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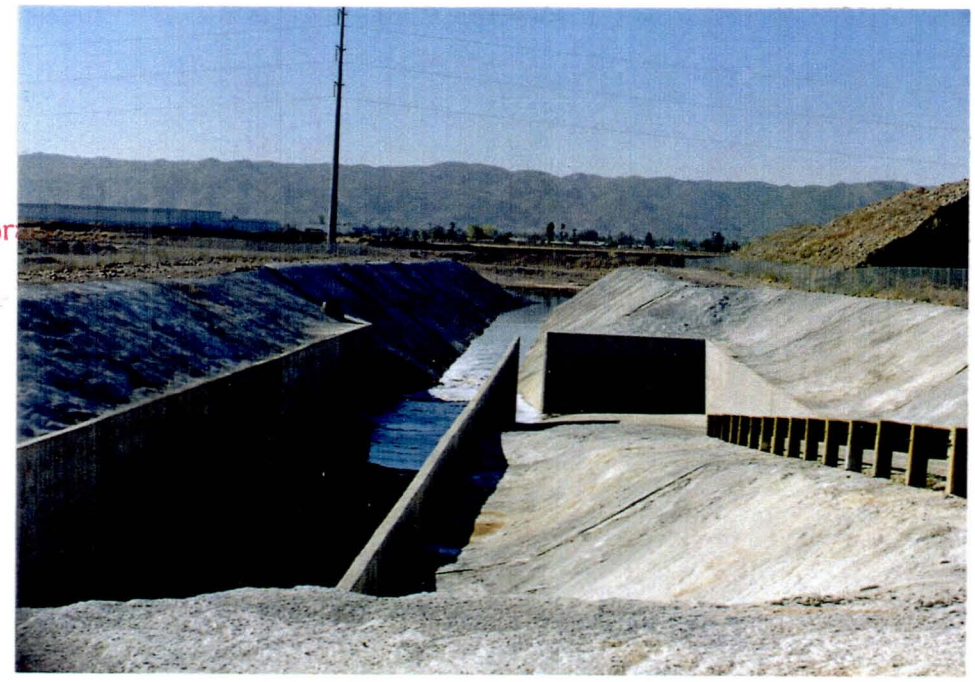

HYDRAULIC INVESTIGATION FOR THE SALT RIVER AT THE EAST TUNNEL OUTFALL PHOENIX, ARIZONA

PREPARED FOR:
ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

JANUARY 1990

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TABLE OF CONTENTS

Section No.	Title	Page No.
	EXECUTIVE SUMMARY	
	Introduction	i
	Findings	ii
	Conclusions	ii
1.	INTRODUCTION	1
	A. Purpose of Study	1
	B. Location and Site Description	1
	C. Project Background	1
	D. Objectives	3
2.	ENGINEERING METHODS	4
	A. Hydrology	4
	B. Hydraulic Analyses	4
	1. Work Map Delineation	4
	2. Roughness Coefficient	5
	3. Effective and Ineffective Flow Area	5
	4. Simulation of Flow Through Bridge	5
	C. HEC-2 Computer Model Set Up	5
3.	ANALYSIS	8
	A. Results	8
	B. Analysis	8
4.	CONCLUSIONS	12
5.	REFERENCES	14
6.	PHOTOGRAPHS	25
7.	APPENDIX	31
	A. Map No. 1	
	B. HEC-2 Computer Program Output	
	Model 1 Output	
	Model 2 Output	

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LIST OF TABLES

Table No.	Title	Page No.
1.	Summary of Discharges.	4
2.	HEC-2 Computer Models	6
3.	Manning's Coefficient of Roughness ("n" values) for the Salt River.	7
4.	Results of the HEC-2 Models for the 100-year Flood.	15
5.	Salt River Channel Bed Comparison.	16

LIST OF FIGURES

Figure No.	Title	Page No.
1.	Vicinity Map	2
2.	Cross Section No. 15.734	17
3.	Cross Section No. 15.834	18
4.	Cross Section No. 15.934	19
5.	Cross Section No. 16.034	20
6.	Cross Section No. 16.134	21
7.	Computed Channel Velocity	22
8.	Salt River Bed Profile	23
9.	100-Year Flood Profile	24

LIST OF PHOTOGRAPHS

PHOTO NO.	TITLE
1	16th Street bridge over the Salt River. Viewer is on west side of bridge on south bank looking north. Approx. Station 15.134.
2	16th Street bridge over the Salt River. Viewer is on west side of bridge on south bank looking upstream (east). Approx. Station 15.134.
3	East Tunnel Outfall. Viewer is looking south from north end of outfall. Approx. Station 15.634.
4	East Tunnel Outfall. Viewer is looking north from south end of outfall. Approx. Station 15.634.
5	Salt River at East Tunnel Outfall. Viewer is at south end of outfall looking southwest (downstream). Photograph shows area where channel banks constrict. Approx. Station 15.534.
6	North Levee. Viewer is at south end of East Tunnel Outfall looking upstream toward 24th Street bridge (east). North levee is on left side (north) of photograph. Note unimproved roadway atop levee.
7	Gravel Pit. Gravel pit located north side of north levee. North levee is located on left side of photograph, viewer is on northwest side of 24th Street bridge looking west toward East Tunnel Outfall.
8	North Levee. Viewer is on northwest side of 24th Street bridge looking west toward East Tunnel Outfall. Note unimproved road goes under bridge.
9	Salt River bottom south of North Levee. Viewer is on southwest side of 24th Street bridge looking northwest toward north levee.
10	24th Street bridge. Viewer is on east side of river channel on south levee looking north. Approx. Station 16.213.
11	Salt River Channel & bottom. Viewer is on east of 24th Street bridge on south levee looking upstream (east).

EXECUTIVE SUMMARY

Introduction

This report presents the results of the hydraulic investigation and analysis of the impact on the Salt River caused by the construction of the East Tunnel Outfall. The East Tunnel Outfall serves as an outlet for storm water from the 21-foot diameter drainage tunnel for the Interstate-10 (I-10) Inner Loop storm drain system. This investigation is part of the work under the seepage prevention project for the Arizona Department of Transportation (ADOT) initiated in November, 1988. The objective of this investigation is to determine and evaluate the potential impacts to the Salt River from conditions associated with the construction of the East Tunnel Outfall.

The East Tunnel Outfall (ETO) is located south of University Drive at 20th Street. The ETO consists of approximately 700 feet of box culvert and 800 feet of open channel leading to the Salt River channel. The open channel section is trapezoidal in shape with concrete covered riprap for the base and concrete surfaced gabions for the sides.

The ETO channel, located within the Salt River floodplain, was designed to be flexible in order that it may sustain minimal damage during severe flooding in the river channel. In early 1989, a layer of fiber reinforced concrete was added to the top of riprap and gabions for the control of seepage.

The primary task of this investigation is to determine if changes occur in the 100-year Salt River flood profile due to the construction of the outfall. A levee, constructed on the north side of the river channel between the ETO and the 24th Street bridge, is also investigated. The levee (north levee) was created by Calmat Co. of Arizona (Calmat) and lies completely within the current Federal Emergency Management Agency (FEMA) floodway.

The HEC-2 computer program, developed by the U.S. Army Corps of Engineers, was used to develop two hydraulic models to simulate the 100-year flood profiles in the river with and without the north levee. Topographic data, developed in early 1989, was used to modify the cross section data in the existing Salt River HEC-2 model from 7th Street to the I-10/Salt River bridge. The existing model was developed by the Corps of Engineers and was obtained from the Flood Control District of Maricopa County. The model, referred to as the 1984 model, was accepted by the FEMA. The results of the HEC-2 models developed in this investigation were compared to the 1984 model.

The study reach for this investigation lies between the 16th and 24th Street bridges at the Salt River. The ETO lies approximately midway between the two bridges on the north side of the river channel.

Findings

Although the ETO lies within the Salt River floodplain and the floodway, there is no significant change in the river's 100-year flood profile as a result of the outfall channel. Interpretation of the results of the two HEC-2 models indicates that the outfall channel (ETO) does not adversely impact the 100-year flood elevations. The ETO was constructed in excavation - no fill was added for the outfall that would impact flood elevations.

The north levee presents a significant encroachment to the Salt River floodway. The levee is not on the 1982 United States Geological Survey topographic map nor is it represented in the 1984 model. The levee reduces the effective cross-sectional areas in the river and prevents flood flows from expanding through the 24th Street bridge.

The results of the two HEC-2 models show differences in the water surface profile. In general, the 100-year flood elevations are approximately one foot lower than the 1984 flood elevations while the channel velocities were slightly increased. These differences are attributed to the changes in the channel geometry (cross section) and bed profile in the period of 1982 to 1989. The changes in channel geometry and bed profile are due to the conjunctive effects of the 1983 Salt River channelization, the October 1983 floods, and sand and gravel mining operations. The river bed has degraded as much as ten feet over the last seven years.

Conclusions

Based on the results of this hydraulic investigation the following conclusions are made:

1. The presence of the ETO does not adversely impact the 100-year Salt River flood profile because the entire ETO construction is in excavation. Adjacent properties should not be affected by this construction.

2. The results of the investigation shows that the 100-year flood elevations have decreased approximately one foot and that there is a slight increase in channel velocities. These changes are attributable to changes in the river channel geometry and degradation between 1982 and 1989. The 100-year elevations may be sensitive to future changes in channel conditions.

3. The north levee presents a significant encroachment to the 1984 FEMA floodway.

4. Since the outfall is designed to be a flexible, erodable channel, inspection and maintenance of the ETO are necessary after all significant river and/or tunnel flows.

5. The removal or failure of the north levee may produce flow velocities in the overbank areas to be high enough to cause some degradation of the ETO's eastern exposure during the 100-year flood event.

6. The discharges from the ETO are not expected to impact the Salt River significantly. There is a very low probability that the peak flood events in both the ETO and the Salt River would coincide at the outfall. In addition, the design capacity of the ETO (5,000 cfs) contributes 2.4 percent of the 100-year flood of 205,000 cfs in the river.

7. A detailed floodplain delineation incorporating the study reach and additional reaches upstream and downstream should be conducted. A channel improvement scheme for floodplain management in this reach of the Salt River should be included.

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1. INTRODUCTION

A. Purpose of Study

The purpose of this study was to investigate the potential impacts of the construction of the East Tunnel Outfall (ETO) on the Salt River channel. The impacts were identified and evaluated by performing a hydraulic analysis of the 100-year water surface profile for the study reach. The results are compared with a previous 1984 hydraulic analysis performed by the U.S. Army Corps of Engineers. The area of study is shown on the Vicinity Map (Figure 1).

B. Location and Site Description

The Salt River originates from the Salt River Project (SRP) watershed and meanders through the Central Arizona cities of Mesa, Scottsdale, Tempe, Phoenix and Tolleson, to eventually join the Gila River west of Phoenix. The Salt River is generally dry throughout most of the year except during periods of intense monsoon and thunderstorm activity or during controlled flood releases by SRP.

The study reach is located at the Salt River between the 16th Street and 24th Street bridges, in the City of Phoenix, Arizona. The total length of the river channel under investigation is approximately 1.2 miles.

C. Project Background

The East Tunnel Outfall (ETO) is an outfall structure which connects the East Tunnel of the I-10 Inner Loop drainage system to the Salt River (see Map No. 1, Appendix). The outfall conveys stormwater flow up to the level of the Salt River and is designed to carry a 50-year peak flow of 5,000 cubic feet per second.

The outfall consists of a double 14' x 12' box culvert riser from the east tunnel at a 10 percent upslope, about 700 additional feet of 14' x 12' box culvert and approximately 800 feet of open channel leading to the river. The open channel portion of the outfall was designed as a flexible structure in order to minimize damage and replacement costs should severe river flooding occur. The gabion channel was lined in early 1989 with fiber reinforced shotcrete to reduce infiltration from the channel. The addition of the concrete lining has increased the susceptibility of the ETO channel to damage from river flows. However, some flexibility remains due to the use of construction joints.

A pump station is provided at the outfall to dewater the East Tunnel after a storm event. The pump station was designed to remove water left in the tunnel after the inverted siphon depressurizes and outflow to the river ceases.

The study reach of the Salt River flows in a westerly direction through the 16th Street and 24th Street bridges. The reach, approximately 1.2 miles in length, follows a fairly straight alignment with encroachments due to the bridges. The channel is naturally and artificially entrenched with steep rock and gravel levees on the south and north banks. The

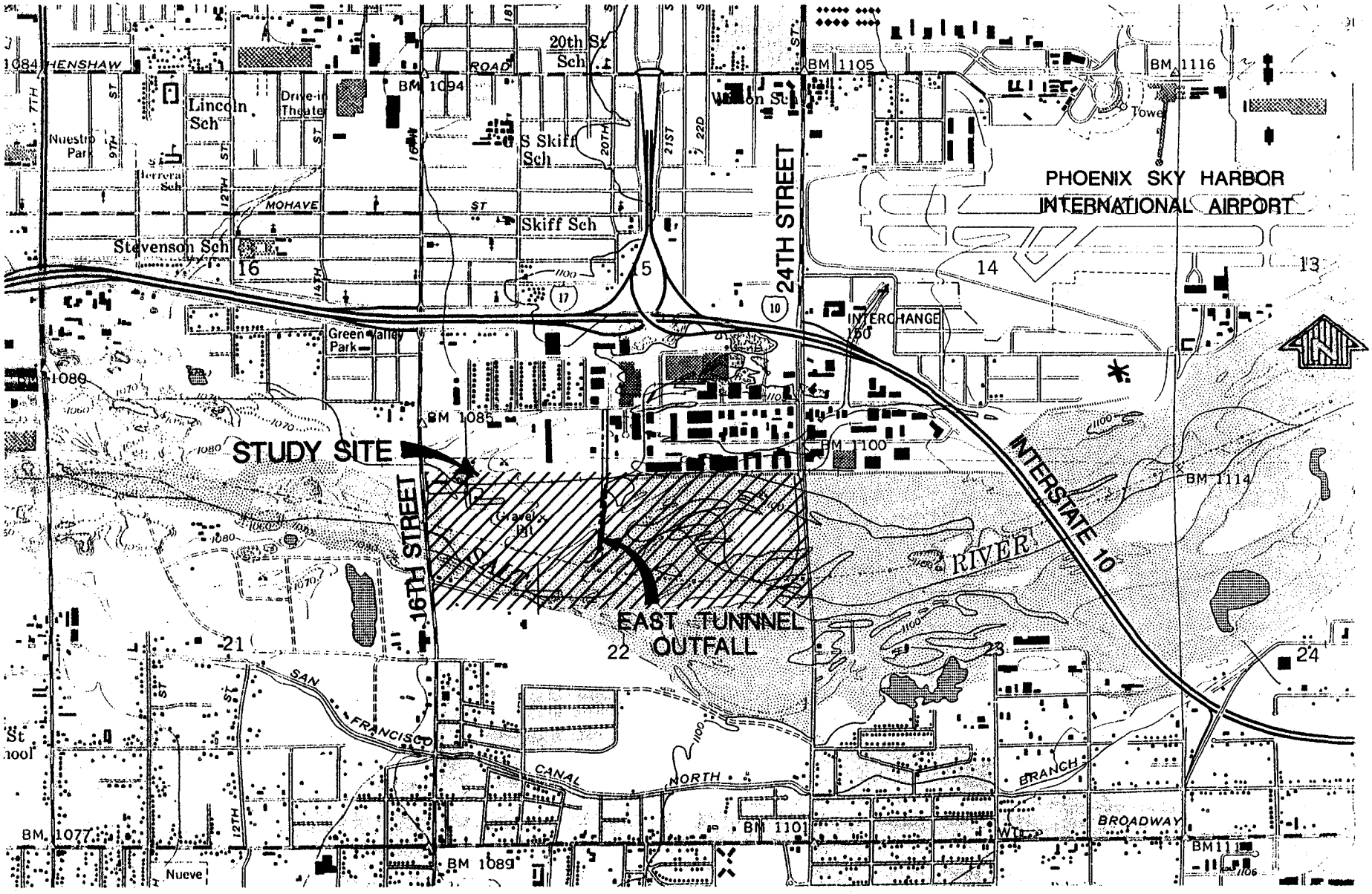

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FIGURE 1

HYDRAULIC INVESTIGATION FOR THE
SALT RIVER AT THE EAT TUNNEL OUTFALL

SECTION 22, T.1 N. R.3 E.
MARICOPA COUNTY, ARIZONA

APPROXIMATE SCALE

1 ½ 0 1 MILE

VICINITY MAP

HNTB

southern levee averages 20 to 25 feet in height while the north levee averages 20 to 24 feet in height between river mile sections 15.734 to mile 16.134. The channel gradient at this reach varies from 0.20 to 0.87 percent, averaging 0.45 percent, with channel invert elevations from about 1057.8 feet to 1067.4 feet in elevation.

Rock, gravel, sand, and debris cover the river bed with small bushes and trees scattered along the river channel and banks. The bank to bank width of the eastern portion of the study reach is approximately 980 feet wide while the bank to bank width of the western portion varies from 600 to 1000 feet wide.

Two bridges, the 16th Street bridge and the 24th Street bridge span the Salt River within the study reach. For the purposes of this investigation only the 24th Street bridge was incorporated into the hydraulic models. The 24th Street bridge is approximately perpendicular to the direction of the channel and river flows. Based on the previous hydraulic study in 1984 by the Corps of Engineers, this bridge has adequate flow capacity to convey the 100-year flood.

The study reach has a history of extensive sand and gravel mining operations as shown in aerial photographs flown in December 1976, January 1978, and April, 1989. The photographs indicate the progression of gravel mining operations within the reach and local areas of active gravel pit mining.

At the present time, two levees serve to contain nuisance and storm water flows within the banks of the Salt River channel. These levees are identified in this report as the south levee and the north levee.

D. Objectives

The objectives of the study are as follows:

1. To perform 100-year water surface profile calculations for approximately 1.2 miles of the Salt River between the 16th and 24th Street bridges and to discuss the results of the hydraulic analysis and compare the results with the 1984 FEMA model. The discussion will focus on the impacts of the north levee and the East Tunnel Outfall on the Salt River.

2. To perform a hydraulic analysis for the 100-year water surface profile assuming that the north levee does not exist (i.e., removed) and to discuss the results of the "without levee" scenario and the impact on the Salt River study reach.

3. To discuss the impact of discharge flows from the East Tunnel Outfall on the Salt River.

2. ENGINEERING METHODS

Standard hydraulic methods were used to determine the flood data and water surface profiles for the study reach of the Salt River. The flood event of a magnitude expected to be equaled or exceeded once, on the average, during any 100-year period (recurrence interval) has been selected for this hydraulic investigation. This event, commonly termed the 100-year flood, has a 1 percent chance of being equaled or exceeded during any year.

A. Hydrology

The discharge values for the 100-year event was adopted from the Flood Insurance Study (FIS) for the City of Phoenix by FEMA (reference 4). Table 1 presents the summary of discharges for the 100-year event for the study reach.

Table 1 - Summary of Discharges

Section to Section (river miles)	100-year Peak Discharge (cfs)
15.173 to 16.134	200,000
16.134 to 16.347	205,000

B. Hydraulic Analysis

1. Work Map Delineation

The water surface profile computations were performed using the HEC-2 computer program developed by the U.S. Army Corps of Engineers (reference 7). Profiles were determined for the 100-year flood for two scenarios - with and without the north levee.

Cross sectional data for this study reach of the Salt River was obtained from the 1984 FEMA model (with the 1982 topographical data) for sections 15.173 and 16.178 through 16.347 (reference 8). Cross sectional data for sections 15.235 through 16.134 was obtained from the 1989 topographic data flown and produced by Cooper Aerial.

The cross sections used for this study are at the same locations used in the 1984 FEMA model. The same cross section locations were used in an attempt to minimize the introduction of extraneous data and information that was not used in the 1984 FEMA model. By minimizing the introduction of new data, a valid comparison can be made between the results of this study and the 1984 FEMA model. The cross section stations are expressed in river miles identical to the FEMA model.

In general, cross sections were selected so that they are normal to the flow lines, located upstream and downstream of bridges, at the head and tail of reaches with levees, and at control sections. Cross sections used in this study follow these general guidelines. Locations of the cross sections used in both the FEMA model and this investigation are shown in Map No. 1 (Appendix). Cross section plots (using 1989 data) at selected locations are also included in Figures 2 through 6 at the end of this report.

For a subcritical profile, computations start from the downstream sections and calculations proceed to the upstream sections.

2. Roughness Coefficient

Roughness coefficients (Manning's "n") for this reach of the Salt River are the same as those used for the 1984 FEMA model. Representative values are n=0.033 for the main channel and n=0.045 and 0.040 for the overbank areas.

3. Effective and Ineffective Flow Area

Defining effective and ineffective flow areas is essential in modeling flow in natural channels. Slack areas or eddies are not effective in carrying flow downstream, and a water-to-water boundary exists between such areas and the main flow in the channel.

An ineffective flow area was designated in the right overbank areas in the "without levee" scenario to model expanding and contracting flows downstream of the 24th Street bridge. Flow was expanded at an angle of 4:1 and contracted at an angle of 1:1 relative to the flow line (reference 5).

4. Simulation of Flow Through Bridges

Energy losses through a bridge structure itself are handled in three different ways, depending on which method of analysis is used: the normal-bridge method, the special-bridge method, or external hydraulic calculations.

In order to minimize the introduction of extraneous or new data concerning the 24th Street bridge and to focus the attention of this study to the ETO, the special bridge routine for the 24th Street bridge was incorporated entirely and exactly from the 1984 FEMA model.

In the special-bridge method, changes in water surface elevation through the bridge structure are computed with momentum and other hydraulic equations. This method can be used to analyze most types of bridges, but it is most applicable to bridges with piers where low flow controls, to bridges with pressure-flow or weir-flow conditions, and to bridges where the flow passes through critical depth while going through the structure. With this method, losses through the structure can be computed for low flow, weir flow, pressure flow, or any combination of these conditions.

C. HEC-2 Computer Model Set-up

HEC-2 computer models were set up for the study reach of the Salt River for subcritical profile computations. The starting water surface elevation for the models at the first cross section (15.173) was obtained from the HEC-2 computer output of the 1984 FEMA model (elevation 1083.77 feet). Contraction coefficients of 0.1 or 0.3 and expansion coefficients of 0.3 or 0.5 were used to estimate energy losses.

Table 2 illustrates the selected HEC-2 models tested to analyze the with and without levee conditions for the study reach of the Salt River.

Table 2. HEC-2 Computer Models

Model No.	File Name	Condition	Flood Profile
1	Model 1.OUT	with levee	Subcritical
2	Model 2.OUT	without levee	Subcritical

Model 1

Model 1 represents the study reach as it presently exists. Notable differences between this model and the 1984 FEMA model are the revised ground elevations for cross sections at river mile 15.235 through river mile 16.134 and the presence of the north levee (see Map No. 1, Appendix). Ground elevations for revised cross sections were obtained or developed (interpolated) by the topographic data furnished by Cooper Aerial. Cooper Aerial flew the study reach in April, 1989.

The north levee that currently forms the north bank of the river channel from the 24th Street bridge to the East Tunnel Outfall was not present in 1982, does not appear on the 1982 contour map, and is not represented in the 1984 FEMA model. North levee elevations were incorporated into Model 1 from the data furnished by Cooper Aerial.

Nineteen cross sections were used to model the 100-year water surface profile for the study reach. These cross sections were taken at the same river stations as identified in the 1984 FEMA model. Figure 2 through 6 show the cross section configurations (geometry) for Model 1 for each of the cross sections incorporating the north levee. The purpose of the illustrations is to show the river channel and overbanks for the two computer models of this study (Model 1 and Model 2).

Model 1 confines flow to the river channel by use of the X3 and ET records. The X3 record uses the channel area as defined by the overbank stations for computations unless the water surface elevation exceeds the elevations of the bank stations. This option is utilized to contain flow between levees until overtopping occurs, if the bank stations are coded at the top of the levees. Overtopping can occur on either side since the left and right bank elevations are tested independently.

Confining the flow to the channel or overbank areas is also accomplished with the use of the ET record. The ET record is primarily used to model encroachments to the floodplain and overbank areas, but can also be used to confine flows to specified cross section stations and/or elevations. The ET record is used to model areas of ineffective flow such as found in slack water areas, ponds, and upstream and downstream of bridges.

Model 2

Model 2 represents the study reach as it may exist without the north levee. The difference between Model 2 and Model 1 is that the north levee

is removed in Model 2 by revising the data at the appropriate cross sections. Figures 2 through 6 show the cross sections where the north levee removed.

For the purposes of this study, the right overbank stations have remained the same as in Model 1, but the right overbank elevations have been revised to reflect the removal of the north levee. The gravel pit adjacent to the north levee was modeled as though the pit was at the same elevation as the right overbank station. The purpose of modeling the gravel pit in this manner is due to the fact that the gravel pit is not effective in carrying flow. The pit, however, would act as a storage reservoir or pool that would create a water boundary between effective flow and ineffective flow.

In Model 2 the gravel pit was actually modeled as though it was filled. The pit was assumed to be filled with materials that would impart a friction characteristic for the right overbank to give a Manning's ("n" value) roughness coefficient as designated in the 1984 FEMA model. The right overbank Manning's "n" values for the right overbanks were either n=0.045 or n=0.040. Manning's "n" values for each cross section are listed in Table 3 and were extracted from the 1984 FEMA model.

Table 3. Manning's Coefficient of Roughness ("n" values) for the Salt River

Cross-Section river mile	Manning's "n" Left Overbank	Main Channel	Right Overbank
15.173	0.045	0.033	0.045
15.235	0.045	0.033	0.045
15.335	0.045	0.033	0.045
15.434	0.045	0.033	0.045
15.534	0.045	0.033	0.045
15.634	0.045	0.033	0.045
15.734	0.045	0.033	0.040
15.834	0.045	0.033	0.040
15.934	0.045	0.033	0.040
16.034	0.045	0.033	0.040
16.134	0.045	0.033	0.040
16.178	0.045	0.033	0.040
16.188	0.045	0.033	0.040
16.202	0.045	0.033	0.040
16.213	0.045	0.033	0.040
16.254	0.045	0.033	0.040
16.347	0.045	0.033	0.040
16.428	0.045	0.033	0.040
16.528	0.045	0.033	0.040

An ineffective flow area was established where the north levee existed. The ineffective flow area was delineated by expanding flow after the 24th Street bridge by a ratio of 4:1.

3. ANALYSIS

A. Results

1. Model 1 (with north levee)

For the entire study reach, the 100-year flood was determined to be a subcritical profile except at section 16.347 where critical flow occurs. Section 16.347 is located upstream of the 24th Street bridge.

Section 15.173 to Section 15.534

The 100-year flood was found to be contained within the channel in this portion of the study reach and flows in the subcritical regime. Channel velocities range from 8.5 fps at section 15.173 to 16.7 fps at Section 15.534. Depths of flow within this section of the study reach ranged from 20.4 feet to 27.1 feet.

Section 15.634 to Section 16.134 (north levee)

The 100-year flood was determined to flow at subcritical depths within this portion of the study reach. Velocities of channel flow within this sub-reach were determined to range from 8.4 fps to 13.8 fps. The velocity of flow at the East Tunnel Outfall (section 15.634) in the channel was determined to be 8.4 fps. Depths of flow within this section of the study reach ranged from 19.8 feet to 30.8 feet.

2. Model 2 (without north levee)

As in Model 1, the 100-year flood was determined to flow at subcritical flow except at section 16.347. At this cross section flow occurs at critical depth.

Section 15.173 to Section 15.534

Channel velocities range from 8.5 fps at section 15.173 to 16.8 fps at section 15.335. Depths of flow within this section of the study reach ranged from 20.1 feet to 27.2 feet. Model 1 and Model 2 results compare favorably in this reach since it is downstream of the north levee.

Section 15.634 to Section 16.134

Velocities of channel flow within this sub-reach was determined to range from 8.3 fps to 13.4 fps. The velocity of flow in the channel at the East Tunnel outfall is 8.3 fps. Depths of flow within this portion of the study reach ranged from 19.5 feet to 30.9 feet.

B. Analysis

The results of the two HEC-2 computer models for this investigation are presented in Table 4 as well as the results from the 1984 FEMA study. The table shows that the computed water surface elevations for each cross section varies from model to model. In order to comprehend the changes or differences that produced these variations, the following discussion presents factors that induce changes in water surface profiles.

Many factors impact water surface elevations. No single factor or hydraulic parameter can be identified as the sole determinant in developing water surface profiles in normal stream bed hydraulic analyses. However, in a comparison study such as this investigation, many variables remain the same among the studies to ease the identification process of "cause and effect." In other words, many parameters in Model 1 and Model 2 were extracted directly and exactly from the 1984 model. In this manner only a few variables need to be adjusted to (1) calibrate the models, and (2) study the effects of the adjustments.

In order to start the comparison of flood profiles, the changes in the stream bed profile from 1982 to the present shall be discussed. Table 5 presents the comparison of the Salt River bed profile between the 1982 and 1989 topographic data using Model 1.

A review of the river bed profile between sections 15.235 through 16.134 reveals that the Model 1 river bed profile is lower, ranging from 0 to 10.2 feet, than the FEMA study. One reason for the drop in river bed profile could be due to the topographic maps, data, scales, and contours used in the respective investigations.

Variations in the river bed profile could be caused by the number of cross sectional data points used to define cross section geometry. Generally, the more data points (station and elevation) used to define a channel cross section the better the delineation of the cross section configuration.

Another explanation for a drop in the river bed profile could be due to channel degradation and scouring from the October, 1983 flooding events and direct excavation by sand and gravel mining activities in the river.

From a review of aerial photographs flown in December, 1976 and December, 1978, gravel mining has an extensive history within this reach of the Salt River. Map No. 1 (Appendix) shows the reach of the Salt River studied in this investigation. The figure shows areas of gravel mining as well as the East Tunnel Outfall and the north levee. The greatest drops in the channel bed occurs within the segment of the north levee.

The effect of the drop in the river bed profile on the 100-year water surface profile can only be stated as a generalization. No specific discussion can be made as to the cause and effect of the channel invert because of other contributing factors that work in conjunction to impact the water surface profile. Generally, if all variables remain constant at a cross section and a drop in the channel invert occurs, the water surface profile would increase because of a change (decrease) in velocity (head) to an increase in (potential head) depth.

The evaluation of the impact of the north levee on the 100-year water surface profile presents a difficult challenge. As stated previously, the north levee that forms the north bank of the river channel from the 24th Street bridge to the East Tunnel Outfall was not present in 1982, does not appear on the 1982 United States Geological Survey topographic map, and is not represented in the 1984 FEMA model. Map No. 1 shows the location of the north levee that runs from section 16.134 to approximately section 15.634 (East Tunnel Outfall).

A field walk was performed on Friday, September 29, 1989, to photograph and observe the 16th Street bridge, the 24th Street bridge, the study reach, the north levee, and the East Tunnel Outfall. Eleven photographs depicting the features of the study reach are included in Section 6 of this report. It was observed that the north levee serves also as a truck/haul road for gravel mining trucks and vehicles to travel from the west side of the bridge underneath to the east side of the bridge. Photo No. 8 shows the road on top of the north levee which is wide enough to accommodate two-way traffic.

