HARZA-EBASCO SUSITNA JOINT VENTURE
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May 15, 1984
4.3.1.2/4.3.1.1.

Arctic Environmental
Information and Data Center
707 A Street
Anchorage, Alaska 99501

Attention: Mr. William J. Wilson
Principal Investigator

Subject: Susitna Hydroelectric Project
Site Reconnaissance for Slough
Modification Program: 10/14-25/82

Dear Mr. Wilson:

The subject document is enclosed for your information and review. Please forward comments to Dr. Larry Moulton of Woodward-Clyde Consultants with a copy to me.

Very truly yours,

Larry G. Gilbertson
Aquatic Group Leader

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Enc: as noted

SUS 270

Memorandum **Woodward-Clyde Consultants**

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To: Larry Gilbertson
Aquatic Studies Group Leader
Harza-Ebasco Susitna Joint Venture

From: Larry L. Moulton LLM
Larry A. Rundquist LAR
of Woodward-Clyde Consultants

Office: Anchorage

Date: April 26, 1984

Subject: Data Summary from 24-25 October 1982
Site Reconnaissance for Slough Modification Program

INTRODUCTION

Woodward-Clyde Consultants conducted a reconnaissance-level study of four sloughs along the Susitna River in the reach between Gold Creek and Curry. The purpose of the study was to gather information to use in a study site for a demonstration project on fisheries habitat modification using mitigation techniques that would be suitable for slough enhancement during operation of the Susitna River Hydroelectric Project. The reconnaissance was conducted on 24 and 25 October 1982 at Sloughs 8B, 8C, and 9A and Curry Slough.

The habitat alteration demonstration project is intended to test the feasibility of mitigating project effects on slough habitats through channel modification. Project flows may have two major impacts on the sloughs in the reach from Devil Canyon to Talkeetna. During the summer, access by adult salmon to slough spawning habitat may be reduced and during winter, colder mainstem water may flood slough habitats through their upstream ends. To rectify these impacts, the channel structure of sloughs can be modified to improve access and to prevent overtopping in winter.

The degree to which a slough will be affected by the project depends on the streambed elevation of the slough and its relationship to the water surface elevation in the mainstem. Since these factors differ between sloughs, mitigation will be addressed on a site-specific basis. Through the demonstration project, general approaches to physical habitat modifications can be evaluated regarding their effectiveness in maintaining the utility of slough habitats.

METHODOLOGY

Site Selection Criteria

The criteria for selecting sloughs for this reconnaissance level study as well as for selecting the slough(s) for modification in a demonstration project are as follows:

- low to moderate fish use at present;
- upwelling or potential for upwelling;

- protection from high scouring flows;
- surface water supply;
- suitable substrate nearby;
- food base; and
- suitable water quality.

We selected Sloughs 8B, 8C, and 9A and Curry Slough for this reconnaissance level study based on our knowledge of how these sloughs met the above criteria.

Field Studies

Field studies included collection of some or all of the following types of data at each of the selected study sites:

- stream flow;
- upwelling rate;
- water temperature;
- dissolved oxygen;
- conductivity;
- thalweg and transect surveys;
- mainstem water levels; and
- overtopping elevations at head of the slough.

The discharge measurements were conducted using standard techniques. Velocities were measured at intervals across the channel using a Marsh-McBirney current meter. Each measurement was taken at a location in the water column that is 0.6 of the depth down from the water surface. These velocities were multiplied by the subsection area to get a discharge through the subsection, which are summed for all subsections to get the total discharge.

Upwelling rates were measured using a simple coffee can collector (Figure 1). The open end of the coffee can was pushed into the bed in an area of upwelling. A vent allows the water to reach an equilibrium free water surface equal to that outside the can. Once equilibrium is established, the upwelling into the can is balanced by the outflow through the tube in the side of the can. The outflow can be collected over a designated time period and its volume measured to get a volumetric flow rate.

A self-leveling level was used to survey the thalwegs and transects using differential leveling techniques. Pocket thermometers and a Horiba meter were used to measure temperatures. The Horiba meter was also used to measure dissolved oxygen and conductivity.

RESULTS

Slough 8B

Data collected at Slough 8B include:

- 2 streamflow measurements;
- 2 measurements of upwelling rates;

- o temperature, dissolved oxygen, and conductivity of stream and upwelling water;
- o thalweg profile near the mouth; and
- o overflow elevation and adjacent water level

These data are presented in Figures 2 and 3.

Slough 8C

Data collected at Slough 8C include:

- o thalweg profile of lower end; and
- o overflow elevation and adjacent high water mark.

These data are presented in Figures 4 and 5.

Slough 9A

Data collected at Slough 9A include:

- o 4 streamflow measurements;
- o 2 measurements of upwelling rates; and
- o temperatures of surface and intergravel flows.

These data are presented in Figure 6.

Curry Slough

Data collected at Curry Slough include:

- o temperatures of surface and intergravel flows;
- o complete thalweg survey;
- o overflow elevation and adjacent water level; and
- o one transect.

These data are presented in Figures 7, 8, and 9.

