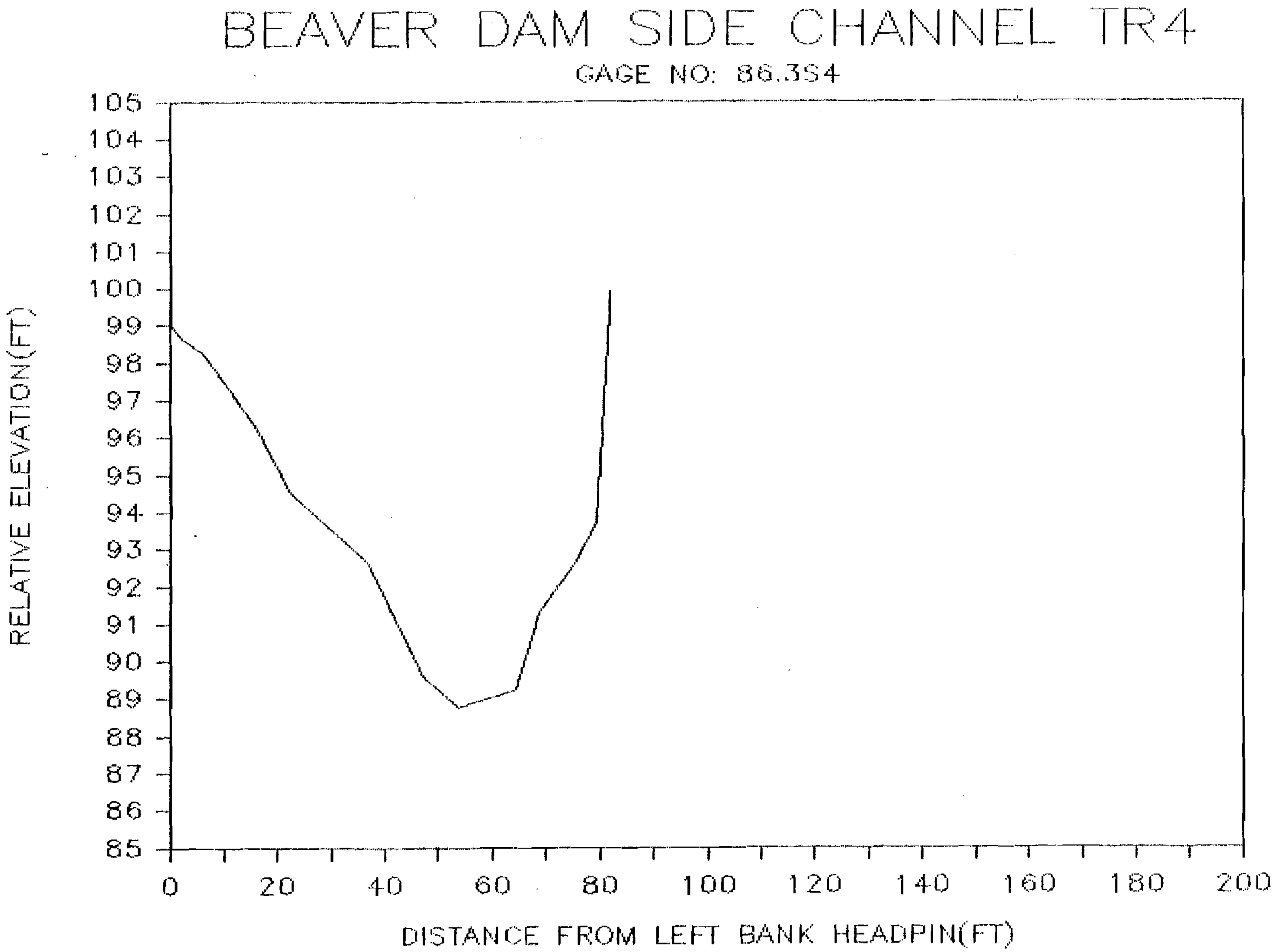
Attachment Figure D-35. Cross sectional profile obtained at transect 2 of Sucker Side Channel.



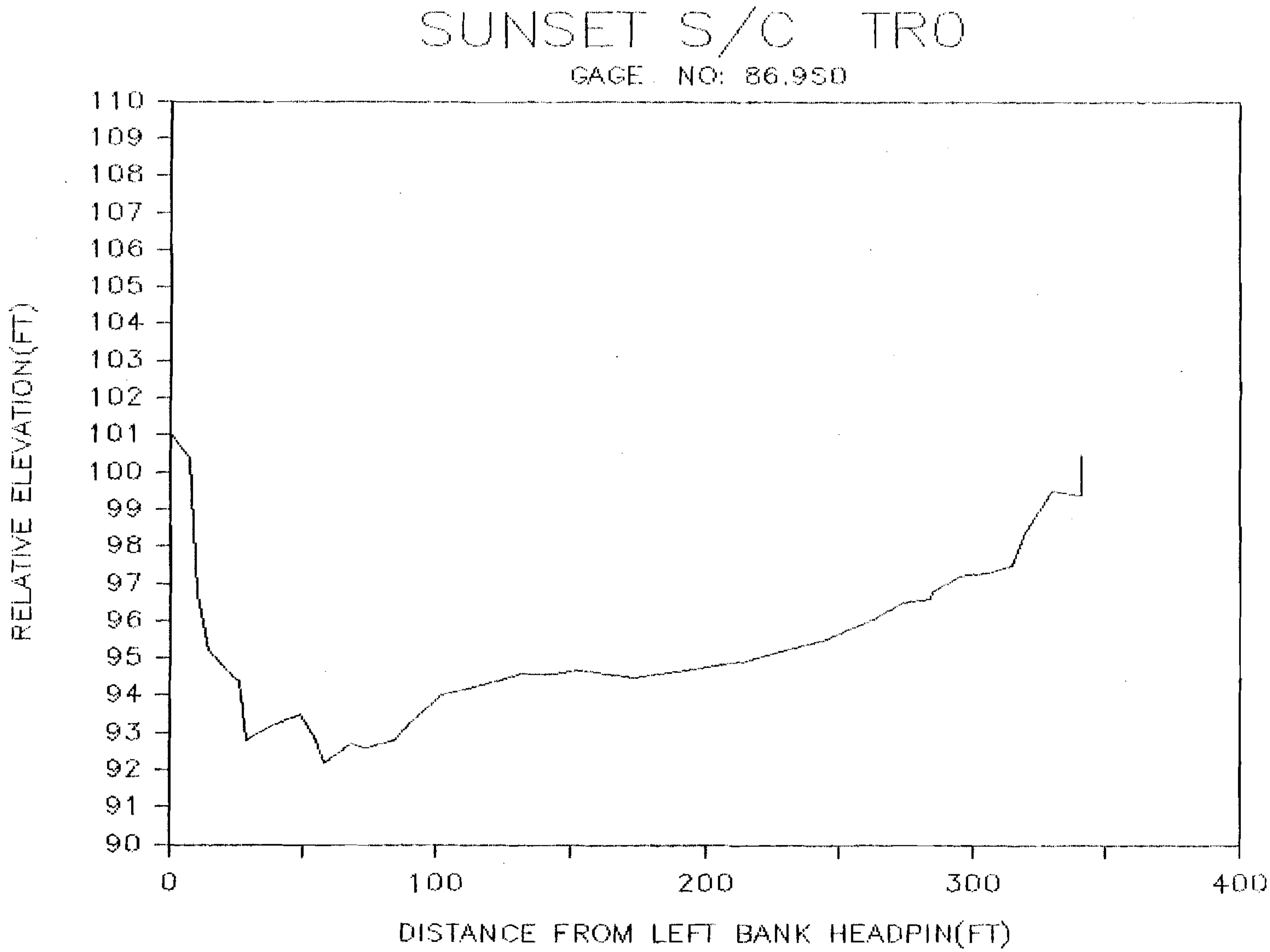
Attachment Figure D-36. Cross sectional profile obtained at transect 5 of Sucker Side Channel.



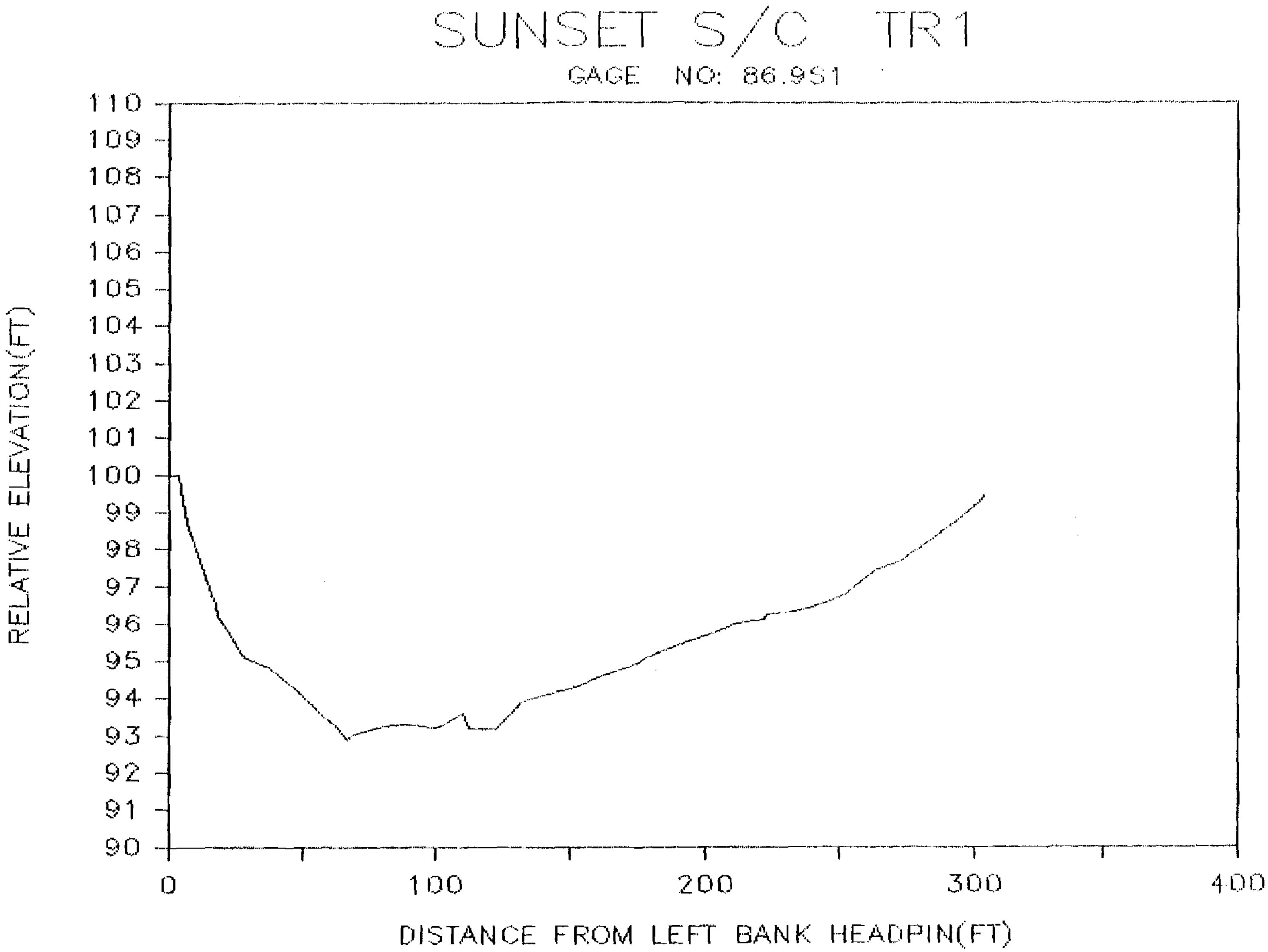
Attachment Figure D-37. Cross sectional profile obtained at transect 1 of Beaver Dam Slough.



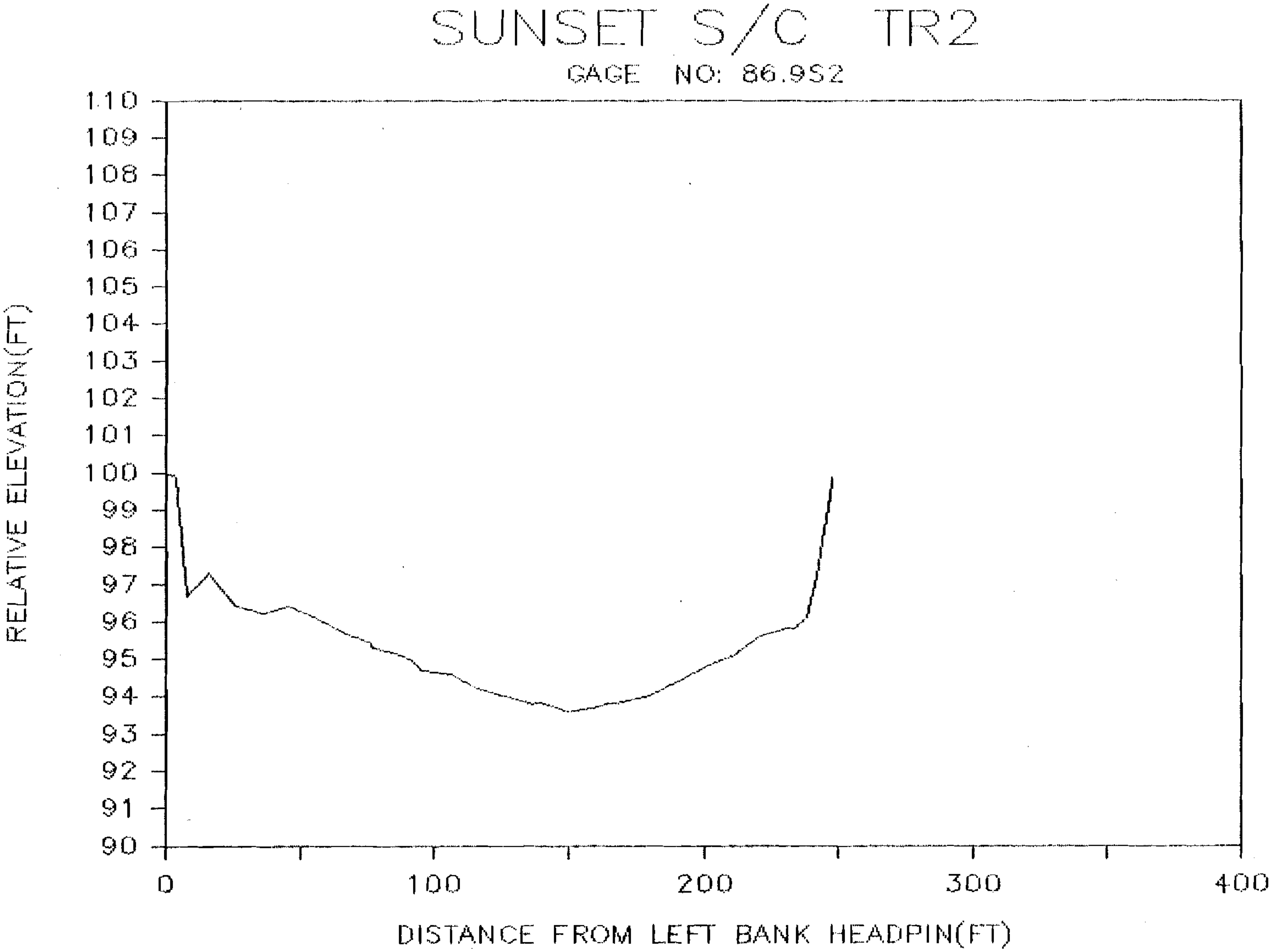
Attachment Figure D-38. Cross sectional profile obtained at transect 4 of Beaver Dam Side Channel.



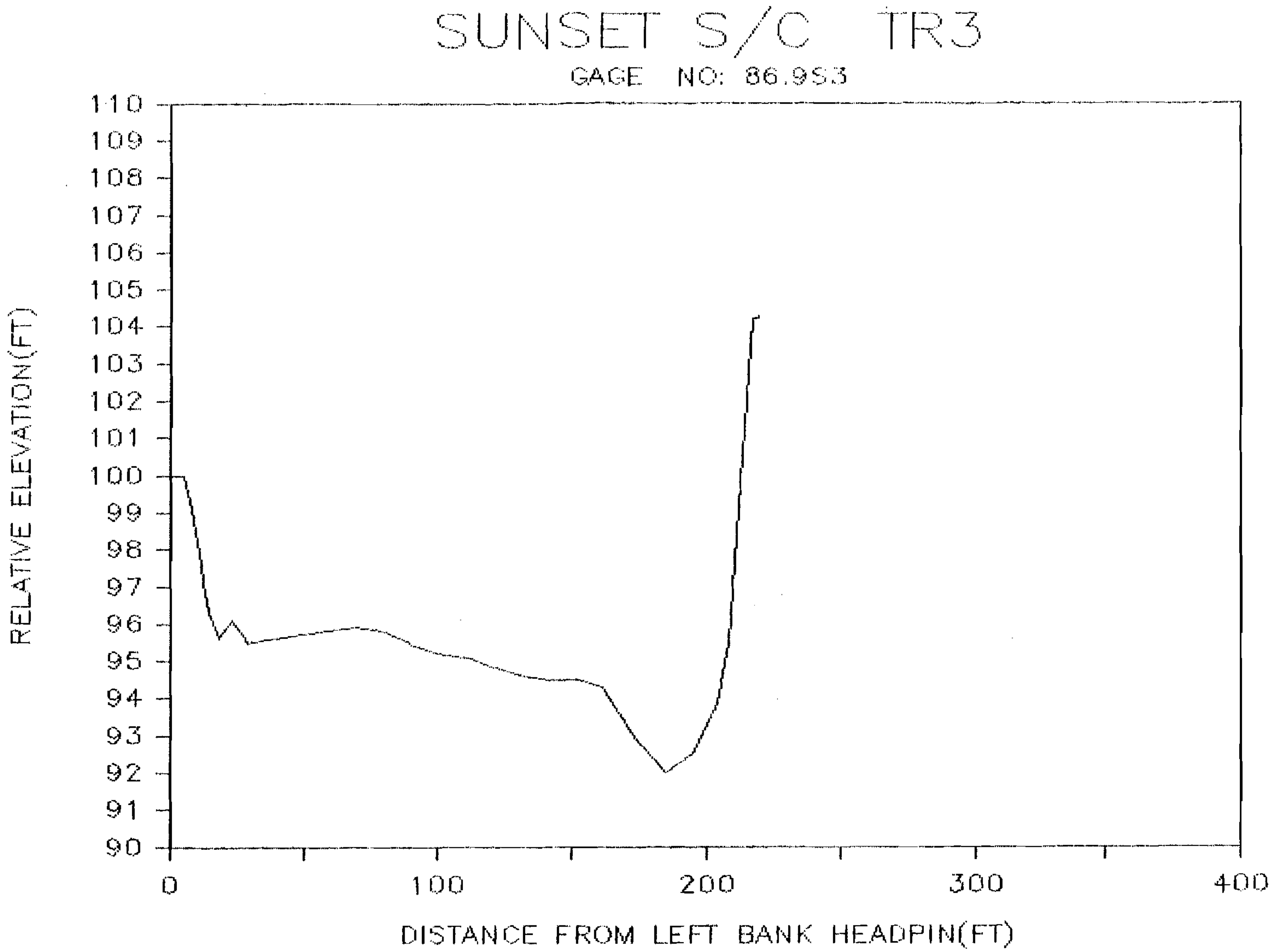
Attachment Figure D-39. Cross sectional profile obtained at transect 0 of Sunset Side Channel.



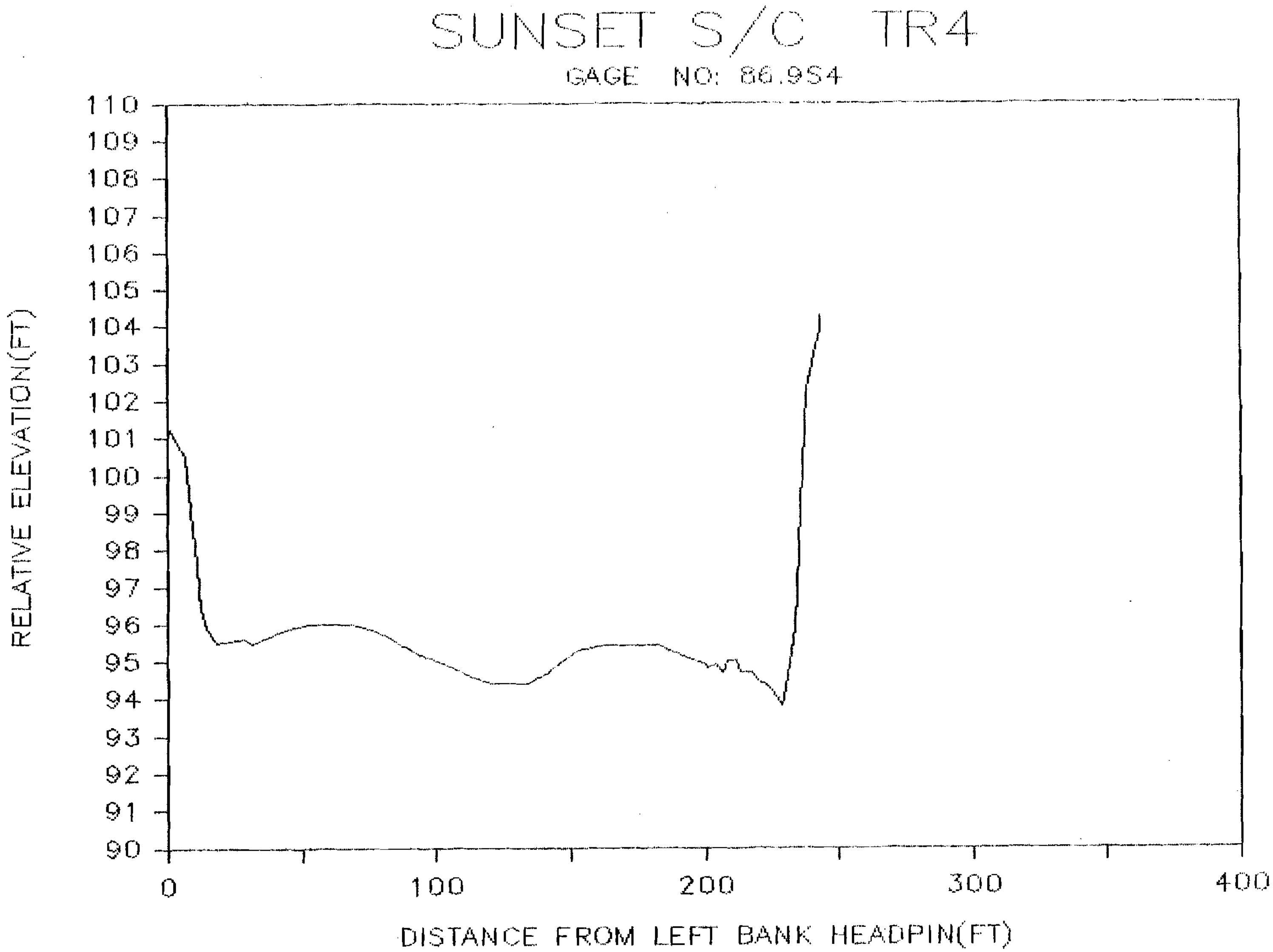
Attachment Figure D- 40. Cross sectional profile obtained at transect 1 of Sunset Side Channel.



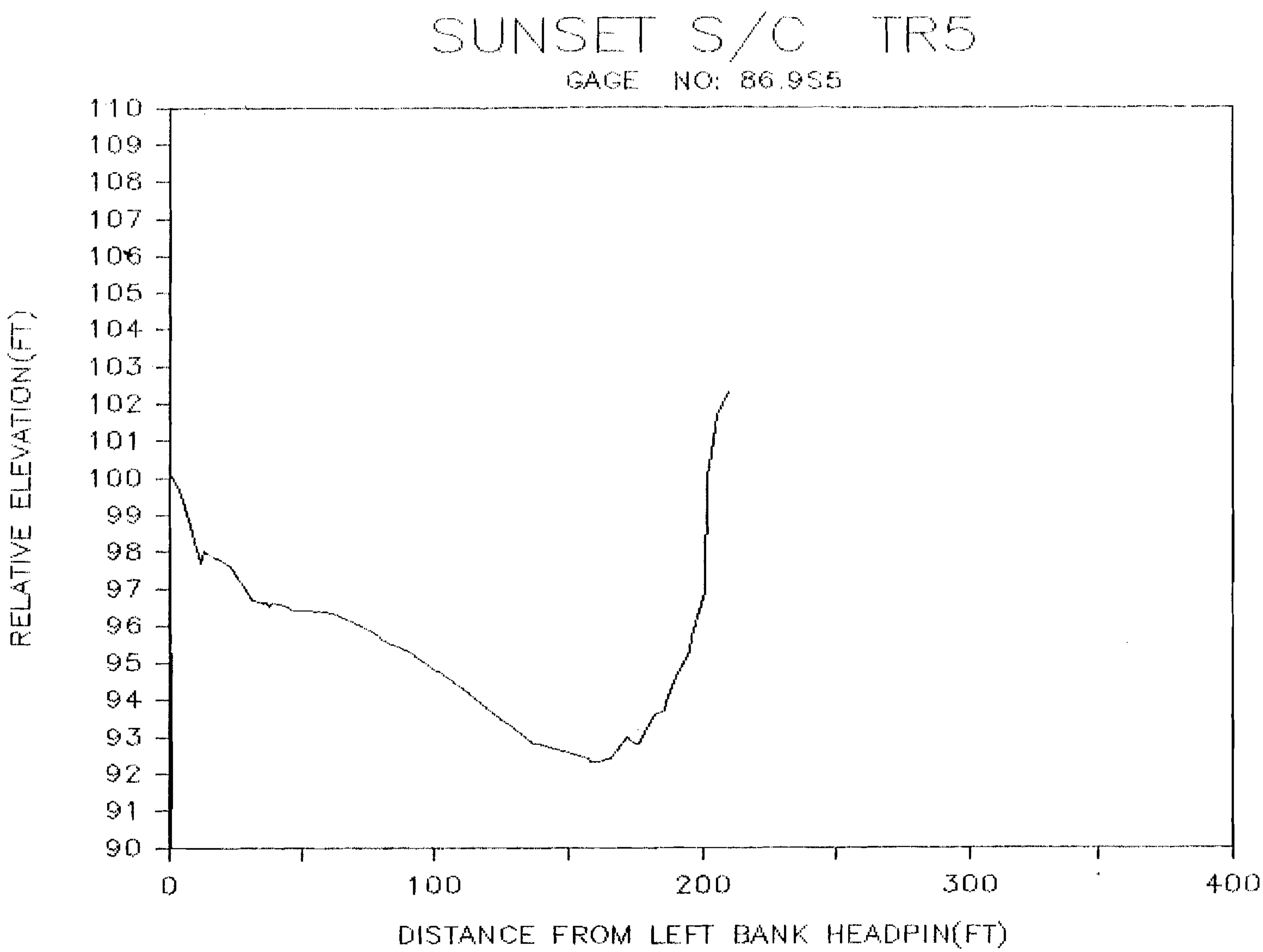
Attachment Figure D- 41. Cross sectional profile obtained at transect 2 of Sunset Side Channel.



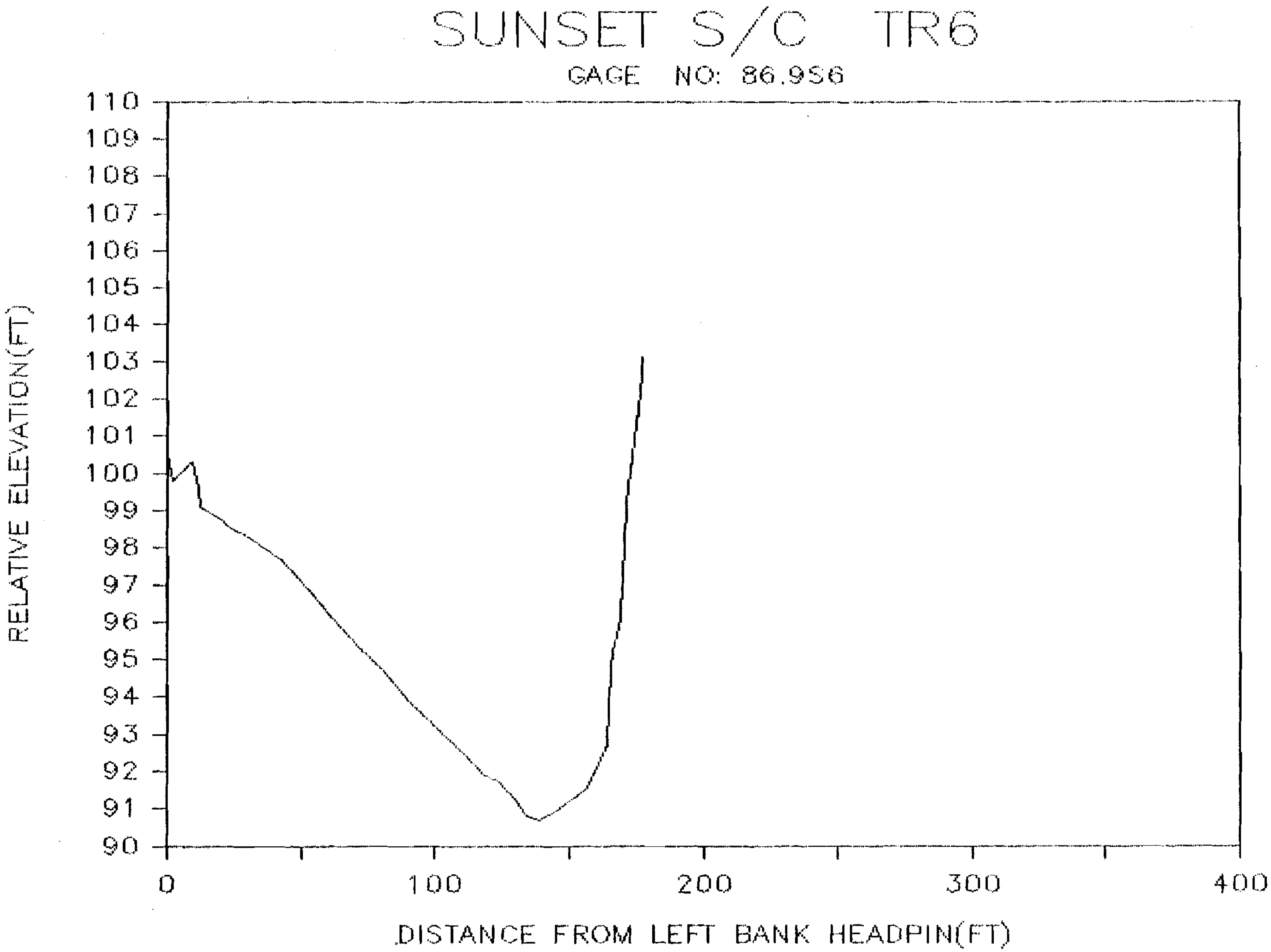
Attachment Figure D-42. Cross sectional profile obtained at transect 3 of Sunset Side channel.



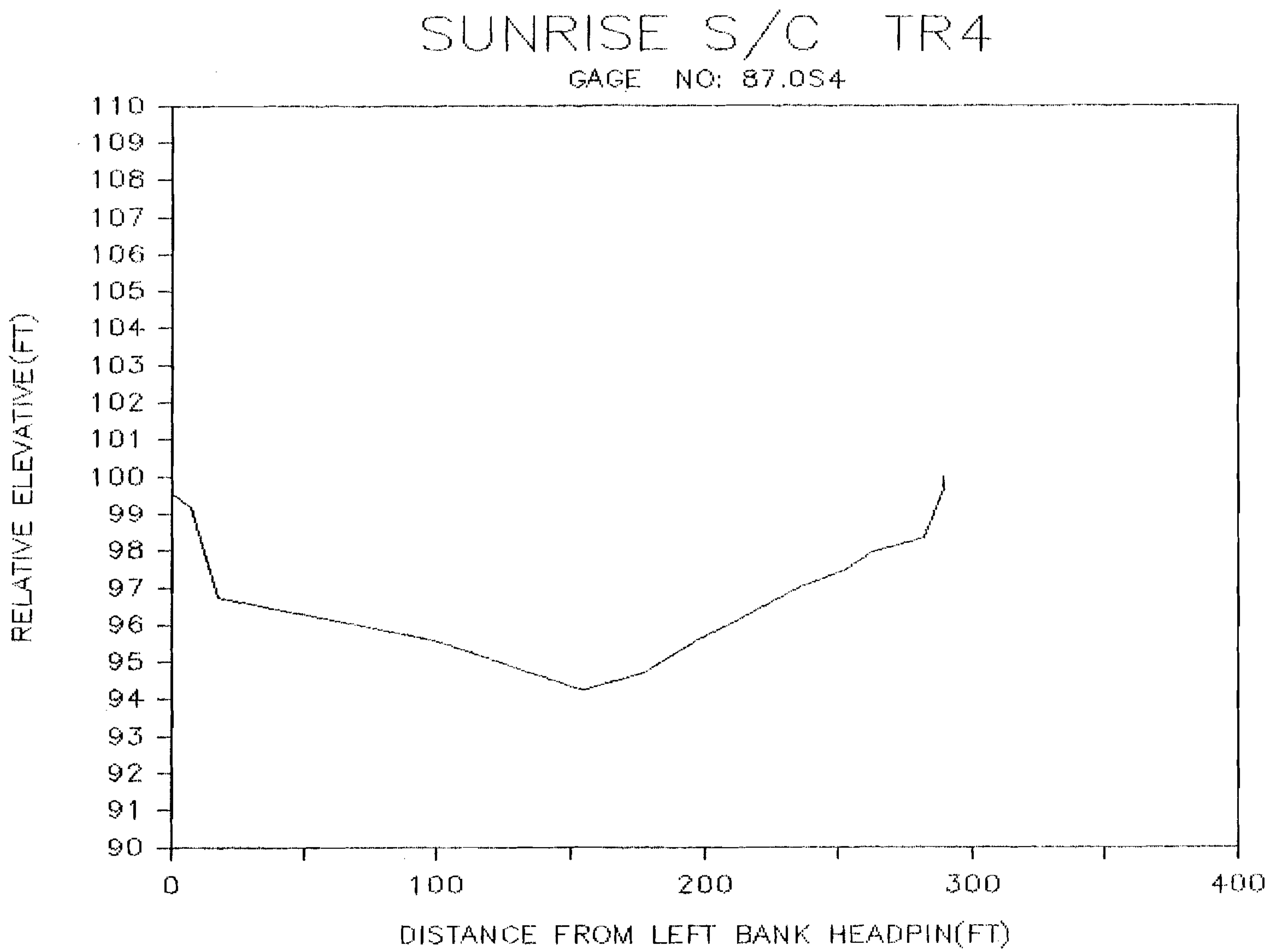
Attachment Figure D-43. Cross sectional profile obtained at transect 4 of Sunset Side Channel.



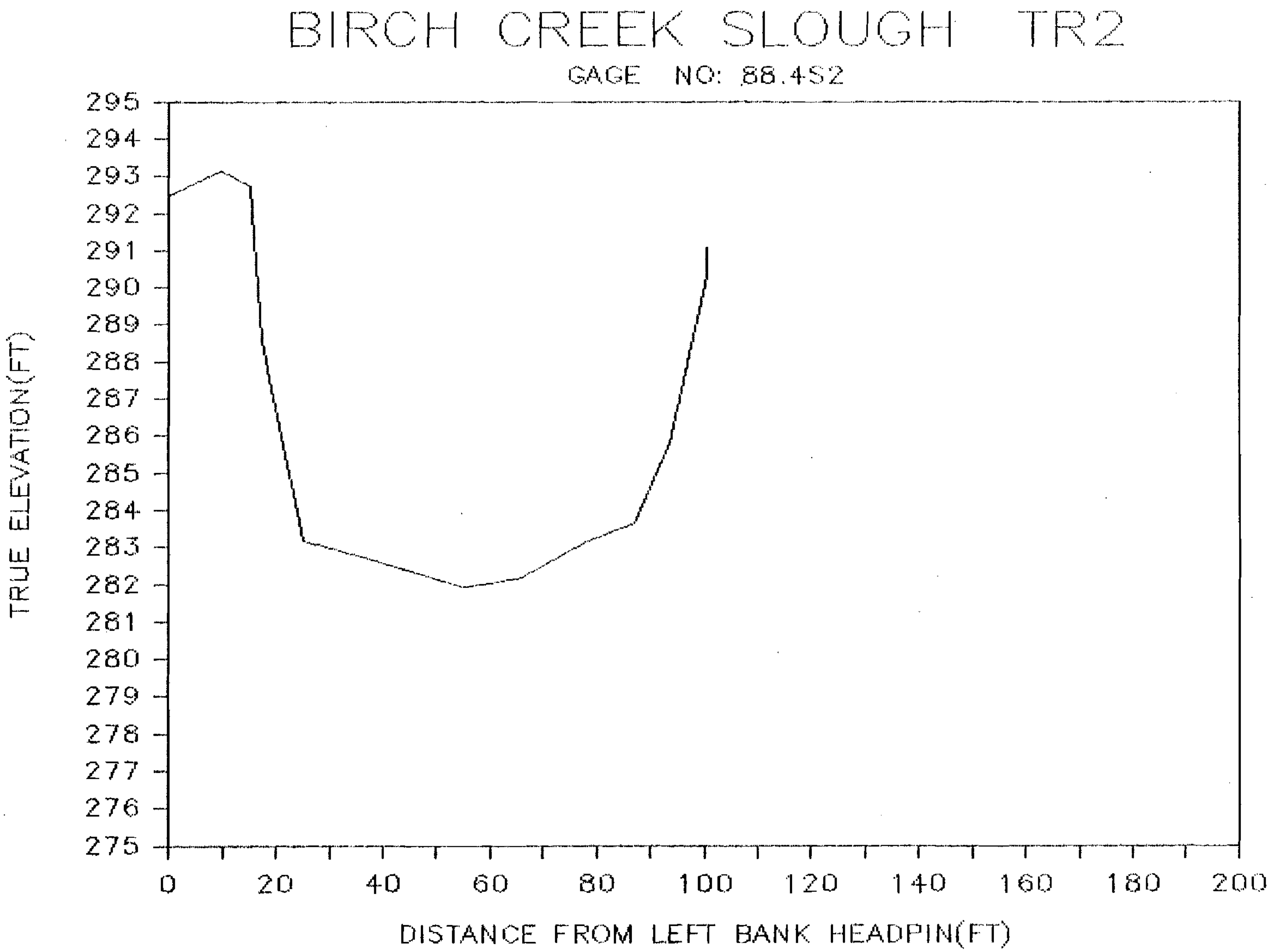
Attachment Figure D-44. Cross sectional profile obtained at transect 5 of Sunset Side Channel.



