NEW RIVER

Between Grand Avenue and Bell Road

STANDARD PROJECT FLOOD DELINEATIONS
AND BANK STABILITY EVALUATION
CONTRACT FCD 91-25

Prepared For:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
3335 West Durango Street
Phoenix, Arizona 85009
(602) 262-1501

Prepared By:

WOOD, PATEL & ASSOCIATES, INC.
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AUGUST 29, 1991

WOOD, PATEL & ASSOCIATES, INC.
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(602) 957-3149
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LETTER OF TRANSMITTAL

DATE	JOB NO.
1-31-92	91755

ATTENTION: Dave Johnson

RE: New River North of Grand Avenue

TO Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona 85009

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☒ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☒ Floppy

COPIES	DATE	NO.	DESCRIPTION
1	8/91		Floppy with SPF and 100-year Analysis
			SPF with CHIMP Analysis
1	8/91	4	Existing Condition Floodplain Delineation

FLOOD CONTROL DISTRICT RECEIVED
FEB 03 1992

CH ENG		P & PM	
DEP		HYDRO	
ADMIN		LMGT	
FINANCE		FILE	
C & O			
ENGR			

REMARKS NR

THESE ARE TRANSMITTED as checked below:

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☐ FOR BIDS DUE _____ 19 _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS Hope this is of help to you. Please call if I can be any further assistance to you.

Sincerely,

COPY TO _____

SIGNED: Ashok C. Patel, P.E., R.L.S.

If enclosures are not as noted, kindly notify us at once.

PRODUCT 240-2 NEBS Inc., Groton, Mass. 01471.

NEW RIVER
FROM GRAND AVENUE TO BELL ROAD
STANDARD PROJECT
FLOODPLAIN DELINEATIONS
AND
BANK STABILITY EVALUATION
CONTRACT FCD 91-25

AUGUST 29, 1991

PREPARED FOR:
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
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WP #91755

Registered Professional Engineer (Civil)
CERTIFICATE NO.
10512
ASHOK C.
PATEL
Date Signed 8/29/91
ARIZONA, U.S.A.

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
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Darrel E. Wood, P.E., R.L.S.
Ashok C. Patel, P.E., R.L.S.
James S. Campbell, P.E.
Lynn M. Thomas, P.E.
G. Thomas Hennessy, P.E.

August 29, 1991

Mr. John Svechovsky, P.E.
Flood Control District of Maricopa County
3335 West Durango Street
Phoenix, Arizona 85009

RE: New River
SPF Analysis and Bank Evaluation
Contract FCD 91-25
WP #91755

Dear John:

In accordance with the referenced contract, we are herewith submitting to you three (3) sets of the evaluation report.

The contract scope of work has been expanded and the following tasks have been added:

1. Review of the District's ownership of right-of-way or easements, as they impact the floodplain delineation.

2. Report content has been expanded from a brief letter report to a detailed report.

We are pleased to report that this submittal is completed within 5 weeks from the Notice to Proceed. It has been possible because we were able to get your timely input.

Our personal thanks to Messers Rodriguez, Raleigh, and you for meeting with us on very short notice, and for providing valuable input.

We appreciate the opportunity to provide services on this interesting project. Please call if we can be of any further assistance to you.

Very truly yours,

WOOD, PATEL & ASSOCIATES, INC.

Ashok C. Patel, P.E., R.L.S.
Principal

ACP/tjb

cc: John Rodriguez, P.E.
Ed Raleigh, P.E.

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APPENDICES

APPENDIX I

- **COMPUTATIONS ON BANK STABILITY**
  - Allowable Velocity Approach
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  - Stable Channel Section
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- **TRACTIVE STRESS ANALYSIS**
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- **PLATE 2, SPF DELINEATION, EXISTING CONDITION**
- **PLATE 3, SPF PROFILES, EXISTING CONDITION**

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- **HEC-2 PRINTOUT, SPF DELINEATION, WITH PARTIAL CHANNELIZATION**
- **PLATE 4, SPF DELINEATION, WITH PARTIAL CHANNELIZATION**
- **PLATE 5, SPF PROFILES, WITH PARTIAL CHANNELIZATION**

PLATE 1 **LOCATION MAP**

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ARIZONA, U.S.A.

1. INTRODUCTION

1.1 Purpose

The Flood Control District of Maricopa County (the District) has contracted with Wood, Patel & Associates, Inc. (Wood/Patel) to provide engineering services for the New River project. Wood/Patel, according to the contract Scope of Work, shall provide the District with the Standard Project Flood (SPF) delineation and bank stability evaluation for the study reach of New River between Grand Avenue and Bell Road.

The U.S. Army Corps of Engineers (Corps) has recently completed a construction contract for channel improvements along the New River from the Arizona Canal Diversion Channel (ACDC) south to Olive Avenue. Due to prior agreements concerning acquisition of SPF flowage easements downstream of ACDC, the District may provide for an SPF channel within the study reach. Downstream from there, channel improvements have been under design to allow flow breakouts to return to natural channel conditions.

1.2 Project Location

The study area for this report is located on New River in between Grand Avenue and Bell Road in the City of Peoria. Plate 1 following Appendix IV depicts the study reach.

Presently, there are three bridged crossings of the New River in this project. These are located at Grand Avenue, Thunderbird Road, and Bell Road. The Outer Loop Freeway (Agua Fria Freeway), by the Arizona Department of Transportation (ADOT), parallels New River along the east side.

1.3 Background

Historically, a flood hazard has existed in the metropolitan Phoenix area along Cave Creek, Skunk Creek, New River, the Agua Fria River and downstream of the Arizona Canal. As a means to help mitigate potential flooding, the Corps, in conjunction with the District, and other municipalities, has implemented a comprehensive flood control plan consisting of both structural and non-structural improvements.

As a part of the overall plan, the ACDC has been designed to intercept 100-year flows from as far east as Cudia City Wash and convey them to an outlet at Skunk Creek, tributary to the New River which in turn is a tributary of the Agua Fria River.

Under an agreement with the Corps, the District plans to acquire flowage easements along Skunk Creek, New River and the Agua Fria River to the confluence with the Gila River, as authorized by Federal Legislation.

1.3 Background (Continued)

Structural improvements have been made along the Agua Fria River and some easements have been acquired. However, due to schedule and cost constraints, flowage easement agreements have not yet been settled for a portion of the New River. To alleviate a potential flooding problem from completion of the ACDC, and the associated liability risk to the District, a decision to provide channel improvements to the New River has been considered.

Improvements to handle the Standard Project Flood (SPF) are proposed to be in the form of channelization and bank protection of the New River from Grand Avenue to Skunk Creek confluence.

2. SCOPE OF WORK

In 1989, a hydraulic analysis was performed for portions of New River and Skunk Creek, by the District. This analysis included a flood insurance study, as well as floodplain delineation for the Standard Project Flood (SPF). The study was subsequently submitted to and accepted by the Federal Emergency Management Agency (FEMA) for the Conditional Letter of Map Revision (CLOMR) process.

The study concluded that a certain portion of the New River channel section, near Thunderbird Road, was not adequate in size to contain the SPF highwater within the banks. The District, as part of these services, requested that Wood/Patel perform a hydraulic analysis, more specifically, the tasks listed below:

2.1 SPF Delineation

1. Create a working HEC-2 model using the digitized data (1991 Mapping) for the 3.5 mile long reach of New River between Grand Avenue and Bell Road.
2. Establish SPF profile based on the Corps flood peak of 68,000 cfs for New River downstream of the Skunk confluence. The SPF profile will be matched to the existing profile at the study limits.
3. Evaluate the riverbanks to check if the SPF is contained within the banks or not.
4. If the SPF is not contained within the banks, do alternative analysis for the channel modification to contain the SPF. This may require lowering of channel thalweg and channel excavation.
5. Finalize SPF profile based on the recommended channel excavation option.
6. Prepare SPF delineations with and without the channel improvement conditions on the available topographic map.
7. Prepare a (brief) letter report documenting the methods used for the SPF delineation, provide earthwork estimate together with summary and conclusion.

It should be noted that this effort to be provided for the feasibility study and not intended for preparation of any Design and Construction plans for the channel modifications.

2.2 Bank and Grade Stabilization

Due to a significant change in the channel gradient, the channel in the vicinity of Desert Harbor Development is believed to be unstable for a major flooding condition.

2.2 Bank and Grade Stabilization

Wood/Patel to perform the following tasks to address the stability of the channel:

1. Perform a hydraulic evaluation to determine the need for bank stabilization for the New River reach from Thunderbird Road to about 5200 feet upstream. For this task, available empirical equations to be used and no extensive sediment transport analysis is anticipated.

2. Provide a conceptual analysis for a drop structure near Desert Harbor Development. Per District's input, the drop structure height of 11 feet should be used as previously established by Ellis-Murphy. A cost analysis is to be prepared for the drop structure.

2.3 Digital Cross-sections and Basemaps

Digital cross-sections in HEC-2 format to be provided by the subconsultant, Kenney Aerial Mapping Company, Inc. These cross-sections to be prepared for the study reach of 3.5 miles of New River.

Kenney Aerial to also prepare basemaps at a scale one (1) inch equals 200 feet for the study reach.

Wood/Patel to collect and utilize existing available data for the performance of these services including:

1. Topographic survey as prepared by the District.
2. Approved hydrology from the Corps SPF = 68,000 cfs (downstream from Skunk Creek confluence).
3. Existing available data on hydraulic analysis including digitized sections (for supplemental information) from the previous work by Coe & Van Loo.
4. As-built data on channel improvements and bridge structures, if available.
5. Future drop structure height from Ellis-Murphy 1985 design plans.
6. Soil gradation analysis by Construction Inspection & Testing, Inc. (1985).

The following tasks were specifically excluded from this Scope of Work:

1. Sediment Transport Analysis
2. Field Survey
3. Topographic Survey
4. Section 404 or NPDES Permits
5. Soil Gradation or Geotechnical Analysis
6. Construction plans & specifications

3. DATA COLLECTION

The following data was collected in conjunction with this study:

Reports

- Dames & Moore, Hydraulic and Geotechnical Engineering Studies, channel bank stabilization and protection, New River and Skunk Creek for Ellis-Murphy, Inc., April 27, 1987.
- Ellis-Murphy Gannett Fleming of Arizona, Inc., Desert Harbor Erosion Study, September, 1988.
- Construction Inspection & Testing Co., Soil Investigation for Erosion Study, Desert Harbor, April 22, 1988.
- Ellis-Murphy, Skunk Creek HEC-2, June 1987.
- Coe & Van Loo Consultants, Inc., New River/Skunk Creek SPF Delineation (including data on HEC-2 input/output), December, 1989.

Plans

- Maricopa County Highway Department, Thunderbird Road Bridge, January, 1981.
- Maricopa County Highway Department, Bell Road Bridge, December, 1981.
- Flood Control District of Maricopa County, 83rd Avenue Bridge, December, 1990.
- Flood Control District of Maricopa County, topographic maps of New River as prepared by Kaminski-Hubbard Engineering & Kenney Aerial Mapping Co., April, 1991.
- Flood Control District of Maricopa County, 91st Avenue Channel Improvements by Dibble & Associates, November, 1990.
- Arizona Department of Transportation, partial set of plans on Agua Fria Freeway Bridge over Skunk Creek, April, 1987.
- U.S. Army Corps of Engineers, partial set of improvement plans, Grand Avenue at New River, December, 1990.
- Ellis-Murphy, Desert Harbor, Drop Structure in New River, City of Peoria, October, 1984, unapproved set of plans.

4. STANDARD PROJECT FLOODPLAIN DELINEATION

Based on the topographic maps dated April, 1991, at a scale one (1) inch equals 200 feet and 2 foot contour interval (Ref. 10.3.4), floodplain delineation was performed for the study reach. The hydraulic analysis was conducted using the U.S. Army Corps of Engineer's HEC-2 computer model (Ref. 10.1.3) to develop a water surface profile.

Study Parameters:

Study Reach: New River from Grand Avenue to Bell Road.

Design Flood: Standard Project Flood (Ref. 10.1.4)

- 68,000 cfs New River downstream of Skunk Creek confluence
- 38,000 cfs New River upstream of Skunk Creek confluence

Manning's Roughness Coefficient

- for channel n = .03
- for overbanks n = .045

Starting water surface elevation was based on the SPF analysis by Coe & Van Loo (Ref. 10.2.5) This delineation based on existing conditions, is depicted on Plate 2, Appendix III and the profiles are shown on Plate 3, Appendix III.

5. BANK STABILITY EVALUATION

The stability of an earth bank against erosive forces can be insured by limiting the erosive power of the flooding waters to such a degree that movement of the soil particles in the channel bank is not initiated.

For the stability of channel banks along the Desert Harbor Development, two basic concepts of stability analysis were used based on the Soil Conservation Service Procedure (Ref. 10.1.7) as follows:

- Allowable Velocity Approach
- Allowable Tractive Force Approach

5.1 Allowable Velocity Approach

Figure 1, "Allowable Velocities for Unlined Earth Channels" reproduced from "Planning and Design of Open Channels", SCS TR-25, (Ref. 10.1.7) was used for the purpose of estimating allowable velocities for the study reach in between Grand Avenue and Greenway Road. Basic parameters used for this analysis are listed below:

1. Consider only straight alignment portion within the study limits.

2. Estimate D_{75} size from the soil gradation data from the Construction Inspection & Testing Company's Soil Report (Ref. 10.2.3).

3. Assume minimum bank slope to be 3 horizontal to 1 vertical (3:1).

The data for estimating D_{75} (Ref. 10.2.3) was very limited. Per the study Scope of Work, that data was to be used for all gradation analysis. To the best of our ability, the data was separated into three categories as identified in Appendix I; west bank, east bank and channel bottom, respectively. Accordingly, the D_{75} ranged from 0.5 mm in the channel bottom to 20 mm in the east bank and 32 mm in the west bank. Based on this limited data, it was concluded the allowable velocity for the east bank was about 8.4 fps, and for the west bank was slightly higher to about 9.6 fps.

	D_{75}	Basic Velocity	Factors D	A	B	Allowable Velocity
East Bank	20.0 mm	6.6 fps	1.5	1	.85	8.4 fps
Channel Bottom	0.5 mm	2.2 fps	1.5	1	.85	2.2 fps
West Bank	32.0 mm	7.5 fps	1.5	1	.85	9.6 fps

5.2 Tractive Stress Analysis

When the water flows in a channel, a force is developed that acts in the direction of flow on the channel bed. This force is simply the pull of water on the wetted area and is known as the tractive force.

5.2.1 Tractive Force

The average value of the tractive force per unit wetted area is also called as unit tractive force or shear stress. For this analysis, channel boundary shear stress has been computed using the HEC-2 computer program with the equation:

$$\tau_{ch} = yD_{ch}S$$

where,

y = specific weight of water (62.4 lb/ft^3)

D_{ch} = average depth of water in the channel (feet)

S = slope of the energy grade line (ft/ft)

τ_{ch} = channel boundary shear streets (lb/ft^2)

5.2.2 Allowable Tractive Force

The allowable tractive force for channel bed and sidebanks has been calculated using the D_{75} as determined from Section 5.1. Please refer to Appendix I for these calculations.

	Bank Sideslope	Allowable Tractive Force
West Bank	3:1	0.42
	5:1	0.47
East Bank	3:1	0.26
	5:1	0.29

In general, the tractive force caused by the standard project flood condition is about 2.0 psf in a uniform flow condition. The allowable tractive force is significantly less to about 0.3 to 0.5 psf range.

Based on this analysis, it is very clear that under the existing condition both banks are susceptible to erosion.

5.3 Bank Stability Enhancement

Several lining alternatives have preliminarily been investigated to determine the most cost effective method of protecting the bank from erosion. Criteria used in the selection process included strength and durability of the material, cost and feasibility of construction, slope stability, aesthetics, and maintenance expenses. The alternatives explored include gabions, soil cement, loose riprap, reinforced gunite, reinforced concrete, and grouted riprap (see Appendix II for details).

Gabions

Gabions, or wire-meshed enclosed riprap, would provide the necessary flexibility to conform to scour holes which could threaten the stability of the bank. This plan would call for placement of the mattresses on a 1.5:1 slope. In addition to being more natural looking than a grouted or concrete structure, gabions could exploit the readily available material in the area. Based on cost effectiveness, flexibility, and availability of material, this option is recommended for further consideration.

Soil Cement

This material was considered for its demonstrated ability to adequately protect the surface in other projects of similar nature, including those designed by the Corps of Engineers. The soil cement alternative calls for placement of 6-inch lifts of 8- to 8.5-foot wide soil cement, compacted with a vibratory smooth roller. The material would then be trimmed on the channel side to a relatively smooth surface. With its massive size and properties, this alternative is expected to be the least expensive in maintenance. Although the width could be reduced, it is anticipated that any savings, due to a reduction in material, would be offset by increased costs in construction, since the standard width for soil cement placement (dictated by the width of the trucks placing the material) is 8 to 8.5 feet. Aesthetically, this alternative would draw the least attention to itself, as the color and gradation would closely match the surrounding soil conditions.

Loose Riprap

This alternative calls for the use of a minimum 2-foot thick lining using a 15-inch minimum stone on a 2:1 slope. To minimize loss of material below the lining, a filter fabric would be used. Although one of the more natural in appearance, loose riprap requires material which may not readily be available in the required size or volume.

5.3 Bank Stability Enhancement (Continued)

Reinforced Gunite

Reinforced gunite of 6-inch thickness would be placed over a welded wire fabric material for strength and control of cracking. At the top of this lining, a 2-foot turn-down would be included for stability and protection from undermining. Weep holes throughout the length of the lining would be provided as a means of reducing hydrostatic pressure caused by saturation of the material behind the lining. Maintenance of the lining would require periodic inspection and repair of any spalling or cracking.

Reinforced Concrete

Reinforced concrete of 6-inches thick would be placed over a reinforcement for enhancing strength and reducing cracks. At the top of this lining, a 2-foot turn-down would be included for stability and protection from undermining. Weep holes throughout the length of the lining would be provided as a means of reducing hydrostatic pressure caused by saturation of the material behind the lining. Maintenance of the lining would require periodic inspection and repair of any spalling or cracking.

Grouted Riprap

This alternative calls for the use of a minimum 1.5-foot thick lining, 10-inch minimum stone, grouted in place with shotcrete. This alternative may call for additional reinforcement or special treatment of the base material, as it is especially susceptible to cracking. Furthermore, this alternative relies heavily on the assumption that adequate material exists in the area. Studies performed by the Corps indicated that use of grouted stone would require a flattening of the side slopes to at least 2:1 because of the rounded material available.

As indicated in Appendix I, for the bank lining material, toe-down of 10 feet has been selected. This toe-down depth is consistent with the previous design work by the Corps (Ref. 10.1.6). Similar toe-down depth has also been adopted by the District's New River channelization project immediately downstream of Olive Avenue.

For the purpose of this study, any kind of sediment transport analysis is beyond the scope of work and, therefore, has not been performed. The selected toe-down depth is considered adequate for this concept analysis.

6. DROP STRUCTURE

As part of design for the Desert Harbor Development, Ellis-Murphy has previously prepared design plans for a drop structure immediately downstream from the New River-Skunk Creek Confluence (Ref. 10.3.8). Their design was based upon the following design parameters:

Design Flow (100-Yr)	=	41,000 cfs
Drop structure Height	=	11 ft

The Ellis-Murphy design was reviewed for its adequacy in conjunction with the SPF design and the following conclusions have been made:

1. The SPF peak is substantially larger than the 100-year peak (68,000 cfs as compared to 41,000 cfs) and, therefore, the drop structure proposed for Desert Harbor Development would not be able to safely handle the SPF.

2. The loose riprap apron provided downstream of the drop structure is found inadequate to withstand the 100-year and SPF peaks.

3. Based on the SPF HEC-2 analysis, the channel section downstream of the drop structure produced velocities in the range of 12 to 13 fps. These velocities are too high to be handled by the unprotected sidebanks of the Desert Harbor Development.

4. To produce velocities to acceptable levels, the channel slope will be required to be reduced to 0.000526 ft/ft from Thunderbird Road upstream to the proposed drop structure location. This flattening of slope will require the drop structure height to be increased from 11 feet to 14 feet.

This study provides a conceptual design for the drop structure which will handle the SPF peak (see Appendix I). The design is based on a vertical concrete drop structure concept as presented in the Hydraulic Engineering Circular, No. 14, Federal Highway Administration (Ref. 10.1.8). If this drop structure height is selected for future consideration, detailed geotechnical, structural, and hydraulic analyses will be required prior to the preparation of the final design plan.

7. CHANNEL IMPROVEMENT ANALYSIS

To contain the SPF within channel banks and generally within the District's flowage easement, partial channelization of New River is necessary. This task was performed by the use of CHIMP subroutine from the HEC-2. Several trials with difference bottom width parameters were analyzed.

Plate 4, Appendix IV depicts the improvement area. Hydraulic analysis was performed using the CHIMP routine of HEC-2 as listed below:

Channel Reach	Sideslopes	Bottom width of Channel
Section 358.0 to 402.0	3:1	270 feet

With channel improvements, the SPF can be contained within a narrow floodway section as shown on Plate 4, Appendix IV.

As an option to bank protection, channel can be designed such that its bank velocity is reduced to an acceptable level. This approach is presented as Option 2 in Appendix II. For this option, a hydraulic analysis was also performed using the CHIMP routine of HEC-2 as listed below:

Channel Reach	Sideslopes	Bottom width of Channel
Section 412.0 to 402.0	3:1	278 feet

8. QUANTITY AND COST ESTIMATES

On a conceptual basis, quantities and costs have been estimated for channel improvements, bank protection and a drop structure.

The earthwork estimate for channel improvements is based upon an end area method and by the use of HEC-2 analysis. It is assumed that excavated material will be disposed off along the channel overbank areas or within a two mile radius.

Estimates for the bank protection material have been based upon similar projects, and similar lining material within the metropolitan Phoenix area.

Appendix II provides detail on the quantities and cost including improvement options. These costs are exclusive of engineering fees, construction management, and contingencies. A summary of cost estimates are presented below:

1. To contain SPF, generally within channel banks, approximately 4000 L.F. of channelization will be required south of Thunderbird Road which is estimated to cost about $363,000. For this approach, no considerations are given for the erosion caused by higher velocities.

2. To enhance bank stability of the study reach north of Thunderbird Road and immediately adjacent to Desert Harbor Development, bank protection together with a drop structure will be required per Option 1, Appendix II. This measure will cost about $2,350,000. The channel bottom will be subject to aggradation/degradation due to high velocities.

   For Option 2, however, channelization will be done downstream of the drop structure to reduce velocities to an acceptable level. This channelization, together with a drop structure and some bank protection, is estimated to cost about $2,036,000.

Revised September 3, 1991

9. CONCLUSIONS AND RECOMMENDATIONS

Based on this study, the following conclusions are made:

1. With a recent partial channelization of New River within the study reach, the standard project floodplain is significantly contained within the channel banks, However, the SPF breaks out into the overbank areas immediately north of Grand Avenue to section no. 402.0, as depicted on Plate 2, Appendix III.

2. To contain the SPF within the channel banks and generally within the District's flowage easement, channelization of New River is necessary. Plate 4, Appendix IV depicts the improvement area. Hydraulic analysis was performed using the CHIMP routine of HEC-2 as listed below:

Channel Reach	Sideslopes	Bottom width of Channel
Section 358.0 to 402.0	3:1	270 feet

With channel improvements, the SPF can be contained within a narrow floodway section as shown on Plate 4, Appendix IV.

3. An evaluation was made to check the bank stability of existing channel banks for the river reach beginning from Thunderbird Road and continuing north to a point about 5,200 feet north form Thunderbird Road.

Based on limited available soil gradation data, it was concluded that the bank can withstand about 8 to 9 fps velocities on a 3:1 sideslope.

Since the SPF velocities are substantially higher than the allowable range, bank protection will be needed.

A 12-inch thick gabion protection was found cost-effective and workable for the study area and is therefore recommended. This approach is presented as Option 1 in Appendix II.

4. As an option to bank protection, channel can be designed such that its bank velocity is reduced to an acceptable level. This approach is presented as Option 2 in Appendix II. For this option, a hydraulic analysis was performed using the CHIMP routine of HEC-2 as listed below:

Channel Reach	Sideslopes	Bottom width of Channel
Section 412.0 to 451.1	3:1	278 feet

9. CONCLUSIONS AND RECOMMENDATIONS (Continued)

5. The drop structure design prepared by Ellis-Murphy is not workable for the SPF since:

   - the SPF peak is substantially greater than the 100-year peak used by Ellis-Murphy.

   - bringing the SPF velocities to an acceptable level downstream of the drop structure, reduction in channel slope will be needed. Consequently, the drop structure height will be increased from 11 feet as proposed by Ellis-Murphy to 14 feet.

6. It is recommended that these conclusions be used by the District in the decision making process as to what route to take in conjunction with the SPF condition.

   Once the implementation option is selected, it is recommended that a more detailed study be made to further refine the design, as well as the costs.

10. REFERENCES

10.1 Bibliography

10.1.1 Flood Control District of Maricopa County, "*New River, Skunk Creek, Agua Fria River Flood Control Master Plan*", Draft, May, 1983.

10.1.2 U.S. Army Corps of Engineers, Office of the Chief of Engineers, "*Hydraulic Design of Flood Control Channels*", July, 1970.

10.1.3 U.S. Army Corps of Engineers, Hydrology Engineering Center, "*HEC-2 Water Surface Profiles*", Users Manual, September, 1982.

10.1.4 U.S. Army Corps of Engineers, Los Angeles District, "*New River and Phoenix City Streams, Arizona, Design Memorandum No. 2, Hydrology Part 1*", October, 1974.

10.1.5 U.S. Army Corps of Engineers, Los Angeles District, "*New River and Phoenix City Streams, Arizona, Design Memorandum No. 3, Skunk Creek and the New and Agua Rivers*", Draft, July, 1985.

10.1.6 U.S. Army Corps of Engineers, Los Angeles District, "*Design Memorandum No. 3, Skunk Creek and the New and Agua Rivers*", Final, May, 1986.

10.1.7 Soil Conservation Service, "*Design of Open Channels, TR-25*", October, 1977.

10.1.8 Federal Highway Administration, "*Hydraulic Design of Energy Dissipators for Culverts and Channels, HEC-14*", September, 1983.

10.2 Reports

10.2.1 Dames & Moore, Hydraulic and Geotechnical Engineering Studies, channel bank stabilization and protection, New River and Skunk Creek for Ellis-Murphy, Inc., April 27, 1987.

10.2.2 Ellis-Murphy Gannett Fleming of Arizona, Inc., Desert Harbor Erosion Study, September, 1988.

10.2.3 Construction Inspection & Testing Co., Soil Investigation for Erosion Study, Desert Harbor, April 22, 1988.

10.2.4 Ellis-Murphy, Skunk Creek HEC-2, June 1987.

10.2.5 Coe & Van Loo Consultants, Inc., New River/Skunk Creek SPF Delineation (including data on HEC-2 input/output), December, 1989.

10.3 Plans

10.3.1 Maricopa County Highway Department, Thunderbird Road Bridge, January, 1981.

10.3.2 Maricopa County Highway Department, Bell Road Bridge, December, 1981.

10.3.3 Flood Control District of Maricopa County, 83rd Avenue Bridge, December, 1990.

10.3.4 Flood Control District of Maricopa County, topographic maps of New River as prepared by Kaminski-Hubbard Engineering & Kenney Aerial Mapping Co., April, 1991.

10.3.5 Flood Control District of Maricopa County, 91st Avenue Channel Improvements by Dibble & Associates, November, 1990.

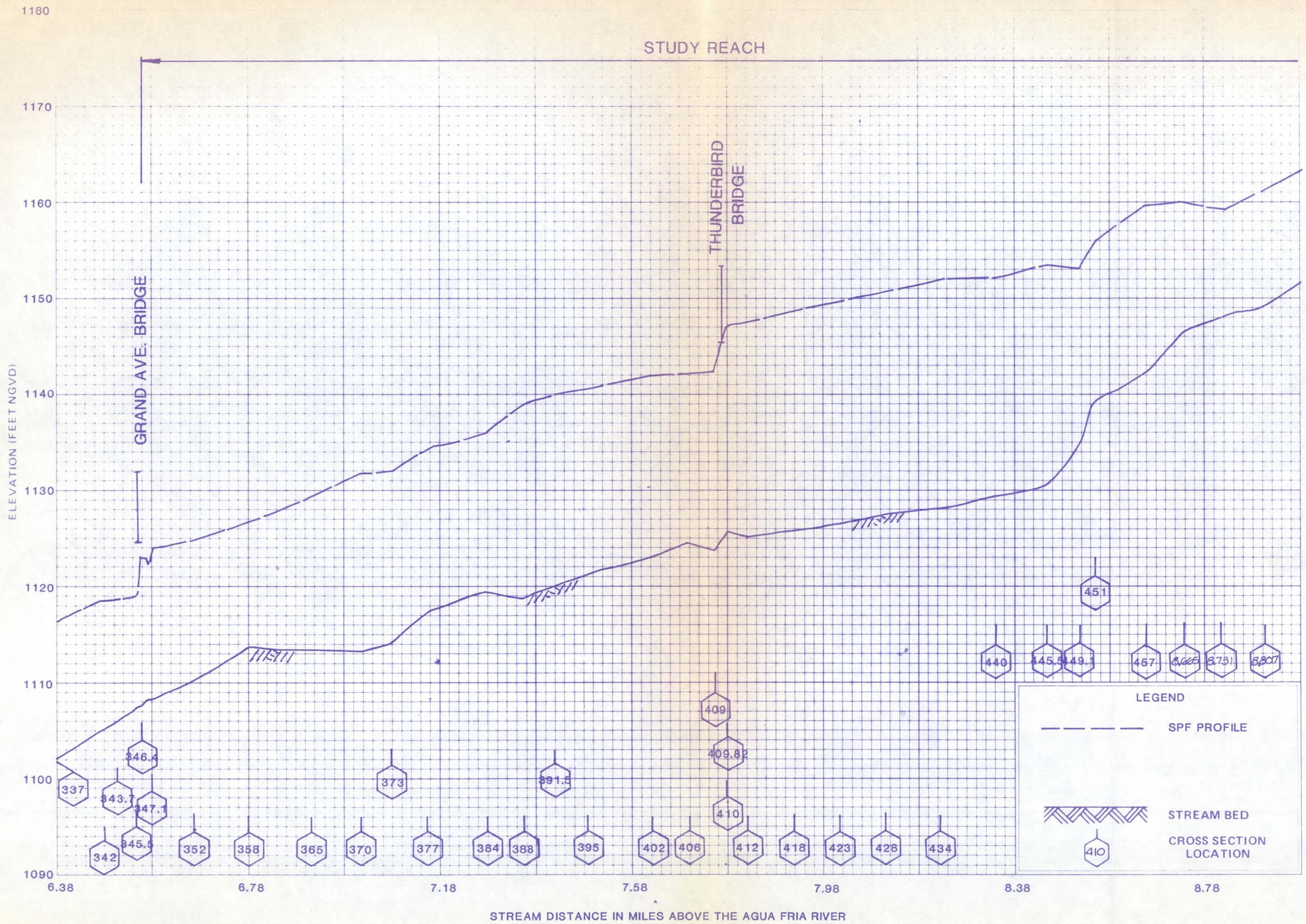
10.3.6 Arizona Department of Transportation, partial set of plans on Agua Fria Freeway Bridge over Skunk Creek, April, 1987.

10.3.7 U.S. Army Corps of Engineers, partial set of improvement plans, New River Improvements, Grand Avenue, As-built, December, 1990.

10.3.8 Ellis-Murphy, Desert Harbor, Drop Structure in New River, City of Peoria, October, 1984, unapproved set of plans.

APPENDIX I

COMPUTATIONS ON BANK STABILITY



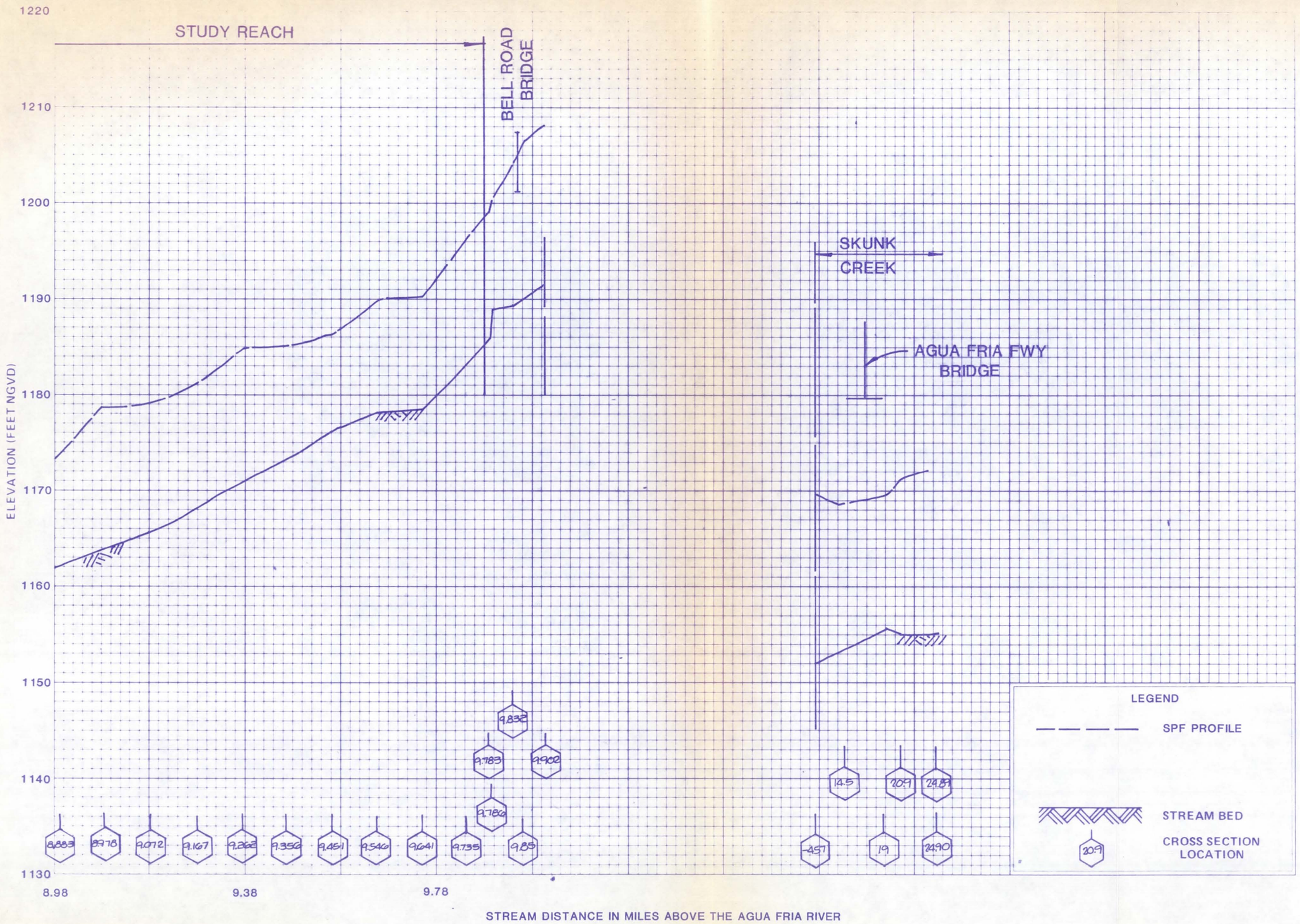
FLOOD PROFILES

NEW RIVER FROM GRAND AVENUE TO BELL ROAD

FLOOD CONTROL DIST OF MARICOPA COUNTY

SPF WITH CHANNEL IMPROVEMENTS

PLATE 3.1



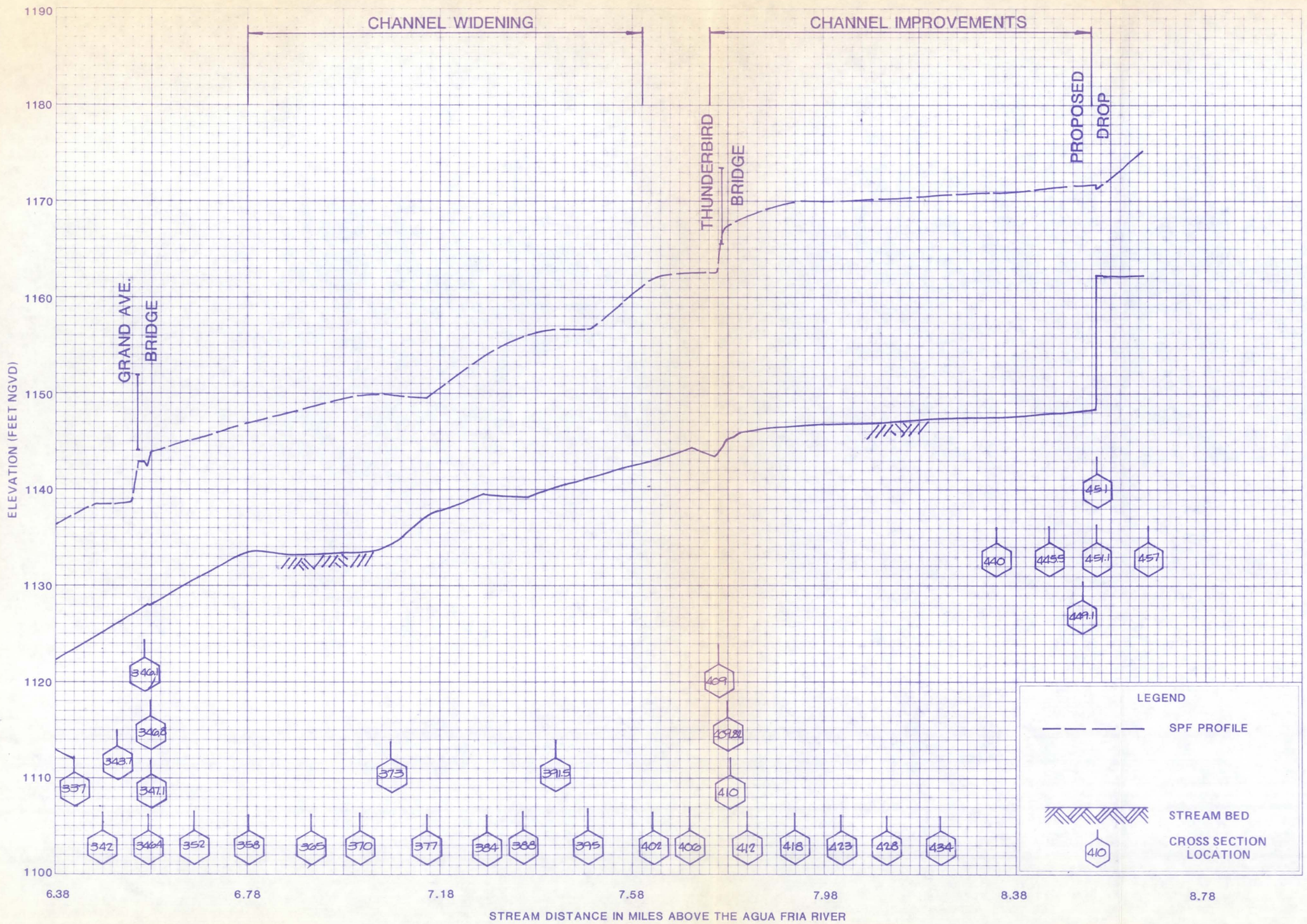
FLOOD PROFILES

NEW RIVER FROM GRAND AVENUE TO BELL ROAD

FLOOD CONTROL DIST OF MARICOPA COUNTY

SPF WITH CHANNEL IMPROVEMENTS

PLATE 3.2



FLOOD PROFILES

NEW RIVER FROM GRAND AVENUE TO PROPOSED DROP

FLOOD CONTROL DIST OF MARICOPA COUNTY

SPF WITH CHANNEL IMPROVEMENTS

PLATE 5

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

Darrel E. Wood, P.E., R.L.S.
Ashok C. Patel, P.E., R.L.S.
James S. Campbell, P.E.
Lynn M. Thomas, P.E.
G. Thomas Hennessy, P.E.

August 29, 1991

Mr. John Svechovsky, P.E.
Flood Control District of Maricopa County
3335 West Durango Street
Phoenix, Arizona 85009

RE: New River
SPF Analysis and Bank Evaluation
Contract FCD 91-25
WP #91755

Dear John:

In accordance with the referenced contract, we are herewith submitting to you three (3) sets of the evaluation report.

The contract scope of work has been expanded and the following tasks have been added:

1. Review of the District's ownership of right-of-way or easements, as they impact the floodplain delineation.

2. Report content has been expanded from a brief letter report to a detailed report.

We are pleased to report that this submittal is completed within 5 weeks from the Notice to Proceed. It has been possible because we were able to get your timely input.

Our personal thanks to Messers Rodriguez, Raleigh, and you for meeting with us on very short notice, and for providing valuable input.

We appreciate the opportunity to provide services on this interesting project. Please call if we can be of any further assistance to you.

Very truly yours,

WOOD, PATEL & ASSOCIATES, INC.

Ashok C. Patel, P.E., R.L.S.
Principal

ACP/tjb

cc: John Rodriguez, P.E.
Ed Raleigh, P.E.

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Phoenix, AZ 85009

NEW RIVER
FROM GRAND AVENUE TO BELL ROAD
STANDARD PROJECT
FLOODPLAIN DELINEATIONS
AND
BANK STABILITY EVALUATION
CONTRACT FCD 91-25

AUGUST 29, 1991

PREPARED FOR:
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
3335 WEST DURANGO STREET
PHOENIX, ARIZONA 85009
(602) 262-1501

PREPARED BY:
WOOD, PATEL & ASSOCIATES, INC.
4105 NORTH 20TH STREET
SUITE 130
PHOENIX, ARIZONA 85016
(602) 957-3149

WP #91755

Registered Professional Engineer (Civil)
CERTIFICATE NO.
10512
ASHOK C.
PATEL
Date Signed 8/29/91
ARIZONA, U.S.A.

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Registered Professional Engineer (Civil)
CERTIFICATE NO. 10512
ASHOK C. PATEL
Date Signed 8/29/91
ARIZONA, U.S.A.

APPENDICES

APPENDIX I

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  - Allowable Velocity Approach
  - Allowable Velocity Chart
  - Stable Channel Section
  - Soil Gradation Data
- **TRACTIVE STRESS ANALYSIS**
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- **QUANTITY AND COST ESTIMATES**
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- **HEC-2 PRINTOUT, SPF DELINEATION, WITH PARTIAL CHANNELIZATION**
- **PLATE 4, SPF DELINEATION, WITH PARTIAL CHANNELIZATION**
- **PLATE 5, SPF PROFILES, WITH PARTIAL CHANNELIZATION**

PLATE 1 LOCATION MAP

Registered Professional Engineer (Civil)
CERTIFICATE No. 10511
ASHOK C. PATEL
Date Signed 8/28/91
ARIZONA, U.S.A.

1. INTRODUCTION

1.1 Purpose

The Flood Control District of Maricopa County (the District) has contracted with Wood, Patel & Associates, Inc. (Wood/Patel) to provide engineering services for the New River project. Wood/Patel, according to the contract Scope of Work, shall provide the District with the Standard Project Flood (SPF) delineation and bank stability evaluation for the study reach of New River between Grand Avenue and Bell Road.

The U.S. Army Corps of Engineers (Corps) has recently completed a construction contract for channel improvements along the New River from the Arizona Canal Diversion Channel (ACDC) south to Olive Avenue. Due to prior agreements concerning acquisition of SPF flowage easements downstream of ACDC, the District may provide for an SPF channel within the study reach. Downstream from there, channel improvements have been under design to allow flow breakouts to return to natural channel conditions.

1.2 Project Location

The study area for this report is located on New River in between Grand Avenue and Bell Road in the City of Peoria. Plate 1 following Appendix IV depicts the study reach.

Presently, there are three bridged crossings of the New River in this project. These are located at Grand Avenue, Thunderbird Road, and Bell Road. The Outer Loop Freeway (Agua Fria Freeway), by the Arizona Department of Transportation (ADOT), parallels New River along the east side.

1.3 Background

Historically, a flood hazard has existed in the metropolitan Phoenix area along Cave Creek, Skunk Creek, New River, the Agua Fria River and downstream of the Arizona Canal. As a means to help mitigate potential flooding, the Corps, in conjunction with the District, and other municipalities, has implemented a comprehensive flood control plan consisting of both structural and non-structural improvements.

As a part of the overall plan, the ACDC has been designed to intercept 100-year flows from as far east as Cudia City Wash and convey them to an outlet at Skunk Creek, tributary to the New River which in turn is a tributary of the Agua Fria River.

Under an agreement with the Corps, the District plans to acquire flowage easements along Skunk Creek, New River and the Agua Fria River to the confluence with the Gila River, as authorized by Federal Legislation.

1.3 Background (Continued)

Structural improvements have been made along the Agua Fria River and some easements have been acquired. However, due to schedule and cost constraints, flowage easement agreements have not yet been settled for a portion of the New River. To alleviate a potential flooding problem from completion of the ACDC, and the associated liability risk to the District, a decision to provide channel improvements to the New River has been considered.

Improvements to handle the Standard Project Flood (SPF) are proposed to be in the form of channelization and bank protection of the New River from Grand Avenue to Skunk Creek confluence.

2. SCOPE OF WORK

In 1989, a hydraulic analysis was performed for portions of New River and Skunk Creek, by the District. This analysis included a flood insurance study, as well as floodplain delineation for the Standard Project Flood (SPF). The study was subsequently submitted to and accepted by the Federal Emergency Management Agency (FEMA) for the Conditional Letter of Map Revision (CLOMR) process.

The study concluded that a certain portion of the New River channel section, near Thunderbird Road, was not adequate in size to contain the SPF highwater within the banks. The District, as part of these services, requested that Wood/Patel perform a hydraulic analysis, more specifically, the tasks listed below:

2.1 SPF Delineation

1. Create a working HEC-2 model using the digitized data (1991 Mapping) for the 3.5 mile long reach of New River between Grand Avenue and Bell Road.
2. Establish SPF profile based on the Corps flood peak of 68,000 cfs for New River downstream of the Skunk confluence. The SPF profile will be matched to the existing profile at the study limits.
3. Evaluate the riverbanks to check if the SPF is contained within the banks or not.
4. If the SPF is not contained within the banks, do alternative analysis for the channel modification to contain the SPF. This may require lowering of channel thalweg and channel excavation.
5. Finalize SPF profile based on the recommended channel excavation option.
6. Prepare SPF delineations with and without the channel improvement conditions on the available topographic map.
7. Prepare a (brief) letter report documenting the methods used for the SPF delineation, provide earthwork estimate together with summary and conclusion.

It should be noted that this effort to be provided for the feasibility study and not intended for preparation of any Design and Construction plans for the channel modifications.

2.2 Bank and Grade Stabilization

Due to a significant change in the channel gradient, the channel in the vicinity of Desert Harbor Development is believed to be unstable for a major flooding condition.

2.2 Bank and Grade Stabilization

Wood/Patel to perform the following tasks to address the stability of the channel:

1. Perform a hydraulic evaluation to determine the need for bank stabilization for the New River reach from Thunderbird Road to about 5200 feet upstream. For this task, available empirical equations to be used and no extensive sediment transport analysis is anticipated.

2. Provide a conceptual analysis for a drop structure near Desert Harbor Development. Per District's input, the drop structure height of 11 feet should be used as previously established by Ellis-Murphy. A cost analysis is to be prepared for the drop structure.

2.3 Digital Cross-sections and Basemaps

Digital cross-sections in HEC-2 format to be provided by the subconsultant, Kenney Aerial Mapping Company, Inc. These cross-sections to be prepared for the study reach of 3.5 miles of New River.

Kenney Aerial to also prepare basemaps at a scale one (1) inch equals 200 feet for the study reach.

Wood/Patel to collect and utilize existing available data for the performance of these services including:

1. Topographic survey as prepared by the District.
2. Approved hydrology from the Corps SPF = 68,000 cfs (downstream from Skunk Creek confluence).
3. Existing available data on hydraulic analysis including digitized sections (for supplemental information) from the previous work by Coe & Van Loo.
4. As-built data on channel improvements and bridge structures, if available.
5. Future drop structure height from Ellis-Murphy 1985 design plans.
6. Soil gradation analysis by Construction Inspection & Testing, Inc. (1985).

The following tasks were specifically excluded from this Scope of Work:

1. Sediment Transport Analysis
2. Field Survey
3. Topographic Survey
4. Section 404 or NPDES Permits
5. Soil Gradation or Geotechnical Analysis
6. Construction plans & specifications

3. DATA COLLECTION

The following data was collected in conjunction with this study:

Reports

- Dames & Moore, Hydraulic and Geotechnical Engineering Studies, channel bank stabilization and protection, New River and Skunk Creek for Ellis-Murphy, Inc., April 27, 1987.
- Ellis-Murphy Gannett Fleming of Arizona, Inc., Desert Harbor Erosion Study, September, 1988.
- Construction Inspection & Testing Co., Soil Investigation for Erosion Study, Desert Harbor, April 22, 1988.
- Ellis-Murphy, Skunk Creek HEC-2, June 1987.
- Coe & Van Loo Consultants, Inc., New River/Skunk Creek SPF Delineation (including data on HEC-2 input/output), December, 1989.

Plans

- Maricopa County Highway Department, Thunderbird Road Bridge, January, 1981.
- Maricopa County Highway Department, Bell Road Bridge, December, 1981.
- Flood Control District of Maricopa County, 83rd Avenue Bridge, December, 1990.
- Flood Control District of Maricopa County, topographic maps of New River as prepared by Kaminski-Hubbard Engineering & Kenney Aerial Mapping Co., April, 1991.
- Flood Control District of Maricopa County, 91st Avenue Channel Improvements by Dibble & Associates, November, 1990.
- Arizona Department of Transportation, partial set of plans on Agua Fria Freeway Bridge over Skunk Creek, April, 1987.
- U.S. Army Corps of Engineers, partial set of improvement plans, Grand Avenue at New River, December, 1990.
- Ellis-Murphy, Desert Harbor, Drop Structure in New River, City of Peoria, October, 1984, unapproved set of plans.

4. STANDARD PROJECT FLOODPLAIN DELINEATION

Based on the topographic maps dated April, 1991, at a scale one (1) inch equals 200 feet and 2 foot contour interval (Ref. 10.3.4), floodplain delineation was performed for the study reach. The hydraulic analysis was conducted using the U.S. Army Corps of Engineer's HEC-2 computer model (Ref. 10.1.3) to develop a water surface profile.

Study Parameters:

Study Reach: New River from Grand Avenue to Bell Road.

Design Flood: Standard Project Flood (Ref. 10.1.4)

- 68,000 cfs New River downstream of Skunk Creek confluence
- 38,000 cfs New River upstream of Skunk Creek confluence

Manning's Roughness Coefficient

- for channel n = .03
- for overbanks n = .045

Starting water surface elevation was based on the SPF analysis by Coe & Van Loo (Ref. 10.2.5) This delineation based on existing conditions, is depicted on Plate 2, Appendix III and the profiles are shown on Plate 3, Appendix III.

5. BANK STABILITY EVALUATION

The stability of an earth bank against erosive forces can be insured by limiting the erosive power of the flooding waters to such a degree that movement of the soil particles in the channel bank is not initiated.

For the stability of channel banks along the Desert Harbor Development, two basic concepts of stability analysis were used based on the Soil Conservation Service Procedure (Ref. 10.1.7) as follows:

- Allowable Velocity Approach
- Allowable Tractive Force Approach

5.1 Allowable Velocity Approach

Figure 1, "Allowable Velocities for Unlined Earth Channels" reproduced from "Planning and Design of Open Channels", SCS TR-25, (Ref. 10.1.7) was used for the purpose of estimating allowable velocities for the study reach in between Grand Avenue and Greenway Road. Basic parameters used for this analysis are listed below:

1. Consider only straight alignment portion within the study limits.

2. Estimate D_{75} size from the soil gradation data from the Construction Inspection & Testing Company's Soil Report (Ref. 10.2.3).

3. Assume minimum bank slope to be 3 horizontal to 1 vertical (3:1).

The data for estimating D_{75} (Ref. 10.2.3) was very limited. Per the study Scope of Work, that data was to be used for all gradation analysis. To the best of our ability, the data was separated into three categories as identified in Appendix I; west bank, east bank and channel bottom, respectively. Accordingly, the D_{75} ranged from 0.5 mm in the channel bottom to 20 mm in the east bank and 32 mm in the west bank. Based on this limited data, it was concluded the allowable velocity for the east bank was about 8.4 fps, and for the west bank was slightly higher to about 9.6 fps.

	D_{75}	Basic Velocity	Factors D	A	B	Allowable Velocity
East Bank	20.0 mm	6.6 fps	1.5	1	.85	8.4 fps
Channel Bottom	0.5 mm	2.2 fps	1.5	1	.85	2.2 fps
West Bank	32.0 mm	7.5 fps	1.5	1	.85	9.6 fps

5.2 Tractive Stress Analysis

When the water flows in a channel, a force is developed that acts in the direction of flow on the channel bed. This force is simply the pull of water on the wetted area and is known as the tractive force.