According to the floodplain/floodway work map dated August 10, 1982, obtained from the Flood Control District of Maricopa County, the north levee lies completely within the existing FEMA floodway. A floodway is designed to pass the base flood (100-year flood) without raising the water surface elevation more than 1 foot above what it would be for the existing flood plain.

The north levee represents an encroachment to the floodway. Encroachments upon floodways generally (by definition) impact the 100-year water surface elevation. The levee is an encroachment in that it lies within the existing designated floodway and presents an obstruction to flow (i.e., preventing flow from reaching the limits of the designated floodway). If an encroachment upon a floodway does not impact the 100-year water surface, it is because there may be some compensating increases in conveyance.

Based on the results of the HEC-2 computer models (Model 1 and Model 2) the channel velocities generally follow the same pattern as compared to the 1984 FEMA study. Figure 7 is a plot of channel velocities for the three models and illustrates the previous statement. Between stations 15.634 and 16.178 the channel velocities are the lowest for all three models. The velocity of flow increases rapidly downstream of section 15.634 and upstream of 16.178 and is reflected in Table 4 and Figure 7. The reason for the increase in velocity downstream of the East Tunnel Outfall (section 15.634) is due to a contraction of the floodway from the limits that exist upstream from the outfall. As the channel cross sectional area is reduced the velocity increases to pass the designated flowrate. The effect of the north levee on downstream velocities appears to be negligible, as would be expected from a subcritical flow regime.

The velocity of flow in the channel is relatively higher in the subreach incorporating the 24th Street bridge as shown in Figure 7. After flow passes the 24th Street bridge, the channel velocity decreases in all three models. The reason for the decrease in velocity after passing underneath the bridge is that the flow progresses from a smaller cross sectional area to a larger cross sectional area. Model 1 shows that the flow velocity within the subreach incorporating the north levee is higher than the channel velocities in Model 2. The increase in flow velocity in Model 1 for this section is attributable to the north levee. The north levee prevents flow from expanding after it passes beneath the 24th Street bridge resulting in an increase in velocity. The Model 2 program allows flow to expand after the 24th Street bridge which shows a corresponding decrease in channel flow velocity as compared to Model 1. The conclusion of this discussion is that the north levee increases flow velocities within the subreach of the river where the levee is located.

Figures 2 through 6 shows the cross section profiles for the river stations incorporating the north levee. These figures were developed to graphically illustrate the north levee in Model 1 and the removal of the north levee in Model 2. The removal of the north levee increased the cross sectional area effective for flow in Model 2 over Model 1. As a result the channel velocities show a decrease in Model 2.

The area determined effective for flow as a result of removing the north levee in Model 2 was based on expanding flow after the 24th Street bridge at a ratio of 4:1. It was assumed that the structural integrity of the south levee remained firm and that flow would not expand south after passing the 24th Street bridge.

Map No. 1 (Appendix) was developed to show the existing FEMA floodway as presented in the 1988 FEMA floodway map (reference 4) and will be used to illustrate and compare the results of this investigation. Map No. 1 shows the locations of the East Tunnel Outfall, the north levee, the 16th Street and 24th Street bridges, the south levee, and the locations of the cross sections used in the computer models.

Map No. 1 shows that both the north levee and a portion of the East Tunnel Outfall encroach upon the floodway. A discussion was presented previously on the obstructive characteristic the north levee has upon the FEMA floodway.

The map indicates the resulting floodway determined from Model 1. The Model 1 floodway is confined between the limits of the north and south levees east of section 15.634 and confined between the south levee and the right overbank west of section 15.634. The change in the floodway boundary between section 15.634 and 16.178 is due to the north levee.

The Model 2 floodway was determined to be essentially the same as the 1988 FEMA floodway. This indicates that the Model 2 floodway is virtually identical to the current 1988 floodway without the existence of the north levee.

The computed water surface elevations at section 15.634 (East Tunnel Outfall) in both Model 1 and Model 2 indicate that the outfall does not adversely impact the 100-year water surface profile for the Salt River. The models actually show a decrease in the computed water surface elevation when compared to the 1984 FEMA study. The physical presence of the outfall does not impart an increase in the 100-year water surface profile.

In Model 2, where the north levee was removed and the gravel pit modeled as though it were filled with channel bed material, the water surface elevation at the East Tunnel Outfall was slightly lower than the water surface elevation determined in the 1984 FEMA study. The significance of this result shows that if the gravel pit were to be abandoned and the north levee removed, the outfall, because of its physical presence in the Salt River floodplain, will not produce detrimental impacts to the 100-year water surface profile. The reason is that the outfall is constructed in excavation and changes in the channel geometry act in

conjunction so as not to produce an increase in the 100-year water surface elevations (i.e., there has been compensating effects).

Flow velocities in the right overbanks in Model 2 range from 4.8 to 7.4 feet per second between sections 15.734 and 16.034 (these sections are where the north levee was removed). The velocities are high enough to adversely impact the stability of common stream bed materials (reference 5). The impact on the ETO of the high velocities would be to cause erosion, degradation, or scouring of the ETO's east exposure. The amount of erosion cannot be ascertained with the results of this study, but the ETO would experience bank erosion and possible uplifting of the outfall lining.

In previous studies, the HEC-2 program was used to compute velocities and water surface profiles through the ETO channel, transition, and access pad (references 1 & 6). Five flow rates were modeled: 1250, 2500, 3750, 5000, and 6000 cfs. All flow rates produced smooth water surface profiles, and the higher discharges resulted in relatively constant computed velocities. The lower discharges produced somewhat more variable velocities, but flow conditions are subcritical in all cases (reference 1).

Discharges from the outfall are designed to spill into the Salt River channel. The impacts of the tunnel discharges on the Salt River should be minimal because all discharge flows should be contained within the river flooday (assuming no concurrent adverse river flows). There could be minimal temporary impacts to existing river channel bottom sand and gravel operations.

From discussions with the authors of references (1) and (6), the impact of discharge flows from the ETO upon the Salt River was considered to be negligible. The authors believe that there is a very low probability that two independant events (i.e., peak flow in the tunnel and peak flow in the Salt River) would occur simultaneously and the peaks would coincide at the ETO.

The capacity of the ETO was designed to accommodate the 50-year peak event of 5,000 cfs. This capacity represents 2.4 percent of the total 100-year flood event in this reach of the Salt River (205,000 cfs). The contribution of flood flows from the ETO to the river is diminutive when compared to the 100-year event in the river.

4. CONCLUSIONS

Based on the results and analysis of this hydraulic investigation the following conclusions are made:

A. The East Tunnel Outfall does not increase the water surface elevations for the 100-year flood in the study reach of the Salt River. Both HEC-2 models of this study show no increase in the water surface elevations for the 100-year flood at the East Tunnel Outfall. Channel velocities follow a consistent distribution as compared with the 1984 FEMA model.

B. Although the East Tunnel Outfall may appear as an obstruction to the Salt River floodplain within the study reach, the construction of the outfall does not impact the Salt River 100-year flood profile. The reason is that the outfall was constructed in excavation.

C. The north levee presents a significant encroachment to the 1988 FEMA floodway.

D. The stream bed profile within the study reach has lowered as compared to the profile determined in the 1984 FEMA model. The lowering of the stream bed profile can be attributed mainly to excavation activities by the gravel mining operations.

E. The removal or failure of the north levee may produce flow velocities in the overbank areas to be high enough to cause erosion and degradation of the ETO's east exposure during the 100-year flood event.

F. The impact of discharge flows from the ETO upon the Salt River are negligible. There is a very low probability that peak flood events in both the ETO and the Salt River would coincide simultaneously at the outfall.

G. A revised detailed floodplain delineation of the Salt River incorporating the study reach and additional reaches upstream and downstream should be conducted. A channel improvement scheme for floodplain management for this reach of the Salt River should be included.

IV. REFERENCES

1. Arizona Department of Transportation Highways Division. "Inner Loop Storm Drain Summary Report, Phoenix, Arizona." Interstate 10 Phoenix-Casa Grande Highway 15th Avenue to Maricopa T.I. Howard Needles Tammen & Bergendoff. July 1988.

2. Federal Emergency Management Agency. "Flood Boundary and Floodway Map (Floodway)", Maricopa County, Arizona and Incorporated Areas, Panel 2145 of 4350, April, 1988.

3. Federal Emergency Management Agency. "Flood Insurance Study", City of Phoenix, Arizona, Maricopa County, Community No. 040051, June, 1984.

4. Federal Emergency Management Agency. "Flood Insurance Study", Maricopa County, Arizona and Incorporated Areas, Volumes 1 through 3, April, 1988.

5. Hoggan, Daniel H. Computer-Assisted Floodplain Hydrology & Hydraulics McGraw-Hill, Inc. 1989.

6. Howard Needles Tammen & Bergendoff. "I-10 Inner Loop Phoenix, Arizona East Tunnel Outfall". January, 1986.

7. U.S. Army Corps of Engineers. The Hydrologic Engineering Center. "HEC-2 Water Surface Profiles - Users Manual." September, 1982.

8. U.S. Army Corps of Engineers. 1984 HEC-2 Salt River computer model, 7th Sreet to I-10 bridge, Salt River, Phoenix, Arizona.

DII419.15/sc

Table 4. Results of the HEC-2 Models for the 100-year Flood.

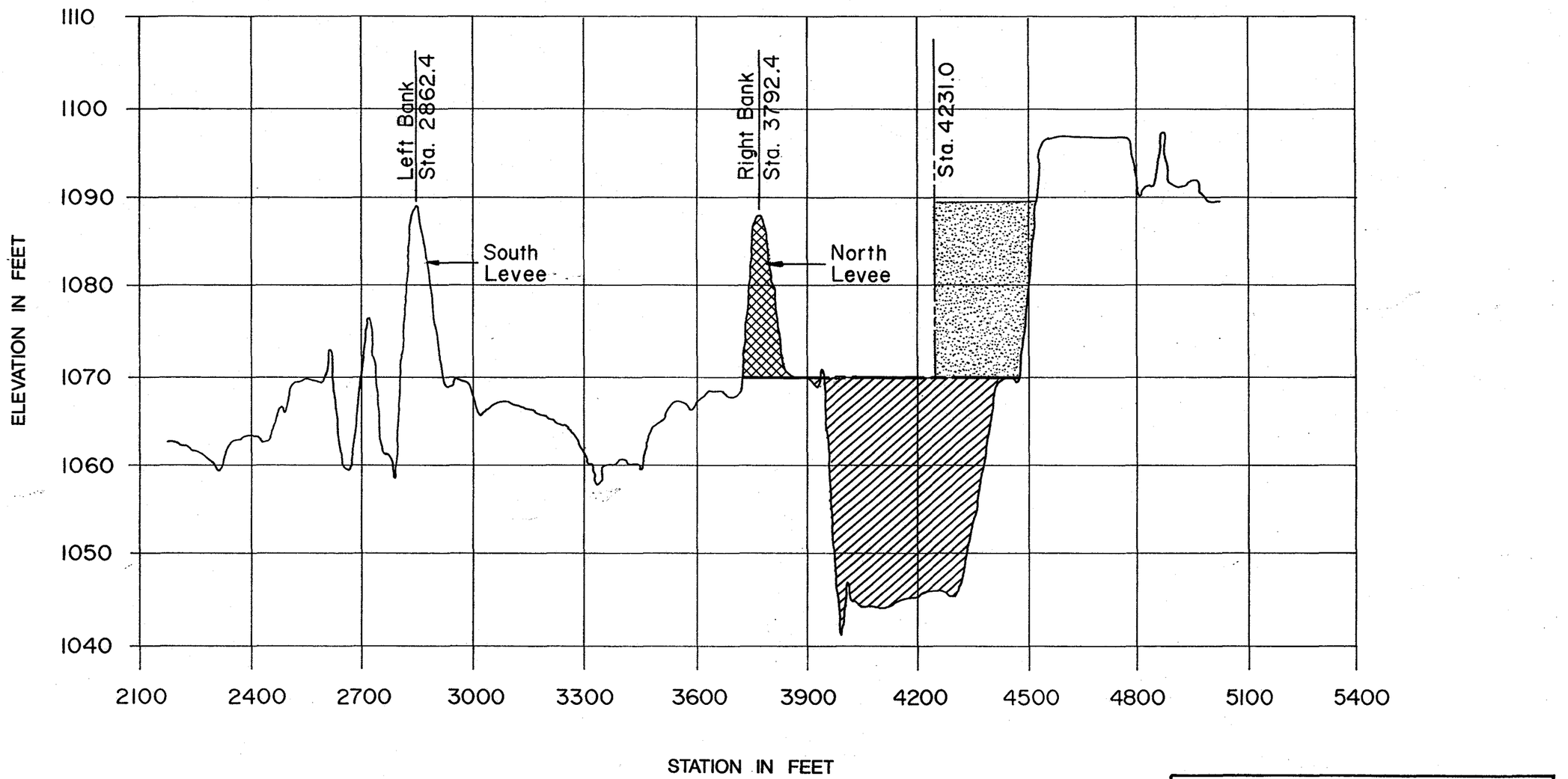
		1984 FEMA Model			Model 1 with North Levee			Model 2 without North Levee		
Station	Q (cfs)	CWSEL (ft)	EG (ft)	VCH (fps)	CWSEL (ft)	EG (ft)	VCH (fps)	CWSEL (ft)	EG (ft)	VCH (fps)
15.173	200,000	1083.77	1084.89	8.51	1083.77	1084.89	8.51	1083.77	1084.89	8.51
15.235	200,000	1083.12	1085.65	12.75	1082.26	1086.11	15.74	1082.26	1086.11	15.74
15.335	200,000	1083.85	1086.84	13.87	1084.05	1087.98	15.91	1083.70	1088.08	16.80
15.434	200,000	1084.13	1088.73	17.20	1086.13	1089.42	14.55	1086.30	1089.53	14.42
15.534	200,000	1085.38	1091.43	19.74	1086.61	1090.85	16.73	1086.76	1091.03	16.60
15.634	200,000	1091.64	1092.81	8.87	1090.68	1091.77	8.37	1090.75	1091.84	8.34
15.734	200,000	1092.10	1093.25	8.67	1090.82	1092.11	9.10	1091.47	1092.07	6.61
15.834	200,000	1092.90	1093.65	7.26	1091.08	1092.49	9.55	1091.52	1092.31	7.42
15.934	200,000	1093.31	1093.96	6.88	1091.34	1093.00	10.34	1091.49	1092.72	9.13
16.034	200,000	1093.65	1094.25	6.49	1091.75	1093.58	10.86	1091.71	1093.22	9.98
16.134	200,000	1092.60	1095.45	13.56	1091.78	1094.74	13.82	1091.52	1094.30	13.38
16.178	205,000	1093.09	1096.05	13.79	1092.20	1095.51	14.58	1091.72	1095.24	15.05
16.188	205,000	1093.22	1096.16	13.76	1092.42	1095.66	14.43	1092.02	1095.42	14.78
16.202	205,000	1095.64	1097.91	12.08	1094.58	1097.11	12.76	1094.03	1096.71	13.15
16.213	205,000	1095.59	1098.14	12.91	1094.52	1097.40	13.61	1093.95	1097.03	14.08
16.254	205,000	1095.41	1098.88	14.96	1094.29	1098.32	16.10	1093.69	1098.07	16.79
16.347	205,000	1096.85	1101.91	18.34	1095.55	1102.29	20.83	1095.56	1102.29	20.82
16.428	205,000	1100.69	1103.52	14.04	1100.71	1104.41	15.43	1101.22	1104.26	14.28
16.528	205,000	1102.30	1104.58	12.68	1103.64	1105.52	11.60	1103.29	1105.27	11.88

Q = Flowrate, cublic feet per second
CWSEL = Computed water surface elevation, feet
EG = Energy grade line, feet
VCH = Channel velocity, feet per second

Table 5. Salt River channel bed comparison.

Station	Stream bed elevation (ft)	
	1984 FEMA	Model 1
15.173	1061.10	1061.10
15.235	1061.10	1061.10
15.335	1062.00	1063.60
15.434	1063.00	1060.10
15.534	1065.00	1059.60
15.634	1066.10	1059.90
15.734	1068.00	1057.80
15.834	1069.20	1061.40
15.934	1071.00	1064.10
16.034	1072.90	1067.40
16.134	1074.50	1072.00
16.178	1075.20	1075.20
16.188	1075.30	1075.30
16.202	1075.30	1075.30
16.213	1076.00	1076.00
16.254	1076.80	1076.80
16.347	1078.20	1078.20
16.428	1080.00	1080.00
16.528	1080.20	1080.20

Notes: Model 1 cross sections 15.173 and 16.178 through 16.528 were taken directly from the 1984 FEMA model. Cross sections 15.235 through 16.134 were developed from Cooper Aerial data.



LEGEND

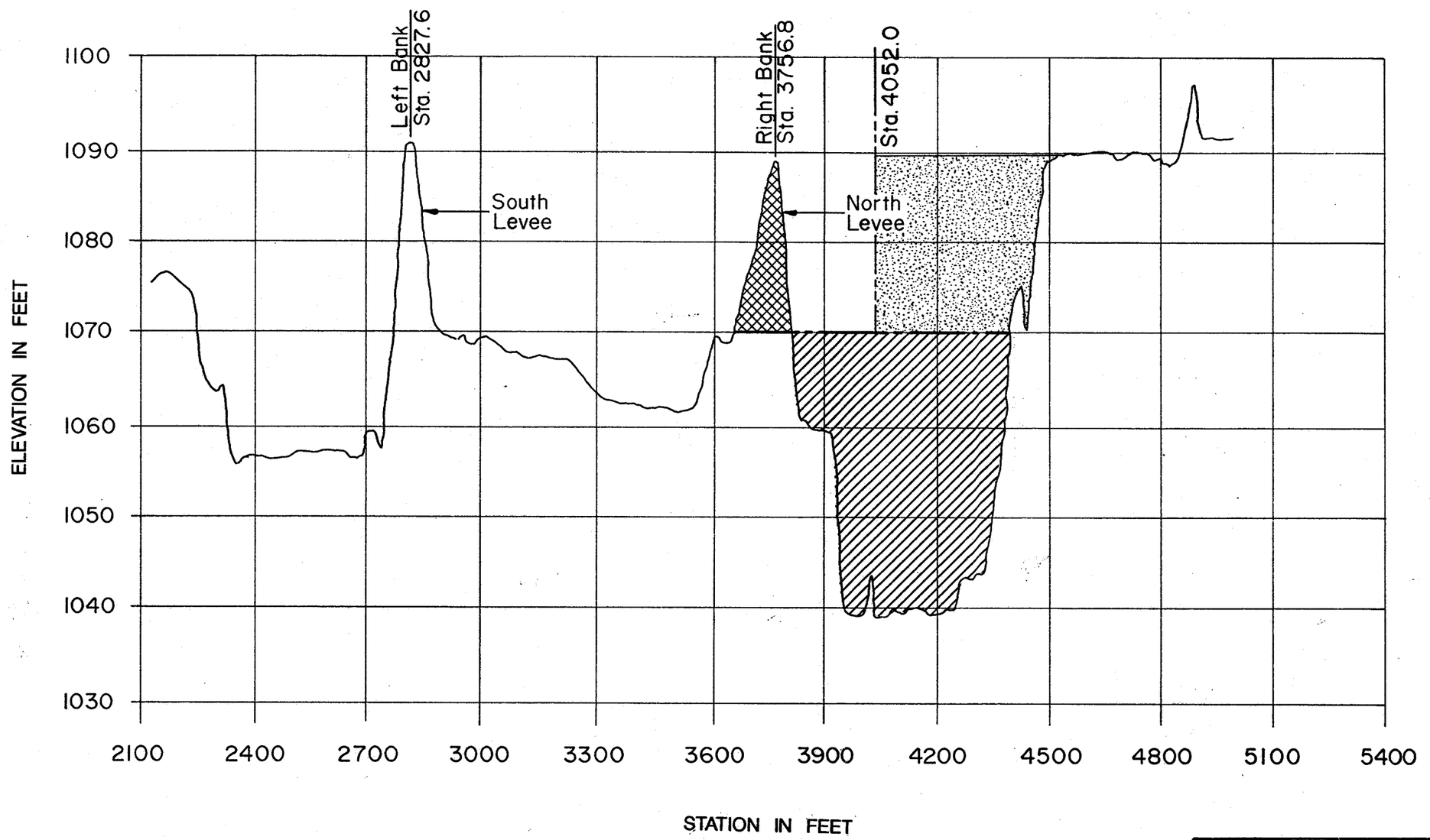
- CROSS SECTION PROFILE MODEL 1
- NORTH LEVEE REMOVED FOR MODEL 2
- GRAVEL PIT FILLED FOR MODEL 2
- INEFFECTIVE FLOW AREA FOR MODEL 2

CROSS SECTION NO. 15.734

LOOKING DOWNSTREAM

HYDRAULIC INVESTIGATION FOR THE SALT RIVER AT THE EAST TUNNEL OUTFALL SECTION 22 T.1 N., R.3 E. MARICOPA COUNTY, ARIZONA

FIGURE 2



LEGEND

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- NORTH LEVEE REMOVED FOR MODEL 2
- GRAVEL PIT FILLED FOR MODEL 2
- INEFFECTIVE FLOW AREA FOR MODEL 2

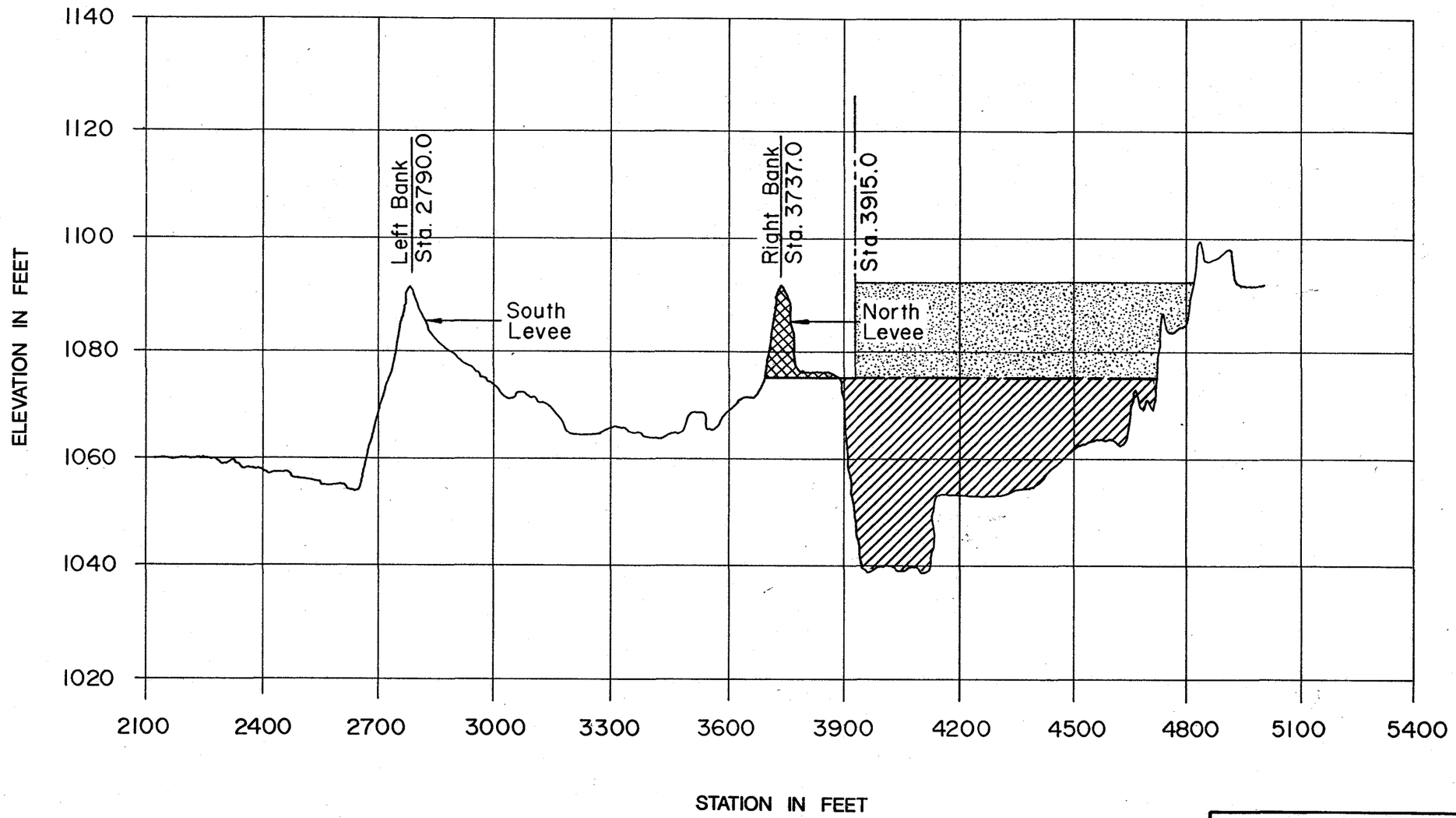
CROSS SECTION NO. 15.834

LOOKING DOWNSTREAM

HYDRAULIC INVESTIGATION FOR THE SALT RIVER AT THE EAST TUNNEL OUTFALL
SECTION 22 T.1 N., R.3 E.
MARICOPA COUNTY, ARIZONA

HNTB

FIGURE 3



LEGEND

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- NORTH LEVEE REMOVED FOR MODEL 2
- GRAVEL PIT FILLED FOR MODEL 2
- INEFFECTIVE FLOW AREA FOR MODEL 2

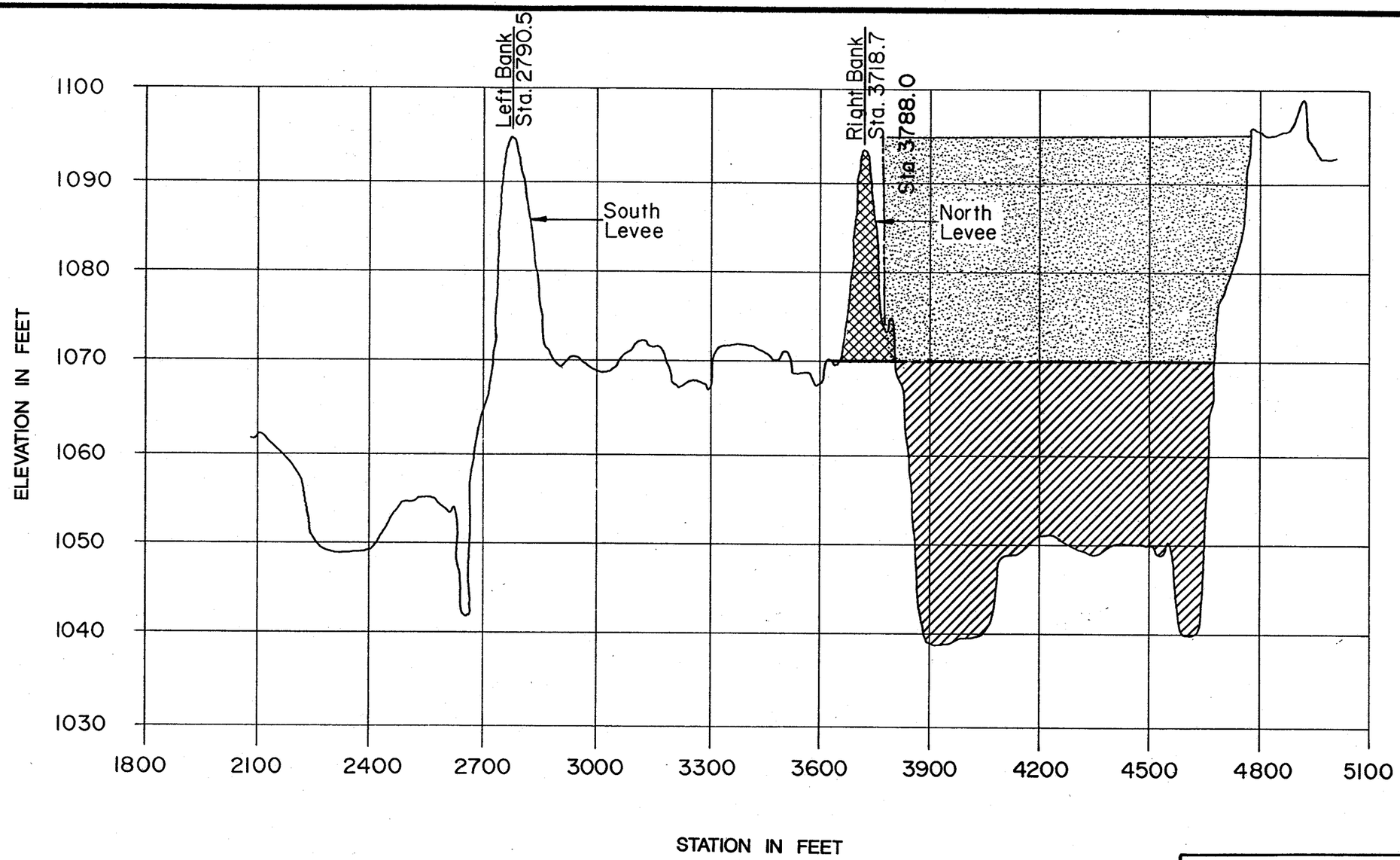
CROSS SECTION NO. 15.934

LOOKING DOWNSTREAM

HYDRAULIC INVESTIGATION FOR THE SALT RIVER AT THE EAST TUNNEL OUTFALL
SECTION 22 T.1 N., R.3 E.
MARICOPA COUNTY, ARIZONA

HNTB

FIGURE 4



LEGEND

- CROSS SECTION PROFILE MODEL 1
- NORTH LEVEE REMOVED FOR MODEL 2
- GRAVEL PIT FILLED FOR MODEL 2
- INEFFECTIVE FLOW AREA FOR MODEL 2

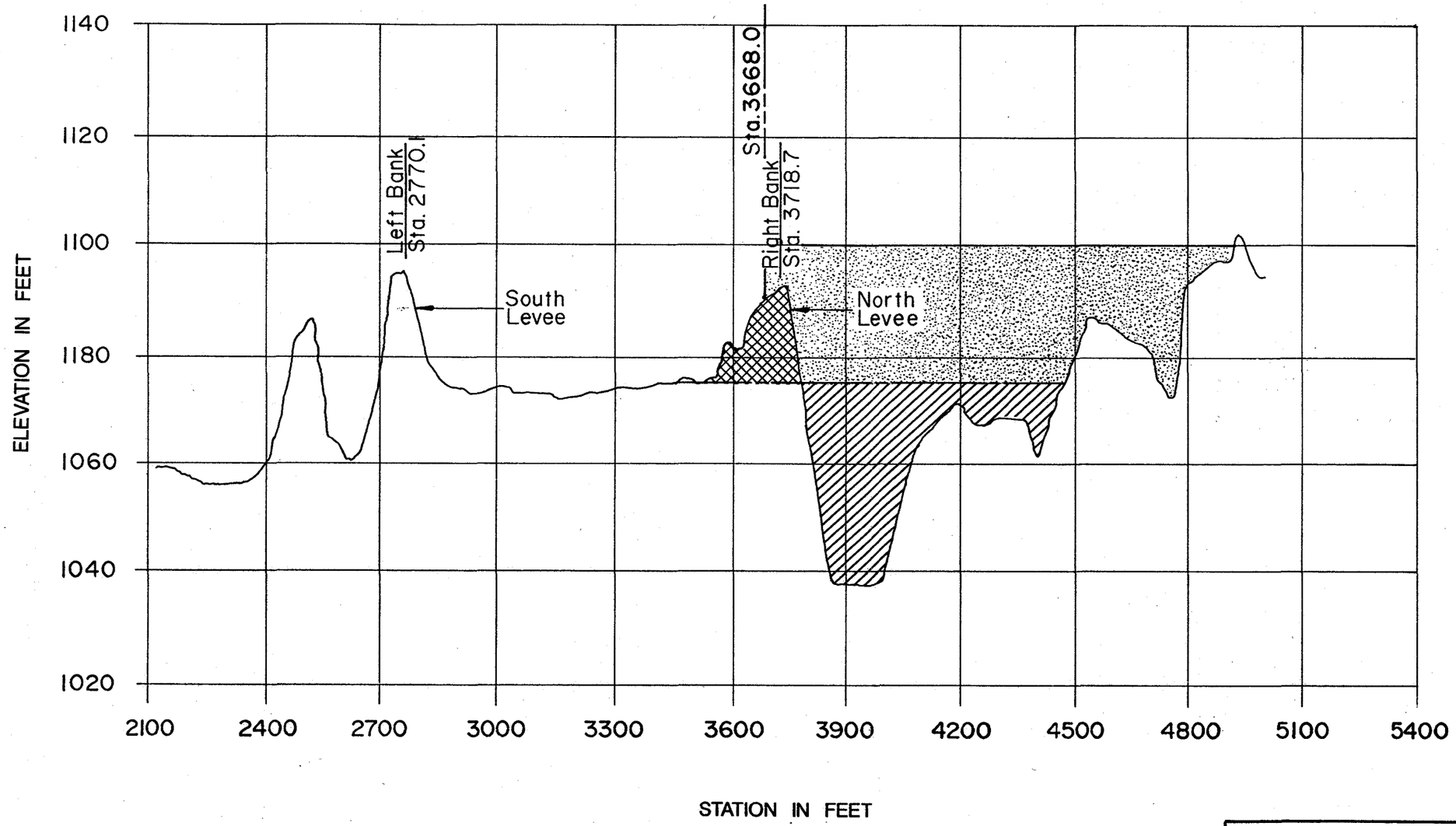
CROSS SECTION NO. 16.034

LOOKING DOWNSTREAM

HYDRAULIC INVESTIGATION FOR THE SALT RIVER AT THE EAST TUNNEL OUTFALL
SECTION 22 T.1 N., R.3 E.
MARICOPA COUNTY, ARIZONA

FIGURE 5

HNTB



LEGEND

- CROSS SECTION PROFILE MODEL 1
- NORTH LEVEE REMOVED FOR MODEL 2
- GRAVEL PIT FILLED FOR MODEL 2
- INEFFECTIVE FLOW AREA FOR MODEL 2

CROSS SECTION NO. 16.134

LOOKING DOWNSTREAM

HYDRAULIC INVESTIGATION FOR THE SALT RIVER AT THE EAST TUNNEL OUTFALL
SECTION 22 T.1 N., R.3 E.
MARICOPA COUNTY, ARIZONA

HNTB

FIGURE 6

Figure 7. Computed channel velocity.