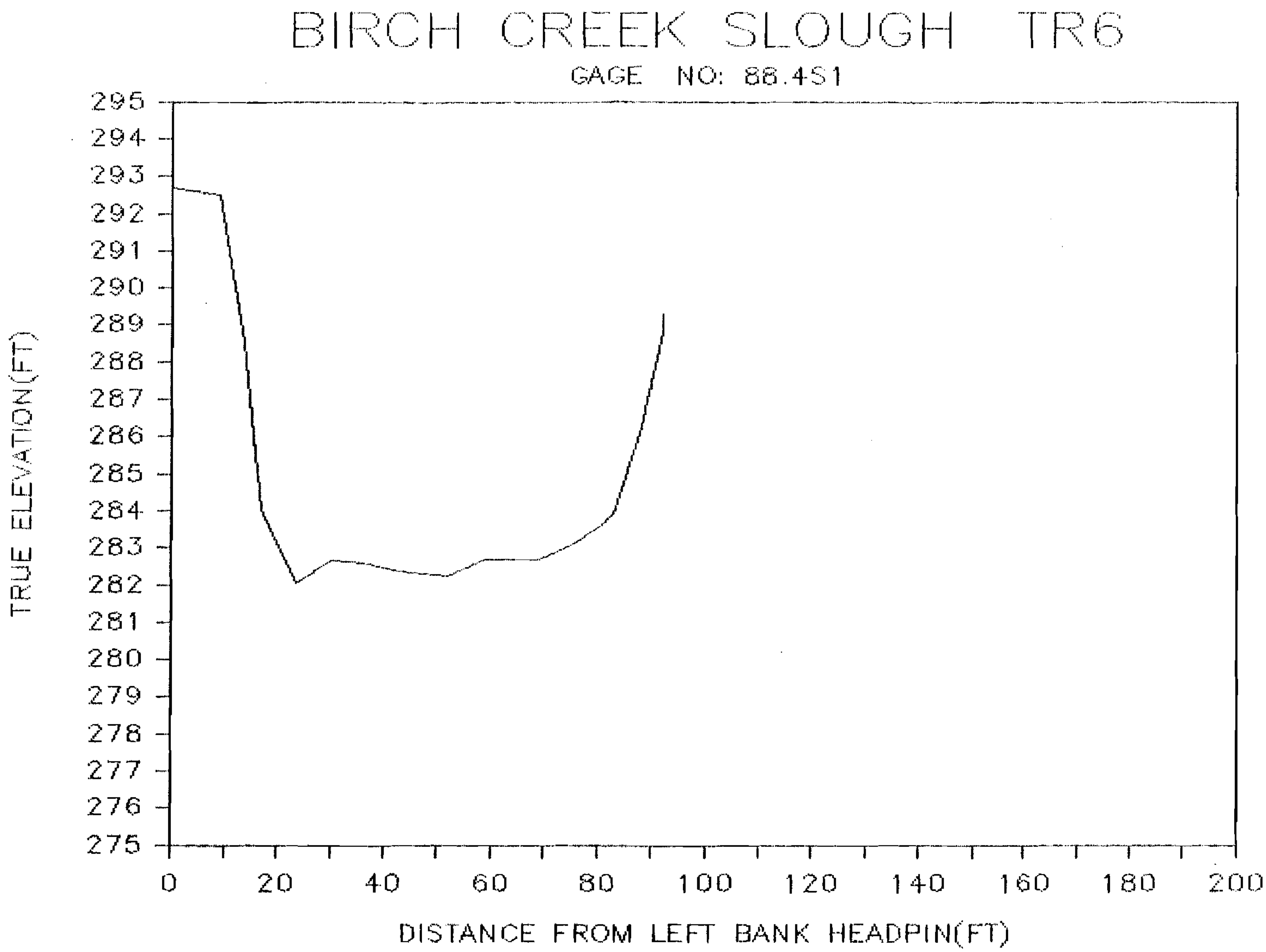
Attachment Figure D-45. Cross sectional profile obtained at transect 6 of Sunset Side Channel.



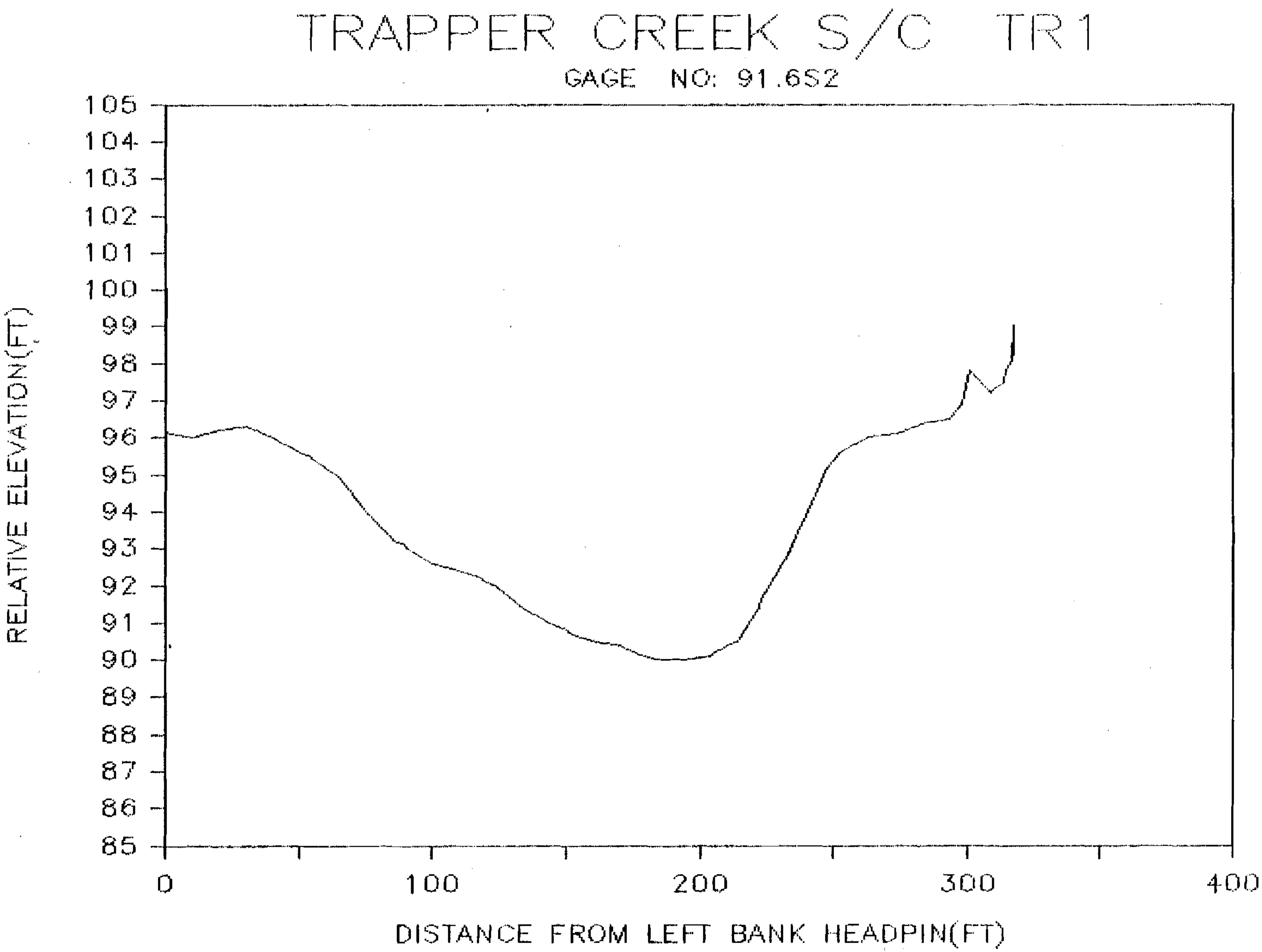
Attachment Figure D- 46. Cross sectional profile obtained at transect 4 of Sunrise Side Channel.



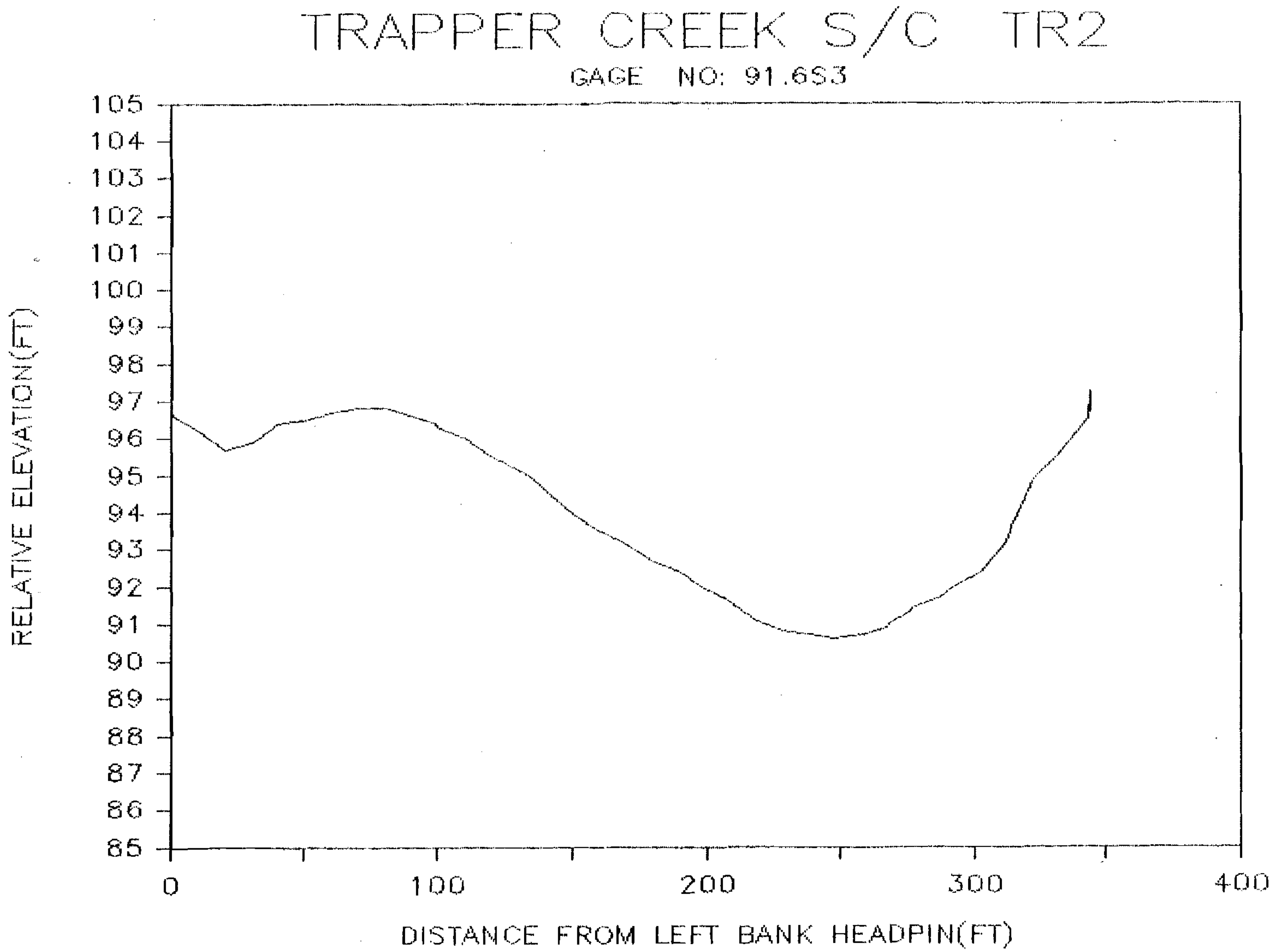
Attachment Figure D- 47. Cross sectional profile obtained at transect 2 of Birch Creek Slough.



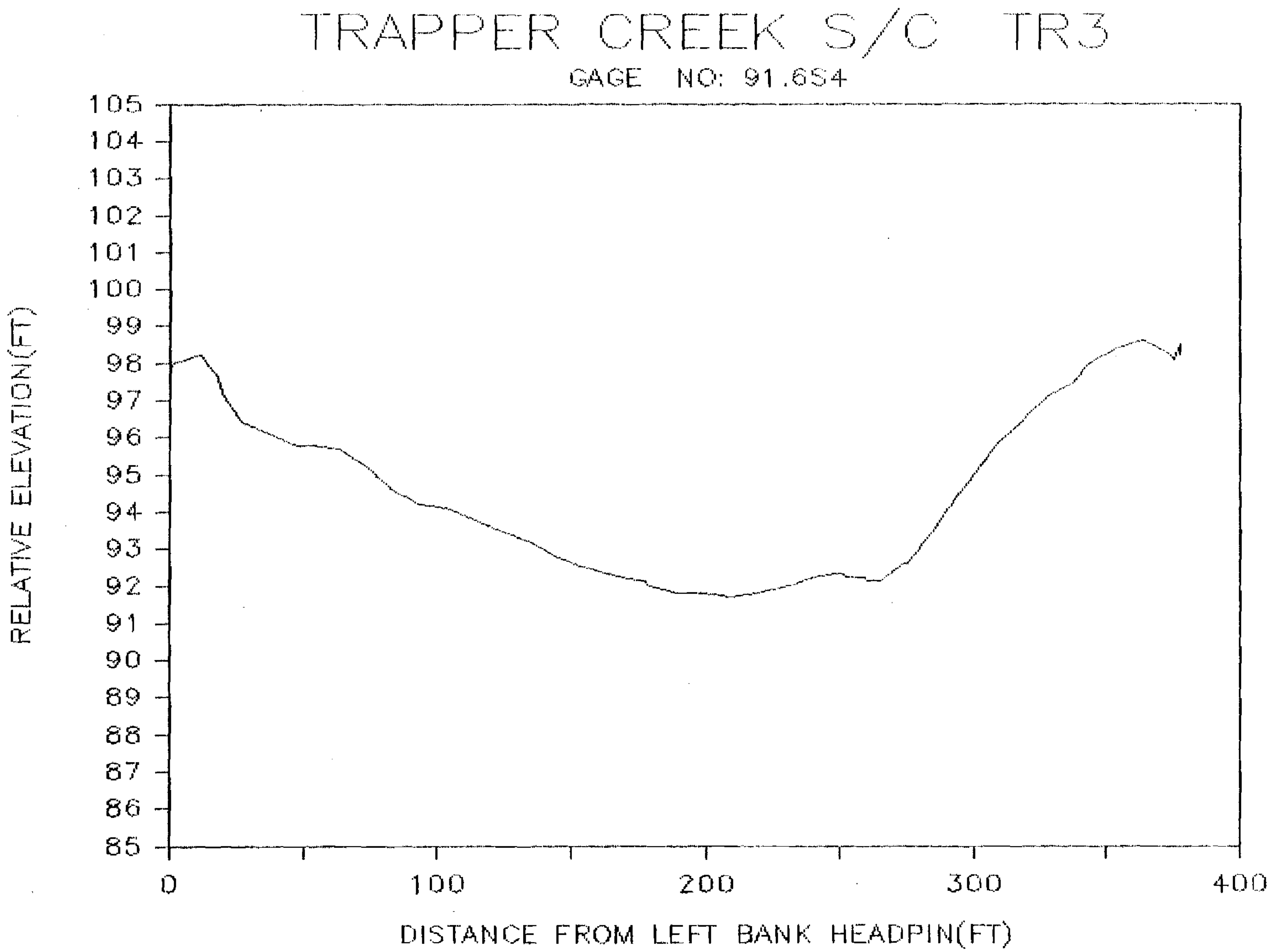
Attachment Figure D-48. Cross sectional profile obtained at transect 6 of Birch Creek Slough.



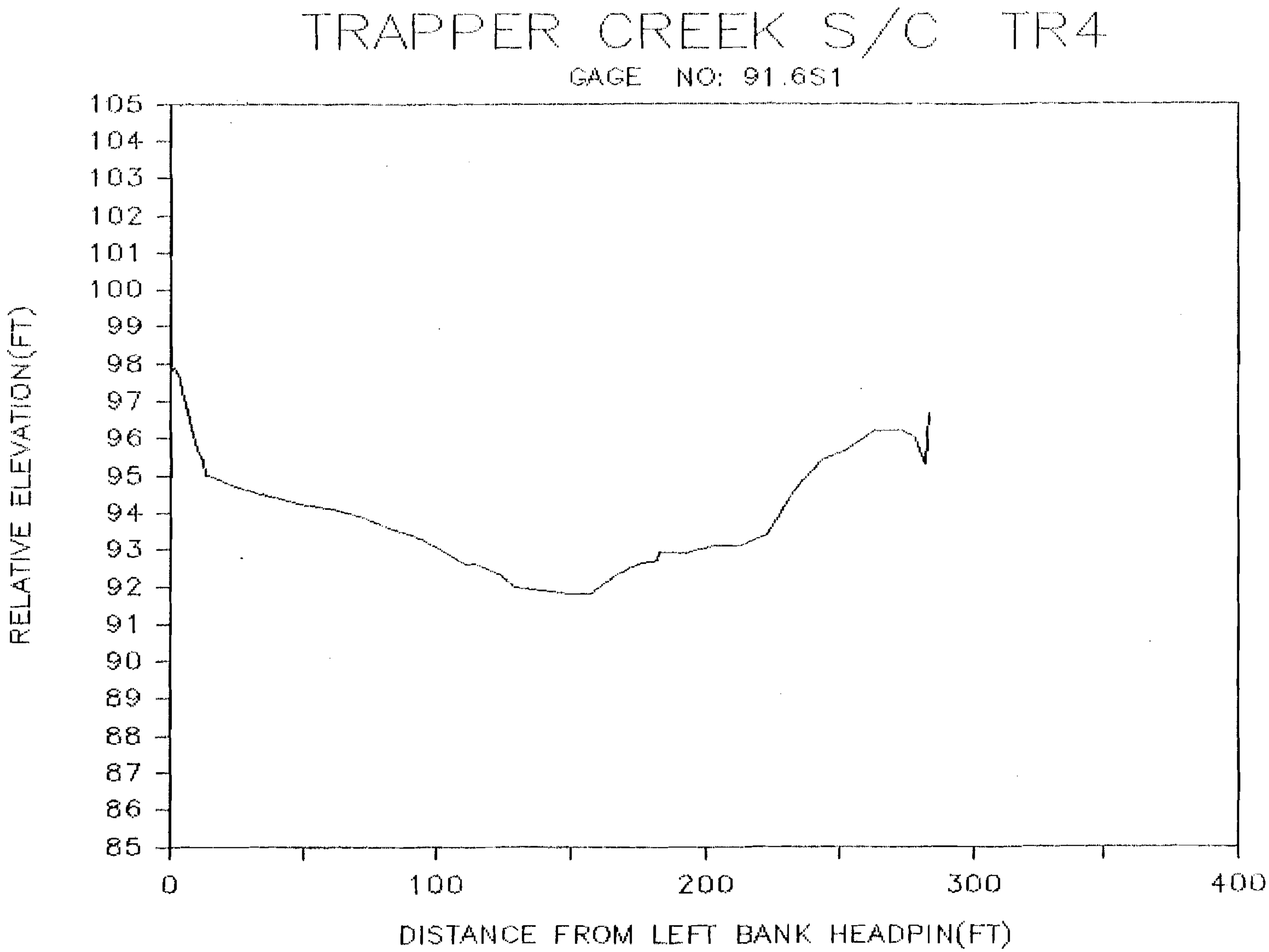
Attachment Figure D- 49. Cross sectional profile obtained at transect 1 of Trapper Creek Side Channel.



Attachment Figure D-50. Cross sectional profile obtained at transect 2 of Trapper Creek Side Channel.



Attachment Figure D-51. Cross sectional profile obtained at transect 3 of Trapper Creek Side Channel.



Attachment Figure D-52. Cross sectional profile obtained at transect 4 of Trapper Creek Side Channel.

Attachment Table D-1. Cross sectional profile data obtained during the 1984 field season at Hooligan Side Channel 50 feet upstream of transect 3 (RM 35.2)

Date: 840925	Gage No: 35.2S1B
Time: 1710	Gage Reading: 1.50
	WSEL: 91.25
TBM: ADF&G 30.2S1 LB 840711	TBM elevation: 100.00
LBHP: ADF&G 30.2S1 LB 840711	LBHP elevation: 100.00
RBHP: ADF&G 30.2S1 RB 092584	RBHP elevation: 96.22

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.0	LBHP
0+00	99.76	GB LBHP[b]
0+06	99.70	Top left bank
0+22	96.10	
0+39	95.77	
0+60	94.69	
0+83	93.65	
1+12	92.21	
1+21	91.24	Left water surface
1+35	90.41	
1+53.5	89.74	
1+65	90.63	
1+83.6	91.26	Right water surface
1+94	93.20	
2+09	95.76	
2+14.7	95.84	GB RBHP[c]
2+14.7	96.22	RBHP

[a] Elevation relative to 100.00 ft, assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-2. Cross sectional profile data obtained during the 1984 field season at Eagle's Nest Side Channel at Transect 2 (RM 36.2).

Date: 840926
Time: 1250

Gage No: 36.2S1C
Gage Reading: 0.52
WSEL: 90.43

TBM: ADF&G 36.2S1 LB 840917
LBHP: ADF&G 36.2S1 LB 840917
RBHP: ADF&G 36.2S1 RB 840926

TBM elevation: 100.00
LBHP elevation: 100.00
RBHP elevation: 98.61

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.0	LBHP
0+00	99.56	GB LBHP[b]
0+03	99.38	Top of bank
0+05	98.29	
0+10	97.95	
0+13	96.13	
0+16	93.42	Bottom of bank
0+24	93.41	
0+36	93.78	
0+45	93.78	
0+52	92.65	
0+65	94.46	
0+74	95.29	
0+81	95.74	
0+80	96.65	
1+41	97.91	
1+46	95.79	
1+57	95.94	
1+83	95.25	
2+12	95.64	
2+19	93.48	
2+30	94.10	
2+49	92.91	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-2 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
2+66.4	90.43	Left water surface
2+74	90.06	
2+83	89.87	GB staff gage 36.2S1C
2+89	89.88	
2+98	90.09	
3+03.5	90.42	Right water surface
3+23	91.26	
3+33	90.43	
3+53	92.18	
3+65.6	98.06	GB RBHP[a]
3+65.6	98.61	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-3. Cross sectional profile data obtained during the 1984 field season at Kroto Slough Head at Transect 2 (RM 36.3).

Date: 840925	Gage No: 36.3S1C
Time: 1225	Gage Reading: 0.74
	WSEL: 89.74
TBM: ADF&G 36.3S1 LB 840711	TBM elevation: 100.00
LBHP: ADF&G 36.3S1 LB 840711	LBHP elevation: 100.00
RBHP: ADF&G 36.3S1 RB 840925	RBHP elevation: 101.11

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.00	LBHP
0+00	99.78	GB LBHP[b]
0+03	99.74	
0+07	99.63	Top of bank
0+12	96.42	Mid bank
0+16	89.68	Bottom of bank
0+26	89.74	Staff gage 36.3S1B
0+28	89.26	Left water surface
0+38	89.01	
0+43.5	88.85	Staff gage 36.3S1C
0+56	89.18	
0+75	88.99	
0+87	88.82	
0+97	88.56	
1+07	88.36	
1+17	88.16	
1+25	89.73	Right water surface
1+34.8	88.64	
1+35	91.90	Mid bank
1+40	98.09	Top of bank
1+45.5	98.09	GB RBHP[c]
1+60.7	100.52	RBHP
1+60.7	101.11	

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-4. Cross sectional profile data obtained during the 1984 field season at Rolly Creek at Transect 2 (RM 39.0).

Date: 840928
Time: 1345

Gage No: 39.0T1C
Gage Reading: 1.16
WSEL: 92.28

TBM: ADF&G 39.0T1 LB 840710
LBHP: ADF&G 39.0T1 LB 840710
RBHP: ADF&G Rolly Ck. 39.0T1 RB 840928

TBM elevation: 100.00
LBHP elevation: 100.00
RBHP elevation: 102.49

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.00	LBHP
0+00	99.60	GB LBHP[b]
0+08	100.02	
0+15	99.34	Top LB
0+18	98.39	Mid bank
0+21	95.35	Bottom LB
0+28	94.16	
0+35	93.22	
0+39	92.28	Left water surface
0+41	92.19	
0+43	92.28	Right water surface
0+50	92.24	Left water surface
0+52	92.16	
0+56	92.25	Right water surface
0+64	92.31	
0+71	92.51	
0+75	92.29	Left water surface
0+89	92.23	
1+01	92.30	Right water surface
1+06	92.28	Left water surface
1+11	91.99	Main channel
1+19	91.91	Mid main channel
1+32	91.93	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-4 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+34	91.98	
1+38	91.18	
1+40	91.46	
1+41	92.28	Right water surface
1+50	93.48	
1+59	94.25	
1+68	96.12	Bottom of bank
1+73	100.25	Mid RB
1+80	101.82	Top RB
1+84	101.95	GB RBHP[a]
1+84	102.49	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-5. Cross sectional profile data obtained during the 1984 field season at Bear Bait Side Channel at Transect 2 (RM 42.9).

Date: 840927
Time: 1110

Gage No: 42.9S1
Gage Reading: None
WSEL: 88.50

TBM: ADF&G 42.9S1 LB 840710
LBHP: ADF&G 42.9S1 LB 840710
RBHP: ADF&G 42.9S1 RB 840727

TBM elevation: 100.00
LBHP elevation: 100.00
RBHP elevation: 98.79

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.00	LBHP
0+00	99.45	GB LBHP [b]
0+07	98.92	Top of bank
0+17	96.56	Mid bank
0+19	95.23	Bottom of bank
0+29	93.73	
0+32	92.49	
0+48	92.56	
0+78	92.22	
0+91	90.05	
1+04	88.50	Left water surface
1+09	87.57	
1+17	87.44	
1+21.5	88.49	Right water surface
1+26	90.89	
1+27	92.24	
1+33	93.26	
1+39	96.05	
1+41	98.35	Top RB
1+46	98.26	GB RBHP[c]
1+46	98.29	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-6. Cross sectional profile data obtained during the 1984 field season at Last Chance Side Channel at Transect 2 (RM 44.4).

Date: 840927
Time: 1445

Gage No: 44.4S1
Gage Reading: Dry
WSEL: Dry

TBM: ADF&G 44.4S1 LB 840725
LBHP: ADF&G 44.4S1 LB 840725
RBHP: ADF&G 44.4S1 RB 840927

TBM elevation: 100.00
LBHP elevation: 100.00
RBHP elevation: 102.02

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.00	LBHP
0+00	99.59	GB LBHP[b]
0+03	98.86	
0+05	98.63	
0+07	98.99	Top LB
0+10	97.57	Mid bank
0+15	94.75	Bottom LB
0+24	93.99	
0+46	93.36	
0+69	92.92	
0+91	93.19	
1+02	93.02	
1+08	92.57	
1+13	94.25	Bottom RB
1+17	96.40	Mid bank
1+24	100.26	
1+27	101.31	Top RB
1+28	102.35	GB RBHP[c]
1+28	102.02	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-7. Cross sectional profile data obtained during the 1984 field season at Rustic Wilderness Side Channel at Transect 4 (RM 59.5).

Date: 841001
Time: 1230

Gage No: 59.5S1
Gage Reading: 0.23
WSEL: 92.90

TBM: ADF&G 59.5S1 RB 840712
LBHP: ADF&G 59.5S1 LB 841001
RBHP: ADF&G 59.5S2 RB 840712

TBM elevation: 100.00
LBHP elevation: 98.76
RBHP elevation: 100.00

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	98.76	LBHP
0+00	98.31	GB LBHP[b]
0+05	97.79	Top LB
0+06	96.94	Bottom LB
0+17	94.99	
0+24	95.63	
0+36	95.22	
0+48	93.52	
0+70.4	92.90	Left water surface
0+76	92.70	
0+85	92.57	GB staff gage 59.5SlB
0+91	92.89	Right water surface
1+04	94.89	Bottom RB
1+06	99.10	Top RB
1+14.8	99.51	GB RBHP[c]
1+14.8	100.00	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-8. Cross sectional profile data obtained during the 1984 field season at Caswell Creek at Transect 4 (RM 63.0).

Date: 841009	Gage No: 63.0T4A
Time: 1140	Gage Reading: 1.16
	WSEL: 93.57
TBM: LBHP	TBM elevation: 100.00
LBHP: ADF&G Caswell Cr Tr 4 LB 840711	LBHP elevation: 100.00
RBHP: 1/2" Rebar	RBHP elevation: 99.35

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.00	LBHP
0+00	98.84	GB LBHP[b]
0+07.9	97.05	Top LB
0+09.7	93.56	Left water surface
0+10.7	93.11	GB staff gage
0+12.7	92.76	
0+15.7	92.88	
0+19.7	92.92	
0+24.7	92.82	
0+29.7	92.87	
0+36.7	92.99	
0+39.7	93.04	
0+41.7	93.57	Right water surface
0+43.3	95.71	Top RB
0+52.3	98.81	GB RBHP[c]
0+52.3	99.35	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-9 . Cross sectional profile data obtained during the 1984 field season at Island Side Channel at transect 1 (RM 63.2).

Date: 840901
Time: 1300

Gage No: 63.2S1A
Gage Reading: Dry
WSEL: 091.69

TBM: ADF&G Island TBM RB 1984
LBHP: ADF&G TR1 LB 840725
RBHP: ADF&G Island S.C. TR1 RB 840725

TBM elevation: 100.00
LBHP elevation: 95.99
RBHP elevation: 98.81

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	96.00	Left bank head pin
0+00	95.7	GB LBHP[b]
0+02	95.6	
0+12	95.1	
0+14	94.8	
0+16	94.4	
0+20	94.2	
0+30	94.2	
0+40	94.0	
0+48	93.6	
0+52	93.8	
0+54	93.9	
0+60	93.5	
0+70	93.3	
0+80	93.4	
0+88	93.0	
0+92	93.0	
1+02	92.8	
1+12	92.7	
1+20	92.4	
1+26	91.9	
1+28	91.69	Left water surface
1+34	91.0	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-9 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+38	90.4	
1+42	90.3	
1+50	90.7	
1+56	90.6	
1+62	90.1	
1+68	89.1	
1+72	89.1	
1+76	89.1	
1+80	89.4	
1+82	89.6	
1+86	90.6	
1+87	91.69	Right water surface
1+87.1	95.3	Undercut
1+92	97.6	
1+94	98.2	
1+96.5	98.4	GB RBHP[a]
1+96.5	98.81	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-10. Cross sectional profile data obtained during the 1984 field season at Island Side Channel at transect 1.

Date: 840901
Time: 1300

Gage No: 63.2S1A
Gage Reading: Dry
WSEL: 091.69

TBM: ADF&G Island TBM RB 1984
LBHP: ADF&G TR1 LB 840725
RBHP: ADF&G Island S.C. TR1 RB 840725

TBM elevation: 100.00
LBHP elevation: 95.99
RBHP elevation: 98.81

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	96.25	Left bank head pin
0+00	95.9	GB LBHP[b]
0+02	95.9	
0+10	95.3	
0+18	94.6	
0+28	94.3	
0+32	94.4	
0+34	94.3	
0+44	94.3	
0+50	93.6	
0+52	93.3	
0+62	93.1	
0+68	93.5	
0+78	93.7	
0+84	93.6	
0+86	93.6	
0+96	93.3	
1+06	92.9	
1+16	92.6	
1+26	92.2	
1+32	91.9	
1+34	91.69	Left water surface

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-10 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+40	91.0	
1+46	90.5	
1+50	90.3	
1+54	90.0	
1+60	89.8	
1+64	89.2	
1+68	88.5	
1+70	88.3	
1+74	87.6	
1+76	87.3	
1+80	87.3	
1+84	87.6	
1+86	88.1	
1+88	88.8	
1+90	89.7	
1+92	90.7	
1+93	91.69	Right water surface
1+94	92.1	
1+96	92.6	
2+00	93.4	
2+02	93.6	
2+04	94.3	
2+06	94.6	
2+07	96.6	Cutbank
2+10	98.1	
2+20	98.2	
2+20.5	98.2	GB RBHP[a]
2+20.5	98.74	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-11. Cross sectional profile data obtained during the 1984 field season at Island Side Channel at transect 2.

Date: 840901
Time: 1400

Gage No: 63.2S2B
Gage Reading: 00.46
WSEL: 91.70

TBM: ADF&G Island TBM RB 1984
LBHP: ADF&G TR2 LB 840725
RBHP: ADF&G Island S.C. TR2 RB 840725

TBM elevation: 100.00
LBHP elevation: 95.94
RBHP elevation: 99.05

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	95.94	Left bank head pin
0+00	95.5	GB LBHP[b]
0+02	95.5	
0+08	95.0	
0+12	94.1	
0+14	93.3	
0+22	93.4	
0+26	93.5	
0+36	93.7	
0+46	93.6	
0+56	93.7	
0+66	94.3	
0+68	94.3	
0+78	94.1	
0+88	93.4	
0+98	93.0	
1+08	92.8	
1+18	92.5	
1+28	92.1	
1+32	91.8	
1+34	91.70	Left water surface
1+38	91.3	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-11 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+42	90.7	
1+46	90.2	
1+50	90.0	
1+54	89.7	
1+60	89.6	
1+64	89.4	
1+68	89.0	
1+72	89.2	
1+76	89.8	
1+78	90.2	
1+80	90.8	
1+83	91.7	Right water surface
1+84	94.9	Root mass
1+86	96.3	
1+88	97.5	
1+90	98.3	
1+93.2	98.5	GB RBHP[a]
1+93.2	99.05	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-12. Cross sectional profile data obtained during the 1984 field season at Island Side Channel at transect 3.

Date: 840901
Time: 1430

Gage No: 63.2S3B
Gage Reading: 00.26
WSEL: 91.68

TBM: ADF&G Island TBM RB 1984
LBHP: ADF&G TR3 LB 840725
RBHP: ADF&G Island S.C. TR3 RB 840725

TBM elevation: 100.00
LBHP elevation: 96.26
RBHP elevation: 99.15

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	96.26	Left bank headpin
0+00	95.7	GB LBHP[b]
0+02	95.6	
0+05	95.3	
0+06	94.9	
0+14	94.3	
0+20	94.3	
0+30	94.4	
0+40	94.3	
0+50	94.3	
0+58	94.3	
0+68	93.8	
0+72	93.7	
0+82	93.2	
0+92	93.0	
1+02	92.9	
1+12	92.7	
1+22	92.4	
1+32	92.0	
1+41	91.68	Left water surface
1+44	91.4	
1+54	91.2	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-12 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+60	91.2	
1+64	91.3	
1+72	91.4	
1+82	91.4	
1+88	90.8	
1+90	90.3	
1+94	90.5	
1+96	90.9	
1+99	91.68	Right water surface
2+00	92.3	
2+02	94.6	
2+04	97.6	
2+08	98.9	GB RBHP[a]
2+08	99.15	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-13. Cross sectional profile data obtained during the 1984 field season at Island Side Channel at transect 4.

Date: 840901
Time: 1500

Gage No: 2S4B
Gage Reading: 00.29
WSEL: 091.68

TBM: ADF&G Island TBM RB 1984
LBHP: ADF&G TR4 LB 840725
RBHP: ADF&G Island S.C. TR4 RB 840725

TBM elevation: 100.00
LBHP elevation: 97.16
RBHP elevation: 100.02

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	97.17	Left bank head pin
0+00	96.6	GB LBHP[b]
0+02	96.5	
0+06	95.5	
0+16	94.8	
0+26	94.3	
0+30	93.6	
0+36	93.6	
0+38	93.5	
0+48	93.1	
0+50	93.0	
0+60	32.8	
0+70	92.5	
0+80	92.3	
0+86	92.1	
0+96	91.9	
1+00	91.68	Left water surface
1+02	91.6	
1+12	91.6	
1+22	91.4	
1+32	91.4	
1+42	91.7	
1+45	91.68	Right water surface

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-13 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+54	92.2	
1+60	92.5	
1+66	92.4	
1+68	92.1	
1+76	91.8	
1+80	91.5	
1+84	92.0	
1+86	92.5	
1+88	97.3	
1+90	97.5	
1+92	98.6	
1+96	99.5	
1+98.2	99.5	GB RBHP[a]
1+98.2	100.01	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-14. Cross sectional profile data obtained during the 1984 field season at Island Side Channel at transect 4A (RM 63.2).

Date: 840919
Time: 1340

Gage No: 63.2S8B
Gage Reading: Dry
WSEL: 91.56

TBM: ADF&G Island TBM RB 1984
LBHP: ADF&G TR4A LB 840725
RBHP: ADF&G Island S.C. TR4A RB 840725

TBM elevation: 100.00
LBHP elevation: 97.77
RBHP elevation: 99.04

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	97.77	LBHP
0+00	97.3	GB LBHP[b]
0+05	97.1	Left bank top
0+11	95.3	Left bank bottom
0+14	95.1	
0+15	95.1	
0+25	94.1	
0+28	93.7	
0+29	93.7	
0+39	93.1	
0+49	92.7	
0+53	92.5	
0+54	92.4	
0+64	91.9	
0+71	91.56	Left water surface
0+72	91.5	
0+76	91.3	
0+80	91.1	
0+84	91.0	
0+88	90.9	
0+92	90.9	
0+96	91.0	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-14 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+00	91.2	
1+04	91.3	
1+08	91.3	
1+12	91.0	
1+14	91.1	
1+18	91.0	
1+22	91.0	
1+26	91.2	
1+30	91.3	
1+33.5	91.56	Right water surface
1+44	91.9	
1+46	92.5	
1+47	92.8	
1+52	93.8	
1+62	93.6	
1+72	93.5	
1+76	93.0	
1+78	93.3	Bottom right bank
1+84	94.9	Top right bank
1+94	94.8	
2+00	95.2	
2+01	95.2	
2+15	98.0	
2+17	98.4	GB RBHP[a]
2+17	99.04	RBHP TR4A

[a] Ground beside right bank headpin.

