Important Notice:

Not Yet Approved by FEMA

Subject to Change per FEMA Review

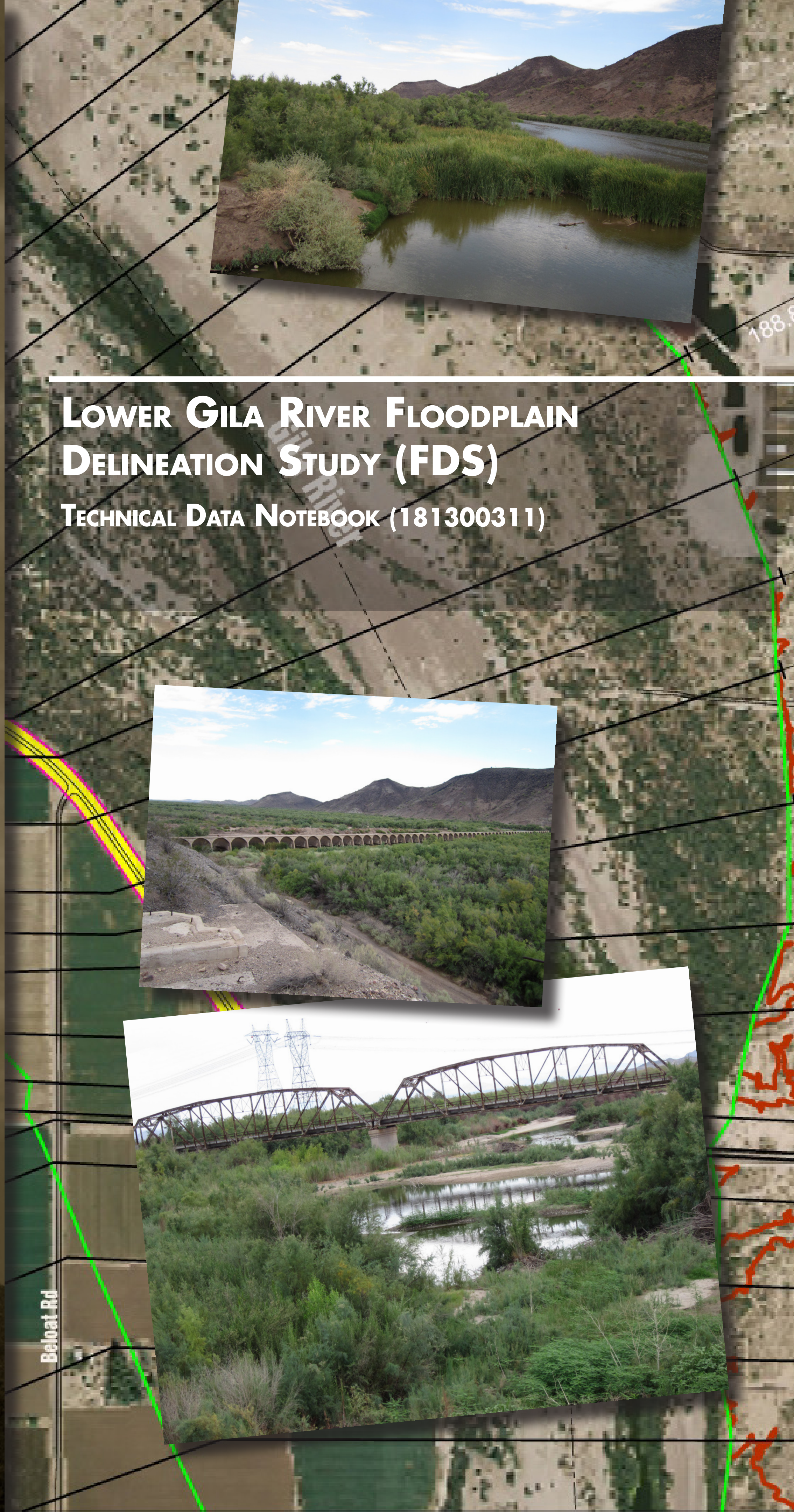
Flood Control District of Maricopa County

Contract FCD 2012C017

June 2016

Lower Gila River Floodplain Delineation Study (FDS)

Technical Data Notebook (181300311)



Stantec

Stantec Consulting Services Inc.
8211 S. 48th Street
Phoenix, AZ 85044
(602) 438-2200

Lower Gila River
Floodplain Delineation Study

Technical Data Notebook

Stantec

Registered Professional Engineer (Civil)
CERTIFICATE NO.
22910
SCOT S.
SCHLUND
Date Signed 6·28·16
ARIZONA U.S.A.

Expires: 6·30·19

June 28, 2016

Table of Contents

Registered Professional Engineer
CERTIFICATE 22010
SCOT S. SCHLUND
Civil
Date Signed 6.28.16
ARIZONA U.S.A.
Expires: 6-30-19

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 Introduction

1.1 PURPOSE OF REPORT

The Lower Gila River Floodplain Delineation Study is conducted for the Flood Control District of Maricopa County (FCD 2012C017, 2012, Catherine Regester (Manager)). Our sincere appreciation is extended to the following communities and agencies for their help and perspective while studying this watercourse:

- Flood Control District of Maricopa County (District)
- City of Goodyear
- City of Buckeye
- Town of Gila Bend
- U.S. Army Corps of Engineers (USACE)
- U.S. Geological Survey (USGS)
- Federal Emergency Management Agency (FEMA)

The primary focus of this FIS report is to document the hydraulic data, assumptions, procedures and criteria used in conducting the delineation of floodplains and floodways for the Lower Gila River. This report is generally structured in a Technical Data Notebook format in accordance with the requirements of Arizona Department of Water Resources (ADWR), State Standard SS1-97 (ADWR, CD Version 2.20, May, 2004).

The project location depicted in Figure 1.1, is within the Town of Gila Bend, City of Buckeye, City of Goodyear, and Unincorporated Maricopa County. For hydraulic modeling purposes the study reach has been subdivided into 2 sub reaches, Reach 1 and Reach 2. Reach 1 extends from the Painted Rock reservoir impoundment area to Gillespie Dam. Reach 2 extends from Gillespie Dam to approximately Bullard Avenue.

Detailed floodplain delineation is performed for approximately 48 miles of the Lower Gila River and 6 miles of the Buckeye Slough. Hydraulic modeling was accomplished for both detailed and approximate study reaches using the USACE HEC-RAS computer program, Version 4.1.0.

1.2 PUBLIC NOTICE

Public notification of the floodplain delineation was achieved through a public meeting and letters to property owners. A public meeting was held in Palo Verde, AZ on September 24, 2014 and in Buckeye, AZ on September 25, 2014. The purpose of the public meetings was to inform residents of the study and to present preliminary floodplain delineation. Copies of letters sent to property owners, the Public Meetings Announcements and Public Meeting material, are provided in Appendices B.1, B.2, and B.3, respectively.

1.3 CORRESPONDENCE

Correspondence that transpired during the course of this study that relates to scope, notice to proceed and review comments concerning the analyses documented in this report are provided in Appendix B.

1.4 PROJECT LOCATION

The location of the study is depicted in Figure 1.1. The study reach of the Gila River extends approximately 48 miles upstream from the Painted Rock Reservoir impoundment area to approximately the confluence with Bullard Wash. The study reach was subdivided into two reaches, Reach 1 and Reach 2 for hydraulic modeling purposes.