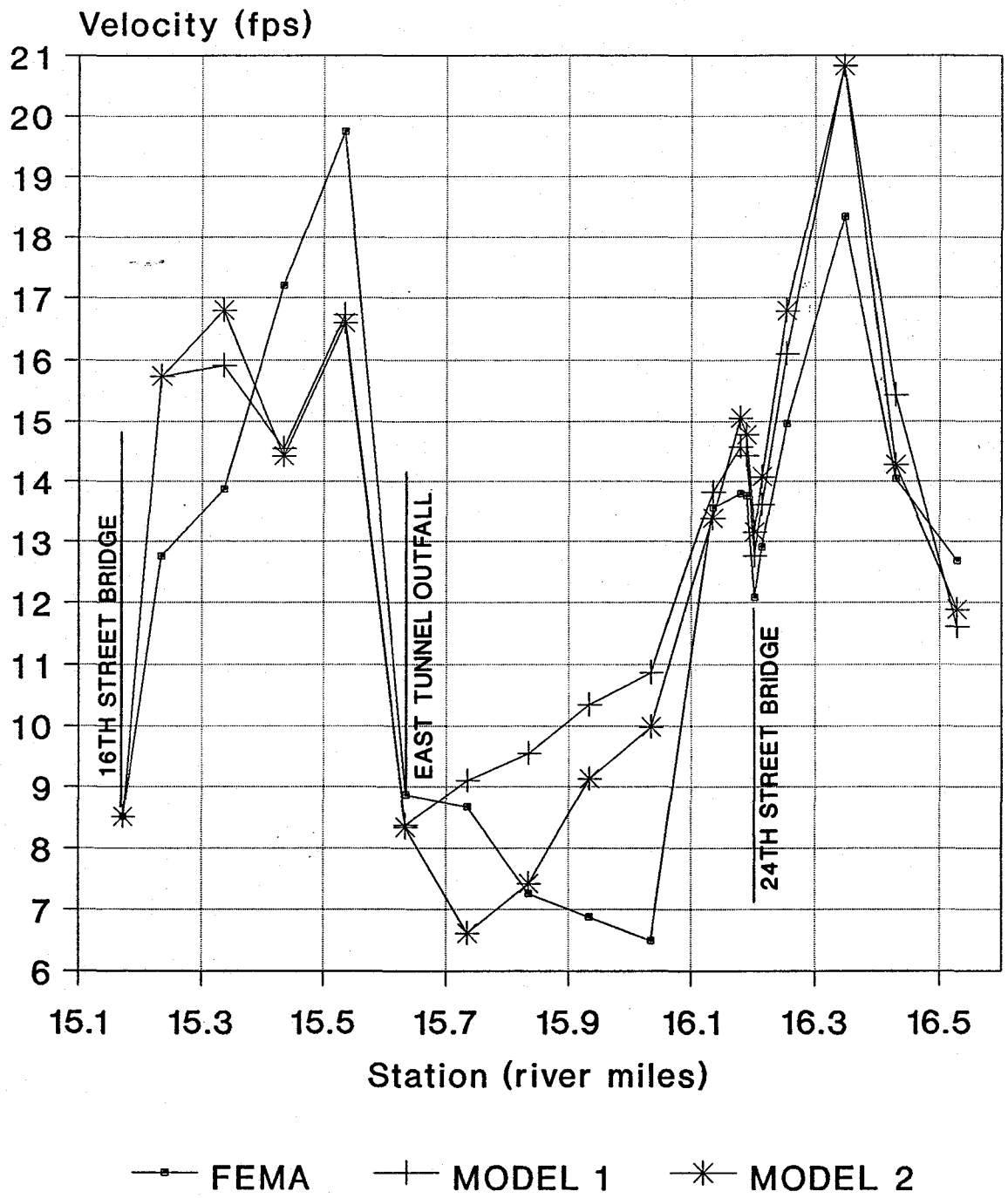


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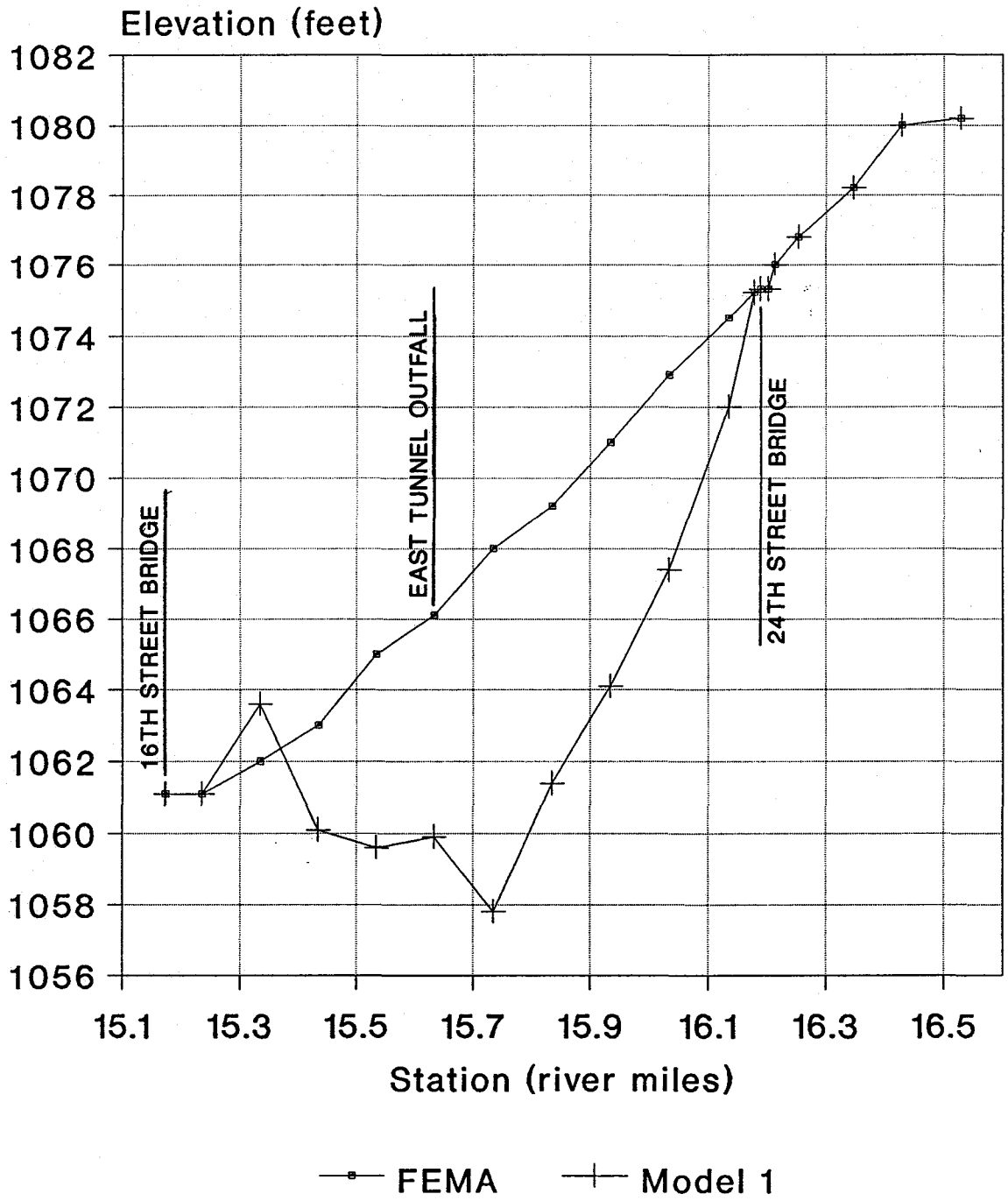
Figure 8. River bed profile comparison.



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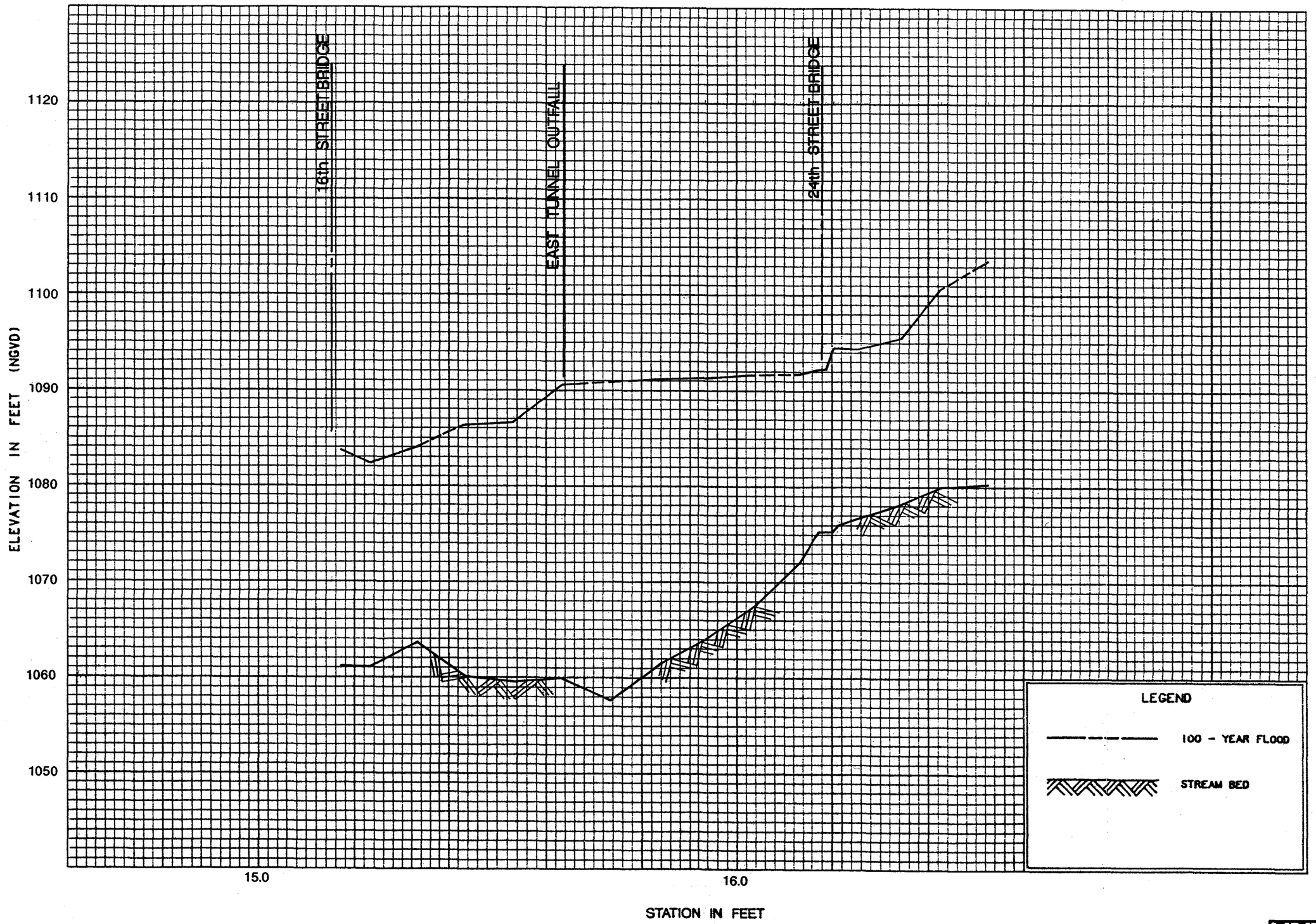


100 YEAR FLOOD PROFILE

MODEL 1

HYDRAULIC INVESTIGATION FOR THE
SALT RIVER AT THE EAST TUNNEL OUTFALL
SECTION 22 T.1 N., R.3 E.
MARICOPA COUNTY, ARIZONA

FIGURE 9

PHOTO 1 16th Street bridge over the Salt River. Viewer is on west side of bridge on south bank looking north. Approx. Station 15.134.

PHOTO 2 16th Street bridge over the Salt River. Viewer is on west side of bridge on south bank looking upstream (east). Approx. Station 15.134.

PHOTO 3 East Tunnel Outfall. Viewer is looking south from north end of outfall. Approx. Station 15. 634.

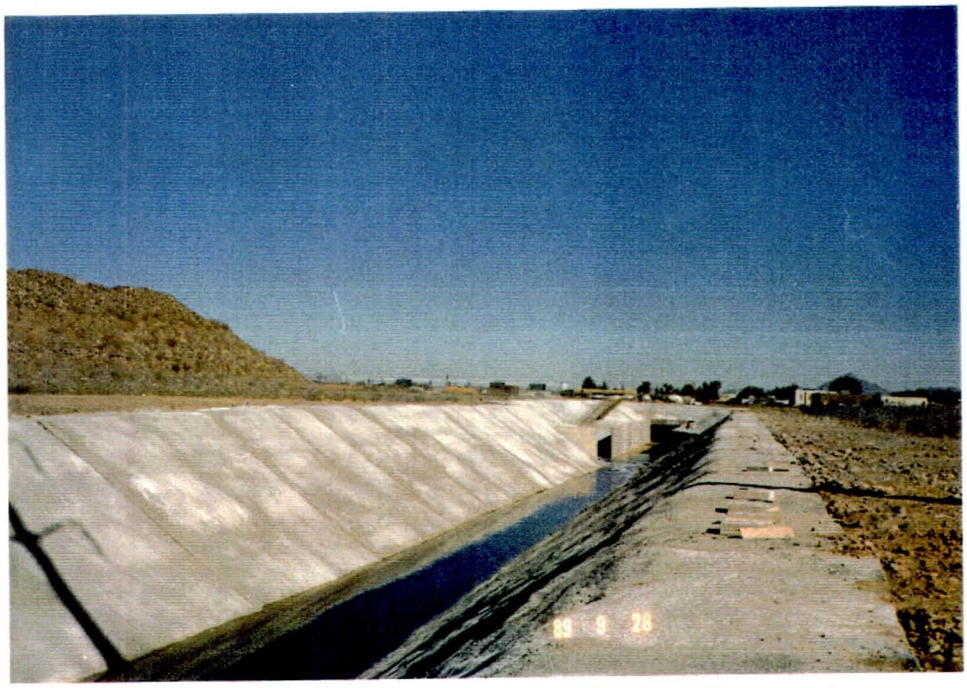


PHOTO 4 East Tunnel Outfall. Viewer is looking north from south end of outfall. Approx. Station 15.634.

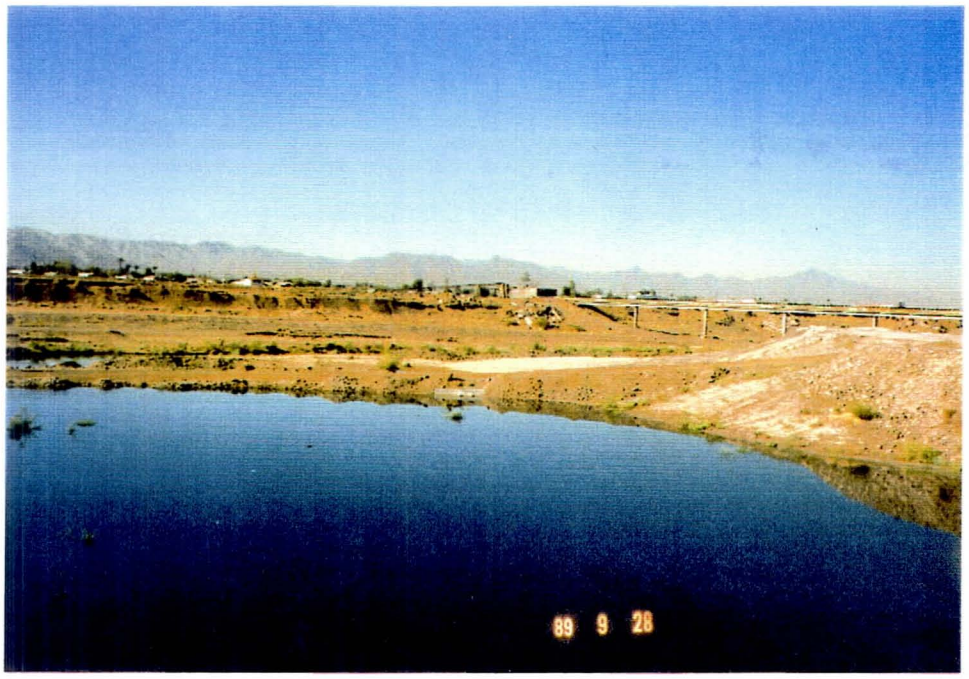


PHOTO 5 Salt River at East Tunnel Outfall. Viewer is at south end of outfall looking southwest (downstream). Photograph shows area where channel banks constrict. Approx. Station 15.534.

PHOTO 6 North levee. Viewer is at south end of East Tunnel Outfall looking upstream toward 24th Street bridge (east). North levee is on left side (north) of photograph. Note unimproved roadway atop levee.

PHOTO 7 Gravel Pit. Gravel pit located north side of north levee. North levee is located on left side of photograph, viewer is on northwest side of 24th Street bridge looking west toward East Tunnel Outfall.

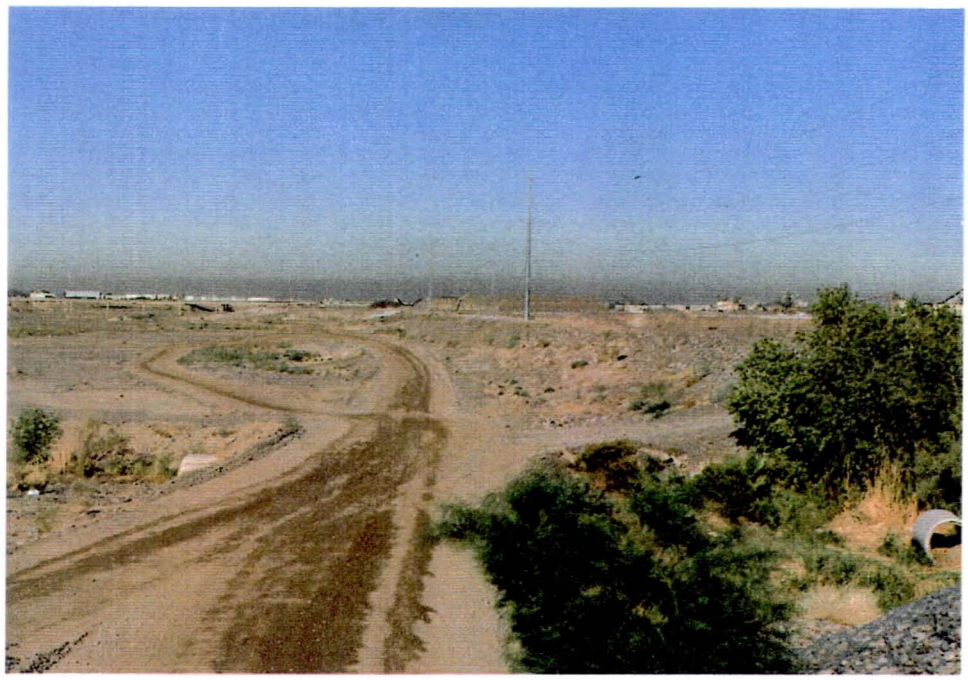


PHOTO 8 North Levee. Viewer is on northwest side of 24th Street bridge looking west toward East Tunnel Outfall. Note unimproved road goes under bridge.

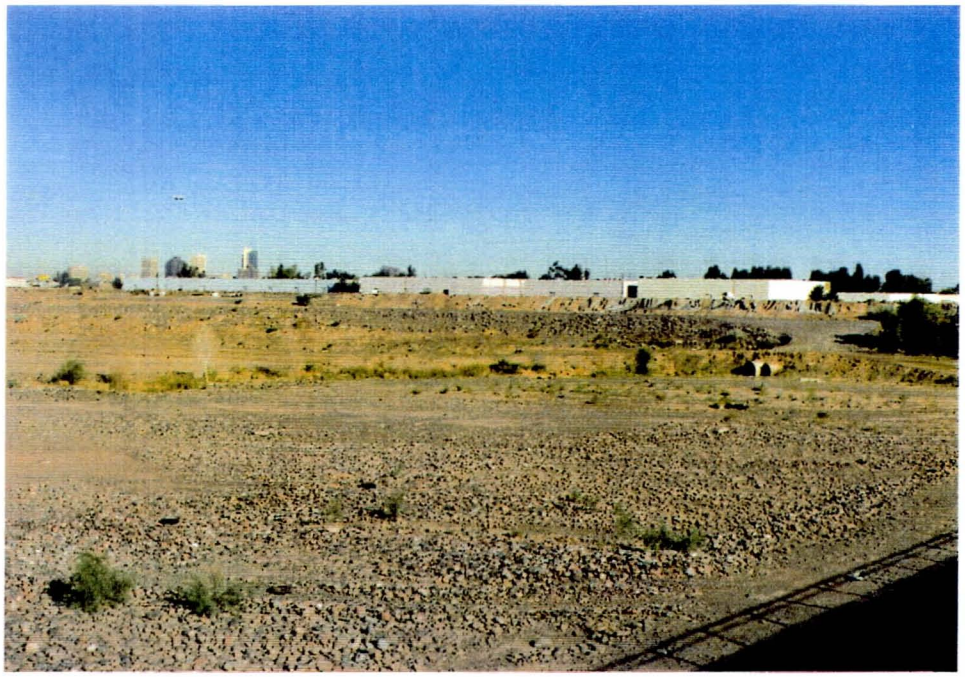


PHOTO 9 Salt River bottom south of North Levee. Viewer is on southwest side of 24th Street bridge looking northwest toward north levee.

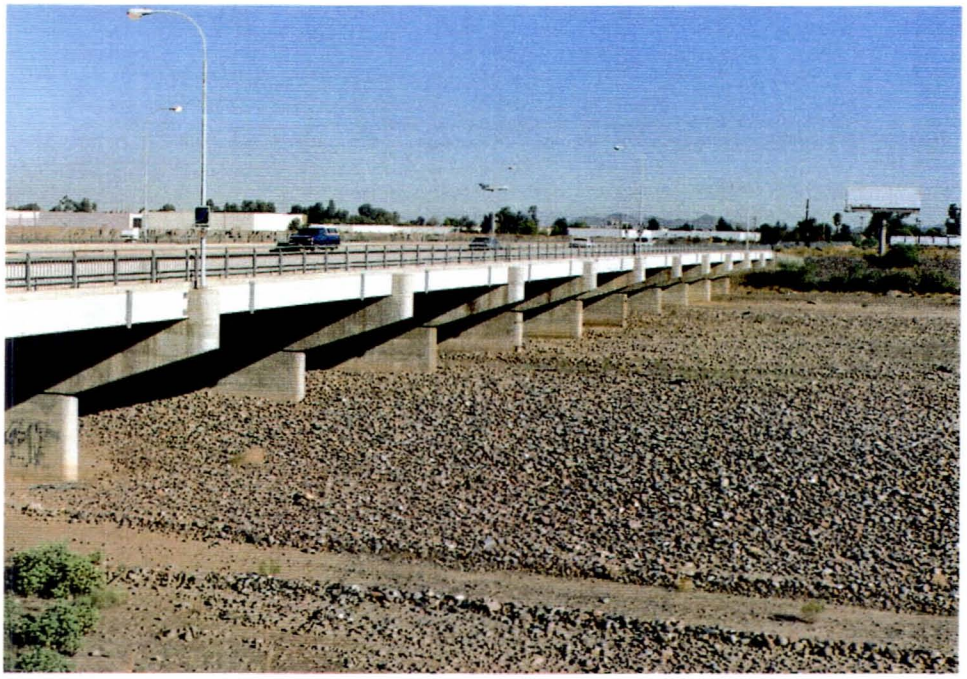


PHOTO 10 24th Street bridge. Viewer is on east side of river channel on south levee looking north. Approx. Station 16.213.

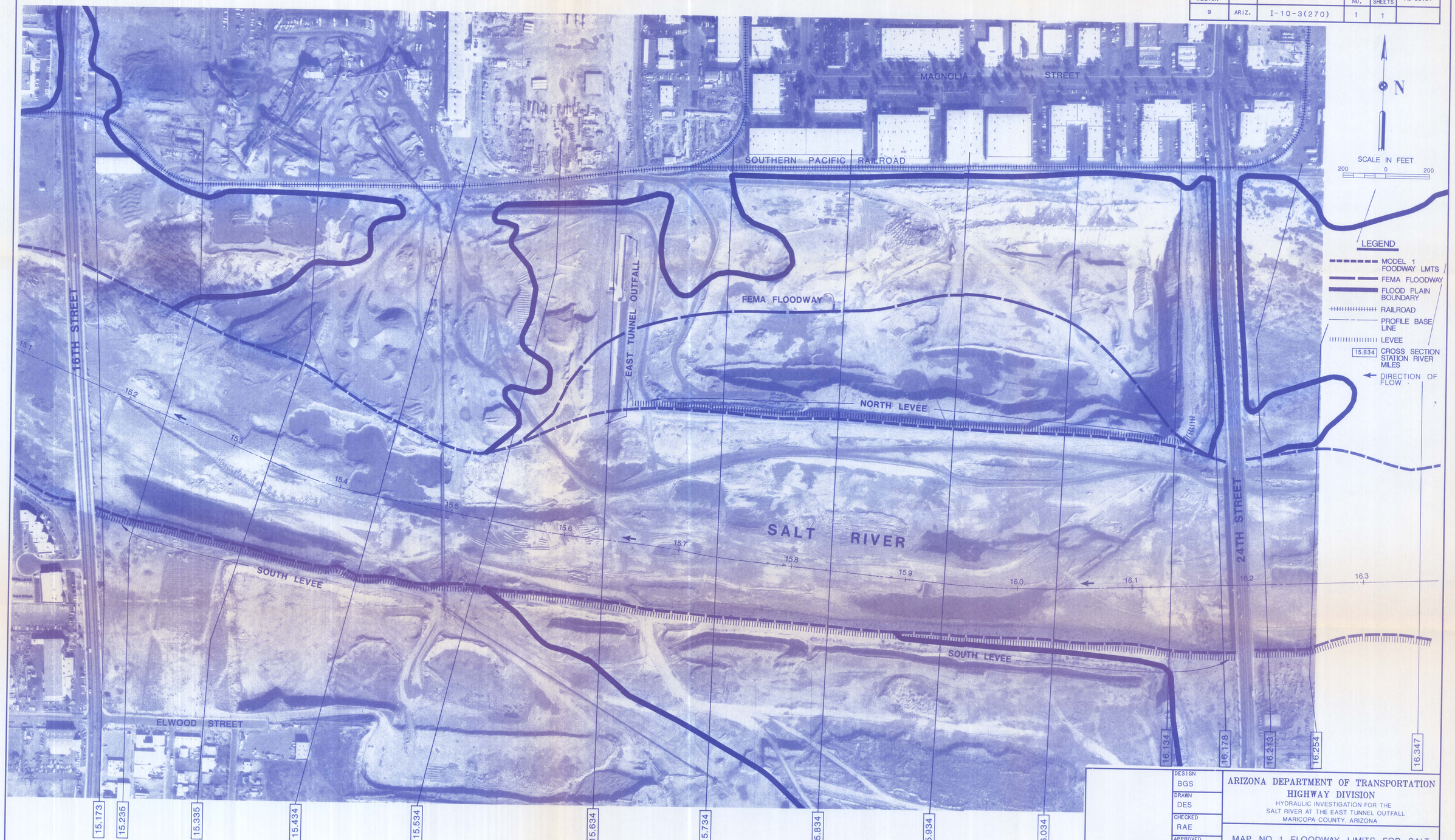
PHOTO 11 Salt River Channel & bottom. Viewer is on east of 24th Street bridge on south levee looking upstream (east).