5.2.1 Tractive Force

The average value of the tractive force per unit wetted area is also called as unit tractive force or shear stress. For this analysis, channel boundary shear stress has been computed using the HEC-2 computer program with the equation:

$$\tau_{ch} = yD_{ch}S$$

where,

y = specific weight of water (62.4 lb/ft^3)

D_{ch} = average depth of water in the channel (feet)

S = slope of the energy grade line (ft/ft)

τ_{ch} = channel boundary shear streets (lb/ft^2)

5.2.2 Allowable Tractive Force

The allowable tractive force for channel bed and sidebanks has been calculated using the D_{75} as determined from Section 5.1. Please refer to Appendix I for these calculations.

	Bank Sideslope	Allowable Tractive Force
West Bank	3:1	0.42
	5:1	0.47
East Bank	3:1	0.26
	5:1	0.29

In general, the tractive force caused by the standard project flood condition is about 2.0 psf in a uniform flow condition. The allowable tractive force is significantly less to about 0.3 to 0.5 psf range.

Based on this analysis, it is very clear that under the existing condition both banks are susceptible to erosion.

5.3 Bank Stability Enhancement

Several lining alternatives have preliminarily been investigated to determine the most cost effective method of protecting the bank from erosion. Criteria used in the selection process included strength and durability of the material, cost and feasibility of construction, slope stability, aesthetics, and maintenance expenses. The alternatives explored include gabions, soil cement, loose riprap, reinforced gunite, reinforced concrete, and grouted riprap (see Appendix II for details).

Gabions

Gabions, or wire-meshed enclosed riprap, would provide the necessary flexibility to conform to scour holes which could threaten the stability of the bank. This plan would call for placement of the mattresses on a 1.5:1 slope. In addition to being more natural looking than a grouted or concrete structure, gabions could exploit the readily available material in the area. Based on cost effectiveness, flexibility, and availability of material, this option is recommended for further consideration.

Soil Cement

This material was considered for its demonstrated ability to adequately protect the surface in other projects of similar nature, including those designed by the Corps of Engineers. The soil cement alternative calls for placement of 6-inch lifts of 8- to 8.5-foot wide soil cement, compacted with a vibratory smooth roller. The material would then be trimmed on the channel side to a relatively smooth surface. With its massive size and properties, this alternative is expected to be the least expensive in maintenance. Although the width could be reduced, it is anticipated that any savings, due to a reduction in material, would be offset by increased costs in construction, since the standard width for soil cement placement (dictated by the width of the trucks placing the material) is 8 to 8.5 feet. Aesthetically, this alternative would draw the least attention to itself, as the color and gradation would closely match the surrounding soil conditions.

Loose Riprap

This alternative calls for the use of a minimum 2-foot thick lining using a 15-inch minimum stone on a 2:1 slope. To minimize loss of material below the lining, a filter fabric would be used. Although one of the more natural in appearance, loose riprap requires material which may not readily be available in the required size or volume.

5.3 Bank Stability Enhancement (Continued)

Reinforced Gunite

Reinforced gunite of 6-inch thickness would be placed over a welded wire fabric material for strength and control of cracking. At the top of this lining, a 2-foot turn-down would be included for stability and protection from undermining. Weep holes throughout the length of the lining would be provided as a means of reducing hydrostatic pressure caused by saturation of the material behind the lining. Maintenance of the lining would require periodic inspection and repair of any spalling or cracking.

Reinforced Concrete

Reinforced concrete of 6-inches thick would be placed over a reinforcement for enhancing strength and reducing cracks. At the top of this lining, a 2-foot turn-down would be included for stability and protection from undermining. Weep holes throughout the length of the lining would be provided as a means of reducing hydrostatic pressure caused by saturation of the material behind the lining. Maintenance of the lining would require periodic inspection and repair of any spalling or cracking.

Grouted Riprap

This alternative calls for the use of a minimum 1.5-foot thick lining, 10-inch minimum stone, grouted in place with shotcrete. This alternative may call for additional reinforcement or special treatment of the base material, as it is especially susceptible to cracking. Furthermore, this alternative relies heavily on the assumption that adequate material exists in the area. Studies performed by the Corps indicated that use of grouted stone would require a flattening of the side slopes to at least 2:1 because of the rounded material available.

As indicated in Appendix I, for the bank lining material, toe-down of 10 feet has been selected. This toe-down depth is consistent with the previous design work by the Corps (Ref. 10.1.6). Similar toe-down depth has also been adopted by the District's New River channelization project immediately downstream of Olive Avenue.

For the purpose of this study, any kind of sediment transport analysis is beyond the scope of work and, therefore, has not been performed. The selected toe-down depth is considered adequate for this concept analysis.

6. DROP STRUCTURE

As part of design for the Desert Harbor Development, Ellis-Murphy has previously prepared design plans for a drop structure immediately downstream from the New River-Skunk Creek Confluence (Ref. 10.3.8). Their design was based upon the following design parameters:

Design Flow (100-Yr)	=	41,000 cfs
Drop structure Height	=	11 ft

The Ellis-Murphy design was reviewed for its adequacy in conjunction with the SPF design and the following conclusions have been made:

1. The SPF peak is substantially larger than the 100-year peak (68,000 cfs as compared to 41,000 cfs) and, therefore, the drop structure proposed for Desert Harbor Development would not be able to safely handle the SPF.

2. The loose riprap apron provided downstream of the drop structure is found inadequate to withstand the 100-year and SPF peaks.

3. Based on the SPF HEC-2 analysis, the channel section downstream of the drop structure produced velocities in the range of 12 to 13 fps. These velocities are too high to be handled by the unprotected sidebanks of the Desert Harbor Development.

4. To produce velocities to acceptable levels, the channel slope will be required to be reduced to 0.000526 ft/ft from Thunderbird Road upstream to the proposed drop structure location. This flattening of slope will require the drop structure height to be increased from 11 feet to 14 feet.

This study provides a conceptual design for the drop structure which will handle the SPF peak (see Appendix I). The design is based on a vertical concrete drop structure concept as presented in the Hydraulic Engineering Circular, No. 14, Federal Highway Administration (Ref. 10.1.8). If this drop structure height is selected for future consideration, detailed geotechnical, structural, and hydraulic analyses will be required prior to the preparation of the final design plan.

7. CHANNEL IMPROVEMENT ANALYSIS

To contain the SPF within channel banks and generally within the District's flowage easement, partial channelization of New River is necessary. This task was performed by the use of CHIMP subroutine from the HEC-2. Several trials with difference bottom width parameters were analyzed.

Plate 4, Appendix IV depicts the improvement area. Hydraulic analysis was performed using the CHIMP routine of HEC-2 as listed below:

Channel Reach	Sideslopes	Bottom width of Channel
Section 358.0 to 402.0	3:1	270 feet

With channel improvements, the SPF can be contained within a narrow floodway section as shown on Plate 4, Appendix IV.

As an option to bank protection, channel can be designed such that its bank velocity is reduced to an acceptable level. This approach is presented as Option 2 in Appendix II. For this option, a hydraulic analysis was also performed using the CHIMP routine of HEC-2 as listed below:

Channel Reach	Sideslopes	Bottom width of Channel
Section 412.0 to 402.0	3:1	278 feet

8. QUANTITY AND COST ESTIMATES

On a conceptual basis, quantities and costs have been estimated for channel improvements, bank protection and a drop structure.

The earthwork estimate for channel improvements is based upon an end area method and by the use of HEC-2 analysis. It is assumed that excavated material will be disposed off along the channel overbank areas or within a two mile radius.

Estimates for the bank protection material have been based upon similar projects, and similar lining material within the metropolitan Phoenix area.

Appendix II provides detail on the quantities and cost including improvement options. These costs are exclusive of engineering fees, construction management, and contingencies. A summary of cost estimates are presented below:

1. To contain SPF, generally within channel banks, approximately 4000 L.F. of channelization will be required south of Thunderbird Road which is estimated to cost about $363,000. For this approach, no considerations are given for the erosion caused by higher velocities.

2. To enhance bank stability of the study reach north of Thunderbird Road and immediately adjacent to Desert Harbor Development, bank protection together with a drop structure will be required per Option 1, Appendix II. This measure will cost about $2,350,000. The channel bottom will be subject to aggradation/degradation due to high velocities.

   For Option 2, however, channelization will be done downstream of the drop structure to reduce velocities to an acceptable level. This channelization, together with a drop structure and some bank protection, is estimated to cost about $2,036,000.

Revised September 3, 1991

9. CONCLUSIONS AND RECOMMENDATIONS

Based on this study, the following conclusions are made:

1. With a recent partial channelization of New River within the study reach, the standard project floodplain is significantly contained within the channel banks, However, the SPF breaks out into the overbank areas immediately north of Grand Avenue to section no. 402.0, as depicted on Plate 2, Appendix III.

2. To contain the SPF within the channel banks and generally within the District's flowage easement, channelization of New River is necessary. Plate 4, Appendix IV depicts the improvement area. Hydraulic analysis was performed using the CHIMP routine of HEC-2 as listed below:

Channel Reach	Sideslopes	Bottom width of Channel
Section 358.0 to 402.0	3:1	270 feet

With channel improvements, the SPF can be contained within a narrow floodway section as shown on Plate 4, Appendix IV.

3. An evaluation was made to check the bank stability of existing channel banks for the river reach beginning from Thunderbird Road and continuing north to a point about 5,200 feet north form Thunderbird Road.

Based on limited available soil gradation data, it was concluded that the bank can withstand about 8 to 9 fps velocities on a 3:1 sideslope.

Since the SPF velocities are substantially higher than the allowable range, bank protection will be needed.

A 12-inch thick gabion protection was found cost-effective and workable for the study area and is therefore recommended. This approach is presented as Option 1 in Appendix II.

4. As an option to bank protection, channel can be designed such that its bank velocity is reduced to an acceptable level. This approach is presented as Option 2 in Appendix II. For this option, a hydraulic analysis was performed using the CHIMP routine of HEC-2 as listed below:

Channel Reach	Sideslopes	Bottom width of Channel
Section 412.0 to 451.1	3:1	278 feet

9. CONCLUSIONS AND RECOMMENDATIONS (Continued)

5. The drop structure design prepared by Ellis-Murphy is not workable for the SPF since:

   - the SPF peak is substantially greater than the 100-year peak used by Ellis-Murphy.

   - bringing the SPF velocities to an acceptable level downstream of the drop structure, reduction in channel slope will be needed. Consequently, the drop structure height will be increased from 11 feet as proposed by Ellis-Murphy to 14 feet.

6. It is recommended that these conclusions be used by the District in the decision making process as to what route to take in conjunction with the SPF condition.

   Once the implementation option is selected, it is recommended that a more detailed study be made to further refine the design, as well as the costs.

10. REFERENCES

10.1 Bibliography

10.1.1 Flood Control District of Maricopa County, "*New River, Skunk Creek, Agua Fria River Flood Control Master Plan*", Draft, May, 1983.

10.1.2 U.S. Army Corps of Engineers, Office of the Chief of Engineers, "*Hydraulic Design of Flood Control Channels*", July, 1970.

10.1.3 U.S. Army Corps of Engineers, Hydrology Engineering Center, "*HEC-2 Water Surface Profiles*", Users Manual, September, 1982.

10.1.4 U.S. Army Corps of Engineers, Los Angeles District, "*New River and Phoenix City Streams, Arizona, Design Memorandum No. 2, Hydrology Part 1*", October, 1974.

10.1.5 U.S. Army Corps of Engineers, Los Angeles District, "*New River and Phoenix City Streams, Arizona, Design Memorandum No. 3, Skunk Creek and the New and Agua Rivers*", Draft, July, 1985.

10.1.6 U.S. Army Corps of Engineers, Los Angeles District, "*Design Memorandum No. 3, Skunk Creek and the New and Agua Rivers*", Final, May, 1986.

10.1.7 Soil Conservation Service, "*Design of Open Channels, TR-25*", October, 1977.

10.1.8 Federal Highway Administration, "*Hydraulic Design of Energy Dissipators for Culverts and Channels, HEC-14*", September, 1983.

10.2 Reports

10.2.1 Dames & Moore, Hydraulic and Geotechnical Engineering Studies, channel bank stabilization and protection, New River and Skunk Creek for Ellis-Murphy, Inc., April 27, 1987.

10.2.2 Ellis-Murphy Gannett Fleming of Arizona, Inc., Desert Harbor Erosion Study, September, 1988.

10.2.3 Construction Inspection & Testing Co., Soil Investigation for Erosion Study, Desert Harbor, April 22, 1988.

10.2.4 Ellis-Murphy, Skunk Creek HEC-2, June 1987.

10.2.5 Coe & Van Loo Consultants, Inc., New River/Skunk Creek SPF Delineation (including data on HEC-2 input/output), December, 1989.

10.3 Plans

10.3.1 Maricopa County Highway Department, Thunderbird Road Bridge, January, 1981.

10.3.2 Maricopa County Highway Department, Bell Road Bridge, December, 1981.

10.3.3 Flood Control District of Maricopa County, 83rd Avenue Bridge, December, 1990.

10.3.4 Flood Control District of Maricopa County, topographic maps of New River as prepared by Kaminski-Hubbard Engineering & Kenney Aerial Mapping Co., April, 1991.

10.3.5 Flood Control District of Maricopa County, 91st Avenue Channel Improvements by Dibble & Associates, November, 1990.

10.3.6 Arizona Department of Transportation, partial set of plans on Agua Fria Freeway Bridge over Skunk Creek, April, 1987.

10.3.7 U.S. Army Corps of Engineers, partial set of improvement plans, New River Improvements, Grand Avenue, As-built, December, 1990.

10.3.8 Ellis-Murphy, Desert Harbor, Drop Structure in New River, City of Peoria, October, 1984, unapproved set of plans.

APPENDIX I

COMPUTATIONS ON BANK STABILITY

WOOD / PATEL ASSOCIATES

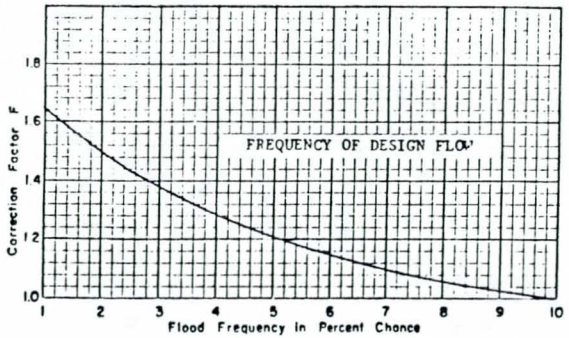
Civil Engineers
Hydrologists
Land Surveyors

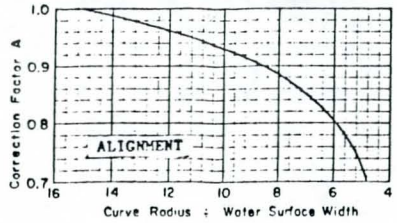
PROJECT New River, Bank Stability
PROJECT NO. 91755 SHEET NO. ____ OF ____
CALCULATED BY AQ DATE 8/21/91
CHECKED BY ____ DATE ____

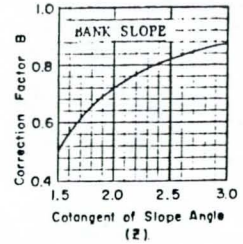
Allowable Velocity Calculations: (Ref. TR-25)

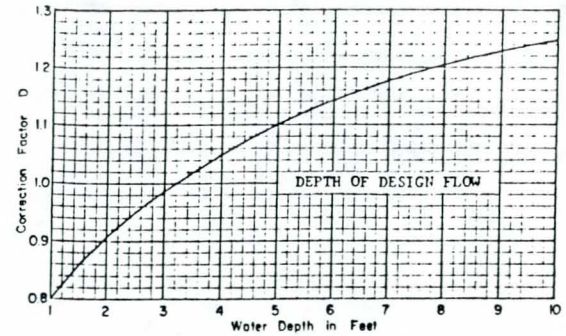
	D_{75} mm [1]	Basic Velocity	D	A	B	Allowable Vel.
West Bank	32mm	7.5	1.5	1	0.85	9.6
bottom	.5mm	2.2	1.5	1	0.85	2.8
East Bank	20mm	6.6	1.5	1	0.85	8.4

1] From Soil Gradation Data, this Appendix



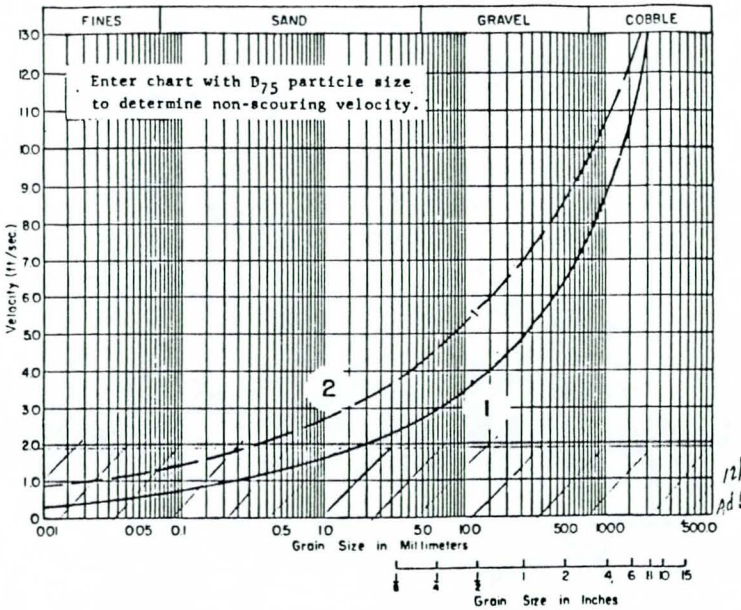






NON-SCOURING VELOCITIES FOR VARIOUS EARTH MATERIALS

SOIL DESCRIPTIONS	SOIL CLASSIFICATION		VELOCITY (FT./SEC.)		
	GROUP	PI	CLEAR WATER	SUSPENDED LOAD	BEDLOAD
Stiff clay, high cohesion	CH	Above 20	4.5	6.0	3.5
Lean to moderately cohesive clays; silty or sandy clays.	CL	7-10	Curve 1	Curve 2	*
	CL	10-20	2.5	4.0	2.5
	CL	Above 20	4.0	5.5	3.5
Colloidal alluvial silts; micaceous or diatomaceous silts; organic silts and clays with high LL.	MH,OH	Below 10	Curve 1	Curve 2	*
	MH,OH	10-20	2.5	4.0	2.5
	MH,OH	Above 20	3.5	5.0	3.0
Non-colloidal alluvial silts; sandy or clayey silts; organic silts with low LL.	ML,OL	Below 10	Curve 1	Curve 2	*
	ML,OL	10-20	2.5	4.0	2.5
Silty sands or gravelly silty sands containing more than 5% fines.	SM	Below 10	Curve 1	Curve 2	*
	SM	10-20	2.5	4.0	2.5
Clayey sand or gravelly clayey sands containing more than 5% fines.	SC	7-10	Curve 1	Curve 2	*
	SC	10-20	2.5	4.0	2.5
	SC	Above 20	4.0	6.0	3.5
Clayey gravels or clayey sandy gravels containing more than 5% fines.	GC	7-10	Curve 1	Curve 2	*
	GC	10-20	Curve 1 or 4.0	Curve 2 or 5.5	* or 5.0
	GC	Above 20	Curve 1 or 5.0	Curve 2 or 6.5	* or 6.0
Silty gravels or silty sandy gravels containing more than 5% fines.	GM	Below 10	Curve 1	Curve 2	*
	GM	10-20	Curve 1 or 4.0	Curve 2 or 5.5	* or 5.5
Clean sands and gravels or sand-gravel mixtures containing less than 5% fines.	GW	-	Curve 1	Curve 2	*
	GP	-	Curve 1	Curve 2	
	SW	-	Curve 1	Curve 2	
	SP	-	Curve 1	Curve 2	



12/15/69
Ad Engr 6-1

*Use curve number 1 if the bed load concentration is less than the capacity of the stream or if the size of the bed load material is larger than the D_{75} size of the channel materials. Use curve number 2 if the bed load concentration is equal to the capacity of the stream or if the size of the bed load material is smaller than the D_{75} size of the channel materials.

Note:
In no case should the allowable velocity be exceeded by the 10% chance discharge regardless of the frequency of occurrence of the design flow.

DESIGN VELOCITIES FOR UNLINED EARTH CHANNELS

TYPE OF FLOW	SOIL GROUP	ALLOWABLE DESIGN VELOCITY
Sustained Flow	Non-Cohesive	Chart value x D x A x B
	Cohesive	Tabular value x D x A
Intermittent Flood Flow	Non-Cohesive	Chart value x D x A x B
	Cohesive	Tabular value x D x A x F

FIGURE 6-1

ALLOWABLE VELOCITIES FOR UNPROTECTED EARTH CHANNELS

WOOD / PATEL ASSOCIATES

Civil Engineers
Hydrologists
Land Surveyors

PROJECT _____

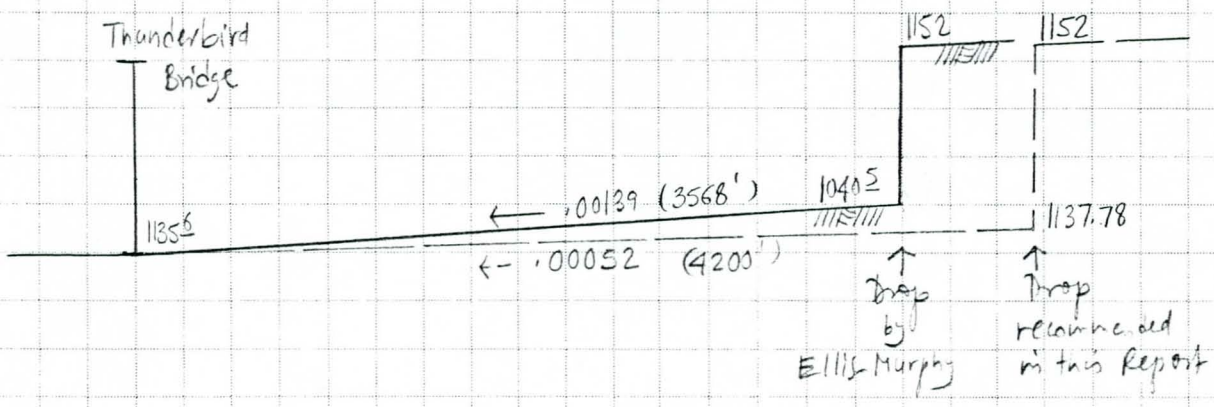
PROJECT NO. _____ SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

Proposed Channel Hydraulics:

Z: 3:1
B: 278 ft
n: .03
S: .00052 ft/ft
d: 23.85'
Q = 68,000 cfs V = 8.16 fps high but within acceptable range



New River Profile - looking west

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

August 27, 1991
NEW RIVER CHANNELIZATION NORTH OF THUNDERBIRD ROAD
STANDARD PROJECT FLOOD
Allowable Velocity Approach

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Channel Bottom Slope (feet per foot).....	0.000526
Manning's Roughness Coefficient (n-value).....	0.0300
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)...	3.00
Channel Bottom Width (feet).....	278.0

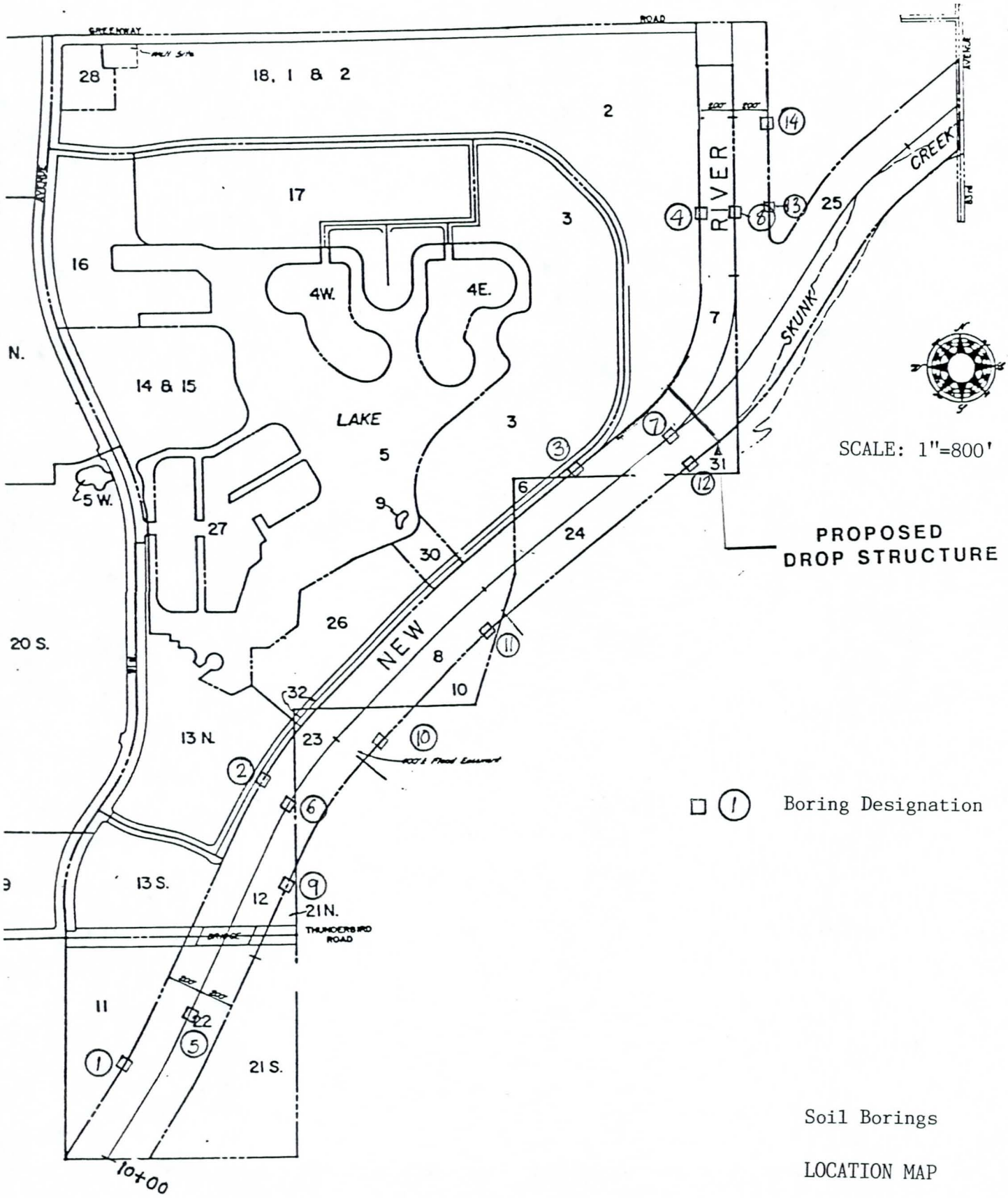
PROGRAM RESULTS:

Depth (ft)	Flow Rate (cfs)	Velocity (fps)	Froude Number	Velocity Head(ft)	Energy Head(ft)	Flow Area (sq ft)	Top Width (ft)	R
5.0	4690.6	3.20	0.259	0.159	5.159	1465.0	308.0	4.73
7.5	9302.3	4.13	0.275	0.265	7.765	2253.7	323.0	6.93
10.0	15168.1	4.92	0.287	0.377	10.377	3080.0	338.0	9.03
12.5	22220.2	5.63	0.297	0.493	12.993	3943.7	353.0	11.05
15.0	30421.2	6.28	0.305	0.612	15.612	4845.0	368.0	12.99
17.5	39750.7	6.87	0.312	0.733	18.233	5783.7	383.0	14.88
20.0	50199.1	7.43	0.318	0.856	20.856	6760.0	398.0	16.71
22.5	61763.7	7.95	0.323	0.980	23.480	7773.7	413.0	18.50
23.5	66702.6	8.14	0.325	1.030	24.530	8189.7	419.0	19.20
24.0	69239.2	8.24	0.326	1.055	25.055	8400.0	422.0	19.54

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

SOIL GRADATION DATA

(SOURCE: REF. 10.2.3)



Soil Borings

LOCATION MAP

PLATE

Construction Inspection & Testing Co.
2002 West North Lane
Phoenix, Arizona 85021-1927
861-2002 / 264-5938

EXISTING SOIL CHARACTERISTICS

PROJECT: NEW RIVER CHANNEL AT DESERT HARBOR
LOCATION: NEW RIVER AND THUNDERBIRD ROAD
FOR:

DATE: 3/11/88
LAB. NO. 8819828-46
TYPE OF SAMPLE SOIL
SOURCE

Boring Designation	Location	% passing (sieve size) 2"	1½	1	½	#4	#10	#40	#100	#200	Atterberg Limits LL	PL	PI
	STA 10+50:												
1	W.BANK, 0-2'		90	76	67	59	52	23	13	9	NON-PLASTIC		
	STA 20+00:												
5	CL, 5-6'			100	98	85	77	52	38	32	40	20	20
	STA 30+00:												
9	E.BANK, 0-1'	88	82	77	65	55	46	15	10	8	27	16	11
	E.BANK, 3-4'		86	79	68	60	54	23	14	12	35	19	16
	STA 35+00:												
6	CL, 8-9'				100	99	97	90	77	64	51	27	24
2	W.BANK, 0-1'	83		77	66	55	45	19	12	10	37	19	18
	STA 40+00:												
10	E.BANK, 5-6'	88	80	71	61	49	37	10	6	5	33	18	15
	STA 50+00:												
11	E.BANK, 0-1'			97	96	87	78	60	49	41	33	21	12
	E.BANK, 2.5-3.5'					98	89	65	48	38	53	35	18
	STA 60+00:												
3	W.BANK, 0-1'	94	-	69	59	51	38	14	8	7	32	18	14
	W.BANK, 2-3'					96	87	69	54	45	75	44	31
	STA 65+00:												
7	CL, 9-10'					100	99	84	70	60	51	24	27

Construction Inspection & Testing Co.
2002 West North Lane
Phoenix, Arizona 85021-1927
861-2002 / 264-5938

EXISTING SOIL CHARACTERISTICS

PROJECT: NEW RIVER CHANNEL AT DESERT HARBOR

LOCATION:

FOR:

DATE:

LAB. NO.

TYPE OF SAMPLE

SOURCE

Boring Designation	Location	% passing (sieve size) 2"	1½	1	½	#4	#10	#40	#100	#200	Atterberg Limits LL	PL	PI
	STA 65+00:												
12	E.BANK, 0-1'	88	80	73	58	47	39	12	7	5	21	19	2
	STA 80+00:												
13	E.BANK, 3-4'			89	78	67	57	13	6	5	NON-PLASTIC		
8	CL, 0-1'			100	94	86	78	24	11	9	NON-PLASTIC		
	CL, 12-13'			100	99	87	76	54	46	41	41	17	24
4	W.BANK, 0-2'	79	65	57	50	45	40	18	11	9	NON-PLASTIC		
	W.BANK, 2-3'			92	83	78	71	28	15	11	NON-PLASTIC		
	STA 85+00:												
14	E.BANK, 0-2'						100	95	74	50	NON-PLASTIC		

FOR CONSTRUCTION INSPECTION
& TESTING CO.

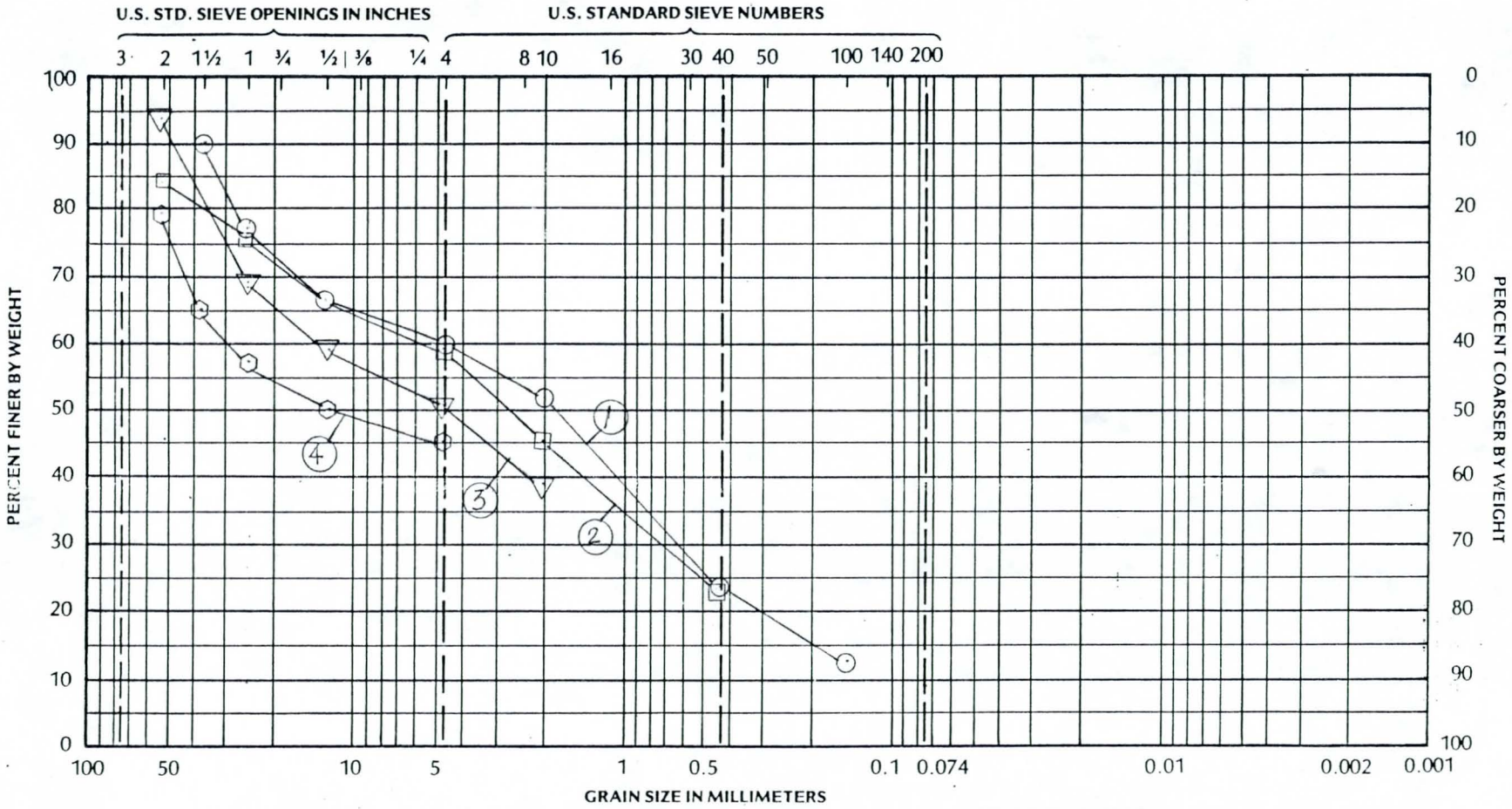
10-21

Type of Material _____ Job No. _____

Source of Material West Bank Line, New River Lab/Inv. No. _____

Test Procedure _____ Tested/Calc. By _____ Date _____

_____ Reviewed By _____ Date _____



Unified	Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt or Clay	
AASHTO	Gravel		Coarse Sand	Fine Sand	Silt	Clay

Particle Size, Percent Passing							Atterberg Limits	
2'' _____	1'' _____	½'' _____	#10 _____	#30 _____	#100 _____	0.05 mm _____	Liquid Limit _____	P.I. _____
1½'' _____	¾'' _____	#4 _____	#16 _____	#50 _____	#200 _____	0.002 mm _____	Plastic Limit _____	Sp. Gr. _____

PARTICLE SIZE DISTRIBUTION CHART

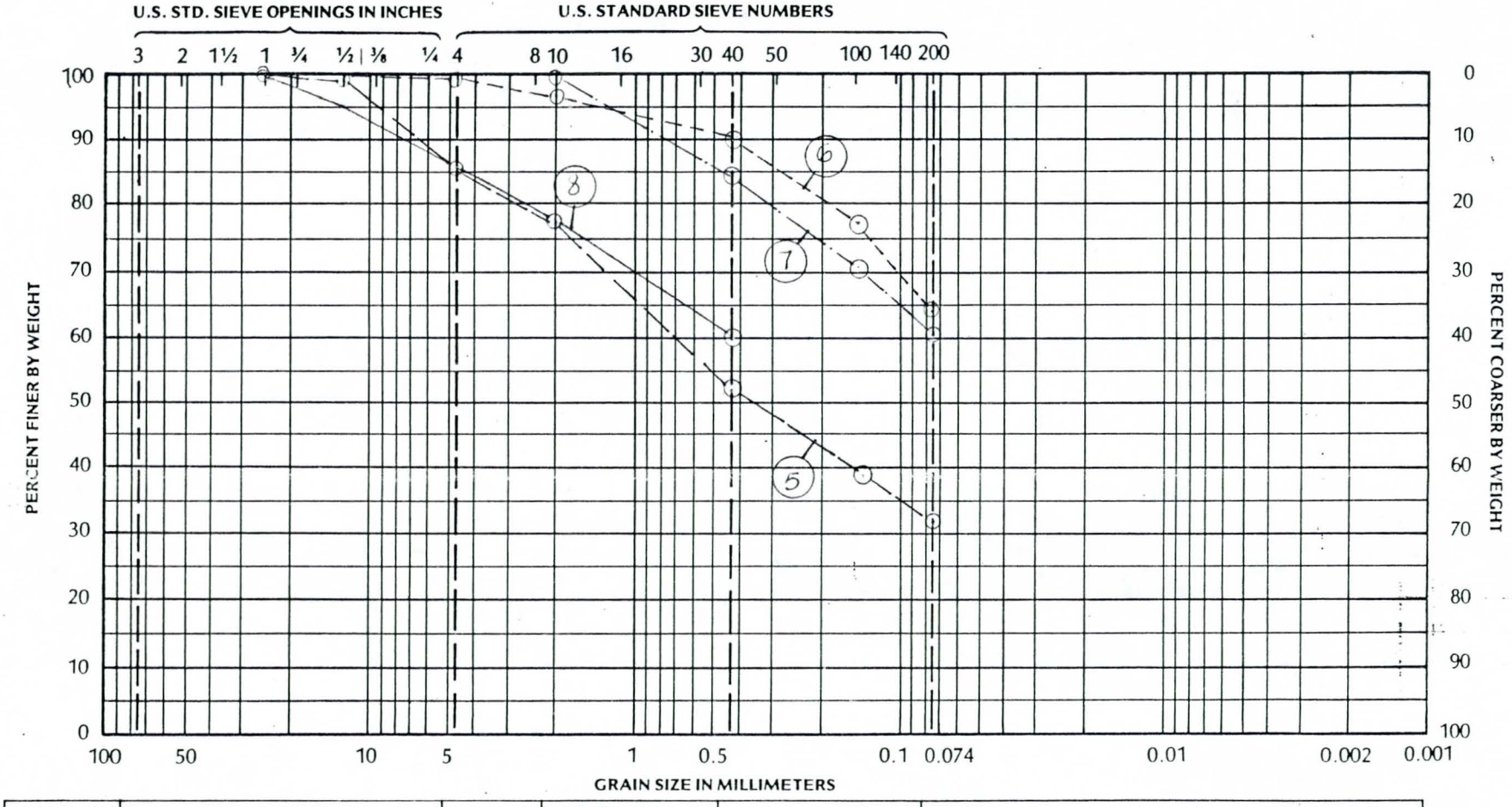
10-21

Type of Material _____ Job No. _____

Source of Material Channel Center Line, New River Lab/Inv. No. _____

Test Procedure _____ Tested/Calc. By _____ Date _____

_____ Reviewed By _____ Date _____



Unified	Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt or Clay	
AASHTO	Gravel		Coarse Sand	Fine Sand	Silt	Clay

Particle Size, Percent Passing								Atterberg Limits	
2'' _____	1'' _____	½'' _____	#10 _____	#30 _____	#100 _____	0.05 mm _____		Liquid Limit _____	P.I. _____
1½'' _____	¾'' _____	#4 _____	#16 _____	#50 _____	#200 _____	0.002 mm _____		Plastic Limit _____	Sp. Gr. _____

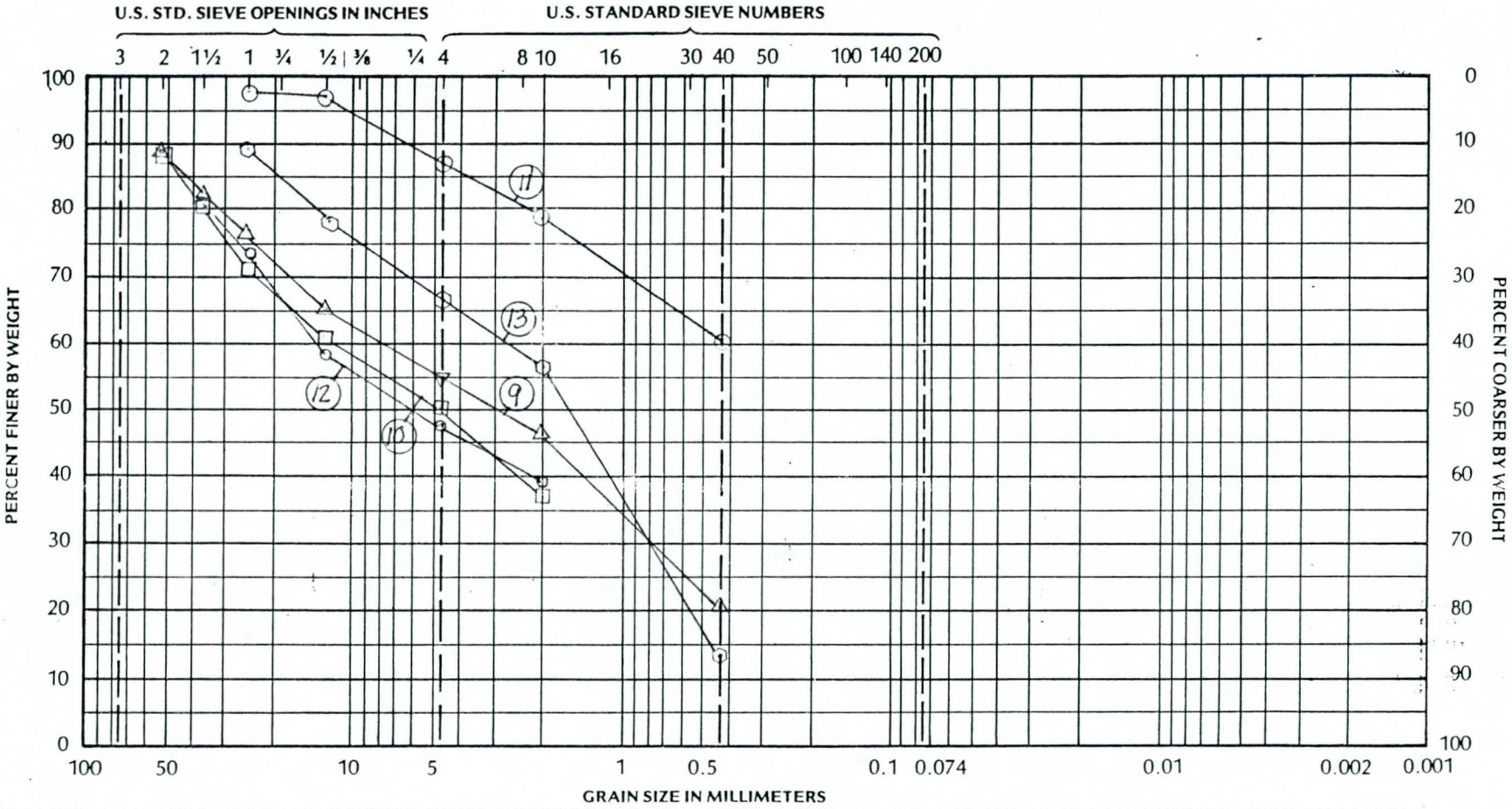
PARTICLE SIZE DISTRIBUTION CHART

Type of Material _____ Job No. _____

Source of Material East Bank Line, New River Lab/Inv. No. _____

Test Procedure _____ Tested/Calc. By _____ Date _____

_____ Reviewed By _____ Date _____



Unified	Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt or Clay	
AASHTO	Gravel		Coarse Sand	Fine Sand	Silt	Clay

Particle Size, Percent Passing							Atterberg Limits
2'' _____	1'' _____	½'' _____	#10 _____	#30 _____	#100 _____	0.05 mm _____	Liquid Limit _____ P.I. _____
1½'' _____	¾'' _____	#4 _____	#16 _____	#50 _____	#200 _____	0.002 mm _____	Plastic Limit _____ Sp. Gr. _____

PARTICLE SIZE DISTRIBUTION CHART

TRACTIVE STRESS ANALYSIS

WOOD / PATEL ASSOCIATES

Civil Engineers
Hydrologists
Land Surveyors

PROJECT: New River, Bank Stability
PROJECT NO. 91755 SHEET NO. ____ OF ____
CALCULATED BY: ACP DATE: 8/14/91
CHECKED BY: ____ DATE: ____

TRACTIVE FORCE:

Allowable:

		T_{Lb} (1)
D_{75} (west bank)	= 1¼" = 32 mm	0.5 psf
(bottom)	= 0.5 mm	
(east bank)	= 20 mm	0.31 psf

(1) From TR-25, Pg 6-15

The allowable tractive force for channel beds T_{Lb} composed of non-cohesive material of gradation D_{75} is: (where $D_{75} > 0.25''$)

$T_{Lb} = 0.4 \times D_{75}$

(2) for channel banks, $T_{Ls} = 0.4 \times K \times D_{75}$

where $K = \sqrt{\dfrac{Z^2 - \cot^2 \phi_R}{1 + Z^2}}$

where Z = cotangent of side slope angle

ϕ_R = angle of repose of coarse non-cohesive material

ϕ_R for slightly rounded material

D_{75}	ϕ_R
1¼"	35.5°
.02"	> 20°
.78"	33°

Side slope	ϕ_R	T_{Ls}/T_{Lb}
3:1	35°	.84
4:1	"	.91
5:1	"	.94
3:1	33°	.82
4:1	"	.89
5:1	"	.93

WOOD / PATEL ASSOCIATES

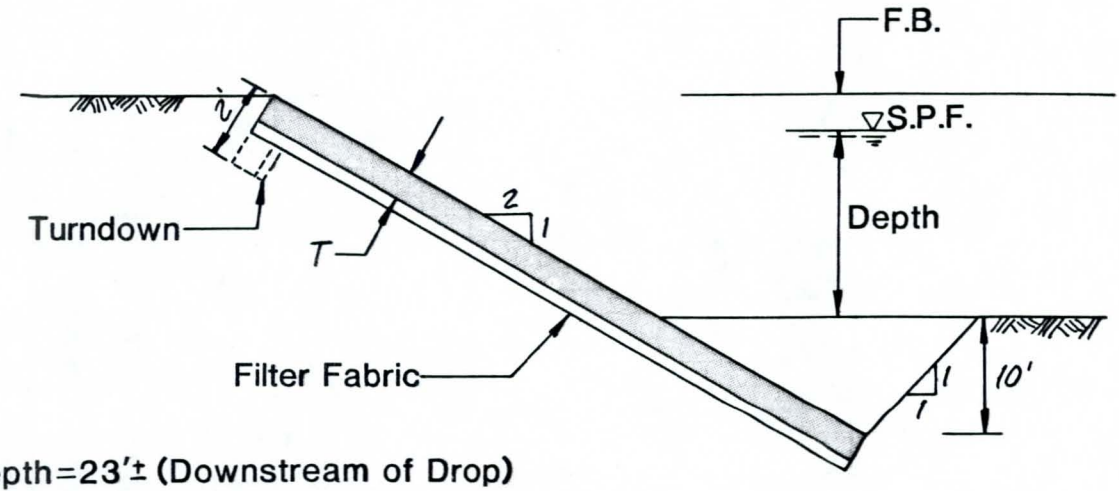
Civil Engineers
Hydrologists
Land Surveyors

PROJECT New River, Bank Stability
PROJECT NO. 91758 SHEET NO. ____ OF ____
CALCULATED BY ACP DATE 8/14/91
CHECKED BY ____ DATE ____

$T_{LS} = .4 \times K \times D_{75}$

West Bank	Side slope	T_{LS}/T_{LB} (ave)	T_{Lb}	T_{Ls}
	3:1	.83	0.5	0.42
	4:1	.90	"	.45
	5:1	.935	"	.47
East Bank	3:1	.83	0.31	0.26
	4:1	.90	"	0.28
	5:1	.935	"	0.29

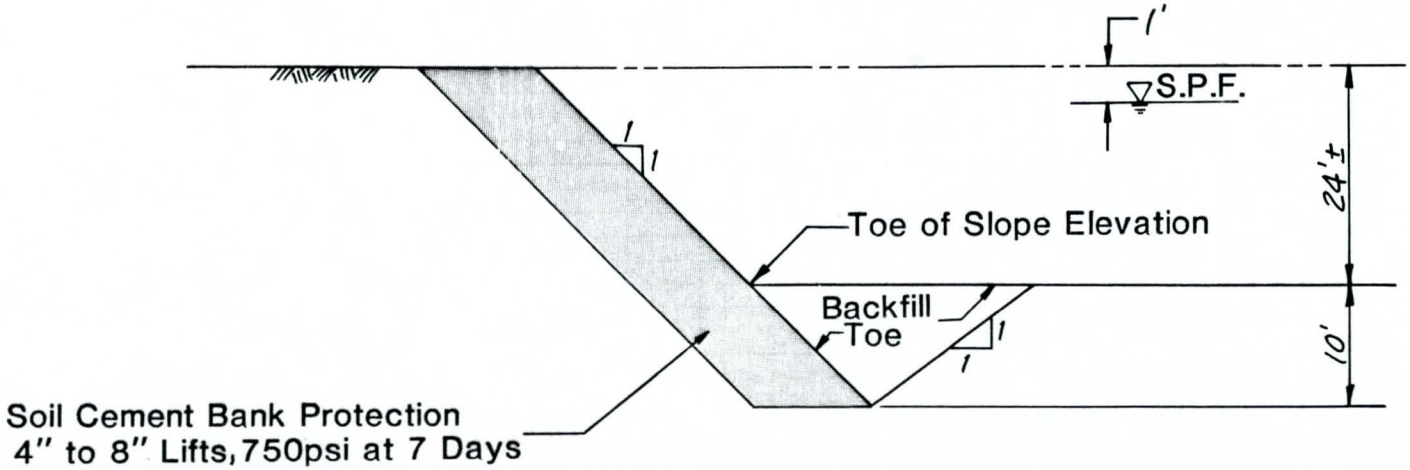
BANK STABILITY ENHANCEMENT



Depth=23'± (Downstream of Drop)
Depth=14'± (Upstream of Drop)

BANK LINING MATERIAL TYPICAL SECTION

OPTION	LINING MATERIAL	THICKNESS T	SIDESLOPE Z:1	FREEBOARD FB	2 FT TURNDOWN
1 (A)	GABION	12"	2:1	3'	NO
(B)	GABION	12"	1.5:1	3'	NO
3	LOOSE RIPRAP	24"	2:1	3'	NO
4	SHOTCRETE	6"	2:1	3'	YES
5	REIN. CONCRETE	6"	2:1	3'	YES
6	GROUTED RIPRAP	18"	2:1	3'	NO



SOIL-CEMENT
TYPICAL BANK SECTION
OPTION 2

DROP STRUCTURE

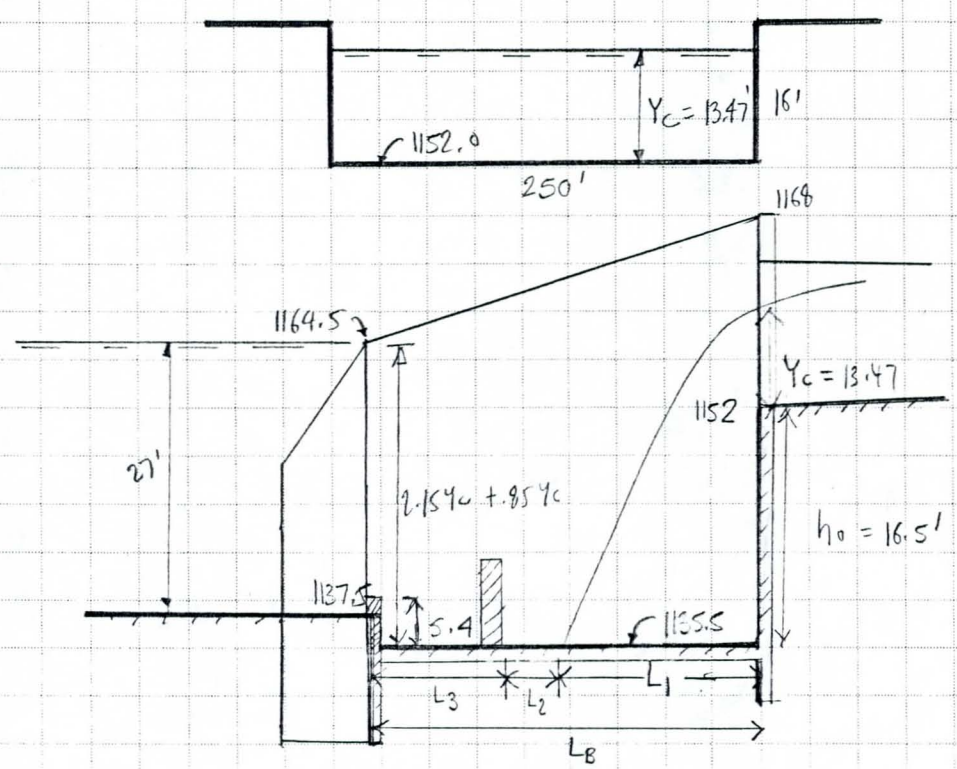
WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

PROJECT: New River, Drop Structure
PROJECT NO. 91755 SHEET NO. 1 OF
CALCULATED BY Agp DATE 8/9/91
CHECKED BY DATE

Try with basin bottom elevation = 1135.5
Section: 451 Near Desert Harbor

Design Parameters: $Q_{SPF} = 68{,}000$ cfs SPF

Hydraulic Design: Ref 10.1.8



drop > 15'
effective drop < 15
need checking

$Y_c = .315\left(\frac{Q}{B}\right)^{2/3} = 13.47'$

$h_0/Y_c = 16.5/13.47 = 1.22$

$h_2 = h_0 - 2.15Y_c$
$= 16.5 - 2.15 \times 13.47$
$= -12.46$

$h_2/Y_c = -.925$

for $h_0/Y_c = 1.22$, $h_2/Y_c = -.925$, from fig IX-A-2, $L/Y_c = 2.4$

$\therefore L_1 = 2.4 \times 13.47 = 32.3'$

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

PROJECT: New River, Drop Structure
PROJECT NO. 91755 SHEET NO. 2 OF
CALCULATED BY: Acp DATE: 8/9/91
CHECKED BY: DATE:

$L_2 = 0.8 \times Y_c = 10.8'$
$L_3 = 1.75 \times Y_c = 23.6'$

$L_B = L_1 + L_2 + L_3 = 68'$

SPF

Floor blocks:

a. height $= .8 \times Y_c = 10.8'$
b. width $= 0.4 \times Y_c = 5.4'$
spacing $= 0.4 \times Y_c = 5.4'$

Sill Height $= 0.4\, Y_c = 5.4'$

Sidewall Height above tailwater $= .85 \times Y_c = 11.45'$

Approach channel protection: $3 \times Y_c = 40.4'$

<u>check Tailwater Requirement:</u>

Tailwater per channel hydraulics:

1137.5 (FE) $+ 27'$ (hyd. depth) $= 1164.5$

Tailwater elevation required per hydraulic jump

1135.5 (FE) $+ (2.15 Y_c) = 1135.5 + 28.96 = 1164.46$

Therefore basin bottom elevation is adequately placed

APPENDIX II

QUANTITY AND COST ESTIMATES

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
and Surveyors

PROJECT: New River, option 1
PROJECT NO.: 91755 SHEET NO. ____ OF ____
CALCULATED BY: AWP DATE: 8/91 revised 9/91
CHECKED BY: ____ DATE: ____

CONCEPTUAL - COST ANALYSIS

OPTION 1 DESERT HARBOR AREA - Bank Stability Enhancement
(see plate following page)

West Bank: 4340 L.F. d/s of Drop: D = 23 + 13 = 36 [1] @ 180 = 781,200
2160 L.F. u/s of Drop: D = 14' + 13' = 27 [2] @ 135 = 291,600
1,072,800

East Bank: 5200 L.F. 4080 L.F. d/s of Drop: D = 23 + 13 = 36 @ 180 = 734,400
1120 L.F. u/s of Drop: D = 14' + 13 = 27 @ 135 = 151,200
885,600

Drop structure: $ 391,000

TOTAL COST = $ 2,349,400 [3] Say $ 2,350,000

1| unit price per calcs = $180/LF
2| unit price, prorated: $180 \times \frac{27}{36} \approx \$135$/LF

3| Eng, Maintenance, Grading of sidebanks, right-of-way, Construction management & contengencies not included

WOOD / PATEL ASSOCIATES

Civil Engineers
Hydrologists
Land Surveyors

PROJECT: New River, SPF
PROJECT NO. 9755 SHEET NO. ____ OF ____
CALCULATED BY: tcp DATE: 8/91 Revised 9/91
CHECKED BY: ____ DATE: ____

OPTION 2 DESERT HARBOR AREA - Bank Stability Enhancement

Criteria: (see plate following page)

① channelization (to reduce velocity) from Thunderbird Road to Drop structure:

Excavation: 601,000 cy @ 2.00 = $1,202,000

② Drop structure (same as for option 1): $391,000 1

③ Bank Stabilization upstream of Drop structure:

West Bank: 2160 L.F. @ $135/LF = 291,600
East Bank: 1120 LF @ $135/LF = 151,200
442,800

TOTAL = $ 2,035,800 2] say 2,036,000

1] slight reduction in cost possible due to reduced drop height
2] Eng, Maintenance, Grading of Sidebanks, right-of-way, Construction Management & Contingencies not included.