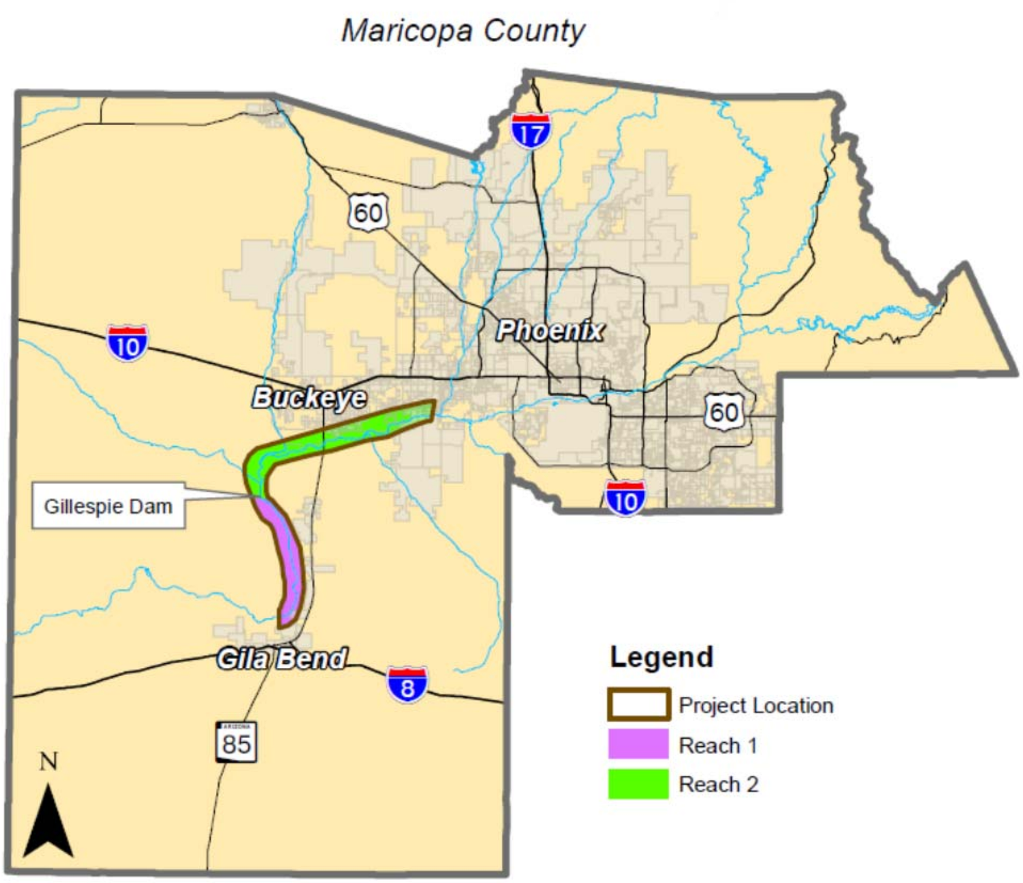


Figure 1.1 – Project Location

1.5 DESCRIPTION OF STUDY REACH

The Gila River is the largest river in the state after the Colorado River, with a contributing drainage area of approximately 46,000 square miles at the study limits. In recent times, this reach of the river has experienced several large flood events resulting in significant damage to property and infrastructure.

The Gila River study reach is an alluvial channel consisting of predominantly sand with some gravels and cobbles. The channel slope ranges from 0.0006 ft/ft to 0.0015 ft/ft (3 to 8 ft/mile). The width of the channel as defined by the bankfull discharge varies from approximately 800 feet to 5,700 feet with the average width estimated at 3,500 feet. The FEMA Effective 100-year Floodplain varies in width from approximately 1,900 feet at Gillespie Dam to 14,800 feet at its widest point upstream of the dam.

1.5.1 River Corridor Form and Vegetation

The study reach is characterized by a corridor defined by multiple channels, bars and/or islands with the position of the channels and bars changing with time. Vegetation within the corridor is primarily confined to the channels and areas immediately adjacent to the channels. Due to water supply, vegetation densities in Reach 2 are much greater than in Reach 1, where the water supply is limited to runoff after major storms or flow releases from upstream dams.

In Reach 2, agricultural water return flows in combination with a shallow groundwater table and wastewater effluent provide sufficient water supply to support a diverse vegetative community. Native riparian vegetation along the study reach of the river includes stands of cottonwood and willow trees as well as cattail and bullrush that line open bodies of water. However, most of the vegetation within the study reach consists of dense, monotypical stands of tamarisk (salt cedar). In areas outside of channels but within the river corridor, vegetation density has generally increased with time; this is particularly true for the area between 211th Avenue and SR 85. Field observations show that the vegetation type in the areas of dense vegetation is salt cedar a non-native species.

Through review of historic aerial photography it is noted that vegetation densities within the river corridor have varied over time. The effects of vegetation patterns and densities on the hydraulic performance of the river were analyzed through Manning's *n* value sensitivity evaluations. Manning's *n* values were estimated for each aerial data set and incorporated into hydraulic models that utilize existing topographic data. The methodology and results of the evaluations are presented in "Manning's *n* Value Sensitivity Memo" (Stantec, 2014 (Appendix F)).

1.5.2 Land Use

Land uses adjacent to banks of the Gila River consists of agricultural, undeveloped desert uplands and some residential. Agricultural land use is the dominate land use through the study reach. In Reach 1, the west and east overbank areas are characterized by agricultural land use that is supported by a network of irrigation canals. At some locations, the canal embankments function as "levee-like" features. In Reach 2, the southern bank of the river is tucked up against the Estrella Mountains and Buckeye Hills. The terrain along the south bank is generally quite steep with only a few pockets of developable land within the floodplain limits. The land adjacent to the north bank of the river is predominantly composed of agricultural uses. Supporting the agricultural activities is an irrigation network consisting of canals, laterals, tailwater ditches and associated structures that lie within the 100-year floodplain limits.

2.0 Study Documentation Abstract

This section, the Study Documentation Abstract lists the pertinent information concerning authority for the study, contractor, reviewer and key elements of the hydraulic analyses. The abstract is listed in table format below.

2.1 ADWR/FEMA FORMS

Study Documentation Abstract for FEMA Submittals	Initial Study		Restudy		CLOMR		LOMR	x	Other	

Section 2.1: Study Documentation Abstract for FEMA Submittals		
2.1.1	Date Study Accepted	
2.1.2	Study Contractor Contact(s) Address Phone Internal Reference Number	Stantec Consulting Services Inc. Scot Schlund, PE 8211 South 48th Street Phoenix, Arizona 85044 (602) 438-2200 FAX: (602) 431-9562 181300311
2.1.3	FEMA Technical Review Contractor Contact(s) Address Phone Internal Reference Contact(s)	
2.1.4	FEMA Regional Reviewer Phone	
2.1.5	State Technical Coordinator Address Phone	
2.1.6	Local Technical Reviewer Address Phone	Flood Control District of Maricopa County Catherine Regester, PE 2801 West Durango Street Phoenix, Arizona 85009 (605) 506-4001

Section 2.1: Study Documentation Abstract for FEMA Submittals Continued		
2.1.7	Reach Description	The Lower Gila River FDS reach is characterized by a watercourse comprised of braided channels, bars, and islands with varied vegetation types and densities and a wide 100-year floodplain. The position, shape and size of channels, bars and islands change in response to a flood event. Upstream of the Gillespie Dam, vegetation is very dense with the majority of the vegetation consisting of Salt Cedar. Downstream of Gillespie Dam due to ground water levels and irrigation diversions, vegetation densities are much less. The FEMA Effective 100-year Floodplain varies in width from approximately 1,900 feet at Gillespie Dam to 14,800 feet at its widest point upstream of the dam. Predominate land use within the 100-year floodplain is agriculture.
2.1.8	USGS Quad Sheet(s) with original photo date & latest photo revision date	NA
2.1.9	Unique Conditions and Problems	See Section 5.7
2.1.10	Coordination of Q=s Discharges (Agency, Date, Comments)	Flood Control District of Maricopa County Catherine Regester (602) 506-4001

2.2 FEMA FORMS

This section of the report presents FEMA MT-2 Forms. The following sections also provide additional information in regard to the data included on the FEMA forms for the specific sections that require additional information. Detailed information regarding the hydrologic and hydraulic analyses are provided in Sections 4 and 5 of this document.