APPENDIX

HNTB

PHOENIX - CASA GRANDE HIGHWAY
INNER LOOP - EAST TUNNEL OUTFALL
MARICOPA COUNTY

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	I-10-3(270)	1	1	



DESIGN	BGS
DRAWN	DES
CHECKED	RAE
APPROVED	

HNTB

ARIZONA DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
HYDRAULIC INVESTIGATION FOR THE
SALT RIVER AT THE EAST TUNNEL OUTFALL
MARICOPA COUNTY, ARIZONA

MAP NO. 1 FLOODWAY LIMITS FOR SALT RIVER CHANNEL BETWEEN 16th STREET AND 24th STREET, PHOENIX, ARIZONA

EAST TUNNEL OUTFALL

DWG. NO. M-1

MODEL 1

HNTB

```
C
C     30
C 15.173
C 15.173INPUT FILE = MODEL1.IH2
C 15.173THE FOLLOWING IS A HEC-2 INPUT FILE FOR THE SALT RIVER CHANNEL
C 15.173BETWEEN 16TH STREET BRIDGE AND 24TH STREET BRIDGE.  THIS STUDY
C 15.173EXAMINES WATER SURFACE PROFILES FOR THE 100-YEAR STORM WITH THE
C 15.173NORTH LEVEE IN PLACE.  THE NORTH LEVEE RUNS ON THE NORTH SIDE OF
C 15.173THE SALT RIVER CHANNEL FROM THE 24TH STREET BRIDGE TO THE EAST
C 15.173TUNNEL OUTFALL.
C 15.173
C 15.173CROSS SECTION 15.173 GR POINTS MATCH PREVI!OUS STUDY
C 15.173CROSS SECTION LOCATED UPSTREAM OF 16TH STREET BRIDGE
C 15.235CROSS SECTION 15.235 DEVELOPED FROM COOPER AERIAL DATA
C 15.335CROSS SECTION 15.335 DEVELOPED FROM COOPER AERIAL DATA
C 15.434CROSS SECTION 15.434 DEVELOPED FROM COOPER AERIAL DATA
C 15.534CROSS SECTION 15.534 DEVELOPED FROM COOPER AERIAL DATA
C 15.634CROSS SECTION 15.634 DEVEOPLED FROM COOPER AERIAL DATA
C 15.634CROSS SECTION 15.634 LOCATED AT EAST TUNNEL OUTFALL
C 15.734CROSS SECTION 15.734 DEVELOPED FROM COOPER AERIAL DATA
C 15.834CROSS SECTION 15.834 DEVELOPED FROM COOPER AERIAL DATA
C 15.934CROSS SECTION 15.934 DEVELOPED FROM COOPER AERIAL DATA
C 16.034CROSS SECTION 16.034 DEVELOPED FROM COOPER AERIAL DATA
C 16.134CROSS SECTION 16.134 DEVELOPED FROM COOPER AERIAL DATA
C 16.178
C 16.178FROM STATION 16.178 THROUGH STATION 16.628 ALL DATA WAS
C 16.178OBTAINED FROM THE 1984 FEMA MODEL.  STATIONS 16.178 THROUGH
C 16.178STATION 16.213 INPUT DATA FOR SPECIAL BRIDGE ROUTNE FOR
C 16.17824TH STREET BRIDGE
C 16.178
C 16.178
C 16.178
T1       HYDRAULIC ANALYSIS OF 1989 SALT RIVER WATER SURFACE (NEGL EXTRA FUTURE
T2       ROOSEVELT DAM FLOOD CAPACITY). STARTING EL FOR 100 YR EVENT IS   1083.77
T3       100-YEAR Q = 200000 CFS, SUBCRITICAL RUN FROM 16TH TO 24TH STREETS (NAT)
J1             2                                                  1083.77
J2     1       0       1                                  -1
J3   110      38      26       8       4       1      13      14      15      23
J3    24     150     200
NC 0.045   0.045   0.033      .1      .3
QT     2  200000  200000
X115.173       8    9430   10560       0       0       0
GR  1091    9310    1090    9430    1065    9482  1061.1    9550  1061.1   10450
GR  1080   10550    1086   10560    1086   10570
X115.235      13    2470    3470     130     490     330
X3  10.0
GR1087.8    1594    1089    1854    1093    2289 1088.67    2415 1088.97    2470
GR1061.1    2810  1061.1    3000  1061.1    3171 1089.76    3470  1087.7    3520
GR1074.3    3580  1082.3    3753  1083.8    3881
ET                 9.1                                          2700    3460
X115.335      11    2560    3620     510     530     528
X3  10.0
GR  1088    1765  1089.4    1955 1089.31    2145 1073.85    2485  1090.7    2560
GR1063.6    2840  1063.8    3000  1064.1    3180  1085.2    3555  1098.1    3620
GR1085.5    3910
X115.434      10    2610    3355     550     580     525
X3  10.0
GR1090.2    1948 1060.21    2368  1091.6    2610  1062.6    2780 1061.39    3000
GR1060.1    3210  1093.2    3355  1087.8    3625 1087.30    4050  1086.6    4475
ET           7.1     7.1                              2670    3320
```

X115.534	26	2670	3320	550	520	528			‖
GR1071.6	1911	1058.4	2210	1092.6	2440	1089.1	2455	1089.7	2670
GR1078.8	2690	1070.0	2720	1067.5	2740	1063.9	2769	1066.4	2788
GR1065.8	2801	1061.2	2852	1063.5	2892	1061.8	3000	1063.4	3012
GR1059.6	3030	1065.2	3105	1063.3	3120	1074.3	3210	1086.6	3318
GR1088.0	3320	1087.8	3580	1086.7	4040	1095.7	4170	1094.8	4275
GR1088.0	4675								
ET	7.1	7.1				2898.4	3790		
X115.634	62	2898.4	4627.6	590	475	528			
X3 10								1095.0	
GR1074.4	2193.3	1074.3	2272.3	1067.6	2296.0	1063.8	2352.1	1061.1	2409.1
GR1061.1	2484.5	1060.0	2539.0	1059.6	2621.0	1059.4	2694.4	1059.9	2707.9
GR1077.6	2756.9	1061.0	2788.7	1061.0	2801.1	1061.0	2815.6	1062.5	2828.5
GR1084.6	2846.3	1085.2	2854.0	1087.1	2865.5	1086.6	2885.9	1087.3	2898.4
GR1074.0	2925.7	‖ 1071.6	2964.4	1069.0	2977.8	1064.2	3027.8	1064.7	3079.6
GR1064.4	3147.3	1064.51	3190	1064.5	3228.5	1062.5	3301.3	1061.5	3345.7
GR1061.4	3371.7	1064.5	3397.4	1063.8	3441.3	1061.9	3452.6	1061.4	3516.2
GR1061.8	3590.0	1059.9	3664.3	1060.5	3718.6	1063.3	3734.1	1060.0	3750.2
GR1060.2	3790.0	1060.4	3803.2	1063.2	3863.4	1066.2	3920.1	1068.5	3998.0
GR1071.6	4069.8	1073.9	4143.6	1075.1	4220.7	1075.1	4273.2	1080.6	4301.3
GR1080.6	4327.7	1066.1	4337.8	1067.5	4367.8	1072.6	4419.2	1077.7	4471.1
GR1082.7	4515.1	1088.8	4574.7	1092.9	4627.6	1090.1	4712.4	1087.4	4825.7
GR1087.2	4897.5	1087.3	5000.0						
NC	0.040								
ET	7.1	7.1				2862.4	3792.4		
X115.734	83	2862.4	3792.4	525	525	528			
GR1062.8	2190.5	1061.7	2257.4	1059.6	2325.5	1062.2	2345.3	1063.6	2395.8
GR1062.9	2458.9	1066.8	2482.0	1065.8	2496.6	1069.4	2512.9	1069.6	2562.0
GR1069.3	2603.8	1073.0	2618.7	1060.2	2645.6	1059.7	2672.8	1076.3	2720.8
GR1061.4	2752.6	1061.0	2762.2	1061.0	2781.1	1058.4	2789.0	1070.2	2809.3
GR1089.1	2839.5	1089.1	2862.4	1068.8	2923.3	1069.3	2985.1	1065.5	3022.5
GR1066.4	3045.9	1067.0	3099.7	1066.56	3125.0	1065.8	3168.0	1064.7	3224.9
GR1063.8	3271.2	1060.1	3321.8	1057.8	3341.1	1059.9	3366.6	1060.4	3413.0
GR1059.7	3457.7	1063.1	3475.7	1064.7	3508.2	1066.7	3532.1	1067.4	3570.6
GR1065.8	3589.1	1068.1	3638.9	1068.3	3669.1	1067.7	3706.7	1068.4	3726.7
GR1088.6	3768.1	1088.5	3792.4	1080.3	3805.2	1081.1	3814.7	1070.6	3837.3
GR1069.7	3898.9	1068.9	3931.0	1070.9	3944.3	1048.3	3978.0	1040.9	3992.0
GR1046.9	4007.5	1044.7	4014.2	1044.4	4055.8	1044.3	4111.7	1045.5	4174.1
GR1045.8	4252.0	1045.2	4313.9	1050.8	4338.1	1061.0	4382.0	1069.2	4414.0
GR1069.8	4454.8	1069.1	4472.3	1078.3	4501.8	1095.8	4539.7	1096.6	4573.4
GR1096.6	4641.1	1096.5	4707.1	1096.3	4783.4	1090.5	4811.0	1091.1	4830.8
GR1091.2	4852.4	1097.0	4867.3	1096.9	4878.9	1091.2	4891.5	1091.3	4920.7
GR1091.9	4969.3	1090.1	4977.2	1089.6	5000.0	0.0	0.0	0.0	0.0
ET	7.1	7.1				2827.6	3756.8		
X115.834	75	2827.6	3756.8	525	535	528			
GR1075.7	2134.6	1077.0	2170.6	1076.4	2197.6	1073.8	2241.1	1065.9	2266.0
GR1064.2	2283.3	1063.7	2310.6	1064.3	2323.4	1056.2	2341.2	1056.6	2409.9
GR1056.7	2483.9	1057.4	2543.8	1057.4	2625.7	1056.8	2684.0	1058.4	2695.6
GR1060.0	2710.2	1059.0	27‖30.5	1057.9	2745.7	1073.1	2782.2	1091.2	2807.4
GR1091.2	2827.6	1080.3	2863.2	1070.7	2890.1	1069.9	2942.1	1069.0	2989.7
GR1069.8	3005.6	1069.6	3028.1	1068.0	3073.9	1068.05	3080.0	1067.5	3158.1
GR1067.3	3235.4	1064.6	3280.8	1063.4	3328.1	1062.7	3393.4	1062.1	3470.9
GR1061.4	3530.7	1062.2	3558.2	1069.5	3600.6	1069.4	3653.3	1074.4	3683.4
GR1079.7	3722.0	1089.1	3756.8	1088.9	3777.8	1060.9	3829.9	1059.9	3890.0
GR1059.2	3926.8	1039.6	3958.5	1039.6	4018.0	1044.0	4028.8	1039.2	4037.4
GR1039.5	4115.5	1040.1	4153.4	1039.7	4197.2	1040.5	4252.4	1044.2	4268.1
GR1043.7	4278.8	1044.0	4330.9	1053.7	4362.0	1054.5	4369.7	1062.7	4388.2
GR1073.8	4410.8	1075.5	4437.0	1070.6	4447.7	1075.9	4463.1	1089.0	4492.1
GR1090.1	4571.1	1090.1	4637.6	1089.4	4700.9	1089.6	4744.0	1089.5	4805.3
GR1088.7	4821.1	1088.7	4849.6	1097.5	4896.1	1091.3	4909.4	1091.6	5000.0

```
ET          7.1     7.1                         2790    3737
X115.934     59    2790    3737     520     530     528
GR1060.1  2240.0 1054.26  2650.0 1091.76  2790.0  1082.2  2840.0 1071.09  3040.0
GR1072.3  3078.4  1070.6  3131.0  1067.0  3176.4  1064.2  3190.5  1064.2  3284.2
GR1065.2  3297.6  1065.8  3333.7  1064.1  3401.9  1064.7  3486.4  1068.1  3505.9
GR1068.1  3540.3  1065.6  3546.2  1065.3  3577.2  1068.7  3593.3  1071.0  3640.7
GR1071.0  3667.0  1072.8  3694.6  1092.0  3737.0  1090.8  3756.6  1075.5  3782.7
GR1075.7  3842.8  1075.4  3888.0  1054.9  3914.3  1039.5  3942.0  1039.6  3982.4
GR1040.0  3993.4  1039.8  4064.0  1040.4  4087.9  1039.6  4092.0  1039.6  4129.0
GR1054.4  4137.6  1053.6  4147.4  1053.3  4235.0  1053.9  4318.2  1054.7  4384.5
GR1056.8  4435.9  1062.0  4504.0  1063.6  4578.6  1063.1  4636.2  1072.9  4664.4
GR1070.0  4671.3  1069.5  4682.5  1071.5  4695.2  1069.1  4708.9  1075.1  4722.4
GR1086.9  4737.2  1083.4  4752.6  1084.5  4800.6  1100.5  4835.9  1096.0  4852.1
GR1096.3  4888.9  1098.0  4913.1  1092.1  4927.3  1091.6  5000.0
ET          7.1     7.1                         2790.5  3718.7
X116.034     81  2790.5  3718.7     525     520     528
GR1061.5  2083.2  1061.8  2112.5  1060.0  2167.4  1057.5  2218.6  1050.0  2248.0
GR1049.1  2294.7  1049.1  2379.3  1049.9  2421.5  1054.4  2483.3  1055.1  2564.6
GR1053.5  2619.9  1054.4  2627.4  1052.9  2633.9  1042.7  2640.2  1042.7  2668.4
GR1057.1  2674.0  1062.7  2691.5  1063.5  2706.2  1070.4  2730.0  1094.4  2767.1
GR1094.7  2790.5  1086.5  2829.1  1071.9  2867.9  1069.7  2904.7  1070.9  2947.0
GR1068.9  3008.6  1069.0  3030.0  1069.1  3050.9  1072.2  3116.4  1072.1  3170.8
GR1067.6  3209.4  1067.8  3270.8  1067.4  3303.2  1072.1  3320.5  1071.7  3420.8
GR1070.4  3491.8  1071.1  3505.4  1071.0  3524.7  1069.0  3535.1  1069.4  3579.3
GR1067.4  3606.6  1070.7  3623.8  1069.9  3651.4  1070.6  3666.5  1079.9  3698.1
GR1092.4  3718.7  1092.4  3741.1  1074.4  3775.1  1073.2  3793.9  1075.4  3800.8
GR1068.4  3816.2  1068.3  3826.1  1058.2  3844.7  1041.0  3871.8  1039.4  3891.1
GR1039.5  4045.5  1041.8  4077.8  1048.4  40!87.1  1048.7  4111.8  1049.1  4152.0
GR1051.2  4199.2  1051.2  4237.1  1049.8  4272.0  1049.1  4351.4  1049.8  4401.5
GR1049.8  4473.2  1049.1  4539.2  1050.7  4553.1  1040.1  4579.3  1040.3  4633.3
GR1054.1  4654.6  1076.6  4688.2  1081.2  4734.2  1086.5  4768.3  1096.4  4788.5
GR1095.6  4793.6  1095.4  4838.2  1095.7  4897.9  1099.5  4926.7  1092.9  4940.4
GR1092.8  5000.0
ET          7.1     7.1                         2770.1  3748
X116.134     69  2770.1  3748.0     540     520     528
GR1059.3  2133.8  1058.7  2165.0  1056.6  2251.6  1056.3  2322.0  1057.5  2379.2
GR1062.1  2420.4  1074.0  2462.2  1082.9  2486.8  1084.7  2509.1  1087.2  2523.9
GR1065.6  2563.2  1062.8  2596.6  1060.4  2627.2  1062.8  2650.3  1070.2  2681.1
GR1084.1  2715.0  1096.6  2737.8  1096.2  2746.9  1095.8  2770.1  1078.1  2831.8
GR1074.4  2880.1  1072.9  2949.7  1073.6  3021.9 1073.41  3055.0  1073.1  3109.6
GR1072.0  3184.6  1072.9  3267.0  1074.2  3321.6  1074.1  3365.0  1074.8  3440.7
GR1075.8  3496.7  1074.7  3509.3  1075.6  3561.3  1082.1  3586.0  1082.5  3611.9
GR1081.0  3625.8  1086.9  3654.1  1091.7  3714.9  1092.8  3748.0  1071.0  3791.1
GR1052.7  3834.2  1038.7  3861.2  1038.7  4004.5  1053.4  4047.0  1062.7  4081.0
GR1067.5  4135.4  1070.8  4195.0  1067.8  4246.2  1068.8  4318.1  1068.7  4373.8
GR1061.5  4401.9  1066.0  4424.8  1073.0  4464.3  1080.7  4506.3  1087.0  4542.9
GR1086.2  4595.0  1083.5  4646.8  1081.2  4698.0  1074.7  4727.7  1072.2  4756.5
GR1077.8  4775.6  1092.5  4797.2  1094.7  4835.5  1097.2  4878.3  1097.4  4913.4
GR1102.0  4932.7  1097.6  4965.3  1095.3  4974.3  1094.6  5000.0
NC     0      0       0      .3      .5
QT     2 205000  205000
ET          7.1     7.1                         9660   10600
X116.178     14    9660   10600     200     220     230
GR  1100   8050    1095    8180    1090    8360    1085    8470  !  1085    8660
GR  1090   8880    1095    9070  1095.5    9420    1097    9660    1080    9720
GR1075.2   9830  1075.2   10510    1096   10600    1096   10605
X116.188     10    3076  3934.5      60      60      50
X3    10                                         1094.5  1094.5
GR1099.4   3075  1099.4    3076  1094.9    3077  1089.5    3078  1075.3    3110
GR1075.3   3904  1089.5    3933  1094.9    3934  1099.5  3934.5  1099.5    3935
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SB   0.9     1.6     2.5       0     794    71.5   14923     0.5  1075.3  1075.2
X116.202                              77      77      77
X2                     1  1094.9  1099.4                    1.33
X3    10                                                  1099.4  1099.4
BT     3    3075  1099.4            3507  1099.8            3935  1099.5
ET            7.1     7.1                                 9690   10570
X116.213        8    9690   10570      60      60      60
GR  1100     9600    1095    9690    1080    9720    1077    9840    1076    9890
GR  1076    10510    1095   10570  1099.5   10800
NC                                  .1      .3
ET            7.1     7.1                                 9680   10570
X116.254        7    9680   10570     200     270     215
GR1101.5     9580    1100    9680  1076.8    9750  1076.8   10350    1080   10380
GR  1095    10570  1099.5   10800
ET            7.1     7.1                                 9700   10480
X116.347       12    9700   10480     500     470     490
GR1107.5     9580    1105    9700  1078.2    9800  1078.2   10210  1088.8   10260
GR  1084    10340    1085   10350    1095   10480    1094   10650    1095   11000
GR  1095    11150    1101   11290
ET                    9.1     9.1                                    9620   10800
X116.428       15    9620   10450     470     370     430
X3    10
GR  1105     9550    1100    9620    1080    9750    1080    9950  1083.4   10100
GR  1080    10250  1087.3   10330    1103   10450    1100   10451    1100   10550
GR  1095    10680  1090.5   10810    1095   10920    1100   11180  1101.5   11300
ET            4.1     9.1           11100                           9600   10900
X116.528       19    9600   10370     560     430     528
X3    10
GR  1104     9480    1100    9600    1095    9610    1090    9650    1085    9700
GR  1082     9850  1080.2    9980  1080.2   10200    1085   10280    1090   10350
GR  1099    10370    1095   10400    1095   10570    1096   10650    1095   10720
GR1092.5     10800    1095   10900    1100   11100    1102   11320
EJ
T1       HYDRAULIC ANALYSIS OF 1989 SALT RIVER WATER SURFACE (NEGL EXTRA FUTURE
T2       ROOSEVELT DAM FLOOD CAPACITY). STARTING EL FOR 100 YR EVENT IS   1083.77
T3       100-YEAR Q = 200000 CFS, SUBCRITICAL RUN FROM 16TH TO 24TH STREETS (NAT)
J1             3                                                  1083.77
J2    15               1                                   -1


ER
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*******************************************************
*  WATER SURFACE PROFILES                             *
*  VERSION OF NOVEMBER 1976                           *
*  UPDATED MAY 1984                                   *
*                                                     *
*  RUN DATE  2-OCT-89  TIME 15:23:40                  *
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****************************************
*  U.S. ARMY CORPS OF ENGINEERS        *
*  THE HYDROLOGIC ENGINEERING CENTER   *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616             *
*  (916) 440-2105 (FTS) 448-2105       *
****************************************
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X     X  XXXXXXX   XXXXX            XXXXX
X     X  X        X     X       !   X     X
X     X  X        X                     X
XXXXXXX  XXXX     X          XXXXX   XXXXX
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX            XXXXXXX
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*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55
*****************************************************

C
T1      HYDRAULIC ANALYSIS OF 1989 SALT RIVER WATER SURFACE (NEGL EXTRA FUTURE
T2      ROOSEVELT DAM FLOOD CAPACITY). STARTING EL FOR 100 YR EVENT IS   1083.77
T3      100-YEAR Q = 200000 CFS, SUBCRITICAL RUN FROM 16TH TO 24TH STREETS (NAT)

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0.       2.        0.        0.  0.000000      0.00       0.0       0.  1083.770     0.000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     1.000     0.000    -1.000     0.000     0.000     0.000    -1.000     0.000     0.000     0.000

J3  VARIABLE CODE#S FOR SUMMARY PRINTOUT

   110.000    38.000    26.000     8.000     4.000     1.000    13.000    14.000    15.000    23.000


    24.000   150.000   200.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000


NC      0.045      0.045      0.033      0.100      0.300      0.000      0.000      0.000      0.000      0.000
QT      2.000 200000.000 200000.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000

        INPUT FILE = MODEL1.IH2
        THE FOLLOWING IS A HEC-2 INPUT FILE FOR THE SALT RIVER CHANNEL
        BETWEEN 16TH STREET BRIDGE AND 24TH STREET BRIDGE.  THIS STUDY
        EXAMINES WATER SURFACE PROFILES FOR THE 100-YEAR STORM WITH THE
        NORTH LEVEE IN PLACE.  THE NORTH LEVEE RUNS ON THE NORTH SIDE OF
        THE SALT RIVER CHANNEL FROM THE 24TH STREET BRIDGE TO THE EAST
        TUNNEL OUTFALL.

        CROSS SECTION 15.173 GR POINTS MATCH PREVIOUS STUDY
        CROSS SECTION LOCATED UPSTREAM OF 16TH STREET BRIDGE
X1     15.173      8.000   9430.000  10560.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1091.000   9310.000   1090.000   9430.000   1065.000   9482.000   1061.100   9550.000   1061.100  10450.000
GR   1080.000  10550.000   1086.000  10560.000   1086.000  10570.000      0.000      0.000      0.000      0.000

        CROSS SECTION 15.235 DEVELOPED FROM COOPER AERIAL DATA
X1     15.235     13.000   2470.000   3470.000    130.000    490.000    330.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1087.800   1594.000   1089.000   1854.000   1093.000   2289.000   1088.670   2415.000   1088.970   2470.000
GR   1061.100   2810.000   1061.100   3000.000   1061.100   3171.000   1089.760   3470.000   1087.700   3520.000
GR   1074.300   3580.000   1082.300   3753.000   1083.800   3881.000      0.000      0.000      0.000      0.000
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ET      0.000      0.000      9.100      0.000      0.000      0.000      0.000      0.000   2700.000   3460.000
        CROSS SECTION 15.335 DEVELOPED FROM COOPER AERIAL DATA
X1     15.335     11.000   2560.000   3620.000    510.000    530.000    528.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1088.000   1765.000   1089.400   1955.000   1089.310   2145.000   1073.850   2485.000   1090.700   2560.000
GR   1063.600   2840.000   1063.800   3000.000   1064.100   3180.000   1085.200   3555.000   1098.100   3620.000
GR   1085.500   3910.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000

        CROSS SECTION 15.434 DEVELOPED FROM COOPER AERIAL DATA
X1     15.434     10.000   2610.000   3355.000    550.000    580.000    525.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1090.200   1948.000   1060.210   2368.000   1091.600   2610.000   1062.600   2780.000   1061.390   3000.000
GR   1060.100   3210.000   1093.200   3355.000   1087.800   3625.000   1087.300   4050.000   1086.600   4475.000

ET      0.000      7.100      7.100      0.000      0.000      0.000   2670.000   3320.000      0.000      0.000
        CROSS SECTION 15.534 DEVELOPED FROM COOPER AERIAL DATA
X1     15.534     26.000   2670.000   3320.000    550.000    520.000    528.000      0.000      0.000      0.000
GR   1071.600   1911.000   1058.400   2210.000   1092.600   2440.000   1089.100   2455.000   1089.700   2670.000
GR   1078.800   2690.000   1070.000   2720.000   1067.500   2740.000   1063.900   2769.000   1066.400   2788.000
GR   1065.800   2801.000   1061.200   2852.000   1063.500   2892.000   1061.800   3000.000   1063.400   3012.000
GR   1059.600   3030.000   1065.200   3105.000   1063.300   3120.000   1074.300   3210.000   1086.600   3318.000
GR   1088.000   3320.000   1087.800   3580.000   1086.700   4040.000   1095.700   4170.000   1094.800   4275.000
GR   1088.000   4675.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000

ET      0.000      7.100      7.100      0.000      0.000      0.000   2898.400   3790.000      0.000      0.000
        CROSS SECTION 15.634 DEVEOPLED FROM COOPER AERIAL DATA
        CROSS SECTION 15.634 LOCATED AT EAST TUNNEL OUTFALL
X1     15.634     62.000   2898.400   4627.600    590.000    475.000    528.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000   1095.000      0.000
GR   1074.400   2193.300   1074.300   2272.300   1067.600   2296.000   1063.800   2352.100   1061.100   2409.100
GR   1061.100   2484.500   1060.000   2539.000   1059.600   2621.000   1059.400   2694.400   1059.900   2707.900
GR   1077.600   2756.900   1061.000   2788.700   1061.000   2801.100   1061.000   2815.600   1062.500   2828.500
GR   1084.600   2846.300   1085.200   2854.000   1087.100   2865.500   1086.600   2885.900   1087.300   2898.400
GR   1074.000   2925.700   1071.600   2964.400   1069.000   2977.800   1064.200   3027.800   1064.700   3079.600
GR   1064.400   3147.300   1064.510   3190.000   1064.500   3228.500   1062.500   3301.300   1061.500   3345.700
GR   1061.400   3371.700   1064.500   3397.400   1063.800   3441.300   1061.900   3452.600   1061.400   3516.200
GR   1061.800   3590.000   1059.900   3664.300   1060.500   3718.600   1063.300   3734.100   1060.000   3750.200
GR   1060.200   3790.000   1060.400   3803.200   1063.200   3863.400   1066.200   3920.100   1068.500   3998.000
GR   1071.600   4069.800   1073.900   4143.600   1075.100   4220.700   1075.100   4273.200   1080.600   4301.300
GR   1080.600   4327.700   1066.100   4337.800   1067.500   4367.800   1072.600   4419.200   1077.700   4471.100
GR   1082.700   4515.100   1088.800   4574.700   1092.900   4627.600   1090.100   4712.400   1087.400   4825.700
GR   1087.200   4897.500   1087.300   5000.000      0.000      0.000      0.000      0.000      0.000      0.000

NC      0.000      0.040      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      7.100      7.100      0.000      0.000      0.000   2862.400   3792.400      0.000      0.000
        CROSS SECTION 15.734 DEVELOPED FROM COOPER AERIAL DATA
X1     15.734     83.000   2862.400   3792.400    525.000    525.000    528.000      0.000      0.000      0.000
GR   1062.800   2190.500   1061.700   2257.400   1059.600   2325.500   1062.200   2345.300   1063.600   2395.800
GR   1062.900   2458.900   1066.800   2482.000   1065.800   2496.600   1069.400   2512.900   1069.600   2562.000
GR   1069.300   2603.800   1073.000   2618.700   1060.200   2645.600   1059.700   2672.800   1076.300   2720.800
GR   1061.400   2752.600   1061.000   2762.200   1061.000   2781.100   1058.400   2789.000   1070.200   2809.300
GR   1089.100   2839.500   1089.100   2862.400   1068.800   2923.300   1069.300   2985.100   1065.500   3022.500
GR   1066.400   3045.900   1067.000   3099.700   1066.560   3125.000   1065.800   3168.000   1064.700   3224.900
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GR   1063.800   3271.200   1060.100   3321.800   1057.800   3341.100   1059.900   3366.600   1060.400   3413.000
GR   1059.700   3457.700   1063.100   3475.700   1064.700   3508.200   1066.700   3532.100   1067.400   3570.600
GR   1065.800   3589.100   1068.100   3638.900   1068.300   3669.100   1067.700   3706.700   1068.400   3726.700
GR   1088.600   3768.100   1088.500   3792.400   1080.300   3805.200   1081.100   3814.700   1070.600   3837.300
GR   1069.700   3898.900   1068.900   3931.000   1070.900   3944.300   1048.300   3978.000   1040.900   3992.000
GR   1046.900   4007.500   1044.700   4014.200   1044.400   4055.800   1044.300   4111.700   1045.500   4174.100
GR   1045.800   4252.000   1045.200   4313.900   1050.800   4338.100   1061.000   4382.000   1069.200   4414.000
GR   1069.800   4454.800   1069.100   4472.300   1078.300   4501.800   1095.800   4539.700   1096.600   4573.400
GR   1096.600   4641.100   1096.500   4707.100   1096.300   4783.400   1090.500   4811.000   1091.100   4830.800
GR   1091.200   4852.400   1097.000   4867.300   1096.900   4878.900   1091.200   4891.500   1091.300   4920.700
GR   1091.900   4969.300   1090.100   4977.200   1089.600   5000.000      0.000      0.000      0.000      0.000

ET      0.000      7.100      7.100      0.000      0.000      0.000   2827.600   3756.800      0.000      0.000
        CROSS SECTION 15.834 DEVELOPED FROM COOPER AERIAL DATA
X1     15.834     75.000   2827.600   3756.800    525.000    535.000    528.000      0.000      0.000      0.000
GR   1075.700   2134.600   1077.000   2170.600   1076.400   2197.600   1073.800   2241.100   1065.900   2266.000
GR   1064.200   2283.300   1063.700   2310.600   1064.300   2323.400   1056.200   2341.200   1056.600   2409.900
GR   1056.700   2483.900   1057.400   2543.800   1057.400   2625.700   1056.800   2684.000   1058.400   2695.600
GR   1060.000   2710.200   1059.000   2730.500   1057.900   2745.700   1073.100   2782.200   1091.200   2807.400
GR   1091.200   2827.600   1080.300   2863.200   1070.700   2890.100   1069.900   2942.100   1069.000   2989.700
GR   1069.800   3005.600   1069.600   3028.100   1068.000   3073.900   1068.050   3080.000   1067.500   3158.100
GR   1067.300   3235.400   1064.600   3280.800   1063.400   3328.100   1062.700   3393.400   1062.100   3470.900
GR   1061.400   3530.700   1062.200   3558.200   1069.500   3600.600   1069.400   3653.300   1074.400   3683.400
GR   1079.700   3722.000   1089.100   3756.800   1088.900   3777.800   1060.900   3829.900   1059.900   3890.000
GR   1059.200   3926.800   1039.600   3958.500   1039.600   4018.000   1044.000   4028.800   1039.200   4037.400
GR   1039.500   4115.500   1040.100   4153.400   1039.700   4197.200   1040.500   4252.400   1044.200   4268.100
GR   1043.700   4278.800   1044.000   4330.900   1053.700   4362.000   1054.500   4369.700   1062.700   4388.200
GR   1073.800   4410.800   1075.500   4437.000   1070.600   4447.700   1075.900   4463.100   1089.000   4492.100
GR   1090.100   4571.100   1090.100   4637.600   1089.400   4700.900   1089.600   4744.000   1089.500   4805.300
GR   1088.700   4821.100   1088.700   4849.600   1097.500   4896.100   1091.300   4909.400   1091.600   5000.000

ET      0.000      7.100      7.100      0.000      0.000      0.000   2790.000   3737.000      0.000      0.000
        CROSS SECTION 15.934 DEVELOPED FROM COOPER AERIAL DATA
X1     15.934     59.000   2790.000   3737.000    520.000    530.000    528.000      0.000      0.000      0.000
GR   1060.100   2240.000   1054.260   2650.000   1091.760   2790.000   1082.200   2840.000   1071.090   3040.000
GR   1072.300   3078.400   1070.600   3131.000   1067.000   3176.400   1064.200   3190.500   1064.200   3284.200
GR   1065.200   3297.600   1065.800   3333.700   1064.100   3401.900   1064.700   3486.400   1068.100   3505.900
GR   1068.100   3540.300   1065.600   3546.200   1065.300   3577.200   1068.700   3593.300   1071.000   3640.700
GR   1071.000   3667.000   1072.800   3694.600   1092.000   3737.000   1090.800   3756.600   1075.500   3782.700
GR   1075.700   3842.800   1075.400   3888.000   1054.900   3914.300   1039.500   3942.000   1039.600   3982.400
GR   1040.000   3993.400   1039.800   4064.000   1040.400   4087.900   1039.600   4092.000   1039.600   4129.000
GR   1054.400   4137.600   1053.600   4147.400   1053.300   4235.000   1053.900   4318.200   1054.700   4384.500
GR   1056.800   4435.900   1062.000   4504.000   1063.600   4578.600   1063.100   4636.200   1072.900   4664.400
GR   1070.000   4671.300   1069.500   4682.500   1071.500   4695.200   1069.100   4708.900   1075.100   4722.400
GR   1086.900   4737.200   1083.400   4752.600   1084.500   4800.600   1100.500   4835.900   1096.000   4852.100
GR   1096.300   4888.900   1098.000   4913.100   1092.100   4927.300   1091.600   5000.000      0.000      0.000

ET      0.000      7.100      7.100      0.000      0.000      0.000   2790.500   3718.700      0.000      0.000
        CROSS SECTION 16.034 DEVELOPED FROM COOPER AERIAL DATA
X1     16.034     81.000   2790.500   3718.700    525.000    520.000    528.000      0.000      0.000      0.000
GR   1061.500   2083.200   1061.800   2112.500   1060.000   2167.400   1057.500   2218.600   1050.000   2248.000
GR   1049.100   2294.700   1049.100   2379.300   1049.900   2421.500   1054.400   2483.300   1055.100   2564.600
GR   1053.500   2619.900   1054.400   2627.400   1052.900   2633.900   1042.700   2640.200   1042.700   2668.400
GR   1057.100   2674.000   1062.700   2691.500   1063.500   2706.200   1070.400   2730.000   1094.400   2767.100
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GR   1094.700   2790.500   1086.500   2829.100   1071.900   2867.900   1069.700   2904.700   1070.900   2947.!!000
GR   1068.900   3008.600   1069.000   3030.000   1069.100   3050.900   1072.200   3116.400   1072.100   3170.800
GR   1067.600   3209.400   1067.800   3270.800   1067.400   3303.200   1072.100   3320.500   1071.700   3420.800
GR   1070.400   3491.800   1071.100   3505.400   1071.000   3524.700   1069.000   3535.100   1069.400   3579.300
GR   1067.400   3606.600   1070.700   3623.800   1069.900   3651.400   1070.600   3666.500   1079.900   3698.100
GR   1092.400   3718.700   1092.400   3741.100   1074.400   3775.100   1073.200   3793.900   1075.400   3800.800
GR   1068.400   3816.200   1068.300   3826.100   1058.200   3844.700   1041.000   3871.800   1039.400   3891.100
GR   1039.500   4045.500   1041.800   4077.800   1048.400   4087.100   1048.700   4111.800   1049.100   4152.000
GR   1051.200   4199.200   1051.200   4237.100   1049.800   4272.000   1049.100   4351.400   1049.800   4401.500
GR   1049.800   4473.200   1049.100   4539.200   1050.700   4553.100   1040.100   4579.300   1040.300   4633.300
GR   1054.100   4654.600   1076.600   4688.200   1081.200   4734.200   1086.500   4768.300   1096.400   4788.500
GR   1095.600   4793.600   1095.400   4838.200   1095.700   4897.900   1099.500   4926.700   1092.900   4940.400
GR   1092.800   5000.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000

ET      0.00!0      7.100      7.100      0.000      0.000      0.000   2770.100   3748.000      0.000      0.000
        CROSS SECTION 16.134 DEVELOPED FROM COOPER AERIAL DATA
X1     16.134     69.000   2770.100   3748.000    540.000    520.000    528.000      0.000      0.000      0.000
GR   1059.300   2133.800   1058.700   2165.000   1056.600   2251.600   1056.300   2322.000   1057.500   2379.200
GR   1062.100   2420.400   1074.000   2462.200   1082.900   2486.800   1084.700   2509.100   1087.200   2523.900
GR   1065.600   2563.200   1062.800   2596.600   1060.400   2627.200   1062.800   2650.300   1070.200   2681.100
GR   1084.100   2715.000   1096.600   2737.800   1096.200   2746.900   1095.800   2770.100   1078.100   2831.800
GR   1074.400   2880.100   1072.900   2949.700   1073.600   3021.900   1073.410   3055.000   1073.100   3109.600
GR   1072.000   3184.600   1072.900   3267.000   1074.200   3321.600   1074.100   3365.000   1074.800   3440.700
GR   1075.800   3496.700   1074.700   3509.300   1075.600   3561.300   1082.100   3586.000   1082.500   3611.900
GR   1081.000   3625.800   1086.900   3654.100   1091.700   3714.900   1092.800   3748.000   1071.000   3791.100
GR   1052.700   3834.200   1038.700   3861.200   1038.700   4004.500   1053.400   4047.000   1062.700   4081.000
GR   1067.500   4135.400   1070.800   4195.000   1067.800   4246.200   1068.800   4318.100   1068.700   4373.800
GR   1061.500   4401.900   1066.000   4424.800   1073.000   4464.300   1080.700   4506.300   1087.000   4542.900
GR   1086.200   4595.000   1083.500   4646.800   1081.200   4698.000   1074.700   4727.700   1072.200   4756.500
GR   1077.800   4775.600   1092.500   4797.200   1094.700   4835.500   1097.200   4878.300   1097.400   4913.400
GR   1102.000   4932.700   1097.600   4965.300   1095.300   4974.300   1094.600   5000.000      0.000      0.000

NC      0.000      0.000      0.000      0.300      0.500      0.000      0.000      0.000      0.000      0.000
QT      2.000 205000.000 205000.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      7.100      7.100      0.000      0.000      0.000   9660.000  10600.000      0.000      0.000

        FROM STATION 16.178 THROUGH STATION 16.628 ALL DATA WAS
        OBTAINED FROM THE 1984 FEMA MODEL.  STATIONS 16.178 THROUGH
        STATION 16.213 INPUT DATA FOR SPECIAL BRIDGE ROUTNE FOR
        24TH STREET BRIDGE


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X1     16.178     14.000   9660.000  10600.000    200.000    220.000    230.000      0.000      0.000      0.000
GR   1100.000   8050.000   1095.000   8180.000   1090.000   8360.000   1085.000   8470.000   1085.000   8660.000
GR   1090.000   8880.000   1095.000   9070.000   1095.500   9420.000   1097.000   9660.000   1080.000   9720.000
GR   1075.200   9830.000   1075.200  10510.000   1096.000  10600.000   1096.000  10605.000      0.000      0.000

X1     16.188     10.000   3076.000   3934.500     60.000     60.000     50.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000   1094.500   1094.500      0.000
GR   1099.400   3075.000   1099.400   3076.000   1094.900   3077.000   1089.500   3078.000   1075.300   3110.000
GR   1075.300   3904.000   1089.500   3933.000   1094.900   3934.000   1099.500   3934.500   1099.500   3935.000
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SB	0.900	1.600	2.500	0.000	794.000	71.500	14923.000	0.500	1075.300	1075.200
X1	16.202	0.000	0.000	0.000	77.000	77.000	77.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	1094.900	1099.400	0.000	0.000	1.330	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1099.400	1099.400	0.000
BT	3.000	3075.000	1099.400	0.000	3507.000	1099.800	0.000	3935.000	1099.500	0.000
ET	0.00[illegible]0	7.100	7.100	0.000	0.000	0.000	9690.000	10570.000	0.000	0.000
X1	16.213	8.000	9690.000	10570.000	60.000	60.000	60.000	0.000	0.000	0.000
GR	1100.000	9600.000	1095.000	9690.000	1080.000	9720.000	1077.000	9840.000	1076.000	9890.000
GR	1076.000	10510.000	1095.000	10570.000	1099.500	10800.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.000	0.100	0.300	0.000	0.000	0.000	0.000	0.000
ET	0.000	7.100	7.100	0.000	0.000	0.000	9680.000	10570.000	0.000	0.000
X1	16.254	7.000	9680.000	10570.000	200.000	270.000	215.000	0.000	0.000	0.000
GR	1101.500	9580.000	1100.000	9680.000	1076.800	9750.000	1076.800	10350.000	1080.000	10380.000
GR	1095.000	10570.000	1099.500	10800.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	7.100	7.100	0.000	0.000	0.000	9700.000	10480.000	0.000	0.000
X1	16.347	12.000	9700.000	10480.000	500.000	470.000	490.000	0.000	0.000	0.000
GR	1107.500	9580.000	1105.000	9700.000	1078.200	9800.000	1078.200	10210.000	1088.800	10260.000
GR	1084.000	10340.000	1085.000	10350.000	1095.000	10480.000	1094.000	10650.000	1095.000	11000.000
GR	1095.000	11150.000	1101.000	11290.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	9.100	9.100	0.000	0.000	0.000	0.000	9620.000	10800.000
X1	16.428	15.000	9620.000	10450.000	470.000	370.000	430.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	1105.000	9550.000	1100.000	9620.000	1080.000	9750.000	1080.000	9950.000	1083.400	10100.000
GR	1080.000	10250.000	1087.300	10330.000	1103.000	10450.000	1100.000	10451.000	1100.000	10550.000
GR	1095.000	10680.000	1090.500	10810.000	1095.000	10920.000	1100.000	11180.000	1101.500	11300.000
ET	0.000	4.100	9.100	0.000	11100.000	0.000	0.000	0.000	9600.000	10900.000
X1	16.528	19.000	9600.000	10370.000	560.000	430.000	528.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	1104.000	9480.000	1100.000	9600.000	1095.000	9610.000	1090.000	9650.000	1085.000	9700.000
GR	1082.000	9850.000	1080.200	9980.000	1080.200	10200.000	1085.000	10280.000	1090.000	10350.000
GR	1099.000	10370.000	1095.000	10400.000	1095.000	10570.000	1096.000	10650.000	1095.000	10720.000
GR	1092.500	10800.000	1095.000	10900.000	1100.000	11100.000	1102.000	11320.000	0.000	0.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