WOOD / PATEL ASSOCIATES

Civil Engineers
Hydrologists
Land Surveyors

PROJECT: New River, option 1
PROJECT NO. 91755 SHEET NO. ____ OF ____
CALCULATED BY: AWP DATE: 8/91
CHECKED BY: ____ DATE: ____

CONCEPTUAL - COST ANALYSIS

OPTION 1 DESERT HARBOR AREA - Bank Stability Enhancement
(see plate following page)

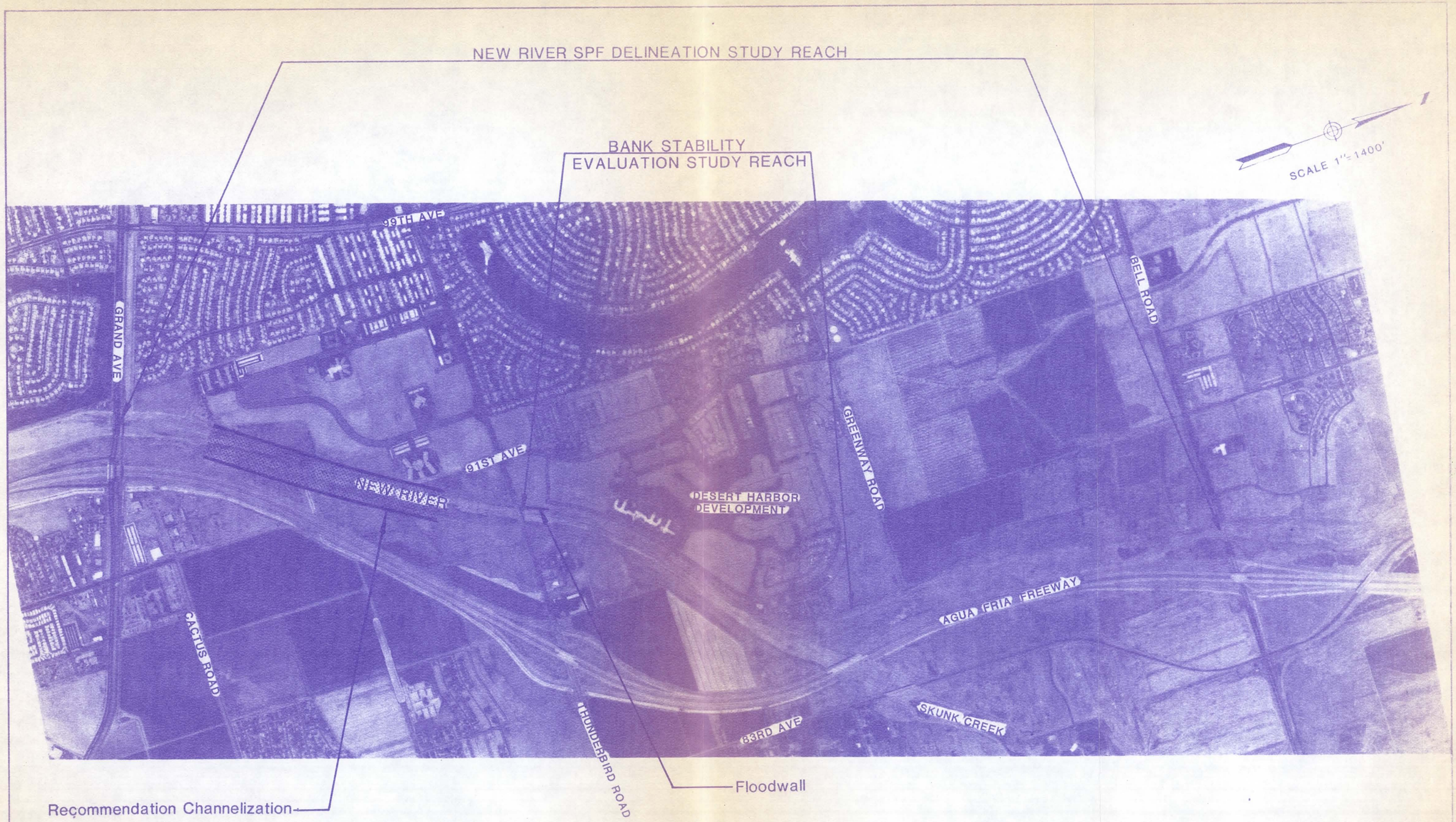
West Bank: 2170 L.F. d/s of Drop: D = 23 + 13 = 46 [1] @ 180 = 390,600
1080 L.F. u/s of Drop: D = 14' + 13' = 27 [2] @ 106 = 114,480
505,080

East Bank: 2600 L.F. 2040 L.F. d/s of Drop: D = 23 + 13 = 46 @ 180 = 367,200
560 L.F. u/s of Drop: D = 14' + 13 = 27 @ 106 = 59,360
426,560

Drop structure: $ 391,000

TOTAL COST = $ 1,322,640 [3]

1 unit price per calcs = $180/LF
2 unit price, prorated: 180 × 27/46 ≈ $106/LF
3 Eng, V C&n, Contingencies not included
maintenance

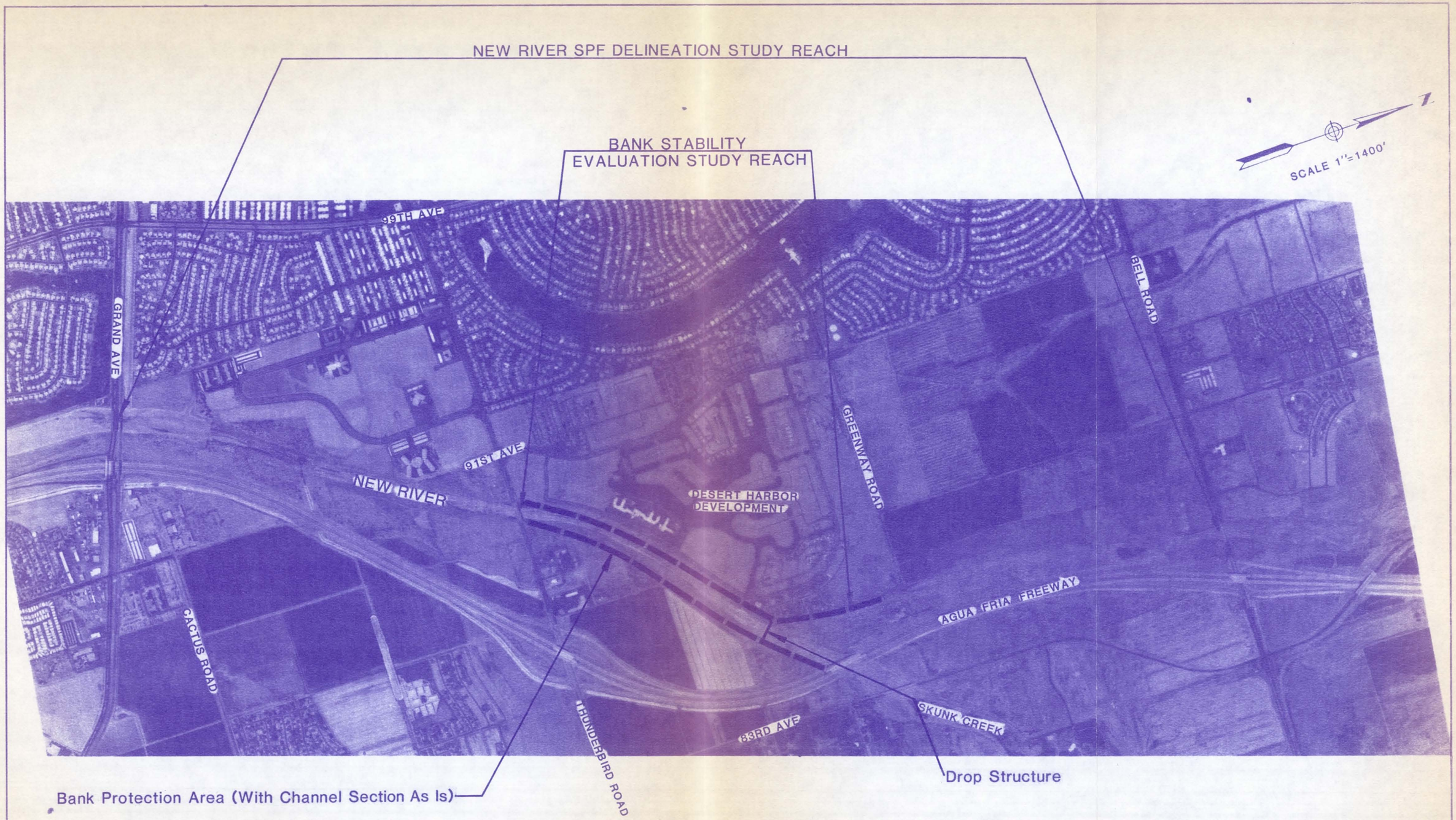


NEW RIVER

CONTRACT FCD 91-25

WOOD, PATEL & ASSOCIATES, INC.

CHANNEL IMPROVEMENTS
TO CONTAIN STANDARD PROJECT FLOOD



NEW RIVER

CONTRACT FCD 91-25

WOOD, PATEL & ASSOCIATES, INC.

DESERT HARBOR AREA
BANK STABILITY ENHANCEMENT
OPTION 1

WOOD / PATEL ASSOCIATES

Civil Engineers
Hydrologists
Land Surveyors

PROJECT New River, SPF
PROJECT NO. 9755 SHEET NO. ____ OF ____
CALCULATED BY tcp DATE 8/91
CHECKED BY ____ DATE ____

OPTION 2 DESERT HARBOR AREA - Bank Stability Enhancement

Criteria: (see plate following page)

① channelization (to reduce velocity) from Thunderbird Road to Drop structure:

Excavation: 601,000 cy @ 2.00 = $1,202,000

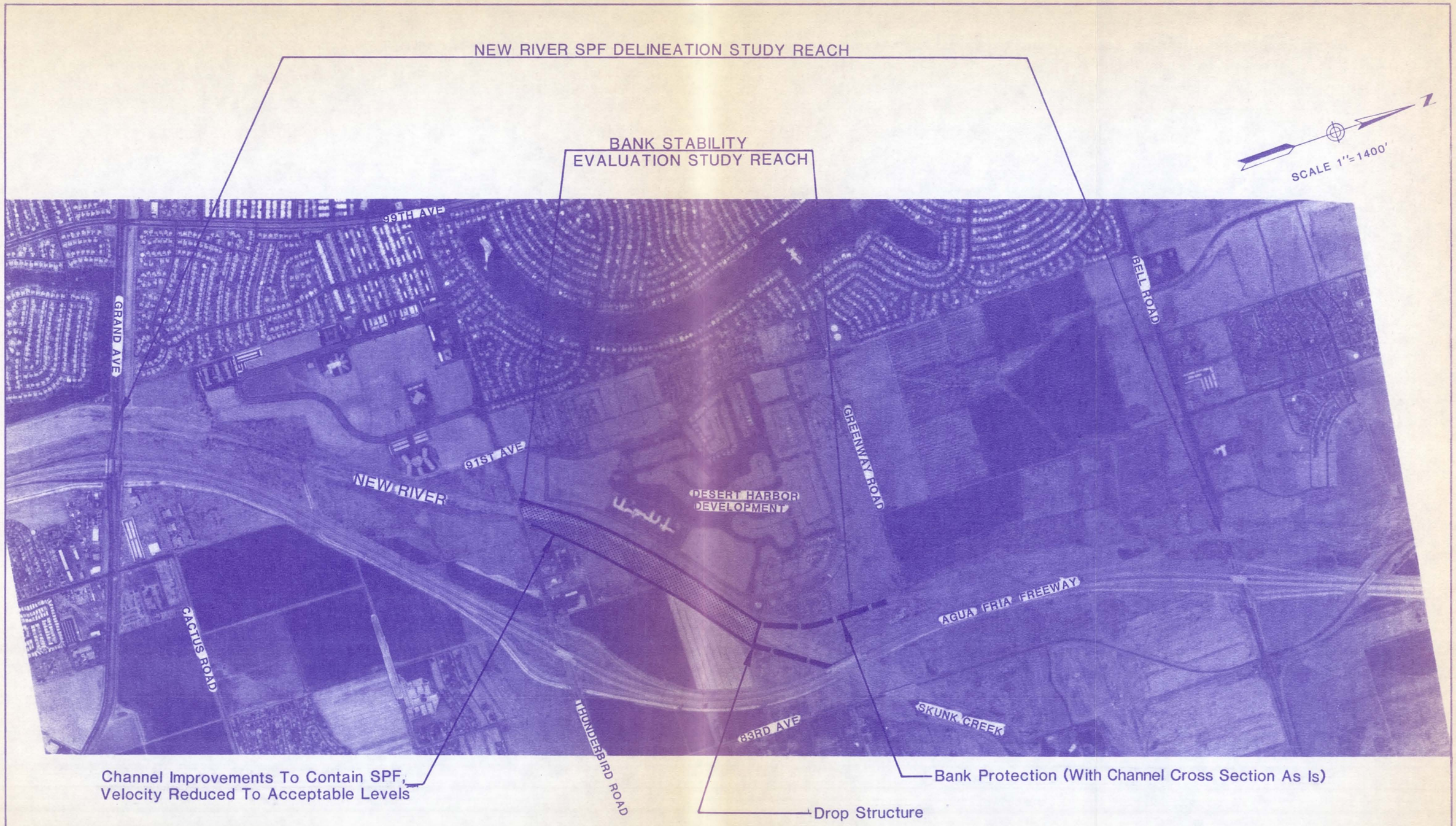
② Drop structure (same as for option 1): $391,000 1]

③ Bank stabilization upstream of Drop structure:

West Bank: 1080 L.F. @ $106/LF = 114,480
East Bank: 560 LF @ $106/LF = 59,360
$173,840

TOTAL = $ 1,766,840 2]

1] slight reduction in cost possible due to reduced drop height
2] Eng, ✓ ct O, maintenance contingencies not included



NEW RIVER

CONTRACT FCD 91-25

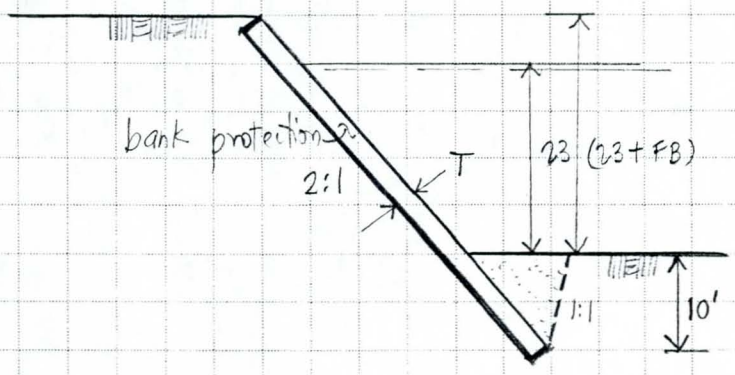
WOOD, PATEL & ASSOCIATES, INC.

DESERT HARBOR AREA
BANK STABILITY ENHANCEMENT
OPTION 2

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
and Surveyors

PROJECT: New River, bank stabilization
PROJECT NO. 91755 SHEET NO. 1 OF
CALCULATED BY: Acp DATE: 8/12/91
CHECKED BY: DATE:

BANK PROTECTION ANALYSIS:



TYPICAL SECTION

OPTION 1. (A) GABION : 2:1 slope FB = 3'

use 1 ft thick on 2:1 slope
volume/L.F = 2.236(26+10) x 1' x 1/27 = 3 c.y. @ 65$/cy* = $195.00

(B) 1½:1 slope, FB = 3'
volume/LF = 1.8(26+10) x 1 x 1/27 = 2.4 cy @ 75$/cy = $180.00

* includes filterfabric, toe down excavation

OPTION 2 SOIL CEMENT, FB = 1'

use 5.658' thick on 1:1 slope
volume/L.F. = 1.414 (23+1+10) x 5.658 x 1/27 = 10.08 cy @ 23$/cy = $231.75

OPTION 3 LOOSE RIPRAP, FB = 3'

Ave. velocity = 13 fps
d_{50} = 15" From HEC-11, 11-32, Curve No. 1
T = 1.5 x 15 = 22.5" say 24"

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

PROJECT New River, Bank Stabilization
PROJECT NO. 91755 SHEET NO. ____ OF ____
CALCULATED BY HCP DATE 9/13/91
CHECKED BY ____ DATE ____

Volume/LF = 2.236(23+3+10) x 2'/27 = 6 cy @ 30 $/cy $ 180

Filter fabric = 2.236(23+3+10) x 1/9 = 9 s.y @ 1.50/sy 13.50

Toe down excavation = $\frac{33 \times 10}{2} \times \frac{1}{27}$ = 6.1 cy @ 2.00/cy 12.20

$ 205.70

OPTION 4 6" thick - Shotcrete FB = 3' (2:1)

Qty / L.F = 2.236(26+10) = 80.5 sq.ft @ 2.50/sq.ft $ 201.25
Toe down (same as option 3) 12.20
$ 213.45

OPTION 5 6" thick - Reinforced Concrete FB=3' (2:1)

Vol./LF = 2.236(26+10) x 1/2 x 1/27 = 1.49 cy @ 125/cy $ 186.33
Toe Down (same as option 3) 12.20
$ 198.53

OPTION 6 18" thick - Grouted Riprap FB = 3' (2:1)

Vol./LF = 2.236(26+10) x 1.5' x 1/27 = 4.47 cy @ 40/cy $ 178.80
Filter fabric (per option 3) 13.50
Toe Down Excavation (per option 3) 12.20
204.50

CONCLUSION:

Recommended option 1 (B) Cost/L.F. ≈ $ 180.00

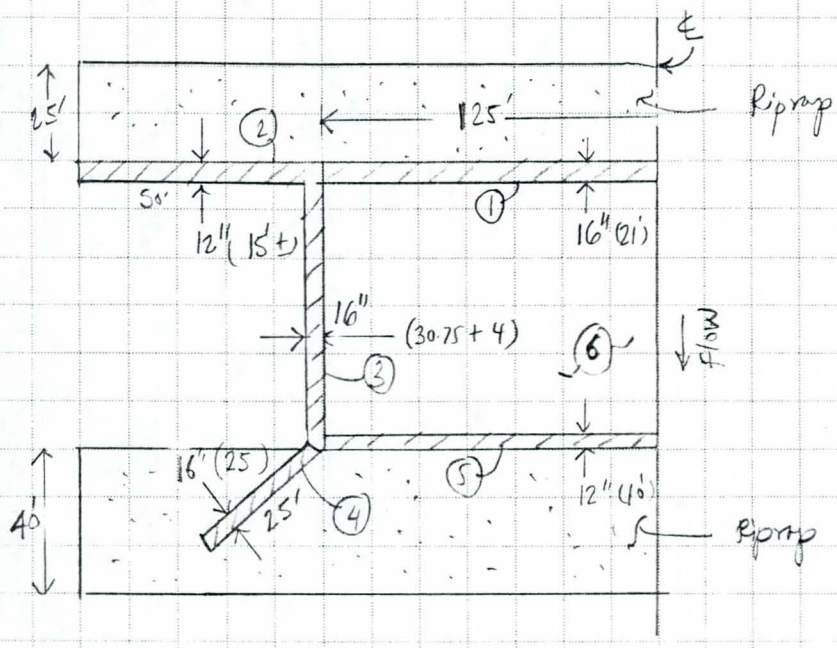
12" - Gabion, on 1½:1 slopes

WOOD / PATEL ASSOCIATES

Civil Engineers
Hydrologists
Land Surveyors

PROJECT: Neri River, Drop
PROJECT NO.: 91755 SHEET NO. ____ OF ____
CALCULATED BY: Acp DATE: 8/14/91
CHECKED BY: ____ DATE: ____

CONCEPTUAL COST- DROP STRUCTURE



SPF

½ structure Quantities:

① $125 \times \frac{16}{12} \times 21 = 3500$

② $50 \times \frac{12}{12} \times 15 = 750$

③ $68 \times \frac{16}{12} \times 34.75 = 3151$

④ $25 \times \frac{16}{12} \times 25 = 833$

⑤ $125 \times \frac{12}{12} \times 10 = 1250$

$\frac{9484}{27}$ c.y. @ \$225 = 79,033 ①

⑥ $125 \times (68-1) \times \frac{16}{12} = 111.67$

$\frac{111.67}{27}$ c.y. @ \$175 = 72,378 ①

Floor blocks 15% of 72,378 = 10,857

\$ 162,268

Full Structure = \$ 324,536

① Quoted by C. S. Construction

WOOD / PATEL ASSOCIATES

Civil Engineers
Hydrologists
Land Surveyors

PROJECT: New River, Drop
PROJECT NO.: 91755 SHEET NO. ____ OF ____
CALCULATED BY: ACP DATE: 8/14/91
CHECKED BY: ____ DATE: ____

Riprap upstream: (25' length)

$$2\left[(53+125)\times 25'\right]\times\frac{24}{12}\times\frac{1}{27} = 660 \text{ c.y.}$$

downstream: (40' length)

$$40/25 \times 660 = 1050 \text{ c.y.}$$

SPF

Total Riprap reqd = 1710 c.y. @ 30 \$/c.y = \$51,300

Earthwork Lump Sum = \$15,000

Total Cost of Drop =

324,536	
51,300	
15,000	
390,836	say \$391,000

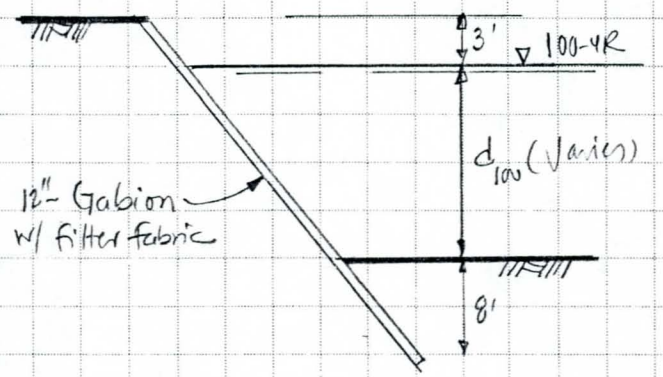
WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

PROJECT: New River, 100-yr / Desert Harbor
PROJECT NO. 91755 SHEET NO. 1 OF 5
CALCULATED BY: AZP DATE: 8/31/91
CHECKED BY: DATE:

DESERT HARBOR AREA - BANK STABILITY ENHANCEMENT

— in Conjunction with 100-year Design Condition:

(Extent of Protection per Option-1)



Bank protection

1. West Bank:

4340', d/s of drop: D = 18 + 11 = 29', @ 145 = 629,300
870', u/s of drop D = 13 + 11 = 24', @ 120 = 104,400
1290', " D = 9 + 11 = 20', @ 100 = 129,000
862,700

2. East Bank:

4080', d/s of drop D = 29' @ 145 = 591,600
1120', u/s of drop D = 24' @ 120 = 134,400
726,000

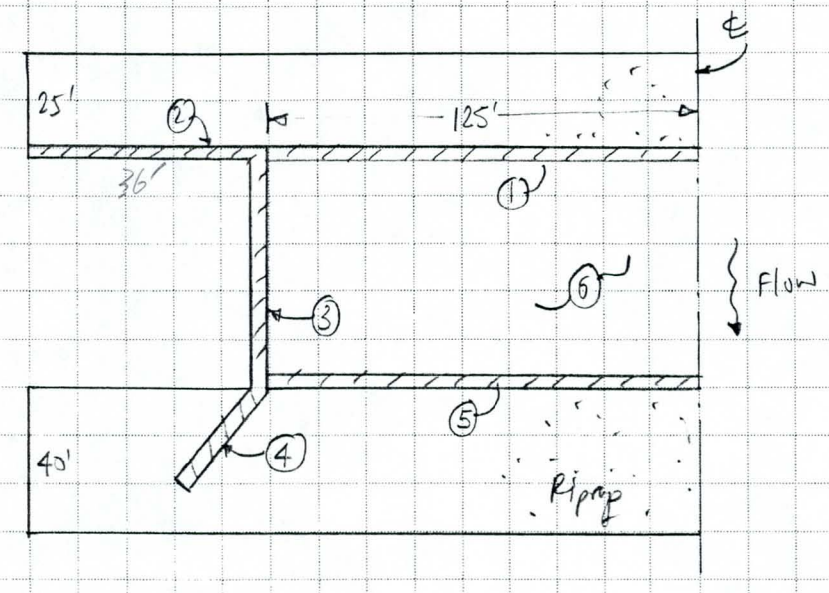
3. Drop structure: $255,000

TOTAL COST = $1,843,700

Unit price, prorated: 180 X 29/36 = 145 $/LF
180 X 24/36 = 120 "
180 X 20/36 = 100 "

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

PROJECT: New River, 100-Yr. Drop
PROJECT NO.: SHEET NO. 2 OF 5
CALCULATED BY: DATE:
CHECKED BY: DATE:



100-yr

1/2 STRUCTURE QUANTITIES

① $125 \times \frac{13}{12} \times 17.5 = 2370$

② $36 \times \frac{11}{12} \times 12 = 396$

③ $50 \times \frac{16}{12} \times 25 = 1667$

④ $25 \times \frac{13}{12} \times 18 = 488$

⑤ $125 \times \frac{10}{12} \times 8.5 = 885$

$\frac{5805}{27}$ @ \$225 ① = 48,383

⑥ $125 \times (50-1) \times \frac{14}{12} = 7146$

$\frac{7146}{27}$ @ \$175 ① = 46,317

Floor blocks 15 % of 46317 = 6,948

101,648

Full structure = \$ 203,296

① Quoted by C.S. Construction

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

PROJECT
PROJECT NO. SHEET NO. 3 OF 5
CALCULATED BY DATE
CHECKED BY DATE

Riprap upstream : 25' length

$2[(40+125)\times 25]\times \frac{20}{12}\times\frac{1}{27} = 510$ cy

100-yr

downstream : 40' length

$40/25 \times 510 = 815$ cy

Total Riprap reqd = 1325 cy @ 30 \$/cy = \$ 39,750

Earthwork, Lump Sum = \$ 12,000

Total Cost of Drop = 203,296
39,750
12,000
\$ 255,046 say \$ 255,000

WOOD / PATEL ASSOCIATES
Civil Engineers
Hydrologists
Land Surveyors

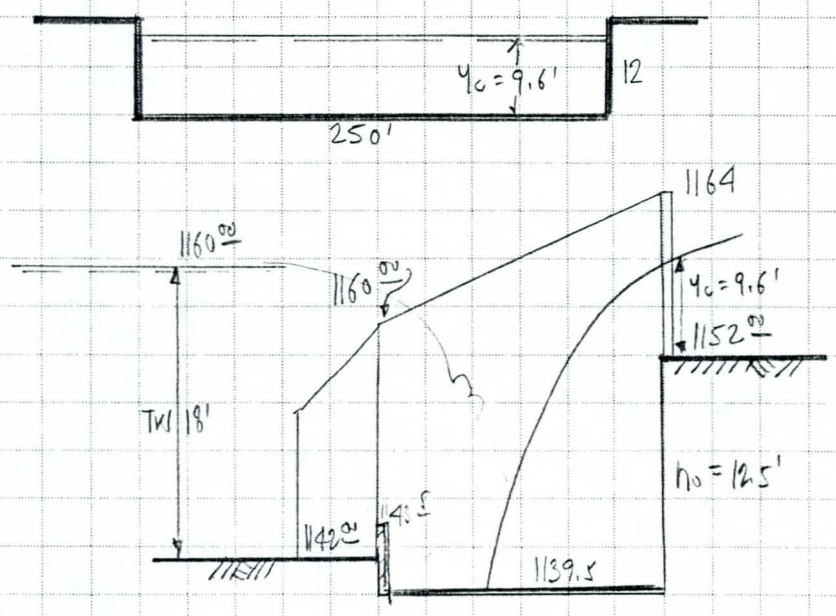
PROJECT: Neal River, 100-yr Drop
PROJECT NO. 91755 SHEET NO. 4 OF 5
CALCULATED BY: AGP DATE: 9/91
CHECKED BY: DATE:

Section 451 near Desert Harbor

Design parameters: $Q_{100} = 41{,}000$ cfs

100-yr

hydraulic design per ref. 10.1.8



drop < 15' ∴ ok

$Y_c = .315 \left(\frac{Q}{B}\right)^{2/3} = 9.6'$

$\frac{h_0}{Y_c} = \frac{12.5}{9.6} = 1.3$

$h_2 = h_0 - 2.15\, Y_c$
$= 12.5 - 2.15 \times 9.6 = -8.14$

$h_2/y_c = -8.14/9.6 = -.848$

For $h_0/y_c = 1.3$, $h_2/y_c = -.848$ from figure IX-A.2, $L/y_c = 2.5$

$\therefore L_1 = 2.5 \times 9.6 = 24'$
$L_2 = 0.8 \times y_c = 7.7'$
$L_3 = 1.75 \times Y_c = 16.8'$
$L_8 = L_1 + L_2 + L_3 = 48.5'$ say 50'

Side wall Height above Tailwater = .85 x y_c = 8.16'

Sill ht. = .4 x y_c = 3.84'
say 4'

Check Tailwater Requirements:

$$1142^{00} + 18\ (T.V.) = 1160^{00}$$

100-yr

Tailwater req'd per hydraulic jump

$$1139.5 + (2.15\,y_c) = 1139.5 + 2.15(9.6)$$
$$= 1160.10$$

Therefore basin bottom elevation is ok.

```
1*****************************************************
 *  WATER SURFACE PROFILES                           *
 *  VERSION OF SEPTEMBER 1988                        *
 *  ERROR: 01,02,03,04                               *
 *  UPDATED:  JUNE 1990                              *
 *  RUN DATE    25AUG91    TIME   14:59:46           *
*****************************************************
```

```
*************************************
 *  U.S. ARMY CORPS OF ENGINEERS     *
 *  THE HYDROLOGIC ENGINEERING CENTER *
 *  609 SECOND STREET, SUITE D       *
 *  DAVIS, CALIFORNIA 95616-4687     *
 *           (916) 756-1104          *
*************************************
```

```
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
```

END OF BANNER

1

25AUG91 14:59:46 PAGE 1

THIS RUN EXECUTED 25AUG91 14:59:46

```
**************************************************
  HEC2 RELEASE DATED SEP 88 UPDATED JUN  1990

  ERROR CORR -  01,02,03,04
  MODIFICATION -
**************************************************
```

```
T1      NEW RIVER - GRAND AVENUE TO BELL ROAD          **9175503.DAT**
T2      EXISTING CONDITIONS      NOTE: N-VALUES reflect new channelization
T3      Standard Project Flood  Analysis based on April 1991 Topo Maps

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

       0       2                        0.0042                                26.5

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     -1                -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150                 105                  38        67

J6  IHLEQ     ICOPY    SUBDIV   STRTDS   RMILE

                1


NC    0.045     0.045     0.035       0.1       0.3
QT        1     69000
          NEW RIVER CHANNELIZATION BY CORPS & ADOT ARE REFLECTED NEAR GRAND
          AVENUE AND AGUA FRIA FREEWAY ON THE NEW TOPOGRAPHIC MAPS BY THE
          DISTRICT. THE MAPS WERE PREPARED BY KAMINSKI -HUBBARD/KENNEY AERIAL
          MAPPING COMPANY DATED APRIL 1991.
          STATIONING ARE IN 100FT STATIONS FROM THE CONFLUENCE WITH AGUA FRIA
```

```
        RIVER. (EXAMPLE 337.0= 33700 FT )
        STARTING WATER SURFACE PER SPF DATA BY COE & VAN LOO DATED DEC 1989
X1    337.0       25    9806.7   10176.4
GR   1131.7   9493.4   1129.2    9508.8   1127.7    9524.0   1127.6    9594.4   1128.5    9624.7
GR   1128.5   9649.0   1129.3    9668.1   1130.6    9726.6   1130.8    9806.7   1113.2    9824.8
GR   1113.3   9900.7   1112.8   10000.0   1113.0   10091.3   1112.4   10152.3   1130.2   10176.4
GR   1130.5  10194.8   1131.6   10211.8   1131.3   10245.7   1127.4   10275.7   1127.2   10300.3
GR   1128.7  10319.6   1129.8   10337.2   1129.0   10357.5   1126.8   10377.8   1127.8   10409.0

NC    0.045    0.045    0.030       0.1       0.3
QT        1    68000
X1    342.0       25    9854.2   10234.6       500       520       510
X3       10
GR   1133.7   9502.7   1130.3    9525.2   1128.9    9546.7   1128.8    9568.7   1129.7    9616.7
GR   1130.2   9646.0   1129.2    9698.2   1130.8    9751.0   1132.0    9854.2   1114.8    9873.1
GR   1115.4  10000.0   1115.3   10034.1   1116.4   10047.3   1115.3   10084.9   1115.9   10125.9
GR   1114.8  10201.5   1119.2   10207.3   1118.9   10219.8   1131.8   10234.6   1131.7   10275.5
GR   1130.2  10279.7   1130.2   10307.0   1133.4   10319.0   1130.3   10359.9   1130.0   10424.3
1
   25AUG91      14:59:46                                                                    PAGE    2


X1    343.7       22    9838.5   10202.7       140       220       180
X3       10
GR   1134.3   9495.7   1133.1    9514.6   1131.3    9538.0   1129.0    9555.2   1128.5    9567.5
GR   1130.0   9591.3   1130.9    9720.4   1132.4    9780.5   1132.8    9838.5   1116.6    9857.6
GR   1115.8   9939.8   1116.2    9952.9   1116.0   10000.0   1116.3   10049.5   1116.7   10118.0
GR   1116.1  10183.8   1133.1   10202.7   1132.8   10230.1   1131.9   10232.7   1131.8   10279.3
GR   1132.3  10346.7   1135.9   10355.6

X1    345.5       26    9812.0   10205.8       180       200       190
X3        0
GR   1137.0   9542.6   1137.3    9559.7   1136.9    9659.0   1137.7    9680.8   1138.6    9687.1
GR   1138.8   9708.3   1135.7    9719.1   1137.1    9812.0   1133.8    9827.6   1134.3    9832.4
GR   1117.6   9857.2   1117.3   10000.0   1117.4   10163.5   1134.5   10189.3   1136.4   10205.8
GR   1137.6  10274.5   1138.1   10329.3   1138.3   10392.2   1137.6   10459.1   1136.7   10545.1
GR   1136.6  10652.0   1136.2   10746.7   1136.1   10840.7   1136.2   10933.7   1136.0   11040.2
GR   1135.4  11114.9

SB       1.1     1.56      2.9                330.      36.5      5279       1.0    1117.5    1117.3
        GRAND AVENUE BRIDGE, DOWN STREAM LIMITS OF STUDY
X1    345.8       4.    9823.9   10186.1       40.       40.       40.
X2                        1.    1134.3    1141.9
X3       10.                                                     1140.5    1140.5
BT       -2.   9823.9   1141.9    1134.3   10186.1   1141.9    1134.3
GR   1134.3   9823.9   1117.4     9840.    1117.4    10170.    1134.3   10186.1

X1    346.1       25    9814.2   10210.4       20        20        20
X3        0
GR   1137.3   9459.0   1138.1    9535.2   1138.5    9618.8   1138.7    9632.2   1138.7    9718.2
GR   1138.9   9768.8   1138.3    9814.2   1134.6    9830.5   1117.8    9855.1   1117.7   10000.0
GR   1117.5  10162.5   1134.2   10188.8   1137.7   10210.4   1138.3   10242.3   1138.1   10329.0
GR   1138.4  10409.8   1138.5   10463.3   1137.5   10618.2   1137.1   10728.9   1137.3   10761.5
GR   1137.9  10798.1   1137.6   10857.6   1137.1   10887.1   1137.3   10978.0   1136.9   11118.0

X1    346.4       21.   9823.   10187.1       40.       40.       40.
BT       -4.   9823.   1141.4    1136.0    9942.    1141.4    1135.8     9947.   1141.4    1134.9
BT            10187.   1141.4    1134.9
GR   1136.    9823.   1117.7     9840.    1117.7     9885.    1135.8    9885.1   1135.8     9886.
GR   1117.7   9886.1   1117.7     9941.    1135.8     9942.    1134.9     9947.   1117.7     9948.
GR   1117.7   10061.   1134.9    10062.    1134.9    10067.    1117.7    10068.   1117.7    10121.
GR   1134.9   10122.   1134.9    10127.    1117.7    10128.    1117.7    10170.    1135.    10187.
GR   1141.   10187.1

ET            9.1                                                                 9827.0    10187.3
```

BRIDGE

BRIDGE

X1	346.8	34	9827.0	10187.3	25	25	25			
X3	0									
GR	1136.7	9443.5	1136.7	9494.7	1137.1	9553.7	1136.8	9633.5	1136.6	9682.2
GR	1136.6	9722.1	1138.2	9744.6	1136.4	9753.1	1135.1	9805.3	1134.3	9816.7
GR	1134.2	9827.0	1118.1	9854.6	1118.2	9898.0	1118.3	10000.0	1118.1	10016.8
GR	1118.1	10082.6	1118.5	10160.8	1131.8	10187.3	1131.9	10214.8	1132.7	10231.4
GR	1131.3	10291.7	1131.7	10337.0	1132.3	10400.5	1132.0	10478.8	1131.8	10535.8
GR	1132.2	10611.2	1132.7	10686.6	1133.4	10745.5	1133.9	10801.8	1134.7	10859.6
GR	1135.4	10938.7	1136.6	10976.5	1137.1	11037.9	1136.6	11169.3		

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RAILROAD BRIDGE

X1	347.1	22.	9823.	10187.1	30.	30.	30.			
BT	-4.	9823.	1141.4	1135.8	9940.	1141.4	1135.8	9947.	1141.4	1134.9
BT		10187.	1141.4	1134.9						
GR	1141.	9823.	1136.	9823.1	1118.3	9840.	1118.3	9882.	1135.8	9882.1
GR	1135.8	9889.	1118.3	9889.1	1118.3	9937.	1135.8	9940.	1134.9	9947.
GR	1118.3	9950.	1118.3	10057.	1134.9	10058.	1134.9	10069.	1118.3	10070.
GR	1118.3	10117.	1134.9	10120.	1134.9	10129.	1118.3	10130.	1118.3	10170.
GR	1135.	10187.	1141.	10187.1						
ET		9.1							9825.5	10194.3
X1	347.4	37	9825.5	10194.3	30	30	30			
X3	0									
GR	1137.3	9438.3	1135.9	9463.5	1133.2	9489.9	1132.3	9547.2	1133.1	9596.8
GR	1132.6	9686.4	1132.5	9757.7	1131.8	9794.0	1131.9	9825.5	1118.3	9855.6
GR	1118.6	9912.5	1119.3	9950.8	1118.9	10000.0	1118.9	10003.6	1118.4	10058.9
GR	1119.1	10071.6	1118.4	10122.3	1119.2	10129.5	1118.2	10164.3	1131.5	10194.3
GR	1131.8	10208.3	1136.7	10237.5	1133.4	10321.5	1131.6	10390.5	1131.7	10436.6
GR	1132.1	10510.7	1132.4	10556.8	1132.6	10614.6	1133.1	10664.1	1134.0	10728.2
GR	1136.1	10807.7	1137.1	10864.9	1137.4	10923.4	1138.4	10955.1	1139.5	11001.3
GR	1139.1	11082.5	1138.3	11124.7						
ET		9.1							9404.3	10652.7
X1	352.0	53	9824.6	10232.3	430	520	460			
GR	1122.6	9327.5	1123.6	9336.7	1133.2	9380.8	1137.6	9404.3	1134.2	9429.7
GR	1133.4	9448.6	1132.6	9457.6	1132.5	9491.6	1132.8	9530.2	1133.3	9568.2
GR	1133.8	9603.6	1133.1	9616.7	1133.4	9665.7	1133.6	9681.2	1132.0	9694.4
GR	1132.0	9752.4	1131.8	9784.7	1132.5	9792.7	1132.8	9812.6	1133.4	9824.6
GR	1121.9	9836.2	1121.9	9858.9	1121.8	9922.0	1122.4	9951.9	1122.5	10000.0
GR	1123.1	10046.5	1122.1	10082.6	1121.3	10116.1	1120.6	10137.4	1121.0	10148.9
GR	1120.1	10165.4	1121.9	10170.9	1121.9	10178.2	1126.7	10186.9	1126.7	10197.8
GR	1132.3	10205.8	1132.6	10220.1	1134.5	10232.3	1135.7	10263.1	1136.7	10318.0
GR	1137.5	10361.1	1138.0	10404.6	1138.4	10472.8	1139.8	10538.6	1140.2	10589.3
GR	1140.7	10652.7	1137.2	10683.8	1131.8	10702.6	1128.0	10725.6	1128.4	10733.0
GR	1140.6	10752.3	1140.0	10760.5	1140.1	10899.4				
ET		9.1							9400.7	10700.0
X1	358.0	57	9828.2	10175.7	610	600	600			
GR	1137.3	9364.0	1137.6	9365.5	1137.5	9378.0	1138.8	9400.7	1135.0	9430.2
GR	1133.8	9446.8	1134.7	9471.1	1135.5	9507.4	1134.6	9530.6	1135.0	9577.3
GR	1134.6	9640.8	1134.0	9708.2	1133.6	9753.1	1134.0	9784.8	1133.8	9828.2
GR	1124.9	9836.8	1124.7	9859.5	1123.7	9875.7	1123.6	9938.8	1124.5	10000.0
GR	1125.4	10032.0	1125.1	10083.7	1126.0	10119.6	1125.3	10165.4	1133.6	10175.7
GR	1133.6	10204.5	1133.1	10269.3	1133.8	10297.5	1133.4	10335.9	1133.9	10357.1
GR	1133.5	10378.0	1133.8	10415.2	1133.4	10447.5	1133.8	10484.1	1136.1	10504.6
GR	1133.8	10532.0	1136.1	10554.4	1137.1	10593.2	1134.9	10609.0	1137.4	10623.2
GR	1137.2	10721.0	1138.4	10733.7	1138.6	10798.9	1139.5	10828.0	1140.4	10955.0
GR	1140.2	11000.6	1141.1	11035.1	1142.8	11121.7	1140.5	11148.0	1140.6	11223.2
GR	1143.7	11240.1	1141.8	11269.0	1142.6	11355.3	1130.4	11385.4	1130.7	11400.7
GR	1140.1	11422.7	1140.8	11500.1						

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ET		9.1							9418.2	10700.0
X1	365.0	69	9817.7	10112.7	690	700	700			
GR	1147.1	9418.2	1147.0	9427.9	1138.3	9467.1	1134.3	9503.9	1137.8	9521.1
GR	1135.9	9541.5	1135.8	9637.5	1135.3	9728.8	1134.7	9750.7	1135.1	9760.0
GR	1134.9	9796.6	1134.2	9817.7	1126.6	9831.7	1125.7	9863.2	1126.0	9878.9
GR	1127.0	9892.6	1132.2	9905.0	1128.0	9917.0	1129.7	9925.5	1128.7	9937.5
GR	1126.2	9956.6	1123.7	9961.6	1123.7	10000.0	1123.4	10031.3	1124.6	10045.1
GR	1127.1	10057.0	1126.0	10062.0	1127.0	10084.7	1135.1	10112.7	1131.8	10130.5
GR	1134.2	10189.4	1134.0	10209.8	1134.8	10232.3	1135.2	10270.7	1135.1	10349.9
GR	1136.6	10358.7	1137.2	10420.6	1137.6	10469.6	1138.6	10520.1	1138.4	10610.8
GR	1137.8	10670.9	1138.4	10676.2	1138.3	10700.0	1137.9	10702.2	1138.0	10734.1
GR	1139.1	10742.3	1137.9	10751.4	1137.9	10782.4	1138.3	10785.8	1138.6	10809.7
GR	1137.0	10822.5	1137.5	10940.0	1137.6	11099.3	1138.1	11232.6	1138.4	11301.0
GR	1139.4	11330.9	1138.8	11358.4	1140.0	11391.3	1140.8	11405.3	1140.9	11437.6
GR	1140.3	11439.3	1140.3	11480.7	1141.0	11491.5	1140.3	11501.0	1140.8	11539.3
GR	1141.2	11543.4	1141.6	11574.5	1140.9	11584.9	1141.6	11642.5		

ET		9.1							9424.4	10780.0
X1	370.0	84	9814.5	10225.7	550	530	535			
GR	1148.6	9424.4	1145.5	9444.9	1138.1	9479.9	1138.1	9503.5	1138.1	9532.0
GR	1138.1	9553.5	1138.1	9566.6	1138.1	9588.6	1140.6	9617.5	1137.9	9647.0
GR	1138.4	9668.2	1137.4	9735.8	1138.1	9754.8	1137.9	9779.3	1137.2	9792.4
GR	1138.0	9814.5	1136.5	9837.0	1132.3	9850.2	1132.7	9862.8	1130.9	9895.5
GR	1130.6	9934.5	1128.1	9970.0	1123.4	9980.0	1123.4	10000.0	1123.5	10011.2
GR	1127.2	10024.1	1127.9	10035.4	1127.8	10059.5	1128.4	10074.6	1127.9	10111.7
GR	1128.9	10125.0	1133.6	10150.9	1135.2	10173.3	1135.4	10210.0	1137.8	10225.7
GR	1138.1	10270.1	1137.6	10295.0	1137.4	10313.1	1136.9	10318.0	1137.6	10331.1
GR	1137.5	10352.5	1134.9	10392.1	1134.2	10397.7	1137.0	10427.2	1137.5	10453.1
GR	1135.8	10469.3	1137.4	10508.1	1139.2	10536.3	1138.4	10540.2	1138.7	10567.9
GR	1138.8	10597.3	1140.7	10611.3	1140.6	10688.3	1141.2	10711.2	1141.4	10766.8
GR	1141.0	10809.5	1141.2	10841.3	1140.9	10890.6	1140.1	10954.1	1140.5	10959.1
GR	1140.5	10981.2	1140.1	10983.0	1140.3	11013.7	1141.3	11024.6	1140.3	11030.5
GR	1140.4	11061.2	1140.8	11064.9	1141.2	11086.5	1140.2	11092.1	1140.2	11178.5
GR	1140.9	11195.8	1140.3	11317.2	1140.4	11363.6	1142.1	11399.0	1142.7	11444.0
GR	1143.5	11460.3	1143.9	11504.8	1144.3	11537.6	1144.3	11636.3	1144.7	11643.8
GR	1144.8	11656.6	1144.2	11658.3	1145.2	11739.8	1144.4	11802.3		

ET		9.1							9399.5	10850.0
X1	373.0	66	9834.2	10155.4	320	330	320			
GR	1148.7	9399.5	1144.9	9420.7	1140.7	9452.2	1140.7	9470.0	1140.7	9497.4
GR	1140.7	9509.1	1139.7	9613.1	1139.0	9681.4	1138.3	9748.3	1138.3	9777.7
GR	1138.0	9811.6	1139.0	9834.2	1134.6	9854.2	1133.0	9882.9	1131.6	9890.4
GR	1131.8	9920.2	1129.6	9950.3	1126.5	9973.2	1124.1	10000.0	1124.1	10007.9
GR	1128.0	10026.2	1129.3	10062.1	1130.8	10110.8	1137.7	10135.2	1139.2	10155.4
GR	1139.2	10195.5	1139.5	10269.1	1138.7	10336.0	1138.9	10391.5	1138.8	10466.4
GR	1137.8	10505.0	1134.9	10529.8	1134.6	10562.7	1139.3	10603.2	1140.3	10628.7
GR	1140.5	10652.2	1142.4	10660.7	1142.2	10724.7	1142.4	10793.0	1142.6	10862.0
GR	1142.3	10933.0	1142.5	10991.4	1141.9	11039.2	1141.3	11041.2	1141.8	11065.1
GR	1142.7	11072.2	1141.5	11076.9	1141.2	11101.3	1141.7	11108.1	1141.9	11121.2
GR	1141.1	11122.5	1141.1	11131.7	1143.5	11152.5	1143.3	11205.5	1143.0	11218.6
GR	1143.8	11231.4	1144.8	11329.9	1145.3	11348.0	1146.2	11386.5	1145.8	11425.7
GR	1145.5	11471.1	1143.8	11477.4	1143.8	11484.2	1141.9	11500.8	1142.2	11545.1
GR	1144.4	11564.5								