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☐ CLOMR: A letter from DHS-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 DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

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

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
040037	Maricopa County	AZ	04013C	2145L	10/16/13

2. a. Flooding Source: Gila River

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Lower Gila River Floodplain Delineation Study, FCDMC Project No.: 2012C017

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

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☐ Physical Change ☐ Improved Methodology/Data ☒ Regulatory Floodway Revision ☐ Base Map Changes

   ☐ Coastal Analysis ☒ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections

   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes

   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $_____

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Catherine W. Regester, P.E., CFM	Company: Flood Control District of Maricopa Co.	
Mailing Address: 2801 W Durango St Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4001	Fax No.: 602-506-4601
	E-Mail Address: cwr@mail.maricopa.gov	
Signature of Requester (required): Catherine W. Regester	Date: 12/2/15	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: William D. Wiley, P.E., Chief Engineer & General Manager	Community Name: Unincorp. Maricopa County	
Mailing Address: 2801 W Durango St Phoenix, AZ 85009	Daytime Telephone No.: 602-506-1501	Fax No.: 602-506-4601
	E-Mail Address: williamwiley@mail.maricopa.gov	
Community Official's Signature (required): [signature]	Date: 12/2/15	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Scot S. Schlund	License No.: 22910	Expiration Date: 06/30/2016
Company Name: Stantec Consulting Services INC.	Telephone No.: (602) 438-2200	Fax No.: (602) 431-9562
Signature: [signature]	Date: 11/02/15	E-Mail Address: Scot.Schlund@stantec.com

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

22910
SCOT S.
SCHLUND
11-23-15

Seal (Optional)

Expires: 6-30-16

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☐ CLOMR: A letter from DHS-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 DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

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

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
040037	Maricopa County	AZ	04013C	2580L	10/16/13
040039	City of Buckeye	AZ	04013C	2580L	10/16/13

2. a. Flooding Source: Gila River

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Lower Gila River Floodplain Delineation Study, FCDMC Project No.: 2012CO17

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

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☐ Physical Change ☐ Improved Methodology/Data ☒ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures:	☐ Channelization	☐ Levee/Floodwall	☒ Bridge/Culvert
	☐ Dam	☐ Fill	☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $_____

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Catherine W. Regester, P.E., CFM	Company: Flood Control District of Maricopa Co.	
Mailing Address: 2801 West Durango Street Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4001	Fax No.: 602-506-4601
	E-Mail Address: cwr@mail.maricopa.gov	
Signature of Requester (required): Catherine W. Regester	Date: 11/19/15	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Scott Zipprich, P.E., City Engineer	Community Name: City of Buckeye	
Mailing Address: 530 East Monroe Avenue Buckeye, AZ 85326	Daytime Telephone No.:	Fax No.:
	E-Mail Address: szipprich@buckeyeaz.gov	
Community Official's Signature (required): [signature]	Date: 12-2-15	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Scot S. Schlund	License No.: 22910	Expiration Date: 06/30/2016
Company Name: Stantec Consulting Services INC.	Telephone No.: (602) 438-2200	Fax No.: (602) 431-9562
Signature: [signature]	Date: 11/19/15	E-Mail Address: Scot.Schlund@stantec.com

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

22910
SCOT S.
SCHLUND
Date Signed 11.19.15
Seal (Optional)
Expires: 6.30.16

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden ...gency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☐ CLOMR: A letter from DHS-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 DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

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

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
040037	Maricopa County	AZ	04013C	2145L	10/16/13
040046	City of Goodyear	AZ	04013C	2145L	10/16/13

2. a. Flooding Source: Gila River

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Lower Gila River Floodplain Delineation Study, FCDMC Project No.: 2012CO17

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

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☐ Physical Change ☐ Improved Methodology/Data ☒ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $_____

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Catherine W. Regester, P.E., CFM	Company: Flood Control Dostrict of Maricopa Co.	
Mailing Address: 2801 W Durango St Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4001	Fax No.: 602-506-4601
	E-Mail Address: cwr@mail.maricopa.gov	
Signature of Requester (required): Catherine W. Regester	Date: 11/23/15	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: David Ramirez, P.E., City Engineer	Community Name: City of Goodyear	
Mailing Address: 14455 W Van Buren St Goodyear, AZ 85338	Daytime Telephone No.: 6238827954	Fax No.:
	E-Mail Address: david.ramirez@goodyearaz.gov	
Community Official's Signature (required): David J Ramirez	Date: 11-30-15	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Scot S. Schlund	License No.: 22910	Expiration Date: 06/30/2016
Company Name: Stantec Consulting Services INC.	Telephone No.: (602) 438-2200	Fax No.: (602) 431-9562
Signature: [signature]	Date: 11/02/15	E-Mail Address: Scot.Schlund@stantec.com

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

11-30-15

Expires: 6-30-16

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☐ CLOMR: A letter from DHS-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 DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

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

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
040037	Maricopa County	AZ	04013C	3315L	10/16/13
040046	Town of Gila Bend	AZ	04013C	3315L	10/16/13

2. a. Flooding Source: Gila River

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Lower Gila River Floodplain Delineation Study, FCDMC Project No.: 2012C017

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

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☐ Physical Change ☐ Improved Methodology/Data ☒ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $_____

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Catherine W. Regester, P.E., CFM	Company: Flood Control District of Maricopa Co.	
Mailing Address: 2601 W Durango St Phoenix, AZ 85009	Daytime Telephone No.: 602-506-4001	Fax No.: 602-506-4601
	E-Mail Address: cwr@mail.maricopa.gov	
Signature of Requester (required): Catherine W. Regester	Date: 11/23/15	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Terry Weter, Public Works Director	Community Name: Town of Gila Bend	
Mailing Address: P.O. Box A Gila Bend, AZ 85337	Daytime Telephone No.: 928 683-2255	Fax No.:
	E-Mail Address: tweter@gilabendaz.org	
Community Official's Signature (required): [signature]	Date: 12/4/15	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Scot S. Schlund	License No.: 22910	Expiration Date: 06/30/2016
Company Name: Stantec Consulting Services INC.	Telephone No.: (602) 438-2200	Fax No.: (602) 431-9562
Signature: [signature]	Date: 11/02/15	E-Mail Address: Scot.Schlund@stantec.com

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	**Required if ...**
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

22910
SCOT S.
SCHLUND
11-22-13

Seal (Optional)

Expires 6-30-16

Form 1 OC Section B.1 Additional Information

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
040037	Maricopa County	AZ	04013C	2145L	10/16/2013
040046	City of Goodyear	AZ	04013C	2145L	10/16/2013
040037	Maricopa County	AZ	04013C	2625M	11/4/2015
040046	City of Goodyear	AZ	04013C	2625M	11/4/2015
040037	Maricopa County	AZ	04013C	2140L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2140L	10/16/2013
040046	City of Goodyear	AZ	04013C	2140L	10/16/2013
040037	Maricopa County	AZ	04013C	2605M	11/4/2015
040039	Town of Buckeye	AZ	04013C	2605M	11/4/2015
040046	City of Goodyear	AZ	04013C	2605M	11/4/2015
040037	Maricopa County	AZ	04013C	2120L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2120L	10/16/2013
040037	Maricopa County	AZ	04013C	2585M	11/4/2015
040039	Town of Buckeye	AZ	04013C	2585M	11/4/2015
040037	Maricopa County	AZ	04013C	2580L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2580L	10/16/2013
040037	Maricopa County	AZ	04013C	2560L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2560L	10/16/2013
040037	Maricopa County	AZ	04013C	2570L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2570L	10/16/2013
040037	Maricopa County	AZ	04013C	2555M	11/4/2015
040039	Town of Buckeye	AZ	04013C	2555M	11/4/2015
040037	Maricopa County	AZ	04013C	2565L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2565L	10/16/2013
040037	Maricopa County	AZ	04013C	2535M	11/4/2015
040037	Maricopa County	AZ	04013C	2545M	11/4/2015
040039	Town of Buckeye	AZ	04013C	2545M	11/4/2015
040037	Maricopa County	AZ	04013C	2910L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2910L	10/16/2013
040037	Maricopa County	AZ	04013C	2930L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2930L	10/16/2013
040037	Maricopa County	AZ	04013C	2940L	10/16/2013
040039	Town of Buckeye	AZ	04013C	2940L	10/16/2013
040037	Maricopa County	AZ	04013C	3305L	10/16/2013
040037	Maricopa County	AZ	04013C	3310L	10/16/2013
040037	Maricopa County	AZ	04013C	3315L	10/16/2013
040043	Town of Gila Bend	AZ	04013C	3315L	10/16/2013
040037	Maricopa County	AZ	04013C	3320L	10/16/2013
040043	Town of Gila Bend	AZ	04013C	3320L	10/16/2013
040037	Maricopa County	AZ	04013C	3555L	10/16/2013
040043	Town of Gila Bend	AZ	04013C	3555L	10/16/2013