```
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV=   0.100 CEHV=   0.300
*SECNO 15.173

        INPUT FILE = MODEL1.IH2
        THE FOLLOWING IS A HEC-2 INPUT FILE FOR THE SALT RIVER CHANNEL
        BETWEEN 16TH STREET BRIDGE AND 24TH STREET BRIDGE.  THIS STUDY
        EXAMINES WATER SURFACE PROFILES FOR THE 100-YEAR STORM WITH THE
        NORTH LEVEE IN PLACE.  THE NORTH LEVEE RUNS ON THE NORTH SIDE OF
        THE SALT RIVER CHANNEL FROM THE 24TH STREET BRIDGE TO THE EAST
        TUNNEL OUTFALL.

        CROSS SECTION 15.173 GR POINTS MATCH PREVIOUS STUDY
        CROSS SECTION LOCATED UPSTREAM OF 16TH STREET BRIDGE
   15.17    22.67  1083.77  1072.09  1083.77  1084.89     1.12     0.00     0.00  1090.00
  200000.      0.  200000.       0.       0.   23512.       0.       0.       0.   1086.00
    0.00     0.00     8.51     0.00    0.000    0.033    0.000    0.000  1061.10  9442.96
 0.000616      0.       0.       0.        0       10        0     0.00  1113.33 10556.28

*SECNO 15.235

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1088.97 ELREA=     1089.76

        CROSS SECTION 15.235 DEVELOPED FROM COOPER AERIAL DATA
   15.23    21.16  1082.26  1078.55     0.00  1086.11     3.85     0.40     0.82  1088.97
  200000.      0.  200000.       0.       0.   12706.       0.     137.       7.   1089.76
    0.01     0.00    15.74     0.00    0.000    0.033    0.000    0.000  1061.10  2551.84
 0.003275     130.     330.     490.        3       15        0     0.00   839.92  3391.77

*SECNO 15.335

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1090.70 ELREA=     1098.10

        CROSS SECTION 15.335 DEVELOPED FROM COOPER AERIAL DATA
   15.34    20.45  1084.05  1081.10     0.00  1087.98     3.93     1.85     0.03  1090.70
  200000.      0.  200000.       0.       0.   12570.       0.     290.      18.   1098.10
    0.02     0.00    15.91     0.00    0.000    0.033    0.000    0.000  1063.60  2628.72
 0.003752     510.     528.     530.        3       15        0     0.00   905.82  3534.54
```

```
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 15.434

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1091.60 ELREA=     1093.20

        CROSS SECTION 15.434 DEVELOPED FROM COOPER AERIAL DATA
    15.43     26.03  1086.13  1078.86      0.00  1089.42      3.29      1.37      0.06  1091.60
   200000.       0.  200000.       0.        0.   13746.        0.      449.       28.   1093.20
     0.03      0.00     14.55     0.00     0.000     0.033     0.000     0.000  1060.10  2642.08
 0.001921      550.      525.     580.         2        11         0      0.00   681.95  3324.02

*SECNO 15.534

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    2670.0    3320.0  TYPE=     1  TARGET=     650.000
        CROSS SECTION 15.534 DEVELOPED FROM COOPER AERIAL DATA
    15.53     27.01  1086.61  1081.76      0.00  1090.95      4.35      1.22      0.32  1089.70
   200000.       0.  200000.       0.        0.   11955.        0.      605.       36. 100000.00
     0.03      0.00     16.73     0.00     0.000     0.033     0.000     0.000  1059.60  2675.67
 0.002835      550.      528.     520.         3        15         0      0.00   642.34  3318.01

*SECNO 15.634
3280 CROSS SECTION     15.63 EXTENDED      3.38 FEET

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    2898.4    3790.0  TYPE=     1  TARGET=     891.600

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1087.30 ELREA=     1095.00

        CROSS SECTION 15.634 DEVEOPLED FROM COOPER AERIAL DATA
        CROSS SECTION 15.634 LOCATED AT EAST TUNNEL OUTFALL
    15.63     30.78  1090.68  1075.18      0.00  1091.77      1.09      0.49      0.33  1087.30
   200000.       0.  200000.       0.        0.   23898.        0.      822.       45. 100000.00
     0.05      0.00      8.37     0.00     0.000     0.033     0.000     0.000  1059.90  2898.40
 0.000455      590.      528.     475.         3        11         0      0.00   891.60  3790.00
```

```
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 15.734
3280 CROSS SECTION     15.73 EXTENDED      1.22 FEET

3470 ENCROACHMENT STATIONS=    2862.4    3792.4  TYPE=     1  TARGET=     930.000
        CROSS SECTION 15.734 DEVELOPED FROM COOPER AERIAL DATA
    15.73    33.02  1090.82  1077.39     0.00  1092.11     1.28     0.28     0.06  1089.10
   200000.       0.  200000.       0.       0.   21987.       0.    1100.      56. 100000.00
     0.07     0.00     9.10     0.00    0.000    0.033    0.000    0.000  1057.80  2862.40
 0.000613     525.     528.     525.        2       14        0     0.00   930.00  3792.40

*SECNO 15.834

3470 ENCROACHMENT STATIONS=    2827.6    3756.8  TYPE=     1  TARGET=     929.200
        CROSS SECTION 15.834 DEVELOPED FROM COOPER AERIAL DATA
    15.83    29.68  1091.08  1078.95     0.00  1092.49     1.42     0.35     0.04  1091.20
   200000.       0.  200000.       0.       0.   20950.       0.    1360.      67. 100000.00
     0.08     0.00     9.55     0.00    0.000    0.033    0.000    0.000  1061.40  2828.00
 0.000713     525.     528.     535.        2       11        0     0.00   928.80  3756.80

*SECNO 15.934

3470 ENCROACHMENT STATIONS=    2790.0    3737.0  TYPE=     1  TARGET=     947.000
        CROSS SECTION 15.934 DEVELOPED FROM COOPER AERIAL DATA
    15.93    27.24  1091.34  1081.24     0.00  1093.00     1.66     0.43     0.07  1091.76
   200000.       0.  200000.       0.       0.   19347.       0.    1605.      79. 100000.00
     0.10     0.00    10.34     0.00    0.000    0.033    0.000    0.000  1064.10  2792.20
 0.000948     520.     528.     530.        2       11        0     0.00   943.34  3735.54

*SECNO 16.034

3470 ENCROACHMENT STATIONS=    2790.5    3718.7  TYPE=     1  TARGET= !    928.200
        CROSS SECTION 16.034 DEVELOPED FROM COOPER AERIAL DATA
    16.03    24.35  1091.75  1082.46     0.00  1093.58     1.83     0.53     0.05  1094.70
   200000.       0.  200000.       0.       0.   18424.       0.    1833.      90. 100000.00
     0.11     0.00    10.86     0.00    0.000    0.033    0.000    0.000  1067.40  2804.38
 0.001073     525.     528.     520.        2       11        0     0.00   913.25  3717.63
```

```
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 16.134

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=    2770.1    3748.0  TYPE=     1  TARGET=     977.900
        CROSS SECTION 16.134 DEVELOPED FROM COOPER AERIAL DATA
    16.13     19.78  1091.78  1086.93      0.00  1094.74      2.97      0.82      0.34  1095.80
  200000.        0.  200000.        0.        0.   14473.        0.     2033.      101. 100000.00
     0.12      0.00     13.82      0.00     0.000     0.033     0.000     0.000   1072.00  2784.11
 0.002448      540.      528.      520.         2        14         0      0.00    933.20  3717.31


CCHV=   0.300 CEHV=   !0.500
*SECNO 16.178

3470 ENCROACHMENT STATIONS=    9660.0   10600.0  TYPE=     1  TARGET=     940.000

        FROM STATION 16.178 THROUGH STATION 16.628 ALL DATA WAS
        OBTAINED FROM THE 1984 FEMA MODEL.  STATIONS 16.178 THROUGH
        STATION 16.213 INPUT DATA FOR SPECIAL BRIDGE ROUTNE FOR
        24TH STREET BRIDGE


    16.18     17.00  1092.20  1088.11      0.00  1095.51      3.30      0.59      0.17  1097.00
  205000.        0.  205000.        0.        0.   14057.        0.     2108.      106. 100000.00
     0.13      0.00     14.58      0.00     0.000     0.033     0.000     0.000   1075.20  9676.93
 0.002727      200.      230.      220.         2        14         0      0.00    906.65 10583.57


*SECNO 16.188

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1094.50 ELREA=     1094.50

    16.19     17.12  1092.42  1087.86      0.00  1095.66      3.23      0.13      0.02  1099.40
  205000.        0.  205000.        0.        0.   14210.        0.     2124.      107.   1099.50
     0.13      0.00     14.43      0.00     0.000     0.033     0.000     0.000   1075.30  3077.46
 0.002466       60.       50.       60.         2        15         0      0.00    856.08  3933.54
```

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     0.90      1.60      2.50      0.00    794.00     71.50  14923.00     0.50   1075.30   1075.20

*SECNO 16.202

3301 HV CHANGED MORE THAN HVINS

PRESSURE FLOW

 EGPRS     EGLWC     H3        QWEIR     QPR       BAREA     TRAPEZOID      ELLC      ELTRD
                                                             AREA
 1097.11   1096.39   1.14        0.    205000.    14923.     14353.     1094.90   1099.40


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1099.40 ELREA=     1099.40

    16.20    19.28  1094.58      0.00      0.00  1097.11      2.53      1.46      0.00  1099.40
  205000.       0.  205000.       0.        0.   16061.       0.      2151.      108.   1099.50
     0.13     0.00     12.76     0.00     0.000    0.033    0.000     0.000  1075.30  3077.06
 0.001650      77.      77.      77.         3        0        0      0.00   856.88  3933.94


*SECNO 16.213

3470 ENCROACHMENT STATIONS=    9690.0    10570.0  TYPE=     1  TARGET=     880.000
    16.21    18.52  1094.52  1089.03      0.00  1097.40      2.88      0.11      0.17  1095.00
  205000.       0.  205000.       0.        0.   15059.       0.      2173.      110.  100000.00
     0.13     0.00     13.61     0.00     0.000    0.033    0.000     0.000  1076.00  9690.96
 0.002084      60.      60.      60.         2       14        0      0.00   877.53 10568.49


CCHV=   0.100 CEHV=   0.300
*SECNO 16.254

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=    9680.0    10570.0  TYPE=     1  TARGET=     890.000
    16.25    17.49  1094.29  1091.25      0.00  1098.32      4.02      0.57      0.34  1100.00
  205000.       0.  205000.       0.        0.   12735.       0.      2241.      114.  100000.00
     0.13     0.00     16.10     0.00     0.000    0.033    0.000     0.000  1076.80  9697.19
 0.003554     200.     215.     270.         2       15        0      0.00   863.96 10561.15
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```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 16.347

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=    9700.0   10480.0  TYPE=     1  TARGET=     780.000
    16.35     17.35  1095.55  1095.55      0.00  1102.29     6.74      2.36      0.82  1105.00
   205000.       0.  205000.       0.        0.    9840.       0.     2368.      123. 100000.00
     0.14      0.00     20.83     0.00     0.000     0.033    0.000     0.000  1078.20  9735.27
 0.006908      500.      490.     470.         0         5        0      0.00   744.73 10480.00

*SECNO 16.428

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1100.00 ELREA=     1103.00

    16.43     20.71  1100.71  1096.49      0.00  1104.41     3.69      1.81      0.30  1100.00
   205000.       3.  204997.       0.        4.   13289.       0.     2482.      131.  1103.00
     0.15      0.88     15.43     0.00     0.045     0.033    0.000     0.000  1080.00  9610.06
 0.002839      470.      430.     370.         4         8        0      0.00   822.44 10432.50

*SECNO 16.528

3301 HV CHANGED MORE THAN HVINS

    16.53     23.44  1103.64  1099.21      0.00  1105.52     1.88      0.93      0.18  1100.00
   205000.      343.  178895.   25762.      199.   15416.    4668.     2681.      144.  1099.00
     0.16      1.73     11.60     5.52     0.045     0.033    0.040     0.000  1080.20  9490.85
 0.001230      560.      528.     430.         2        14        0      0.00  1409.16 10900.02
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*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55
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T1      HYDRAULIC ANALYSIS OF 1989 SALT RIVER WATER SURFACE (NEGL EXTRA FUTURE
T2      ROOSEVELT DAM FLOOD CAPACITY). STARTING EL FOR 100 YR EVENT IS   1083.77
T3      100-YEAR Q = 200000 CFS, SUBCRITICAL RUN FROM 16TH TO 24TH STREETS (NAT)
```

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0.	3.	0.	0.	0.000000	0.00	0.0	0.	1083.770	0.000

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15.000	0.000	-1.000	0.000	0.000	0.000	-1.000	0.000	0.000	0.000

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*PROF 2

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV=   0.100 CEHV=   0.300
*SECNO 15.173

        INPUT FILE = MODEL1.IH2
        THE FOLLOWING IS A HEC-2 INPUT FILE FOR THE SALT RIVER CHANNEL
        BETWEEN 16TH STREET BRIDGE AND 24TH STREET BRIDGE.  THIS STUDY
        EXAMINES WATER SURFACE PROFILES FOR THE 100-YEAR STORM WITH THE
        NORTH LEVEE IN PLACE.  THE NORTH LEVEE RUNS ON THE NORTH SIDE OF
        T!HE SALT RIVER CHANNEL FROM THE 24TH STREET BRIDGE TO THE EAST
        TUNNEL OUTFALL.

        CROSS SECTION 15.173 GR POINTS MATCH PREVIOUS STUDY
        CROSS SECTION LOCATED UPSTREAM OF 16TH STREET BRIDGE
   15.17    22.67  1083.77  1072.09  1083.77  1084.89     1.12     0.00     0.00  1090.00
  200000.      0.  200000.       0.       0.   23512.       0.       0.       0.   1086.00
    0.00     0.00     8.51     0.00    0.000    0.033    0.000    0.000  1061.10  9442.96
 0.000616      0.       0.       0.        0       10        0     0.00  1113.33 10556.28

*SECNO 15.235

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1088.97 ELREA=     1089.76

        CROSS SECTION 15.235 DEVELOPED FROM COOPER AERIAL DATA
   15.23    21.16  1082.26  1078.55     0.00  1086.11     3.85     0.40     0.82  1088.97
  200000.      0.  200000.       0.       0.   12706.       0.     137.       7.   1089.76
    0.01     0.00    15.74     0.00    0.000    0.033    0.000    0.000  1061.10  2551.84
 0.003275     130.     330.     490.        3       15        0     0.00   839.92  3391.77

*SECNO 15.335

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    2700.0    3460.0  TYPE=     1  TARGET=     760.000
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```
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=   100000.00 ELREA=   100000.00

        CROSS SECTION 15.335 DEVELOPED FROM COOPER AERIAL DATA
   15.34    20.10  1083.70  1080.86  1084.05  1088.08     4.38     1.82     0.16100000.00
  200000.      0.  200000.       0.       0.   11907.       0.     286.      17. 100000.00
    0.01     0.00    16.80     0.00    0.000    0.033    0.000    0.000  1063.60  2700.00
 0.003620     510.     528.     530.        2       15        0     0.00   760.00  3460.00


*SECNO 15.434

3301 HV CHANGED MORE THAN HVINS


3495 OVERBANK AREA A!SSUMED NON-EFFECTIVE,ELLEA=     1091.60 ELREA=     1093.20

        CROSS SECTION 15.434 DEVELOPED FROM COOPER AERIAL DATA
   15.43    26.20  1086.30  1078.86  1086.13  1089.53     3.23     1.33     0.12  1091.60
  200000.      0.  200000.       0.       0.   13867.       0.     442.      26.   1093.20
    0.02     0.00    14.42     0.00    0.000    0.033    0.000    0.000  1060.10  2641.04
 0.001873     550.     525.     580.        2       11        0     0.00   683.75  3324.79


*SECNO 15.534

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=    2670.0    3320.0  TYPE=     1  TARGET=     650.000
        CROSS SECTION 15.534 DEVELOPED FROM COOPER AERIAL DATA
   15.53    27.16  1086.76  1081.75  1086.61  1091.03     4.28     1.19     0.31  1089.70
  200000.      0.  200000.       0.       0.   12050.       0.     599.      34. 100000.00
    0.03     0.00    16.60     0.00    0.000    0.033    0.000    0.000  1059.60  2675.40
 0.002764     550.     528.     520.        3       15        0     0.00   642.82  3318.22


*SECNO 15.634
3280 CROSS SECTION     15.63 EXTENDED      3.45 FEET


3301 HV CHANGED MORE THAN HVINS
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


3470 ENCROACHMENT STATIONS=    2898.4    3790.0  TYPE=     1  TARGET=     891.600

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1087.30 ELREA=     1095.00

        CROSS SECTION 15.634 DEVEOPLED FROM COOPER AERIAL DATA
        CROSS SECTION 15.634 LOCATED AT EAST TUNNEL OUTFALL
    15.63    30.85  1090.75  1075.17  1090.68  1091.84     1.08     0.48     0.32  1087.30
  200000.       0.  200000.       0.       0.   23963.       0.     817.      43. 100000.00
     0.05     0.00     8.35     0.00    0.000    0.033    0.000    0.000  1059.90  2898.40
 0.#000451     590.     528.     475.        3       11        0     0.00   891.60  3790.00


*SECNO 15.734
3280 CROSS SECTION     15.73 EXTENDED      1.29 FEET


3470 ENCROACHMENT STATIONS=    2862.4    3792.4  TYPE=     1  TARGET=     930.000
        CROSS SECTION 15.734 DEVELOPED FROM COOPER AERIAL DATA
    15.73    33.09  1090.89  1077.38  1090.82  1092.17     1.28     0.27     0.06  1089.10
  200000.       0.  200000.       0.       0.   22053.       0.    1096.      54. 100000.00
     0.07     0.00     9.07     0.00    0.000    0.033    0.000    0.000  1057.80  2862.40
 0.000607     525.     528.     525.        2       14        0     0.00   930.00  3792.40


*SECNO 15.834

3470 ENCROACHMENT STATIONS=    2827.6    3756.8  TYPE=     1  TARGET=     929.200
        CROSS SECTION 15.834 DEVELOPED FROM COOPER AERIAL DATA
    15.83    29.75  1091.15  1078.95  1091.08  1092.55     1.41     0.35     0.04  1091.20
  200000.       0.  200000.       0.       0.   21014.       0.    1357.      65. 100000.00
     0.08     0.00     9.52     0.00    0.000    0.033    0.000    0.000  1061.40  2827.77
 0.000706     525.     528.     535.        2       11        0     0.00   929.03  3756.80


*SECNO 15.934

3470 ENCROACHMENT STATIONS=    2790.0    3737.0  TYPE=     1  TARGET=     947.000
        CROSS SECTION 15.934 DEVELOPED FROM COOPER AERIAL DATA
    15.93    27.31  1091.41  1081.23  1091.34  1093.05     1.65     0.43     0.07  1091.76
  200000.       0.  200000.       0.       0.   19409.       0.    1602.      77. 100000.00
     0.10     0.00    10.30     0.00    0.000    0.033    0.000    0.000  1064.10  2791.86
 0.000938     520.     528.     530.        2       11        0     0.00   943.83  3735.69
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 16.034

3470 ENCROACHMENT STATIONS=    2790.5    3718.7  TYPE=     1  TARGET=     928.200
        CROSS SECTION 16.034 DEVELOPED FROM COOPER AERIAL DATA
    16.03    24.41  1091.81  1082.46  1091.75  1093.63     1.82     0.53     0.05  1094.70
   200000.      0.  200000.       0.       0.   18480.      0.     1832.      88. 100000.00
     0.11     0.00    10.82     0.00    0.000    0.033    0.000    0.000  1067.40  2804.09
 0#.001063    525.     528.     520.        2       11        0     0.00   913.64  3717.73

