FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

GILA BEND AREA DRAINAGE MASTER PLAN

Floodplain Delineation Study

August, 2003

Book 1 of 3

Engineering and Environmental Consultants, Inc.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PHOENIX, ARIZONA

GILA BEND AREA DRAINAGE MASTER PLAN
FLOODPLAIN DELINEATION STUDY
FCD 99-18

TECHNICAL DATA NOTEBOOK

Book 1 of 3

Prepared by:

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August 2003

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Gila Bend Area Drainage Master Plan
Town of Gila Bend, in Maricopa County, Arizona

Authorizing agency: Flood Control District of Maricopa County
2801 West Durango Street
Phoenix, Arizona
Tel: 602-506-1501

HEC - 1 Flood Hydrograph Package

The Hydrology for the Gila Bend area was developed as part of a study performed by Burgess & Niple in 1992. Revised by EEC in 2000.

	file name		Revision Date
1.	GB083100.IH1	(input file)	Revised 08-31-00
2.	GB083100.OH1	(output file)	Revised 08-31-00
3.	NoCanal.IH1	(input file)	Revised 08-31-00
4.	NoCanal.OH1	(output file)	Revised 08-31-00

HEC-RAS Version 3.0.1

	file name	Date	Wash Names
1.	Bender.prj	06-21-01	Bender Wash, Bender Wash North Tributary
2.	Cemetery.prj	06-21-01	Pioneer Cemetery Wash
3.	CitrusVW.prj	05-18-01	Citrus Valley Wash
4.	Evans.prj	01-11-02	Evans Wash
5.	GBCwash.prj	05-16-01	Gila Bend Canal Wash
6.	Hacker.prj	06-21-01	Hacker Wash (Canal in place)
7.	Hacker1.prj	05-17-01	Hacker Wash (no Canal)
8.	HWDiv.prj	05-16-01	Hacker Wash Diversion
9.	I-8WEast.prj	05-16-01	I-8 Wash East
10.	I-8WWest.prj	06-21-01	I-8 Wash West
11.	Quilotosa1.prj	01-22-02	Quilotosa Wash
12.	Sandtank.prj	05-18-01	Sand Tank Wash
13.	Sauceda1.prj	06-21-01	Sauceda Wash
14.	ScottAve.prj	06-21-01	Scott Avenue Wash
15.	WQuilotosa.prj	01-22-02	West Quilotosa Wash

SECTION 1: INTRODUCTION

1.1 Purpose of Report

The purpose of this report is to provide documentation for new floodplain delineation for the Gila Bend ADMP. The 100-year floodplain and floodway are delineated for a number of washes from the I-8 Interstate Highway south to the northern boundary of the Barry M. Goldwater Gunnery Range. A previous flood insurance study has delineated the floodplain and floodway for Bender, Sand Tank and Scott Avenue Washes from the I-8 Interstate Highway north to the confluence with the Gila River. Another study prior to this one delineates the floodplain behind the Gila Bend Canal.

This study delineates approximately 18 miles of floodplain and floodway along Bender Wash, Sand Tank Wash, Scott Avenue Wash, Quilotosa Wash and Sauceda Wash. New delineation is also prepared for several unnamed washes with proposed names of Pioneer Cemetery Wash, Evans Wash, Hacker Wash, West Quilotosa Wash and Citrus Valley Wash. New delineation was also prepared for conveyance corridors behind the Gila Bend Canal and I-8 where overtopping of the canal and highway occurs. The proposed names for these corridors are Gila Bend Canal Wash, I-8 Wash East, I-8 Wash West and Hacker Diversion Wash.

1.2 Authority

The authority for this project is:

The Flood Control District of Maricopa County, Arizona
FCD 99-18
Project Manager: Geza Kmetty

1.3 Location of Project

The project site resides within Maricopa County and includes part or all of the following sections: T6S R4W sections 5-9, T6S R5W sections 1-5 and 8-12. There is also approximate floodplain delineation located in T5S R5W sections 15-17, 20-22, 27-29 and 32-35. See the Location and Vicinity Maps located on pages 3 and 4.

The starting river mile for each wash is based upon the distance to the confluence with the major downstream watercourse. In the case of Citrus Valley Wash, Sauceda Wash and Quilotosa Wash this is the Gila River. The entire study is in unincorporated Maricopa County and the project is generally located south and southwest of the town of Gila Bend, Arizona. Figure 1-1 is a Location Map for the Study Area. Figure 1-2 is a Vicinity map showing the location for the Study Area with respect to the town.

1.4 Methodology

HEC-RAS models were developed for each detailed study reach using peak discharges from the 1992 *Gila Bend Area Floodplain Delineation Study*. The 1992 hydrologic model had to be modified, however, in order to 1) account for additional split flows identified with the HEC-RAS modeling, and 2) account for changes in the storage routing behind the Gila Bend Canal identified with the new detailed mapping. In fact, the analysis of many of the detailed study reaches that involve split flows required an integrated, iterative approach of hydrologic and hydraulic modeling to determine the final peak discharges and corresponding floodplain boundaries. In addition to the split flow and storage routing revisions, several of the drainage subbasins in the 1992 hydrologic model had to be further subdivided in order to calculate peak discharges for study reaches along Scott Avenue Wash and along Hacker, Evans and Pioneer Cemetery washes.

Figure 1-1 Location Map

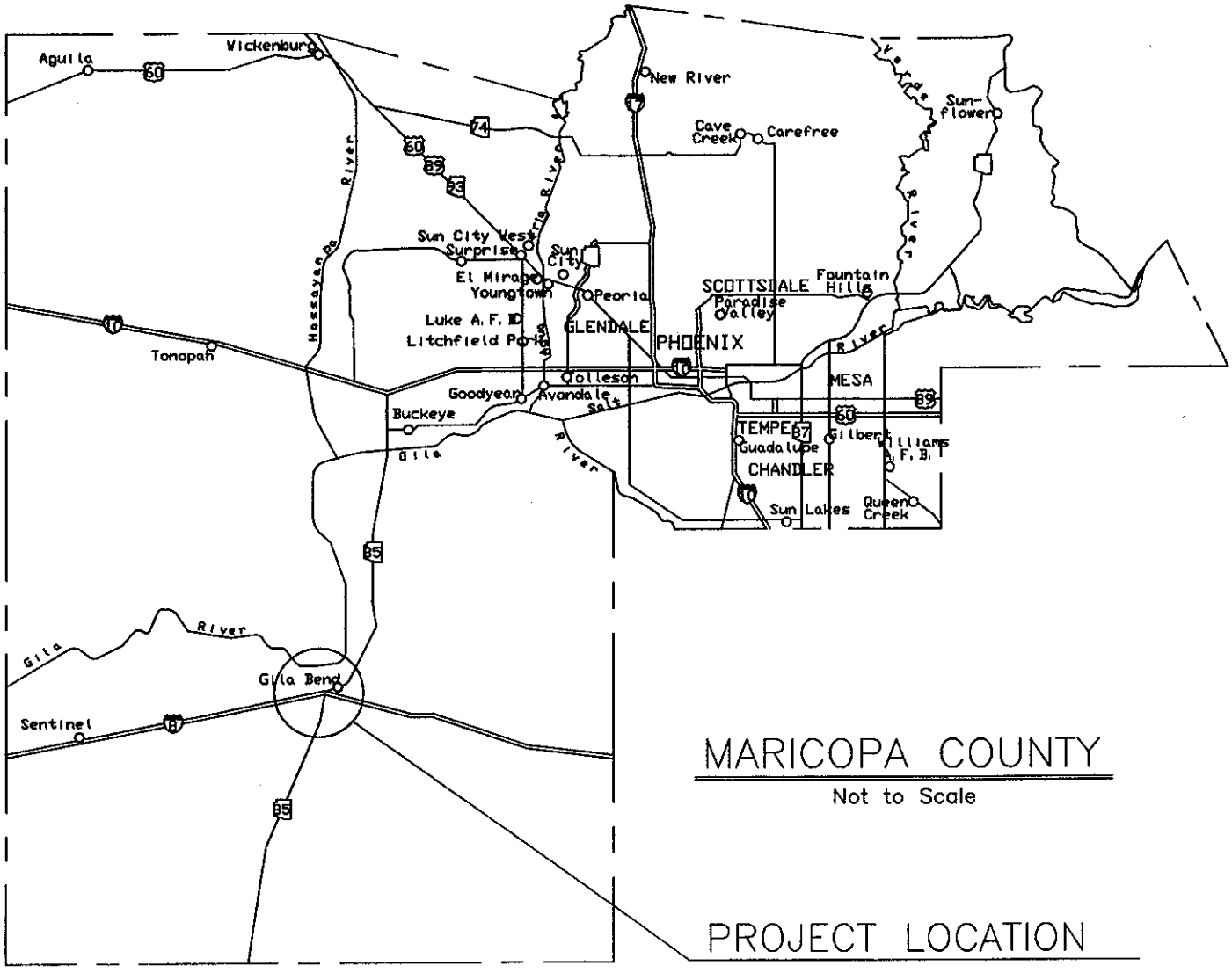
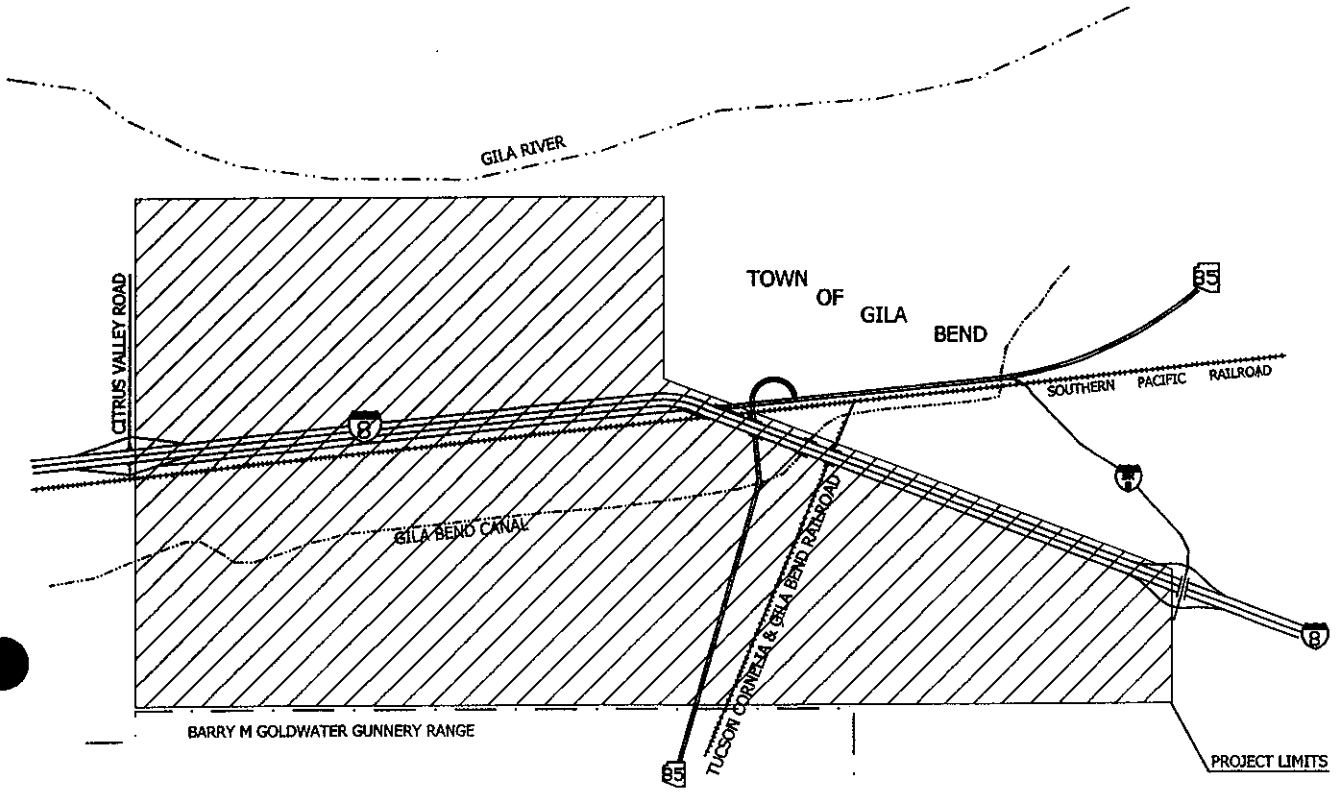


Figure 1-2 Vicinity Map



Section 2: FEMA Forms

2.1 Study Documentation Abstract for FEMA Submittals

2.1.1 Date Study Accepted

To be filled in upon acceptance by FEMA

2.1.2 Study Contractor

Engineering and Environmental Consultants, Inc.
3003 N. Central Avenue, Suite 600
Phoenix, Arizona 85012-2905
Tel: 602-248-7702
FAX: 602-248-7851

Contacts: Mark Gavan, P.E.
Lloyd Vick, E.I.T.

Contract Number: 99541

List of Subcontractors:

Premier Engineering Corps
1600 W. Broadway Road
Tempe, Arizona 85282
Tel. 480-829-6000

Cooper Aerial of Phoenix Inc.
11402 N. Cave Creek Road
Phoenix, Arizona 85020
Tel. 602-678-5111

SurvNet Inc.
150 N. Stapley Drive
Mesa, Arizona 85203
Tel. 480-835-9070

2.1.3 FEMA Technical Review Contractor

2.1.4 FEMA Regional Reviewer

2.1.5 State Technical Reviewer

2.1.6 Local Technical Reviewer

Flood Control District of Maricopa County
2801 W. Durango Street
Phoenix, Arizona 85009
Tel: 602-506-1501

Contact: Tim Murphy, P.E.

2.1.7 Reach Description

Revision to the existing FIRM maps can be found in the Map Section off Book 3.

Bender Wash – a meandering southwestern desert wash, beginning upstream of I-8 on FIRM Panel 04013C3490E and ending on FIRM Panel 04013C3491E.

Bender Wash North Tributary - a meandering southwestern desert wash, splitting off from Bender Wash just upstream of I-8 on FIRM Panel 04013C3490E and ending on FIRM Panel 04013C3491E.

Sand Tank Wash - a meandering southwestern desert wash, beginning upstream of I-8 on FIRM Panel 04013C3490E.

Scott Avenue Wash - a meandering southwestern desert wash, beginning upstream of I-8 on Firm Panel 04013C3490E.

I-8 Wash East – wash resulting from a diversion at Scott Avenue Wash, with runoff routed through a retention basin. Begins upstream of I-8 and west of Scott Avenue Wash on Firm Panel 04013C3490E.

Pioneer Cemetery Wash - a meandering southwestern desert wash, beginning upstream of the Tucson Cornelia and Gila Bend Railroad at the confluence with Evans Wash and I-8 Wash East on Firm Panel 04013C3490E.

Evans Wash - a meandering southwestern desert wash, beginning upstream of the Gila Bend Canal at the confluence with Hacker Wash on Firm Panel 04013C3490E.

Hacker Wash – upstream of the Gila Bend Canal this is a meandering southwestern desert wash (except at borrow pit), however, downstream of the canal it is channelized through I-8, the Southern Pacific Railroad and Pima Road. It begins on FIRM Panel 04013C3480E and ends on FIRM Panel 04013C3490E.

Hacker Wash Diversion – wash resulting from a diversion at I-8 and Hacker Wash on FIRM Panel 04013C3480E.

Gila Bend Canal Wash - wash resulting from a diversion at Gila Bend Canal and Hacker Wash on FIRM Panel 04013C3490E. Flow follows the Canal to the west to the confluence with Quilotosa Wash.

Quilotosa Wash - a meandering southwestern desert wash, beginning downstream of I-8 on FIRM Panel 04013C3475E and continues on FIRM Panel 04013C3470D and ending on FIRM Panel 04013C3490E

West Quilotosa Wash – a wide area of shallow sheet flow on FIRM Panel 04013C3470D. A diversion at the Gila Bend Canal routes some flow to Sauceda wash. The remainder flow converges with Quilotosa Wash just upstream of I-8.

Sauceda Wash – a meandering southwestern desert wash, beginning downstream of I-8 on FIRM Panel 04013C3470D.

I-8 Wash West – wash resulting from a diversion at Sauceda Wash and the Southern Pacific Railroad on FIRM Panel 04013C3470D. Runoff flows to the east to converge with West Quilotosa Wash.

Citrus Valley Wash - a meandering southwestern desert wash, beginning downstream of I-8 on FIRM Panel 04013C3470D.

2.1.8 USGS Quad Sheets

7.5 minute Series (Topographic)

GILA BEND, ARIZ.	1973	Aerial Photographs taken in 1972
SMURR, ARIZ.	1973	Aerial Photographs taken in 1972

2.1.9 Unique Conditions and Problems

There are several unique conditions that complicate this study. Supporting Hydrologic data can be found in Section 4 and calculations in Appendix D. Hydraulic data can be found in Section 5 and calculations in Appendix E.

Diversions and Split Flows

- Bender Wash diversion at I-8. Two sets of culverts are spaces so that stormwater in Bender Wash does not flow through the culverts. This causes an increase in the diverted flow along I-8 to Sand Tank Wash.
- There is breakout occurring upstream of I-8 from Sand Tank Wash to Scott Avenue Wash.
- Split flow occurs at the confluence of I-8 Wash East with Cemetery and Evans Wash. This split occurs as flow overtops the Tucson Cornelia and Gila Bend Railroad. The breakout flow is conveyed along the I-8 embankment and rejoins the flow in Evans wash at the Gila Bend Canal.

- A diversion at Hacker Wash and the Gila Bend Canal directs runoff over SR-85 along the Gila Bend Canal. This flow experiences side weir flow that eventually converges with Hacker Wash Diversion. The remaining stormwater flows behind the canal and converges with Quilotosa Wash.
- A diversion at Hacker Wash and I-8 creates Hacker Wash Diversion as stormwater flows along the I-8 embankment to the traffic interchange at the Southern Pacific Railroad.
- A diversion of flow at the Gila Bend Canal and West Quilotosa Wash. At this location there is no conveyance corridor through the canal. The diverted runoff flows to the west to Sauceda Wash while the remaining flow ponds and then overtops the canal and continues on to I-8 where it converges with Quilotosa Wash.
- A diversion at Sauceda Wash and the Southern Pacific Railroad directs stormwater to the east along the railroad to converge with West Quilotosa Wash.

Alternate Flow Conditions (with and without Canal embankment)

- The Gila Bend Canal embankment is subject to overtopping and washout. As such the washes subject to the potential washout of the Canal embankment were modeled in HEC-1 for two conditions. One condition is with the canal embankment remaining in place and the other is without the canal, ignoring the storage and/or diversion effects of the canal embankment. For purposes of delineating the floodplains, the largest peak discharge from the two conditions was used. The washes impacted by the potential washout are Citrus Valley Wash, Sauceda Wash, Quilotosa Wash, West Quilotosa Wash and Hacker Wash.

Side Weir Flow

- Side weir flow occurs as diverted stormwater flows along the Gila Bend Canal Wash. The water surface elevation is consistently higher than the canal embankment causing water to spill over the canal.
- The diverted flow from Sauceda at the Southern Pacific Railroad flows east to join with West Quilotosa Wash. Along the way side weir flow spills over the railroad and highway.

2.1.10 Coordination of Peak Discharges

The hydrology for this project was prepared by Burgess & Niple Inc., *Gila Bend Area Floodplain Delineation Study, March 1992*. Revisions to the hydrology based upon new mapping are included in this technical data notebook.

2.2 FEMA Forms

This section contains the FEMA Forms for the following Washes.

1 Bender Wash
2 Bender Wash North Tributary
3 Sand Tank Wash
4 Scott Avenue Wash
5 I-8 Wash East
6 Pioneer Cemetery Wash
7 Evans Wash
8 Hacker Wash
9 Hacker Wash Diversion
10 Gila Bend Canal Wash
11 Quilotosa Wash
12 West Quilotosa Wash
13 Sauceda Wash
14 I-8 Wash West
15 Citrus Valley Wash

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Bender Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95
040037	Unincorporated area of Maricopa County	AZ	04013C	3491E	09/30/95

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

_____
Printed Name and Title of Community Official

Flood Control District of Maricopa County
Community Name

Telephone No.: 602-506-1501 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Bender Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
Bender Wash at I-8 (CP 82)	85	5530	5530
Diverted flow west along I-8	85	520	3360
Bender Wash Downstream of I-8	85	5010	2180

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Bender Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: I-8 Highway

Upstream Limit: End of contracted study limit. See attached FIRM map.

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain after the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☒ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within n/a (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within n/a (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within n/a (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☒ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

Bender Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). For this wash the changes are limited to the Diversion at I-8.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: Bender.prj

*.prj is the project file. The plan, flow data and geometric files all have the same name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The WSEL from the previous study by Burgess & Niple (1992) was used as the starting WSEL at the downstream cross section.

Form 4, Section 4: Explain water surface elevations higher than the end of cross sections.

Breakout occurs along Bender wash upstream of I-8. This runoff flows overland to the west and joins discharge in Sand Tank Wash.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

Public reporting burden for this form is estimated to average 2.13 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

A photograph is not required, but is very helpful during review.

2. Flooding Source: Bender Wash, North Tributary

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	*Katy, City* Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95
040037	Unincorporated area of Maricopa County	AZ	04013C	3491E	09/30/95

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

_____
Printed Name and Title of Community Official

Flood Control District of Maricopa County
Community Name

Telephone No.: 602-506-1501 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

Mark T. Gavan, P.E. Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☐ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Bender Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: I-8 Highway

Upstream Limit: End of contracted study limit. See FIRM map.

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☒ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

Bender Wash, North Tributary.

Explanations provided for FEMA forms:

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: Bender.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for the north tributary was taken as a known WSEL from the HEC-RAS model for Bender Wash at cross section 2.024 of the main wash.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

A photograph is not required, but is very helpful during review.

2. Flooding Source: Sand Tank Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

_____
Printed Name and Title of Community Official

Flood Control District of Maricopa County
Community Name

Telephone No.: 602-506-1501 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Signature

Mark T. Gavan, P.E. Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State arizona

Type of License/Expertise: Civil Engineer

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Sand Tank Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☐ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** *If No, attach explanation.* ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
Concentration Point at I-8 (C132)	330.4	23700	24300
Diversion to west along I-8	330.4	8100	13200
Flow Routed downstream of I-8 in Sand Tank Wash	330.4	14900	11100

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 Hour		24 Hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Sand Tank Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: I-8 Highway

Upstream Limit: Limit of Study is a imaginary line extending east along the northern border of the Gunnery Range

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☒ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☒ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

Sand Tank Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). For this wash the changes are limited to the Diversion at I-8 and breakout which occurs upstream of I-8.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: Sandtank.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The ending water surface from the previous study by Burgess & Niple (1992) was used as the starting WSEL at the downstream cross section.

Form 4, Section 4: Explain water surface elevations higher than the end of cross sections.

Breakout occurs along Sand Tank Wash upstream of I-8. This runoff flows overland to the west and joins discharge in Scott Avenue Wash.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. *The basis for this revision request is (are):* (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

A photograph is not required, but is very helpful during review.

2. Flooding Source: Scott Avevnue Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

_____
Printed Name and Title of Community Official

Flood Control District of Maricopa County
Community Name

Telephone No.: 602-506-1501 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Scott Avenue Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
Scott Ave Wash at I-8, concentration point C150	332	8100	13200
Diverted flow to I-8 Wash East	332	4600	9300
Flow in Scott Avenue Wash downstream of I-8	332	3500	3900

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 Hour		24 Hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Scott Avenue Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: I-8 Highway

Upstream Limit: Limit of Study at the northern boundary of the Barry M. Goldwater Gunnery Range

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	*Only the 100-year (Base) flood profile is* required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the *reasonableness of the situation.*

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☒ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - Indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End _____ within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☒ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

Scott Avenue Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). For this wash the changes are limited to the Diversion at I-8 from Scott Avenue Wash.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: Scottave.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was taken as a known WSEL from the Evans Wash model at cross section 0.694.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: I-8 Wash East

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

_____
Printed Name and Title of Community Official

Flood Control District of Maricopa County
Community Name

Telephone No.: 602-506-1501 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

[redacted] T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: I-8 Wash East (divert from Scott Avenue Wash)

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
Diverted flow from Scott Avenue Wash	330	4600	9300
Flow routed through borrow pit to C151	330	4080	9000

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		august 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: I-8 Wash East (diversion from Scott Avenue Wash)

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: convergence with Evans Wash

Upstream Limit: Diversion at Scott Avenue Wash

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☒ Community Name ☐ Corporate Limits labeled ☐ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

I-8 Wash East

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). For this wash the changes are limited to the Diversion at I-8 from Scott Avenue Wash.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: I8Weast.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was taken as a known WSEL from the Evans Wash model at cross section 0.694.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Pioneer Cemetery Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	Katy, City	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
   ☐ Yes ☐ No

If yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

_____
Printed Name and Title of Community Official

Flood Control District of Maricopa County
Community Name

Telephone No.: 602-506-1501 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Pioneer Cemetery Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
not comparable, original study and revised hydrology	____	____	____
do not share a common concentration point.	____	____	____
New Subbasin (3KD) develops	13	____	800

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 Hour		24 Hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☐ Yes	☒ No	☐ Yes	☒ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Pioneer Cemetery Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Confluence with Evans Wash

Upstream Limit: Northern boundary of Barry M. Goldwater Gunnery Range

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding**:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. **Profile Transition**

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

2. **Profile Checklist (check box if information has been provided on profile)**

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☒ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

Pioneer Cemetery Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). For this wash the changes are limited to subdividing the drainage area 3K into 3KA, 3KB, 3KC and 3KD to identify additional concentration points.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS Model for this wash is: Cemetery.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was taken as a known WSEL from the Evans Wash model at cross section 0.694.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): *(check all that apply)*

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

: A photograph is not required, but is very helpful during review.

2. Flooding Source: Evans Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X, A
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95
040037	Unincorporated area of Maricopa County	AZ	04013C	3480E	12/03/93

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☒ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
   ☐ Yes ☐ No

If yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

_____
Printed Name and Title of Community Official

Flood Control District of Maricopa County
Community Name

Telephone No.: 602-506-1501 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Evans Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	*Back-up computations and supporting data*	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
C151, convergence of I-8 East with 3KC and 3KD	18		9000
Combined at C12I	18	4100	9000
Combine at C12O	18	4000	8900

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☐ Yes	☒ No	☐ Yes	☒ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time *for reviewing instructions, searching existing data sources,* gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Evans Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: Convergence with Hacker Wash upstream of Gila Bend Canal

Upstream Limit: Limit of study at northern boundary of Barry M. Goldwater Gunnery Range

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. *See instructions for directions on when other models may* be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☒ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricopa County

Flooding Source: Evans Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Tucson Cornelia Gila Bend Railroad

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 0.684

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). (Attach justification)

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

TUCSON, CORNELIA AND GILA BEND R.R. STRUCTURE UNNAMED WASH NO. 3

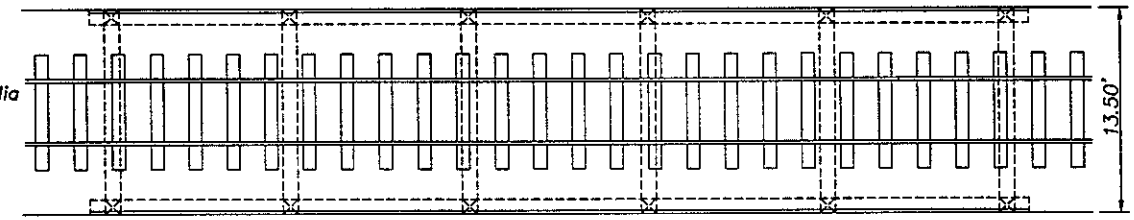
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



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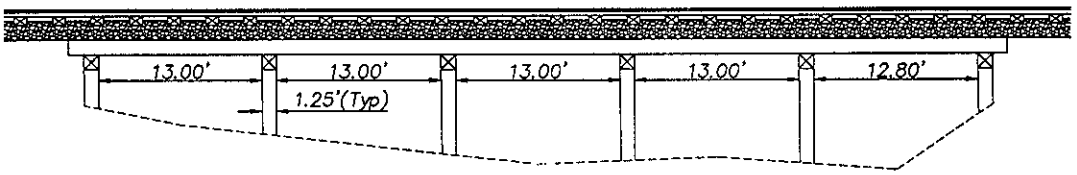

ELEVATION
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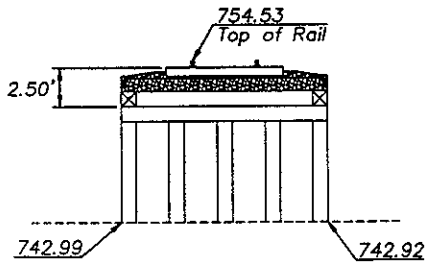

PROFILE
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Evans Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). For this wash the changes are limited to subdividing the drainage area 3K into 3KA, 3KB, 3KC and 3KD to identify additional concentration points. This wash joins with Hacker Wash on the upstream side of the Gila Bend Canal.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: Evans.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was taken as a known WSEL from the confluence with Hacker Wash at cross section 1.846.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Hacker Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X, A
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	Katy, City	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95
040037	Unincorporated area of Maricopa County	AZ	04013C	3480E	12/03/93

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☒ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Hacker Wash

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
   ☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

Shane Dille, City Manager
Printed Name and Title of Community Official

Town of Gila Bend
Community Name

Telephone No.: 928-683-2255 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☒ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Uincorporated Maricopa County

Flooding Source: Hacker Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
Concentration Point C14 with canal in place	19	2700	7100
Concentration Point C14 without canal in place	19	2700	8700

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☒ **Explanation Included** ☐ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		s-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, *hydrologic model schematic, curve number calculations, time of concentration* calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☐ Yes ☒ No

NOTE: FEMA policy is to base flooding on existing conditions.

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☒ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☒ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☒ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Gila Bend Canal culvert # 1

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 1.825

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided)**:

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

GILA BEND CANAL STRUCTURE
UNNAMED WASH NO. 2
(2) 48" CMP'S TRANSITION TO (2) 6'Wx4'H RCBC'S

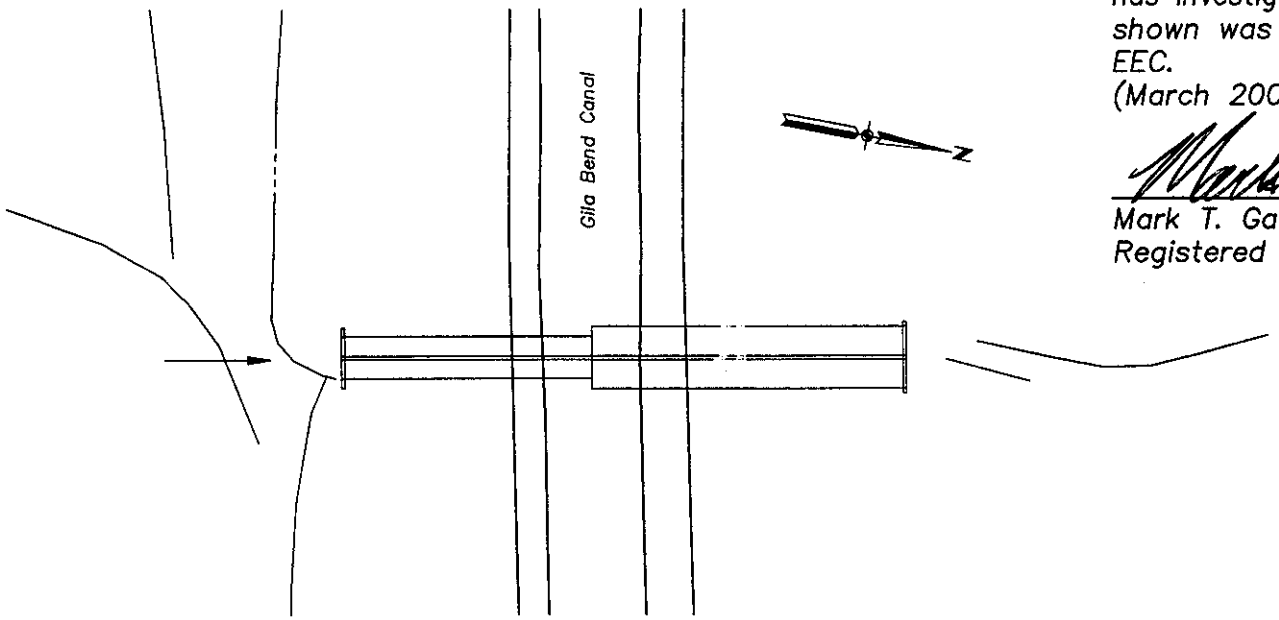
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



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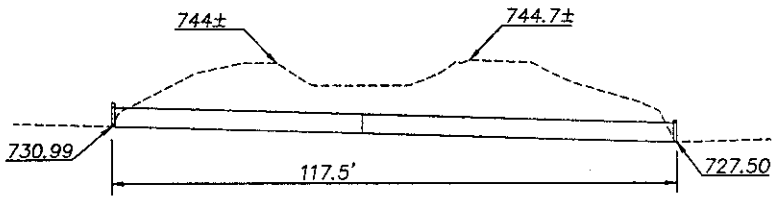

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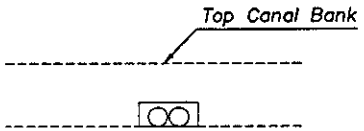

ELEVATION
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FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

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Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Gila Bend Canal culvert # 2

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 1.825

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☐ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. *SEDIMENT TRANSPORT CONSIDERATIONS*

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ *Estimated sediment load*
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

GILA BEND CANAL STRUCTURE
UNNAMED WASH NO. 3
(1) 48" CMP TRANSITION TO (1) 6'Wx3'H RCBC

RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.
(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (Civil)
CERTIFICATE No.
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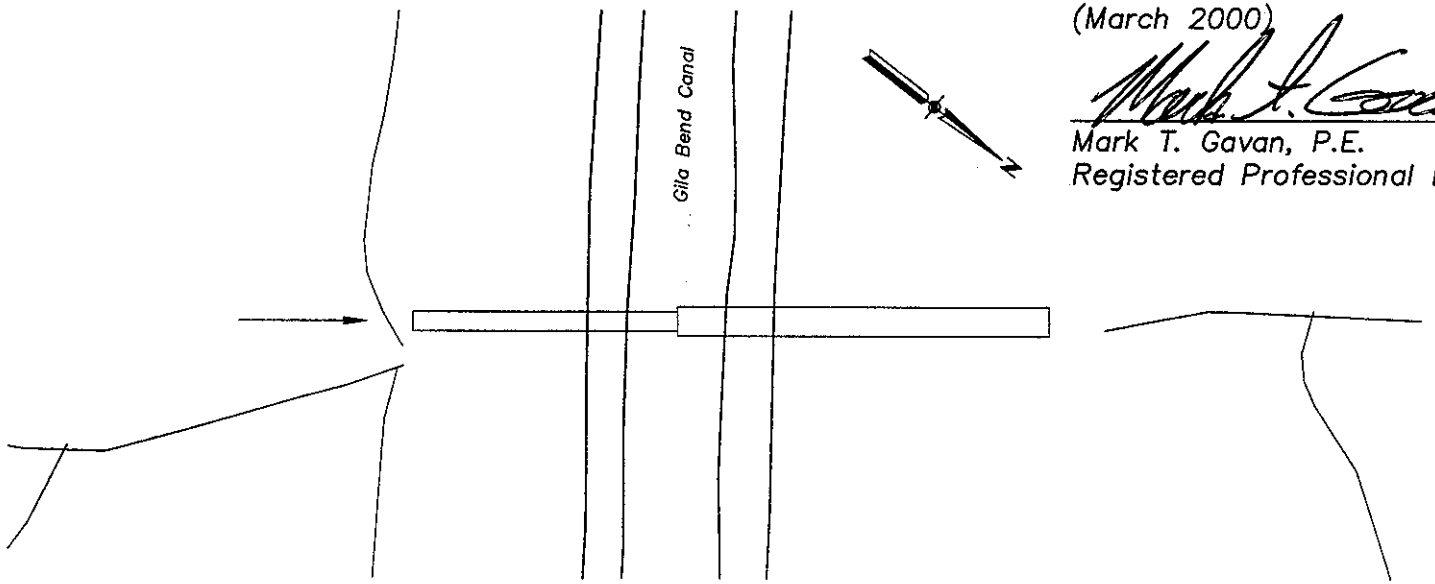
GAVAN
Date Signed.....
ARIZONA, USA



PLAN
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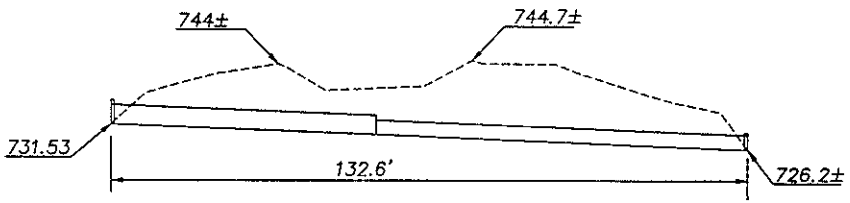

PROFILE
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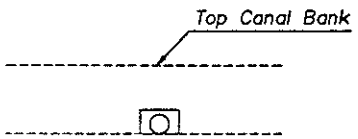

ELEVATION
1"=40'

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

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Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): I-8 Highway

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   1.474

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

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- ☒ Shape (culverts only)
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- ☒ Stream Invert Elevations - Upstream and Downstream
- ☒ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

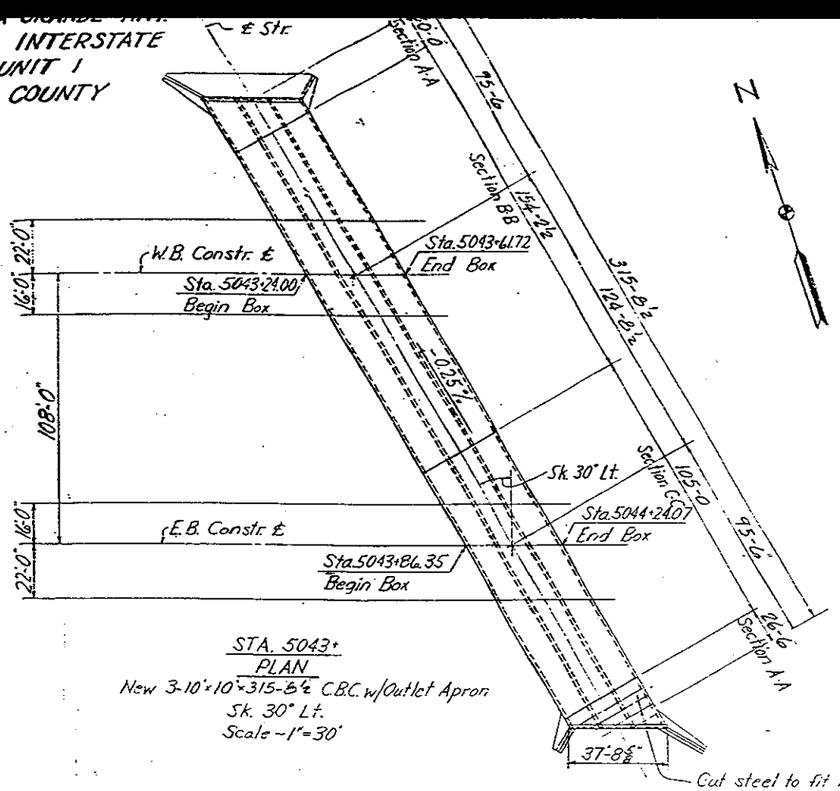
3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

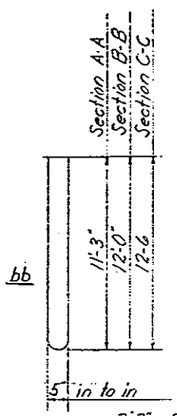
- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

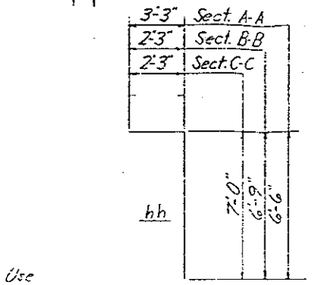
VIA CASA GRANDE NAT'L.
A BEND INTERSTATE
FREEWAY UNIT I
PICOPA COUNTY

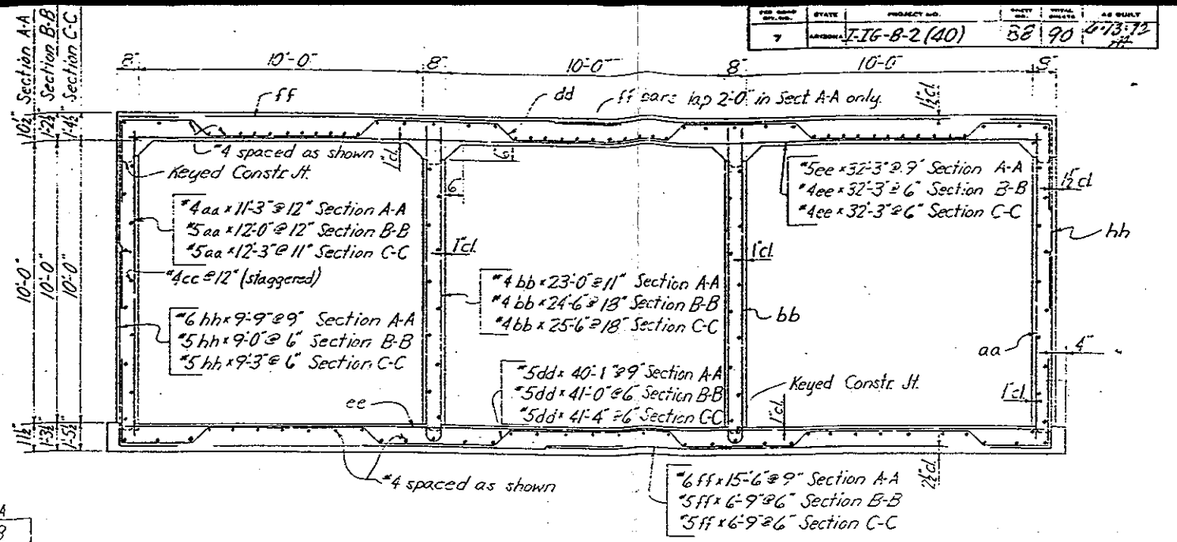
FED. ROAD DIV. NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZONA	I-IG-B-2(40)	88	90	6-13-72



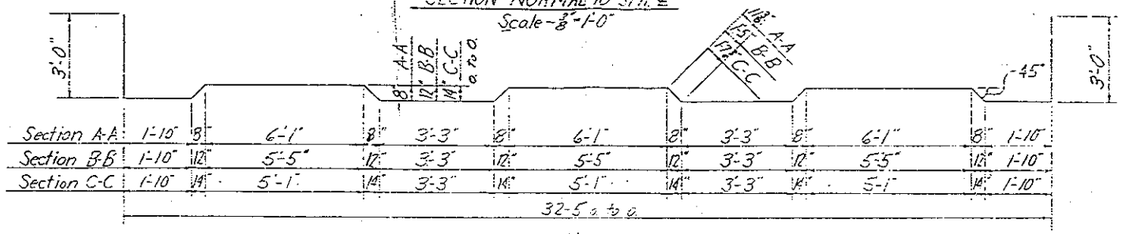
STA. 5043+
PLAN
New 3-10'×10'×315-8½ C.B.C. w/Outlet Apron
Sk. 30° Lt.
Scale – 1"=30'







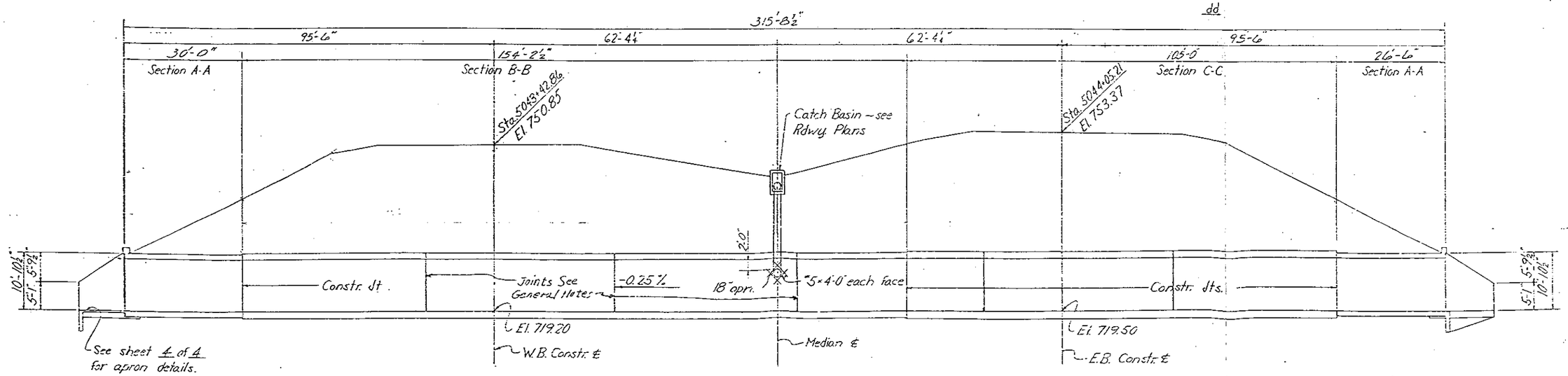
SECTION NORMAL TO STR. ℄
Scale – ⅜"-1'-0"



Section A-A	1'-10"	8"	6'-1"	8"	3'-3"	8"	6'-1"	8"	3'-3"	8"	6'-1"	8"	1'-10"		
Section B-B	1'-10"	12"	5'-5"	12"	3'-3"	12"	5'-5"	12"	3'-3"	12"	5'-5"	12"	1'-10"		
Section C-C	1'-10"	14"	5'-1"	14"	3'-3"	14"	5'-1"	14"	3'-3"	14"	5'-1"	14"	1'-10"		

32-5 c. to c.

dd



SECTION THRU ℄ STRUCTURE
Not to Scale

For General Notes see Summary Sheet

STA 5043+ Unnamed WASH #2

NOTE
For all other Rdwl. details, dimensions, bend diagrams & steel lists, see Std. C1-10-1a 30° sk.

	DATE	
LAYOUT		ARIZONA HIGHWAY DEPARTMENT BRIDGE DIVISION
DESIGN		
ARCHITECTURE		
DRAWN	E.L.C.	5-64
TRACED		STA. 5043+ LOCATION & SPECIAL DETAILS
CHECKED	J.E.A.	11-64
SHEET NO. 3 OF 5	BRIDGE NUMBER	DRAWING NUMBER
		BRIDGE ENGINEER

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash

Project Name/Identifier: Hacker Wash

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Pima Road

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   1.273

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

PIMA ROAD STRUCTURE
UNNAMED WASH NO. 2

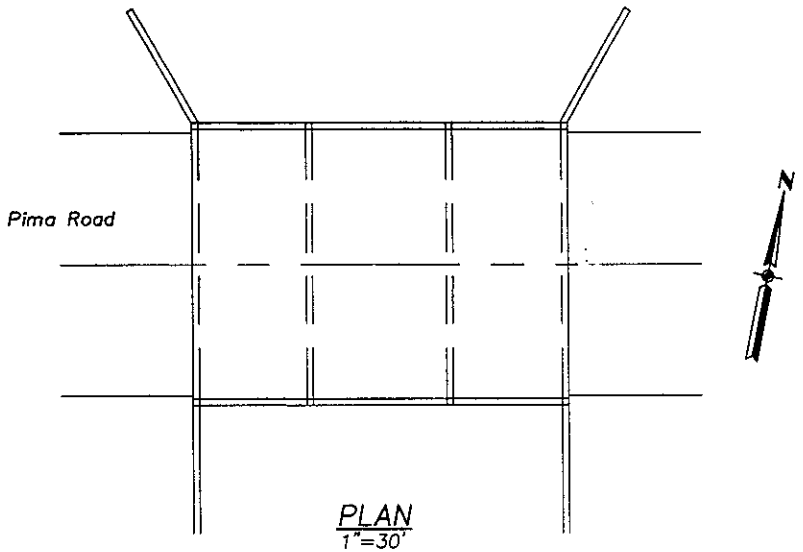
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (Civil)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



PLAN
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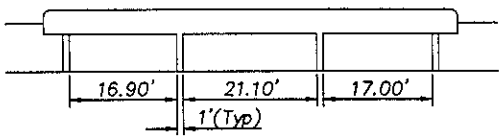

ELEVATION
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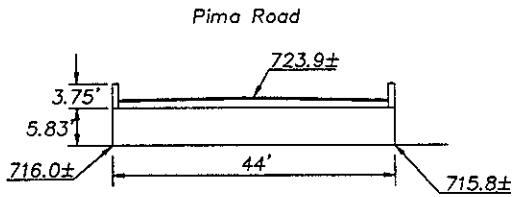

PROFILE
1"=30'

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Southern Pacific Railroad

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   1.309

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should *include the following (check the boxes if the information has been provided):*

- ☒ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☒ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

SOUTHERN PACIFIC RAILROAD
STRUCTURE AT MP 854.60
UNNAMED WASH NO. 2

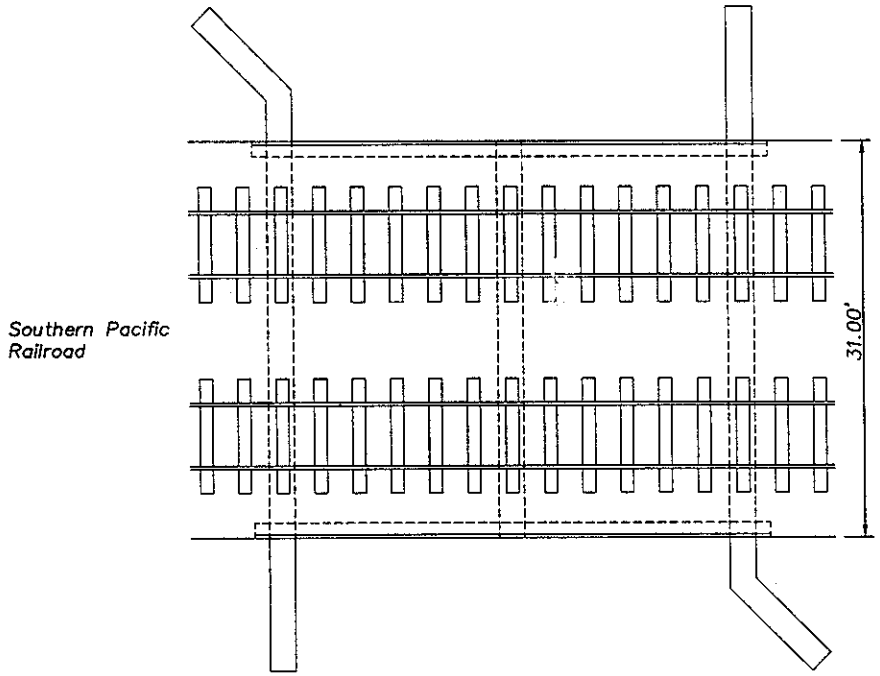
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (Civil)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



PLAN
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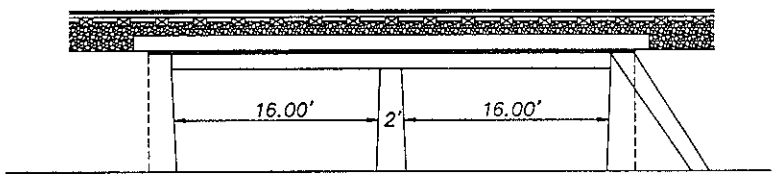
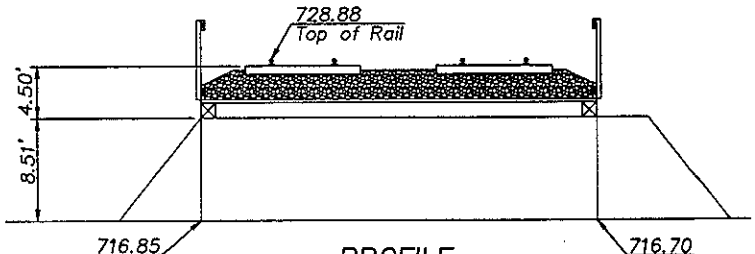


ELEVATION
1"=15'



PROFILE
1"=15'

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

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Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash

Project Name/Identifier: Hacker Wash

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Tucson Cornelia Gila Bend Railroad

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 3.165

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should *include the following* (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

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- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

TUCSON, CORNELIA AND GILA BEND R.R. STRUCTURE UNNAMED WASH NO. 2

RECORD DRAWING

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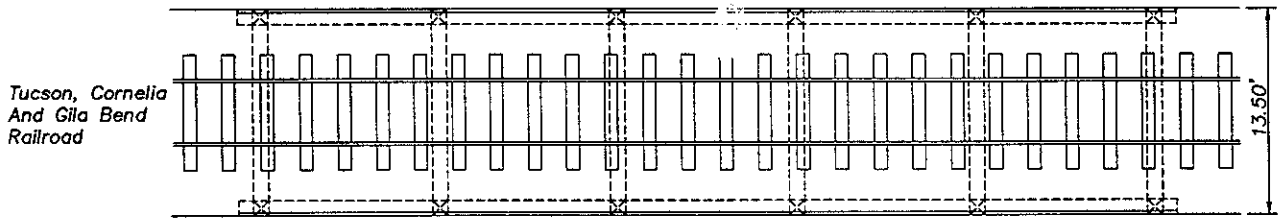
(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



PLAN
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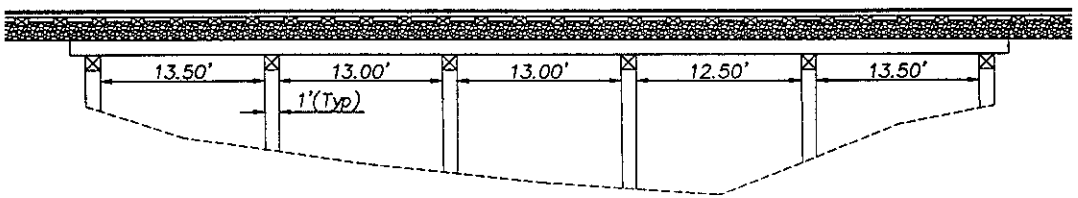
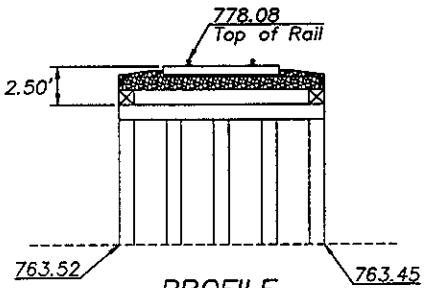


ELEVATION
1"=15'



PROFILE
1"=15'

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

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Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): SR-85

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   1.610

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   ———

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ ***Yes*** ☐ ***No*** ☒ ***N/A***

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
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- ☒ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
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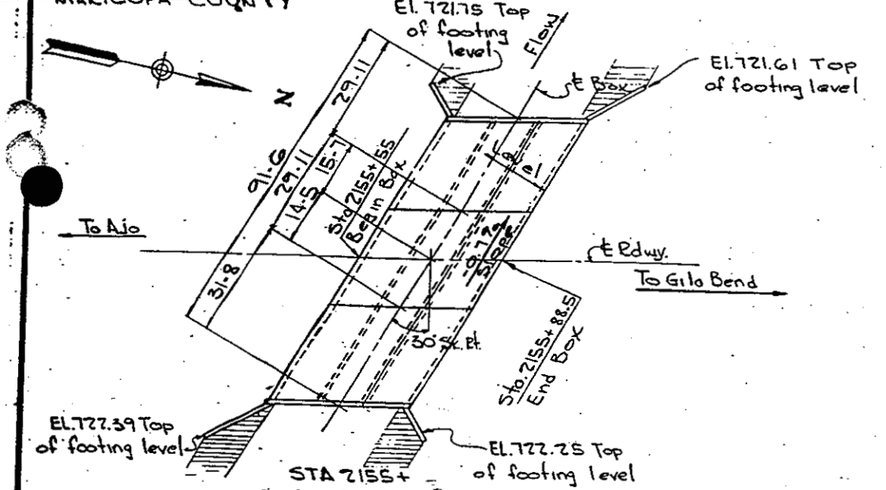
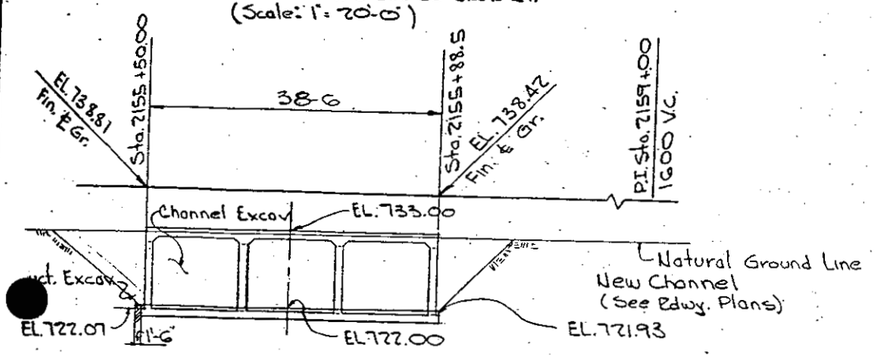
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

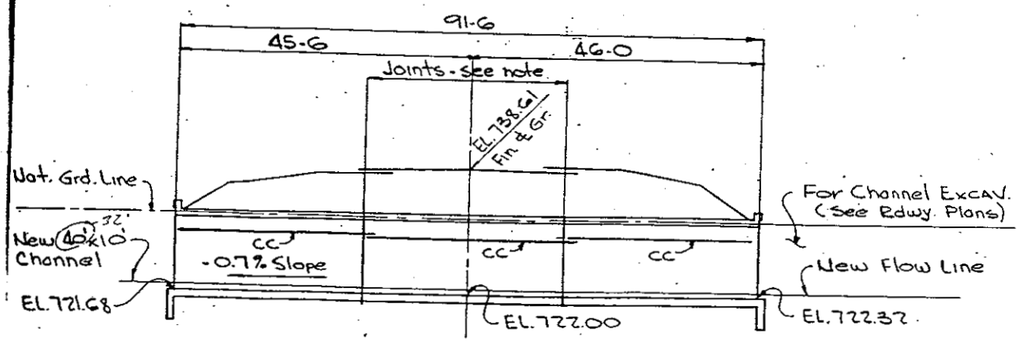
MARICOPA COUNTY



STA 2155+
LOCATION PLAN
New 3-10'x10'x91'-6 Box 30° Skew Rt.
(Scale: 1"=20'-0")



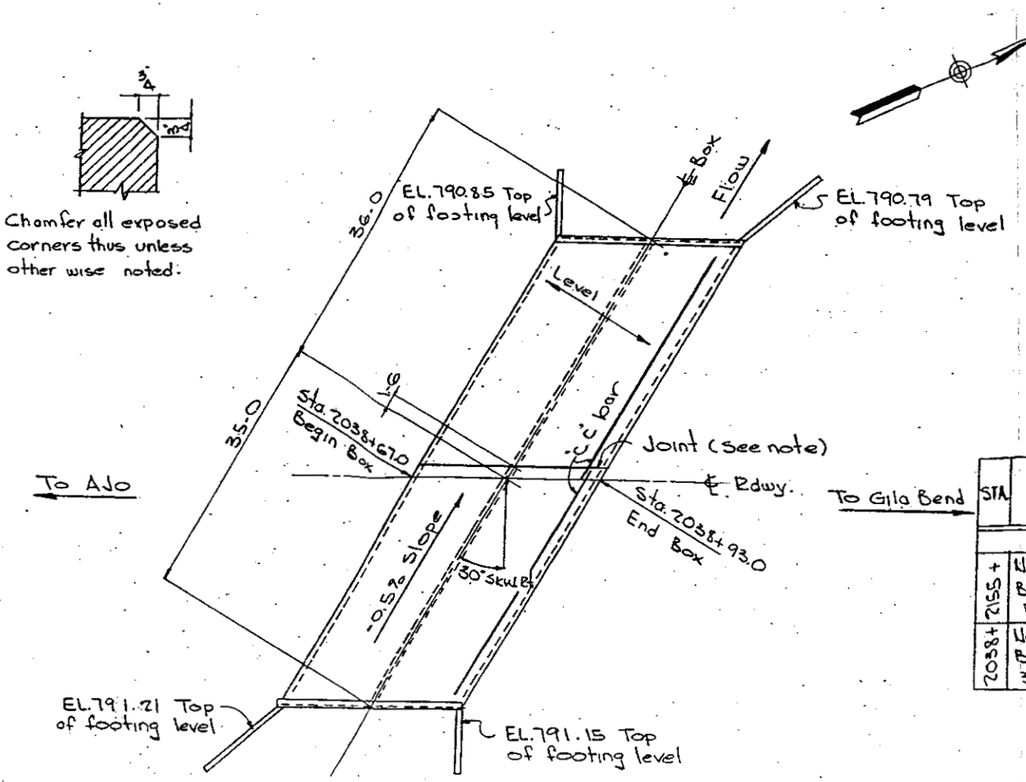
SECTION ON ℄ RDWY.
(Scale: 1"=10'-0")



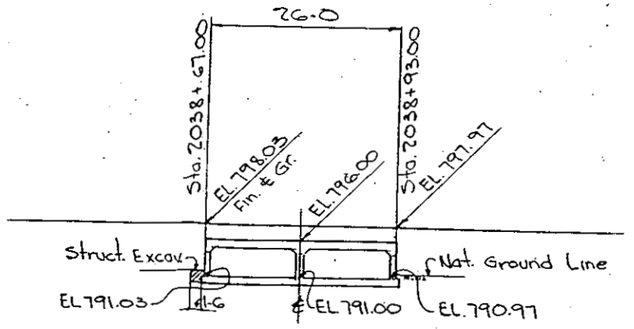
SECTION ON ℄ CULVERT
(Scale: 1"=10'-0")

STA. Sta. 2155+
See Std. C1-10-3 30° Skew for all other barrel, curb & cut-off wall details, dimensions, bend diagrams & steel list.
Std. C1-10-7a 30° Skew for all other wing details, dimensions, bend diagrams & steel list.

Chamfer all exposed corners thus unless other wise noted.



Sta. 2038+
LOCATION PLAN
New 2-10'x9'x71-0 Box 30° Skew Rt.
(Scale: 1"=10'-0")



SECTION ON ℄ RDWY.
(Scale: 1"=10'-0)

NOTE:- STA. 2038+
See Std. C1-10-7-30° Skew for other barrel details, dimensions & bend diagrams.
See Std. CW1-3 for all other headwall details, dimensions, bend diagrams & steel list

7	ARIZONA	S-722(22)	45	46	6-19-63 JRP

STEEL LIST
(Sta. 2155+)

Mark	No	Size	Lgth	Bend
Standard Barrel				
aa	184	#6	129	A.
bb	184	#6	280	B2
cc	462	#4	31-6	Str.
dd	128	#7	460	D2
ee	176	#7	38-3	Str.
ff	252	#7	7-0	Str.

STEEL LIST
(Sta. 2038+)

Mark	No	Size	Lgth	Bend
Standard Barrel				
aa	184	#5	6-6	A
bb	72	#5	12-0	B
cc	172	#4	36-3	Str.
dd	100	#7	33-0	D
ee	102	#7	25-9	Str.
ff	102	#7	7-0	Str.

APPROXIMATE QUANTITIES

STA.	Structure	Std No.	Sheet No.	Struct. Excav. C.Y.	Spec. Comp. C.Y.	Class A Conc. C.Y.	Reinf. Steel Lbs.
2155+	New 3-10'x10'x91'-6" Box Culv. 30° Skew Rt.	Spec. C1-10-3 & 3-6a C1-10-7a-30a	45	361.8 ~~390~~	✓ 560	✓ 396.24	48696 ~~49,250~~
2038+	New 2-10'x9'x71'-0 Box Culv. 30° Skew Rt.	Spec. C1-10-7-30 & 7a CW1-3	45	241.1 ~~260~~	✓ 160	✓ 173.59	20,811 ~~20,900~~

REDUCED SIZE
DO NOT SCALE

STA 2155+
UNNAMED WASH No 2
SR-85

GENERAL NOTES
Construction - Std Specs. Ariz. Hwy. Dept. Edition of 1960
Reinforcing Steel shall be intermediate grade ASTM A15 & A305
All dimensions for reinforcing steel shall be from the surface of concrete to center of bars except when noted otherwise

JOINT NOTE:
All structures shall have Contraction or Cold Joints in the top slab and walls (Optional in floor slab) spaced not more than 40 feet apart or as shown. The joint may be made with ¼" plywood bulkhead which shall be left in place. Reinforcing steel shall project through the joint.