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Gila River, Maricopa County, Arizona

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

   ☒ Not revised (skip to section B) ☐ No existing analysis ☐ Improved data
   ☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)

3. Methodology for New Hydrologic Analysis (check all that apply)

   ☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: ____________
   ☐ Regional Regression Equations ☐ Other (please attach description)

   Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

   If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

   Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☒ No

   If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit*	Painted Rock Dam Ponding	147.44	662.98	662.98
Upstream Limit*	Downstream of Bullard Ave., 0.33 miles	194.81	913.84	913.59

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: USACE HEC-RAS Computer Program, Version 4.1.0

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	**Natural Run** File Name:	Plan Name:	**Floodway Run** File Name:	Plan Name:	**Datum**
Duplicate Effective Model*					
Corrected Effective Model*	LGR_FDS_R1	LGR_FDS_R1	LGR_FDS_R1	LGR_FDS_R1	NAVD 88
Existing or Pre-Project Conditions Model					
Revised or Post-Project Conditions Model					
Other - (attach description)	LGR_FDS_R2	LGR_FDS_R2_FP	LGR_FDS_R2	LGR_FDS_R2_FW	NAVD 88

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☐ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: Buckeye/SunValley, Gillespie, New Lower Gila River

Source: Flood Control District of Maricopa County   Date: 4/8/2002, 07/16/2008, 11/06/2013

Accuracy: 2 foot contour interval, scale of 1"=200'

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☒ Yes ☐ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:

   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☒ Yes ☐ No

   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☒ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

Form 2 RHH Section B.4, additional information

Other – Model description

To model the Lower Gila River hydraulically, two models were used, Reach 1 and Reach 2. The model listed in the "Other" row, is of Reach 2.

Additionally five other models were created to delineate floodplain behind a levee-like feature on the northern side of the river, in a low lying area known as the Buckeye Slough. All five are natural runs with no floodway runs. Below is the information for the file name, plan name and description for each of the five additional models.

File Name	**Plan Name**	**Description**	**Datum**
LGR_FDS_R2_Natural Valley	LGR_FDS_R2_NV	This model the "Natural Valley" model estimates water surface elevations for the South Extension Canal "levee out" scenario between RM 185.22 and 187.14. The initial results of the Buckeye Slough Unsteady Flow Model were compared with the results of the Gila River Unsteady Flow Model. The comparison showed that Buckeye Slough water surface elevations at equivalent locations to Gila River water surface elevations, for the majority of the cross sections downstream of Gila River RM 187.14 are higher than water surface elevations estimated with the Gila River Unsteady flow model. This indicates that potential weir flow from the Gila River is drowned out by flow from the Buckeye slough and flow between the Buckeye Slough and the Gila River has comingled. Because of this hydraulic condition a "Natural Valley" model was developed.	NAVD 88
LGR_FDS_R2B_USF	LGR_FDS_R2B_USF	This Unsteady Flow Model for the Gila River is for a segment of Reach 2 (referred to as Reach 2B) to quantify flow leaving the Gila River along the South Extension Canal that drains to the Buckeye Slough. The Unsteady Flow model extends from RM 184.47 to RM 192.33.	NAVD 88
Buckeye Slough	Unsteady Buckeye Slough	These project files were developed to estimate 100-year peak discharges for the Buckeye Slough. Hydrographs at weir locations from the Unsteady Flow Model for the Gila River were coded into the Buckeye Slough, Unsteady Flow editor.	NAVD 88
Buckeye Slough	BS Steady Flow	These project files were developed to define the 100-year floodplain for the Buckeye Slough.	NAVD 88
400-09-012	400-09-012	These project files were developed to define the 100-year floodplain for a portion of the Buckeye Slough area parcel in the northeast corner of 207th Ave/Tuthill Road at the South Extension Canal	NAVD 88

3.0 Mapping and Survey Information

3.1 DESCRIPTION OF MAPPING

A number of topographic data sources were utilized to develop maps for the hydraulic analyses that were conducted for the floodplain delineation. The following sections describe the maps that were developed and the source of the information depicted on the maps. Maps are presented as Plates and folded copies are provided in pockets in the back of this report.

3.2 TOPOGRAPHIC AND AERIAL MAPPING

Detailed topographic mapping and aerial photography that serve as the base to maps developed for the project were obtained from the Flood Control District of Maricopa County (District). Topographic data sets, flight dates, scale, contour interval and datum are listed in Table 3.1. Figure 3.1 depicts the location and datum specifics of the different mapping sets utilized in developing topographic mapping for the project. Detailed topographic data is used in the development of the hydraulic models for the floodplain delineation.

Table 3.1
Summary of Topographic Data Sets

Topographic Data	Flight Date	Scale	Contour Interval (ft)	Vertical Datum
Buckeye/Sun Valley	4/8/2002	1” = 200’	2	NAVD 88
Gillespie	7/16/2008	1” = 200’	2	NAVD 88
New Lower Gila River	11/06/2013	1” = 200’	2	NAVD 88