*SECNO 16.134

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    2770.1    3748.0  TYPE=     1  TARGET=     977.900
        CROSS SECTION 16.134 DEVELOPED FROM COOPER AERIAL DATA
    16.13    19.84  1091.84  1086.93  1091.78  1094.78     2.94     0.81     0.34  1095.80
   200000.      0.  200000.       0.       0.   14531.      0.     2032.      99. 100000.00
     0.12     0.00    13.76     0.00    0.000    0.033    0.000    0.000  1072.00  2783.90
 0.002423    540.     528.     520.        2       14        0     0.00   935.28  3719.18

CCHV=   0.300 CEHV=   0.500
*SECNO 16.178

3470 ENCROACHMENT STATIONS=    9660.0   10600.0  TYPE=     1  TARGET=     940.000

        FROM STATION 16.178 THROUGH STATION 16.628 ALL DATA WAS
        OBTAINED FROM THE 1984 FEMA MODEL.  STATIONS 16.178 THROUGH
        STATION 16.213 INPUT DATA FOR SPECIAL BRIDGE ROUTNE FOR
        24TH STREET BRIDGE


    16.18    17.06  1092.26  1088.11  1092.20  1095.54     3.28     0.59     0.17  1097.00
   205000.      0.  205000.       0.       0.   14107.      0.     2107.     104. 100000.00
     0.13     0.00    14.53     0.00    0.000    0.033    0.000    0.000  1075.20  9676.73
 0.002697    200.     230.     220.        2       14        0     0.00   907.08 10583.81

*SECNO 16.188
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1094.50 ELREA=     1094.50

    16.19     17.17  1092.47  1087.87  1092.42  1095.69      3.21      0.13      0.02  1099.40
   205000.       0.  205000.       0.       0.   14251.       0.     2123.      105.   1099.50
     0.13      0.00     14.38     0.00    0.000    0.033    0.000     0.000   1075.30  3077.45
 0.002442       60.       50.      60.        2       15        0      0.00    856.10  3933.55


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     0.90      1.60      2.50     *0.00    794.00     71.50  14923.00      0.50   1075.30   1075.20

*SECNO 16.202

3301 HV CHANGED MORE THAN HVINS

PRESSURE FLOW


 EGPRS      EGLWC      H3       QWEIR      QPR       BAREA   TRAPEZOID      ELLC      ELTRD
                                                              AREA
 1097.16   1096.42     1.12        0.   205000.    14923.    14353.     1094.90   1099.40


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1099.40 ELREA=     1099.40

    16.20     19.35  1094.65     0.00  1094.58  1097.16      2.51      1.48      0.00  1099.40
   205000.       0.  205000.       0.       0.   16117.       0.     2150.      107.   1099.50
     0.13      0.00     12.72     0.00    0.000    0.033    0.000     0.000   1075.30  3077.05
 0.001632       77.       77.      77.        3        0        0      0.00    856.91  3933.95


*SECNO 16.213

3470 ENCROACHMENT STATIONS=    9690.0   10570.0  TYPE=      1  TARGET=     880.000
    16.21     18.59  1094.59  1089.03  1094.52  1097.44      2.86      0.11      0.17  1095.00
   205000.       0.  205000.       0.       0.   15117.       0.     2172.      108.  100000.00
     0.13      0.00     13.56     0.00    0.000    0.033    0.000     0.000   1076.00  9690.83
 0.002059       60.       60.      60.        2       14        0      0.00    877.87 10568.69
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

CCHV=   0.100 CEHV=   0.300
*SECNO 16.254

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=    9680.0   10570.0  TYPE=     1  TARGET=     890.000
    16.25    17.56  1094.36  1091.25  1094.29  1098.35     3.99      0.57      0.34  1100.00
  205000.       0.  205000.       0.       0.   12795.       0.     2241.      112. 100000.00
     0.13     0.00    16.02     0.00    0.000    0.033    0.000     0.000   1076.80  9696.99
 0.003505     200.     215.     270.        2       15        0      0.00    865.04 10562.03


*SECNO 16.347

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC #ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=    9700.0   10480.0  TYPE=     1  TARGET=     780.000
    16.35    17.33  1095.53  1095.53  1095.55  1102.29     6.76      2.35      0.83  1105.00
  205000.       0.  205000.       0.       0.    9823.       0.     2368.      121. 100000.00
     0.14     0.00    20.87     0.00    0.000    0.033    0.000     0.000   1078.20  9735.35
 0.006945     500.     490.     470.        0        5        0      0.00    744.65 10480.00


*SECNO 16.428

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=    9620.0   10800.0  TYPE=     1  TARGET=    1180.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1100.00 ELREA=     1103.00

    16.43    20.72  1100.72  1096.49  1100.71  1104.41     3.69      1.82      0.31  1100.00
  205000.       0.  205000.       0.       0.   13298.       0.     2482.      129.   1103.00
     0.15     0.00    15.42     0.00    0.000    0.033    0.000     0.000   1080.00  9620.00
 0.002837     470.     430.     370.        4        8        0      0.00    812.58 10432.58
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  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 16.528
3280 CROSS SECTION     16.53 EXTENDED      1.64 FEET