Fish Use of Study Sloughs

The peak escapement counts in the four study sloughs are as follows:

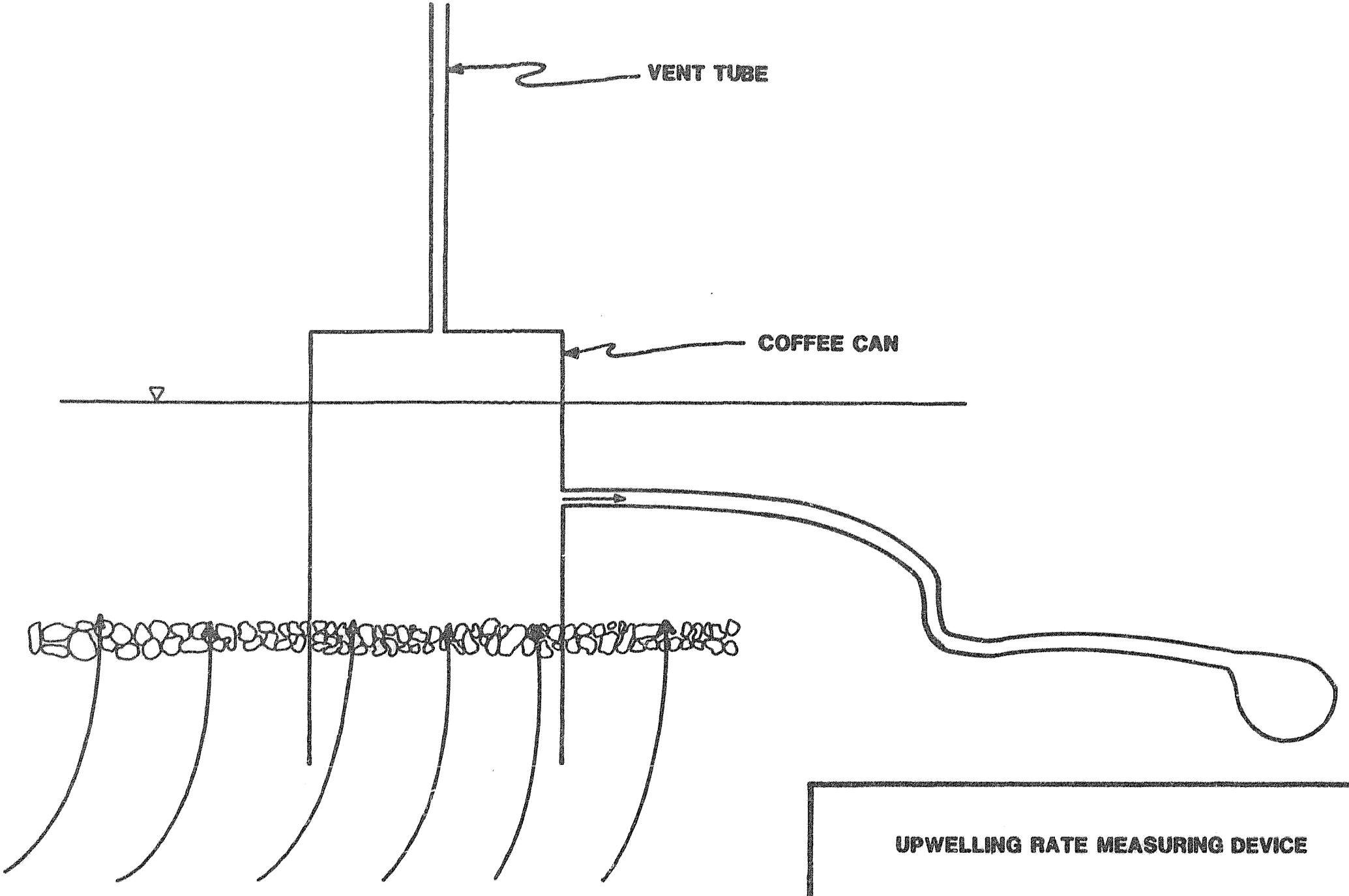
Slough	Species	1981	1982	1983
8B	chum	1	80	104
	sockeye	0	5	0
8C	chum	0	48	4
	sockeye	0	2	0
9A	chum	182	118	105
	sockeye	2	1	1
Curry	chum	0	0	0
	sockeye	0	0	0

CONCLUSIONS

Woodward-Clyde Consultants conducted a reconnaissance-level study of Sloughs 8B, 8C, and 9A and Curry Slough to evaluate their potential for use in a slough mitigation demonstration project. The physical data collected during this study were used to rank the sites; at the present time, the sites are ranked as follows:

1. 9A
2. 8B
3. 8C
4. Curry

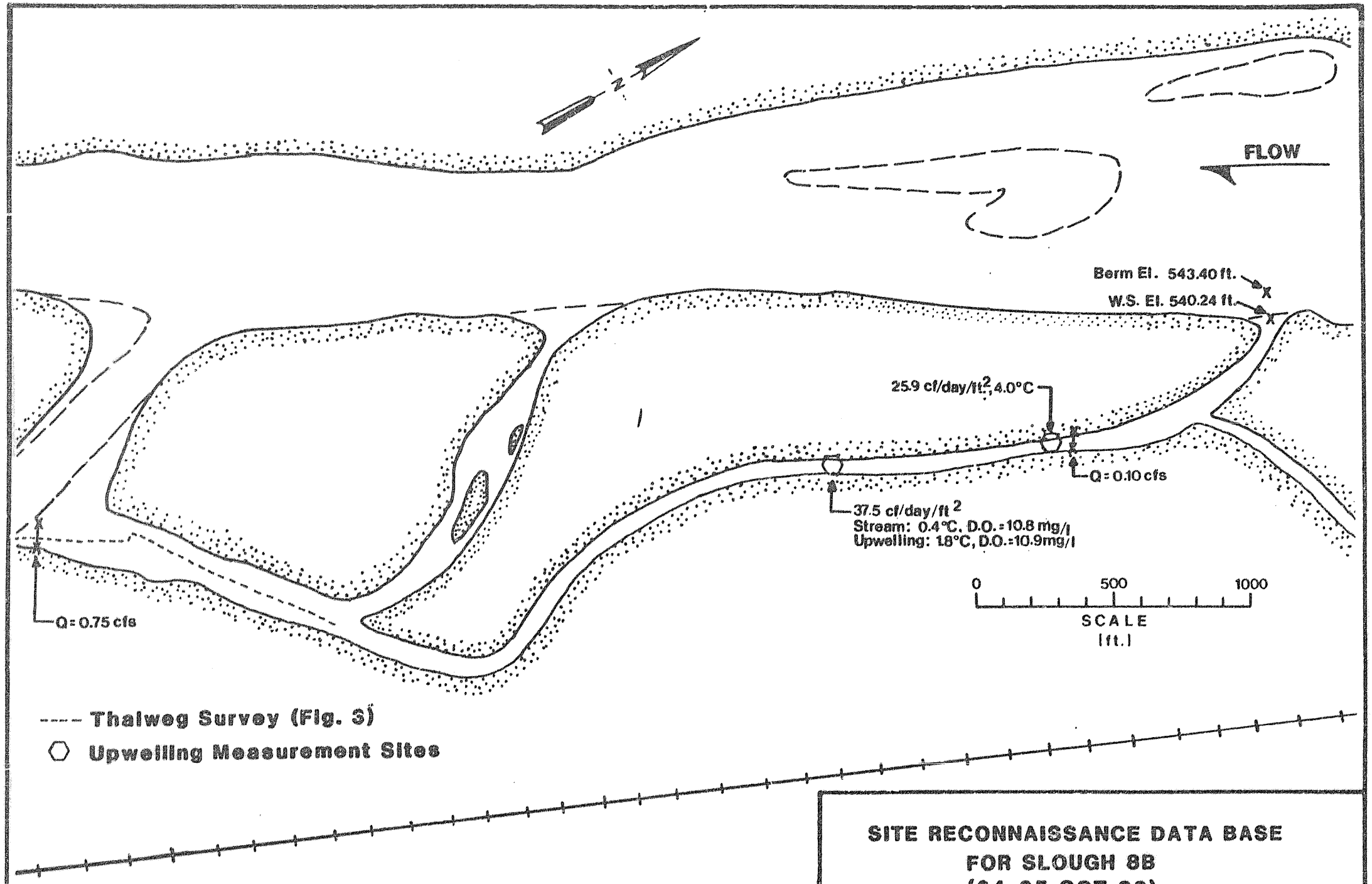
Further evaluation of additional criteria will be conducted during the study design.