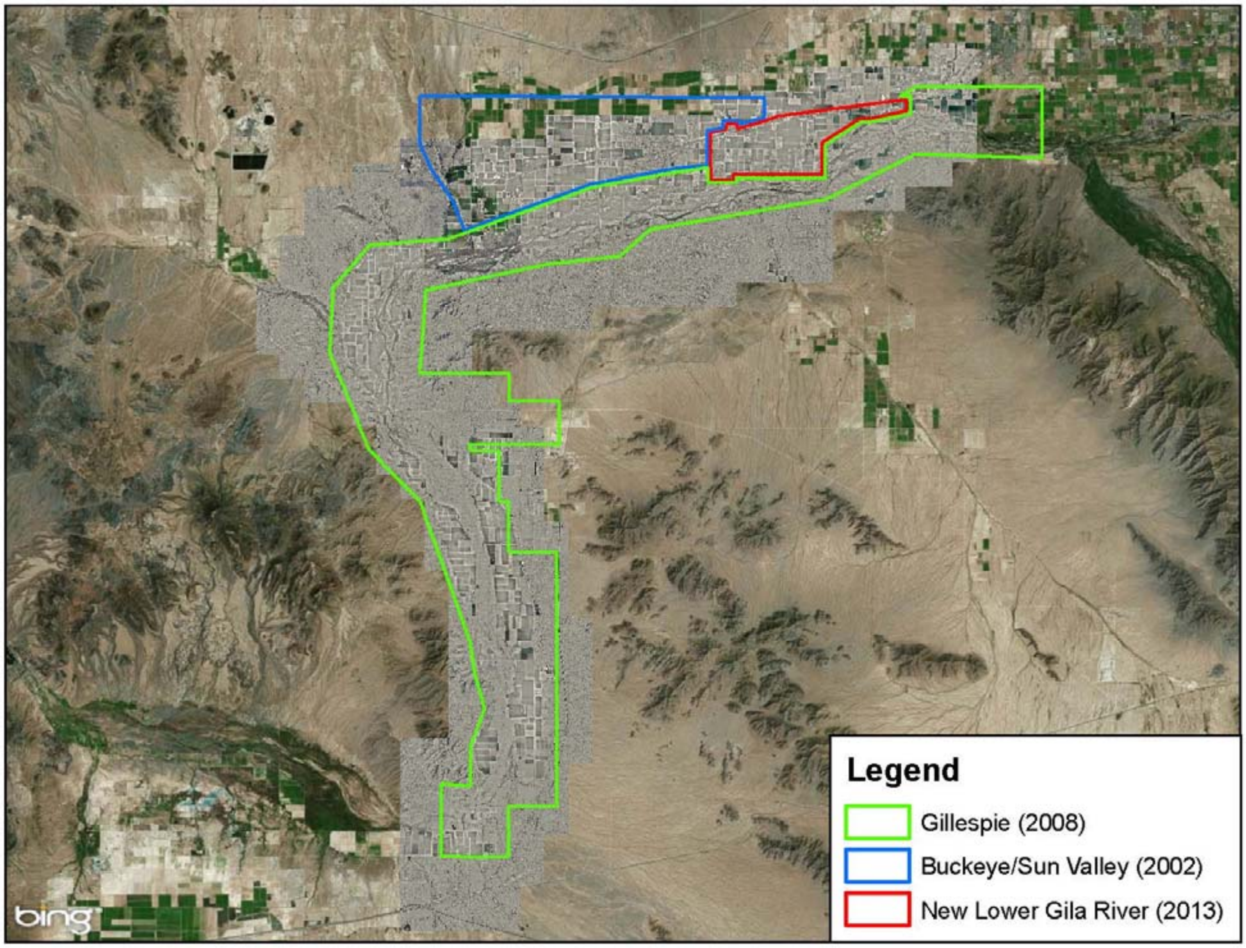


Figure 3.1 – Location of Topographic Data Sets

3.2.1 Painted Rock Dam Spillway Survey

The Painted Rock Dam spillway was surveyed to obtain a spillway crest elevation that was used as the pooling elevation of the reservoir. This pooling elevation was mapped on the work maps, up to the point where the normal depth profile for the 100-YR intersects this pooling elevation, where upstream from this point the floodplain and floodway mapped are from the Reach 1 model. Figure 3.2 depicts spillway survey elevations. Crest elevations are designated by red triangles. The spillway elevation was estimated by averaging surveyed crest elevations along the top of spillway. The average crest elevation is 662.98 feet (NAVD 88).

Figure 3.2 – Painted Rock Dam Spillway

3.3 BRIDGE SURVEYS

As part of the topographic mapping, field surveys were conducted for bridges within the study reach. Appendix C includes plots of the field survey results for each bridge.

3.4 FIRM, FHBM DRAFT MAPS

Annotated FIRM panels showing the proposed floodplain limits are provided in Section 7.

3.5 COMMUNITY MAPS

General street and corporate information for the communities are shown on all Work Maps.

4.0 Hydrology

Peak discharges used in the hydraulic analysis at and upstream of Gillespie Dam were taken from the March 1996 U.S. Army Corps of Engineers report for the modifications to Roosevelt Dam entitled *Gila River Basin, Arizona, Section 7 Study for Modified Roosevelt Dam, Arizona, Hydrologic Evaluation of Water Control Plans, Salt River Project to Gila River at Gillespie Dam.*

Downstream of Gillespie Dam the FEMA Effective peak discharges are pre-modified Roosevelt Dam peak discharges. This study updates the peak discharges to be consistent with post modification Roosevelt Dam conditions. The Section 7 Study report states that this reach of the Gila River is considered a diminishing stream. Peak discharges will decrease in the downstream direction due to flow attenuation. An unsteady flow hydraulic model using the USACE HEC-RAS v4.1.0 was used to model potential flow attenuation that occurs downstream of Gillespie Dam to the inundation limits of Painted Rock Dam Reservoir. Peak discharges were estimated at RM 161.72 and RM 154.79. A memo describing the methodology and results of the unsteady flow analysis is provided in Appendix D.1.

4.1 MODEL DISCHARGES

The following table summarizes the peak discharges used in the hydraulic analysis.

Table 4.1
HEC-RAS model discharges

Flow Change Location RM	10-Year cfs	50-Year cfs	100-Year cfs	500-Year cfs
195.09	57,000	185,000	227,000	285,000
186.18	46,000	160,000	210,000	270,000
174.75	42,000	153,000	203,000	270,000
166.25	38,000	145,000	195,000	270,000
161.72	37,600	143,500[1]	192,900	270,000[2]
154.79	37,300	142,400[1]	191,500	270,000[2]

[1]Prorated based off of the 10-YR, and 100-YR discharges from the unsteady flow hydraulic model, and rounded up. Prorating by the Pre-Roosevelt Modification discharges, was done initially for this reach, however, the prorated ratios calculated to determine the 50-YR and 500-YR yielded discharges in the downstream direction greater than what was at the RM 166.25 flow change location.

[2]From Section 7 Report, in Table 2-4, the 500-YR frequency discharges did not attenuate downstream, so this value was kept constant in Reach 1, without prorating based off of the unsteady flow hydraulic model.

5.0 Hydraulic Analysis

5.1 METHOD DESCRIPTION

Hydraulic analysis is performed in accordance with the guidelines and specifications set forth in the Guidelines and Specifications for Flood Hazard Mapping Partners (Federal Emergency Management Agency (FEMA), 2003), State Standards 2-96, Delineation of Riverine Floodplains and Floodways in Arizona (ADWR, 2004), State Standard 9-02, Hydraulic Modeling Guidelines (ADWR, July, 2003) and the District's Consultant Guidelines (Flood Control District of Maricopa County, 2003). Detailed floodplain limits are determined for the Lower Gila River for approximately 48 miles. The flood hazard limits were determined using the USACE HEC-RAS Computer Program, Version 4.1.0, dated January 2010. HEC-RAS hydraulic models are provided digitally on a CD (Appendix E). The location of the watercourse is shown in Figure 1-1.

A reach boundary condition is required to properly execute the HEC-RAS models. A normal depth of 0.000925 ft/ft was used as the downstream boundary condition for Reach 1, which was estimated within the mile just upstream of the first cross section within the reach, slope between approximately RM 147.44 and RM 148.44. The starting water surface elevation for Reach 2 was taken from the results of the Reach 1 HEC-RAS hydraulic model.

5.2 WORK STUDY MAPS

Work Study Maps depict base flood elevations and the limits and type of special Flood Hazard Zones that were delineated for the Lower Gila River. Cadastral information depicted on the Work Maps includes Township, Range and Section lines, municipal boundaries and associated text and roadway names. Full size 22"x34" and 11"x17" half size copies of the Work Study Maps are provided in the back of the report.

5.3 PARAMETER ESTIMATION

5.3.1 Manning's *n*-Value

5.3.1.1 Methodology

In order to estimate Manning's *n*-values for the study watercourse, physical characteristics for the watercourse were identified through field observations and examination of ground and aerial photographs as well as examination of topographic mapping. The discerning characteristics recorded are, channel shape, bed material, vegetation density, the presence of meanders or channel bends and the presence or absence of channel obstructions. Physical characteristics of the watercourse were viewed during field reconnaissance and the watercourse was photographed at representative locations.

Manning's *n*-values were estimated using the methods set forth in the publication titled "Selection of Manning's Roughness Coefficient for Natural and Constructed Vegetated and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona" (Phillps and Tadayon, 2006). That method involved the selection of an initial

Manning's *n*-value based on the channel bed material and then the adjustment of that value for channel irregularities, effects of obstructions, vegetation and channel cross sectional variations. If the channel has sufficient meander to increase roughness, then the sum of the base *n*-value plus subsequent adjustments is multiplied by a meander value, m.

The base *n*-value for the bed and overbank material roughness was estimated from field investigations. A 1-foot square grid (grid on 1-inch centers) was utilized for the estimation of the average size of bed material. Adjustment of the base *n*-value was then made based on vegetation present in the channel and the overbanks, field assessment of the channel bank conditions and the impact of any obstructions as well as a review of topographic data for variations in channel geometry.