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    9600.0   10900.0  TYPE=     1  TARGET=    1300.000
    16.53    23.44  1103.64  1099.25  1103.64  1105.53     1.89      0.94      0.18  1100.00
   205000.      0.  179119.   25881.      0.   15418.    4669.     2679.      141.   1099.00
     0.16     0.00    11.62     5.54    0.000    0.033    0.040     0.000   1080.20  9600.00
 0.001240     560.     528.     430.        2       14        0      0.00   1300.00 10900.00
```

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*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT

SECNO	VCH	DEPTH	TOPWID	CWSEL	QLOB	QCH	QROB	XLBEL	RBEL
15.173	8.51	22.67	1113.33	1083.77	0.00	200000.00	0.00	1090.00	1086.00
15.173	8.51	22.67	1113.33	1083.77	0.00	200000.00	0.00	1090.00	1086.00
15.235	15.74	21.16	839.92	1082.26	0.00	199999.98	0.00	1088.97	1089.76
15.235	15.74	21.16	839.92	1082.26	0.00	199999.98	0.00	1088.97	1089.76
15.335	15.91	20.45	905.82	1084.05	0.00	200000.00	0.00	* 1090.70	1098.10
15.335	16.80	20.10	760.00	1083.70	0.00	200000.00	0.00	100000.00	100000.00
15.434	14.55	26.03	681.95	1086.13	0.00	199999.98	0.00	1091.60	1093.20
15.434	14.42	26.20	683.75	1086.30	0.00	200000.02	0.00	1091.60	1093.20
15.534	16.73	27.01	642.34	1086.61	0.00	200000.02	0.00	1089.70	100000.00
15.534	16.60	27.16	642.82	1086.76	0.00	199999.97	0.00	1089.70	100000.00
15.634	8.37	30.78	891.60	1090.68	0.00	200000.00	0.00	1087.30	100000.00
15.634	8.35	30.85	891.60	1090.75	0.00	200000.00	0.00	1087.30	100000.00
15.734	9.10	33.02	930.00	1090.82	0.00	199999.98	0.00	1089.10	100000.00
15.734	9.07	33.09	930.00	1090.89	0.00	200000.00	0.00	1089.10	100000.00
15.834	9.55	29.68	928.80	1091.08	0.00	200000.00	0.00	1091.20	100000.00
15.834	9.52	29.75	929.03	1091.15	0.00	200000.00	0.00	1091.20	100000.00
15.934	10.34	27.24	943.34	1091.34	0.00	200000.00	0.00	1091.76	100000.00
15.934	10.30	27.31	943.83	1091.41	0.00	200000.00	0.00	1091.76	100000.00
16.034	10.86	24.35	913.25	1091.75	0.00	199999.98	0.00	1094.70	100000.00
16.034	10.82	24.41	913.64	1091.81	0.00	199999.98	0.00	1094.70	100000.00
16.134	13.82	19.78	933.20	1091.78	0.00	199999.98	0.00	1095.80	100000.00
16.134	13.76	19.84	935.28	1091.84	0.00	199999.98	0.00	1095.80	100000.00

	SECNO	VCH	DEPTH	TOPWID	CWSEL	QLOB	QCH	QROB	XLBEL	RBEL
	16.178	14.58	17.00	906.65	1092.20	0.00	205000.00	0.00	1097.00	100000.00
	16.178	14.53	17.06	907.08	1092.26	0.00	205000.00	0.00	1097.00	100000.00
	16.188	14.43	17.12	856.08	1092.42	0.00	205000.02	0.00	1099.40	1099.50
	16.188	14.38	17.17	856.10	1092.47	0.00	205000.00	0.00	1099.40	1099.50
	16.202	12.76	19.28	856.88	1094.58	0.00	205000.00	0.00	1099.40	1099.50
	16.202	12.72	19.35	856.91	1094.65	0.00	205000.00	0.00	1099.40	1099.50
	16.213	13.61!	18.52	877.53	1094.52	0.00	205000.00	0.00	1095.00	100000.00
	16.213	13.56	18.59	877.87	1094.59	0.00	205000.00	0.00	1095.00	100000.00
	16.254	16.10	17.49	863.96	1094.29	0.00	204999.98	0.00	1100.00	100000.00
	16.254	16.02	17.56	865.04	1094.36	0.00	204999.98	0.00	1100.00	100000.00
*	16.347	20.83	17.35	744.73	1095.55	0.00	205000.00	0.00	1105.00	100000.00
*	16.347	20.87	17.33	744.65	1095.53	0.00	205000.00	0.00	1105.00	100000.00
	16.428	15.43	20.71	822.44	1100.71	3.11	204996.91	0.00	1100.00	1103.00
	16.428	15.42	20.72	812.58	1100.72	0.00	205000.00	0.00	1100.00	1103.00
	16.528	11.60	23.44	1409.16	1103.64	342.51	178895.06	25762.44	1100.00	1099.00
	16.528	11.62	23.44	1300.00	1103.64	0.00	179119.27	25880.72	1100.00	1099.00

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT TABLE 110

SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
15.173	1083.77	0.00	1084.89	1113.33	0.00	200000.00	0.00	0.00	0.00	9430.00	10560.00	0.00
15.173	1083.77	0.00	1084.89	1113.33	0.00	200000.00	0.00	0.00	0.00	9430.00	10560.00	0.00
15.235	1082.26	0.00	1086.11	839.92	0.00	199999.98	0.00	0.00	0.00	2470.00	3470.00	0.00
15.235	1082.26	0.00	1086.11	839.92	0.00	199999.98	0.00	0.00	0.00	2470.00	3470.00	0.00
15.335	1084.05	0.00	1087.98	905.82	0.00	200000.00	0.00	0.00	0.00	2560.00	3620.00	0.00
15.335	1083.70	-0.35	1088.08	760.00	0.00	200000.00	0.00	760.00	2700.00	2560.00	3620.00	*3460.00
15.434	1086.13	0.00	1089.42	681.95	0.00	199999.98	0.00	0.00	0.00	2610.00	3355.00	0.00
15.434	1086.30	0.17	1089.53	683.75	0.00	200000.02	0.00	0.00	0.00	2610.00	3355.00	0.00
15.534	1086.61	0.00	1090.95	642.34	0.00	200000.02	0.00	650.00	2670.00	2670.00	3320.00	3320.00
15.534	1086.76	0.15	1091.03	642.82	0.00	199999.97	0.00	650.00	2670.00	2670.00	3320.00	3320.00
15.634	1090.68	0.00	1091.77	891.60	0.00	200000.00	0.00	891.60	2898.40	2898.40	4627.60	3790.00
15.634	1090.75	0.07	1091.84	891.60	0.00	200000.00	0.00	891.60	2898.40	2898.40	4627.60	3790.00
15.734	1090.82	0.00	1092.11	930.00	0.00	199999.98	0.00	930.00	2862.40	2862.40	3792.40	3792.40
15.734	1090.89	0.07	1092.17	930.00	0.00	200000.00	0.00	930.00	2862.40	2862.40	3792.40	3792.40
15.834	1091.08	0.00	1092.49	928.80	0.00	200000.00	0.00	929.20	2827.60	2827.60	3756.80	3756.80
15.834	1091.15	0.07	1092.55	929.03	0.00	200000.00	0.00	929.20	2827.60	2827.60	3756.80	3756.80
15.934	1091.34	0.00	1093.00	943.34	0.00	200000.00	0.00	947.00	2790.00	2790.00	3737.00	3737.00
15.934	1091.41	0.07	1093.05	943.83	0.00	200000.00	0.00	947.00	2790.00	2790.00	3737.00	3737.00
16.034	1091.75	0.00	1093.58	913.25	0.00	199999.98	0.00	928.20	2790.50	2790.50	3718.70	3718.70
16.034	1091.81	0.06	1093.63	913.64	0.00	199999.98	0.00	928.20	2790.50	2790.50	3718.70	3718.70
16.134	1091.78	0.00	1094.74	933.20	0.00	199999.98	0.00	977.90	2770.10	2770.10	3748.00	3748.00
16.134	1091.84	0.06	1094.78	935.28	0.00	199999.98	0.00	977.90	2770.10	2770.10	3748.00	3748.00
16.178	1092.20	0.00	1095.51	906.65	0.00	205000.00	0.00	940.00	9660.00	9660.00	10600.00	10600.00
16.178	1092.26	0.06	1095.54	907.08	0.00	205000.00	0.00	940.00	9660.00	9660.00	10600.00	10600.00
16.188	1092.42	0.00	1095.66	856.08	0.00	205000.02	0.00	0.00	0.00	3076.00	3934.50	0.00
16.188	1092.47	0*.05	1095.69	856.10	0.00	205000.00	0.00	0.00	0.00	3076.00	3934.50	0.00
16.202	1094.58	0.00	1097.11	856.88	0.00	205000.00	0.00	0.00	0.00	3076.00	3934.50	0.00
16.202	1094.65	0.07	1097.16	856.91	0.00	205000.00	0.00	0.00	0.00	3076.00	3934.50	0.00
16.213	1094.52	0.00	1097.40	877.53	0.00	205000.00	0.00	880.00	9690.00	9690.00	10570.00	10570.00
16.213	1094.59	0.07	1097.44	877.87	0.00	205000.00	0.00	880.00	9690.00	9690.00	10570.00	10570.00
16.254	1094.29	0.00	1098.32	863.96	0.00	204999.98	0.00	890.00	9680.00	9680.00	10570.00	10570.00
16.254	1094.36	0.07	1098.35	865.04	0.00	204999.98	0.00	890.00	9680.00	9680.00	10570.00	10570.00

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
*	16.347	1095.55	0.00	1102.29	744.73	0.00	205000.00	0.00	780.00	9700.00	9700.00	10480.00	10480.00
*	16.347	1095.53	-0.02	1102.29	744.65	0.00	205000.00	0.00	780.00	9700.00	9700.00	10480.00	10480.00
	16.428	1100.71	0.00	1104.41	822.44	3.11	204996.91	0.00	0.00	0.00	9620.00	10450.00	0.00
	16.428	1100.72	0.01	1104.41	812.58	0.00	205000.00	0.00	1180.00	9620.00	9620.00	10450.00	10800.00
	16.528	1103.64	0.00	1105.52	1409.16	342.51	178895.06	25762.44	11100.00	0.00	9600.00	10370.00	11100.00
	16.528	1103.64	0.00	1105.53	1300.00	0.00	179119.27	25880.72	1300.00	9600.00	9600.00	10370.00	10900.00

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*IS	VCH	AREA	.01K
15.173	0.00	0.00	0.00	1061.10	200000.00	1083.77	1072.09	1084.89	6.16	8.51	23512.25	80554.61
15.173	0.00	0.00	0.00	1061.10	200000.00	1083.77	1072.09	1084.89	6.16	8.51	23512.25	80554.61
15.235	330.00	0.00	0.00	1061.10	200000.00	1082.26	1078.55	1086.11	32.75	15.74	12706.43	34949.79
15.235	330.00	0.00	0.00	1061.10	200000.00	1082.26	1078.55	1086.11	32.75	15.74	12706.43	34949.79
15.335	528.00	0.00	0.00	1063.60	200000.00	1084.05	1081.10	1087.98	37.52	15.91	12570.11	32652.64
15.335	528.00	0.00	0.00	1063.60	200000.00	1083.70	1080.86	1088.08	36.20	16.80	11907.24	33240.75
15.434	525.00	0.00	0.00	1060.10	200000.00	1086.13	1078.86	1089.42	19.21	14.55	13746.28	45632.06
15.434	525.00	0.00	0.00	1060.10	200000.00	1086.30	1078.86	1089.53	18.73	14.42	13866.65	46217.44
15.534	528.00	0.00	0.00	1059.60	200000.00	1086.61	1081.76	1090.95	28.35	16.73	11954.58	37563.97
15.534	528.00	0.00	0.00	1059.60	200000.00	1086.76	1081.75	1091.03	27.64	16.60	12049.73	38041.42
15.634	528.00	0.00	0.00	1059.90	200000.00	1090.68	1075.18	1091.77	4.55	8.37	23897.81	93712.55
15.634	528.00	0.00	0.00	1059.90	200000.00	1090.75	1075.17	1091.84	4.51	8.35	23962.79	94127.78
15.734	528.00	0.00	0.00	1057.80	200000.00	1090.82	1077.39	1092.11	6.13	9.10	21987.02	80802.44
15.734	528.00	0.00	0.00	1057.80	200000.00	1090.89	1077.38	1092.17	6.07	9.07	22053.21	81200.09
15.834	528.00	0.00	0.00	1061.40	200000.00	1091.08	1078.95	1092.49	7.13	9.55	20949.85	74884.87
15.834	528.00	0.00	0.00	1061.40	200000.00	1091.15	1078.95	1092.55	7.06	9.52	21013.68	75249.30
15.934	528.00	0.00	0.00	1064.10	200000.00	1091.34	1081.24	1093.00	9.48	10.34	19347.10	64962.37
15.934	528.00	0.00	0.00	1064.10	200000.00	1091.41	1081.23	1093.05	9.38	10.30	19409.30	65287.44
16.034	528.00	0.00	0.00	1067.40	200000.00	1091.75	1082.46	1093.58	10.73	10.86	18423.76	61060.86
16.034	528.00	0.00	0.00	1067.40	200000.00	1091.81	1082.46	1093.63	10.63	10.82	18479.51	61350.90
16.134	528.00	0.00	0.00	1072.00	200000.00	1091.78	1086.93	1094.74	24.48	13.82	14472.60	40419.98
16.134	528.00	0.00	0.00	1072.00	200000.00	1091.84	1086.93	1094.78	24.23	13.76	14530.53	40629.57
16.178	230.00	0.00	0.00	1075.20	205000.00	1092.20	1088.11	1095.51	27.27	14.58	14057.31	39255.29
16.178	230.00	0.00	0.00	1075.20	205000.00	1092.26	1088.11	1095.54	26.97	14.53	14107.12	39474.54
16.188	50.00	0.00	0.00	1075.30	205000.00	1092.42	1087.86	1095.66	24.66	14.43	14210.46	41285.41
16.188	50.00	0.00	0.00	1075.30	205000.00	1092.47	1087.87	1095.69	24.42	14.38	14251.33	41480.37
16.202	77.00	1099.40	1094.90	1075.30	205000.00	1094.58	0.00	1097.11	16.50	12.76	16061.13	50460.05
16.202	77.00	1099.40	1094.90	1075.30	205000.00	1094.65	0.00	1097.16	16.32	12.72	16116.98	50747.73
16.213	60.00	0.00	0.00	1076.00	205000.00	1094.52	1089.03	1097.40	20.84	13.61	15058.95	44903.42
16.213	60.00	0.00	0.00	1076.00	205000.00	1094.59	1089.03	1097.44	20.59	13.56	15116.91	45179.40
16.254	215.00	0.00	0.00	1076.80	205000.00	1094.29	1091.25	1098.32	35.54	16.10	12735.39	34385.79
16.254	215.00	0.00	0.00	1076.80	205000.00	1094.36	1091.25	1098.35	35.05	16.02	12795.21	34626.15

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	16.347	490.00	0.00	0.00	1078.20	205000.00	1095.55	1095.55	1102.29	69.08	20.83	9839.57	24665.21
*	16.347	490.00	0.00	0.00	1078.20	205000.00	1095.53	1095.53	1102.29	69.45	20.87	9823.12	24598.88
	16.428	430.00	0.00	0.00	1080.00	205000.00	1100.71	1096.49	1104.41	28.39	15.43	13292.81	38474.49
	16.428	430.00	0.00	0.00	1080.00	205000.00	1100.72	1096.49	1104.41	28.37	15.42	13298.10	38491.17
	16.528	528.00	0.00	0.00	1080.20	205000.00	1103.64	1099.21	1105.52	12.30	11.60	20283.28	58456.77
	16.528	528.00	0.00	0.00	1080.20	205000.00	1103.64	1099.25	1105.53	12.40	11.62	20087.19	58210.72

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
15.173	200000.00	1083.77	0.00	0.00	0.00	1113.33	0.00
15.173	200000.00	1083.77	0.00	0.00	0.00	1113.33	0.00
15.235	200000.00	1082.26	0.00	-1.51	0.00	839.92	330.00
15.235	200000.00	1082.26	0.00	-1.51	0.00	839.92	330.00
15.335	200000.00	1084.05	0.00	1.79	0.00	905.82	528.00
15.335	200000.00	1083.70	-0.35	1.44	-0.35	760.00	528.00
15.434	200000.00	1086.13	0.00	2.08	0.00	681.95	525.00
15.434	200000.00	1086.30	0.17	2.60	0.17	683.75	525.00
15.534	200000.00	1086.61	0.00	0.48	0.00	642.34	528.00
15.534	200000.00	1086.76	0.15	0.46	0.15	642.82	5#28.00
15.634	200000.00	1090.68	0.00	4.07	0.00	891.60	528.00
15.634	200000.00	1090.75	0.07	4.00	0.07	891.60	528.00
15.734	200000.00	1090.82	0.00	0.14	0.00	930.00	528.00
15.734	200000.00	1090.89	0.07	0.14	0.07	930.00	528.00
15.834	200000.00	1091.08	0.00	0.26	0.00	928.80	528.00
15.834	200000.00	1091.15	0.07	0.25	0.07	929.03	528.00
15.934	200000.00	1091.34	0.00	0.26	0.00	943.34	528.00
15.934	200000.00	1091.41	0.07	0.26	0.07	943.83	528.00
16.034	200000.00	1091.75	0.00	0.41	0.00	913.25	528.00
16.034	200000.00	1091.81	0.06	0.41	0.06	913.64	528.00
16.134	200000.00	1091.78	0.00	0.03	0.00	933.20	528.00
16.134	200000.00	1091.84	0.06	0.03	0.06	935.28	528.00
16.178	205000.00	1092.20	0.00	0.43	0.00	906.65	230.00
16.178	205000.00	1092.26	0.06	0.42	0.06	907.08	230.00
16.188	205000.00	1092.42	0.00	0.22	0.00	856.08	50.00
16.188	205000.00	1092.47	0.05	0.21	0.05	856.10	50.00
16.202	205000.00	1094.58	0.00	2.16	0.00	856.88	77.00
16.202	205000.00	1094.65	0.07	2.18	0.07	856.91	77.00
16.213	205000.00	1094.52	0.00	-0.06	0.00	877.53	60.00
16.213	205000.00	1094.59	0.07	-0.06	0.07	877.87	60.00
16.254	205000.00	1094.29	0.00	-0.23	0.00	863.96	215.00
16.254	205000.00	1094.36	0.07	-0.22	0.07	865.04	215.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	16.347	205000.00	1095.55	0.00	1.25	0.00	744.73	490.00
*	16.347	205000.00	1095.53	-0.02	1.16	-0.02	744.65	490.00
	16.428	205000.00	1100.71	0.00	5.16	0.00	822.44	430.00
	16.428	205000.00#	1100.72	0.01	5.20	0.01	812.58	430.00
	16.528	205000.00	1103.64	0.00	2.93	0.00	1409.16	528.00
	16.528	205000.00	1103.64	0.00	2.92	0.00	1300.00	528.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION  SECNO=   16.347  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=   16.347  PROFILE= 1  MINIMUM SPECIFIC ENERGY
CAUTION  SECNO=   16.347  PROFILE= 2  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=   16.347  PROFILE= 2  MINIMUM SPECIFIC ENERGY
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FLOODWAY DATA, 100-YEAR Q = 200000 CFS,
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCE
15.173	1113.	23512.	8.5	1083.8	1083.8	0.0
15.235	840.	12706.	15.7	1082.3	1082.3	0.0
15.335	760.	11907.	16.8	1083.8	1084.0	-0.2
15.434	684.	13867.	14.4	1086.3	1086.1	0.2
15.534#	643.	12050.	16.6	1086.7	1086.6	0.1
15.634	892.	23963.	8.3	1090.8	1090.7	0.1
15.734	930.	22053.	9.1	1090.9	1090.8	0.1
15.834	929.	21014.	9.5	1091.2	1091.1	0.1
15.934	944.	19409.	10.3	1091.4	1091.3	0.1
16.034	914.	18480.	10.8	1091.9	1091.8	0.1
16.134	935.	14531.	13.8	1091.9	1091.8	0.1
16.178	907.	14107.	14.5	1092.3	1092.2	0.1
16.188	856.	14251.	14.4	1092.4	1092.4	0.0
16.202	857.	16117.	12.7	1094.7	1094.6	0.1
16.213	878.	15117.	13.6	1094.6	1094.5	0.1
16.254	865.	12795.	16.0	1094.4	1094.3	0.1
16.347	745.	9823.	20.9	1095.5	1095.5	0.0
16.428	813.	13298.	15.4	1100.7	1100.7	0.0
16.528	1300.	20087.	10.2	1103.6	1103.6	0.0

MODEL 2

HNTB

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C
C     28
C 15.173INPUT FILENAME = MODEL2.IH2
C 15.173THE FOLLOWING IS A HEC-2 INPUT FILE FOR THE SALT RIVER CHANNEL
C 15.173BETWEEN 16TH STREET BRIDGE AND 24TH STREET BRIDGE.  THIS
C 15.173STUDY EXAMINES WATER SURFACE PROFILES FOR THE 100-YEAR STORM
C 15.173WITHOUT THE NORTH LEVEE THAT RUNS FROM THE 24TH STREET BRIDGE
C 15.173TO THE EAST TUNNEL OUTFALL.
C 15.173CROSS SECTION 15.173 GR POINTS MATCH PREVIOUS STUDY
C 15.173CROSS SECTION LOCATED UPSTREAM OF 16TH STREET BRIDGE
C 15.23!5CROSS SECTION 15.235 DEVELOPED FROM COOPER AERIAL DATA
C 15.335CROSS SECTION 15.335 DEVELOPED FROM COOPER AERIAL DATA
C 15.434CROSS SECTION 15.434 DEVELOPED FROM COOPER AERIAL DATA
C 15.534CROSS SECTION 15.534 DEVELOPED FROM COOPER AERIAL DATA
C 15.634CROSS SECTION 15.634 DEVELOPED FROM COOPER AERIAL DATA
C 15.634CROSS SECTION 15.634 LOCATED AT EAST TUNNEL OUTFALL
C 15.734CROSS SECTION 15.734 DEVELOPED FROM COOPER AERIAL DATA
C 15.734REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
C 15.834CROSS SECTION 15.834 DEVELOPED FROM COOPER AERIAL DATA
C 15.834REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
C 15.934CROSS SECTION 15.934 DEVELOPED FROM COOPER AERIAL DATA
C 15.934REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
C 16.034CROSS SECTION 16.034 DEVELOPED FROM COOPER AERIAL DATA
C 16.034REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
C 16.134CROSS SECTION 16.134 DEVELOPED FROM COOPER AERIAL DATA
C 16.134REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
C 16.178FROM STATION 16.178 THROUGH STATION 16.347 ALL
C 16.178DATA WAS OBTAINED FROM THE PREVIOUS SALT RIVER STUDY.
C 16.178STATIONS 16.178 THROUGH STATION 16.213 INPUT DATA FOR SPECIAL
C 16.178BRIDGE ROUTINE FOR 24TH STREET BRIDGE.
T1       HYDRAULIC ANALYSIS OF 1989 SALT RIVER WATER SURFACE (NEGL EXTRA FUTURE
T2       ROOSEVELT DAM FLOOD CAPACITY). STARTING EL FOR 100 YR EVENT IS   1083.77
T3       100-YEAR Q = 200000 CFS, SUBCRITICAL RUN FROM 16TH TO 24TH STREETS (NAT)
J1            4                                                   1083.77
J2    -1      0      -1                              -1
J3   150    110
J3    38      1       8       4      26      56      43      14      15      27
J3    28             31      32       9
NC 0.045   0.045   0.033      .1      .3
QT     3  200000  200000  200000
X115.173      8    9430   10560       0       0       0
GR  1091    9310    1090    9430    1065    9482  1061.1    9550  1061.1   10450
GR  1080   10550    1086   10560    1086   10570
X115.235     13    2470    3470     130     490     330
X3  10.0
GR1087.8    1594    1089    1854    1093    2289 1088.67    2415 1088.97    2470
GR1061.1    2810  1061.1    3000  1061.1    3171 1089.76    3470  1087.7    3520
GR1074.3    3580  1082.3    3753  1083.8    3881
ET                 9.1     9.1                                       2700    3460
X115.335     11    2560    3620     510     530     528
X3  10.0
GR  1088    1765  1089.4    1955 1089.31    2145 1073.85    2485  1090.7    2560
GR1063.6    2840  1063.8    3000  1064.1    3180  1085.2    3555  1098.1    3620
GR1085.5    3910                                                   !
X115.434     10    2610    3355     550     580     525
X3  10.0
GR1090.2    1948 1060.21    2368  1091.6    2610  1062.6    2780 1061.39    3000
GR1060.1    3210  1093.2    3355  1087.8    3625 1087.30    4050  1086.6    4475
ET           7.1     7.1     9.1                    2670    3320    2670    3320
X115.534      26    2670    3320     550     520     528
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X3  10.0
GR1071.6    1911  1058.4    2210  1092.6    2440  1089.1    2455  1089.7    2670
GR1078.8    2690  1070.0    2720  1067.5    2740  1063.9    2769  1066.4    2788
GR1065.8    2801  1061.2    2852  1063.5    2892  1061.8    3000  1063.4    3012
GR1059.6    3030  1065.2    3105  1063.3    3120  1074.3    3210  1086.6    3318
GR1088.0    3320  1087.8    3580  1086.7    4040  1095.7    4170  1094.8    4275
GR1088.0    4675
ET           7.1     7.1     9.1                 2898.4    3790  2898.4    3790
X115.634      62  2898.4  4627.6     590    1108     528
X3    10                                                   1095.0
GR1074.4  2193.3  1074.3  2272.3  1067.6  2296.0  1063.8  2352.1  1061.1  2409.1
GR1061.1  2484.5  1060.0  2539.0  1059.6  2621.0  1059.4  2694.4  1059.9  2707.9
GR1077.6  2756.9  1061.0  2788.7  1061.0  2801.1  1061.0  2815.6  1062.5  2828.5
GR1084.6  2846.3  1085.2  2854.0  1087.1  2865.5  1086.6  2885.9  1087.3  2898.4
GR1074.0  2925.7  1071.6  2964.4  1069.0  2977.8  1064.2  3027.8  1064.7  3079.6
GR1064.4  3147.3 1064.51    3190  1064.5  3228.5  1062.5  3301.3  1061.5  3345.7
GR1061.4  3371.7  1064.5  3397.4  1063.8  3441.3  1061.9  3452.6  1061.4  3516.2
GR1061.8  3590.0  1059.9  3664.3  1060.5  3718.6  1063.3  3734.1  1060.0  3750.2
GR1060.2  3790.0  1060.4  3803.2  1063.2  3863.4  1066.2  3920.1  1068.5  3998.0
GR1071.6  4069.8  1073.9  4143.6  1075.1  4220.7  1075.1  4273.2  1080.6  4301.3
GR1080.6  4327.7  1066.1  4337.8  1067.5  4367.8  1072.6  4419.2  1077.7  4471.1
GR1082.7  4515.1  1088.8  4574.7  1092.9  4627.6  1090.1  4712.4  1087.4  4825.7
GR1087.2  4897.5  1087.3  5000.0
NC         0.040
ET           7.1     7.1     9.1                 2862.4  3792.4  2862.4  4231.0
X115.734      83  2862.4  3792.4     525     530     528
X3  10.0
GR1062.8  2190.5  1061.7  2257.4  1059.6  2325.5  1062.2  2345.3  1063.6  2395.8
GR1062.9  2458.9  1066.8  2482.0  1065.8  2496.6  1069.4  2512.9  1069.6  2562.0
GR1069.3  2603.8  1073.0  2618.7  1060.2  2645.6  1059.7  2672.8  1076.3  2720.8
GR1061.4  2752.6  1061.0  2762.2  1061.0  2781.1  1058.4  2789.0  1070.2  2809.3
GR1089.1  2839.5  1089.1  2862.4  1068.8  2923.3  1069.3  2985.1  1065.5  3022.5
GR1066.4  3045.9  1067.0  3099.7 1066.56  3125.0  1065.8  3168.0  1064.7  3224.9
GR1063.8  3271.2  1060.1  3321.8  1057.8  3341.1  1059.9  3366.6  1060.4  3413.0
GR1059.7  3457.7  1063.1  3475.7  1064.7  3508.2  1066.7  3532.1  1067.4  3570.6
GR1065.8  3589.1  1068.1  3638.9  1068.3  3669.1  1067.7  3706.7  1068.4  3726.7
GR1070.0  3768.1  1070.0  3792.4  1070.0  3805.2  1070.0  3814.7  1070.0  3837.3
GR1070.0  3898.9  1070.0  3931.0  1070.0  3944.3  1070.0  3978.0  1070.0  3992.0
GR1070.0  4007.5  1070.0  4014.2  1070.0  4055.8  1070.0  4111.7  1070.0  4174.1
GR1070.0  4252.0  1070.0  4313.9  1070.0  4338.1  1070.0  4382.0  1070.0  4414.0
GR1070.0  4454.8  1070.0  4472.3  1078.3  4501.8  1095.8  4539.7  1096.6  4573.4
GR1096.6  4641.1  1096.5  4707.1  1096.3  4783.4  1090.5  4811.0  1091.1  4830.8
GR1091.2  4852.4  1097.0  4867.3  1096.9  4878.9  1091.2  4891.5  1091.3  4920.7
GR1091.9  4969.3  1090.1  4977.2  1089.6  5000.0     0.0     0.0     0.0     0.0
ET           7.1     7.1     9.1                 2827.6  3756.8  2827.6  4052.0
X115.834      75  2827.6  3756.8     525     560     528
X3  10.0
GR1075.7  2134.6  1077.0  2170.6  1076.4  2197.6  1073.8  2241.1  1065.9  2266.0
GR1064.2  2283.3  1063.7  2310.6  1064.3  2323.4  1056.2  2341.2  1056.6  2409.9
GR1056.7  2483.9  1057.4  2543.8  1057.4  2625.7  1056.8  2684.0  1058.4  2695.6
GR1060.0  2710.2  1059.0  2730.5  1057.9  2745.7  1073.1  2782.2  1091.2  2807.4
GR1091.2  2827.6  1080.3  2863.2  1070.7  2890.1  1069.9  2942.1  1069.0  2989.7
GR1069.8  3005.6  1069.6  3028.1  1068.0  3073.9 1068.05  3080.0  1067.5  3158.1
GR1067.3  3235.4  1064.6  3280.8  1063.4  3328.1  1062.7  3393.4  1062.1  3470.9
GR1061.4  3530.7  1062.2  3558.2  1069.5  3600.6  1069.4  3653.3  1070.0  3683.4
GR1070.0  3722.0  1071.0  3756.8  1070.0  3777.8  1070.0  3829.9  1070.0  3890.0
GR1070.0  3926.8  1070.0  3958.5  1070.0  4018.0  1070.0  4028.8  1070.0  4037.4
GR1070.0  4115.5  1070.0  4153.4  1070.0  4197.2  1070.0  4252.4  1070.0  4268.1
GR1070.0  4278.8  1070.0  4330.9  1070.0  4362.0  1070.0  4369.7  1070.0  4388.2
GR1073.8  4410.8  1075.5  4437.0  1070.6  4447.7  1075.9  4463.1  1089.0  4492.1
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GR1090.1  4571.1  1090.1  4637.6  1089.4  4700.9  1089.6  4744.0  1089.5  4805.3
GR1088.7  4821.1  1088.7  4849.6  1097.5  4896.1  1091.3  4909.4  1091.6  5000.0
ET           7.1     7.1     9.1                  2790    3737    2790    3915
X115.934      59    2790    3737     520     545     528
X3  10.0
GR1060.1  2240.0 1054.26  2650.0 1091.76  2790.0  1082.2  2840.0 1071.09  3040.0
GR1072.3  3078.4  1070.6  3131.0  1067.0  3176.4  1064.2  3190.5  1064.2  3284.2
GR1065.2  3297.6  1065.8  3333.7  1064.1  3401.9  1064.7  3486.4  1068.1  3505.9
GR1068.1  3540.3  1065.6  3546.2  1065.3  3577.2  1068.7  3593.3  1071.0  3640.7
GR1071.0  3667.0  1072.8  3694.6  1075.0  3737.0  1075.0  3756.6  1075.0  3782.7
GR1075.0  3842.8  1075.0  3888.0  1075.0  3914.3  1075.0  3942.0  1075.0  3982.4
GR1075.0  3993.4  1075.0  4064.0  1075.0  4087.9  1075.0  4092.0  1075.0  4129.0
GR1075.0  4137.6  1075.0  4147.4  1075.0  4235.0  1075.0  4318.2  1075.0  4384.5
GR1075.0  4435.9  1075.0  4504.0  1075.0  4578.6  1075.0  4636.2  1075.0  4664.4
GR1075.0  4671.3  1075.0  4682.5  1075.0  4695.2  1075.0  4708.9  1075.1  4722.4
GR1086.9  4737.2  1083.4  4752.6  1084.5  4800.6  1100.5  4835.9  1096.0  4852.1
GR1096.3  4888.9  1098.0  4913.1  1092.1  4927.3  1091.6  5000.0
ET           7.1     7.1     9.1     9.1          2790.5  3718.7  2790.5    3788
X116.034      81  2790.5  3718.7     525     530     528
X3  10.0
GR1061.5  2083.2  1061.8  2112.5  1060.0  2167.4  1057.5  2218.6  1050.0  2248.0
GR1049.1  2294.7  1049.1  2379.3  1049.9  2421.5  1054.4  2483.3  1055.1  2564.6
GR1053.5  2619.9  1054.4  2627.4  1052.9  2633.9  1042.7  2640.2  1042.7  2668.4
GR1057.1  2674.0  1062.[illegible]7  2691.5  1063.5  2706.2  1070.4  2730.0  1094.4  2767.1
GR1094.7  2790.5  1086.5  2829.1  1071.9  2867.9  1069.7  2904.7  1070.9  2947.0
GR1068.9  3008.6  1069.0  3030.0  1069.1  3050.9  1072.2  3116.4  1072.1  3170.8
GR1067.6  3209.4  1067.8  3270.8  1067.4  3303.2  1072.1  3320.5  1071.7  3420.8
GR1070.4  3491.8  1071.1  3505.4  1071.0  3524.7  1069.0  3535.1  1069.4  3579.3
GR1067.4  3606.6  1070.7  3623.8  1069.9  3651.4  1070.6  3666.5  1070.0  3698.1
GR1070.0  3718.7  1070.0  3741.1  1070.0  3775.1  1070.0  3793.9  1070.0  3800.8
GR1070.0  3816.2  1070.0  3826.1  1070.0  3844.7  1070.0  3871.8  1070.0  3891.1
GR1070.0  4045.5  1070.0  4077.8  1070.0  4087.1  1070.0  4111.8  1070.0  4152.0
GR1070.0  4199.2  1070.0  4237.1  1070.0  4272.0  1070.0  4351.4  1070.0  4401.5
GR1070.0  4473.2  1070.0  4539.2  1070.0  4553.1  1070.0  4579.3  1070.0  4633.3
GR1070.0  4654.6  1076.6  4688.2  1081.2  4734.2  1086.5  4768.3  1096.4  4788.5
GR1095.6  4793.6  1095.4  4838.2  1095.7  4897.9  1099.5  4926.7  1092.9  4940.4
GR1092.8  5000.0
ET           7.1     7.1     9.1                  2770.1    3748  2770.1    3668
X116.134      69  2770.1    3748     540     970     528
X3  10.0
GR1059.3  2133.8  1058.7  2165.0  1056.6  2251.6  1056.3  2322.0  1057.5  2379.2
GR1062.1  2420.4  1074.0  2462.2  1082.9  2486.8  1084.7  2509.1  1087.2  2523.9
GR1065.6  2563.2  1062.8  2596.6  1060.4  2627.2  1062.8  2650.3  1070.2  2681.1
GR1084.1  2715.0  1096.6  2737.8  1096.2  2746.9  1095.8  2770.1  1078.1  2831.8
GR1074.4  2880.1  1072.9  2949.7  1073.6  3021.9 1073.41  3055.0  1073.1  3109.6
GR1072.0  3184.6  1072.9  3267.0  1074.2  3321.6  1074.1  3365.0  1074.8  3440.7
GR1075.8  3496.7  1074.7  3509.3  1075.6  3561.3  1075.0  3586.0  1075.0  3611.9
GR1075.0  3625.8  1075.0  3654.1  1075.0  3714.9  1075.0  3748.0  1075.0  3791.1
GR1075.0  3834.2  1075.0  3861.2  1075.0  4004.5  1075.0  4047.0  1075.0  4081.0
GR1075.0  4135.4  1075.0  4195.0  1075.0  4246.2  1075.0  4318.1  1075.0  4373.8
GR1075.0  4401.9  1075.0  4424.8  1075.0  4464.3  1080.7  4506.3  1087.0  4542.9
GR1086.2  4595.0  1083.5  4646.8  1081.2  4698.0  1074.7  4727.7  1072.2  4756.5
GR1077.8  4775.6  1092.5  4797.2  1094.7  4835.5  1097.2  4878.3  1097.4  4913.4
GR1102.0  4932.7  1097.6  4965.3  1095.3  4974.3  1094.6  50[illegible]00.0
NC     0       0       0      .3      .5
QT     3  205000  205000  205000
ET           7.1     7.1     9.1                  9660   10600    9660   10600
X116.178      14    9660   10600     200     220     230
X3    10
GR  1100    8050    1095    8180    1090    8360    1085    8470    1085    8660
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GR  1090    8880    1095    9070  1095.5    9420    1097    9660    1080    9720
GR1075.2    9830  1075.2   10510    1096   10600    1096   10605
X116.188      10    3076  3934.5      60      60      50
X3    10                                            1094.5  1094.5
GR1099.4    3075  1099.4    3076  1094.9    3077  1089.5    3078  1075.3    3110
GR1075.3    3904  1089.5    3933  1094.9    3934  1099.5  3934.5  1099.5    3935
SB   0.9     1.6     2.5       0     794    71.5   14923     0.5  1075.3  1075.2
X116.202                              77      77      77
X2                     1  1094.9  1099.4                    1.33
X3    10                                            1099.4  1099.4
BT     3    3075  1099.4            3507  1099.8    3935  1099.5
ET           7.1     7.1     9.1                    9690   10570    9690   10570
X116.213       8    9690   10570      60      60      60
X3    10
GR  1100    9600    1095    9690    1080    9720    1077    9840    1076    9890
GR  1076   10510    1095   10570  1099.5   10800
NC                            .1      .3
ET           7.1     7.1     9.1                    9680   10570    9680   10570
X116.254       7    9680   10570     200     270     215
X3    10
GR1101.5    9580    1100    9680  1076.8    9750  1076.8   10350    1080   10380
GR  1095   10570  1099.5   10800
ET           7.1     7.1     9.1                    9700   10480    9700   10480
X116.347      12    9700   10480     500     470     490
X3    10
GR1107.5    9580    1105    9700  1078.2    9800  1078.2   10210  1088.8   10260
GR  1084   10340    1085   10350    1095   10480    1094   10650    1095   11000
GR  1095   11150    1101   11290
ET                   9.1     9.1                                    9620   10800
X116.428      15    9620   10450     470     370     430
GR  1105    9550    1100    9620    1080    9750    1080    9950  1083.4   10100
GR  1080   10250  1087.3   10330    1103   10450    1100   10451    1100   10550
GR  1095   10680  1090.5   10810    1095   10920    1100   11180  1101.5   11300
ET           4.1     9.1     9.1   11100                            9600   10900
X116.528      19    9600   10370     560     430     528
GR  1104    9480    1100    9600    1095    9610    1090    9650    1085    9700
GR  1082    9850  1080.2    9980  1080.2   10200    1085   10280    1090   10350
GR  1099   10370    1095   10400    1095   10570    1096   10650    1095   10720
GR1092.5   10800    1095   10900    1100   11100    1102   11320
ET           4.1     9.1     9.1   10800                            9500   10730
X116.628      22    9220   10600     550     440     528
GR  1106    9200    1100    9220  1098.7    9390    1095    9610    1090    9670
GR  1085    9700    1082    9850  1080.4    9920  1080.4   10200    1085   10250
GR  1100   10310    1109   10350    1105   10390    1105   10450    1107   10540
GR  1100   10600    1096   10650    1095   10700    1094   10730    1095   10800
GR  1100   11070    1102   11150
EJ


ER
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*******************************************************
*  WATER SURFACE PROFILES                             *
*  VERSION OF NOVEMBER 1976                           *
*  UPDATED MAY 1984                                   *
*                                                     *
*  RUN DATE 10-JAN-90  TIME 16:56:18                  *
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*  U.S. ARMY CORPS OF ENGINEERS        *
*  THE HYDROLOGIC ENGINEERING CENTER   *
*  609 SECOND STREET, SUITE D          *
*  DAVIS, CALIFORNIA 95616             *
*  (916) 440-2105 (FTS) 448-2105       *
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X     X  XXXXXXX   XXXXX              XXXXX
X     X  X        X     X            X     X
X     X  X        X                        X
XXXXXXX  XXXX     X          XXXXX    XXXXX
X     X  X        X                  X
X     X  X        X     X            X
X     X  XXXXXXX   XXXXX             XXXXXXX
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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55
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C
T1      HYDRAULIC ANALYSIS OF 1989 SALT RIVER WATER SURFACE (NEGL EXTRA FUTURE
T2      ROOSEVELT DAM FLOOD CAPACITY). STARTING EL FOR 100 YR EVENT IS   1083.77
T3      100-YEAR Q = 200000 CFS, SUBCRITICAL RUN FROM 16TH TO 24TH STREETS (NAT)

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0.        4.        0.        0.  0.000000      0.00      0.0       0.  1083.770     0.000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

    -1.000     0.000    -1.000     0.000     0.000     0.000    -1.000     0.000     0.000     0.000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

   150.000   110.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

    38.000     1.000     8.000     4.000    26.000    56.000    43.000    14.000    15.000    27.000

    28.000     0.000    31.000    32.000     9.000     0.000     0.000     0.000     0.000     0.000

NC      0.045      0.045      0.033      0.100      0.300      0.000      0.000      0.000      0.000      0.000
QT      3.000 200000.000 200000.000  200000.000      0.000      0.000      0.000      0.000      0.000      0.000
        INPUT FILENAME = MODEL2.IH2
        THE FOLLOWING IS A HEC-2 INPUT FILE FOR THE SALT RIVER CHANNEL
        BETWEEN 16TH STREET BRIDGE AND 24TH STREET BRIDGE.  THIS
        STUDY EXAMINES WATER SURFACE PROFILES FOR THE 100-YEAR STORM
        WITHOUT THE NORTH LEVEE THAT RUNS FROM THE 24TH STREET BRIDGE
        TO THE EAST TUNNEL OUTFALL.
        CROSS SECTION 15.173 GR POINTS MATCH PREVIOUS STUDY
        CROSS SECTION LOCATED UPSTREAM OF 16TH STREET BRIDGE
X1     15.173      8.000   9430.000  10560.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1091.000   9310.000   1090.000   9430.000   1065.000   9482.000   1061.100   9550.000   1061.100  10450.000
GR   1080.000  10550.000   1086.000  10560.000   1086.000  10570.000      0.000      0.000      0.000      0.000

        CROSS SECTION 15.235 DEVELOPED FROM COOPER AERIAL DATA
X1     15.235     13.000   2470.000   3470.000    130.000    490.000    330.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1087.800   1594.000   1089.000   1854.000   1093.000   2289.000   1088.670   2415.000   1088.970   2470.000
GR   1061.100   2810.000   1061.100   3000.000   1061.100   3171.000   1089.760   3470.000   1087.700   3520.000
GR   1074.300   3580.000   1082.300   3753.000   1083.800   3881.000      0.000      0.000      0.000      0.000
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ET      0.000      0.000      9.100      9.100      0.000      0.000      0.000      0.000   2700.000   3460.000
        CROSS SECTION 15.335 DEVELOPED FROM COOPER AERIAL DATA
X1     15.335     11.000   2560.000   3620.000    510.000    530.000    528.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1088.000   1765.000   1089.400   1955.000   1089.310   2145.000   1073.850   2485.000   1090.700   2560.000
GR   1063.600   2840.000   1063.800   3000.000   1064.100   3180.000   1085.200   3555.000   1098.100   3620.000
GR   1085.500   3910.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000

        CROSS SECTION 15.434 DEVELOPED FROM COOPER AERIAL DATA
X1     15.434     10.000   2610.000   3355.000    550.000    580.000    525.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1090.200   1948.000   1060.210   2368.000   1091.600   2610.000   1062.600   2780.000   1061.390   3000.000
GR   1060.100   3210.000   1093.200   3355.000   1087.800   3625.000   1087.300   4050.000   1086.600   4475.000

ET      0.000      7.100      7.100      9.100      0.000      0.000   2670.000   3320.000   2670.000   3320.000
        CROSS SECTION 15.534 DEVELOPED FROM COOPER AERIAL DATA
X1     15.534     26.000   2670.000   3320.000    550.000   5#20.000    528.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1071.600   1911.000   1058.400   2210.000   1092.600   2440.000   1089.100   2455.000   1089.700   2670.000
GR   1078.800   2690.000   1070.000   2720.000   1067.500   2740.000   1063.900   2769.000   1066.400   2788.000
GR   1065.800   2801.000   1061.200   2852.000   1063.500   2892.000   1061.800   3000.000   1063.400   3012.000
GR   1059.600   3030.000   1065.200   3105.000   1063.300   3120.000   1074.300   3210.000   1086.600   3318.000
GR   1088.000   3320.000   1087.800   3580.000   1086.700   4040.000   1095.700   4170.000   1094.800   4275.000
GR   1088.000   4675.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000

ET      0.000      7.100      7.100      9.100      0.000      0.000   2898.400   3790.000   2898.400   3790.000
        CROSS SECTION 15.634 DEVELOPED FROM COOPER AERIAL DATA
        CROSS SECTION 15.634 LOCATED AT EAST TUNNEL OUTFALL
X1     15.634     62.000   2898.400   4627.600    590.000   1108.000    528.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000   1095.000      0.000
GR   1074.400   2193.300   1074.300   2272.300   1067.600   2296.000   1063.800   2352.100   1061.100   2409.100
GR   1061.100   2484.500   1060.000   2539.000   1059.600   2621.000   1059.400   2694.400   1059.900   2707.900
GR   1077.600   2756.900   1061.000   2788.700   1061.000   2801.100   1061.000   2815.600   1062.500   2828.500
GR   1084.600   2846.300   1085.200   2854.000   1087.100   2865.500   1086.600   2885.900   1087.300   2898.400
GR   1074.000   2925.700   1071.600   2964.400   1069.000   2977.800   1064.200   3027.800   1064.700   3079.600
GR   1064.400   3147.300   1064.510   3190.000   1064.500   3228.500   1062.500   3301.300   1061.500   3345.700
GR   1061.400   3371.700   1064.500   3397.400   1063.800   3441.300   1061.900   3452.600   1061.400   3516.200
GR   1061.800   3590.000   1059.900   3664.300   1060.500   3718.600   1063.300   3734.100   1060.000   3750.200
GR   1060.200   3790.000   1060.400   3803.200   1063.200   3863.400   1066.200   3920.100   1068.500   3998.000
GR   1071.600   4069.800   1073.900   4143.600   1075.100   4220.700   1075.100   4273.200   1080.600   4301.300
GR   1080.600   4327.700   1066.100   4337.800   1067.500   4367.800   1072.600   4419.200   1077.700   4471.100
GR   1082.700   4515.100   1088.800   4574.700   1092.900   4627.600   1090.100   4712.400   1087.400   4825.700
GR   1087.200   4897.500   1087.300   5000.000      0.000      0.000      0.000      0.000      0.000      0.000

NC      0.000      0.040      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      7.100      7.100      9.100      0.000      0.000   2862.400   3792.400   2862.400   4231.000
        CROSS SECTION 15.734 DEVELOPED FROM COOPER AERIAL DATA
        REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
X1     15.734     83.000   2862.400   3792.400   # 525.000    530.000    528.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1062.800   2190.500   1061.700   2257.400   1059.600   2325.500   1062.200   2345.300   1063.600   2395.800
GR   1062.900   2458.900   1066.800   2482.000   1065.800   2496.600   1069.400   2512.900   1069.600   2562.000
GR   1069.300   2603.800   1073.000   2618.700   1060.200   2645.600   1059.700   2672.800   1076.300   2720.800
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GR    1061.400    2752.600    1061.000    2762.200    1061.000    2781.100    1058.400    2789.000    1070.200    2809.300
GR    1089.100    2839.500    1089.100    2862.400    1068.800    2923.300    1069.300    2985.100    1065.500    3022.500
GR    1066.400    3045.900    1067.000    3099.700    1066.560    3125.000    1065.800    3168.000    1064.700    3224.900
GR    1063.800    3271.200    1060.100    3321.800    1057.800    3341.100    1059.900    3366.600    1060.400    3413.000
GR    1059.700    3457.700    1063.100    3475.700    1064.700    3508.200    1066.700    3532.100    1067.400    3570.600
GR    1065.800    3589.100    1068.100    3638.900    1068.300    3669.100    1067.700    3706.700    1068.400    3726.700
GR    1070.000    3768.100    1070.000    3792.400    1070.000    3805.200    1070.000    3814.700    1070.000    3837.300
GR    1070.000    3898.900    1070.000    3931.000    1070.000    3944.300    1070.000    3978.000    1070.000    3992.000
GR    1070.000    4007.5#00    1070.000    4014.200    1070.000    4055.800    1070.000    4111.700    1070.000    4174.100
GR    1070.000    4252.000    1070.000    4313.900    1070.000    4338.100    1070.000    4382.000    1070.000    4414.000
GR    1070.000    4454.800    1070.000    4472.300    1078.300    4501.800    1095.800    4539.700    1096.600    4573.400
GR    1096.600    4641.100    1096.500    4707.100    1096.300    4783.400    1090.500    4811.000    1091.100    4830.800
GR    1091.200    4852.400    1097.000    4867.300    1096.900    4878.900    1091.200    4891.500    1091.300    4920.700
GR    1091.900    4969.300    1090.100    4977.200    1089.600    5000.000       0.000       0.000       0.000       0.000

ET       0.000       7.100       7.100       9.100       0.000       0.000    2827.600    3756.800    2827.600    4052.000
         CROSS SECTION 15.834 DEVELOPED FROM COOPER AERIAL DATA
         REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
X1      15.834      75.000    2827.600    3756.800     525.000     560.000     528.000       0.000       0.000       0.000
X3      10.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
GR    1075.700    2134.600    1077.000    2170.600    1076.400    2197.600    1073.800    2241.100    1065.900    2266.000
GR    1064.200    2283.300    1063.700    2310.600    1064.300    2323.400    1056.200    2341.200    1056.600    2409.900
GR    1056.700    2483.900    1057.400    2543.800    1057.400    2625.700    1056.800    2684.000    1058.400    2695.600
GR    1060.000    2710.200    1059.000    2730.500    1057.900    2745.700    1073.100    2782.200    1091.200    2807.400
GR    1091.200    2827.600    1080.300    2863.200    1070.700    2890.100    1069.900    2942.100    1069.000    2989.700
GR    1069.800    3005.600    1069.600    3028.100    1068.000    3073.900    1068.050    3080.000    1067.500    3158.100
GR    1067.300    3235.400    1064.600    3280.800    1063.400    3328.100    1062.700    3393.400    1062.100    3470.900
GR    1061.400    3530.700    1062.200    3558.200    1069.500    3600.600    1069.400    3653.300    1070.000    3683.400
GR    1070.000    3722.000    1071.000    3756.800    1070.000    3777.800    1070.000    3829.900    1070.000    3890.000
GR    1070.000    3926.800    1070.000    3958.500    1070.000    4018.000    1070.000    4028.800    1070.000    4037.400
GR    1070.000    4115.500    1070.000    4153.400    1070.000    4197.200    1070.000    4252.400    1070.000    4268.100
GR#    1070.000    4278.800    1070.000    4330.900    1070.000    4362.000    1070.000    4369.700    1070.000    4388.200
GR    1073.800    4410.800    1075.500    4437.000    1070.600    4447.700    1075.900    4463.100    1089.000    4492.100
GR    1090.100    4571.100    1090.100    4637.600    1089.400    4700.900    1089.600    4744.000    1089.500    4805.300
GR    1088.700    4821.100    1088.700    4849.600    1097.500    4896.100    1091.300    4909.400    1091.600    5000.000

ET       0.000       7.100       7.100       9.100       0.000       0.000    2790.000    3737.000    2790.000    3915.000
         CROSS SECTION 15.934 DEVELOPED FROM COOPER AERIAL DATA
         REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
X1      15.934      59.000    2790.000    3737.000     520.000     545.000     528.000       0.000       0.000       0.000
X3      10.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000       0.000
GR    1060.100    2240.000    1054.260    2650.000    1091.760    2790.000    1082.200    2840.000    1071.090    3040.000
GR    1072.300    3078.400    1070.600    3131.000    1067.000    3176.400    1064.200    3190.500    1064.200    3284.200
GR    1065.200    3297.600    1065.800    3333.700    1064.100    3401.900    1064.700    3486.400    1068.100    3505.900
GR    1068.100    3540.300    1065.600    3546.200    1065.300    3577.200    1068.700    3593.300    1071.000    3640.700
GR    1071.000    3667.000    1072.800    3694.600    1075.000    3737.000    1075.000    3756.600    1075.000    3782.700
GR    1075.000    3842.800    1075.000    3888.000    1075.000    3914.300    1075.000    3942.000    1075.000    3982.400
GR    1075.000    3993.400    1075.000    4064.000    1075.000    4087.900    1075.000    4092.000    1075.000    4129.000
GR    1075.000    4137.600    1075.000    4147.400    1075.00#0    4235.000    1075.000    4318.200    1075.000    4384.500
GR    1075.000    4435.900    1075.000    4504.000    1075.000    4578.600    1075.000    4636.200    1075.000    4664.400
GR    1075.000    4671.300    1075.000    4682.500    1075.000    4695.200    1075.000    4708.900    1075.100    4722.400
GR    1086.900    4737.200    1083.400    4752.600    1084.500    4800.600    1100.500    4835.900    1096.000    4852.100
GR    1096.300    4888.900    1098.000    4913.100    1092.100    4927.300    1091.600    5000.000       0.000       0.000
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ET      0.000      7.100      7.100      9.100      9.100      0.000   2790.500   3718.700   2790.500   3788.000
        CROSS SECTION 16.034 DEVELOPED FROM COOPER AERIAL DATA
        REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
X1     16.034     81.000   2790.500   3718.700    525.000    530.000    528.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1061.500   2083.200   1061.800   2112.500   1060.000   2167.400   1057.500   2218.600   1050.000   2248.000
GR   1049.100   2294.700   1049.100   2379.300   1049.900   2421.500   1054.400   2483.300   1055.100   2564.600
GR   1053.500   2619.900   1054.400   2627.400   1052.900   2633.900   1042.700   2640.200   1042.700   2668.400
GR   1057.100   2674.000   1062.700   2691.500   1063.500   2706.200   1070.400   2730.000   1094.400   2767.100
GR   1094.700   2790.500   1086.500   2829.100   1071.900   2867.900   1069.700   2904.700   1070.900   2947.000
GR   1068.900   3008.600   1069.000   3030.000   1069.100   3050.900   1072.200   3116.400   1072.100   3170.800
GR   1067.600   3209.400   1067.800   3270.800   1067.400   3303.200   1072.100   3320.500   1071.700   3420.800
GR   1070.400   3491.800   1071.100   3505.400   1071.000   3524.700   1069.000   3535.100   1069.400   3579.300
GR   1067.400   3606.600   1070.700   3623.800   1069.900   3651.400   1070.600   3666.500   1070.000   3698.100
GR   1070.000   3718.700   1070.000   3741.100   1070.000   3775.100   1070.000   3793.900   1070.000   3800.800
GR   1070.000   3816.200   1070.000   3826.100   1070.000   3844.700   1070.000   3871.800   1070.000   3891.100
GR   1070.000   4045.500   1070.000   4077.800   1070.000   4087.100   1070.000   4111.800   1070.000   4152.000
GR   1070.000   4199.200   1070.000   4237.100   1070.000   4272.000   1070.000   4351.400   1070.000   4401.500
GR   1070.000   4473.200   1070.000   4539.200   1070.000   4553.100   1070.000   4579.300   1070.000   4633.300
GR   1070.000   4654.600   1076.600   4688.200   1081.200   4734.200   1086.500   4768.300   1096.400   4788.500
GR   1095.600   4793.600   1095.400   4838.200   1095.700   4897.900   1099.500   4926.700   1092.900   4940.400
GR   1092.800   5000.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000

ET      0.000      7.100      7.100      9.100      0.000      0.000   2770.100   3748.000   2770.100   3668.000
        CROSS SECTION 16.134 DEVELOPED FROM COOPER AERIAL DATA
        REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
X1     16.134     69.000   2770.100   3748.000    540.000    970.000    528.000      0.000      0.000      0.000
X3     10.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
GR   1059.300   2133.800   1058.700   2165.000   1056.600   2251.600   1056.300   2322.000   1057.500   2379.200
GR   1062.100   2420.400   1074.000   2462.200   1082.900   2486.800   1084.700   2509.100   1087.200   2523.900
GR   1065.600   2563.200   1062.800   2596.600   1060.400   2627.200   1062.800   2650.300   1070.200   2681.100
GR   1084.100   2715.000   1096.600   2737.800   1096.200   2746.900   1095.800   2770.100   1078.100   2831.800
GR   1074.400   2880.100   1072.900   2949.700   1073.600   3021.900   1073.410   3055.000   1073.100   3109.600
GR   1072.000   3184.600   1072.900   3267.000   1074.200   3321.600   1074.100   3365.000   1074.800   3440.700
GR   1075.800   3496.700   1074.700   3509.300   1075.600   3561.300   1075.000   3586.000   1075.000   3611.900
GR   1075.000   3625.800   1075.000   3654.100   1075.000   3714.900   1075.000   3748.000   1075.000   3791.100
GR   1075.000   3834.200   1075.000   3861.200   1075.000   4004.500   1075.000   4047.000   1075.000   4081.000
GR   1075.000   4135.400   1075.000   4195.000   1075.000   4246.200   1075.000   4318.100   1075.000   4373.800
GR   1075.000   4401.900   1075.000   4424.800   1075.000   4464.300   1080.700   4506.300   1087.000   4542.900
GR   1086.200   4595.000   1083.500   4646.800   1081.200   4698.000   1074.700   4727.700   1072.1200  4756.500
GR   1077.800   4775.600   1092.500   4797.200   1094.700   4835.500   1097.200   4878.300   1097.400   4913.400
GR   1102.000   4932.700   1097.600   4965.300   1095.300   4974.300   1094.600   5000.000      0.000      0.000

NC      0.000      0.000      0.000      0.300      0.500      0.000      0.000      0.000      0.000      0.000
QT      3.000 205000.000 205000.000 205000.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      7.100      7.100      9.100      0.000      0.000   9660.000  10600.000   9660.000  10600.000
        FROM STATION 16.178 THROUGH STATION 16.347 ALL
        DATA WAS OBTAINED FROM THE PREVIOUS SALT RIVER STUDY.
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STATIONS 16.178 THROUGH STATION 16.213 INPUT DATA FOR SPECIAL
BRIDGE ROUTINE FOR 24TH STREET BRIDGE.

X1	16.178	14.000	9660.000	10600.000	200.000	220.000	230.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	1100.000	8050.000	1095.000	8180.000	1090.000	8360.000	1085.000	8470.000	1085.000	8660.000
GR	1090.000	8880.000	1095.000	9070.000	1095.500	9420.000	1097.000	9660.000	1080.000	9720.000
GR	1075.200	9830.000	1075.200	10510.000	1096.000	10600.000	1096.000	10605.000	0.000	0.000
X1	16.188	10.000	3076.000	3934.500	60.000	60.000	50.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1094.500	1094.500	0.000
GR	1099.400	3075.000	1099.400	3076.000	1094.900	3077.000	1089.500	3078.000	1075.300	3110.000
GR	1075.300	3904.000	1089.500	3933.000	1094.900	3934.000	1099.500	3934.500	1099.500	3935.000
SB	0.900	1.600	2.500	0.000	794.000	71.500	14923.000	0.500	1075.300	1075.200
X1	16.202	0.000	0.000	0.000	77.000	77.000	77.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	1094.900	1099.400	0.000	0.000	1.330	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1099.400	1099.400	0.000
BT	3.000	3075.000	1099.400	0.000	3507.000	1099.800	0.000	3935.000	1099.500	0.000
ET	0.000	7.100	7.100	9.100	0.000	0.000	9690.000	10570.000	9690.000	10570.000
X1	16.213	8.000	9690.000	10570.000	60.000	60.000	60.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	1100.000	9600.000	1095.000	9690.000	1080.000	9720.000	1077.000	9840.000	1076.000	9890.000
GR	1076.000	10510.000	1095.000	10570.000	1099.500	10800.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.000	0.100	0.300	0.000	0.000	0.000	0.000	0.000
ET	0.000	7.100	7.100	9.100	0.000	0.000	9680.000	10570.000	9680.000	10570.000
X1	16.254	7.000	9680.000	10570.000	200.000	270.000	215.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	1101.500	9580.000	1100.000	9680.000	1076.800	9750.000	1076.800	10350.000	1080.000	10380.000
GR	1095.000	10570.000	1099.500	10800.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	7.100	7.100	9.100	0.000	0.000	9700.000	10480.000	9700.000	10480.000
X1	16.347	12.000	9700.000	10480.000	500.000	470.000	490.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	1107.500	9580.000	1105.000	9700.000	1078.200	9800.000	1078.200	10210.000	1088.800	10260.000
GR	1084.000	10340.000	1085.000	10350.000	1095.000	10480.000	1094.000	10650.000	1095.000	11000.000
GR	1095.000	11150.000	1101.000	11290.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	9.100	9.100	0.000	0.000	0.000	0.000	9620.000	10800.000
X1	16.428	15.000	9620.000	10450.000	470.000	370.000	430.000	0.000	0.000	0.000
GR	1105.000	9550.000	1100.000	9620.000	1080.000	9750.000	1080.000	9950.000	1083.400	10100.000
GR	1080.000	10250.000	1087.300	10330.000	1103.000	10450.000	1100.000	10451.000	1100.000	10550.000
GR	1095.000	10680.000	1090.500	10810.000	1095.000	10920.000	1100.000	11180.000	1101.500	11300.000
ET	0.000	4.100	9.100	9.100	11100.000	0.000	0.000	0.000	9600.000	10900.000
X1	16.528	19.000	9600.000	10370.000	560.000	430.000	528.000	0.000	0.000	0.000
GR	1104.000	9480.000	1100.000	9600.000	1095.000	9610.000	1090.000	9650.000	1085.000	9700.000
GR	1082.000	9850.000	1080.200	9980.000	1080.200	10200.000	1085.000	10280.000	1090.000	10350.000
GR	1099.000	10370.000	1095.000	10400.000	1095.000	10570.000	1096.000	10650.000	1095.000	10720.000
GR	1092.500	10800.000	1095.000	10900.000	1100.000	11100.000	1102.000	11320.000	0.000	0.000

ET	0.000	4.100	9.100	9.100	10800.000	0.000	0.000	0.000	9500.000	10730.000
X1	16.628	22.000	9220.000	10600.000	550.000	440.000	528.000	0.000	0.000	0.000
GR	1106.000	9200.000	1100.000	9220.000	1098.700	9390.000	1095.000	9610.000	1090.000	9670.000
GR	1085.000	9700.000	1082.000	9850.000	1080.400	9920.000	1080.400	10200.000	1085.000	10250.000
GR	1100.000	10310.000	1109.000	10350.000	1105.000	10390.000	1105.000	10450.000	1107.000	10540.000
GR	1100.000	10600.000	1096.000	10650.000	1095.000	10700.000	1094.000	10730.000	1095.000	10800.000
GR	1100.000	11070.000	1102.000	11150.000	0.000	0.000	0.000	0.000	0.000	0.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*PROF 1

CRITICAL DEPTH TO BE CALCULATED AT ALL CROSS SECTIONS

CCHV=   0.100 CEHV=   0.300
*SECNO 15.173
        INPUT FILENAME = MODEL2.IH2
        THE FOLLOWING IS A HEC-2 INPUT FILE FOR THE SALT RIVER CHANNEL
        BETWEEN 16TH STREET BRIDGE AND 24TH STREET BRIDGE.  THIS
        STUDY EXAMINES WATER SURFACE PROFILES FOR THE 100-YEAR STORM
        WITHOUT THE NORTH LEVEE THAT RUNS FROM THE 24TH STREET BRIDGE
        TO THE EAST TUNNEL OUTFALL.
        CROSS SECTION 15.173 GR POINTS MATCH PREVIOUS STUDY
        CROSS SECTION LOCATED UPSTREAM OF 16TH STREET BRIDGE
   15.17    22.67  1083.77  1072.09  1083.77  1084.89     1.12     0.00     0.00  1090.00
  200000.      0.  200000.      0.       0.  23512.       0.       0.       0.   1086.00
    0.00     0.00     8.51     0.00    0.000    0.033    0.000    0.000  1061.10  9442.96
 0.000616      0.       0.       0.        0       10        0     0.00  1113.33 10556.28

*SECNO 15.235

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1088.97 ELREA=     1089.76

        CROSS SECTION 15.235 DEVELOPED FROM COOPER AERIAL DATA
   15.23    21.16  1082.26  1078.55     0.00  1086.11     3.85     0.40     0.82  1088.97
  200000.      0.  200000.      0.       0.  12706.       0.      137.       7.   1089.76
    0.01     0.00    15.74     0.00    0.000    0.033    0.000    0.000  1061.10  2551.84
 0.003275     130.     330.     490.        3       15        0     0.00   839.92  3391.77

*SECNO 15.335

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    2700.0    3460.0  TYPE=     1  TARGET=     760.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=   100000.00 ELREA=   100000.00
```

```
        CROSS SECTION# 15.335 DEVELOPED FROM COOPER AERIAL DATA
   15.34    20.10  1083.70  1080.86     0.00  1088.08     4.38     1.82     0.16100000.00
  200000.      0.  200000.       0.       0.   11907.       0.     286.      17. 100000.00
    0.01     0.00    16.80     0.00    0.000    0.033    0.000    0.000  1063.60  2700.00
 0.003620     510.     528.     530.        2       15        0     0.00   760.00  3460.00

*SECNO 15.434

3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1091.60 ELREA=     1093.20

        CROSS SECTION 15.434 DEVELOPED FROM COOPER AERIAL DATA
   15.43    26.20  1086.30  1078.86     0.00  1089.53     3.23     1.33     0.12  1091.60
  200000.      0.  200000.       0.       0.   13867.       0.     442.      26.  1093.20
    0.02     0.00    14.42     0.00    0.000    0.033    0.000    0.000  1060.10  2641.04
 0.001873     550.     525.     580.   #    2       11        0     0.00   683.75  3324.79

*SECNO 15.534

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    2670.0    3320.0  TYPE=     1  TARGET=     650.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1089.70 ELREA=   100000.00

        CROSS SECTION 15.534 DEVELOPED FROM COOPER AERIAL DATA
   15.53    27.16  1086.76  1081.75     0.00  1091.03     4.28     1.19     0.31  1089.70
  200000.      0.  200000.       0.       0.   12050.       0.     599.      34. 100000.00
    0.03     0.00    16.60     0.00    0.000    0.033    0.000    0.000  1059.60  2675.40
 0.002764     550.     528.     520.        3       15        0     0.00   642.82  3318.22

*SECNO 15.634
3280 CROSS SECTION     15.63 EXTENDED      3.46 FEET

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    2898.4    3790.0  TYPE=     1  TARGET=     891.600

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1087.30 ELREA=     1095.00

        CROSS SECTION 15.634 DEVELOPED FROM COOPER AERIAL DATA
```

```
        CROSS SECTION 15.634 LOCATED AT EAST TUNNEL OUTFALL
   15.63    30.85  1090.75  1075.17     0.00  1091.84     1.08     0.48     0.32  1087.30
  200000.      0.  200000.       0.       0.   23971.       0.     817.      43. 100000.00
    0.05     0.00     8.34     0.00    0.000    0.033    0.000    0.000  1059.90  2898.40
 0.000451     590.     528.    1108.        2       11        0     0.00   891.60  3790.00

*SECNO 15.734
3280 CROSS SECTION     15.73 EXTENDED      1.87 FEET

3470 ENCROACHMENT STATIONS=    2862.4    4231.0  TYPE=     1  TARGET=    1368.600
        CROSS SECTION 15.734 DEVELOPED FROM COOPER AERIAL DATA
        REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
   15.73    33.67  1091.47  1076.17     0.00  1092.07     0.61     0.19     0.05  1089.10
  200000.      0.  154782.   45218.       0.   23423.    9416.    1162.      57.   1070.00
    0.07     0.00     6.61    4.80    0.000    0.033    0.040    0.000  1057.80  2862.40
 0.000295     525.     528.     530.        2       14        0     0.00  1368.60  4231.00

*SECNO 15.834

3470 ENCROACHMENT STATIONS=    2827.6    4052.0  TYPE=     1  TARGET=    1224.400
        CROSS SECTION 15.834 DEVELOPED FROM COOPER AERIAL DATA
        REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
   15.83    30.12  1091.52  1077.41     0.00  1092.31     0.79     0.18     0.05  1091.20
  200000.      0.  164527.   35473.       0.   22184.    6343.    1539.      73.   1071.00
    0.10     0.00     7.42     5.59    0.000    0.033    0.040    0.000  1061.40  2827.60
 0.000397     525.     528.     560.        2       14        0     0.00  1224.40  4052.00

*SECNO 15.934

3470 ENCROACHMENT STATIONS=    2790.0    3915.0  TYPE=     1  TARGET=    1125.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1091.76 ELREA=     1075.00

        CROSS SECTION 15.934 DEVELOPED FROM COOPER AERIAL DATA
        REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
   15.93    27.39  1091.49  1080.87     0.00  1092.72     1.23     0.28     0.13  1091.76
  200000.      0.  181206.   18794.       0.   19847.    2935.    1852.      87.   1075.00
    0.11     0.00     9.13     6.40    0.000    0.033    0.040    0.000  1064.10  2791.43
 0.000713     520.     528.     545.        2       11        0     0.00  1123.57  3915.00

*SECNO 16.034

3470 ENCROACHMENT STATIONS=    2790.5    3788.0  TYPE=     1  TARGET=     997.500
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```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1094.70 ELREA=     1070.00

        CROSS SECTION 16.034 DEVELOPED FROM COOPER AERIAL DATA
        REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
    16.03    24.31  1091.71  1081.46     0.00  1093.22     1.51     0.42     0.08  1094.70
   200000.       0.  188303.   11697.       0.   18873.    1504.    2114.     100.   1070.00
     0.13     0.00     9.98     7.78     0.000    0.033    0.040    0.000  1067.40  2804.58
 0.000873     525.     528.     530.         2       11        0     0.00   983.42  3788.0!0

*SECNO 16.134

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=    2770.1    3668.0  TYPE=     1  TARGET=     897.900

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1095.80 ELREA=   100000.00

        CROSS SECTION 16.134 DEVELOPED FROM COOPER AERIAL DATA
        REMOVED NORTH LEVEE. GRAVEL PIT MODELED AS INEFFECTIVE FLOW.
    16.13    19.52  1091.52  1086.13     0.00  1094.30     2.78     0.70     0.38  1095.80
   200000.       0.  200000.       0.       0.   14951.       0.    2335.     112. 100000.00
     0.14     0.00    13.38     0.00     0.000    0.033    0.000    0.000  1072.00  2785.01
 0.002087     540.     528.     970.         2       11        0     0.00   882.99  3668.00


CCHV=   0.300 CEHV=   0.500
*SECNO 16.178

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=    9660.0   10600.0  TYPE=     1  TARGET=     940.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1097.00 ELREA=   100000.00

        FROM STATION 16.178 THROUGH STATION 16.347 ALL
        DATA WAS OBTAINED FROM THE PREVIOUS SALT RIVER STUDY.
        STATIONS 16.178 THROUGH STATION 16.213 INPUT DATA FOR SPECIAL
        BRIDGE ROUTINE FOR 24TH STREET BRIDGE.
    16.18    16.52  1091.72  1088.11     0.00  1095.24     3.52     0.57     0.37  1097.00
   205000.       0.  205000.       0.       0.   13620.       0.    2411.     116. 100000.00
     0.14     0.00    15.05     0.00     0.000    0.033    0.000    0.000  1075.20  9678.63
 0.003012     200.     230.     220.         2       14        0     0.00   902.85 10581.48
```