Attachment Table D-15. Cross sectional profile data obtained during the 1984 field season at Island Side Channel at transect 5.

Date: 840919
Time: 1400

Gage No: 63.2S5B
Gage Reading: Dry
WSEL: 91.57

TBM: ADF&G Island TBM RB 840725
LBHP: ADF&G TR 5LB 840725
RBHP: ADF&G Island S.C. TR 5 RB 840725

TBM elevation: 100.00
LBHP elevation: 096.82
RBHP elevation: 099.68

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	96.82	Left bank head pin
0+00	96.3	GB LBHP[b]
0+10	96.0	
0+16	96.0	LB Top
0+19	95.0	
0+22	93.8	
0+23	93.6	
0+24	93.5	
0+25	93.5	
0+35	92.6	
0+45	91.8	
0+50	91.57	Left water surface
0+54	91.2	
0+58	91.1	
0+62	90.9	
0+66	90.7	
0+70	90.4	
0+74	90.1	
0+78	89.8	
0+82	89.7	
0+86	89.4	
0+90	88.9	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-15 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
0+94	88.6	
0+98	89.0	
1+02	89.3	
1+06	90.0	
1+10	90.9	
1+12.5	91.57	Right water surface
1+13	91.7	
1+17	92.9	
1+18	93.2	
1+19	93.7	RB Bottom
1+25	98.6	RB Top
1+33	99.1	GB RBHP[a]
1+33	99.69	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-16. Cross sectional profile data obtained during the 1984 field season at Island Side Channel at transect 6.

Date: 840919	Gage No: 63.2S6B
Time: 1425	Gage Reading: Dry
	WSEL: 91.57
TBM: ADF&G Island TBM RB 1984	TBM elevation: 100.00
LBHP: ADF&G TR 6 LB 840725	LBHP elevation: 097.25
RBHP: ADF&G Island S.C. TR 6 RB 840725	RBHP elevation: 099.41

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	97.25	Left bank head pin
0+00	96.4	GB LBHP[b]
0+10	96.3	
0+20	95.9	
0+26	95.6	
0+27	95.5	
0+28	95.7	
0+29	95.8	
0+34	95.0	
0+35	94.9	
0+45	94.3	
0+55	93.7	
0+56	93.5	
0+66	92.9	
0+76	92.4	
0+86	92.3	
0+96	91.9	
0+97	91.8	
1+02	91.59	Left water surface
1+04	91.4	
1+08	91.1	
1+12	90.6	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-16 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+16	90.0	
1+20	89.3	
1+24	89.1	
1+25	89.2	
1+28	89.0	
1+32	89.3	
1+36	89.8	
1+40	90.7	
1+43	91.54	Right water surface
1+44	91.9	
1+48	93.7	RB Bottom
1+52	98.5	RB Top
1+61	98.8	GB RBHP[a]
1+61	99.42	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-17. Cross sectional profile data obtained during the 1984 field season at Mainstem West Bank at transect 1.

Date: 840902	Gage No: 074.4S1C
Time: 1230	Gage Reading: 01.50
	WSEL: 94.96
TBM: ADF&G Mainstem W/B TBM RB 840915	TBM elevation: 100.00
LBHP: ADF&G Rebar	LBHP elevation: 99.47
RBHP: ADF&G 74.4S1 TR1 RB 840711	RBHP elevation: 99.96

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	99.47	Left bank head pin
0+00	99.3	GB LBHP[b]
0+01	99.0	
0+03	98.2	
0+05	98.4	
0+06	97.9	
0+08	96.9	
0+10	96.0	
0+12	94.93	Left water surface
0+16	94.2	
0+20	93.8	
0+23	93.2	
0+26	92.8	
0+28	92.2	
0+32	91.8	
0+37	91.5	
0+47	91.1	
0+57	91.5	
0+67	92.0	
0+77	92.2	
0+87	92.3	
0+97	92.4	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-17 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+07	92.4	
1+14	92.6	
1+24	93.1	
1+32	93.7	
1+36	94.0	
1+42	94.5	
1+47	94.6	
1+52.5	94.93	Right water surface
1+57	95.1	
1+67	95.5	
1+71	95.6	
1+75	96.0	
1+78	96.1	
1+86	96.7	
1+93	97.5	
2+00	97.8	
2+06	98.4	High water mark
2+11	99.0	
2+17	98.5	
2+19	98.0	
2+21	97.7	
2+26	98.2	
2+33	98.6	
2+35	99.7	
2+36	99.7	GB RBHP[a]
2+36	99.97	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-18. Cross sectional profile data obtained during the 1984 field season at Mainstem West Bank at transect 2.

Date: 840902
Time: 1500

Gage No: 074.4S2C
Gage Reading: 01.46
WSEL: 94.99

TBM: ADF&G Mainstem W/B TBM RB 840915
LBHP: ADF&G Rebar
RBHP: ADF&G 74.4S2 TR2 RB 840711

TBM elevation: 100.00
LBHP elevation: 100.65
RBHP elevation: 100.03

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.65	Left bank head pin
0+00	100.3	GB LBHP[b]
0+01	100.3	
0+03	99.3	
0+04	98.7	
0+05	95.6	
0+08	94.97	Left water surface
0+12	94.4	
0+19	93.8	
0+27	93.3	
0+37	92.4	
0+47	91.6	
0+57	91.7	
0+67	92.0	
0+77	92.5	
0+87	92.6	
0+97	92.8	
1+07	92.7	
1+17	93.1	
1+27	94.0	
1+37	94.7	
1+42.5	94.97	Right water surface

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-18 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+47	95.2	
1+57	96.0	
1+67	96.7	
1+71	96.9	
1+73	97.1	
1+80	97.8	
1+87	98.3	
1+92	98.5	High water mark
1+97	99.1	
2+00	98.6	
2+04	98.2	
2+12	98.9	
2+16	99.8	
2+17	99.9	GB RBHP[a]
2+17	100.04	RBHP TR 2

[a] Ground beside right bank headpin.

Attachment Table D-19. Cross sectional profile data obtained during the 1984 field season at Mainstem West Bank at transect 2A.

Date: 840903
Time: 1230

Gage No: 74.4S5C
Gage Reading: 00.56
WSEL: 94.90

TBM: ADF&G Mainstem W/B TBM RB 840915
LBHP: ADF&G Rebar
RBHP: ADF&G Rebar

TBM elevation: 100.00
LBHP elevation: 96.53
RBHP elevation: 99.38

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	96.53	Left bank head pin
0+00	96.1	GB LBHP[b]
0+01	96.1	
0+04	96.1	
0+08	95.9	
0+19	95.5	
0+29	95.4	
0+34	94.85	Left water surface
0+36	94.7	
0+38	94.5	
0+40	94.5	
0+42	94.5	
0+44	94.5	
0+46	94.6	
0+48	94.6	
0+50	94.9	Right water surface
0+60	95.5	
0+70	95.3	
0+80	95.9	
0+88	96.4	
0+89	96.5	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-19 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
0+90	96.6	
0+94	98.4	
0+96	98.5	
0+99	99.1	GB RBHP[a]
0+99	99.37	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-20. Cross sectional profile data obtained during the 1984 field season at Mainstem West Bank at transect 3.

Date: 840902
Time: 1600

Gage No: 74.4S3C
Gage Reading: 1.50
WSEL: 95.18

TBM: ADF&G Mainstem W/B TBM RB 840915
LBHP: ADF&G Rebar
RBHP: ADF&G 74.4S3 TR3 RB 840711

TBM elevation: 100.00
LBHP elevation: 101.16
RBHP elevation: 101.03

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	101.16	Left bank head pin
0+00	100.9	GB LBHP[b]
0+01	100.8	
0+03	101.2	Top LB
0+04	97.6	
0+07	97.3	
0+08	96.5	
0+11	95.18	Left water surface
0+15	94.4	
0+18	93.8	
0+25	93.1	
0+32	93.1	
0+42	92.7	
0+52	92.8	
0+62	92.9	
0+72	93.3	
0+82	93.7	
0+92	94.7	
0+98	95.18	Right water surface
1+02	95.5	
1+12	96.1	
1+22	96.3	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-20 (Continued).

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
1+26	96.4	
1+34	96.6	
1+38	96.99	Middle, gravel bar
1+40	96.7	
1+50	96.5	
1+60	96.5	
1+65	96.7	
1+70	96.3	
1+71	96.2	
1+81	95.5	
1+91	94.89	Left water surface
2+01	94.4	
2+11	93.9	
2+17	94.3	
2+19	94.9	Right water surf. bottom RB
2+20	99.5	
2+25	100.6	
2+29	100.9	
2+29.5	101.0	GB RBHP[a]
2+29.5	101.04	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-21. Cross sectional profile data obtained during the 1984 field season at Mainstem West Bank at transect 3A.

Date: 840903
Time: 1100

Gage No: 74.4S6C
Gage Reading: 1.82
WSEL: 95.20

TBM: ADF&G Mainstem W/B TBM RB 840915
LBHP: ADF&G Rebar
RBHP: ADF&G No rebar

TBM elevation: 100.00
LBHP elevation: 101.15
RBHP elevation: 96.92

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	101.15	Left bank head pin
0+00	100.8	GB LBHP[b]
0+01	100.7	
0+03	100.4	
0+04	97.7	
0+05	98.6	
0+08	98.1	
0+10	96.9	
0+11	95.8	
0+12	95.09	Left water surface
0+14	94.2	
0+24	94.0	
0+25	93.4	
0+26	93.4	
0+32	93.2	
0+35	93.3	
0+40	93.3	
0+50	93.2	
0+60	93.0	
0+66	93.0	
0+76	93.2	
0+86	93.8	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-21 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
0+96	94.8	
1+00.5	95.2	Right water surface
1+10	95.8	
1+20	96.2	
1+30	96.4	
1+40	96.6	
1+45	96.7	
1+46	96.8	GB RBHP[a]
1+46	96.93	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-22. Cross sectional profile data obtained during the 1984 field season at Mainstem West Bank at transect 3B.

Date: 840903
Time: 1220

Gage No: 74.4S7C
Gage Reading: 1.20
WSEL: 95.06

TBM: ADF&G Mainstem W/B TBM RB 840915
LBHP: ADF&G Rebar
RBHP: ADF&G Rebar

TBM elevation: 100.00
LBHP elevation: 97.91
RBHP elevation: 102.02

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	97.91	Left bank head pin
0+00	97.6	GB LBHP[b]
0+01	97.5	
0+08	97.2	
0+11	97.0	
0+19	97.1	
0+20	97.0	
0+30	96.7	
0+40	95.9	
0+46	95.4	
0+49	94.84	Left water surface
0+51	94.6	
0+53	94.3	
0+55	94.1	
0+57	93.9	
0+59	94.0	
0+61	94.4	
0+62	94.5	Right water surface
0+66	101.9	
0+67.5	101.6	GB RBHP[c]
0+67.5	102.02	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-23. Cross sectional profile data obtained during the 1984 field season at Mainstem West Bank at transect 4.

Date: 840902	Gage No: 74.4S4C
Time: 1715	Gage Reading: 00.83
	WSEL: 96.53
TBM: ADF&G Mainstem W/B TBM RB 840915	TBM elevation: 100.00
LBHP: ADF&G Rebar	LBHP elevation: 100.03
RBHP: ADF&G 74.4S4 TR4 RB 840711	RBHP elevation: 100.99

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.03	Left bank head pin
0+00	99.7	GB LBHP[b]
0+01	99.7	
0+06	99.5	
0+10	99.1	
0+20	98.8	
0+30	98.5	
0+33	98.3	Top LB
0+35	96.7	
0+35.5	96.44	Left water surface
0+38	95.3	
0+41	95.0	
0+51	94.7	
0+61	94.7	
0+71	95.0	
0+81	95.0	
0+91	95.0	
1+01	95.1	
1+11	95.4	
1+21	95.6	
1+31	95.7	
1+41	95.9	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-23 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+44	96.1	
1+48	96.0	
1+56	96.3	
1+61	96.1	
1+63	96.2	
1+68.5	96.5	Right water surface
1+73	96.9	
1+83	97.0	
1+93	96.8	
2+03	97.1	
2+13	97.4	
2+23	97.6	
2+33	98.3	
2+37	98.3	
2+46	98.5	
2+48	98.3	
2+52	98.2	
2+54	97.3	
2+56	96.9	
2+61	96.8	
2+65	98.6	
2+68	98.7	
2+69	99.2	
2+71	99.5	
2+78	99.4	
2+86	99.3	
2+88	99.3	
2+97	99.1	
3+13	98.8	
3+31	100.9	GB RBHP[a]
3+31	100.99	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-24. Cross sectional profile data obtained during the 1984 field season at Goose 2 Side Channel at transect 2.

Date: 840925
Time: 1230

Gage No: 74.8S2
Gage Reading: Dry
WSEL: Dry

TBM: ADF&G Goose 2 TR 2 RB 1984
LBHP: ADF&G Alcap
RBHP: ADF&G Goose 2 TR 2 RB 1984

TBM elevation: 217.17
LBHP elevation: 221.17
RBHP elevation: 217.17

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	221.17	LBHP
0+00	220.17	GB LBHP[b]
0+11	219.92	Top LB
0+27	217.19	
0+44	216.72	
0+49	215.00	Toe LB
0+70	214.15	
0+90	214.53	
1+09	215.10	
1+26	214.59	
1+38	214.61	Toe RB
1+43.5	216.17	Mid RB
1+51	217.48	Top RB
1+61.6	216.82	GB RBHP[c]
1+61.6	217.18	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-25. Cross sectional profile data obtained during the 1984 field season at Circular Side Channel at transect 1.

Date: 840905
Time: 0900

Gage No: 75.3S1
Gage Reading: No reading taken
WSEL: 87.67

TBM: ADF&G Circular TBM RB 840824
LBHP: ADF&G TR1 LB 840724
RBHP: ADF&G Circular S.C. TR1 RB 1984

TBM elevation: 100.00
LBHP elevation: 94.06
RBHP elevation: 94.06

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	94.06	Left bank head pin
0+00	93.7	GB LBHP[b]
0+07	94.1	
0+13	91.7	
0+15	91.3	
0+26	91.0	
0+36	90.5	
0+46	89.9	
0+56	89.3	
0+63	88.9	
0+72	88.4	
0+74	88.3	
0+84	87.9	
0+94	87.6	
1+01	87.64	Left water surface
1+04	87.6	
1+14	87.4	
1+24	87.3	
1+34	87.5	
1+42	87.69	Right water surface
1+46	88.1	
1+50	89.2	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-25 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+54	89.6	
1+56	90.2	
1+59	91.8	
1+60.6	93.7	GB RBHP[a]
1+60.6	94.06	RBHP

a. Ground beside right bank headpin.

Attachment Table D-26. Cross sectional profile data obtained during the 1984 field season at Circular Side Channel at transect 2.

Date: 840905
Time: 0930

Gage No: 75.3S2
Gage Reading: No reading taken
WSEL: 88.45

TBM: ADF&G Circular TBM RB 840824
LBHP: ADF&G TR2 LB 840724
RBHP: ADF&G Circular S.C. TR2 RB 840724

TBM elevation: 100.00
LBHP elevation: 96.50
RBHP elevation: 99.66

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	96.50	Left bank head pin
0+00	96.1	GB LBHP[b]
0+04	95.9	Top of bank
0+10	90.8	Bottom LB
0+13	89.6	
0+23	89.3	
0+24	89.4	
0+34	89.5	
0+44	89.5	
0+54	89.6	
0+64	89.9	
0+70	89.7	
0+71	89.6	
0+81	89.5	
0+90	89.3	
0+91	89.3	
1+01	88.8	
1+11	88.5	
1+14	88.45	Left water surface
1+24	88.4	
1+26	88.3	
1+31	88.5	Right water surface

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-26 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+36	88.7	
1+45	88.7	
1+46	88.6	
1+53	88.8	
1+54	89.0	
1+58	90.8	Bottom RB
1+59	93.3	
1+66	99.0	Top RB
1+69	99.2	GB RBHP[a]
1+69	99.66	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-27. Cross sectional profile data obtained during the 1984 field season at Circular Side Channel at transect 2A.

Date: 840905
Time: 1000

Gage No: 75.3S6
Gage Reading: No reading taken
WSEL: 88.65

TBM: ADF&G Circular TBM RB 840824
LBHP: ADF&G TR2A LB 840724
RBHP: ADF&G Circular S.C. TR2A RB 840724

TBM elevation: 100.00
LBHP elevation: 99.46
RBHP elevation: 99.68

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	99.46	Left bank head pin
0+00	98.9	GB LBHP[b]
0+07	98.3	Top of bank
0+12	94.6	
0+14	90.2	Bottom LB undercut
0+16	89.5	Inundated logs
0+17	89.02	Left water surface
0+19	88.6	
0+20	88.7	
0+25	89.02	Right water surface
0+27	89.1	
0+28	89.3	
0+38	89.2	
0+45	89.9	
0+56	89.9	
0+57	90.0	
0+67	90.5	
0+77	90.3	
0+87	90.3	
0+97	90.2	
1+07	90.3	
1+13	90.3	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-27 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+14	90.2	
1+24	90.0	
1+25	90.0	
1+35	89.3	
1+37	89.1	
1+48	88.65	Left water surf. main channel
1+49	88.4	
1+59	87.6	
1+69	88.6	
1+70	88.65	Right water surf. main channel
1+72	88.8	
1+73	89.1	
1+75	89.6	
1+76	89.8	
1+81	92.6	
1+84	94.2	
1+87	95.5	Bottom of cut bank
1+88	98.2	
1+90	99.2	Top RB
1+92.5	99.4	GB RBHP[a]
1+92.5	99.70	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-28. Cross sectional profile data obtained during the 1984 field season at Circular Side Channel at transect 3.

Date: 840905
Time: 1030

Gage No: 75.3S3
Gage Reading: No reading taken
WSEL: 89.50

TBM: ADF&G Circular TBM RB 840824
LBHP: ADF&G TR3 LB 840724
RBHP: ADF&G Circular S.C. TR3 RB 1984

TBM elevation: 100.00
LBHP elevation: 99.08
RBHP elevation: 96.09

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	99.08	Left bank head pin
0+00	98.6	GB LBHP[b]
0+01	98.6	
0+06	97.8	Top LB
0+11	93.0	
0+13	91.2	
0+16	90.4	
0+27	90.3	
0+28	90.3	
0+38	90.7	
0+48	90.7	
0+58	90.8	
0+59	90.9	
0+69	90.8	
0+79	90.6	
0+89	90.5	
0+99	90.1	
1+09	90.0	
1+19	89.9	
1+25	89.9	
1+26	89.9	
1+36	89.7	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-28 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+39	89.51	Left water surface
1+49	89.1	
1+59	89.3	
1+63	89.49	Right water surface
1+74	91.0	
1+78	90.9	
1+79	90.9	
1+89	91.3	
1+99	91.7	
2+04	92.5	
2+11	93.9	High water mark
2+13	95.1	
2+14.5	95.8	GB RBHP[a]
2+14.5	96.10	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-29. Cross sectional profile data obtained during the 1984 field season at Circular Side Channel at transect 4.

Date: 840905
Time: 1100

Gage No: 75.3S4
Gage Reading: No reading taken
WSEL: 89.81

TBM: ADF&G Circular TBM RB 840824
LBHP: ADF&G TR4 LB 840710
RBHP: ADF&G Circular S.C. TR4 840710

TBM elevation: 100.00
LBHP elevation: 97.56
RBHP elevation: 97.85

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	97.56	Left bank head pin
0+00	97.1	GB LBHP[b]
0+01	96.8	
0+08	95.6	Top LB
0+10	94.4	
0+14	92.2	Bottom LB
0+15	91.9	
0+16	91.8	
0+22	91.7	
0+24	91.7	
0+34	91.5	
0+44	91.3	
0+45	91.4	
0+55	90.9	
0+65	90.5	
0+75	90.0	
0+78	89.80	Left water surface
0+88	89.4	
0+98	89.2	
1+08	89.1	
1+18	89.3	
1+22	89.5	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-29 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+23	89.5	
1+32	89.4	
1+33	89.4	
1+42	89.81	Right water surface
1+52	90.9	
1+53	91.0	
1+63	91.5	
1+68	91.6	
1+69	91.7	
1+73	92.3	Bottom RB
1+77	93.9	
1+78	94.01	
1+88	93.7	
1+98	93.7	
2+02	94.3	
2+09	96.5	
2+12	97.7	GB RBHP[a]
2+12	97.84	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-30. Cross sectional profile data obtained during the 1984 field season at Circular Side Channel at transect 5.

Date: 840905
Time: 1130

Gage No: 75.3S5
Gage Reading: No reading taken
WSEL: 89.77

TBM: ADF&G Circular TBM RB 840824
LBHP: ADF&G TR5 Lb 840724
RBHP: ADF&G Circular S.C. TR5 RB 840724

TBM elevation: 100.00
LBHP elevation: 98.00
RBHP elevation: 96.59

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	98.00	Left bank head pin
0+00	97.4	GB LBHP[b]
0+01	97.3	
0+04.5	96.9	Top LB
0+06	93.8	Bottom LB
0+10	91.9	
0+14.5	89.76	Left water surface
0+24	89.2	
0+29	89.8	Right water surface
0+35	90.3	Top of gravel bar
0+40	89.78	Left water surface
0+50	89.0	
0+60	88.1	
0+68	87.0	
0+70	86.9	
0+80	88.3	
0+90	89.6	
0+95	89.7	Right water surface
1+05	90.7	
1+15	91.5	
1+25	91.4	
1+35	91.4	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-30 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+45	92.8	
1+55	93.5	
1+65	93.7	
1+75	93.1	
1+85	92.0	
1+95	92.4	
2+05	91.5	
2+11	90.7	Bottom of cut bank, overhanging
2+14	93.9	Top of cut bank
2+19	95.1	
2+26	95.8	
2+26.5	96.2	GB RBHP[a]
2+26.5	96.57	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-31. Cross sectional profile data obtained during the 1984 field season at Sauna Side Channel at transect 1 (RM 79.8).

Date: 840915
Time: 1400

Gage No: 79.8S1C
Gage Reading: Dry
WSEL: 88.75

TBM: ADF&G Sauna TBM LB 840823
LBHP: ADF&G Sauna S.C. TR1 LB 840723
RBHP: ADF&G TR1 RB 840723

TBM elevation: 100.00
LBHP elevation: 96.33
RBHP elevation: 94.45

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	96.33	Left bank head pin
0+00	95.9	GB LBHP[b], mid bank[b]
0+03	93.9	
0+06	92.9	
0+07	90.3	LB Bottom
0+17	89.1	
0+22	88.75	Left water surface
0+23	88.6	Thalweg
0+24	88.75	Right water surface
0+34	89.1	
0+44	89.2	
0+54	89.3	
0+64	89.6	Bottom of bank
0+74	91.2	Top of bank
0+84	91.6	
0+94	91.9	
0+95	91.9	
1+05	92.0	Bottom of RB
1+15	93.4	
1+23.3	94.1	GB RBHP[c]
1+23.3	94.46	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-32. Cross sectional profile data obtained during the 1984 field season at Sauna Side Channel at Transect 2.

Date: 840915
Time: 1430

Gage No: 79.8S2C
Gage Reading: Dry
WSEL: 89.00

TBM: ADF&G Sauna TBM LB 840823
LBHP: ADF&G Sauna S.C. TR2 LB 1984
RBHP: ADF&G TR2 RB 840723

TBM elevation: 100.00
LBHP elevation: 92.94
RBHP elevation: 95.38

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	99.33	Left bank head pin
0+00	98.8	GB LBHP[b]
0+01	98.9	
0+03	98.8	Top left bank
0+04	96.6	Bottom LB
0+07	95.1	
0+08	94.7	
0+18	91.5	
0+28	89.2	
0+30.5	88.97	Left water surface
0+40	87.5	
0+50	87.4	
0+60	88.2	
0+63.5	88.6	Right water surface
0+73	91.4	RB
0+83	91.8	
0+93	92.0	
1+03	92.3	
1+08	92.2	
1+18	92.2	
1+28	92.4	
1+38	92.8	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-32 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+48	93.0	
1+58	93.2	
1+68	93.1	
1+78	93.1	
1+88	93.2	
1+92.5	93.1	GB RBHP[a]
1+92.5	93.87	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-33. Cross sectional profile data obtained during the 1984 field season at Sauna Side Channel at transect 3.

Date: 840905
Time: 1300

Gage No: 79.8S3C
Gage Reading: Dry
WSEL: 88.97

TBM: ADF&G Sauna TBM LB 840823
LBHP: ADF&G Sauna S.C. TR3 LB 840723
RBHP: ADF&G TR3 RB 840723

TBM elevation: 100.00
LBHP elevation: 99.33
RBHP elevation: 93.84

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	99.33	Left bank head pin
0+00	98.8	GB LBHP[b]
0+01	98.9	
0+03	98.8	Top left bank
0+04	96.6	Bottom LB
0+07	95.1	
0+08	94.7	
0+18	91.5	
0+28	89.2	
0+30.5	88.97	Left water surface
0+40	87.5	
0+50	87.4	
0+60	88.2	
0+63.5	88.6	Right water surface
0+73	91.4	RB
0+83	91.8	
0+93	92.0	
1+03	92.3	
1+08	92.2	
1+18	92.2	
1+28	92.4	
1+38	92.8	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-33 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+48	93.0	
1+58	93.2	
1+68	93.1	
1+78	93.1	
1+88	93.2	
1+92.5	93.1	GB RBHP[a]
1+92.5	93.87	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-34. Cross sectional profile data obtained during the 1984 field season at Sauna Side Channel at Transect 4.

Date: 840905
Time: 1330

Gage No: 79.8S4C
Gage Reading: 1.36
WSEL: 088.99

TBM: ADF&G Sauna TBM LB 840823 — TBM elevation: 100.00
LBHP: ADF&G Sauna S.C. TR4 LB 840723 — LBHP elevation: 100.57
RBHP: ADF&G TR4 RB 840723 — RBHP elevation: 93.82

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.57	Left bank head pin
0+00	100.0	GB LBHP[b]
0+07	99.8	Top LB
0+08	95.4	Bottom LB
0+10	93.7	
0+13	91.9	
0+18	89.6	
0+21	88.99	Left water surface
0+22	88.0	
0+24	87.5	
0+27	87.8	
0+31	88.8	Right water surface
0+35	90.1	
0+45	90.5	
0+55	90.6	
0+65	91.3	
0+75	91.3	
0+85	91.9	
0+95	92.5	
0+98	92.3	
1+01	91.9	
1+11	91.9	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-34 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+16	92.3	
1+17	92.4	
1+27	92.9	
1+37	93.6	
1+39	93.6	
1+41	93.5	GB RBHP[a]
1+41	93.83	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-35. Cross sectional profile data obtained during the 1984 field season at Sucker Side Channel at TR 2 (RM 84.5).

Date: 840914
Time: 1110

Gage No: 84.5S2C
Gage Reading: 0.42
WSEL: 261.51

TBM: ADF&G Sucker TBM LB 840823
LBHP: ADF&G Sucker TR 2 LB 840914
RBHP: ADF&G Sucker S/C TR 2 RB 1984

TBM elevation: 269.71
LBHP elevation: 268.81
RBHP elevation: 270.41

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	268.81	LBHP
0+00	268.66	GB LBHP[b]
0+08.3	267.37	Edge of vegetation
0+15.7	267.26	Toe
0+20.7	264.58	
0+31.7	264.03	
0+45.7	264.61	
0+63.8	263.78	
0+73.1	262.92	
0+90.7	262.49	
0+94.7	263.24	
1+12.5	263.41	
1+18.9	261.50	Left water surface
1+25.1	261.52	Right water surface
1+25.7	261.25	Thalweg
1+33.4	262.78	
1+36.7	263.02	
1+40.7	266.48	
1+45.7	268.08	Edge of vegetation
1+47.4	270.22	GB RBHP[c]
1+47.4	270.41	RBHP

[a] Elevation relative to mean sea level assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-36. Cross sectional profile data obtained during the 1984 field season at Sucker Side Channel at Transect 5 (RM 84.5).

Date: 840914	Gage No: 84.5S5B
Time: 1210	Gage Reading: 0.22
	WSEL: 262.37
TBM: ADF&G Sucker TBM LB 840823	TBM elevation: 269.71
LBHP: ADF&G Sucker TR5 LB 840914	LBHP elevation: 269.00
RBHP: ADF&G Sucker S/C TR5 RB 1984	RBHP elevation: 267.84

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	269.00	LBHP
0+00	268.76	GB LBHP[b]
0+03.9	268.90	Top, veg. line
0+11.4	264.65	
0+18.5	264.31	
0+24.2	264.04	
0+42.9	264.41	
0+51.2	264.26	
0+76.4	262.73	Left water edge
0+96.6	262.29	Thalweg
1+10.2	262.74	Right water edge
1+17.4	264.49	
1+22.8	264.19	
1+31.2	267.46	GB RBHP[c]
1+31.2	267.84	RBHP

[a] Elevation relative to mean sea level assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-37. Cross sectional profile data obtained during the 1984 field season at Beaver Dam Slough at transect 1 (RM 86.3).

Date: 840914
Time: 1540

Gage No: 86.3S1C
Gage Reading: 1.42
WSEL: 92.85

TBM: ADF&G Beaver Dam TBM RB 840914 — TBM elevation: 100.00
LBHP: ADF&G Beaver Dam SL.GR1 TR1LB 1984 — LBHP elevation: 97.75
RBHP: ADF&G Beaver GR1 TR1 RB 840914 — RBHP elevation: 100.05

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	97.75	LBHP
0+00	97.31	GB LBHP[b]
0+01	96.52	Edge of veg.
0+09	95.03	
0+18	93.80	Toe LB
0+20.3	92.79	Left water surface
0+26	92.12	
0+30.5	91.91	Thalweg
0+39	92.15	
0+44.5	92.00	
0+49.8	92.79	Right water surface
0+55.6	94.98	
0+61.5	99.57	
0+63.3	99.84	GB RBHP[c]
0+63.3	100.05	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-38. Cross sectional profile data obtained during the 1984 field season at Beaver Dam Side Channel at transect 4 (RM 86.3).

Date: 840916
Time: 1200

Gage No: 86.3S4D
Gage Reading: 1.36
WSEL: 92.67

TBM: ADF&G Beaver Dam TBM RB 840914 — TBM elevation: 100.00
LBHP: ADF&G Beaver Dam Slough GR2 TR4LB — LBHP elevation: 99.02
RBHP: ADF&G Beaver GR2 TR4 RB 840914 — RBHP elevation: 100.16

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	99.02	LBHP
0+00	98.61	GB LBHP[b]
0+02.4	98.25	Top LB
0+06	96.32	
0+15.8	94.50	
0+22.4	92.65	Left water surface
0+36.8	89.60	
0+47.3	88.74	
0+53.8	89.23	
0+64.3	91.29	
0+68.8	92.68	Right water surface
0+75.6	93.71	Toe
0+79.5	99.41	Top RB
0+81.8	99.91	GB RBHP[c]
0+81.8	100.16	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-39. Cross sectional profile data obtained during the 1984 field season at Sunset Side Channel at transect 0 (RM 86.9).

Date: 840914
Time: 1400

Gage No: 86.9SOC
Gage Reading: Dry
WSEL: 92.81

TBM: ADF&G Sunset TBM LB 840822
LBHP: ADF&G TRO LB 840722
RBHP: ADF&G 86.9SO TRO 840722

TBM elevation: 100.00
LBHP elevation: 101.66
RBHP elevation: 100.47

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	101.66	Left bank head pin
0+00	101.0	GB LBHP[b]
0+07	100.4	Top of cut bank
0+10	96.7	Bottom of LB
0+14	95.2	
0+24	94.5	
0+26	94.4	
0+29	92.8	
0+39	93.2	
0+49	93.5	
0+55	92.80	Left water surface
0+58	92.2	Thalweg
0+68	92.7	
0+73	92.6	
0+74	92.6	
0+84	92.81	Right water surface
0+91	93.3	
0+92	93.4	
1+02	94.0	
1+12	94.2	
1+22	94.4	
1+32	94.6	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-39 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+33	94.6	
1+43	94.6	
1+53	94.7	
1+63	94.6	
1+73	94.5	
1+83	94.6	
1+93	94.7	
2+03	94.8	
2+13	94.9	
2+23	95.1	
2+33	95.3.	
2+43	95.5	
2+44	95.5	
2+54	95.8	
2+64	96.1	
2+74	96.5	
2+84	96.6	
2+85	96.8	
2+95	97.2	
3+05	97.3	
3+15	97.5	
3+17	97.9	Bottom RB
3+20	98.4	Top RB
3+30	99.5	
3+40	99.4	
3+41	99.4	GB RBHP[a]
3+41	100.46	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-40. Cross sectional profile data obtained during the 1984 field season at Sunset Side Channel at transect 1.

Date: 840913
Time: 1440

Gage No: 86.9S1C
Gage Reading: 0.49
WSEL: 93.27

TBM: ADF&G Sunset TBM LB 840822
LBHP: ADF&G TR1 LB 840722
RBHP: ADF&G 86.9S1

TBM elevation: 100.00
LBHP elevation: 100.36
RBHP elevation: 99.43

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.36	Left bank head pin
0+00	100.0	GB LBHP[b]
0+03	100.0	Top of LB
0+06	98.7	
0+07	98.6	
0+17	96.5	
0+18	96.2	LB bottom
0+28	95.1	
0+38	94.8	
0+48	94.2	
0+58	93.5	
0+62.5	93.28	Left water surface
0+67	92.9	Thalweg
0+68	93.0	
0+78	93.2	
0+88	93.3	
0+98	93.2	
1+02	93.26	Right water surface
1+10	93.6	
1+12	93.19	Backwater pool left water surf.
1+22	93.17	Backwater pool right water surf.
1+32	93.9	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-40 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+42	94.1	
1+52	94.3	
1+62	94.6	
1+72	94.8	
1+82	95.2	
1+92	95.5	
2+02	95.7	
2+12	96.0	
2+22	96.1	
2+23	96.2	
2+33	96.3	
2+43	96.5	
2+53	96.8	
2+63	97.4	
2+73	97.7	
2+83	98.2	
2+93	98.7	
3+03	99.3	
3+04	99.4	GB RBHP[a]
3+04	99.45	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-41. Cross sectional profile data obtained during the 1984 field season at Sunset Side Channel at transect 2.

Date: 840914
Time: 1500

Gage No: 86.9S2B
Gage Reading: 00.32
WSEL: 93.83

TBM: ADF&G Sunset TBM LB 840822
LBHP: ADF&G TR2 LB 840722
RBHP: ADF&G 86.9S2 TR2 840709

TBM elevation: 100.00
LBHP elevation: 100.49
RBHP elevation: 99.88

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.49	Left bank head pin
0+00	100.0	GB LBHP[b]
0+03	99.9	Top LB
0+08	96.7	Bottom LB
0+15	97.2	
0+16	97.3	
0+26	96.4	
0+36	96.2	
0+46	96.4	
0+56	96.1	
0+66	95.7	
0+76	95.4	
0+77	95.3	
0+87	95.1	
0+90	95.0	
0+91	95.0	
0+95	94.7	
0+96	94.7	
1+06	94.6	
1+16	94.2	
1+26	94.0	
1+36	93.8	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-41 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+39	93.81	Left water surface
1+49	93.6	Thalweg
1+59	93.7	
1+64	93.8	
1+65	93.8	
1+70	93.84	Right water surface
1+80	94.0	
1+90	94.4	
1+91	94.4	
2+01	94.8	
2+11	95.1	
2+21	95.6	
2+31	95.8	
2+33	95.8	
2+38	96.1	Bottom RB
2+42	97.2	
2+47.5	99.7	GB RBHP[a]
2+47.5	99.88	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-42. Cross sectional profile data obtained during the 1984 field season at Sunset Side Channel at transect 3.

Date: 840914
Time: 1525

Gage No: 86.9S3B
Gage Reading: 1.12
WSEL: 93.85

TBM: ADF&G Sunset TBM LB 840822
LBHP: ADF&G TR3 LB 840722
RBHP: ADF&G 86.9S4 TR4 840709

TBM elevation: 290.00
LBHP elevation: 100.32
RBHP elevation: 104.29

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.32	Left bank head pin
0+00	100.0	GB LBHP[b]
0+05	100.0	Top LB
0+08	99.1	
0+11	97.6	
0+12	97.1	
0+14	96.3	Bottom LB
0+18	95.6	
0+23	96.1	
0+28	95.6	
0+29	95.5	
0+39	95.6	
0+49	95.7	
0+59	95.8	
0+69	95.9	
0+79	95.8	
0+89	95.5	
0+90	95.4	
1+00	95.2	
1+10	95.1	
1+11	95.1	
1+21	94.8	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-42 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+22	94.8	
1+32	94.6	
1+42	94.5	
1+52	94.5	
1+62	94.3	
1+65.5	93.86	Left water surface
1+75	92.8	
1+76	92.7	
1+85	92.0	Thalweg
1+95	92.5	
2+04	93.84	Right water surface
2+08	95.5	Bottom RB
2+17	104.2	
2+19	104.2	GB RBHP[a]
2+19	104.28	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-43. Cross sectional profile data obtained during the 1984 field season at Sunset Side Channel at transect 4.

Date: 840914
Time: 1615

Gage No: 86.9S4B
Gage Reading: 00.74
WSEL: 94.55

TBM: ADF&G Sunset TBM LB 840822
LBHP: ADF&G TR4LB 840722
RBHP: ADF&G 86.9S4 TR4 840709

TBM elevation: 100.00
LBHP elevation: 101.62
RBHP elevation: 104.26

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	101.62	Left bank head pin
0+00	101.3	GB LBHP[b]
0+06	100.5	Top bank
0+10	98.1	
0+12	96.4	Bottom LB
0+14	95.9	
0+18	95.5	
0+28	95.6	
0+31	95.5	
0+32	95.5	
0+42	95.8	
0+52	96.0	
0+62	96.0	
0+67	96.0	
0+68	96.0	
0+78	95.8	
0+83	95.6	
0+93	95.2	
1+03	94.9	
1+13	94.57	Left water surface
1+20	94.4	Thalweg
1+23	94.4	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-43 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+24	94.4	
1+34	94.4	
1+37	94.53	Right water surface
1+42	94.7	
1+43	94.8	
1+53	95.3	
1+63	95.4	
1+73	95.4	
1+83	95.4	
1+93	95.1	
2+00	94.9	
2+01	94.8	
2+04	94.9	
2+05	94.8	
2+07	94.7	
2+08	95.0	
2+12	95.0	
2+13	94.7	
2+18	94.7	
2+21	94.4	
2+22	94.4	
2+24	94.28	Left water surface
2+29	93.8	
2+30	94.27	
2+31	94.6	
2+34	95.9	Bottom RB
2+38	102.3	Top RB
2+43	103.9	GB RBHP[a]
2+43	104.26	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-44. Cross sectional profile data obtained during the 1984 field season at Sunset Side Channel at transect 5.