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ET		9.1							9323.8	10780.0
X1	377.0	56	9831.5	10197.8	400	390	400			
GR	1148.1	9323.8	1139.5	9371.8	1139.6	9424.7	1140.3	9437.8	1140.6	9507.9
GR	1140.9	9541.5	1140.0	9592.5	1140.3	9616.5	1140.3	9630.8	1140.3	9648.3
GR	1140.3	9662.4	1140.3	9690.9	1140.3	9761.1	1140.9	9799.5	1142.3	9831.5
GR	1137.6	9860.5	1132.6	9888.6	1131.5	9909.6	1129.2	9948.3	1127.4	9984.8

GR	1128.0	10000.0	1128.6	10026.3	1129.4	10048.0	1133.3	10085.0	1137.5	10118.2
GR	1140.6	10166.0	1142.4	10197.8	1142.3	10244.2	1143.1	10258.0	1143.0	10272.4
GR	1138.8	10278.4	1143.3	10290.2	1143.6	10321.3	1143.3	10427.9	1143.1	10490.9
GR	1143.0	10621.9	1143.1	10713.0	1143.6	10770.9	1143.6	10844.7	1143.0	10881.3
GR	1142.3	10883.2	1143.0	10910.7	1144.1	10917.8	1142.8	10923.7	1142.9	10950.1
GR	1142.9	10957.0	1143.0	11001.8	1142.7	11020.9	1143.5	11034.6	1144.1	11057.6
GR	1143.2	11065.6	1144.3	11118.8	1142.9	11134.0	1142.6	11193.4	1144.8	11219.5
GR	1145.3	11239.0								
ET		9.1							9822.6	10604.4
X1	384.0	65	9822.6	10236.5	670	660	660			
GR	1149.8	9169.7	1141.4	9211.0	1140.9	9236.1	1139.6	9250.3	1142.0	9288.4
GR	1144.1	9319.4	1144.5	9365.6	1143.8	9446.0	1143.4	9496.6	1143.9	9511.4
GR	1144.0	9571.7	1143.9	9607.8	1144.6	9626.6	1144.4	9682.8	1144.7	9744.7
GR	1144.4	9807.4	1147.4	9822.6	1144.3	9834.5	1141.8	9859.8	1137.6	9891.4
GR	1132.0	9912.0	1129.4	9925.8	1130.7	9943.0	1130.3	9978.0	1129.9	10000.0
GR	1130.2	10049.2	1129.8	10074.5	1130.4	10085.5	1130.7	10104.5	1135.3	10132.5
GR	1144.9	10175.6	1145.7	10191.7	1147.0	10205.1	1147.7	10236.5	1147.7	10272.7
GR	1147.2	10300.9	1146.0	10340.8	1146.5	10357.2	1146.7	10408.5	1145.7	10440.8
GR	1145.3	10472.9	1144.3	10538.9	1144.6	10580.9	1145.0	10587.3	1145.6	10604.4
GR	1144.9	10606.0	1145.4	10630.6	1146.1	10637.7	1145.1	10643.2	1145.1	10667.0
GR	1145.5	10670.1	1145.4	10686.9	1144.1	10707.0	1144.8	10740.0	1145.4	10789.8
GR	1146.0	10935.7	1146.6	11011.0	1147.5	11160.5	1147.6	11289.9	1148.3	11361.6
GR	1148.4	11453.1	1147.9	11504.0	1148.4	11531.7	1148.5	11560.4	1155.9	11583.3
ET		9.1							9799.0	10674.5
X1	388.0	81	9799.5	10277.2	420	400	410			
GR	1151.8	9031.9	1145.5	9067.7	1145.6	9119.1	1144.5	9122.2	1146.5	9127.9
GR	1145.0	9132.5	1144.8	9172.2	1144.7	9235.8	1142.0	9281.2	1146.1	9312.1
GR	1146.8	9330.0	1146.5	9348.6	1145.9	9395.0	1146.1	9465.1	1145.8	9524.3
GR	1146.5	9549.9	1146.2	9574.3	1145.6	9616.8	1145.7	9663.4	1142.4	9675.0
GR	1140.5	9691.7	1150.1	9715.5	1148.4	9720.4	1148.2	9768.8	1148.0	9793.5
GR	1150.5	9799.5	1146.4	9807.2	1143.6	9833.3	1137.1	9880.8	1129.0	9918.8
GR	1129.8	9940.4	1132.6	9948.0	1130.2	9956.3	1131.2	9978.1	1131.4	10000.0
GR	1131.0	10061.6	1130.3	10065.8	1130.3	10096.2	1131.6	10106.4	1132.1	10114.5
GR	1141.6	10146.5	1147.1	10172.2	1147.6	10197.5	1151.4	10206.2	1152.2	10277.2
GR	1152.2	10277.3	1151.4	10309.3	1149.4	10346.9	1148.1	10392.6	1147.6	10440.5
GR	1146.7	10492.2	1145.3	10589.6	1144.1	10600.9	1145.7	10617.9	1146.7	10650.5
GR	1143.8	10661.2	1146.0	10674.5	1146.0	10695.2	1145.3	10696.6	1145.9	10728.0
GR	1146.8	10736.2	1146.1	10744.6	1146.1	10774.6	1146.6	10785.0	1146.6	10800.0
GR	1146.0	10804.0	1146.7	10869.0	1146.3	10900.6	1146.7	10928.1	1143.1	10950.2
GR	1143.2	10960.0	1145.0	10970.3	1146.7	10998.8	1146.9	11027.1	1147.8	11075.5
GR	1147.0	11120.4	1146.4	11189.1	1145.8	11255.2	1148.7	11270.1	1149.4	11315.1
GR	1149.3	11360.6								

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ET		9.1							9772.5	10700.0
X1	391.5	80	9772.5	10182.7	350	350	350			
GR	1152.5	8934.9	1147.0	8966.0	1146.9	9019.2	1146.4	9037.0	1146.5	9209.6
GR	1148.0	9214.3	1146.4	9217.5	1148.7	9222.4	1146.7	9227.3	1146.5	9273.3
GR	1146.6	9330.0	1146.9	9357.3	1144.0	9367.0	1144.2	9387.7	1143.6	9421.9
GR	1147.6	9441.8	1147.8	9467.9	1147.4	9511.4	1146.6	9531.6	1147.7	9543.9
GR	1150.2	9550.0	1149.9	9606.2	1149.4	9669.5	1149.2	9733.6	1149.1	9763.3
GR	1152.9	9772.5	1147.5	9783.3	1144.2	9818.9	1137.9	9874.3	1131.7	9916.6
GR	1130.1	9959.7	1130.6	9980.0	1131.2	10000.0	1131.7	10018.5	1131.1	10045.2
GR	1131.6	10054.3	1131.0	10089.5	1132.3	10101.0	1139.2	10128.5	1147.2	10158.6
GR	1147.9	10182.7	1145.7	10207.7	1146.7	10231.7	1147.6	10325.1	1147.9	10341.7
GR	1148.6	10393.4	1147.8	10564.7	1147.7	10660.2	1147.5	10683.9	1148.9	10742.6
GR	1148.7	10797.9	1148.9	10824.0	1146.5	10832.2	1146.6	10867.9	1148.1	10877.4
GR	1147.8	10900.2	1147.3	10902.3	1147.9	10935.8	1148.7	10946.1	1147.9	10951.9
GR	1147.9	10984.5	1148.4	10992.5	1149.1	11019.5	1148.5	11060.2	1148.5	11074.2
GR	1148.9	11113.4	1148.1	11150.6	1148.6	11191.2	1148.0	11229.4	1148.8	11270.8
GR	1149.2	11282.7	1149.4	11297.2	1149.1	11315.7	1149.3	11319.3	1149.5	11351.8

GR	1148.9	11353.2	1148.8	11373.7	1149.3	11398.9	1149.7	11400.2	1149.8	11434.7
ET		9.1							9600.0	10728.0
X1	395.0	67	9799.6	10178.3	340	360	350			
GR	1153.7	8887.7	1148.3	8920.2	1147.9	9074.9	1148.0	9181.0	1147.8	9289.8
GR	1147.9	9308.8	1149.8	9311.2	1147.5	9313.9	1150.3	9321.2	1149.2	9366.5
GR	1149.6	9429.8	1148.7	9475.3	1145.9	9483.1	1146.1	9533.4	1150.6	9552.5
GR	1151.1	9581.0	1151.0	9638.7	1151.1	9708.1	1150.4	9735.8	1150.3	9772.7
GR	1148.7	9799.6	1145.8	9827.3	1144.6	9848.7	1134.4	9910.7	1132.8	9953.3
GR	1131.3	9964.9	1131.5	10000.0	1131.7	10006.5	1132.5	10022.5	1132.0	10080.0
GR	1133.3	10085.7	1132.8	10090.5	1136.3	10111.1	1137.1	10126.6	1148.4	10178.3
GR	1148.7	10195.0	1135.5	10212.1	1136.1	10230.2	1149.4	10247.7	1149.6	10288.2
GR	1149.1	10326.7	1148.0	10350.4	1149.5	10403.2	1148.2	10608.4	1151.1	10630.0
GR	1150.0	10643.2	1149.7	10658.2	1148.5	10670.1	1150.6	10718.1	1150.8	10727.8
GR	1149.7	10742.8	1148.8	10808.3	1149.4	10868.2	1149.9	10943.3	1149.7	10999.3
GR	1149.3	11088.9	1149.8	11115.0	1149.3	11136.0	1148.8	11138.0	1149.1	11165.6
GR	1150.3	11176.1	1150.3	11176.3	1149.6	11180.7	1149.8	11208.8	1150.1	11212.7
GR	1150.4	11286.2	1150.1	11345.6						
ET		9.1							9755.0	10479.1
X1	402.0	57	9755.3	10166.7	725	710	720			
GR	1156.1	8564.0	1156.6	8588.7	1155.3	8592.9	1154.6	8602.9	1154.9	8614.7
GR	1156.8	8622.1	1155.0	8695.1	1152.0	8719.7	1151.7	8756.8	1152.1	8763.3
GR	1152.1	8776.0	1150.9	8784.0	1150.3	9057.8	1148.5	9063.5	1152.4	9073.9
GR	1150.3	9082.4	1151.3	9090.1	1150.8	9119.9	1149.3	9128.6	1151.0	9138.7
GR	1151.2	9274.8	1152.1	9363.6	1152.3	9424.7	1152.5	9520.4	1153.1	9550.9
GR	1153.1	9610.9	1153.3	9703.3	1153.9	9722.3	1153.6	9755.3	1143.4	9814.8
GR	1134.8	9871.3	1135.0	9889.8	1133.6	9896.9	1133.8	9938.5	1133.8	10000.0
GR	1132.9	10061.1	1134.2	10066.8	1133.3	10073.9	1133.2	10085.0	1134.5	10092.4
GR	1141.3	10122.0	1150.8	10166.7	1151.6	10209.3	1152.0	10251.6	1151.2	10280.9
GR	1150.6	10284.2	1151.0	10350.0	1151.1	10416.1	1151.9	10479.1	1151.2	10510.3
GR	1151.3	10546.0	1151.5	10581.4	1140.8	10606.4	1140.8	10614.2	1145.8	10626.9
GR	1151.0	10647.8	1150.6	10723.4						

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ET		9.1							9770.0	10234.6
X1	406.0	38	9773.6	10212.3	410	390	400			
GR	1161.1	8418.3	1161.0	8425.0	1158.6	8441.3	1159.4	8452.7	1161.2	8462.3
GR	1158.2	8547.6	1153.2	8586.3	1152.9	8609.8	1152.7	8836.4	1152.9	8975.7
GR	1154.3	8978.5	1151.5	8983.0	1154.0	8987.1	1153.6	8998.2	1153.9	9028.2
GR	1154.1	9132.8	1153.5	9172.2	1154.1	9237.3	1153.5	9340.8	1150.7	9353.2
GR	1153.8	9370.1	1154.8	9483.4	1155.9	9672.5	1155.6	9712.9	1156.2	9743.7
GR	1155.5	9773.6	1142.2	9846.7	1134.4	9896.8	1135.5	9902.3	1135.5	9961.2
GR	1134.3	10000.0	1134.7	10061.2	1136.1	10083.7	1143.2	10116.0	1149.5	10152.3
GR	1151.0	10196.1	1154.3	10212.3	1154.5	10234.6				
ET		9.1							9800.3	10199.2
X1	409.0	70	9834.6	10199.2	380	275	310			
GR	1160.2	8134.3	1159.8	8153.9	1159.7	8178.5	1159.9	8184.4	1161.2	8215.1
GR	1157.7	8250.1	1157.6	8307.5	1156.0	8314.6	1155.7	8425.3	1155.4	8452.9
GR	1155.3	8573.1	1154.7	8668.0	1154.8	8731.2	1156.0	8735.7	1153.3	8739.2
GR	1155.9	8743.6	1154.3	8752.3	1153.3	8854.7	1153.2	8898.2	1154.4	8958.4
GR	1154.3	9052.4	1154.1	9156.8	1153.3	9212.4	1152.9	9316.4	1152.9	9385.8
GR	1152.9	9436.4	1150.6	9453.5	1150.6	9468.5	1151.4	9526.8	1152.5	9561.9
GR	1156.5	9577.0	1156.5	9613.3	1158.8	9684.3	1159.1	9771.4	1160.0	9834.6
GR	1159.9	9839.6	1146.0	9884.0	1133.6	9915.7	1135.7	9933.5	1135.9	10000.0
GR	1135.9	10100.5	1145.1	10139.0	1155.1	10172.4	1157.5	10199.2	1155.8	10219.5
GR	1151.4	10252.2	1152.6	10301.4	1152.5	10344.8	1155.0	10358.9	1155.6	10446.3
GR	1155.9	10509.9	1152.3	10520.4	1151.8	10579.2	1152.7	10622.3	1153.0	10692.5
GR	1152.4	10776.6	1152.3	10848.0	1146.8	10870.5	1151.7	10891.8	1151.2	10934.3
GR	1151.2	11011.0	1151.2	11108.6	1150.9	11211.5	1151.3	11310.1	1151.4	11389.4
GR	1151.2	11433.5	1151.8	11449.1	1152.0	11481.8	1154.2	11549.2	1158.5	11586.2

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ET              9.1                                                          9800.0    10148.0
SB     1.05     1.56      2.9        0     167.33        18    3913.31      2.44    1135.6    1135.2
         THUNDER BIRD ROAD BRIDGE
X1   409.82       35     9852    10148         91        91         91       0.0
X2        0        0        1   1155.4     1163.5         0          0         0       .89         0
BT       -5     9852   1163.7   1155.3       9922    1163.5     1155.6      9997    1163.3    1155.6
BT              10072   1163.1   1155.4      10148    1163.0     1154.6
GR   1161.7     8100   1160.2     8300     1159.0      8500     1157.8      8720    1157.3      8920
GR   1157.2     8930   1156.5     9140     1156.7      9370       1158      9500      1160      9600
GR   1161.5     9852     1138     9890       1136      9900     1135.9      9922    1135.9      9923
GR   1135.9     9927   1135.9     9928     1135.8      9997     1135.7      9998    1135.7     10002
GR   1135.6    10003   1135.8    10072     1135.7     10073     1135.7     10077    1135.6     10078
GR     1136    10095   1160.6    10148       1160     10260       1158     10380      1156     10470
GR     1154    10570     1152    10700     1150.4     10880     1151.7     11380    1151.9     11730

ET              9.1                                                          9807.0    10166.6
X1    410.0       57   9833.4   10166.6         20        20         20
X3        0
GR   1158.5   8597.1   1158.4    8616.2     1158.0      8651.2     1157.2      8711.4    1156.6    8751.2
GR   1156.3   8874.1   1154.1    8884.4     1155.8      8898.6     1155.3      8901.1    1154.9    8942.6
GR   1155.7   8952.3   1156.2    9020.9     1156.4      9073.5     1155.8      9145.6    1155.5    9169.5
GR   1156.0   9187.8   1155.7    9244.8     1155.0      9261.6     1155.9      9281.2    1154.3    9343.2
GR   1153.9   9424.4   1153.7    9508.1     1152.8      9566.5     1152.2      9617.9    1153.6    9656.5
GR   1153.9   9723.0   1154.0    9732.1     1156.1      9768.2     1158.9      9807.3    1159.4    9833.4
GR   1159.3   9843.7   1135.6    9898.5     1136.1     10000.0     1137.1     10092.1    1136.3   10097.6
1
   25AUG91      14:59:46                                                                          PAGE    8

GR   1152.5  10139.6   1156.8   10156.8     1157.5     10166.6     1155.3     10190.9    1154.1   10415.2
GR   1153.7  10512.0   1153.0   10615.8     1152.5     10692.0     1152.0     10740.3    1151.4   10832.6
GR   1151.7  10885.2   1150.1   10902.5     1149.4     10905.5     1149.9     10945.2    1149.6   10982.0
GR   1150.2  10984.7   1150.2   11001.1     1151.8     11002.7     1151.9     11056.2    1151.7   11090.2
GR   1151.8  11280.8   1152.1   11452.3

ET              9.1                                                          9800.3    10230.0
X1    412.0       64   9833.8   10202.8        170       290         210
GR   1160.0   8285.3   1160.3    8343.2     1159.7      8361.3     1160.9      8364.7    1159.7    8368.3
GR   1159.5   8387.7   1157.5    8397.7     1158.3      8403.0     1157.6      8493.1    1156.5    8561.2
GR   1156.2   8594.1   1158.2    8655.8     1158.7      8691.4     1157.8      8731.5    1158.0    8773.5
GR   1157.2   8798.5   1156.6    8827.8     1156.7      8910.4     1157.1      8950.6    1153.9    8961.2
GR   1156.1   8973.8   1155.2    8976.7     1154.9      9018.2     1155.8      9027.0    1156.4    9063.0
GR   1156.5   9150.5   1156.3    9189.1     1155.9      9222.6     1155.6      9244.1    1155.8    9291.8
GR   1155.7   9338.8   1156.1    9357.8     1153.9      9383.5     1154.3      9473.7    1154.0    9565.1
GR   1153.7   9627.1   1152.1    9675.8     1153.9      9693.2     1154.1      9765.8    1157.6    9798.7
GR   1158.1   9821.3   1158.1    9833.8     1151.1      9863.5     1141.5      9896.3    1135.4    9923.2
GR   1135.1   9966.3   1136.9   10000.0     1137.9     10020.9     1137.9     10039.2    1136.0   10050.3
GR   1137.2  10081.2   1143.1   10111.3     1153.3     10159.8     1156.0     10187.6    1157.6   10202.8
GR   1157.3  10280.7   1156.8   10372.5     1156.4     10474.9     1155.9     10597.2    1155.7   10677.3
GR   1154.9  10731.5   1155.4   10769.0     1154.7     10842.0     1155.1     10891.5

ET              9.1                                                          9770.5    10250.0
X1    418.0       60   9769.9   10204.3        500       560         520
GR   1159.8   8429.5   1159.8    8455.6     1159.4      8494.3     1161.3      8498.2    1159.6    8503.7
GR   1159.3   8522.3   1158.3    8531.1     1156.8      8685.3     1156.3      8736.1    1157.3    8775.3
GR   1158.1   8794.0   1158.3    8871.3     1157.8      8924.9     1157.6      8984.2    1156.8    8988.4
GR   1157.4   8993.2   1156.8    9063.6     1156.3      9111.3     1156.5      9158.8    1156.3    9208.2
GR   1157.3   9216.2   1157.3    9275.7     1156.7      9311.7     1157.6      9379.1    1157.4    9413.3
GR   1155.5   9423.3   1155.6    9436.6     1157.5      9447.5     1158.4      9545.9    1158.2    9595.6
GR   1156.3   9602.4   1156.5    9716.5     1156.7      9751.5     1160.3      9769.9    1159.9    9800.1
GR   1158.2   9815.5   1148.5    9866.0     1141.0      9914.6     1135.8      9940.1    1135.9    9961.4
GR   1137.3   9971.4   1137.9   10000.0     1139.3     10027.4     1136.8     10031.8    1136.8   10064.5
GR   1143.6  10103.8   1151.0   10144.8     1156.7     10185.3     1160.9     10204.3    1160.1   10217.3
GR   1160.7  10242.9   1161.1   10244.9     1161.1     10258.0     1160.3     10260.0    1159.9   10286.0
GR   1160.3  10296.3   1160.3   10356.1     1160.3     10427.1     1160.4     10499.0    1160.7   10533.5
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ET		9.1							9790.3	10200.0
X1	423.0	64	9790.9	10195.1	500	550	520			
GR	1159.4	8489.3	1159.4	8523.7	1159.2	8577.4	1161.4	8589.8	1159.0	8610.3
GR	1160.4	8621.1	1160.5	8634.8	1161.8	8642.1	1161.8	8655.2	1159.2	8662.0
GR	1158.5	8759.0	1158.1	8801.7	1158.5	8827.1	1158.3	8887.4	1158.7	8917.4
GR	1158.9	8934.2	1158.3	8937.9	1158.2	8965.9	1157.6	9000.5	1156.7	9035.6
GR	1157.6	9072.8	1158.7	9083.6	1158.7	9144.3	1159.0	9161.7	1158.9	9183.0
GR	1157.3	9205.8	1157.8	9213.9	1158.2	9245.0	1157.8	9253.8	1157.9	9320.3
GR	1157.9	9446.3	1158.3	9564.7	1158.2	9631.6	1158.5	9711.1	1159.1	9747.8
GR	1161.4	9766.9	1161.6	9790.9	1156.4	9822.2	1148.6	9867.4	1144.4	9892.5
GR	1141.1	9924.3	1136.6	9938.8	1136.7	9968.1	1138.3	9976.2	1138.2	10000.0
GR	1138.7	10005.7	1139.8	10011.5	1139.3	10033.5	1137.1	10042.9	1137.6	10061.6
GR	1148.5	10116.0	1154.7	10155.3	1162.4	10195.1	1162.4	10208.9	1161.7	10210.5
GR	1162.3	10235.2	1162.6	10237.4	1162.8	10250.4	1162.0	10252.6	1161.8	10278.6
GR	1161.7	10308.2	1162.0	10333.1	1163.3	10369.6	1164.1	10472.5		

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ET		9.1							9744.8	10250.0
X1	428.0	60	9744.7	10204.4	490	520	500			
GR	1163.6	8411.8	1164.6	8425.6	1161.5	8474.4	1161.3	8506.7	1160.7	8509.9
GR	1160.5	8680.1	1160.5	8842.3	1160.5	8992.0	1161.4	8996.8	1161.2	9018.7
GR	1161.4	9024.0	1157.9	9042.2	1159.3	9050.8	1158.8	9056.9	1158.7	9101.6
GR	1158.8	9180.6	1158.6	9237.0	1158.3	9245.0	1158.9	9260.6	1159.4	9332.3
GR	1159.7	9456.6	1160.2	9601.7	1160.8	9646.8	1160.6	9668.5	1162.1	9676.2
GR	1159.6	9681.5	1160.4	9691.7	1161.6	9744.7	1161.2	9784.7	1158.3	9800.9
GR	1151.9	9819.5	1151.2	9833.2	1149.5	9841.5	1149.8	9864.6	1142.4	9905.9
GR	1137.6	9936.5	1138.2	9977.0	1140.0	9987.9	1140.0	10000.0	1140.5	10027.3
GR	1138.5	10033.5	1139.2	10063.9	1142.4	10081.3	1153.7	10140.9	1163.3	10192.5
GR	1163.0	10204.4	1162.2	10206.3	1163.0	10231.8	1163.3	10234.2	1163.5	10245.9
GR	1162.7	10248.0	1162.7	10274.4	1163.1	10279.7	1160.0	10293.5	1161.7	10305.7
GR	1162.6	10363.8	1163.0	10365.4	1164.1	10430.7	1163.5	10649.4	1163.4	10716.4
ET		9.1							9761.8	10201.9
X1	434.0	59	9761.8	10201.9	590	620	600			
GR	1163.7	8368.0	1163.2	8386.4	1162.8	8426.3	1162.8	8662.4	1162.9	8851.5
GR	1163.0	9034.3	1163.0	9211.4	1164.6	9218.3	1162.7	9221.5	1164.0	9225.5
GR	1163.9	9236.3	1162.3	9243.8	1162.1	9403.4	1161.9	9564.7	1163.1	9579.3
GR	1163.2	9592.5	1161.0	9598.5	1163.3	9605.3	1161.7	9616.6	1162.1	9637.7
GR	1162.7	9667.1	1163.1	9695.0	1162.1	9729.1	1162.9	9737.4	1163.0	9761.8
GR	1159.3	9769.9	1157.0	9784.4	1152.6	9796.8	1152.4	9815.6	1151.6	9830.4
GR	1152.6	9855.3	1143.3	9911.7	1141.6	9929.4	1138.1	9941.6	1138.2	9969.5
GR	1139.9	9973.1	1140.6	10000.0	1141.0	10023.9	1140.5	10041.2	1139.5	10044.2
GR	1139.5	10069.5	1141.3	10078.6	1148.4	10118.3	1158.6	10177.8	1164.1	10201.9
GR	1163.8	10214.4	1163.4	10216.3	1163.9	10251.6	1164.3	10252.7	1164.4	10256.3
GR	1163.8	10258.6	1163.6	10284.4	1163.9	10289.1	1163.3	10292.1	1163.5	10308.6
GR	1163.4	10347.2	1164.0	10367.5	1163.2	10449.8	1162.8	10599.0		
ET		9.1							9783.5	10215.2
X1	440.0	46	9783.5	10215.2	610	610	610			
GR	1167.4	8348.4	1167.0	8354.1	1165.4	8359.3	1164.7	8423.7	1164.9	8625.9
GR	1165.0	8764.6	1166.4	8770.8	1164.6	8773.6	1166.6	8778.5	1166.8	8788.9
GR	1165.2	8796.8	1164.8	8907.5	1165.6	9288.3	1164.7	9427.8	1164.7	9561.8
GR	1165.2	9670.6	1164.8	9680.5	1165.2	9693.4	1163.2	9697.3	1165.7	9702.0
GR	1165.6	9714.6	1166.6	9720.3	1167.3	9783.5	1167.2	9822.3	1153.4	9881.8
GR	1143.2	9932.2	1143.3	10000.0	1141.9	10042.3	1139.5	10053.3	1139.6	10079.0
GR	1142.3	10088.0	1142.5	10097.4	1150.1	10130.9	1162.2	10197.7	1166.4	10215.2
GR	1166.1	10229.7	1165.4	10231.1	1166.0	10256.5	1166.4	10258.2	1166.3	10271.2
GR	1165.6	10272.7	1165.6	10298.5	1165.9	10301.3	1166.3	10331.7	1166.6	10479.4
GR	1165.7	10543.1								
ET		9.1							9809.5	10208.3
X1	445.5	56	9809.5	10208.3	560	560	560			
GR	1169.4	8475.7	1168.6	8498.0	1166.9	8508.6	1167.1	8558.8	1167.9	8565.4

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GR   1168.5    8573.4    1166.3    8576.1    1168.5    8581.8    1167.0    8591.8    1167.6    8731.7
GR   1167.6    9132.3    1167.2    9517.7    1166.7    9659.6    1167.4    9670.8    1164.2    9676.0
GR   1167.3    9682.4    1166.9    9689.2    1167.8    9700.6    1168.2    9774.6    1168.4    9809.5
GR   1162.7    9840.3    1151.7    9896.5    1149.0    9904.3    1144.1    9929.2    1142.3    9945.6
GR   1140.5    9955.1    1141.8    9972.4    1141.2   10000.0    1141.0   10004.0    1142.0   10013.4
GR   1141.3   10042.8    1142.8   10049.0    1145.6   10070.8    1146.1   10088.3    1145.5   10097.1
GR   1147.9   10108.7    1147.9   10114.2    1149.4   10119.2    1162.8   10181.1    1168.2   10208.3
1
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GR   1167.5   10229.5    1166.3   10240.7    1166.8   10266.9    1167.2   10269.9    1166.9   10282.5
GR   1166.3   10283.6    1166.2   10309.5    1166.4   10312.5    1166.3   10326.5    1168.2   10338.3
GR   1167.1   10372.7    1164.2   10409.2    1163.5   10443.7    1163.3   10491.5    1160.1   10504.5
GR   1160.1   10591.0

ET              9.1                                                                    9818.2   10218.3
X1    449.1      59    9818.2   10218.3     370      370      370
GR   1171.5    8663.0    1171.3    8663.3    1169.2    8680.0    1168.8    8718.2    1169.8    8726.4
GR   1169.9    8735.3    1167.8    8738.8    1170.0    8744.4    1168.4    8747.5    1168.8    9112.7
GR   1168.1    9503.3    1167.8    9634.7    1167.2    9641.7    1167.5    9653.1    1165.3    9657.6
GR   1168.3    9665.4    1167.4    9674.0    1168.3    9682.5    1168.5    9720.0    1168.9    9763.0
GR   1169.1    9818.2    1163.1    9836.0    1157.0    9878.6    1150.5    9903.5    1150.4    9927.2
GR   1147.0    9946.7    1150.8    9959.3    1151.0   10000.0    1150.9   10021.0    1149.2   10035.7
GR   1149.2   10048.9    1145.3   10068.3    1152.1   10093.5    1152.5   10126.8    1153.5   10132.1
GR   1151.7   10136.7    1159.4   10177.1    1169.4   10218.3    1168.9   10233.1    1167.8   10254.7
GR   1167.1   10275.5    1167.2   10306.6    1167.8   10314.3    1166.8   10350.5    1166.6   10388.9
GR   1168.3   10397.6    1167.5   10414.7    1167.3   10431.4    1166.5   10433.0    1165.8   10478.3
GR   1165.4   10508.4    1165.8   10510.5    1166.5   10551.4    1166.6   10615.4    1165.9   10638.3
GR   1166.2   10674.7    1166.6   10684.3    1166.1   10764.6    1165.6   10882.0

ET              9.1                                                                    9818.3   10209.2
X1    451.0      66    9818.3   10209.2     190      160      180
GR   1173.3    8803.7    1173.1    8803.8    1171.1    8818.8    1170.1    8847.1    1170.1    8872.1
GR   1170.6    8877.3    1170.6    8893.8    1168.3    8897.5    1170.0    8902.6    1169.3    8905.9
GR   1169.1    9314.9    1168.7    9505.9    1168.6    9525.2    1166.6    9530.3    1170.2    9538.8
GR   1168.6    9542.1    1168.6    9587.4    1168.2    9611.3    1170.1    9634.9    1170.6    9654.4
GR   1167.6    9678.5    1164.3    9706.3    1163.6    9733.2    1163.8    9762.5    1166.0    9781.3
GR   1166.1    9793.2    1167.5    9798.7    1167.5    9818.3    1154.1    9846.2    1152.1    9867.7
GR   1152.1    9935.7    1150.2   10000.0    1149.5   10006.0    1150.3   10014.2    1150.0   10032.5
GR   1150.8   10044.2    1150.4   10069.8    1152.3   10082.3    1152.7   10126.9    1155.2   10142.5
GR   1162.6   10178.4    1169.7   10209.2    1169.3   10239.8    1168.2   10244.1    1168.3   10262.5
GR   1168.4   10337.7    1167.8   10350.4    1167.7   10389.8    1168.5   10413.0    1168.8   10486.4
GR   1168.4   10518.6    1167.2   10523.3    1167.2   10531.3    1166.5   10532.7    1166.2   10564.0
GR   1165.4   10611.2    1166.6   10626.5    1166.3   10685.6    1166.5   10701.7    1165.7   10739.5
GR   1165.3   10743.8    1165.7   10780.6    1166.4   10794.9    1165.4   10857.6    1165.0   10866.2
GR   1165.3   10905.3

ET              9.1                                                                    9306.5   10231.7
X1    457.0      28    9306.5   10231.7     800      400      580
GR   1181.3    9224.2    1180.7    9260.4    1176.6    9280.6    1172.0    9306.5    1171.2    9334.7
GR   1170.7    9399.0    1169.4    9468.8    1167.9    9544.0    1167.8    9572.0    1159.1    9590.5
GR   1154.2    9610.5    1154.0    9713.4    1153.0   10000.0    1153.2   10009.5    1152.1   10016.7
GR   1152.1   10031.3    1154.3   10038.5    1154.0   10047.5    1154.8   10059.4    1154.2   10093.0
GR   1156.5   10103.0    1156.2   10146.9    1154.7   10152.0    1156.4   10163.9    1161.2   10186.1
GR   1172.0   10231.7    1171.5   10313.3    1170.2   10405.5

QT      1     38000
ET              9.1                                                                    9708.7   10219.5
        UP STREAM OF SKUNK CREEK CONFLUENCE
1
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        STATIONING IN RIVER MILES FROM AGUA FRIA RIVER CONFLUENCE
X1    8.655      46    9708.7   10219.5     510      410      410
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GR	1169.6	9708.7	1158.3	9736.8	1163.0	9767.0	1160.5	9772.8	1162.8	9801.7
GR	1158.0	9810.5	1157.9	9830.2	1156.5	9834.0	1157.3	9851.9	1156.6	9857.1
GR	1157.4	9882.3	1157.7	9951.1	1158.1	9956.9	1158.0	10000.0	1157.9	10000.0
GR	1157.2	10105.3	1158.4	10113.9	1156.9	10117.6	1157.1	10143.1	1157.8	10149.9
GR	1171.2	10204.8	1173.2	10219.5	1172.8	10296.7	1170.3	10435.3	1169.7	10476.4
GR	1168.4	10480.5	1168.9	10490.7	1168.8	10524.5	1169.4	10530.0	1170.3	10577.5
GR	1169.5	10636.7	1168.4	10641.3	1168.4	10649.0	1167.7	10650.2	1167.4	10677.2
GR	1167.8	10679.5	1167.9	10691.6	1167.1	10693.1	1166.8	10719.3	1167.1	10725.7
GR	1168.3	10729.7	1168.7	10737.8	1168.7	10818.0	1167.9	10824.0	1168.2	10866.6
GR	1167.5	10952.2								
X1	8.731	43	9702.5	10191.4	400	400	400			
GR	1173.3	9472.9	1173.1	9520.7	1174.0	9538.7	1174.7	9548.8	1188.1	9577.9
GR	1188.8	9586.5	1195.8	9610.8	1196.8	9655.7	1199.6	9687.8	1199.3	9702.5
GR	1194.3	9729.6	1172.7	9770.8	1171.8	9794.0	1169.5	9814.4	1161.6	9833.6
GR	1159.1	9842.6	1159.1	9907.1	1159.8	9950.5	1159.3	10000.0	1158.9	10035.8
GR	1158.9	10069.4	1159.4	10076.6	1158.0	10082.0	1159.0	10090.0	1158.9	10103.9
GR	1163.1	10124.5	1173.5	10175.3	1175.2	10191.4	1175.2	10207.0	1173.9	10209.5
GR	1174.4	10255.0	1174.0	10298.9	1174.1	10339.6	1173.0	10459.2	1173.2	10473.0
GR	1172.0	10541.0	1171.8	10593.0	1169.7	10606.7	1169.4	10651.6	1169.8	10658.1
GR	1169.5	10669.4	1170.8	10682.0	1170.4	10764.7				
X1	8.807	42	9746.6	10189.3	470	470	470			
GR	1182.9	9463.8	1183.2	9471.7	1175.6	9506.6	1174.3	9517.5	1173.8	9547.2
GR	1176.7	9559.0	1176.4	9578.5	1177.9	9598.9	1177.7	9632.8	1178.6	9650.4
GR	1177.9	9672.7	1175.0	9691.5	1174.1	9746.6	1165.7	9764.9	1165.1	9776.3
GR	1164.4	9820.4	1162.8	9856.7	1162.8	9883.0	1163.5	9930.7	1163.5	9951.1
GR	1159.5	9958.7	1159.7	10000.0	1159.3	10033.8	1160.2	10054.8	1159.5	10060.3
GR	1160.4	10081.6	1164.3	10101.0	1176.8	10150.3	1177.2	10189.3	1180.9	10212.4
GR	1180.7	10237.9	1182.4	10243.4	1182.1	10274.8	1183.1	10301.4	1184.2	10378.0
GR	1183.9	10401.7	1183.8	10436.8	1184.6	10476.0	1181.9	10483.1	1181.1	10498.2
GR	1182.4	10506.3	1182.4	10522.8						
X1	8.883	27	9865.6	10202.8	450	450	450			
GR	1182.4	9537.3	1182.4	9545.1	1177.6	9570.8	1176.5	9616.2	1177.1	9689.1
GR	1177.2	9756.5	1177.3	9811.3	1177.6	9865.6	1169.7	9891.2	1164.1	9919.8
GR	1162.1	9941.0	1162.5	10000.0	1162.7	10066.4	1163.8	10075.7	1163.3	10086.5
GR	1175.4	10125.8	1178.2	10149.4	1181.0	10173.3	1182.1	10202.8	1181.3	10228.4
GR	1179.2	10249.8	1179.1	10274.9	1178.8	10347.1	1178.7	10477.5	1178.6	10523.5
GR	1177.8	10638.9	1177.4	10690.0						
ET		9.1							9752.9	10196.9
X1	8.978	33	9752.9	10196.9	500	500	500			
GR	1185.3	9616.4	1185.0	9623.9	1177.8	9665.3	1178.7	9671.1	1179.8	9693.0
GR	1180.1	9752.9	1173.7	9782.9	1164.9	9824.8	1163.9	9836.9	1164.3	9905.1
GR	1164.4	9947.3	1164.8	10000.0	1164.5	10124.2	1163.9	10163.6	1169.3	10178.0
GR	1177.7	10196.9	1176.8	10209.4	1178.2	10216.3	1178.4	10244.4	1177.4	10286.5
GR	1177.9	10346.6	1177.1	10378.2	1177.1	10422.6	1178.7	10452.1	1177.4	10486.3
GR	1177.5	10529.5	1179.0	10555.0	1177.4	10558.5	1179.1	10561.3	1179.0	10574.1
GR	1178.3	10578.2	1179.0	10585.7	1179.3	10675.8				

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ET		9.1							9686.4	10235.4
X1	9.072	44	9686.4	10235.4	525	520	520			
GR	1188.0	9604.4	1182.8	9638.4	1181.1	9662.2	1182.2	9686.4	1181.9	9703.1
GR	1175.4	9732.5	1167.0	9768.7	1165.8	9781.6	1165.9	9806.9	1166.3	9811.1
GR	1165.4	9854.0	1166.1	9878.3	1165.5	9886.1	1166.0	9912.3	1165.7	9922.6
GR	1166.5	9927.7	1166.8	9971.3	1166.7	10000.0	1166.8	10017.1	1167.2	10069.3
GR	1167.2	10113.9	1167.8	10135.8	1168.7	10141.1	1168.5	10166.5	1167.8	10187.5
GR	1168.0	10207.9	1171.5	10220.6	1182.7	10235.4	1187.3	10253.1	1180.6	10264.0
GR	1180.3	10292.1	1180.1	10345.2	1180.9	10379.1	1180.0	10405.2	1179.5	10442.8
GR	1180.6	10471.2	1179.6	10489.6	1179.6	10532.9	1181.1	10560.2	1179.3	10562.5
GR	1181.6	10566.3	1182.5	10580.6	1181.7	10583.2	1182.0	10600.1		

ET		9.1							9844.4	10218.8
X1	9.167	26	9844.4	10218.8	525	520	520			
GR	1185.3	9706.9	1185.2	9761.2	1184.5	9789.7	1184.4	9826.8	1183.6	9844.4
GR	1175.7	9883.2	1174.0	9903.3	1171.9	9955.3	1170.3	9981.6	1168.8	9988.2
GR	1168.9	10000.0	1168.3	10028.1	1170.8	10044.7	1171.6	10057.6	1173.3	10112.5
GR	1174.2	10136.3	1179.4	10169.0	1181.2	10218.8	1181.6	10295.1	1181.2	10361.9
GR	1181.8	10416.2	1181.2	10457.4	1182.4	10497.4	1182.7	10536.8	1181.4	10539.6
GR	1184.2	10546.6								
ET		9.1							9739.1	10228.7
X1	9.262	31	9739.1	10228.7	470	530	500			
GR	1192.1	9683.4	1190.7	9694.9	1189.1	9710.4	1186.5	9723.8	1185.9	9739.1
GR	1173.0	9765.0	1171.7	9815.2	1171.0	9866.7	1171.0	9904.9	1171.0	9952.4
GR	1171.0	10000.0	1170.8	10022.8	1172.0	10042.3	1173.4	10071.6	1173.4	10094.9
GR	1174.1	10103.7	1174.1	10155.2	1174.8	10166.3	1175.5	10185.0	1176.6	10194.6
GR	1176.9	10212.9	1183.8	10228.7	1183.5	10331.3	1183.7	10388.2	1183.8	10459.0
GR	1183.8	10549.5	1184.2	10635.5	1184.4	10702.5	1184.9	10708.4	1184.1	10710.8
GR	1187.1	10719.6								
X1	9.356	32	9782.9	10287.8	490	490	490			
GR	1194.3	9729.0	1192.1	9750.4	1189.5	9765.6	1189.2	9782.9	1173.7	9814.3
GR	1174.2	9831.1	1173.3	9855.8	1174.3	9920.6	1174.6	9972.5	1174.0	10000.0
GR	1173.5	10024.0	1174.4	10033.0	1174.5	10057.3	1174.9	10120.0	1175.6	10131.9
GR	1176.2	10196.8	1176.7	10229.0	1179.8	10257.6	1180.4	10280.3	1185.4	10287.8
GR	1186.0	10294.0	1186.4	10384.1	1186.2	10425.5	1185.8	10499.3	1185.6	10579.8
GR	1185.8	10643.0	1186.1	10721.6	1186.1	10746.8	1188.1	10752.3	1186.2	10754.8
GR	1188.8	10760.0	1189.4	10776.0						
X1	9.451	37	9848.5	10244.3	500	510	500			
GR	1196.7	9792.8	1193.3	9822.7	1192.0	9827.7	1191.6	9848.5	1178.5	9874.8
GR	1178.7	9882.6	1176.5	9885.2	1178.1	9899.0	1178.6	9966.0	1178.3	10000.0
GR	1178.3	10004.7	1179.0	10008.0	1179.1	10039.2	1179.6	10073.0	1179.2	10110.8
GR	1179.7	10127.9	1180.2	10171.7	1180.0	10184.6	1179.7	10197.5	1180.7	10204.2
GR	1181.0	10226.3	1190.2	10244.3	1190.4	10298.1	1190.4	10361.9	1190.4	10432.7
GR	1190.6	10439.6	1190.2	10444.6	1190.2	10455.8	1191.1	10464.2	1190.2	10469.8
GR	1190.3	10483.6	1190.8	10489.5	1190.3	10496.7	1190.2	10507.3	1190.6	10518.6
GR	1190.4	10523.1	1190.3	10545.1						

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X1	9.546	21	9838.2	10245.3	500	500	500			
GR	1202.6	9796.3	1201.8	9804.7	1195.2	9838.2	1194.4	9845.9	1180.0	9873.6
GR	1179.1	9932.3	1179.9	9943.8	1177.9	9954.2	1178.0	10000.0	1178.0	10120.8
GR	1178.5	10135.4	1181.1	10169.5	1181.7	10185.2	1181.8	10225.4	1193.8	10245.3
GR	1194.3	10315.5	1193.7	10343.8	1193.7	10386.3	1194.6	10419.8	1193.6	10488.5
GR	1193.3	10552.9								
X1	9.641	24	9789.3	10146.5	510	490	500			
GR	1207.3	9661.8	1200.0	9705.2	1197.8	9722.6	1196.3	9774.6	1196.3	9782.6
GR	1195.6	9789.3	1178.4	9823.2	1180.0	9838.7	1181.3	9870.0	1182.2	9920.2
GR	1182.3	9960.1	1181.3	9963.1	1181.2	10000.0	1181.4	10012.2	1183.5	10028.2
GR	1184.5	10047.0	1184.6	10089.7	1186.9	10114.2	1186.5	10134.6	1195.4	10146.5
GR	1195.5	10236.0	1195.4	10301.2	1195.5	10408.8	1195.3	10545.7		
X1	9.735	38	9907.7	10126.7	510	490	500			
GR	1201.0	9634.2	1199.7	9645.2	1198.5	9689.3	1198.0	9750.3	1197.2	9796.8
GR	1197.1	9849.5	1196.8	9885.4	1197.7	9893.9	1197.0	9907.7	1184.2	9933.9
GR	1183.5	9940.2	1185.8	9954.1	1186.1	10000.0	1185.6	10023.4	1186.2	10044.6
GR	1185.1	10062.9	1183.5	10068.0	1184.1	10071.7	1184.0	10087.6	1192.2	10105.5
GR	1200.3	10126.7	1200.6	10136.0	1199.3	10140.9	1199.9	10152.6	1200.8	10176.9
GR	1199.6	10179.0	1200.1	10228.6	1199.6	10293.8	1199.9	10356.0	1200.7	10386.4
GR	1200.2	10431.6	1198.8	10439.0	1198.6	10449.2	1199.4	10456.2	1199.7	10508.4
GR	1200.0	10540.9	1200.8	10550.8	1200.6	10601.5				

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ET              9.1                                                                  9900.0    10115.3
X1    9.783      27     9833.7    10115.3       27    0   220       250
GR   1197.5    9687.0   1198.6     9753.7   1198.9     9775.0    1200.2    9785.8   1200.5    9797.9
GR   1199.6    9810.5   1202.1     9824.1   1202.3     9833.7    1199.4    9847.7   1196.4    9872.2
GR   1196.0    9896.9   1195.2     9905.8   1190.6     9922.3    1187.7    9934.9   1189.3    9945.4
GR   1189.3    9952.7   1187.6     9958.5   1189.8     9975.2    1186.1   10000.0   1186.2   10006.8
GR   1188.0   10035.8   1188.1    10066.0   1187.6    10091.3    1200.2   10115.3   1200.7   10127.1
GR   1199.8   10146.0   1200.1    10195.4

ET              9.1                                                                  9900.0    10114.3
        UP-STREAM STUDY LIMITS
X1    9.786      23     9787.8    10114.3       20        20        20
GR   1202.6    9701.3   1202.2     9769.9   1201.2     9787.8    1199.2    9816.7   1195.2    9837.3
GR   1197.1    9867.7   1196.7     9894.1   1193.5     9898.2    1196.5    9905.5   1189.6    9919.5
GR   1189.5    9935.8   1190.4     9954.3   1190.0     9969.8    1189.3   10000.0   1189.3   10039.7
GR   1189.8   10072.6   1189.2    10080.0   1189.0    10090.5    1201.2   10114.3   1201.3   10121.2
GR   1199.7   10127.5   1200.3    10166.3   1200.5    10225.3

ET              9.1                                                                  9833.8    10123.1
X1    9.832      38     9833.8    10123.1      220       245       225
X3        0
GR   1204.1    9548.0   1203.7     9562.8   1203.7     9604.5    1202.9    9633.1   1201.5    9666.8
GR   1200.9    9696.0   1203.1     9735.0   1203.6     9760.7    1203.4    9825.2   1203.1    9833.8
GR   1193.4    9869.1   1192.6     9897.9   1194.5     9907.3    1192.4    9938.1   1192.8    9971.8
GR   1189.7    9979.2   1189.3    10000.0   1189.2    10005.7    1192.2   10024.3   1190.6   10057.3
GR   1191.4   10080.6   1194.6    10102.0   1203.3    10123.1    1201.4   10145.3   1202.0   10159.4
GR   1202.0   10197.5   1202.4    10254.8   1202.1    10293.0    1201.8   10360.7   1201.6   10407.8
GR   1201.1   10465.5   1201.1    10567.1   1201.8    10614.4    1202.5   10621.9   1203.0   10645.8
GR   1202.5   10685.1   1201.7    10693.6   1201.3    10723.5
1
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missing

are not needed.