5.3.1.2 Manning's *n*-Value Determination

A description of procedures employed for the estimation of Manning's *n*-values, field photographs that document the physical characteristics of the river at specific locations, calculation sheets listing the estimated base *n*-values and adjustments to that value for each site evaluated and mapped Manning's *n*-value zones are provided in the Field Reconnaissance Report located in Appendix E.1. A summary of Manning's *n*-values estimated for the study are presented in Table 5.1.

Table 5.1
Summary of Manning's *n* Values

Category	Subcategory	Manning *n*
Riverine	n1	0.035
	n2	0.050
	n3	0.080
	n5	0.070
	n6a	0.155
	n6b	0.100
	n6c	0.120
	n8	0.130
	nW	0.030
	nC	0.015
Agricultural	nAg1	0.035
	nAg2	0.030
	nAg3	0.045 thru 0.155
	nAg4	0.075
Residential	nR	0.040 thru 0.155
Sand and Gravel	nSg	0.065 thru 0.145
Industrial	nI	0.030 thru 0.090
Undisturbed Desert	n7	0.045

5.3.2 Expansion and Contraction Coefficients

Expansion and contraction coefficients of 0.3 and 0.5, respectively, were utilized in the hydraulic evaluation at bridge crossings of the Gila River, Gillespie Dam and at a natural constriction between river mile (RM) 172.6 and RM 173.21. The rest of the study reach is relatively free of any abrupt transitions, therefore, gradual contraction and expansion coefficients of 0.1 and 0.3, respectively, were used.

5.4 CROSS SECTION DESCRIPTION

5.4.1 General

Cross sectional geometry for the study reach were determined from a triangulated irregular network (TIN). The TIN was developed from a digital terrain model (DTM) supplied by the Flood Control District of Maricopa County using the 3D Analyst extension of ArcView GIS v10.1. Cross sections alignments from previous study's served as the initial cross section alignments. A channel centerline was established that paralleled, as close as possible to channels within the river bottom and as perpendicular as possible to the initial cross section alignments. The channel centerline approximates the flow alignments for the 100-year event. Where needed, cross section alignments where adjusted to be perpendicular, as near as possible, to the channel centerline. If cross sections are skewed in an effort to capture flow conditions away from the channel centerline the skew is less than 18 degrees. Cross sections with dog legs were used at locations where flow paths were not parallel to one another. Cross sections were located at approximately 500-foot or less intervals as well as at significant changes in channel slope and cross sectional area. Cross section numbering is expressed in river miles (RM) above the confluence with the Colorado River. Cross section stationing is from left to right looking downstream with the location of the hydraulic baseline set to station 20,000.

5.4.2 Channel and Overbanks

Cross section reach lengths and channel bank stations were determined using the HEC-GeoRAS extension for ArcView GIS. The process involves the initial layout of line work representing the hydraulic baseline (channel reach length), flow paths (overbank reach lengths) and bank stations. This data, along with cross sectional geometry is exported into a format required by HEC-RAS to get an initial estimation of the flooding limits. Based on the initial results, this data is refined to be representative of the hydraulic conditions of the 100-year event.

The limits of the 10-year floodplain were utilized to establish initial bank stations for the 100-year event. Based on the results of the 100-year event initial bank stations were adjusted to be consistent with natural channel banks or major grade breaks along the channel cross section. The final locations of the channel bank stations are shown on the cross section plots provided in Appendix E.2

5.5 MODELING CONSIDERATIONS

5.5.1 Hydraulic Jump Analysis

Hydraulic profiles for the 100-year event do not indicate a potential for a hydraulic jump to occur within the study reach.

5.5.2 Bridges, Culverts and Constrictions

Modeling considerations for bridges, culverts and constrictions for the project are limited to bridges and natural constrictions. A primary modeling consideration for bridges is the bridge geometric description. Construction drawings, record drawings, and field surveys (Appendix C and E.3) were utilize to define bridge geometry required for hydraulic modeling.

Flow constrictions are either natural or they occur at bridge locations and at Gillespie Dam. The flow constriction at Gillespie Dam is due to abrupt changes in flow conditions at the location where the dam was breached (Figure 5.1) during a runoff event. Considerations for flow constrictions are discussed in section 5.3.2 (Expansion and Contraction Coefficients) and 5.5.6 (Ineffective Flow Areas). Table 5.2 lists the location of bridges.

Figure 5.1 – Gillespie Dam

Table 5.2
Summary of Bridge Locations

Bridge	River Mile Location
Old US 80	166.10
State Route 85	179.90
Tuthill Road	188.04
Cotton Lane	192.42
Estrella Parkway	194.26

5.5.3 Levees and Dikes

There are spur dikes and one engineered levee within the study reach. The engineered levee located along the south bank, downstream of Estrella Parkway between RM 193.85 and RM 194.25 has not been certified per 44 CFR 65.10 criteria. The levee option in the HEC-RAS Geometry Editor was not used to define the levee because the area behind the levee is an ineffective flow area for either the levee or natural valley (levee-out) conditions. Water surface elevations along the levee and behind the levee would be the same for either the levee-in and levee-out conditions.

Spur dikes are located at some of the bridge locations. The HEC-RAS ineffective flow option was utilized to define ineffective flow areas behind spur dikes.

5.5.4 Islands and Flow Splits

Island and flow splits were identified through initial hydraulic modeling. Islands are typically located in sand and gravel operations where material has been stocked piled and in isolated locations within the channel or overbank areas where the natural ground is higher than the 100-year water surface elevations. Islands are mapped as being in the 100-year floodplain.

Flow splits occur along segments of the South Extension Canal located in the north overbank area between RM 185.22 and RM 191.67. The South Extension Canal is a levee-like feature. This levee-like feature is described in Section 5.5.5 (“Levee-like” Embankments) and Section 5.7 (Special Problems).

5.5.5 “Levee-like” Embankments

Levee-like embankments are physical features such as agricultural berms, canal embankments and roadways that are located within the 100-year floodplain that may constrain flow in the overbank areas resulting in higher water surface elevations. These embankments are non-engineered embankments that do not meet levee certification criteria per 44 CFR 65.10. Embankments are wholly or partially overtopped during the 100-year storm event. Flow on either side of the embankment or along segments of the embankment comingles. Figure 5.2 depicts agricultural road embankments between fields and an unedited 100-year floodplain (blue). Some embankments are completely overtopped and others partially. The embankment may function as a levee for events less than the 100-year event, however for the 100-year event flow overtops the roadway. Under this condition the embankment was not modeled in HEC-RAS as a levee.

The South Extension Canal banks are levee-like embankments that constrain flow. During a 100-year event, flow overtops the canal banks at a few locations, however for the majority of the canal reach the embankments are functioning like levees. Figure 5.3 depicts the alignment of the South Extension Canal and Figure 5.4 shows a picture of the canal. Hydraulic modeling considerations for the South Extension Canal are discussed in Section 5.7 (Special Problems).