Date: 840914
Time: 1710

Gage No: 86.9S5B
Gage Reading: 1.14
WSEL: 94.74

TBM: ADF&G Sunset TBM LB 840822
LBHP: ADF&G TR5 LB 840722
RBHP: ADF&G 86.9S5 TR5 840709

TBM elevation: 100.00
LBHP elevation: 100.61
RBHP elevation: 102.42

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.61	Left bank head pin
0+00	100.1	GB LBHP[b]
0+03	99.7	Top LB
0+08	98.7	
0+11	97.7	Bottom LB
0+13	98.0	
0+23	97.6	
0+30	96.8	
0+31	96.7	
0+35	96.6	
0+36	96.6	
0+37	96.6	
0+38	96.5	
0+39	96.6	
0+45	96.5	
0+46	96.4	
0+51	96.4	
0+52	96.4	
0+62	96.3	
0+72	96.0	
0+79	95.7	
0+80	95.6	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-44 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
0+90	95.3	
1+00	94.8	
1+02	94.74	Left water surface
1+12	94.2	
1+22	93.6	
1+32	93.1	
1+37	92.8	
1+38	92.8	
1+48	92.6	
1+57	92.4	
1+58	92.3	
1+62	92.3	Thalweg
1+65	92.4	
1+66	92.4	
1+72	93.0	
1+75	92.8	
1+76	92.8	
1+81	93.5	
1+82	93.6	
1+86	93.7	
1+87	94.1	
1+91	94.73	Right water surface
1+95	95.3	
1+96	95.7	
2+01	96.9	RB bottom
2+02	100.0	Top RB
2+05	101.7	
2+10	102.3	GB RBHP[a]
2+10		RBHP elevation not shot

[a] Ground beside right bank headpin.

Attachment Table D-45. Cross sectional profile data obtained during the 1984 field season at Sunset Side Channel at transect 6.

Date: 840914
Time: 1800

Gage No: 86.9S6C
Gage Reading: 00.45
WSEL: 94.77

TBM: ADF&G Sunset TBM LB 840822
LBHP: ADF&G TR6 LB 840722
RBHP: ADF&G 86.9S6 TR6 840722

TBM elevation: 100.00
LBHP elevation: 100.71
RBHP elevation: 103.13

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.71	Left bank head pin
0+00	100.5	GB LBHP[b]
0+02	99.8	
0+09	100.3	Top LB
0+11	99.6	
0+12	99.1	Bottom LB
0+21	98.7	
0+22	98.6	
0+32	98.2	
0+42	97.7	
0+52	96.9	
0+62	96.1	
0+72	95.3	
0+80	94.74	Left water surface
0+90	93.9	
1+00	93.2	
1+10	92.5	
1+13	92.3	
1+14	92.2	
1+18	91.9	
1+24	91.7	
1+30	91.2	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-45 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+31	91.1	
1+34	90.8	
1+39	90.7	Thalweg
1+45	90.9	
1+50	91.2	
1+56	91.5	
1+60	92.1	
1+64	92.7	Bottom RB
1+65	94.75	Right water surface
1+66	95.2	
1+69	96.1	
1+71	99.2	
1+77	102.6	GB RBHP[a]
1+77	103.14	RBHP

[a] Ground beside right bank headpin.

Attachment Table D-46. Cross sectional profile data obtained during the 1984 field season at Sunrise Side Channel at transect 4 (RM 87.0).

Date: 840912
Time: 1600

Gage No: 87.0S4
Gage Reading: Dry
WSEL: Dry

TBM: ADF&G Sunrise S.C. TR4 RB 1984
LBHP: ADF&G Sunrise TR4 LB 840912
RBHP: ADF&G Sunrise S/C TR4 RB 1984

TBM elevation: 100.00
LBHP elevation: 100.00
RBHP elevation: 100.00

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	100.00	LBHP
0+00	99.55	GB LBHP[b]
0+07	99.20	Top of bank
0+17	96.74	Toe
0+99	95.57	
1+54	94.22	Thalweg
1+78	94.73	
1+97	95.57	
2+13	96.16	
2+36	97.01	
2+53	97.47	
2+62	97.93	
2+82	98.33	
2+89	99.67	GB RBHP[c]
2+89	100.00	RBHP

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-47. Cross sectional profile data obtained during the 1984 field season at Birch Creek Slough at transect 2 (RM 88.4).

Date: 840927
Time: 1635

Gage No: 88.4S2B
Gage Reading: 1.30
WSEL: 274.17

TBM: R&M Consultants 89.3S1 LB 1982
LBHP: ADF&G Birch TR2 LB 1984
RBHP: ADF&G Birch Cr Sl TR 2 RB 1984

TBM elevation: 278.79
LBHP elevation: 293.50
RBHP elevation: 291.07

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	293.50	LBHP
0+00	292.46	GB LBHP[b]
0+09.5	293.15	Top LB
0+15	292.72	Edge of bank
0+17.5	288.57	Mid-bank
0+25	283.18	Toe, left water surface
0+30	282.99	
0+39	282.62	
0+48	282.20	
0+55	281.91	
0+60	282.01	
0+66	282.17	
0+78	283.14	Right water surface
0+87	283.64	Toe RB
0+93.5	285.80	Mid bank
1+00.5	290.31	GB RBHP[c]
1+00.5	291.07	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-48. Cross sectional profile data obtained during the 1984 field season at Birch Creek Slough at transect 6 (RM 88.4).

Date: 840927
Time: 1610

Gage No: 88.4S1B
Gage Reading: 1.32
WSEL: 278.38

TBM: R&M Consultants 89.3SI LB 1982
LBHP: ADF&G Birch TR6 LB 1984
RBHP: ADF&G Birch Cr Sl TR 6 RB 1984

TBM elevation: 278.79
LBHP elevation: 293.39
RBHP elevation: 289.31

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	293.39	LBHP
0+00	292.70	GB LBHP[b]
0+09	292.48	Top LB
0+13.5	288.54	Mid bank
0+17	284.05	Toe LB
0+19	283.48	Right water surface
0+23.5	282.06	
0+30	282.65	
0+36	282.58	
0+43	282.37	
0+52	282.24	
0+59	282.67	
0+69	282.70	
0+75	283.08	
0+80.5	283.60	Left water surface
0+83	283.92	Toe RB
0+88	286.28	Mid bank
0+92	288.82	GB RBHP[c]
0+92	289.31	RBHP

[a] Elevation relative to 100.00 ft assigned to the study site TBM.

[b] Ground beside left bank headpin.

[c] Ground beside right bank headpin.

Attachment Table D-49. Cross sectional profile data obtained during the 1984 field season at Trapper Side Channel at transect 1 (RM 91.6).

Date: 840904
Time: 1300

Gage No: 91.6S2D
Gage Reading: Not obtained
WSEL: 91.98

TBM: ADF&G Trapper TBM RB 840822
LBHP: ADF&G TR1 LB 840721
RBHP: ADF&G TR1 RB 84 07 21

TBM elevation: 100.00
LBHP elevation: 96.74
RBHP elevation: 99.02

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	96.74	Left bank head pin
0+00	96.2	GB LBHP[b]
0+01	96.1	
0+10	96.0	
0+20	96.2	
0+30	96.3	
0+40	96.0	
0+50	95.6	
0+54	95.5	
0+55	95.4	
0+64	95.0	
0+65	94.9	
0+75	94.0	
0+76	93.9	
0+86	93.2	
0+89	93.1	
0+90	93.0	
1+00	92.6	
1+10	92.4	
1+18	92.2	
1+19	92.1	
1+23.5	91.99	Left water surface

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-49 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+32	91.5	
1+33	91.4	
1+43	91.0	
1+50	90.8	
1+51	90.7	
1+61	90.5	
1+68	90.4	
1+69	90.4	
1+79	90.1	
1+84	90.0	
1+85	90.0	
1+93	90.0	
1+94	90.0	
2+04	90.1	
2+05	90.2	
2+13	90.5	
2+14	90.5	
2+22	91.4	
2+23	91.6	
2+26	91.97	Right water surface
2+34	92.93	
2+35	93.2	
2+45	94.7	
2+47	95.1	
2+53	95.6	
2+63	96.0	
2+73	96.1	
2+74	96.1	
2+84	96.4	
2+94	96.5	
2+98	96.9	
3+01	97.8	
3+09	97.2	
3+10	97.3	
3+14	97.5	
3+15	97.8	
3+17	98.1	
3+18	99.02	RBHP
3+18	98.2	GB RBHP[a]

[a] Ground beside right bank headpin.

Attachment Table D-50. Cross sectional profile data obtained during the 1984 field season at Trapper Side Channel at transect 2.

Date: 840904	Gage No: 91.6S3C
Time: 1330	Gage Reading: Not read
	WSEL: 92.00
TBM: ADF&G Trapper TBM RB 840822	TBM elevation: 100.00
LBHP: ADF&G TR2 LB 840721	LBHP elevation: 97.21
RBHP: ADF&G TR2 RB 84 07 21	RBHP elevation: 97.21

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	97.21	Left bank headpin
0+00	96.7	GB LBHP[b]
0+01	96.6	
0+10	96.2	
0+20	95.7	
0+30	95.9	
0+39	96.3	
0+40	96.4	
0+50	96.5	
0+60	96.7	
0+70	96.8	
0+80	96.8	
0+90	96.6	
0+99	96.4	
1+00	96.3	
1+10	96.0	
1+20	95.5	
1+30	95.1	
1+31	95.1	
1+37	94.8	
1+38	94.7	
1+48	94.1	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-50 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+58	93.6	
1+68	93.2	
1+78	92.8	
1+79	92.7	
1+89	92.4	
1+98	92.00	Left water surface
2+08	91.6	
2+18	91.1	
2+28	90.8	
2+38	90.7	
2+48	90.6	
2+58	90.7	
2+67	90.9	
2+68	91.0	
2+76	91.3	
2+77	91.4	
2+87	91.7	
2+93	91.99	Right water surface
3+03	92.4	
3+12	93.2	
3+13	93.5	
3+22	94.8	
3+23	94.9	
3+33	95.6	
3+43	96.5	
3+44	97.21	RBHP
3+44	96.7	GB RBHP[a]

[a] Ground beside right bank headpin.

Attachment Table D-51. Cross sectional profile data obtained during the 1984 field season at Trapper Side Channel at transect 3.

Date: 840904
Time: 1400

Gage No: 91.6S4D
Gage Reading: Not read
WSEL: 92.18

TBM: ADF&G Trapper TBM RB 840822
LBHP: ADF&G TR3 LB 840721
RBHP: ADF&G TR3 RB 840721

TBM elevation: 100.00
LBHP elevation: 98.21
RBHP elevation: 98.51

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	98.21	Left bank head pin
0+00	97.9	GB LBHP[b]
0+01	98.0	
0+11	98.2	
0+18	97.6	
0+19	97.2	
0+26	96.5	
0+27	96.4	
0+37	96.1	
0+47	95.8	
0+52	95.8	
0+53	95.8	
0+63	95.7	
0+73	95.2	
0+83	94.6	
0+93	94.2	
1+03	94.1	
1+13	93.8	
1+23	93.5	
1+33	93.2	
1+34	93.2	
1+44	92.8	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

[b] Ground beside left bank headpin.

Attachment Table D-51 (Continued).

STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+54	92.5	
1+64	92.3	
1+71	92.18	Left water surface
1+78	92.1	
1+79	92.0	
1+89	91.8	
1+99	92.8	
2+09	92.7	
2+19	92.8	
2+31	92.0	
2+32	92.0	
2+38.5	92.17	Right water surface
2+48	92.3	
2+51	92.3	
2+52	92.2	
2+59	92.2	
2+60	92.1	
2+65	92.1	
2+74	92.6	
2+75	92.6	
2+85	93.5	
2+94	94.4	
2+95	94.5	
3+05	95.5	
3+08	95.8	
3+18	96.4	
3+28	97.1	
3+38	97.5	
3+43	98.0	
3+44	98.0	
3+54	98.4	
3+64	98.6	
3+74	98.2	
3+75	98.1	
3+77.5	98.52	RBHP
3+77.5	98.2	GB RBHP[a]

[a] Ground beside right bank headpin.

Attachment Table D-52. Cross sectional profile data obtained during the 1984 field season at Trapper Side Channel at transect 4.

Date: 840904
Time: 1430

Gage No: 91.6S1D
Gage Reading: Not read
WSEL: 92.61

TBM: ADF&G Trapper TBM RB 840822
LBHP: ADF&G TR4 LB 840721
RBHP: ADF&G TR4 RB 840721

TBM elevation: 100.00
LBHP elevation: 98.21
RBHP elevation: 96.64

STATION (ft)	TRUE ELEVATION[a] (ft)	DESCRIPTION
0+00	98.21	Left bank headpin
0+00	97.8	GB LBHP[b]
0+01	97.9	
0+03	97.6	
0+04	97.3	
0+10	95.7	
0+12	95.4	
0+13	95.0	
0+14	95.0	
0+24	94.7	
0+34	94.5	
0+44	94.3	
0+51	94.2	
0+52	94.2	
0+62	94.1	
0+70	93.9	
0+71	93.9	
0+81	93.6	
0+91	93.4	
1+01	93.0	
1+10.5	92.61	Left water surface
1+14	92.6	

[a] Elevation relative to 100.00 ft. assigned to the study site TBM.

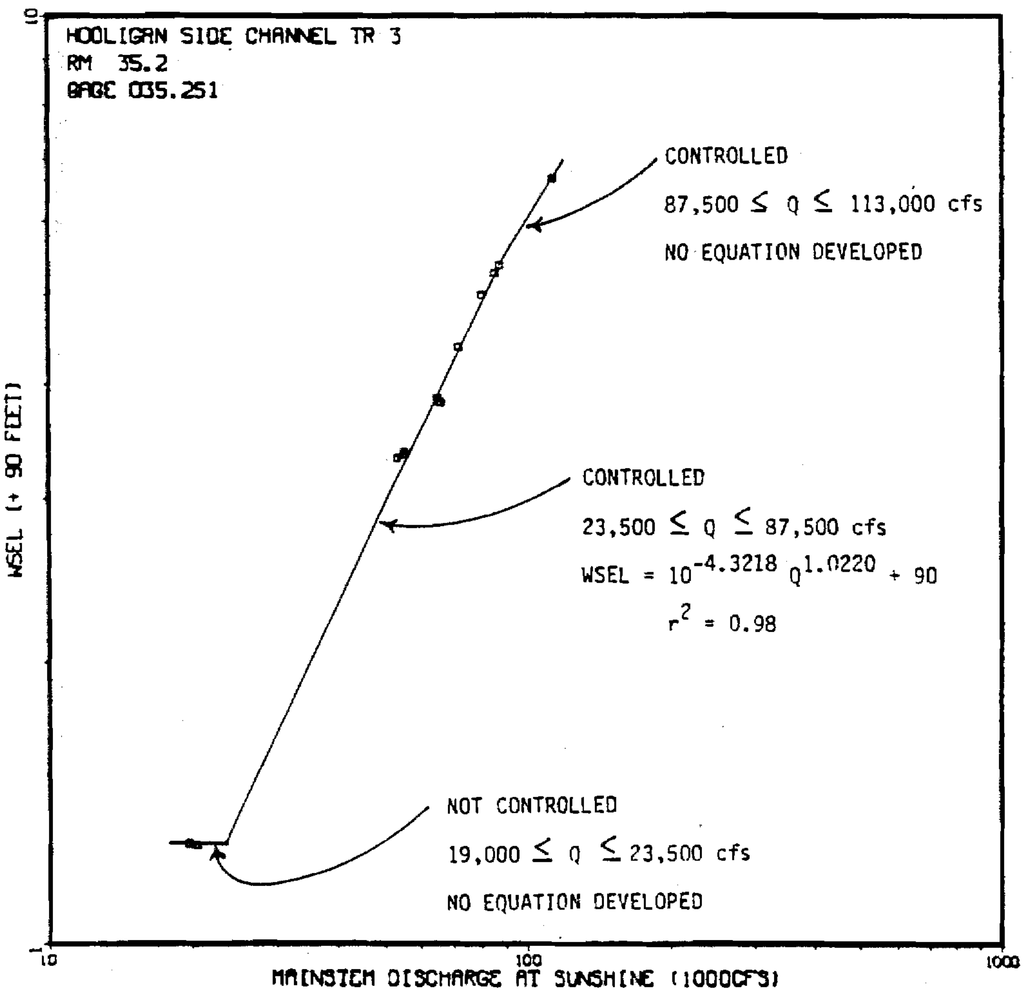
[b] Ground beside left bank headpin.

Attachment Table D-52 (Continued).

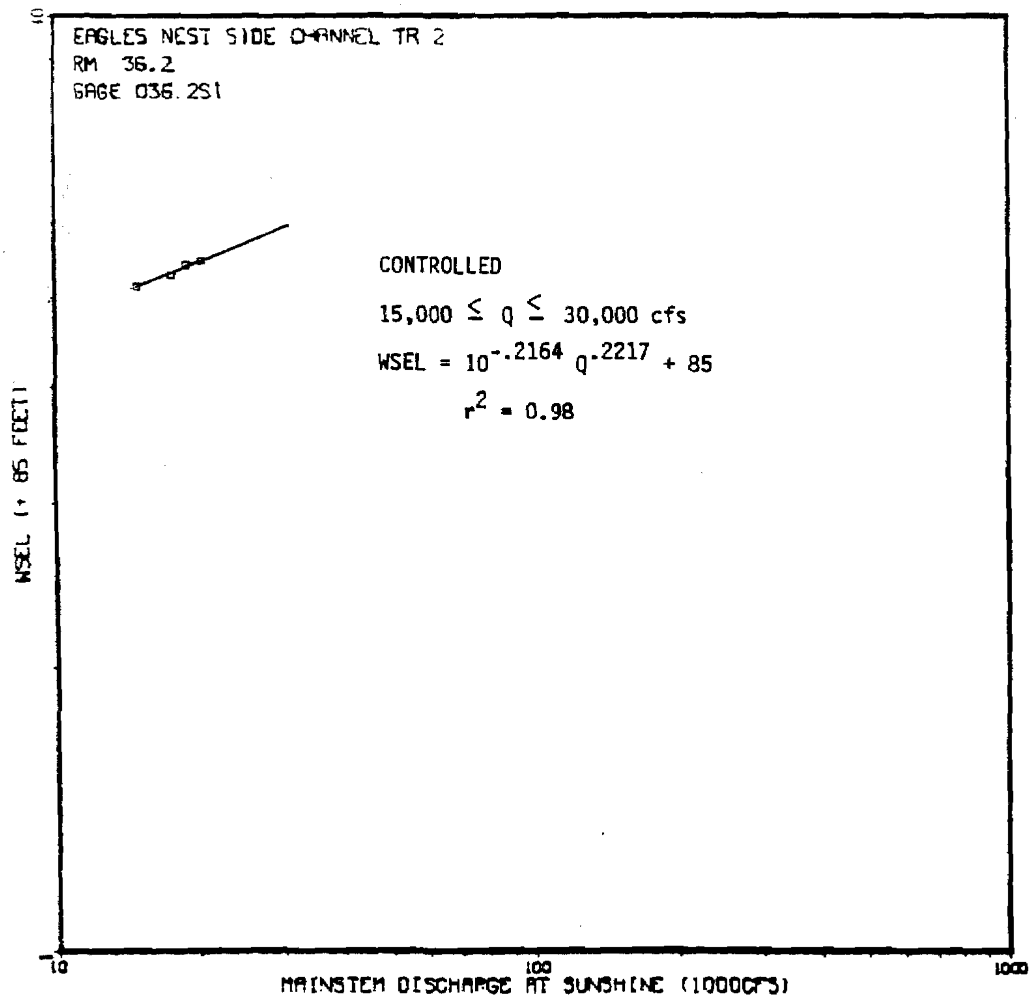
STATION (ft)	TRUE ELEVATION (ft)	DESCRIPTION
1+24	92.3	
1+29	92.0	
1+39	91.9	
1+49	91.8	
1+57	91.8	
1+67	92.3	
1+75	92.61	Right water surface
1+82	92.7	
1+83	92.9	
1+93	92.9	
2+03	93.1	
2+13	93.1	
2+23	93.4	
2+33	94.6	
2+43	95.4	
2+53	95.7	
2+63	96.2	
2+73	96.2	
2+78	96.0	
2+79	95.8	
2+82	95.3	
2+83	96.64	RBHP
2+83	96.4	GB RBHP[a]

[a] Ground beside right bank headpin.

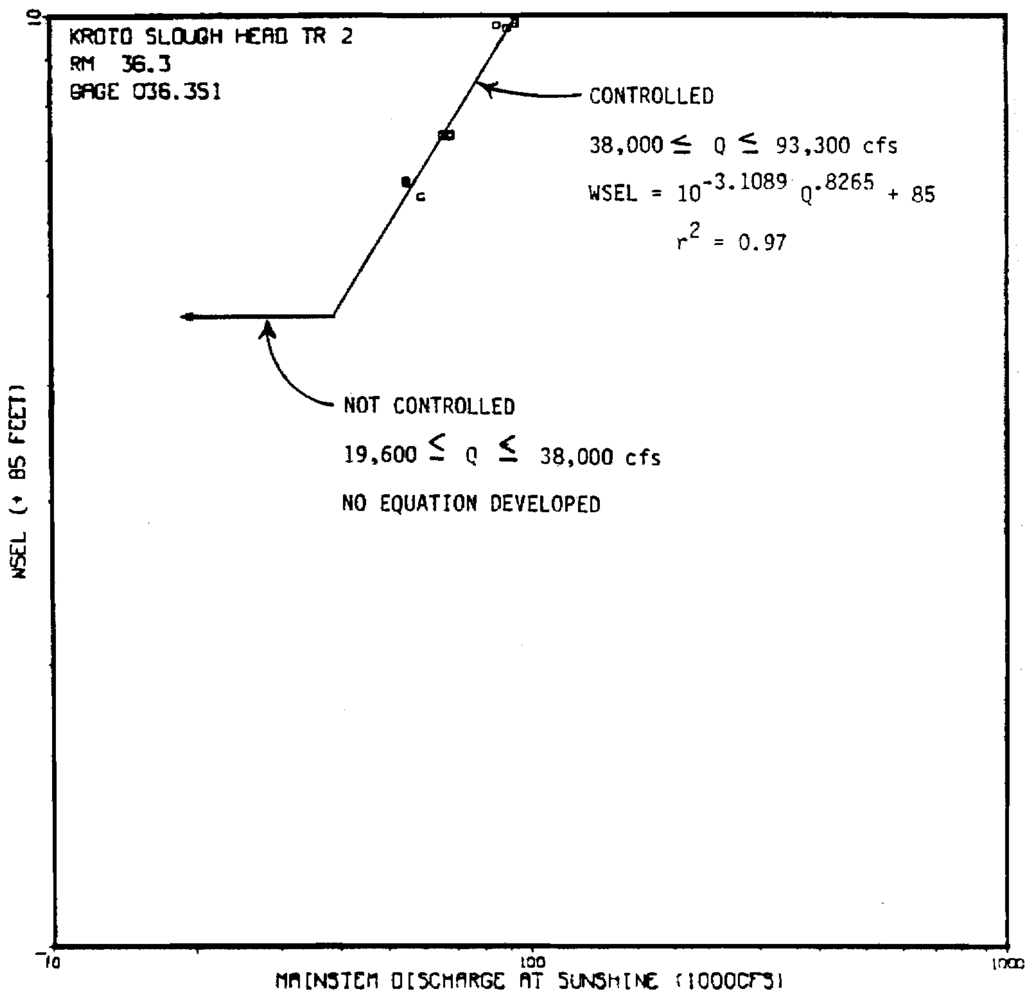
ATTACHMENT E



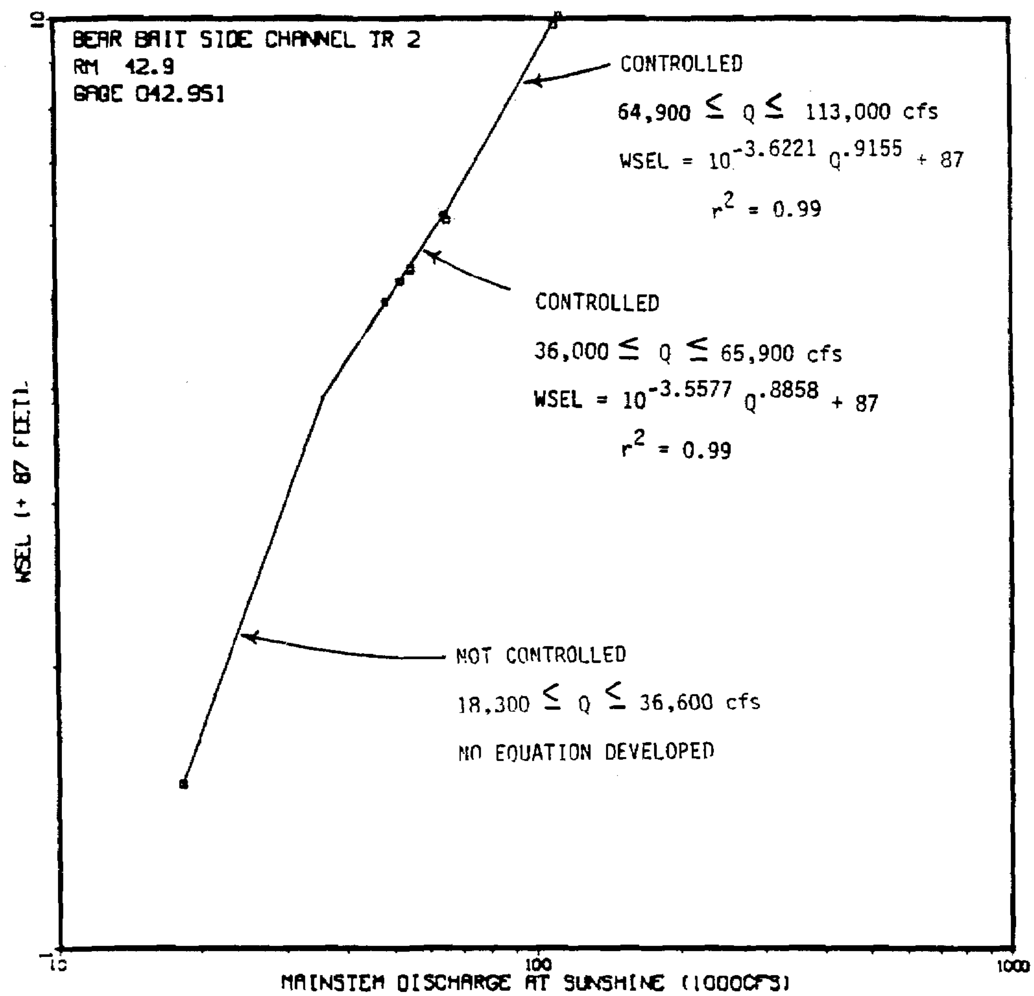
Attachment Figure E-1. WSEL versus mainstem discharge (USGS 15292780) at Hooligan Side Channel 50 feet upstream of transect 3 (Q site).



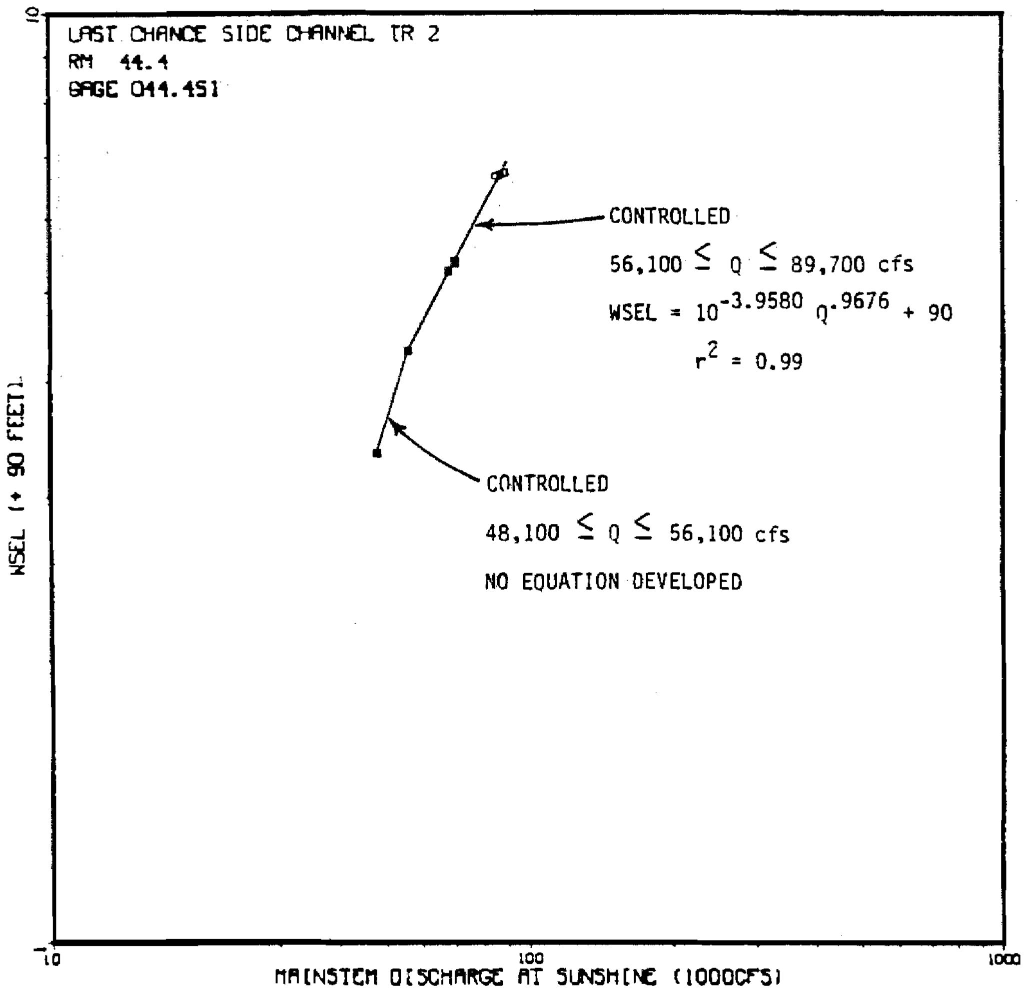
Attachment Figure E-2. WSEL versus mainstem discharge (USGS 15292780) at Eagle's Nest Side Channel transect 2 (Q site).



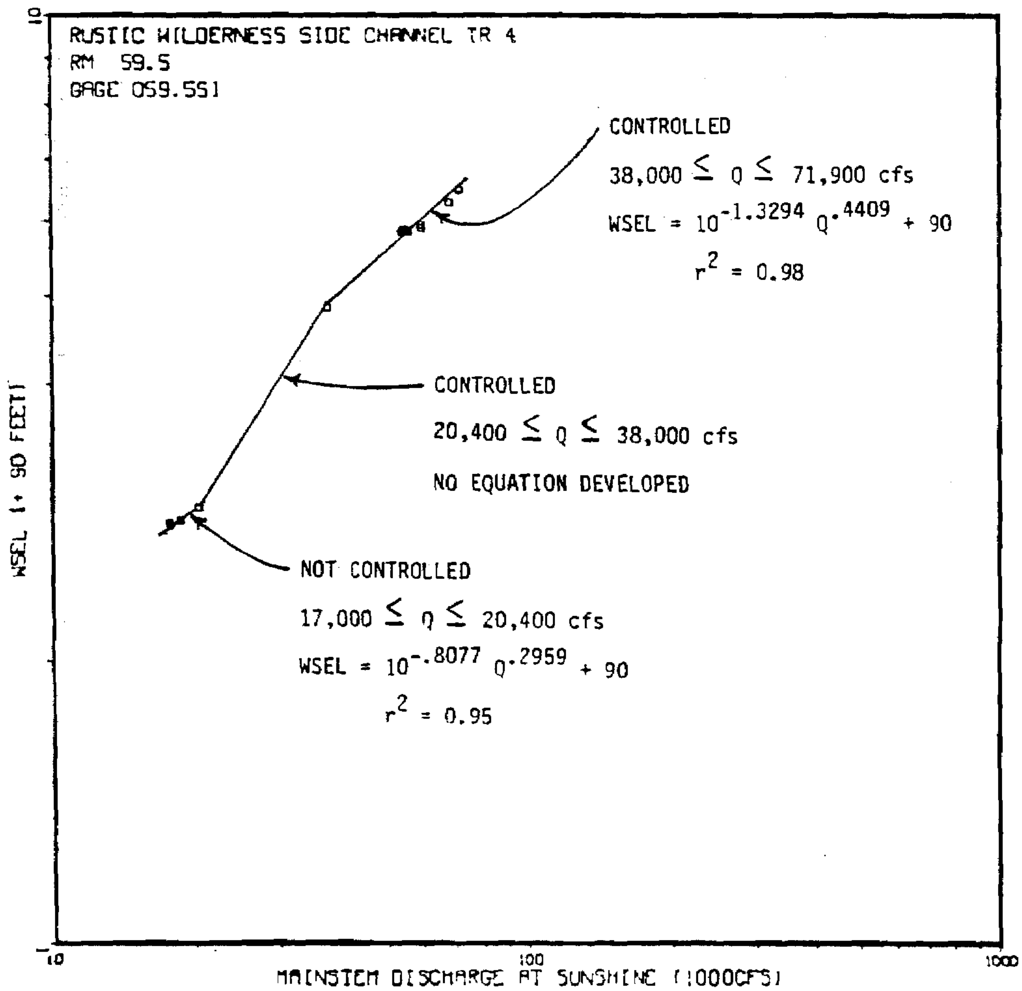
Attachment Figure E- 3. WSEL versus mainstem discharge (USGS 15292780) at Kroto Slough Side Channel transect 2 (Q site).



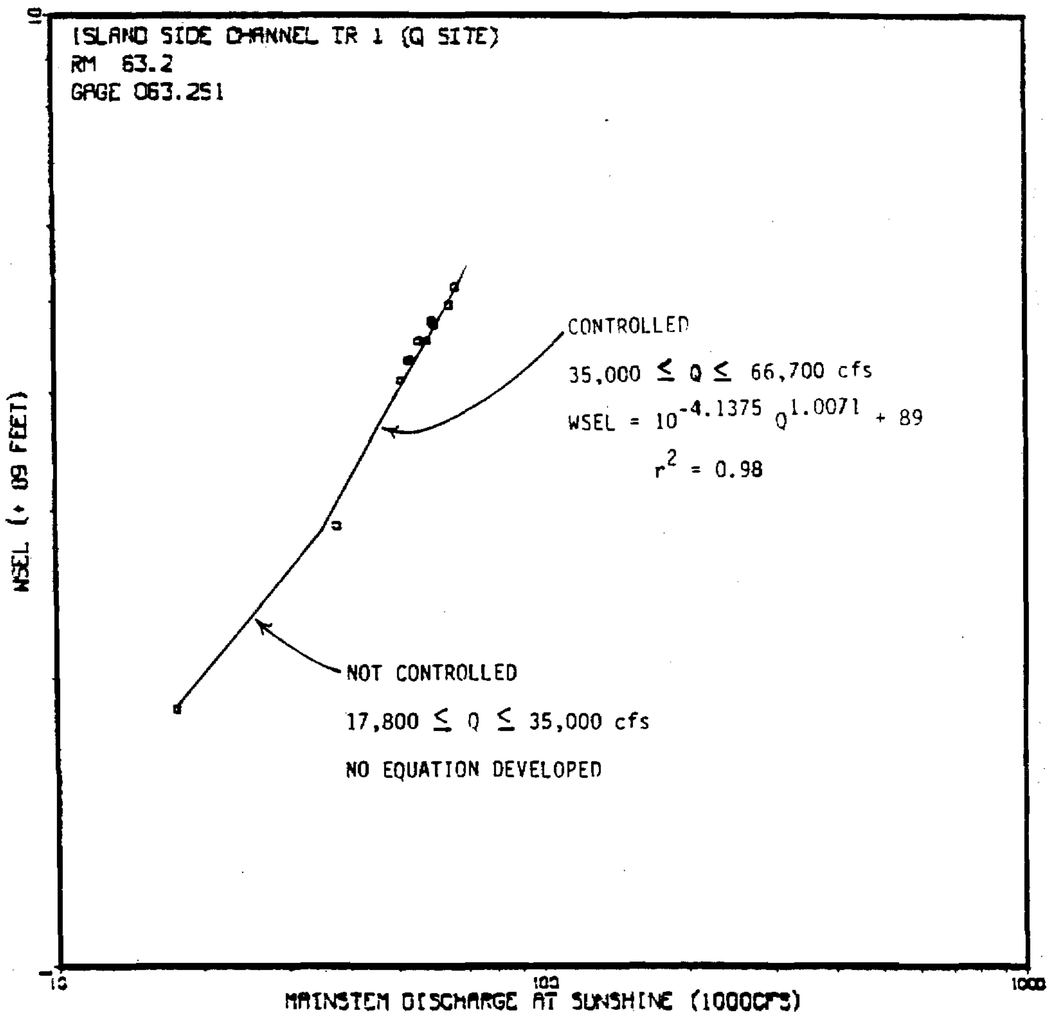
Attachment Figure E- 4. WSEL versus mainstem discharge (USGS 15292780) at Bear Bait Side Channel transect 2 (Q site).