ALL CONCRETE CLASS "A"

		DATE
LAYOUT	-	
DESIGN	-	
ARCHITECTURE	-	
QUANTS	J.E.B.	5-61
TRACING	-	
CHECKED	N.A.B.	6-61
SHEET No.	1 - 2	

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

STA. 2155+ & STA. 2038+
LOCATION & SPECIAL DETAILS

Registered Professional Engineer — Certificate Expires — MARTIN TONEY — Dec. 31, 19__ — Arizona U.S.A.

S-722(22)

Hacker Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). For this wash the changes are limited to subdividing the drainage area 3K into 3KA, 3KB, 3KC and 3KD to identify additional concentration points. Hacker Wash also has two diversions in the hydrology model, one at the Gila Bend Canal and the other at I-8.

Form 3, Section 4: Comparison of Flood Discharges

Two flows are compared to the existing model. One with and one without the canal in place. It is our belief that a dam break could occur severely increasing the likelihood of flooding downstream of the canal. Therefore peak flows were determined for both cases.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: Hacker.prj , Hacker1.prj

Hacker.prj is the model with the Gila Bend Canal in place
Hacker1.prj is the model without the Gila Bend Canal.

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was taken from hydraulic calculations of the slope area method at the downstream cross section.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

A photograph is not required, but is very helpful during review.

2. Flooding Source: Hacker Wash Diversion

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X, A
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3480E	12/03/93

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Hucker Wash 011

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____ (Name) flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the *project is fee exempt.* ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

***Note:* I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

***Note:* Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

Shane Dille, Town Manager
Printed Name and Title of Community Official

Town of Gila Bend
Community Name

Telephone No.: 928-683-2255 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Mark Gavan
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash, (Diversions at I-8)

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☐ Precipitation/Runoff Model	Form 3 - Attachment D	☐ Yes ☐ No
☐ Other	*Back-up computations and supporting data*	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
in the original study this diversion did not take place			

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☐ Yes	☒ No	☐ Yes	☒ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Hacker Wash Diversion

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☐ Precipitation/Runoff Model	Form 3 - Attachment D	☐ Yes ☐ No
☐ Other	*Back-up computations and supporting data*	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
in the original study this diversion did not take place			

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the *reasonableness of the situation.*

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

Hacker Wash Diversion

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). Revisions to the original study included an significant increase in flood flows in Hacker Wash. This resulted in a diversion at I-8 which was not accounted for in the original study.

Form 3, Section 4: Comparison of Flood Discharges

Two flows are compared to the existing model. One with and one without the canal in place. It is our belief that a dam break could occur severely increasing the likelihood of flooding downstream of the canal. Therefore peak flows were determined for both cases.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: HWDiv.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was taken as the known WSEL at the down stream convergence with Hacker Wash.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area
A photograph is not required, but is very helpful during review.

2. Flooding Source: Gila Bend Canal Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X, A
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95
040037	Unincorporated area of Maricopa County	AZ	04013C	3470D	04/15/88

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Gila Bend Canal Wash

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
   ☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____ (Name) flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ Yes ☒ No ☐ N/A

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

Shane Dille, Town Manager
Printed Name and Title of Community Official

Town of Gila Bend
Community Name

Telephone No.: 928-683-2255 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

M. T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Gila Bend Canal Wash, (diversion from Hacker Wash)

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
Diverted flow from Hacker Wash, DC12L	19	1250	3400

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☐ Yes	☒ No	☐ Yes	☒ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: *FEMA policy is to base flooding on existing conditions.*

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Gial Bend Canal Wash, (diversion from Hacker Wash)

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: convergence with Quilotosa Wash at Gila Bend Canal

Upstream Limit: Diversion from Hacker Wash at Gila Bend Canal

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ Natural File Name _____ ☐ Floodway File Name _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ Natural File Name _____ ☐ Floodway File Name _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ Natural File Name _____ ☐ Floodway File Name _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ Natural File Name _____ ☐ Floodway File Name _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain after the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ Natural ☐ Floodway

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☒ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☒ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☒ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

Gila Bend Canal Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). Revisions to the original study included a significant increase in flood flows in Hacker Wash. This resulted in a diversion at I-8 which was not accounted for in the original study.

Form 3, Section 4: Comparison of Flood Discharges

There is a marked increase in the diverted flow from Hacker Wash when comparing the new HEC-1 model to the previous study. This is primarily due to the increase in diverted flow west along I-8.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: GBCwash.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was taken as the known WSEL at the down stream convergence with Quilotosa Wash.

Form 4, Section 4: Explain why the WSEL is higher than the end of the cross sections.

The Gila Bend Canal acts as a side weir for the diverted flow. This was modeled in HEC-2 to develop a diversion rating curve which was incorporated in the HEC-1 modeling. The remaining flows were then input into the HEC-RAS model.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area
A photograph is not required, but is very helpful during review.

2. Flooding Source: Quilotosa Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X, A
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3470D	04/15/88
040037	Unincorporated area of Maricopa County	AZ	04013C	3490E	09/30/95

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☒ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Quilotosa Wash

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
   ☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ Yes ☒ No ☐ N/A

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

Shane Dille, Town Manager
Printed Name and Title of Community Official

Town of Gila Bend
Community Name

Telephone No.: 928-683-2255 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☒ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Quilotosa Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS *for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.*

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
C11 in, at Gila Bend Canal	20	7800	9200
C11 out, at Gila Bend Canal	20	3700	9200
C17 at I-8	21	3600	12000

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Quilotosa Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: limit of study is just north of I-8

Upstream Limit: limit of study is the northern boundary of the Barry M. Goldwater gunnery range

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ Natural File Name _____ ☐ Floodway File Name _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ Natural File Name _____ ☐ Floodway File Name _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ Natural File Name _____ ☐ Floodway File Name _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ Natural File Name _____ ☐ Floodway File Name _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other - Please attach a sheet describing all other models submitted along with the file names. ☒ Natural ☐ Floodway

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☒ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☒ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricopa County

Flooding Source: Quilotosa Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): I-8 Highway

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 3.831

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

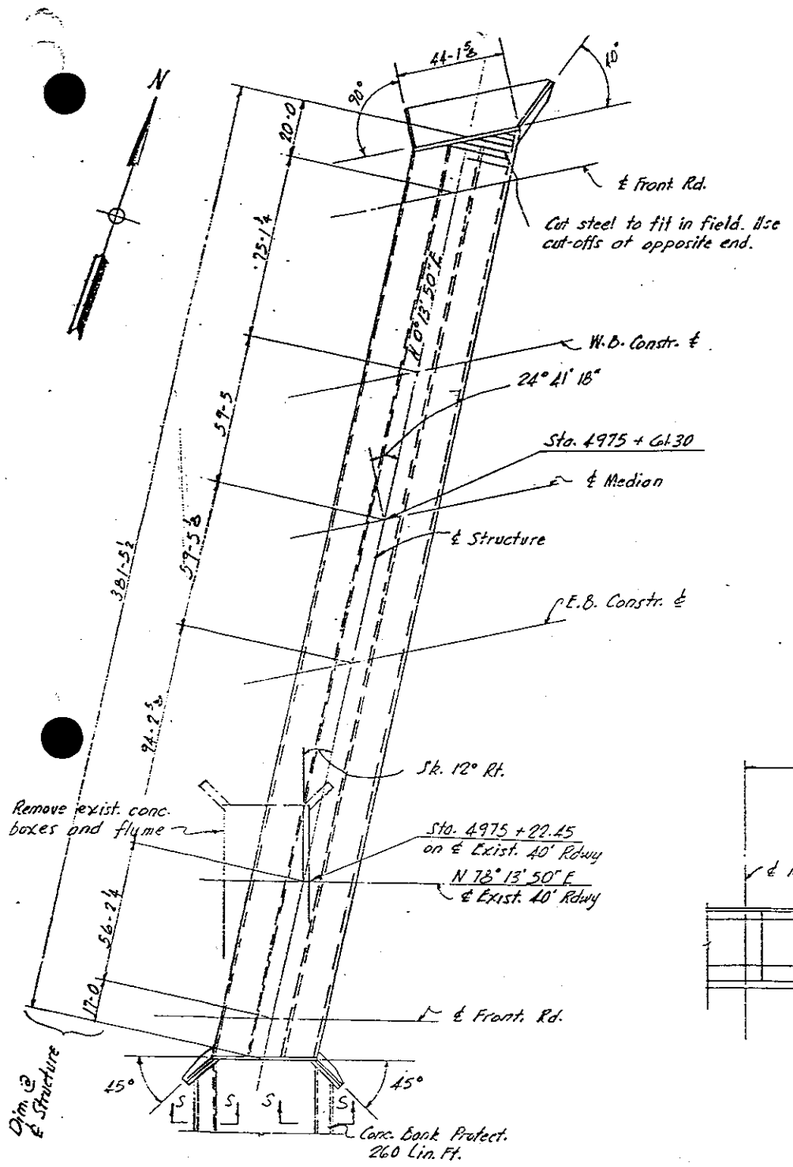
- ☒ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☒ Material
- ☒ Beveling or Rounding
- ☒ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

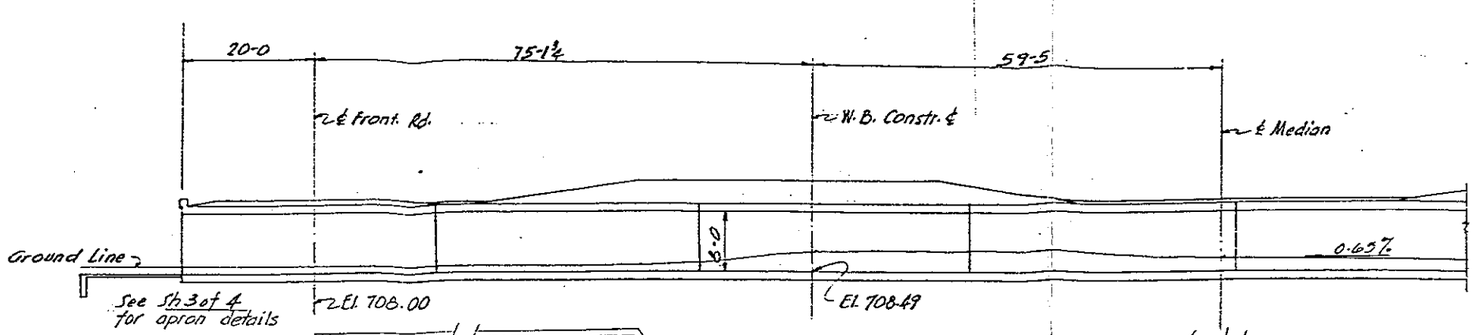
- ☐ Suspended sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

	STATE	PROJECT NO.			
7	ARIZONA	I-IG-8-2(40)	87	90	2-73-72

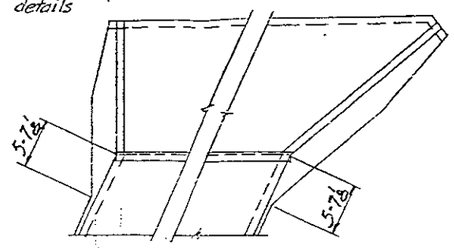


Sta. 4975+
PLAN
New 3-12'-6" x 381-5½ C.B.C. w/Outlet Apron

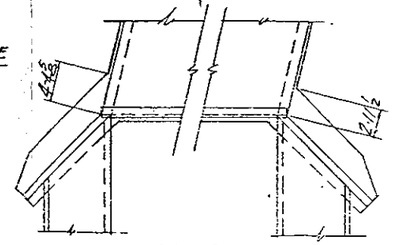
Note – N. Front. Rd & S. Front. Rd. curbs to be built parallel to edge of rdwy.



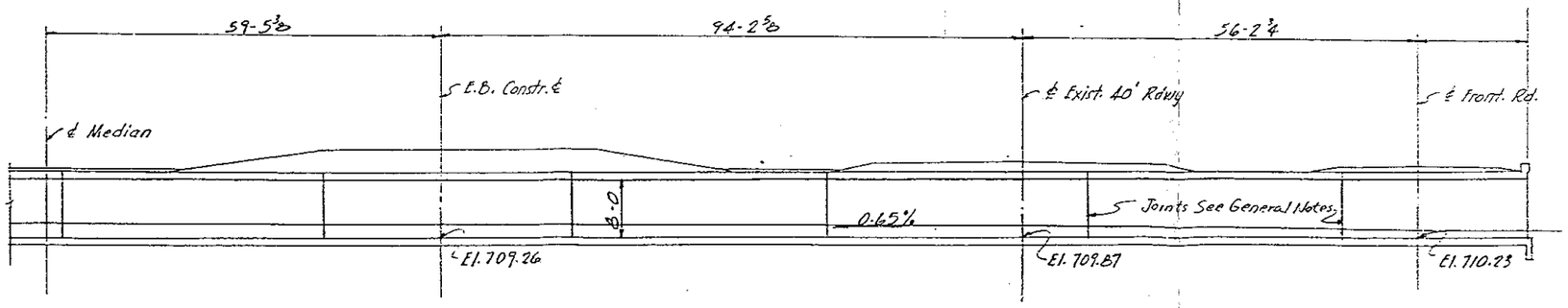
SECTION THRU £ STRUCTURE



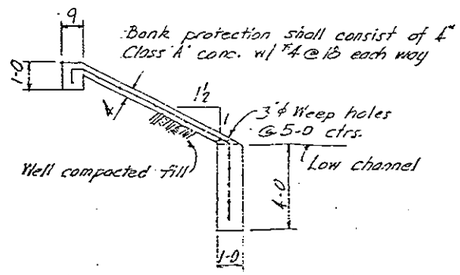
OUTLET HDWL



INLET HDWL



SECTION THRU £ STRUCTURE



SECTION S-S

Note – For all other bbl. details see Std C1-12-3
" " " inlet hdwl details see Std CW-2
" " " outlet " " " Std CW-4

For General Notes see Summary Sheet.

STA 4975+ Quilotosa Wash MAIN

		DATE
LAYOUT		
DESIGN		
ARCHITECTURE		
DRAWN	KM	6-68
TRACED		
CHECKED	WJ	6-68

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

Sta. 4975+
LOCATION & SPECIAL DETAILS

SHEET NO 2 OF 5

BRIDGE NUMBER

DRAWING NUMBER

BRIDGE ENGINEER

I-IG-8-2(40)

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

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Community Name: Unincorporated Maricopa County

Flooding Source: Quilotosa Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Southern Pacific Railroad

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 3.897

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ *New analysis of bridge/culvert previously modeled in the FIS*

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should *include the following* (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

SOUTHERN PACIFIC RAILROAD
STRUCTURE AT MP 853.39
QUILOTOSA WASH

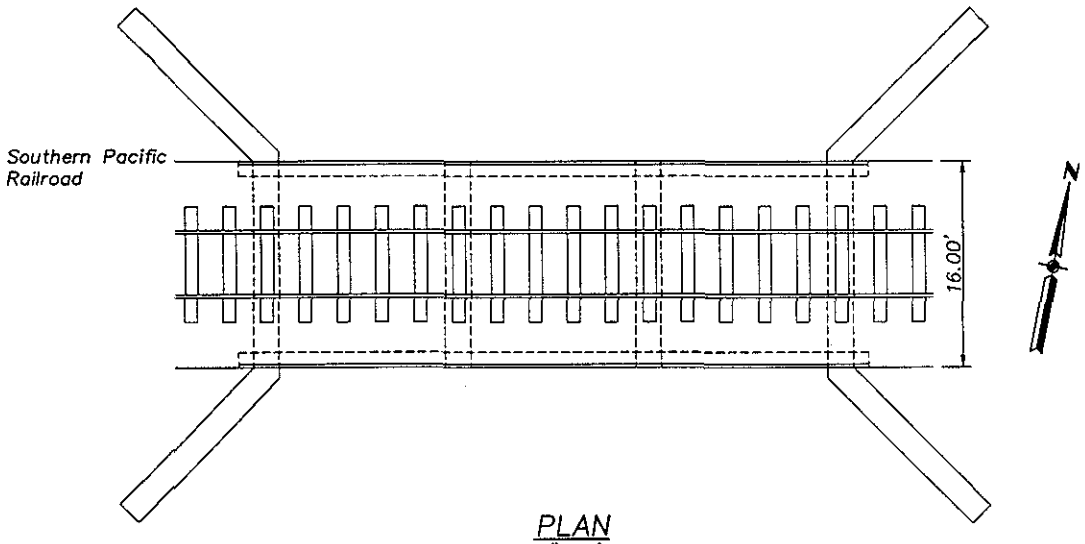
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

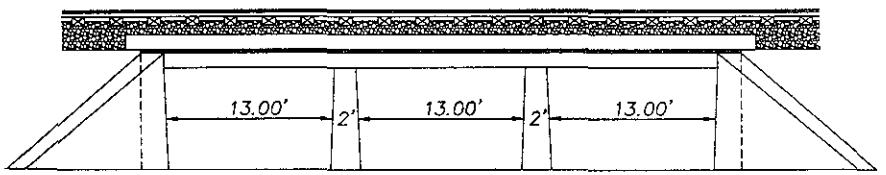
(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



PLAN
1"=15'



ELEVATION
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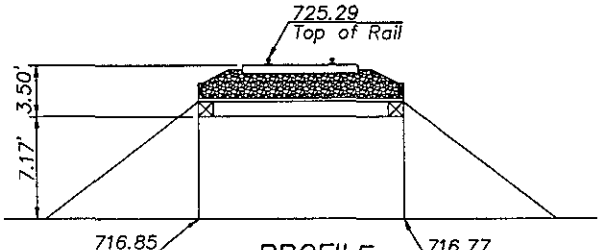

PROFILE
1"=15'

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

Public reporting burden for this form is estimated to average 2.13 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

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1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area

A photograph is not required, but is very helpful during review.

2. Flooding Source: West Quilotosa Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X, A
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3470D	04/15/88
040037	Unincorporated area of Maricopa County	AZ	04013C	3475D	04/15/88

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☒ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

West Quitobaquito Wash

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ Yes ☒ No ☐ N/A

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

***Note:* I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

***Note:* Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

Shane Dille, Town Manager
Printed Name and Title of Community Official

Town of Gila Bend
Community Name

Telephone No.: 928-683-2255 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

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Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: West Quilotosa Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
C34 in, upstream of Gila Bend Canal	19	11000	10700
Diversion to Sauceda Wash	———	———	4300
C34 out, downstream of Gila Bend Canal	———	———	6000

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		Pro HEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	*Loss rate method:*	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration *calculations, and supporting maps,* delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

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Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: West Quilotosa Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: limit of study just north of I-8

Upstream Limit: limit of study is the northern boundary of the Barry M. Goldwater gunnery range

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) Upstream End n/a within _____ (feet)
Cross-Section # *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☒ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☒ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right *corner of this form.*

Community Name: Unincorporated Maricopa County

Flooding Source: West Quilotosa Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. *Name of structure (roadway, railroad, etc.):* I-8 Highway

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River mile 0.314

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☒ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

INTERSTATE 8 STRUCTURE
W.B. STA 4954+87.00 TO 4955+33.19
THREE BARREL 12'x8' BOX CULVERT

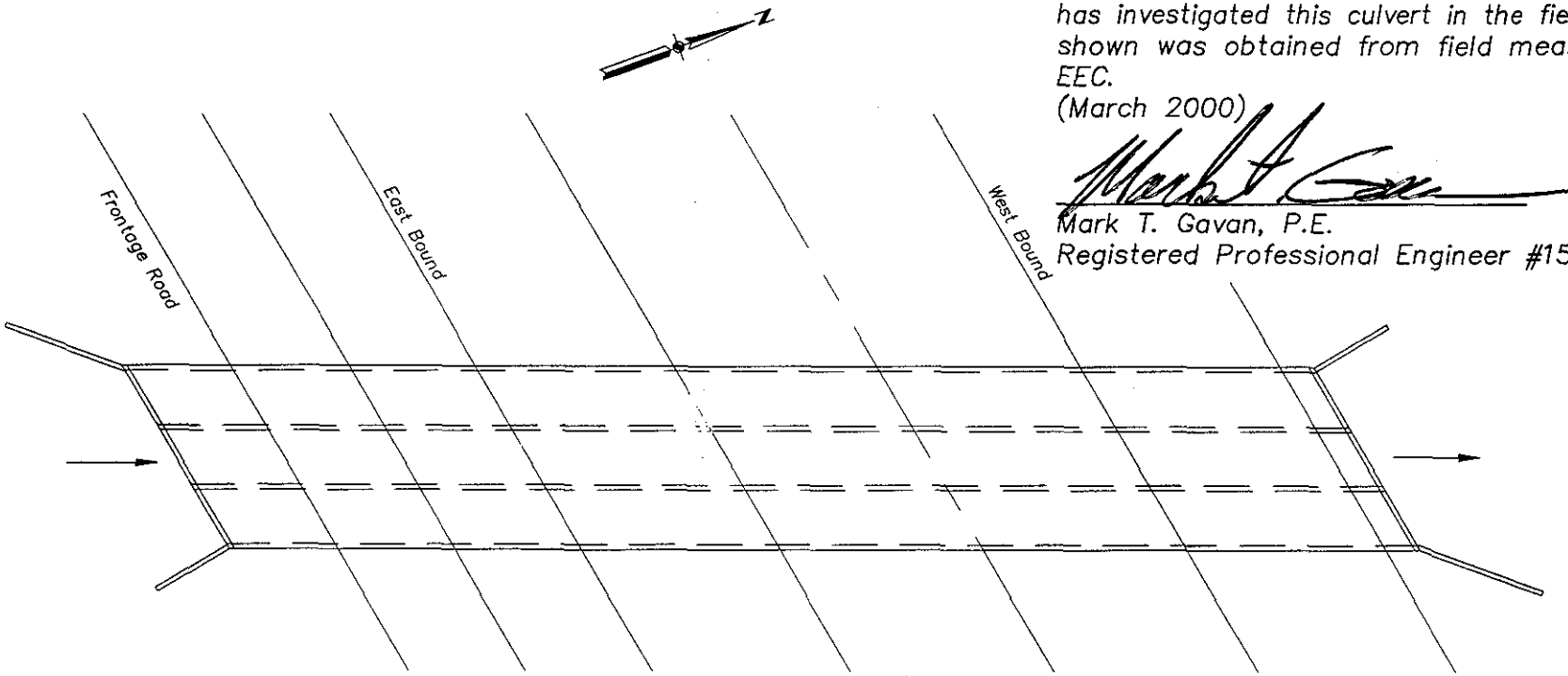
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



PLAN
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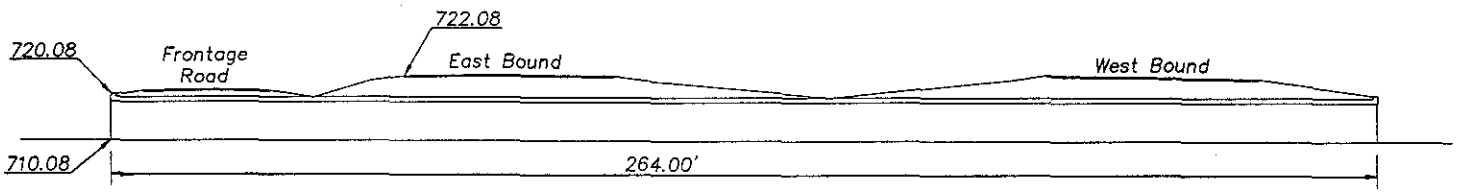

PROFILE
1"=40'

ELEVATION
1"=40'

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricopa County

Flooding Source: West Quilotosa Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Southern Pacific Railroad

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 0.366

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

SOUTHERN PACIFIC RAILROAD
STRUCTURE AT MP 853.01

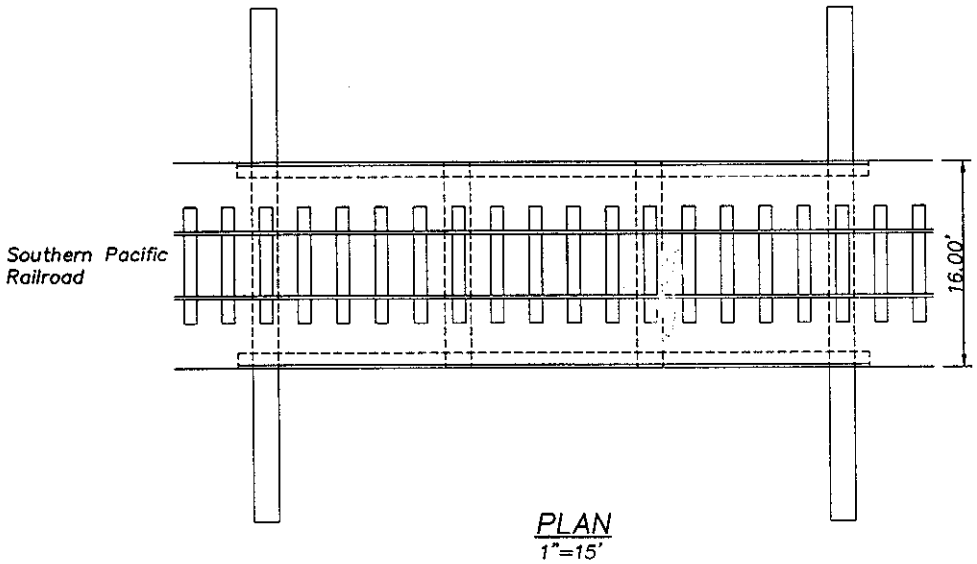
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



PLAN
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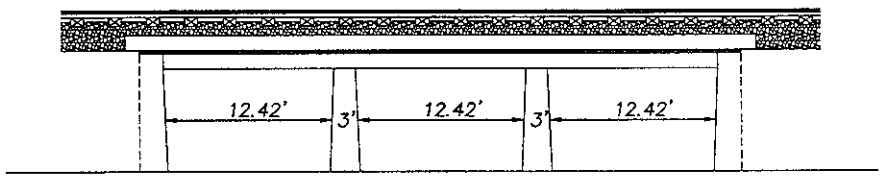
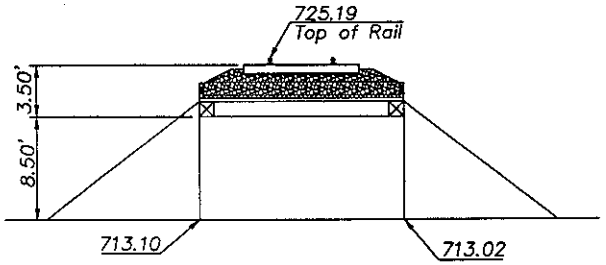


ELEVATION
1"=15'



PROFILE
1"=15'

West Quilotosa Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). Revisions to the original study included the reduction of storage and the separation of a common flood pool, behind the Gila Bend Canal, into wash specific reservoir routes.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: WQuilotosa.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was taken as the know WSEL the downstream cross section of Quilotosa Wash.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area
A photograph is not required, but is very helpful during review.

2. Flooding Source: I-8 Wash West

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3470D	04/15/88

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☐ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

I-8 wash west

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
   ☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ *Yes* ☒ *No* ☐ *N/A*

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: **I understand that my signature indicates that all information submitted in support of this request is correct**

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

Shane Dille, Town Manager
Printed Name and Title of Community Official

Town of Gila Bend
Community Name

Telephone No.: 928-683-2255 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

_____
Signature

k T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☐ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: I-8 Wash West, (diversion from Sauceda Wash)

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMI)	FIS(cfs)	Revised (cfs)
not modeled in original study			

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☐ Yes	☒ No	☐ Yes	☒ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: *FEMA policy is to base flooding on existing conditions.*

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Uincorporated Maricopa County

Flooding Source: I-8 Wash West, (diversion from Sauceda Wash)

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: confluence with West Quilotosa Wash

Upstream Limit: diversion from Sauceda Wash

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding:**
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ **Natural** **File Name** _____ ☐ **Floodway** **File Name** _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain after the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ **Natural** ☐ **Floodway**

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the *requester's property)*

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☐ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☐ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area
A photograph is not required, but is very helpful during review.

2. Flooding Source: Sauceda Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X, A
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301 480287	Katy, City Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3470D	04/15/88

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☒ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Saucedo Wash

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note: ***I understand that my signature indicates that all information submitted in support of this request is correct***

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

Note: **Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

Shane Dille, Town Manager
Printed Name and Title of Community Official

Town of Gila Bend
Community Name

Telephone No.: 928-683-2255 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Mark T. Gavan
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☒ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. *Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to:* Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Sauceda Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	Back-up computations and supporting data	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
C36 in, at Gial Bend Canal	20	16200	9600
C36 out	20	12500	8700
C37 at Southern Pacific Railroad	20	12400	8700

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		ProHEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. ***Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.***

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Sauceda Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: limit of study just downstream of I-8

Upstream Limit: limit of study is the northern boundary of the Barry M. Goldwater gunnery range

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:	**for areas which do not have detailed flooding**:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.	Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ Natural File Name _____ ☐ Floodway File Name _____

Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ Natural File Name _____ ☐ Floodway File Name _____

The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ Natural File Name _____ ☐ Floodway File Name _____

The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ Natural File Name _____ ☐ Floodway File Name _____

The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ Natural ☐ Floodway

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. 100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

b. Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

c. Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

2. Profile Checklist (check box if information has been provided on profile)

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☒ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☒ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricipa County

Flooding Source: Sauceda Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): I-8 Highway

2. Location of bridge/culvert along flooding source (*in terms of stream distance or cross-section identifier*):

   River Mile 4.066

3. *This revision reflects (check one of the following):*

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

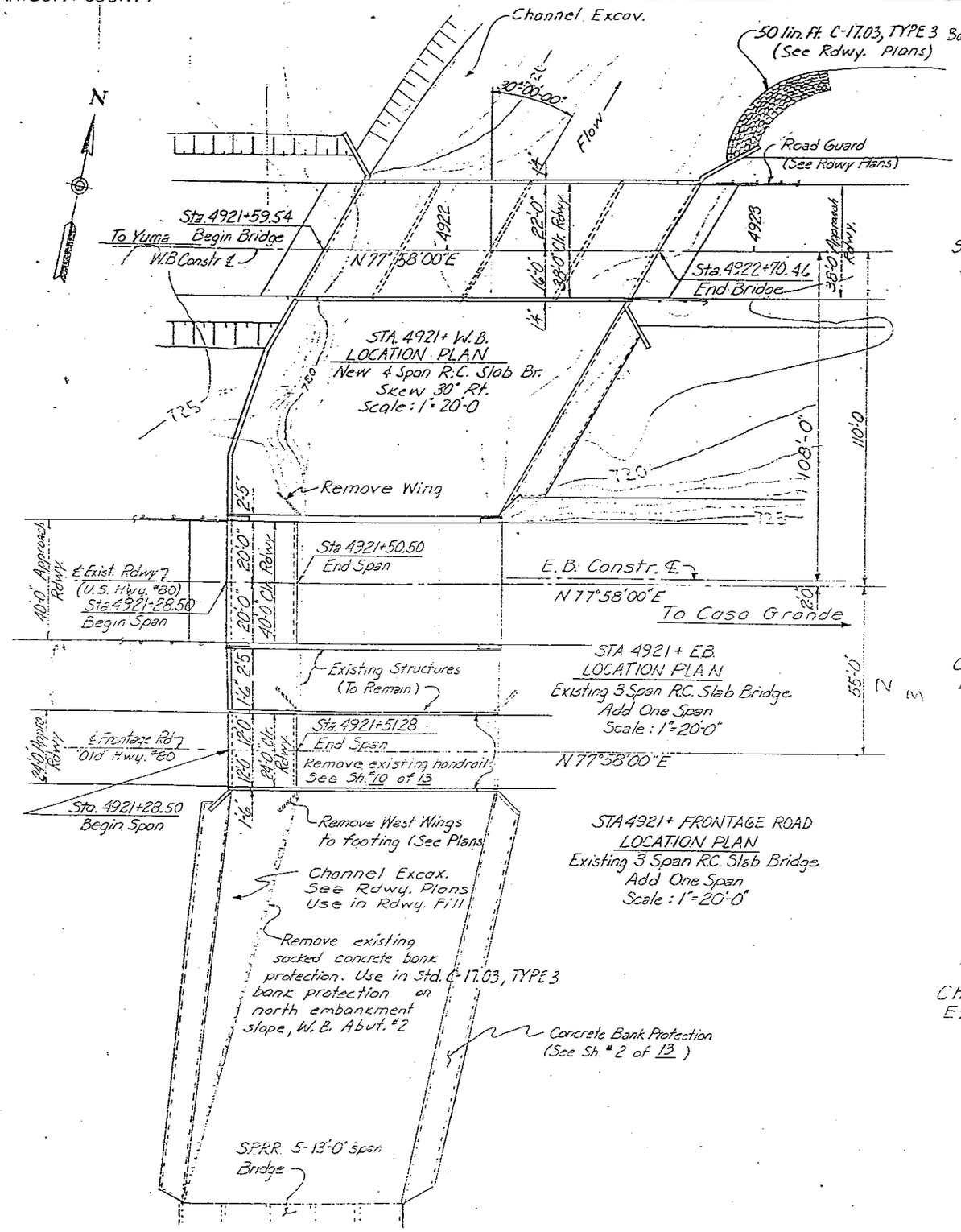
   ———

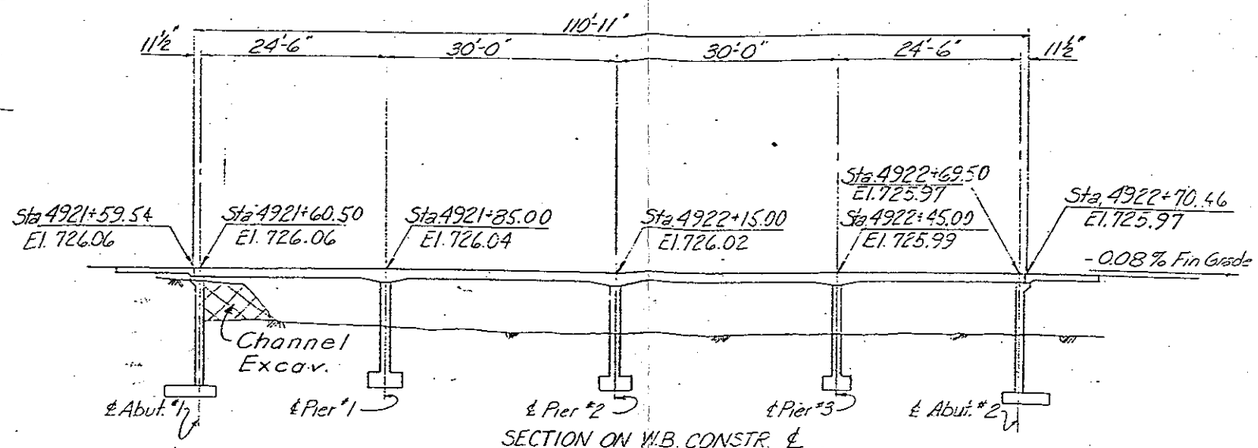
   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

7	I-IG-8-2 (40)	36	90	8-13-73





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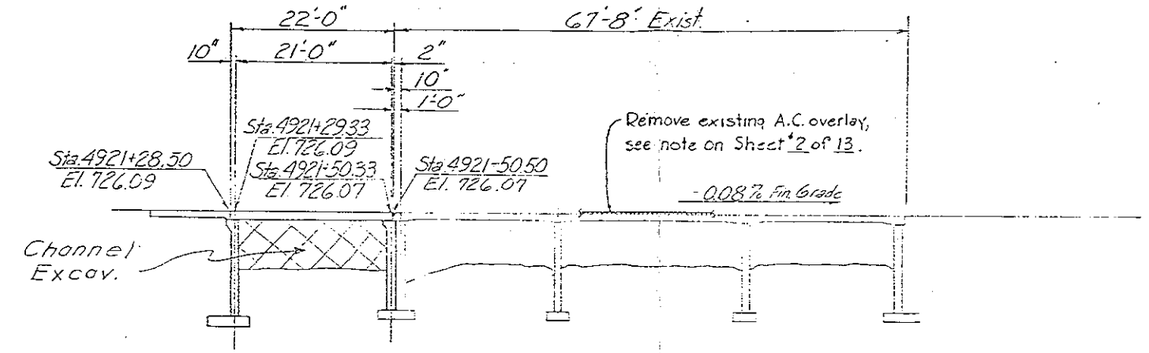

SECTION ON E.B ℄
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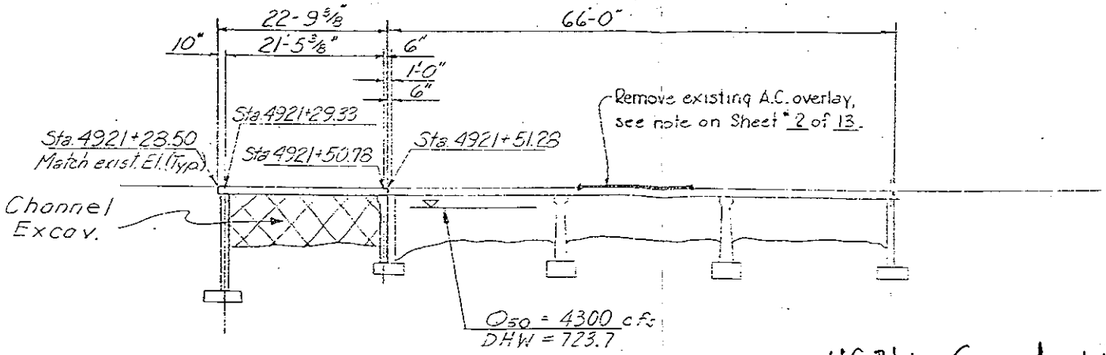

SECTION ON FRONTAGE RD ℄
Scale: 1"=10'

4921+ Sauceda WASH (MAIN)

	DATE
LAYOUT	
DESIGN	
ARCHITECTURE	
DRAWN	H&R 4-74
TRACED	
CHECKED	JEM 11-74
SHEET NO.	1 OF 13

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

STA. 4921+
SAUCEDA WASH BRIDGES
LOCATION DETAILS

BRIDGE NUMBER | DRAWING NUMBER | BRIDGE ENGR.

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricipa County

Flooding Source: Sauceda Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. *Name of structure (roadway, railroad, etc.):* Southern Pacific Railroad

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   4.112

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. *The plan detail and information should* include the following (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ *Estimated sediment load*
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

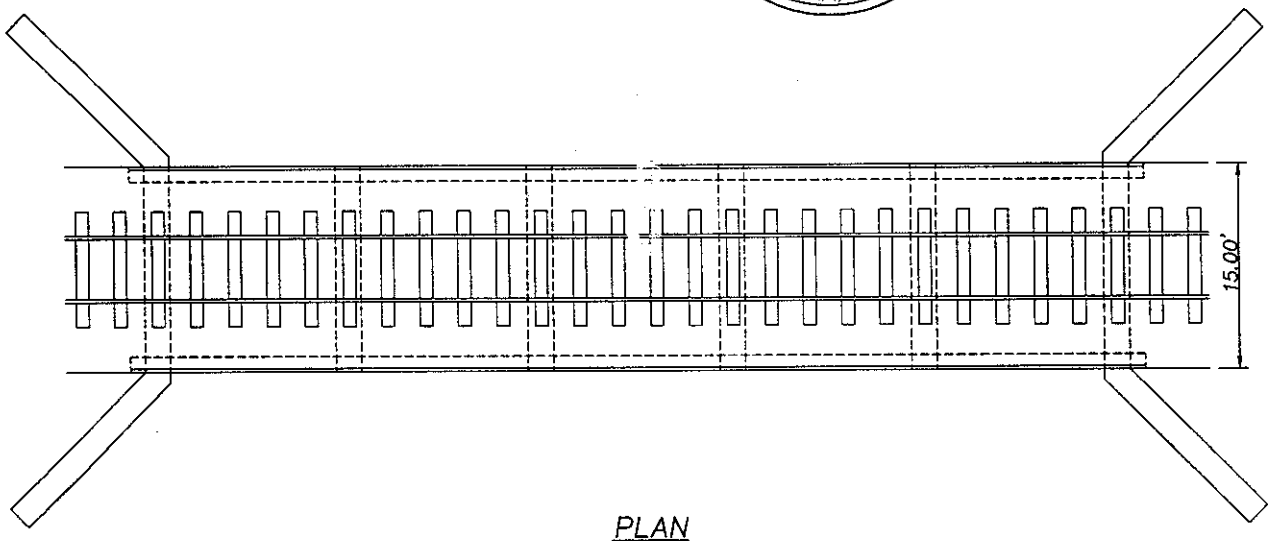
SOUTHERN PACIFIC RAILROAD
STRUCTURE AT MP 852.38
SAUCEDA WASH

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (Civil)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.

RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.
(March 2000)



PLAN
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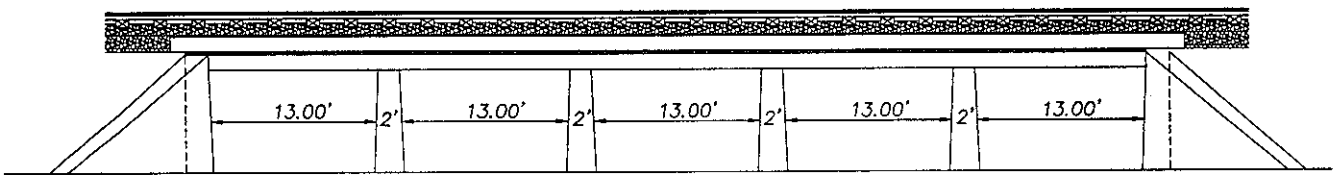
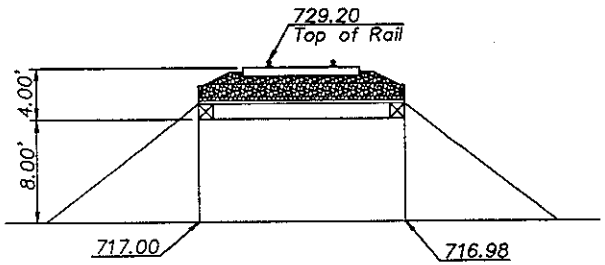


ELEVATION
1"=15'



PROFILE
1"=15'

Sauceda Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). Revisions to the original study included the reduction of storage and the separation of a common flood pool, behind the Gila Bend Canal, into wash specific reservoir routes.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: Sauceda1.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was calculated using the slope area method at the downstream cross section of Sauceda Wash.

FEDERAL EMERGENCY MANAGEMENT AGENCY **REVISION REQUESTER AND COMMUNITY OFFICIAL**	O.M.B No. 3067-0148 Expires April 30, 2001

1. REQUESTED RESPONSE FROM FEMA

This request is for a:

☐ CLOMR A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60,65 & 72).

☐ LOMR A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, floodway or flood elevations. LOMRs typically decrease flood hazards. (See 44 CFR Ch. 1 Parts 60 & 65.)

☒ Other Describe: Floodplain and Floodway Determination

2. OVERVIEW

1. The basis for this revision request is (are): (check all that apply)

☐ Physical Change ☐ Improved Methodology/Data ☐ Floodway Revision

☒ Other Describe: This is the first detailed study of this area
Note: A photograph is not required, but is very helpful during review.

2. Flooding Source: Wash

3. Project Name/Identifier: Gila Bend ADMP/Floodplain Delineation Study, F.C.D. No 99-18

4. FEMA zone designations affected: zone X
(example: A, AH, AO, A1-A30, A99, AE, V, V1-V30, VE, B, C, D, X)

5. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	Katy, City	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040037	Unincorporated area of Maricopa County	AZ	04013C	3470D	04/15/88

6. The area of revision encompasses the following types of flooding and structures. Check all that apply.

Types of Flooding	Structures
☒ Riverine	☐ Channelization
☐ Coastal	☐ Levee/Floodwall
☐ Alluvial fan	☒ Bridge/Culvert
☐ Shallow Flooding (e.g. Zones AO and AH)	☐ Dam
☐ Lakes	☐ Fill
☐ Other (describe)	☐ Other (describe)

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

Citrus Valley Wash

4. ENCROACHMENT INFORMATION

1. Does the State have jurisdiction over the floodway or its adoption by communities participating in the NFIP?
☐ Yes ☐ No

If Yes, attach a copy of a letter notifying the appropriate State agency of the floodway revision and documentation of the approval of the revised floodway by the appropriate State agency.

2. Does the development in the floodway cause the 1% annual chance (base) elevation to increase at any location by more than 0.000 feet? ☐ Yes ☐ No ☐ N/A

3. Does the cumulative effect of all development that has occurred since the effective SFHA was originally identified cause the base flood elevation to increase at any location by more than one foot (or other increase limit if community or state has adopted more stringent criteria - even if a floodway has not been delineated by FEMA)? ☐ Yes ☐ No

If the answer to either items is Yes, please attach documentation that all requirements of Section 65.12 of the NFIP regulations have been met, regarding *evaluation of alternatives, notice to individual legal property owners, concurrence of CEO, and* certification that no insurable structures are impacted.

5. MAINTENANCE RESPONSIBILITY

The community is willing to assume responsibility for ☐ performing ☐ overseeing compliance with the maintenance and operation plans of the _____
(Name)
flood control structure. If not performed promptly by an owner other than the community, the community will provide the necessary services without cost to the Federal government.

Operation and maintenance plans are attached. ☐ **Yes** ☒ **No** ☐ **N/A**

6. REVIEW FEE

The review fee for the appropriate request category has been included. ☒ Yes Fee amount: $_____

OR

This request is based on a federally sponsored flood-control project where 50 percent or more of the project's cost is federally sponsored, or the request is based on detailed hydrologic and hydraulic studies conducted by Federal, State, or local agencies to replace approximate studies conducted by FEMA and shown on the effective FIRM; thus the project is fee exempt. ☐ Yes

Please see Instructions for Fee Amounts

7. SIGNATURE

Note:* I understand that my signature indicates that all information *submitted in support of this request is correct

_____
Signature of Revision Requester

_____
Printed Name and Title of Revision Requester

Flood Control District of Maricopa County
Company Name

Telephone No.: 602-506-1501 Date: _____

***Note:* Signature indicates that the community understands, from the revision requester, the impacts of the revision on flooding conditions in the community.**

_____
Signature of Community Official

Shane Dille, Town Manager
Printed Name and Title of Community Official

Town of Gila Bend
Community Name

Telephone No.: 928-683-2255 Date: _____

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is in accordance with 44 CFR Ch. 1, Sect 65.2

Mark T. Gavan
Signature

Mark T. Gavan, P.E., Project Manager
Printed Name and Title of Revision Requester

Registr No. 15594 Expires (Date) _____ State Arizona

Type of License/Expertise: Civil Engineering

Check which forms have been included with this request

Form Name and (Number)	Required if .....
☒ **Hydrologic** (3)	new or revised discharges
☒ **Hydraulic** (4)	new or revised water-surface elevations
☐ **Mapping** (5)	floodplain/floodway changes
☐ **Channelization** (6)	channel is modified
☒ **Bridge/Culvert** (7)	addition/revision of bridge/culvert
☐ **Levee/Floodwall** (8)	addition/revision of levee/floodwall
☐ **Coastal** (9)	new or revised coastal elevations
☐ **Coastal Structures** (10)	addition/revision of coastal structure
☐ **Dam** (11)	addition/revision of dam
☐ **Alluvial Fan** (12)	structures proposed on alluvial fan

FEDERAL EMERGENCY MANAGEMENT AGENCY **HYDROLOGIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average **3.67** hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Citrus Valley Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REASON FOR NEW HYDROLOGIC ANALYSIS

☐ No existing analysis ☒ Improved data ☐ Changed physical condition of watershed

☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Other

For the reason stated above, please attach a detailed explanation. If a computer program/model was used in revising the hydrologic analysis, **please provide a diskette with the input files** for the same flood recurrence intervals contained in the FIS for that stream; and at least for the 1% annual chance (base) flood where no detailed study exists.

Explanation provided: ☒ Yes ☐ No **Diskettes provided:** ☒ Yes ☐ No

2. METHODOLOGY FOR NEW ANALYSIS

Indicate Method	Required Data	Data Included
☐ Statistical Analysis of Gage Records	Form 3 - Attachment A	☐ Yes ☐ No
☐ Regional Regression Equations	Form 3 - Attachment C	☐ Yes ☐ No
☒ Precipitation/Runoff Model	Form 3 - Attachment D	☒ Yes ☐ No
☐ Other	*Back-up computations and supporting data*	☐ Yes ☐ No

3. APPROVAL OF ANALYSIS

The hydrologic analysis has already been approved by a local, state, or Federal Agency. ☐ Yes ☐ No ☐ Not Required

If Yes, attach evidence of approval. ☐ **Approval attached.** If No, attach explanation. ☐ **Explanation attached.**

4. COMPARISON OF BASE FLOOD DISCHARGES

Location:	Drainage Area (SqMi)	FIS(cfs)	Revised (cfs)
C53 in, at Gila Bend Canal	____	3200	3200
C53 out, at Gila Bend Canal	____	1900	2200
C56	____	1800	2100

Note: When revised discharges are not significantly different than the FIS discharges, FEMA may require a confidence limits analysis (see attachment B) at a later date to complete the review.

If only a portion of a detailed study area was revised please attach an explanation describing the transition from the proposed discharges to the effective discharges. ☐ **Explanation Included** ☒ **Explanation Not Required**

5. HISTORICAL FLOODING INFORMATION

If historical data are available for the flooding source please provide: Location, peak discharges/water-surface elevations and dates, and source of information. ☐ **Data Attached** ☒ **Data Not Available**

ATTACHMENT D: PRECIPITATION/RUNOFF MODEL

		FIS:		Revised:	
	Method or model used:	HEC-1		Pro HEC-1	
	Version:	4.0.1E		4.0.1PD	
	Date:	May 1991		August 1995	
2.	Source of rainfall depth:	———		———	
3.	Source of rainfall distribution:	———		———	
4.	Rainfall duration:	24 hour		24 hour	
5.	Areal adjustment to precipitation (%):	———		———	
6.	Maximum overland flow length	———		———	
7.	Hydrograph development method:	S-graph		S-graph	
8.	Loss rate method:	Green & AMPT		Green & AMPT	
	Source of soils information:	———		———	
	Source of land use information:	———		———	
9.	Channel routing method:	Normal Depth		Normal Depth	
10.	Reservoir routing:	☒ Yes	☐ No	☒ Yes	☐ No
	Baseflow considerations:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how baseflow was determined:				
	———				
12.	Snowmelt considerations:	☐ Yes	☒ No	☐ Yes	☒ No
13.	Model calibration:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain below how calibration was performed				
	———				
14.	Future land use condition:	☐ Yes	☒ No	☐ Yes	☒ No
	If Yes, explain why below				
	———				

15. **Attach precipitation/runoff model, hydrologic model schematic, curve number calculations, time of concentration calculations, and supporting maps, delineating the watershed boundary and drainage area divides.**

Information and Maps provided? ☒ Yes ☐ No

NOTE: FEMA policy is to base flooding on existing conditions.

FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE HYDRAULIC ANALYSIS**	O.M.B No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2.25 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Note: Fill out one form for each flooding source studied

Community Name: Unincorporated Maricopa County

Flooding Source: Citrus Valley Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. REACH TO BE REVISED

Describe the limits of the revision OR submit a copy of the FIRM with the revision area clearly highlighted.
Copy of FIRM(s) attached depicting area of the revision (highlighted, or circled)? ☒ Yes

Downstream Limit: limit of study just downstream of I-8

Upstream Limit: limit of study is the northern boundary of the Barry M. Goldwater gunnery range

2. MODELS SUBMITTED

Requirements: for areas which have detailed flooding:
Full input and output listings along with files on diskette for each of the models listed below (items 1-4) and a summary of the source of input parameters used in the models must be provided. The summary must include a description of any changes made from model to model (e.g., Duplicate Effective model to Corrected Effective model). At a minimum, the Duplicate Effective (item 1) and the Revised or Post-Project Conditions (item 4) models must be submitted. See instructions for directions on when other models may be required.

for areas which do not have detailed flooding:
Only the 100-year (Base) flood profile is required. A hydraulic model is not required for areas which do not have detailed flooding; however, BFEs may not be added to the revised FIRM. If a hydraulic model is developed for the area, items 3 and 4 described below must be submitted.

If hydraulic models are not developed, hydraulic analyses (including all calculations) for existing or pre-project conditions and revised or post-project conditions must be submitted.

1. Duplicate Effective Model ☐ Natural File Name _____ ☐ Floodway File Name _____
Copies of the hydraulic analysis used in the effective FIS, referred to as the effective models (10-, 50-, 100-, and 500-year multi-profile runs and the floodway run) must be obtained and then reproduced on the requester's equipment to produce the Duplicate Effective model. This is required to assure that the effective models input data has been transferred correctly to the requester's equipment and to assure that the revised data will be integrated into the effective data to provide a continuous FIS model upstream and downstream of the revised reach.

2. Corrected Effective Model ☐ Natural File Name _____ ☐ Floodway File Name _____
The Corrected Effective model is the model that corrects any errors that occur in the Duplicate Effective model, adds any additional cross sections to the Duplicate Effective model, or incorporates more detailed topographic information than that used in the currently effective model. The Corrected Effective model must not reflect any man-made physical changes since the date of the effective model. An error could be a technical error in the modeling procedures, or any construction in the floodplain that occurred prior to the date of the effective model but was not incorporated into the effective model.

3. Existing or Pre-Project Conditions Model ☐ Natural File Name _____ ☐ Floodway File Name _____
The Duplicate Effective model or Corrective Effective model is modified to produce the Existing or Pre-Project Conditions model to reflect any modifications that have occurred within the floodplain since the date of the Effective model but prior to the construction of the project for which the revision is being requested. If no modification has occurred since the date of the effective model, then this model would be identical to the Corrected Effective model or Duplicate Effective model.

4. Revised or Post-Project Conditions Model ☐ Natural File Name _____ ☐ Floodway File Name _____
The Existing or Pre-Project Conditions model (or Duplicate Effective model or Corrected Effective model, as appropriate) is revised to reflect revised or post-project conditions. This model must incorporate any physical changes to the floodplain since the effective model was produced as well as the effects of the project. When the request is for the proposed project this model must reflect proposed conditions.

5. Other – Please attach a sheet describing all other models submitted along with the file names. ☒ Natural ☐ Floodway

3. STARTING WATER-SURFACE ELEVATIONS

Explain how they were determined. Explanation Attached? ☒ Yes ☐ No

NOTE: If the effective study is an approximate study, the slope/area method is recommended. For detailed analysis studies, using a known water-surface elevation is recommended.

4. RESULTS (from the model used to revise the 100-year water surface elevations)

If the results indicate any of the following, attach an explanation - to this form, or to the hydraulic model printout- as to the reasonableness of the situation.

☐ Supercritical depth ☐ Critical Depth ☐ Drawdowns ☐ Negative Floodway Surcharges

☐ Floodway Surcharges Greater Than Maximum Allowed by Community/State

☐ Water surface elevations higher than the end points of cross sections.

☐ Floodway discharge is different than the Natural 100-year (base) flood discharge.

☐ Project causes 100-year floodplain or floodway elevations to increase (state if increases are located off the requester's property)

Explanation attached with Form ☐ **Explanation provided on attached printout** ☐

If Hydraulic model used is HEC-2, has it been checked with FEMA'S CHECK-2 computer program? ☐ **Yes** ☐ **No**
(see instructions for information on how to obtain CHECK-2)

5. REVISED FIRM/FBFM AND FLOOD PROFILES

1. Profile Transition

a. *100-Year Water-Surface Elevations - indicate the difference in water surface elevations where the project 100-year elevations tie into the existing 100-year water surface elevations at each end of the project.*

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

b. *Floodway Elevations - indicate the difference in water surface elevations where the project floodway elevations tie into the existing floodway water surface elevations at each end of the project.*

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

c. *Floodway widths - indicate the difference in floodway widths where the project floodway widths tie into the existing floodway width at each end of the project.*

Downstream End n/a within _____ (feet) *Cross-Section #* Upstream End n/a within _____ (feet) *Cross-Section #*

2. *Profile Checklist (check box if information has been provided on profile)*

The following information (unless in parentheses) must be included at the same scale as the existing profiles for this project:

☒ Stream Name ☐ Community Name ☐ Corporate Limits labeled ☒ Study limits labeled

☒ Confluences labeled ☒ Channel Stationing ☒ Streambed profiled ☒ Cross Sections labeled

☒ Horizontal/Vertical Scales indicated ☒ 100-year elevs profiled*

☒ Road Crossings ☐ Labeled ☐ Low Chord Elevations ☒ Top of Road Elevations

*All recurrence intervals in the effective study must also be profiled.

Floodway Data Table

Attach a Floodway Data Table for each cross section listed in the published Floodway Data table in the FIS report.

Floodway Data Table Attached ☐ **Yes** ☒ **Not Required**

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricopa County

Flooding Source: Citrus Valley Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): I-8 Highway

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 4.800

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

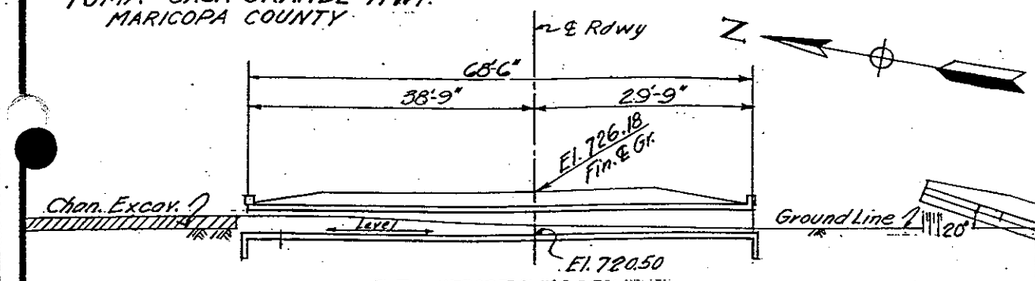
   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

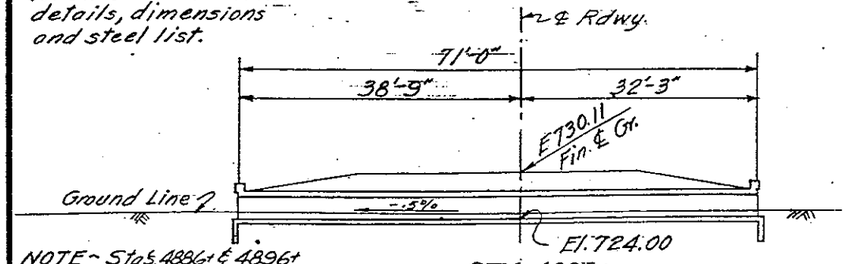
PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

YUMA - CASA GRANDE HWY.
MARICOPA COUNTY



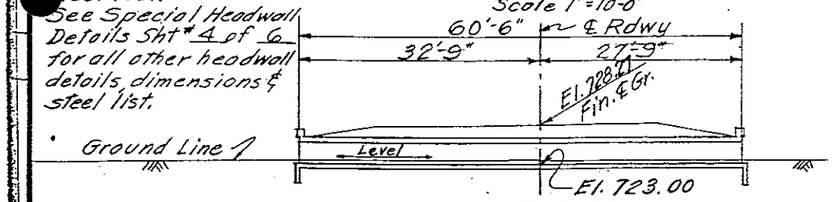
NOTE - Sta. 4806+
See Std. CI-6-2 for all other barrel details, dimensions, bend diagrams & steel list.
See Special Headwall Details Sht# 4 of 6 for all other headwall details, dimensions and steel list.

STA. 4806+
SECTION ON ℄ BOX
New 2-6x3x68'-6" Box Culvert
Special Headwalls
Scale 1"=10'-0"

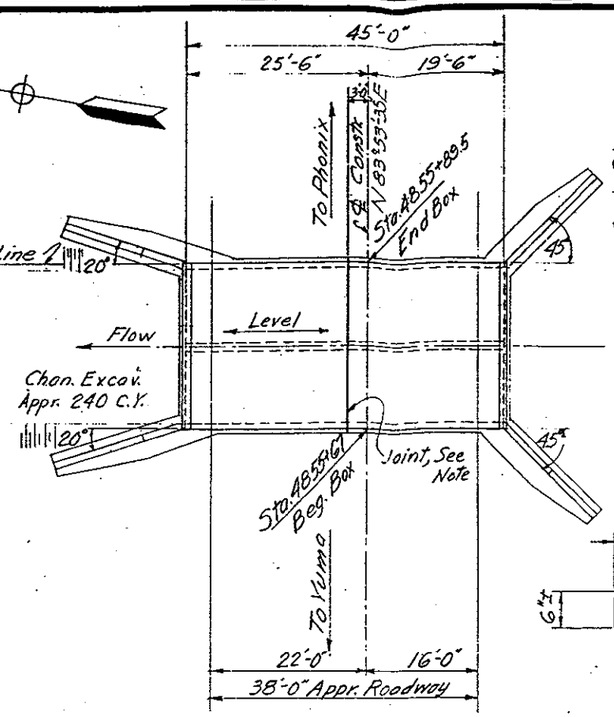


NOTE - Sta. 4886+ & 4896+
See Std. CI-6-1 for all other barrel details, dimensions, bend diagrams & steel list.
See Special Headwall Details Sht# 4 of 6 for all other headwall details, dimensions & steel list.

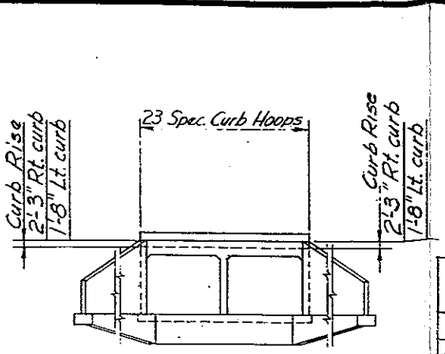
STA. 4886+
SECTION ON ℄ BOX
New 6x3x71'-0" Box Culvert
Special Headwalls
Scale 1"=10'-0"



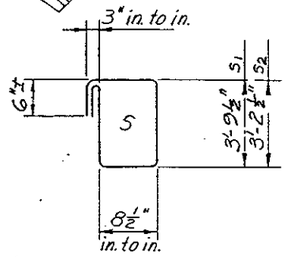
STA. 4896+
SECTION ON ℄ BOX
New 6x3x 60'-6" Box Culvert
Special Headwalls
Scale 1"=10'-0"

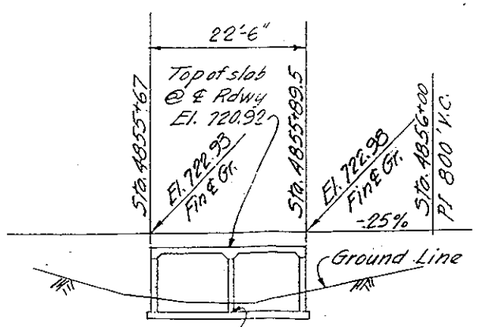


STA. 4855+
LOCATION PLAN
New 2-10x8x45'-0" Box Culv.
25'-0" Std. RG-1 Rood Guard Lt. and Rt.
Special Headwalls
Scale 1"=10'-0"



STA. 4855+
END ELEVATION
No Scale

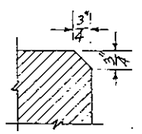




STA. 4855+
SECTION ON ℄ RDWY
Scale 1"=10'-0"

NOTE - Sta. 4855+
See Std's CI-10-2 for all other barrel details, dimensions, bend diagrams and steel list.
See Std. RG-1 and Special Headwall Details Sht. # 5 of 6 for all other headwall details, dimensions and steel list.

REDUCED SIZE DO NOT SCALE



Chamfer all exposed corners thus unless otherwise noted. This note applicable to all sheets pertaining to this structure.

FED. ROAD DIV. NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
7	ARIZONA	I-8-2.(18)	37		9-28-60 JRP

APPROXIMATE QUANTITIES

STRUCTURE	Std. No.	Sheet No.	Struct. Excav. C.Y.	Class A Conc. C.Y.	Reinf. Steel Lbs.	Spec. RG-1 Rd. Guard Lin. Ft.
Sta. 4806+						
New 2-6x3x68'-6" Box Culvert Special Headwalls	CI-6-2 CI-6-5	43 44 39	~~180~~ 152	82	~~9360~~ 9356	
Sta. 4855+						
New 2-10x8x45'-0" Box Culvert Std. Rood Guard Special Headwalls	CI-10-2 CI-10-5 RG-1	45 46 49 40	~~270~~ 263	150	~~15,440~~ 15,177	50
Sta. 4886+						
New 6x3x71'-0" Box Culvert Special Headwall	CI-6-1 CI-6-5	42 43 39	~~120~~ 68	51	~~5178~~ 5156	
Sta. 4896+						
New 6x3x60'-6" Box Culvert Special Headwalls	CI-6-1 CI-6-5	42 43 39	~~59~~ ~~56~~	45	~~4475~~ 4490	

GENERAL NOTES ~
Construction - Standard Specs. Arizona Highway Dept. Edition of 1948.
Design - A.A.S.H.O. Specs. 1957, revised to date.
Stresses: Class A Conc: f_c = 1,000 psi; n = 12
Reinf. Steel: f_s = 20,000 psi
Reinforcing steel shall be intermediate grade and shall conform to A.S.T.M. Specs. A-15 and A-305.