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ET              9.1                                                                  9825.0    10118.0
SB      0.9     1.56       2.6                213        20      2500      1.88   1188.61    1188.6
        BELL ROAD BRIDGE, AREA UPSTREAM OF BELL ROAD NOT EVALUATED
X1    9.850      12     9825.0    10110.0      100       100       100
X2                          1     1200.9     1207.5
X3       10
BT       -4    9800.0   1205.0     1200.9     9825.    0 1207.5    1200.9   10110.0   1207.5    1200.9
BT            10635.0   1204.0     1200.9
GR   1205.0    9800.0   1204.0     9825.0   1196.0     9845.0    1194.0    9860.0   1192.0    9890.0
GR   1192.0    9980.0   1190.0    10015.0   1190.0    10025.0    1190.0   10035.0   1194.0   10060.0
GR   1205.8   10130.0   1204.0    10635.0

ET              9.1                                                                  9547.6    10568.3
X1    9.902      48     9847.1    10174.9      255       270       260
GR   1206.5    9462.5   1206.4     9480.2   1205.2     9494.3    1204.6    9514.5   1203.9    9547.6
GR   1197.3    9559.0   1197.4     9609.6   1198.4     9625.7    1199.3    9645.7   1199.3    9676.8
GR   1197.7    9698.2   1196.0     9739.0   1195.9     9783.0    1195.8    9815.6   1199.9    9825.4
GR   1198.5    9843.2   1200.2     9847.1   1194.6     9864.9    1191.9    9881.5   1192.8    9901.7
GR   1193.5    9943.4   1195.0     9975.3   1195.2     9994.7    1193.7   10000.0   1193.1   10010.7
GR   1194.1   10055.4   1191.8    10067.1   1191.3    10076.1    1194.3   10087.4   1194.8   10104.1
GR   1195.9   10114.0   1196.5    10140.2   1197.9    10162.4    1203.8   10174.9   1204.0   10188.9
GR   1202.9   10192.3   1203.3    10204.1   1203.7    10310.7    1203.4   10400.9   1203.2   10469.8
GR   1203.4   10568.3   1203.4    10628.1   1204.1    10633.9    1203.7   10638.1   1204.3   10661.9
GR   1204.2   10691.5   1203.2    10697.8   1202.9    10793.9

QT        1     68000
ET              9.1                                                                  9306.5    10231.7
X1     -457.0     28     9306.5    10231.7      800       400       550
GR   1181.3    9224.2   1180.7     9260.4   1176.6     9280.6    1172.0    9306.5   1171.2    9334.7
GR   1170.7    9399.0   1169.4     9468.8   1167.9     9544.0    1167.8    9572.0   1159.1    9590.5
GR   1154.2    9610.5   1154.0     9713.4   1153.0    10000.0    1153.2   10009.5   1152.1   10016.7
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GR   1152.1    10031.3     1154.3    10038.5      1154.0     10047.5      1154.8     10059.4      1154.2     10093.0
GR   1156.5    10103.0     1156.2    10146.9      1154.7     10152.0      1156.4     10163.9      1161.2     10186.1
GR   1172.0    10231.7     1171.5    10313.3      1170.2     10405.5

NC    0.032     0.032       0.032       0.1          0.3
QT        1     55000
         SKUNK CREEK STATION ABOVE NEW RIVER CONFLUENCE
X1    14.50        11      9837.1    10180.6        330        420        340
GR   1174.8    9837.1      1160.2     9865.0      1160.2     9872.9      1154.7     9880.7      1153.9     9892.1
GR   1154.4    9932.7      1154.1    10000.0      1154.0    10071.3      1154.2    10141.6      1169.1    10180.6
GR   1169.2   10196.6

SB     1.05        1.         2.8        .0        269         15       7148          2      1155.5     1155.1
         AGUA FRIA FREEWAY BRIDGE
X1    19.00         8       9859     10180.        440        440        440
X2        0         0          1    1179.5     1188.0          0          0       1.33          0          0
GR   1174.0      9859      1170.0      9871      1160.0      9883      1155.7      9893      1155.7      10000
GR   1155.7     10142      1160.0     10146      1174.0     10180
1
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X1    20.90        21      9898.6    10233.9        200        200        200
GR   1173.4    9539.4      1173.2     9561.6      1173.8     9668.8      1173.5     9778.1      1172.7     9833.4
GR   1173.5    9852.5      1173.3     9870.6      1173.9     9898.6      1168.3     9902.7      1167.9     9916.9
GR   1156.3    9930.8      1157.0     9951.3      1156.8     9972.6      1155.4    10000.0      1156.6    10042.9
GR   1155.8   10077.5      1155.8    10150.3      1156.1    10187.7      1155.2    10212.3      1172.9    10233.9
GR   1173.9   10247.4

NC    0.032     0.032       0.032        .1           .3
         DROP STRUCTURE BUILT IN CONJUCTION WITH 83rd AVENUE BRIDGE
         SPF PROFILE MATCH WITH PROFILE BY COE & VAN LOO (DEC 1989)
X1    24.89        15      9898.8    10231.0        380        380        380
GR   1175.9    9869.7      1173.6     9888.9      1173.4     9898.8      1155.9     9917.7      1157.3     9945.1
GR   1157.3   10000.0      1155.8    10051.6      1156.3    10093.8      1157.3    10141.3      1157.5    10205.1
GR   1155.4   10211.3      1173.4    10231.0      1175.9    10282.5      1177.0    10353.9      1177.0    10450.1

X1    24.90         8      9906.8    10236.2          6          6          6
GR   1172.4    9906.8      1162.2     9919.8      1162.0    10000.0      1162.3    10079.3      1162.2    10188.1
GR   1161.9   10222.7      1174.4    10236.2      1176.7    10335.6


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   25AUG91      14:59:46                                                                                PAGE   16

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


*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO 337.000
         NEW RIVER CHANNELIZATION BY CORPS & ADOT ARE REFLECTED NEAR GRAND
         AVENUE AND AGUA FRIA FREEWAY ON THE NEW TOPOGRAPHIC MAPS BY THE
         DISTRICT. THE MAPS WERE PREPARED BY KAMINSKI -HUBBARD/KENNEY AERIAL
         MAPPING COMPANY DATED APRIL 1991.
         STATIONING ARE IN 100FT STATIONS FROM THE CONFLUENCE WITH AGUA FRIA
         RIVER. (EXAMPLE 337.0= 33700 FT )
         STARTING WATER SURFACE PER SPF DATA BY COE & VAN LOO DATED DEC 1989
   337.000     14.08   1126.48       .00     26.50   1129.91      3.43       .00       .00   1130.80
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   69000.0        .0   69000.0        .0        .0    4642.5        .0        .0        .0   1130.20
       .00       .00     14.86       .00      .000      .035      .000      .000   1112.40   9811.14
   .004206        0.        0.        0.         0         0         8       .00    360.22  10171.36


CCHV=     .100 CEHV=     .300
*SECNO 342.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1132.00 ELREA=      1131.80

   342.000     13.62   1128.42       .00       .00   1131.77      3.36      1.86       .01   1132.00
   68000.0        .0   68000.0        .0        .0    4624.9        .0      54.3       4.3   1131.80
       .01       .00     14.70       .00      .000      .030      .000      .000   1114.80   9858.14
   .003180      500.      510.      520.         2         0         0       .00    372.58  10230.72


*SECNO 343.700

3301 HV CHANGED MORE THAN HVINS


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1132.80 ELREA=      1133.10

   343.700     12.73   1128.53       .00       .00   1132.66      4.12       .65       .23   1132.80
   68000.0        .0   68000.0        .0        .0    4172.2        .0      72.4       5.8   1133.10
       .01       .00     16.30       .00      .000      .030      .000      .000   1115.80   9843.52
   .004178      140.      180.      220.         2         0         0       .00    354.11  10197.63


*SECNO 345.500
1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK        EG        HV        HL     OLOSS   L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN   SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID  ENDST


3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   345.500     11.37   1128.67   1128.67       .00   1134.09      5.42       .96       .39   1137.10
   68000.0        .0   68000.0        .0        .0    3640.2        .0      89.5       7.3   1136.40
       .02       .00     18.68       .00      .000      .030      .000      .000   1117.30   9840.76
   .006181      180.      190.      200.         3        11         0       .00    339.75  10180.51


SPECIAL BRIDGE

5227 DOWNSTREAM ELEV IS     1125.77 , NOT     1128.67 HYDRAULIC JUMP OCCURS DOWNSTREAM (IF LOW FLOW CONTROLS)

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     1.10      1.56      2.90       .00    330.00     36.50   5279.00      1.00   1117.50   1117.30

*SECNO 345.800

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.84
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CLASS B LOW FLOW

3420 BRIDGE W.S.= 1129.10 BRIDGE VELOCITY= 19.05 CALCULATED CHANNEL AREA= 3539.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
1132.69	1135.55	.00	0.	68000.	5279.	5213.	1134.30	1141.90	0.

free board of 1.20'

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1140.50 ELREA= 1140.50

GRAND AVENUE BRIDGE, DOWN STREAM LIMITS OF STUDY

345.800	15.70	1133.10	.00	.00	1135.55	2.45	1.46	.00	1134.30
68000.0	.0	68000.0	.0	.0	5414.3	.0	93.6	7.6	1134.30
.02	.00	12.56	.00	.000	.030	.000	.000	1117.40	9825.05
.001818	40.	40.	40.	0	0	0	.00	359.90	10184.95

1

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

*SECNO 346.100

346.100	15.36	1132.86	.00	.00	1135.71	2.85	.04	.12	1138.30
68000.0	.0	68000.0	.0	.0	5020.4	.0	96.0	7.8	1137.70
.02	.00	13.54	.00	.000	.030	.000	.000	1117.50	9833.05
.002250	20.	20.	20.	2	0	0	.00	353.64	10186.69

*SECNO 346.400

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 4 MIN ELTRD= 1141.40 MAX ELLC= 1136.00

346.400	15.20	1132.90	.00	.00	1135.84	2.94	.11	.03	1136.00
68000.0	.0	68000.0	.0	.0	4943.2	.0	100.6	5.1	1141.00
.02	.00	13.76	.00	.000	.030	.000	.000	1117.70	9825.88
.003363	40.	40.	40.	2	0	0	.00	342.39	10184.94

*SECNO 346.800

3470 ENCROACHMENT STATIONS= 9827.0 10187.3 TYPE= 1 TARGET= 360.300

346.800	14.84	1132.94	.00	.00	1135.93	2.98	.07	.01	1134.20
68000.0	.0	68000.0	.0	.0	4905.2	.0	103.4	8.3	100000.00
.02	.00	13.86	.00	.000	.030	.000	.000	1118.10	9829.16
.002464	25.	25.	25.	2	0	0	.00	358.14	10187.30

*SECNO 347.100

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3370 NORMAL BRIDGE, NRD= 4 MIN ELTRD= 1141.40 MAX ELLC= 1135.80

347.100	14.06	1132.36	.00	.00	1136.32	3.96	.10	.29	1141.00
68000.0	.0	68000.0	.0	.0	4259.2	.0	106.6	8.5	1141.00
.02	.00	15.97	.00	.000	.030	.000	.000	1118.30	9826.57
.004984	30.	30.	30.	3	0	0	.00	321.84	10184.32

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

*SECNO 347.400

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.54

3470 ENCROACHMENT STATIONS= 9825.5 10194.3 TYPE= 1 TARGET= 368.800

347.400	15.70	1133.90	.00	.00	1136.54	2.65	.09	.13	1131.90
68000.0	.0	68000.0	.0	.0	5207.0	.0	109.8	8.8	100000.00
.02	.00	13.06	.00	.000	.030	.000	.000	1118.20	9825.50
.002112	30.	30.	30.	3	0	0	.00	368.80	10194.30

*SECNO 352.000

3470 ENCROACHMENT STATIONS= 9404.3 10652.7 TYPE= 1 TARGET= 1248.400

352.000	14.83	1134.93	.00	.00	1137.72	2.79	1.13	.04	1133.40
68000.0	2584.6	65413.8	1.6	842.1	4791.9	2.5	166.8	14.9	1134.50
.03	3.07	13.65	.65	.045	.030	.045	.000	1120.10	9424.19
.002919	430.	460.	520.	3	0	0	.00	819.32	10243.52

*SECNO 358.000

3265 DIVIDED FLOW

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9400.7 10700.0 TYPE= 1 TARGET= 1299.300

358.000	13.03	1136.63	1136.63	.00	1139.75	3.12	1.92	.10	1133.80
68000.0	3017.2	60677.5	4305.3	889.9	4057.0	1091.2	247.4	28.8	1133.60
.04	3.39	14.96	3.95	.045	.030	.045	.000	1123.60	9417.57
.003532	610.	600.	600.	2	15	0	.00	1179.47	10618.81

*SECNO 365.000

3470 ENCROACHMENT STATIONS= 9418.2 10700.0 TYPE= 1 TARGET= 1281.800

365.000	15.99	1139.39	1139.00	.00	1142.06	2.67	2.27	.04	1134.20
68000.0	5785.4	54260.2	7954.4	1315.9	3738.5	1743.0	350.3	48.1	1135.10
.06	4.40	14.51	4.56	.045	.030	.045	.000	1123.40	9462.20
.002988	690.	700.	700.	6	11	0	.00	1237.80	10700.00

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

*SECNO 370.000

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     9424.4   10780.0  TYPE=      1  TARGET=     1355.600
   370.000     18.20   1141.60       .00       .00   1143.61      2.02      1.49       .07   1138.00
   68000.0    4458.3   56138.0    7403.7    1168.2    4527.2    1717.2     437.8      63.9   1137.80
       .07      3.82     12.40      4.31      .045      .030      .045      .000   1123.40   9463.37
   .002585      550.      535.      530.         3         0         0       .00   1316.63  10780.00


*SECNO 373.000

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9399.5   10850.0  TYPE=      1  TARGET=     1450.500
   373.000     18.01   1142.11   1142.11       .00   1145.03      2.91       .99       .27   1139.00
   68000.0    4262.1   54626.5    9111.4    1034.8    3617.4    1795.9     489.1      73.3   1139.20
       .08      4.12     15.10      5.07      .045      .030      .045      .000   1124.10   9441.61
   .003720      320.      320.      330.         3         5         0       .00   1217.80  10659.41


*SECNO 377.000
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9323.8   10780.0  TYPE=      1  TARGET=     1456.200
   377.000     17.04   1144.44   1144.44       .00   1147.13      2.69      1.45       .02   1142.30
   68000.0    9627.0   56346.5    2026.6    1932.9    3937.0     796.4     549.0      85.4   1142.40
       .09      4.98     14.31      2.54      .045      .030      .045      .000   1127.40   9344.23
   .003540      400.      400.      390.         7        12         0       .00   1435.77  10780.00


*SECNO 384.000

3265 DIVIDED FLOW
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     9822.6   10604.4  TYPE=      1  TARGET=      781.801
   384.000     16.66   1146.06   1144.45       .00   1150.04      3.98      2.52       .39   1147.40
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   68000.0        .0   67518.4     481.6        .0    4202.7     194.4     633.0     100.4   1147.70
       .10       .00     16.07      2.48      .000      .030      .045      .000   1129.40   9827.69
   .004135      670.      660.      660.         4        11         0       .00    548.35  10604.40


*SECNO 388.000

3265 DIVIDED FLOW


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.40


3470 ENCROACHMENT STATIONS=     9799.0   10674.5  TYPE=      1  TARGET=      875.500
   388.000     20.02   1149.02       .00       .00   1151.38      2.36      1.17       .16   1150.50
   68000.0        .0   65677.9    2322.1        .0    5241.5     765.5     681.9     106.3   1152.20
       .11       .00     12.53      3.03      .000      .030      .045      .000   1129.00   9802.29
   .002098      420.      410.      400.         3         0         0       .00    712.43  10674.50


*SECNO 391.500
3280 CROSS SECTION    391.50 EXTENDED       .13 FEET


3470 ENCROACHMENT STATIONS=     9772.5   10700.0  TYPE=      1  TARGET=      927.500
   391.500     19.83   1149.93       .00       .00   1152.09      2.16       .70       .02   1152.90
   68000.0        .0   65111.3    2888.7        .0    5404.0    1147.5     732.3     112.9   1147.90
       .11       .00     12.05      2.52      .000      .030      .045      .000   1130.10   9778.43
   .001887      350.      350.      350.         2         0         0       .00    921.56  10700.00


*SECNO 395.000
1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3265 DIVIDED FLOW

3280 CROSS SECTION    395.00 EXTENDED       .49 FEET


3470 ENCROACHMENT STATIONS=     9600.0   10728.0  TYPE=      1  TARGET=     1128.000
   395.000     19.29   1150.59       .00       .00   1152.76      2.17       .67       .00   1148.70
   68000.0      49.8   62744.0    5206.2      38.7    5118.3    1279.5     784.8     120.6   1148.40
       .12      1.29     12.26      4.07      .045      .030      .045      .000   1131.30   9728.37
   .001921      340.      350.      360.         2         0         0       .00    979.49  10717.82


*SECNO 402.000

3265 DIVIDED FLOW

3280 CROSS SECTION    402.00 EXTENDED      1.27 FEET


3470 ENCROACHMENT STATIONS=     9755.0   10479.1  TYPE=      1  TARGET=      724.100
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```
   402.000     18.97   1151.87      .00      .00   1154.12     2.26     1.33      .03   1153.60
   68000.0       .0   67774.3    225.7       .0    5613.0    190.4    885.8    134.4   1150.80
       .14      .00     12.07     1.19     .000      .030     .045     .000  1132.90   9765.42
   .001784     725.      720.     710.        2         0        0      .00   691.75  10476.36


*SECNO 406.000

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     9770.0   10234.6  TYPE=      1  TARGET=      464.600
   406.000     17.96   1152.26      .00      .00   1155.23     2.97      .89      .22   1155.50
   68000.0       .0   68000.0       .0       .0    4913.0       .0    935.0    139.4   1154.30
       .15      .00     13.84      .00     .000      .030     .000     .000  1134.30   9791.41
   .002884     410.      400.     390.        2         0        0      .00   410.87  10202.28


*SECNO 409.000

3301 HV CHANGED MORE THAN HVINS

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


3470 ENCROACHMENT STATIONS=     9800.3   10199.2  TYPE=      1  TARGET=      398.900
   409.000     18.68   1152.28      .00      .00   1156.65     4.37     1.00      .42   1160.00
   68000.0       .0   68000.0       .0       .0    4054.9       .0    966.9    141.9 100000.00
       .15      .00     16.77      .00     .000      .030     .000     .000  1133.60   9863.93
   .003633     380.      310.     275.        3         0        0      .00   299.06  10162.99


SPECIAL BRIDGE

5227 DOWNSTREAM ELEV IS    1148.21 , NOT    1152.28 HYDRAULIC JUMP OCCURS DOWNSTREAM (IF LOW FLOW CONTROLS)

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     1.05      1.56      2.90       .00    167.33     18.00   3913.31     2.44   1135.60   1135.20

*SECNO 409.820
3280 CROSS SECTION    409.82 EXTENDED      4.96 FEET


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.49

CLASS B LOW FLOW

3420 BRIDGE W.S.=    1152.28 BRIDGE VELOCITY=      21.14     CALCULATED CHANNEL AREA=      3170.

 EGPRS     EGLWC     H3        QWEIR     QLOW      BAREA     TRAPEZOID      ELLC      ELTRD     WEIRLN
                                                             AREA
   1159.60   1159.66      .00        0.   68000.     3913.     3913.     1155.40   1163.50        0.
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3470 ENCROACHMENT STATIONS=     9800.0   10148.0  TYPE=      1  TARGET=      348.000
        THUNDER BIRD ROAD BRIDGE
   409.820     21.26   1156.86       .00       .00   1159.66      2.80      3.01       .00   1161.50
   68000.0        .0   68000.0        .0        .0    5061.5        .0     976.4     142.5 100000.00
       .15       .00     13.43       .00      .000      .030      .000      .000   1135.60   9859.51
   .001629       91.       91.       91.         0         0         0       .00    280.43  10139.93


*SECNO 410.000
1
   25AUG91      14:59:46                                                                          PAGE   24


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


3280 CROSS SECTION    410.00 EXTENDED      5.04 FEET


3470 ENCROACHMENT STATIONS=     9807.0   10166.6  TYPE=      1  TARGET=      359.600
   410.000     21.54   1157.14       .00       .00   1159.71      2.58       .03       .02   1159.40
   68000.0        .0   68000.0        .0        .0    5280.4        .0     978.8     142.6 100000.00
       .16       .00     12.88       .00      .000      .030      .000      .000   1135.60   9848.69
   .001615       20.       20.       20.         2         0         0       .00    312.87  10161.57


*SECNO 412.000

3265 DIVIDED FLOW

3280 CROSS SECTION    412.00 EXTENDED      2.54 FEET


3470 ENCROACHMENT STATIONS=     9800.3   10230.0  TYPE=      1  TARGET=      429.700
   412.000     22.54   1157.64       .00       .00   1160.09      2.45       .36       .01   1158.10
   68000.0        .0   67999.3        .7        .0    5417.3       2.5    1004.6     144.4   1157.60
       .16       .00     12.55       .29      .000      .030      .045      .000   1135.10   9800.30
   .001805      170.      210.      290.         2         0         0       .00    394.45  10230.00


*SECNO 418.000

3470 ENCROACHMENT STATIONS=     9770.5   10250.0  TYPE=      1  TARGET=      479.500
   418.000     22.88   1158.68       .00       .00   1161.03      2.35       .93       .01 100000.00
   68000.0        .0   68000.0        .0        .0    5527.7        .0    1069.9     149.0   1160.90
       .17       .00     12.30       .00      .000      .030      .000      .000   1135.80   9811.16
   .001784      500.      520.      560.         2         0         0       .00    383.09  10194.25


*SECNO 423.000

3470 ENCROACHMENT STATIONS=     9790.3   10200.0  TYPE=      1  TARGET=      409.700
   423.000     22.97   1159.57       .00       .00   1162.00      2.43       .94       .02   1161.60
   68000.0        .0   68000.0        .0        .0    5438.7        .0    1135.4     153.6   1162.40
       .18       .00     12.50       .00      .000      .030      .000      .000   1136.60   9803.13
   .001846      500.      520.      550.         2         0         0       .00    377.34  10180.46


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


*SECNO 428.000

3470 ENCROACHMENT STATIONS=     9744.8   10250.0  TYPE=      1  TARGET=      505.200
   428.000     23.16   1160.76       .00        .00   1162.87      2.10        .84        .03 100000.00
   68000.0       .0   68000.0        .0         .0    5843.7        .0     1200.1      158.0   1163.00
       .20       .00     11.64       .00       .000      .030      .000       .000    1137.60   9787.13
   .001528     490.      500.      520.          2         0         0        .00     391.74  10178.87


*SECNO 434.000

3470 ENCROACHMENT STATIONS=     9761.8   10201.9  TYPE=      1  TARGET=      440.101
   434.000     23.87   1161.97       .00        .00   1163.74      1.77        .84        .03   1163.00
   68000.0       .0   68000.0        .0         .0    6375.0        .0     1284.3      163.6 100000.00
       .21       .00     10.67       .00       .000      .030      .000       .000    1138.10   9764.05
   .001289     590.      600.      620.          2         0         0        .00     428.54  10192.58


*SECNO 440.000

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     9783.5   10215.2  TYPE=      1  TARGET=      431.700
   440.000     22.79   1162.29       .00        .00   1165.00      2.71        .98        .28   1167.30
   68000.0       .0   68000.0        .0         .0    5147.5        .0     1365.0      169.1 100000.00
       .22       .00     13.21       .00       .000      .030      .000       .000    1139.50   9843.45
   .002044     610.      610.      610.          2         0         0        .00     354.64  10198.09


*SECNO 445.500
3280 CROSS SECTION    445.50 EXTENDED      3.33 FEET


3470 ENCROACHMENT STATIONS=     9809.5   10208.3  TYPE=      1  TARGET=      398.800
   445.500     22.93   1163.43       .00        .00   1166.13      2.69       1.12        .00   1168.40
   68000.0       .0   68000.0        .0         .0    5163.3        .0     1431.2      173.6 100000.00
       .24       .00     13.17       .00       .000      .030      .000       .000    1140.50   9836.37
   .001974     560.      560.      560.          2         0         0        .00     347.89  10184.26


*SECNO 449.100
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   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
   TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
   SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST


3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9818.2   10218.3  TYPE=      1  TARGET=      400.100
   449.100     17.71   1163.01   1163.01       .00   1168.31      5.30       1.20        .78   1169.10
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   68000.0        .0   68000.0        .0        .0    3681.1        .0    1468.8     176.6 100000.00
       .24       .00     18.47       .00      .000      .030      .000      .000   1145.30   9836.65
   .006275      370.      370.      370.         4        15         0       .00    355.31  10191.96


*SECNO 451.000
3280 CROSS SECTION    451.00 EXTENDED       .64 FEET


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.44


3470 ENCROACHMENT STATIONS=     9818.3   10209.2  TYPE=      1  TARGET=      390.900
   451.000     16.45   1165.95       .00       .00   1169.26      3.32       .76       .20   1167.50
   68000.0        .0   68000.0        .0        .0    4651.8        .0    1486.0     178.1 100000.00
       .24       .00     14.62       .00      .000      .030      .000      .000   1149.50   9821.55
   .003041      190.      180.      160.         4         0         0       .00    371.35  10192.89


*SECNO 457.000

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.03


3470 ENCROACHMENT STATIONS=     9306.5   10231.7  TYPE=      1  TARGET=      925.200
   457.000     17.38   1169.48       .00       .00   1170.28       .80       .77       .25   1172.00
   68000.0        .0   68000.0        .0        .0    9445.0        .0    1579.9     185.6 100000.00
       .27       .00      7.20       .00      .000      .030      .000      .000   1152.10   9464.45
   .000736      800.      580.      400.         2         0         0       .00    756.62  10221.06


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


*SECNO 8.655
3280 CROSS SECTION      8.65 EXTENDED      2.30 FEET


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .50


3470 ENCROACHMENT STATIONS=     9708.7   10219.5  TYPE=      1  TARGET=      510.800
        UP STREAM OF SKUNK CREEK CONFLUENCE
        STATIONING IN RIVER MILES FROM AGUA FRIA RIVER CONFLUENCE
     8.655     13.30   1169.80       .00       .00   1170.61       .81       .32       .00   1219.60
   38000.0        .0   38000.0        .0        .0    5270.4        .0    1649.1     191.5 100000.00
       .28       .00      7.21       .00      .000      .030      .000      .000   1156.50   9708.70
   .000910      510.      410.      410.         2         0         0       .00    490.38  10199.08


*SECNO 8.731

3301 HV CHANGED MORE THAN HVINS
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3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .52

8.731	11.33	1169.33	.00	.00	1171.71	2.38	.63	.47	1199.30
38000.0	.0	38000.0	.0	.0	3071.9	.0	1687.4	195.3	1175.20
.29	.00	12.37	.00	.000	.030	.000	.000	1158.00	9814.81
.003357	400.	400.	400.	3	0	0	.00	340.14	10154.95

*SECNO 8.807

8.807	11.75	1171.05	.00	.00	1173.35	2.30	1.64	.01	1174.10
38000.0	.0	38000.0	.0	.0	3121.5	.0	1720.8	199.2	1177.20
.30	.00	12.17	.00	.000	.030	.000	.000	1159.30	9753.24
.003617	470.	470.	470.	3	0	0	.00	374.38	10127.62

*SECNO 8.883

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

1

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST
8.883	11.48	1173.58	1173.58	.00	1178.18	4.60	2.12	.69	1177.60
38000.0	.0	38000.0	.0	.0	2207.8	.0	1748.4	202.3	1182.10
.31	.00	17.21	.00	.000	.030	.000	.000	1162.10	9878.63
.006406	450.	450.	450.	20	8	0	.00	241.25	10119.88

*SECNO 8.978

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 3.09

3470 ENCROACHMENT STATIONS= 9752.9 10196.9 TYPE= 1 TARGET= 444.000

8.978	14.69	1178.59	.00	.00	1179.33	.74	.77	.39	1180.10
38000.0	.0	38000.0	.0	.0	5511.6	.0	1792.7	206.2	100000.00
.33	.00	6.89	.00	.000	.030	.000	.000	1163.90	9759.97
.000670	500.	500.	500.	2	0	0	.00	436.93	10196.90

*SECNO 9.072

3470 ENCROACHMENT STATIONS= 9686.4 10235.4 TYPE= 1 TARGET= 549.000

9.072	13.63	1179.03	.00	.00	1179.69	.65	.35	.01	1182.20
38000.0	.0	38000.0	.0	.0	5855.6	.0	1860.5	211.9	100000.00
.35	.00	6.49	.00	.000	.030	.000	.000	1165.40	9716.01
.000679	525.	520.	520.	2	0	0	.00	514.55	10230.57

*SECNO 9.167

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9844.4 10218.8 TYPE= 1 TARGET= 374.399

9.167	12.50	1180.80	1180.80	.00	1184.39	3.59	.82	.88	1183.60
38000.0	.0	38000.0	.0	.0	2497.9	.0	1910.4	217.1	100000.00
.36	.00	15.21	.00	.000	.030	.000	.000	1168.30	9858.17
.006889	525.	520.	520.	20	11	0	.00	349.43	10207.60

1

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

*SECNO 9.262

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 3.18

3470 ENCROACHMENT STATIONS= 9739.1 10228.7 TYPE= 1 TARGET= 489.601

9.262	13.98	1184.78	.00	.00	1185.47	.68	.79	.29	1185.90
38000.0	.0	38000.0	.0	.0	5732.7	.0	1957.6	221.9	100000.00
.38	.00	6.63	.00	.000	.030	.000	.000	1170.80	9741.34
.000679	470.	500.	530.	2	0	0	.00	487.36	10228.70

*SECNO 9.356

9.356	11.71	1185.01	.00	.00	1186.01	1.00	.45	.09	1189.20
38000.0	.0	38000.0	.0	.0	4745.8	.0	2016.5	227.4	1185.40
.40	.00	8.01	.00	.000	.030	.000	.000	1173.30	9791.36
.001301	490.	490.	490.	2	0	0	.00	495.88	10287.24

*SECNO 9.451

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

9.451	9.66	1186.16	1186.16	.00	1189.62	3.46	1.28	.74	1191.60
38000.0	.0	38000.0	.0	.0	2547.4	.0	2058.4	232.4	1190.20
.41	.00	14.92	.00	.000	.030	.000	.000	1176.50	9859.42
.007202	500.	500.	510.	20	15	0	.00	376.98	10236.40

*SECNO 9.546

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.06

9.546	12.03	1189.93	.00	.00	1191.36	1.43	1.54	.20	1195.20

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   38000.0        .0   38000.0        .0        .0    3962.7        .0    2095.8     236.8   1193.80
       .42       .00      9.59       .00      .000      .030      .000      .000   1177.90   9854.50
   .001699      500.      500.      500.         2         0         0       .00    384.39  10238.88
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 9.641

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     9.641     11.77   1190.17   1190.17       .00   1193.84      3.67      1.52       .67   1195.60
   38000.0        .0   38000.0        .0        .0    2473.4        .0    2132.7     240.9   1195.40
       .43       .00     15.36       .00      .000      .030      .000      .000   1178.40   9800.00
   .006934      510.      500.      490.         5         8         0       .00    339.50  10139.51

*SECNO 9.735

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
     9.735     13.29   1196.79   1196.79       .00   1201.88      5.10      3.34       .43   1197.00
   38000.0        .0   38000.0        .0        .0    2097.2        .0    2158.9     244.1   1200.30
       .44       .00     18.12       .00      .000      .030      .000      .000   1183.50   9908.14
   .006438      510.      500.      490.        20         8         0       .00    209.36  10117.50

*SECNO 9.783
7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9900.0   10115.3  TYPE=      1  TARGET=      215.300
     9.783     12.97   1199.07   1199.07       .00   1204.07      5.00      1.61       .01 100000.00
   38000.0        .0   38000.0        .0        .0    2118.2        .0    2171.0     245.3 100000.00
       .44       .00     17.94       .00      .000      .030      .000      .000   1186.10   9900.00
   .006448       27.      250.      220.         3         8         0       .00    213.15  10113.15

*SECNO 9.786
3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=     9900.0   10114.3  TYPE=      1  TARGET=      214.300
        UP-STREAM STUDY LIMITS
```



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

9.786	11.43	1200.43	1200.43	.00	1205.45	5.02	.13	.01	100000.00
38000.0	.0	38000.0	.0	.0	2113.9	.0	2172.0	245.4	100000.00
.44	.00	17.98	.00	.000	.030	.000	.000	1189.00	9900.00
.006599	20.	20.	20.	20	11	0	.00	212.80	10112.80

*SECNO 9.832
3280 CROSS SECTION 9.83 EXTENDED 3.11 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.69

3470 ENCROACHMENT STATIONS= 9833.8 10123.1 TYPE= 1 TARGET= 289.300

9.832	15.22	1204.42	.00	.00	1206.56	2.14	.82	.29	1203.10
38000.0	.0	38000.0	.0	.0	3235.3	.0	2185.8	246.7	100000.00
.45	.00	11.75	.00	.000	.030	.000	.000	1189.20	9833.80
.002320	220.	225.	245.	4	0	0	.00	289.30	10123.10

SPECIAL BRIDGE

SB XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
.90	1.56	2.60	.00	213.00	20.00	2500.00	1.88	1188.61	1188.60

*SECNO 9.850
3280 CROSS SECTION 9.85 EXTENDED 2.53 FEET

PRESSURE AND WEIR FLOW, Weir Submergence Based on TRAPEZOIDAL Shape

EGPRS	EGLWC,	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
1210.01	1207.30	.53	6419.	31779.	2500.	2656.	1200.90	1207.50	835.

3470 ENCROACHMENT STATIONS= 9825.0 10118.0 TYPE= 1 TARGET= 293.000
BELL ROAD BRIDGE, AREA UPSTREAM OF BELL ROAD NOT EVALUATED

9.850	16.53	1206.53	.00	.00	1208.33	1.80	1.77	.00	1204.00
38000.0	.0	35866.6	2133.4	.0	3255.6	443.5	2193.8	247.4	1194.00
.45	.00	11.02	4.81	.000	.030	.045	.000	1190.00	9825.00
.001526	100.	100.	100.	3	0	2	.00	293.00	10118.00

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

*SECNO 9.902
3280 CROSS SECTION 9.90 EXTENDED 5.41 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.03

3470 ENCROACHMENT STATIONS= 9547.6 10568.3 TYPE= 1 TARGET= 1020.700

9.902	17.01	1208.31	.00	.00	1208.65	.34	.17	.15	1200.20
38000.0	9919.6	24592.8	3487.6	3206.3	4514.8	1920.1	2233.7	251.3	1203.80
.47	3.09	5.45	1.82	.045	.030	.045	.000	1191.30	9547.60
.000371	255.	260.	270.	3	0	0	.00	1020.70	10568.30

*SECNO -457.000
START TRIB COMP
-457.000 457.000 1169.478

3470 ENCROACHMENT STATIONS= 9306.5 10231.7 TYPE= 1 TARGET= 925.200

-457.000	17.38	1169.48	.00	.00	1170.28	.81	.00	.00	1172.00
68000.0	.0	68000.0	.0	.0	9442.7	.0	2360.1	262.7	100000.00
.49	.00	7.20	.00	.000	.030	.000	.000	1152.10	9464.61
.000736	800.	550.	400.	0	0	0	.00	756.44	10221.05

CCHV= .100 CEHV= .300
*SECNO 14.500

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .43

SKUNK CREEK STATION ABOVE NEW RIVER CONFLUENCE

14.500	14.75	1168.65	.00	.00	1171.21	2.56	.40	.53	1174.80
55000.0	.0	55000.0	.0	.0	4279.8	.0	2413.6	267.0	1169.10
.50	.00	12.85	.00	.000	.032	.000	.000	1153.90	9848.86
.002585	330.	340.	420.	3	0	0	.00	330.55	10179.41

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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
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
	1.05	1.00	2.80	.00	269.00	15.00	7148.00	2.00	1155.50	1155.10

*SECNO 19.000

3301 HV CHANGED MORE THAN HVINS

CLASS A LOW FLOW

3420 BRIDGE W.S.= 1168.05 BRIDGE VELOCITY= 15.43 CALCULATED CHANNEL AREA= 3504.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
.00	1172.72	.64	0.	55000.	7148.	7248.	1179.50	1188.00	0.

```
        AGUA FRIA FREEWAY BRIDGE
   19.000     13.59   1169.29      .00      .00   1172.72     3.43     1.51      .00   1174.00
  55000.0        .0   55000.0       .0       .0    3699.7       .0   2453.9    270.1   1174.00
     .51       .00     14.87      .00     .000      .032     .000     .000  1155.70   9871.86
 .003671      440.      440.     440.        0         0        0      .00   296.70  10168.55


*SECNO 20.900

3301 HV CHANGED MORE THAN HVINS

   20.900     15.93   1171.13      .00      .00   1173.38     2.25      .55      .12   1173.90
  55000.0        .0   55000.0       .0       .0    4569.3       .0   2472.9    271.6   1172.90
     .51       .00     12.04      .00     .000      .032     .000     .000  1155.20   9900.63
 .002124      200.      200.     200.        3         0        0      .00   331.12  10231.74


CCHV=     .100 CEHV=     .300
*SECNO 24.890
        DROP STRUCTURE BUILT IN CONJUCTION WITH 83rd AVENUE BRIDGE
        SPF PROFILE MATCH WITH PROFILE BY COE & VAN LOO (DEC 1989)
   24.890     16.69   1172.09      .00      .00   1174.15     2.07      .75      .02   1173.40
  55000.0        .0   55000.0       .0       .0    4769.2       .0   2513.6    274.5   1173.40
     .52       .00     11.53      .00     .000      .032     .000     .000  1155.40   9900.22
 .001841      380.      380.     380.        2         0        0      .00   329.35  10229.57


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


*SECNO 24.900

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
   24.900     10.17   1172.07   1172.07      .00   1176.90     4.83      .02      .83   1172.40
  55000.0        .0   55000.0       .0       .0    3118.8       .0   2514.2    274.5   1174.40
     .52       .00     17.64      .00     .000      .032     .000     .000  1161.90   9907.22
 .007329        6.        6.        6.       20        14        0      .00   326.46  10233.68


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                                                                THIS RUN EXECUTED 25AUG91     15:00:09
*****************************************************
  HEC2 RELEASE DATED SEP 88 UPDATED JUN  1990

  ERROR CORR -  01,02,03,04
  MODIFICATION -
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Standard Project Flood

SUMMARY PRINTOUT

	SECNO	SHEAR
	337.000	3.38
	342.000	2.46
	343.700	3.07
*	345.500	4.13
*	345.800	1.71
	346.100	1.99
	346.400	2.89
	346.800	2.11
	347.100	3.70
*	347.400	1.86
	352.000	2.14
*	358.000	2.57
	365.000	2.36
	370.000	1.78
*	373.000	2.61
*	377.000	2.37
	384.000	2.65

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	SECNO	SHEAR
*	388.000	1.44
	391.500	1.57
	395.000	1.62
	402.000	1.56
	406.000	2.15
	409.000	3.07
*	409.820	1.83
	410.000	1.70

	412.000	1.65
	418.000	1.61
	423.000	1.66
	428.000	1.42
	434.000	1.20
	440.000	1.85
	445.500	1.83
*	449.100	4.06
*	451.000	2.38
*	457.000	.57
*	8.655	.61
*	8.731	1.89
	8.807	1.88
*	8.883	3.66
*	8.978	.53
	9.072	.48
*	9.167	3.07
*	9.262	.50

	SECNO	SHEAR
	9.356	.78
*	9.451	3.04
*	9.546	1.09
*	9.641	3.15
*	9.735	4.02
*	9.783	4.00
*	9.786	4.09
*	9.832	1.62
	9.850	1.32
*	9.902	.32
	-457.000	.57
*	14.500	2.09

	19.000	2.86
	20.900	1.83
	24.890	1.66
*	24.900	4.37

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Standard Project Flood

SUMMARY PRINTOUT TABLE 105

	SECNO	CWSEL	HL	OLOSS	TOPWID	QLOB	QCH	QROB
	343.700	1128.53	.65	.23	354.11	.00	68000.00	.00
*	345.500	1128.67	.96	.39	339.75	.00	68000.00	.00
*	345.800	1133.10	1.46	.00	359.90	.00	68000.00	.00
	346.100	1132.86	.04	.12	353.64	.00	68000.00	.00
	406.000	1152.26	.89	.22	410.87	.00	68000.00	.00
	409.000	1152.28	1.00	.42	299.06	.00	68000.00	.00
*	409.820	1156.86	3.01	.00	280.43	.00	68000.00	.00
	410.000	1157.14	.03	.02	312.87	.00	67999.99	.00
*	9.786	1200.43	.13	.01	212.80	.00	38000.00	.00
*	9.832	1204.42	.82	.29	289.30	.00	38000.00	.00
	9.850	1206.53	1.77	.00	293.00	.00	35866.59	2133.41
*	9.902	1208.31	.17	.15	1020.70	9919.63	24592.82	3487.55
	-457.000	1169.48	.00	.00	756.44	.00	68000.00	.00
*	14.500	1168.65	.40	.53	330.55	.00	55000.00	.00
	19.000	1169.29	1.51	.00	296.70	.00	55000.00	.00
	20.900	1171.13	.55	.12	331.12	.00	55000.00	.00

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Standard Project Flood

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
337.000	.00	.00	.00	1112.40	69000.00	1126.48	.00	1129.91	42.06	14.86	4642.54	10639.40

	342.000	510.00	.00	.00	1114.80	68000.00	1128.42	.00	1131.77	31.80	14.70	4624.85	12059.08
	343.700	180.00	.00	.00	1115.80	68000.00	1128.53	.00	1132.66	41.78	16.30	4172.18	10520.62
*	345.500	190.00	.00	.00	1117.30	68000.00	1128.67	1128.67	1134.09	61.81	18.68	3640.22	8649.48
*	345.800	40.00	1141.90	1134.30	1117.40	68000.00	1133.10	.00	1135.55	18.18	12.56	5414.30	15949.92
	346.100	20.00	.00	.00	1117.50	68000.00	1132.86	.00	1135.71	22.50	13.54	5020.37	14335.81
	346.400	40.00	1141.40	1136.00	1117.70	68000.00	1132.90	.00	1135.84	33.63	13.76	4943.18	11725.72
	346.800	25.00	.00	.00	1118.10	68000.00	1132.94	.00	1135.93	24.64	13.86	4905.22	13699.02
	347.100	30.00	1141.40	1135.80	1118.30	68000.00	1132.36	.00	1136.32	49.84	15.97	4259.20	9632.09
*	347.400	30.00	.00	.00	1118.20	68000.00	1133.90	.00	1136.54	21.12	13.06	5206.97	14795.90
	352.000	460.00	.00	.00	1120.10	68000.00	1134.93	.00	1137.72	29.19	13.65	5636.46	12587.10
*	358.000	600.00	.00	.00	1123.60	68000.00	1136.63	1136.63	1139.75	35.32	14.96	6038.14	11442.68
	365.000	700.00	.00	.00	1123.40	68000.00	1139.39	1139.00	1142.06	29.88	14.51	6797.45	12438.95
	370.000	535.00	.00	.00	1123.40	68000.00	1141.60	.00	1143.61	25.85	12.40	7412.67	13375.77
*	373.000	320.00	.00	.00	1124.10	68000.00	1142.11	1142.11	1145.03	37.20	15.10	6448.06	11149.36
*	377.000	400.00	.00	.00	1127.40	68000.00	1144.44	1144.44	1147.13	35.40	14.31	6666.30	11429.14
	384.000	660.00	.00	.00	1129.40	68000.00	1146.06	1144.45	1150.04	41.35	16.07	4397.08	10575.40
*	388.000	410.00	.00	.00	1129.00	68000.00	1149.02	.00	1151.38	20.98	12.53	6006.98	14847.33
	391.500	350.00	.00	.00	1130.10	68000.00	1149.93	.00	1152.09	18.87	12.05	6551.52	15654.39
	395.000	350.00	.00	.00	1131.30	68000.00	1150.59	.00	1152.76	19.21	12.26	6436.57	15512.92
	402.000	720.00	.00	.00	1132.90	68000.00	1151.87	.00	1154.12	17.84	12.07	5803.43	16099.92
	406.000	400.00	.00	.00	1134.30	68000.00	1152.26	.00	1155.23	28.84	13.84	4912.99	12661.92
	409.000	310.00	.00	.00	1133.60	68000.00	1152.28	.00	1156.65	36.33	16.77	4054.85	11282.15
*	409.820	91.00	1163.50	1155.40	1135.60	68000.00	1156.86	.00	1159.66	16.29	13.43	5061.48	16847.05

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
410.000	20.00	.00	.00	1135.60	68000.00	1157.14	.00	1159.71	16.15	12.88	5280.37	16920.63
412.000	210.00	.00	.00	1135.10	68000.00	1157.64	.00	1160.09	18.05	12.55	5419.83	16004.46
418.000	520.00	.00	.00	1135.80	68000.00	1158.68	.00	1161.03	17.84	12.30	5527.72	16097.98
423.000	520.00	.00	.00	1136.60	68000.00	1159.57	.00	1162.00	18.46	12.50	5438.71	15825.13
428.000	500.00	.00	.00	1137.60	68000.00	1160.76	.00	1162.87	15.28	11.64	5843.73	17394.62
434.000	600.00	.00	.00	1138.10	68000.00	1161.97	.00	1163.74	12.89	10.67	6374.99	18939.64
440.000	610.00	.00	.00	1139.50	68000.00	1162.29	.00	1165.00	20.44	13.21	5147.49	15041.20

	445.500	560.00	.00	.00	1140.50	68000.00	1163.43	.00	1166.13	19.74	13.17	5163.31	15306.81
*	449.100	370.00	.00	.00	1145.30	68000.00	1163.01	1163.01	1168.31	62.75	18.47	3681.10	8584.18
*	451.000	180.00	.00	.00	1149.50	68000.00	1165.95	.00	1169.26	30.41	14.62	4651.83	12332.08
*	457.000	580.00	.00	.00	1152.10	68000.00	1169.48	.00	1170.28	7.36	7.20	9445.02	25065.89
*	8.655	410.00	.00	.00	1156.50	38000.00	1169.80	.00	1170.61	9.10	7.21	5270.42	12594.08
*	8.731	400.00	.00	.00	1158.00	38000.00	1169.33	.00	1171.71	33.57	12.37	3071.93	6558.46
	8.807	470.00	.00	.00	1159.30	38000.00	1171.05	.00	1173.35	36.17	12.17	3121.55	6318.54
*	8.883	450.00	.00	.00	1162.10	38000.00	1173.58	1173.58	1178.18	64.06	17.21	2207.77	4747.65
*	8.978	500.00	.00	.00	1163.90	38000.00	1178.59	.00	1179.33	6.70	6.89	5511.62	14680.52
	9.072	520.00	.00	.00	1165.40	38000.00	1179.03	.00	1179.69	6.79	6.49	5855.62	14587.88
*	9.167	520.00	.00	.00	1168.30	38000.00	1180.80	1180.80	1184.39	68.89	15.21	2497.91	4578.34
*	9.262	500.00	.00	.00	1170.80	38000.00	1184.78	.00	1185.47	6.79	6.63	5732.72	14580.34
	9.356	490.00	.00	.00	1173.30	38000.00	1185.01	.00	1186.01	13.01	8.01	4745.85	10536.21
*	9.451	500.00	.00	.00	1176.50	38000.00	1186.16	1186.16	1189.62	72.02	14.92	2547.42	4477.80
*	9.546	500.00	.00	.00	1177.90	38000.00	1189.93	.00	1191.36	16.99	9.59	3962.74	9218.13
*	9.641	500.00	.00	.00	1178.40	38000.00	1190.17	1190.17	1193.84	69.34	15.36	2473.36	4563.35
*	9.735	500.00	.00	.00	1183.50	38000.00	1196.79	1196.79	1201.88	64.38	18.12	2097.23	4735.97
*	9.783	250.00	.00	.00	1186.10	38000.00	1199.07	1199.07	1204.07	64.48	17.94	2118.20	4732.28
*	9.786	20.00	.00	.00	1189.00	38000.00	1200.43	1200.43	1205.45	65.99	17.98	2113.85	4677.96

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	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	9.832	225.00	.00	.00	1189.20	38000.00	1204.42	.00	1206.56	23.20	11.75	3235.25	7889.71
	9.850	100.00	1207.50	1200.90	1190.00	38000.00	1206.53	.00	1208.33	15.26	11.02	3699.11	9728.36
*	9.902	260.00	.00	.00	1191.30	38000.00	1208.31	.00	1208.65	3.71	5.45	9641.24	19718.63
	-457.000	550.00	.00	.00	1152.10	68000.00	1169.48	.00	1170.28	7.36	7.20	9442.72	25059.57
*	14.500	340.00	.00	.00	1153.90	55000.00	1168.65	.00	1171.21	25.85	12.85	4279.77	10817.43
	19.000	440.00	1188.00	1179.50	1155.70	55000.00	1169.29	.00	1172.72	36.71	14.87	3699.70	9077.71
	20.900	200.00	.00	.00	1155.20	55000.00	1171.13	.00	1173.38	21.24	12.04	4569.26	11935.27
	24.890	380.00	.00	.00	1155.40	55000.00	1172.09	.00	1174.15	18.41	11.53	4769.21	12817.50
*	24.900	6.00	.00	.00	1161.90	55000.00	1172.07	1172.07	1176.90	73.29	17.64	3118.79	6424.51

1

Standard Project Flood

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	337.000	69000.00	1126.48	.00	.00	1099.98	360.22	.00
	342.000	68000.00	1128.42	.00	1.94	.00	372.58	510.00
	343.700	68000.00	1128.53	.00	.12	.00	354.11	180.00
*	345.500	68000.00	1128.67	.00	.14	.00	339.75	190.00
*	345.800	68000.00	1133.10	.00	4.42	.00	359.90	40.00
	346.100	68000.00	1132.86	.00	-.24	.00	353.64	20.00
	346.400	68000.00	1132.90	.00	.05	.00	342.39	40.00
	346.800	68000.00	1132.94	.00	.04	.00	358.14	25.00
	347.100	68000.00	1132.36	.00	-.58	.00	321.84	30.00
*	347.400	68000.00	1133.90	.00	1.53	.00	368.80	30.00
	352.000	68000.00	1134.93	.00	1.03	.00	819.32	460.00
*	358.000	68000.00	1136.63	.00	1.70	.00	1179.47	600.00
	365.000	68000.00	1139.39	.00	2.76	.00	1237.80	700.00
	370.000	68000.00	1141.60	.00	2.21	.00	1316.63	535.00
*	373.000	68000.00	1142.11	.00	.51	.00	1217.80	320.00
*	377.000	68000.00	1144.44	.00	2.33	.00	1435.77	400.00
	384.000	68000.00	1146.06	.00	1.62	.00	548.35	660.00
*	388.000	68000.00	1149.02	.00	2.96	.00	712.43	410.00
	391.500	68000.00	1149.93	.00	.91	.00	921.56	350.00
	395.000	68000.00	1150.59	.00	.66	.00	979.49	350.00
	402.000	68000.00	1151.87	.00	1.27	.00	691.75	720.00
	406.000	68000.00	1152.26	.00	.39	.00	410.87	400.00
	409.000	68000.00	1152.28	.00	.03	.00	299.06	310.00
*	409.820	68000.00	1156.86	.00	4.57	.00	280.43	91.00

1

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	410.000	68000.00	1157.14	.00	.28	.00	312.87	20.00
	412.000	68000.00	1157.64	.00	.50	.00	394.45	210.00

	418.000	68000.00	1158.68	.00	1.04	.00	383.09	520.00
	423.000	68000.00	1159.57	.00	.89	.00	377.34	520.00
	428.000	68000.00	1160.76	.00	1.20	.00	391.74	500.00
	434.000	68000.00	1161.97	.00	1.21	.00	428.54	600.00
	440.000	68000.00	1162.29	.00	.32	.00	354.64	610.00
	445.500	68000.00	1163.43	.00	1.14	.00	347.89	560.00
*	449.100	68000.00	1163.01	.00	-.43	.00	355.31	370.00
*	451.000	68000.00	1165.95	.00	2.94	.00	371.35	180.00
*	457.000	68000.00	1169.48	.00	3.53	.00	756.62	580.00
*	8.655	38000.00	1169.80	.00	.32	.00	490.38	410.00
*	8.731	38000.00	1169.33	.00	-.47	.00	340.14	400.00
	8.807	38000.00	1171.05	.00	1.72	.00	374.38	470.00
*	8.883	38000.00	1173.58	.00	2.53	.00	241.25	450.00
*	8.978	38000.00	1178.59	.00	5.01	.00	436.93	500.00
	9.072	38000.00	1179.03	.00	.44	.00	514.55	520.00
*	9.167	38000.00	1180.80	.00	1.76	.00	349.43	520.00
*	9.262	38000.00	1184.78	.00	3.99	.00	487.36	500.00
	9.356	38000.00	1185.01	.00	.23	.00	495.88	490.00
*	9.451	38000.00	1186.16	.00	1.15	.00	376.98	500.00
*	9.546	38000.00	1189.93	.00	3.77	.00	384.39	500.00
*	9.641	38000.00	1190.17	.00	.24	.00	339.50	500.00
*	9.735	38000.00	1196.79	.00	6.61	.00	209.36	500.00
*	9.783	38000.00	1199.07	.00	2.29	.00	213.15	250.00
*	9.786	38000.00	1200.43	.00	1.36	.00	212.80	20.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
*	9.832	38000.00	1204.42	.00	3.99	.00	289.30	225.00
	9.850	38000.00	1206.53	.00	2.12	.00	293.00	100.00
*	9.902	38000.00	1208.31	.00	1.78	.00	1020.70	260.00
	-457.000	68000.00	1169.48	.00	-38.83	.00	756.44	550.00
*	14.500	55000.00	1168.65	.00	-.83	.00	330.55	340.00
	19.000	55000.00	1169.29	.00	.64	.00	296.70	440.00

	20.900	55000.00	1171.13	.00	1.85	.00	331.12	200.00
	24.890	55000.00	1172.09	.00	.95	.00	329.35	380.00
*	24.900	55000.00	1172.07	.00	-.02	.00	326.46	6.00

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SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION SECNO=    345.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    345.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=    345.800  PROFILE=  1  HYDRAULIC JUMP D.S.
WARNING SECNO=    345.800  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=    347.400  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=    358.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    358.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=    373.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    373.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=    377.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    377.000  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=    388.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=    409.820  PROFILE=  1  HYDRAULIC JUMP D.S.
WARNING SECNO=    409.820  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=    449.100  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    449.100  PROFILE=  1  MINIMUM SPECIFIC ENERGY

WARNING SECNO=    451.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=    457.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      8.655  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      8.731  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      8.883  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      8.883  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      8.883  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      8.978  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      9.167  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.167  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      9.167  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      9.262  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      9.451  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.451  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      9.451  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      9.546  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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CAUTION SECNO=      9.641  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      9.641  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=      9.735  PROFILE=  1  CRITICAL DEPTH ASSUMED
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WARNING SECNO=      9.832  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      9.902  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=     14.500  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=     24.900  PROFILE=  1  CRITICAL DEPTH ASSUMED
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CAUTION SECNO=     24.900  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL
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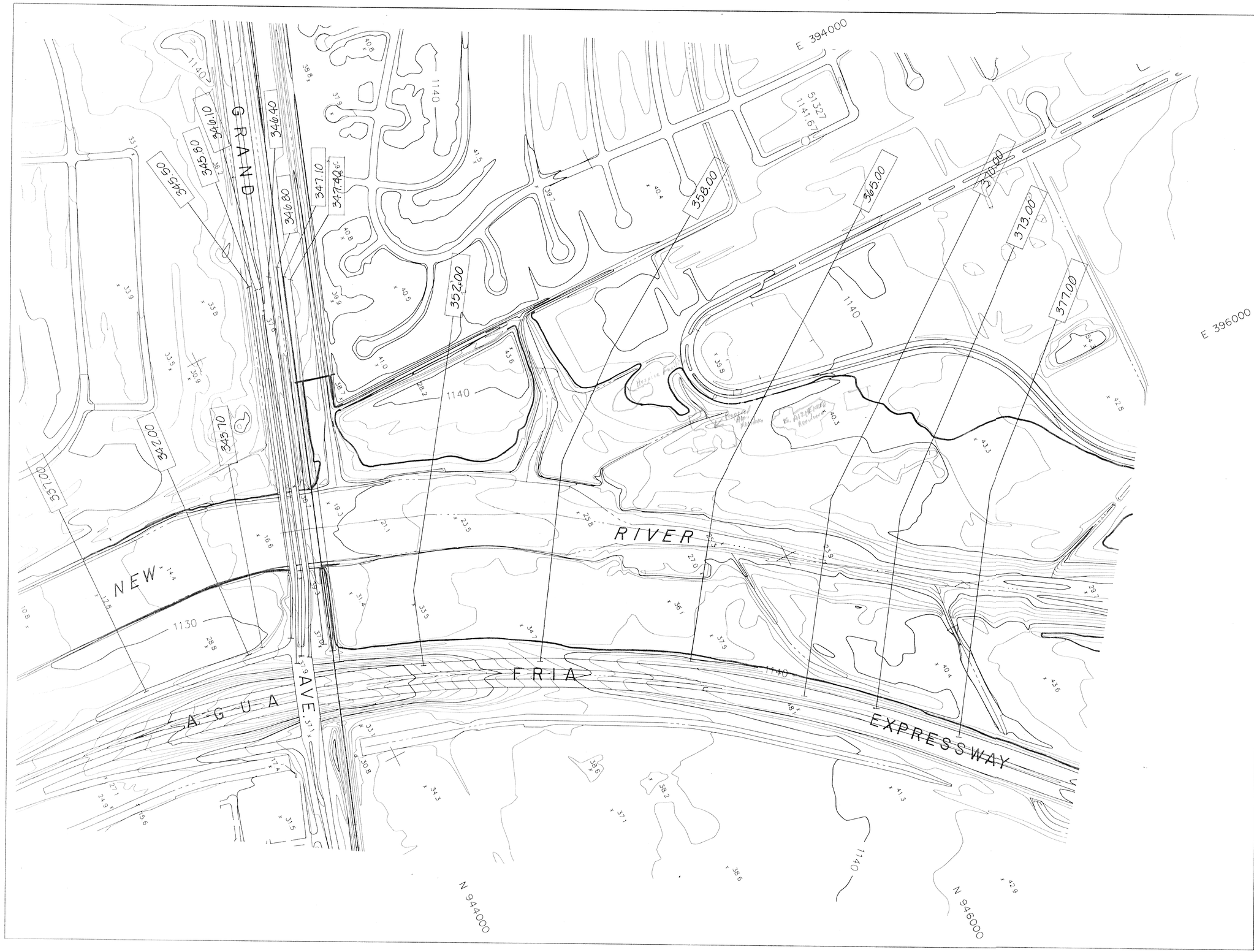
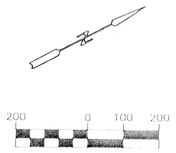




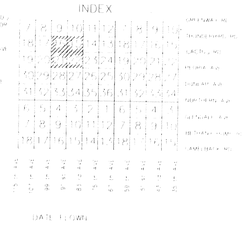
CONTOUR INTERVAL 2 FEET

LEGEND

- STANDARD PROJECT FLOOD LIMITS
- STATIONING IN RIVER MILES UPSTREAM FROM AGUA FRIA RIVER
- 337.00 — CROSS-SECTION NUMBER
- REFERENCE MARK
- CONTROL LINE

KEY MAP

INDEX



MAPPING NOTES

THE ORIGINAL TOPOGRAPHIC MAPPING, ENLARGED TO A SCALE OF 1"=200' ON THESE PLANS, WAS PREPARED AT A SCALE OF 1"=400' AND A 2 FOOT CONTOUR INTERVAL IN JUNE 1991. THAT MAPPING WAS PREPARED UNDER FLOOD CONTROL DISTRICT OF MARICOPA COUNTY CONTRACT NO. 90-19 BY KAMINSKI-HUBBARD ENGINEERING, INC. THE ORIGINAL MAPPING IS ON FILE AT THE DISTRICT.