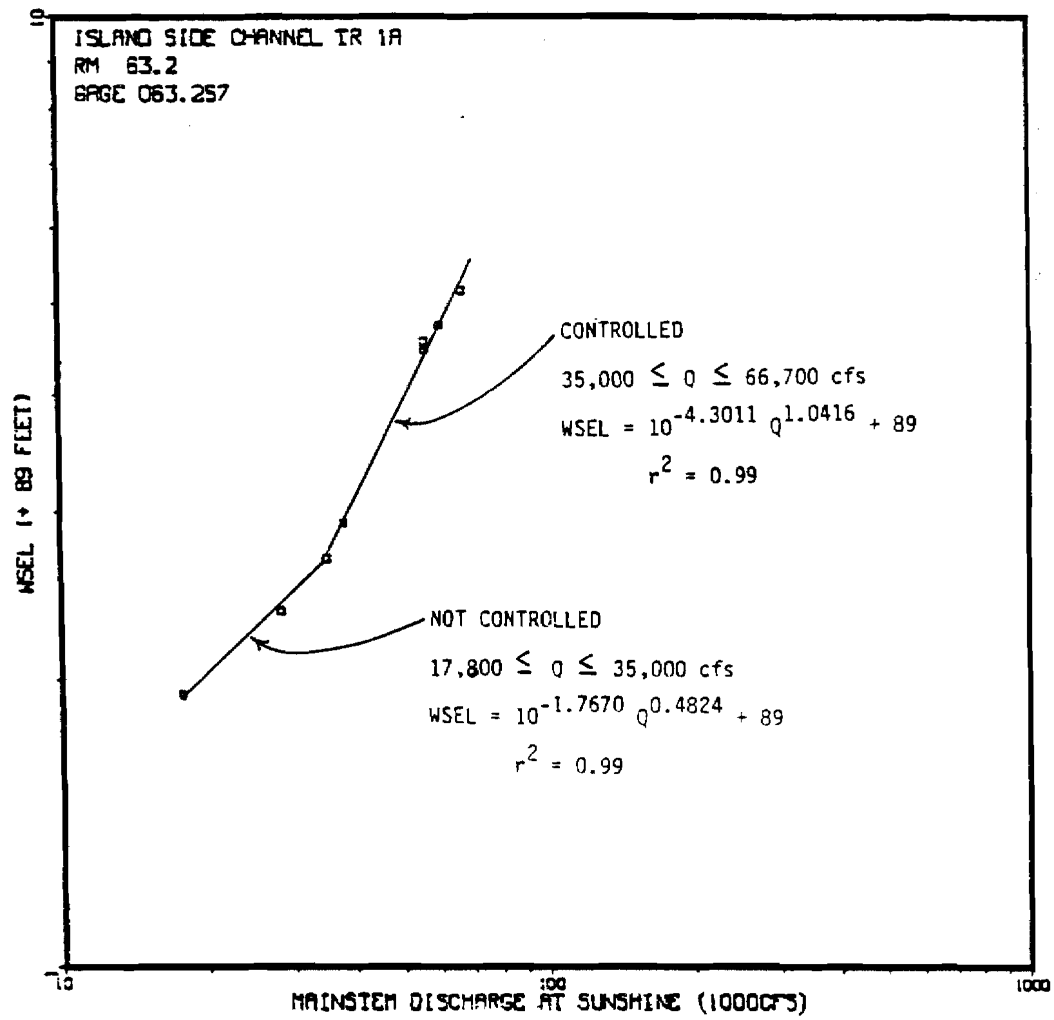
Attachment Figure E- 5. WSEL versus mainstem discharge (USGS 15292780) at Last Chance Side Channel transect 2 (Q site).



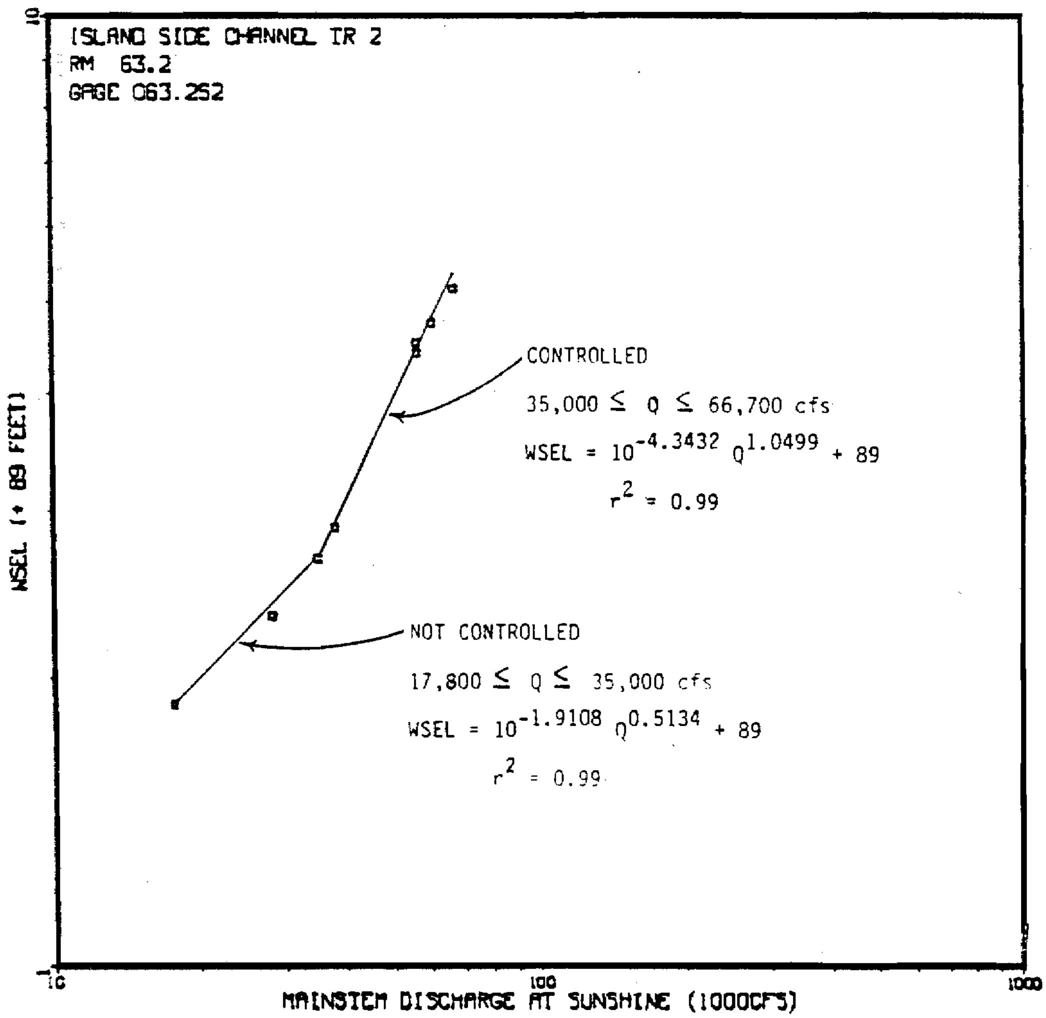
Attachment Figure E-6. WSEL versus mainstem discharge (USGS 15292780) at Rustic Wilderness Side Channel transect 4 (Q site).



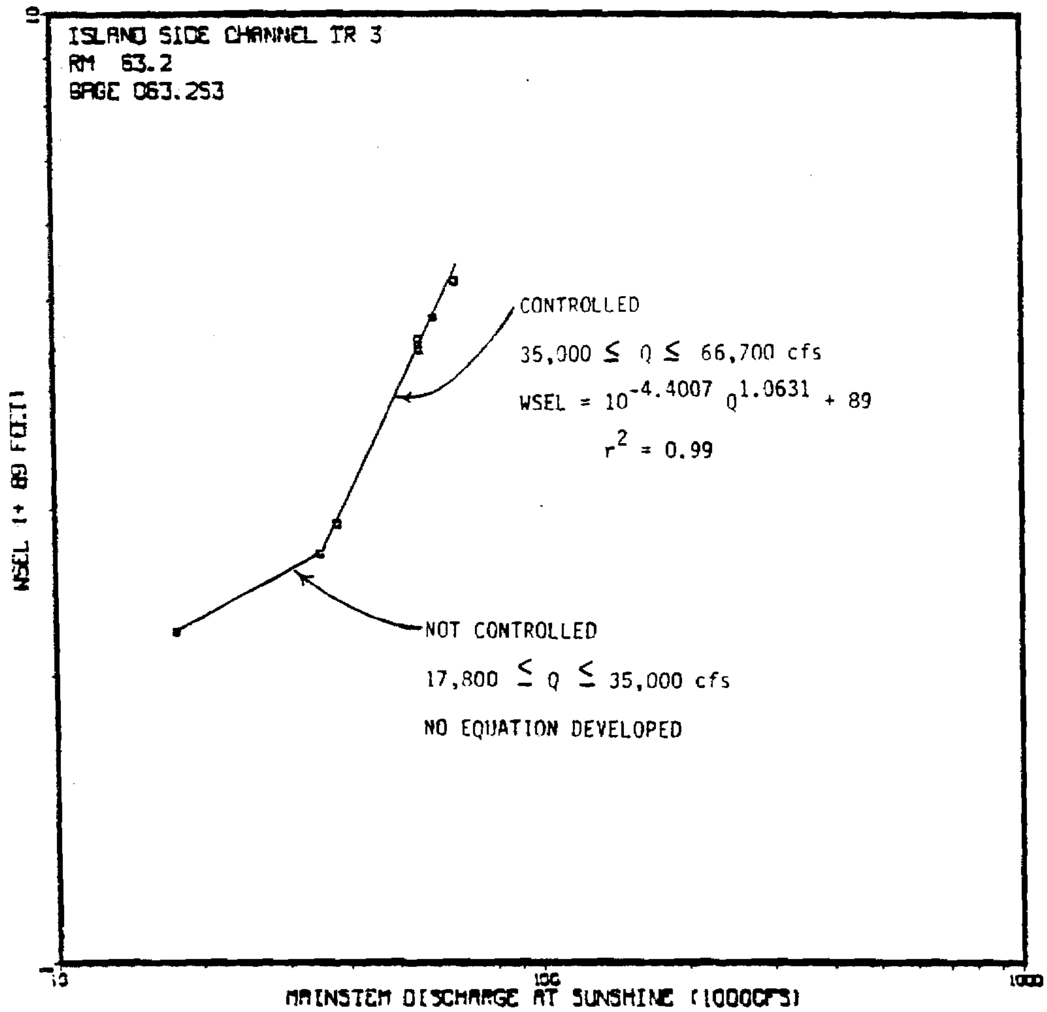
Attachment Figure E-7. WSEL versus mainstem discharge (USGS 15292780) at Island Side Channel transect 1 (Q site).



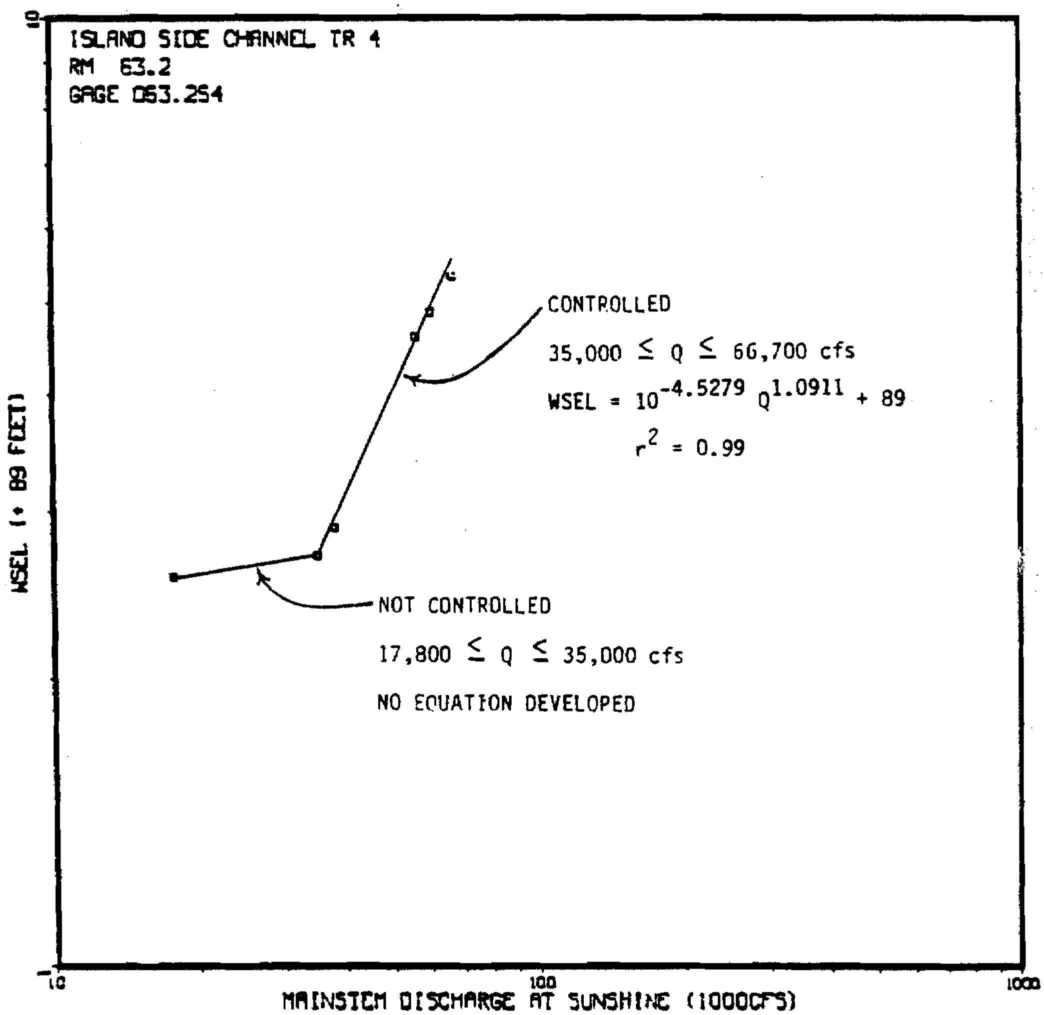
Attachment Figure E-8. WSEL versus mainstem discharge (USGS 15292780) at Island Side Channel transect 1A.



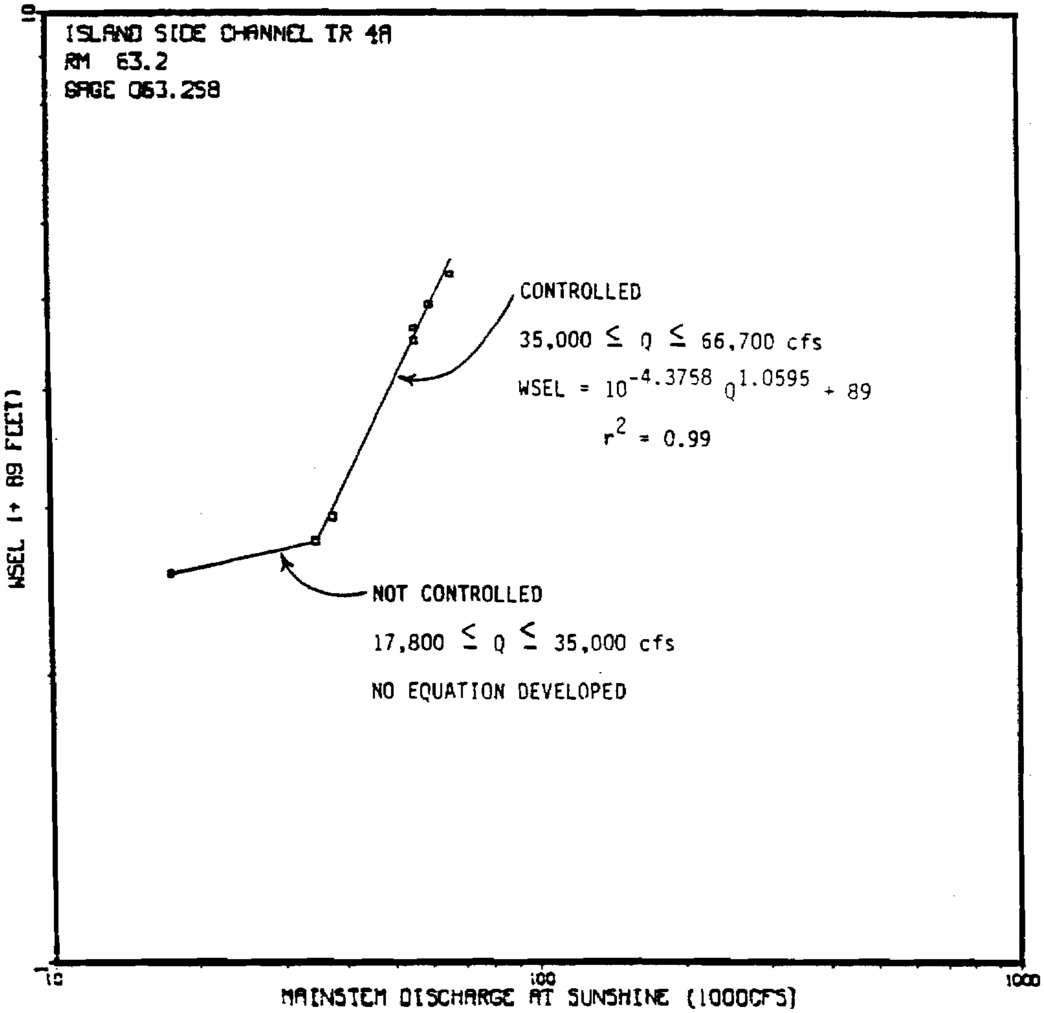
Attachment Figure E-9. WSEL versus mainstem discharge (USGS 15292780) at Island Side channel transect 2.



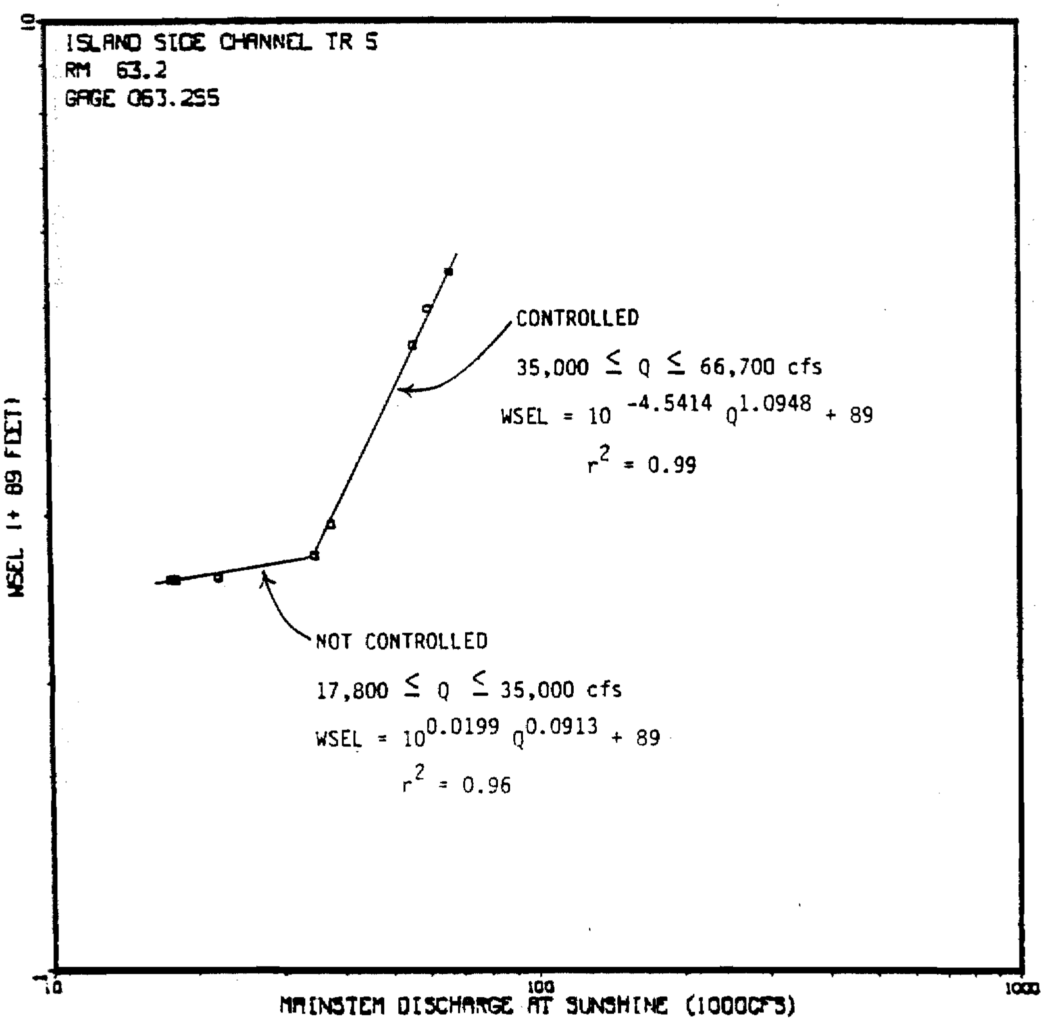
Attachment Figure E- 10. WSEL versus mainstem discharge (USGS 15292780) at Island Side Channel transect 3.



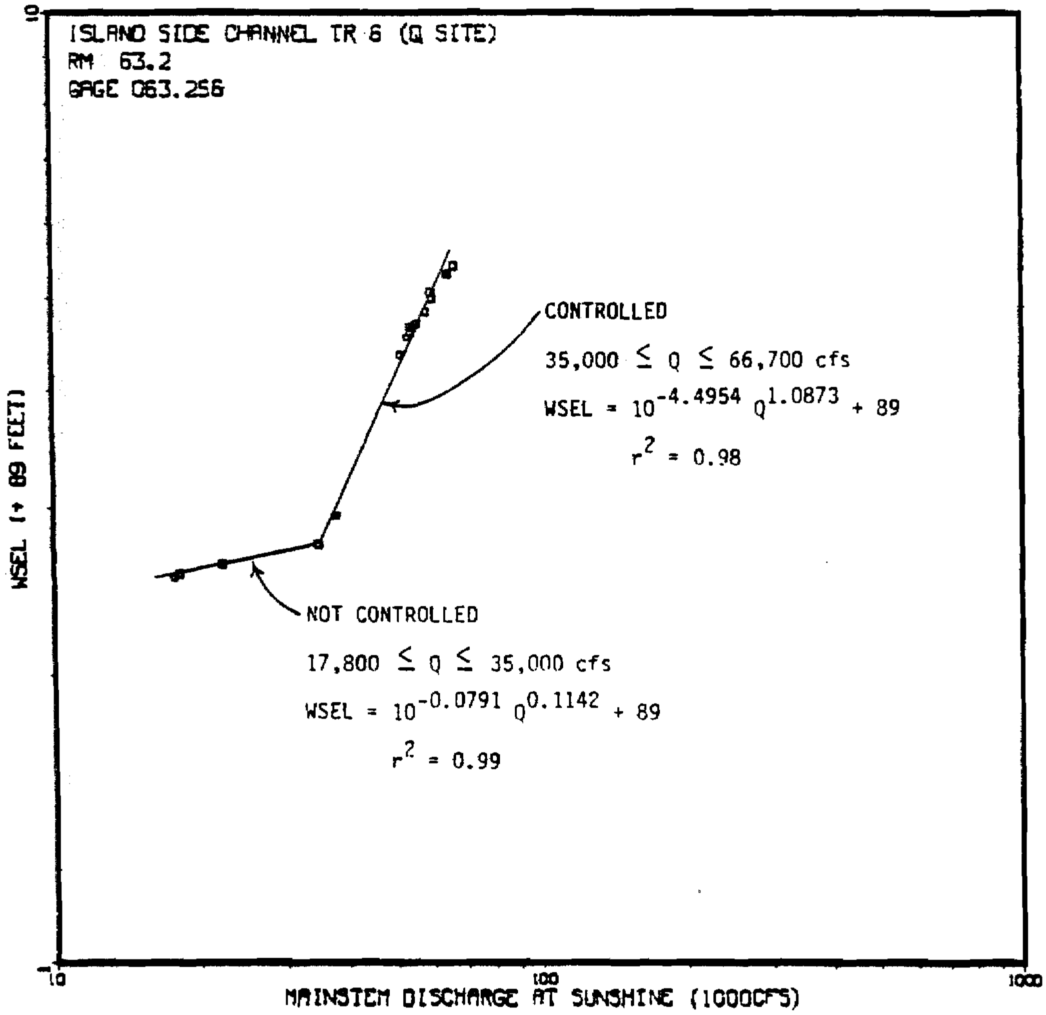
Attachment Figure E-11. WSEL versus mainstem discharge (USGS 15292780) at Island Side Channel transect 4.



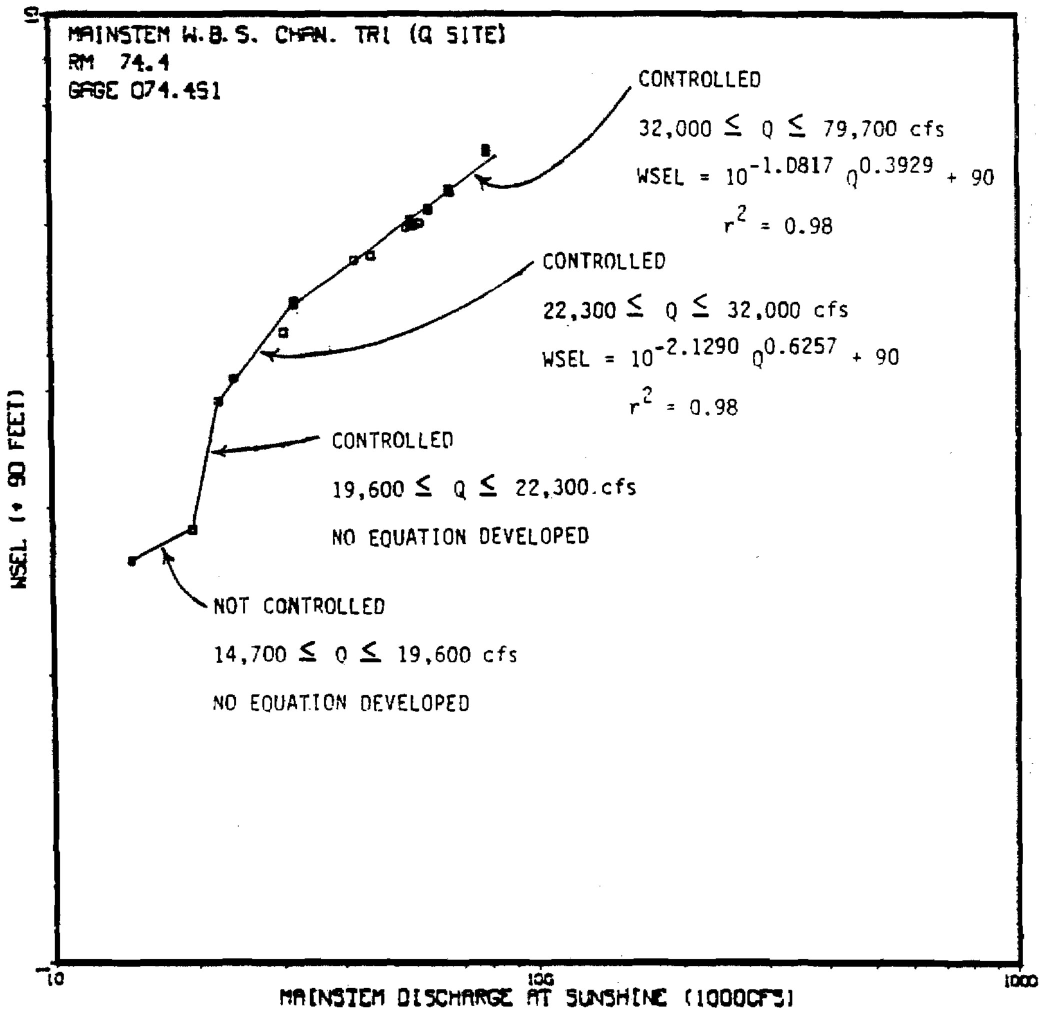
Attachment Figure E-12. WSEL versus mainstem discharge (USGS 15292780) at Island Side Channel transect 4A.



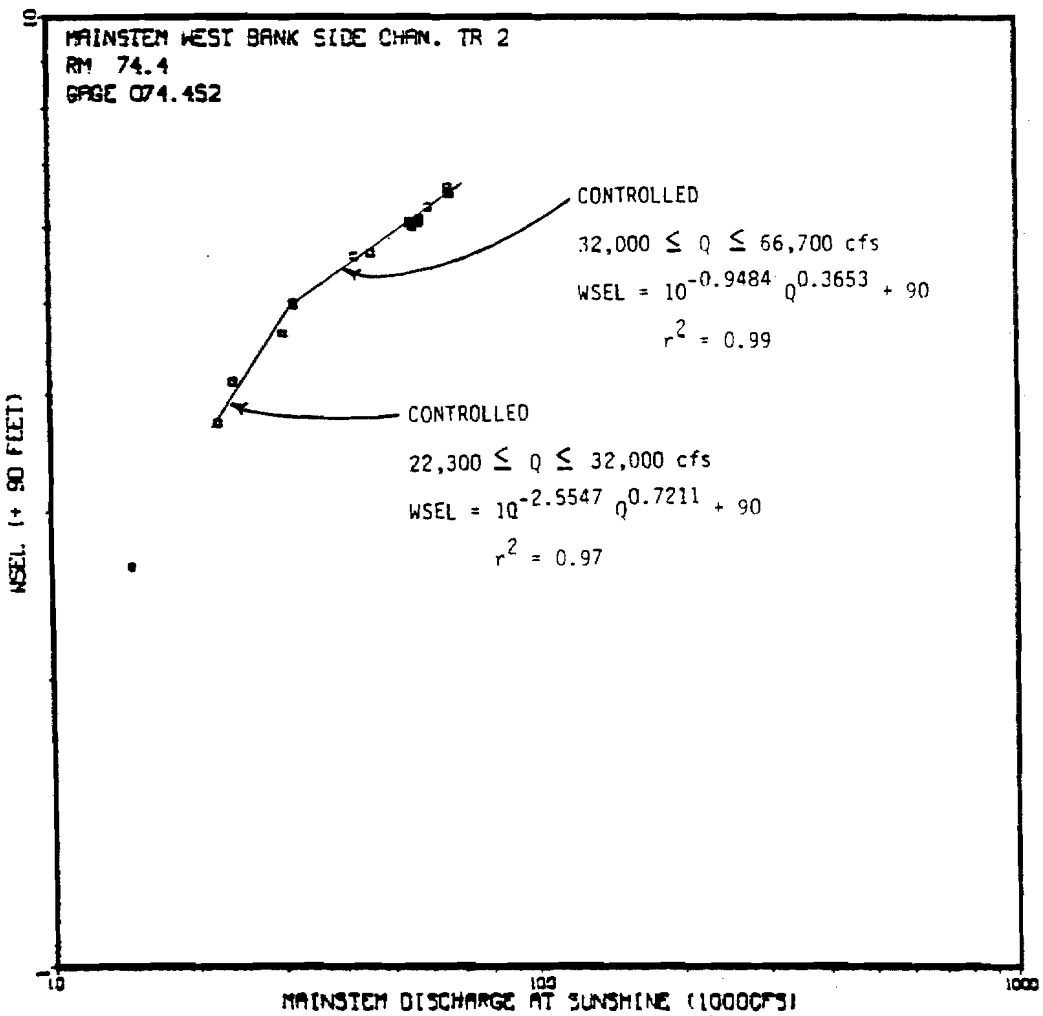
Attachment Figure E-13. WSEL versus mainstem discharge (USGS 15292780) at Island Side Channel transect 5.



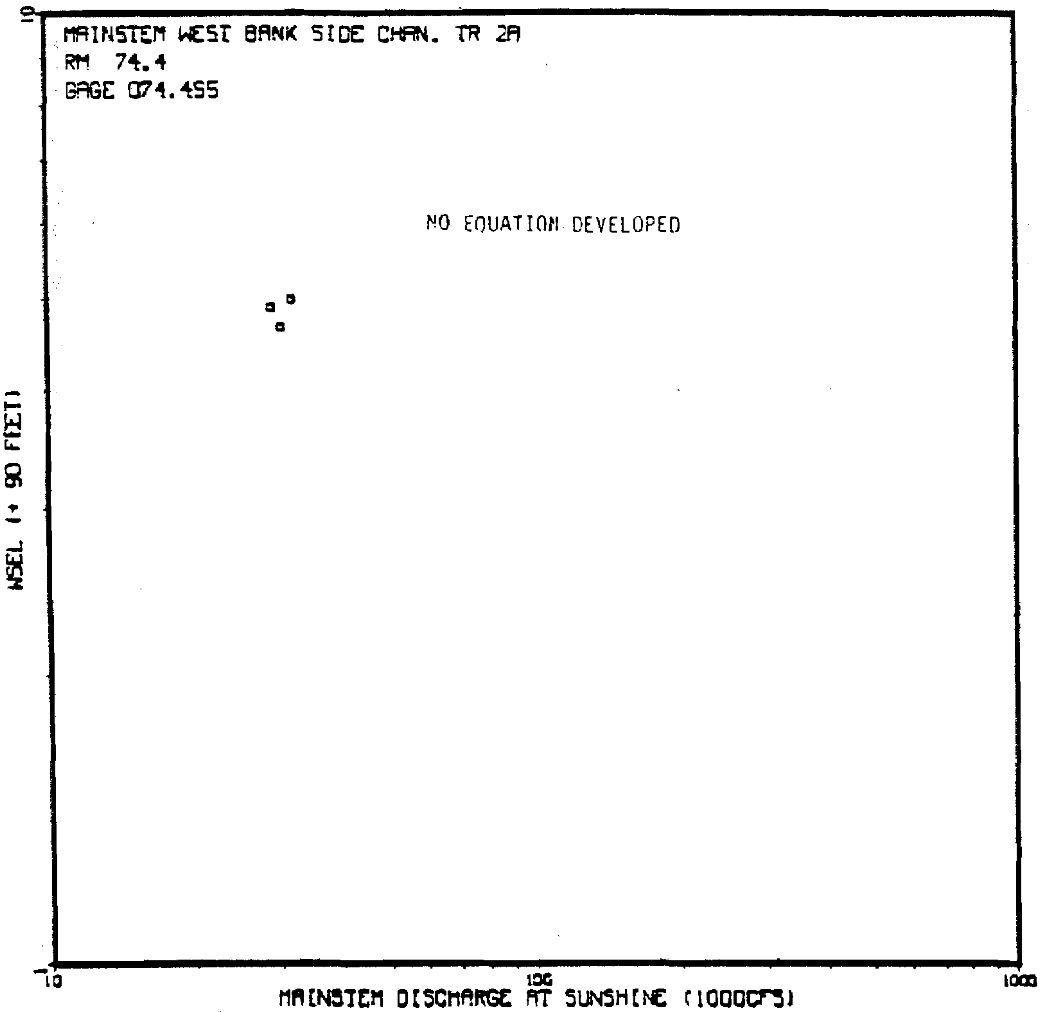
Attachment Figure E-14. WSEL versus mainstem discharge (USGS 15292780) at Island Side Channel transect 6 (Q site).



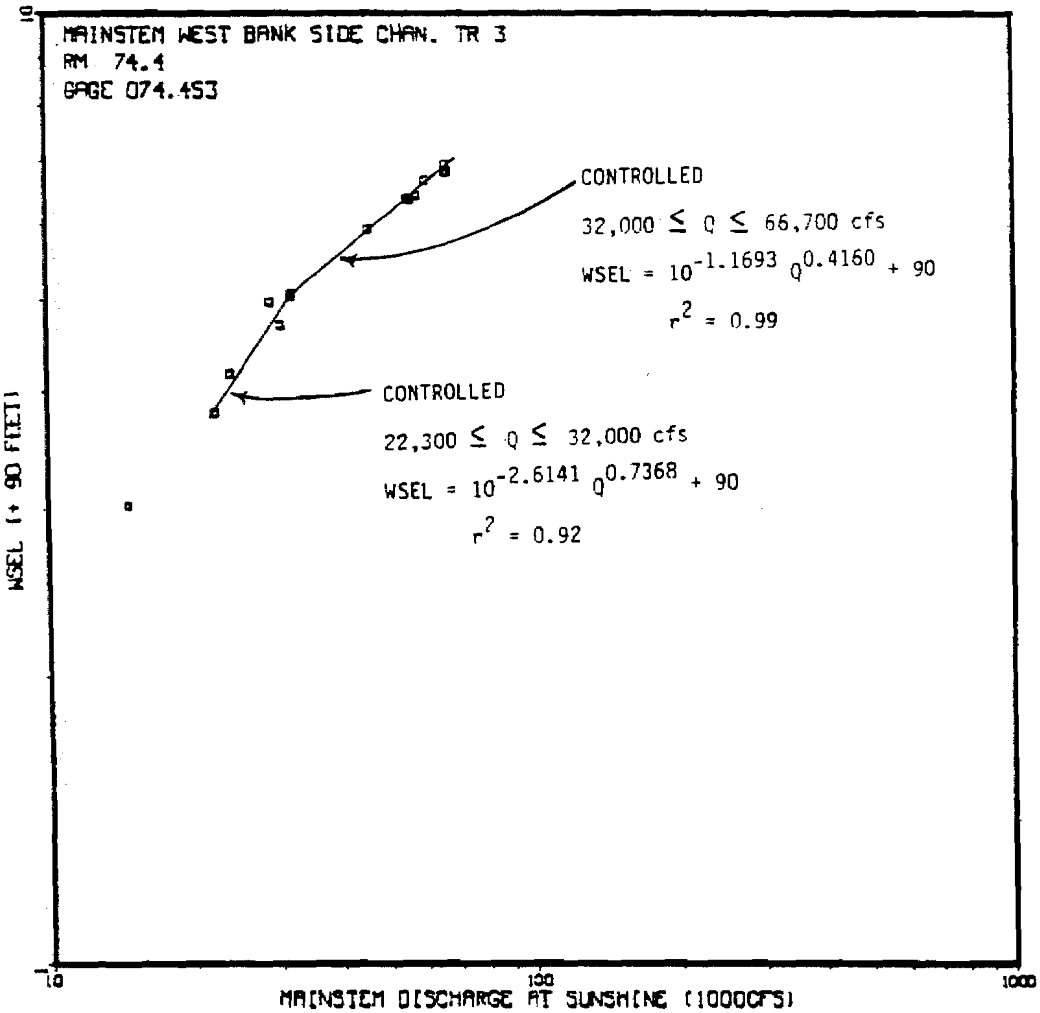
Attachment Figure E-15. WSEL versus mainstem discharge (USGS 15292780) at Mainstem West Bank Side Channel transect 1 (Q site).