UPWELLING RATE MEASURING DEVICE

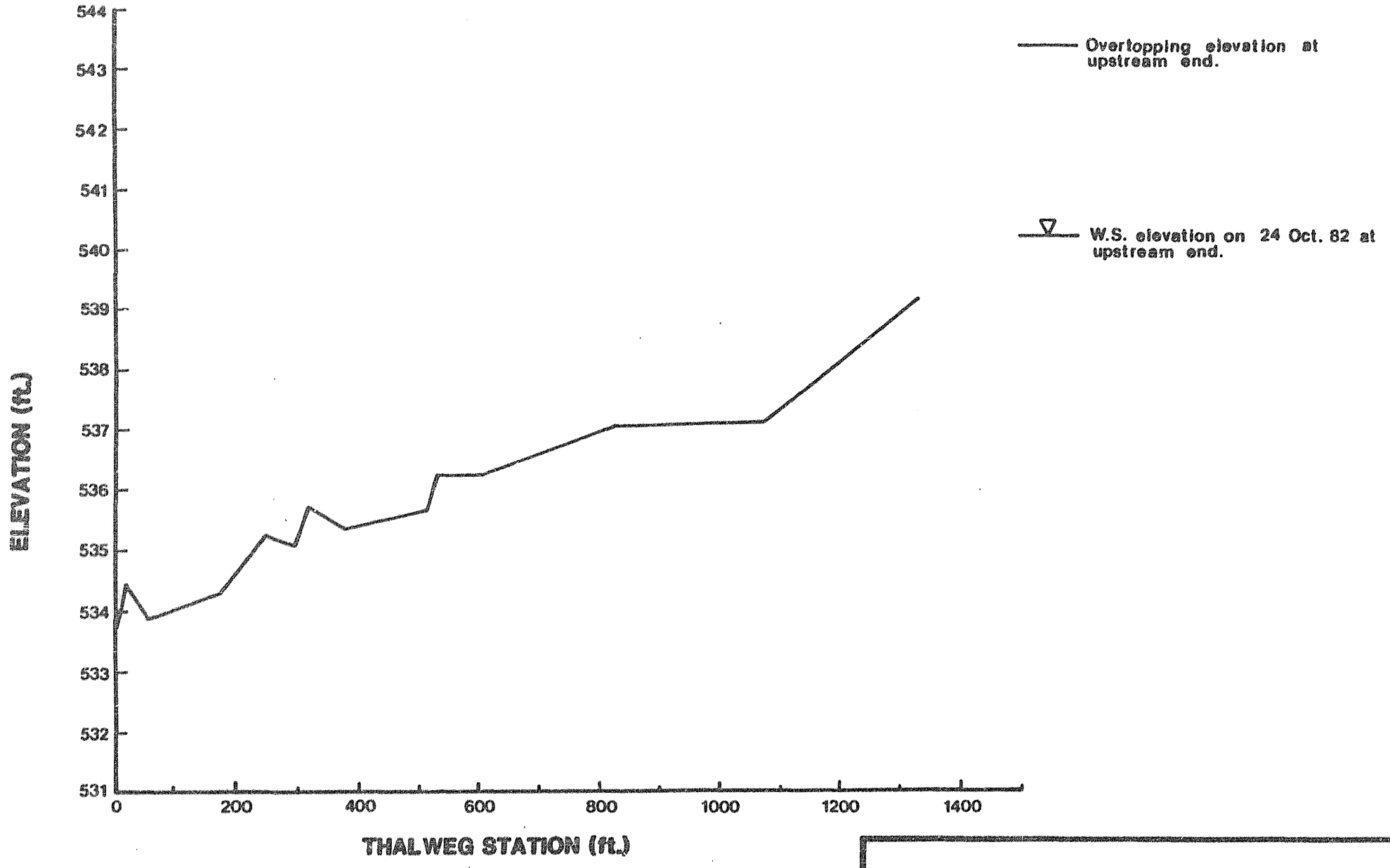
Woodward-Clyde Consultants

FIGURE 1



SITE RECONNAISSANCE DATA BASE FOR SLOUGH 8B (24-25 OCT 82)