JOINT NOTE ~
All structures shall have contraction or cold joints in top slabs and walls (optional in floor slab) spaced not more than 40 feet apart or as shown. The joint may be made with ¼" plywood bulkhead which shall be left in place. Reinforcing steel shall project through the joint. Plywood for bulkhead shall be treated, either hot dipped 4 hours in approved treating solution or standard pressure treated.

4855+ Unnamed Wash #1 MAIN

ALL CONCRETE CLASS A

		DATE
LAYOUT		
DESIGN		
ARCHITECTURE		
DRAWN	H.W. T.G.L.B.	9/58
TRACED		
CHECKED	H.W.	10/58
SHEET NO.	2 OF 6	

ARIZONA HIGHWAY DEPARTMENT
BRIDGE DIVISION

STA'S. 4806+, 4855+, 4886+ 4896+
LOCATION & SPECIAL DETAILS

BRIDGE NUMBER | DRAWING NUMBER

BRIDGE ENGINEER

I-8-2(18) I-002-2(18) Old

FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 2 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, S.W., Washington, DC 20472; and to the Office of Management and Budget, Paperwork Reduction Project (3067-0148), Washington, DC 20503.

You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricopa County

Flooding Source: Citrus Valley Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Southern Pacific Railroad

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 4.847

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New *analysis of bridge/culvert previously modeled in the FIS*

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

2. DRAWING CHECKLIST

Attach plans of the structure(s) certified by a registered professional engineer. The plan detail and information should *include the following* (check the boxes if the information has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☐ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☐ Wing Wall Angle
- ☒ Low Chord Elevations - Upstream and Downstream
- ☒ Top of Road Elevations - Upstream and Downstream
- ☒ Structure Invert Elevations - Upstream and Downstream
- ☒ Stream Invert Elevations - Upstream and Downstream
- ☐ Skew Angle
- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

SOUTHERN PACIFIC RAILROAD
STRUCTURE AT MP 851.13+
UNNAMED WASH NO. 1

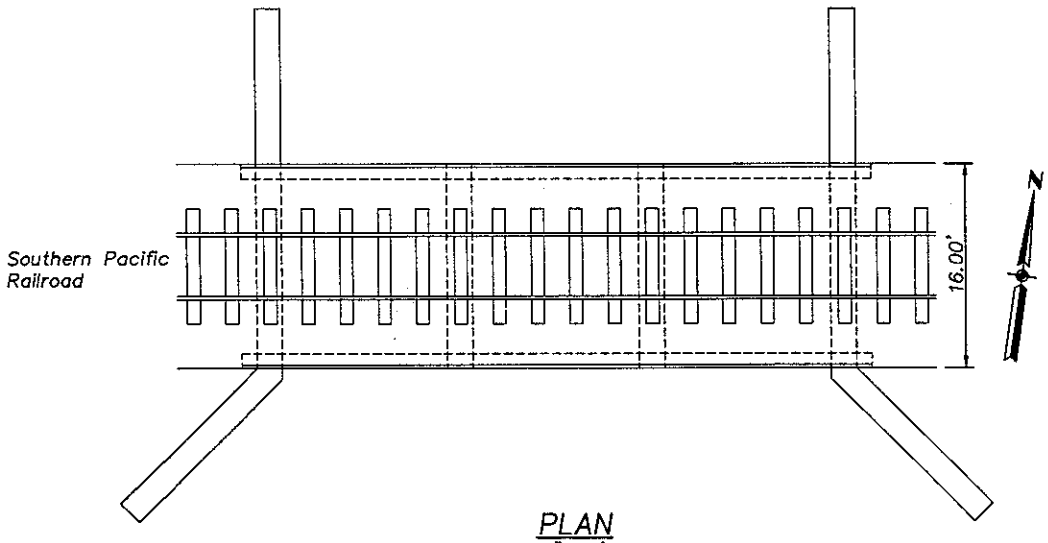
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (Civil)
CERTIFICATE No.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



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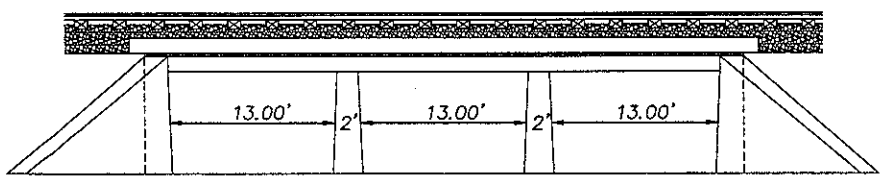

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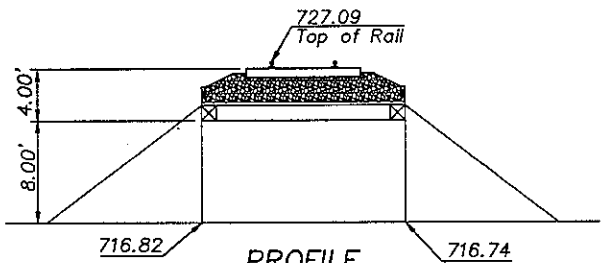

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FEDERAL EMERGENCY MANAGEMENT AGENCY **BRIDGE/CULVERT**	O.M.B. Burden No. 3067-0148 Expires April 30, 2001

PUBLIC BURDEN DISCLOSURE NOTICE

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You are not required to respond to this collection of information unless a valid OMB Control Number is displayed in the upper right corner of this form.

Community Name: Unincorporated Maricopa County

Flooding Source: Citrus Valley Wash

Project Name/Identifier: Gila Bend ADMP, FCD No. 99-18

1. IDENTIFIER

1. Name of structure (roadway, railroad, etc.): Gila Bend Canal

2. Location of bridge/culvert along flooding source (in terms of stream distance or cross-section identifier):

   River Mile 5.332

3. This revision reflects (check one of the following):

   ☒ New bridge/culvert not modeled in the FIS

   ☐ Modified bridge/culvert previously modeled in the FIS

   ☐ New analysis of bridge/culvert previously modeled in the FIS

4. Hydraulic model used to analyze the structure *(e.g., HEC-2 with special bridge routine, WSPRO, HY8)*

   HEC-RAS

   If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structure(s). *(Attach justification)*

   Justification attached ☐ **Yes** ☐ **No** ☒ **N/A**

PLEASE REFER TO THE INSTRUCTIONS FOR THE APPROPRIATE MAILING ADDRESS

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- ☐ Cross-Section Locations
- ☐ Distances Between Cross Sections
- ☐ Erosion Protection

3. SEDIMENT TRANSPORT CONSIDERATIONS

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the 100-year (base flood) water-surface elevations; and/or based on the stream geomorphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including sewer and deposition) to affect the base flood elevations, then provide the following information **(Check the box if provided):**

- ☐ Estimated sediment load
- ☐ Method used to estimate sediment transport
- ☐ Method used to estimate scour and/or deposition
- ☐ Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport

GILA BEND CANAL STRUCTURE
UNNAMED WASH NO. 1
(2) 48" CMP'S TRANSITION TO (1) 8'Wx6'H RCBC

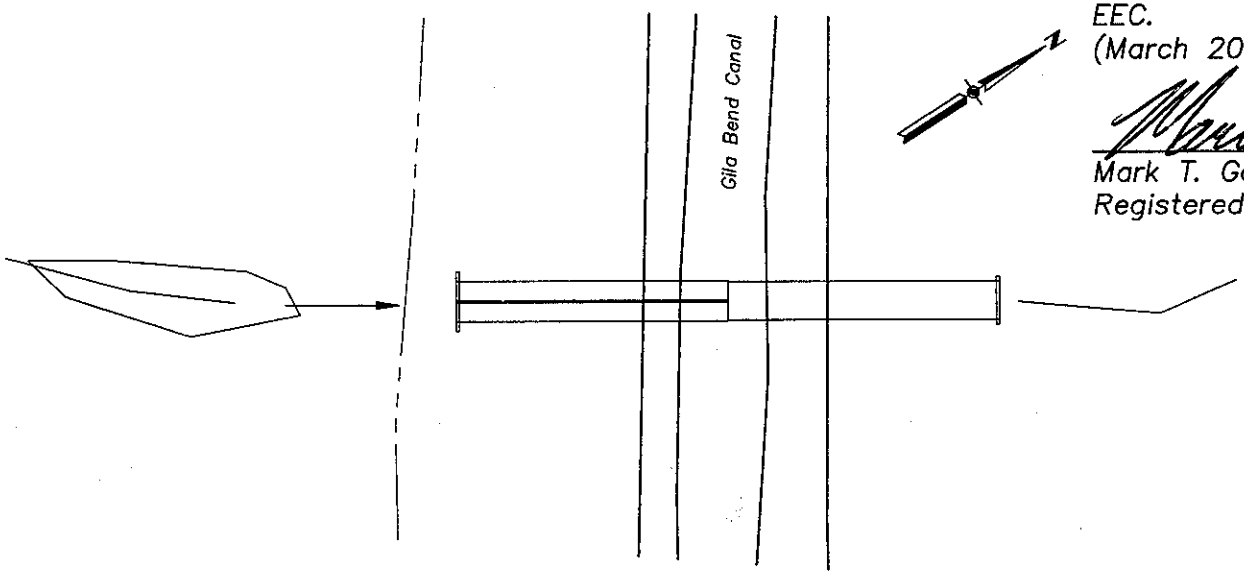
RECORD DRAWING

The Record Drawing information shown hereon is correct to the best of my knowledge and belief. This Record Drawing is for noted dimensions and noted elevations only. The Engineer making this Record Drawing statement did not participate in the culvert design or construction observation, and has investigated this culvert in the field. Information shown was obtained from field measurements by EEC.

(March 2000)

Mark T. Gavan, P.E.
Registered Professional Engineer #15594

REGISTERED PROFESSIONAL ENGINEER (Civil)
CERTIFICATE NO.
15594
MARK T.
GAVAN
Date Signed.....
ARIZONA, U.S.A.



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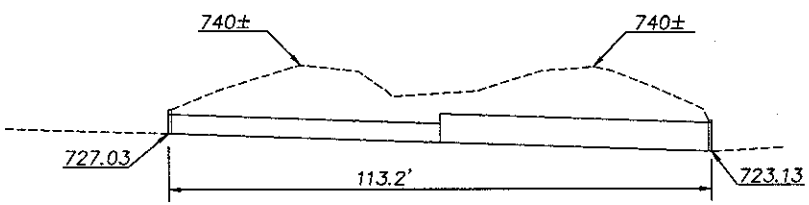

PROFILE
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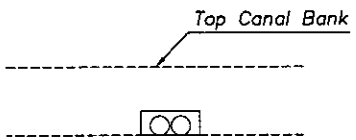


ELEVATION
1"=40'

Citrus Valley Wash

Explanations provided for FEMA forms:

Form 3, Sect 1: Explain reason for new Hydrology

Updated Mapping led to changes in the original Hydrology (developed by Burgess & Niple (1992)). Revisions to the original study included the reduction of storage and the separation of a common flood pool, behind the Gila Bend Canal, into wash specific reservoir routes.

Form 4, Section 2: Models Submitted

Since this is a new study only the 100-year base profile is required. The HEC-RAS model provided for this wash is: CitrusVW.prj

*.prj is the project file. The plan, flow data and geometric files all have the same file name but different extensions.

Form 4, Section 3: Explain how the starting WSEL was determined.

The starting water surface for this model was calculated using the slope area method at the downstream cross section of Citrus Valley Wash.

SECTION 3: SURVEY AND MAPPING INFORMATION

3.1 Field Survey Information

Field surveys were conducted with this study to 1) provide photo control for the aerial mapping, 2) establish elevation reference marks, 3) perform map check profiles, and 4) provide supplemental elevations along the canal, roadway and railroad embankments and obtain invert and top of roadway elevations at bridges and culverts. The survey work was done using GPS technology.

Survey for Photo Control Points

64 photo control points were surveyed to establish control for the aerial mapping. The survey work was done in September and October of 1999. Coordinate printouts for the control points are included in Appendix C-1. The survey was conducted in NAVD 1988 vertical datum. Calculations are included in Appendix C-1 to convert the elevations to NGVD 1929.

Survey for Elevation Reference Marks

Field survey was done to establish elevation reference marks (ERMs) for the floodplain mapping. The survey work was done in December 1999 and January 2000. Coordinate printouts for the ERMs are included in Appendix C-3. The survey was conducted in NAVD 1988 vertical datum. Calculations are included in Appendix C-3 to convert the elevations to NGVD 1929.

Survey for Map Check Profiles and Supplemental Topography

Field survey work was done to provide supplemental elevations along the canal, roadway and railroad embankments and obtain invert and top of roadway elevations at bridges and culverts. Field survey was also done to provide map check profiles. The survey work was done in December 1999 and January 2000. Coordinate printouts for the points surveyed, along with plots of the check profiles, are included in Appendix C-3. The survey was conducted in NAVD1988 vertical datum. To convert to NGVD1929, 1.93 feet was subtracted from the NAVD1988 elevations. The 1.93 feet was the average difference found between the NAVD1988 and the NGVD1929 elevations on the ERMs.

Professional Responsible for the Field Work

Matthew A. Graham, R.L.S.
SurvNet, Inc.
150 N. Stapley Dr., Suite 105
Mesa, AZ 85203
SurvNet Project No. 994014

3.2 Mapping

Mapping for Hydrology:
The hydrology used for this study was previously developed with the "Gila Bend Area Floodplain Delineation Study". For a description of the mapping used to develop the hydrology, refer to "Gila Bend Area Floodplain Delineation Study, FCD 90-67, Technical Data Notebook, by Burgess and Niple Inc, March 1992."

Mapping for Hydraulics:
The mapping used to develop base sheets for this study is a combination of existing and new mapping (refer to Appendix C-1 for a map of the mapping limits). The following paragraphs describe the mapping used to create base sheets for the flood study hydraulics.

Limits of New and Existing Mapping - Refer to the map in Appendix C-1 for the limits of new and existing mapping.

Source of Existing Mapping - The existing mapping was prepared by Burgess and Niple, Inc for the Flood Control District of Maricopa County. For a complete description of the existing mapping, refer to "Gila Bend Area Floodplain Delineation Study, FCD 90-67, Technical Data Notebook Hydraulics, Book 1 of 2, Burgess and Niple Inc., March 1992."

Horizontal Datum - Arizona State Plane System, Central Zone, on NAD 1983 datum.

Vertical Datum - NGVD 1929.

Date of Photography
Existing Mapping: September 13, 1991 and September 20, 1991.
New Mapping: September 7, 1999 and September 30, 1999.

Mapping Scale - 1:2400 and 1:4800. Refer to "Map of Aerial Mapping Limits" in Appendix C-1 for limits of each mapping scale.

Contour Interval - 2-foot and 4-foot contour interval. . Refer to "Map of Aerial Mapping Limits" in Appendix C-1 for limits of each contour interval.

Survey Control - The National Geodetic Survey points used for the survey control of the new mapping were last adjusted in 1991 for vertical datum and 1992 for horizontal datum.

Flight Path - The flight path for the new aerial photography was taken in an East to West and in West to East directions.

Number of Stereo Models - There were 58 stereo models used to develop the new mapping.

Photo Scale - The photo scale for the new mapping is 1:7200 (for the 2-foot contour interval mapping) and 1:12000 (for the 4-foot contour interval mapping).

Mapping Subconsultant
The new mapping was prepared by:
Cooper Aerial Surveys Company
11402 N. Cave Creek Road
Phoenix, AZ 85020
Cooper Project No. 6067-080799

The existing mapping was prepared by:
Aerial Mapping Company, Inc.
Project No. 91124

SECTION 4: HYDROLOGY

4.1 Method Description

The hydrologic model used in this study comes from a report by Burgess & Niple (Gila Bend Area FDS, 1992). The hydrology was revised due to new and more accurate mapping performed with this project. The basic hydrologic methods used in the original study were emulated when revising the hydrologic model. Table 4.5.1 contains a summary of the peak discharges and Table 4.5.2 contains a comparison with the 1992 study.

The Gila Bend Canal embankment is subject to overtopping and washout. As such the washes subject to the potential washout of the Canal embankment were modeled in HEC-1 for two conditions. One condition is with the canal embankment remaining in place and the other is without the canal, ignoring the storage and/or diversion effects of the canal embankment. For purposes of delineating the floodplains, the largest peak discharge from the two conditions was used. The washes impacted by the potential washout are Citrus Valley Wash, Sauceda Wash, Quilotosa Wash, West Quilotosa Wash and Hacker Wash.

4.1.1 Revisions to HEC-1

The 100-year, 24-hour peak discharges used in the floodplain delineation study were taken from the 1992 *Gila Bend Area Floodplain Delineation Study*. The 1992 hydrologic model had to be modified, however, in order to 1) account for additional split flows identified with the HEC-RAS modeling, and 2) to account for changes in the storage routing behind the Gila Bend Canal identified with the new detailed mapping. In addition, several of the drainage subbasins in the 1992 hydrologic model had to be further subdivided in order to calculate peak discharges for study reaches along Hacker Wash, Evans Wash, Pioneer Cemetery Wash, and along Scott Avenue Wash.

Modifications were made to divert operation rating curves on Bender, Sand Tank, and Scott Avenue Washes at I-8. This was necessary because many flow breakouts, both at I-8 and upstream of I-8, were discovered during the detailed hydraulic analysis of those washes. The rating curve modifications are discussed in detail in Section 5.1 (Hydraulic Method Description) since the development of the new rating curves is based on the hydraulic analysis.

4.1.2 Summary of Revisions to 1992 HEC-1 Model

The following itemizes the revisions made to the 1992 HEC-1 model. Documentation for the revisions can be found in the Appendix.

Subbasin Revisions

Subdivided subbasin 7A into 7AA, 7AB, and 7AC. This was done to calculate peak discharges for the study reach on Scott Avenue Wash.

Subdivided subbasin 3K into 3KA, 3KB, 3KC, and 3KD. This was done to calculate peak discharges for the study reaches on Unnamed Wash No.'s 2, 3, and 4.

Modified subbasin 3L to include 3KA. Subbasin 3KA was incorporated into 3L because it drains to the concentration point for subbasin 3L (C11 on Quilotosa Wash)

Diversion Revisions

1. Revised diversion at C82 (operation DC82R and DC82L) on Bender Wash. This diversion was revised to divert more flow westerly toward Sand Tank Wash. The HEC-RAS model on Bender Wash identified split flows upstream of I-8 that weren't accounted for in the original model. They were added to the diversion at I-8 to quantify the total flow diverted westerly.
2. Revised diversion at C132 (operation DC132R and DC132L) on Sand Tank Wash. This diversion was revised to divert more flow westerly toward Scott Avenue Wash. The HEC-RAS model on Sand Tank Wash identified substantial split flows upstream of I-8 that weren't accounted for in the original model. They were added to the diversion at I-8 to quantify the total flow diverted westerly.
3. Added diversion at C14A (operation DC14AR and DC14AL) on Unnamed Wash No. 2. This diversion was added to model the split flow on Unnamed Wash No. 2 at the culvert crossing on I-8. This split was identified with the HEC-RAS floodplain delineation model.
4. Added diversion at C11A (operation DC11AR and DC11AL) on Gila Bend Canal. This diversion was added to model the flow that overtops the Gila Bend Canal, west of SR85. The overtopping problem was identified with the HEC-RAS floodplain delineation model for the lateral flow along the Gila Bend Canal.
5. Added diversion at C34 (operation DC34R and DC34L) on Unnamed Wash No. 6 at the Gila Bend Canal. At this point of concentration there isn't any structure over or under the Canal. Some of the floodwater travels to the Sauceda Wash overchute and the remainder spills over the Canal. This diversion was added to model the flow that overtops the Canal. The overtopping problem was identified with the HEC-RAS floodplain delineation model for Unnamed Wash No. 6. It was determined with the detailed hydraulic analysis that approximately 4300 cfs can flow to the Sauceda overchute; the remainder will spill over the top of the Canal embankment.
6. Added diversion at C37 (operation DC37R and DC37L) on Sauceda Wash at Interstate 8. At this point of concentration, some of the floodwater travels through culverts under the RR and I-8 and the remainder flows easterly along the RR embankment. This diversion was added to model flow that is diverted easterly along the railroad. This diversion was identified with the HEC-RAS model for Sauceda Wash.
7. Added diversion at C37A (operation DC37AR and DC37AL) along the RR, east of Sauceda Wash. Most of the floodwater, that is diverted easterly at C37, overtops the RR and I-8. This concentration point and diversion was

added in order to model the flow that overtops. The diversion was identified with the HEC-RAS floodplain delineation model for I-8 Wash West.

8. Added a diversion at C14. This diversion represents split of flow in the diversion channel located on Hacker Wash just north of Pima Road. The channel is unsuitable for conveyance of the 100-year discharge and the majority of runoff would be diverted overland following the original wash alignment. The flow is added back into Quilotosa Wash at Watermelon Road.

Storage Routes

1. Renamed storage route C151 to SR151. C151 is used to combine hydrographs from 3KC, 3KD, and the diverted flow from C150. The storage route (an old borrow pit) only affects the diversion from C150. Therefore, the diversion hydrograph (DC150L) was routed through the borrow pit and the outflow was added to the other hydrographs at C151.
2. Deleted PND2. This was the storage routing routine for the single reservoir behind the Gila Bend Canal between Citrus Valley Road and SR85. It was determined with the detailed contour mapping, and hydraulic calculations, that there isn't sufficient lateral conveyance along the Canal embankment for it to behave as one single reservoir. In addition, the total storage volume is considerably smaller, about one-half, of what was in the original model. Therefore, this one large storage route was eliminated and replaced with smaller storage routes at each major wash crossing of the Canal, as described below.
3. Added storage route at C11. This storage route was added to account for the storage behind the Gila Bend Canal at Quilotosa Wash.
4. Added storage route at C34. This storage route was added to account for the storage behind the Gila Bend Canal at West Quilotosa Wash.
5. Added storage route at C36. This storage route was added to account for the storage behind the Gila Bend Canal at Sauceda Wash.
6. Added storage route at C53. This storage route was added to account for the storage behind the Gila Bend Canal at Citrus Valley Wash.

Channel Routes

1. Added 7AC-150
2. Added R151-12
3. Divided R12-14 into R12-14A and R14A-14
4. Added R12-11A
5. Added R11A-11B
6. Added R14A-11B
7. Added R11B-14
8. Added R11A-11
9. Added R37A-17
10. Added R34-17
11. Added R37A-13A
12. Divided R13-16 into R13-13A and R13A-16

4.1.3 *Summary of Revisions to 1992 HEC-1 Model (without Gila Bend Canal)*
In order to determine peak discharges for the condition without the Gila Bend Canal, the following revisions were made to the 1992 HEC-1 model. These are actually revisions to the revised model, as described above in Section 4.1.2. Documentation for the revisions can be found in the Appendix.

Diversion Revisions

1. Removed diversion at C12 (operation DC12R and DC12L) on Hacker Wash. This diversion was removed to eliminate the split flow westerly, over SR85, along the Gila Bend Canal. The HEC-RAS model for Unnamed Wash No. 2 indicates that no flow will spill, over SR85, if the Canal embankment weren't there.
2. Removed diversion at C11A (operation DC11AR and DC11AL) on Gila Bend Canal Wash. This diversion was removed to eliminate the split flow over the Gila Bend Canal. Since the diversion at C12 was removed, eliminating the flow over SR85, there isn't a significant flow along the Canal and, therefore, there isn't any need for this diversion.
3. Removed diversion at C34 (DC34R and DC34L) at West Quilotosa Wash and the Gila Bend Canal. Without the Canal in place, the flow on West Quilotosa Wash would simply continue northerly without being diverted to Sauceda Wash.

Storage Routes

1. Remove storage route at C12. This storage would not exist without the Canal Embankment.
2. Revise storage route at C11. The storage volume provided by the borrow pit, upstream of the canal, remains in the storage route. The storage created by impoundment behind the canal embankment, however, was removed.
3. Remove storage route at C34. This storage would not exist without the Canal Embankment.
4. Remove storage route at C36. This storage would not exist without the Canal Embankment.
5. Remove storage route at C53. This storage would not exist without the Canal Embankment.

4.1.4 Diversions at Bender Wash, Sand Tank Wash and Scott Avenue Wash
These washes are characterized by highly braided, commingling flow patterns. Floodwaters from Bender Wash tend to spill westerly to Sand Tank Wash and likewise from Sand Tank Wash to Scott Avenue Wash. At Interstate 8, the freeway embankment adds further complexity by diverting large quantities of flow to the west. Although the 1992 hydrologic model accounted for the flow diversions at I-8, it did not include upstream flow splits that have been identified with the more detailed floodplain mapping done with this project. The amount of flow spilling to the west, upstream of I-8, is considerable. Therefore, the 1992 model was revised to incorporate additional flow splits upstream of I-8. The hydrologic modeling changes have resulted in considerably more flow being directed towards the west. The peak discharge more than doubled on Unnamed Wash No. 2 (Hacker Wash), at the Gila Bend Canal, from 4100 cfs to 9000 cfs.

The divert operations on Bender and Sand Tank Washes were modified, using results from the detailed hydraulic analysis. Refer to the Hydraulics section of this report for a more complete discussion of the approach used to determine the split flows.

4.1.5 Storage behind the Gila Bend Canal

The 1992 hydrologic model was based on the assumption that the Gila Bend Canal, between SR85 and Citrus Valley Road, created a single pond with outlets at Citrus Valley Wash, Sauceda Wash and Quilotosa Wash. It was discovered, however, with the detailed mapping developed for this study that there are ridgelines between the major washes that carry through to the Canal embankment; severely restricting lateral movement of floodwaters along the Canal. In some cases, these ridgelines are only a foot, or so, below the top of the canal embankment. Therefore, most of the floodwater reaching the Canal in the major washes will flow over the Canal; rather then flow laterally along the Canal. In addition, the actual storage volume of the large, single basin is only about half of what was assumed in the original 1992 model. The 1992 model was developed using USGS quadrangle maps. The new mapping is much more detailed, with a 4-foot contour interval. The total volume at elevation 740 (near the top of the canal embankment) is 610 acre-feet based on the new mapping; compared to 1210 acre-feet in the 1992 model. Therefore, the storage volume behind the Canal has significantly less impact on the peak discharges than what was modeled previously. Accordingly, the 1992 model was revised; changing the single large storage basin into individual storage basins at each major wash inflow point. Also, since the Canal is overtopped, an analysis was done for the case without the canal embankment.

4.2 Parameter Estimation

With the exception of revising several drainage area boundaries the parameter estimations were unchanged from the 1992 report by Burgess & Niple.

4.2.1 Drainage Area Boundaries

As stated in section 4.1.2 Basin 7A (Scott Avenue Wash) and Basin 3K (Hacker Wash, Evans Wash and Pioneer Cemetery Wash), from the 1992 study, were subdivided into smaller basins to define flows for the detailed study reaches. Refer to revised Drainage Subbasin map attached to this report.

New unit hydrograph parameters such as area, slope, L, and Lca were calculated for each new subbasin. The original subbasin Green and Ampt soil loss parameters were applied to each of the subdivided subbasins. Two new channel routing reaches were created as a result of subdividing the model; channel infiltration losses were calculated based on the Green and Ampt XKSAT parameter as in the 1992 study. Revised HEC-1 subbasin and routing calculations are found in Appendix D.

4.2.2 Watershed Work Maps

The revisions made to the hydrology are shown on copies of the original work study maps and can be found at the back of Book 2 of 3.

4.2.3 Gage Data
No gage data was included in the revision to the 1992 study.

4.2.4 Statistical Parameters
The rainfall data was not revised from the 1992 study.

4.2.5 Precipitation
Precipitation data was not revised from the 1992 study.

4.2.6 Physical Parameters
Physical parameters such as rainfall losses, time of concentration or lag were emulated from the 1992 study.

4.3 Problems Encountered During the Study

4.3.1 Special Problems and Solutions
No special problems were encountered in subdividing basins 7A and 3K. However, development of new divert rating curves for Bender, Sand Tank, Scott Avenue, Sauceda and Hacker Washes is complex and actually involves hydraulic modeling rather than revision of the subbasin hydrologic parameters. Therefore the procedure used is described in detail in Section 5.1, Hydraulic Method Description.

Additionally HEC-2 side weir models were developed for the Gila Bend Canal Wash and I-8 Wash West to determine overtopping of lateral flow along the Canal and the Highway. Then a divert rating curve was developed for the hydrologic model.

4.3.2 WARNING AND ERROR MESSAGES (HYDROLOGY)
There were no new warning messages in the HEC-1 output resulting from the modifications to the HEC-1 model in this study. The 1992 *Floodplain Delineation Study* explains the warning messages from the original model.

4.4 Calibration

There is no stream gauge data available within the study limits to calibrate the study wash HEC-RAS models.

4.5 Final Results

The results of the revisions to the 1992 HEC-1 model are presented, as colored changes to the black and white workmaps found the map pockets of Book 2 of 3. One map presents the existing conditions with the Canal embankment and the other presents the conditions without the Canal embankment. Printouts of both HEC-1 models can be found in Appendix D.

As can be seen from the maps, the primary effect of the revisions was a major shift of flow into Quilotosa Wash from both Sand Tank Wash and Sauceda Wash. The peak discharge on Quilotosa Wash increased from 5500 cfs to 20,500 cfs. Without the Canal

embankment, it increased to 22,300 cfs. There is a corresponding decrease in peak discharge on Sand Tank Wash from 18,100 cfs down to 12,400 cfs and on Sauceda Wash from 12,400 cfs down to 4700 cfs.

4.5.1 Hydrologic Analysis Results

Table 4.5.1 summarizes peak discharges at key locations affected by the modifications to the HEC-1 model. Table 4.5.2 compares the difference between the discharges used in the 1992 study with those in this study.

Table 4.5.1 Summary of Peak Discharges (Revised 1992 HEC-1 Model)

HEC-1 Operation Identifier	Location	Drainage Area [sm]	Discharge with Gila Bend Canal [cfs]	Discharge w/o Gila Bend Canal [cfs]	Study Discharge [cfs]
Divert- 82	Bender Wash upstream side of I-8	85.07	5,500	n/a	5,500
	Divert along Highway to Sand Tank Wash		3,390		3,390
	Remainder d/s in Bender Wash		2,150		2,150
Divert-132	Sand Tank Wash upstream side of I-8	330.4	24,300	n/a	24,300
	Divert along Highway to Scott Avenue Wash		13,200		13,200
	Remainder d/s in Sand Tank Wash		11,100		11,100
Divert-150	Scott Avenue Wash upstream side of I-8	332.17	13,200	n/a	13,200
	Divert along Highway to I-8 Wash East		9,300		9,300
	Remainder d/s in Scott Ave. Wash		3,900		3,900
CP-151	Hacker Wash upstream side of GBC (with borrow pit)	337.88	9,000	9,000	9,000
Divert-12	Hacker Wash u/s side of Gila Bend Canal	339.24	8,900	9,000	9,000
	Divert Left along Canal		3,400	0	3,400
	Remainder d/s in Hacker Wash		5,500	9,000	9,000
Divert-14A	Hacker Wash upstream side of I-8	339.24	5,400	8,800	8,800
	Divert Left along Highway		2,500	5,600	5,600
	Remainder d/s in Hacker Wash		2,900	3,200	3,200
CP-14	Hacker Wash downstream of Pima Road	339.24	7,100	8,700	8,700
CP-11	Quilotosa Wash u/s of Gila Bend Canal	87.36	9,200	7,800	9,200
CP-17	Quilotosa Wash upstream of I-8	350.76	12,000	15,200	15,200
CP-34	West Quilotosa Wash, upstream of Canal	131.17	10,300	10,700	10,700
	Canal diversion to Sauceda Wash		4,300	0	4,300

	Flow over Canal to I-8		6,000	10,600	10,600
CP-36	Sauceda Wash u/s of Gila Bend Canal	132.23	8,700	5,700	8,700
CP-37	Sauceda Wash upstream of I-8	263.4	8,700	5,600	8,700
	diversion to West Quilotosa Wash		3,900	1,400	3,900
	remainder d/s in Sauceda Wash		4,700	4,200	4,700
CP-53	Citrus Valley Wash upstream of Canal	7.84	3,200	3,200	3,200
	Citrus Valley Wash downstream of Canal		2,400	3,200	3,200
CP-56	Citrus Valley Wash at I-8	8.32	2,200	3,100	3,100
CP- 16	Quilotosa Wash at Watermelon Road	354.4	19,600	21,200	21,200
CP-38	Sauceda Wash at Watermelon Road	242.09	4,700	4,200	4,700
CP-59	Citrus Valley Wash at Watermelon Road	10.7	1,800	2,700	2,700

Table 4.5.2 Comparison of Peak Discharges (with 1992 Study)

HEC-1 Operation Identifier	Location	Drainage Area [sm]	1992 Study Discharge [cfs]	2001 Study Discharge [cfs]
Divert- 82	Bender Wash upstream side of I-8	[85.07] 85.07	5,500	5,500
	Divert along Highway to Sand Tank Wash		500	3,390
	Remainder in Bender Wash		5,000	2,150
Divert-132	Sand Tank Wash upstream side of I-8	[330.4] 330.4	23,700	24,300
	Divert along Highway to Scott Avenue Wash		8,100	13,200
	Remainder d/s in Sand Tank Wash		14,900	11,100
Divert-150	Scott Avenue Wash upstream side of I-8	[330.4] 332.17	8,100	13,200
	Divert along Highway to I-8 Wash East		4,600	9,300
	Remainder d/s in Scott Ave. Wash		3,500	3,900
CP-151	Hacker Wash upstream of GBC	[330.4] 337.88	4,600	9,000
Divert-12	Hacker Wash u/s side of Gila Bend Canal	[330.4] 339.24	4,100	9,000
	Divert Left along Highway		1,200	3,400
	Remainder d/s in Hacker Wash		2,800	9,000
CP-14	Hacker Wash downstream of Pima Road	339.24	2,800	8,700
CP-11	*Quilotosa Wash u/s of Gila Bend Canal*	[86.5] 87.36	7,900	9,200
	discharge after storage		3,800	
CP-17	Quilotosa Wash upstream of I-8	[239.68] 350.76	3,700	15,200

CP-34	West Quilotosa Wash, u/s of Gila Bend Canal	[131.17] 131.17	11,000	10,700
CP-36	Sauceda Wash at the Gila Bend Canal discharge after storage	[140.36] 132.23	16,700 12,600	9,600 8,700
CP-37	Sauceda Wash upstream of I-8	[239.69] 263.4	12,600	8,700
CP-53	Citrus Valley Wash upstream of Canal discharge after storage	[239.68] 7.84	3,200 2,400	3,200 3,200
CP-56	Citrus Valley Wash at I-8	[239.83] 8.32	2,400	3,100
CP- 16	Quilotosa Wash at Watermelon Road	354.4	5,500	21,200
CP-38	Sauceda Wash at Watermelon Road	[243.57] 242.09	12,400	4,700
CP-59	Citrus Valley Wash at Watermelon Road	[242.54] 10.7	2,300	2,700
note	drainage areas within [ ] are from 1992 Study			

4.5.2 Verification of Results

The majority of the revisions are based upon physical changes due to more accurate topography. The methodology used for the modified subbasins matched that used in the original 1992 *Floodplain Delineation Study*. The differences, between the models, are the changes in diverts and storage routes along I-8 and the Gila Bend Canal. Therefore no further verification steps were taken as part of the hydrologic analysis in this study.

SECTION 5: HYDRAULICS

A previous study prepared by Burgess and Niple (1992) delineated the floodplain and floodway for Scott Avenue Wash, Sand Tank Wash and Bender Wash from the Gila River to the Interstate Highway (I-8). This continues the floodplain delineation for these washes upstream of I-8 to an imaginary line extending east-west from the northern boundary of the Barry M. Goldwater Gunnery Range.

Floodplain and floodway delineations have also been done for Citrus Valley Wash, Sauceda Wash, West Quilotosa Wash, Quilotosa Wash and three unnamed washes between Gila Bend and the west study limit at Citrus Valley Road. The north-south limit of detailed study is between I-8 and the Gunnery Range. The east-west limit of detailed study is between the I-8 traffic interchange at Exit 119 (Business Route 8) and Citrus Valley Road. Between Gila Boulevard and Citrus Valley Road, and north of I-8, approximate floodplain delineation was performed for the washes from the Gila River to I-8.

5.1 Method Description

The U.S. Army Corps of Engineer's computer programs, HEC-RAS version 2.2 and HEC-2, were used for the detailed hydraulic analysis of the washes in the study area. HEC-RAS was the primary modeling program while HEC-2 was used to model split flow conditions at side weir locations.

The computer program Micro Station SE, was used to map the cross-sections and generate GR data which was imported into HEC-RAS. Then the floodplain was mapped onto the digital base maps. All computer-drawn lines were reviewed for accuracy and reasonableness.

The floodplains and floodways were prepared using the guidelines in the January 1995 edition of FEMA Document 37, Flood Insurance Study Guidelines and Specification for Study Contractors [FEMA, 1995] and FIA Document 12, Appeals, Revision, and Amendments to Flood Insurance Maps [FEMA, 1990]. Floodways were initially determined using the equal conveyance encroachment method with the final analysis utilizing Encroachment Method 1 (specified encroachment stations).

5.1.1 Bender Wash and its north Tributary

The HEC-RAS model for Bender Wash was started using the rating curves from the 1992 *Floodplain Delineation Study.* Those rating curves are provided in the Appendix. Cross sections 1.904, 1.930, and 2.024 were placed at the inlet of the three westernmost I-8 culvert crossings. During modeling it was found that relatively little flow passes through the easternmost two Bender Wash culverts. A flow distribution analysis was performed to estimate the quantity of flow in cross sections 2.326 and 2.275 that would flow towards the culverts. The flows were estimated at 188 cfs and 33 cfs. These flows were not subtracted from the main channel flow because it was not certain from the topographic mapping if any flow at all would enter these culverts. A Zone A region is

shown on the floodplain delineation where the flow may break out and flood the inlet areas of the easternmost culverts, adjacent to the levees.

Downstream of cross section 2.326, flow breakouts to the west occur, and are shown on the work maps. The region in between the Bender Wash and Sand Tank Wash floodplains is shown as a Zone A region.

5.1.2 Sand Tank Wash

The Sand Tank Wash HEC-RAS model was started using a known water surface elevation, based on the total calculated flow reaching cross section 4.911. Using the 1992 rating curves, the water surface elevation corresponding to the total flow at the upstream face of the culverts was entered into the model. This is the total flow, after subtracting the weir flow that spills to Scott Avenue Wash.

Numerous flow breakouts occur between Sand Tank Wash and Scott Avenue Wash. There is a space between the plotted floodplains of the two washes that doesn't have a computed water surface elevation, but certainly is inundated by significant flows. Therefore these areas were plotted as Zone A regions.

Zone A regions are also plotted between Sand Tank Wash and Scott Avenue Wash along I-8, just as they are between Bender and Sand Tank Washes. The depth of flow in these areas was estimated using the breakout flow along I-8 shown on the work maps. Calculations are provided in the Appendix.

5.1.3 Scott Avenue Wash

The Scott Avenue Wash HEC-RAS model was started using the 1992 rating curves, just as was the case with Bender Wash and Sand Tank Wash. With the Scott Avenue Wash model, however, no iterative process was necessary, since the flows were determined upstream. The total flow arriving at the upstream face of the Scott Avenue Wash culvert at I-8 was used along with the 1992 rating curve to determine the starting water surface elevation for the model.

At each cross section in the Scott Avenue Wash model, inflow from the calculated Sand Tank Wash upstream breakout flows was added to the previous upstream cross section's flow. Since the sizes of the Scott Avenue Wash and Sand Tank Wash watersheds are so vastly different (1.77 versus 330 square miles, respectively), the Scott Avenue Wash flows are gone by the time the Sand Tank Wash peak flow arrives. Furthermore, the relative magnitudes of the respective flows are very different; 380 cfs versus 24,300 cfs. Therefore the Sand Tank Wash overflows govern the flow in Scott Avenue Wash.

5.1.4 I-8 Wash East

I-8 Wash East was analyzed in detail from its confluence with Unnamed Wash No.3 up to Martin Avenue (cross section 0.695). Upstream of that point, an approximate Zone A analysis was performed. The majority of the wash upstream of Martin Avenue is drowned out by the backwater from the I-8 culverts at Bender, Sand Tank, and Scott Avenue Washes.

The main feature of the I-8 Wash East is the borrow pit west of Martin Avenue. This pit has an existing storage volume of approximately 300 acre-feet. For flows breaking out towards the west over Martin Avenue, it acts as an online retention basin attenuating the peak flow by 300 cfs; from 9,300 cfs inflow to about 9000 cfs outflow.

The basin was modeled using HEC-RAS with a starting water surface elevation corresponding to the computed water surface elevation at cross section 0.694 of Evans Wash, which is at the upstream face of the culvert at the railroad tracks. The flow in Evans Wash downstream of the railroad tracks is 8988 cfs and is governed by the flow from I-8 Wash East.

The water surface elevation in the pit is governed by backwater behind the railroad, which extends from the Evans Wash culvert crossing at the railroad northward to I-8. In the Evans Wash model, at cross section 0.694, it was found that 1740 cfs of flow breaks out into a separate flow path north of Evans Wash (see the Evans Wash discussion for details).

5.1.5 Unnamed Wash No. 4 (Pioneer Cemetery Wash)

Unnamed Wash No. 4 was started at its confluence with Unnamed Wash No. 3 (cross section 0.694). Coincident peak flows were assumed, setting the starting water surface elevation equal to the water surface elevation calculated with the HEC-RAS model for Unnamed Wash No. 3. Coincident peak flows were assumed because it is likely that the flood producing storm would cover both the watersheds. There are several cross sections that required setting limits of effective flow area to prevent flow in adjacent washes that are separated by ridgelines. Refer to the plotted cross sections in the Appendix.

5.1.6 Unnamed Wash No. 3 (Evans Wash)

Unnamed Wash No. 3 starts at its confluence with Unnamed No. 2, just upstream of the Gila Bend Canal. Coincident peak flows were assumed, setting the starting water surface elevation equal to the water surface elevation calculated with the HEC-RAS model for Unnamed Wash No. 2. Coincident peak flows were assumed because it is likely that the flood producing storm would cover both the watersheds. The model includes a bridge routine for crossing the railroad tracks at cross section number 0.686. As is the case with Unnamed No. 4, there are several cross sections that required setting limits of effective flow area to prevent flow in adjacent washes that are separated by ridgelines. Refer to the plotted cross sections in the Appendix.

The most significant issue related to Evans Wash is the 1740 cfs breakout flow described under I-8 Wash East (Section 5.1.4). This breakout occurs at the railroad tracks just on the downstream side of the 300 ac-ft borrow pit (cross section no. 0.118). The breakout flow passes over the railroad tracks and flows along I-8 for about 2000 feet, until it recombines with Evans Wash at the Gila Bend Canal. Some of the flow will pass under I-8 in the existing cross drainage culverts. However, the capacity of the culverts are relatively small compared to the 1740 cfs breakout and, therefore, the flow through I-8

was ignored. Hence, the entire 1740 cfs was recombined with the remainder flow in Evans Wash at the Gila Bend Canal (cross section 0.154).

The breakout flow area was analyzed using normal depth calculations and delineated with a zone A. The Evans Wash flow was reduced by 1740 cfs for the floodplain delineation between the railroad (cross section 0.664) and the Gila Bend Canal (cross section 0.228). The floodway, however, was calculated using the entire flow, which will allow future development to convey the 100-year flow through Evans Wash. The width of this future conditions floodway is easily contained within the present conditions (reduced by 1740 cfs) floodplain.

5.1.7 *Unnamed Wash No. 2 and its western Diversion* (Hacker Wash & Hacker Wash Diversion)

The hydraulic modeling for Unnamed Wash No. 2 is quite complicated; involving a number of flow diversions. The work required an iterative approach of hydrologic and hydraulic modeling to reach a final floodplain delineation.

Two scenarios are possible under existing conditions. The first is with the Gila Bend Canal in place and results in a larger floodplain limit upstream of the canal as a result of the backwater caused by the elevated canal embankment. The canal also causes a diversion of flow over SR-85 to the west along the Gila Bend Canal.

The second scenario is that the canal is washed out by the flood water. This is a real possibility because the canal wan not built to FEMA standards. This condition results in a larger peak discharge and correspondingly larger floodplain downstream of the Gila Bend Canal.

The HEC-RAS model was started at normal depth, downstream of I-8, at cross section 1.210. This cross section is located along the I-8 frontage road, downstream of I-8, where all of the flow recombines on Unnamed Wash No. 2. This is the starting cross section for two HEC-RAS models, one for Unnamed Wash No. 2 (Hacker Wash) and the other for Unnamed Wash No.2 West (Hacker Wash Diversion). These two models represent an "island flow" computation around the I-8 embankment. They were developed to delineate the extents of flooding around I-8 as well as to determine the split flow that occurs at the I-8 culvert (cross section 1.528). This "island flow" computation resulted in a split flow of 5600 cfs (without canal) being diverted westerly along the I-8 embankment; with the remaining 3200 cfs going through the I-8 culvert.

At cross section 1.635, Unnamed Wash No. 2 (Hacker Wash) crosses SR-85 with flow both through the culverts and over the roadway. Upstream of the roadway, flow is contained in a well defined floodplain. In some cases, the cross sections extend beyond the computed floodplain limit into adjacent swales. Ineffective flow areas were used in the HEC-RAS model to exclude those areas from the computed flow area.

Split flow occurs a second time just upstream of the Gila Bend Canal. With the canal in place, approximately 3400 cfs splits to the west, over SR-85, and flows along the Gila Bend Canal. The remaining 5500 cfs passes through the culverts and over the canal.

5.1.8 Gila Bend Canal Wash

This study reach, along the south side of the Gila Bend Canal, conveys the diverted flow from Unnamed Wash No. 2 that spills over SR85 under the "with canal in place" conditions. During the development of the hydraulic model, it was determined that as flow traveled to the west along the canal, some runoff would overtop the canal. In order to analyze the overtopping, both HEC-2 and HEC-RAS were utilized. The HEC-2 side weir analysis was used to determine the breakout flow per cross section. The remaining, reduced flows, were input into the HEC-RAS model to establish the floodplain boundary.

The HEC-RAS model was started at its confluence with Quilotosa Wash using normal depth. Normal depth was used because the peak is generated from floodwaters diverted from the Sand Tank Wash watershed. The chance for coincident peak flows with Quilotosa wash is unlikely.

5.1.9 Quilotosa Wash

The peak discharge utilized for modeling Quilotosa Wash was the larger of the two conditions (with and without canal). Quilotosa Wash combines with West Quilotosa Wash, just upstream of I-8. The combined peak discharge is 15,200 cfs, which is based on the condition without the Canal embankment. This is the larger peak because, without the canal, no flow from West Quilotosa Wash is diverted to Sauceda Wash. Instead it all combines with Quliotosa Wash. From the railroad upstream to the Gila Bend Canal, however, the larger flow (9173 cfs) comes from the condition with the canal. That's because the canal diverts considerable flow from Unnamed Wash No. 2 (Hacker Wash) to Quilotosa Wash. Upstream of the Gila Bend Canal the peak discharge is 7849 cfs, which is unaffected by the canal. Just upstream of the Gila Bend Canal a split occurs in Quilotosa Wash. The main channel conveys approximately 4450 cfs and the east branch of the split conveys approximately 3400 cfs. The split flows were determined using the flow optimization procedure in the HEC-RAS model.

The HEC-RAS model was started at normal depth downstream of I-8. At the Southern Pacific Railroad and I-8, where the flow from Quilotosa Wash is combined with West Quilotosa Wash, a multiple structure approach was used to model the two bridges. Floodwaters are contained in a wide dip section over both the railroad and I-8. The HEC-RAS model uses a broad crested weir to analyze the overtopping.

Between the railroad and the Gila Bend Canal, the flow is contained in a wide floodplain. At the canal, the flow passes through an overchute. The HEC-RAS model indicates that the overchute is exceeded and floodwaters overtop the canal in a broad crested weir flow. The lengths of the weir was determined by inspecting the existing topography and selecting local ridgelines to contain the runoff. This resulted in a weir length of about 3000 feet and a depth of one to two feet, over the Canal.

Upstream of the canal a split takes place just downstream of river mile 5.480. The eastern branch rejoins the main branch of Quilotosa Wash in the floodpool on the upstream side of the Gila Bend Canal just upstream of river mile 4.414. There are several cross sections upstream of the Gila Bend Canal that required setting limits of effective flow area to prevent flow in adjacent washes that are separated by ridgelines. The effective flow option was also used on borrow pits to make the bottom of the pits non-effective. Refer to the plotted cross sections in Appendix E.

5.1.10 West Quilotosa Wash

The HEC-RAS model was started at normal depth downstream of I-8. At the Southern Pacific Railroad and I-8, a multiple structure approach was used to model the combined flow from Quilotosa Wash and West Quilotosa Wash. Floodwaters are contained in a wide dip section over both the railroad and I-8. The HEC-RAS model uses a broad crested weir to analyze the overtopping.

The peak discharges utilized for modeling West Quilotosa Wash were taken from the HEC-1 models for both of the conditions, with and without the Gila Bend Canal. Downstream of the canal, flows were taken from the model without the Canal. In this case, no flow from West Quilotosa Wash is diverted to Sauceda Wash. Instead, it all flows through the canal alignment and combines with Quliotosa Wash. The combined peak discharge of Quilotosa and West Quilotosa Wash, just upstream of I-8, is 15,200 cfs.

Upstream of the canal, including the flow over the canal, peak discharges were taken from the HEC-1 model with the canal in place. There isn't an existing drainage structure where West Quilotosa Wash intersects the Gila Bend Canal. Instead, the flow is diverted westerly to the Sauceda Wash overchute. During the 100-year flood, however, flow exceeds the capacity of the diversion channel along the canal; causing overtopping of the Canal. Therefore, as explained above, the peak discharge, downstream of the canal, is based on the assumption that the canal embankment will wash out and no flow is diverted to Sauceda Wash. On the other hand, the floodplain boundary upstream of the canal is based on the assumption that the canal will remain in place. The "with canal" peak discharges govern upstream of the Canal because the Canal embankment creates a significant backwater effect that results in a higher water surface elevation. With the canal in place, 4300 cfs is diverted to Sauceda Wash and 6018 cfs overtops the canal.

The HEC-RAS model assumes a long weir section for the canal overtopping. The overtopping was assumed to be about 2600 feet, between the ridgelines that separate West Quilotosa Wash from Sauceda Wash on the west and Quilotosa Wash on the east. Ineffective flow boundaries were used to limit the overtopping width.

Upstream of the Gila Bend Canal, there is considerable conveyance in the right overbank that was considered to be ineffective. The floodplain boundary, however, included the ineffective overbank area. From inspection of the topography and cross sections, it appeared that some floodwater can spill into the overbank conveyance area. However, it's separated from the main channel with a continuous ridgeline that prevents it from

sharing a common water surface elevation. Therefore, ineffective flow limits were set for computing the base flood elevation, and it was extended out to edge of the overbank conveyance area. Refer to the plotted cross sections in Appendix E.

5.1.11 Sauceda Wash

The Sauceda Wash HEC-RAS model was started at normal depth downstream of I-8. The 100-year peak discharges used for the floodplain delineation are based on conditions with the canal. This condition yields the highest peak discharge because the canal causes a 4300 cfs diversion into Sauceda Wash at the Gila Bend Canal.

Upstream of I-8, at the railroad, substantial flow is diverted out of Sauceda Wash, along the railroad embankment, toward Quilotosa Wash. This diversion reduces the peak flow on Sauceda Wash; from 8700 cfs down to 4800 cfs (refer to Section 3.3.12 for a more complete discussion).

At the Gila Bend Canal, flow is conveyed through the canal in an overchute structure. The 100-year peak discharge at this point is increased significantly by a diversion, along the canal, from West Quilotosa Wash (refer to Section 3.3.10). The increase in peak discharge causes the capacity of the overchute to be exceeded, which results in flow overtopping the Canal. Some flow could move laterally along the canal; toward Citrus Valley Wash. All of the flow, however, was assumed to overtop the canal, ignoring possible lateral flow to the west. It was assumed that the storage area to the west, along the canal, would be filled with other inflows which would preclude the lateral migration of floodwaters.

Upstream of the canal, flow is contained in a well defined floodplain. In some cases, the cross sections extend beyond the computed floodplain limit into adjacent swales. Ineffective flow areas were used in the HEC-RAS model to exclude those areas from the computed flow area.

5.1.12 I-8 Wash West

This wash, which is actually the conveyance along the south side of the railroad adjacent to I-8, was analyzed using both HEC-2 and HEC-RAS. The analysis was done to: 1) determine the amount of flow that splits out of Sauceda Wash at I-8 and flows toward Quilotosa Wash, 2) from the flow that splits towards Quilotosa Wash, determine the amount that spills over the railroad and I-8, and 3) delineate the floodplain and associated floodway for this diversion that's caused by the railroad and highway embankments.

The HEC-RAS/HEC-2 models, for I-8 Wash West, were started with the water surface elevation for Quilotosa Wash just upstream of the railroad.

In order to determine the split flow at Sauceda Wash and the railroad, a series of increasing flows were run through the HEC-2 model for I-8 Wash West with a complimentary series of flows run through the HEC-RAS model for Sauceda Wash. The resulting water surface elevations were compared at the point of the flow split; Sauceda Wash at the Railroad. Through trial and error, complimentary peak discharges that

resulted in about the same water surface elevation, at the point of the split flow, were determined. The result was a flow split of 4800 cfs through the railroad bridge and 3900 cfs diverted toward Quilotosa Wash.

During development of the HEC-2 model, it was determined that the railroad embankment and I-8 would be overtopped by the diverted flow. In order to analyze the overtopping, both HEC-2 and HEC-RAS were utilized. The HEC-2 side weir analysis was used to determine the breakout flow per cross section. The remaining, reduced flows, were input into the HEC-RAS model to establish the floodplain boundary. Most of the flow spills over the railroad and I-8.

5.1.13 Citrus Valley Wash

The HEC-RAS model was started at normal depth downstream of I-8. The peak discharges, utilized for modeling Citrus Valley Wash, were taken from the HEC-1 models for both of the conditions, with and without the Gila Bend Canal. Downstream of the canal, flows were taken from the model without the Canal. This condition results in larger peak discharge because the effect of the floodwater storage behind the canal embankment is eliminated. Upstream of the canal, including the flow over the canal, peak discharges were taken from the HEC-1 model with the canal in place. With the canal in place, the peak discharge through the canal is less, 2200 cfs compared with 3200 cfs, but the floodplain is wider because the canal embankment causes a significant backwater effect.

Downstream of the canal, runoff follows a manmade channel to the railroad. The railroad structure has capacity to convey the discharge but the highway, located just downstream, does not. The highway, however, has a dip section that easily contains the 100-year flood. HEC-RAS uses a broad crested weir analysis to determine the limits of overtopping.

At the Gila Bend Canal, two culverts allow runoff to pass underneath the Canal. The culverts, however, are inadequate to handle the 100-year flood. Therefore, floodwater overtops the canal. In addition, there are potential breakouts of flow, moving laterally to both the east and west, upstream of the canal. All of the flow, however, was assumed to flow over the canal, ignoring possible lateral flow to the east and west. It was assumed that the storage areas to the east and west, along the canal, would be filled with other inflows. The culvert modeling routine was used in HEC-RAS to determine the overtopping of the canal at Citrus Valley Wash. Ineffective flow boundaries were used to limit the weir length to about 2700 feet at the canal. The bridge/culvert routines in HEC-RAS were also used to model the railroad and highway structures.

Upstream of the Canal, the 100-year peak discharge is contained in a well defined, relatively narrow floodplain.

5.2 Work Study Maps

The work study maps were prepared at 1" = 400' and cover all of the washes delineated within this study. An additional map was prepared for the approximate delineations of the washes continuing from I-8 to the Gila River. This map was prepared at a scale of 1" = 2000'. Half-size 11" x 17" maps were also prepared and can be found at the back of this report.

5.3 Parameter Estimation

Each wash is separated into one or more reaches having similar hydraulic characteristics, and therefore, have similar Manning's n roughness coefficient values. The reaches are numbered from downstream to upstream starting at Reach A, with a varying river mile dependant upon the confluence distance to the major wash, and progressing upstream to the end of the study limits (refer to the Reach Identification Map in Appendix E-1). The numbering sequence of the reaches are unique to this study and are not related to the numbering or naming of reaches in any other adjacent study.

Each reach was identified based upon field reconnaissance, ground photographs and by examining 9 inch by 9 inch aerial photographs. The discerning characteristics are channel size and shape, similarities in bed material, vegetation, and the presence/absence of channel obstructions. The entire study area was viewed on foot during the field reconnaissance and each reach was photographed at representative locations.

5.3.1 Roughness Coefficients

The Reach Identification Map, in Appendix E.1, shows the location and limit of each reach. The n-Value worksheets, also found in Appendix E.1, show photographs of typical reach characteristics and estimates of the n-Values. Vegetation within the floodplain has been identified as typical for a southwest Sonoran Desert. The plastic grid shown in all bed material photographs and most of the channel photographs has an outside measurement of 1.5 feet by 1.5 feet. The grid inside of the frame measures 1.0 feet by 1.0 feet with 1 inch square grids. Unless otherwise noted, each page of photographs is arranged in the following sequence.

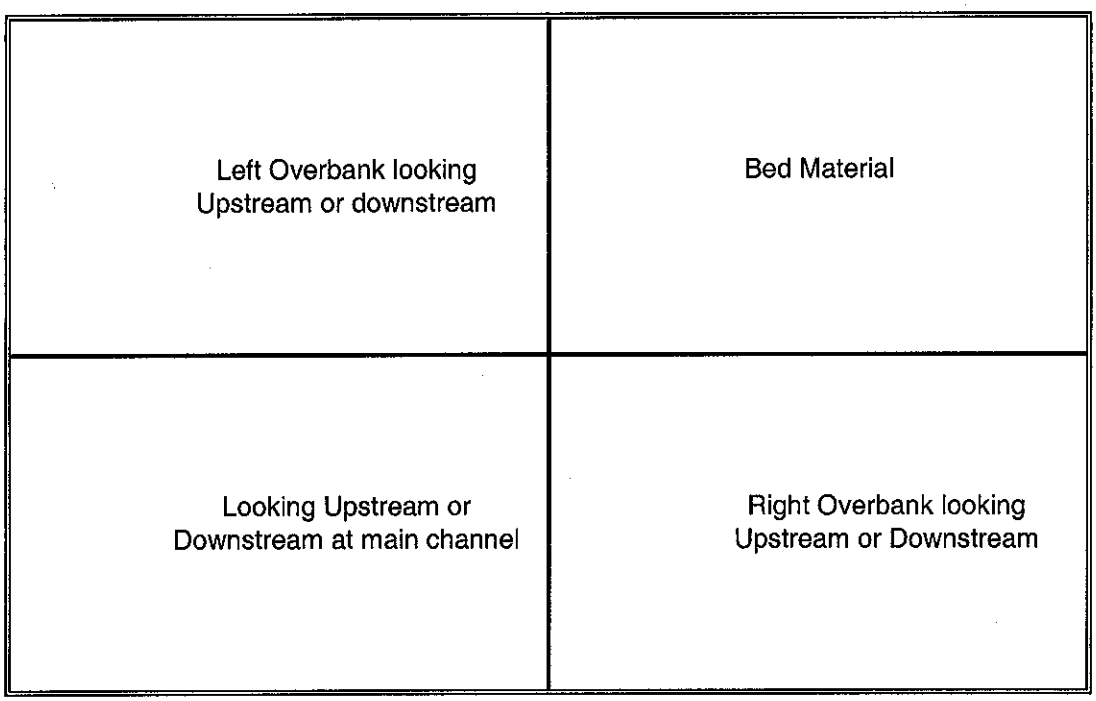


Figure 5.3.1 Channel Photograph Layout

Manning's roughness coefficients are estimated using a method accepted by the Flood Control District of Maricopa County and outlined in "Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" [U.S.G.S, 1991]. The method selects an initial value of Manning's n based upon the bed material and then adjust the n-value for channel irregularities, the effect of obstructions, vegetation, and variations in channel cross sections. If the channel meanders sufficiently to increase roughness, then the sum of the base n-Value plus subsequent adjustments is multiplied by a meander value, m. Tables for the determination of Manning's roughness coefficient for each reach are shown in Appendix E.1. Each reach is briefly described in the Determination of Manning's Roughness Coefficient Tables. Abbreviations LOB, ROB and CH stand for left overbank, right overbank and channel respectively.

The starting n-value for bed material roughness is selected based upon field inspection and utilizing a photograph of the grid on the bed material. The grid allows for the determination of the size of the bed material. Based upon field reconnaissance and photographs, adjustments are made to the base roughness value to account for vegetation, obstructions, irregularities, and channel cross section variations. The overbanks vary depending on the defined location of the left and right overbank. Where the left and right overbanks are defined as the vegetated portions within the channel, the overbanks tend to be fairly well-vegetated with grass, medium sized brush and occasional trees. The bed material remains fairly smooth with occasional concentrations of cobbles and small boulders. Where the overbanks are defied by elevated embankments, the bed material tends to be less rocky and the overbanks are well-vegetated with grass, brush, trees and cacti.

5.3.2 Expansion and Contraction Coefficients

The contraction and expansion coefficients are set at 0.1 and 0.3, respectively, for most applications. At bridge, overchute and culverts, or other constrictions, these values are revised to 0.3 (contraction) and 0.5 (expansion) to account for the increased hydraulic losses. These values were selected because the culverts are generally large multi-barreled structures having a headwall and wingwalls. The exception would be the culverts under the Gila Bend Canal at Citrus Valley, Hacker and Evans washes where the culverts are one or two barrel and are generally 48 inches in diameter or smaller. The contraction and expansion for these culverts are set at 0.6 and 0.8 respectively.

5.4 Cross Section Description

Cross sections for the HEC-RAS models were created using Inroads software, which contains a module for exporting cross section data to a set of HEC-2 GR records. These GR records were then imported into HEC-RAS using the import geometry option.

Cross sections were cut perpendicular to the flow direction across the estimated floodplains of the study washes. In most cases, the original cross section alignments were used in the hydraulic analyses, but several cross sections required minor adjustment in length or alignment after the hydraulic modeling task was begun.

Cross section shapes vary from reach to reach, but generally, most reaches have a low flow channel with a flat bottom (3 feet to 80 feet wide), are sparsely vegetated, stepping up to the floodplain area which is less densely vegetated. The low-flow channel comprises relatively well-defined embankments of varying heights (2 feet to 12 feet). The side slopes at the floodplain edge are relatively mild.

Channel bank stations have been approximated from field reconnaissance and aerial photographs. Simple rough sketches of typical channel cross sections with proposed locations of channel bank stations were drawn in the field. These sketches are shown at the top right corner of the Manning's n-Value Determination Tables (Appendix E.1) for each reach.

The typical main channel includes the sandy wash bottom, the channel banks and the thick vegetation growing along the banks and extending back away from the wash. The extent of the heavy vegetation sets the limit of the main channel boundary and begins that of the overbanks. The final location of the left and right channel bank stations for each cross section are contained in Appendix E.2, Cross Sections Plots. The following figure is an illustration of a typical section.

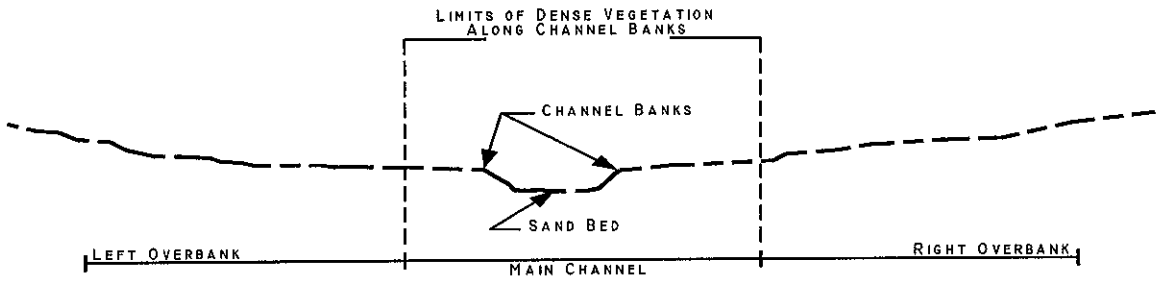


Figure 5.4 Typical Channel Cross Section

5.5 Modeling Considerations

5.5.1 Hydraulic Jump and Drop Analysis

The natural washes are more or less uniform, and there are no abrupt changes in channel slope that would warrant a hydraulic jump analysis. Therefore, this type of analysis is not performed in this study.