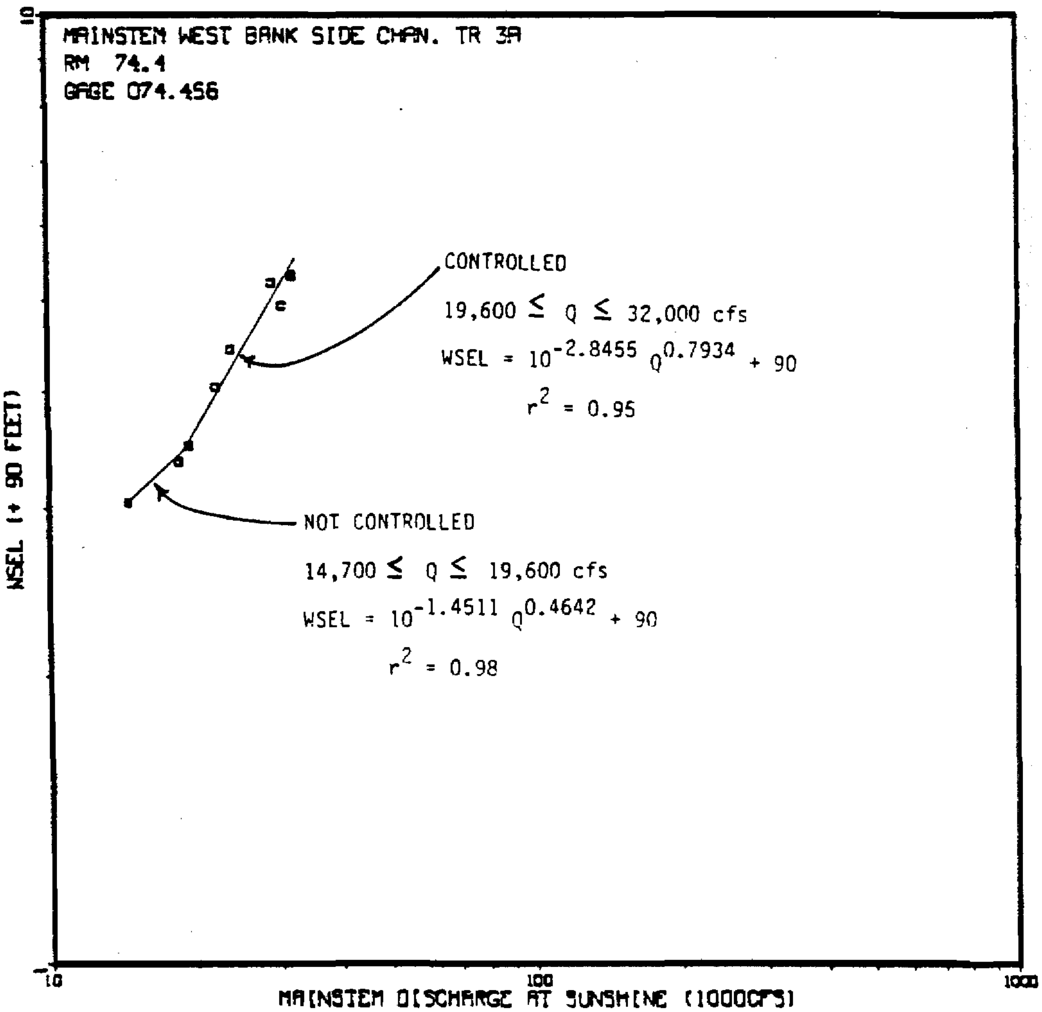
Attachment Figure E-16. WSEL versus mainstem discharge (USGS 15292780) at Mainstem West Bank Side Channel transect 2.



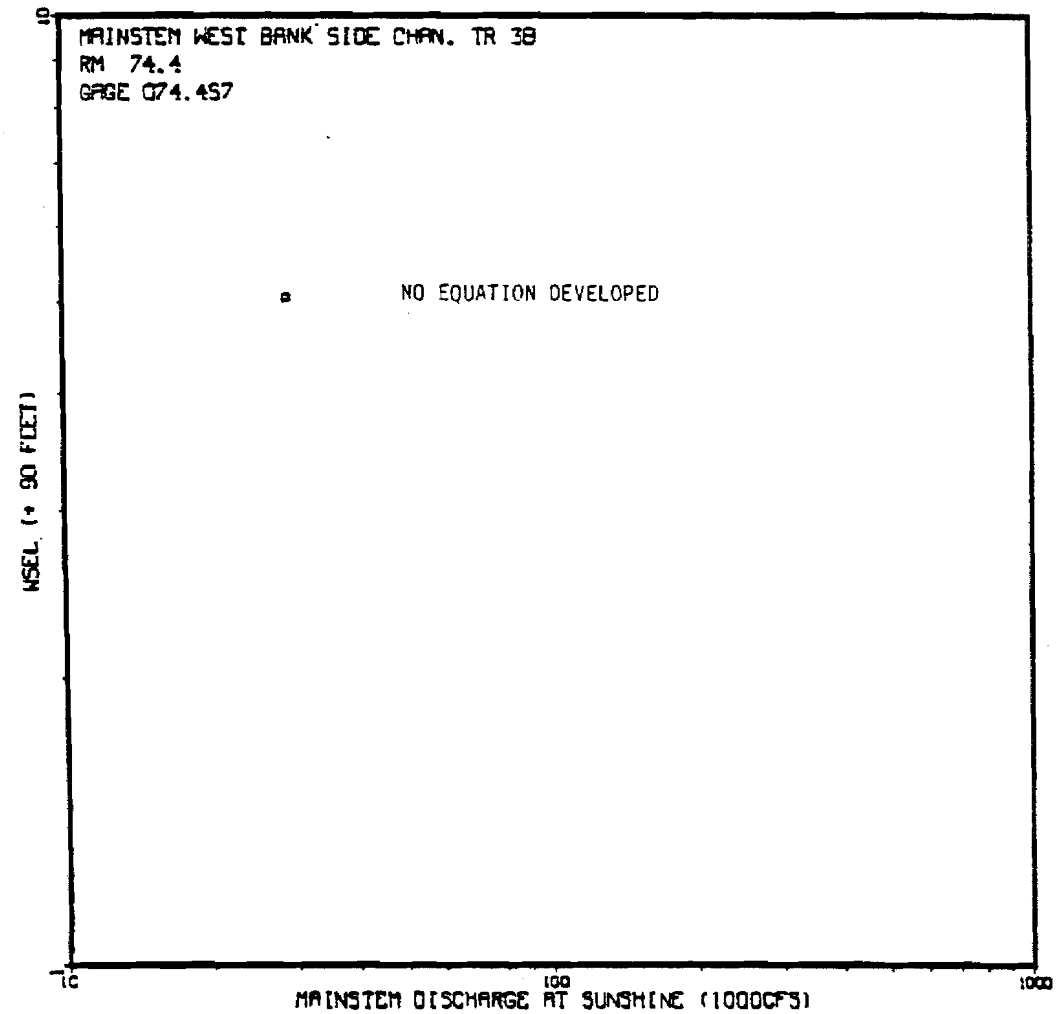
Attachment Figure E-17. WSEL versus mainstem discharge (USGS 15292780) at Mainstem West Bank Side Channel transect 2A.



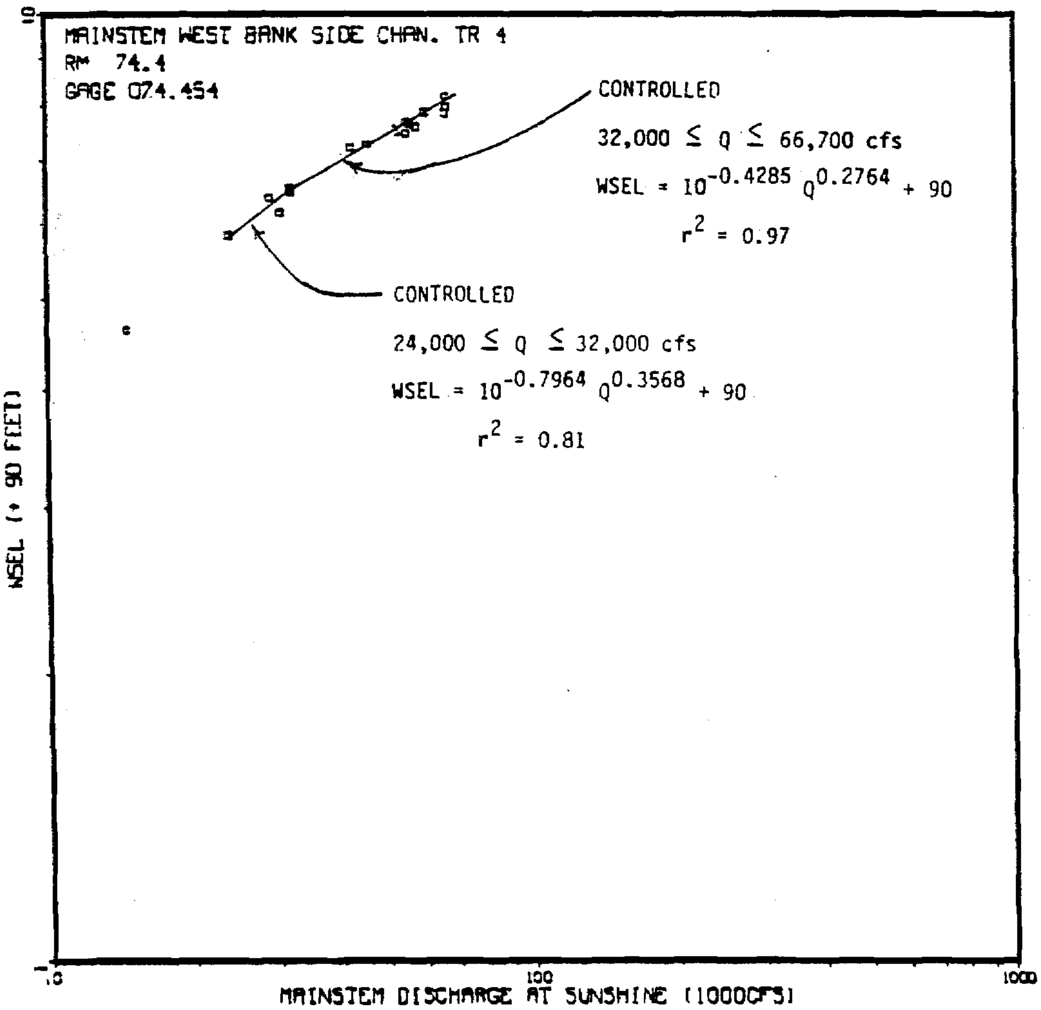
Attachment Figure E-18. WSEL versus mainstem discharge (USGS 15292780) at Mainstem West Bank Side Channel transect 3.



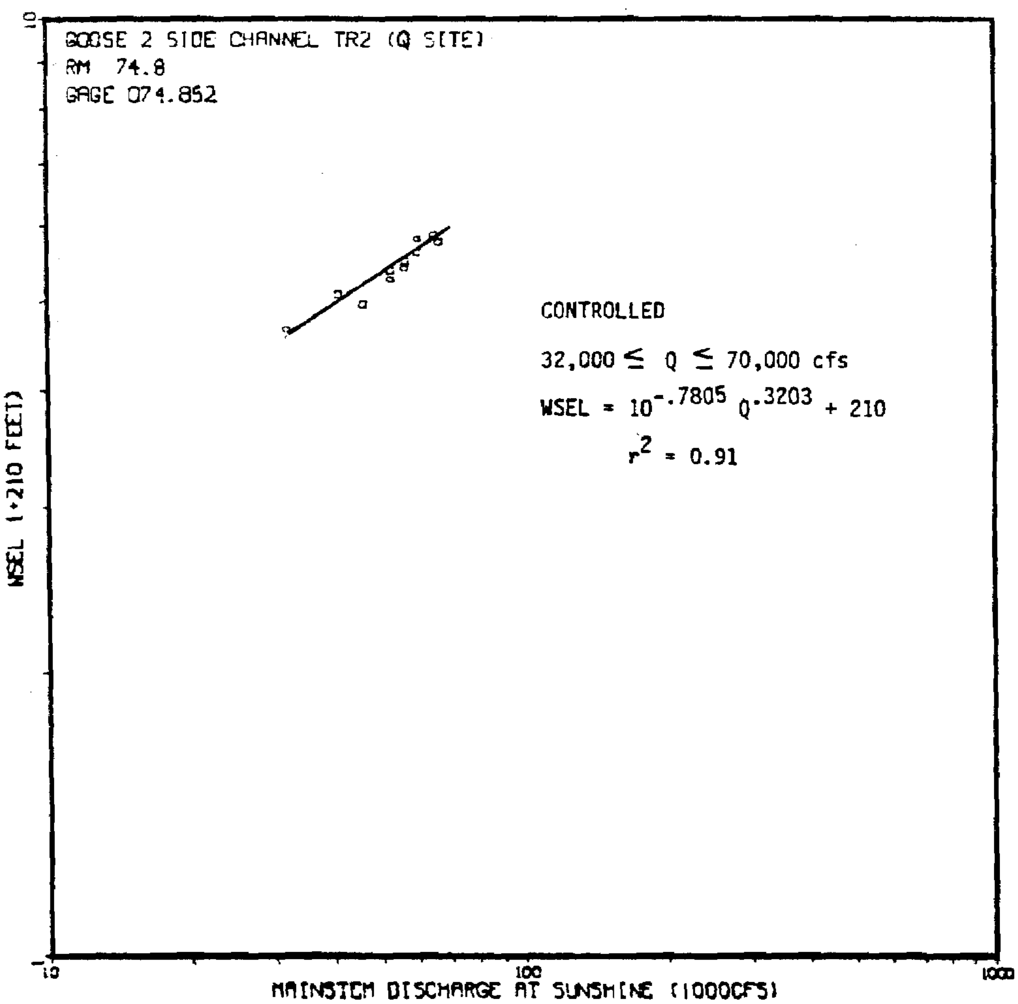
Attachment Figure E- 19. WSEL versus mainstem discharge (USGS 15292780) at Mainstem West Bank Side Channel transect 3A.



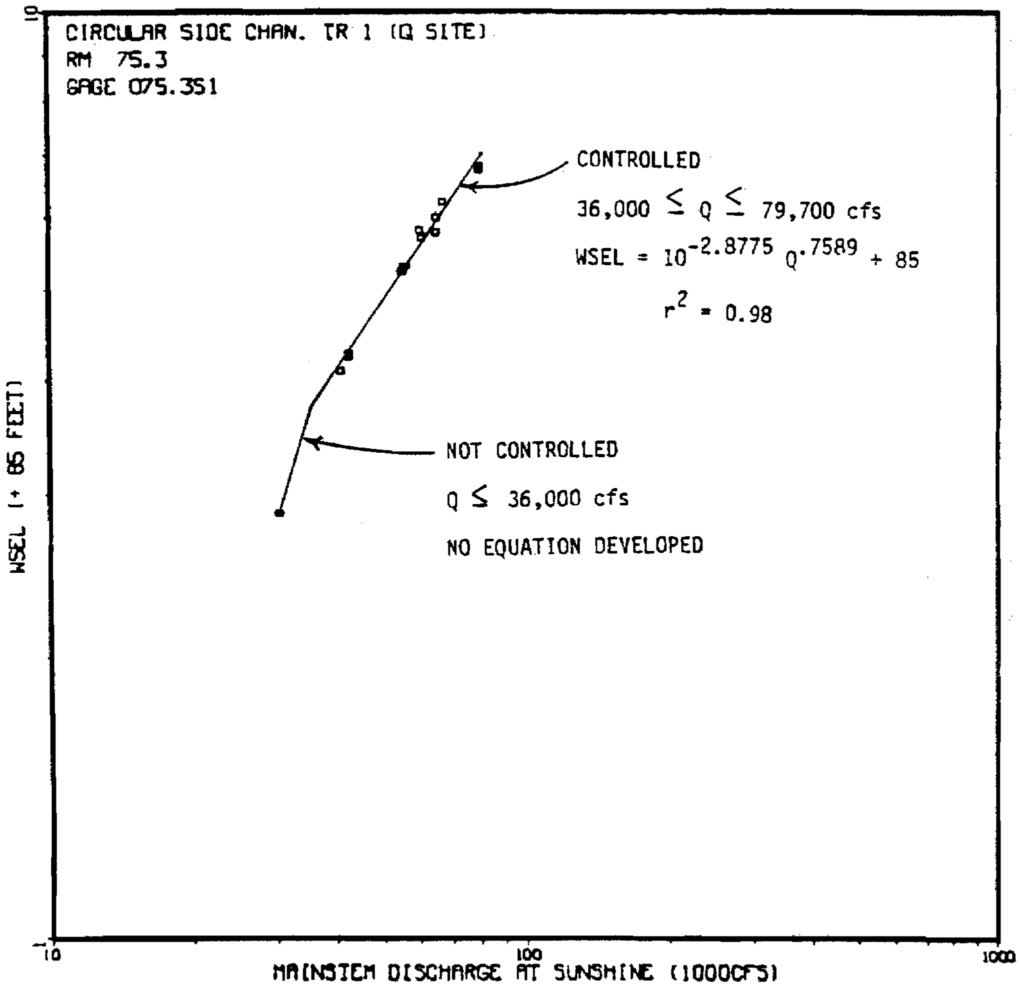
Attachment Figure E-20. WSEL versus mainstem discharge (USGS 15292780) at Mainstem West Bank Side Channel transect 3B.



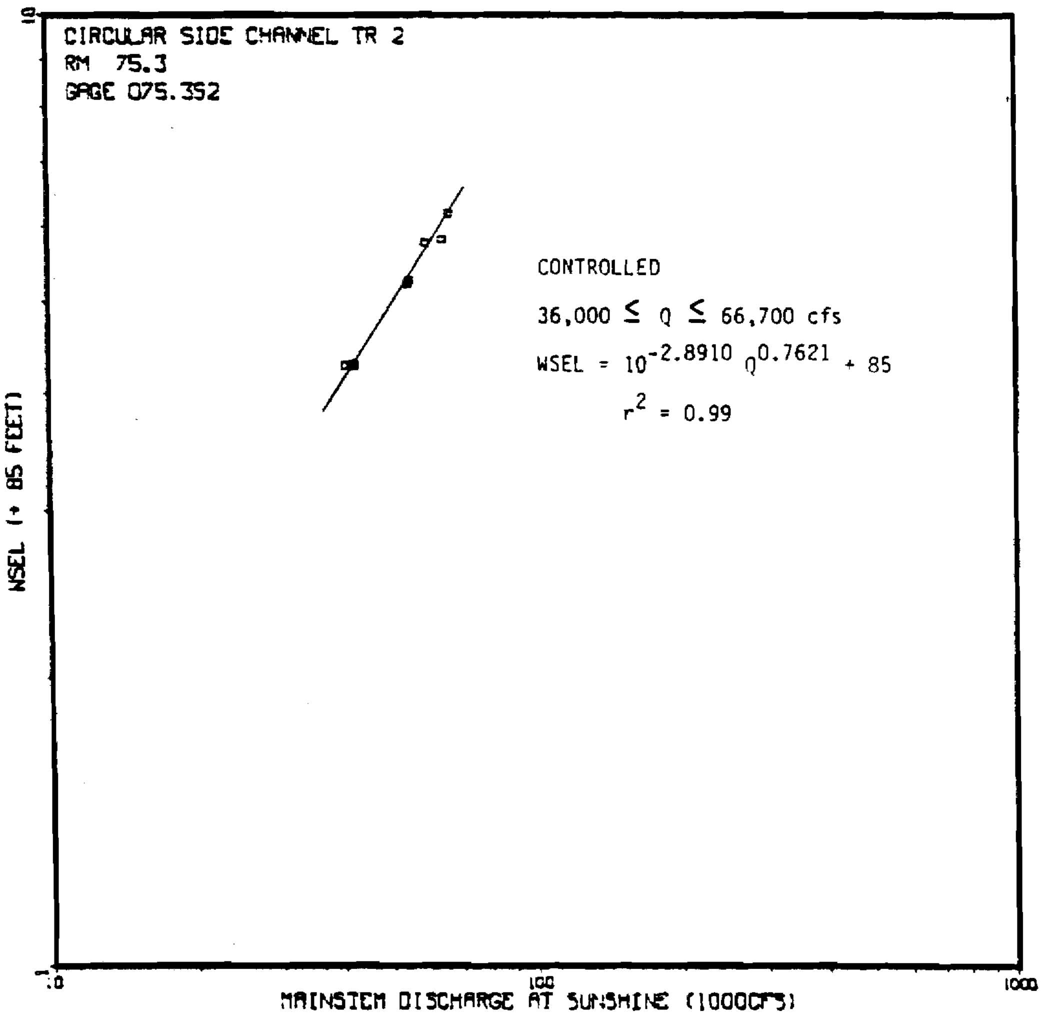
Attachment Figure E-21. WSEL versus mainstem discharge (USGS 15292780) at Mainstem West Bank Side Channel transect 4.



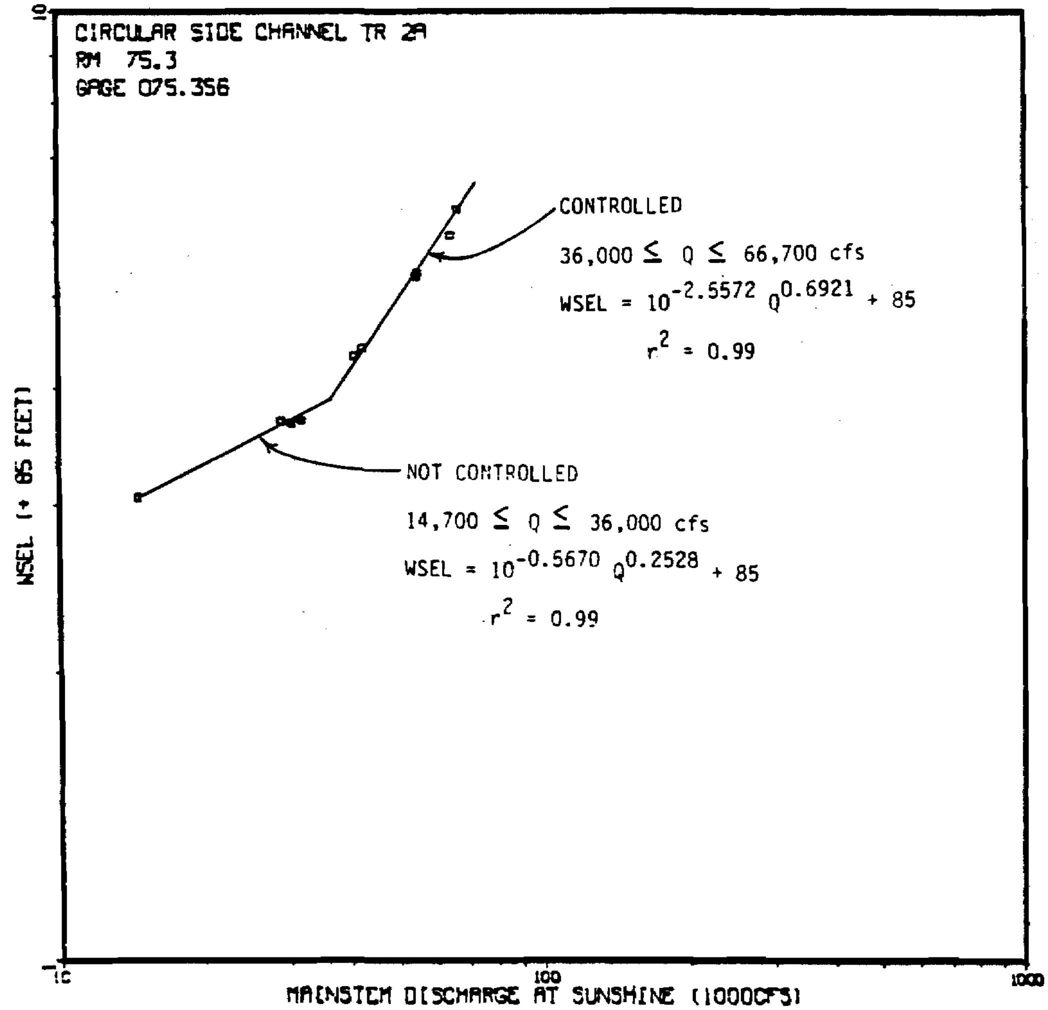
Attachment Figure E-22. WSEL versus mainstem discharge (USGS 15292780) at Goose 2 Side Channel transect 2 (Q site).



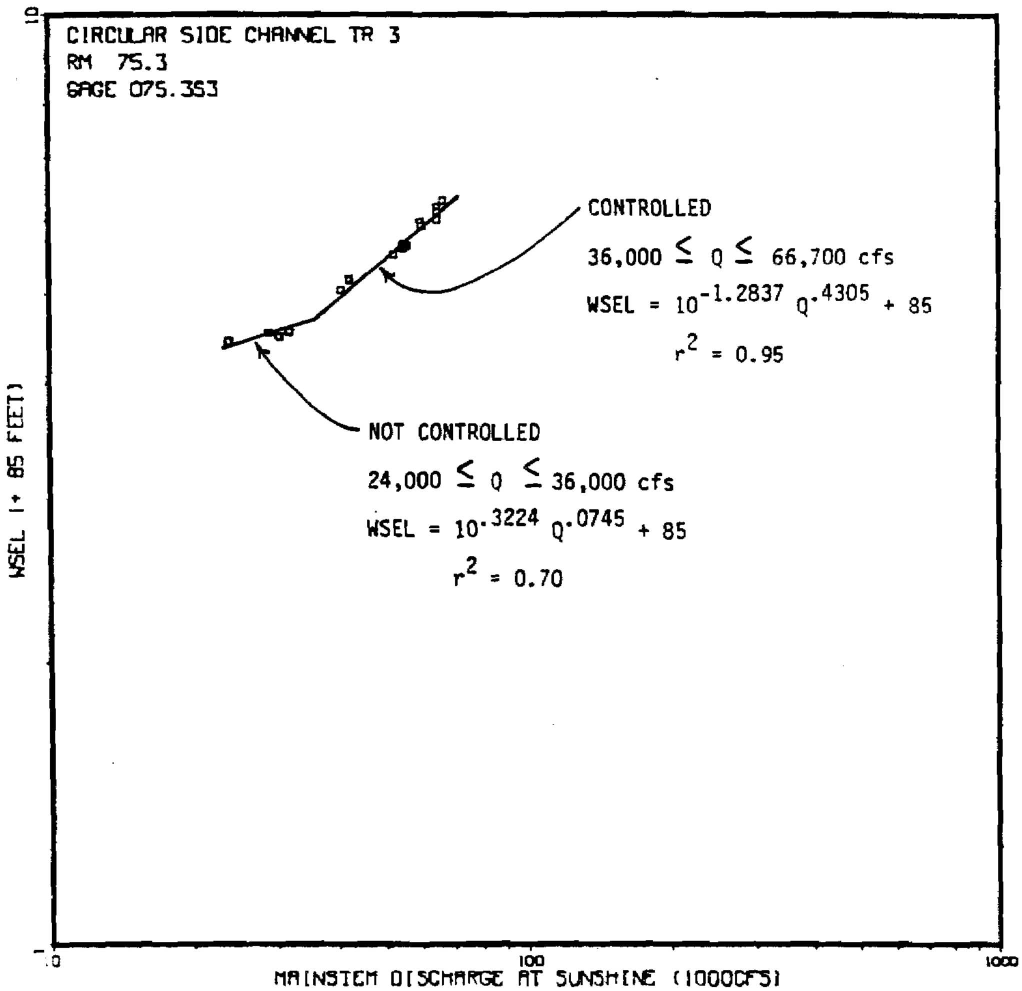
Attachment Figure E-23. WSEL versus mainstem discharge (USGS 15292780) at Circular Side Channel transect 1 (Q Site).



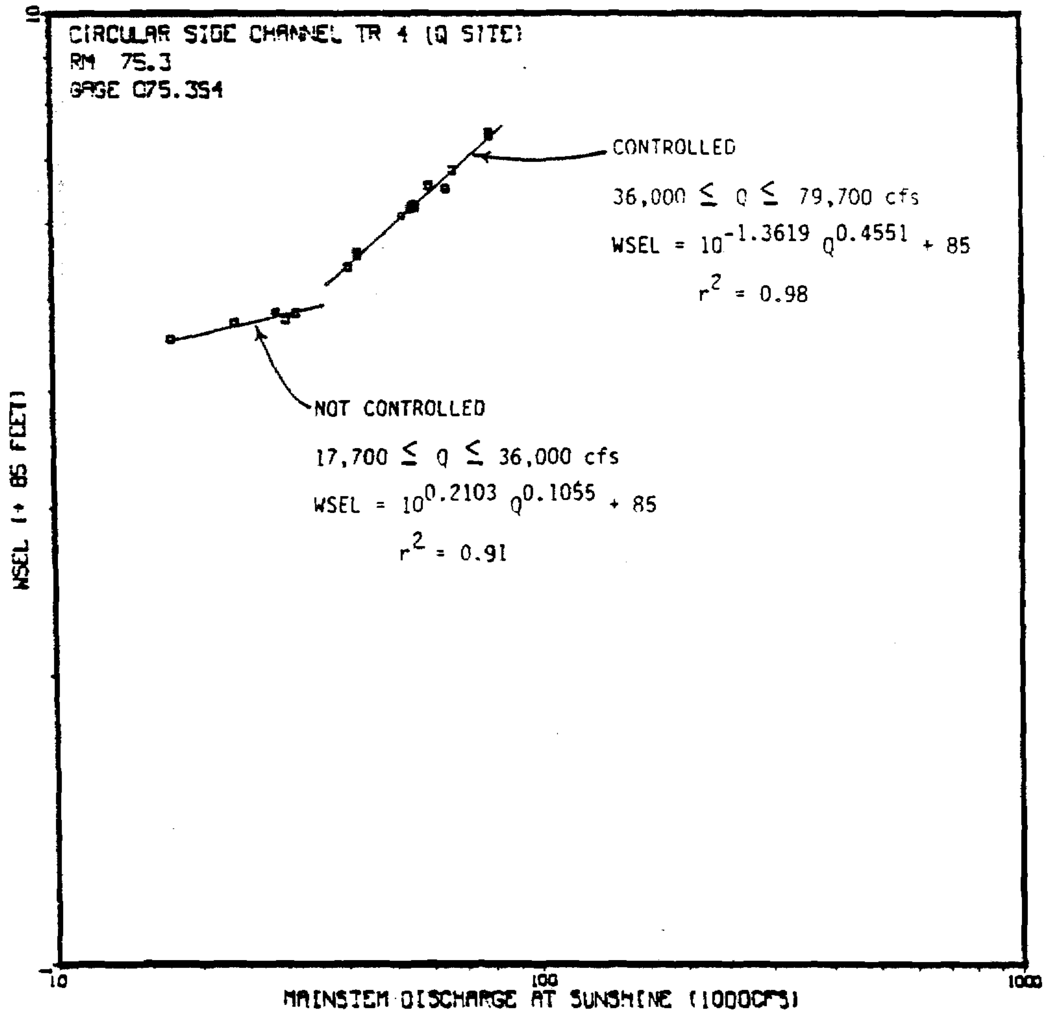
Attachment Figure E-24. WSEL versus mainstem discharge (USGS 15292780) at Circular Side Channel transect 2.



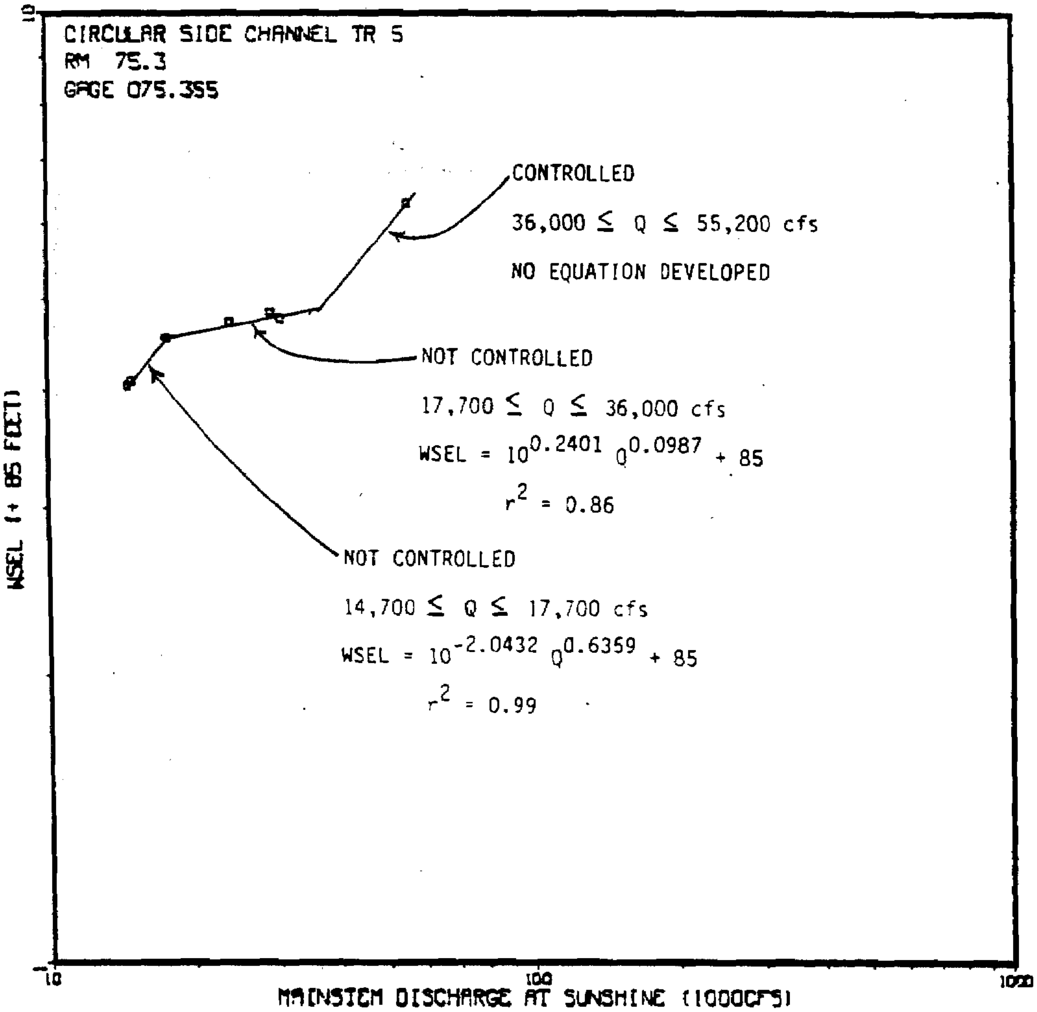
Attachment Figure E-25. WSEL versus mainstem discharge (USGS 15292780) at Circular Side Channel transect 2A.



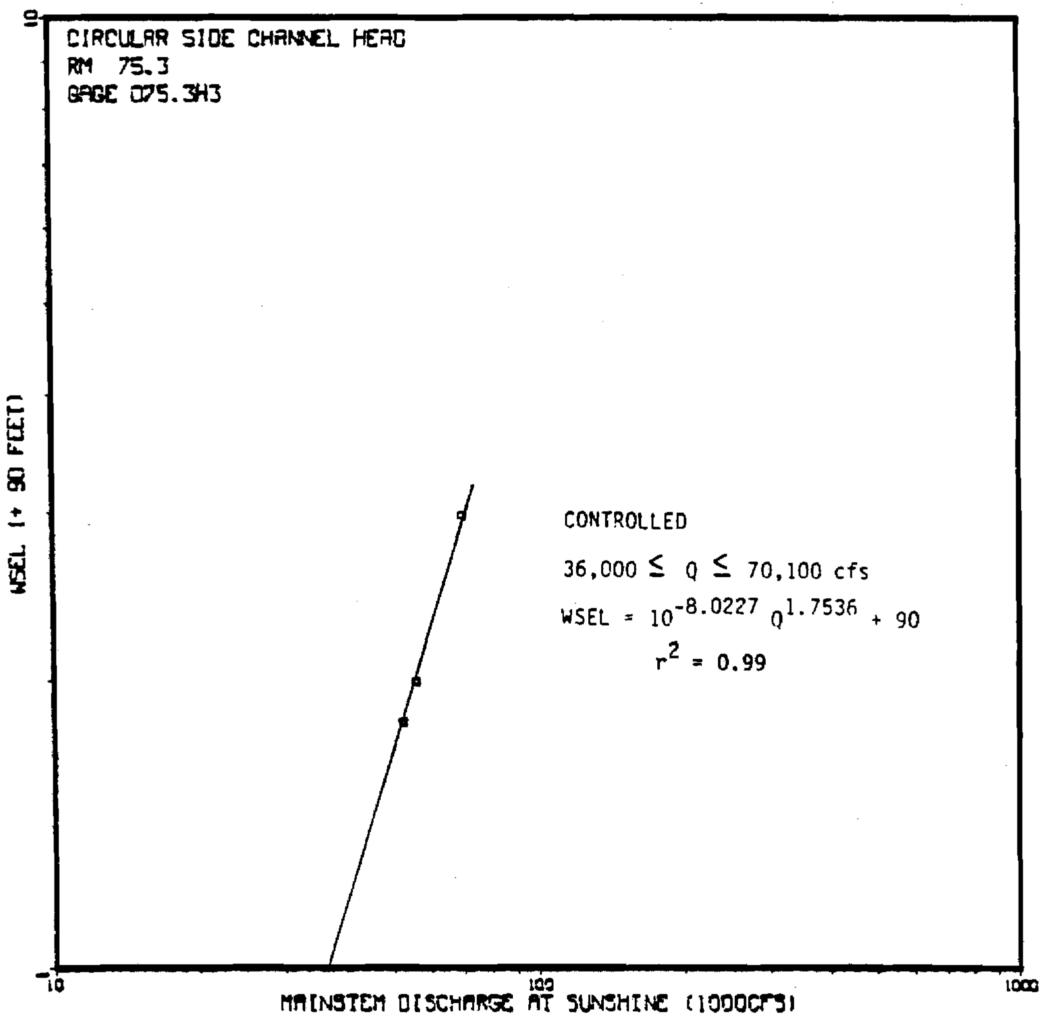
Attachment Figure E-26. WSEL versus mainstem discharge (USGS 15292780) at Circular Side Channel transect 3.