EXISTING CONDITION

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, Land Surveyors
4105 North 20th Street, Suite 130, Phoenix, Az. 85016
(602)-957-3149 Fax 955-3765

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

NEW RIVER
STANDARD PROJECT
FLOOD DELINEATION

GRAND AVENUE TO BELL ROAD

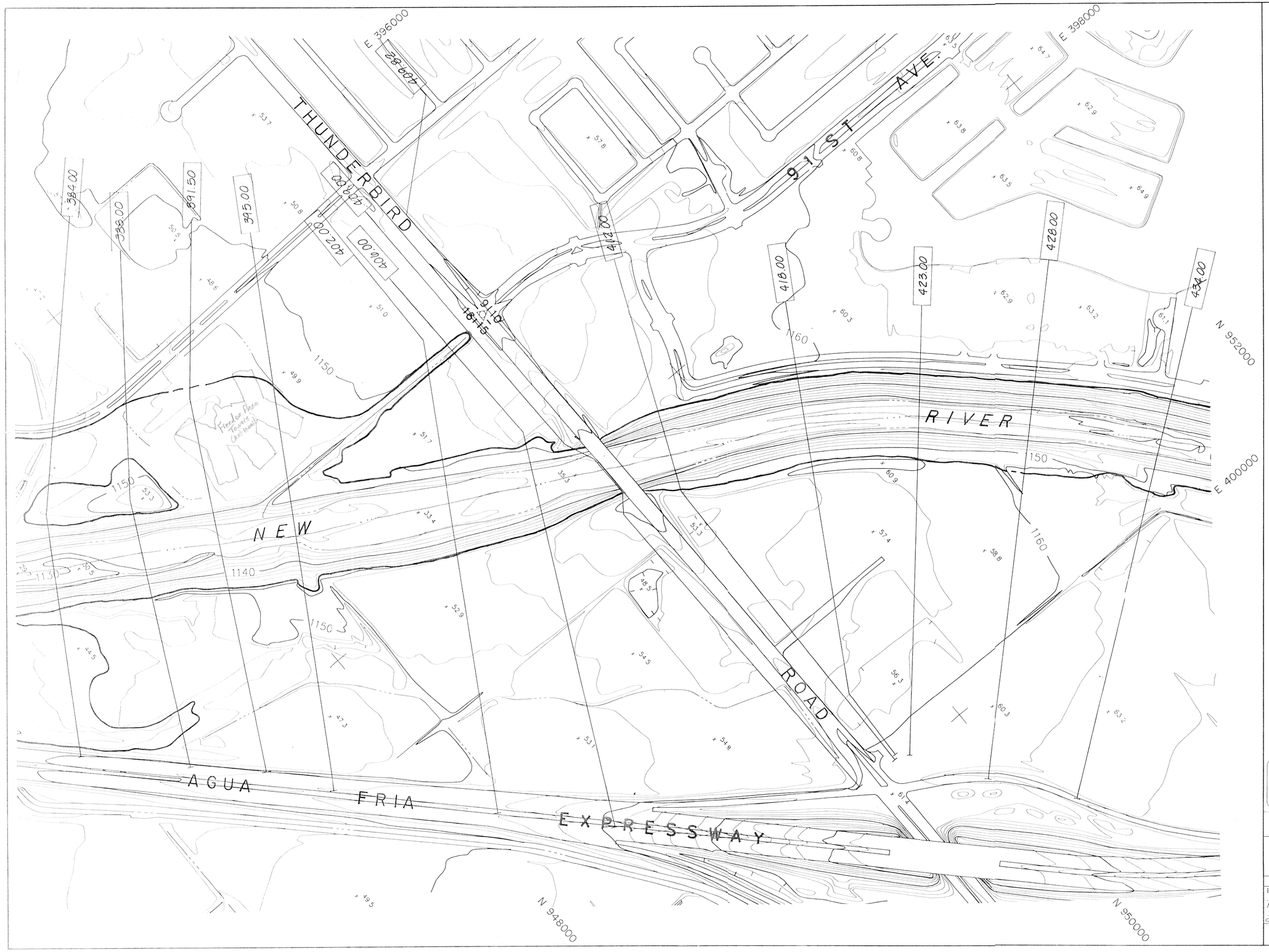
RECOMMENDED BY: DATE:

APPROVED BY: DATE:

CHIEF ENGINEER AND GENERAL MANAGER

PLATE 2
1 OF 4

FCDMC CONTRACT NO. 91-25
W.P.# 91755



200 0 100 200

1 inch = 200 ft.

CONTOUR INTERVAL 2 FEET

LEGEND

- STANDARD PROJECT FLOOD LIMITS
- STATIONING IN RIVER MILES UPSTREAM FROM AGUA FRIA RIVER
- 337.00 — CROSS-SECTION NUMBER
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KEY MAP

INDEX

DATE FLOWN

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NEW RIVER
STANDARD PROJECT FLOOD DELINEATION

GRAND AVENUE TO BELL ROAD

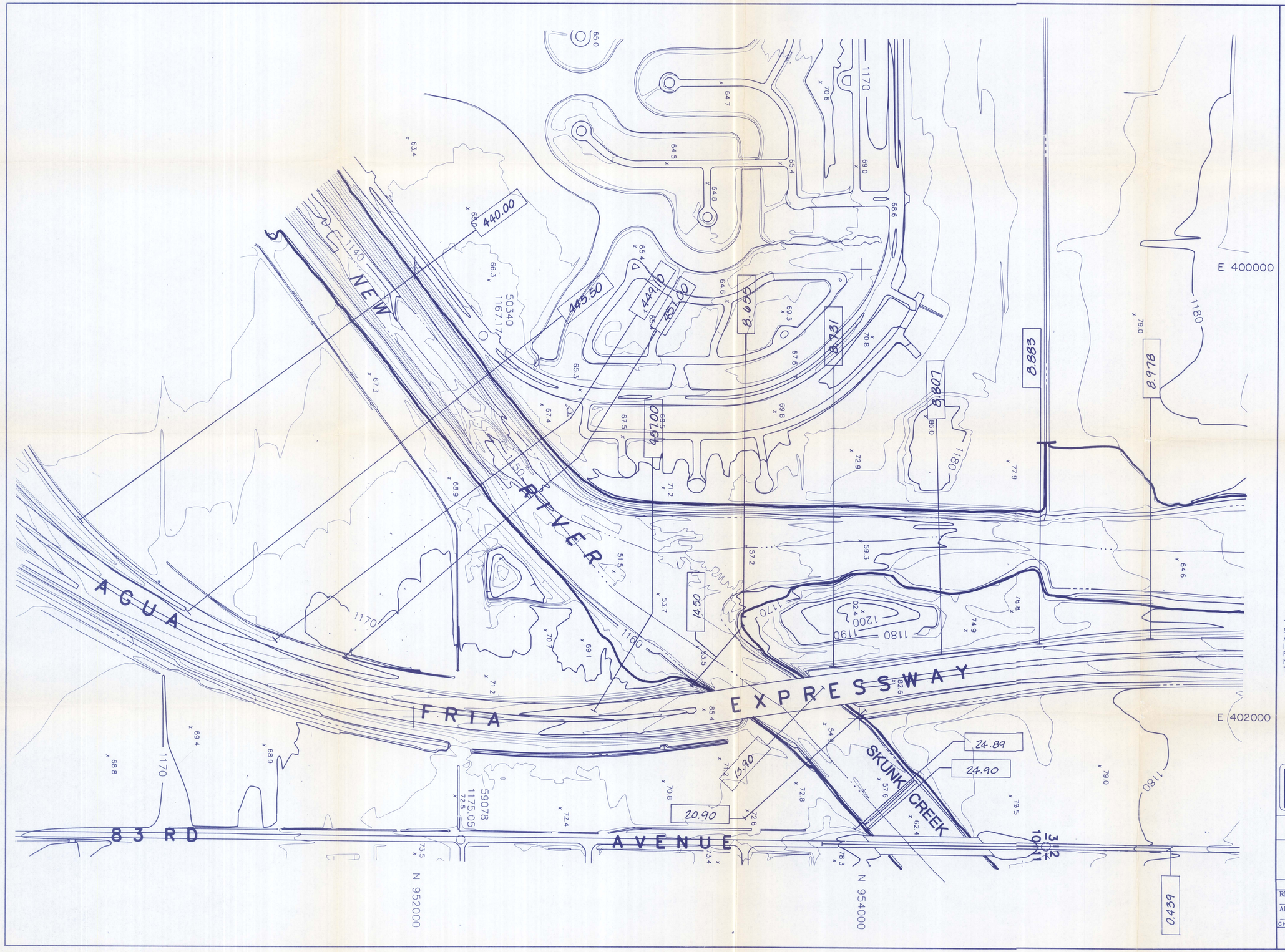
RECOMMENDED BY: DATE:

APPROVED BY: DATE:

CHIEF ENGINEER AND GENERAL MANAGER

PLATE 2
2 OF 4

FCDMC CONTRACT NO. 91-25
W.P.# 91755



200 0 100 200

1 inch = 200 ft.

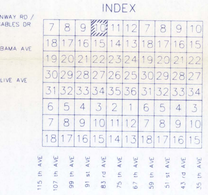
CONTOUR INTERVAL 2 FEET

LEGEND

- STANDARD PROJECT FLOOD LIMITS
- STATIONING IN RIVER MILES UPSTREAM FROM AGUA FRIA RIVER
- 337.00 — CROSS-SECTION NUMBER
- REFERENCE MARK
- CONTROL LINE

KEY MAP

INDEX



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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NEW RIVER
STANDARD PROJECT FLOOD DELINEATION

GRAND AVENUE TO BELL ROAD

RECOMMENDED BY: DATE:

APPROVED BY: DATE:

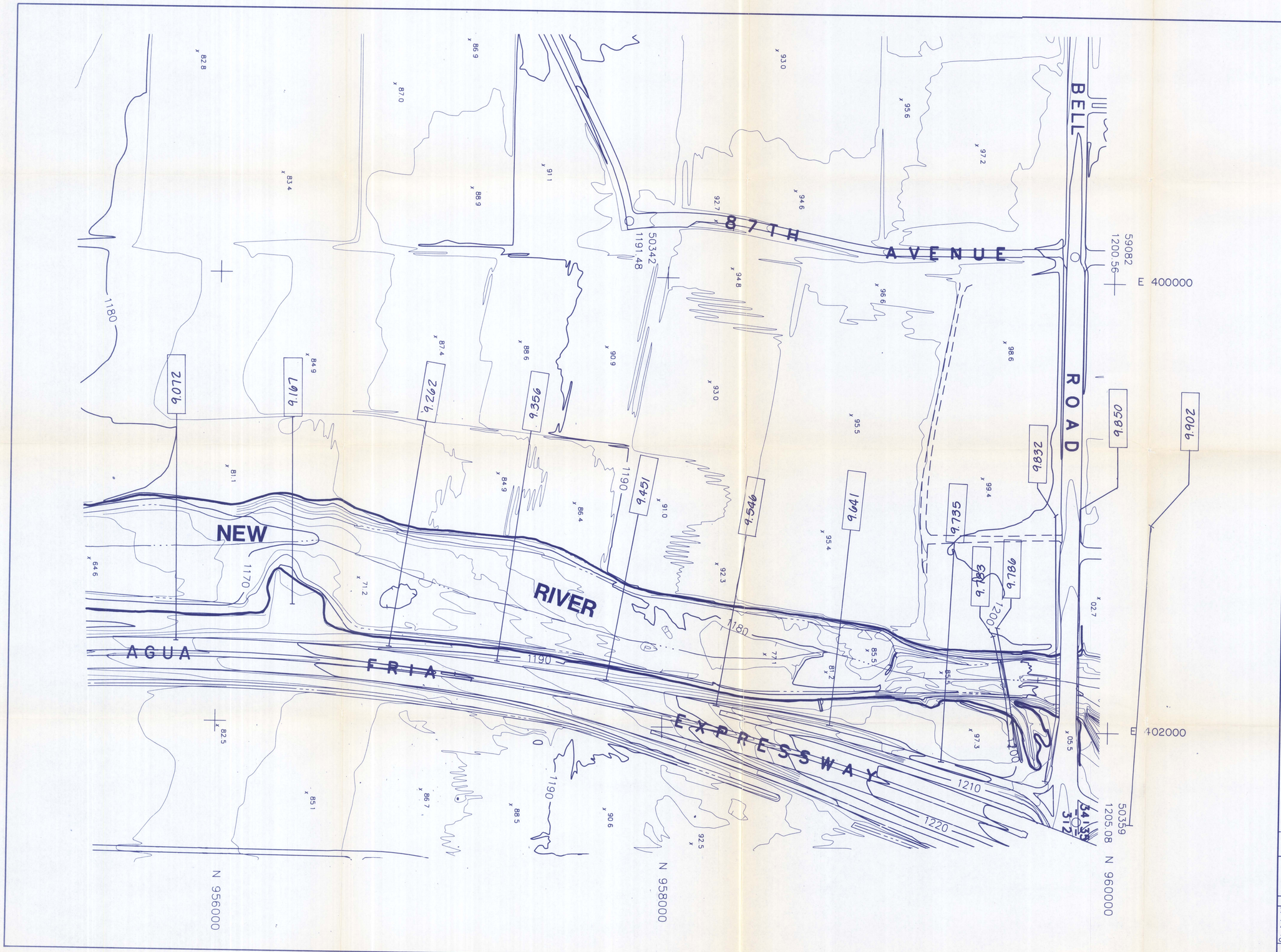
CHIEF ENGINEER AND GENERAL MANAGER

PLATE 2
3 OF 4

FCDMC CONTRACT NO. 91-25
W.P.# 91755

AUG 28 1991

KENNEY AERIAL MAPPING INC.
PHOENIX, ARIZONA



N

200 0 100 200

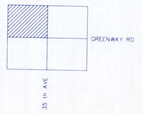
1 inch = 200 ft.

CONTOUR INTERVAL 2 FEET

LEGEND

- STANDARD PROJECT FLOOD LIMITS
- STATIONING IN RIVER MILES UPSTREAM FROM AGUA FRIA RIVER
- 337.00 CROSS-SECTION NUMBER
- REFERENCE MARK
- CONTROL LINE

KEY MAP



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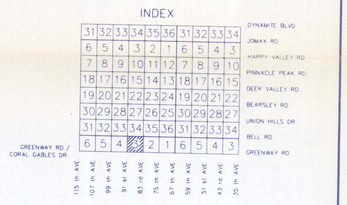

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(602)-957-3149 Fax 955-3765

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NEW RIVER
STANDARD PROJECT FLOOD DELINEATION

GRAND AVENUE TO BELL ROAD

RECOMMENDED BY: DATE:

APPROVED BY: DATE:

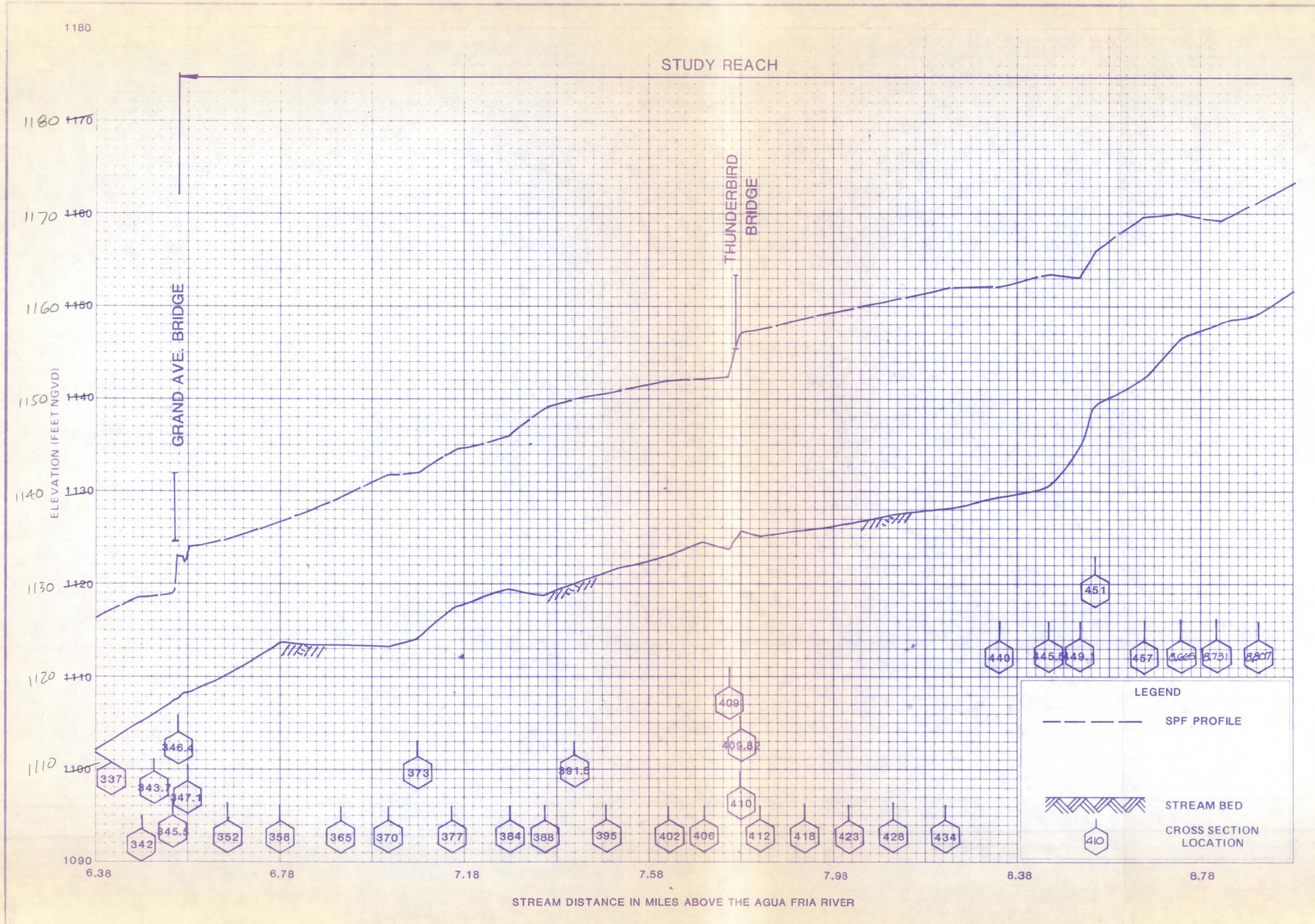
CHIEF ENGINEER AND GENERAL MANAGER

PLATE 2
4 OF 4

FCDMC CONTRACT NO. 91-25
W.P.# 91755

AUG 29 1991

KENNEY AERIAL MAPPING INC.



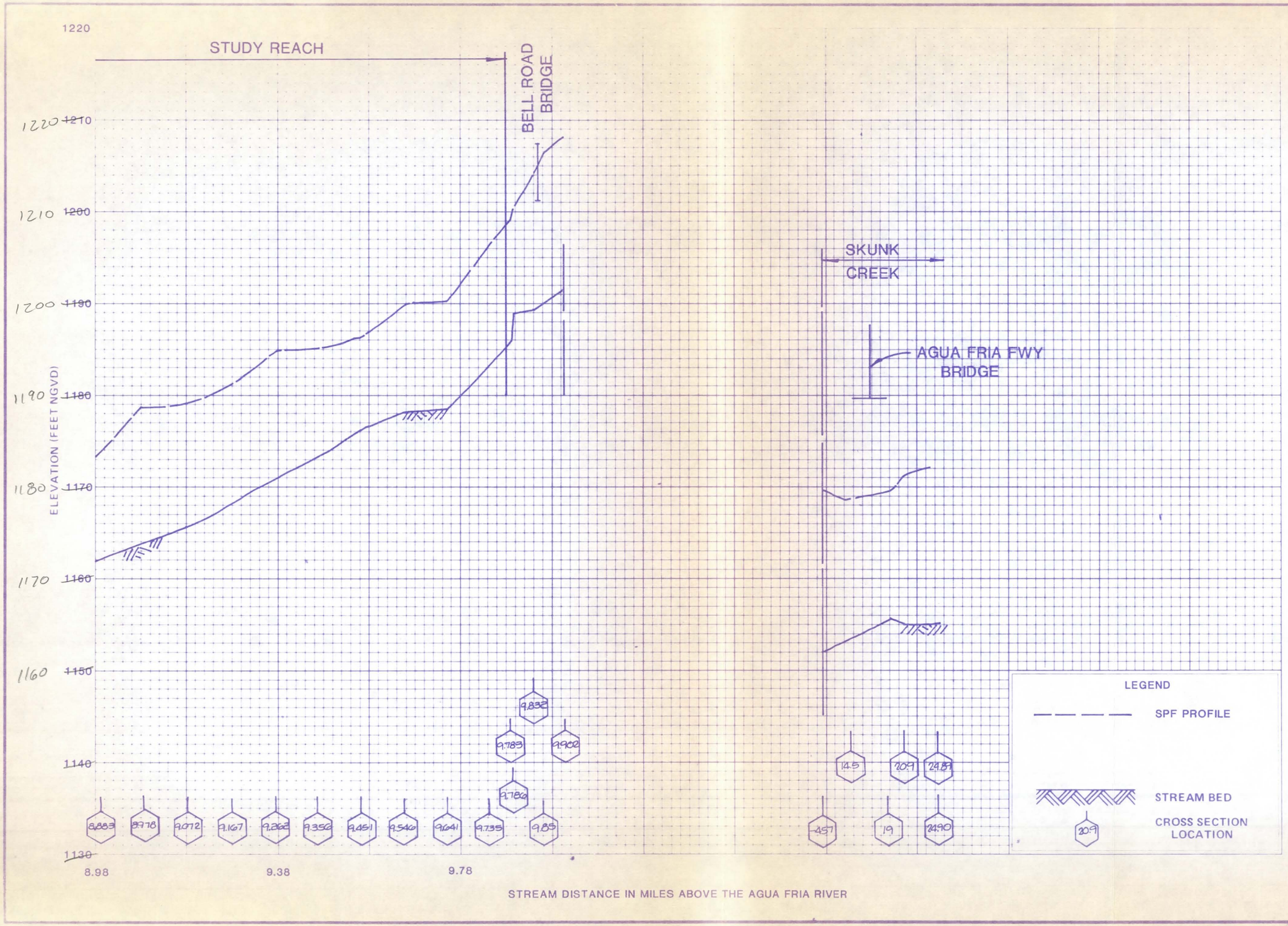
FLOOD PROFILES

NEW RIVER FROM GRAND AVENUE TO BELL ROAD

FLOOD CONTROL DIST OF MARICOPA COUNTY

SPF WITH CHANNEL IMPROVEMENTS

PLATE 3.1



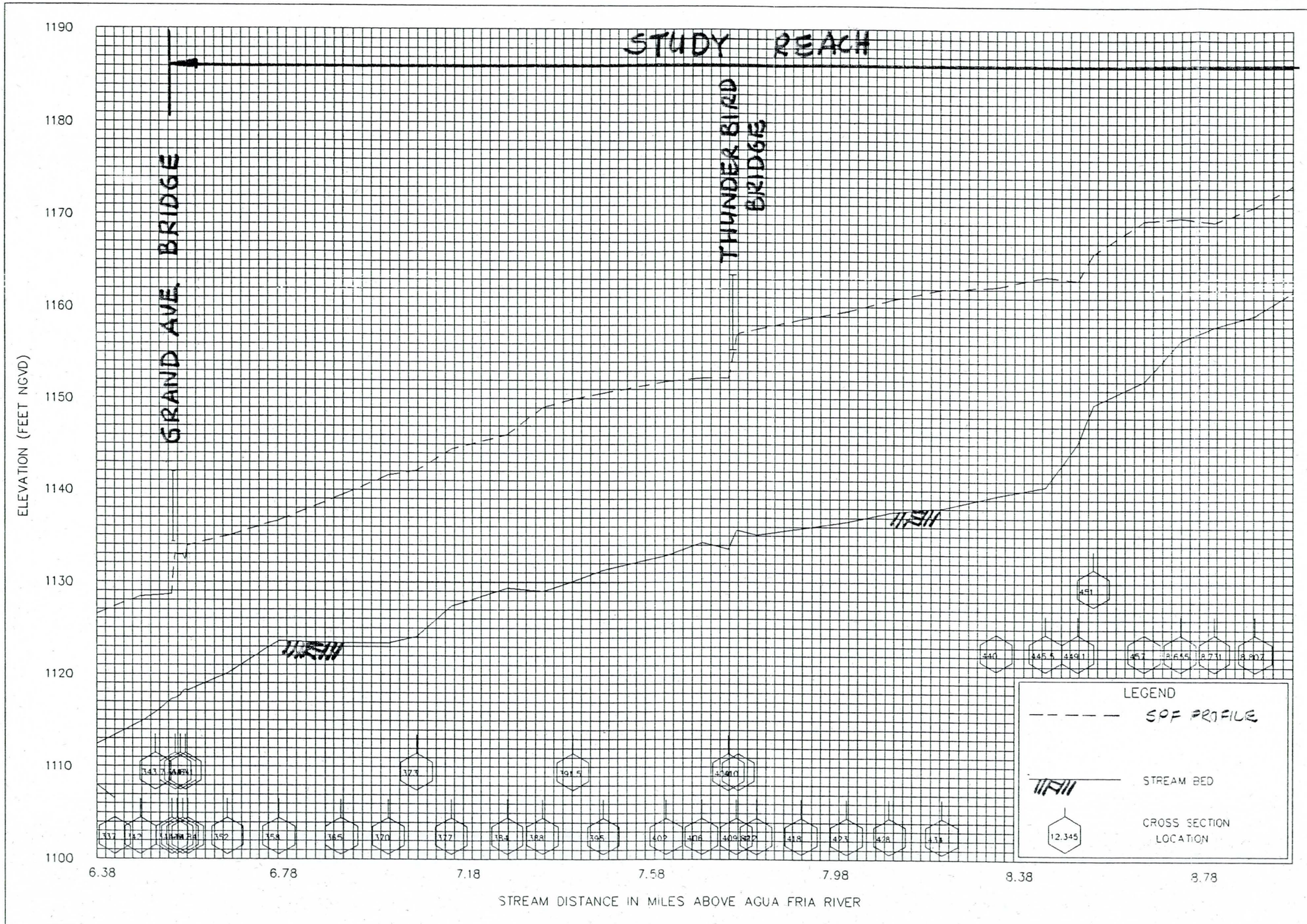
FLOOD PROFILES

NEW RIVER FROM GRAND AVENUE TO BELL ROAD

FLOOD CONTROL DIST OF MARICOPA COUNTY

SPF WITH CHANNEL IMPROVEMENTS

PLATE 3.2



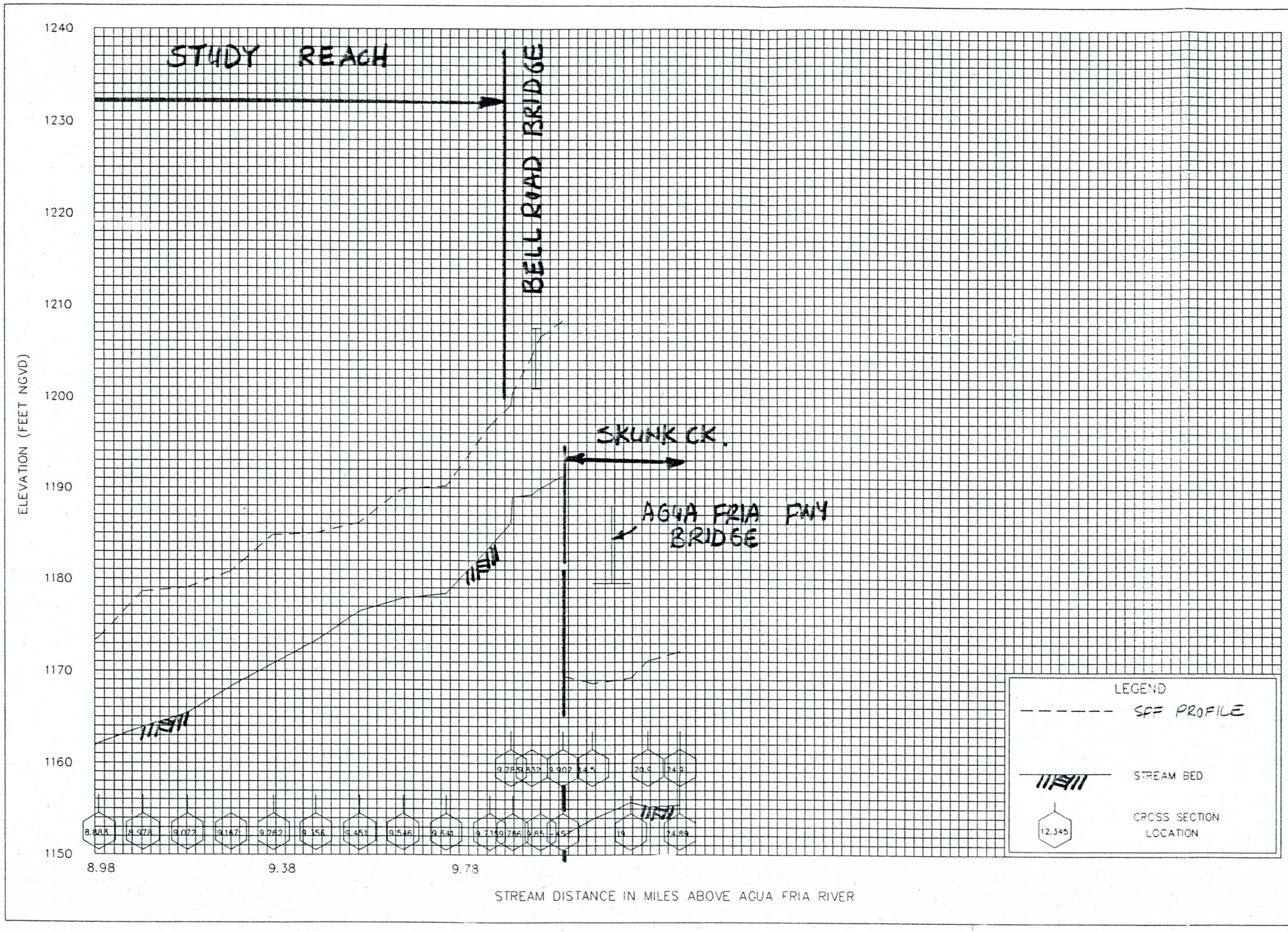
FLOOD PROFILES

NEW RIVER FROM GRAND AVE TO BELL RD

SPF - Natural Path

FLOOD CONTROL DIST OF MARICOPA COUNTY
SPF WITH CHANNEL IMPROVEMENTS

PLATE 3



FLOOD PROFILES

NEW RIVER FROM GRAND AVE TO BELL RD

SPF Natural Profile

FLOOD CONTROL DIST OF MARICOPA COUNTY

SPF WITH NO CHANNEL IMPROVEMENTS

PLATE 3

```
1*****************************************************
 *  WATER SURFACE PROFILES                           *
 *  VERSION OF SEPTEMBER 1988                        *
 *  ERROR: 01,02,03,04                               *
 *  UPDATED:  JUNE 1990                              *
 *  RUN DATE    28AUG91    TIME   17:28:10           *
 *****************************************************
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 ****************************************
 *  U.S. ARMY CORPS OF ENGINEERS        *
 *  THE HYDROLOGIC ENGINEERING CENTER   *
 *  609 SECOND STREET, SUITE D          *
 *  DAVIS, CALIFORNIA 95616-4687        *
 *           (916) 756-1104             *
 ****************************************
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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
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END OF BANNER

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28AUG91 17:28:10 PAGE 1

THIS RUN EXECUTED 28AUG91 17:28:10

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*****************************************************
  HEC2 RELEASE DATED SEP 88 UPDATED JUN  1990

  ERROR CORR -  01,02,03,04
  MODIFICATION -
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T1 NEW RIVER - GRAND AVENUE TO SKUNK CK CONFLUENCE *91755C2.DAT*
T2 EXIST. CONDITION W/CHIMP partially north & south of Thunderbird Road
T3 Standard Project Flood Analysis based on April 1991 Topo Maps

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2			0.0042				26.5	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	-1		-1							

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

150	105	38	67	7	120

J6	IHLEQ	ICOPY	SUBDIV	STRTDS	RMILE
		1			

NC	0.045	0.045	0.035	0.1	0.3
QT	1	69000			

NEW RIVER CHANNELIZATION BY CORPS & ADOT ARE REFLECTED NEAR GRAND AVENUE AND AGUA FRIA FREEWAY ON THE NEW TOPOGRAPHIC MAPS BY THE DISTRICT. THE MAPS WERE PREPARED BY KAMINSKI-HUBBARD/KENNEY AERIAL MAPPING COMPANY DATED APRIL 1991.
STATIONING ARE IN 100FT STATIONS FROM THE CONFLUENCE WITH AGUA FRIA

```
        RIVER. (EXAMPLE 337.0= 33700 FT )
        STARTING WATER SURFACE PER SPF DATA BY COE & VAN LOO DATED DEC 1989
X1    337.0       25    9806.7   10176.4
GR   1131.7   9493.4   1129.2    9508.8   1127.7    9524.0   1127.6    9594.4   1128.5    9624.7
GR   1128.5   9649.0   1129.3    9668.1   1130.6    9726.6   1130.8    9806.7   1113.2    9824.8
GR   1113.3   9900.7   1112.8   10000.0   1113.0   10091.3   1112.4   10152.3   1130.2   10176.4
GR   1130.5  10194.8   1131.6   10211.8   1131.3   10245.7   1127.4   10275.7   1127.2   10300.3
GR   1128.7  10319.6   1129.8   10337.2   1129.0   10357.5   1126.8   10377.8   1127.8   10409.0

NC    0.045    0.045    0.030       0.1       0.3
QT        1    68000
X1    342.0       25    9854.2   10234.6       500       520       510
X3       10
GR   1133.7   9502.7   1130.3    9525.2   1128.9    9546.7   1128.8    9568.7   1129.7    9616.7
GR   1130.2   9646.0   1129.2    9698.2   1130.8    9751.0   1132.0    9854.2   1114.8    9873.1
GR   1115.4  10000.0   1115.3   10034.1   1116.4   10047.3   1115.3   10084.9   1115.9   10125.9
GR   1114.8  10201.5   1119.2   10207.3   1118.9   10219.8   1131.8   10234.6   1131.7   10275.5
GR   1130.2  10279.7   1130.2   10307.0   1133.4   10319.0   1130.3   10359.9   1130.0   10424.3
1
   28AUG91      17:28:10                                                                    PAGE    2


X1    343.7       22    9838.5   10202.7       140       220       180
X3       10
GR   1134.3   9495.7   1133.1    9514.6   1131.3    9538.0   1129.0    9555.2   1128.5    9567.5
GR   1130.0   9591.3   1130.9    9720.4   1132.4    9780.5   1132.8    9838.5   1116.6    9857.6
GR   1115.8   9939.8   1116.2    9952.9   1116.0   10000.0   1116.3   10049.5   1116.7   10118.0
GR   1116.1  10183.8   1133.1   10202.7   1132.8   10230.1   1131.9   10232.7   1131.8   10279.3
GR   1132.3  10346.7   1135.9   10355.6

X1    345.5       26    9812.0   10205.8       180       200       190
X3        0
GR   1137.0   9542.6   1137.3    9559.7   1136.9    9659.0   1137.7    9680.8   1138.6    9687.1
GR   1138.8   9708.3   1135.7    9719.1   1137.1    9812.0   1133.8    9827.6   1134.3    9832.4
GR   1117.6   9857.2   1117.3   10000.0   1117.4   10163.5   1134.5   10189.3   1136.4   10205.8
GR   1137.6  10274.5   1138.1   10329.3   1138.3   10392.2   1137.6   10459.1   1136.7   10545.1
GR   1136.6  10652.0   1136.2   10746.7   1136.1   10840.7   1136.2   10933.7   1136.0   11040.2
GR   1135.4  11114.9

SB       1.1     1.56      2.9                 330.      36.5      5279       1.0    1117.5    1117.3
        GRAND AVENUE BRIDGE
X1    345.8       4.    9823.9   10186.1       40.       40.       40.
X2                         1.    1134.3    1141.9
X3       10.                                                     1140.5    1140.5
BT       -2.   9823.9   1141.9    1134.3   10186.1    1141.9    1134.3
GR   1134.3   9823.9   1117.4     9840.    1117.4    10170.    1134.3   10186.1

X1    346.1       25    9814.2   10210.4       20        20        20
X3        0
GR   1137.3   9459.0   1138.1    9535.2   1138.5    9618.8   1138.7    9632.2   1138.7    9718.2
GR   1138.9   9768.8   1138.3    9814.2   1134.6    9830.5   1117.8    9855.1   1117.7   10000.0
GR   1117.5  10162.5   1134.2   10188.8   1137.7   10210.4   1138.3   10242.3   1138.1   10329.0
GR   1138.4  10409.8   1138.5   10463.3   1137.5   10618.2   1137.1   10728.9   1137.3   10761.5
GR   1137.9  10798.1   1137.6   10857.6   1137.1   10887.1   1137.3   10978.0   1136.9   11118.0

X1    346.4      21.     9823.   10187.1       40.       40.       40.
BT       -4.    9823.   1141.4    1136.0     9942.    1141.4    1135.8     9947.   1141.4    1134.9
BT           10187.     1141.4    1134.9
GR    1136.     9823.   1117.7     9840.   1117.7     9885.    1135.8    9885.1   1135.8     9886.
GR   1117.7    9886.1   1117.7     9941.   1135.8     9942.    1134.9     9947.   1117.7     9948.
GR   1117.7    10061.   1134.9    10062.   1134.9    10067.    1117.7    10068.   1117.7    10121.
GR   1134.9    10122.   1134.9    10127.   1117.7    10128.    1117.7    10170.    1135.    10187.
GR    1141.   10187.1

ET             9.1                                                                 9827.0   10187.3
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```
X1    346.8       34    9827.0   10187.3      25      25      25
X3        0
GR   1136.7   9443.5   1136.7    9494.7  1137.1  9553.7  1136.8  9633.5  1136.6  9682.2
GR   1136.6   9722.1   1138.2    9744.6  1136.4  9753.1  1135.1  9805.3  1134.3  9816.7
GR   1134.2   9827.0   1118.1    9854.6  1118.2  9898.0  1118.3 10000.0  1118.1 10016.8
GR   1118.1  10082.6   1118.5   10160.8  1131.8 10187.3  1131.9 10214.8  1132.7 10231.4
GR   1131.3  10291.7   1131.7   10337.0  1132.3 10400.5  1132.0 10478.8  1131.8 10535.8
GR   1132.2  10611.2   1132.7   10686.6  1133.4 10745.5  1133.9 10801.8  1134.7 10859.6
GR   1135.4  10938.7   1136.6   10976.5  1137.1 11037.9  1136.6 11169.3
1
   28AUG91      17:28:10                                                          PAGE    3


X1    347.1       22.    9823.   10187.1      30.     30.     30.
BT     -4.     9823.    1141.4    1135.8   9940.  1141.4  1135.8   9947.  1141.4  1134.9
BT            10187.    1141.4    1134.9
GR    1141.    9823.     1136.    9823.1  1118.3   9840.  1118.3   9882.  1135.8  9882.1
GR   1135.8    9889.    1118.3    9889.1  1118.3   9937.  1135.8   9940.  1134.9   9947.
GR   1118.3    9950.    1118.3    10057.  1134.9  10058.  1134.9  10069.  1118.3  10070.
GR   1118.3   10117.    1134.9    10120.  1134.9  10129.  1118.3  10130.  1118.3  10170.
GR    1135.   10187.     1141.   10187.1

ET             9.1                                                          9825.5 10194.3
X1    347.4       37    9825.5   10194.3      30      30      30
X3        0
GR   1137.3   9438.3   1135.9    9463.5  1133.2  9489.9  1132.3  9547.2  1133.1  9596.8
GR   1132.6   9686.4   1132.5    9757.7  1131.8  9794.0  1131.9  9825.5  1118.3  9855.6
GR   1118.6   9912.5   1119.3    9950.8  1118.9 10000.0  1118.9 10003.6  1118.4 10058.9
GR   1119.1  10071.6   1118.4   10122.3  1119.2 10129.5  1118.2 10164.3  1131.5 10194.3
GR   1131.8  10208.3   1136.7   10237.5  1133.4 10321.5  1131.6 10390.5  1131.7 10436.6
GR   1132.1  10510.7   1132.4   10556.8  1132.6 10614.6  1133.1 10664.1  1134.0 10728.2
GR   1136.1  10807.7   1137.1   10864.9  1137.4 10923.4  1138.4 10955.1  1139.5 11001.3
GR   1139.1  11082.5   1138.3   11124.7

ET             9.1                                                          9404.3 10652.7
X1    352.0       53    9824.6   10232.3     430     520     460
GR   1122.6   9327.5   1123.6    9336.7  1133.2  9380.8  1137.6  9404.3  1134.2  9429.7
GR   1133.4   9448.6   1132.6    9457.6  1132.5  9491.6  1132.8  9530.2  1133.3  9568.2
GR   1133.8   9603.6   1133.1    9616.7  1133.4  9665.7  1133.6  9681.2  1132.0  9694.4
GR   1132.0   9752.4   1131.8    9784.7  1132.5  9792.7  1132.8  9812.6  1133.4  9824.6
GR   1121.9   9836.2   1121.9    9858.9  1121.8  9922.0  1122.4  9951.9  1122.5 10000.0
GR   1123.1  10046.5   1122.1   10082.6  1121.3 10116.1  1120.6 10137.4  1121.0 10148.9
GR   1120.1  10165.4   1121.9   10170.9  1121.9 10178.2  1126.7 10186.9  1126.7 10197.8
GR   1132.3  10205.8   1132.6   10220.1  1134.5 10232.3  1135.7 10263.1  1136.7 10318.0
GR   1137.5  10361.1   1138.0   10404.6  1138.4 10472.8  1139.8 10538.6  1140.2 10589.3
GR   1140.7  10652.7   1137.2   10683.8  1131.8 10702.6  1128.0 10725.6  1128.4 10733.0
GR   1140.6  10752.3   1140.0   10760.5  1140.1 10899.4