5.5.2 Bridges and Culverts

Constrictions in the floodplain are caused by bridges, canal overchutes and culverts. Most of these are large hydraulic structures such as the ones at the I-8 Highway, Southern Pacific Railroad, Tucson Cornelia and Gila Bend Railroad, and the Gila Bend Canal.

There are no bridges or culverts within the study area of Bender, Bender North, Sand Tank, or Scott Avenue Washes. The 1992 *Floodplain Delineation Study* ended at the upstream end of the I-8 culverts. EEC and Premier reviewed the culvert modeling in that study to confirm that the results were reasonable.

The 1992 study used observed sediment depths in modeling the existing culverts under I-8. As a check, EEC and Premier made field visits to measure the current sediment depths and resulting culvert opening height. It was observed that the height of the openings in the culvert models has not significantly changed from those in the 1992 study. Therefore it was decided to use the 1992 study rating curves for the starting water surface elevations in the Bender, Sand Tank, and Scott Avenue Wash hydraulic models.

Existing structures were photographed and inventoried in the field, with record drawings created for those where existing drawings could not be found (see Appendix E 5.4). The following table describes the bridge and culvert structures located within the floodplain.

Table 5.5.2 Summary of Structures

#	Location	Structure Type	Method of Analysis	Drawings Available
1	Evans Wash - T.C. & G. B. Railroad	Wooden Bridge	HEC-RAS Bridge Routine	Record Drawing – dimensions obtained by field survey
2	Hacker Wash - T.C. & G. B. Railroad	Wooden Bridge	HEC-RAS Bridge Routine	Record Drawing – dimensions obtained by field survey
3	Hacker Wash - Gila Bend Canal	CMP Culverts	HEC-RAS Culvert Routine	Record Drawing – dimensions obtained by field survey
4	Hacker Wash - SR-85 Highway	CBC Culverts	HEC-RAS Culvert Routine	As-built drawings (ADOT)
5	Hacker Wash - I-8 Highway	CBC Culverts	HEC-RAS Culvert Routine	As-built drawings (ADOT)
6	Hacker Wash - S.P. Railroad	Wooden Bridge	HEC-RAS Bridge Routine	Record Drawing – dimensions obtained by field survey
7	Hacker Wash - Pima Road	Concrete & Pier Bridge	HEC-RAS Bridge Routine	Record Drawing – dimensions obtained by field survey
8	Quilotosa Wash – S.P. Railroad	Wooden Bridge	HEC-RAS Bridge Routine	Record Drawing – dimensions obtained by field survey
9	Quilotosa Wash - I-8 Highway	CBC Culverts	HEC-RAS Culvert Routine	As-built drawings (ADOT)
10	West Quilotosa Wash - S.P. Railroad	Wooden Bridge	HEC-RAS Bridge Routine	Record Drawing – dimensions obtained by field survey
11	West Quilotosa Wash - I-8 Highway	CBC Culverts	HEC-RAS Culvert Routine	As-built drawings (ADOT)
12	Sauceda Wash - S.P. Railroad	Wooden Bridge	HEC-RAS Bridge Routine	Record Drawing – dimensions obtained by field survey
13	Sauceda Wash - I-8 Highway	CBC Culverts	HEC-RAS Culvert Routine	As-built drawings (ADOT)
14	Citrus Valley Wash - S.P. Railroad	Wooden Bridge	HEC-RAS Bridge Routine	Record Drawing – dimensions obtained by field survey
15	Citrus Valley Wash - I-8 Highway	CBC Culverts	HEC-RAS Culvert Routine	As-built drawings (ADOT)

The majority of the bridges, culverts and canal overchutes appear to be stable from scour and from washing out during a 100-year overtopping event. The exception is on the down stream side of the Gila Bend canal at Hacker and Evans Wash. There is evidence of severe scour pits and in one case the headwall was undercut and fell off.

The previous 1992 study conducted by Burgess & Niple extended their floodplain models to the south side of I-8 for Bender, Sand Tank and Scott Avenue Washes. After the field reconnaissance the measured sediment depth, in the I-8 culverts, was compared to that used in the Burgess & Niple report and found to be similar. Therefore, the rating curves were not changed from the original HEC-1 model.

New rating curves were developed for the remainder of the structures by running multiple iterations using the HEC-RAS model at different flow rates based upon field measured dimensions of the structures. The rating curves were then input into the HEC-1 model.

Where possible As-built drawings were collected for ADOT structures and record drawings were prepared for railroad and canal structures. Photographs were also taken of each structure. These photos and drawings can be found in Appendix E.4. Unless otherwise noted, photographs are arranged in the following sequence.

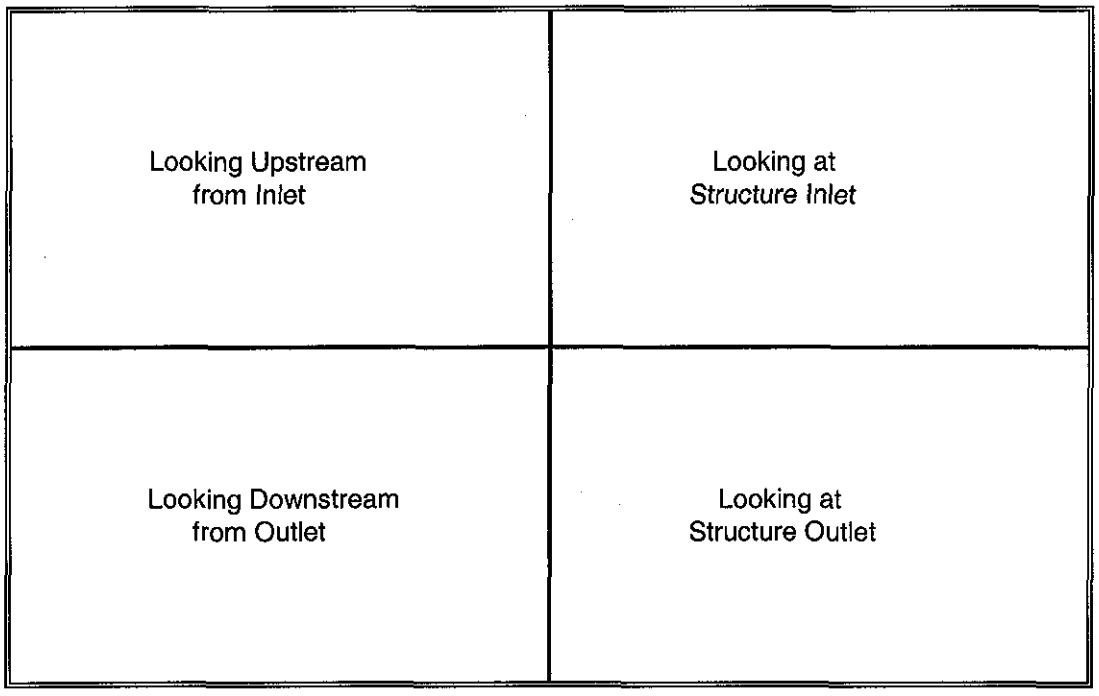


Figure 5.5.2 Structure Photograph Layout

5.5.3 Levees and Dikes

Along I-8 at Bender and Sand Tank Washes training dikes are used to improve efficiency by directing more runoff thorough the highway culverts. These dikes are several hundred feet long and extend upstream along the washes from the highway. Due to the diversion along the highway these dikes are overtopped during the 100-year event.

The Gila Bend Canal acts as a dike. As runoff from West Quilotosa Wash reaches the canal embankment the discharge is forced laterally along the canal to Sauceda Wash. There is concern that this may cause a dam break in the canal, so this topic is discussed further in Section 5.7.

Another situation involves the west side of the study area where diverted runoff flows laterally along the Gila Bend Canal and the Southern Pacific Railroad respectively. In both of these cases it was found that the lateral flow would overtop and spill over the canal and railroad. HEC-2 was used to determine the side weir discharge and this flow was redirected in the HEC-1 model.

5.5.4 Islands and Flow Splits

Braided flow conditions exist throughout the study area, meaning that many islands are present within the floodplains, especially on Bender and Sand Tank Washes. During preliminary modeling, trial ineffective flow encroachments were used in an attempt to limit flow to the smallest possible number of parallel flow paths outside of the main channel. Adding the encroachments to the model often resulted in the water surface elevation rising above the confining ridge line and overflowing into the adjacent flow path. The ineffective flow encroachment was then moved to the next ridge line away from the thalweg, causing the water surface to lower and islands to emerge in the floodplain.

This method was used in conjunction with visual inspection of the floodplain limits and the topographic mapping to ensure continuity of flow paths.

The end result is that many islands and parallel flow paths exist within the Bender Wash and Sand Tank Wash floodplains. It should be noted that these islands or parallel flow paths are not continuous for more than 3 cross sections, and that many of the islands are less than 1 foot above the computed water surface elevation. There is likely to be some spillover or exchange of flow between the parallel flow paths in between cross sections. The islands are not continuous at the same height, and the required accuracy of the topographic mapping is +/- 1 foot in the 2-foot contour interval mapping areas, and +/- 2 feet in the 4-foot contour interval mapping areas.

5.5.5 Ineffective Flow Areas

Ineffective flow limits are set when it's necessary to restrict the effective flow area of a cross section. Several uses of ineffective flow boundaries are to simulate sediment deposition, confine flows to levied channels, block out road fills and to analyze floodplain encroachments. It also can be used to eliminate ponded water such as in borrow pits from the effective flow area.

Ineffective flow areas to analyze floodplain encroachment are used throughout the study washes. The last example, to remove ponding areas, is also used for Quilotosa and Hacker Wash where the main channel alignment passes through borrow pits.

In addition to the use of ineffective flow areas as described in the above, ineffective flow encroachments were also used to limit expansion of flow within a wash in areas where the floodplain width increases abruptly. Encroachments were also used to confine flow to culvert widths at starting cross sections (to match the corresponding culvert flow).

Finally, ineffective encroachment limits were set to determine the effects of overtopping at the Gila Bend Canal. Limits were placed along ridges running perpendicular to the canal and adjacent to Citrus Valley, Sauceda, West Quilotosa and Quilotosa Wash. The limits were set where overtopping would seem to naturally occur or at limits of abrupt expansion of flow.

5.5.6 Supercritical Flow

The floodplain models, for all washes, were set up to run subcritical flow regime since the terrain has a relatively shallow slope.

5.6 Floodway Modeling

Within the study limits, the washes vary between having small and large channels but all tend to have a relatively large overbank floodplain. The 100-year floodplain is contained outside the limits of the low flow channel. To delineate the floodway, encroachments were initially set through equal conveyance reduction (Floodway Method 4). The floodway target was varied to ensure floodway water surface elevations. The values obtained from the Method 4 results were input into the final HEC-RAS model using Floodway Method 1. A maximum target of one-foot of rise was used to ultimately adjust the floodways into their final locations. The Floodway Data Tables can be found in Section 7.2 in FEMA format.

On Bender Wash and Bender Wash North Tributary, a preliminary floodway delineation was carried out using method 4, then it was finalized with minor adjustments using method 1. Near I-8 in the right overbank, floodway stations were set equal to floodplain limits because of the proximity of the right floodplain station to the right channel station.

On Sand Tank Wash and Scott Avenue Wash, floodway stations were set equal to floodplain limits throughout the models. This approach was taken after discussions with the Flood Control District of Maricopa County. The District was concerned that if this approach was not used, overflows from Sand Tank Wash into Scott Avenue Wash could be blocked off by potential future development in the floodway fringe, causing an increase in flow downstream in Sand Tank Wash compared to the existing condition.

The "floodway equals floodplain" approach, in combination with the adjacent Zone A region, helps to discourage development in areas where the overflows occur.

5.7 Problems Encountered During the Study

5.7.1 Special Problems and Solutions

5.7.1.1 Breakouts on Bender and Sand Tank Washes

In the development of the Bender Wash and Sand Tank Wash HEC-RAS models, it was found that the computed water surface elevations at many cross sections exceeded the ground elevations at the west end of the sections. These breakouts are minor between Bender Wash and Sand Tank Wash but are quite significant between Sand Tank Wash and Scott Avenue Wash. The consequence of this is that the original rating curves used at the HEC-1 divert operations at I-8 are no longer valid. The original divert operations were based only on the capacities of the I-8 culverts and weir flow to the west over levees or natural ridge lines west of the culverts.

In addition, it was found that a significant amount of flow in both Bender Wash and Sand Tank Wash outflanks the guide levees at the west end of the culverts, proceeds westerly along I-8, and combines with flow in the next wash to the west. Modifications to the HEC-1 rating curves were necessary for this reason as well.

The breakouts were quantified using a weir calculation in an iterative procedure similar to the split flow routine in HEC-2. Since the current version of HEC-RAS does not have a similar module, spreadsheets were set up to aid in performing a manual, iterative split flow procedure.

The Split Flow Computation Worksheets are found in the Appendix along with the HEC-RAS printouts for Bender and Sand Tank Washes.

The manual split flow procedure, which is described in detail in the Appendix, was used to determine flows for the final floodplain delineations. The results were also used to develop new rating curves for divert operations at C82 (Bender Wash at I-8) and C132 (Sand Tank Wash at I-8) in the HEC-1 model. The following paragraphs describe the general procedure followed in the spreadsheets.

To develop rating curves for the HEC-1 model, several HEC-RAS models and corresponding spreadsheets were created for each wash, in which the upstream flow values (flow entering the study reach) were varied. The resulting water surface elevations were imported into the spreadsheet, new split flow weir discharges were calculated, and the new discharges were transferred back into the HEC-RAS model. The HEC-RAS model was then re-executed, new computed water surface elevations were imported to the spreadsheet, new weir discharges calculated, and so on. This procedure was repeated until the computed water surface elevations converged to within 0.01 feet.

Another component of the development of the HEC-1 rating curves is the additional flow along I-8 that outflanks the culvert levees. To quantify this for Bender Wash, the model was started with the normal depth option, using the ground slope along the south side of I-8 between Bender and Sand Tank Wash. The model was executed and a water surface elevation was determined for the starting section (section 1.904). This water surface elevation was then used along with the rating curve for the westernmost culvert to calculate the discharge through the culvert. The total flow at the starting section minus the culvert discharge then equals the bypass flow along I-8. The assumption made here is that no weir flow per se exists at the westernmost Bender Wash levee; the flow continuing west along I-8 is actually due to flow in the far left overbank of Bender Wash outflanking the levee. The weir rating curve from the 1992 study was therefore not used in the present study.

The assumption made here is that no weir flow per se exists at the westernmost Bender Wash levee; the flow continuing west along I-8 is actually due to flow in the far left overbank of Bender Wash outflanking the levee. The weir rating curve from the 1992 study was therefore not used in the present study.

At Sand Tank Wash, flow also outflanks the levee at the westernmost crossing of I-8. However, the method used to start the HEC-RAS model differs slightly from that used at Bender Wash. In the 1992 *Floodplain Delineation Study,* the flow to the west along I-8 was modeled using a weir rating curve along the ridge line between Sand Tank Wash and Scott Avenue Wash instead of along the top of the actual levee adjacent to the wash. This means that the 1992 weir rating curve allows for outflanking the levee on the west side of the westernmost Sand Tank Wash culvert crossing under I-8. Therefore, the 1992 weir rating curve was adopted for the HEC-RAS models in the present study as well.

Another difference, between the Bender and Sand Tank Wash models, is that a common water surface elevation was used for the 1992 rating curves for all culvert or bridge crossings of Sand Tank Wash. On Bender Wash, separate water surface elevations were used for each of the five culvert crossings. This is due to the high skew angle at which Bender Wash approaches I-8. At Sand Tank Wash, the ridge line to the west is high enough to create a single water surface elevation across all three culvert/bridge inlets on the south side of I-8.

The Sand Tank Wash HEC-RAS model was started using a known water surface elevation, based on the total calculated flow reaching cross section 4.917. Using the 1992 rating curve, the water surface elevation corresponding to the total flow at the upstream face of the culverts was entered into the model.

After the breakout flow is calculated at each cross section, the spreadsheet uses the sum of the individual weir discharges plus the calculated flow along I-8 to calculate the total weir discharge for the wash. A new rating curve was then created by compiling the upstream wash discharge versus the total weir discharge values. This procedure was applied to both divert operations DC82R (Bender Wash at I-8) and DC132R (Sand Tank Wash at I-8).

The HEC-1 model was then re-executed with the new rating curves. A significantly greater amount of flow breaks out to the west from Sand Tank Wash into Scott Avenue Wash compared to the 1992 model. This is mainly due to breakout flows upstream of I-8 over the ridge line separating the two washes. The additional flow increases the flow downstream in Scott Avenue Wash from 3500 cfs to 3900 cfs, and flow to the west over Martin Avenue increases from 4600 cfs to 9300 cfs. The peak discharge at the confluence of Unnamed Wash No.2 (Hacker Wash) and Unnamed Wash No.3 (Evans Wash) located at the Gila Bend Canal, increased from 4400 cfs to 9000 cfs. This results in a much greater flow overtopping SR85 and spilling to the west; increasing from 1240 cfs to 3390 cfs.

5.7.1.2 Breakout from I-8 Wash East

Breakout flow occurs in the northwest corner of the borrow pit on the upstream side of the Tucson Cornelia and Gila Bend Railroad. The control for the breakout is the railroad tracks. A single cross section along the railroad was used for the weir profile. The HEC-RAS model determined that 1740 cfs would break out to the northwest and flow along I-8.

Once this flow overtops the railroad, it sheet flows along the south side of I-8. Two culverts convey stormwater under I-8 that will divert a portion of the breakout flow to Scott Avenue Wash. The remainder of the breakout continues along I-8 to the Gila Bend Canal where it recombines with flow in Evans Wash. Of the two culverts under I-8, one is a 60 inch RCP and the other is a 42 inch RCP. The culverts are inadequate to convey the breakout flow. As a conservative approach for this study, the conveyance capacity of the culverts was ignored, and the entire 1740 cfs is considered to recombine with Evans Wash at the Gila Bend Canal.

5.7.1.3 Potential Washout of Gila Bend Canal Embankment

It's reasonable to assume that the Gila Bend Canal embankment will wash out during a major flood event. According to the HEC-RAS hydraulic models, floodwater will spill over the top of the Canal embankment at all five of the major wash crossings; in the western part of the planning area. This includes the crossings at Citrus Valley Wash, Sauceda, Quilotosa, and Unnamed Wash No. 2 (Hacker Wash). It also includes the crossing at West Quilotosa Wash. There's no drainage structure at West Quilotosa Wash, but the peak discharge is too high to be diverted to Sauceda without overtopping the Canal. There's also overtopping between Quilotosa and Hacker Wash, that is caused by the diversion over SR85 at Hacker Wash and the Gila Bend Canal.

Since the Canal is highly susceptible to overtopping, two HEC-RAS models were developed for Hacker Wash, one for the condition with the Canal and the other for the condition without the Canal. For Citrus Valley Wash and West Quilotosa Wash, the peak discharges were simply increased downstream of the Canal to represent the condition without the Canal embankment. Sauceda and Quilotosa would have smaller peak discharges, without the canal, because the Canal diverts considerable flows to their overchutes that wouldn't occur if the Canal weren't there. Therefore, the HEC-RAS models for Sauceda Wash and Quilotosa Wash are based on the condition with the Canal in place.

One side effect of the potential dam break along the canal is that there is a degree of uncertainty where that would occur. Therefore it seems prudent that all of the ground between the canal and I-8, which isn't part of a detailed floodplain delineation, be designated as Zone A. Currently this area is fallow agriculture and therefore it is recommended to leave it for agriculture use.

5.7.2 Modeling Warning and Error Messages

Divided flow is found in cross sections of washes, this is to be expected with wide floodplains and therefore is not a reason for concern.

Messages stating that the cross section ends had to be extended vertically refer to locations where ineffective flow is modeled. These areas will be removed when the cross sections are trimmed before the final acceptance of the floodplains.

Energy losses greater than 1 foot, conveyance ratios greater than 0.7 and changes in velocity greater than 0.5 feet per second suggest that additional cross sections may be required. This is also not of concern as the cross sections are spaced approximately 500 feet apart which is within normal modeling parameters.

Warning messages at the bridge structures state that the Yarnell and Momentum analysis were attempted and disregarded. This is due to weir flow so the computer model used the answer from the balanced Energy analysis.

5.8 Calibration

No observed stage/discharge relationship is available for the study washes, so no hydraulic calibration was performed.

5.9 Final Results

5.9.1 Hydraulic Analysis Results

The final HEC-RAS analyses are presented in Appendix E.5. The following files contain the final HEC-RAS input and output for the Existing Conditions 100-year Floodplain and Floodway profiles. The cross section and stream profile plots can be found in Appendix E.2 and Section 7.4 respectively.

The following summary tables contain the results for each wash. Tables are also included for each bridge or culvert.

5.9.2 Verification of Results

The results appear reasonable for the existing physical conditions found in the field. The floodplains on the eastside of the study closely match those developed in the Burgess & Niple 1992 *Floodplain Delineation Study.*

HEC-RAS Plan: Bender N FW1 River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1.818	PF 1	1670.00	833.70	836.47	835.84	836.61	0.007740	3.27	594.59	666.50	0.42
Reach-1	1.818	PF 2	1670.00	833.70	836.65	835.85	836.83	0.007894	3.51	521.94	448.15	0.43
Reach-1	1.727	PF 1	1670.00	826.77	828.31	828.31	828.69	0.060149	4.92	340.10	476.26	1.02
Reach-1	1.727	PF 2	1670.00	826.77	828.31	828.31	828.69	0.061177	4.95	337.44	464.18	1.02
Reach-1	1.622	PF 1	1670.00	822.17	825.97		825.99	0.000371	1.06	1593.36	515.23	0.10
Reach-1	1.622	PF 2	1670.00	822.17	826.09		826.11	0.000346	1.04	1600.33	464.82	0.10
Reach-1	1.530	PF 1	1670.00	819.90	825.58		825.66	0.001468	2.41	753.46	302.39	0.21
Reach-1	1.530	PF 2	1670.00	819.90	825.68		825.78	0.001698	2.60	643.40	155.07	0.22
Reach-1	1.495	PF 1	1670.00	820.32	823.73	823.73	824.80	0.039247	8.30	202.35	101.81	0.98
Reach-1	1.495	PF 2	1670.00	820.32	823.70	823.70	824.80	0.041688	8.44	197.89	91.05	1.01
Reach-1	1.450	PF 1	1670.00	813.44	820.37		820.40	0.000285	1.25	1375.26	328.88	0.10
Reach-1	1.450	PF 2	1670.00	813.44	820.41		820.43	0.000296	1.27	1320.14	254.77	0.10
Reach-1	1.358	PF 1	1670.00	815.10	820.23		820.25	0.000337	1.19	1409.04	343.62	0.10
Reach-1	1.358	PF 2	1670.00	815.10	820.26		820.28	0.000329	1.18	1418.74	333.31	0.10
Reach-1	1.317	PF 1	1670.00	815.31	819.97		820.08	0.002747	2.65	667.21	370.43	0.27
Reach-1	1.317	PF 2	1670.00	815.31	820.00		820.11	0.002674	2.71	616.85	209.96	0.28
Reach-1	1.267	PF 1	1670.00	816.66	819.15	818.25	819.21	0.003979	1.97	855.64	662.53	0.29
Reach-1	1.267	PF 2	1670.00	816.66	819.13	818.25	819.20	0.004151	2.00	836.11	596.32	0.30
Reach-1	1.176	PF 1	1670.00	813.50	815.97	815.35	816.14	0.011673	3.33	503.52	393.22	0.50
Reach-1	1.176	PF 2	1670.00	813.50	816.02	815.35	816.18	0.010376	3.21	519.80	361.28	0.47
Reach-1	1.090	PF 1	1670.00	807.71	811.69	810.71	811.91	0.007587	3.76	453.19	241.45	0.44
Reach-1	1.090	PF 2	1670.00	807.71	812.32		812.57	0.006258	3.98	419.81	143.29	0.41
Reach-1	1.000	PF 1	1670.00	802.59	805.08	805.08	805.58	0.029796	5.28	295.77	288.61	0.79
Reach-1	1.000	PF 2	1670.00	802.59	806.07	806.07	806.91	0.029962	7.59	233.58	142.78	0.87
Reach-1	0.987	PF 1	1670.00	801.97	804.55		804.56	0.000199	0.63	1773.34	639.64	0.07
Reach-1	0.987	PF 2	1670.00	801.97	804.68		804.91	0.000293	0.84	1337.06	401.81	0.09
Reach-1	0.925	PF 1	1670.00	800.02	804.49		804.51	0.000297	0.71	1545.07	655.18	0.09
Reach-1	0.925	PF 2	1670.00	800.02	804.75		804.80	0.000868	1.32	1019.70	477.05	0.15
Reach-1	0.910	PF 1	1670.00	799.66	804.45		804.48	0.000564	1.45	1293.25	631.62	0.13
Reach-1	0.910	PF 2	1670.00	799.66	804.72		804.75	0.000435	1.33	1287.66	381.61	0.11
Reach-1	0.829	PF 1	1670.00	799.37	803.90		804.01	0.002968	2.65	650.21	318.64	0.28
Reach-1	0.829	PF 2	1670.00	799.37	804.32		804.40	0.001937	2.33	715.23	225.71	0.23
Reach-1	0.734	PF 1	1670.00	797.60	800.52	800.52	800.84	0.020177	5.25	403.69	553.98	0.68
Reach-1	0.734	PF 2	1670.00	797.60	800.64	800.64	801.62	0.042943	7.93	210.49	107.82	1.00
Reach-1	0.637	PF 1	1670.00	793.73	797.07	795.77	797.15	0.002964	2.38	742.74	431.52	0.27
Reach-1	0.637	PF 2	1670.00	793.73	797.19	795.79	797.29	0.003148	2.51	664.28	270.28	0.28
Reach-1	0.576	PF 1	1670.00	791.92	794.00	794.00	794.64	0.046926	6.42	261.86	218.51	0.99
Reach-1	0.576	PF 2	1670.00	791.92	793.98	793.98	794.64	0.049581	6.53	255.79	198.00	1.01
Reach-1	0.562	PF 1	1670.00	789.10	792.93		792.95	0.000148	0.65	1824.29	604.46	0.06
Reach-1	0.562	PF 2	1670.00	789.10	793.10		793.16	0.001543	2.15	835.33	348.56	0.21
Reach-1	0.481	PF 1	1670.00	785.15	792.90	786.83	792.90	0.000077	0.69	2444.14	1673.84	0.05
Reach-1	0.481	PF 2	1670.00	785.15	793.06	786.83	793.07	0.000071	0.67	2476.66	422.29	0.05
Reach-1	0.416	PF 1	1670.00	789.54	792.77		792.84	0.002524	2.28	823.44	637.70	0.25
Reach-1	0.416	PF 2	1670.00	789.54	792.86	791.99	792.99	0.004020	2.92	565.80	323.10	0.32
Reach-1	0.323	PF 1	5530.00	786.39	789.88	789.31	790.12	0.006416	4.90	1429.84	1105.84	0.59
Reach-1	0.323	PF 2	5530.00	786.39	790.09	789.31	790.34	0.005323	4.75	1408.18	878.42	0.55

HEC-RAS Plan: Bend M FW1 River: Bender Wash Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	3.671	PF 1	3970.00	833.30	836.60		836.75	0.006053	3.21	1330.51	934.00	0.39
Main Channel	3.671	PF 2	3970.00	833.30	837.09		837.22	0.003866	2.92	1358.65	516.91	0.32
Main Channel	3.588	PF 1	3970.00	830.80	833.15	832.75	833.37	0.008302	3.12	1089.12	894.17	0.43
Main Channel	3.588	PF 2	3970.00	830.80	833.82	833.43	834.27	0.013245	4.96	736.89	405.00	0.58
Main Channel	3.495	PF 1	3970.00	827.14	829.84		829.98	0.006087	3.25	1302.36	998.42	0.39
Main Channel	3.495	PF 2	3970.00	827.14	830.38		830.59	0.004965	3.37	1090.87	482.86	0.35
Main Channel	3.409	PF 1	3970.00	824.22	825.83	825.48	826.02	0.012628	3.64	1160.17	1170.85	0.52
Main Channel	3.409	PF 2	3970.00	824.22	826.29	825.84	826.66	0.016995	5.03	846.93	604.81	0.63
Main Channel	3.299	PF 1	3969.00	818.14	821.14	820.59	821.27	0.006499	2.83	1368.17	2771.96	0.38
Main Channel	3.299	PF 2	3969.00	818.14	821.17	820.59	821.30	0.006184	2.79	1378.34	1106.87	0.37
Main Channel	3.224	PF 1	3969.00	815.31	817.27	816.93	817.48	0.011487	2.79	1102.33	2294.86	0.47
Main Channel	3.224	PF 2	3969.00	815.31	817.33	817.00	817.55	0.011926	2.94	1064.61	975.54	0.49
Main Channel	3.122	PF 1	3969.00	811.50	814.20	813.55	814.36	0.007348	2.80	1245.01	1548.01	0.40
Main Channel	3.122	PF 2	3969.00	811.50	814.15	813.55	814.34	0.007493	2.77	1167.78	813.51	0.40
Main Channel	3.024	PF 1	3969.00	807.90	811.57	810.41	811.70	0.004306	2.58	1381.41	1279.55	0.32
Main Channel	3.024	PF 2	3969.00	807.90	811.64	810.37	811.79	0.003948	2.52	1286.58	613.61	0.31
Main Channel	2.924	PF 1	3969.00	805.97	808.42	807.97	808.59	0.008440	2.53	1254.28	1846.06	0.41
Main Channel	2.924	PF 2	3969.00	805.97	808.62	808.13	808.83	0.008386	2.60	1109.66	802.53	0.42
Main Channel	2.837	PF 1	3969.00	802.53	805.18	804.41	805.32	0.004562	1.56	1387.26	1992.22	0.29
Main Channel	2.837	PF 2	3969.00	802.53	806.01	805.05	806.11	0.003402	2.07	1583.59	975.68	0.28
Main Channel	2.724	PF 1	3969.00	798.60	800.81	800.53	800.99	0.011847	3.24	1162.94	1291.27	0.50
Main Channel	2.724	PF 2	3969.00	798.60	801.40		801.77	0.021303	5.51	812.98	753.22	0.70
Main Channel	2.644	PF 1	3969.00	795.54	797.77		797.93	0.004323	2.42	1296.09	1102.52	0.34
Main Channel	2.644	PF 2	3969.00	795.54	798.47		798.69	0.003189	2.62	1086.23	478.84	0.31
Main Channel	2.553	PF 1	3969.00	792.58	795.64		795.79	0.004186	2.81	1284.50	840.64	0.35
Main Channel	2.553	PF 2	3969.00	792.58	795.55		796.78	0.004762	3.83	1030.97	425.00	0.39
Main Channel	2.445	PF 1	3969.00	789.78	793.20	792.74	793.33	0.005239	3.15	1396.74	1755.56	0.39
Main Channel	2.445	PF 2	3969.00	789.78	793.64	792.93	793.85	0.005905	3.81	1086.57	569.20	0.43
Main Channel	2.329	PF 1	5530.00	783.40	789.88	789.41	790.13	0.005268	5.08	1426.41	1104.49	0.43
Main Channel	2.329	PF 2	5530.00	783.40	789.95	789.41	790.26	0.005661	5.32	1283.54	849.92	0.45
Main Channel	2.274	PF 1	5350.00	782.40	787.30	787.04	787.55	0.009121	4.15	1348.17	1455.86	0.51
Main Channel	2.274	PF 2	5350.00	782.40	787.29	787.04	787.55	0.009373	4.19	1333.38	1439.84	0.52
Main Channel	2.184	PF 1	5182.00	780.25	784.72	784.31	784.85	0.004239	3.92	1874.08	1974.91	0.37
Main Channel	2.184	PF 2	5182.00	780.25	784.73	784.31	784.86	0.004121	3.87	1892.17	1978.91	0.37
Main Channel	2.089	PF 1	5101.00	778.12	780.06	780.02	780.50	0.015893	3.33	970.09	1022.37	0.60
Main Channel	2.089	PF 2	5101.00	778.12	780.03	780.03	780.50	0.016936	3.38	944.95	991.46	0.61
Main Channel	2.013	PF 1	5101.00	775.50	778.62	778.06	778.78	0.004299	3.02	1601.18	1335.04	0.36
Main Channel	2.013	PF 2	5101.00	775.50	778.71	778.06	778.84	0.003759	2.89	1716.05	1347.93	0.33
Main Channel	1.968	PF 1	4116.00	773.55	778.32	776.65	778.37	0.000637	2.03	2286.56	1371.81	0.22
Main Channel	1.968	PF 2	4116.00	773.55	778.43	776.66	778.48	0.000584	2.00	2417.91	1373.39	0.21
Main Channel	1.930	PF 1	4116.00	772.70	777.32	777.32	777.90	0.006392	8.48	832.54	787.28	0.72
Main Channel	1.930	PF 2	4116.00	772.70	777.95	777.34	778.17	0.002425	5.67	1301.14	887.53	0.45
Main Channel	1.904	PF 1	3612.00	772.00	777.00	775.70	777.08	0.000722	3.29	1745.26	887.87	0.26
Main Channel	1.904	PF 2	3612.00	772.00	778.00	775.70	778.04	0.000229	2.10	2537.01	911.60	0.15

HEC-RAS Plan: Un 4 FW M 1 River: Cemetery Wash Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1.530	PF 1	790.00	791.68	792.58	792.34	792.65	0.009269	2.45	373.21	614.11	0.49
Reach-1	1.530	PF 2	790.00	791.68	792.83	792.83	793.36	0.036732	5.89	135.65	130.00	1.01
Reach-1	1.429	PF 1	790.00	788.00	789.99		790.06	0.003001	2.41	385.04	358.49	0.32
Reach-1	1.429	PF 2	790.00	788.00	790.58		790.65	0.001686	2.18	365.37	160.00	0.25
Reach-1	1.335	PF 1	790.00	786.80	788.11	787.54	788.19	0.004852	2.33	354.61	395.34	0.38
Reach-1	1.335	PF 2	790.00	786.81	788.67		788.95	0.009777	4.30	183.62	100.00	0.56
Reach-1	1.244	PF 1	790.00	784.00	784.73	784.50	784.81	0.011127	2.26	349.41	570.44	0.51
Reach-1	1.244	PF 2	790.00	784.00	785.63		785.75	0.004714	2.75	286.96	180.00	0.38
Reach-1	1.151	PF 1	790.00	780.00	780.98	780.55	781.04	0.005566	2.04	389.73	484.35	0.38
Reach-1	1.151	PF 2	790.00	780.00	781.64	781.24	782.00	0.014101	4.81	164.29	100.00	0.66
Reach-1	1.052	PF 1	790.00	776.00	777.81		777.97	0.006174	3.29	248.23	174.47	0.45
Reach-1	1.052	PF 2	790.00	776.00	777.99		778.13	0.004429	2.99	267.17	148.00	0.39
Reach-1	.959	PF 1	790.00	773.05	775.34		775.46	0.004203	2.88	292.23	210.63	0.35
Reach-1	.959	PF 2	790.00	773.05	775.61		775.79	0.005032	3.41	230.88	100.00	0.39
Reach-1	.861	PF 1	790.00	770.80	772.60	772.11	772.73	0.006822	2.97	274.82	235.34	0.42
Reach-1	.861	PF 2	790.00	770.80	773.19		773.33	0.004466	2.96	264.88	125.00	0.36
Reach-1	.754	PF 1	790.00	763.45	768.92	766.05	769.21	0.005664	4.59	188.99	96.54	0.43
Reach-1	.754	PF 2	790.00	763.45	769.79	766.30	770.28	0.006443	5.66	140.81	35.00	0.47
Reach-1	0.682	PF 1	790.00	761.91	765.17	765.17	765.60	0.019100	5.73	155.56	184.73	0.72
Reach-1	0.682	PF 2	790.00	761.91	766.07		766.72	0.014850	6.50	123.06	60.00	0.68
Reach-1	.592	PF 1	790.00	757.85	763.63		763.73	0.001525	2.69	316.92	126.50	0.23
Reach-1	.592	PF 2	790.00	757.85	764.57		764.73	0.001733	3.29	243.70	55.00	0.26
Reach-1	0.497	PF 1	790.00	756.93	761.81		762.21	0.008295	5.50	161.76	94.48	0.53
Reach-1	0.497	PF 2	790.00	756.93	762.64		763.16	0.007109	5.89	138.47	35.00	0.50
Reach-1	0.395	PF 1	790.00	753.40	759.58	757.48	759.80	0.002694	4.03	210.27	63.85	0.32
Reach-1	0.395	PF 2	790.00	753.40	759.98	757.45	760.37	0.003835	5.07	159.17	30.00	0.39
Reach-1	0.292	PF 1	790.00	751.15	755.16	755.16	756.07	0.038349	7.64	103.41	107.00	1.02
Reach-1	0.292	PF 2	790.00	751.15	755.51		756.13	0.023160	6.32	124.94	64.77	0.80
Reach-1	0.202	PF 1	790.00	748.70	754.93		754.95	0.000138	0.91	851.38	282.34	0.07
Reach-1	0.202	PF 2	790.00	748.70	755.80		755.82	0.000076	0.75	906.75	200.00	0.05
Reach-1	0.106	PF 1	790.00	745.55	754.91		754.92	0.000026	0.55	1689.14	503.40	0.03
Reach-1	0.106	PF 2	790.00	745.55	755.79		755.80	0.000019	0.50	1613.99	320.00	0.03
Reach-1	.001	PF 1	8988.00	743.04	754.76	748.59	754.80	0.000284	1.96	5679.47	1293.31	0.11
Reach-1	.001	PF 2	8988.00	743.04	755.66	748.59	755.71	0.000221	1.82	5173.34	760.00	0.10

HEC-RAS Plan: CVW 1 River: Citrus Valley Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6.298	PF 1	3210.00	749.92	755.00	754.38	755.36	0.007825	5.03	687.24	373.21	0.54
Reach-1	6.298	PF 2	3210.00	749.92	755.75	754.37	756.05	0.004373	4.43	731.92	226.00	0.42
Reach-1	6.206	PF 1	3210.00	748.11	753.36		753.50	0.002192	3.46	1216.16	768.80	0.31
Reach-1	6.206	PF 2	3210.00	748.11	754.27		754.52	0.002335	4.10	801.18	180.00	0.33
Reach-1	6.114	PF 1	3210.00	744.98	751.74	751.19	751.99	0.004972	4.40	860.00	591.32	0.44
Reach-1	6.114	PF 2	3210.00	744.98	752.63	751.17	753.02	0.004330	4.87	644.17	176.88	0.43
Reach-1	6.026	PF 1	3210.00	743.82	748.95		749.30	0.007075	5.98	754.44	582.35	0.54
Reach-1	6.026	PF 2	3210.00	743.82	749.42		750.14	0.009727	7.59	491.76	205.00	0.65
Reach-1	5.944	PF 1	3210.00	741.11	746.34		746.65	0.005300	4.99	767.71	436.84	0.47
Reach-1	5.944	PF 2	3210.00	741.11	747.31		747.65	0.003526	4.79	686.77	175.00	0.40
Reach-1	5.841	PF 1	3210.00	737.80	743.69	742.98	744.03	0.004948	5.26	720.90	361.58	0.46
Reach-1	5.841	PF 2	3210.00	737.80	744.32	743.14	745.06	0.006999	6.89	466.48	113.06	0.56
Reach-1	5.750	PF 1	3210.00	736.44	742.00		742.22	0.002925	4.27	983.05	463.58	0.36
Reach-1	5.750	PF 2	3210.00	736.44	742.30		742.62	0.003550	4.91	732.42	200.00	0.40
Reach-1	5.660	PF 1	3210.00	734.50	741.70		741.74	0.000433	1.93	2312.25	840.63	0.14
Reach-1	5.660	PF 2	3210.00	734.50	741.75		741.84	0.000832	2.70	1406.60	350.60	0.20
Reach-1	5.569	PF 1	3210.00	731.96	741.63		741.65	0.000107	1.31	3194.33	674.78	0.08
Reach-1	5.569	PF 2	3210.00	731.96	741.65		741.68	0.000161	1.60	2112.08	289.68	0.10
Reach-1	5.483	PF 1	2190.00	730.82	741.62		741.62	0.000028	0.68	3792.83	649.45	0.04
Reach-1	5.483	PF 2	2190.00	730.82	741.62		741.64	0.000051	0.92	2439.70	285.00	0.05
Reach-1	5.385	PF 1	2190.00	727.03	741.61	733.06	741.61	0.000008	0.43	6922.65	3766.06	0.02
Reach-1	5.385	PF 2	2190.00	727.03	741.61	733.06	741.62	0.000025	0.73	3108.06	335.00	0.04
Reach-1	5.339		Culvert									
Reach-1	5.294	PF 1	3210.00	723.13	730.62		730.89	0.002798	5.03	831.19	413.01	0.40
Reach-1	5.294	PF 2	3210.00	723.13	730.66		730.94	0.002529	4.81	798.41	331.27	0.38
Reach-1	5.202	PF 1	3210.00	721.69	729.06		729.34	0.003587	4.88	786.47	416.86	0.43
Reach-1	5.202	PF 2	3210.00	721.69	729.27		729.58	0.003019	4.64	739.21	287.49	0.40
Reach-1	5.102	PF 1	3210.00	719.14	727.90		728.09	0.001620	3.83	946.90	417.86	0.30
Reach-1	5.102	PF 2	3210.00	719.14	728.63		728.79	0.000837	3.01	1040.54	260.00	0.22
Reach-1	5.015	PF 1	3210.00	718.88	727.54		727.62	0.000618	2.69	1460.05	1320.48	0.19
Reach-1	5.015	PF 2	3210.00	718.88	728.11		728.34	0.001099	3.81	854.67	170.00	0.26
Reach-1	4.920	PF 1	3210.00	717.17	727.54		727.55	0.000031	0.72	4774.62	1966.43	0.05
Reach-1	4.920	PF 2	3210.00	717.17	728.11		728.15	0.000125	1.51	2029.84	325.00	0.09
Reach-1	4.856	PF 1	3210.00	715.25	727.54	719.28	727.55	0.000012	0.54	6897.05	1920.64	0.03
Reach-1	4.856	PF 2	3210.00	715.25	728.10	719.47	728.12	0.000030	0.91	3078.29	330.00	0.05
Reach-1	4.847		Bridge									
Reach-1	4.841	PF 1	3210.00	715.80	725.09		725.10	0.000067	0.94	4049.76	1023.14	0.06
Reach-1	4.841	PF 2	3210.00	715.80	726.07		726.11	0.000147	1.51	2154.45	260.00	0.09
Reach-1	4.821	PF 1	3210.00	714.08	725.08	718.59	725.09	0.000070	1.18	3792.82	1198.80	0.07
Reach-1	4.821	PF 2	3210.00	714.08	726.05	718.59	726.09	0.000121	1.67	1953.84	240.00	0.09
Reach-1	4.820		Culvert									
Reach-1	4.778	PF 1	3210.00	713.00	720.16	719.99	722.58	0.017225	12.49	257.04	48.65	0.96
Reach-1	4.778	PF 2	3210.00	713.00	721.13		722.85	0.009901	10.53	305.77	52.10	0.75
Reach-1	4.721	PF 1	3110.00	712.70	718.95	718.32	719.25	0.004002	4.74	715.44	443.29	0.45
Reach-1	4.721	PF 2	3110.00	712.70	719.95	718.65	720.44	0.003854	5.47	556.97	150.00	0.46

Plan: CVW 1 Citrus Valley Reach-1 RS: 4.820 Culv Group: Culvert #1 Profile: PF 1

Q Culv Group (cfs)	1778.15	Culv Full Len (ft)	
# Barrels	2	Culv Vel US (ft/s)	14.20
Q Barrel (cfs)	889.08	Culv Vel DS (ft/s)	12.32
E.G. US. (ft)	725.09	Culv Inv El Up (ft)	714.08
W.S. US. (ft)	725.08	Culv Inv El Dn (ft)	713.00
E.G. DS (ft)	722.58	Culv Frctn Ls (ft)	0.89
W.S. DS (ft)	720.16	Culv Exit Loss (ft)	
Delta EG (ft)	2.51	Culv Entr Loss (ft)	1.62
Delta WS (ft)	4.92	Q Weir (cfs)	1431.85
E.G. IC (ft)	725.09	Weir Sta Lft (ft)	9267.97
E.G. OC (ft)	725.07	Weir Sta Rgt (ft)	10211.15
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (ft)	720.34	Weir Max Depth (ft)	1.03
Culv WS Outlet (ft)	720.22	Weir Avg Depth (ft)	0.67
Culv Nml Depth (ft)	5.76	Weir Flow Area (sq ft)	635.16
Culv Crt Depth (ft)	6.26	Min El Weir Flow (ft)	724.10

Plan: CVW 1 Citrus Valley Reach-1 RS: 5.339 Culv Group: 5.339-Canal Profile: PF 1

Q Culv Group (cfs)	398.14	Culv Full Len (ft)	113.20
# Barrels	2	Culv Vel US (ft/s)	15.84
Q Barrel (cfs)	199.07	Culv Vel DS (ft/s)	15.84
E.G. US. (ft)	741.61	Culv Inv El Up (ft)	727.03
W.S. US. (ft)	741.61	Culv Inv El Dn (ft)	723.13
E.G. DS (ft)	730.89	Culv Frctn Ls (ft)	5.15
W.S. DS (ft)	730.62	Culv Exit Loss (ft)	3.63
Delta EG (ft)	10.73	Culv Entr Loss (ft)	1.95
Delta WS (ft)	10.99	Q Weir (cfs)	1787.61
E.G. IC (ft)	741.60	Weir Sta Lft (ft)	9499.96
E.G. OC (ft)	741.61	Weir Sta Rgt (ft)	10801.88
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	731.03	Weir Max Depth (ft)	0.83
Culv WS Outlet (ft)	727.13	Weir Avg Depth (ft)	0.65
Culv Nml Depth (ft)	4.00	Weir Flow Area (sq ft)	840.99
Culv Crt Depth (ft)	4.00	Min El Weir Flow (ft)	740.79

Plan: CVW 1 Citrus Valley Reach-1 RS: 4.847 Profile: PF 1

E.G. US. (ft)	727.55	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	727.54	E.G. Elev (ft)	727.55	727.51
Q Total (cfs)	3210.00	W.S. Elev (ft)	727.54	727.42
Q Bridge (cfs)	2884.69	Crit W.S. (ft)	721.56	721.75
Q Weir (cfs)	325.31	Max Chl Dpth (ft)	12.29	11.62
Weir Sta Lft (ft)	9330.79	Vel Total (ft/s)	6.20	7.62
Weir Sta Rgt (ft)	10122.80	Flow Area (sq ft)	517.74	421.16
Weir Submerg	0.00	Froude # Chl	0.04	0.05
Weir Max Depth (ft)	0.46	Specif Force (cu ft)	3131.49	3100.81
Min El Weir Flow (ft)	727.10	Hydr Depth (ft)	0.66	0.58
Min El Prs (ft)	723.09	W.P. Total (ft)	914.82	845.18
Delta EG (ft)	2.45	Conv. Total (cfs)		
Delta WS (ft)	2.45	Top Width (ft)	789.26	720.44
BR Open Area (sq ft)	286.23	Frctn Loss (ft)		
BR Open Vel (ft/s)	10.08	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

HEC-RAS Plan: Un 3 FW M 1 River: Evans Wash Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2.111	PF 1	1110.00	782.90	788.38		788.58	0.003207	3.59	312.96	162.90	0.33
Reach-1	2.111	PF 2	1110.00	782.90	789.38		789.66	0.003389	4.18	260.38	66.00	0.34
Reach-1	1.998	PF 1	1110.00	779.56	785.93		786.24	0.004817	4.82	261.78	137.79	0.41
Reach-1	1.998	PF 2	1110.00	779.56	786.67		787.15	0.005274	5.62	204.06	45.00	0.44
Reach-1	1.903	PF 1	1110.00	776.11	783.34	781.88	783.73	0.005123	5.48	241.57	193.35	0.43
Reach-1	1.903	PF 2	1110.00	776.11	783.41	781.70	784.06	0.007149	6.54	174.62	37.00	0.51
Reach-1	1.812	PF 1	1110.00	773.30	778.27		779.16	0.023054	7.56	147.48	123.83	0.84
Reach-1	1.812	PF 2	1110.00	773.30	778.89		779.63	0.012416	6.90	161.97	45.00	0.63
Reach-1	1.728	PF 1	1110.00	769.94	775.67		775.92	0.003263	4.32	291.85	108.90	0.35
Reach-1	1.728	PF 2	1110.00	769.94	775.71		776.17	0.005151	5.46	207.86	45.00	0.44
Reach-1	1.654	PF 1	1110.00	767.68	772.54		773.40	0.016154	7.65	152.14	60.43	0.73
Reach-1	1.654	PF 2	1110.00	767.68	773.49		773.96	0.006118	5.56	204.79	56.00	0.47
Reach-1	1.558	PF 1	1110.00	764.70	769.75		769.95	0.003440	3.52	326.71	184.70	0.34
Reach-1	1.558	PF 2	1110.00	764.70	770.55		770.96	0.005713	5.23	217.80	65.00	0.45
Reach-1	1.460	PF 1	1110.00	761.90	766.58	766.22	767.03	0.010519	5.29	205.24	118.93	0.56
Reach-1	1.460	PF 2	1110.00	761.90	767.54		767.96	0.005853	4.69	217.82	77.00	0.43
Reach-1	1.375	PF 1	1110.00	758.32	763.65		763.92	0.004815	4.11	263.94	97.94	0.40
Reach-1	1.375	PF 2	1110.00	758.32	764.40		764.93	0.007918	5.83	190.33	45.00	0.50
Reach-1	1.280	PF 1	1110.00	755.30	761.46		761.76	0.003829	4.61	256.19	78.83	0.38
Reach-1	1.280	PF 2	1110.00	755.30	762.42		762.70	0.002672	4.36	261.70	50.00	0.33
Reach-1	1.185	PF 1	1110.00	754.06	759.41		759.69	0.004481	4.53	269.35	105.06	0.40
Reach-1	1.185	PF 2	1110.00	754.06	759.84		760.45	0.008931	6.23	178.14	40.00	0.52
Reach-1	1.092	PF 1	1110.00	750.84	757.05		757.41	0.004782	4.92	235.12	69.57	0.42
Reach-1	1.092	PF 2	1110.00	750.84	757.37		757.67	0.003677	4.53	252.52	63.00	0.37
Reach-1	1.001	PF 1	1110.00	750.10	755.12		755.32	0.003767	3.50	308.32	158.46	0.35
Reach-1	1.001	PF 2	1110.00	750.10	755.94		756.18	0.002584	3.28	291.91	90.00	0.29
Reach-1	0.901	PF 1	1110.00	748.12	754.87		754.91	0.000279	1.42	740.33	169.20	0.11
Reach-1	0.901	PF 2	1110.00	748.12	755.81		755.84	0.000218	1.39	756.61	140.00	0.10
Reach-1	0.795	PF 1	1110.00	745.20	754.86		754.86	0.000031	0.60	1984.85	492.92	0.04
Reach-1	0.795	PF 2	1110.00	745.20	755.79		755.80	0.000030	0.63	1806.65	370.00	0.04
Reach-1	0.694	PF 1	8988.00	743.04	754.76	748.59	754.78	0.000198	1.63	7536.96	2260.54	0.09
Reach-1	0.694	PF 2	8988.00	743.04	755.66	748.59	755.71	0.000221	1.82	5174.68	760.00	0.10
Reach-1	0.686		Bridge									
Reach-1	0.664	PF 1	7248.00	742.59	750.99		751.30	0.004156	4.63	1629.53	535.34	0.37
Reach-1	0.664	PF 2	8988.00	742.59	751.89		752.30	0.003958	5.01	1766.00	370.00	0.37
Reach-1	0.599	PF 1	7248.00	740.53	749.63		749.99	0.003541	5.40	1555.16	441.88	0.36
Reach-1	0.599	PF 2	8988.00	740.53	750.42		750.97	0.003699	5.92	1500.79	250.00	0.37
Reach-1	0.508	PF 1	7248.00	739.00	747.39		747.93	0.005227	6.58	1246.99	392.99	0.44
Reach-1	0.508	PF 2	8988.00	739.00	748.09		748.89	0.005056	6.89	1256.59	200.00	0.44
Reach-1	0.418	PF 1	7248.00	738.57	745.94		746.24	0.002372	4.15	1664.44	1264.40	0.29
Reach-1	0.418	PF 2	8988.00	738.57	746.94		747.28	0.002052	4.25	1945.61	330.00	0.28
Reach-1	0.324	PF 1	7248.00	736.75	745.94		745.97	0.000150	1.22	5913.86	1195.68	0.08
Reach-1	0.324	PF 2	8988.00	736.75	746.80		746.88	0.000312	1.88	4078.41	575.00	0.11
Reach-1	0.228	PF 1	7248.00	734.52	745.90		745.92	0.000071	0.98	6830.82	984.20	0.05
Reach-1	0.228	PF 2	8988.00	734.52	746.71		746.77	0.000152	1.51	5075.54	575.00	0.08
Reach-1	0.154	PF 1	8872.00	731.50	745.89	736.90	745.90	0.000034	0.74	12038.78	1339.69	0.04
Reach-1	0.154	PF 2	8872.00	731.50	746.71	736.99	746.72	0.000044	0.88	9849.47	910.00	0.04

Plan: Un 3 FW M 1 Evans Wash Reach-1 RS: 0.686 Profile: PF 1

E.G. US. (ft)	754.78	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	754.76	E.G. Elev (ft)	754.78	754.78
Q Total (cfs)	8988.00	W.S. Elev (ft)	754.76	754.76
Q Bridge (cfs)	5369.32	Crit W.S. (ft)	754.62	751.62
Q Weir (cfs)	3618.68	Max Chl Dpth (ft)	11.72	12.17
Weir Sta Lft (ft)	9921.40	Vel Total (ft/s)	4.63	9.48
Weir Sta Rgt (ft)	11872.23	Flow Area (sq ft)	1942.24	948.52
Weir Submerg	0.00	Froude # Chl	0.03	0.06
Weir Max Depth (ft)	1.78	Specif Force (cu ft)	5607.18	6848.24
Min El Weir Flow (ft)	753.84	Hydr Depth (ft)	1.12	1.52
Min El Prs (ft)	752.03	W.P. Total (ft)	1956.59	845.61
Delta EG (ft)	3.48	Conv. Total (cfs)		
Delta WS (ft)	3.76	Top Width (ft)	1741.24	625.03
BR Open Area (sq ft)	538.86	Frctn Loss (ft)		
BR Open Vel (ft/s)	9.96	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

HEC-RAS Plan: Gila Bend Ca River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1.143	PF 1	3380.00	743.72	745.04	745.04	745.41	0.018397	6.58	787.54	1045.83	1.05
Reach-1	1.143	PF 2	3380.00	743.72	745.61		746.04	0.008958	5.90	662.12	370.00	0.78
Reach-1	1.052	PF 1	3100.00	736.93	744.94		744.95	0.000080	1.39	4085.78	1222.17	0.09
Reach-1	1.052	PF 2	3100.00	736.93	745.68		745.72	0.000122	1.84	2193.76	330.00	0.12
Reach-1	0.974	PF 1	3090.00	736.68	744.86		744.90	0.000217	2.15	2629.32	1062.43	0.15
Reach-1	0.974	PF 2	3090.00	736.68	745.60		745.66	0.000189	2.16	1888.74	355.00	0.14
Reach-1	0.902	PF 1	3090.00	736.50	744.85		744.86	0.000049	1.09	5084.21	1399.63	0.07
Reach-1	0.902	PF 2	3090.00	736.50	745.57		745.60	0.000091	1.58	2484.24	365.00	0.10
Reach-1	0.835	PF 1	3040.00	737.44	744.80		744.83	0.000205	2.01	2716.92	983.92	0.14
Reach-1	0.835	PF 2	3040.00	737.44	745.48		745.55	0.000266	2.46	1634.58	315.00	0.17
Reach-1	0.773	PF 1	2890.00	737.10	744.77		744.78	0.000079	1.22	4066.96	1220.27	0.09
Reach-1	0.773	PF 2	2890.00	737.10	745.43		745.46	0.000142	1.75	2014.82	320.00	0.12
Reach-1	0.689	PF 1	2600.00	737.52	744.73		744.75	0.000119	1.54	3156.41	1084.41	0.11
Reach-1	0.689	PF 2	2600.00	737.52	745.38		745.41	0.000138	1.77	2004.39	370.00	0.12
Reach-1	0.620	PF 1	2200.00	736.83	744.71		744.72	0.000031	0.83	4784.31	1441.93	0.06
Reach-1	0.620	PF 2	2200.00	736.83	745.35		745.37	0.000051	1.13	2529.21	420.00	0.07
Reach-1	0.546	PF 1	1650.00	738.60	744.68		744.69	0.000062	0.93	2701.29	1110.12	0.08
Reach-1	0.546	PF 2	1650.00	738.60	745.33		745.34	0.000061	1.01	1902.58	420.00	0.08
Reach-1	0.478	PF 1	1570.00	739.17	744.63		744.65	0.000152	1.27	1937.19	938.16	0.12
Reach-1	0.478	PF 2	1570.00	739.17	745.29		745.31	0.000124	1.29	1547.88	410.00	0.11
Reach-1	0.375	PF 1	1530.00	739.38	744.56	741.69	744.57	0.000109	1.07	2225.60	906.79	0.10
Reach-1	0.375	PF 2	1530.00	739.38	745.24	741.70	745.25	0.000092	1.10	1736.27	410.00	0.09
Reach-1	0.270	PF 1	1310.00	739.80	744.49	741.81	744.50	0.000123	1.15	1864.11	886.77	0.10
Reach-1	0.270	PF 2	1310.00	739.80	745.19	741.81	745.20	0.000077	1.02	1658.35	435.00	0.08
Reach-1	0.172	PF 1	1080.00	738.29	744.40		744.42	0.000219	1.45	1239.60	700.41	0.14
Reach-1	0.172	PF 2	1080.00	738.29	745.15		745.16	0.000094	1.08	1477.32	510.00	0.09
Reach-1	0.069	PF 1	1040.00	738.60	744.40	742.58	744.40	0.000003	0.18	5796.04	1165.41	0.02
Reach-1	0.069	PF 2	1040.00	738.60	745.15	742.57	745.15	0.000004	0.24	4286.51	710.00	0.02

HEC-RAS Plan: Hacker River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.655	PF 1	1350.00	776.21	782.81		783.28	0.008783	6.19	254.32	104.46	0.51
Reach-1	3.655	PF 2	1350.00	776.21	783.75		784.88	0.013308	8.65	160.74	32.00	0.65
Reach-1	3.555	PF 1	1350.00	772.50	778.54		778.92	0.007929	5.27	279.50	128.38	0.48
Reach-1	3.555	PF 2	1350.00	772.50	779.10		779.58	0.007384	5.58	246.16	60.00	0.47
Reach-1	3.464	PF 1	1350.00	769.97	776.19		776.45	0.003460	4.08	336.54	97.73	0.33
Reach-1	3.464	PF 2	1350.00	769.97	777.09		777.37	0.002986	4.26	322.64	60.00	0.32
Reach-1	3.361	PF 1	1350.00	767.00	773.09		773.52	0.009224	6.01	267.41	144.79	0.52
Reach-1	3.361	PF 2	1350.00	767.00	773.47		774.33	0.013134	7.60	182.47	50.00	0.63
Reach-1	3.258	PF 1	1350.00	763.52	771.84	768.23	771.95	0.001269	2.80	531.74	172.28	0.21
Reach-1	3.258	PF 2	1350.00	763.52	772.23	768.24	772.37	0.001416	3.09	444.70	75.00	0.22
Reach-1	3.248		Bridge									
Reach-1	3.163	PF 1	1350.00	761.89	767.23		767.44	0.003894	3.78	363.68	133.17	0.34
Reach-1	3.163	PF 2	1350.00	761.89	768.02		768.42	0.005523	5.10	270.14	60.00	0.42
Reach-1	3.066	PF 1	1350.00	758.53	764.31		764.68	0.007768	5.18	291.63	138.20	0.47
Reach-1	3.066	PF 2	1350.00	758.53	765.20		765.58	0.005535	5.05	273.46	65.00	0.42
Reach-1	2.972	PF 1	1350.00	756.06	762.22		762.34	0.002982	2.78	491.38	151.95	0.25
Reach-1	2.972	PF 2	1350.00	756.06	763.00		763.23	0.003949	3.90	346.04	60.00	0.29
Reach-1	2.882	PF 1	1350.00	751.91	758.30		758.97	0.031123	6.61	205.22	111.83	0.75
Reach-1	2.882	PF 2	1350.00	751.91	759.24		759.79	0.016852	5.99	225.85	68.00	0.58
Reach-1	2.791	PF 1	1350.00	749.62	756.98		757.04	0.001326	1.90	679.30	220.41	0.17
Reach-1	2.791	PF 2	1350.00	749.62	757.45		757.55	0.001971	2.50	540.17	130.00	0.21
Reach-1	2.686	PF 1	1350.00	747.53	755.70		755.87	0.003938	3.31	421.19	239.79	0.29
Reach-1	2.686	PF 2	1350.00	747.53	755.93		756.09	0.003662	3.24	416.28	99.45	0.28
Reach-1	2.599	PF 1	1350.00	746.39	753.67		753.89	0.004720	3.89	364.62	120.48	0.33
Reach-1	2.599	PF 2	1350.00	746.39	753.68		753.97	0.005967	4.34	311.39	68.00	0.36
Reach-1	2.508	PF 1	1350.00	745.20	750.88		751.07	0.007394	3.53	386.61	164.58	0.38
Reach-1	2.508	PF 2	1350.00	745.20	751.60		751.73	0.003582	2.81	480.03	142.58	0.27
Reach-1	2.416	PF 1	1350.00	741.64	748.48		748.65	0.003588	3.65	406.14	480.68	0.32
Reach-1	2.416	PF 2	1350.00	741.64	748.98		749.39	0.006537	5.28	263.11	64.58	0.44
Reach-1	2.298	PF 1	1350.00	740.57	746.49	743.92	746.66	0.002881	3.38	425.96	739.32	0.29
Reach-1	2.298	PF 2	1350.00	740.57	746.88	743.92	747.04	0.002338	3.22	423.95	100.00	0.27
Reach-1	2.204	PF 1	1350.00	739.32	745.93		745.98	0.000742	1.91	742.96	962.97	0.15
Reach-1	2.204	PF 2	1350.00	739.32	746.36		746.42	0.000709	2.00	683.54	130.00	0.15
Reach-1	2.030	PF 1	1350.00	737.71	745.93		745.93	0.000010	0.31	4662.10	1593.52	0.02
Reach-1	2.030	PF 2	1350.00	737.71	746.36		746.36	0.000013	0.37	3711.36	610.00	0.02
Reach-1	1.952	PF 1	1350.00	734.20	745.92		745.92	0.000007	0.30	4875.94	1000.05	0.02
Reach-1	1.952	PF 2	1350.00	734.20	746.35		746.36	0.000006	0.29	4808.22	628.00	0.02
Reach-1	1.865	PF 1	8870.00	731.00	745.90	737.00	745.91	0.000035	0.74	12110.14	1381.71	0.04
Reach-1	1.865	PF 2	8870.00	731.00	746.32	737.16	746.33	0.000053	0.94	9291.75	895.91	0.05
Reach-1	1.655		Culvert									
Reach-1	1.829	PF 1	8960.00	722.61	741.34		741.36	0.000031	1.01	9768.41	1131.39	0.05
Reach-1	1.829	PF 2	8960.00	722.61	741.56		741.57	0.000032	1.04	8943.18	876.74	0.05
Reach-1	1.734	PF 1	8960.00	722.88	741.32		741.34	0.000037	1.36	8779.02	954.47	0.06
Reach-1	1.734	PF 2	8960.00	722.88	741.50		741.54	0.000058	1.70	5959.77	447.77	0.07
Reach-1	1.650	PF 1	8960.00	722.25	741.26	735.49	741.31	0.000168	2.49	5638.85	1027.35	0.11
Reach-1	1.650	PF 2	8960.00	722.25	741.33	735.40	741.48	0.000375	3.73	3176.94	422.17	0.17
Reach-1	1.635		Culvert									
Reach-1	1.612	PF 1	8960.00	720.99	733.96	733.96	735.01	0.004949	9.80	1427.40	705.13	0.55
Reach-1	1.612	PF 2	8960.00	720.99	734.42	733.90	735.36	0.004093	9.20	1406.18	425.00	0.51
Reach-1	1.539	PF 1	8960.00	718.41	731.84	731.84	732.90	0.005637	10.16	1559.70	843.04	0.60
Reach-1	1.539	PF 2	8960.00	718.41	732.10	732.10	733.37	0.005917	10.61	1232.79	432.19	0.62
Reach-1	1.530	PF 1	3250.00	719.73	731.61	725.71	731.93	0.001101	4.73	774.17	793.35	0.27