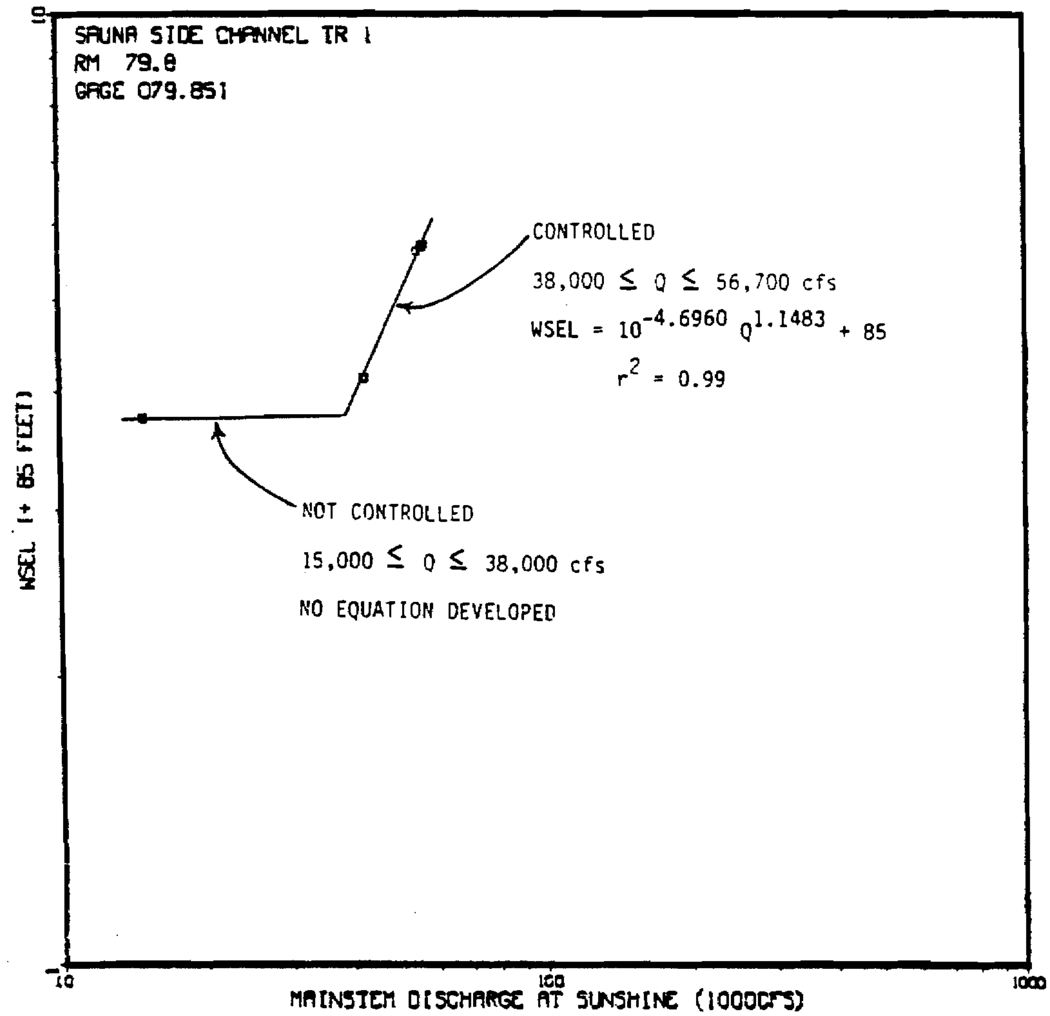
Attachment Figure E-27. WSEL versus mainstem discharge (USGS 15292780) at Circular Side Channel transect 4 (Q site).



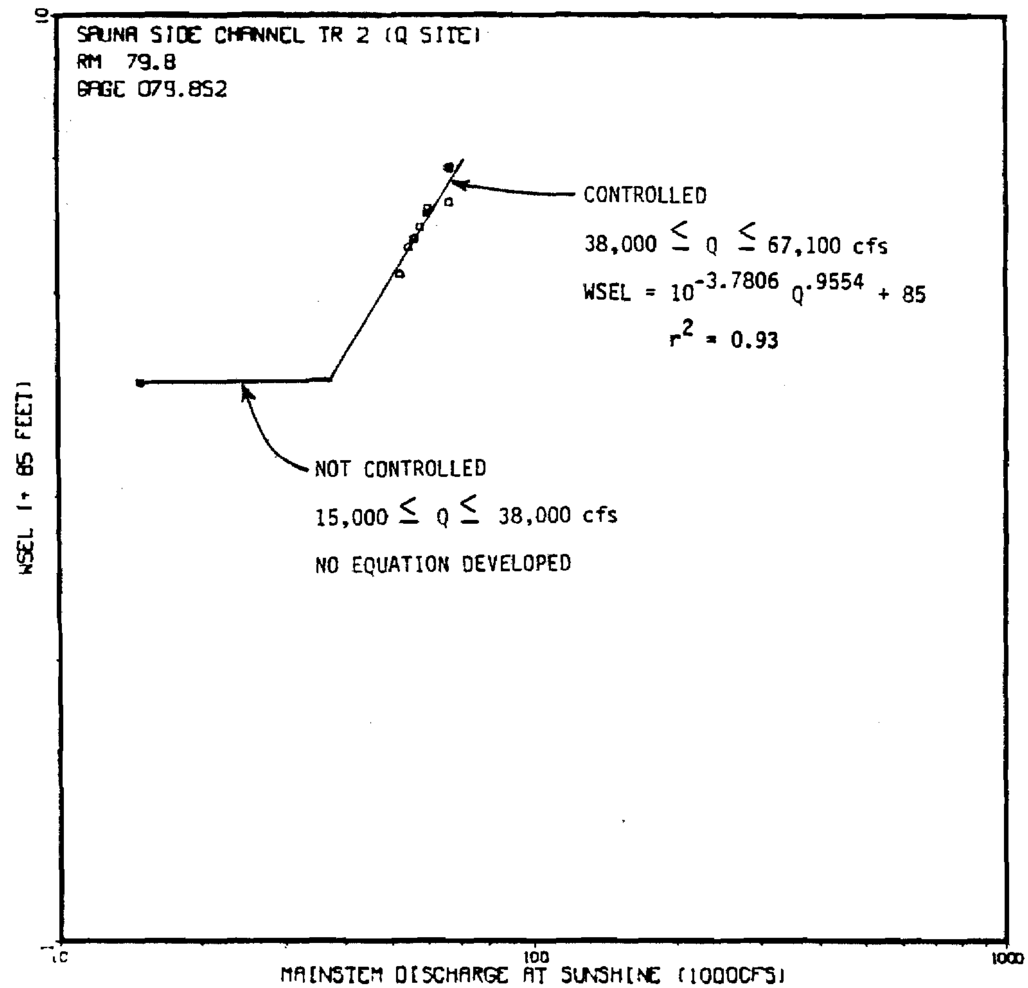
Attachment Figure E-28. WSEL versus mainstem discharge (USGS 15292780) at Circular Side Channel transect 5.



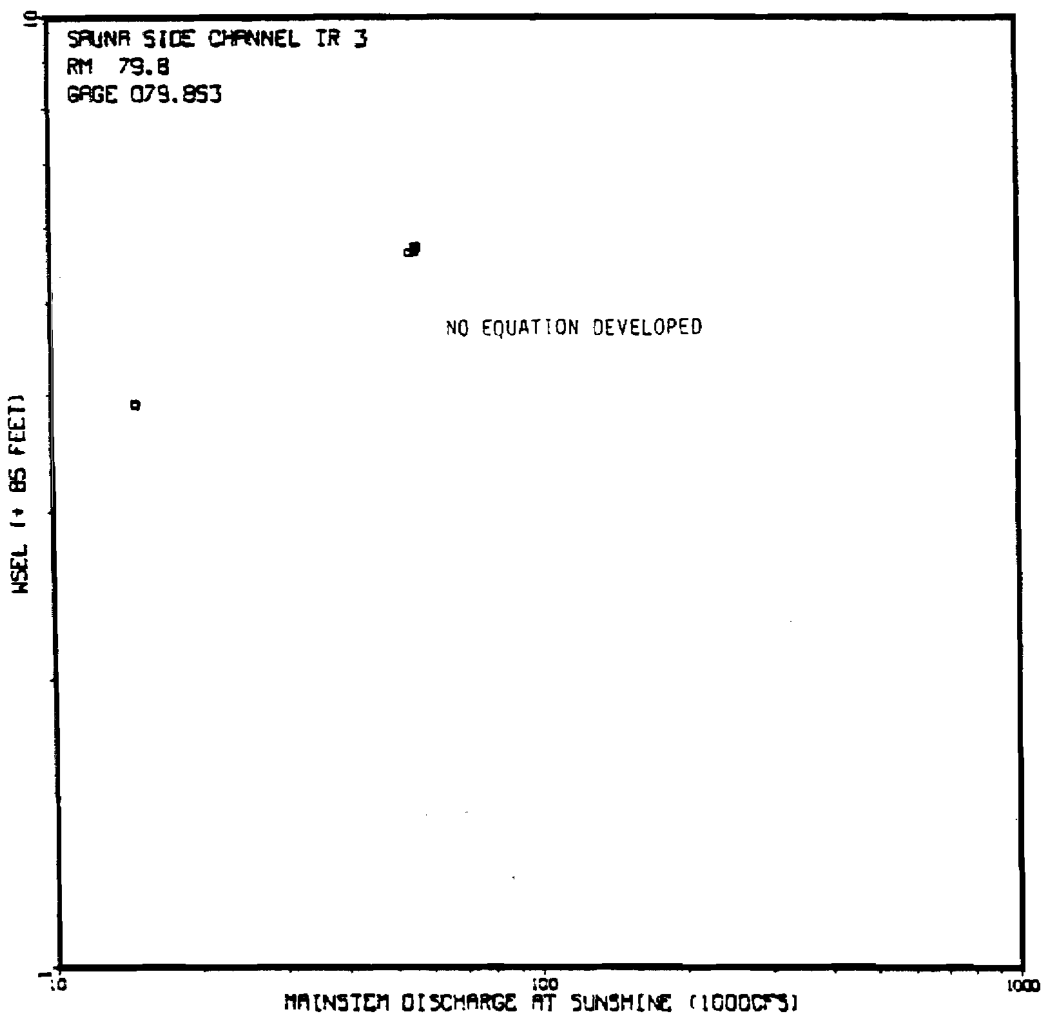
Attachment Figure E-29. WSEL versus mainstem discharge (USGS 15292780) at Circular Side Channel head.



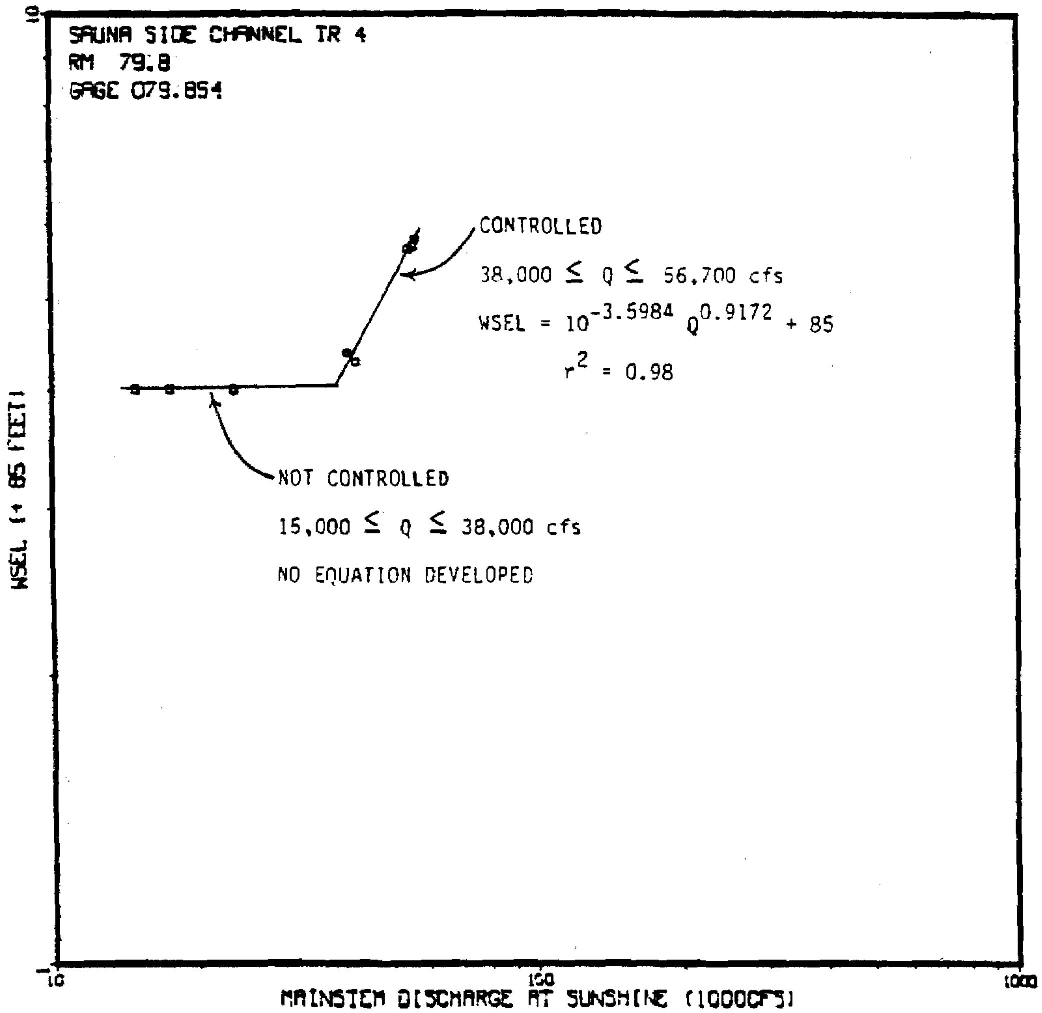
Attachment Figure E- 30. WSEL versus mainstem discharge (USGS 15292780) at Sauna Side Channel transect 1.



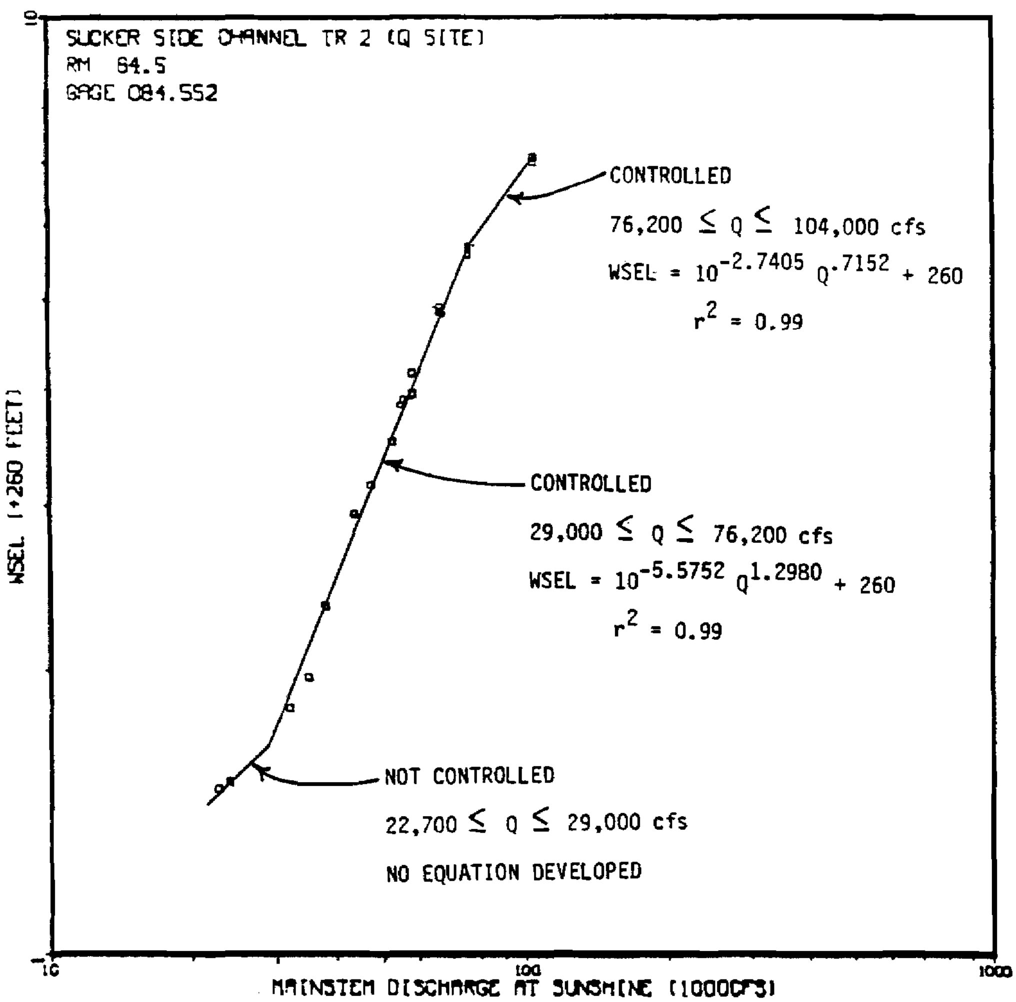
Attachment Figure E- 31. WSEL versus mainstem discharge (USGS 15292780) at Sauna Side Channel transect 2 (Q site).



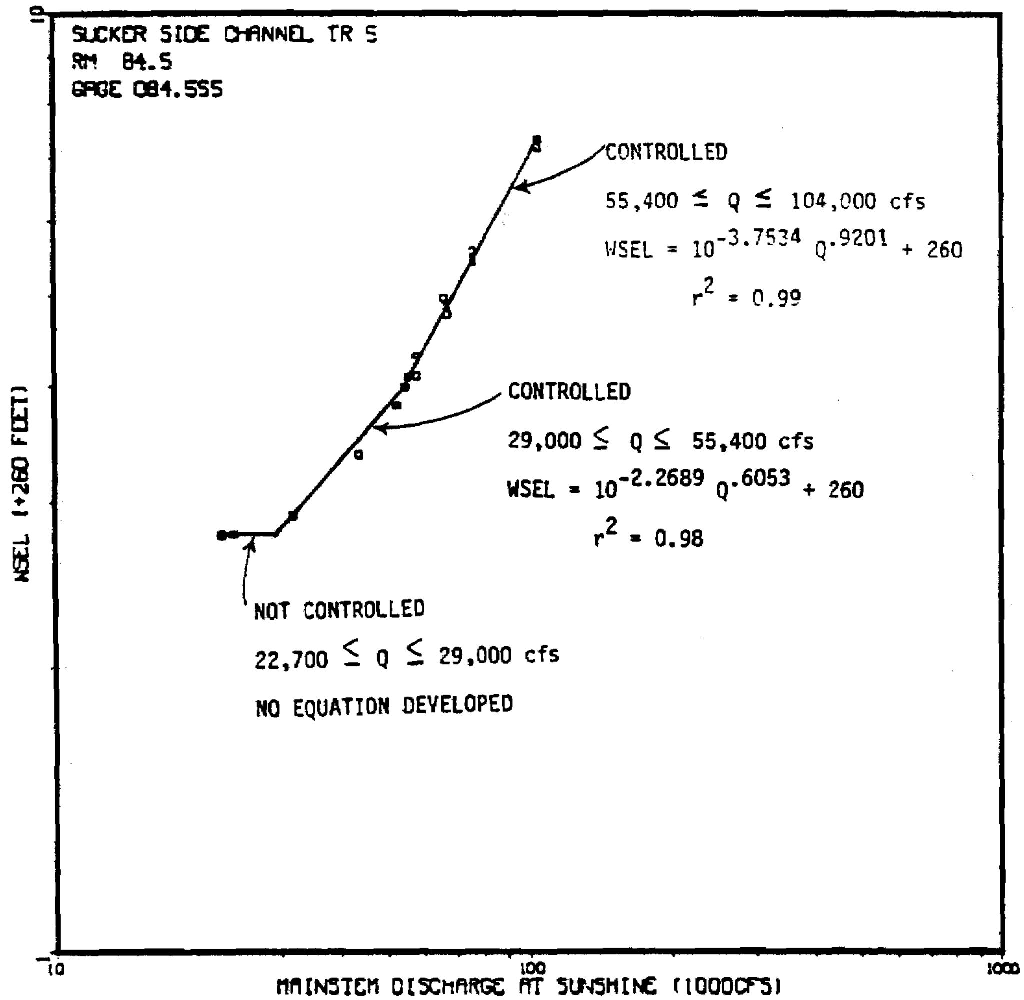
Attachment Figure E-32. WSEL versus mainstem discharge (USGS 15292780) at Sauna Side Channel transect 3.



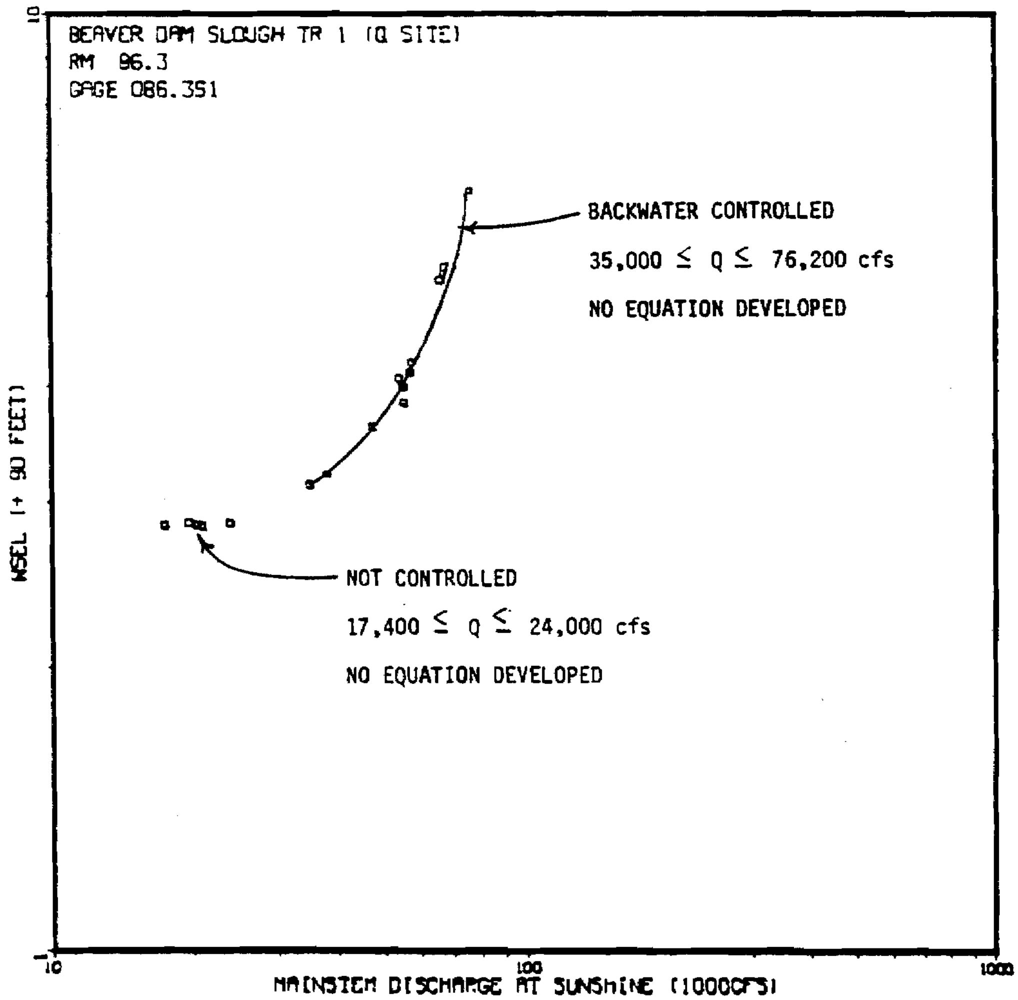
Attachment Figure E- 33. WSEL versus mainstem discharge (USGS 15292780) at Sauna Side Channel transect 4.



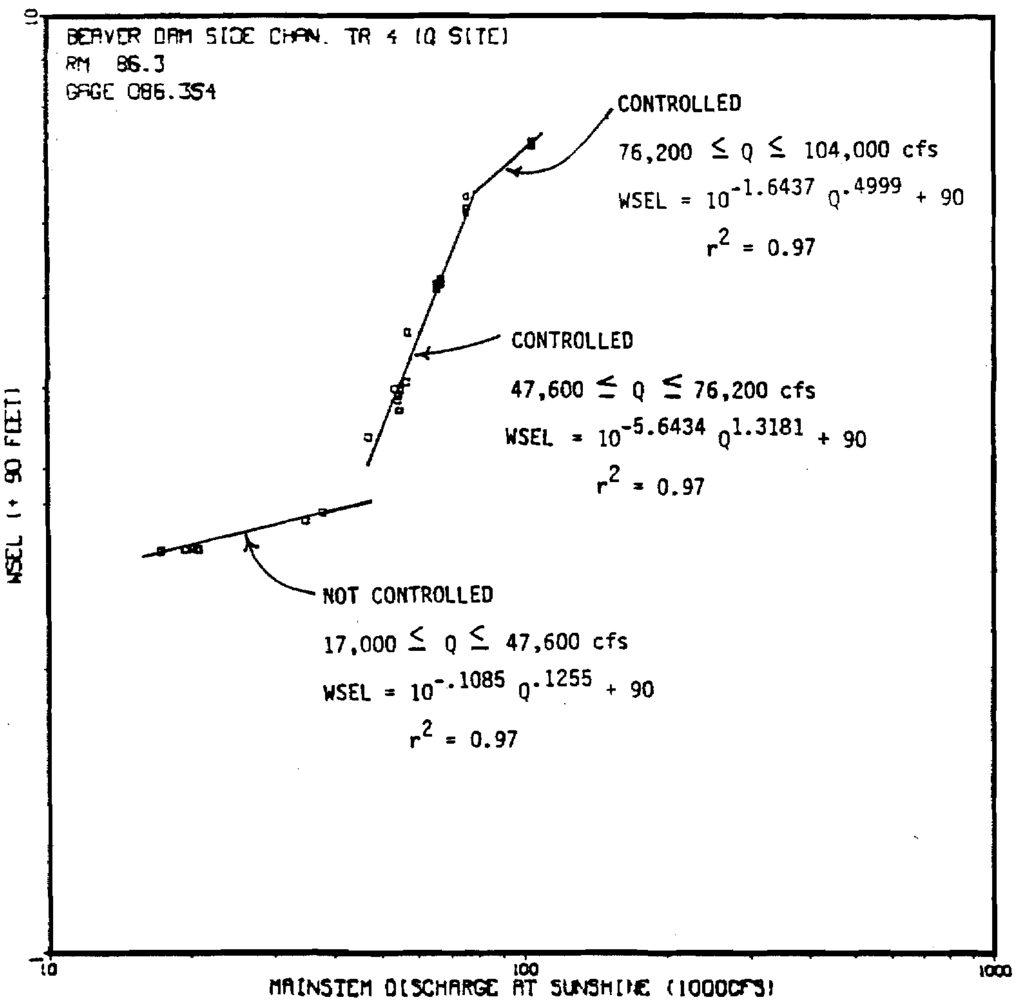
Attachment Figure E-34. WSEL versus mainstem discharge (USGS 15292780) at Sucker Side Channel transect 2 (Q site).



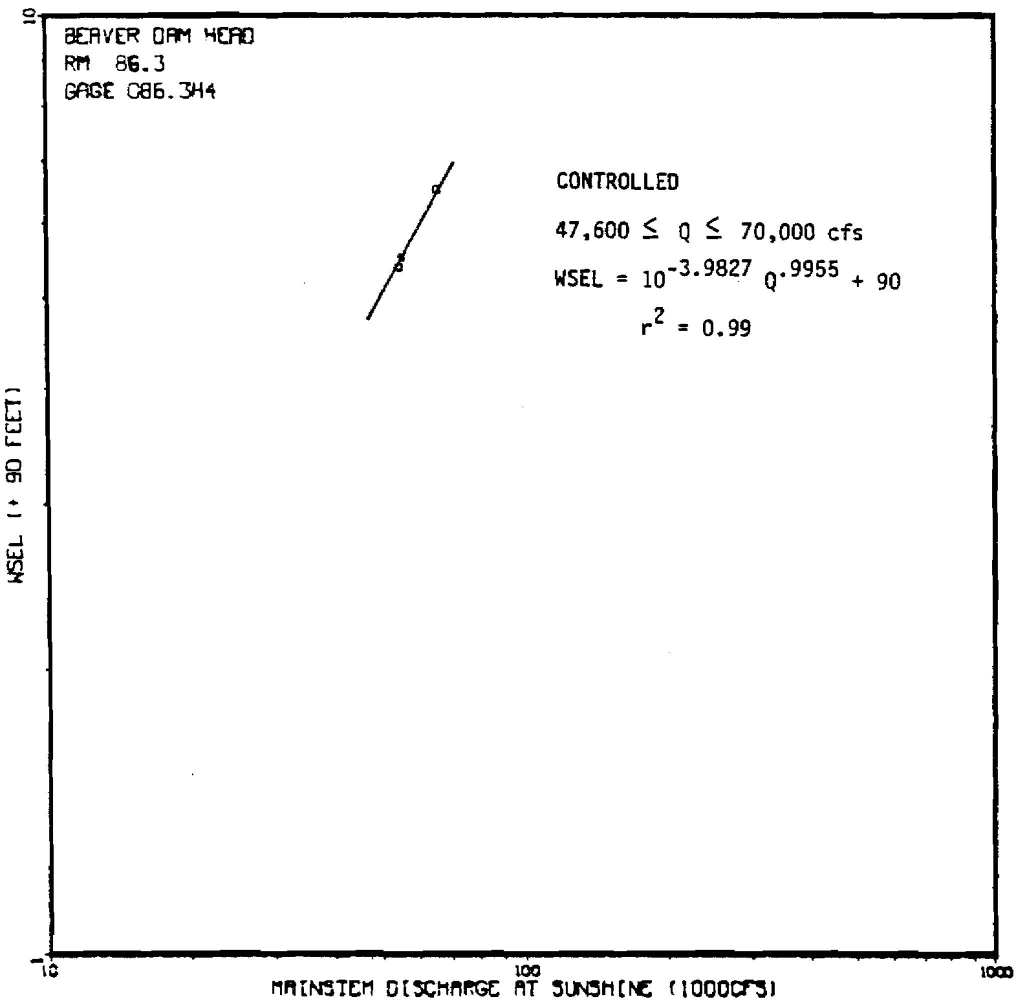
Attachment Figure E- 35. WSEL versus mainstem discharge (USGS 15292780) at Sucker Side Channel transect 5 (Q site).



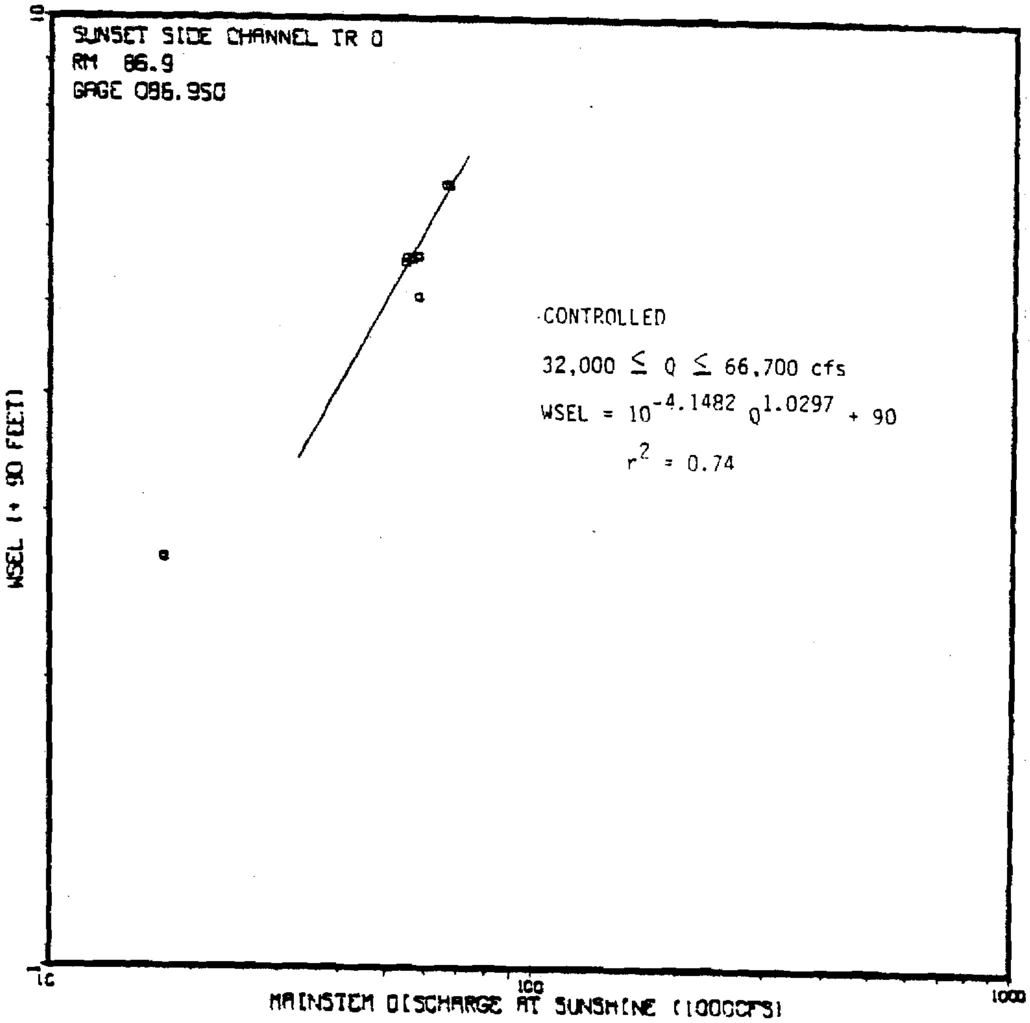
Attachment Figure E- 36. WSEL versus mainstem discharge (USGS 15292780) at Beaver Dam Slough transect 1 (Q site).



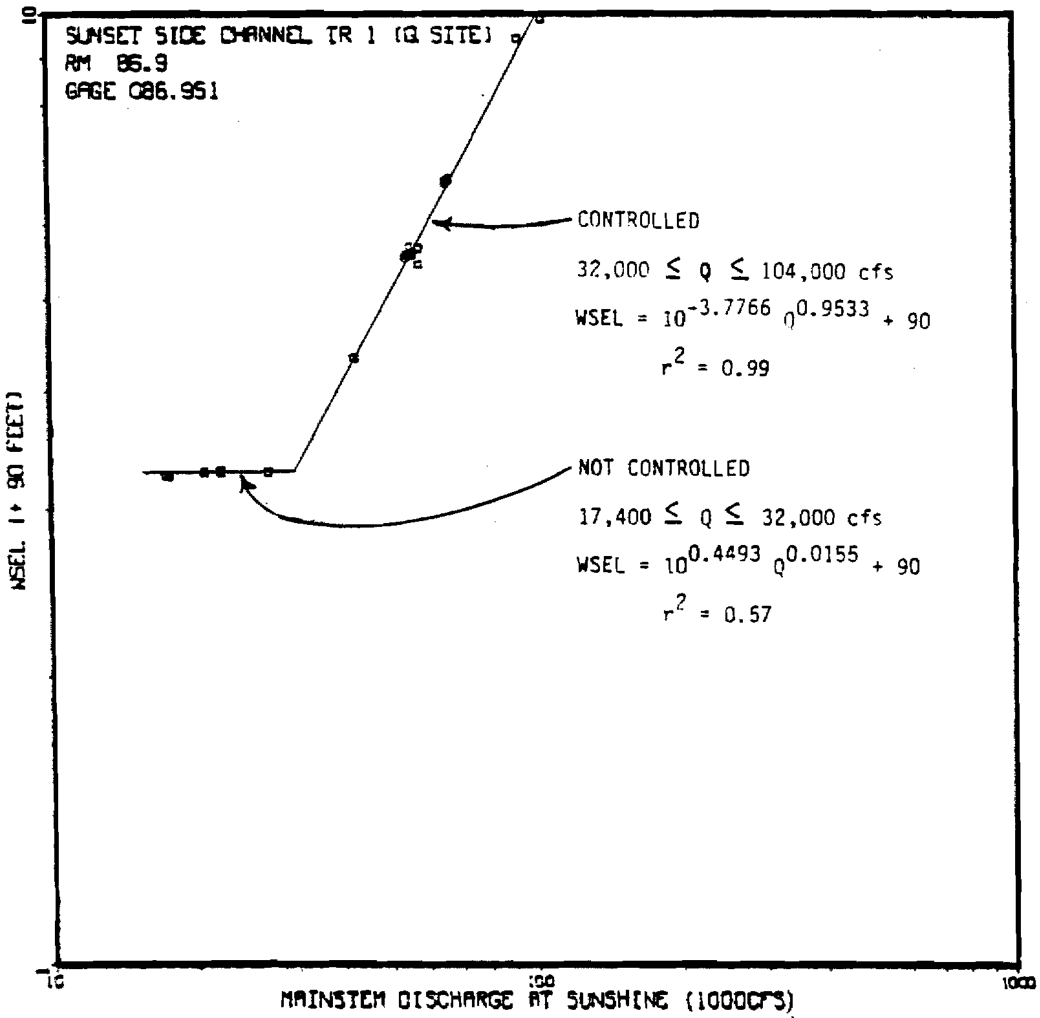
Attachment Figure E-37. WSEL versus mainstem discharge (USGS 15292780) at Beaver Dam Side Channel transect 4 (Q site).