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 16.188

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1094.50 ELREA=     1094.50

    16.19     16.72  1092.02  1087.85      0.00  1095.42      3.39      0.14      0.04   1099.40
   205000.       0.  205000.       0.        0.   13868.        0.     2427.      117.   1099.50
     0.14      0.00     14.78     0.00     0.000     0.033     0.000     0.000   1075.30   3077.53
 0.002671       60.       50.       60.         2        15         0      0.00    855.94   3933.47


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     # BWC      BWP      BAREA      SS       ELCHU     ELCHD
     0.90      1.60      2.50      0.00    794.00    71.50  14923.00     0.50    1075.30   1075.20

*SECNO 16.202

3301 HV CHANGED MORE THAN HVINS

PRESSURE FLOW


 EGPRS      EGLWC      H3       QWEIR      QPR       BAREA   TRAPEZOID      ELLC      ELTRD
                                                             AREA
 1096.71   1096.21    1.27        0.    205000.    14923.    14353.     1094.90   1099.40


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1099.40 ELREA=     1099.40

    16.20     18.73  1094.03      0.00      0.00  1096.71      2.69      1.30      0.00   1099.40
   205000.       0.  205000.       0.        0.   15584.        0.     2453.      119.   1099.50
     0.15      0.00     13.15     0.00     0.000     0.033     0.000     0.000   1075.30   3077.16
 0.001822       77.       77.       77.         3         0         0      0.00    856.68   3933.84

*SECNO 16.213

3470 ENCROACHMENT STATIONS=    9690.0    10570.0  TYPE=     1  TARGET=     880.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1095.00 ELREA=   100000.00

    16.21     17.95  1093.95  1089.02      0.00  1097.03      3.08      0.12      0.20   1095.00
   205000.       0.  205000.       0.        0.   14562.        0.     2473.      120.  100000.00
     0.15      0.00     14.08     0.00     0.000     0.033     0.000     0.000   1076.00   9692.09
 0.002320       60.       60.       60.         2        19         0      0.00    874.60  10566.70
```

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

CCHV=   0.100 CEHV=   0.300
*SECNO 16.254

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    9680.0   10570.0  TYPE=     1  TARGET=     890.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1100.00 ELREA=   100000.00

    16.25     16.89  1093.69  1091.25      0.00  1098.07      4.38      0.65      0.39  1100.00
   205000.       0.  205000.       0.        0.   12209.        0.     2540.      124. 100000.00
     0.15      0.00     16.79     0.00     0.000     0.033     0.000     0.000  1076.80  9699.04
 0.004031      200.      215.     270.         3        15         0      0.00   854.34 1055#3.38

*SECNO 16.347

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=    9700.0   10480.0  TYPE=     1  TARGET=     780.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=     1105.00 ELREA=   100000.00

    16.35     17.36  1095.56  1095.56      0.00  1102.29      6.73      2.54      0.71  1105.00
   205000.       0.  205000.       0.        0.    9846.        0.     2664.      133. 100000.00
     0.16      0.00     20.82     0.00     0.000     0.033     0.000     0.000  1078.20  9735.24
 0.006893      500.      490.     470.         0         8         0      0.00   744.76 10480.00

*SECNO 16.428

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    9620.0   10800.0  TYPE=     1  TARGET=    1180.000
    16.43     21.22  1101.22  1096.73      0.00  1104.26      3.05      1.61      0.37  1100.00
   205000.       0.  195708.     9292.        0.   13701.     1599.     2787.      142.  1103.00
     0.17      0.00     14.28     5.81     0.000     0.033     0.040     0.000  1080.00  9620.00
 0.002357      470.      430.     370.         4         8         0      0.00  1165.77 10800.00
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 16.528
3280 CROSS SECTION      16.53 EXTENDED       1.29 FEET

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    9600.0   10900.0  TYPE=     1  TARGET=    1300.000
    16.53     23.09  1103.29  1097.32     0.00  1105.27     1.98      0.90      0.11  1100.00
  205000.        0.  179959.   25041.       0.   15148.    4484.     2991.      156.   1099.00
     0.18      0.00    11.88     5.59    0.000    0.033    0.040     0.000   1080.20  9600.00
 0.001327      560.     528.     430.        2       15        0      0.00   1300.00 10900.00

*SECNO 16.628

3265 DIVIDED FLOW

3280 CROSS# SECTION      16.63 EXTENDED       1.62 FEET

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS=    9500.0   10730.0  TYPE=     1  TARGET=    1230.000
    16.63     23.21  1103.61  1097.97     0.00  1106.33     2.72      0.84      0.22100000.00
  205000.        0.  199166.    5834.       0.   14882.     960.     3201.      170.   1100.00
     0.19      0.00    13.38     6.08    0.000    0.033    0.040     0.000   1080.40  9500.00
 0.001995      550.     528.     440.        2       15        0      0.00    987.08 10730.00
```

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*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT

	SECNO	CWSEL	DEPTH	TOPWID	VCH	VROB	Q	QCH	QROB	STENCL	STENCR
	15.173	1083.77	22.67	1113.33	8.51	0.00	200000.00	200000.00	0.00	0.00	0.00
	15.235	1082.26	21.16	839.92	15.74	0.00	200000.00	199999.98	0.00	0.00	0.00
	15.335	1083.70	20.10	760.00	16.80	0.00	200000.00	200000.00	0.00	2700.00	3460.00
	15.434	1086.30	26.20	683.75	14.42	0.00	200000.00	200000.02	0.00	0.00	0.00
	15.534	1086.76	27[illegible].16	642.82	16.60	0.00	200000.00	199999.97	0.00	2670.00	3320.00
	15.634	1090.75	30.85	891.60	8.34	0.00	200000.00	200000.00	0.00	2898.40	3790.00
	15.734	1091.47	33.67	1368.60	6.61	4.80	200000.00	154782.20	45217.79	2862.40	4231.00
	15.834	1091.52	30.12	1224.40	7.42	5.59	200000.00	164526.55	35473.45	2827.60	4052.00
	15.934	1091.49	27.39	1123.57	9.13	6.40	200000.00	181205.72	18794.27	2790.00	3915.00
	16.034	1091.71	24.31	983.42	9.98	7.78	200000.00	188302.78	11697.22	2790.50	3788.00
	16.134	1091.52	19.52	882.99	13.38	0.00	200000.00	200000.00	0.00	2770.10	3668.00
	16.178	1091.72	16.52	902.85	15.05	0.00	205000.00	205000.00	0.00	9660.00	10600.00
	16.188	1092.02	16.72	855.94	14.78	0.00	205000.00	204999.98	0.00	0.00	0.00
	16.202	1094.03	18.73	856.68	13.15	0.00	205000.00	204999.98	0.00	0.00	0.00
	16.213	1093.95	17.95	874.60	14.08	0.00	205000.00	204999.98	0.00	9690.00	10570.00
	16.254	1093.69	16.89	854.34	16.79	0.00	205000.00	205000.00	0.00	9680.00	10570.00
*	16.347	1095.56	17.36	744.76	20.82	0.00	205000.00	204999.98	0.00	9700.00	10480.00

SECNO	CWSEL	DEPTH	TOPWID	VCH	VROB	Q	QCH	QROB	STENCL	STENCR
16.428	1101.22	21.22	1165.77	14.28	5.81	205000.00	195708.03	9291.95	9620.00	10800.00
16.528	1103.29	23.09	1300.00	11.88	5.59	205000.00	179958.83	25041.18	9600.00	10900.00
16.628	1103.61	23.21	987.08	13.38	6.08	205000.00	199165.58	5834.44	9500.00	10730.00

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT

ELENCL	ELENCR	WSELK
0.000	0.00	1083.77
0.000	0.00	0.00
100000.000	100000.00	0.00
0.000	0.00	0.00
100000.000	100000.00	0.00
100000.000	100000.00	0.00
100000.000	100000.00	0.00
100000.000	100000.00	0.00
100000.000	1000[illegible]00.00	0.00
100000.000	100000.00	0.00
100000.000	100000.00	0.00
100000.000	100000.00	0.00
0.000	0.00	0.00
0.000	0.00	0.00
100000.000	100000.00	0.00
100000.000	100000.00	0.00
* 100000.000	100000.00	0.00
100000.000	100000.00	0.00
100000.000	100000.00	0.00
100000.000	100000.00	0.00

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT TABLE 110

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
	15.173	1083.77	0.00	1084.89	1113.33	0.00	200000.00	0.00	0.00	0.00	9430.00	10560.00	0.00
	15.235	1082.26	0.00	1086.11	839.92	0.00	199999.98	0.00	0.00	0.00	2470.00	3470.00	0.00
	15.335	1083.70	0.00	1088.08	760.00	0.00	200000.00	0.00	760.00	2700.00	2560.00	3620.00	3460.00
	15.434	1086.30	0.00	1089.53	683.75	0.00	200000.02	0.00	0.00	0.00	2610.00	3355.00	0.00
	15.534	1086.76	0.00	1091.03	642.82	0.00	199999.97	0.00	650.00	2670.00	2670.00	3320.00	3320.00
	15.634	1090.75	0.00	1091.84	891.60	0.00	200000.00	0.00	891.60	2898.40	2898.40	4627.60	3790.00
	15.734	1091.47	0.00	1092.07	1368.60	0.00	154782.20	45217.79	1368.60	2862.40	2862.40	3792.40	4231.00
	15.834	1091.52	0.00	1092.31	1224.40	0.00	164526.55	35473.45	1224.40	2827.60	2827.60	3756.80	4052.00
	15.934	1091.49	0.00	1092.72	1123.57	0.00	181205.72	18794.27	1125.00	2790.00	2790.00	3737.00	3915.00
	16.034	1091.71	0.00	1093.22	983.42	0.00	188302.78	11697.22	997.50	2790.50	2790.50	3718.70	3788.00
	16.134	1091.52	0.00	1094.30	882.99	0.00	200000.00	0.00	897.90	2770.10	2770.10	3748.00	3668.00
	16.178	1091.72	0.00	1095.24	902.85	0.00	205000.00	0.00	940.00	9660.00	9660.00	10600.00	10600.00
	16.188	1092.02	0.00	1095.42	855.94	0.00	204999.98	0.00	0.00	0.00	3076.00	3934.50	0.00
	16.202	1094.03	0.00	1096.71	856.68	0.00	204999.98	0.00	0.00	0.00	3076.00	3934.50	0.00
	16.213	1093.95	0.00	1097.03	874.60	0.00	204999.98	0.00	880.00	9690.00	9690.00	10570.00	10570.00
	16.254	1093.69	0.00	1098.07	854.34	0.00	205000.00	0.00	890.00	9680.00	9680.00	10570.00	10570.00
*	16.347	1095.56	0.00	1102.29	744.76	0.00	204999.98	0.00	780.00	9700.00	9700.00	10480.00	10480.00
	16.428	1101.22	0.00	1104.26	1165.77	0.00	195708.03	9291.95	1180.00	9620.00	9620.00	10450.00	10800.00
	16.528	1103.29	0.00	1105.27	1300.00	0.00	179958.83	25041.18	1300.00	9600.00	9600.00	10370.00	10900.00
	16.628	1103.61	0.00	1106.33	987.08	0.00	199165.58	5834.44	1230.00	9500.00	9220.00	10600.00	10730.00

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
	15.173	0.00	0.00	0.00	1061.10	200000.00	1083.77	1072.09	1084.89	6.16	8.51	23512.25	80554.61
	15.235	330.00	0.00	0.00	1061.10	200000.00	1082.26	1078.55	1086.11	32.75	15.74	12706.43	34949.79
	15.335	528.00	0.00	0.00	1063.60	200000.00	1083.70	1080.86	1088.08	36.20	16.80	11907.24	33240.75
	15.434	525.00	0.00	0.00	1060.10	200000.00	1086.30	1078.86	1089.53	18.73	14.42	13866.65	46217.44
	15.534	528.00	0.00	0.00	1059.60	200000.00	1086.76	1081.75	1091.03	27.64	16.60	12049.73	38041.42
	15.634	528.00	0.00	0.00	1059.90	200000.00	1090.75	1075.17	1091.84	4.51	8.34	23971.28	94182.09
	15.734	528.00	0.00	0.00	1057.80	200000.00	1091.47	1076.17	1092.07	2.95	6.61	32838.92	116540.12
	15.834	528.00	0.00	0.00	1061.40	200000.00	1091.52	1077.41	1092.31	3.97	7.42	28526.71	100374.55
	15.934	528.00	0.00	0.00	1064.10	200000.00	1091.49	1080.87	1092.72	7.13	9.13	22781.59	74902.78
	16.034	528.00	0.00	0.00	1067.40	200000.00	1091.71	1081.46	1093.22	8.73	9.98	20377.05	67694.56
	16.134	528.00	0.00	0.00	1072.00	200000.00	1091.52	1086.13	1094.30	20.87	13.38	14950.72	43781.09
	16.178	230.00	0.00	0.00	1075.20	205000.00	1091.72	1088.11	1095.24	30.12	15.05	13620.39	37350.11
	16.188	50.00	0.00	0.00	1075.30	205000.00	1092.02	1087.85	1095.42	26.71	14.78	13868.36	39666.96
	16.202	77.00	1099.40	1094.90	1075.30	205000.00	1094.03	0.00	1096.71	18.22	13.15	15584.31	48029.66
	16.213	60.00	0.00	0.00	1076.00	205000.00	1093.95	1089.02	1097.03	23.20	14.08	14562.20	42563.02
	16.254	215.00	0.00	0.00	1076.80	205000.00	1093.69	1091.25	1098.07	40.31	16.79	12208.58	32290.07
*	16.347	490.00	0.00	0.00	1078.20	205000.00	1095.56	1095.56	1102.29	68.93	20.82	9846.02	24691.28
	16.428	430.00	0.00	0.00	1080.00	205000.00	1101.22	1096.73	1104.26	23.57	14.28	15300.06	42227.94
	16.528	528.00	0.00	0.00	1080.20	205000.00	1103.29	1097.32	1105.27	13.27	11.88	19631.58	56275.75
	16.628	528.00	0.00	0.00	1080.40	205000.00	1103.61	1097.97	1106.33	19.95	13.38	15842.40	45896.95

100-YEAR Q = 200000 CFS,

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	15.173	200000.00	1083.77	0.00	0.00	0.00	1113.33	0.00
	15.235	200000.00	1082.26	0.00	-1.51	0.00	839.92	330.00
	15.335	200000.00	1083.70	0.00	1.44	0.00	760.00	528.00
	15.434	200000.00	1086.30	0.00	2.60	0.00	683.75	525.00
	15.534	200000.00	1086.76	0.00	0.46	0.00	6[illegible]42.82	528.00
	15.634	200000.00	1090.75	0.00	4.00	0.00	891.60	528.00
	15.734	200000.00	1091.47	0.00	0.71	0.00	1368.60	528.00
	15.834	200000.00	1091.52	0.00	0.05	0.00	1224.40	528.00
	15.934	200000.00	1091.49	0.00	-0.03	0.00	1123.57	528.00
	16.034	200000.00	1091.71	0.00	0.22	0.00	983.42	528.00
	16.134	200000.00	1091.52	0.00	-0.19	0.00	882.99	528.00
	16.178	205000.00	1091.72	0.00	0.20	0.00	902.85	230.00
	16.188	205000.00	1092.02	0.00	0.30	0.00	855.94	50.00
	16.202	205000.00	1094.03	0.00	2.00	0.00	856.68	77.00
	16.213	205000.00	1093.95	0.00	-0.07	0.00	874.60	60.00
	16.254	205000.00	1093.69	0.00	-0.27	0.00	854.34	215.00
*	16.347	205000.00	1095.56	0.00	1.87	0.00	744.76	490.00
	16.428	205000.00	1101.22	0.00	5.66	0.00	1165.77	430.00
	16.528	205000.00	1103.29	0.00	2.07	0.00	1300.00	528.00
	16.628	205000.00	1103.61	0.00	0.32	0.00	987.08	528.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION  SECNO=   16.347  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO=   16.347  PROFILE= 1  MINIMUM SPECIFIC ENERGY
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