HEC-RAS Plan: Hacker River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	1.530	PF 2	3250.00	719.73	732.31	725.71	732.55	0.000769	4.15	967.13	886.47	0.23
Reach-1	1.528		Mult Open									
Reach-1	1.452	PF 1	3250.00	717.89	728.47	724.73	729.08	0.002669	6.44	546.51	1028.53	0.41
Reach-1	1.452	PF 2	3250.00	717.89	729.29	724.74	729.83	0.002029	6.00	568.34	80.00	0.36
Reach-1	1.351	PF 1	3250.00	716.14	728.65	722.22	728.67	0.000073	1.17	2728.30	1144.71	0.07
Reach-1	1.351	PF 2	3250.00	716.14	728.98	723.51	729.13	0.000547	3.29	1083.08	140.00	0.19
Reach-1	1.336	PF 1	3250.00	716.40	728.19	722.40	728.61	0.001728	5.62	780.95	1370.71	0.30
Reach-1	1.336	PF 2	3250.00	716.40	728.54	722.41	729.02	0.001775	5.81	661.12	160.00	0.30
Reach-1	1.333		Bridge									
Reach-1	1.320	PF 1	3250.00	716.40	725.17	721.65	725.25	0.000491	2.74	1594.91	971.88	0.17
Reach-1	1.320	PF 2	3250.00	716.40	725.60	721.25	725.89	0.001328	4.67	811.74	160.00	0.28
Reach-1	1.306	PF 1	3250.00	716.85	725.18	718.51	725.21	0.000147	1.40	2448.66	813.67	0.09
Reach-1	1.306	PF 2	3250.00	716.85	725.23	723.28	725.70	0.002800	6.15	648.35	160.00	0.39
Reach-1	1.298		Bridge									
Reach-1	1.283	PF 1	3250.00	716.20	724.52	719.67	724.58	0.000372	2.17	1718.38	859.67	0.15
Reach-1	1.283	PF 2	3250.00	716.20	725.40	720.56	725.47	0.000368	2.38	1637.56	350.00	0.15
Reach-1	1.210	PF 1	8700.00	715.00	723.41	723.41	723.92	0.004240	7.85	1830.20	1546.65	0.52
Reach-1	1.210	PF 2	8700.00	715.00	724.41	723.84	724.91	0.003005	6.89	1613.55	622.48	0.42

Plan: Hacker RIVER-1 Reach-1 RS: 1.635 Culv Group: Culvert #1 Profile: PF 1

Q Culv Group (cfs)	5304.65	Culv Full Len (ft)	91.50
# Barrels	3	Culv Vel US (ft/s)	17.68
Q Barrel (cfs)	1768.22	Culv Vel DS (ft/s)	17.68
E.G. US. (ft)	741.31	Culv Inv El Up (ft)	722.37
W.S. US. (ft)	741.26	Culv Inv El Dn (ft)	721.68
E.G. DS (ft)	735.01	Culv Frctn Ls (ft)	0.55
W.S. DS (ft)	733.96	Culv Exit Loss (ft)	3.80
Delta EG (ft)	6.30	Culv Entr Loss (ft)	1.94
Delta WS (ft)	7.30	Q Weir (cfs)	3655.35
E.G. IC (ft)	741.38	Weir Sta Lft (ft)	9646.07
E.G. OC (ft)	741.31	Weir Sta Rgt (ft)	10298.41
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	732.37	Weir Max Depth (ft)	2.81
Culv WS Outlet (ft)	731.68	Weir Avg Depth (ft)	1.57
Culv Nml Depth (ft)	7.82	Weir Flow Area (sq ft)	1021.33
Culv Crt Depth (ft)	9.90	Min El Weir Flow (ft)	738.51

Plan: Hacker RIVER-1 Reach-1 RS: 1.855 Culv Group: Culvert #1 Profile: PF 1

Q Culv Group (cfs)	231.05	Culv Full Len (ft)	117.50
# Barrels	2	Culv Vel US (ft/s)	9.19
Q Barrel (cfs)	115.52	Culv Vel DS (ft/s)	9.19
E.G. US. (ft)	745.91	Culv Inv El Up (ft)	730.99
W.S. US. (ft)	745.90	Culv Inv El Dn (ft)	727.50
E.G. DS (ft)	741.36	Culv Frctn Ls (ft)	2.59
W.S. DS (ft)	741.34	Culv Exit Loss (ft)	1.30
Delta EG (ft)	4.55	Culv Entr Loss (ft)	0.66
Delta WS (ft)	4.55	Q Weir (cfs)	8522.17
E.G. IC (ft)	736.97	Weir Sta Lft (ft)	9620.19
E.G. OC (ft)	745.90	Weir Sta Rgt (ft)	11001.98
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	734.99	Weir Max Depth (ft)	2.24
Culv WS Outlet (ft)	731.50	Weir Avg Depth (ft)	1.77
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	2439.67
Culv Crt Depth (ft)	3.24	Min El Weir Flow (ft)	743.68

Plan: Hacker RIVER-1 Reach-1 RS: 1.298 Profile: PF 1

E.G. US. (ft)	725.21	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	725.18	E.G. Elev (ft)	725.21	724.86
Q Total (cfs)	3250.00	W.S. Elev (ft)	725.18	724.52
Q Bridge (cfs)	1046.62	Crit W.S. (ft)	724.36	721.29
Q Weir (cfs)	2203.38	Max Chl Dpth (ft)	8.33	8.32
Weir Sta Lft (ft)	9765.00	Vel Total (ft/s)	3.81	4.17
Weir Sta Rgt (ft)	10230.00	Flow Area (sq ft)	852.36	780.15
Weir Submerg	0.56	Froude # Chl	0.02	0.03
Weir Max Depth (ft)	2.30	Specif Force (cu ft)	2080.14	2306.91
Min El Weir Flow (ft)	722.91	Hydr Depth (ft)	1.83	1.65
Min El Prs (ft)	721.83	W.P. Total (ft)	577.48	615.87
Delta EG (ft)	0.63	Conv. Total (cfs)		
Delta WS (ft)	0.66	Top Width (ft)	813.67	752.05
BR Open Area (sq ft)	197.36	Frctn Loss (ft)		
BR Open Vel (ft/s)	5.30	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: Hacker RIVER-1 Reach-1 RS: 1.333 Profile: PF 1

E.G. US. (ft)	728.61	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	728.19	E.G. Elev (ft)	728.61	728.02
Q Total (cfs)	3250.00	W.S. Elev (ft)	728.19	728.02
Q Bridge (cfs)	3224.86	Crit W.S. (ft)	722.84	722.84
Q Weir (cfs)	25.14	Max Chl Dpth (ft)	11.79	11.62
Weir Sta Lft (ft)	9800.00	Vel Total (ft/s)	12.00	6.36
Weir Sta Rgt (ft)	9909.14	Flow Area (sq ft)	270.91	511.24
Weir Submerg	0.00	Froude # Chl	0.08	0.04
Weir Max Depth (ft)	0.40	Specif Force (cu ft)	3334.17	2926.67
Min El Weir Flow (ft)	728.23	Hydr Depth (ft)		1.14
Min El Prs (ft)	724.38	W.P. Total (ft)	100.72	551.74
Delta EG (ft)	3.36	Conv. Total (cfs)		
Delta WS (ft)	3.01	Top Width (ft)		448.90
BR Open Area (sq ft)	270.89	Frctn Loss (ft)		
BR Open Vel (ft/s)	11.90	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: Hacker RIVER-1 Reach-1 RS: 3.248 Profile: PF 1

E.G. US. (ft)	771.95	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	771.84	E.G. Elev (ft)	771.86	769.33
Q Total (cfs)	1350.00	W.S. Elev (ft)	771.65	769.14
Q Bridge (cfs)	1350.00	Crit W.S. (ft)	768.37	765.94
Q Weir (cfs)		Max Chl Dpth (ft)	8.13	7.25
Weir Sta Lft (ft)		Vel Total (ft/s)	3.63	3.54
Weir Sta Rgt (ft)		Flow Area (sq ft)	371.44	381.48
Weir Submerg		Froude # Chl	0.02	0.02
Weir Max Depth (ft)		Specif Force (cu ft)	1241.31	1219.53
Min El Weir Flow (ft)	777.42	Hydr Depth (ft)	5.50	5.54
Min El Prs (ft)	775.58	W.P. Total (ft)	123.88	126.64
Delta EG (ft)	4.51	Conv. Total (cfs)	19453.1	21695.3
Delta WS (ft)	4.61	Top Width (ft)	67.57	68.89
BR Open Area (sq ft)	632.84	Frctn Loss (ft)		
BR Open Vel (ft/s)	3.63	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	0.90	0.73
Br Sel Method	Momentum	Power Total (lb/ft s)	3.28	2.58

Plan: Hacker RIVER-1 Reach-1 RS: 1.528 Open#1: Culvert #1 Profile: PF 1

Q Culv Group (cfs)	3250.00	Culv Full Len (ft)	
# Barrels	3	Culv Vel US (ft/s)	11.82
Q Barrel (cfs)	1083.33	Culv Vel DS (ft/s)	11.40
E.G. US. (ft)	731.93	Culv Inv El Up (ft)	719.73
W.S. US. (ft)	731.61	Culv Inv El Dn (ft)	718.97
E.G. DS (ft)	729.08	Culv Frctn Ls (ft)	0.58
W.S. DS (ft)	728.47	Culv Exit Loss (ft)	1.41
Delta EG (ft)	2.85	Culv Entr Loss (ft)	0.87
Delta WS (ft)	3.14	Q Weir (cfs)	
E.G. IC (ft)	731.85	Weir Sta Lft (ft)	
E.G. OC (ft)	731.93	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	728.90	Weir Max Depth (ft)	
Culv WS Outlet (ft)	728.47	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	8.34	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	7.14	Min El Weir Flow (ft)	752.87

HEC-RAS Plan: U2west River: Hacker Diversion Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	0.540	PF 1	5570.00	728.00	733.90		734.22	0.003074	5.28	1286.72	498.83	0.42
Reach-1	0.540	PF 2	5570.00	728.00	734.90		735.33	0.002417	5.15	1059.69	200.67	0.37
Reach-1	0.449	PF 1	5570.00	728.00	732.63	731.50	732.82	0.002586	4.01	1806.02	1133.73	0.37
Reach-1	0.449	PF 2	5570.00	728.00	733.59	731.50	733.98	0.003127	5.04	1105.12	237.80	0.41
Reach-1	0.364	PF 1	5570.00	726.80	729.54	729.54	730.23	0.017109	7.16	869.80	626.81	0.86
Reach-1	0.364	PF 2	5570.00	726.80	729.76	729.67	730.83	0.020611	8.32	669.18	284.10	0.96
Reach-1	0.268	PF 1	5570.00	723.75	728.01		728.12	0.001181	2.87	2128.50	812.31	0.25
Reach-1	0.268	PF 2	5570.00	723.75	728.97		729.16	0.001128	3.20	1617.02	344.80	0.25
Reach-1	0.219	PF 1	5570.00	720.80	727.97		727.98	0.000059	0.85	6762.68	1624.10	0.06
Reach-1	0.219	PF 2	5570.00	720.80	728.77	725.15	728.84	0.000319	2.14	2662.83	500.00	0.14
Reach-1	0.170	PF 1	5540.00	724.00	727.44	727.44	727.92	0.017460	7.66	1022.58	1080.61	0.86
Reach-1	0.170	PF 2	5540.00	725.71	727.79	727.79	728.65	0.015334	9.01	744.90	440.00	0.88
Reach-1	0.139	PF 1	5540.00	720.00	724.11	722.01	724.16	0.000668	1.58	3103.55	2087.85	0.18
Reach-1	0.139	PF 2	5540.00	720.00	725.08	722.56	725.15	0.000751	2.09	2616.49	850.00	0.20
Reach-1	0.029	PF 1	5540.00	720.90	724.06	722.41	724.10	0.000670	1.69	3509.23	2387.27	0.18
Reach-1	0.029	PF 2	5540.00	720.90	725.04	722.40	725.09	0.000442	1.68	3269.05	880.00	0.15
Reach-1	0.000	PF 1	8700.00	722.60	723.45	723.25	723.82	0.004001	3.17	1892.55	1546.90	0.65
Reach-1	0.000	PF 2	8700.00	722.60	724.45	724.09	724.87	0.003492	5.26	1675.93	990.00	0.71

HEC-RAS Plan: I-8 Wash E River: I-8 Wash East Reach: Main

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	.695	PF 1	9290.00	757.60	761.42	761.42	762.19	0.032033	7.02	1323.97	899.94	1.02
Main	.695	PF 2	9290.00	757.60	761.42	761.42	762.19	0.032033	7.02	1323.97	899.94	1.02
Main	.490	PF 1	9290.00	741.68	755.60		755.64	0.000212	1.62	5739.63	791.41	0.11
Main	.490	PF 2	9290.00	741.68	756.29		756.33	0.000159	1.48	6291.88	802.64	0.09
Main	.395	PF 1	9290.00	746.40	755.45		755.50	0.000361	1.80	5167.56	907.48	0.13
Main	.395	PF 2	9290.00	746.40	756.18		756.22	0.000242	1.59	5827.10	907.38	0.11
Main	.299	PF 1	9290.00	745.20	755.24		755.29	0.000473	1.87	4958.29	1002.61	0.15
Main	.299	PF 2	9290.00	745.20	756.04		756.08	0.000300	1.60	5789.70	1048.25	0.12
Main	.198	PF 1	9290.00	746.35	755.09		755.11	0.000222	1.22	7605.54	1658.25	0.10
Main	.198	PF 2	9290.00	746.35	755.95		755.97	0.000126	1.03	9046.66	1658.44	0.08
Main	.118	PF 1	9290.00	744.82	754.92		754.98	0.000370	1.90	4900.69	809.15	0.14
Main	.118	PF 2	9290.00	744.82	755.86		755.90	0.000230	1.64	5654.57	809.15	0.11
Main	0	PF 1	8988.00	743.04	754.74	748.59	754.78	0.000276	1.96	5653.60	1291.52	0.11
Main	0	PF 2	8988.00	743.04	755.72	748.59	755.77	0.000205	1.80	5218.94	760.00	0.09

HEC-RAS Plan: I-8 Wash Wes River: I-8 West Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	0.520	PF 1	3910.00	723.82	728.33	726.93	728.46	0.001989	3.56	1440.17	735.94	0.35
Reach-1	0.520	PF 2	3910.00	723.82	729.14	727.13	729.41	0.002016	4.15	935.83	230.14	0.37
Reach-1	0.428	PF 1	3560.00	721.20	727.12		727.37	0.003477	4.90	1035.39	672.18	0.47
Reach-1	0.428	PF 2	3560.00	721.20	727.91		728.32	0.003411	5.54	726.33	233.67	0.48
Reach-1	0.332	PF 1	2640.00	720.50	726.53		726.60	0.000862	2.67	1348.87	664.53	0.24
Reach-1	0.332	PF 2	2640.00	720.50	727.48		727.59	0.000720	2.80	1007.34	233.57	0.23
Reach-1	0.235	PF 1	700.00	721.18	726.41		726.41	0.000055	0.64	1428.98	740.88	0.06
Reach-1	0.235	PF 2	700.00	721.18	727.41		727.42	0.000047	0.69	1056.73	253.10	0.06
Reach-1	0.163	PF 1	40.00	722.24	726.40		726.40	0.000001	0.05	905.76	528.85	0.01
Reach-1	0.163	PF 2	40.00	722.24	727.40		727.40	0.000002	0.11	387.24	124.06	0.01
Reach-1	0.076	PF 1	40.00	720.80	726.40	721.12	726.40	0.000000	0.03	1830.92	832.65	0.00
Reach-1	0.076	PF 2	40.00	720.80	727.40	721.63	727.40	0.000001	0.08	539.50	126.53	0.01

HEC-RAS Plan: Imported Pla

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Quilotosa (west)	Reach-3	5.379	PF 1	4450.00	758.99	762.11	762.11	762.77	0.019182	5.12	699.87	1406.15	0.77
Quilotosa (west)	Reach-3	5.379	PF 2	4450.00	758.99	762.63	762.23	763.04	0.009470	4.24	877.19	545.11	0.56
Quilotosa (west)	Reach-3	5.289	PF 1	4450.00	755.46	758.49		758.70	0.003269	1.76	1220.62	751.01	0.30
Quilotosa (west)	Reach-3	5.289	PF 2	4450.00	755.46	759.41		759.68	0.006809	3.81	1072.95	815.88	0.48
Quilotosa (west)	Reach-3	5.203	PF 1	4450.00	752.16	757.04	756.06	757.19	0.002590	2.65	1433.77	1367.13	0.30
Quilotosa (west)	Reach-3	5.203	PF 2	4450.00	752.16	757.38	756.38	757.57	0.002705	2.95	1293.75	610.00	0.31
Quilotosa (west)	Reach-3	5.114	PF 1	4450.00	747.40	755.14		755.48	0.010770	5.04	985.94	707.45	0.50
Quilotosa (west)	Reach-3	5.114	PF 2	4450.00	748.50	755.65		756.04	0.008198	4.76	894.16	400.00	0.44
Quilotosa (west)	Reach-3	5.025	PF 1	4450.00	744.86	754.94	753.13	754.98	0.000351	1.43	2687.86	1303.92	0.10
Quilotosa (west)	Reach-3	5.025	PF 2	4450.00	744.86	755.32	753.15	755.39	0.000541	1.85	2083.57	500.00	0.12
Quilotosa (west)	Reach-3	4.936	PF 1	4450.00	744.80	753.88	753.40	754.48	0.011599	7.36	784.99	1253.77	0.58
Quilotosa (west)	Reach-3	4.936	PF 2	4450.00	744.80	754.34	753.40	754.77	0.007020	6.08	863.69	469.12	0.44
Quilotosa (west)	Reach-3	4.846	PF 1	4450.00	741.85	748.20	747.82	748.92	0.013959	5.95	666.38	310.53	0.58
Quilotosa (west)	Reach-3	4.846	PF 2	4450.00	741.85	748.81	748.36	750.10	0.018844	7.28	524.26	144.23	0.66
Quilotosa (west)	Reach-3	4.755	PF 1	4450.00	739.03	747.00	745.01	747.06	0.001624	1.84	2415.83	893.41	0.19
Quilotosa (west)	Reach-3	4.755	PF 2	4450.00	739.84	747.36	745.28	747.45	0.002311	2.42	1835.82	550.00	0.23
Quilotosa (west)	Reach-3	4.664	PF 1	4450.00	738.53	744.52	744.52	744.95	0.037479	4.33	873.33	1179.33	0.78
Quilotosa (west)	Reach-3	4.664	PF 2	4450.00	738.53	745.07		745.33	0.012351	3.37	1136.40	900.00	0.48
Quilotosa (west)	Reach-3	4.567	PF 1	4450.00	733.97	744.45	740.03	744.46	0.000022	0.44	10526.38	3109.96	0.03
Quilotosa (west)	Reach-3	4.567	PF 2	4450.00	733.97	745.20	740.02	745.20	0.000026	0.54	8197.29	800.00	0.03
Quilotosa (west)	Reach-3	4.477	PF 1	4450.00	742.50	744.41	742.50	744.43	0.000253	0.46	4194.78	3728.99	0.07
Quilotosa (west)	Reach-3	4.477	PF 2	4450.00	742.50	745.13	742.61	745.17	0.000341	0.70	2977.84	1124.55	0.08
Quilotosa (east	Reach-2	5.372	PF 1	3400.00	760.83	762.62		762.77	0.006309	4.27	1104.75	1278.63	0.57
Quilotosa (east	Reach-2	5.372	PF 2	3400.00	760.83	763.47		763.91	0.005392	5.15	641.58	275.00	0.56
Quilotosa (east	Reach-2	5.269	PF 1	3400.00	757.75	759.35	759.05	759.49	0.006066	3.81	1149.49	1375.76	0.55
Quilotosa (east	Reach-2	5.269	PF 2	3400.00	757.75	760.32		760.82	0.006261	5.40	604.91	270.00	0.60
Quilotosa (east	Reach-2	5.186	PF 1	3400.00	754.97	756.75	756.47	756.91	0.006186	4.11	1193.00	1717.96	0.56
Quilotosa (east	Reach-2	5.186	PF 2	3400.00	754.97	757.48		757.98	0.007066	5.60	602.21	285.00	0.64
Quilotosa (east	Reach-2	5.099	PF 1	3400.00	752.47	754.65		754.76	0.003724	3.74	1374.43	1536.06	0.45
Quilotosa (east	Reach-2	5.099	PF 2	3400.00	752.47	755.12		755.43	0.004241	4.55	760.61	350.00	0.50
Quilotosa (east	Reach-2	4.980	PF 1	3400.00	749.46	751.39	751.23	751.62	0.008330	5.06	957.35	1322.48	0.68
Quilotosa (east	Reach-2	4.980	PF 2	3400.00	749.46	752.04		752.46	0.005798	5.19	656.23	290.00	0.58
Quilotosa (east	Reach-2	4.870	PF 1	3400.00	746.24	748.52	748.09	748.62	0.003284	3.54	1522.52	1994.77	0.43
Quilotosa (east	Reach-2	4.870	PF 2	3400.00	746.24	749.52	748.69	749.80	0.003437	4.68	804.80	340.00	0.46
Quilotosa (east	Reach-2	4.770	PF 1	3400.00	743.13	744.98	744.98	745.30	0.014258	6.28	813.35	1206.97	0.85
Quilotosa (east	Reach-2	4.770	PF 2	3400.00	743.13	745.42	745.42	746.25	0.016200	7.81	486.61	280.00	0.94
Quilotosa (east	Reach-2	4.673	PF 1	3400.00	740.00	744.41		744.42	0.000100	0.98	5275.78	3020.20	0.08
Quilotosa (east	Reach-2	4.673	PF 2	3400.00	740.00	745.13		745.16	0.000178	1.45	2559.13	690.00	0.11
Quilotosa	Reach-1	6.084	PF 1	7850.00	780.61	782.88	782.63	783.23	0.006744	2.67	1681.29	1383.78	0.44
Quilotosa	Reach-1	6.084	PF 2	7850.00	780.61	783.74	783.45	784.25	0.006898	3.88	1375.47	973.71	0.47
Quilotosa	Reach-1	5.993	PF 1	7850.00	778.00	780.70	780.20	780.86	0.003683	2.25	2470.11	2287.11	0.33
Quilotosa	Reach-1	5.993	PF 2	7850.00	778.00	781.59	781.03	781.85	0.003640	3.11	1941.30	1196.50	0.35
Quilotosa	Reach-1	5.907	PF 1	7850.00	776.09	777.60	777.60	778.09	0.011945	2.66	1409.85	1441.34	0.54
Quilotosa	Reach-1	5.907	PF 2	7850.00	776.09	778.59	778.59	779.29	0.009631	4.04	1179.42	860.20	0.55
Quilotosa	Reach-1	5.841	PF 1	7850.00	775.01	776.19	775.34	776.32	0.002000	0.93	2873.46	1827.68	0.21
Quilotosa	Reach-1	5.841	PF 2	7850.00	775.01	776.68	775.81	776.96	0.002781	1.48	1860.53	1006.53	0.28
Quilotosa	Reach-1	5.749	PF 1	7850.00	772.29	774.24	774.08	774.55	0.008686	3.33	1756.32	1778.57	0.51
Quilotosa	Reach-1	5.749	PF 2	7850.00	772.29	774.82	774.48	775.14	0.005363	3.34	1752.42	1216.50	0.43
Quilotosa	Reach-1	5.663	PF 1	7850.00	769.72	771.65		771.88	0.004091	1.84	2057.14	1553.34	0.33
Quilotosa	Reach-1	5.663	PF 2	7850.00	769.72	772.32	771.92	772.71	0.005187	2.94	1580.25	951.23	0.39
Quilotosa	Reach-1	5.589	PF 1	7850.00	765.82	768.72	768.57	769.09	0.008790	3.87	1625.88	1523.95	0.53
Quilotosa	Reach-1	5.589	PF 2	7850.00	765.82	769.11	768.94	769.57	0.008450	4.36	1452.06	1086.65	0.53
Quilotosa	Reach-1	5.480	PF 1	7850.00	763.52	766.07	765.70	766.26	0.004223	2.55	2217.38	1907.74	0.36
Quilotosa	Reach-1	5.480	PF 2	7850.00	763.52	766.18	765.86	766.44	0.005198	2.97	1952.54	1608.48	0.41
Quilotosa	Reach-4	4.414	PF 1	9170.00	732.46	744.03		744.26	0.000341	5.97	4594.37	3871.77	0.36
Quilotosa	Reach-4	4.414	PF 2	9170.00	732.46	744.81		744.96	0.000390	6.67	3433.37	1700.00	0.39

HEC-RAS Plan: Imported Pla (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Quilotosa	Reach-4	4.399	PF 1	9170.00	732.46	743.73	743.73	744.16	0.000577	7.57	3677.32	3651.89	0.47
Quilotosa	Reach-4	4.399	PF 2	9170.00	732.46	744.16	744.16	744.83	0.000691	8.52	2680.67	1671.54	0.52
Quilotosa	Reach-4	4.386	PF 1	9170.00	733.09	737.69	737.64	738.20	0.007484	6.86	1835.83	1680.40	0.68
Quilotosa	Reach-4	4.386	PF 2	9170.00	733.09	738.26		738.75	0.005043	6.30	1735.69	808.42	0.58
Quilotosa	Reach-4	4.290	PF 1	9170.00	727.20	734.45	734.45	734.97	0.005552	7.69	1979.64	1992.15	0.63
Quilotosa	Reach-4	4.290	PF 2	9170.00	727.20	734.97		735.61	0.006508	8.93	1483.31	845.63	0.69
Quilotosa	Reach-4	4.201	PF 1	9170.00	724.32	731.91	731.91	732.34	0.004560	7.16	2375.33	2288.65	0.57
Quilotosa	Reach-4	4.201	PF 2	9170.00	724.32	732.46	732.46	733.13	0.005101	8.12	1700.25	980.00	0.62
Quilotosa	Reach-4	4.109	PF 1	9170.00	721.02	728.32	728.32	728.79	0.005325	7.54	2177.34	2202.16	0.61
Quilotosa	Reach-4	4.109	PF 2	9170.00	721.02	728.88	728.88	729.72	0.006404	8.92	1479.45	817.52	0.69
Quilotosa	Reach-4	4.013	PF 1	9170.00	717.20	726.38		726.45	0.000670	3.22	4847.65	2790.26	0.23
Quilotosa	Reach-4	4.013	PF 2	9170.00	717.20	726.48		726.83	0.002048	5.70	2101.46	700.00	0.40
Quilotosa	Reach-4	3.921	PF 1	15200.00	710.10	726.37	722.32	726.39	0.000046	0.87	19060.86	4787.49	0.07
Quilotosa	Reach-4	3.921	PF 2	15200.00	710.10	726.62	722.32	726.64	0.000085	1.22	12498.80	2400.00	0.09
Quilotosa	Reach-4	3.895		Mult Open									
Quilotosa	Reach-4	3.892	PF 1	15200.00	710.83	723.11		723.14	0.000206	1.51	11336.80	4350.96	0.15
Quilotosa	Reach-4	3.892	PF 2	15200.00	710.83	723.17		723.23	0.000371	2.04	7489.14	2380.00	0.20
Quilotosa	Reach-4	3.874	PF 1	15200.00	709.88	723.10	720.74	723.12	0.000150	1.35	12633.28	4557.69	0.13
Quilotosa	Reach-4	3.874	PF 2	15200.00	709.88	723.14	719.54	723.20	0.000305	1.94	7839.08	2330.00	0.19
Quilotosa	Reach-4	3.870		Mult Open									
Quilotosa	Reach-4	3.793	PF 1	15200.00	706.50	717.95		718.10	0.001416	3.17	5068.81	1916.29	0.30
Quilotosa	Reach-4	3.793	PF 2	15200.00	706.50	718.62		718.74	0.000988	2.79	5445.00	1416.64	0.26
Quilotosa	Reach-4	3.776	PF 1	15200.00	709.07	717.21	717.21	717.72	0.008691	6.18	2808.92	2567.41	0.91
Quilotosa	Reach-4	3.776	PF 2	15200.00	709.07	718.21	717.38	718.53	0.003303	4.53	3375.39	1517.92	0.53

Plan: Imported Pla Quilotosa Reach-4 RS: 3.870 Open#1: Culvert #2 Profile: PF 1

Q Culv Group (cfs)	3760.31	Culv Full Len (ft)	381.50
# Barrels	3	Culv Vel US (ft/s)	13.06
Q Barrel (cfs)	1253.44	Culv Vel DS (ft/s)	13.06
E.G. US. (ft)	723.12	Culv Inv El Up (ft)	710.23
W.S. US. (ft)	723.10	Culv Inv El Dn (ft)	708.00
E.G. DS (ft)	718.10	Culv Frctn Ls (ft)	1.55
W.S. DS (ft)	717.86	Culv Exit Loss (ft)	2.42
Delta EG (ft)	5.02	Culv Entr Loss (ft)	1.06
Delta WS (ft)	5.24	Q Weir (cfs)	3579.35
E.G. IC (ft)	723.02	Weir Sta Lft (ft)	7578.32
E.G. OC (ft)	723.12	Weir Sta Rgt (ft)	9100.00
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	718.23	Weir Max Depth (ft)	1.40
Culv WS Outlet (ft)	716.00	Weir Avg Depth (ft)	0.89
Culv Nml Depth (ft)		Weir Flow Area (sq ft)	1350.28
Culv Crt Depth (ft)	6.97	Min El Weir Flow (ft)	721.70

Plan: Imported Pla Quilotosa Reach-4 RS: 3.895 Open#1: Bridge Profile: PF 1

E.G. US. (ft)	726.38	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	726.37	E.G. Elev (ft)	726.38	726.37
Q Total (cfs)	7567.23	W.S. Elev (ft)	726.37	726.00
Q Bridge (cfs)	2333.36	Crit W.S. (ft)	726.09	725.95
Q Weir (cfs)	5233.86	Max Chl Dpth (ft)	13.27	15.17
Weir Sta Lft (ft)	6815.12	Vel Total (ft/s)	11.61	5.84
Weir Sta Rgt (ft)	9000.00	Flow Area (sq ft)	200.97	399.74
Weir Submerg	0.00	Froude # Chl	0.08	0.04
Weir Max Depth (ft)	1.25	Specif Force (cu ft)	2572.43	4231.52
Min El Weir Flow (ft)	725.14	Hydr Depth (ft)		
Min El Prs (ft)	721.69	W.P. Total (ft)	106.88	139.18
Delta EG (ft)	3.24	Conv. Total (cfs)	11373.3	30004.0
Delta WS (ft)	3.26	Top Width (ft)		
BR Open Area (sq ft)	200.97	Frctn Loss (ft)		
BR Open Vel (ft/s)	11.61	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	51.97	11.41
Br Sel Method	Press/Weir	Power Total (lb/ft s)	603.36	66.57

HEC-RAS Plan: Sand Tk Main River: Sand Tank Wash Reach: Main Branch

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Branch	6.257	PF 1	24265.00	797.10	804.26		804.53	0.003173	5.14	6128.58	2458.80	0.39
Main Branch	6.257	PF 2	24265.00	797.10	804.26		804.53	0.003180	5.15	6122.58	2456.32	0.39
Main Branch	6.151	PF 1	21020.00	794.00	800.78	800.78	801.48	0.013914	7.92	3400.85	2116.07	0.76
Main Branch	6.151	PF 2	21020.00	794.00	800.79	800.74	801.48	0.013838	7.90	3407.18	2116.23	0.76
Main Branch	6.062	PF 1	19813.00	791.40	798.40	797.68	798.78	0.005462	6.09	4098.41	1728.27	0.50
Main Branch	6.062	PF 2	19813.00	791.40	798.40	797.68	798.78	0.005485	6.10	4092.08	1726.93	0.50
Main Branch	5.959	PF 1	18177.00	789.20	795.25		795.67	0.006148	5.45	3528.14	1430.23	0.51
Main Branch	5.959	PF 2	18177.00	789.20	795.25		795.67	0.006126	5.45	3531.89	1430.16	0.51
Main Branch	5.862	PF 1	17257.00	786.40	793.15		793.45	0.003031	4.87	3918.16	1183.03	0.38
Main Branch	5.862	PF 2	17257.00	786.40	793.13		793.44	0.003084	4.90	3897.09	1182.39	0.38
Main Branch	5.770	PF 1	16679.00	783.60	788.96	788.96	790.40	0.020171	10.03	1761.32	625.79	0.86
Main Branch	5.770	PF 2	16679.00	783.60	789.01	789.01	790.40	0.019100	9.84	1792.63	625.72	0.84
Main Branch	5.676	PF 1	16679.00	781.91	785.09		785.24	0.000447	0.96	5748.51	1163.81	0.11
Main Branch	5.676	PF 2	16679.00	781.91	785.09		785.23	0.000447	0.96	5748.36	1163.61	0.11
Main Branch	5.580	PF 1	16859.00	779.05	784.62		784.82	0.001681	3.05	4760.15	1568.04	0.25
Main Branch	5.580	PF 2	16859.00	779.05	784.62		784.82	0.001681	3.05	4759.96	1567.01	0.25
Main Branch	5.482	PF 1	16765.00	777.47	783.12		783.50	0.004993	4.34	3545.76	1667.98	0.41
Main Branch	5.482	PF 2	16765.00	777.47	783.13		783.50	0.004992	4.34	3545.96	1667.71	0.41
Main Branch	5.387	PF 1	16536.00	775.22	780.75		781.06	0.005586	4.84	3681.21	1902.76	0.44
Main Branch	5.387	PF 2	16536.00	775.22	780.74		781.06	0.005595	4.85	3678.88	1901.89	0.44
Main Branch	5.299	PF 1	16139.00	772.71	778.55	777.74	778.84	0.003318	5.29	3940.29	1936.51	0.47
Main Branch	5.299	PF 2	16139.00	772.71	778.55	777.74	778.84	0.003321	5.29	3939.11	1936.29	0.47
Main Branch	5.207	PF 1	15699.00	770.44	774.66	774.66	775.61	0.013842	8.76	2052.26	1165.85	0.91
Main Branch	5.207	PF 2	15699.00	770.44	774.66	774.66	775.61	0.013814	8.76	2054.04	1167.31	0.91
Main Branch	5.112	PF 1	15703.00	767.53	771.65		771.93	0.001486	3.06	3816.23	1046.27	0.30
Main Branch	5.112	PF 2	15703.00	767.53	771.65		771.93	0.001488	3.06	3814.83	1046.06	0.30
Main Branch	5.013	PF 1	15703.00	764.42	770.28		770.81	0.004549	6.66	2772.21	1127.32	0.56
Main Branch	5.013	PF 2	15703.00	764.42	770.28		770.81	0.004514	6.64	2779.85	1128.02	0.56
Main Branch	4.917	PF 1	15573.00	761.62	769.49	767.96	769.68	0.001261	4.79	4790.27	1847.41	0.32
Main Branch	4.917	PF 2	15573.00	761.62	769.49	767.96	769.68	0.001261	4.79	4790.27	1847.41	0.32

HEC-RAS Plan: Sauceda Wash River: Sauceda Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5.734	PF 1	5690.00	761.68	767.59		767.88	0.004096	4.54	1326.95	508.41	0.36
Reach-1	5.734	PF 2	5690.00	761.68	768.44		768.96	0.004304	5.18	1002.28	215.59	0.38
Reach-1	5.639	PF 1	5690.00	759.30	765.91		766.14	0.002956	3.72	1512.99	510.68	0.31
Reach-1	5.639	PF 2	5690.00	759.30	766.55		766.91	0.003704	4.49	1200.31	239.64	0.34
Reach-1	5.551	PF 1	5690.00	757.21	763.95		764.29	0.005645	4.86	1211.38	522.23	0.41
Reach-1	5.551	PF 2	5690.00	757.21	764.95		765.30	0.003338	4.30	1208.99	315.00	0.33
Reach-1	5.453	PF 1	5690.00	753.00	761.28	760.41	761.62	0.005107	5.13	1214.72	525.30	0.40
Reach-1	5.453	PF 2	5690.00	753.00	762.18	761.55	762.85	0.007594	6.98	867.68	283.15	0.50
Reach-1	5.367	PF 1	5690.00	752.06	759.07		759.46	0.004530	4.60	1143.83	380.64	0.38
Reach-1	5.367	PF 2	5690.00	752.06	759.81		760.28	0.004269	4.93	1038.60	260.85	0.37
Reach-1	5.270	PF 1	5690.00	748.40	757.00	755.93	757.24	0.004366	4.34	1480.55	785.32	0.37
Reach-1	5.270	PF 2	5690.00	748.40	757.77		758.24	0.004101	4.68	1072.17	240.00	0.36
Reach-1	5.187	PF 1	5690.00	746.93	754.49		754.84	0.006685	5.31	1261.66	652.65	0.45
Reach-1	5.187	PF 2	5690.00	746.93	755.00		755.64	0.008684	6.53	886.17	214.83	0.52
Reach-1	5.091	PF 1	5690.00	744.49	752.24		752.55	0.003256	5.58	1439.21	573.47	0.40
Reach-1	5.091	PF 2	5690.00	744.49	752.74		753.15	0.003043	5.69	1147.71	250.00	0.39
Reach-1	5.001	PF 1	5690.00	743.44	750.03	749.66	750.37	0.007497	6.29	1498.78	1656.73	0.57
Reach-1	5.001	PF 2	5690.00	743.44	750.83		751.29	0.005531	6.13	1076.15	330.00	0.50
Reach-1	4.909	PF 1	5690.00	738.79	747.82	747.26	748.02	0.003309	5.15	1930.50	1146.92	0.39
Reach-1	4.909	PF 2	5690.00	738.79	748.82	747.86	749.16	0.003461	5.90	1330.23	440.00	0.41
Reach-1	4.821	PF 1	5690.00	738.16	744.41	744.41	745.11	0.016250	9.07	997.72	798.93	0.82
Reach-1	4.821	PF 2	5690.00	738.16	745.30	745.30	746.28	0.013883	9.66	792.19	340.00	0.79
Reach-1	4.728	PF 1	5690.00	736.43	743.52		743.56	0.000304	1.72	3862.03	961.06	0.12
Reach-1	4.728	PF 2	5690.00	736.43	744.44		744.50	0.000309	1.91	2932.77	458.00	0.13
Reach-1	4.640	PF 1	5690.00	734.19	743.44		743.47	0.000139	1.34	4616.05	2221.12	0.09
Reach-1	4.640	PF 2	5690.00	734.19	744.39		744.42	0.000113	1.31	4206.09	550.00	0.08
Reach-1	4.543	PF 1	8720.00	729.70	743.44		743.44	0.000030	0.83	13292.15	3054.89	0.04
Reach-1	4.543	PF 2	8720.00	729.70	744.39		744.39	0.000024	0.78	13432.78	1690.00	0.04
Reach-1	4.497	PF 1	8720.00	727.85	743.10		743.36	0.000398	6.09	4902.62	4035.17	0.38
Reach-1	4.497	PF 2	8720.00	727.85	743.91		744.28	0.000420	6.67	3564.45	1704.62	0.39
Reach-1	4.482	PF 1	8720.00	727.85	742.82	742.82	743.27	0.000623	7.48	3953.09	3924.15	0.47
Reach-1	4.482	PF 2	8720.00	727.85	743.38	743.38	744.12	0.000779	8.72	2663.21	1675.89	0.53
Reach-1	4.457	PF 1	8720.00	725.90	732.78		733.21	0.003921	5.70	1716.41	765.39	0.43
Reach-1	4.457	PF 2	8720.00	725.90	733.50		734.12	0.003894	6.25	1383.50	355.00	0.43
Reach-1	4.364	PF 1	8720.00	723.51	731.28	730.32	731.57	0.002621	5.14	2059.43	855.36	0.36
Reach-1	4.364	PF 2	8720.00	723.51	732.01		732.49	0.002623	5.53	1589.02	370.00	0.37
Reach-1	4.270	PF 1	8720.00	721.60	729.42	728.44	730.01	0.003840	6.44	1460.48	1899.11	0.44
Reach-1	4.270	PF 2	8720.00	721.60	730.04	729.03	730.81	0.004522	7.41	1270.44	320.00	0.48
Reach-1	4.184	PF 1	8720.00	718.80	729.22		729.35	0.000543	2.89	3173.91	2112.67	0.17
Reach-1	4.184	PF 2	8720.00	718.80	729.55		729.82	0.001013	4.04	2147.78	375.00	0.24
Reach-1	4.129	PF 1	4670.00	717.10	729.24	722.69	729.26	0.000052	0.97	4881.78	1944.53	0.05
Reach-1	4.129	PF 2	4670.00	717.10	729.60	722.69	729.64	0.000108	1.42	3035.16	400.00	0.08
Reach-1	4.119		Bridge									
Reach-1	4.107	PF 1	4670.00	716.90	727.56	721.81	727.89	0.001604	4.57	1027.67	163.44	0.29
Reach-1	4.107	PF 2	4670.00	716.90	727.76	721.81	728.11	0.001449	4.77	978.73	103.00	0.27
Reach-1	4.090	PF 1	4670.00	716.98	727.47	722.29	727.73	0.001258	4.09	1215.07	368.49	0.26
Reach-1	4.090	PF 2	4670.00	716.98	727.61	722.24	727.98	0.001569	4.83	966.11	105.00	0.28
Reach-1	4.088		Bridge									
Reach-1	4.079	PF 1	4670.00	715.58	726.07	720.62	726.43	0.001525	4.81	971.26	352.27	0.28
Reach-1	4.079	PF 2	4670.00	715.58	726.07	720.62	726.43	0.001526	4.81	971.08	108.86	0.28

HEC-RAS Plan: Sauceda Wash River: Sauceda Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.077		Bridge									
Reach-1	4.062	PF 1	4670.00	716.99	724.06	721.18	724.69	0.004068	6.38	731.62	113.49	0.44
Reach-1	4.062	PF 2	4670.00	716.99	724.42	721.19	724.99	0.003381	6.04	775.52	124.29	0.41
Reach-1	4.055		Bridge									
Reach-1	4.045	PF 1	4670.00	716.67	722.41		723.32	0.007962	7.66	609.62	121.84	0.60
Reach-1	4.045	PF 2	4670.00	716.67	723.18		723.87	0.005051	6.69	697.99	118.00	0.48
Reach-1	4.011	PF 1	4670.00	715.30	721.39	719.99	721.93	0.005707	6.28	870.27	510.91	0.51
Reach-1	4.011	PF 2	4670.00	715.30	722.39	719.95	722.99	0.004371	6.19	754.29	132.00	0.46

Plan: Sauceda Wash Sauceda Reach-1 RS: 4.055 Profile: PF 1

E.G. US. (ft)	724.69	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	724.06	E.G. Elev (ft)	724.61	723.69
Q Total (cfs)	4670.00	W.S. Elev (ft)	723.67	722.47
Q Bridge (cfs)	4670.00	Crit W.S. (ft)	721.50	721.12
Q Weir (cfs)		Max Chl Dpth (ft)	6.68	5.80
Weir Sta Lft (ft)		Vel Total (ft/s)	7.79	8.87
Weir Sta Rgt (ft)		Flow Area (sq ft)	599.28	526.27
Weir Submerg		Froude # Chl	0.05	0.06
Weir Max Depth (ft)		Specif Force (cu ft)	3073.33	2750.60
Min El Weir Flow (ft)	727.89	Hydr Depth (ft)	6.52	5.63
Min El Prs (ft)	725.37	W.P. Total (ft)	145.68	141.58
Delta EG (ft)	1.37	Conv. Total (cfs)	45724.1	37530.5
Delta WS (ft)	1.65	Top Width (ft)	91.93	93.48
BR Open Area (sq ft)	751.26	Frctn Loss (ft)		
BR Open Vel (ft/s)	8.87	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	2.68	3.59
Br Sel Method	Momentum	Power Total (lb/ft s)	20.88	31.89

Plan: Sauceda Wash Sauceda Reach-1 RS: 4.077 Profile: PF 1

E.G. US. (ft)	726.43	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	726.07	E.G. Elev (ft)	726.43	724.69
Q Total (cfs)	4670.00	W.S. Elev (ft)	724.43	724.06
Q Bridge (cfs)	4670.00	Crit W.S. (ft)	721.90	721.76
Q Weir (cfs)		Max Chl Dpth (ft)	8.72	7.07
Weir Sta Lft (ft)		Vel Total (ft/s)	8.65	8.18
Weir Sta Rgt (ft)		Flow Area (sq ft)	540.16	571.05
Weir Submerg		Froude # Chl	0.06	0.05
Weir Max Depth (ft)		Specif Force (cu ft)	3364.62	3165.93
Min El Weir Flow (ft)	726.49	Hydr Depth (ft)	276561.80	6.94
Min El Prs (ft)	724.43	W.P. Total (ft)	202.92	137.52
Delta EG (ft)	1.74	Conv. Total (cfs)	30832.3	43845.1
Delta WS (ft)	2.01	Top Width (ft)		82.23
BR Open Area (sq ft)	540.16	Frctn Loss (ft)		
BR Open Vel (ft/s)	8.65	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	3.81	2.94
Br Sel Method	Press Only	Power Total (lb/ft s)	32.96	24.05

Plan: Sauceda Wash Sauceda Reach-1 RS: 4.088 Profile: PF 1

E.G. US. (ft)	727.73	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	727.47	E.G. Elev (ft)	727.72	727.72
Q Total (cfs)	4670.00	W.S. Elev (ft)	727.47	727.47
Q Bridge (cfs)	4053.98	Crit W.S. (ft)	722.59	721.88
Q Weir (cfs)	616.02	Max Chl Dpth (ft)	10.49	11.80
Weir Sta Lft (ft)	9850.00	Vel Total (ft/s)	7.00	7.34
Weir Sta Rgt (ft)	10125.00	Flow Area (sq ft)	667.11	636.45
Weir Submerg	0.00	Froude # Chl	0.05	0.05
Weir Max Depth (ft)	1.26	Specif Force (cu ft)	4341.37	4784.11
Min El Weir Flow (ft)	726.66	Hydr Depth (ft)	2.43	2.11
Min El Prs (ft)	724.01	W.P. Total (ft)	484.37	500.67
Delta EG (ft)	1.30	Conv. Total (cfs)		
Delta WS (ft)	1.40	Top Width (ft)	368.49	693.23
BR Open Area (sq ft)	491.10	Frctn Loss (ft)		
BR Open Vel (ft/s)	8.25	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: Sauceda Wash Sauceda Reach-1 RS: 4.119 Profile: PF 1

E.G. US. (ft)	729.26	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	729.24	E.G. Elev (ft)	729.26	729.26
Q Total (cfs)	4670.00	W.S. Elev (ft)	729.24	729.24
Q Bridge (cfs)	4321.52	Crit W.S. (ft)	722.44	722.58
Q Weir (cfs)	348.48	Max Chl Dpth (ft)	12.14	12.34
Weir Sta Lft (ft)	9926.58	Vel Total (ft/s)	6.47	8.93
Weir Sta Rgt (ft)	10500.00	Flow Area (sq ft)	721.46	522.80
Weir Submerg	0.00	Froude # Chl	0.04	0.06
Weir Max Depth (ft)	0.79	Specif Force (cu ft)	5308.15	5502.71
Min El Weir Flow (ft)	729.14	Hydr Depth (ft)	1.30	4.35
Min El Prs (ft)	725.06	W.P. Total (ft)	764.92	330.48
Delta EG (ft)	1.37	Conv. Total (cfs)		
Delta WS (ft)	1.68	Top Width (ft)	1563.63	120.28
BR Open Area (sq ft)	516.98	Frctn Loss (ft)		
BR Open Vel (ft/s)	8.36	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

HEC-RAS Plan: Scott Ave. River: Scott Ave. Wash Reach: Main Channel

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main Channel	6.986	PF 1	3245.00	795.45	799.61		799.99	0.006796	5.11	683.28	272.88	0.48
Main Channel	6.986	PF 2	3245.00	795.45	799.61		799.99	0.006796	5.11	683.26	272.84	0.48
Main Channel	6.895	PF 1	3245.00	793.30	798.50		798.59	0.001510	2.67	1379.84	590.81	0.23
Main Channel	6.895	PF 2	3245.00	793.30	798.50		798.59	0.001514	2.68	1378.18	590.17	0.23
Main Channel	6.792	PF 1	3245.00	790.70	796.01		796.84	0.011794	7.77	469.79	171.43	0.66
Main Channel	6.792	PF 2	3245.00	790.70	796.02		796.84	0.011751	7.76	470.38	171.41	0.66
Main Channel	6.700	PF 1	4453.00	787.96	794.83		794.97	0.001909	3.95	1660.76	775.19	0.28
Main Channel	6.700	PF 2	4453.00	787.96	794.82		794.97	0.001910	3.95	1660.20	775.11	0.28
Main Channel	6.605	PF 1	7009.00	786.43	792.69	791.29	793.13	0.007052	5.69	1533.79	1091.44	0.50
Main Channel	6.605	PF 2	7009.00	786.43	792.69	791.29	793.13	0.007025	5.68	1536.99	1093.91	0.50
Main Channel	6.505	PF 1	7587.00	784.47	789.18		789.46	0.006728	4.77	1963.82	1282.46	0.47
Main Channel	6.505	PF 2	7587.00	784.47	789.18		789.46	0.006769	4.78	1959.43	1281.44	0.47
Main Channel	6.398	PF 1	7587.00	779.97	786.90	786.15	787.15	0.002867	4.28	1987.41	833.87	0.31
Main Channel	6.398	PF 2	7587.00	779.97	786.91	786.15	787.15	0.002851	4.27	1990.76	833.03	0.31
Main Channel	6.306	PF 1	7587.00	778.62	785.16		785.55	0.004509	5.31	1664.73	846.48	0.39
Main Channel	6.306	PF 2	7587.00	778.62	785.15		785.54	0.004546	5.33	1658.21	845.30	0.39
Main Channel	6.202	PF 1	7850.00	776.57	783.11	782.02	783.37	0.003975	4.92	2094.57	1052.94	0.37
Main Channel	6.202	PF 2	7850.00	776.57	783.11	782.02	783.37	0.003974	4.92	2094.77	1052.93	0.37
Main Channel	6.104	PF 1	8079.00	774.16	780.86		781.14	0.005583	5.02	2119.39	1523.24	0.42
Main Channel	6.104	PF 2	8079.00	774.16	780.86		781.14	0.005587	5.02	2118.83	1523.16	0.42
Main Channel	6.012	PF 1	8079.00	771.60	779.20		779.36	0.002573	3.91	2710.15	1505.49	0.29
Main Channel	6.012	PF 2	8079.00	771.60	779.20		779.36	0.002573	3.91	2710.15	1505.45	0.29
Main Channel	5.909	PF 1	8556.00	770.00	777.41		777.73	0.004664	5.07	2155.27	1581.13	0.39
Main Channel	5.909	PF 2	8556.00	770.00	777.41		777.73	0.004665	5.07	2155.07	1581.07	0.39
Main Channel	5.819	PF 1	8997.00	766.92	775.10		775.58	0.005009	6.36	1914.44	1191.61	0.49
Main Channel	5.819	PF 2	8997.00	766.92	775.11		775.58	0.005005	6.36	1915.54	1192.36	0.49
Main Channel	5.724	PF 1	8997.00	763.77	772.74		773.16	0.005093	6.54	2104.35	1236.76	0.49
Main Channel	5.724	PF 2	8997.00	763.77	772.73		773.15	0.005115	6.55	2098.56	1228.06	0.49
Main Channel	5.625	PF 1	8997.00	761.13	770.40		770.74	0.004183	5.43	2573.63	1953.02	0.44
Main Channel	5.625	PF 2	8997.00	761.13	770.40		770.74	0.004185	5.43	2572.79	1952.62	0.44
Main Channel	5.521	PF 1	13168.00	757.76	767.43		767.80	0.006704	6.46	3345.96	2165.03	0.55
Main Channel	5.521	PF 2	13168.00	757.76	767.43		767.80	0.006704	6.46	3345.96	2165.03	0.55
Main Channel	5.427	PF 1	13168.00	755.62	765.05	764.28	765.40	0.004091	6.23	3309.26	1735.81	0.45
Main Channel	5.427	PF 2	13168.00	755.62	765.05	764.28	765.40	0.004091	6.23	3309.36	1735.84	0.45
Main Channel	5.338	PF 1	13168.00	753.70	762.48	760.99	762.96	0.005817	7.54	2614.49	1188.98	0.54
Main Channel	5.338	PF 2	13168.00	753.70	762.48	760.99	762.96	0.005819	7.54	2614.21	1188.98	0.54
Main Channel	5.258	PF 1	1408.00	751.50	760.10	757.55	761.11	0.005379	8.05	174.99	888.79	0.53
Main Channel	5.258	PF 2	1408.00	751.50	760.10	757.55	761.11	0.005379	8.05	174.99	888.79	0.53

HEC-RAS Plan: West Quiloto River: West Quilotosa Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	2.155	PF 1	10700.00	768.37	772.67		773.21	0.006591	3.79	2086.62	1340.17	0.44
Reach-1	2.155	PF 2	10700.00	768.37	773.10		773.72	0.006014	4.06	1913.81	830.08	0.44
Reach-1	2.058	PF 1	10700.00	765.18	769.07	768.90	769.48	0.008441	2.78	2151.95	1784.78	0.45
Reach-1	2.058	PF 2	10700.00	765.18	769.93	769.67	770.58	0.006940	3.62	1845.46	1190.00	0.45
Reach-1	1.969	PF 1	10700.00	763.20	765.34	765.18	765.77	0.005861	1.52	2120.49	1800.24	0.36
Reach-1	1.969	PF 2	10700.00	763.20	766.29	766.25	767.02	0.009497	3.25	1699.54	1050.00	0.49
Reach-1	1.873	PF 1	10700.00	760.38	763.13	762.76	763.35	0.004411	2.61	2840.56	2314.96	0.35
Reach-1	1.873	PF 2	10700.00	760.38	764.10		764.45	0.003558	3.14	2328.50	1100.00	0.34
Reach-1	1.772	PF 1	10700.00	756.98	760.74		760.97	0.006005	3.35	2762.79	2798.35	0.41
Reach-1	1.772	PF 2	10700.00	756.98	761.41		762.02	0.006838	4.32	1718.00	850.00	0.46
Reach-1	1.675	PF 1	10700.00	754.46	758.16	757.84	758.38	0.005048	3.50	2785.90	2552.19	0.39
Reach-1	1.675	PF 2	10700.00	754.46	758.79	758.31	759.29	0.004890	4.01	1912.53	895.00	0.40
Reach-1	1.593	PF 1	10700.00	754.78	756.67		756.87	0.003608	1.94	3034.71	2371.52	0.30
Reach-1	1.593	PF 2	10700.00	754.78	757.62		757.93	0.002888	2.50	2543.23	1100.00	0.29
Reach-1	1.515	PF 1	10700.00	753.22	755.21		755.45	0.004012	2.17	3094.65	2465.76	0.32
Reach-1	1.515	PF 2	10700.00	753.22	756.08		756.44	0.005492	3.48	2502.08	1200.00	0.41
Reach-1	1.449	PF 1	10700.00	751.03	753.68		753.85	0.006567	3.33	3330.57	3033.14	0.43
Reach-1	1.449	PF 2	10700.00	751.03	754.32		754.60	0.005789	3.81	2545.53	1250.00	0.42
Reach-1	1.371	PF 1	10700.00	749.41	751.45	750.99	751.57	0.004748	2.66	3861.93	3379.21	0.36
Reach-1	1.371	PF 2	10700.00	749.41	752.06		752.32	0.005449	3.50	2665.98	1350.00	0.40
Reach-1	1.293	PF 1	10700.00	744.51	749.11	748.82	749.27	0.008170	3.97	3327.11	3625.02	0.48
Reach-1	1.293	PF 2	10700.00	744.51	750.09		750.33	0.004954	4.00	2759.32	1480.00	0.40
Reach-1	1.202	PF 1	10700.00	742.08	747.07	746.39	747.16	0.002830	2.46	4417.82	3260.36	0.29
Reach-1	1.202	PF 2	10700.00	742.08	747.55	746.97	747.81	0.005941	4.05	2615.90	1480.00	0.43
Reach-1	1.107	PF 1	10700.00	740.40	743.76	743.76	744.15	0.025681	6.15	2168.79	2879.56	0.83
Reach-1	1.107	PF 2	10700.00	740.40	744.76		745.02	0.005959	4.03	2628.90	1510.00	0.43
Reach-1	1.018	PF 1	10700.00	739.72	743.49		743.52	0.000304	0.95	8579.41	3286.79	0.10
Reach-1	1.018	PF 2	10700.00	739.72	744.37		744.43	0.000464	1.38	5689.50	1510.00	0.13
Reach-1	0.926	PF 1	10700.00	737.02	743.44		743.45	0.000081	0.72	12403.24	3615.01	0.06
Reach-1	0.926	PF 2	10700.00	737.02	744.27	740.07	744.30	0.000166	1.14	7928.54	1480.00	0.08
Reach-1	0.890	PF 1	10700.00	741.46	743.33	742.53	743.40	0.003561	2.08	5133.75	3689.80	0.31
Reach-1	0.890	PF 2	10700.00	741.46	744.04		744.20	0.004043	3.21	3338.17	1380.00	0.36
Reach-1	0.879	PF 1	10600.00	741.46	742.52	742.52	742.86	0.048213	4.68	2266.50	3422.01	1.01
Reach-1	0.879	PF 2	10600.00	741.46	742.94	742.94	743.61	0.037754	6.60	1605.03	1200.00	1.01
Reach-1	0.832	PF 1	10600.00	732.58	735.55	735.10	735.84	0.005998	4.87	2489.94	1547.43	0.53
Reach-1	0.832	PF 2	10600.00	732.58	736.12		736.63	0.006782	5.90	1857.65	700.00	0.58
Reach-1	0.742	PF 1	10600.00	728.31	732.66		733.01	0.005924	5.18	2431.79	1591.44	0.54
Reach-1	0.742	PF 2	10600.00	728.31	733.36		733.84	0.005172	5.63	1899.74	541.67	0.52
Reach-1	.654	PF 1	10600.00	725.50	730.74	729.94	731.00	0.003462	4.54	2833.50	1597.81	0.42
Reach-1	.654	PF 2	10600.00	725.50	731.08	729.75	731.56	0.004716	5.63	1904.73	514.03	0.50
Reach-1	.563	PF 1	10600.00	723.62	727.29	727.10	727.98	0.014070	6.75	1647.15	1046.47	0.79
Reach-1	.563	PF 2	10600.00	723.62	727.48	726.95	728.18	0.011354	6.73	1576.43	600.00	0.73
Reach-1	0.475	PF 1	10600.00	720.06	726.24		726.36	0.001344	2.96	3995.89	2130.35	0.27
Reach-1	0.475	PF 2	10600.00	720.06	726.24		726.43	0.001622	3.51	3017.41	700.00	0.30
Reach-1	0.387	PF 1	15200.00	713.10	726.26	722.26	726.27	0.000049	0.89	18869.08	4780.62	0.07
Reach-1	0.387	PF 2	15200.00	713.10	726.25	722.36	726.28	0.000106	1.30	11779.48	2450.00	0.10
Reach-1	0.358		Mult Open									
Reach-1	0.355	PF 1	15200.00	710.83	723.05		723.08	0.000220	1.54	11086.60	4337.91	0.15
Reach-1	0.355	PF 2	15200.00	710.83	723.09		723.16	0.000398	2.09	7327.79	2370.00	0.21
Reach-1	0.337	PF 1	15200.00	709.88	723.04	720.74	723.07	0.000160	1.39	12367.40	4555.69	0.13
Reach-1	0.337	PF 2	15200.00	709.88	723.06	719.54	723.13	0.000326	1.98	7684.85	2340.00	0.19
Reach-1	0.333		Mult Open									

HEC-RAS Plan: West Quiloto River: West Quilotosa Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	0.256	PF 1	15200.00	708.50	717.95		718.10	0.001419	3.14	5123.01	2021.41	0.30
Reach-1	0.256	PF 2	15200.00	708.50	718.63		718.75	0.000965	2.79	5452.76	1428.82	0.25
Reach-1	0.239	PF 1	15200.00	709.07	717.21	717.21	717.72	0.008670	6.17	2811.91	2568.38	0.91
Reach-1	0.239	PF 2	15200.00	709.07	718.21	717.40	718.54	0.003405	4.60	3324.22	1497.92	0.54

Plan: West Quiloto West Quilotosa Reach-1 RS: 0.358 Open#1: Bridge Profile: PF 1

E.G. US. (ft)	726.27	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	726.26	E.G. Elev (ft)	726.27	726.27
Q Total (cfs)	7796.54	W.S. Elev (ft)	726.26	726.00
Q Bridge (cfs)	3611.65	Crit W.S. (ft)	726.06	726.00
Q Weir (cfs)	4184.89	Max Chl Dpth (ft)	13.16	15.14
Weir Sta Lft (ft)	8875.56	Vel Total (ft/s)	11.53	8.94
Weir Sta Rgt (ft)	11000.00	Flow Area (sq ft)	313.18	404.00
Weir Submerg	0.00	Froude # Chl	0.08	0.06
Weir Max Depth (ft)	1.14	Specif Force (cu ft)	4009.88	4864.58
Min El Weir Flow (ft)	725.14	Hydr Depth (ft)		
Min El Prs (ft)	721.69	W.P. Total (ft)	124.60	139.61
Delta EG (ft)	3.19	Conv. Total (cfs)	21506.5	30476.3
Delta WS (ft)	3.21	Top Width (ft)		
BR Open Area (sq ft)	313.18	Frctn Loss (ft)		
BR Open Vel (ft/s)	11.53	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)	20.62	11.82
Br Sel Method	Press/Weir	Power Total (lb/ft s)	237.82	105.70

SECTION 6: EROSION AND SEDIMENT TRANSPORT

Since the original Gila Bend Floodplain study (Burgess & Niple, 1992) there has been one major flooding of the washes which occurred in 1993. Field observation of the I-8 structures along Bender and Sand Tank Wash show that no appreciable sedimentation has occurred. Therefore, erosion was not considered to be a problem so this section was omitted from the scope of work.

SECTION 7: DRAFT FIS REPORT DATA

7.1 Summary of Peak Discharges

A table containing a summary of peak discharges can be found on the following pages. This table is set up in FEMA format.

7.2 Floodway Data

A table containing a draft version of the Floodway Data results can be found in this section after the Summary of Peak Discharge table.

7.3 Annotated Flood Insurance Rate Maps

New Flood Insurance Rate Maps prepared with this study can be found in the map pockets along with copies of the revised FEMA maps.

7.4 Flood Profiles

Flood Profiles for all of the washes can be found in this section after the Floodway Data tables.