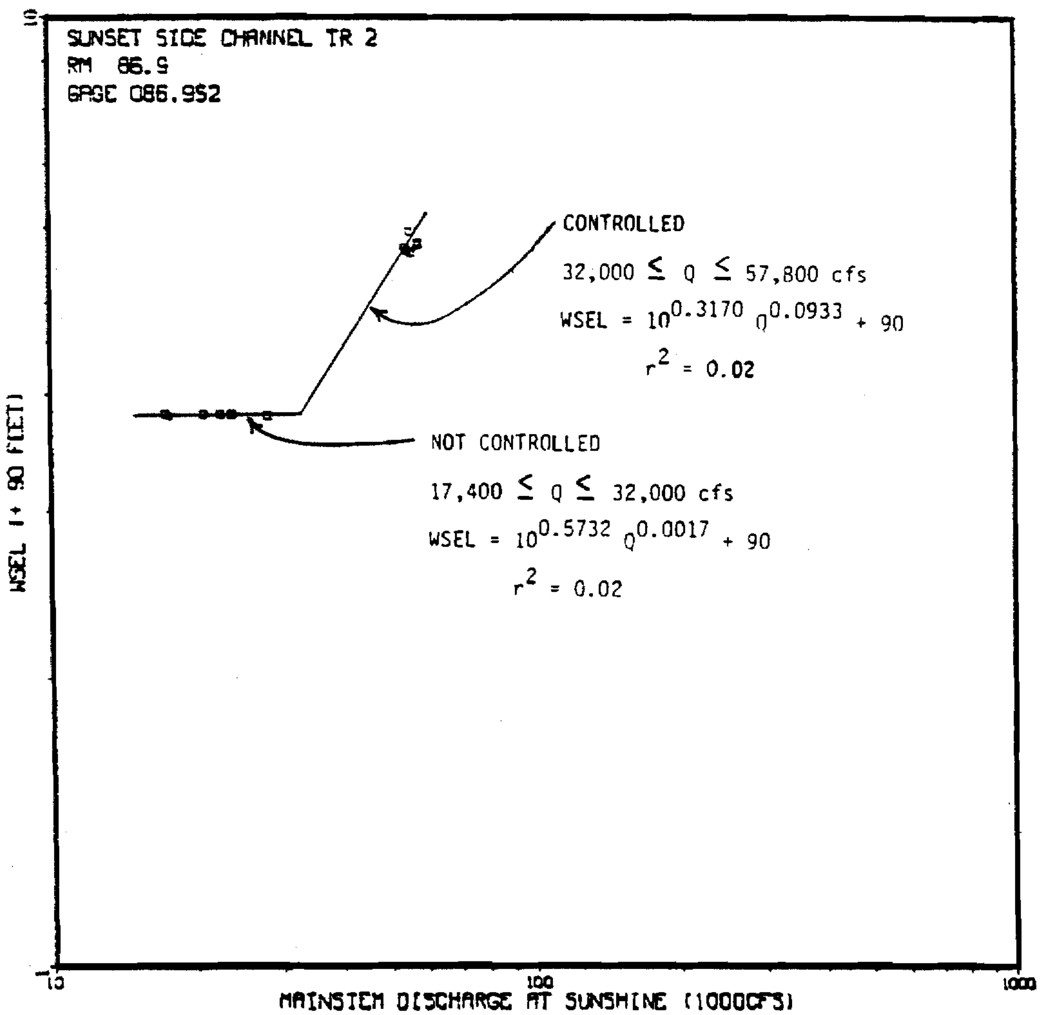
Attachment Figure E-38. WSEL versus mainstem discharge (USGS 15292780) at Beaver Dam Side Channel Head.



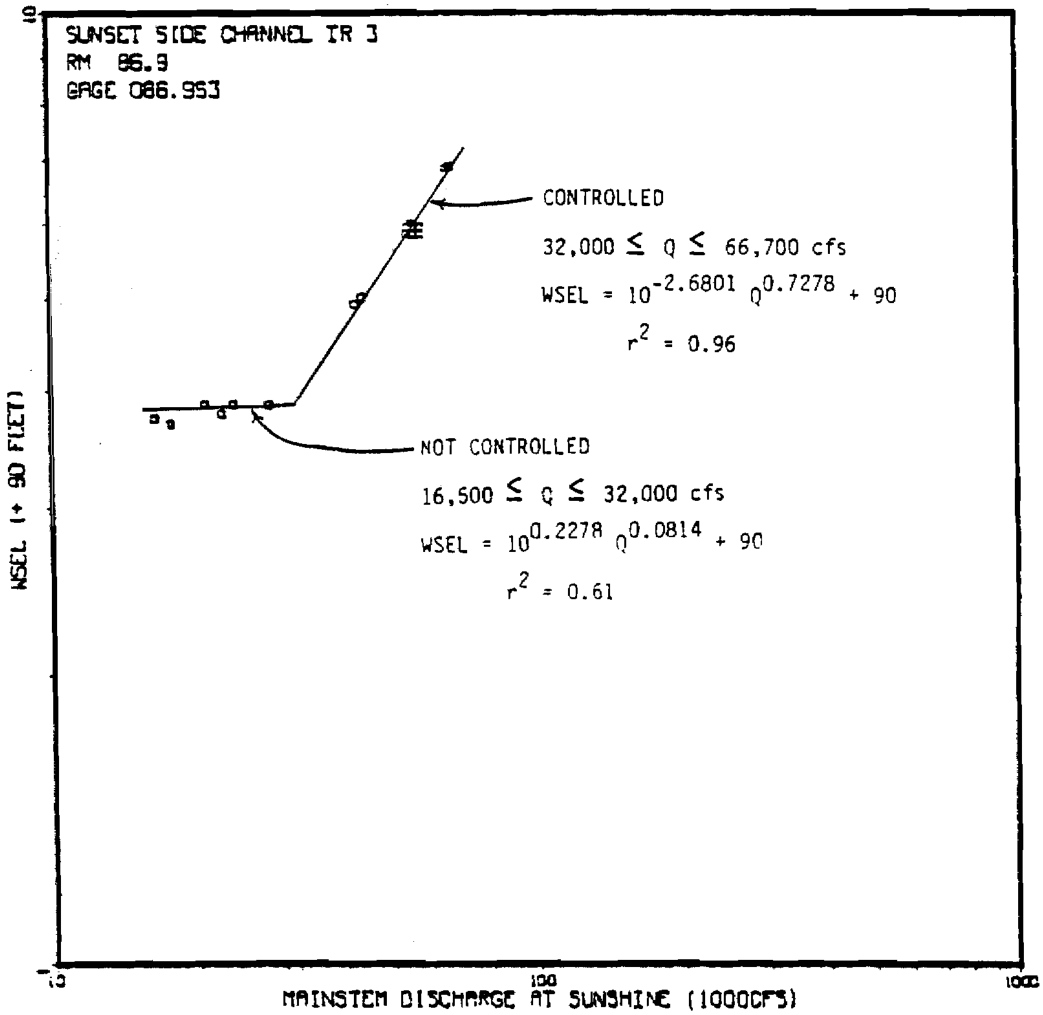
Attachment Figure E-39. WSEL versus mainstem discharge (USGS 15292780) at Sunset Side Channel transect 0.



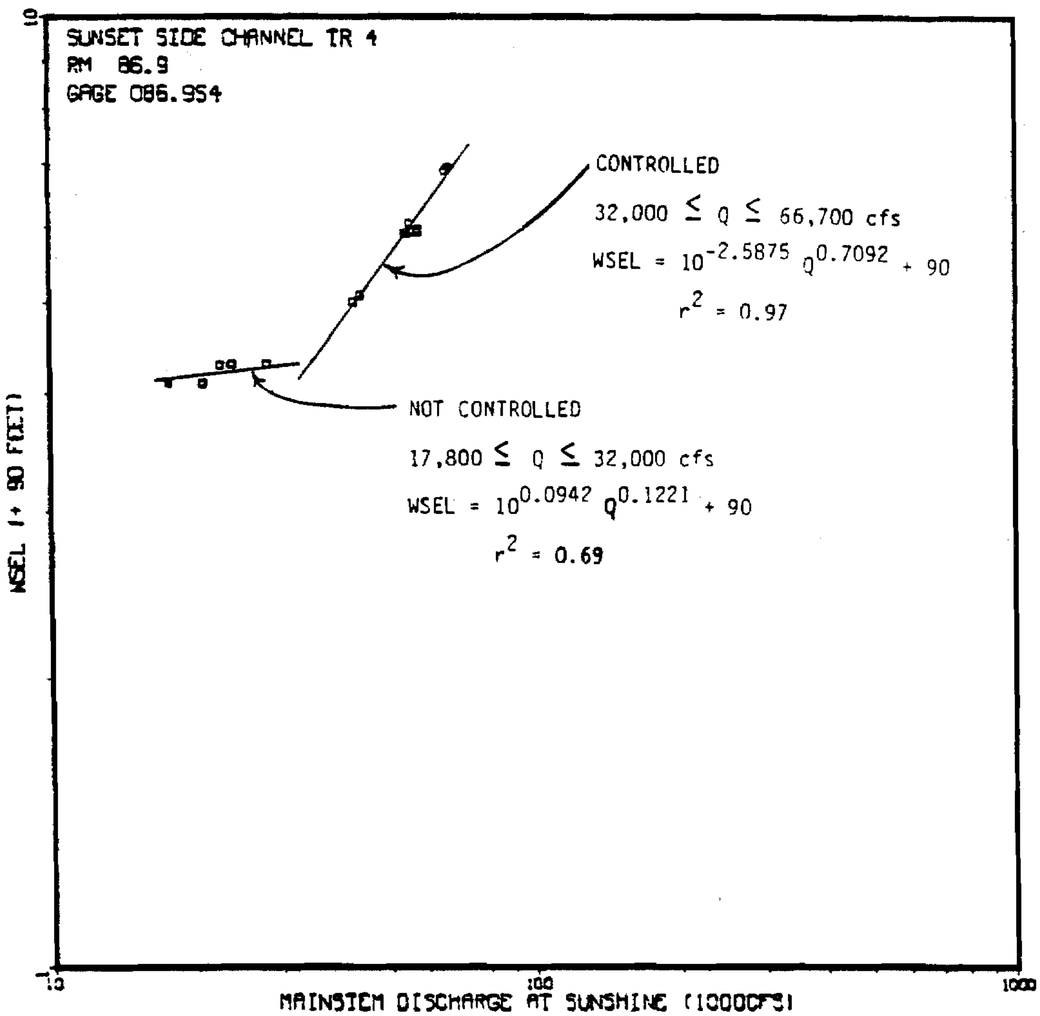
Attachment Figure E- 40. WSEL versus mainstem discharge (USGS 15292780) at Sunset Side Channel transect 1 (Q site).



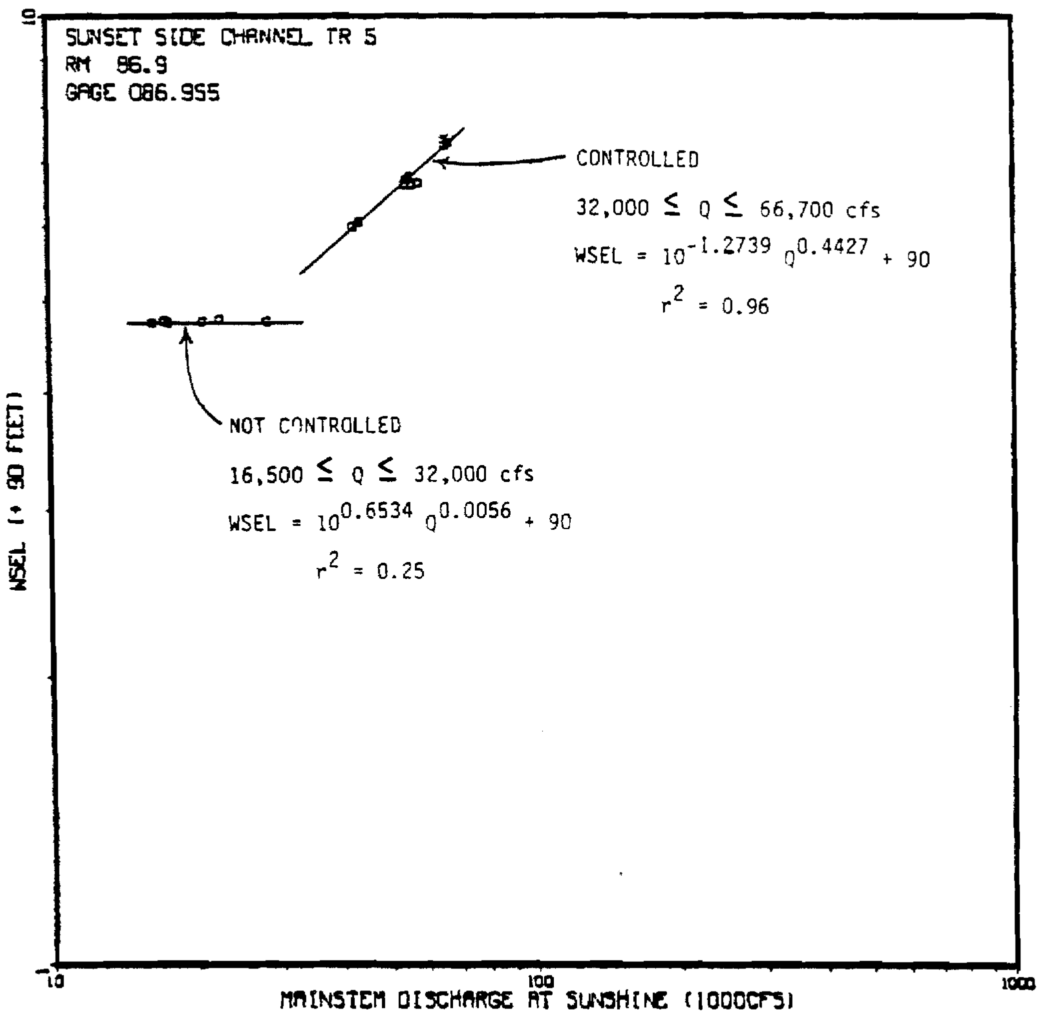
Attachment Figure E-41. WSEL versus mainstem discharge (USGS 15292780) at Sunset Side Channel transect 2.



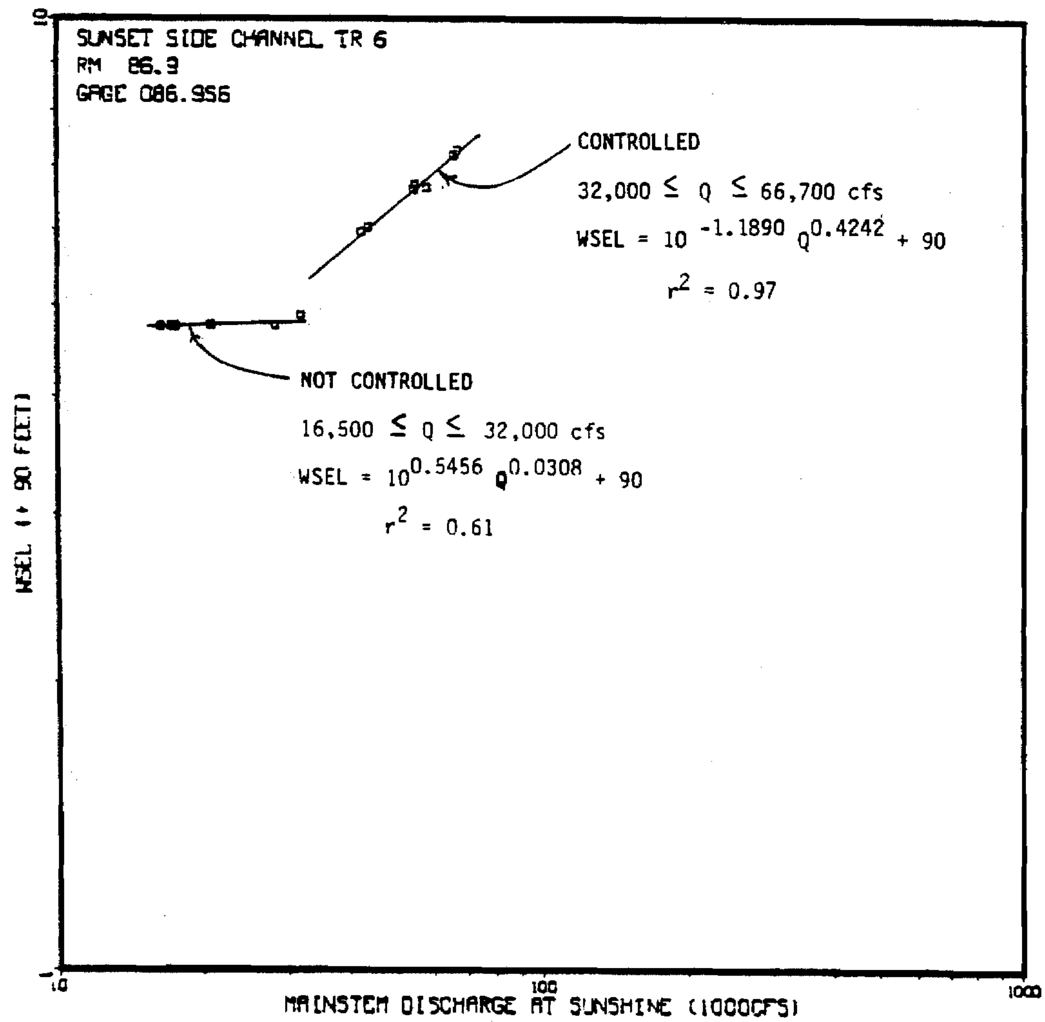
Attachment Figure E-42. WSEL versus mainstem discharge (USGS 15292780) at Sunset Side channel transect 3.



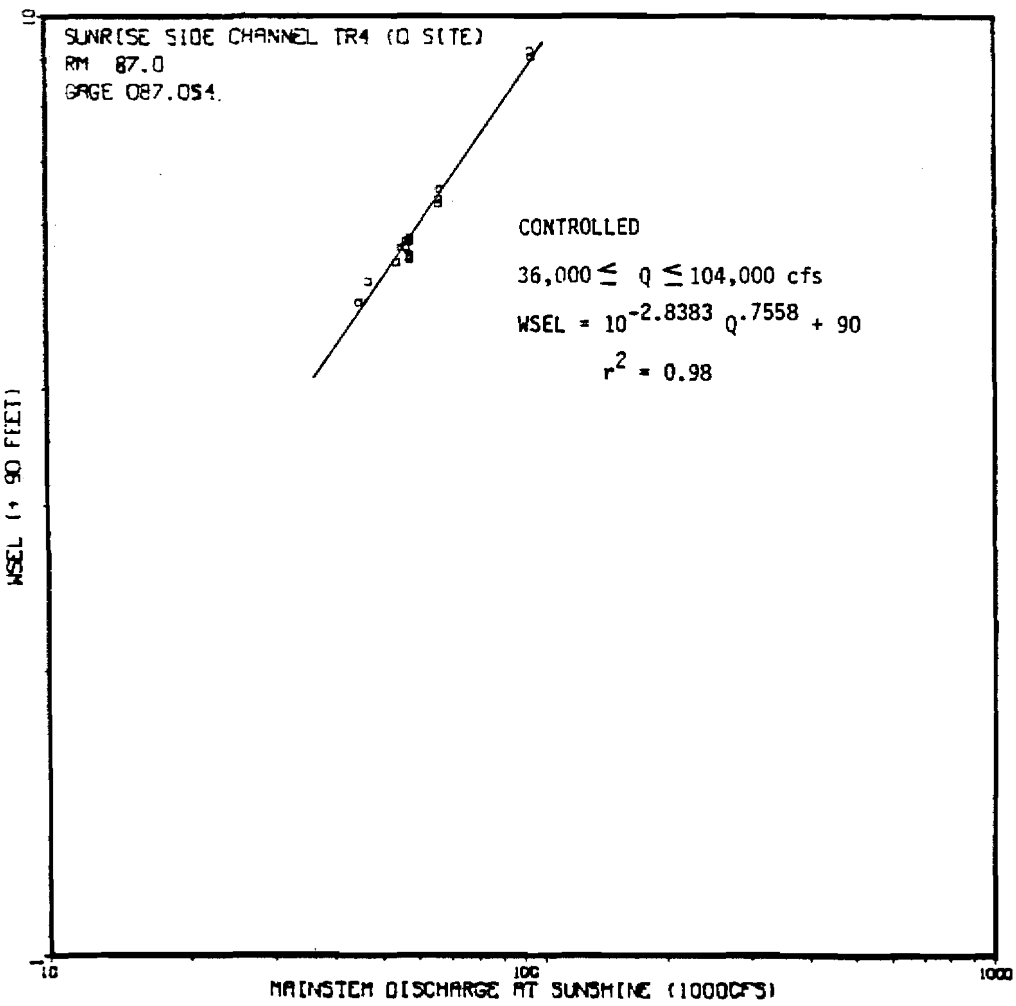
Attachment Figure E-43. WSEL versus mainstem discharge (USGS 15292780) at Sunset Side Channel transect 4.



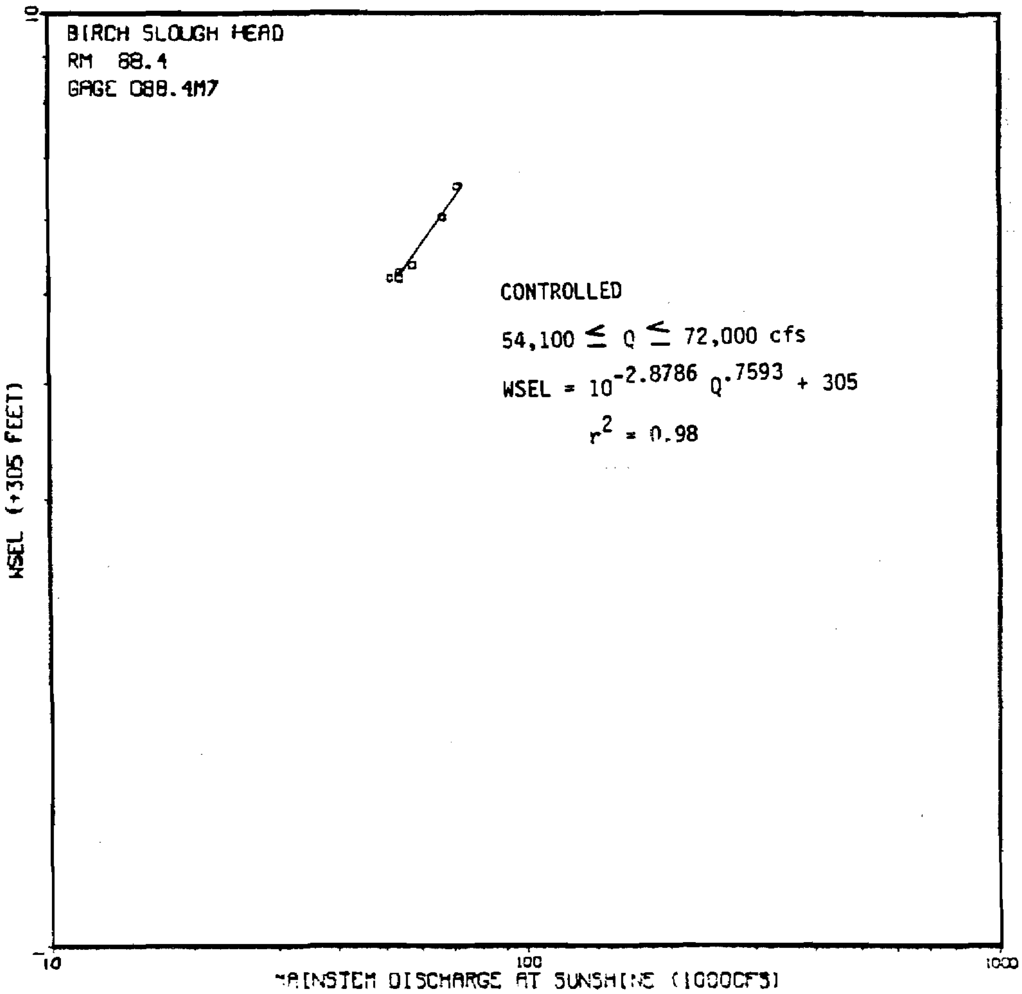
Attachment Figure E- 44. WSEL versus mainstem discharge (USGS 15292780) at Sunset Side Channel transect 5.



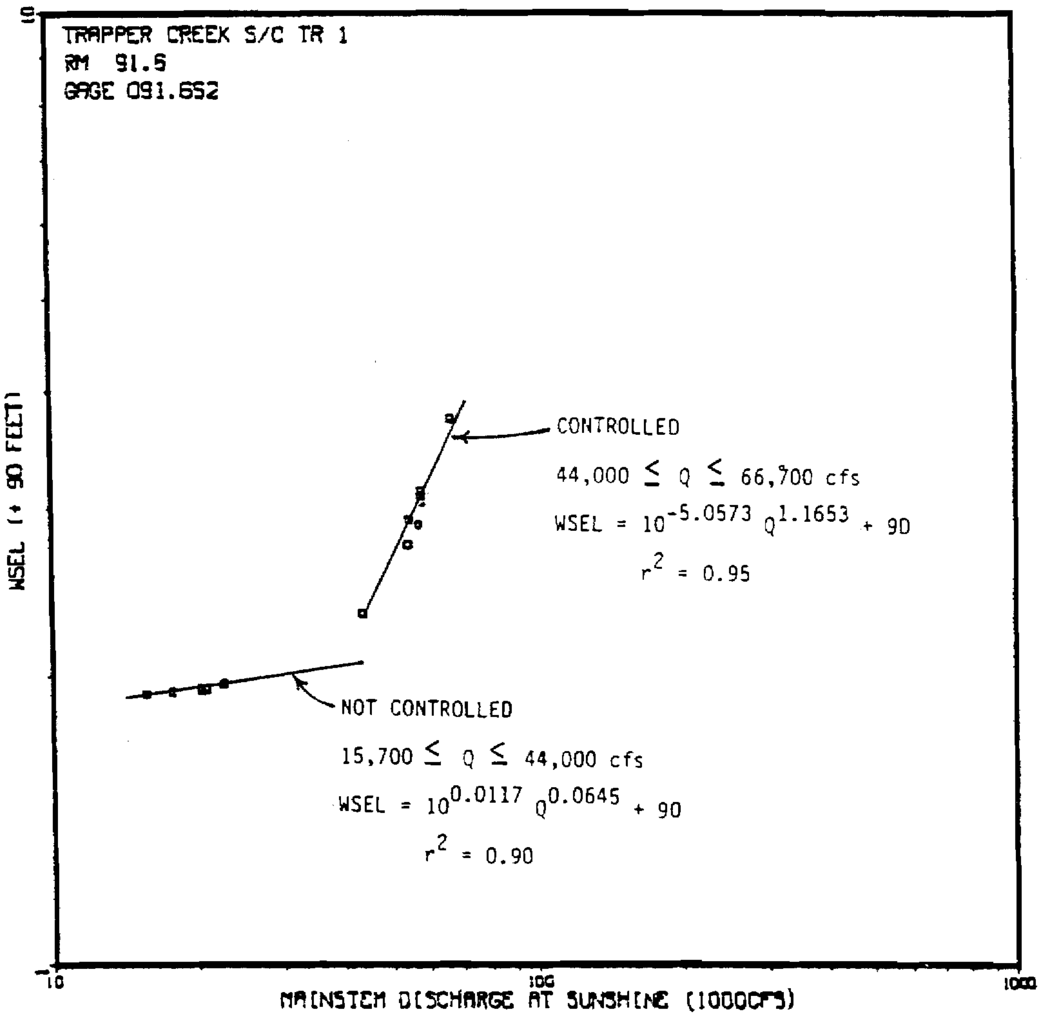
Attachment Figure E-45. WSEL versus mainstem discharge (USGS 15292780) at Sunset Side Channel transect 6.



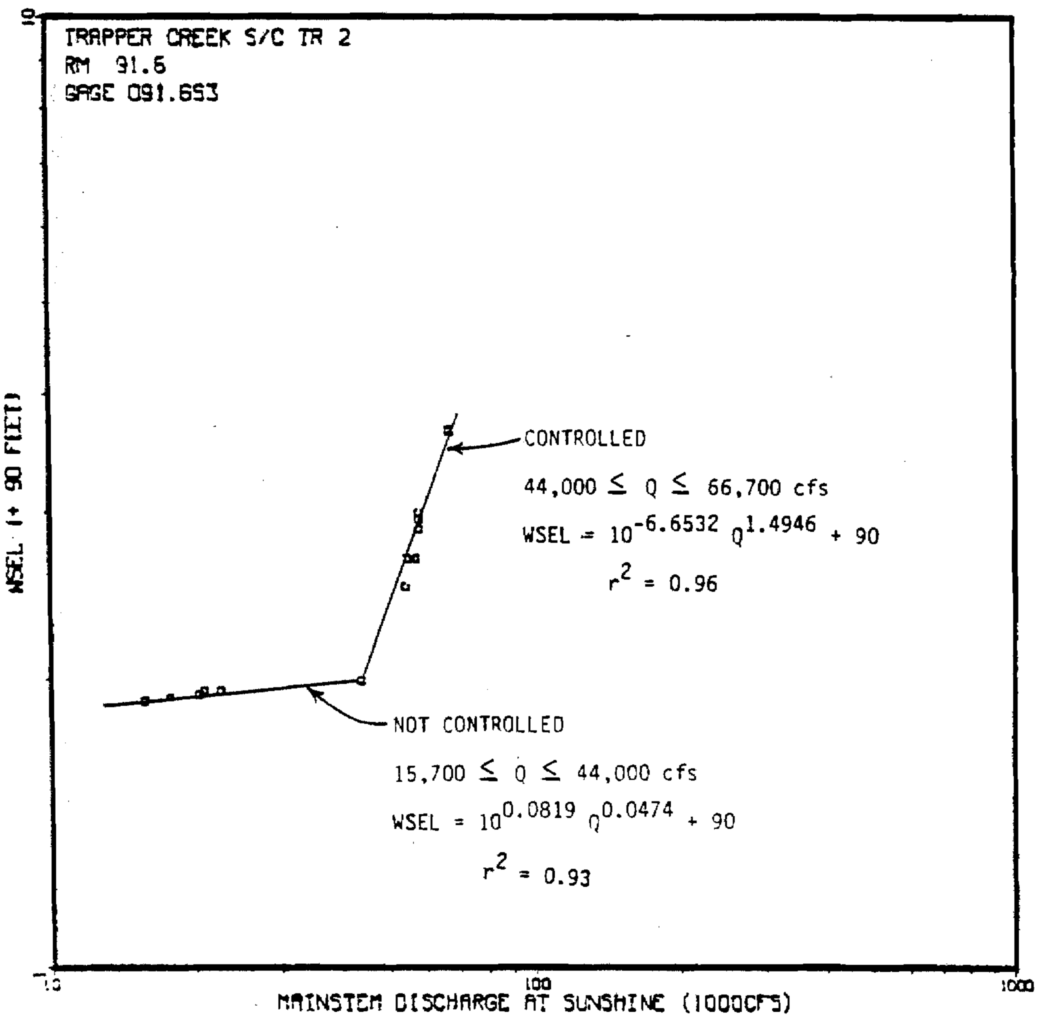
Attachment Figure E- 46. WSEL versus mainstem discharge (USGS 15292780) at Sunrise Side Channel transect 4 (Q site).



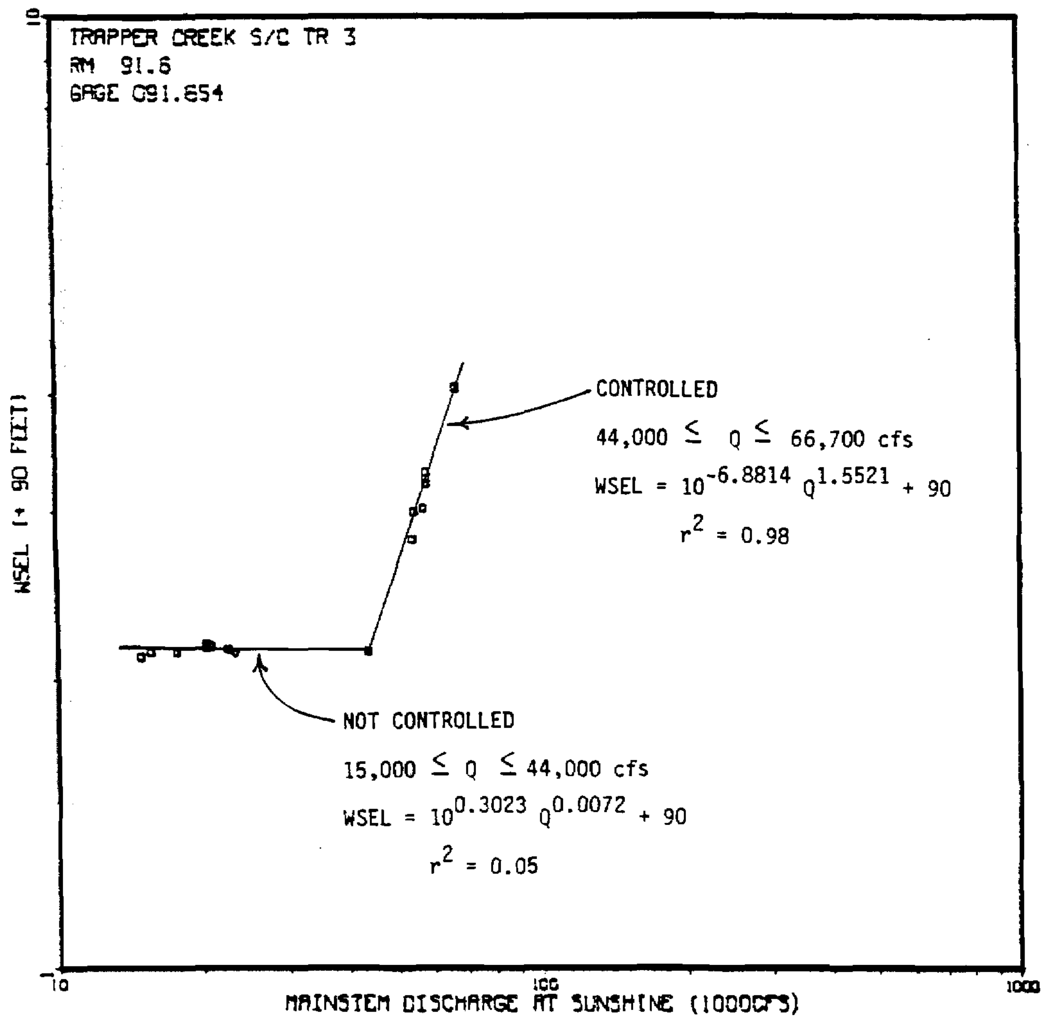
Attachment Figure E- 47. WSEL versus mainstem discharge (USGS 15292780) at Birch Creek Slough head.



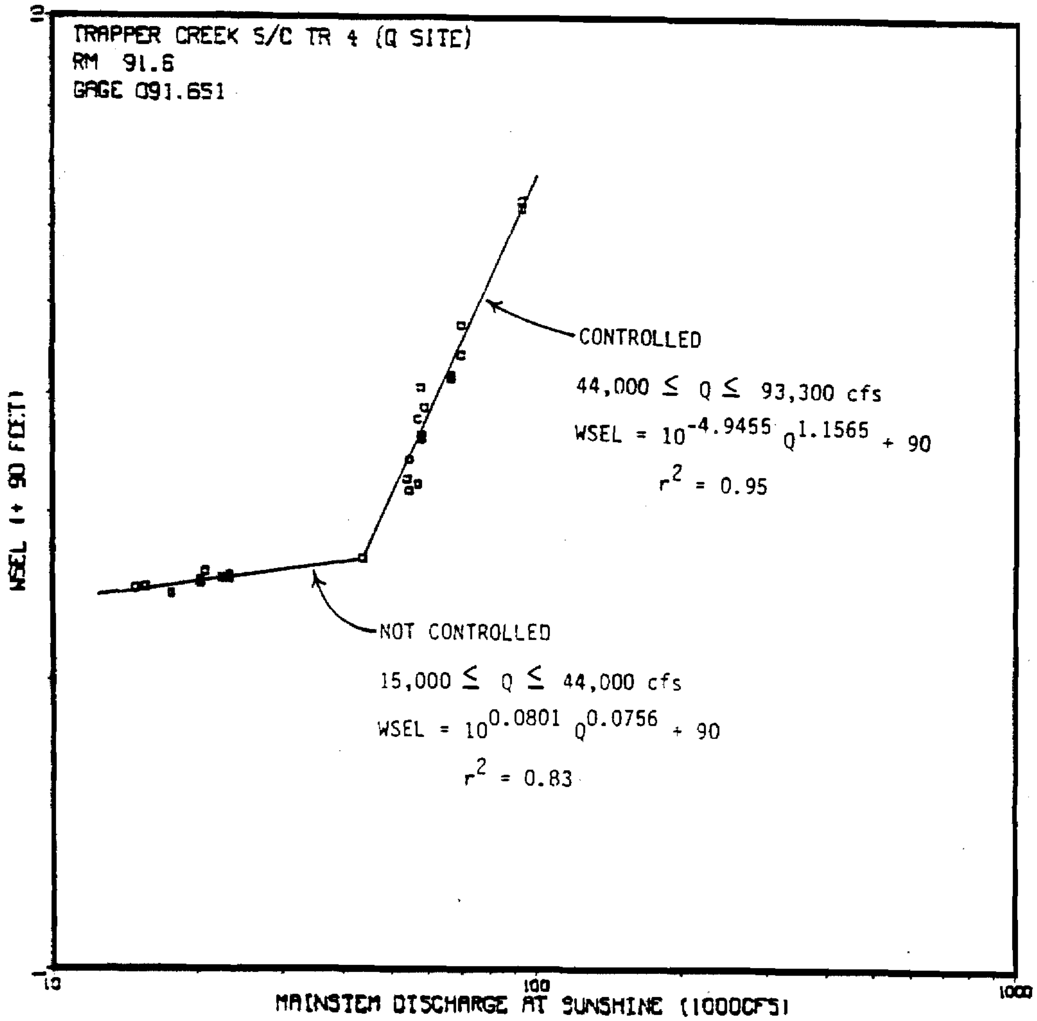
Attachment Figure E-48. WSEL versus mainstem discharge (USGS 15292780) at Trapper Creek Side Channel transect 1.



Attachment Figure E-49. WSEL versus mainstem discharge (USGS 15292780) at Trapper Creek Side Channel transect 2.



Attachment Figure E- 50. WSEL versus mainstem discharge (USGS 15292780) at Trapper Creek Side Channel transect 3.



Attachment Figure E-51. WSEL versus mainstem discharge (USGS 15292780) at Trapper Creek Side Channel transect 4 (Q site).