Woodward-Clyde Consultants | FIGURE 2



PARTIAL THALWEG PROFILE AT SLOUGH 8B

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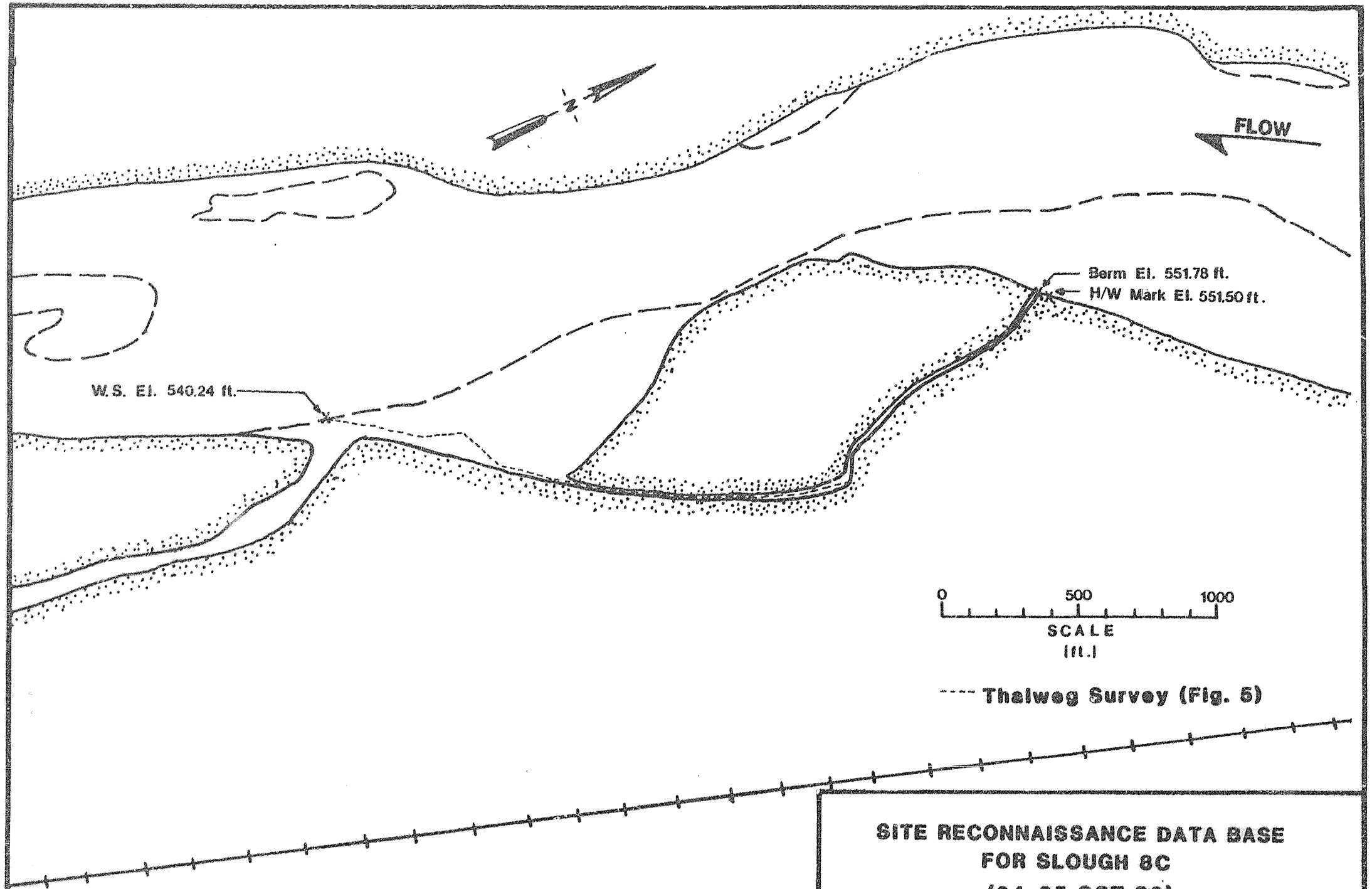
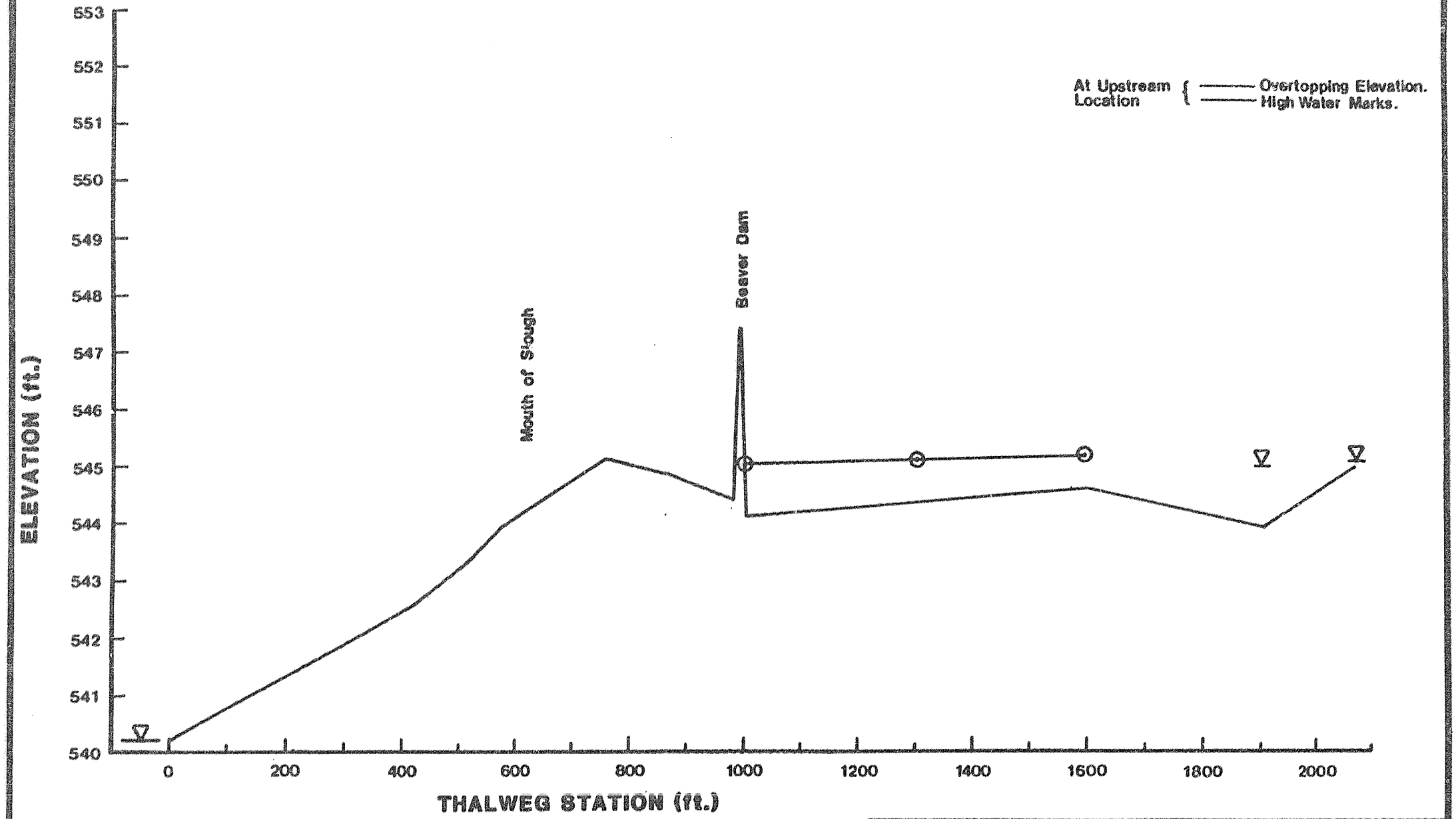
FIGURE 3



SITE RECONNAISSANCE DATA BASE FOR SLOUGH 8C (24-25 OCT 82)