Summary of Peak Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Bender Wash					
Diversion to Sand Tank Wash along I-8	85.1	__ 1	__ 1	3400	__ 1
Above I-8	85.1	__ 1	__ 1	5500	__ 1
Sand Tank Wash					
Diversion to Scott Avenue Wash along I-8	330.4	__ 1	__ 1	13200	__ 1
Confluence with Diversion from Bender Wash	330.4	__ 1	__ 1	24300	__ 1
Above Confluence with diverted flow from Bender Wash	241.6	__ 1	__ 1	23800	__ 1
Scott Avenue Wash					
Diversion to I-8 Wash East along I-8	332.2	__ 1	__ 1	9100	__ 1
Confluence with Diversion from Sand Tank Wash	332.2	__ 1	__ 1	13200	__ 1
Above confluence with diverted flow from Sand Tank Wash	1.8	__ 1	__ 1	380	__ 1
I-8 Wash East					
Diversion/Split from Scott Avenue Wash at I-8	332.2	__ 1	__ 1	9300	__ 1
Above Conflunce with Evans Wash	332.2	__ 1	__ 1	9100	__ 1
Unnamed Wash No. 4 (Pioneer Cemetery Wash)					
Above Confluence with Evans Wash	2.3	__ 1	__ 1	790	__ 1
Unnamed Wash No. 3 (Evans Wash)					
Above Conflunce with Hacker Wash at Gila Bend Canal	337.9	__ 1	__ 1	9000	__ 1
At Conflunce with I-8 Wash East and Pioneer Cemetery Wash	337.9	__ 1	__ 1	9000	__ 1
Above Confluence with I-8 Wash East and Pioneer Cemetery Wash	3.5	__ 1	__ 1	1100	__ 1
Unnamed Wash No. 2 (Hacker Wash)					
Above Confluence with Quilotosa Wash	339.2	__ 1	__ 1	8700	__ 1
At Confluence with Hacker Diversion	339.2	__ 1	__ 1	8700	__ 1
At Pima Road	339.2	__ 1	__ 1	3200	__ 1
After Diversion/Split to Hacker Diversion at I-8	339.2	__ 1	__ 1	3200	__ 1
Before Diversion at I-8	339.2	__ 1	__ 1	8800	__ 1
At SR-85	339.2	__ 1	__ 1	8800	__ 1
Diversion at Gila Bend Canal west over SR-85 to Gila Bend Canal Wash	339.2	__ 1	__ 1	3400	__ 1
Above Gila Bend Canal at Conflunce with Evans Wash	339.2	__ 1	__ 1	9000	__ 1
Above Confluence with Evans Wash	2.3	__ 1	__ 1	1350	__ 1

[1]Not Computed

[2]Data Not Available

Summary of Peak Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Gila Bend Canal Wash					
Above Confluence with Quilotosa Wash at Gila Bend Canal	339.2	__ 1	__ 1	1400	__ 1
Side Weir/Diversion over Gila Bend Canal to Hacker Diversion	339.2	__ 1	__ 1	1910	__ 1
Diversion/Split from Hacker Wash at Gila Bend Canal	339.2	__ 1	__ 1	3400	__ 1
Hacker Diversion					
At Pima Road (Above Confluence with Hacker Wash)	339.2	__ 1	__ 1	5600	__ 1
Conflunce with Diversion from Gila Bend Canal Wash at Southern Pacific Railroad	339.2	__ 1	__ 1	5600	__ 1
Diversion/Split from Hacker Wash at I-8	339.2	__ 1	__ 1	5600	__ 1
Quilotosa Wash					
At Watermelon Road (Above Confluence with Gila River)	354.4	__ 1	__ 1	21200	__ 1
At Indian Road and Conflunce with Diversion from I-8 Wash West	350.8	__ 1	__ 1	16200	__ 1
At Confluence with Hacker Wash downstream of I-8	350.8	__ 1	__ 1	15550	__ 1
At Confluence with West Quilotosa Wash upstream at I-8	131.1	__ 1	__ 1	15200	__ 1
Above Confluence with West Quilotosa Wash	87.4	__ 1	__ 1	9200	__ 1
Confluence with Gila Bend Canal Wash at Gila Bend Canal	87.4	__ 1	__ 1	9200	__ 1
Above Confluence with Gila Bend Canal Wash	84	__ 1	__ 1	7800	__ 1
West Quilotosa Wash					
Confluence with Quilotosa Wash and I-8 Wash West at I-8	131.2	__ 1	__ 1	15200	__ 1
Above Confluence with Quilotosa Wash	131.2	__ 1	__ 1	10600	__ 1
Diversion/Split to Sauceda Wash at Gila Bend Canal	131.2	__ 1	__ 1	4300	__ 1
Above Diversion to Sauceda Wash	131.2	__ 1	__ 1	10700	__ 1
Sauceda Wash					
At Watermelon Road (Above Confluence with Gila River)	265.4	__ 1	__ 1	4700	__ 1
Downstream of I-8	263.4	__ 1	__ 1	4800	__ 1
Diversion to I-8 Wash West at Southern Pacific Railroad	263.4	__ 1	__ 1	3900	__ 1
Above Diverision to I-8 Wash West	263.4	__ 1	__ 1	8700	__ 1
Confluence with Diversion from West Quilotosa Wash at Gila Bend Canal	263.4	__ 1	__ 1	9600	__ 1
Above Confluence with West Quilotosa Wash	132.2	__ 1	__ 1	5700	__ 1
I-8 Wash West					
Above Confluence with West Quilotosa Wash at I-8	263.4	__ 1	__ 1	40	__ 1
Side Weir/Diversion over Southern Pacific Railroad and I-8 to Confluence with Quilotosa Wash at Indian Road	263.4	__ 1	__ 1	3900	__ 1

[1]Not Computed

[2]Data Not Available

Summary of Peak Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (cfs) 10-Year	50-Year	100-Year	500-Year
Diversion from Sauceda Wash at Southern Pacific Railroad	263.4	__[1]	__[1]	3900	__[1]
Citrus Valley Wash					
At Watermelon Road (Above Confluence with Gila River)	10.7	__[1]	__[1]	2700	__[1]
At I-8	7.8	__[1]	__[1]	3100	__[1]
Above Gila Bend Canal	7.8	__[1]	__[1]	3200	__[1]

[1]Not Computed
[2]Data Not Available

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Bender Wash North Triburary								
A	0.323	878	1408.18	3.93	789.88	789.88	790.09	0.21
B	0.416	323	565.93	2.95	792.77	792.77	792.86	0.09
C	0.481	422	2476.71	0.67	792.9	792.9	793.06	0.16
D	0.562	349	835.46	2	792.93	792.93	793.1	0.17
E	0.576	198	255.39	6.54	794	794	793.98	-0.02
F	0.637	270	665.31	2.51	797.07	797.07	797.19	0.12
G	0.734	108	210.48	7.93	800.52	800.52	800.64	0.12
H	0.829	226	715.31	2.33	803.9	803.9	804.32	0.42
I	0.91	450	1322.27	1.26	804.45	804.45	804.72	0.27
J	0.925	477	1022.43	1.63	804.49	804.49	804.75	0.26
K	0.987	402	1339.02	1.25	804.55	804.55	804.88	0.33
L	1	143	233.58	7.15	805.08	805.08	806.07	0.99
M	1.09	143	419.83	3.98	811.69	811.69	812.32	0.63
N	1.176	361	519.11	3.22	815.97	815.97	816.02	0.05
O	1.267	596	836.29	2	819.15	819.15	819.13	-0.02
P	1.317	210	617.08	2.71	819.97	819.97	820	0.03
Q	1.358	333	1418.29	1.18	820.23	820.23	820.26	0.03
R	1.45	255	1319.81	1.27	820.37	820.37	820.41	0.04
S	1.495	91	199.73	8.36	823.73	823.73	823.7	-0.03
T	1.53	155	642.71	2.6	825.58	825.58	825.68	0.1
U	1.622	465	1599.28	1.04	825.97	825.97	826.09	0.12
V	1.727	464	337.44	4.95	828.31	828.31	828.31	0
W	1.818	448	521.96	3.5	836.47	836.47	836.65	0.18

[1]Miles Above Confluence with Bender Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

BENDER WASH NORTH TRIBUTARY

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Bender Wash								
A	1.904	799	2888.72	1.42	777	777	778	1
B	1.930	791	1507.51	3.19	777.32	777.32	777.95	0.63
C	1.968	1177	2619.32	1.71	778.32	778.32	778.43	0.11
D	2.013	1336	1726.22	2.98	778.62	778.62	778.71	0.09
E	2.089	991	944.95	5.4	780.06	780.06	780.03	-0.03
F	2.184	1979	1892.9	2.74	784.72	784.72	784.73	0.01
G	2.274	1465	1360.08	3.93	787.3	787.3	787.29	-0.01
H	2.329	852	1290.66	4.28	789.88	789.88	789.95	0.07
I	2.445	569	1082.05	3.67	793.2	793.2	793.64	0.44
J	2.553	425	1031.93	3.85	795.64	795.64	796.55	0.91
K	2.644	479	1084.82	3.66	797.77	797.77	798.47	0.7
L	2.724	756	815.65	4.87	800.81	800.81	801.4	0.59
M	2.837	976	1584.01	2.51	805.18	805.18	806.01	0.83
N	2.924	807	1114.57	3.56	808.42	808.42	808.62	0.2
O	3.024	614	1286.2	3.09	811.57	811.57	811.64	0.07
P	3.122	813	1165.05	3.41	814.2	814.2	814.15	-0.05
Q	3.224	976	1066.52	3.72	817.27	817.27	817.33	0.06
R	3.299	1107	1377.73	2.88	821.14	821.14	821.17	0.03
S	3.409	605	848.44	4.68	825.83	825.84	826.29	0.45
T	3.495	483	1090.31	3.64	829.84	829.84	830.38	0.54
U	3.588	405	737.36	5.38	833.15	833.15	833.82	0.67
V	3.671	517	1359.88	2.92	836.6	836.6	837.09	0.49

[1]Miles Above Confluence with Sand Tank Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

BENDER WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Sand Tank Wash								
A	4.917	1847	4790.27	3.25	769.49	769.49	769.49	0
B	5.013	1128	2779.88	5.65	770.28	770.28	770.28	0
C	5.112	1046	3814.83	4.12	771.65	771.65	771.65	0
D	5.207	1167	2054.04	7.64	774.66	774.66	774.66	0
E	5.299	1936	3939.11	4.1	778.55	778.55	778.55	0
F	5.387	1902	3678.88	4.49	780.75	780.75	780.74	-0.01
G	5.482	1668	3545.96	4.73	783.12	783.12	783.13	0.01
H	5.58	1567	4759.96	3.54	784.62	784.62	784.62	0
I	5.676	1164	5748.36	2.9	785.09	785.09	785.09	0
J	5.77	626	1792.63	9.3	788.96	788.96	789.01	0.05
K	5.862	1182	3897.09	4.43	793.15	793.15	793.13	-0.02
L	5.959	1430	3531.89	5.15	795.25	795.25	795.25	0
M	6.062	1727	4092.08	4.84	798.4	798.4	798.4	0
N	6.151	2116	3407.18	6.17	800.78	800.78	800.79	0.01
O	6.257	2456	6122.58	3.96	804.26	804.26	804.26	0

[1]Miles Above Confluence with Gila River

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

SAND TANK WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Scott Avenue Wash								
A	5.258	889	174.99	8.05	760.1	760.1	760.1	0
B	5.338	1189	3222.52	5.04	762.48	762.48	762.48	0
C	5.427	1736	3370.29	3.98	765.05	765.05	765.05	0
D	5.521	2165	3345.96	3.94	767.43	767.43	767.43	0
E	5.625	1953	2572.79	3.5	770.4	770.4	770.4	0
F	5.724	1228	2098.56	4.29	772.74	772.74	772.73	-0.01
G	5.819	1192	1915.54	4.7	775.1	775.1	775.11	0.01
H	5.909	1581	2155.07	3.97	777.41	777.41	777.41	0
I	6.012	1505	2710.15	2.98	779.2	779.2	779.2	0
J	6.104	1523	2118.83	3.81	780.86	780.86	780.86	0
K	6.202	1053	2094.77	3.75	783.11	783.11	783.11	0
L	6.306	845	1658.21	4.58	785.16	785.16	785.15	-0.01
M	6.398	833	1990.76	3.81	786.9	786.9	786.91	0.01
N	6.505	1281	1959.43	3.87	789.18	789.18	789.18	0
O	6.605	1094	1536.99	4.56	792.69	792.69	792.69	0
P	6.7	775	1660.2	2.68	794.83	794.83	794.82	-0.01
Q	6.792	171	470.38	6.9	796.01	796.01	796.02	0.01
R	6.895	590	1378.18	2.35	798.5	798.5	798.5	0
S	6.986	272	683.26	4.75	799.61	799.61	799.61	0

[1]Miles Above Confluence withSand Tank Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

SCOTT AVENUE WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
I-8 Wash East								
A	0.001	760	5218.94	1.72	754.74	754.74	755.72	0.98
B	0.118	809	5654.57	1.64	754.92	754.92	755.86	0.94
C	0.198	1668	9046.66	1.03	755.09	755.09	755.95	0.86
D	0.299	1048	5789.7	1.6	755.24	755.24	756.04	0.8
E	0.395	907	5827.1	1.59	755.45	755.45	756.18	0.73
F	0.49	803	6291.88	1.48	755.6	755.6	756.29	0.69
G	0.695	900	1323.97	7.02	761.42	761.42	761.42	0

[1]Miles Above Confluence withSand Tank Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

I-8 Wash East

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Cemetery Wash								
A	0.001	760	5173.34	1.72	754.76	754.76	755.66	0.9
B	0.106	320	1613.99	0.49	754.91	754.91	755.79	0.88
C	0.202	200	906.75	0.87	754.93	754.93	755.8	0.87
D	0.292	65	124.94	6.32	755.16	755.16	755.51	0.35
E	0.395	30	159.17	4.96	759.58	759.58	759.98	0.4
F	0.497	35	138.47	5.71	761.81	761.81	762.64	0.83
G	0.592	55	243.7	3.24	763.63	763.63	764.57	0.94
H	0.682	60	123.06	6.42	765.17	765.17	766.07	0.9
I	0.754	35	140.81	5.61	768.92	768.92	769.79	0.87
J	0.861	125	764.88	2.98	772.6	772.6	773.19	0.59
K	0.959	100	230.88	3.42	775.34	775.34	775.61	0.27
L	1.052	148	267.17	2.96	777.81	777.81	777.99	0.18
M	1.151	100	164.29	4.81	780.98	780.98	781.64	0.66
N	1.244	180	286.96	2.75	784.73	784.73	785.63	0.9
O	1.335	100	183.62	4.3	788.11	788.11	788.67	0.56
P	1.429	160	365.37	2.16	789.99	789.99	790.58	0.59
Q	1.53	130	135.65	5.82	792.58	792.58	792.83	0.25

[1]Miles Above Confluence withSand Tank Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

PIONEER CEMETERY WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Evans Wash								
A	0.154	910	9849.47	0.9	745.89	745.89	746.71	0.82
B	0.228	575	5075.54	1.77	745.9	745.9	746.71	0.81
C	0.324	575	4078.41	2.2	745.94	745.94	746.8	0.86
D	0.418	330	1945.61	4.62	745.94	745.94	746.94	1
E	0.508	200	1256.59	7.15	747.39	747.39	748.09	0.7
F	0.599	250	1500.79	5.99	749.63	749.63	750.42	0.79
G	0.664	370	1766	5.09	750.99	750.99	751.89	0.9
H	0.694	760	5174.68	1.74	754.76	754.76	755.66	0.9
I	0.795	370	1806.65	0.61	754.86	754.86	755.79	0.93
J	0.901	140	756.61	1.47	754.87	754.87	755.81	0.94
K	1.001	90	291.91	3.8	755.12	755.12	755.94	0.82
L	1.092	63	252.52	4.4	757.05	757.05	757.37	0.32
M	1.185	40	178.14	6.23	759.41	759.41	759.84	0.43
N	1.28	50	261.7	4.24	761.46	761.46	762.42	0.96
O	1.375	45	190.33	5.83	763.65	763.65	764.4	0.75
P	1.46	77	217.82	5.1	766.58	766.58	767.54	0.96
Q	1.558	65	217.8	5.1	769.75	769.75	770.55	0.8
R	1.654	56	204.79	5.42	772.54	772.54	773.49	0.95
S	1.728	45	207.86	5.34	775.67	775.67	775.71	0.04
T	1.812	45	161.97	6.85	778.27	778.27	778.89	0.62
U	1.903	37	174.62	6.36	783.34	783.34	783.41	0.07
V	1.998	45	204.06	5.44	785.93	785.93	786.67	0.74
W	2.111	66	260.38	4.26	788.38	788.38	789.38	1

[1]Miles Above Confluence withSand Tank Wash [2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

EVANS WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Hacker Wash								
A	1.21	622	1613.55	5.39	723.41	723.41	724.41	1
B	1.283	350	1637.56	1.98	724.52	724.52	725.4	0.88
C	1.306	160	648.35	5.01	725.18	725.18	725.23	0.05
D	1.32	160	811.74	4	725.17	725.17	725.6	0.43
E	1.336	160	661.12	4.92	728.19	728.19	728.54	0.35
F	1.351	140	1083.08	3	728.65	728.65	728.98	0.33
G	1.452	80	568.34	5.72	728.47	728.47	729.29	0.82
H	1.53	886	3358.86	3.36	731.61	731.61	732.31	0.7
I	1.539	432	1232.79	7.27	731.84	731.84	732.1	0.26
J	1.612	425	1406.18	6.37	733.96	733.96	734.42	0.46
K	1.65	422	3176.94	2.82	741.26	741.26	741.33	0.07
L	1.734	448	5959.77	1.5	741.32	741.32	741.5	0.18
M	1.829	877	8943.18	1	741.34	741.34	741.56	0.22
N	1.865	896	9291.75	0.95	745.9	745.9	746.32	0.42
O	1.952	628	4808.22	0.28	745.92	745.92	746.35	0.43
P	2.03	610	3887.28	0.36	745.93	745.93	746.36	0.43
Q	2.204	130	683.54	1.98	745.93	745.93	746.36	0.43
R	2.298	100	423.95	3.18	746.49	746.49	746.88	0.39
S	2.416	65	263.11	5.13	748.48	748.48	748.98	0.5
T	2.508	143	480.03	2.81	750.88	750.88	751.6	0.72
U	2.599	72	311.39	4.34	753.67	753.67	753.68	0.01
V	2.686	99	416.28	3.24	755.7	755.7	755.93	0.23
W	2.791	130	540.17	2.5	756.98	756.98	757.45	0.47
X	2.882	68	225.85	5.98	758.3	758.3	759.24	0.94

[1]Miles Above Confluence withSand Tank Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ
AND INCORPORATED AREAS

FLOODWAY DATA

HACKER WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Hacker Wash (Continued)								
Y	2.972	60	346.04	3.9	762.22	762.22	763	0.78
Z	3.066	65	273.48	4.94	764.31	764.31	765.2	0.89
AA	3.163	60	270.14	5	767.23	767.23	768.02	0.79
AB	3.258	75	444.7	3.04	771.84	771.84	772.23	0.39
AC	3.361	50	182.47	7.4	773.09	773.09	773.47	0.38
AD	3.464	60	322.64	4.18	776.19	776.19	777.09	0.9
AE	3.555	60	246.16	5.48	778.54	778.54	779.1	0.56
AF	3.655	32	160.74	8.4	782.81	782.81	783.75	0.94

[1]Miles Above Confluence withSand Tank Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

HACKER WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Hacker Wash Diversion								
A	0	990	1675.93	5.19	723.45	723.45	724.45	1
B	0.029	880	3269.05	1.69	724.06	724.06	725.04	0.98
C	0.139	850	2616.49	2.12	724.11	724.11	725.08	0.97
D	0.17	440	744.9	7.44	727.44	727.44	727.79	0.35
G	0.219	500	2662.83	2.09	727.97	727.97	728.77	0.8
H	0.268	345	1617.02	3.44	728.01	728.01	728.97	0.96
I	0.364	284	669.18	8.32	729.54	729.54	729.76	0.22
J	0.449	238	1105.12	5.04	732.63	732.63	733.59	0.96
K	0.54	201	1059.69	5.26	733.9	733.9	734.9	1

[1]Miles Above Confluence withSand Tank Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

HACKER WASH DIVERSION

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Gila Bend Canal Wash								
A	0.069	710	4286.51	0.24	744.4	744.4	745.15	0.75
B	0.172	510	1477.32	0.73	744.4	744.4	745.15	0.75
C	0.27	435	1658.35	0.79	744.49	744.49	745.19	0.7
D	0.375	410	1736.27	0.88	744.56	744.56	745.24	0.68
E	0.478	410	1547.88	1.01	744.63	744.63	745.29	0.66
F	0.546	420	1902.58	0.87	744.68	744.68	745.33	0.65
G	0.62	420	2529.21	0.87	744.71	744.71	745.35	0.64
H	0.689	370	2004.39	1.3	744.73	744.73	745.38	0.65
I	0.773	320	2014.82	1.43	744.77	744.77	745.43	0.66
J	0.835	315	1634.58	1.86	744.8	744.8	745.48	0.68
K	0.902	365	2484.24	1.24	744.85	744.85	745.57	0.72
L	0.974	355	1888.74	1.64	744.86	744.86	745.6	0.74
M	1.052	330	2193.76	1.34	744.94	744.94	745.68	0.74
N	1.143	370	662.12	5.1	745.04	745.04	745.61	0.57

[1]Miles Above Confluence withSand Tank Wash [2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

GILA BEND CANAL WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Quilotosa Wash								
A	3.776	1518	3375.39	4.5	717.21	717.21	718.21	1
B	3.793	1417	5445	2.79	717.95	717.95	718.62	0.67
C	3.874	2330	7839.08	1.94	723.1	723.1	723.14	0.04
D	3.892	2360	7489.14	2.03	723.11	723.11	723.17	0.06
E	3.921	2400	12498.8	1.22	726.37	726.37	726.62	0.25
F	4.013	700	2101.46	4.36	726.38	726.38	726.48	0.1
G	4.109	818	1479.45	6.2	728.32	728.32	728.88	0.56
H	4.201	980	1700.25	5.39	731.91	731.91	732.46	0.55
I	4.29	846	1483.31	6.18	734.45	734.45	734.97	0.52
J	4.386	808	1735.69	5.28	737.69	737.69	738.26	0.57
K	4.399	1672	2680.67	3.42	743.73	743.73	744.16	0.43
L	4.414	1700	3433.37	2.67	744.03	744.03	744.61	0.58
M	4.477	1125	2977.84	1.49	744.41	744.41	745.13	0.72
N	4.567	800	8197.29	0.54	744.45	744.45	745.2	0.75
O	4.664	900	3226.73	3.92	744.52	744.52	745.07	0.55
P	4.755	550	3738.34	2.42	747	747	747.36	0.36
Q	4.846	144	524.26	8.49	748.2	748.2	748.81	0.61
R	4.936	469	2730.97	5.04	753.88	753.88	754.34	0.46
S	5.025	500	2083.57	2.14	754.94	754.94	755.32	0.38
T	5.114	400	894.16	4.98	755.14	755.14	755.65	0.51
U	5.203	610	1293.75	3.44	757.04	757.04	757.38	0.34
V	5.289	816	1072.95	4.15	758.49	758.49	759.41	0.92
W	5.379	545	877.19	5.07	762.11	762.11	762.63	0.52
X	5.48	1608	1952.54	4.02	766.07	766.07	766.18	0.11

[1]Miles Above Confluence withSand Tank Wash [2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

QUILOTOSA WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Quilotosa Wash (Continued)								
Y	5.569	1087	1452.06	5.41	768.72	768.72	769.11	0.39
Z	5.663	951	1580.25	4.97	771.65	771.65	772.32	0.67
AA	5.749	1217	1752.42	4.48	774.24	774.24	774.82	0.58
AB	5.841	1007	1860.53	4.22	776.19	776.19	776.68	0.49
AC	5.907	860.2	1179.42	6.66	777.6	777.6	778.59	0.99
AD	5.993	1197	1941.3	4.04	780.7	780.7	781.59	0.89
AE	6.084	974	1375.47	5.71	782.88	782.88	783.74	0.86

[1]Miles Above Confluence withSand Tank Wash [2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

QUILOTOSA WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Quilotosa Wash (Continued)								
AF	4.673	690	2559.13	1.33	744.41	744.41	745.13	0.72
AG	4.770	280	466.61	7.29	744.98	744.98	745.42	0.44
AH	4.870	340	804.6	4.23	748.52	748.52	749.52	1
AI	4.980	290	656.23	5.18	751.39	751.39	752.04	0.65
AJ	5.099	350	760.61	4.47	754.65	754.65	755.12	0.47
AK	5.186	285	602.21	5.65	756.75	756.75	757.48	0.73
AL	5.269	270	604.91	5.62	759.35	759.35	760.32	0.97
AM	5.372	275	641.58	5.3	762.62	762.62	763.47	0.85

[1]Miles Above Confluence withSand Tank Wash [2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

QUILOTOSA WASH (EAST SPLIT)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
West Quilotosa Wash								
A	0.239	1498	3324.22	4.57	717.21	717.21	718.21	1
B	0.256	1429	5452.76	2.79	717.95	717.95	718.63	0.68
C	0.337	2340	7684.85	1.98	723.04	723.04	723.06	0.02
D	0.355	2370	7327.79	2.07	723.05	723.05	723.09	0.04
E	0.387	2450	11779.48	1.29	726.26	726.26	726.25	-0.01
F	0.475	700	3017.41	3.51	726.24	726.24	726.24	0
G	0.563	600	1576.43	6.72	727.29	727.29	727.48	0.19
H	0.654	514	1904.73	5.57	730.74	730.74	731.08	0.34
I	0.742	542	1899.74	5.58	732.66	732.66	733.36	0.7
J	0.832	700	1857.65	5.71	735.55	735.55	736.12	0.57
K	0.879	1200	1605.03	6.6	742.52	742.52	742.94	0.42
L	0.89	1380	3338.17	3.21	743.33	743.33	744.04	0.71
M	0.926	1480	7928.54	1.35	743.44	743.44	744.27	0.83
N	1.018	1510	5689.5	1.88	743.49	743.49	744.37	0.88
O	1.107	1510	2628.9	4.07	743.76	743.76	744.76	1
P	1.202	1480	2615.9	4.09	747.07	747.07	747.55	0.48
Q	1.293	1480	2759.32	3.88	749.11	749.11	750.09	0.98
R	1.371	1350	2666.31	4.01	751.45	751.45	752.06	0.61
S	1.449	1250	2545.38	4.2	753.68	753.68	754.32	0.64
T	1.515	1200	2502.15	4.28	755.21	755.21	756.08	0.87
U	1.593	1100	2543.23	4.21	756.67	756.67	757.62	0.95
V	1.675	895	1912.53	5.59	758.16	758.16	758.79	0.63
W	1.772	850	1718	6.23	760.74	760.74	761.41	0.67
X	1.873	1100	2328.5	4.6	763.13	763.13	764.1	0.97

[1]Miles Above Confluence withSand Tank Wash [2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

WEST QUILOTOSA WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
West Quilotosa Wash (Continued)								
Y	1.969	1050	1699.54	6.3	765.34	765.34	766.29	0.95
Z	2.058	1190	1845.46	5.8	769.07	769.07	769.93	0.86
AA	2.155	830	1913.81	5.59	772.65	772.65	773.1	0.45

[1]Miles Above Confluence withSand Tank Wash [2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

FLOODWAY DATA

WEST QUILOTOSA WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
Cross Section	Distance[1]	Width[2] (FEET)	Section Area (SQUARE FEET)	Mean Velocity (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Sauceda Wash								
A	4.011	132	754.29	6.19	721.39	721.39	722.39	1
B	4.045	118	697.99	6.69	722.41	722.41	723.18	0.77
C	4.062	110	775.52	6.02	724.06	724.06	724.42	0.36
D	4.079	94	971.08	4.81	726.07	726.07	726.07	0
E	4.09	105	966.11	4.83	727.47	727.47	727.61	0.14
F	4.107	103	978.73	4.77	727.56	727.56	727.76	0.2
G	4.129	500	3035.16	1.54	729.24	729.24	729.6	0.36
H	4.184	555	2147.78	4.06	729.22	729.22	729.55	0.33
I	4.27	408	1270.44	6.86	729.42	729.42	730.04	0.62
J	4.364	425	1589.02	5.49	731.28	731.28	732.01	0.73
K	4.457	355	1383.5	6.3	732.78	732.78	733.5	0.72
L	4.482	1676	2663.21	3.27	742.82	742.82	743.38	0.56
M	4.497	1705	3564.45	2.45	743.1	743.1	743.91	0.81
N	4.543	1690	13432.78	0.65	743.44	743.44	744.39	0.95
O	4.64	550	4206.09	1.35	743.44	743.44	744.39	0.95
P	4.728	458	2932.77	1.94	743.52	743.52	744.44	0.92
Q	4.821	340	792.19	7.18	744.41	744.41	745.3	0.89
R	4.909	440	1330.23	4.28	747.82	747.82	748.82	1
S	5.001	330	1076.15	5.29	750.03	750.03	750.83	0.8
T	5.091	250	1147.71	4.96	752.24	752.24	752.74	0.5
U	5.187	215	886.17	6.42	754.49	754.49	755	0.51
V	5.27	240	1072.17	5.31	757	757	757.77	0.77
W	5.367	261	1038.6	5.48	759.07	759.07	759.81	0.74
X	5.453	283	867.68	6.56	761.28	761.28	762.18	0.9
Y	5.551	315	1208.99	4.71	763.95	763.95	764.95	1
Z	5.639	240	1200.31	4.74	765.91	765.91	766.55	0.64
AA	5.734	216	1002.28	5.68	767.59	767.59	768.44	0.85

[1]Miles Above Confluence withSand Tank Wash

[2]Width/Width Within County

TABLE 5

FEDERAL EMERGENCY MANAGEMENT AGENCY

MARICOPA COUNTY, AZ AND INCORPORATED AREAS

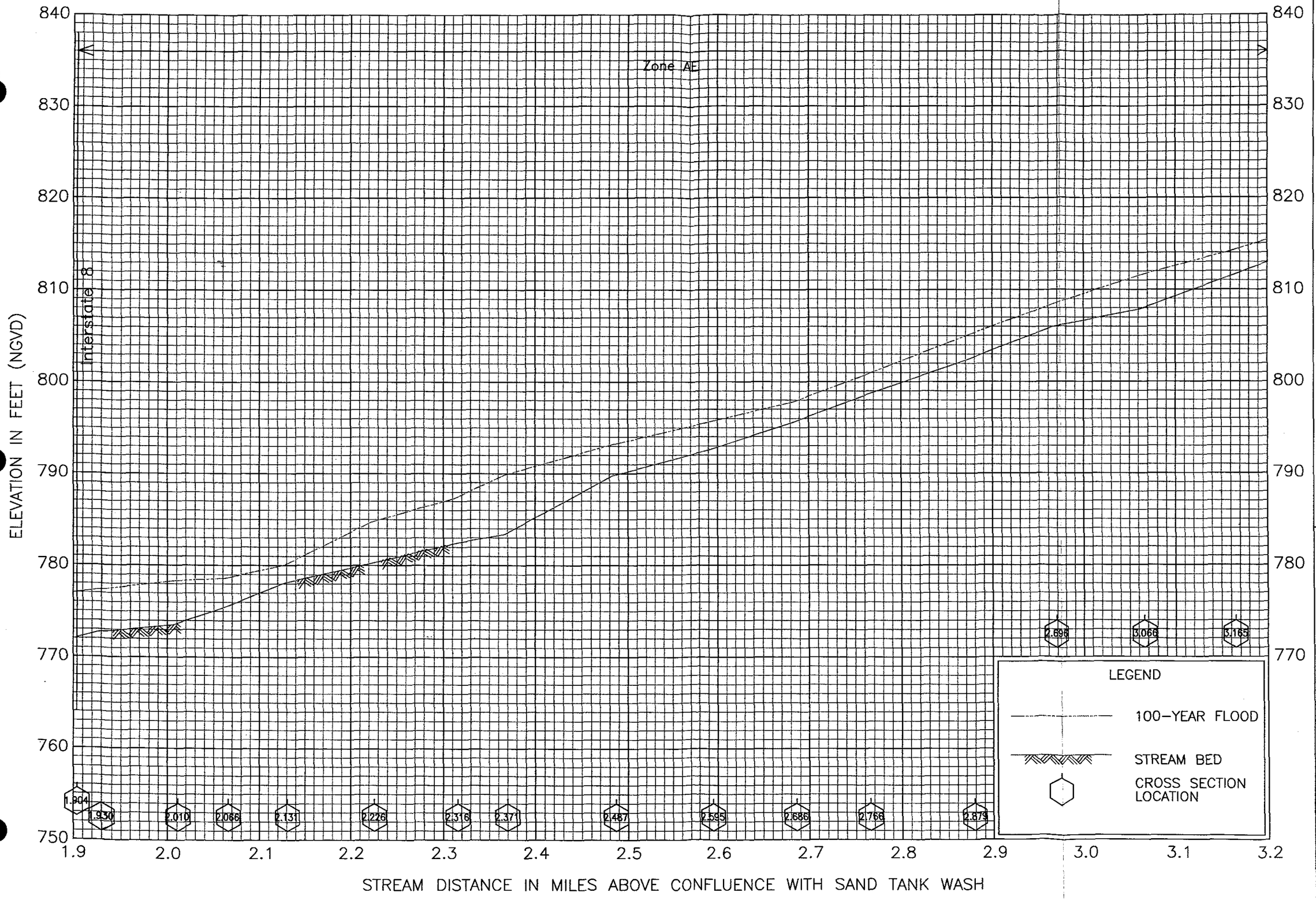
FLOODWAY DATA

SAUCEDA WASH

FLOOD PROFILES

BENDER WASH MAIN BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF GILA BEND, AZ
MARICOPA COUNTY



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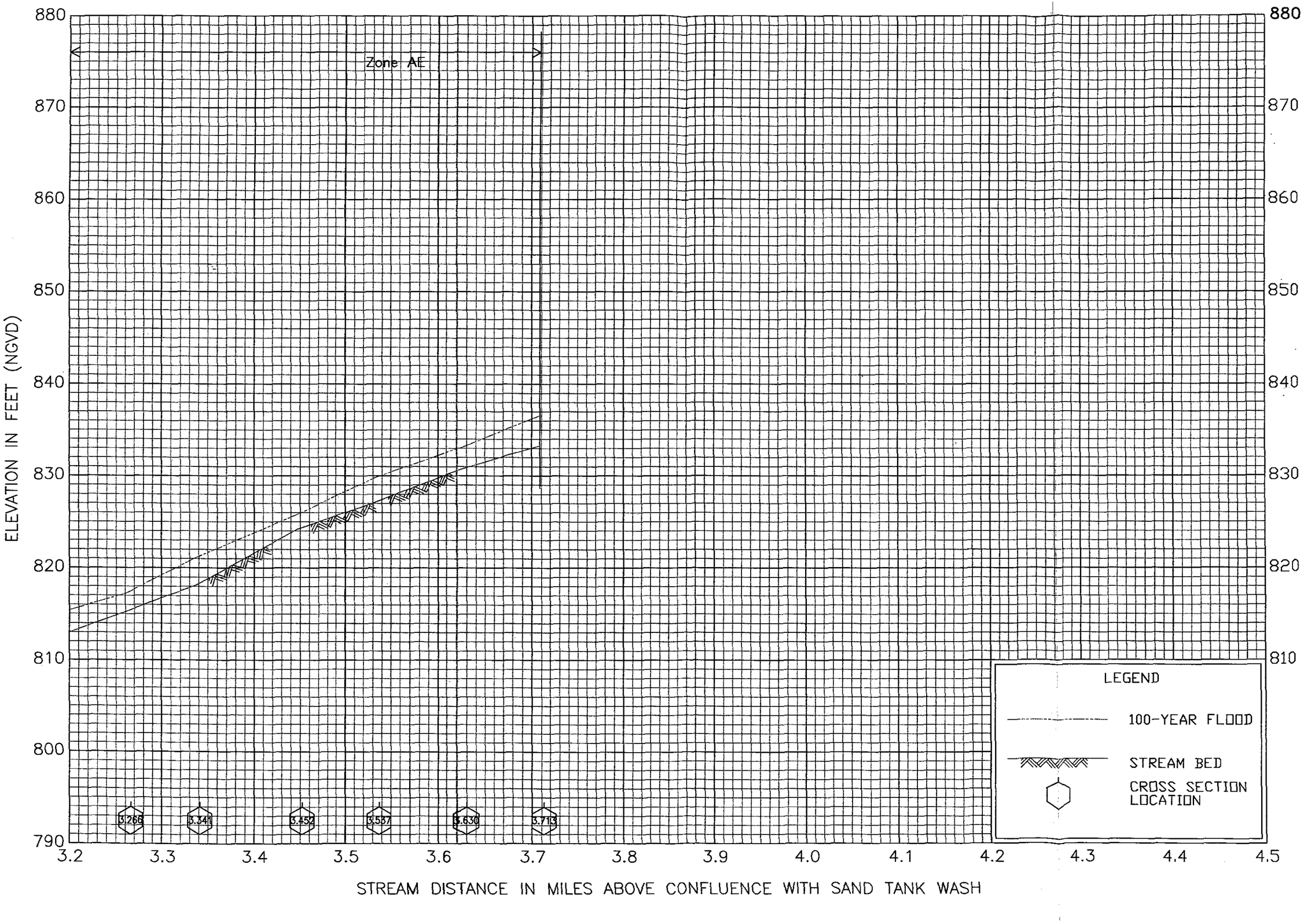
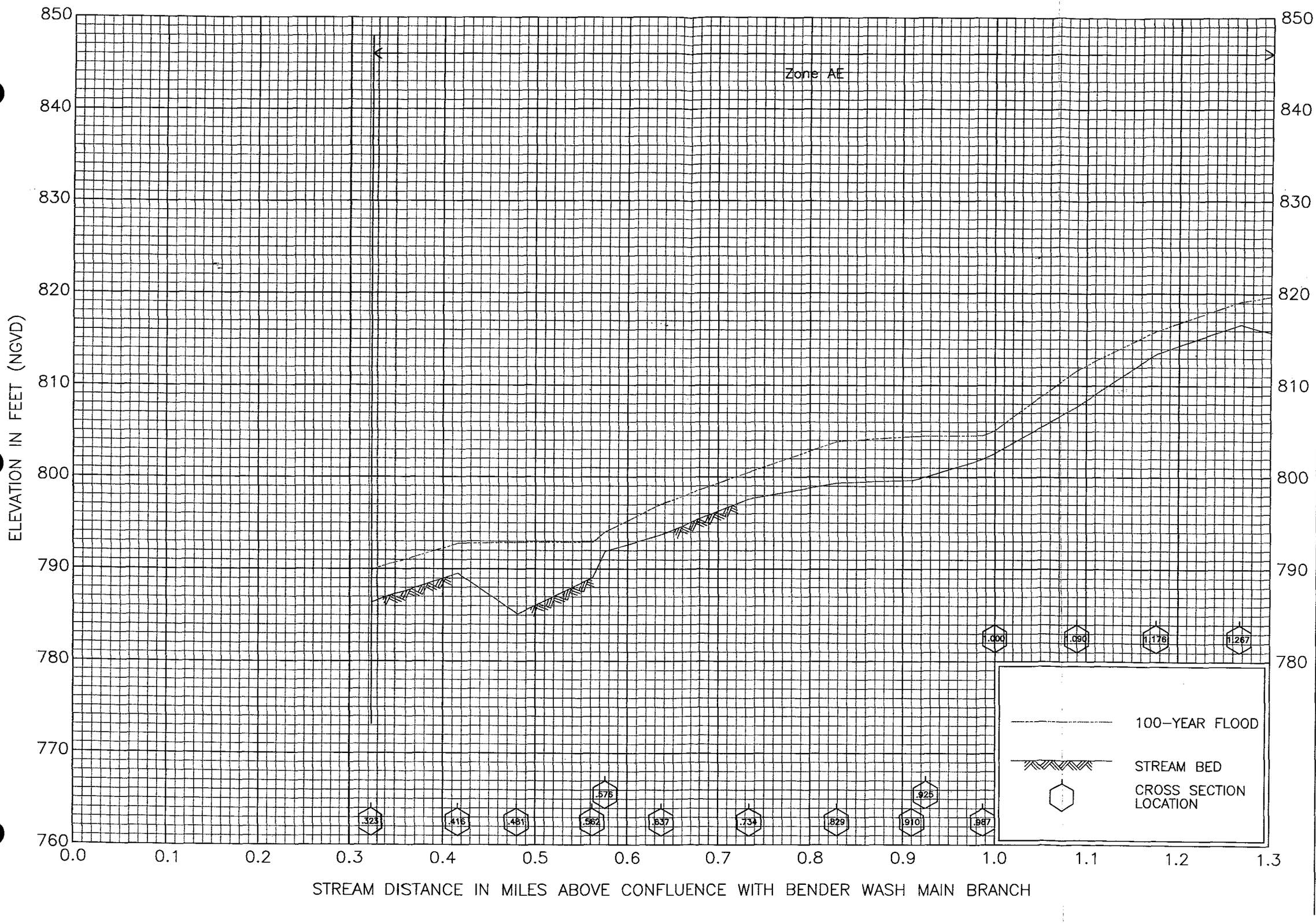


FLOOD PROFILES

BENDER WASH MAIN BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF GILA BEND, AZ
MARICOPA COUNTY

02P

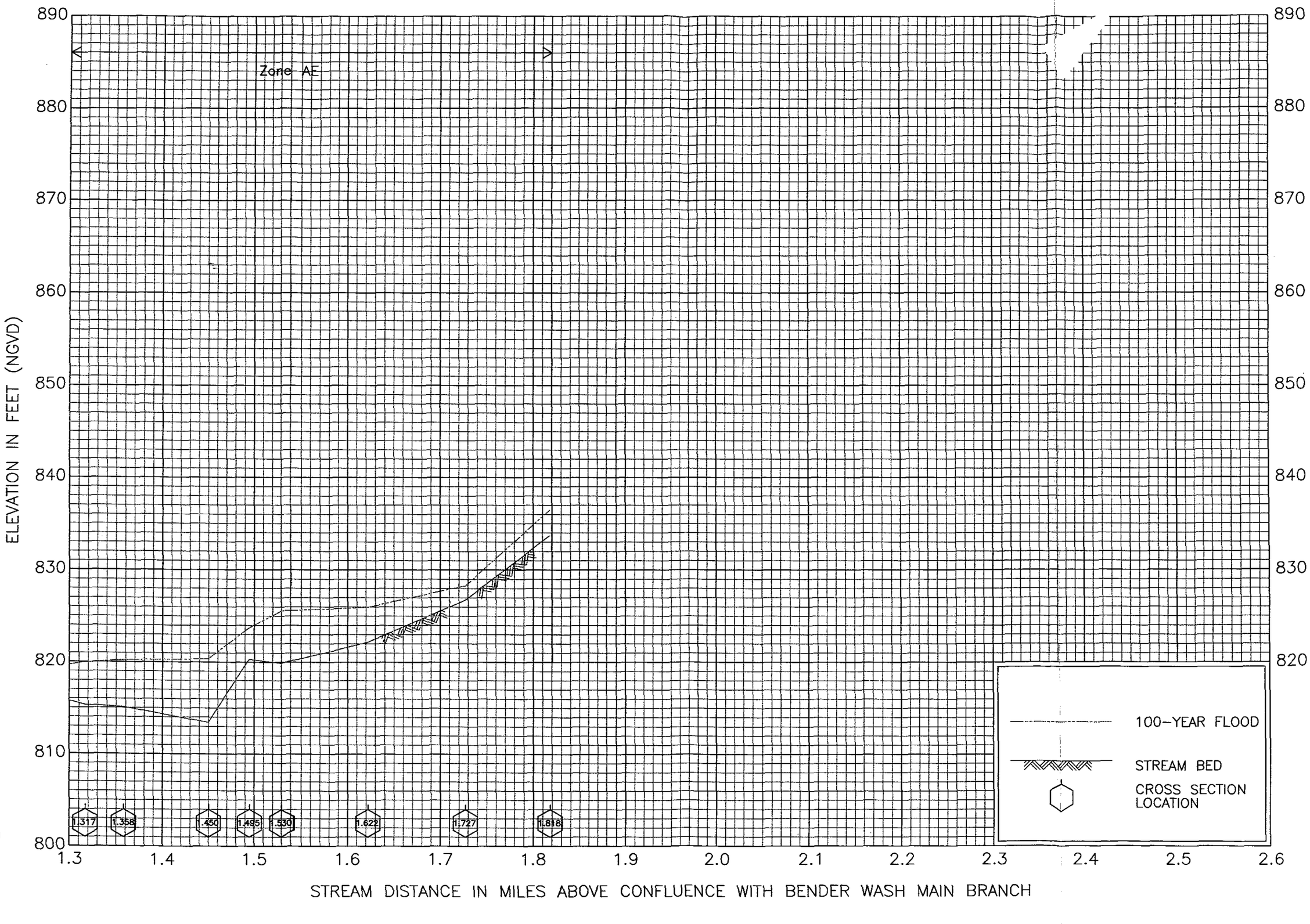


FLOOD PROFILES

BENDER WASH NORTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF GILA BEND, AZ
MARICOPA COUNTY

01P



FLOOD PROFILES

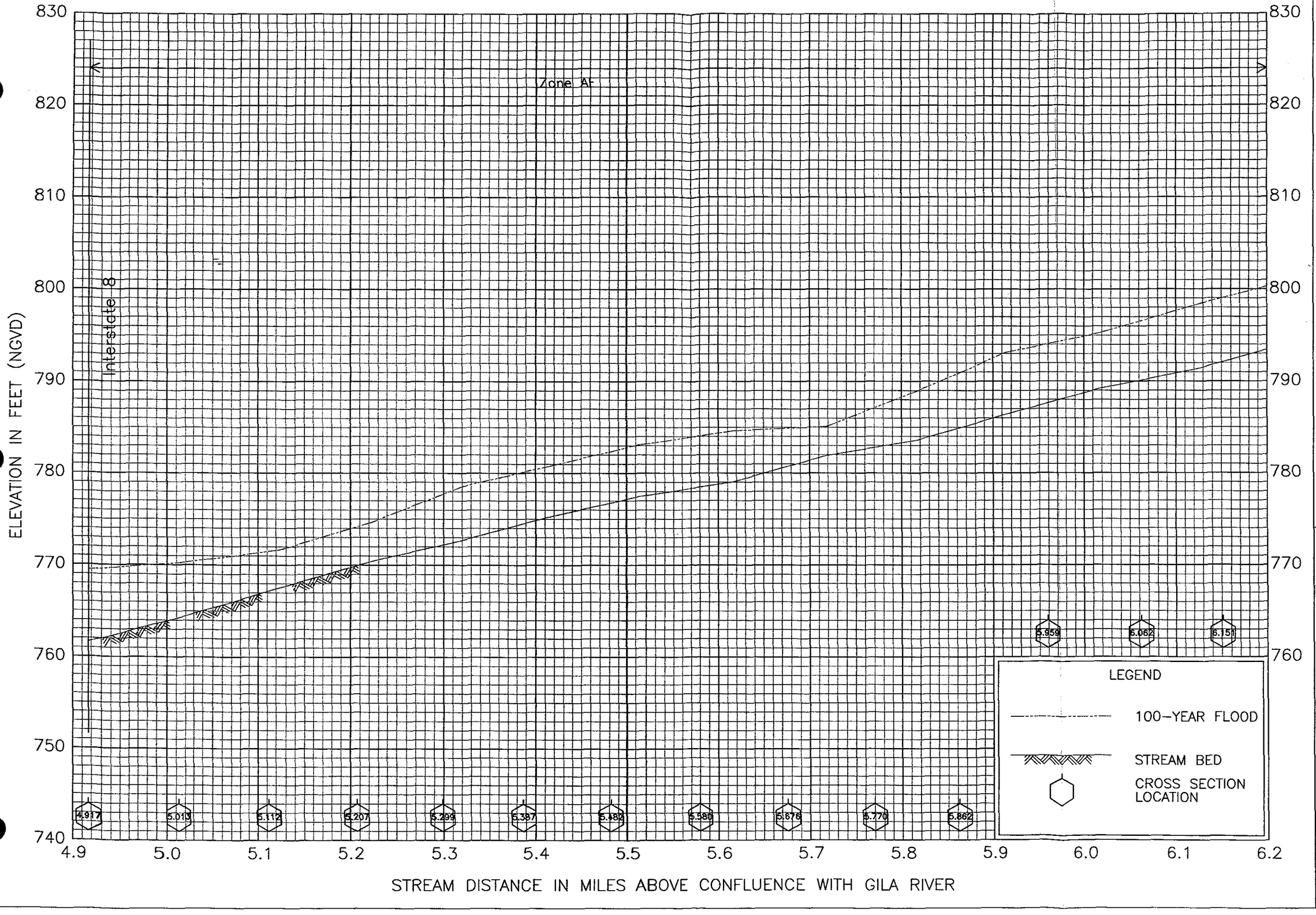
BENDER WASH NORTH BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF GILA BEND, AZ
MARICOPA COUNTY

02P

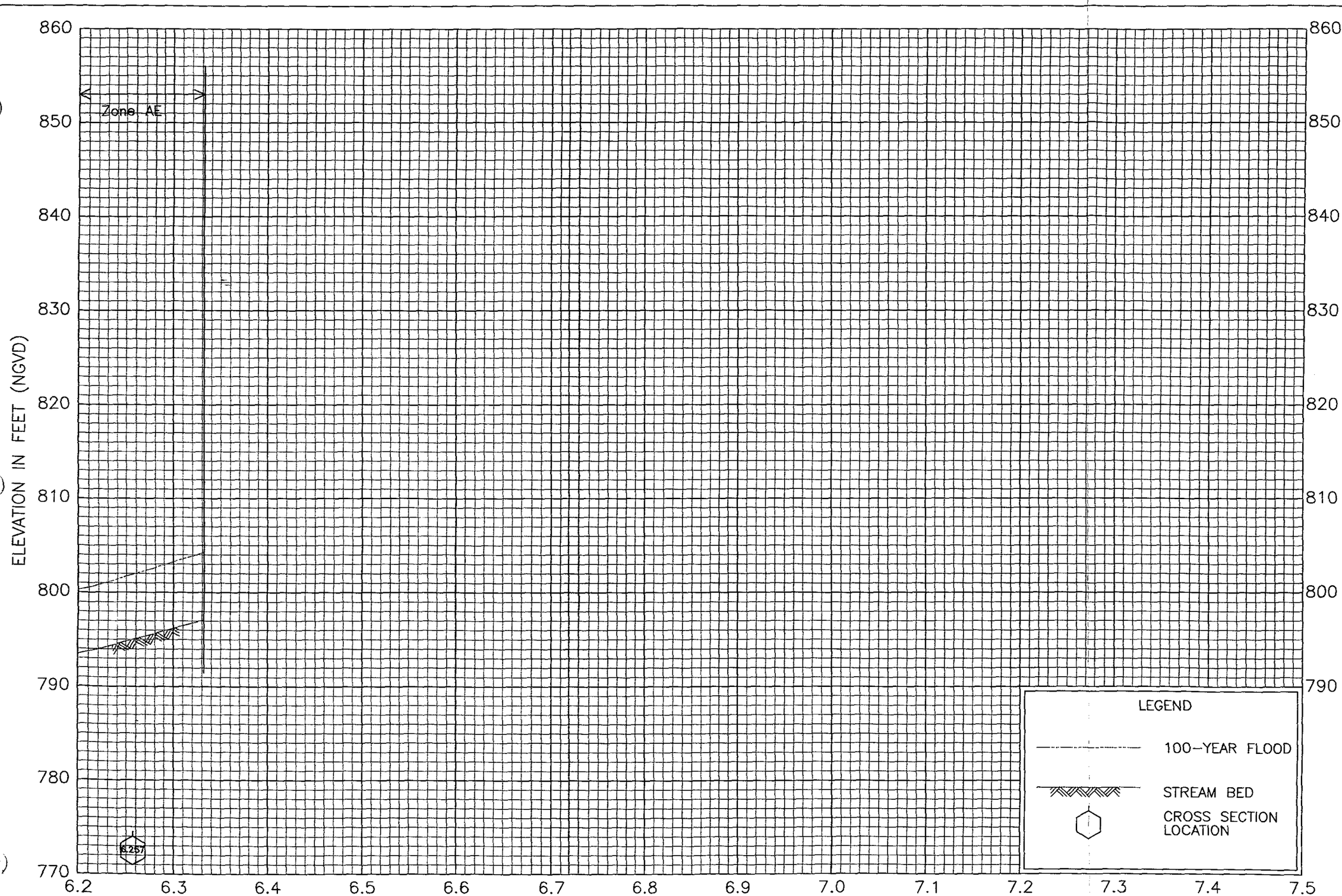
FLOOD PROFILES

SAND TANK WASH



FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF GILA BEND, AZ
MARICOPA COUNTY

01P



FLOOD PROFILES

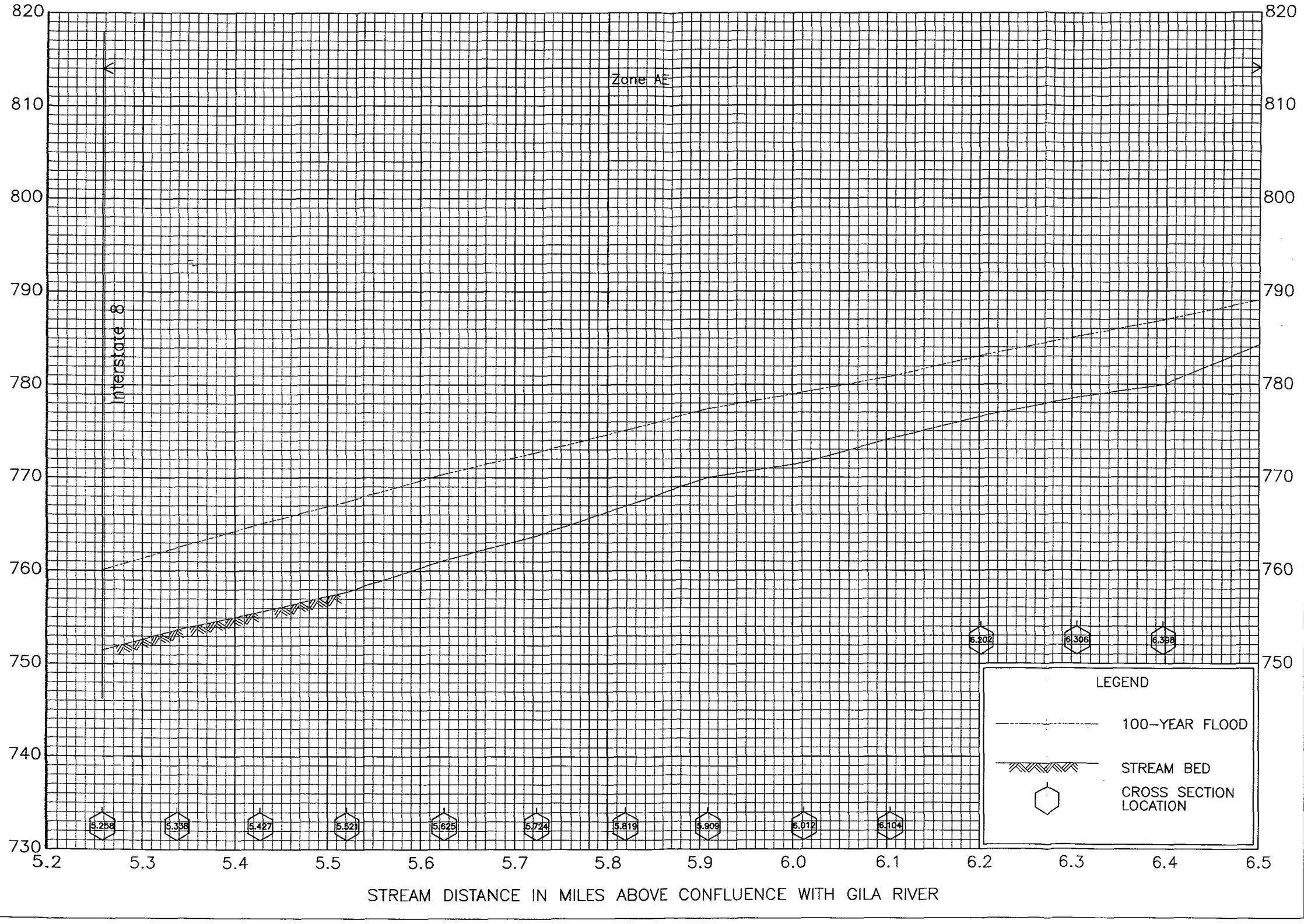
SAND TANK WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF GILA BEND, AZ
MARICOPA COUNTY

02P

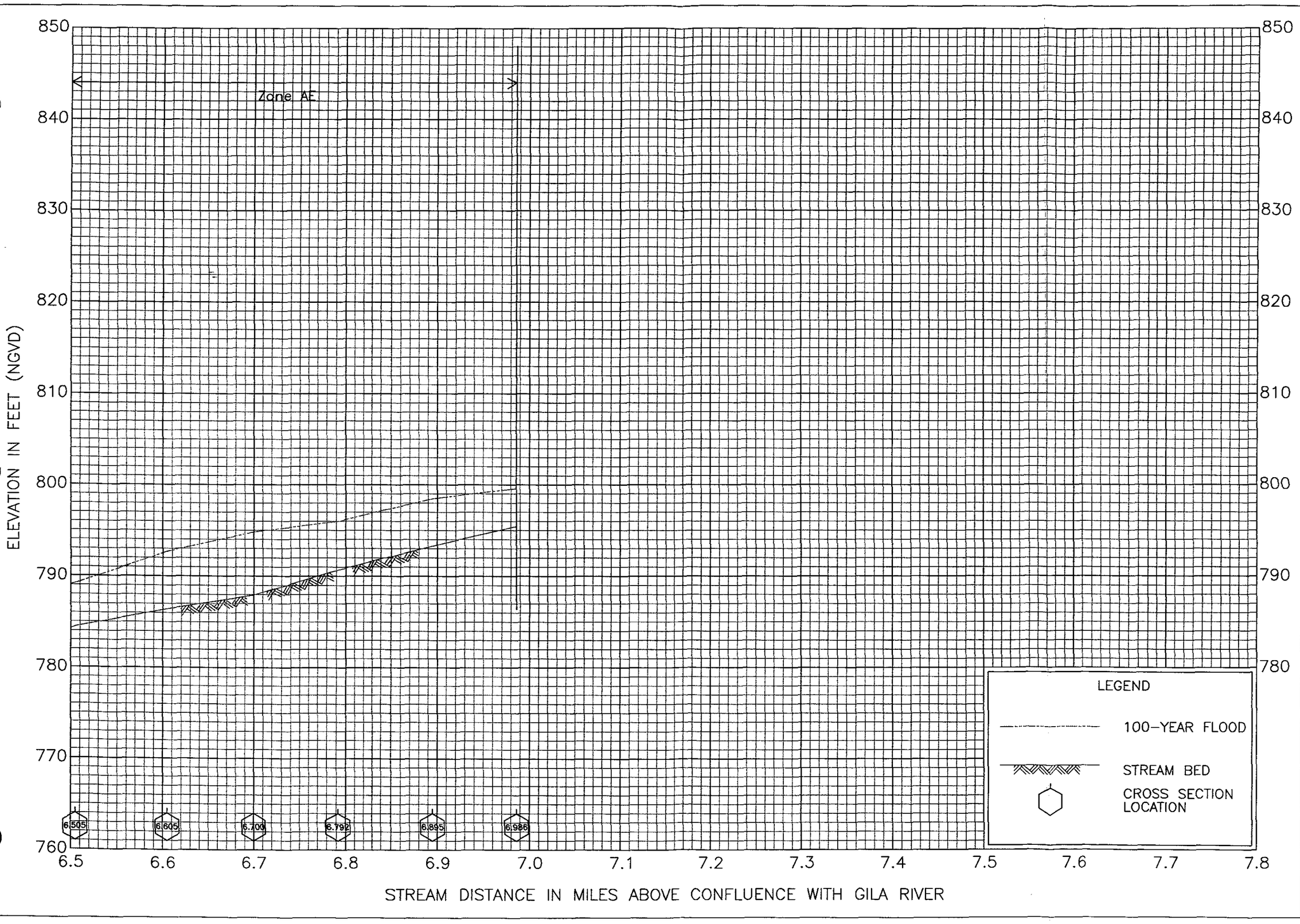
FLOOD PROFILES

SCOTT AVENUE WASH



FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF GILA BEND, AZ
MARICOPA COUNTY

01P



FLOOD PROFILES

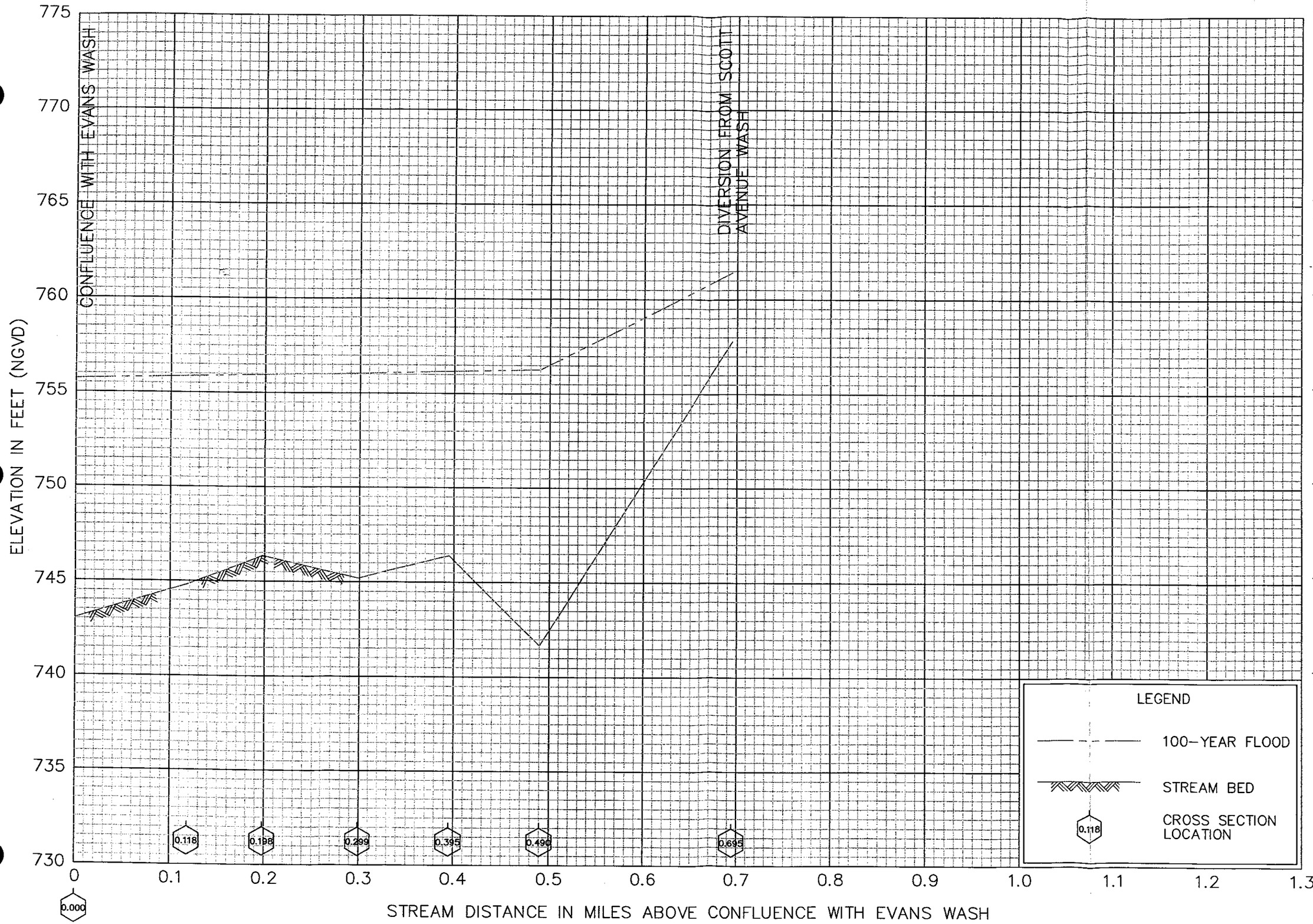
SCOTT AVENUE WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF GILA BEND, AZ