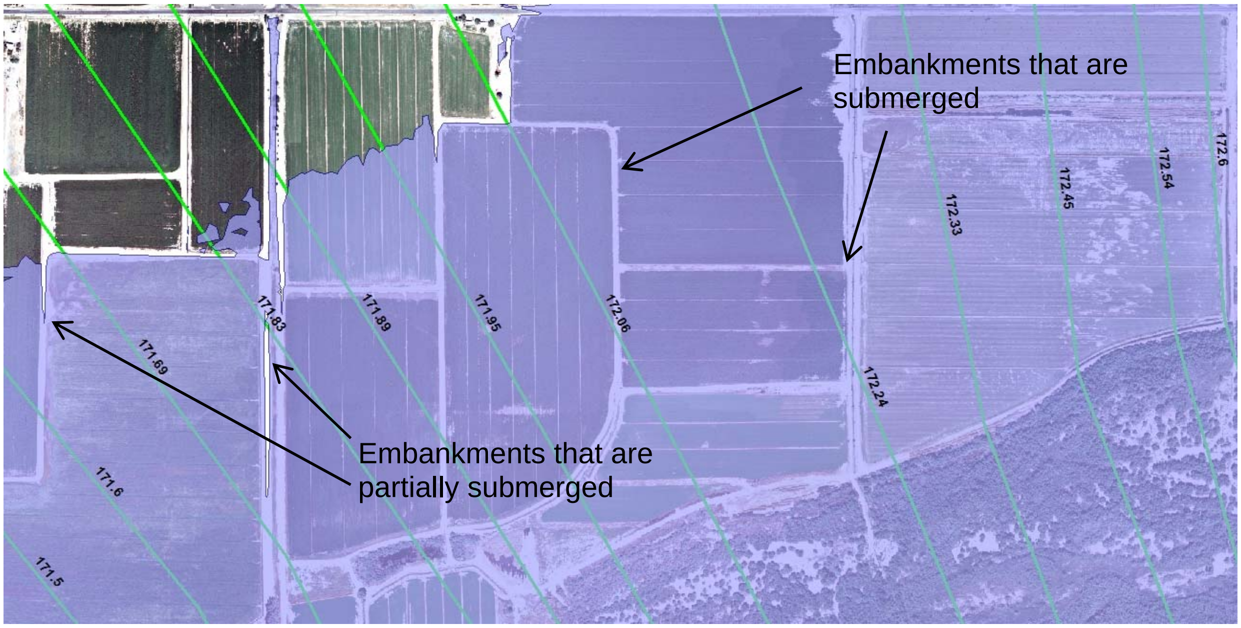
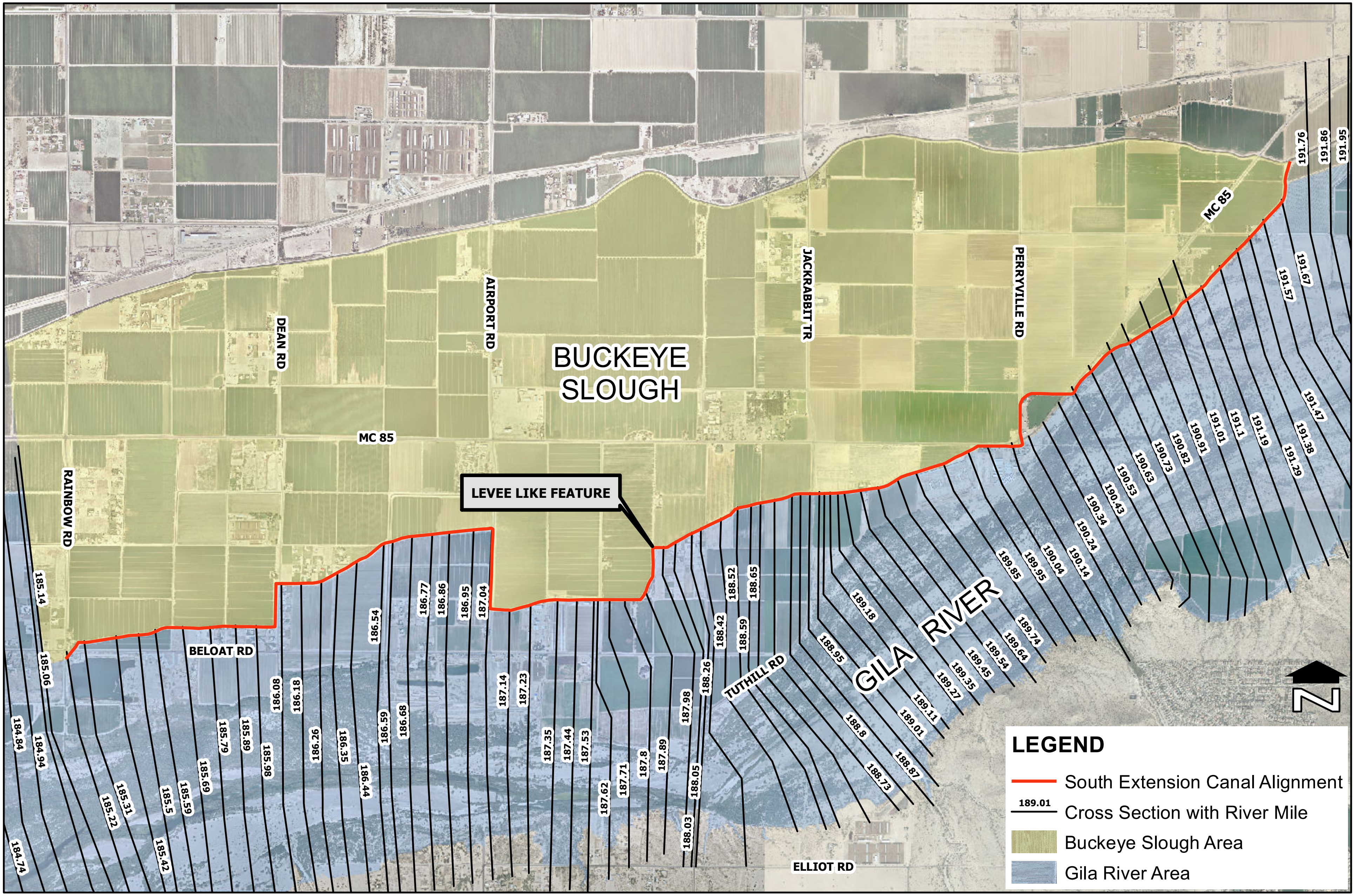


Figure 5.2 – Example of embankments that are levee-like features



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
DATE:	10-3-2014
SCALE:	N.T.S.
DRAWN BY:	AML

Figure 5.3
South Extension Canal Alignment

LOWER GILA RIVER FDS
F.C.D. CONTRACT NO. 2012C017

Stantec

Figure 5.4 – South Extension Canal

5.5.6 Ineffective Flow Areas

The ineffective flow area option of the HEC-RAS computer program is used to model areas of ineffective flow. An iterative process was used to establish ineffective flow areas. Shape files defining the limits of initial ineffective flow areas were created and then imported to HEC-RAS using the HEC-GeoRAS extension for ArcView GIS. Shape files were then revised based on the results of an initial HEC-RAS model. Ineffective flow areas occur:

- In areas of rapid expansion and contraction such as at bridge approaches located within the floodplain.
- In backwater areas behind spur dikes and levee-like embankments.
- In backwater areas located at tributary confluences with the Gila River. See Figure 5.5.
- Within sand and gravel pits located within the floodplain. See Figure 5.6 as an example.
- In agricultural areas where the depth of flow is less than or equal to two feet. Figure 5.7a depicts an example of an agricultural area were the depth of flow for the 100-year event is less than two feet (green shaded area) and the flow is not continuous from one field to the next due to the height of the agricultural roads and/or canals between the fields.