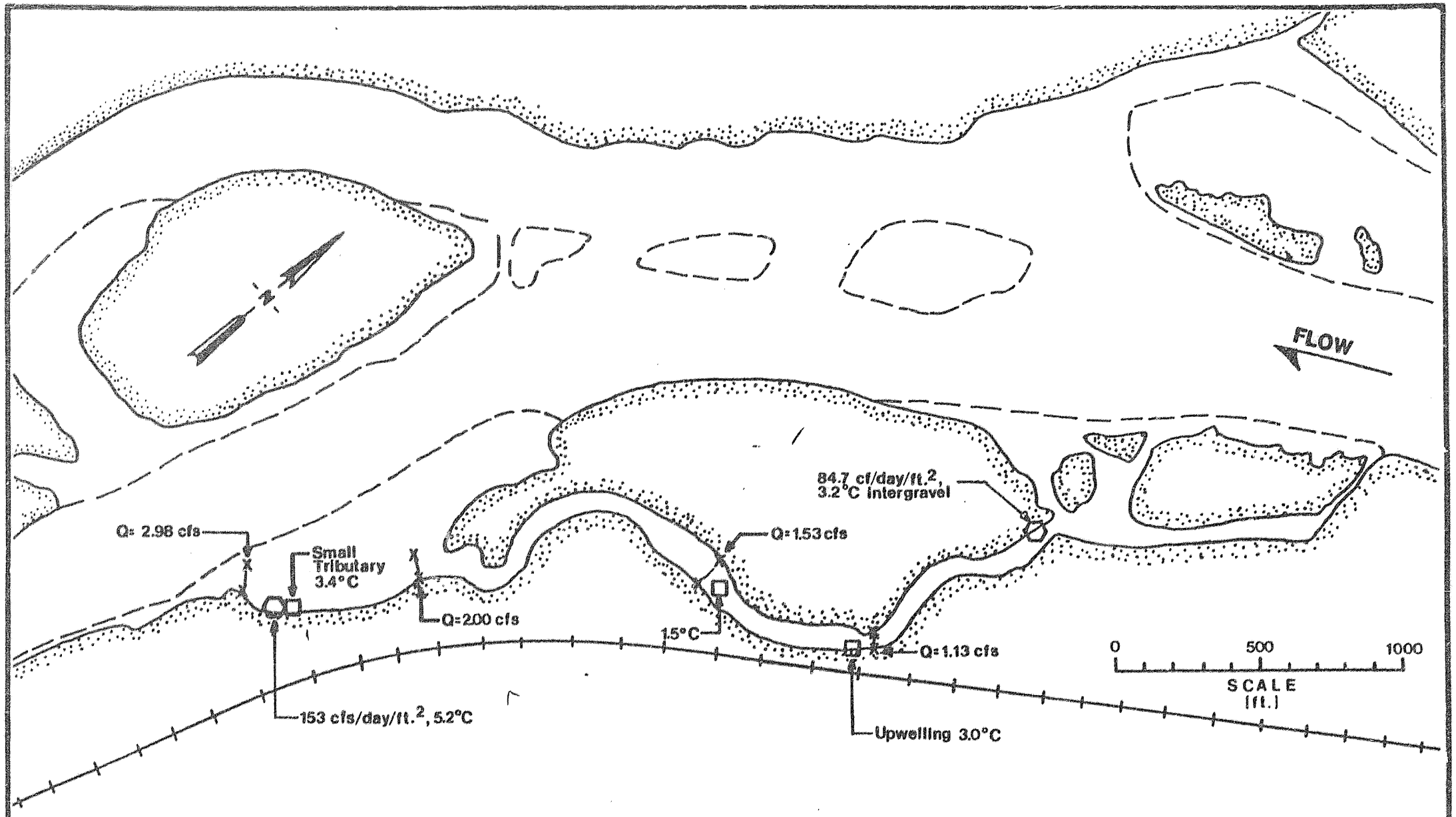
Woodward-Clyde Consultants | FIGURE 4



PARTIAL THALWEG PROFILE AT SLOUGH 8C

Woodward-Clyde Consultants

FIGURE 5

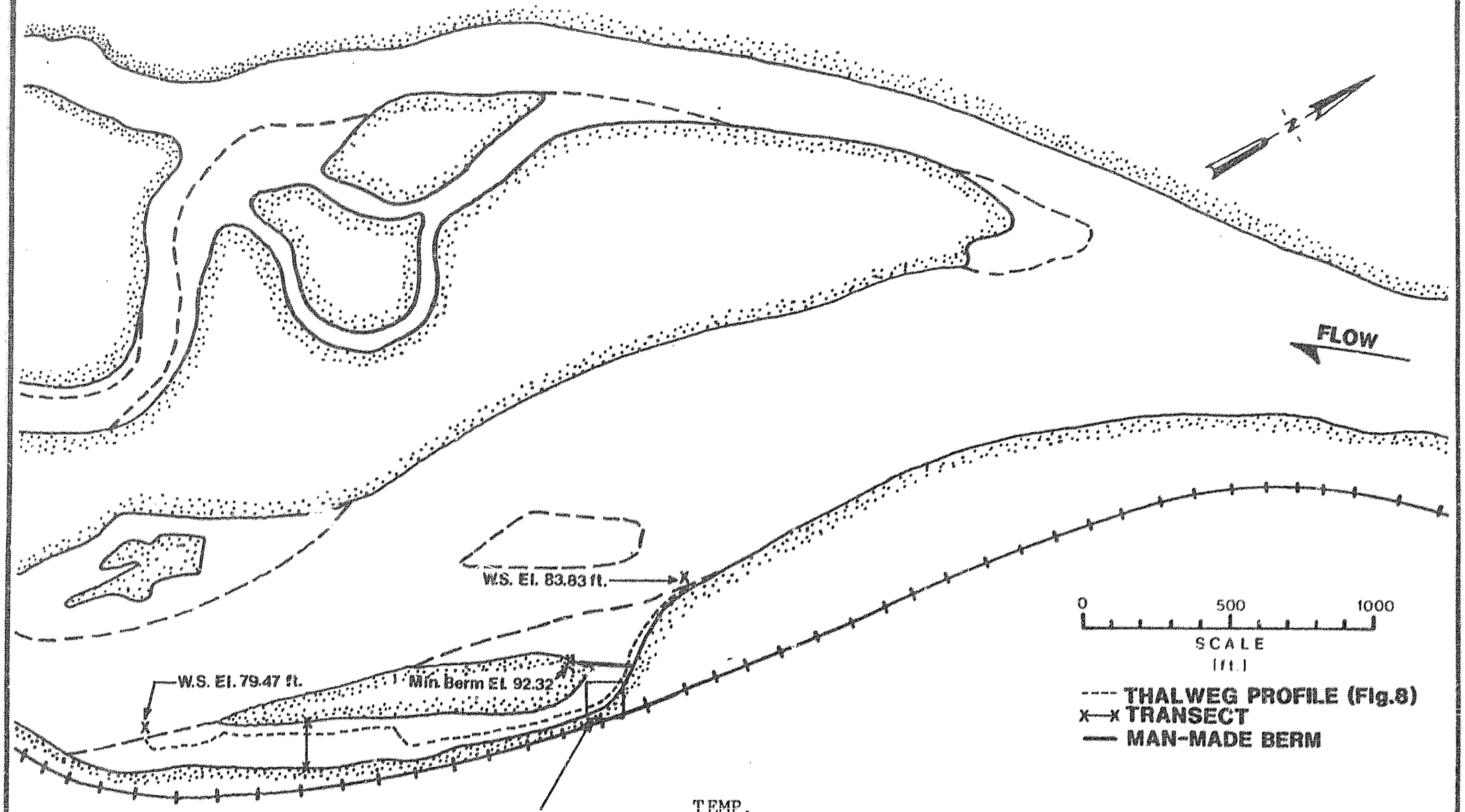


⬡ UPWELLING MEASUREMENT SITE

□ TEMPERATURE MEASUREMENT SITE

SITE RECONNAISSANCE DATA BASE FOR SLOUGH 9A (24-25 OCT 82)

Woodward-Clyde Consultants | FIGURE 6



LOCATION	TYPE	TEMP. °C
At upwelling inflow	Surface	1.2
	Intergravel	3.2
In pool under ice cover	Surface	1.3
	Intergravel	3.2
Seep on hillside	Surface	2.5
	Intergravel	4.1
Upstream from Hillside Seep	Intergravel	2.0

SITE RECONNAISSANCE DATA BASE FOR CURRY SLOUGH (24-25 OCT 82)