ET             9.1                                                          9400.7 10700.0
        BEGIN CHANNEL IMPROVEMETS, BOTTOM=270 Ft, SIDE SLOPES=3(H):1(V)
X1    358.0       57    9828.2   10175.7     610     600     600
CI    10000       -1                 1       1     330
GR   1137.3   9364.0   1137.6    9365.5  1137.5  9378.0  1138.8  9400.7  1135.0  9430.2
GR   1133.8   9446.8   1134.7    9471.1  1135.5  9507.4  1134.6  9530.6  1135.0  9577.3
GR   1134.6   9640.8   1134.0    9708.2  1133.6  9753.1  1134.0  9784.8  1133.8  9828.2
GR   1124.9   9836.8   1124.7    9859.5  1123.7  9875.7  1123.6  9938.8  1124.5 10000.0
GR   1125.4  10032.0   1125.1   10083.7  1126.0 10119.6  1125.3 10165.4  1133.6 10175.7
GR   1133.6  10204.5   1133.1   10269.3  1133.8 10297.5  1133.4 10335.9  1133.9 10357.1
GR   1133.5  10378.0   1133.8   10415.2  1133.4 10447.5  1133.8 10484.1  1136.1 10504.6
GR   1133.8  10532.0   1136.1   10554.4  1137.1 10593.2  1134.9 10609.0  1137.4 10623.2
GR   1137.2  10721.0   1138.4   10733.7  1138.6 10798.9  1139.5 10828.0  1140.4 10955.0
GR   1140.2  11000.6   1141.1   11035.1  1142.8 11121.7  1140.5 11148.0  1140.6 11223.2
GR   1143.7  11240.1   1141.8   11269.0  1142.6 11355.3  1130.4 11385.4  1130.7 11400.7
GR   1140.1  11422.7   1140.8   11500.1
1
```

ET		9.1							9418.2	10500.0
X1	365.0	69	9817.7	10112.7	690	700	700			
CI		-1		3	3	270				
GR	1147.1	9418.2	1147.0	9427.9	1138.3	9467.1	1134.3	9503.9	1137.8	9521.1
GR	1135.9	9541.5	1135.8	9637.5	1135.3	9728.8	1134.7	9750.7	1135.1	9760.0
GR	1134.9	9796.6	1134.2	9817.7	1126.6	9831.7	1125.7	9863.2	1126.0	9878.9
GR	1127.0	9892.6	1132.2	9905.0	1128.0	9917.0	1129.7	9925.5	1128.7	9937.5
GR	1126.2	9956.6	1123.7	9961.6	1123.7	10000.0	1123.4	10031.3	1124.6	10045.1
GR	1127.1	10057.0	1126.0	10062.0	1127.0	10084.7	1135.1	10112.7	1131.8	10130.5
GR	1134.2	10189.4	1134.0	10209.8	1134.8	10232.3	1135.2	10270.7	1135.1	10349.9
GR	1136.6	10358.7	1137.2	10420.6	1137.6	10469.6	1138.6	10520.1	1138.4	10610.8
GR	1137.8	10670.9	1138.4	10676.2	1138.3	10700.0	1137.9	10702.2	1138.0	10734.1
GR	1139.1	10742.3	1137.9	10751.4	1137.9	10782.4	1138.3	10785.8	1138.6	10809.7
GR	1137.0	10822.5	1137.5	10940.0	1137.6	11099.3	1138.1	11232.6	1138.4	11301.0
GR	1139.4	11330.9	1138.8	11358.4	1140.0	11391.3	1140.8	11405.3	1140.9	11437.6
GR	1140.3	11439.3	1140.3	11480.7	1141.0	11491.5	1140.3	11501.0	1140.8	11539.3
GR	1141.2	11543.4	1141.6	11574.5	1140.9	11584.9	1141.6	11642.5		
ET		9.1							9424.4	10780.0
X1	370.0	84	9814.5	10225.7	550	530	535			
CI		-1								
GR	1148.6	9424.4	1145.5	9444.9	1138.1	9479.9	1138.1	9503.5	1138.1	9532.0
GR	1138.1	9553.5	1138.1	9566.6	1138.1	9588.6	1140.6	9617.5	1137.9	9647.0
GR	1138.4	9668.2	1137.4	9735.8	1138.1	9754.8	1137.9	9779.3	1137.2	9792.4
GR	1138.0	9814.5	1136.5	9837.0	1132.3	9850.2	1132.7	9862.8	1130.9	9895.5
GR	1130.6	9934.5	1128.1	9970.0	1123.4	9980.0	1123.4	10000.0	1123.5	10011.2
GR	1127.2	10024.1	1127.9	10035.4	1127.8	10059.5	1128.4	10074.6	1127.9	10111.7
GR	1128.9	10125.0	1133.6	10150.9	1135.2	10173.3	1135.4	10210.0	1137.8	10225.7
GR	1138.1	10270.1	1137.6	10295.0	1137.4	10313.1	1136.9	10318.0	1137.6	10331.1
GR	1137.5	10352.5	1134.9	10392.1	1134.2	10397.7	1137.0	10427.2	1137.5	10453.1
GR	1135.8	10469.3	1137.4	10508.1	1139.2	10536.3	1138.4	10540.2	1138.7	10567.9
GR	1138.8	10597.3	1140.7	10611.3	1140.6	10688.3	1141.2	10711.2	1141.4	10766.8
GR	1141.0	10809.5	1141.2	10841.3	1140.9	10890.6	1140.1	10954.1	1140.5	10959.1
GR	1140.5	10981.2	1140.1	10983.0	1140.3	11013.7	1141.3	11024.6	1140.3	11030.5
GR	1140.4	11061.2	1140.8	11064.9	1141.2	11086.5	1140.2	11092.1	1140.2	11178.5
GR	1140.9	11195.8	1140.3	11317.2	1140.4	11363.6	1142.1	11399.0	1142.7	11444.0
GR	1143.5	11460.3	1143.9	11504.8	1144.3	11537.6	1144.3	11636.3	1144.7	11643.8
GR	1144.8	11656.6	1144.2	11658.3	1145.2	11739.8	1144.4	11802.3		
ET		9.1							9399.5	10200.0
X1	373.0	66	9834.2	10155.4	320	330	320			
CI		-1								
GR	1148.7	9399.5	1144.9	9420.7	1140.7	9452.2	1140.7	9470.0	1140.7	9497.4
GR	1140.7	9509.1	1139.7	9613.1	1139.0	9681.4	1138.3	9748.3	1138.3	9777.7
GR	1138.0	9811.6	1139.0	9834.2	1134.6	9854.2	1133.0	9882.9	1131.6	9890.4
GR	1131.8	9920.2	1129.6	9950.3	1126.5	9973.2	1124.1	10000.0	1124.1	10007.9
GR	1128.0	10026.2	1129.3	10062.1	1130.8	10110.8	1137.7	10135.2	1139.2	10155.4
GR	1139.2	10195.5	1139.5	10269.1	1138.7	10336.0	1138.9	10391.5	1138.8	10466.4
GR	1137.8	10505.0	1134.9	10529.8	1134.6	10562.7	1139.3	10603.2	1140.3	10628.7
GR	1140.5	10652.2	1142.4	10660.7	1142.2	10724.7	1142.4	10793.0	1142.6	10862.0
GR	1142.3	10933.0	1142.5	10991.4	1141.9	11039.2	1141.3	11041.2	1141.8	11065.1
GR	1142.7	11072.2	1141.5	11076.9	1141.2	11101.3	1141.7	11108.1	1141.9	11121.2
GR	1141.1	11122.5	1141.1	11131.7	1143.5	11152.5	1143.3	11205.5	1143.0	11218.6

1

GR	1143.8	11231.4	1144.8	11329.9	1145.3	11348.0	1146.2	11386.5	1145.8	11425.7
GR	1145.5	11471.1	1143.8	11477.4	1143.8	11484.2	1141.9	11500.8	1142.2	11545.1
GR	1144.4	11564.5								
ET		9.1							9831.5	10210.0

X1	377.0	56	9831.5	10197.8	400	390	400			
CI		-1								
GR	1148.1	9323.8	1139.5	9371.8	1139.6	9424.7	1140.3	9437.8	1140.6	9507.9
GR	1140.9	9541.5	1140.0	9592.5	1140.3	9616.5	1140.3	9630.8	1140.3	9648.3
GR	1140.3	9662.4	1140.3	9690.9	1140.3	9761.1	1140.9	9799.5	1142.3	9831.5
GR	1137.6	9860.5	1132.6	9888.6	1131.5	9909.6	1129.2	9948.3	1127.4	9984.8
GR	1128.0	10000.0	1128.6	10026.3	1129.4	10048.0	1133.3	10085.0	1137.5	10118.2
GR	1140.6	10166.0	1142.4	10197.8	1142.3	10244.2	1143.1	10258.0	1143.0	10272.4
GR	1138.8	10278.4	1143.3	10290.2	1143.6	10321.3	1143.3	10427.9	1143.1	10490.9
GR	1143.0	10621.9	1143.1	10713.0	1143.6	10770.9	1143.6	10844.7	1143.0	10881.3
GR	1142.3	10883.2	1143.0	10910.7	1144.1	10917.8	1142.8	10923.7	1142.9	10950.1
GR	1142.9	10957.0	1143.0	11001.8	1142.7	11020.9	1143.5	11034.6	1144.1	11057.6
GR	1143.2	11065.6	1144.3	11118.8	1142.9	11134.0	1142.6	11193.4	1144.8	11219.5
GR	1145.3	11239.0								
ET		9.1							9822.7	10210.0
X1	384.0	65	9822.6	10236.5	670	660	660			
CI		-1								
GR	1149.8	9169.7	1141.4	9211.0	1140.9	9236.1	1139.6	9250.3	1142.0	9288.4
GR	1144.1	9319.4	1144.5	9365.6	1143.8	9446.0	1143.4	9496.6	1143.9	9511.4
GR	1144.0	9571.7	1143.9	9607.8	1144.6	9626.6	1144.4	9682.8	1144.7	9744.7
GR	1144.4	9807.4	1147.4	9822.6	1144.3	9834.5	1141.8	9859.8	1137.6	9891.4
GR	1132.0	9912.0	1129.4	9925.8	1130.7	9943.0	1130.3	9978.0	1129.9	10000.0
GR	1130.2	10049.2	1129.8	10074.5	1130.4	10085.5	1130.7	10104.5	1135.3	10132.5
GR	1144.9	10175.6	1145.7	10191.7	1147.0	10205.1	1147.7	10236.5	1147.7	10272.7
GR	1147.2	10300.9	1146.0	10340.8	1146.5	10357.2	1146.7	10408.5	1145.7	10440.8
GR	1145.3	10472.9	1144.3	10538.9	1144.6	10580.9	1145.0	10587.3	1145.6	10604.4
GR	1144.9	10606.0	1145.4	10630.6	1146.1	10637.7	1145.1	10643.2	1145.1	10667.0
GR	1145.5	10670.1	1145.4	10686.9	1144.1	10707.0	1144.8	10740.0	1145.4	10789.8
GR	1146.0	10935.7	1146.6	11011.0	1147.5	11160.5	1147.6	11289.9	1148.3	11361.6
GR	1148.4	11453.1	1147.9	11504.0	1148.4	11531.7	1148.5	11560.4	1155.9	11583.3
ET		9.1							9799.9	10210.0
X1	388.0	81	9799.5	10277.2	420	400	410			
CI		-1								
GR	1151.8	9031.9	1145.5	9067.7	1145.6	9119.1	1144.5	9122.2	1146.5	9127.9
GR	1145.0	9132.5	1144.8	9172.2	1144.7	9235.8	1142.0	9281.2	1146.1	9312.1
GR	1146.8	9330.0	1146.5	9348.6	1145.9	9395.0	1146.1	9465.1	1145.8	9524.3
GR	1146.5	9549.9	1146.2	9574.3	1145.6	9616.8	1145.7	9663.4	1142.4	9675.0
GR	1140.5	9691.7	1150.1	9715.5	1148.4	9720.4	1148.2	9768.8	1148.0	9793.5
GR	1150.5	9799.5	1146.4	9807.2	1143.6	9833.3	1137.1	9880.8	1129.0	9918.8
GR	1129.8	9940.4	1132.6	9948.0	1130.2	9956.3	1131.2	9978.1	1131.4	10000.0
GR	1131.0	10061.6	1130.3	10065.8	1130.3	10096.2	1131.6	10106.4	1132.1	10114.5
GR	1141.6	10146.5	1147.1	10172.2	1147.6	10197.5	1151.4	10206.2	1152.2	10277.2
GR	1152.2	10277.3	1151.4	10309.3	1149.4	10346.9	1148.1	10392.6	1147.6	10440.5
GR	1146.7	10492.2	1145.3	10589.6	1144.1	10600.9	1145.7	10617.9	1146.7	10650.5
GR	1143.8	10661.2	1146.0	10674.5	1146.0	10695.2	1145.3	10696.6	1145.9	10728.0
GR	1146.8	10736.2	1146.1	10744.6	1146.1	10774.6	1146.6	10785.0	1146.6	10800.0
GR	1146.0	10804.0	1146.7	10869.0	1146.3	10900.6	1146.7	10928.1	1143.1	10950.2

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GR	1143.2	10960.0	1145.0	10970.3	1146.7	10998.8	1146.9	11027.1	1147.8	11075.5
GR	1147.0	11120.4	1146.4	11189.1	1145.8	11255.2	1148.7	11270.1	1149.4	11315.1
GR	1149.3	11360.6								
ET		9.1							9772.9	10210.0
X1	391.5	80	9772.5	10182.7	350	350	350			
CI		-1								
GR	1152.5	8934.9	1147.0	8966.0	1146.9	9019.2	1146.4	9037.0	1146.5	9209.6
GR	1148.0	9214.3	1146.4	9217.5	1148.7	9222.4	1146.7	9227.3	1146.5	9273.3
GR	1146.6	9330.0	1146.9	9357.3	1144.0	9367.0	1144.2	9387.7	1143.6	9421.9
GR	1147.6	9441.8	1147.8	9467.9	1147.4	9511.4	1146.6	9531.6	1147.7	9543.9
GR	1150.2	9550.0	1149.9	9606.2	1149.4	9669.5	1149.2	9733.6	1149.1	9763.3
GR	1152.9	9772.5	1147.5	9783.3	1144.2	9818.9	1137.9	9874.3	1131.7	9916.6

GR	1130.1	9959.7	1130.6	9980.0	1131.2	10000.0	1131.7	10018.5	1131.1	10045.2
GR	1131.6	10054.3	1131.0	10089.5	1132.3	10101.0	1139.2	10128.5	1147.2	10158.6
GR	1147.9	10182.7	1145.7	10207.7	1146.7	10231.7	1147.6	10325.1	1147.9	10341.7
GR	1148.6	10393.4	1147.8	10564.7	1147.7	10660.2	1147.5	10683.9	1148.9	10742.6
GR	1148.7	10797.9	1148.9	10824.0	1146.5	10832.2	1146.6	10867.9	1148.1	10877.4
GR	1147.8	10900.2	1147.3	10902.3	1147.9	10935.8	1148.7	10946.1	1147.9	10951.9
GR	1147.9	10984.5	1148.4	10992.5	1149.1	11019.5	1148.5	11060.2	1148.5	11074.2
GR	1148.9	11113.4	1148.1	11150.6	1148.6	11191.2	1148.0	11229.4	1148.8	11270.8
GR	1149.2	11282.7	1149.4	11297.2	1149.1	11315.7	1149.3	11319.3	1149.5	11351.8
GR	1148.9	11353.2	1148.8	11373.7	1149.3	11398.9	1149.7	11400.2	1149.8	11434.7
ET		9.1							9799.7	10180.0
X1	395.0	67	9799.6	10178.3	340	360	350			
CI		-1								
GR	1153.7	8887.7	1148.3	8920.2	1147.9	9074.9	1148.0	9181.0	1147.8	9289.8
GR	1147.9	9308.8	1149.8	9311.2	1147.5	9313.9	1150.3	9321.2	1149.2	9366.5
GR	1149.6	9429.8	1148.7	9475.3	1145.9	9483.1	1146.1	9533.4	1150.6	9552.5
GR	1151.1	9581.0	1151.0	9638.7	1151.1	9708.1	1150.4	9735.8	1150.3	9772.7
GR	1148.7	9799.6	1145.8	9827.3	1144.6	9848.7	1134.4	9910.7	1132.8	9953.3
GR	1131.3	9964.9	1131.5	10000.0	1131.7	10006.5	1132.5	10022.5	1132.0	10080.0
GR	1133.3	10085.7	1132.8	10090.5	1136.3	10111.1	1137.1	10126.6	1148.4	10178.3
GR	1148.7	10195.0	1135.5	10212.1	1136.1	10230.2	1149.4	10247.7	1149.6	10288.2
GR	1149.1	10326.7	1148.0	10350.4	1149.5	10403.2	1148.2	10608.4	1151.1	10630.0
GR	1150.0	10643.2	1149.7	10658.2	1148.5	10670.1	1150.6	10718.1	1150.8	10727.8
GR	1149.7	10742.8	1148.8	10808.3	1149.4	10868.2	1149.9	10943.3	1149.7	10999.3
GR	1149.3	11088.9	1149.8	11115.0	1149.3	11136.0	1148.8	11138.0	1149.1	11165.6
GR	1150.3	11176.1	1150.3	11176.3	1149.6	11180.7	1149.8	11208.8	1150.1	11212.7
GR	1150.4	11286.2	1150.1	11345.6						
ET		9.1							9755.0	10200.0
	END CHANNEL IMPROVEMENTS									
X1	402.0	57	9755.3	10166.7	725	710	720			
CI						.01				
GR	1156.1	8564.0	1156.6	8588.7	1155.3	8592.9	1154.6	8602.9	1154.9	8614.7
GR	1156.8	8622.1	1155.0	8695.1	1152.0	8719.7	1151.7	8756.8	1152.1	8763.3
GR	1152.1	8776.0	1150.9	8784.0	1150.3	9057.8	1148.5	9063.5	1152.4	9073.9
GR	1150.3	9082.4	1151.3	9090.1	1150.8	9119.9	1149.3	9128.6	1151.0	9138.7
GR	1151.2	9274.8	1152.1	9363.6	1152.3	9424.7	1152.5	9520.4	1153.1	9550.9
GR	1153.1	9610.9	1153.3	9703.3	1153.9	9722.3	1153.6	9755.3	1143.4	9814.8
GR	1134.8	9871.3	1135.0	9889.8	1133.6	9896.9	1133.8	9938.5	1133.8	10000.0
GR	1132.9	10061.1	1134.2	10066.8	1133.3	10073.9	1133.2	10085.0	1134.5	10092.4

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GR	1141.3	10122.0	1150.8	10166.7	1151.6	10209.3	1152.0	10251.6	1151.2	10280.9
GR	1150.6	10284.2	1151.0	10350.0	1151.1	10416.1	1151.9	10479.1	1151.2	10510.3
GR	1151.3	10546.0	1151.5	10581.4	1140.8	10606.4	1140.8	10614.2	1145.8	10626.9
GR	1151.0	10647.8	1150.6	10723.4						
ET		9.1							9773.3	10234.6
X1	406.0	38	9773.6	10212.3	410	390	400			
GR	1161.1	8418.3	1161.0	8425.0	1158.6	8441.3	1159.4	8452.7	1161.2	8462.3
GR	1158.2	8547.6	1153.2	8586.3	1152.9	8609.8	1152.7	8836.4	1152.9	8975.7
GR	1154.3	8978.5	1151.5	8983.0	1154.0	8987.1	1153.6	8998.2	1153.9	9028.2
GR	1154.1	9132.8	1153.5	9172.2	1154.1	9237.3	1153.5	9340.8	1150.7	9353.2
GR	1153.8	9370.1	1154.8	9483.4	1155.9	9672.5	1155.6	9712.9	1156.2	9743.7
GR	1155.5	9773.6	1142.2	9846.7	1134.4	9896.8	1135.5	9902.3	1135.5	9961.2
GR	1134.3	10000.0	1134.7	10061.2	1136.1	10083.7	1143.2	10116.0	1149.5	10152.3
GR	1151.0	10196.1	1154.3	10212.3	1154.5	10234.6				
ET		9.1							9800.3	10199.2
X1	409.0	70	9834.6	10199.2	380	275	310			
GR	1160.2	8134.3	1159.8	8153.9	1159.7	8178.5	1159.9	8184.4	1161.2	8215.1
GR	1157.7	8250.1	1157.6	8307.5	1156.0	8314.6	1155.7	8425.3	1155.4	8452.9
GR	1155.3	8573.1	1154.7	8668.0	1154.8	8731.2	1156.0	8735.7	1153.3	8739.2

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GR   1155.9    8743.6    1154.3    8752.3    1153.3    8854.7    1153.2    8898.2    1154.4    8958.4
GR   1154.3    9052.4    1154.1    9156.8    1153.3    9212.4    1152.9    9316.4    1152.9    9385.8
GR   1152.9    9436.4    1150.6    9453.5    1150.6    9468.5    1151.4    9526.8    1152.5    9561.9
GR   1156.5    9577.0    1156.5    9613.3    1158.8    9684.3    1159.1    9771.4    1160.0    9834.6
GR   1159.9    9839.6    1146.0    9884.0    1133.6    9915.7    1135.7    9933.5    1135.9   10000.0
GR   1135.9   10100.5    1145.1   10139.0    1155.1   10172.4    1157.5   10199.2    1155.8   10219.5
GR   1151.4   10252.2    1152.6   10301.4    1152.5   10344.8    1155.0   10358.9    1155.6   10446.3
GR   1155.9   10509.9    1152.3   10520.4    1151.8   10579.2    1152.7   10622.3    1153.0   10692.5
GR   1152.4   10776.6    1152.3   10848.0    1146.8   10870.5    1151.7   10891.8    1151.2   10934.3
GR   1151.2   11011.0    1151.2   11108.6    1150.9   11211.5    1151.3   11310.1    1151.4   11389.4
GR   1151.2   11433.5    1151.8   11449.1    1152.0   11481.8    1154.2   11549.2    1158.5   11586.2

ET             9.1                                                                    9800.0   10148.0
SB     1.05    1.56       2.9       0     167.33       18    3913.31      2.44    1135.6    1135.2
         THUNDER BIRD ROAD BRIDGE
X1   409.82      35      9852   10148       91       91       91       0.0
X2        0       0         1  1155.4   1163.5        0        0         0     .89         0
BT       -5    9852    1163.7  1155.3     9922   1163.5   1155.6      9997   1163.3    1155.6
BT             10072    1163.1  1155.4    10148   1163.0   1154.6
GR   1161.7    8100    1160.2    8300   1159.0     8500   1157.8      8720   1157.3      8920
GR   1157.2    8930    1156.5    9140   1156.7     9370     1158      9500     1160      9600
GR   1161.5    9852      1138    9890     1136     9900   1135.9      9922   1135.9      9923
GR   1135.9    9927    1135.9    9928   1135.8     9997   1135.7      9998   1135.7     10002
GR   1135.6   10003    1135.8   10072   1135.7    10073   1135.7     10077   1135.6     10078
GR     1136   10095    1160.6   10148     1160    10260     1158     10380     1156     10470
GR     1154   10570      1152   10700   1150.4    10880   1151.7     11380   1151.9     11730

ET             9.1                                                                    9807.0   10166.6
X1   410.0      57    9833.4   10166.6       20       20       20
X3       0
GR   1158.5    8597.1    1158.4    8616.2    1158.0    8651.2    1157.2    8711.4    1156.6    8751.2
GR   1156.3    8874.1    1154.1    8884.4    1155.8    8898.6    1155.3    8901.1    1154.9    8942.6
GR   1155.7    8952.3    1156.2    9020.9    1156.4    9073.5    1155.8    9145.6    1155.5    9169.5
1
   28AUG91      17:28:10                                                                          PAGE    8

GR   1156.0    9187.8    1155.7    9244.8    1155.0    9261.6    1155.9    9281.2    1154.3    9343.2
GR   1153.9    9424.4    1153.7    9508.1    1152.8    9566.5    1152.2    9617.9    1153.6    9656.5
GR   1153.9    9723.0    1154.0    9732.1    1156.1    9768.2    1158.9    9807.3    1159.4    9833.4
GR   1159.3    9843.7    1135.6    9898.5    1136.1   10000.0    1137.1   10092.1    1136.3   10097.6
GR   1152.5   10139.6    1156.8   10156.8    1157.5   10166.6    1155.3   10190.9    1154.1   10415.2
GR   1153.7   10512.0    1153.0   10615.8    1152.5   10692.0    1152.0   10740.3    1151.4   10832.6
GR   1151.7   10885.2    1150.1   10902.5    1149.4   10905.5    1149.9   10945.2    1149.6   10982.0
GR   1150.2   10984.7    1150.2   11001.1    1151.8   11002.7    1151.9   11056.2    1151.7   11090.2
GR   1151.8   11280.8    1152.1   11452.3

ET             9.1                                                                    9800.3   10230.0
         BEGIN CHANNEL IMPROVEMENTS, BOTTOM=278 Ft, SIDE SLOPES=3(H):1(V)
X1   412.0      64    9833.8   10202.8      170      290      210
CI   10015    1136.2       0         3        3      200
GR   1160.0    8285.3    1160.3    8343.2    1159.7    8361.3    1160.9    8364.7    1159.7    8368.3
GR   1159.5    8387.7    1157.5    8397.7    1158.3    8403.0    1157.6    8493.1    1156.5    8561.2
GR   1156.2    8594.1    1158.2    8655.8    1158.7    8691.4    1157.8    8731.5    1158.0    8773.5
GR   1157.2    8798.5    1156.6    8827.8    1156.7    8910.4    1157.1    8950.6    1153.9    8961.2
GR   1156.1    8973.8    1155.2    8976.7    1154.9    9018.2    1155.8    9027.0    1156.4    9063.0
GR   1156.5    9150.5    1156.3    9189.1    1155.9    9222.6    1155.6    9244.1    1155.8    9291.8
GR   1155.7    9338.8    1156.1    9357.8    1153.9    9383.5    1154.3    9473.7    1154.0    9565.1
GR   1153.7    9627.1    1152.1    9675.8    1153.9    9693.2    1154.1    9765.8    1157.6    9798.7
GR   1158.1    9821.3    1158.1    9833.8    1151.1    9863.5    1141.5    9896.3    1135.4    9923.2
GR   1135.1    9966.3    1136.9   10000.0    1137.9   10020.9    1137.9   10039.2    1136.0   10050.3
GR   1137.2   10081.2    1143.1   10111.3    1153.3   10159.8    1156.0   10187.6    1157.6   10202.8
GR   1157.3   10280.7    1156.8   10372.5    1156.4   10474.9    1155.9   10597.2    1155.7   10677.3
GR   1154.9   10731.5    1155.4   10769.0    1154.7   10842.0    1155.1   10891.5

ET             9.1                                                                    9770.0   10250.0
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X1	418.0	60	9770.0	10204.3	500	560	520			
CI	9990	1136.53	0	3	3	278	1165.0			
GR	1159.8	8429.5	1159.8	8455.6	1159.4	8494.3	1161.3	8498.2	1159.6	8503.7
GR	1159.3	8522.3	1158.3	8531.1	1156.8	8685.3	1156.3	8736.1	1157.3	8775.3
GR	1158.1	8794.0	1158.3	8871.3	1157.8	8924.9	1157.6	8984.2	1156.8	8988.4
GR	1157.4	8993.2	1156.8	9063.6	1156.3	9111.3	1156.5	9158.8	1156.3	9208.2
GR	1157.3	9216.2	1157.3	9275.7	1156.7	9311.7	1157.6	9379.1	1157.4	9413.3
GR	1155.5	9423.3	1155.6	9436.6	1157.5	9447.5	1158.4	9545.9	1158.2	9595.6
GR	1156.3	9602.4	1156.5	9716.5	1156.7	9751.5	1160.3	9770.0	1159.9	9800.1
GR	1158.2	9815.5	1148.5	9866.0	1141.0	9914.6	1135.8	9940.1	1135.9	9961.4
GR	1137.3	9971.4	1137.9	10000.0	1139.3	10027.4	1136.8	10031.8	1136.8	10064.5
GR	1143.6	10103.8	1151.0	10144.8	1156.7	10185.3	1160.9	10204.3	1160.1	10217.3
GR	1160.7	10242.9	1161.1	10244.9	1161.1	10258.0	1160.3	10260.0	1159.9	10286.0
GR	1160.3	10296.3	1160.3	10356.1	1160.3	10427.1	1160.4	10499.0	1160.7	10533.5
ET		9.1							9790.3	10200.0
X1	423.0	64	9790.9	10195.1	500	550	520			
CI	9990	1136.80	0	3	3	278				
GR	1159.4	8489.3	1159.4	8523.7	1159.2	8577.4	1161.4	8589.8	1159.0	8610.3
GR	1160.4	8621.1	1160.5	8634.8	1161.8	8642.1	1161.8	8655.2	1159.2	8662.0
GR	1158.5	8759.0	1158.1	8801.7	1158.5	8827.1	1158.3	8887.4	1158.7	8917.4
GR	1158.9	8934.2	1158.3	8937.9	1158.2	8965.9	1157.6	9000.5	1156.7	9035.6
GR	1157.6	9072.8	1158.7	9083.6	1158.7	9144.3	1159.0	9161.7	1158.9	9183.0
GR	1157.3	9205.8	1157.8	9213.9	1158.2	9245.0	1157.8	9253.8	1157.9	9320.3
GR	1157.9	9446.3	1158.3	9564.7	1158.2	9631.6	1158.5	9711.1	1159.1	9747.8

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GR	1161.4	9766.9	1161.6	9790.9	1156.4	9822.2	1148.6	9867.4	1144.4	9892.5
GR	1141.1	9924.3	1136.6	9938.8	1136.7	9968.1	1138.3	9976.2	1138.2	10000.0
GR	1138.7	10005.7	1139.8	10011.5	1139.3	10033.5	1137.1	10042.9	1137.6	10061.6
GR	1148.5	10116.0	1154.7	10155.3	1162.4	10195.1	1162.4	10208.9	1161.7	10210.5
GR	1162.3	10235.2	1162.6	10237.4	1162.8	10250.4	1162.0	10252.6	1161.8	10278.6
GR	1161.7	10308.2	1162.0	10333.1	1163.3	10369.6	1164.1	10472.5		
ET		9.1							9744.8	10250.0
X1	428.0	60	9744.7	10204.4	490	520	500			
CI	9990	1137.06	0	3	3	278				
GR	1163.6	8411.8	1164.6	8425.6	1161.5	8474.4	1161.3	8506.7	1160.7	8509.9
GR	1160.5	8680.1	1160.5	8842.3	1160.5	8992.0	1161.4	8996.8	1161.2	9018.7
GR	1161.4	9024.0	1157.9	9042.2	1159.3	9050.8	1158.8	9056.9	1158.7	9101.6
GR	1158.8	9180.6	1158.6	9237.0	1158.3	9245.0	1158.9	9260.6	1159.4	9332.3
GR	1159.7	9456.6	1160.2	9601.7	1160.8	9646.8	1160.6	9668.5	1162.1	9676.2
GR	1159.6	9681.5	1160.4	9691.7	1161.6	9744.7	1161.2	9784.7	1158.3	9800.9
GR	1151.9	9819.5	1151.2	9833.2	1149.5	9841.5	1149.8	9864.6	1142.4	9905.9
GR	1137.6	9936.5	1138.2	9977.0	1140.0	9987.9	1140.0	10000.0	1140.5	10027.3
GR	1138.5	10033.5	1139.2	10063.9	1142.4	10081.3	1153.7	10140.9	1163.3	10192.5
GR	1163.0	10204.4	1162.2	10206.3	1163.0	10231.8	1163.3	10234.2	1163.5	10245.9
GR	1162.7	10248.0	1162.7	10274.4	1163.1	10279.7	1160.0	10293.5	1161.7	10305.7
GR	1162.6	10363.8	1163.0	10365.4	1164.1	10430.7	1163.5	10649.4	1163.4	10716.4
ET		9.1							9761.8	10201.9
X1	434.0	59	9761.8	10201.9	590	620	600			
CI	9990	1137.37	0	3	3	278				
GR	1163.7	8368.0	1163.2	8386.4	1162.8	8426.3	1162.8	8662.4	1162.9	8851.5
GR	1163.0	9034.3	1163.0	9211.4	1164.6	9218.3	1162.7	9221.5	1164.0	9225.5
GR	1163.9	9236.3	1162.3	9243.8	1162.1	9403.4	1161.9	9564.7	1163.1	9579.3
GR	1163.2	9592.5	1161.0	9598.5	1163.3	9605.3	1161.7	9616.6	1162.1	9637.7
GR	1162.7	9667.1	1163.1	9695.0	1162.1	9729.1	1162.9	9737.4	1163.0	9761.8
GR	1159.3	9769.9	1157.0	9784.4	1152.6	9796.8	1152.4	9815.6	1151.6	9830.4
GR	1152.6	9855.3	1143.3	9911.7	1141.6	9929.4	1138.1	9941.6	1138.2	9969.5
GR	1139.9	9973.1	1140.6	10000.0	1141.0	10023.9	1140.5	10041.2	1139.5	10044.2
GR	1139.5	10069.5	1141.3	10078.6	1148.4	10118.3	1158.6	10177.8	1164.1	10201.9
GR	1163.8	10214.4	1163.4	10216.3	1163.9	10251.6	1164.3	10252.7	1164.4	10256.3
GR	1163.8	10258.6	1163.6	10284.4	1163.9	10289.1	1163.3	10292.1	1163.5	10308.6

GR	1163.4	10347.2	1164.0	10367.5	1163.2	10449.8	1162.8	10599.0		
ET		9.1							9783.5	10215.2
X1	440.0	46	9783.5	10215.2	610	610	610			
CI	9990	1137.69	0	3	3	278				
GR	1167.4	8348.4	1167.0	8354.1	1165.4	8359.3	1164.7	8423.7	1164.9	8625.9
GR	1165.0	8764.6	1166.4	8770.8	1164.6	8773.6	1166.6	8778.5	1166.8	8788.9
GR	1165.2	8796.8	1164.8	8907.5	1165.6	9288.3	1164.7	9427.8	1164.7	9561.8
GR	1165.2	9670.6	1164.8	9680.5	1165.2	9693.4	1163.2	9697.3	1165.7	9702.0
GR	1165.6	9714.6	1166.6	9720.3	1167.3	9783.5	1167.2	9822.3	1153.4	9881.8
GR	1143.2	9932.2	1143.3	10000.0	1141.9	10042.3	1139.5	10053.3	1139.6	10079.0
GR	1142.3	10088.0	1142.5	10097.4	1150.1	10130.9	1162.2	10197.7	1166.4	10215.2
GR	1166.1	10229.7	1165.4	10231.1	1166.0	10256.5	1166.4	10258.2	1166.3	10271.2
GR	1165.6	10272.7	1165.6	10298.5	1165.9	10301.3	1166.3	10331.7	1166.6	10479.4
GR	1165.7	10543.1								

1

ET		9.1							9809.5	10208.3
X1	445.5	56	9809.5	10208.3	560	560	560			
CI	9990	1137.98	0	3	3	278				
GR	1169.4	8475.7	1168.6	8498.0	1166.9	8508.6	1167.1	8558.8	1167.9	8565.4
GR	1168.5	8573.4	1166.3	8576.1	1168.5	8581.8	1167.0	8591.8	1167.6	8731.7
GR	1167.6	9132.3	1167.2	9517.7	1166.7	9659.6	1167.4	9670.8	1164.2	9676.0
GR	1167.3	9682.4	1166.9	9689.2	1167.8	9700.6	1168.2	9774.6	1168.4	9809.5
GR	1162.7	9840.3	1151.7	9896.5	1149.0	9904.3	1144.1	9929.2	1142.3	9945.6
GR	1140.5	9955.1	1141.8	9972.4	1141.2	10000.0	1141.0	10004.0	1142.0	10013.4
GR	1141.3	10042.8	1142.8	10049.0	1145.6	10070.8	1146.1	10088.3	1145.5	10097.1
GR	1147.9	10108.7	1147.9	10114.2	1149.4	10119.2	1162.8	10181.1	1168.2	10208.3
GR	1167.5	10229.5	1166.3	10240.7	1166.8	10266.9	1167.2	10269.9	1166.9	10282.5
GR	1166.3	10283.6	1166.2	10309.5	1166.4	10312.5	1166.3	10326.5	1168.2	10338.3
GR	1167.1	10372.7	1164.2	10409.2	1163.5	10443.7	1163.3	10491.5	1160.1	10504.5
GR	1160.1	10591.0								
ET		9.1							9818.2	10218.3
X1	449.1	59	9818.2	10218.3	370	370	370			
CI	9990	1138.17	0	3	3	278				
GR	1171.5	8663.0	1171.3	8663.3	1169.2	8680.0	1168.8	8718.2	1169.8	8726.4
GR	1169.9	8735.3	1167.8	8738.8	1170.0	8744.4	1168.4	8747.5	1168.8	9112.7
GR	1168.1	9503.3	1167.8	9634.7	1167.2	9641.7	1167.5	9653.1	1165.3	9657.6
GR	1168.3	9665.4	1167.4	9674.0	1168.3	9682.5	1168.5	9720.0	1168.9	9763.0
GR	1169.1	9818.2	1163.1	9836.0	1157.0	9878.6	1150.5	9903.5	1150.4	9927.2
GR	1147.0	9946.7	1150.8	9959.3	1151.0	10000.0	1150.9	10021.0	1149.2	10035.7
GR	1149.2	10048.9	1145.3	10068.3	1152.1	10093.5	1152.5	10126.8	1153.5	10132.1
GR	1151.7	10136.7	1159.4	10177.1	1169.4	10218.3	1168.9	10233.1	1167.8	10254.7
GR	1167.1	10275.5	1167.2	10306.6	1167.8	10314.3	1166.8	10350.5	1166.6	10388.9
GR	1168.3	10397.6	1167.5	10414.7	1167.3	10431.4	1166.5	10433.0	1165.8	10478.3
GR	1165.4	10508.4	1165.8	10510.5	1166.5	10551.4	1166.6	10615.4	1165.9	10638.3
GR	1166.2	10674.7	1166.6	10684.3	1166.1	10764.6	1165.6	10882.0		
ET		9.1							9818.3	10209.2
X1	451.0	66	9818.3	10209.2	190	160	180			
CI	9990	1138.26	0	3	3	278				
GR	1173.3	8803.7	1173.1	8803.8	1171.1	8818.8	1170.1	8847.1	1170.1	8872.1
GR	1170.6	8877.3	1170.6	8893.8	1168.3	8897.5	1170.0	8902.6	1169.3	8905.9
GR	1169.1	9314.9	1168.7	9505.9	1168.6	9525.2	1166.6	9530.3	1170.2	9538.8
GR	1168.6	9542.1	1168.6	9587.4	1168.2	9611.3	1170.1	9634.9	1170.6	9654.4
GR	1167.6	9678.5	1164.3	9706.3	1163.6	9733.2	1163.8	9762.5	1166.0	9781.3
GR	1166.1	9793.2	1167.5	9798.7	1167.5	9818.3	1154.1	9846.2	1152.1	9867.7
GR	1152.1	9935.7	1150.2	10000.0	1149.5	10006.0	1150.3	10014.2	1150.0	10032.5
GR	1150.8	10044.2	1150.4	10069.8	1152.3	10082.3	1152.7	10126.9	1155.2	10142.5
GR	1162.6	10178.4	1169.7	10209.2	1169.3	10239.8	1168.2	10244.1	1168.3	10262.5
GR	1168.4	10337.7	1167.8	10350.4	1167.7	10389.8	1168.5	10413.0	1168.8	10486.4
GR	1168.4	10518.6	1167.2	10523.3	1167.2	10531.3	1166.5	10532.7	1166.2	10564.0

GR	1163.4	10347.2	1164.0	10367.5	1163.2	10449.8	1162.8	10599.0		
ET		9.1							9783.5	10215.2
X1	440.0	46	9783.5	10215.2	610	610	610			
CI	9990	1137.69	0	3	3	278				
GR	1167.4	8348.4	1167.0	8354.1	1165.4	8359.3	1164.7	8423.7	1164.9	8625.9
GR	1165.0	8764.6	1166.4	8770.8	1164.6	8773.6	1166.6	8778.5	1166.8	8788.9
GR	1165.2	8796.8	1164.8	8907.5	1165.6	9288.3	1164.7	9427.8	1164.7	9561.8
GR	1165.2	9670.6	1164.8	9680.5	1165.2	9693.4	1163.2	9697.3	1165.7	9702.0
GR	1165.6	9714.6	1166.6	9720.3	1167.3	9783.5	1167.2	9822.3	1153.4	9881.8
GR	1143.2	9932.2	1143.3	10000.0	1141.9	10042.3	1139.5	10053.3	1139.6	10079.0
GR	1142.3	10088.0	1142.5	10097.4	1150.1	10130.9	1162.2	10197.7	1166.4	10215.2
GR	1166.1	10229.7	1165.4	10231.1	1166.0	10256.5	1166.4	10258.2	1166.3	10271.2
GR	1165.6	10272.7	1165.6	10298.5	1165.9	10301.3	1166.3	10331.7	1166.6	10479.4
GR	1165.7	10543.1								

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ET		9.1							9809.5	10208.3
X1	445.5	56	9809.5	10208.3	560	560	560			
CI	9990	1137.98	0	3	3	278				
GR	1169.4	8475.7	1168.6	8498.0	1166.9	8508.6	1167.1	8558.8	1167.9	8565.4
GR	1168.5	8573.4	1166.3	8576.1	1168.5	8581.8	1167.0	8591.8	1167.6	8731.7
GR	1167.6	9132.3	1167.2	9517.7	1166.7	9659.6	1167.4	9670.8	1164.2	9676.0
GR	1167.3	9682.4	1166.9	9689.2	1167.8	9700.6	1168.2	9774.6	1168.4	9809.5
GR	1162.7	9840.3	1151.7	9896.5	1149.0	9904.3	1144.1	9929.2	1142.3	9945.6
GR	1140.5	9955.1	1141.8	9972.4	1141.2	10000.0	1141.0	10004.0	1142.0	10013.4
GR	1141.3	10042.8	1142.8	10049.0	1145.6	10070.8	1146.1	10088.3	1145.5	10097.1
GR	1147.9	10108.7	1147.9	10114.2	1149.4	10119.2	1162.8	10181.1	1168.2	10208.3
GR	1167.5	10229.5	1166.3	10240.7	1166.8	10266.9	1167.2	10269.9	1166.9	10282.5
GR	1166.3	10283.6	1166.2	10309.5	1166.4	10312.5	1166.3	10326.5	1168.2	10338.3
GR	1167.1	10372.7	1164.2	10409.2	1163.5	10443.7	1163.3	10491.5	1160.1	10504.5
GR	1160.1	10591.0								
ET		9.1							9818.2	10218.3
X1	449.1	59	9818.2	10218.3	370	370	370			
CI	9990	1138.17	0	3	3	278				
GR	1171.5	8663.0	1171.3	8663.3	1169.2	8680.0	1168.8	8718.2	1169.8	8726.4
GR	1169.9	8735.3	1167.8	8738.8	1170.0	8744.4	1168.4	8747.5	1168.8	9112.7
GR	1168.1	9503.3	1167.8	9634.7	1167.2	9641.7	1167.5	9653.1	1165.3	9657.6
GR	1168.3	9665.4	1167.4	9674.0	1168.3	9682.5	1168.5	9720.0	1168.9	9763.0
GR	1169.1	9818.2	1163.1	9836.0	1157.0	9878.6	1150.5	9903.5	1150.4	9927.2
GR	1147.0	9946.7	1150.8	9959.3	1151.0	10000.0	1150.9	10021.0	1149.2	10035.7
GR	1149.2	10048.9	1145.3	10068.3	1152.1	10093.5	1152.5	10126.8	1153.5	10132.1
GR	1151.7	10136.7	1159.4	10177.1	1169.4	10218.3	1168.9	10233.1	1167.8	10254.7
GR	1167.1	10275.5	1167.2	10306.6	1167.8	10314.3	1166.8	10350.5	1166.6	10388.9
GR	1168.3	10397.6	1167.5	10414.7	1167.3	10431.4	1166.5	10433.0	1165.8	10478.3
GR	1165.4	10508.4	1165.8	10510.5	1166.5	10551.4	1166.6	10615.4	1165.9	10638.3
GR	1166.2	10674.7	1166.6	10684.3	1166.1	10764.6	1165.6	10882.0		
ET		9.1							9818.3	10209.2
X1	451.0	66	9818.3	10209.2	190	160	180			
CI	9990	1138.26	0	3	3	278				
GR	1173.3	8803.7	1173.1	8803.8	1171.1	8818.8	1170.1	8847.1	1170.1	8872.1
GR	1170.6	8877.3	1170.6	8893.8	1168.3	8897.5	1170.0	8902.6	1169.3	8905.9
GR	1169.1	9314.9	1168.7	9505.9	1168.6	9525.2	1166.6	9530.3	1170.2	9538.8
GR	1168.6	9542.1	1168.6	9587.4	1168.2	9611.3	1170.1	9634.9	1170.6	9654.4
GR	1167.6	9678.5	1164.3	9706.3	1163.6	9733.2	1163.8	9762.5	1166.0	9781.3
GR	1166.1	9793.2	1167.5	9798.7	1167.5	9818.3	1154.1	9846.2	1152.1	9867.7
GR	1152.1	9935.7	1150.2	10000.0	1149.5	10006.0	1150.3	10014.2	1150.0	10032.5
GR	1150.8	10044.2	1150.4	10069.8	1152.3	10082.3	1152.7	10126.9	1155.2	10142.5
GR	1162.6	10178.4	1169.7	10209.2	1169.3	10239.8	1168.2	10244.1	1168.3	10262.5
GR	1168.4	10337.7	1167.8	10350.4	1167.7	10389.8	1168.5	10413.0	1168.8	10486.4
GR	1168.4	10518.6	1167.2	10523.3	1167.2	10531.3	1166.5	10532.7	1166.2	10564.0

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GR   1165.4    10611.2     1166.6    10626.5     1166.3    10685.6     1166.5    10701.7     1165.7    10739.5
GR   1165.3    10743.8     1165.7    10780.6     1166.4    10794.9     1165.4    10857.6     1165.0    10866.2
GR   1165.3    10905.3
1
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ET                9.1                                                                                   9760      10220
         PROPOSED DROP STRUCTURE, DROP HEIGHT=14 Ft.
X1    451.1         0     9760.0    10200.0          5          5          5          0          0
CI     9990    1152.26          0         3          3   -1152.26

ET                9.1                                                                                  9306.5    10231.7
         END CHANNEL IMPROVEMETS
X1    457.0        28     9306.5    10231.7        800        400        575
CI     9990                                                   .01
GR   1181.3     9224.2     1180.7     9260.4     1176.6     9280.6     1172.0     9306.5     1171.2     9334.7
GR   1170.7     9399.0     1169.4     9468.8     1167.9     9544.0     1167.8     9572.0     1159.1     9590.5
GR   1154.2     9610.5     1154.0     9713.4     1153.0    10000.0     1153.2    10009.5     1152.1    10016.7
GR   1152.1    10031.3     1154.3    10038.5     1154.0    10047.5     1154.8    10059.4     1154.2    10093.0
GR   1156.5    10103.0     1156.2    10146.9     1154.7    10152.0     1156.4    10163.9     1161.2    10186.1
GR   1172.0    10231.7     1171.5    10313.3     1170.2    10405.5


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


*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO 337.000
         NEW RIVER CHANNELIZATION BY CORPS & ADOT ARE REFLECTED NEAR GRAND
         AVENUE AND AGUA FRIA FREEWAY ON THE NEW TOPOGRAPHIC MAPS BY THE
         DISTRICT. THE MAPS WERE PREPARED BY KAMINSKI-HUBBARD/KENNEY AERIAL
         MAPPING COMPANY DATED APRIL 1991.
         STATIONING ARE IN 100FT STATIONS FROM THE CONFLUENCE WITH AGUA FRIA
         RIVER. (EXAMPLE 337.0= 33700 FT )
         STARTING WATER SURFACE PER SPF DATA BY COE & VAN LOO DATED DEC 1989
   337.000     14.08   1126.48       .00     26.50   1129.91      3.43       .00       .00   1130.80
   69000.0        .0   69000.0        .0        .0    4642.5        .0        .0        .0   1130.20
       .00       .00     14.86       .00      .000      .035      .000      .000   1112.40   9811.14
   .004206        0.        0.        0.         0         0         8       .00    360.22  10171.36


CCHV=     .100 CEHV=     .300
*SECNO 342.000

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=      1132.00 ELREA=      1131.80

   342.000     13.62   1128.42       .00       .00   1131.77      3.36      1.86       .01   1132.00
   68000.0        .0   68000.0        .0        .0    4624.9        .0      54.3       4.3   1131.80
       .01       .00     14.70       .00      .000      .030      .000      .000   1114.80   9858.14
   .003180      500.      510.      520.         2         0         0       .00    372.58  10230.72


*SECNO 343.700
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3301 HV CHANGED MORE THAN HVINS

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1132.80 ELREA= 1133.10

343.700	12.73	1128.53	.00	.00	1132.66	4.12	.65	.23	1132.80
68000.0	.0	68000.0	.0	.0	4172.2	.0	72.4	5.8	1133.10
.01	.00	16.30	.00	.000	.030	.000	.000	1115.80	9843.52
.004178	140.	180.	220.	2	0	0	.00	354.11	10197.63

*SECNO 345.500

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

3301 HV CHANGED MORE THAN HVINS

7185 MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

345.500	11.37	1128.67	1128.67	.00	1134.09	5.42	.96	.39	1137.10
68000.0	.0	68000.0	.0	.0	3640.2	.0	89.5	7.3	1136.40
.02	.00	18.68	.00	.000	.030	.000	.000	1117.30	9840.76
.006181	180.	190.	200.	3	11	0	.00	339.75	10180.51

SPECIAL BRIDGE

5227 DOWNSTREAM ELEV IS 1125.77 , NOT 1128.67 HYDRAULIC JUMP OCCURS DOWNSTREAM (IF LOW FLOW CONTROLS)

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	1.10	1.56	2.90	.00	330.00	36.50	5279.00	1.00	1117.50	1117.30

*SECNO 345.800

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.84

CLASS B LOW FLOW

3420 BRIDGE W.S.= 1129.10 BRIDGE VELOCITY= 19.05 CALCULATED CHANNEL AREA= 3539.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
1132.69	1135.55	.00	0.	68000.	5279.	5213.	1134.30	1141.90	0.

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 1140.50 ELREA= 1140.50

GRAND AVENUE BRIDGE

345.800	15.70	1133.10	.00	.00	1135.55	2.45	1.46	.00	1134.30
68000.0	.0	68000.0	.0	.0	5414.3	.0	93.6	7.6	1134.30
.02	.00	12.56	.00	.000	.030	.000	.000	1117.40	9825.05
.001818	40.	40.	40.	0	0	0	.00	359.90	10184.95

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

*SECNO 346.100

346.100	15.36	1132.86	.00	.00	1135.71	2.85	.04	.12	1138.30
68000.0	.0	68000.0	.0	.0	5020.4	.0	96.0	7.8	1137.70
.02	.00	13.54	.00	.000	.030	.000	.000	1117.50	9833.05
.002250	20.	20.	20.	2	0	0	.00	353.64	10186.69

*SECNO 346.400

3265 DIVIDED FLOW

3370 NORMAL BRIDGE, NRD= 4 MIN ELTRD= 1141.40 MAX ELLC= 1136.00

346.400	15.20	1132.90	.00	.00	1135.84	2.94	.11	.03	1136.00
68000.0	.0	68000.0	.0	.0	4943.2	.0	100.6	8.1	1141.00
.02	.00	13.76	.00	.000	.030	.000	.000	1117.70	9825.88
.003363	40.	40.	40.	2	0	0	.00	342.39	10184.94

*SECNO 346.800

3470 ENCROACHMENT STATIONS= 9827.0 10187.3 TYPE= 1 TARGET= 360.300

346.800	14.84	1132.94	.00	.00	1135.93	2.98	.07	.01	1134.20
68000.0	.0	68000.0	.0	.0	4905.2	.0	103.4	8.3	100000.00
.02	.00	13.86	.00	.000	.030	.000	.000	1118.10	9829.16
.002464	25.	25.	25.	2	0	0	.00	358.14	10187.30

*SECNO 347.100

3265 DIVIDED FLOW

3301 HV CHANGED MORE THAN HVINS

3370 NORMAL BRIDGE, NRD= 4 MIN ELTRD= 1141.40 MAX ELLC= 1135.80

347.100	14.06	1132.36	.00	.00	1136.32	3.96	.10	.29	1141.00
68000.0	.0	68000.0	.0	.0	4259.2	.0	106.6	8.5	1141.00
.02	.00	15.97	.00	.000	.030	.000	.000	1118.30	9826.57
.004984	30.	30.	30.	3	0	0	.00	321.84	10184.32

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

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*SECNO 347.400

3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.54


3470 ENCROACHMENT STATIONS=     9825.5   10194.3  TYPE=      1  TARGET=     368.800
   347.400     15.70   1133.90      .00       .00   1136.54      2.65       .09       .13   1131.90
   68000.0       .0   68000.0       .0        .0    5207.0        .0     109.8       8.8 100000.00
       .02       .00     13.06      .00      .000      .030      .000      .000   1118.20   9825.50
   .002112      30.       30.      30.         3         0         0       .00    368.80  10194.30


*SECNO 352.000

3470 ENCROACHMENT STATIONS=     9404.3   10652.7  TYPE=      1  TARGET=    1248.400
   352.000     14.83   1134.93      .00       .00   1137.72      2.79      1.13       .04   1133.40
   68000.0    2584.6   65413.8      1.6     842.1    4791.9       2.5     166.8      14.9   1134.50
       .03      3.07     13.65      .65      .045      .030      .045      .000   1120.10   9424.19
   .002919      430.      460.     520.         3         0         0       .00    819.32  10243.52


*SECNO 358.000
CHIMP CLSTA=   10000.00 CELCH=    1123.60 BW=     330.00 STCHL=    9824.78 STCHR=   10175.70
EXCAVATION DATA
AEX=     396.5SQ-FT     VEXR=        .0K*CU-YD     VEXT=        .0K*CU-YD


3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=     9400.7   10700.0  TYPE=      1  TARGET=    1299.300
        BEGIN CHANNEL IMPROVEMETS, BOTTOM=270 Ft, SIDE SLOPES=3(H):1(V)
   358.000     13.23   1136.83      .00       .00   1139.37      2.54      1.62       .02   1133.82
   68000.0    2901.8   61022.3   4075.9     963.3    4534.5    1178.0     251.8      28.9   1133.60
       .04      3.01     13.46     3.46      .045      .030      .045      .000   1123.60   9415.99
   .002510      610.      600.     600.         3         0         0       .00   1191.55  10619.96


*SECNO 365.000
CHIMP CLSTA=   10000.00 CELCH=    1123.40 BW=     270.00 STCHL=    9817.70 STCHR=   10164.34
1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


EXCAVATION DATA
AEX=    1140.4SQ-FT     VEXR=      19.9K*CU-YD     VEXT=      19.9K*CU-YD


3470 ENCROACHMENT STATIONS=     9418.2   10500.0  TYPE=      1  TARGET=    1081.800
   365.000     15.32   1138.72      .00       .00   1140.89      2.17      1.48       .04   1134.20
   68000.0    3257.4   61642.8   3099.8    1078.7    4985.7     969.8     361.7      46.7   1133.18
       .06      3.02     12.36     3.20      .045      .030      .045      .000   1123.40   9465.22
   .001808      690.      700.     700.         0         0         0       .00   1034.78  10500.00


*SECNO 370.000
CHIMP CLSTA=   10000.00 CELCH=    1123.40 BW=     270.00 STCHL=    9814.50 STCHR=   10225.70
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EXCAVATION DATA
AEX=    1652.4SQ-FT     VEXR=      27.7K*CU-YD     VEXT=       47.6K*CU-YD


3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=     9424.4   10780.0  TYPE=      1  TARGET=     1355.600
   370.000     16.43   1139.83       .00       .00   1141.87      2.04       .97       .01   1138.00
   68000.0    1177.4   64201.7    2621.0     563.4    5455.0     931.9     447.8      60.0   1137.80
       .07      2.09     11.77      2.81      .045      .030      .045      .000   1123.40   9471.70
   .001823      550.      535.      530.         2         0         0       .00   1115.97  10604.91


*SECNO 373.000
CHIMP CLSTA=   10000.00 CELCH=    1124.10 BW=     270.00 STCHL=    9821.93 STCHR=   10180.30
EXCAVATION DATA
AEX=    2072.3SQ-FT     VEXR=      22.1K*CU-YD     VEXT=       69.7K*CU-YD


3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=     9399.5   10200.0  TYPE=      1  TARGET=      800.500
   373.000     15.86   1139.96       .00       .00   1142.73      2.77       .64       .22   1138.46
   68000.0     498.6   67482.5      18.9     261.3    5033.3      15.0     492.9      66.4   1139.20
       .08      1.91     13.41      1.26      .045      .030      .045      .000   1124.10   9585.86
   .002200      320.      320.      330.         2         0         0       .00    614.14  10200.00


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


*SECNO 377.000
CHIMP CLSTA=   10000.00 CELCH=    1127.40 BW=     270.00 STCHL=    9821.60 STCHR=   10197.80
EXCAVATION DATA
AEX=    1542.7SQ-FT     VEXR=      26.8K*CU-YD     VEXT=       96.4K*CU-YD


3301 HV CHANGED MORE THAN HVINS


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .63


3470 ENCROACHMENT STATIONS=     9831.5   10210.0  TYPE=      1  TARGET=      378.500
   377.000     12.27   1139.67       .00       .00   1144.74      5.06      1.32       .69 100000.00
   68000.0        .0   68000.0        .0        .0    3765.7        .0     534.6      70.7   1142.40
       .09       .00     18.06       .00      .000      .030      .000      .000   1127.40   9831.50
   .005494      400.      400.      390.         3         0         0       .00    340.33  10171.83


*SECNO 384.000
CHIMP CLSTA=   10000.00 CELCH=    1129.40 BW=     270.00 STCHL=    9815.31 STCHR=   10236.50
EXCAVATION DATA
AEX=    1146.1SQ-FT     VEXR=      32.9K*CU-YD     VEXT=      129.3K*CU-YD


3301 HV CHANGED MORE THAN HVINS
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3470 ENCROACHMENT STATIONS=     9822.7   10210.0  TYPE=      1  TARGET=      387.300
   384.000      14.75   1144.15       .00       .00   1147.49      3.34      2.58       .17 100000.00
   68000.0         .0   68000.0        .0        .0    4634.4        .0     598.2      76.0 100000.00
       .10        .00     14.67       .00      .000      .030      .000      .000   1129.40   9822.70
   .002928       670.      660.      660.         4         0         0       .00    356.55  10179.25


*SECNO 388.000
CHIMP CLSTA=   10000.00 CELCH=    1129.00 BW=     270.00 STCHL=    9799.50 STCHR=   10277.20
EXCAVATION DATA
AEX=    1386.0SQ-FT     VEXR=      19.2K*CU-YD     VEXT=      148.5K*CU-YD


3301 HV CHANGED MORE THAN HVINS

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


3470 ENCROACHMENT STATIONS=     9799.9   10210.0  TYPE=      1  TARGET=      410.100
   388.000      17.15   1146.15       .00       .00   1148.51      2.36       .92       .10 100000.00
   68000.0         .0   68000.0        .0        .0    5513.2        .0     646.0      79.5 100000.00
       .11        .00     12.33       .00      .000      .030      .000      .000   1129.00   9809.55
   .001767       420.      410.      400.         2         0         0       .00    376.89  10186.44


*SECNO 391.500
CHIMP CLSTA=   10000.00 CELCH=    1130.10 BW=     270.00 STCHL=    9772.50 STCHR=   10187.21
EXCAVATION DATA
AEX=    1236.8SQ-FT     VEXR=      17.0K*CU-YD     VEXT=      165.5K*CU-YD


3265 DIVIDED FLOW


3470 ENCROACHMENT STATIONS=     9772.9   10210.0  TYPE=      1  TARGET=      437.100
   391.500      16.61   1146.71       .00       .00   1149.22      2.51       .67       .04 100000.00
   68000.0         .0   67991.9       8.1        .0    5348.1       8.0     689.6      82.6   1147.50
       .11        .00     12.71      1.01      .000      .030      .045      .000   1130.10   9791.81
   .002062       350.      350.      350.         2         0         0       .00    406.81  10210.00


*SECNO 395.000
CHIMP CLSTA=   10000.00 CELCH=    1131.30 BW=     270.00 STCHL=    9799.60 STCHR=   10186.75
EXCAVATION DATA
AEX=    1214.2SQ-FT     VEXR=      15.9K*CU-YD     VEXT=      181.4K*CU-YD


3470 ENCROACHMENT STATIONS=     9799.7   10180.0  TYPE=      1  TARGET=      380.300
   395.000      15.97   1147.27       .00       .00   1150.06      2.79       .75       .08 100000.00
   68000.0         .0   68000.0        .0        .0    5076.9        .0     731.6      85.7 100000.00
       .12        .00     13.39       .00      .000      .030      .000      .000   1131.30   9813.25
   .002247       340.      350.      360.         2         0         0       .00    366.75  10180.00


*SECNO 402.000
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3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9755.0 10200.0 TYPE= 1 TARGET= 445.000

1

END CHANNEL IMPROVEMENTS

402.000	15.74	1148.64	.00	.00	1152.41	3.78	2.06	.30	1153.60
68000.0	.0	68000.0	.0	.0	4359.0	.0	809.5	91.8	1150.80
.13	.00	15.60	.00	.000	.030	.000	.000	1132.90	9784.25
.003771	725.	720.	710.	2	0	0	.00	372.27	10156.52

*SECNO 406.000

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9773.3 10234.6 TYPE= 1 TARGET= 461.300

406.000	15.46	1149.76	.00	.00	1154.39	4.63	1.72	.26	1155.50
68000.0	.0	68000.0	.0	.0	3938.4	.0	847.6	95.2	1154.30
.14	.00	17.27	.00	.000	.030	.000	.000	1134.30	9805.13
.004958	410.	400.	390.	2	0	0	.00	354.83	10159.96

*SECNO 409.000

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9800.3 10199.2 TYPE= 1 TARGET= 398.900

409.000	17.06	1150.66	.00	.00	1156.26	5.60	1.58	.29	1160.00
68000.0	.0	68000.0	.0	.0	3582.1	.0	874.4	97.5	100000.00
.15	.00	18.98	.00	.000	.030	.000	.000	1133.60	9869.07
.005229	380.	310.	275.	2	0	0	.00	288.54	10157.62

SPECIAL BRIDGE

5227 DOWNSTREAM ELEV IS 1148.21 , NOT 1150.66 HYDRAULIC JUMP OCCURS DOWNSTREAM (IF LOW FLOW CONTROLS)

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	1.05	1.56	2.90	.00	167.33	18.00	3913.31	2.44	1135.60	1135.20

*SECNO 409.820
3280 CROSS SECTION 409.82 EXTENDED 4.96 FEET

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.79

1

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

CLASS B LOW FLOW

3420 BRIDGE W.S.= 1152.28 BRIDGE VELOCITY= 21.15 CALCULATED CHANNEL AREA= 3169.

EGPRS	EGLWC	H3	QWEIR	QLOW	BAREA	TRAPEZOID AREA	ELLC	ELTRD	WEIRLN
1157.98	1159.66	.00	0.	68000.	3913.	3913.	1155.40	1163.50	0.

3470 ENCROACHMENT STATIONS= 9800.0 10148.0 TYPE= 1 TARGET= 348.000

THUNDER BIRD ROAD BRIDGE

409.820	21.26	1156.86	.00	.00	1159.66	2.80	3.40	.00	1161.50
68000.0	.0	68000.0	.0	.0	5061.5	.0	883.4	98.1	100000.00
.15	.00	13.43	.00	.000	.030	.000	.000	1135.60	9859.51
.001629	91.	91.	91.	0	0	0	.00	280.43	10139.93

*SECNO 410.000

3280 CROSS SECTION 410.00 EXTENDED 5.04 FEET

3470 ENCROACHMENT STATIONS= 9807.0 10166.6 TYPE= 1 TARGET= 359.600

410.000	21.54	1157.14	.00	.00	1159.71	2.58	.03	.02	1159.40
68000.0	.0	68000.0	.0	.0	5280.3	.0	885.8	98.2	100000.00
.15	.00	12.88	.00	.000	.030	.000	.000	1135.60	9848.69
.001615	20.	20.	20.	2	0	0	.00	312.87	10161.56

*SECNO 412.000

CHIMP CLSTA= 10015.00 CELCH= 1136.20 BW= 200.00 STCHL= 9833.80 STCHR= 10202.80

EXCAVATION DATA

AEX= 466.1SQ-FT VEXR= 6.5K*CU-YD VEXT= 188.0K*CU-YD

3280 CROSS SECTION 412.00 EXTENDED 3.03 FEET

3301 HV CHANGED MORE THAN HVINS

3470 ENCROACHMENT STATIONS= 9800.3 10230.0 TYPE= 1 TARGET= 429.700

BEGIN CHANNEL IMPROVEMENTS, BOTTOM=278 Ft, SIDE SLOPES=3(H):1(V)

412.000	23.02	1158.12	.00	.00	1160.07	1.95	.30	.06	1158.10
68000.0	2.6	67984.7	12.7	5.8	6063.5	15.8	913.2	100.0	1157.60
.15	.45	11.21	.80	.045	.030	.045	.000	1135.10	9800.30
.001254	170.	210.	290.	2	0	0	.00	429.70	10230.00

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

*SECNO 418.000

CHIMP CLSTA= 9990.00 CELCH= 1136.53 BW= 278.00 STCHL= 9770.00 STCHR= 10204.30

EXCAVATION DATA

AEX= 2149.7SQ-FT VEXR= 25.2K*CU-YD VEXT= 213.1K*CU-YD

3301 HV CHANGED MORE THAN HVINS

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3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.46

3470 ENCROACHMENT STATIONS=     9770.0   10250.0  TYPE=      1  TARGET=      480.000
   418.000     23.66   1159.46      .00       .00   1160.59      1.13       .43       .08   1160.30
   68000.0       .0   68000.0       .0        .0    7969.3       .0     997.1     105.0   1160.90
       .17       .00      8.53      .00      .000      .030      .000      .000   1135.80   9782.21
   .000592     500.      520.     560.         2         0         0       .00    415.58  10197.79


*SECNO 423.000
CHIMP CLSTA=    9990.00 CELCH=    1136.80 BW=     278.00 STCHL=    9776.95 STCHR=   10205.80
EXCAVATION DATA
AEX=    2524.3SQ-FT     VEXR=      45.0K*CU-YD     VEXT=      258.1K*CU-YD


3470 ENCROACHMENT STATIONS=     9790.3   10200.0  TYPE=      1  TARGET=      409.700
   423.000     23.16   1159.76      .00       .00   1160.90      1.13       .31       .00 100000.00
   68000.0       .0   68000.0       .0        .0    7958.3       .0    1092.2     109.9 100000.00
       .19       .00      8.54      .00      .000      .030      .000      .000   1136.60   9790.30
   .000584     500.      520.     550.         2         0         0       .00    407.58  10197.88


*SECNO 428.000
CHIMP CLSTA=    9990.00 CELCH=    1137.06 BW=     278.00 STCHL=    9744.70 STCHR=   10205.47
EXCAVATION DATA
AEX=    2478.1SQ-FT     VEXR=      46.3K*CU-YD     VEXT=      304.5K*CU-YD


3470 ENCROACHMENT STATIONS=     9744.8   10250.0  TYPE=      1  TARGET=      505.200
   428.000     23.00   1160.06      .00       .00   1161.19      1.13       .29       .00 100000.00
   68000.0       .0   68000.0       .0        .0    7980.4       .0    1183.6     114.7   1162.55
       .20       .00      8.52      .00      .000      .030      .000      .000   1137.06   9782.00
   .000590     490.      500.     520.         0         0         0       .00    415.99  10198.00


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


*SECNO 434.000
CHIMP CLSTA=    9990.00 CELCH=    1137.37 BW=     278.00 STCHL=    9761.80 STCHR=   10208.70
EXCAVATION DATA
AEX=    2399.7SQ-FT     VEXR=      54.2K*CU-YD     VEXT=      358.7K*CU-YD


3470 ENCROACHMENT STATIONS=     9761.8   10201.9  TYPE=      1  TARGET=      440.101
   434.000     23.08   1160.45      .00       .00   1161.55      1.10       .35       .00   1163.00
   68000.0       .0   68000.0       .0        .0    8094.5       .0    1294.4     120.5 100000.00
       .22       .00      8.40      .00      .000      .030      .000      .000   1137.37   9767.38
   .000589     590.      600.     620.         2         0         0       .00    430.86  10198.24


*SECNO 440.000
CHIMP CLSTA=    9990.00 CELCH=    1137.69 BW=     278.00 STCHL=    9762.86 STCHR=   10215.20
EXCAVATION DATA
AEX=    3829.0SQ-FT     VEXR=      70.4K*CU-YD     VEXT=      429.0K*CU-YD
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3470 ENCROACHMENT STATIONS=     9783.5   10215.2  TYPE=      1  TARGET=      431.700
   440.000     23.10   1160.79       .00       .00   1161.91      1.11       .36       .01 100000.00
   68000.0        .0   68000.0        .0        .0    8027.4        .0    1407.2     126.4 100000.00
       .24       .00      8.47       .00      .000      .030      .000      .000   1137.69   9783.50
   .000577      610.      610.      610.         1         0         0       .00    414.84  10198.34


*SECNO 445.500
CHIMP CLSTA=    9990.00 CELCH=    1137.98 BW=     278.00 STCHL=    9760.57 STCHR=   10218.64
EXCAVATION DATA
AEX=    4199.5SQ-FT     VEXR=      83.3K*CU-YD     VEXT=      512.3K*CU-YD

3280 CROSS SECTION    445.50 EXTENDED       .99 FEET


3470 ENCROACHMENT STATIONS=     9809.5   10208.3  TYPE=      1  TARGET=      398.800
   445.500     23.11   1161.09       .00       .00   1162.24      1.15       .32       .01 100000.00
   68000.0        .0   68000.0        .0        .0    7897.9        .0    1509.6     131.6 100000.00
       .26       .00      8.61       .00      .000      .030      .000      .000   1137.98   9809.50
   .000574      560.      560.      560.         2         0         0       .00    388.83  10198.33


*SECNO 449.100
CHIMP CLSTA=    9990.00 CELCH=    1138.17 BW=     278.00 STCHL=    9758.92 STCHR=   10222.29
1
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


EXCAVATION DATA
AEX=    5483.1SQ-FT     VEXR=      66.3K*CU-YD     VEXT=      578.6K*CU-YD


3470 ENCROACHMENT STATIONS=     9818.2   10218.3  TYPE=      1  TARGET=      400.100
   449.100     23.12   1161.29       .00       .00   1162.46      1.18       .21       .01 100000.00
   68000.0        .0   68000.0        .0        .0    7810.1        .0    1576.3     134.9 100000.00
       .27       .00      8.71       .00      .000      .030      .000      .000   1138.17   9818.20
   .000583      370.      370.      370.         1         0         0       .00    380.17  10198.38


*SECNO 451.000
CHIMP CLSTA=    9990.00 CELCH=    1138.26 BW=     278.00 STCHL=    9771.29 STCHR=   10222.79
EXCAVATION DATA
AEX=    5435.5SQ-FT     VEXR=      36.4K*CU-YD     VEXT=      615.0K*CU-YD


3470 ENCROACHMENT STATIONS=     9818.3   10209.2  TYPE=      1  TARGET=      390.900
   451.000     23.13   1161.39       .00       .00   1162.57      1.18       .10       .00 100000.00
   68000.0        .0   68000.0        .0        .0    7810.2        .0    1608.6     136.4 100000.00
       .28       .00      8.71       .00      .000      .030      .000      .000   1138.26   9818.30
   .000583      190.      180.      160.         0         0         0       .00    380.08  10198.38


*SECNO 451.100
CHIMP CLSTA=    9990.00 CELCH=    1152.26 BW=    1152.26 STCHL=    9363.66 STCHR=   10605.82
EXCAVATION DATA
AEX=   13321.1SQ-FT     VEXR=       1.7K*CU-YD     VEXT=      616.8K*CU-YD


3301 HV CHANGED MORE THAN HVINS
```