MARICOPA COUNTY

02P



FLOOD PROFILES

I-8 WASH EAST

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA
MARICOPA COUNTY

01P

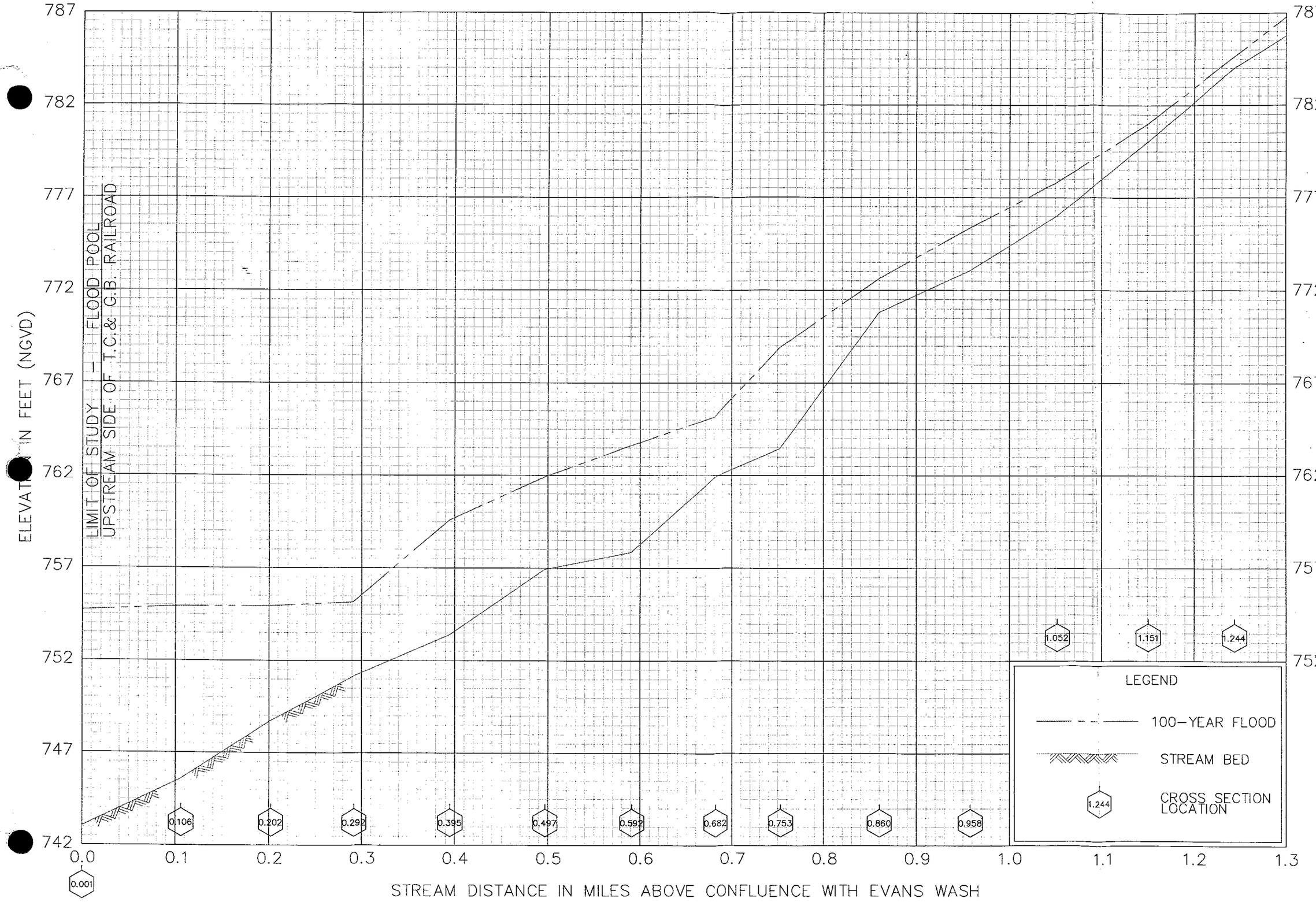
FLOOD PROFILES

PIONEER CEMETERY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY



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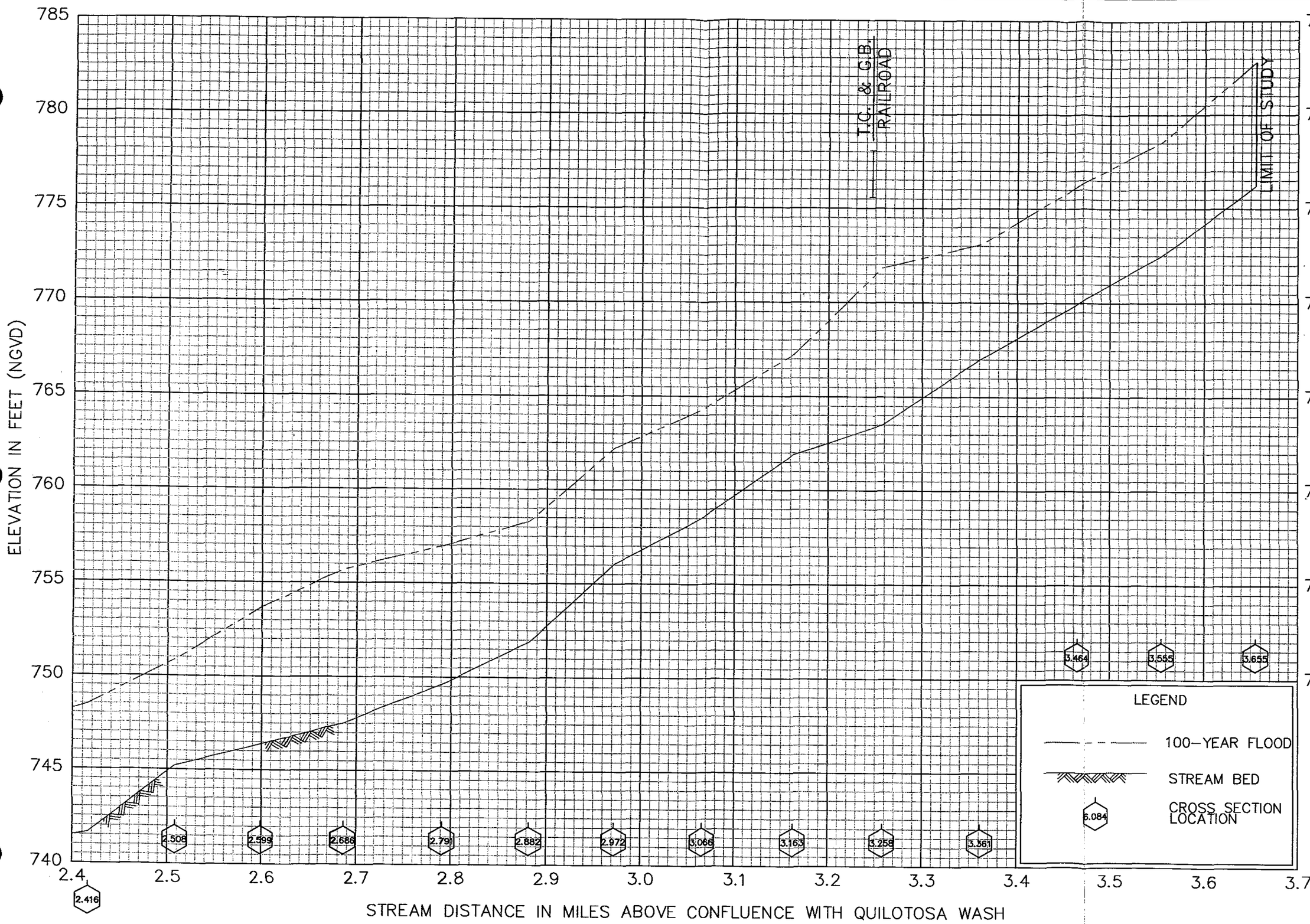


FLOOD PROFILES

HACKER WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

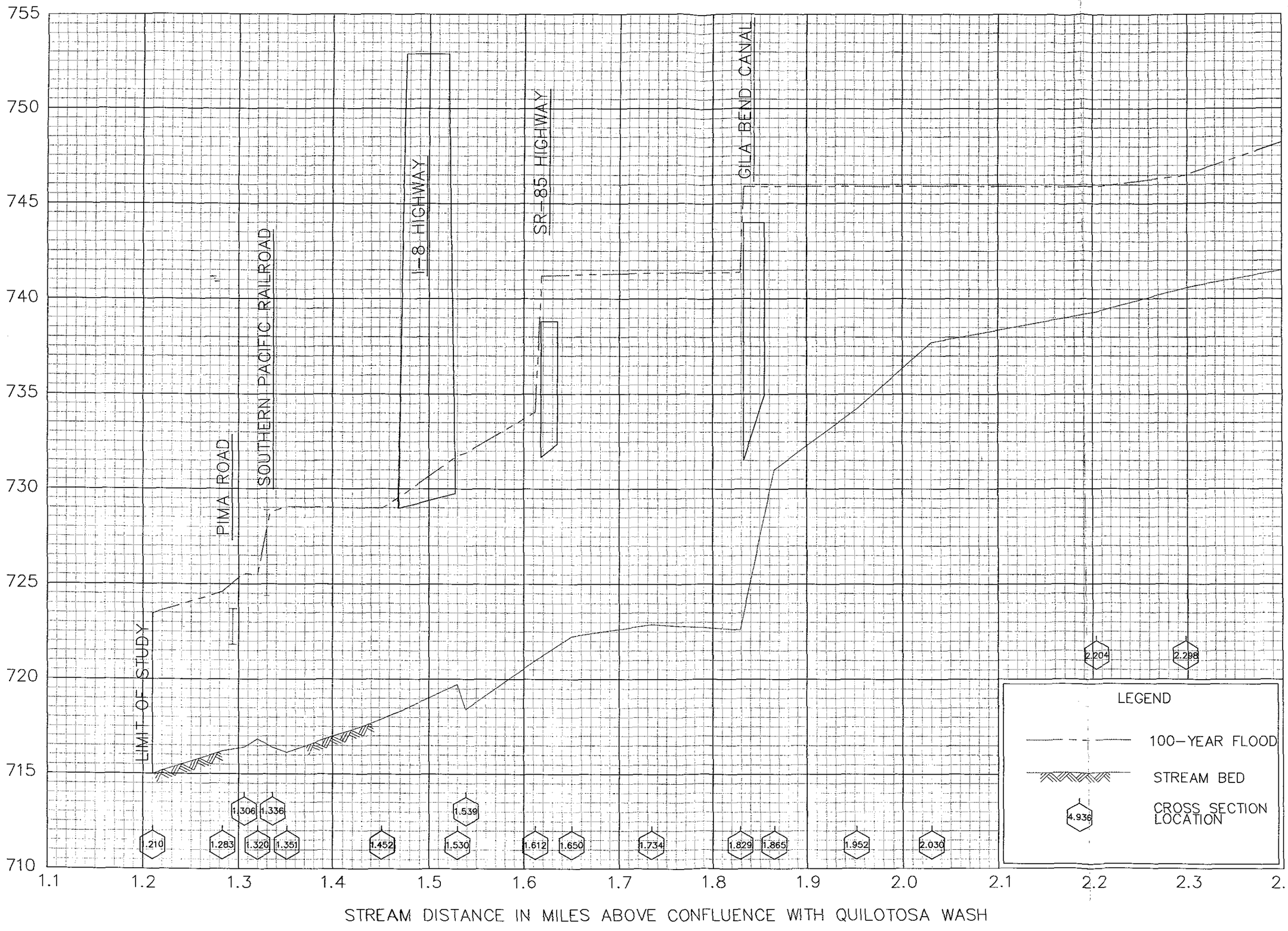
02P

FLOOD PROFILES

HACKER WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY



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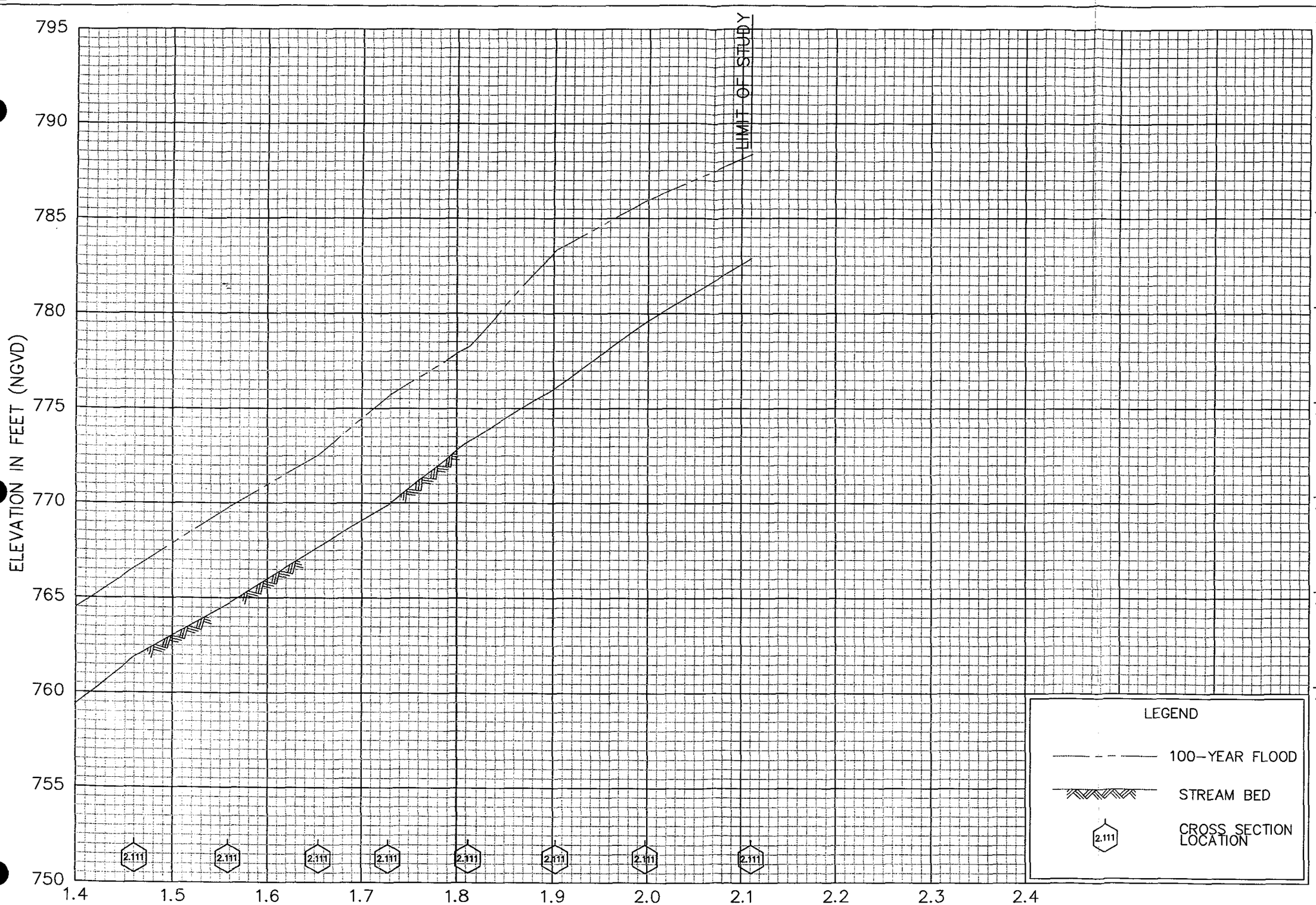


FLOOD PROFILES

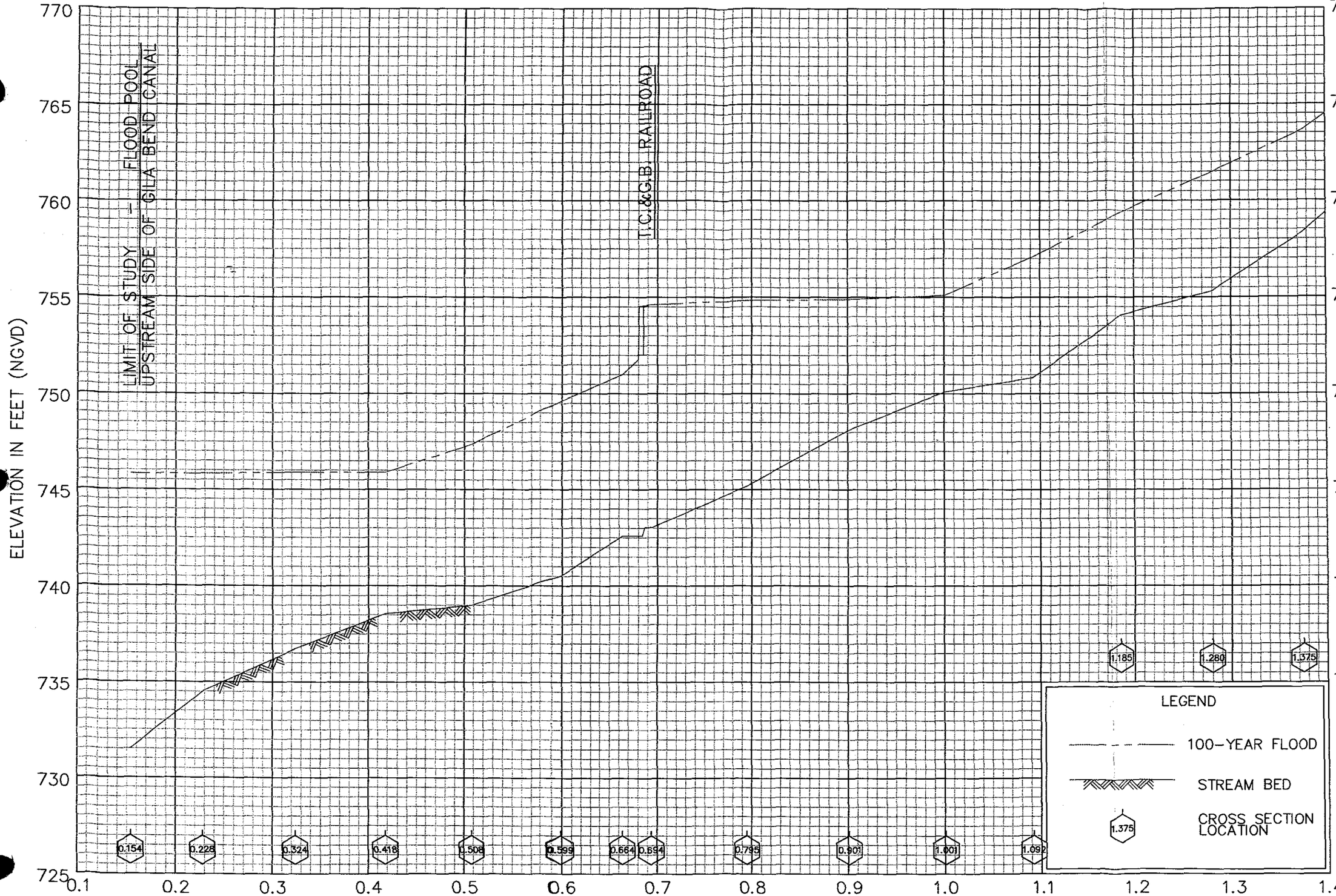
EVANS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

02P

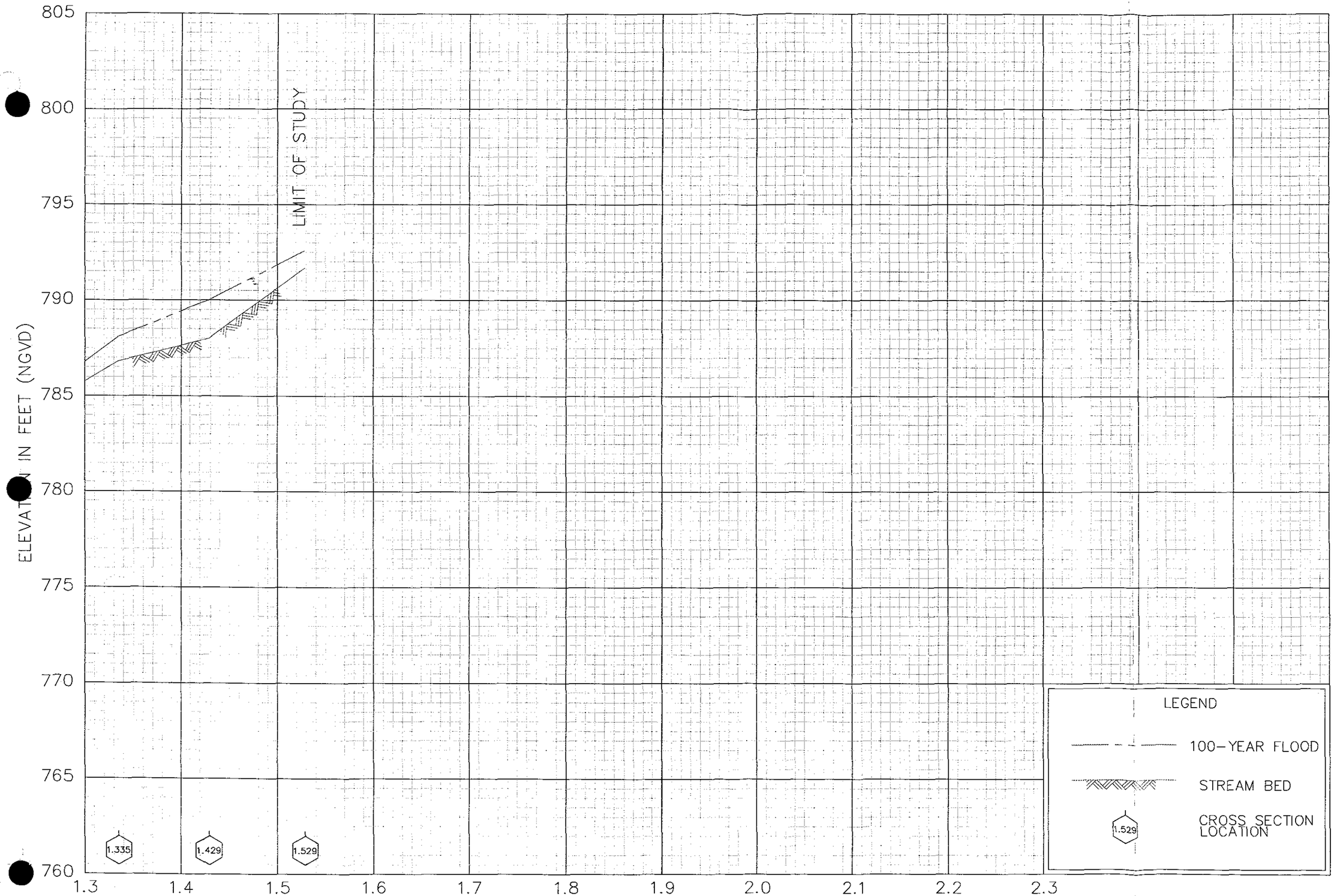


FLOOD PROFILES

EVANS WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA
MARICOPA COUNTY

01P



FLOOD PROFILES

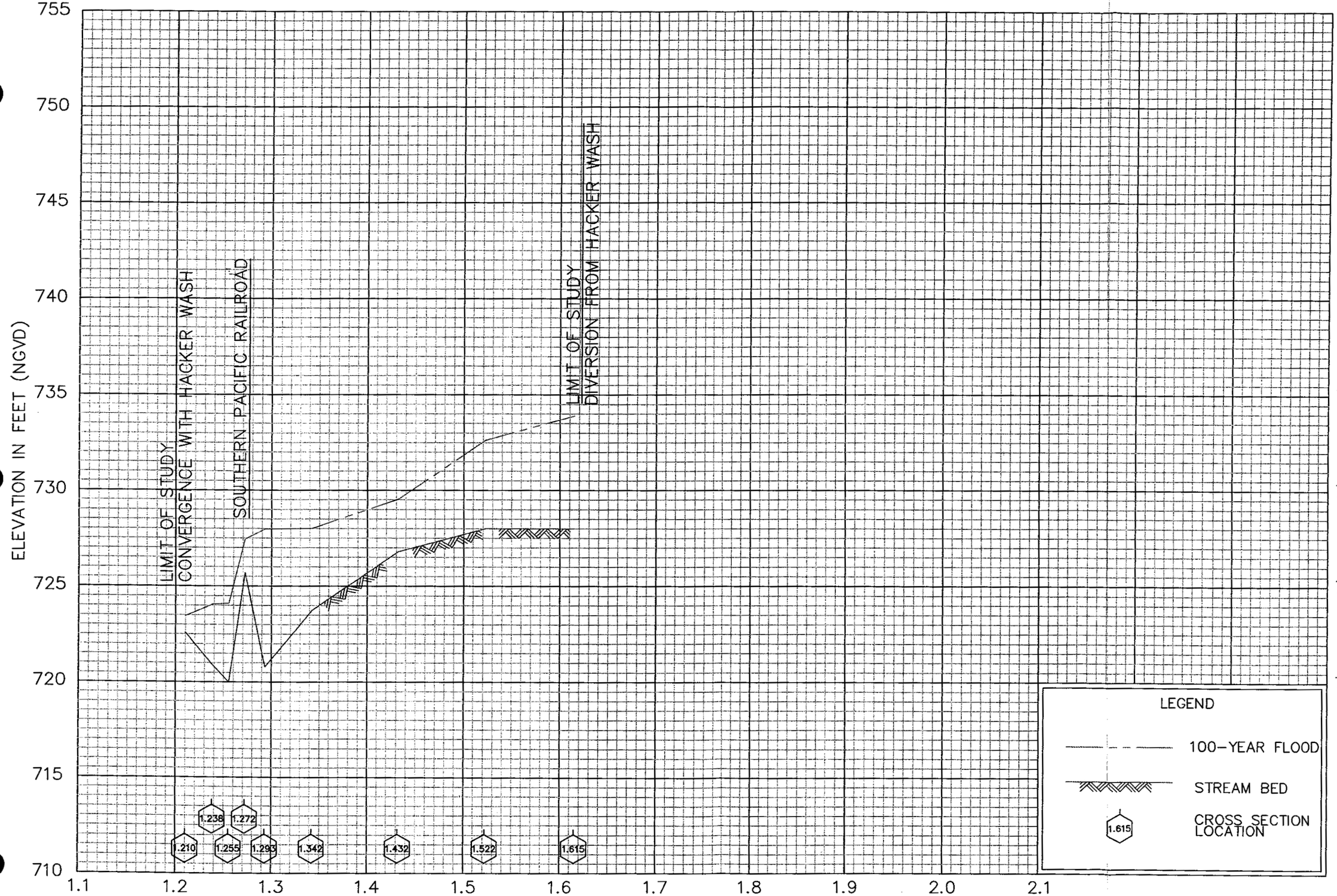
PIONEER CEMETERY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

02P

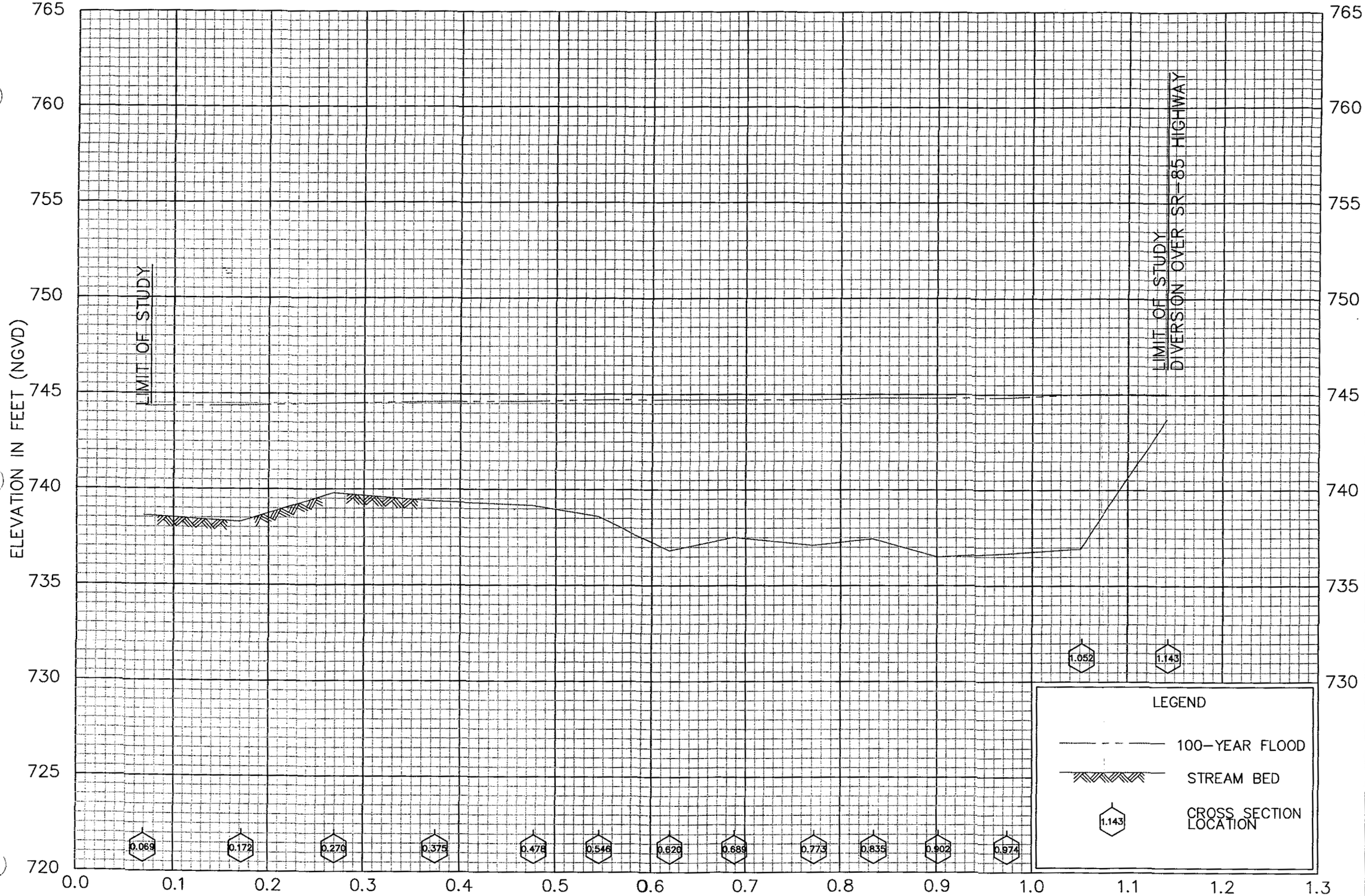


FLOOD PROFILES

HACKER WASH DIVERSION

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA
MARICOPA COUNTY

01P



FLOOD PROFILES

GILA BEND CANAL WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA
MARICOPA COUNTY

01P

FLOOD PROFILES

QUILOTOSA WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

01P

ELEVATION IN FEET (NGVD)

754
749
744
739
734
729
724
719
714
709

3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH THE GILA RIVER

LIMIT OF STUDY

I-8 HIGHWAY

SOUTHERN PACIFIC RAILROAD

GILA BEND CANAL OVERCHUTE

3.776 3.793 3.874 3.892 3.921 4.013 4.106 4.201 4.296 4.396 4.388 4.414 4.477 4.587 4.664 4.755 4.849 4.936

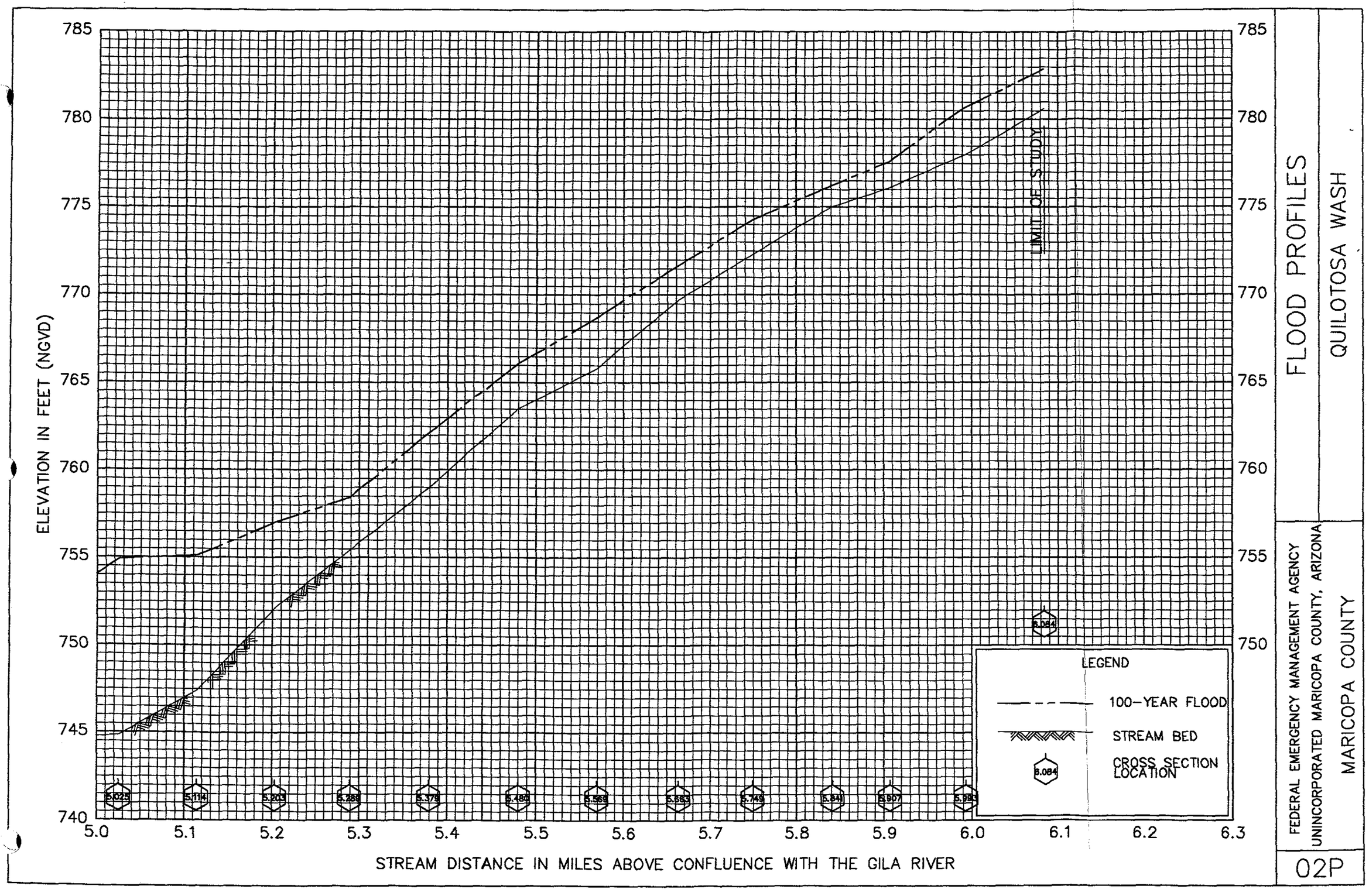
LEGEND

100-YEAR FLOOD

STREAM BED

CROSS SECTION LOCATION

4.936



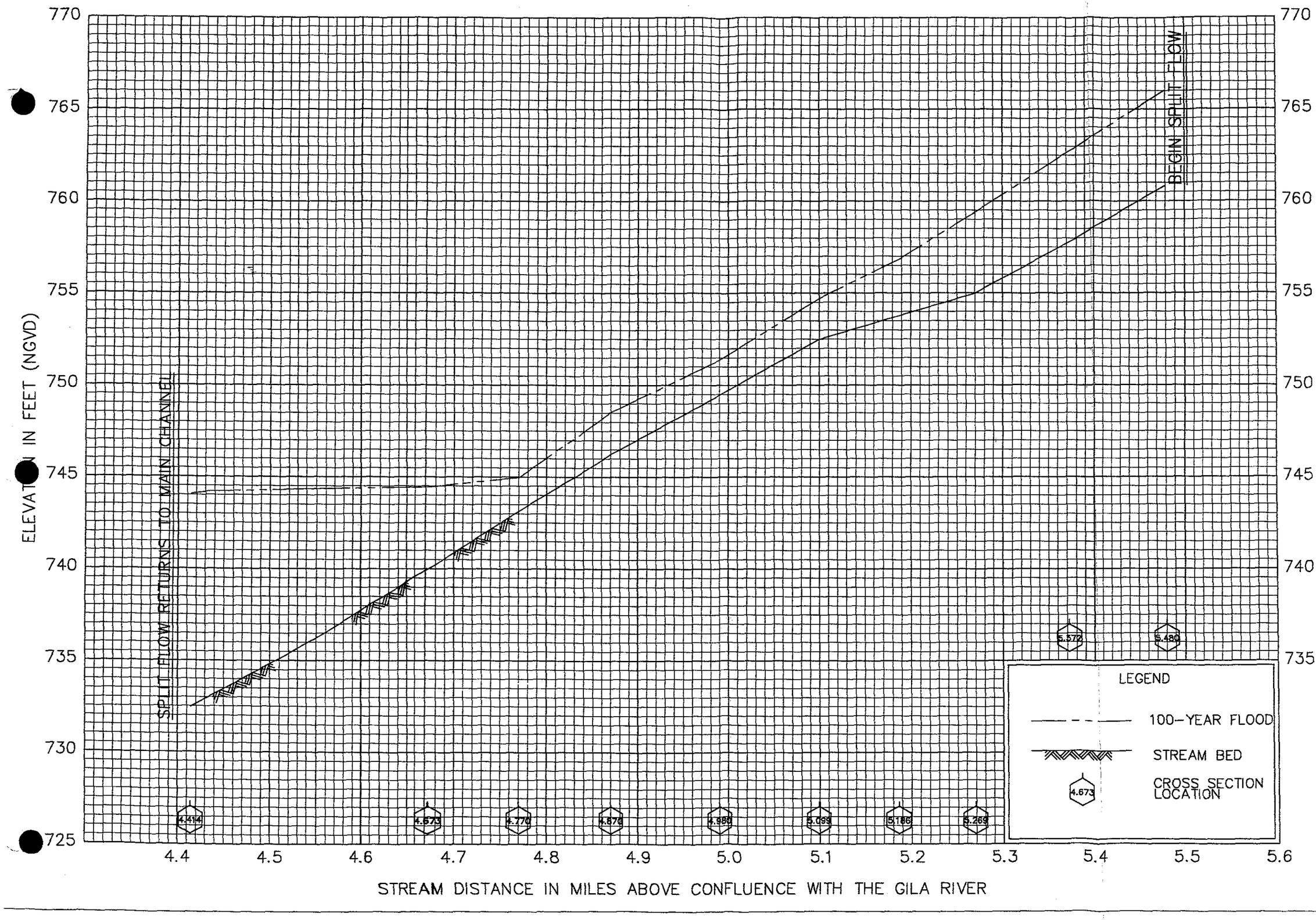
FLOOD PROFILES

QUILOTOSA WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

02P



FLOOD PROFILES

QUILOTOSA WASH (EAST SPLIT)

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

03P

FLOOD PROFILES

WEST QUILOTOSA WASH

ELEVATION IN FEET (NGVD)

754
749
744
739
734
729
724
719
714
709

0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH QUILOTOSA WASH

LIMIT OF STUDY

I-8 HIGHWAY

SOUTHERN PACIFIC RAILROAD

GILA BEND CANAL OVERCHUTE

0.239 0.256 0.337 0.355 0.387 0.475 0.563 0.654 0.742 0.832 0.879 0.890 0.926 1.018 1.107 1.202 1.293 1.371 1.449

LEGEND

100-YEAR FLOOD

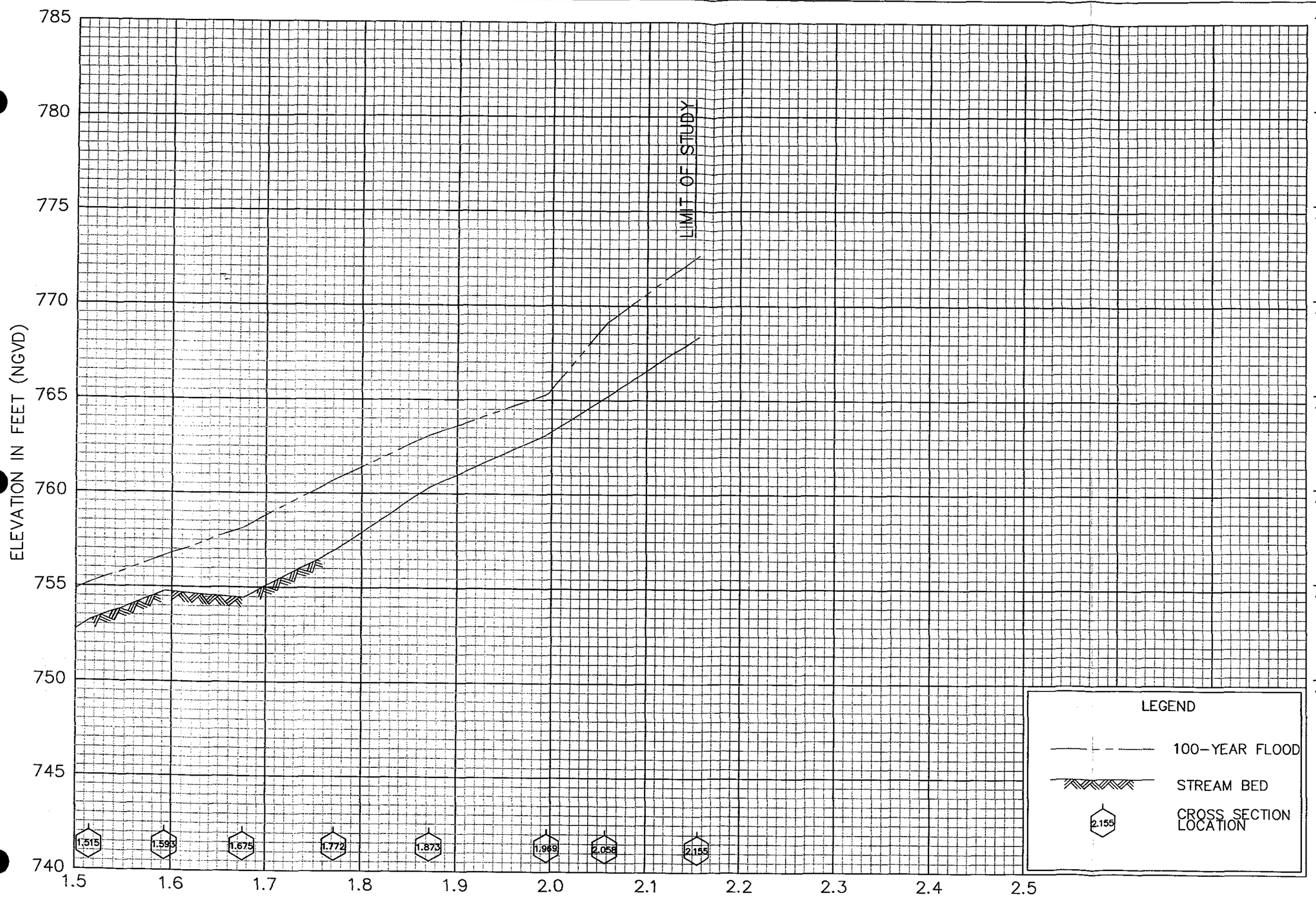
STREAM BED

1.593 CROSS SECTION LOCATION

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

01P



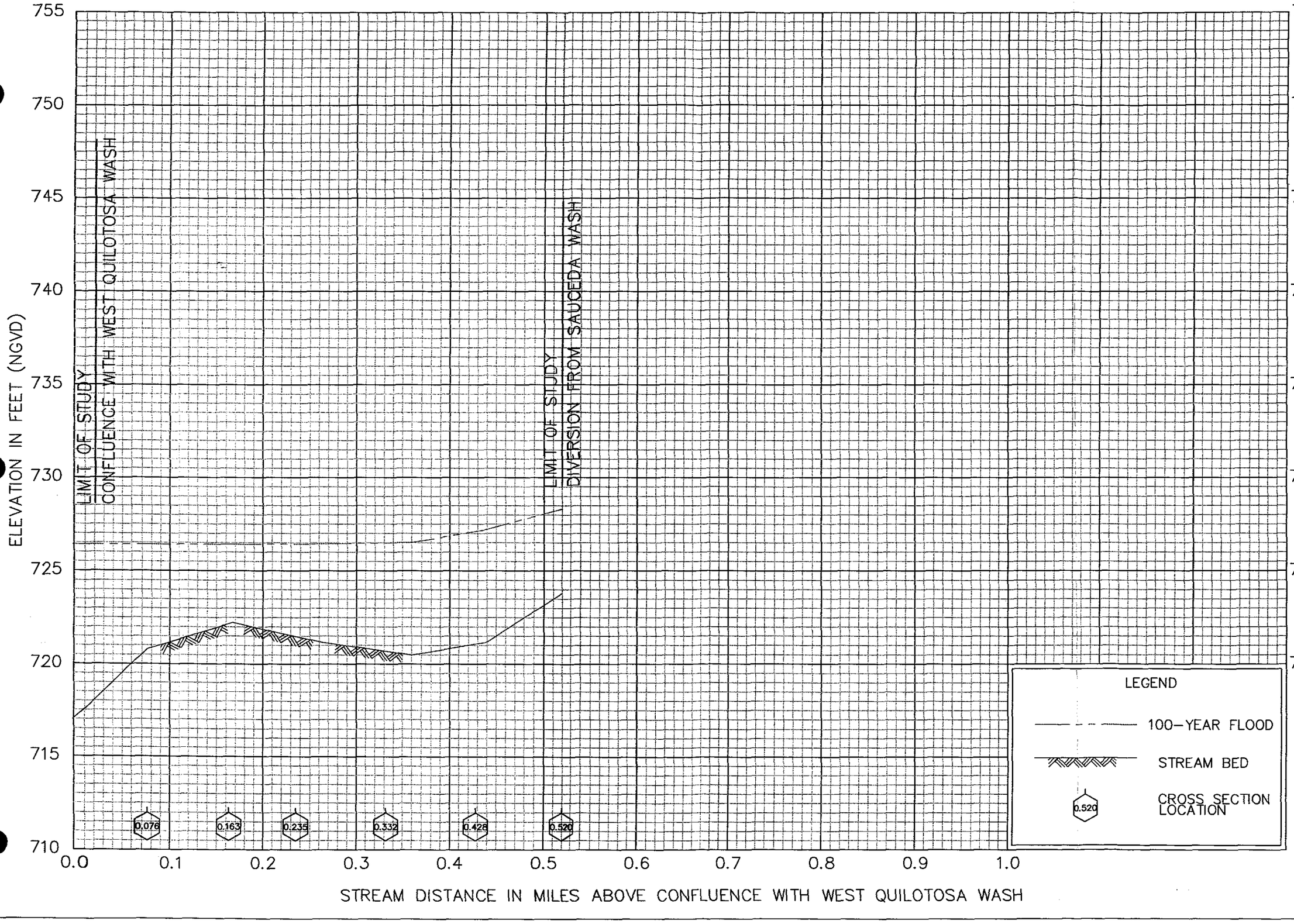
FLOOD PROFILES

WEST QUILOTOSA WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

02P



FLOOD PROFILES

I-8 WASH WEST

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA
MARICOPA COUNTY

01P

FLOOD PROFILES

SAUCEDA WASH

ELEVATION IN FEET (NGVD)

759
754
749
744
739
734
729
724
719
714

I-8 WESTBOUND LANE
I-8 EASTBOUND LANE
I-8 FRONTAGE ROAD
SOUTHERN PACIFIC RAILROAD
GILA BEND CANAL
OVERCHUTE SPILLWAY
LIMIT OF STUDY

4.011
4.045
4.062
4.079
4.090
4.107
4.129
4.184
4.270
4.364
4.457
4.482
4.497
4.543
4.640
4.728
4.821
4.909
5.001
5.091
5.187
5.270

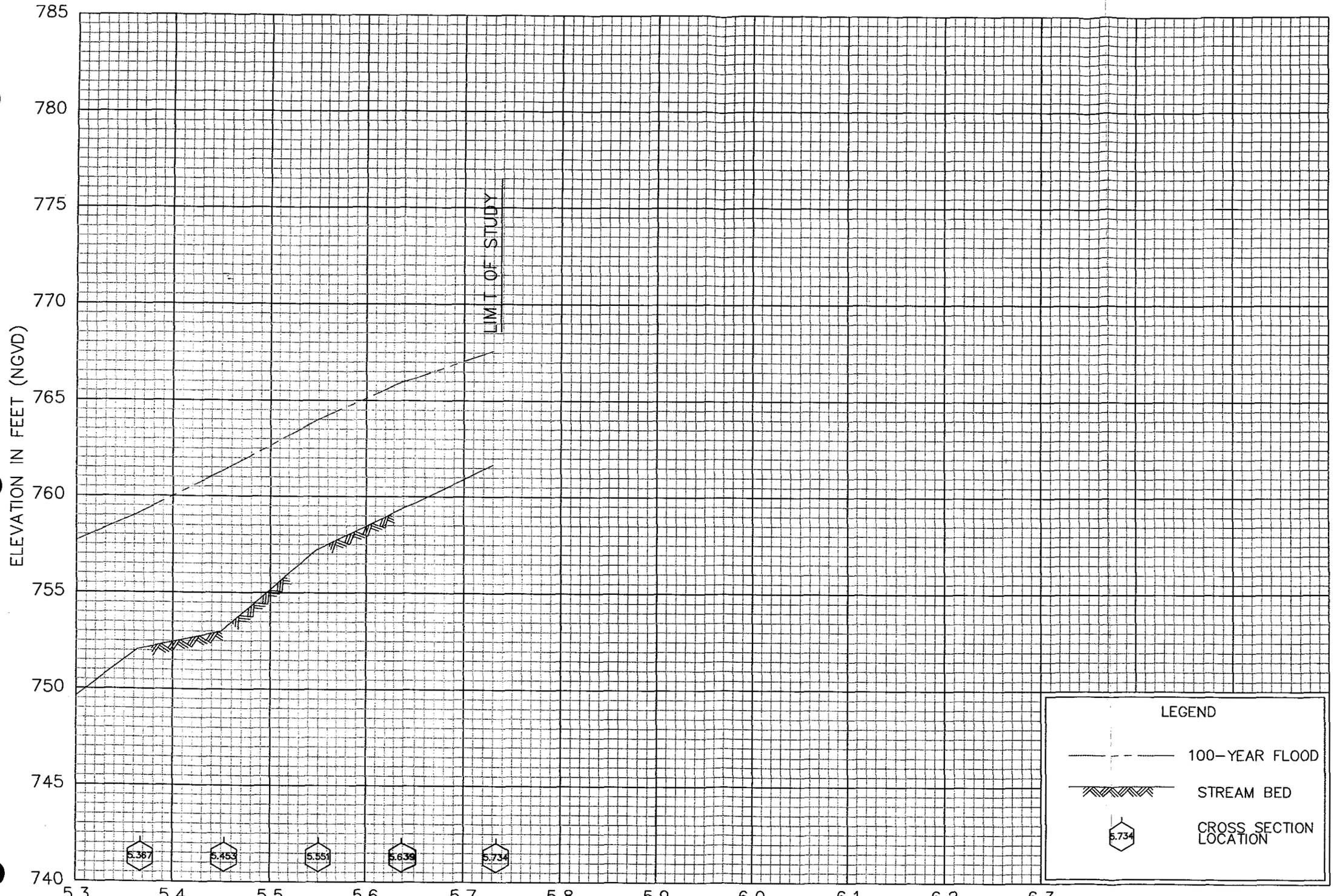
LEGEND
100-YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION

4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3

STREAM DISTANCE IN MILES ABOVE CONFLUENCE WITH GILA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA
MARICOPA COUNTY

01P



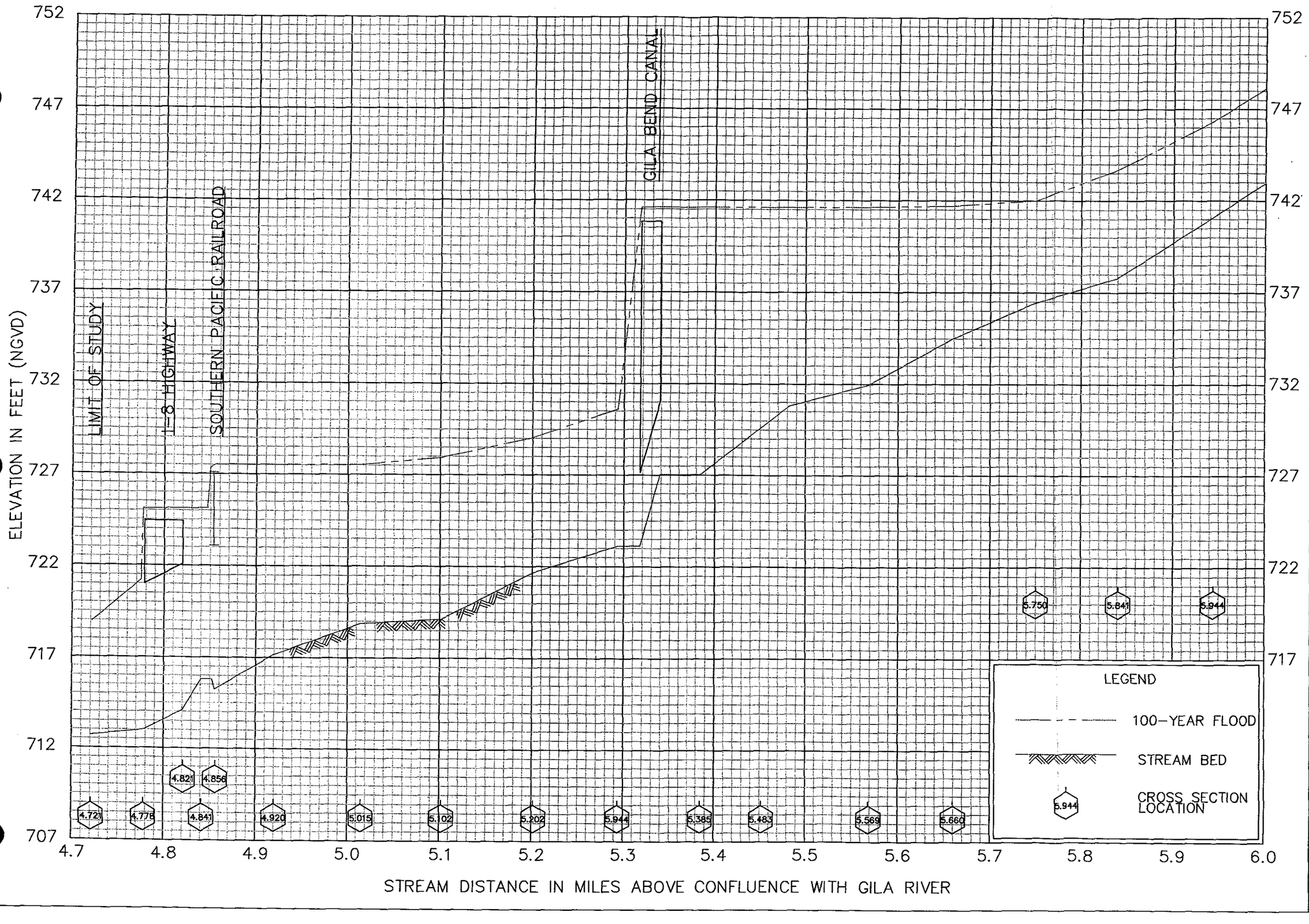
FLOOD PROFILES

SAUCEDA WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA

MARICOPA COUNTY

02P

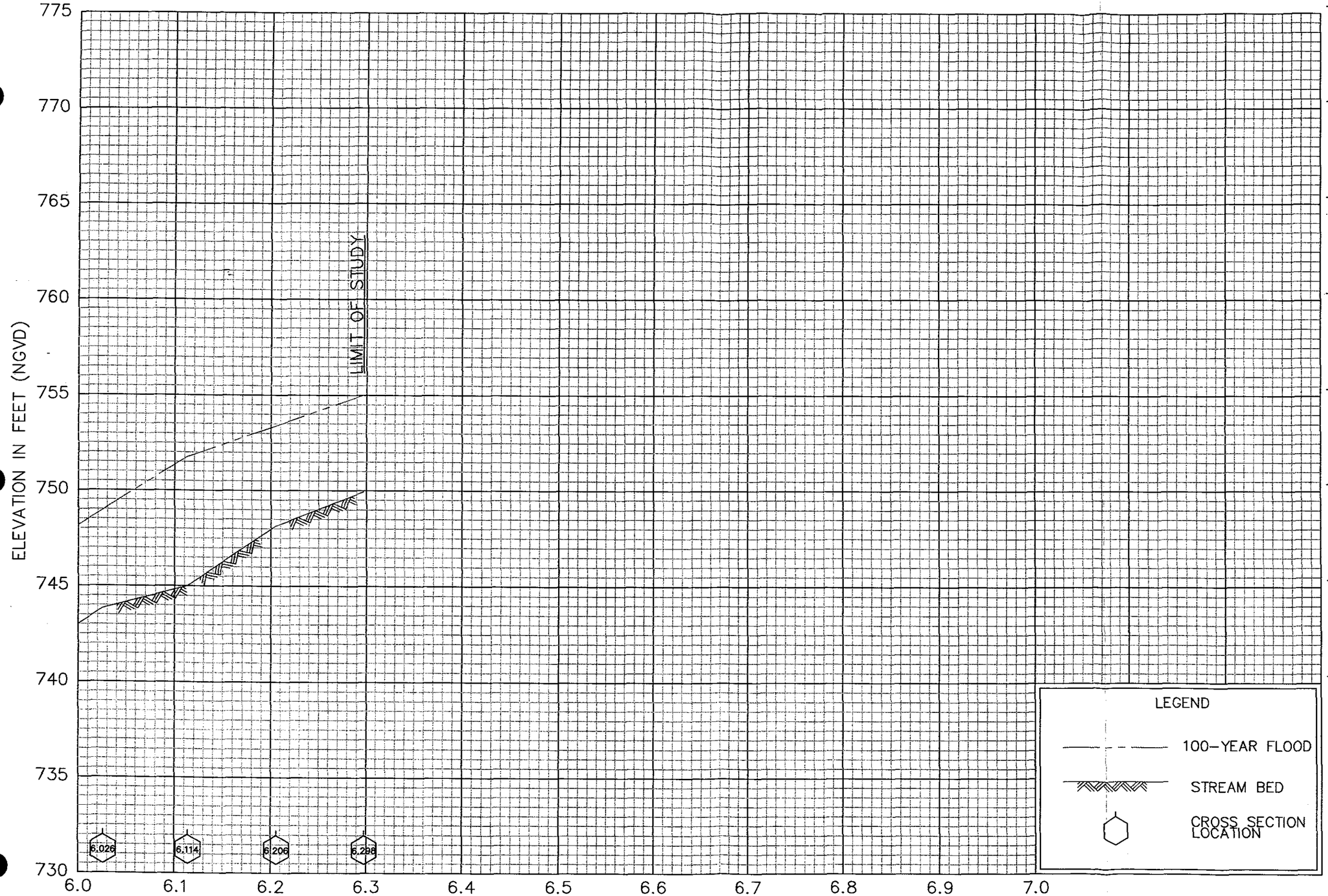


FLOOD PROFILES

CITRUS VALLEY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA
MARICOPA COUNTY

01P



FLOOD PROFILES

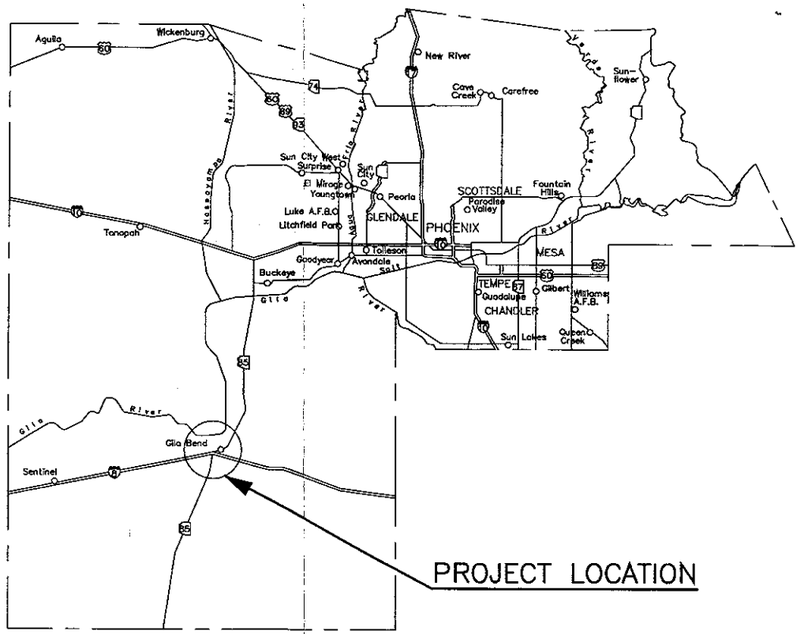
CITRUS VALLEY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
UNINCORPORATED MARICOPA COUNTY, ARIZONA
MARICOPA COUNTY

02P

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOODPLAIN DELINEATION STUDY OF GILA BEND AREA
FCD CONTRACT NO. 99-18



MARICOPA COUNTY
Not to Scale

DATUM

HORIZONTAL: North American Datum of 1983
VERTICAL: National Geodetic Vertical Datum of 1929

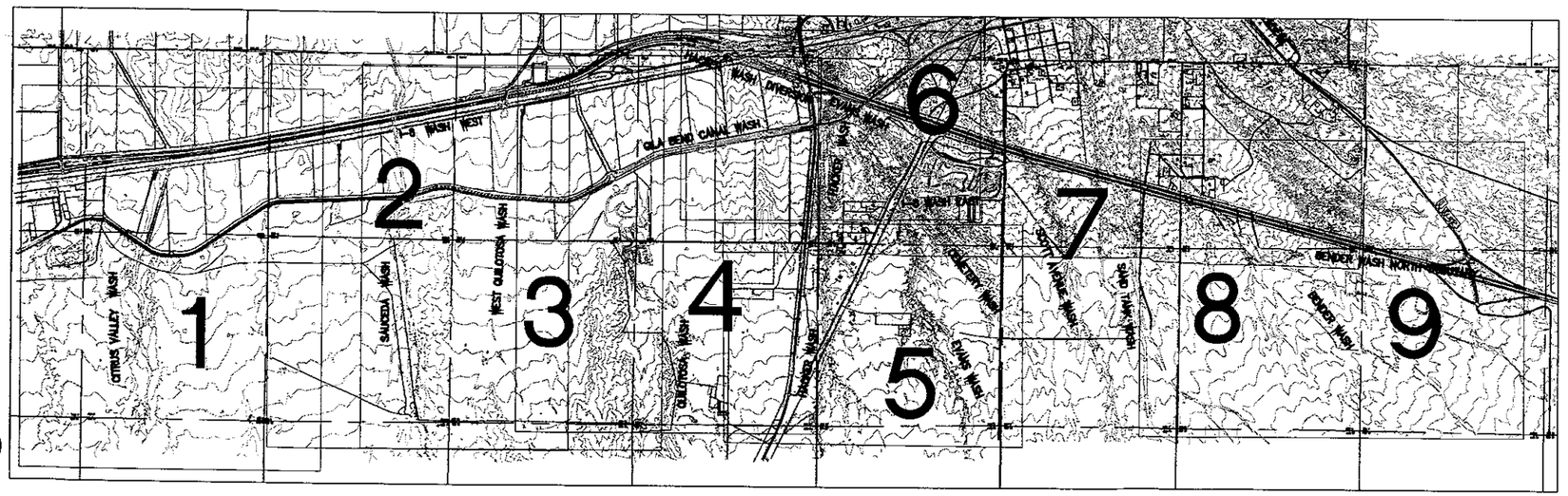
STATEMENTS BY PROFESSIONAL REGISTRANTS

The following statements apply to the individual seals affixed to each of the maps following the cover sheet.

The ground control survey was prepared under my direct supervision

The photogrammetry and topographic mapping were prepared under my direct supervision:

The floodplain and floodway delineation were prepared under my direct supervision:



STUDY AREA MAP AND SHEET INDEX

AERIAL MAPPING

COOPER AERIAL SURVEYS CO.
11402 N. CAVE CREEK ROAD
PHOENIX, ARIZONA 85020
FLIGHT DATE: 9-7-99 & 9-30-99
CONTOUR INTERVAL: 2' & 4'

GROUND CONTROL

SURVNET INC.
150 N. STAPLEY DRIVE
MESA, ARIZONA 85203

HYDRAULICS

ENGINEERING AND ENVIRONMENTAL CONSULTANTS
3003 N. CENTRAL AVENUE, SUITE 600
PHOENIX, AZ. 85012-2905 602-248-7702

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF CITRUS VALLEY WASH F.C.D. CONTRACT NO. 99-18 GILA BEND ADMP

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE — 2.0
- CROSS SECTION — FP=100 Yr WSEL; FW=Floodway WSEL 5.519; Q=100 Yr Flow
- ELEVATION REFERENCE MARK — ⊗ ERM26
- BASE FLOOD ELEVATIONS — 1770
- ZONE DESIGNATIONS — ZONE AE
- SECTION LINE

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUM. ELEV. (FT) DESCRIPTION/LOCATION

ERM #19 EL=738.01
Chiseled square at the northeast corner of 9.5' x 9.5' masonry foundation at well site, 3.0 miles west of Highway 85 along the Gila Bend Canal, on the north side of north canal road. Section 5, T 6 S, R 5 W.

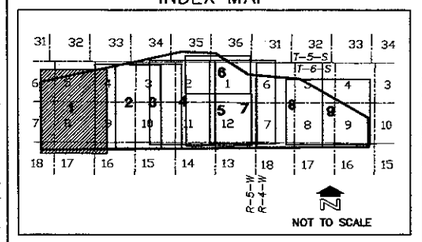
ERM #20 EL=740.09 Chiseled square at the northwest corner of bridge over canal at base of 4" x 4" metal gatepost, 4.0 miles west of Highway 85 along the Gila Bend Canal, on the south side of north canal road. Section 5, T 6 S, R 5 W.

ERM #26 EL=721.20 ADOT Brass Cap marked "4855.71" at centerline of headwall on north side of west bound Interstate 8, +/- 120 feet east of milepost 112. Section 5, T 6 S, R 5 W.

ERM #27 EL=730.88
Brass cap in centerline of headwall on the west end of a cattle guard, on the west side of Citrus Valley Road, 55 feet north of the west bound Interstate 8 off ramp. Section 6, T 6 S, R 5 W.