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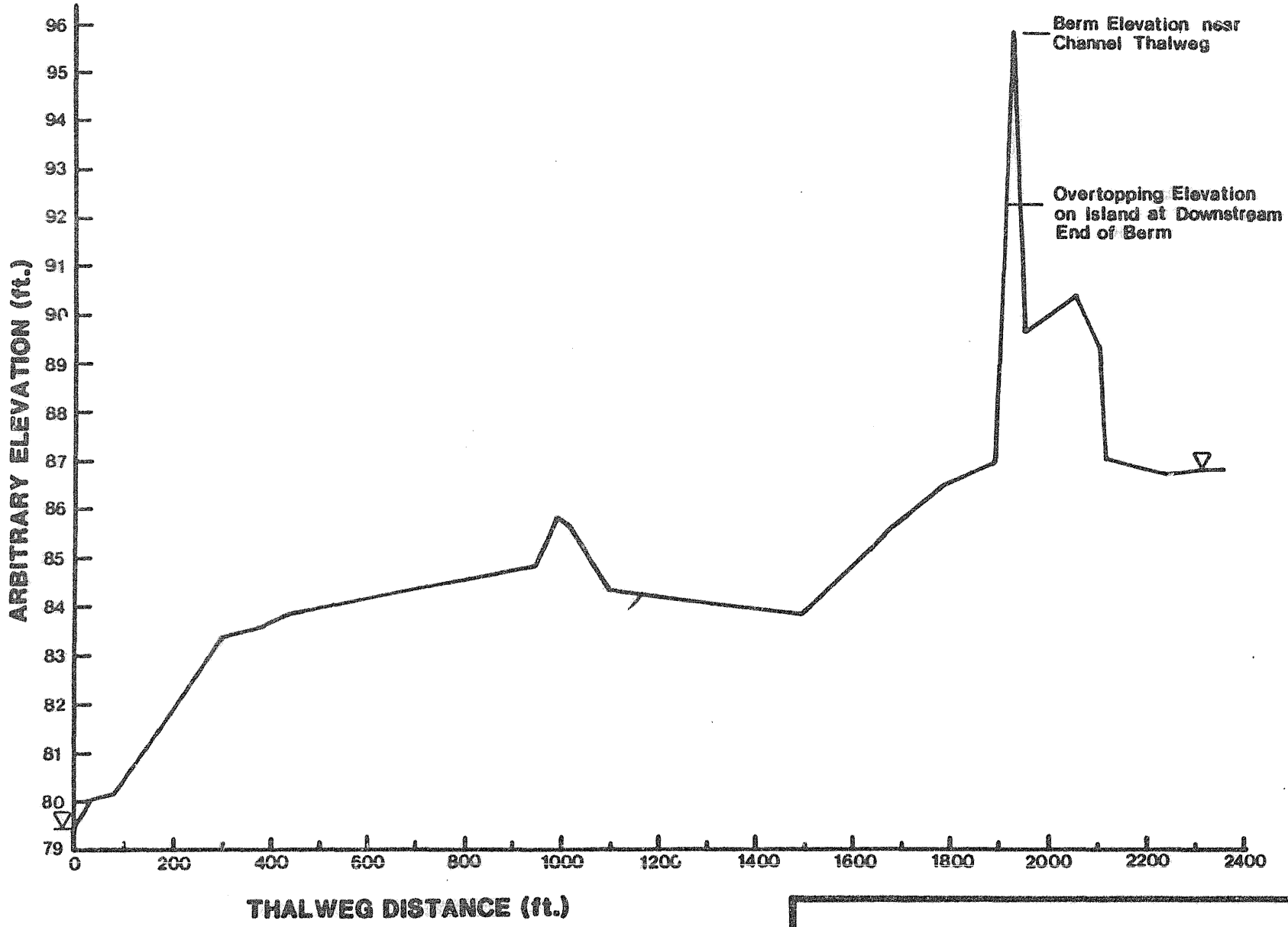
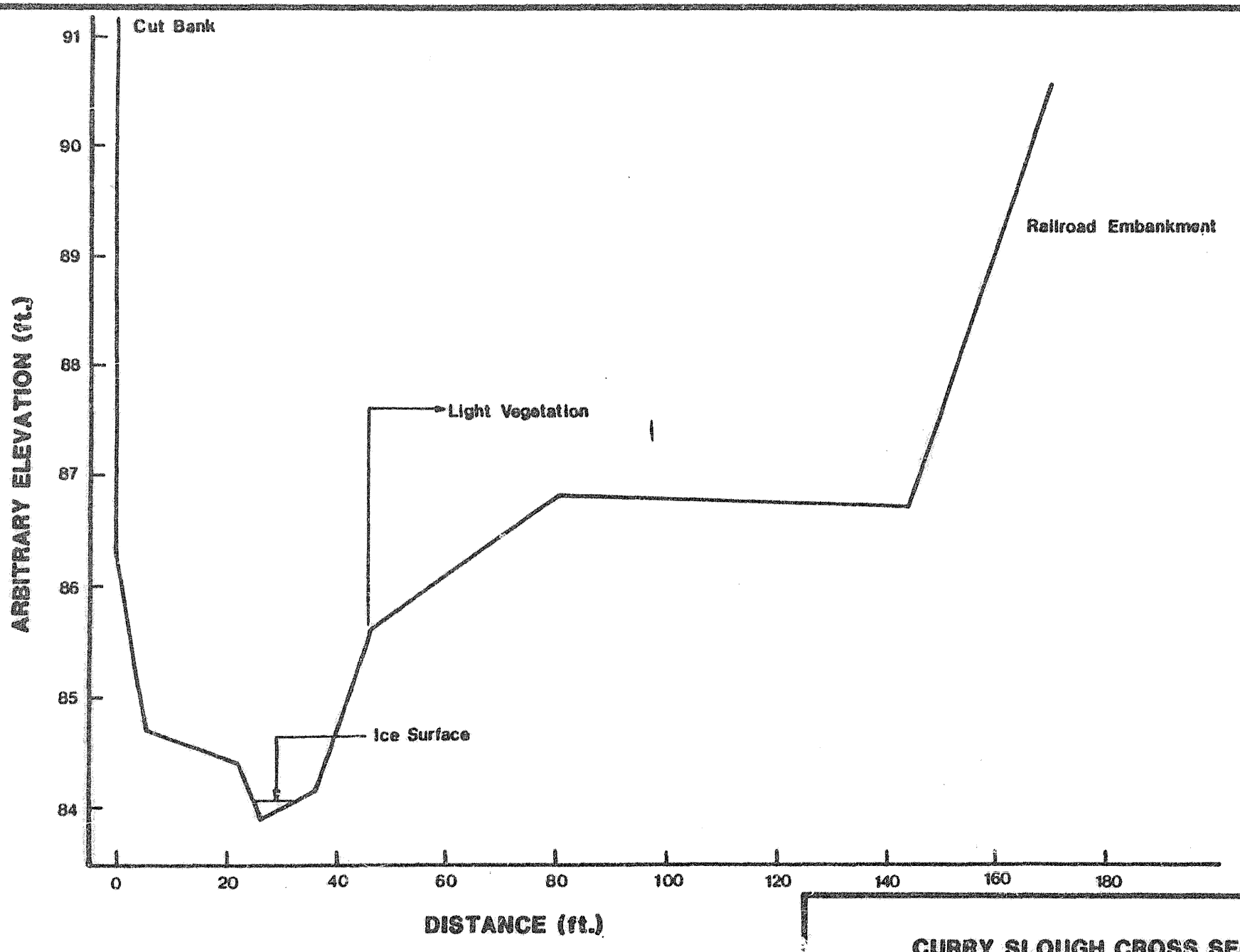
FIGURE 7



THALWEG PROFILE AT CURRY SLOUGH

Woodward-Clyde Consultants

FIGURE 8



CURRY SLOUGH CROSS SECTION
(looking upstream)

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FIGURE 9