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS= 9760.0 10220.0 TYPE= 1 TARGET= 460.000
PROPOSED DROP STRUCTURE, DROP HEIGHT=14 Ft.

451.100	8.76	1161.02	1161.02	.00	1165.44	4.42	.01	.97	100000.00
68000.0	.0	68000.0	.0	.0	4028.4	.0	1609.3	136.5	100000.00
.28	.00	16.88	.00	.000	.030	.000	.000	1152.26	9760.00
.006761	5.	5.	5.	20	18	0	.00	460.00	10220.00

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

*SECNO 457.000

3301 HV CHANGED MORE THAN HVINS

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.10

3470 ENCROACHMENT STATIONS= 9306.5 10231.7 TYPE= 1 TARGET= 925.200
END CHANNEL IMPROVEMETS

457.000	13.81	1165.91	.00	.00	1167.35	1.44	1.61	.30	1172.00
68000.0	.0	68000.0	.0	.0	7050.2	.0	1682.4	143.7	100000.00
.30	.00	9.65	.00	.000	.030	.000	.000	1152.10	9576.02
.001528	800.	575.	400.	2	0	0	.00	629.97	10205.99

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THIS RUN EXECUTED 28AUG91 17:28:24

****
HEC2 RELEASE DATED SEP 88 UPDATED JUN 1990

ERROR CORR - 01,02,03,04
MODIFICATION -
****

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

Standard Project Flood

SUMMARY PRINTOUT

SECNO	SHEAR	VOL
337.000	3.38	.00
342.000	2.46	54.25

	343.700	3.07	72.43
*	345.500	4.13	89.47
*	345.800	1.71	93.62
	346.100	1.99	96.02
	346.400	2.89	100.59
	346.800	2.11	103.42
	347.100	3.70	106.57
*	347.400	1.86	109.83
	352.000	2.14	166.80
	358.000	2.02	251.80
	365.000	1.62	361.73
	370.000	1.51	447.78
	373.000	1.93	492.92
*	377.000	3.79	534.58
	384.000	2.37	598.22

	SECNO	SHEAR	VOL
	388.000	1.61	645.98
	391.500	1.74	689.64
	395.000	1.94	731.56
	402.000	2.76	809.54
	406.000	3.43	847.64
	409.000	4.05	874.40
*	409.820	1.83	883.43
	410.000	1.70	885.80
	412.000	1.29	913.21
*	418.000	.71	997.10
	423.000	.71	1092.17
	428.000	.71	1183.65
	434.000	.69	1294.35
	440.000	.70	1407.24
	445.500	.73	1509.60

	449.100	.75	1576.32
	451.000	.75	1608.59
*	451.100	3.69	1609.27
*	457.000	1.07	1682.39

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Standard Project Flood

SUMMARY PRINTOUT TABLE 105

	SECNO	CWSEL	HL	OLOSS	TOPWID	QLOB	QCH	QROB
	343.700	1128.53	.65	.23	354.11	.00	68000.00	.00
*	345.500	1128.67	.96	.39	339.75	.00	68000.00	.00
*	345.800	1133.10	1.46	.00	359.90	.00	68000.00	.00
	346.100	1132.86	.04	.12	353.64	.00	68000.00	.00
	406.000	1149.76	1.72	.26	354.83	.00	67999.99	.00
	409.000	1150.66	1.58	.29	288.54	.00	68000.00	.00
*	409.820	1156.86	3.40	.00	280.43	.00	68000.00	.00
	410.000	1157.14	.03	.02	312.87	.00	68000.00	.00

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Standard Project Flood

SUMMARY PRINTOUT TABLE 120

	SECNO	CWSEL	EG	VCH	10*KS	DEPTH	TOPWID	CLSTA	BW	STCHL	XLBEL	STCHR	RBEL
	337.000	1126.48	1129.91	14.86	42.06	14.08	360.22	.00	.01	9806.70	1130.80	10176.40	1130.20
	342.000	1128.42	1131.77	14.70	31.80	13.62	372.58	.00	.01	9854.20	1132.00	10234.60	1131.80
	343.700	1128.53	1132.66	16.30	41.78	12.73	354.11	.00	.01	9838.50	1132.80	10202.70	1133.10
*	345.500	1128.67	1134.09	18.68	61.81	11.37	339.75	.00	.01	9812.00	1137.10	10205.80	1136.40
*	345.800	1133.10	1135.55	12.56	18.18	15.70	359.90	.00	.01	9823.90	1134.30	10186.10	1134.30
	346.100	1132.86	1135.71	13.54	22.50	15.36	353.64	.00	.01	9814.20	1138.30	10210.40	1137.70
	346.400	1132.90	1135.84	13.76	33.63	15.20	342.39	.00	.01	9823.00	1136.00	10187.10	1141.00
	346.800	1132.94	1135.93	13.86	24.64	14.84	358.14	.00	.01	9827.00	1134.20	10187.30	100000.00
	347.100	1132.36	1136.32	15.97	49.84	14.06	321.84	.00	.01	9823.00	1141.00	10187.10	1141.00

*	347.400	1133.90	1136.54	13.06	21.12	15.70	368.80	.00	.01	9825.50	1131.90	10194.30	100000.00
	352.000	1134.93	1137.72	13.65	29.19	14.83	819.32	.00	.01	9824.60	1133.40	10232.30	1134.50
	358.000	1136.83	1139.37	13.46	25.10	13.23	1191.55	10000.00	330.00	9824.78	1133.82	10175.70	1133.60
	365.000	1138.72	1140.89	12.36	18.08	15.32	1034.78	10000.00	270.00	9817.70	1134.20	10164.34	1133.18
	370.000	1139.83	1141.87	11.77	18.23	16.43	1115.97	10000.00	270.00	9814.50	1138.00	10225.70	1137.80
	373.000	1139.96	1142.73	13.41	22.00	15.86	614.14	10000.00	270.00	9821.93	1138.46	10180.30	1139.20
*	377.000	1139.67	1144.74	18.06	54.94	12.27	340.33	10000.00	270.00	9821.60	100000.00	10197.80	1142.40
	384.000	1144.15	1147.49	14.67	29.28	14.75	356.55	10000.00	270.00	9815.31	100000.00	10236.50	100000.00
	388.000	1146.15	1148.51	12.33	17.67	17.15	376.89	10000.00	270.00	9799.50	100000.00	10277.20	100000.00
	391.500	1146.71	1149.22	12.71	20.62	16.61	406.81	10000.00	270.00	9772.50	100000.00	10187.21	1147.50
	395.000	1147.27	1150.06	13.39	22.47	15.97	366.75	10000.00	270.00	9799.60	100000.00	10186.75	100000.00
	402.000	1148.64	1152.41	15.60	37.71	15.74	372.27	.00	.01	9755.30	1153.60	10166.70	1150.80
	406.000	1149.76	1154.39	17.27	49.58	15.46	354.83	.00	.01	9773.60	1155.50	10212.30	1154.30
	409.000	1150.66	1156.26	18.98	52.29	17.06	288.54	.00	.01	9834.60	1160.00	10199.20	100000.00
*	409.820	1156.86	1159.66	13.43	16.29	21.26	280.43	.00	.01	9852.00	1161.50	10148.00	100000.00

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SECNO	CWSEL	EG	VCH	10*KS	DEPTH	TOPWID	CLSTA	BW	STCHL	XLBEL	STCHR	RBEL
410.000	1157.14	1159.71	12.88	16.15	21.54	312.87	.00	.01	9833.40	1159.40	10166.60	100000.00
412.000	1158.12	1160.07	11.21	12.54	23.02	429.70	10015.00	200.00	9833.80	1158.10	10202.80	1157.60
* 418.000	1159.46	1160.59	8.53	5.92	23.66	415.58	9990.00	278.00	9770.00	1160.30	10204.30	1160.90
423.000	1159.76	1160.90	8.54	5.84	23.16	407.58	9990.00	278.00	9776.95	100000.00	10205.80	100000.00
428.000	1160.06	1161.19	8.52	5.90	23.00	415.99	9990.00	278.00	9744.70	100000.00	10205.47	1162.55
434.000	1160.45	1161.55	8.40	5.89	23.08	430.86	9990.00	278.00	9761.80	1163.00	10208.70	100000.00
440.000	1160.79	1161.91	8.47	5.77	23.10	414.84	9990.00	278.00	9762.86	100000.00	10215.20	100000.00
445.500	1161.09	1162.24	8.61	5.74	23.11	388.83	9990.00	278.00	9760.57	100000.00	10218.64	100000.00
449.100	1161.29	1162.46	8.71	5.83	23.12	380.17	9990.00	278.00	9758.92	100000.00	10222.29	100000.00
451.000	1161.39	1162.57	8.71	5.83	23.13	380.08	9990.00	278.00	9771.29	100000.00	10222.79	100000.00
* 451.100	1161.02	1165.44	16.88	67.61	8.76	460.00	9990.00	1152.26	9363.66	100000.00	10605.82	100000.00
* 457.000	1165.91	1167.35	9.65	15.28	13.81	629.97	.00	.01	9306.50	1172.00	10231.70	100000.00

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Standard Project Flood

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	337.000	.00	.00	.00	1112.40	69000.00	1126.48	.00	1129.91	42.06	14.86	4642.54	10639.40
	342.000	510.00	.00	.00	1114.80	68000.00	1128.42	.00	1131.77	31.80	14.70	4624.85	12059.08
	343.700	180.00	.00	.00	1115.80	68000.00	1128.53	.00	1132.66	41.78	16.30	4172.18	10520.62
*	345.500	190.00	.00	.00	1117.30	68000.00	1128.67	1128.67	1134.09	61.81	18.68	3640.22	8649.48
*	345.800	40.00	1141.90	1134.30	1117.40	68000.00	1133.10	.00	1135.55	18.18	12.56	5414.30	15949.92
	346.100	20.00	.00	.00	1117.50	68000.00	1132.86	.00	1135.71	22.50	13.54	5020.37	14335.81
	346.400	40.00	1141.40	1136.00	1117.70	68000.00	1132.90	.00	1135.84	33.63	13.76	4943.18	11725.72
	346.800	25.00	.00	.00	1118.10	68000.00	1132.94	.00	1135.93	24.64	13.86	4905.22	13699.02
	347.100	30.00	1141.40	1135.80	1118.30	68000.00	1132.36	.00	1136.32	49.84	15.97	4259.20	9632.09
*	347.400	30.00	.00	.00	1118.20	68000.00	1133.90	.00	1136.54	21.12	13.06	5206.97	14795.90
	352.000	460.00	.00	.00	1120.10	68000.00	1134.93	.00	1137.72	29.19	13.65	5636.46	12587.10
	358.000	600.00	.00	.00	1123.60	68000.00	1136.83	.00	1139.37	25.10	13.46	6675.71	13573.02
	365.000	700.00	.00	.00	1123.40	68000.00	1138.72	.00	1140.89	18.08	12.36	7034.26	15993.18
	370.000	535.00	.00	.00	1123.40	68000.00	1139.83	.00	1141.87	18.23	11.77	6950.35	15926.83
	373.000	320.00	.00	.00	1124.10	68000.00	1139.96	.00	1142.73	22.00	13.41	5309.54	14496.93
*	377.000	400.00	.00	.00	1127.40	68000.00	1139.67	.00	1144.74	54.94	18.06	3765.65	9174.34
	384.000	660.00	.00	.00	1129.40	68000.00	1144.15	.00	1147.49	29.28	14.67	4634.42	12566.59
	388.000	410.00	.00	.00	1129.00	68000.00	1146.15	.00	1148.51	17.67	12.33	5513.22	16178.73
	391.500	350.00	.00	.00	1130.10	68000.00	1146.71	.00	1149.22	20.62	12.71	5356.09	14974.67
	395.000	350.00	.00	.00	1131.30	68000.00	1147.27	.00	1150.06	22.47	13.39	5076.90	14345.37
	402.000	720.00	.00	.00	1132.90	68000.00	1148.64	.00	1152.41	37.71	15.60	4359.01	11073.15
	406.000	400.00	.00	.00	1134.30	68000.00	1149.76	.00	1154.39	49.58	17.27	3938.36	9657.29
	409.000	310.00	.00	.00	1133.60	68000.00	1150.66	.00	1156.26	52.29	18.98	3582.09	9403.82
*	409.820	91.00	1163.50	1155.40	1135.60	68000.00	1156.86	.00	1159.66	16.29	13.43	5061.48	16847.05

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	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	410.000	20.00	.00	.00	1135.60	68000.00	1157.14	.00	1159.71	16.15	12.88	5280.28	16920.37
	412.000	210.00	.00	.00	1135.10	68000.00	1158.12	.00	1160.07	12.54	11.21	6085.15	19204.93
*	418.000	520.00	.00	.00	1135.80	68000.00	1159.46	.00	1160.59	5.92	8.53	7969.25	27945.46

	423.000	520.00	.00	.00	1136.60	68000.00	1159.76	.00	1160.90	5.84	8.54	7958.29	28138.27
	428.000	500.00	.00	.00	1137.06	68000.00	1160.06	.00	1161.19	5.90	8.52	7980.35	27996.59
	434.000	600.00	.00	.00	1137.37	68000.00	1160.45	.00	1161.55	5.89	8.40	8094.52	28018.23
	440.000	610.00	.00	.00	1137.69	68000.00	1160.79	.00	1161.91	5.77	8.47	8027.39	28299.01
	445.500	560.00	.00	.00	1137.98	68000.00	1161.09	.00	1162.24	5.74	8.61	7897.88	28387.75
	449.100	370.00	.00	.00	1138.17	68000.00	1161.29	.00	1162.46	5.83	8.71	7810.13	28153.12
	451.000	180.00	.00	.00	1138.26	68000.00	1161.39	.00	1162.57	5.83	8.71	7810.25	28156.56
*	451.100	5.00	.00	.00	1152.26	68000.00	1161.02	1161.02	1165.44	67.61	16.88	4028.42	8269.80
*	457.000	575.00	.00	.00	1152.10	68000.00	1165.91	.00	1167.35	15.28	9.65	7050.18	17395.94

Standard Project Flood

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	337.000	69000.00	1126.48	.00	.00	1099.98	360.22	.00
	342.000	68000.00	1128.42	.00	1.94	.00	372.58	510.00
	343.700	68000.00	1128.53	.00	.12	.00	354.11	180.00
*	345.500	68000.00	1128.67	.00	.14	.00	339.75	190.00
*	345.800	68000.00	1133.10	.00	4.42	.00	359.90	40.00
	346.100	68000.00	1132.86	.00	-.24	.00	353.64	20.00
	346.400	68000.00	1132.90	.00	.05	.00	342.39	40.00
	346.800	68000.00	1132.94	.00	.04	.00	358.14	25.00
	347.100	68000.00	1132.36	.00	-.58	.00	321.84	30.00
*	347.400	68000.00	1133.90	.00	1.53	.00	368.80	30.00
	352.000	68000.00	1134.93	.00	1.03	.00	819.32	460.00
	358.000	68000.00	1136.83	.00	1.90	.00	1191.55	600.00
	365.000	68000.00	1138.72	.00	1.89	.00	1034.78	700.00
	370.000	68000.00	1139.83	.00	1.11	.00	1115.97	535.00
	373.000	68000.00	1139.96	.00	.13	.00	614.14	320.00
*	377.000	68000.00	1139.67	.00	-.28	.00	340.33	400.00
	384.000	68000.00	1144.15	.00	4.48	.00	356.55	660.00
	388.000	68000.00	1146.15	.00	2.00	.00	376.89	410.00
	391.500	68000.00	1146.71	.00	.56	.00	406.81	350.00

	395.000	68000.00	1147.27	.00	.56	.00	366.75	350.00
	402.000	68000.00	1148.64	.00	1.37	.00	372.27	720.00
	406.000	68000.00	1149.76	.00	1.13	.00	354.83	400.00
	409.000	68000.00	1150.66	.00	.90	.00	288.54	310.00
*	409.820	68000.00	1156.86	.00	6.19	.00	280.43	91.00

1

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	410.000	68000.00	1157.14	.00	.28	.00	312.87	20.00
	412.000	68000.00	1158.12	.00	.98	.00	429.70	210.00
*	418.000	68000.00	1159.46	.00	1.34	.00	415.58	520.00
	423.000	68000.00	1159.76	.00	.30	.00	407.58	520.00
	428.000	68000.00	1160.06	.00	.30	.00	415.99	500.00
	434.000	68000.00	1160.45	.00	.39	.00	430.86	600.00
	440.000	68000.00	1160.79	.00	.34	.00	414.84	610.00
	445.500	68000.00	1161.09	.00	.30	.00	388.83	560.00
	449.100	68000.00	1161.29	.00	.20	.00	380.17	370.00
	451.000	68000.00	1161.39	.00	.10	.00	380.08	180.00
*	451.100	68000.00	1161.02	.00	-.37	.00	460.00	5.00
*	457.000	68000.00	1165.91	.00	4.89	.00	629.97	575.00

1

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION SECNO=    345.500  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    345.500  PROFILE=  1  MINIMUM SPECIFIC ENERGY

CAUTION SECNO=    345.800  PROFILE=  1  HYDRAULIC JUMP D.S.
WARNING SECNO=    345.800  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=    347.400  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=    377.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=    409.820  PROFILE=  1  HYDRAULIC JUMP D.S.
WARNING SECNO=    409.820  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=    418.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=    451.100  PROFILE=  1  CRITICAL DEPTH ASSUMED
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CAUTION SECNO=    451.100  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    451.100  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=    457.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
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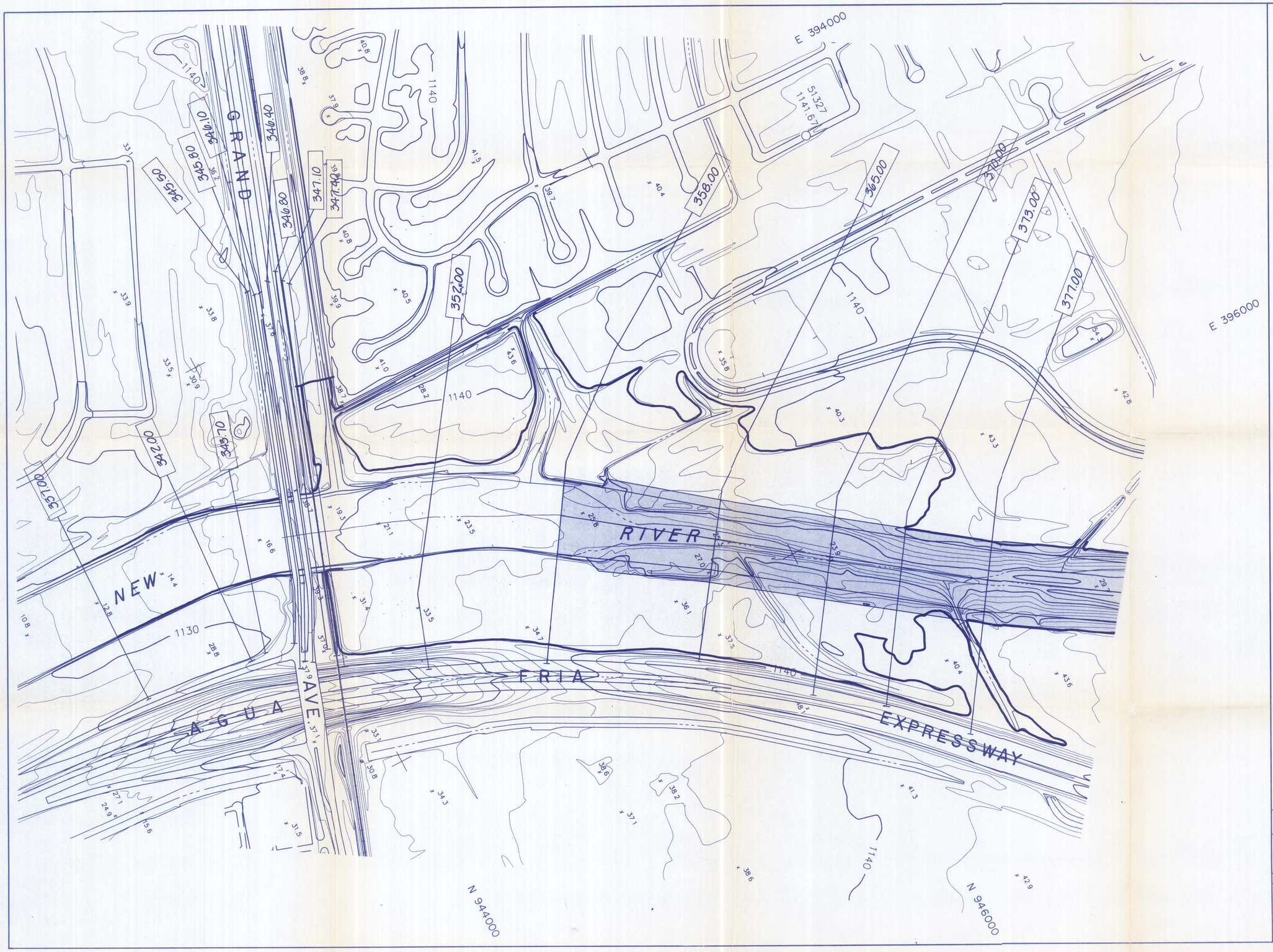


200 0 100 200

1 inch = 200 ft.

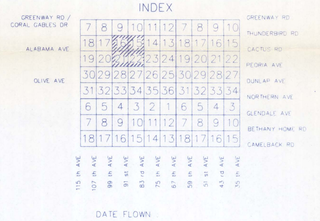
CONTOUR INTERVAL 2 FEET

LEGEND

- STANDARD PROJECT FLOOD LIMITS
- STATIONING IN RIVER MILES UPSTREAM FROM AGUA FRIA RIVER
- 337.00 — CROSS-SECTION NUMBER
- REFERENCE MARK
- CONTROL LINE

KEY MAP

INDEX



MAPPING NOTES

THE ORIGINAL TOPOGRAPHIC MAPPING, ENLARGED TO A SCALE OF 1"=200' ON THESE PLANS, WAS PREPARED AT A SCALE OF 1"=400' AND A 2 FOOT CONTOUR INTERVAL IN JUNE 1991. THAT MAPPING WAS PREPARED UNDER FLOOD CONTROL DISTRICT OF MARICOPA COUNTY CONTRACT NO. 90-19 BY KAMINSKI-HUBBARD ENGINEERING, INC. THE ORIGINAL MAPPING IS ON FILE AT THE DISTRICT.

WITH PARTIAL CHANNELIZATION

WOOD, PATEL & ASSOCIATES, INC.
Civil Engineers, Hydrologists, Land Surveyors
4105 North 20th Street, Suite 130, Phoenix, Az. 85016
(602)-957-3149 Fax 955-3765

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

NEW RIVER
STANDARD PROJECT FLOOD DELINEATION

GRAND AVENUE TO BELL ROAD

RECOMMENDED BY: DATE:

APPROVED BY: DATE:

CHIEF ENGINEER AND GENERAL MANAGER

PLATE 4 OF 4

FCDMC CONTRACT NO. 91-25
W.P.# 91755

AUG 29 1991

KENNEY AERIAL MAPPING INC.
PHOENIX, ARIZONA

200 0 100 200

1 inch = 200 ft.

CONTOUR INTERVAL 2 FEET

LEGEND

- STANDARD PROJECT FLOOD LIMITS
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KEY MAP

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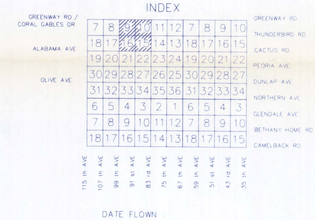

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PLATE 4
2 OF 4

FCDMC CONTRACT NO. 91-25
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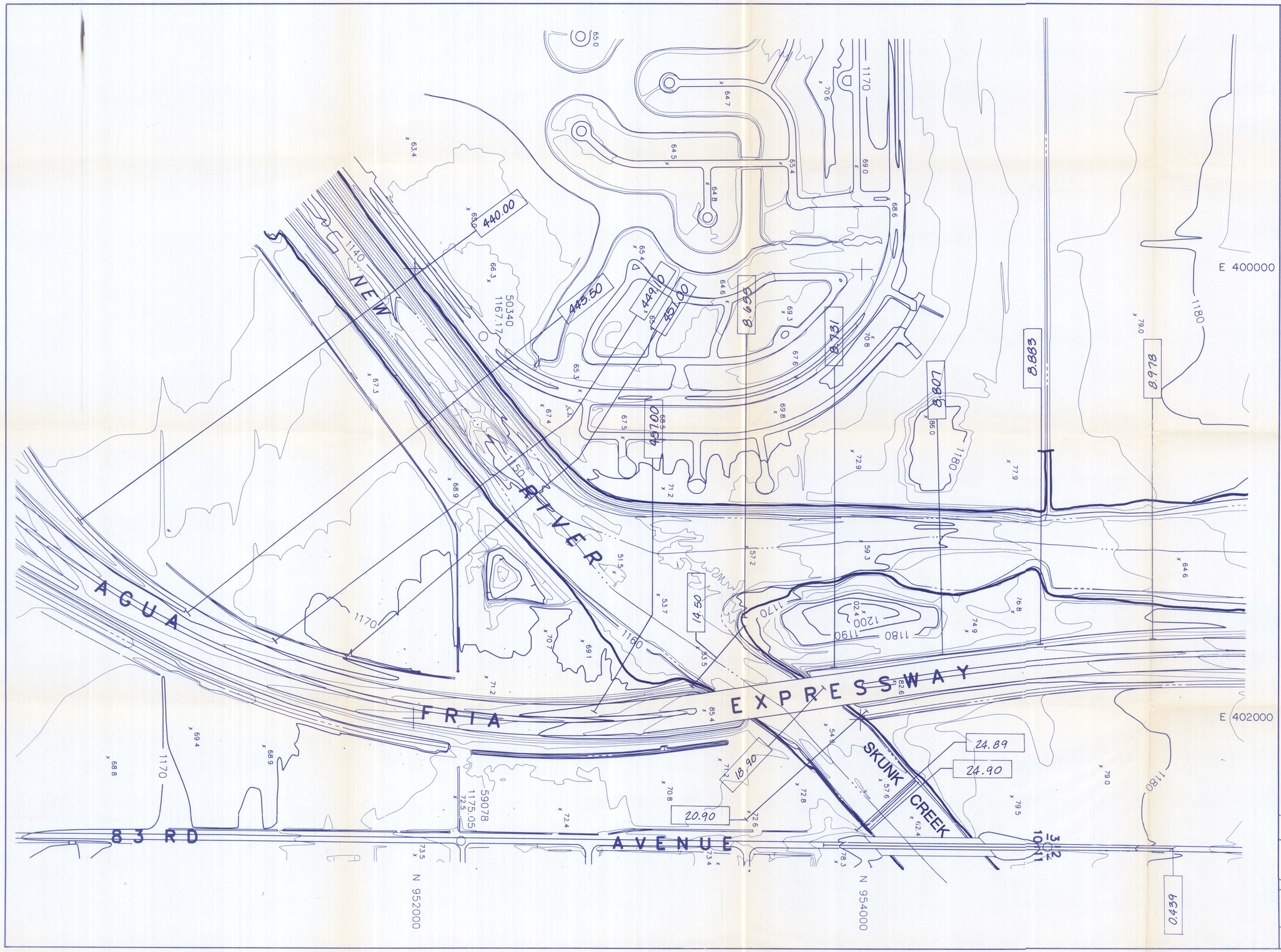
KENNEY AERIAL MAPPING INC.
PHOENIX, ARIZONA



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GRAND AVENUE TO BELL ROAD

RECOMMENDED BY: _____ DATE:

APPROVED BY: _____ DATE:

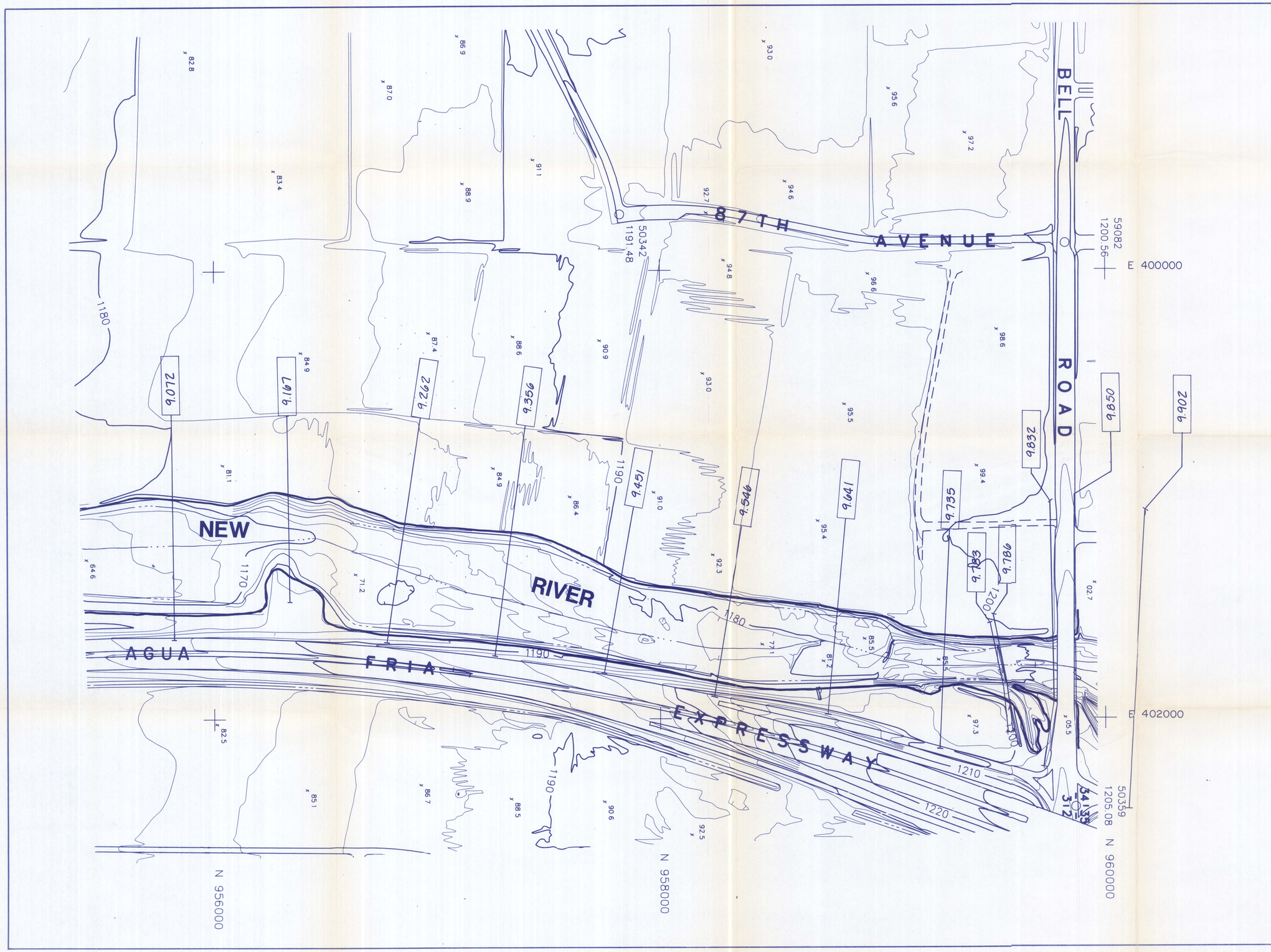
CHIEF ENGINEER AND GENERAL MANAGER

PLATE 4
3 OF 4

FCDMC CONTRACT NO. 91-25
W.P.# 91755

AUG 29 1991

KENNEY AERIAL MAPPING INC.
PHOENIX ARIZONA



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1 inch = 200 ft.

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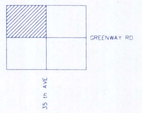
KEY MAP



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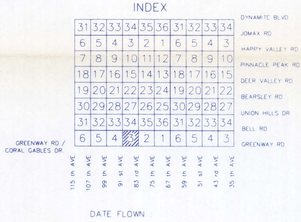

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PLATE 4
4 OF 4

FCDMC CONTRACT NO. 91-25
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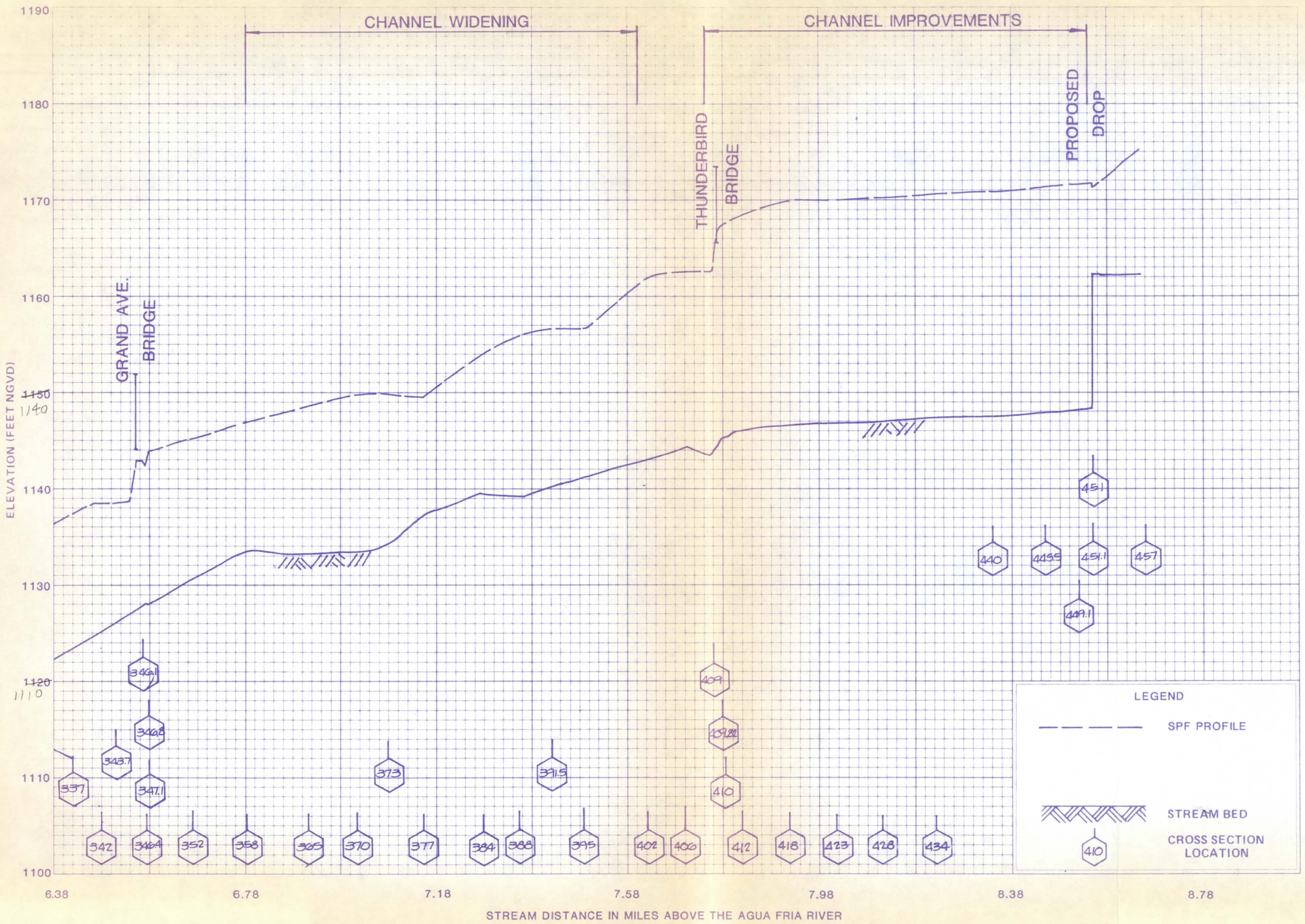
AUG 29 1991

KENNEY AERIAL MAPPING INC.
PHOENIX - ARIZONA



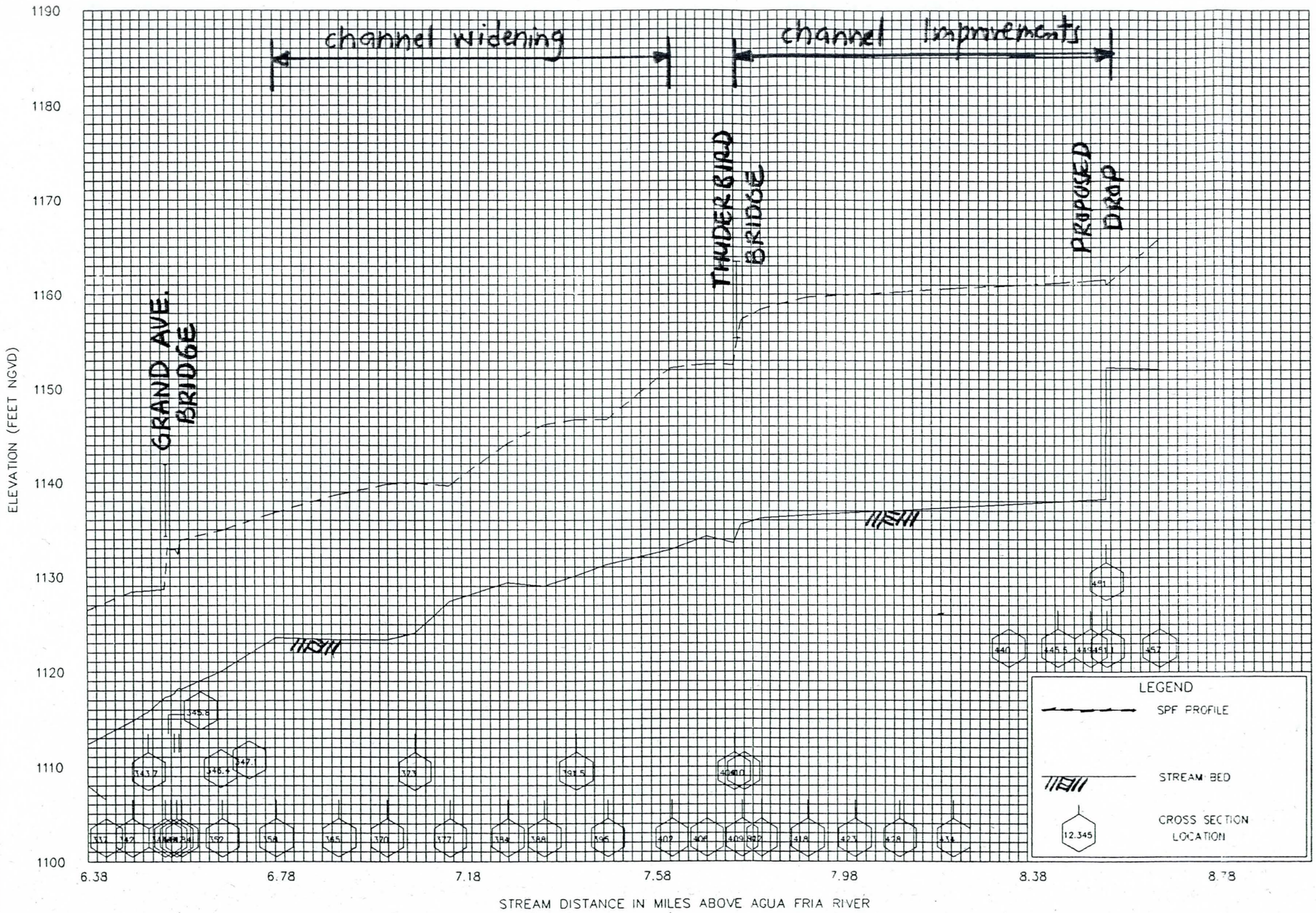
FLOOD PROFILES

NEW RIVER FROM GRAND AVENUE TO PROPOSED DROP

FLOOD CONTROL DIST OF MARICOPA COUNTY

SPF WITH CHANNEL IMPROVEMENTS

PLATE 5



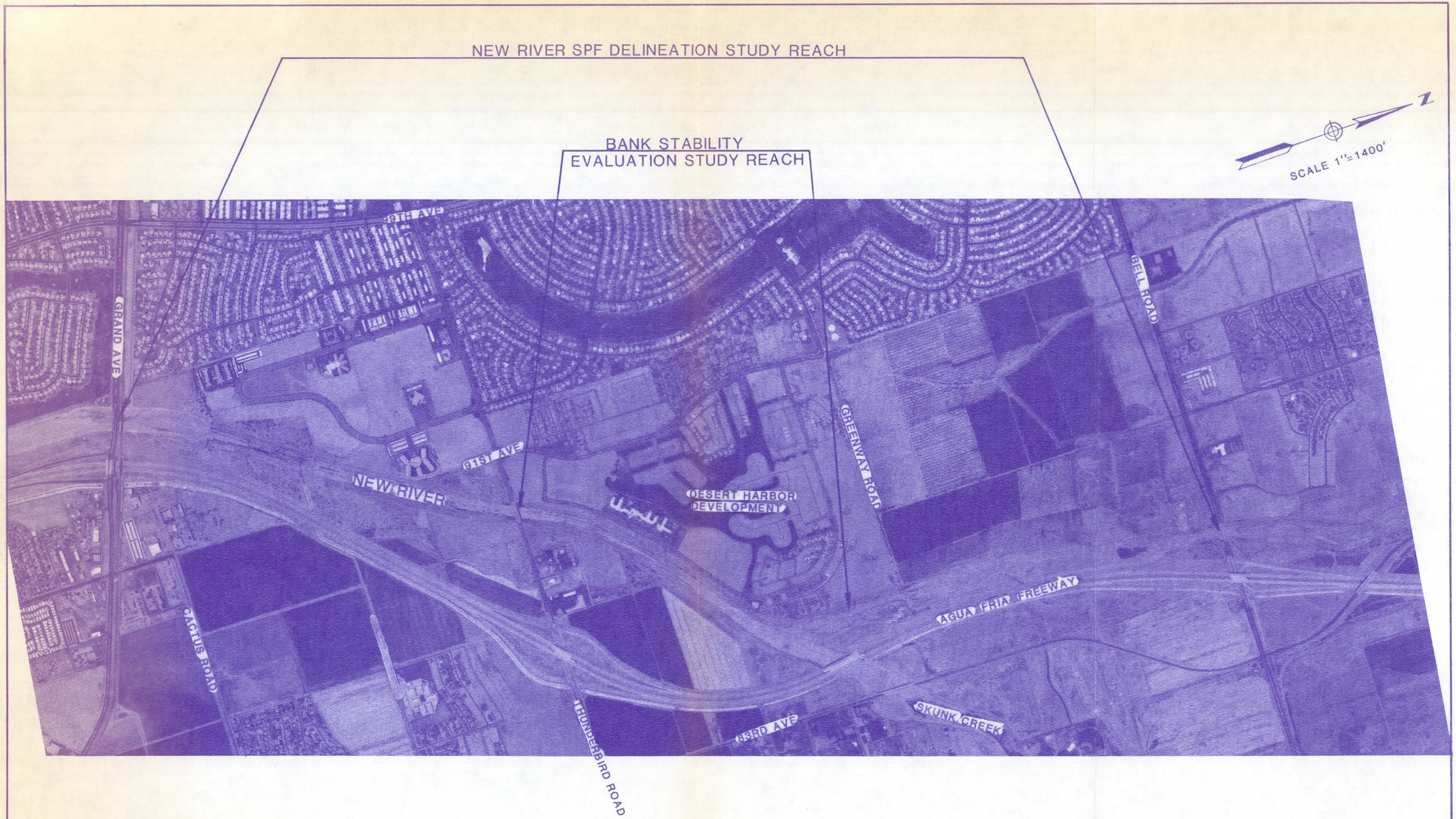
FLOOD PROFILES

NEW RIVER

STANDARD PROJECT FLOOD DELINEATION

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

PLATE 5



NEW RIVER

CONTRACT FCD 91-25

WOOD, PATEL & ASSOCIATES, INC.

LOCATION MAP
PLATE 1