ERM #43 EL=762.57
Brass cap in concrete. 4.0 miles west of Highway 85 on the north side of the Gila Bend Canal to a bridge, then southerly across bridge 0.05 miles to a Y, right at Y then southerly along dirt track 0.95 miles then left 150 feet to the point. Brass cap lies +/-15 feet west of a mesquite tree and +/-145 feet north of 8' high metal post. Section 8, T 6 S, R 5 W.

INDEX MAP



400' 0' 400' 800'
SCALE: 1" = 400'
CONTOUR INTERVAL = 4 FEET

eec
Engineering and Environmental Consultants, Inc.
3003 N. Central Avenue, Suite 600
Phoenix, Arizona 85012-2905
TEL: (602)248-7702 FAX: (602)248-7851

	BY	DATE
DESIGN	LAV	10/01
DESIGN CHK.	FCDMC	10/01
PLANS	KLH	10/01
PLANS CHK.	LAV	10/01

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 1 OF 9

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF SAUCEDA WASH

F.C.D. CONTRACT NO. 99-18

GILA BEND ADMP

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE — 2.0
- CROSS SECTION — FP=100 Yr WSEL, FW=Floodway WSEL, Q=100 Yr Flow — 5.519
- ELEVATION REFERENCE MARK — ⊗ ERM26
- BASE FLOOD ELEVATIONS — 1770
- ZONE DESIGNATIONS — ZONE AE
- SECTION LINE

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUM.	ELEV. (FT)	DESCRIPTION/LOCATION

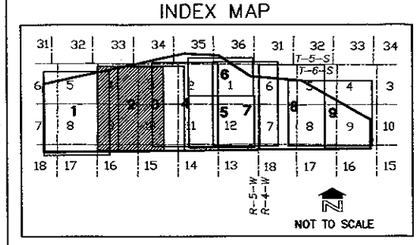
ERM #18 EL=742.84
Chiseled square at centerline of headwall at gate valve, north side of canal, +/- 95 feet west of west side of siphon, 2.3 miles west of Highway 85 along Gila Bend Canal, on the south side of north canal road.
Section 4, T 6 S, R 5 W.

ERM #25 EL=725.56
Chiseled square on top of headwall at northwest corner of bridge on west bound Interstate 8, 0.25 miles east of milepost 113.
Section 4, T 6 S, R 5 W.

ERM #44 EL=766.52
Brass cap in concrete. 4.0 miles west of Highway 85 on the north side of the Gila Bend Canal to a bridge, then southerly across bridge 0.05 miles to a Y, left at Y and south easterly and easterly 1.45 miles to a Y, right at Y then southeasterly 0.95 miles to a gate in fence. Station at north end of gate, 2 feet north and 2 feet west of a 6"x8" post.
Section 9, T 6 S, R 5 W.

ERM #45 EL=774.62
Brass cap in concrete. 4.0 miles west of Highway 85 on the north side of the Gila Bend Canal to a bridge, then southerly across bridge 0.05 miles to a Y, left at Y and south easterly and easterly 1.45 miles to a Y, left at Y and continue easterly 0.85 miles to a line of utility poles running north and south, south along utility line 0.95 miles to a gate in a fence. Station at west end of gate, 2.5' north and 1.5' west of a 6"x8" post.
Section 10, T 6 S, R 5 W.

INDEX MAP



400' 0' 400' 800'
SCALE: 1"= 400'
CONTOUR INTERVAL = 4 FEET

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	BY	DATE
DESIGN	LAV	10/01
DESIGN CHK.	FCDMC	10/01
PLANS	KLH	10/01
PLANS CHK.	LAV	10/01

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

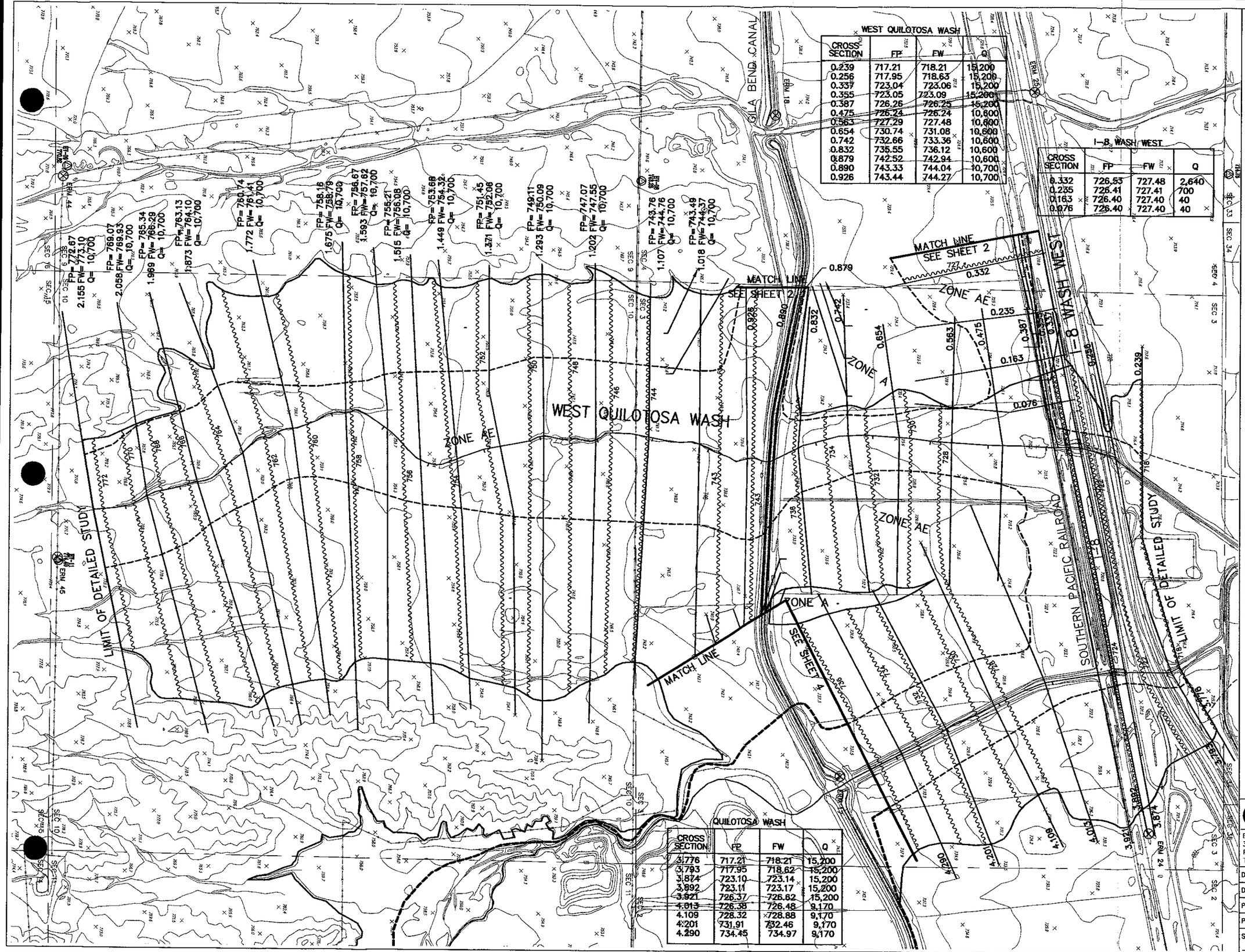
RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SUBMITTED BY: DATE:

SHEET 2 OF 9



WEST QUILOTOSA WASH			
CROSS SECTION	FP	FW	Q
0.239	717.21	718.21	15,200
0.256	717.95	718.63	15,200
0.337	723.04	723.06	15,200
0.355	723.05	723.09	15,200
0.387	726.26	726.25	15,200
0.475	726.24	726.24	10,600
0.563	727.29	727.48	10,600
0.654	730.74	731.08	10,600
0.742	732.66	733.36	10,600
0.832	735.55	736.12	10,600
0.879	742.52	742.94	10,600
0.890	743.33	744.04	10,700
0.926	743.44	744.27	10,700

I-8 WASH WEST			
CROSS SECTION	FP	FW	Q
0.332	726.53	727.48	2,640
0.235	726.41	727.41	700
0.163	726.40	727.40	40
0.076	726.40	727.40	40

QUILOTOSA WASH			
CROSS SECTION	FP	FW	Q
3.776	717.21	718.21	15,200
3.793	717.95	718.62	15,200
3.874	723.10	723.14	15,200
3.892	723.11	723.17	15,200
3.921	726.37	726.62	15,200
4.013	726.38	726.48	9,170
4.109	728.32	728.88	9,170
4.201	731.91	732.46	9,170
4.290	734.45	734.97	9,170

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF WEST QUILOTOSA WASH F.C.D. CONTRACT NO. 99-18 GILA BEND ADMP

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE — 2.0
- CROSS SECTION — 5.519 — FP=100 Yr WSEL, FW=Floodway WSEL, Q=100 Yr Flow
- ELEVATION REFERENCE MARK — ⊗ ERM26
- BASE FLOOD ELEVATIONS — 1770
- ZONE DESIGNATIONS — ZONE AE
- SECTION LINE

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUM. ELEV. (FT) DESCRIPTION/LOCATION

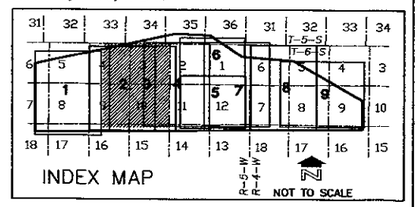
ERM #17 EL=742.46
Chiseled square in north end of headwall, on the west side of canal siphon, 1.15 miles west of Highway 85 along the Gila Bend Canal, on the south side of north canal road.
Section 3, T 6 S, R 5 W.

ERM #24 EL=727.69
NGS Point "TOSA", (PID DA0685) Located West of Gila Bend along the Union Pacific Railroad, 2.1 miles west of Martin Avenue. Point lies 1.6 miles west of the I-8 overpass, 50 feet north of the north rail, and 96.5 feet south of the extended centerline of the I-8 frontage road
Section 3, T 6 S, R 5 W.

ERM #25 EL=725.56
Chiseled square on top of headwall at northwest corner of bridge on west bound Interstate 8, 0.25 miles east of milepost 113.
Section 4, T 6 S, R 5 W.

ERM #44 EL=766.52
Brass cap in concrete. 4.0 miles west of Highway 85 on the north side of the Gila Bend Canal to a bridge, then southerly across bridge 0.05 miles to a Y, left at Y and south easterly and easterly 1.45 miles to a Y, right at Y then southeasterly 0.95 miles to a gate in fence. Station at north end of gate, 2 feet north and 2 feet west of a 6"x8" post.
Section 9, T 6 S, R 5 W.

ERM #45 EL=774.62
Brass cap in concrete. 4.0 miles west of Highway 85 on the north side of the Gila Bend Canal to a bridge, then southerly across bridge 0.05 miles to a Y, left at Y and south easterly and easterly 1.45 miles to a Y, left at Y and continue easterly 0.85 miles to a line of utility poles running north and south, south along utility line 0.95 miles to a gate in a fence. Station at west end of gate, 2.5' north and 1.5' west of a 6"x8" post.
Section 10, T 6 S, R 5 W.



400' 0' 400' 800'
SCALE: 1"= 400'
CONTOUR INTERVAL = 4 FEET

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PLANS	KLH	10/01
PLANS CHK.	LAV	10/01

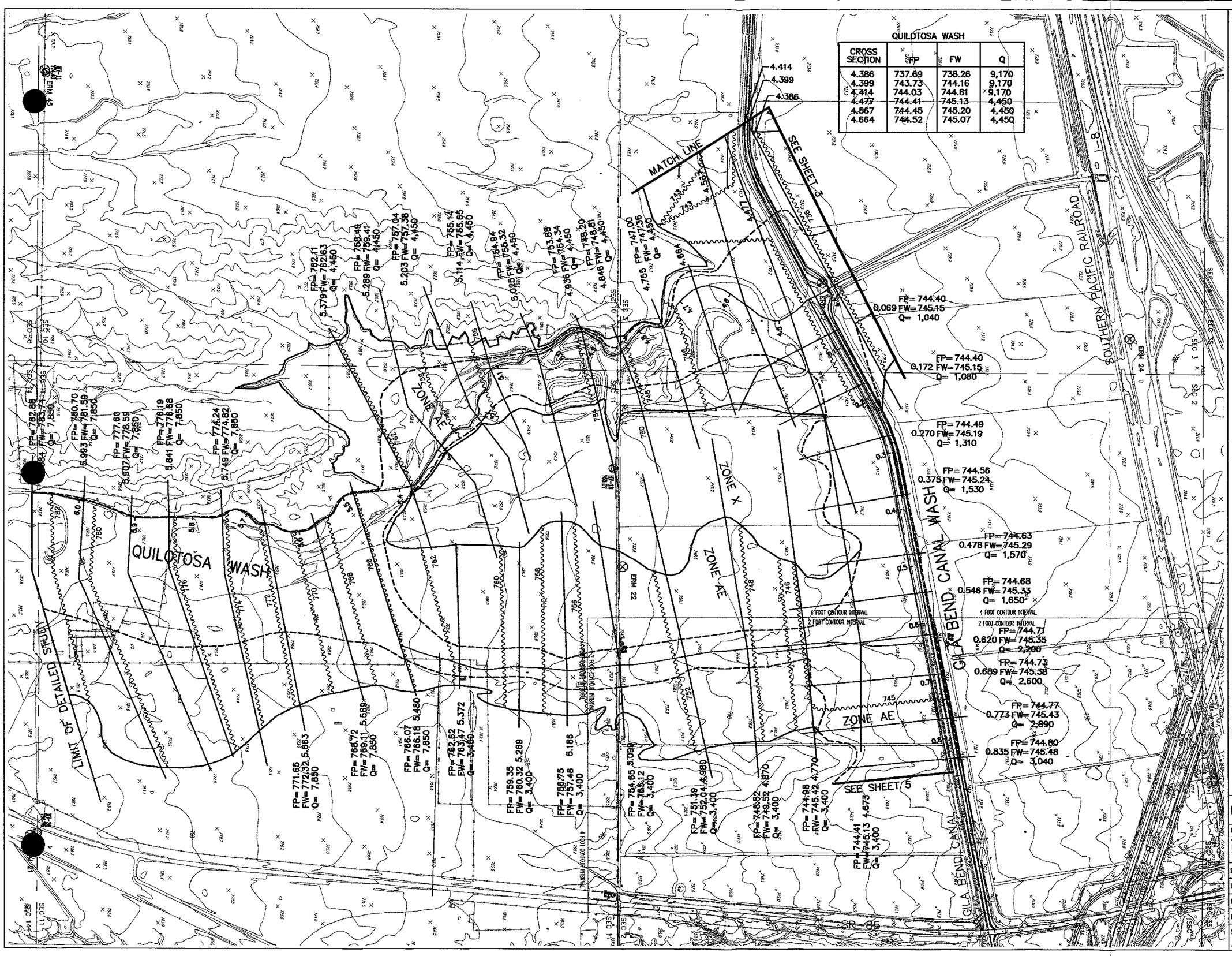
SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF QUILOTOSA WASH F.C.D. CONTRACT NO. 99-18 GILA BEND ADMP

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE (2.0)
- CROSS SECTION (FP=100 Yr WSEL 5.519; FW=Floodway WSEL; Q=100 Yr Flow)
- ELEVATION REFERENCE MARK (⊗ ERM26)
- BASE FLOOD ELEVATIONS (1770)
- ZONE DESIGNATIONS (ZONE AE)
- SECTION LINE

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUM. ELEV. (FT) DESCRIPTION/LOCATION

ERM #17 EL=742.46
Chiseled square in north end of headwall, on the west side of canal siphon, 1.15 miles west of Highway 85 along the Gila Bend Canal, on the south side of north canal road. Section 3, T 6 S, R 5 W.

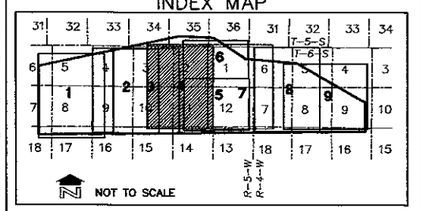
ERM #21 EL=787.94
NGS Point "R-1", (PID DA0499) Located SW of Gila Bend along the E side of SR 85, 1.9 miles S of I-18. Point lies between SR 85 and the Railroad tracks, 66 feet SE of the SR 85 centerline, 90 feet NW rail of the tracks, and 5 feet SE of Railway milepost 3. Section 14, T 6 S, R 5 W.

ERM #22 EL=754.46
Chiseled square on the southwest corner of an electrical equipment pad at pump, 25 feet north of a utility pole, 0.55 miles west of Highway 85 from the intersection of Highway 85 and Thayer Road. Section 2, T 6 S, R 5 W.

ERM #24 EL=727.69
NGS Point "TOSA", (PID DA0685) Located West of Gila Bend along the Union Pacific Railroad, 2.1 miles west of Martin Avenue. Point lies 1.6 miles west of the I-8 overpass, 50 feet north of the north rail, and 96.5 feet south of the extended centerline of the I-8 frontage road Section 3, T 6 S, R 5 W.

ERM #45 EL=774.62
Brass cap in concrete. 4.0 miles west of Highway 85 on the north side of the Gila Bend Canal to a bridge, then southerly across bridge 0.05 miles to a Y, left at Y and south easterly and easterly 1.45 miles to a Y, left at Y and continue easterly 0.85 miles to a line of utility poles running north and south, south along utility line 0.95 miles to a gate in a fence. Station at west end of gate, 2.5' north and 1.5' west of a 6"x8" post. Section 10, T 6 S, R 5 W.

INDEX MAP



400' 0' 400' 800'
SCALE: 1"= 400'
CONTOUR INTERVAL = 4 FEET

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PLANS	KLH	10/01
PLANS CHK.	LAV	10/01

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
RECOMMENDED BY: DATE
APPROVED BY: DATE
CHIEF ENGINEER AND GENERAL MANAGER

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HACKER WASH F.C.D. CONTRACT NO. 99-18 GILA BEND ADMP

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE (2.0)
- CROSS SECTION — FP=100 Yr WSEL 5.519; FW=Floodway WSEL 100 Yr Flow
- ELEVATION REFERENCE MARK — ⊗ ERM26
- BASE FLOOD ELEVATIONS — 1770
- ZONE DESIGNATIONS — ZONE AE
- SECTION LINE

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

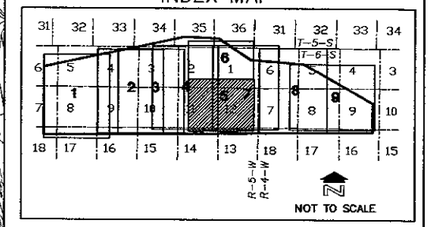
I.D. NUM.	ELEV. (FT)	DESCRIPTION/LOCATION

ERM #4 EL=727.68
1.1 Miles west along the Southern Pacific Railroad from the depot at Gila Bend to a bridge, 8 Feet north of the north rail of the north track set in a drill hole in the top of the northwest concrete abutment and about 5 inches lower than the track. The mark is a brass cap stamped Coast & Geodetic Survey K354

ERM #22 EL=754.46
Chiseled square on the southwest corner of an electrical equipment pad at pump, 25 feet north of a utility pole, 0.55 miles west of Highway 85 from the intersection of Highway 85 and Thayer Road. Section 2, T 6 S, R 5 W.

ERM #23 EL=765.42
NGS Point "J-331", (PID DA0498) Located 1.65 mi. SW along the Tucson, Cornelia and Gila Bend Railway from the Martin Avenue crossing in Gila Bend, at the second telegraph pole SW of railway milepole 2, at a dip in the old highway 8, 195.5 feet North of the NW corner of a wooden railway bridge number 21, 95.4 feet NW of the NW rail of the tracks, 46.0 feet SE of the centerline of the old highway, 5.0 feet NE oth the telegraph pole, 2 ft. SW from a witness post, and 1 ft. below the tracks. Section 12 T 6 S, R 5 W.

INDEX MAP



400' 0' 400' 800'
SCALE: 1"= 400'
CONTOUR INTERVAL = 2 FEET AND 4 FEET

HACKER WASH

CROSS SECTION	FP	FW	Q
2.204	745.93	746.36	1,350
2.030	745.93	746.36	1,350
1.952	745.92	746.35	1,350

GILA BEND CANAL WASH

CROSS SECTION	FP	FW	Q
0.902	744.85	745.57	3,090
0.974	744.86	745.60	3,090
1.052	744.94	745.68	3,100
1.143	745.04	745.61	3,380

EVANS WASH

CROSS SECTION	FP	FW	Q w/o FP	Q w/o FW
0.228	745.90	746.34	7,248	8988
0.324	745.94	746.80	7,248	8988
0.418	745.94	746.94	7,248	8988
0.508	747.39	748.09	7,248	8988

To account for the 1740 cfs split flow, the floodplain peak discharge on Evans Wash was reduced by 1740 cfs between stations 0.228 and 0.664. The floodway peak discharge, however, was not reduced in order to provide conveyance for future conditions.

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SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF HACKER WASH F.C.D. CONTRACT NO. 99-18 GILA BEND ADMP

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE (2.0)
- CROSS SECTION — FP=100 Yr WSEL; FW=Floodway WSEL 5.519; Q=100 Yr Flow
- ELEVATION REFERENCE MARK ⊗ ERM26
- BASE FLOOD ELEVATIONS 1770
- ZONE DESIGNATIONS ZONE AE
- SECTION LINE

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUM.	ELEV. (FT)	DESCRIPTION/LOCATION

ERM #4 EL=727.68
1.1 Miles west along the Southern Pacific Railroad from the depot at Gila Bend to a bridge, 8 Feet north of the north rail of the north track set in a drill hole in the top of the northwest concrete abutment and about 5 inches lower than the track. The mark is a brass cap stamped Coast & Geodetic Survey K354

ERM #22 EL=754.46
Chiseled square on the southwest corner of an electrical equipment pad at pump, 25 feet north of a utility pole, 0.55 miles west of Highway 85 from the intersection of Highway 85 and Thayer Road. Section 2, T 6 S, R 5 W.

ERM #23 EL=765.42
NGS Point "J-331", (PID DA0498) Located 1.65 mi. SW along the Tucson, Cornelio and Gila Bend Railway from the Martin Avenue crossing in Gila Bend, at the second telegraph pole SW of railway milepole 2, at a dip in the old highway 8, 195.5 feet North of the NW corner of a wooden railway bridge number 21, 95.4 feet NW of the NW rail of the tracks, 46.0 feet SE of the centerline of the old highway, 5.0 feet NE oth the telegraph pole, 2 ft. SW from a witness post, and 1 ft. below the tracks.
Section 12 T 6 S, R 5 W.

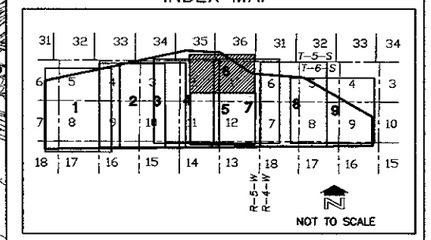
HACKER WASH

CROSS SECTION	FP	FW	Q
1.210	723.41	724.41	8,700
1.283	724.52	725.40	3,250
1.306	725.18	725.23	3,250
1.320	725.17	725.60	3,250
1.336	728.19	728.54	3,250
1.351	728.65	728.98	3,250
1.452	728.47	729.29	3,250
1.530	731.61	732.31	3,250
1.539	731.84	732.10	8,960
1.612	733.96	734.42	8,960
1.650	741.26	741.33	8,960
1.734	741.32	741.50	8,960
1.829	741.34	741.56	8,960
1.865	745.90	746.32	8,870

HACKER WASH DIVERSION

CROSS SECTION	FP	FW	Q
0.268	728.01	728.97	5,570
0.364	729.54	729.76	5,570
0.449	732.63	733.59	5,570
0.540	733.90	734.90	5,570

INDEX MAP



200' 0' 200' 400'
SCALE: 1"= 200'
CONTOUR INTERVAL = 2 FEET AND 4 FEET

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DESIGN	LAV	10/01
DESIGN CHK.	FCDMC	10/01
PLANS	KLH	10/01
PLANS CHK.	LAV	10/01

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 6 OF 9

LIMIT OF DETAILED STUDY

I-8 · SOUTHERN PACIFIC RAILROAD · PIMA ROAD · SR-85 · EVANS WASH · GILA BEND CANAL · SR-85 · SEE SHEET 5 · MATCH LINE · ZONE AE · 4 FOOT CONTOUR INTERVAL · 2 FOOT CONTOUR INTERVAL · FP=723.45 FW=724.45 Q=8,700 · FP=724.06 FW=725.04 Q=5,540 0.029 · FP=724.11 FW=725.08 Q=5,540 0.139 · FP=727.44 FW=727.79 Q=5,540 0.170 · FP=727.97 FW=728.77 Q=5,570 0.219

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF EVANS WASH & CEMETERY WASH F.C.D. CONTRACT NO. 99-18 GILA BEND ADMP

EVANS WASH

CROSS SECTION	FP	FW	Q-FP	Q-FW
0.599	749.68	750.42	7,248	8,988
0.664	750.99	751.89	7,248	8,988
0.694	754.76	755.66	8,988	8,988
0.795	754.85	755.79	1,110	1,110
0.901	754.87	755.81	1,110	1,110
1.001	755.12	755.94	1,110	1,110
1.092	757.05	757.37	1,110	1,110

To account for the 1740 cfs split flow, the floodplain peak discharge on Evans Wash was reduced by 1740 cfs between stations 0.228 and 0.664. The floodway peak discharge, however, was not reduced in order to provide conveyance for future conditions.

PIONEER CEMETERY WASH

CROSS SECTION	FP	FW	Q
0.001	754.76	755.66	8,988
0.196	754.91	755.79	790
0.202	754.93	755.80	790
0.292	755.16	755.51	790
0.395	759.58	759.98	790

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE (2.0)
- CROSS SECTION — FP=100 Yr WSEL; FW=Floodway WSEL 5.519; Q=100 Yr Flow
- ELEVATION REFERENCE MARK — ⊗ ERM26
- BASE FLOOD ELEVATIONS — 1770
- ZONE DESIGNATIONS — ZONE AE
- SECTION LINE

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUM.	ELEV. (FT)	DESCRIPTION/LOCATION

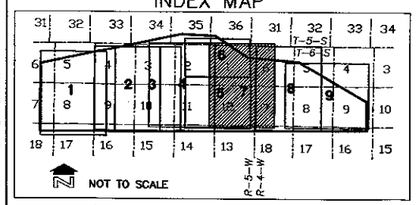
ERM #13 EL=795.60
Located 0.3 miles south along State Highway 85 from the Southern Pacific Company Railroad Station at gila bend, thence 1.9 miles south along graded road at the "T" junction of a graded road leading east of a fence corner, 51 feet north of the centerline of the road east, 45 feet east of the centerline of the centerline of the rood south, 36 feet north of the fence corner 2.8 feet north of a witness post 2.4 feet west of a fence, and set in the top of a concrete post projecting 0.6 feet above the ground and level with the road. The mark is a brass cap stamped "U.S. Coast & Geodetic Survey N298"

ERM #14 EL=766.82
Located 0.3 miles south along State Highway 85 from the Southern Pacific Company Railroad Station at Gila Bend. Thence 0.7 mile south along a graded road on a small barren patch, 59 feet south of the centerline of the road, 2.4 feet north of a witness post and set in the top of a concrete post projecting 0.5 foot above the ground and about 1 foot higher than the road. The mark is a brass cap stamped "U.S. Coast and Geodetic Survey M298"

ERM #23 EL=765.42
NGS Point "J-331", (PID DA0498) Located 1.65 mi. SW along the Tucson, Cornelia and Gila Bend Railway from the Martin Avenue crossing in Gila Bend, at the second telegraph pole SW of railway mile pole 2, at a dip in the old highway 8, 195.5 feet North of the NW corner of a wooden railway bridge number 21, 95.4 feet NW of the NW rail of the tracks, 46.0 feet SE of the centerline of the old highway, 5.0 feet NE oth the telegraph pole, 2 ft. SW from a witness post, and 1 ft. below the tracks.
Section 12 T 6 S, R 5 W.

ERM #32 EL=744.75
1" iron pipe, 2.8 feet east and 1.0 foot north of a utility pole and 2.6 feet north of a #4 rebar with cap stamped "LS 9087", +/- 30 feet south of a building corner and +/- 150 feet west of the intersection of Main St. and Martin Ave.
Section 31, T 5 S, R 5 W.

INDEX MAP



400' 0' 400' 800'

SCALE: 1"= 400'
CONTOUR INTERVAL = 2 FEET AND 4 FEET

eec
Engineering and Environmental Consultants, Inc.
3003 N. Central Avenue, Suite 600
Phoenix, Arizona 85012-2905
TEL:(602)248-7702 FAX:(602)248-7851

	BY	DATE
DESIGN	LAV	10/01
DESIGN CHK.	FCDMC	10/01
PLANS	KLH	10/01
PLANS CHK.	LAV	10/01

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF SAND TANK WASH & SCOTT AVENUE WASH F.C.D. CONTRACT NO. 99-18 GILA BEND ADMP

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE — 2.0
- CROSS SECTION — FP=100 Yr WSEL; FW=Floodway WSEL 5.519; Q=100 Yr Flow
- ELEVATION REFERENCE MARK — ⊗ ERM26
- BASE FLOOD ELEVATIONS — 1770
- ZONE DESIGNATIONS — ZONE AE
- SECTION LINE

ZONE A WITH SPECIAL FLOOD HAZARD AREAS THAT EXPERIENCE SIGNIFICANT LATERAL FLOW BETWEEN WASHES. NO DEVELOPMENT SHALL BE ALLOWED THAT WOULD INHIBIT THE LATERAL CROSS FLOW.

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

I.D. NUM. ELEV. (FT) DESCRIPTION/LOCATION

ERM #13 EL=795.60
Located 0.3 miles south along State Highway 85 from the Southern Pacific Company Railroad Station at gila bend, thence 1.9 miles south along graded road at the "T" function of a graded road leading east of a fence corner, 51 feet north of the centerline of the road east, 45 feet east of the centerline of the centerline of the road south, 36 feet north of the fence corner 2.8 feet north of a witness post 2.4 feet west of a fence, and set in the top of a concrete post projecting 0.6 feet above the ground and level with the road. The mark is a brass cap stamped "U.S. Coast & Geodetic Survey N298"

ERM #14 EL=766.82
Located 0.3 miles south along State Highway 85 from the Southern Pacific Company Railroad Station at Gila Bend. Thence 0.7 mile south along a graded road on a small barren patch, 59 feet south of the centerline of the road, 2.4 feet north of a witness post and set in the top of a concrete post projecting 0.5 foot above the ground and about 1 foot higher than the road. The mark is a brass cap stamped "U.S. Coost and Geodetic Survey M298"

ERM #16 ERM EL=804.28
Located 0.3 mile south along State Highway 85 from the Southern Pacific Railroad Station at Gila Bend. Thence 1.9 miles south along a graded road, thence 0.7 mile east along a graded road at a gravel pit and a large mound of dirt at the junction of a track road leading south along a fence line, 86 feet north of the remains of a fnece corner. 111 feet north of the junction of the tracked road, 18 feet east of the dirt mound, 5.0 feet northwest of a 6 foot high wooden post, 1.6 feet southwest of a witness post, set in the top of a concrete post projecting 0.4 foot above the ground and level with the roads. The mark is a brass cap stamped "U.S. Coast & Geodetic Survey R60"

ERM #38 EL=786.03
ADOT Brass Cap marked "786.19" on headwall on the north side of west bound Interstate 8, 0.8 miles west of milepost 119. Section 5, T 6 S, R 4 W.

ERM #39 EL=773.63
ADOT Brass Cap marked "Elev 773.79 MED. STA. 5145+22.66", on headwall on north side of west bound Interstate 8, 0.5 miles west of milepost 118 and 0.1 miles west of bridge over Sand Tank Wash. Section 6, T 6 S, R 4 W.

I-8 WASH EAST

CROSS SECTION	FP	FW	Q
0.395	756.45	756.18	9,290
0.490	755.60	756.29	9,290
0.695	761.42	761.42	9,290

SCOTT AVENUE WASH

CROSS SECTION	FP	FW	Q
5.258	760.10	760.10	1,408
5.338	762.48	762.48	13,168
5.427	765.05	765.05	13,168
5.521	767.43	767.43	13,168
5.625	770.40	770.40	8,997
5.724	772.74	772.73	8,997

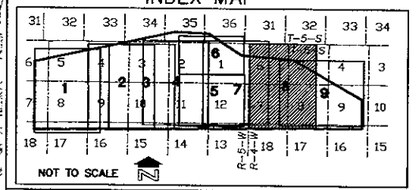
SAND TANK WASH

CROSS SECTION	FP	FW	Q
4.917	769.49	769.49	15,573
5.013	770.28	770.28	15,703
5.112	771.65	771.65	15,703
5.207	774.66	774.66	15,699
5.299	778.55	778.55	16,139
5.387	780.75	780.74	16,536
5.482	783.12	783.13	16,765
5.580	784.62	784.62	16,859
5.676	785.09	785.09	16,679

BENDER WASH

CROSS SECTION	FP	FW	Q
1.904	777.00	778.00	3,612
1.930	777.32	777.95	4,116
1.966	778.32	778.43	4,116
2.013	778.62	778.71	5,101
2.089	780.06	780.03	5,101
2.184	784.72	784.73	5382
2.274	787.30	787.29	5,350

INDEX MAP



SCALE: 1"= 400'
CONTOUR INTERVAL = 2 FEET AND 4 FEET

Engineering and Environmental Consultants, Inc.
3003 N. Central Avenue, Suite 600
Phoenix, Arizona 85012-2905
TEL:(602)248-7702 FAX:(602)248-7851

	BY	DATE
DESIGN	LAV	10/01
DESIGN CHK.	FCDMC	10/01
PLANS	KLH	10/01
PLANS CHK.	LAV	10/01

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SUBMITTED BY: DATE:

SHEET 8 OF 9

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FLOOD DELINEATION STUDY OF

BENDER WASH & BENDER WASH NORTH TRIBUTARY

F.C.D. CONTRACT NO. 99-18

GILA BEND ADMP

BENDER WASH NORTH TRIBUTARY

CROSS SECTION	FP	FW	Q
0.323	789.88	790.09	5,530
0.416	792.77	792.86	1,670
0.481	792.90	793.06	1,670
0.562	792.93	793.10	1,670
0.576	794.00	793.98	1,670
0.637	797.07	797.19	1,670
0.734	800.51	800.64	1,670
0.829	803.90	804.32	1,670
0.910	804.45	804.73	1,670
0.925	804.49	804.76	1,670
0.987	804.55	804.89	1,670
1.000	805.08	806.07	1,670
1.090	811.69	812.32	1,670
1.176	815.97	816.02	1,670
1.267	819.15	819.13	1,670
1.317	819.97	820.00	1,670
1.358	820.22	820.26	1,670
1.450	820.37	820.41	1,670
1.495	823.73	823.72	1,670
1.530	825.58	825.68	1,670
1.622	825.97	826.09	1,670
1.727	828.31	828.31	1,670
1.818	836.47	836.65	1,670

LEGEND

- 100-YR FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EXISTING APPROXIMATE FLOODPLAIN BOUNDARY
- HYDRAULIC BASE LINE & RIVER MILE (2.0)
- CROSS SECTION (FP=100 Yr WSEL, FW=Floodway WSEL, Q=100 Yr Flow) 5,519
- ELEVATION REFERENCE MARK ⊗ ERM26
- BASE FLOOD ELEVATIONS 1770
- ZONE DESIGNATIONS ZONE AE
- SECTION LINE

ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929

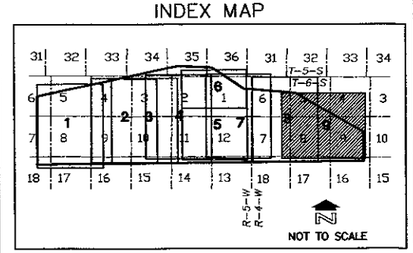
I.D. NUM. | ELEV. (FT) | DESCRIPTION/LOCATION

ERM # 10: ERM EL = 806.43
This station is located 2.6 miles east along State Highway 84 from the Southern Pacific Company Railroad Station at Gila Bend about 0.3 miles east of a ranch house, 50 feet north of the centerline of the highway, 1 foot north of the highway boundary line, and about 1 foot above the surface of the highway; set in the top of a concrete post projecting 3 inches above ground. The mark is a brass cap stamped "U.S. Coast & Geodetic Survey A84".

ERM#12 EL = 819.24
This station is located 2.5 miles southeast on State Highway 84 from the junction of U.S. Highway 80, 1.0 miles east of Gila Bend, to a gate in right-of-way fence, pass thru gate and go 0.2 miles southerly to the proposed Interstate Route, thence 0.5 miles on the proposed route, 70.19 feet north of F.M. 2, 52.85 feet southwest of R.M.I, 4 feet south of a metal witness post with sign, set in a cylindrical concrete post projecting 4 inches. The mark is a brass cap stamped "Coast & Geodetic Survey GIANT".

ERM #38 EL=786.03
ADOT Brass Cap marked "786.19" on headwall on the north side of west bound Interstate 8, 0.8 miles west of milepost 119.
Section 5, T 6 S, R 4 W.

INDEX MAP



N

400' 0' 400' 800'

SCALE: 1"= 400'
CONTOUR INTERVAL = 2 FEET AND 4 FEET

eec
Engineering and Environmental Consultants, Inc.
3003 N. Central Avenue, Suite 600
Phoenix, Arizona 85012-2905
TEL:(602)248-7702 FAX:(602)248-7851

	BY	DATE
DESIGN	LAV	10/01
DESIGN CHK.	FCDMC	10/01
PLANS	KLH	10/01
PLANS CHK.	LAV	10/01

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

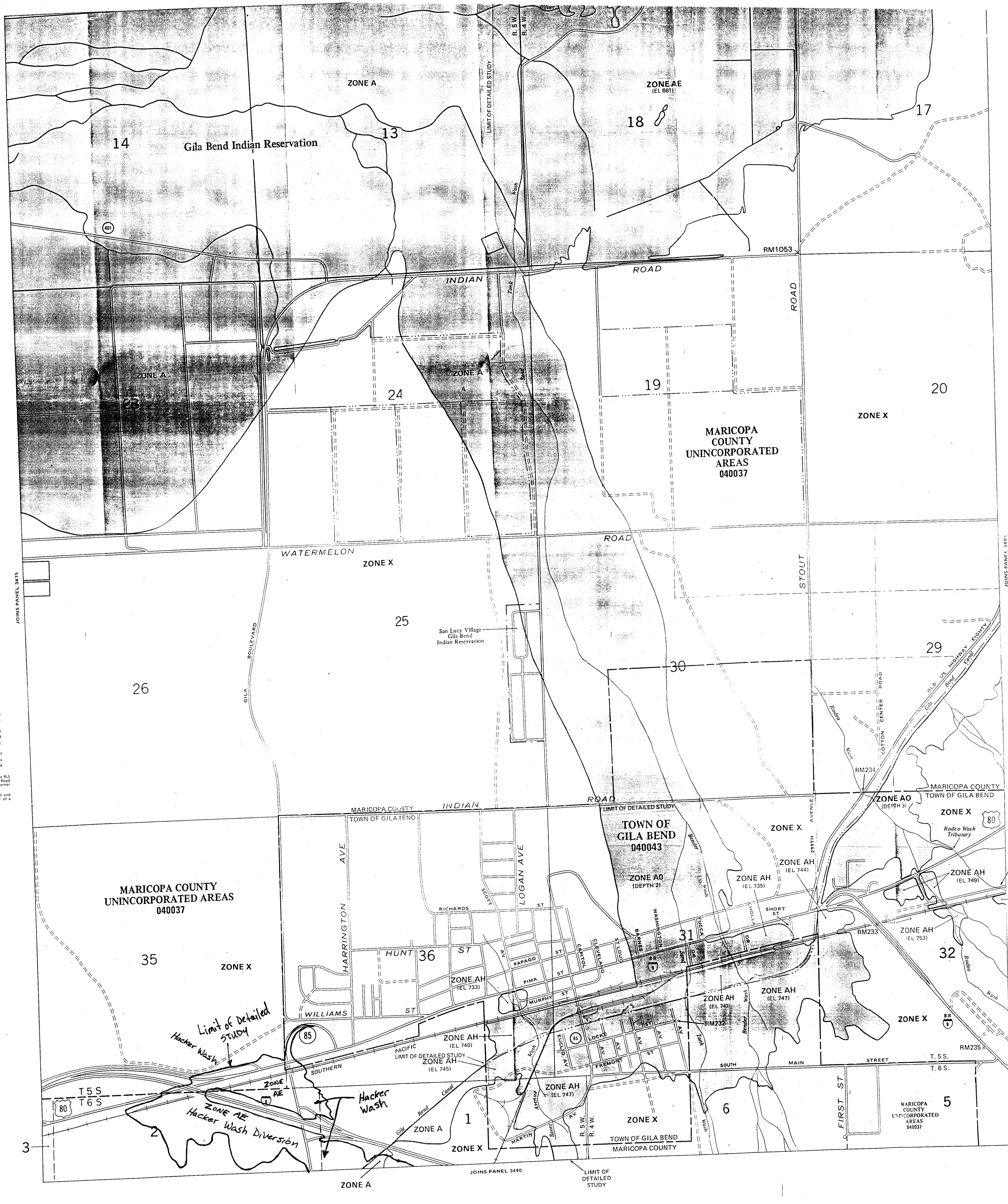
APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

SHEET 9 OF 9

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM232	740.88	Top pavement at centerline intersection of Washington Avenue and Locke Street.
RM233	781.20	U.S. Geological Survey brass cap in concrete cylinder in median on north side of Business Route Interstate 8 bridge over the Southern Pacific Railroad. Marked GILA.
RM234	738.36	AHD brass cap in center of north concrete headwall of culvert under old U.S. Highway 80. At first crossing of Rodeo Wash northeast of Gila Bend, north of rodeo grounds. Marked AHD, El. 738, 60, Sta 75 - 19, 1930
RM235	[illegible]	U.S. Geological brass cap in concrete cylinder 0.5 mile southeast of Southern Pacific Railroad along the westerly side of Business Route Interstate 8, southwest of entrance to trailer park. Marked R285.
RM1053	676.14	A 3 1/4" aluminum cap stamped "MCFCD bench mark Cella Barr Associates RLS 19324 1989", located at the northwest corner of a "T" intersection of Stout Road and a Dirt Road to the west. 1 mile north of Watermelon Road near Section corner 17, 18, 19, 20, T5S R4W, 2.5' south of a 4 strand barbed wire fence.
RM1054	645.94	GLO brass cap at Section corner 7, 8, 17, 18, T5S R4W Located at the north end of Stout Road at the Gila River 10' ± northwest of the southeast corner of a barbed wire fence.



ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year flood plain.

ZONE D Areas in which flood hazards are undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet*

(D)—(D) Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone*

RM7 X Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL
Map revised DECEMBER 3, 1993 to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to change special flood hazard areas, to change zone designations, to update map format, to add roads and road names, to reflect updated topographic information and to incorporate previously issued letters of map revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 3480 OF 4350

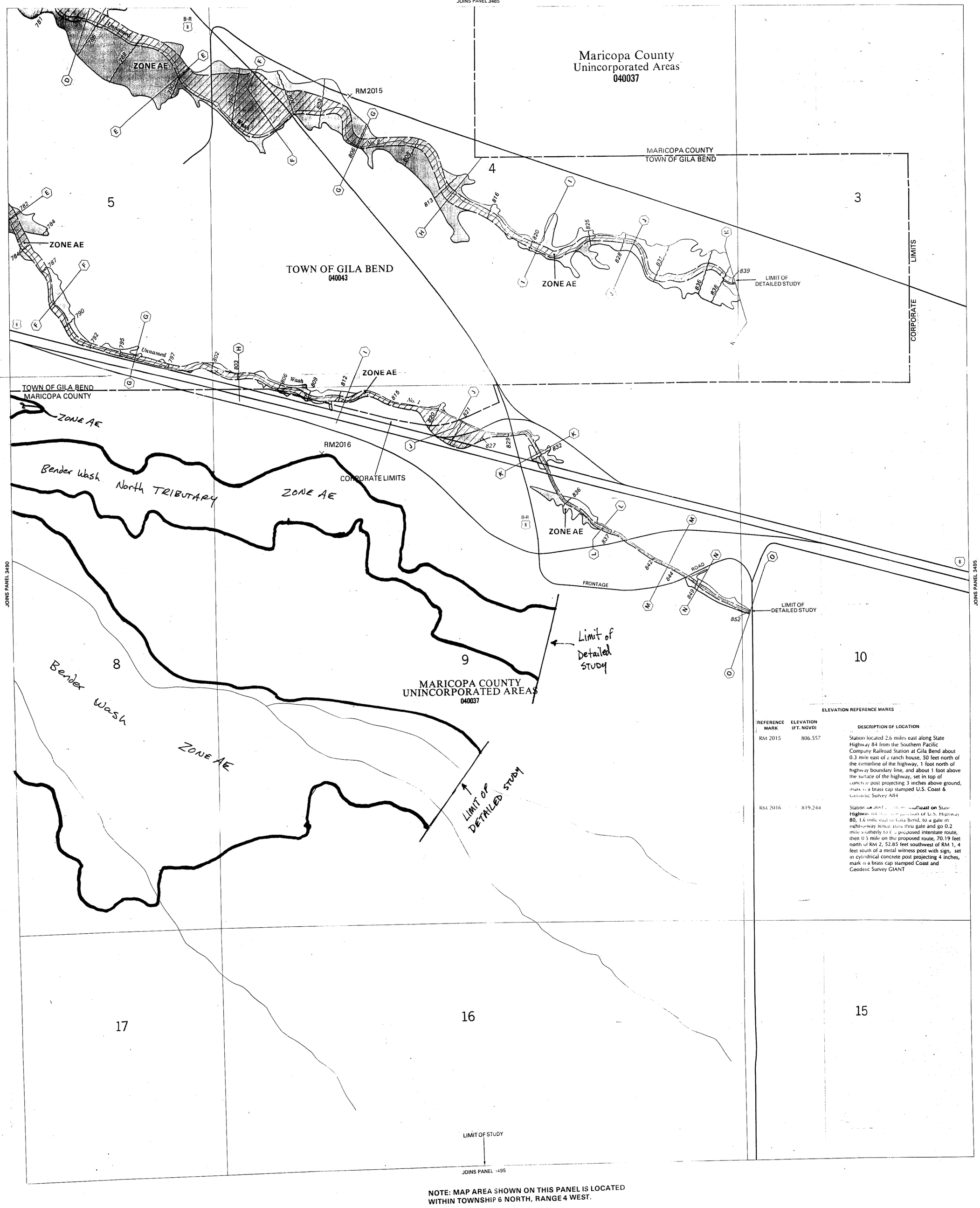
CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
GILA BEND, TOWN OF	040043	3480	E
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	3480	E

MAP NUMBER
04013C3480 E

MAP REVISED:
DECEMBER 3, 1993

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM 2015	806.557	Station located 2.6 miles east along State Highway 84 from the Southern Pacific Company Railroad Station at Gila Bend about 0.3 mile east of a ranch house, 50 feet north of the centerline of the highway, 1 foot north of highway boundary line, and about 1 foot above the surface of the highway, set in top of concrete post projecting 3 inches above ground, mark is a brass cap stamped U.S. Coast & Geodetic Survey A84
RM 2016	819.244	Station located [illegible] southeast on State Highway 84 from the junction of U.S. Highway 80, 1.6 mile east of Gila Bend, to a gate in right-of-way fence, pass thru gate and go 0.2 mile southerly to the proposed interstate route, then 0.5 mile on the proposed route, 70.19 feet north of RM 2, 52.85 feet southwest of RM 1, 4 feet south of a metal witness post with sign, set in cylindrical concrete post projecting 4 inches, mark is a brass cap stamped Coast and Geodetic Survey GIANT

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 NORTH, RANGE 4 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDAT BY 100-YEAR FLOOD

- ZONE A — No base flood elevations determined.
- ZONE AE — Base flood elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually area ponding); base flood elevations determi
- ZONE AO — Flood depths of 1 to 3 feet (usually s flow on sloping terrain); average de determined. For areas of alluvial fan fl ing, velocities also determined.
- ZONE A99 — To be protected from 100-year flood Federal flood protection system u construction; no base elevations determi
- ZONE V — Coastal flood with velocity hazard (v action); no base flood elevations de mined.
- ZONE VE — Coastal flood with velocity hazard (v action); base flood elevations determi

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- ZONE X — Areas of 500-year flood; areas 100-year flood with average de of less than 1 foot or with drain areas less than 1 square mile; areas protected by levees from year flood.

OTHER AREAS

- ZONE X — Areas determined to be outside year flood plain.
- ZONE D — Areas in which flood hazards undetermined.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Fl Hazard Zones, and Boun Dividing Areas of Diffe Coastal Base Flood Elevat Within Special Flood Ha Zones.

513 — Base Flood Elevation Line; vation in Feet*

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Where Uniform Within Zo

RM7X — Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Pro it does not necessarily identify all areas subject to flooding, partic from local drainage sources of small size, or all planimetric features o Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-3 AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by control structures.

Boundaries of the floodways were computed at cross sections and in tated between cross sections. The floodways were based on hyd considerations with regard to requirements of the Federal Emer Management Agency.

Floodway widths in some areas may be too narrow to show to s Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. Th should contact appropriate community officials to determine if cor limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mappir Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index

MAP REPOSITORY
Refer to Repository Listing on Index Map

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988
EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANE

Map revised SEPTEMBER 30, 1995 to update corporate lim change base flood elevations, to add base flood elevations, t special flood hazard areas, to change special flood hazard are change zone designations, to add and update roads and road n to reflect updated topographic information, to incorporate prev issued letters of map revision, and to incorporate previously letters of map amendment.

To determine if flood insurance is available, contact an ins agent or call the National Flood Insurance Program at 638-6620.

APPROXIMATE SCALE IN FEET
500 0 500

NATIONAL FLOOD INSURANCE P

FIRM
FLOOD INSURANCE RATE

MARICOPA COUNTY
ARIZONA AND
INCORPORATED AR

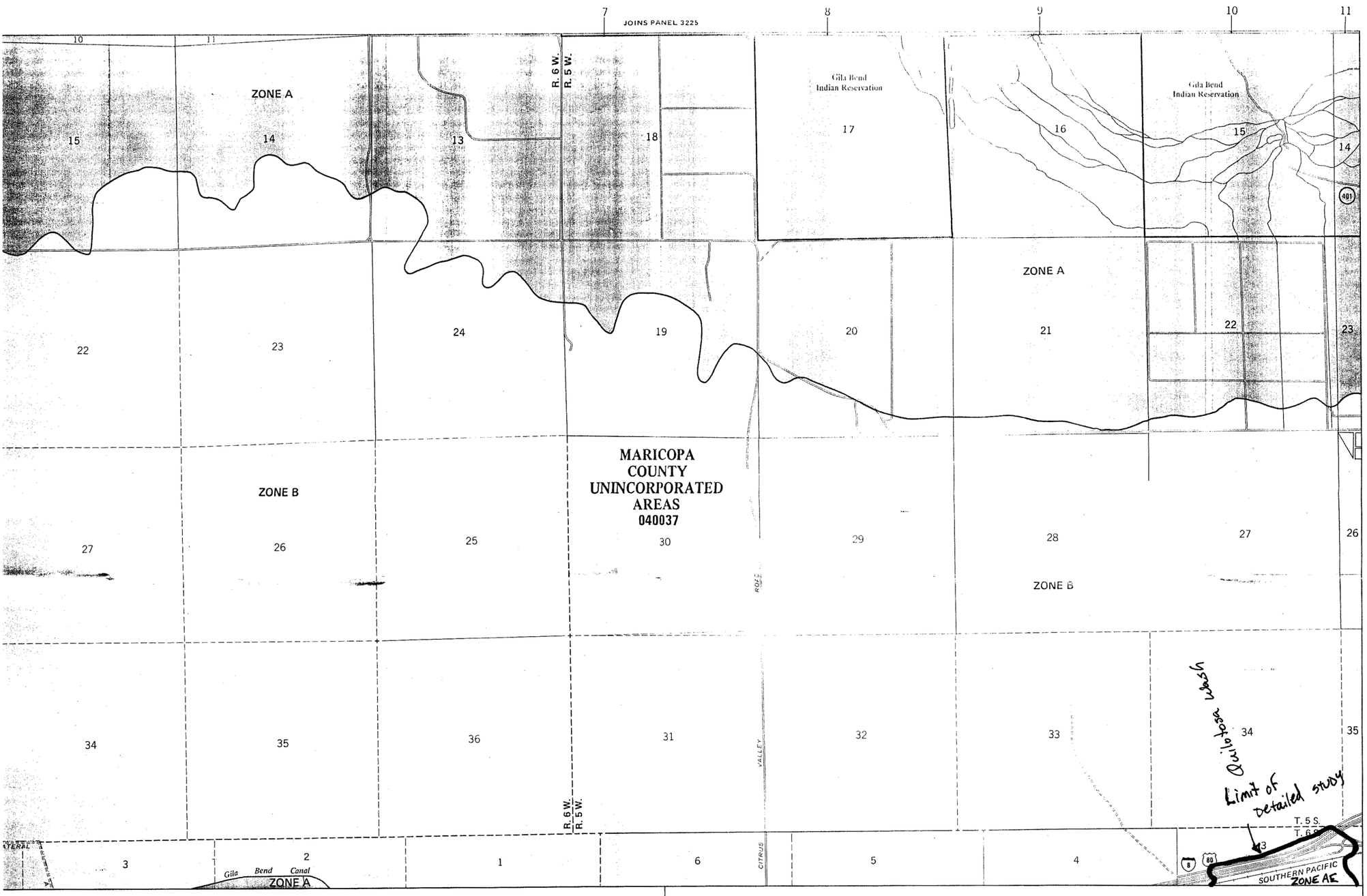
CONTAINS:

COMMUNITY	NUMBER	PAN
GILA BEND, TOWN OF	040043	349
MARICOPA COUNTY UNINCORPORATED AREAS	040037	349

PANEL 3491 OF 4350

MAP NU
04013C3491 E 04013C3
MAP RE
SEPTEMBER 30

Federal Emergency Management



THIS AREA IS SHOWN ON MAP NUMBER 04013C3465 D

THIS AREA IS SHOWN ON MAP NUMBER 04013C3470 D

KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	ZONE B
Zone Designations	ZONE A1 / ZONE A5
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

This map is for use in administering the National Flood Insurance Program. It does not necessarily show all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Certain areas not in the Special Flood Hazard Areas (zones A and V) may be protected by flood control structures.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 5.4 of the Flood Insurance Study Report.

For adjoining map panels, see separately printed Map Index.

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 3475 OF 4350

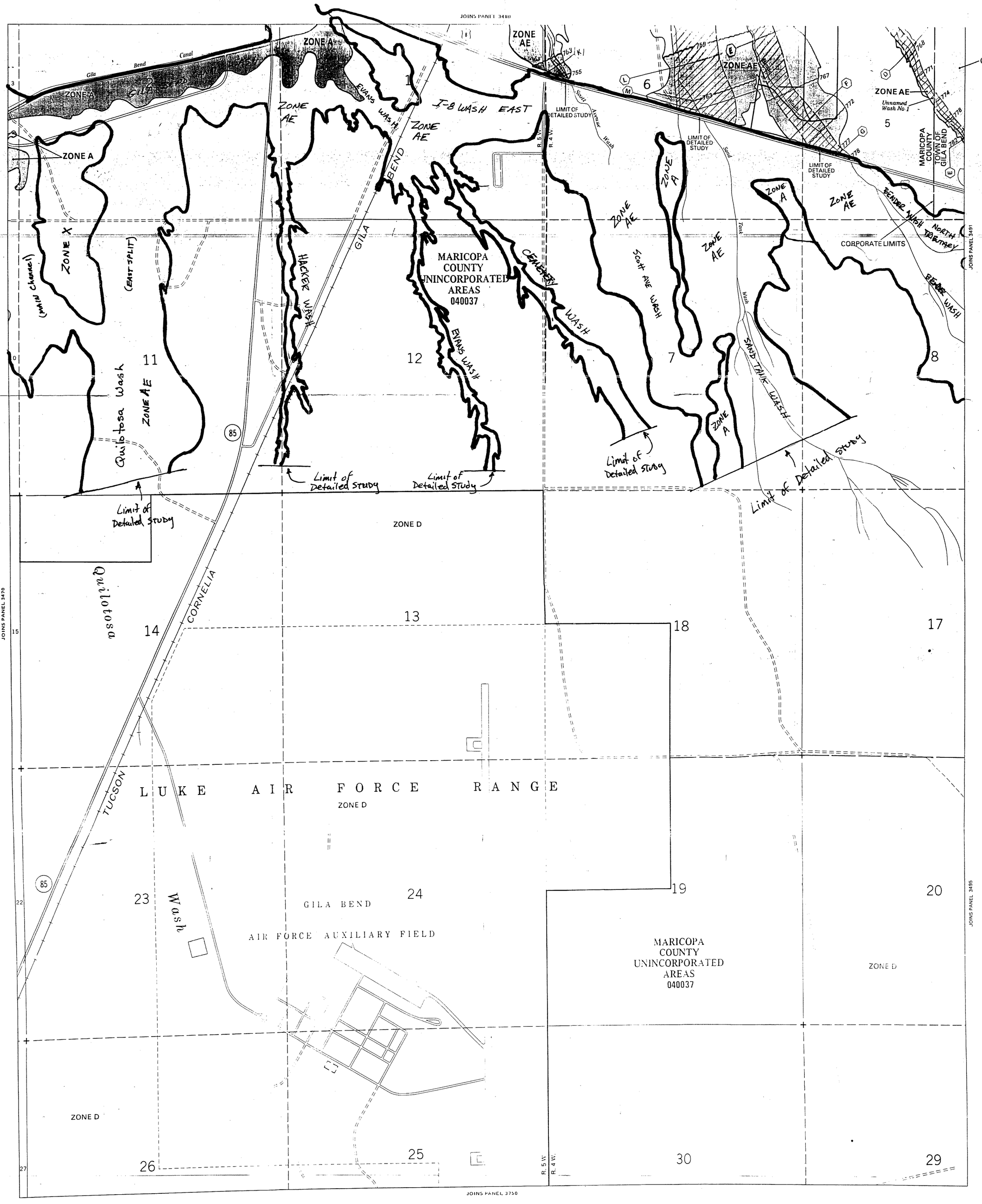
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	3475	D

MAP NUMBER
04013C3475 D

EFFECTIVE DATE:
APRIL 15, 1988

Federal Emergency Management Agency



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 SOUTH, RANGE 4 WEST AND TOWNSHIP 6 SOUTH, RANGE 5 WEST

BY 100-YEAR FLOOD

ZONE A

ZONE AE

ZONE AH

ZONE AO

ZONE A99

ZONE V

ZONE VE

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X

OTHER AREAS

ZONE X

ZONE D

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Special Flood Hazard Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Areas; Limit of Moderate Wave Action Zones.

513

Base Flood Elevation Line; Elevation in Feet*

Cross Section Line

(EL 987)

Base Flood Elevations Shown Where Uniform Within Zone

RM7X

Elevation Reference Mark

*Referenced to the National Geodetic Vertical Datum of 1929

NOTES

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100 year floods) include Zones A, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show. Floodway widths are provided in the Flood Insurance Study Report.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this panel. Users should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Index Map

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL

Map revised SEPTEMBER 30, 1995 to update corporate limits, to change base flood elevations, to add base flood elevations, to change special flood hazard areas, to change special flood hazard areas, to change zone designations, to add and update roads and drainage, to reflect updated topographic information, to incorporate previously issued letters of map revision, and to incorporate previously issued letters of map amendment.

To determine if flood insurance is available, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

APPROXIMATE SCALE IN FEET

1000 0

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 3490 OF 4350

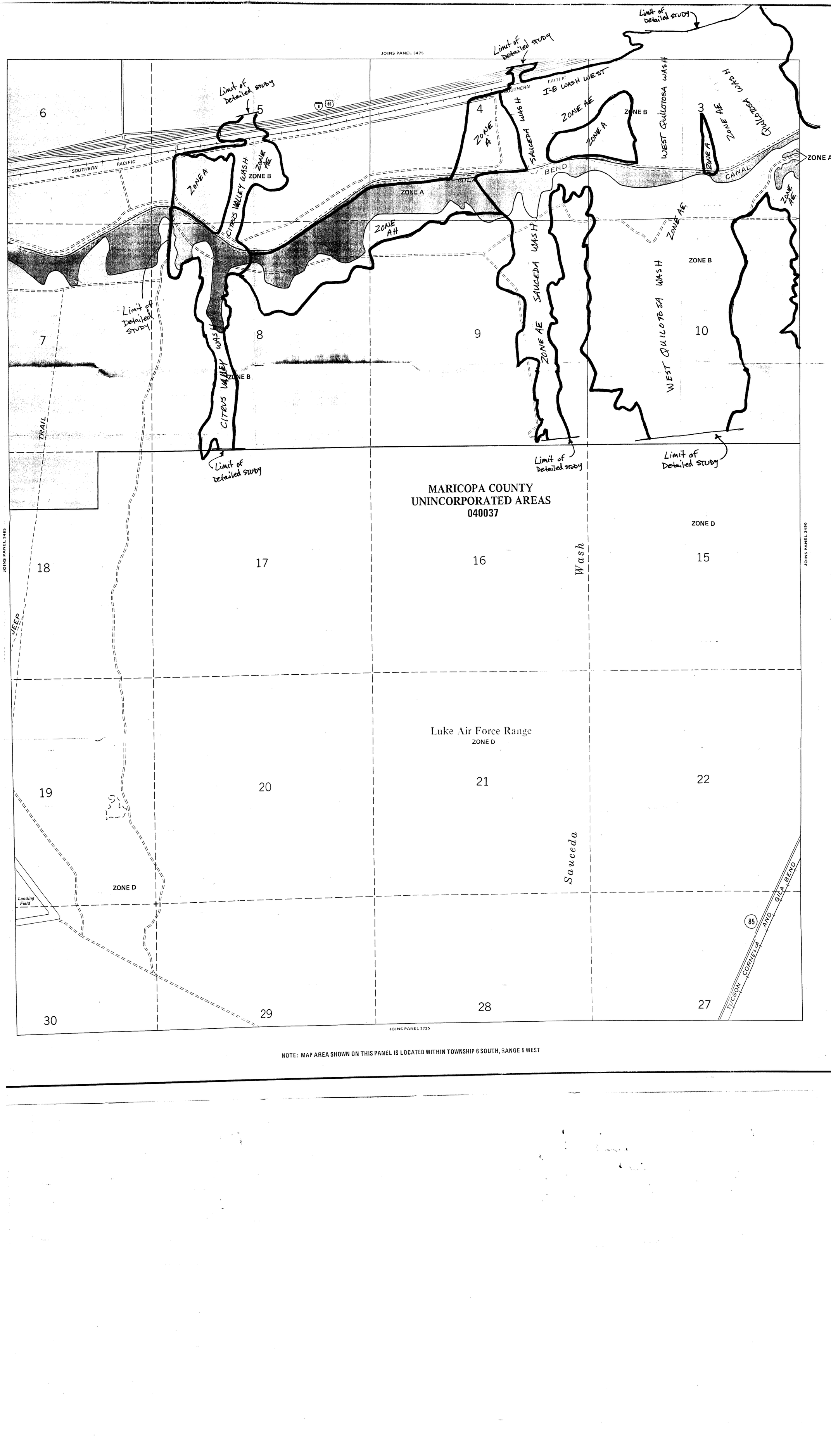
CONTAINS:

COMMUNITY	NUMBER
MARICOPA COUNTY, UNINCORPORATED AREAS	040037
GILA BEND, TOWN OF	040043

040013C3490 E

MAP REVISED: SEPTEMBER

Federal Emergency Management Agency



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 6 SOUTH, RANGE 5 WEST

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	
Zone Designations	ZONE A1 / ZONE A5
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Certain areas not in the Special Flood Hazard Areas (zones A and V) may be protected by flood control structures.

Coastal base flood elevations apply only landward of the shoreline.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of the map.

For community map revision history prior to countywide mapping, see Section 5.4 of the Flood Insurance Study Report.

For adjoining map panels, see separately printed Map Index.

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
APRIL 15, 1988

EFFECTIVE DATE (S) OF REVISION (S) TO THIS PANEL:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE IN FEET
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NATIONAL FLOOD INSURANCE PROGR

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FLOOD INSURANCE RATE MA

MARICOPA COUNTY,
ARIZONA AND
INCORPORATED AREA

PANEL 3470 OF 4350

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUF
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	3470	

MAP NUMBE
04013C3470

EFFECTIVE DATE
APRIL 15, 198

Federal Emergency Management Age