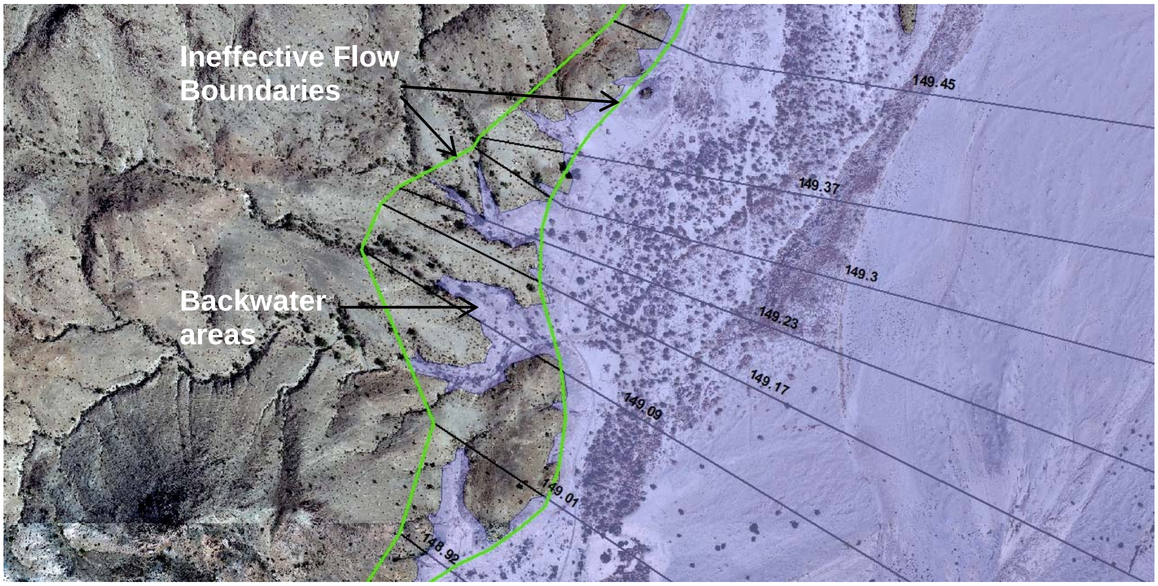


Figure 5.5 – Ineffective flow in backwater areas.

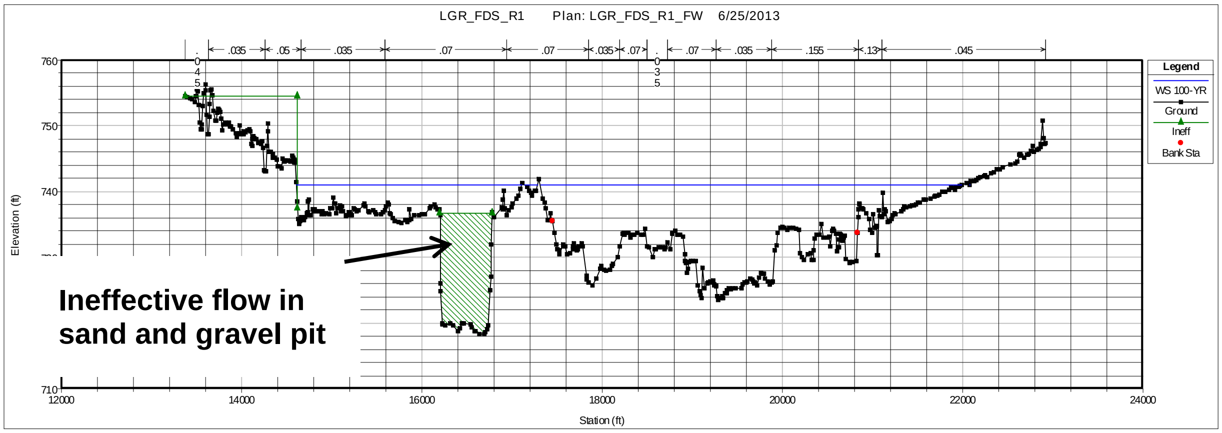


Figure 5.6 – Ineffective flow in sand and gravel pits

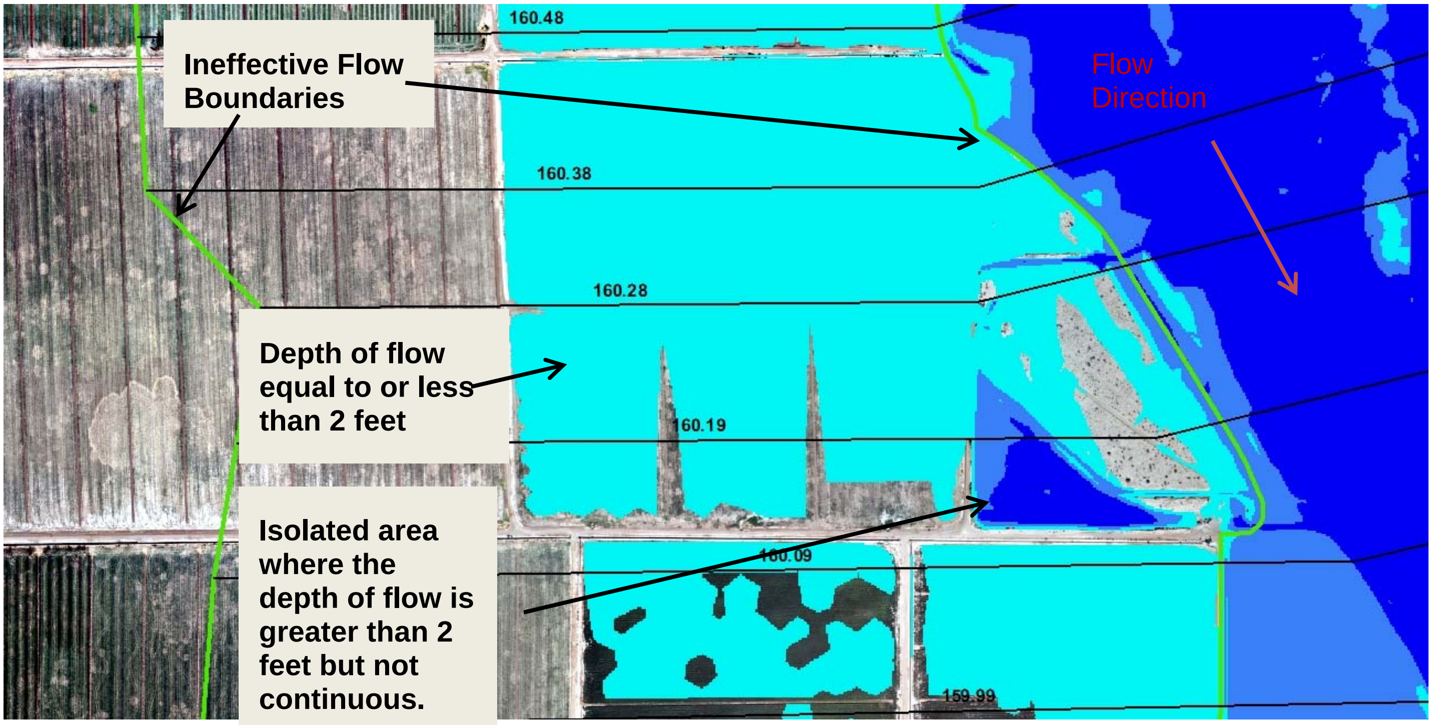


Figure 5.7a – Ineffective flow in agricultural areas

There were areas of exceptions where ineffective flow areas appears to be needed based off of the aerials, but from field reconnaissance these areas of exceptions were existing development that primarily had structures that would not impede flow, such as pole barns (shown in Figure 5.7b), large stacks of hay/cotton bales, or fences that would break away.

Figure 5.7b – Pole Barn

5.5.7 Supercritical Flow

Results of hydraulic modeling demonstrate that the flow regime for the project reach is sub critical flow.

5.6 FLOODWAY MODELING

5.6.1 Floodway Modeling

Floodway encroachments for the study reach were initially established using the Method 4 equal conveyance encroachment option with a target rise in water surface elevation of 1 foot. The target rise was then adjusted at various river stations as necessary to eliminate all rises greater than 1 foot and to eliminate negative changes in water surface elevations. The encroachment stations obtained from the results of the Method 4 option were then imported to the Floodway Method 1 option of the HEC-RAS program. Method 1 encroachments were then revised to produce a rise in water surface elevation as near as possible to 1 foot, and to define floodway boundaries free of frequent oscillations.

5.7 SPECIAL PROBLEMS

Special problems identified in the study area are associated with “levee-like” features and shallow flooding. The South Extension Canal, Jackrabbit Trail and the approach to the Tuthill Road Bridge are levee-like features. Given the structural uncertainty on whether or not the “levee-like” systems will fail during a 100-year event, special hydraulic modeling considerations are required to determine the risk associated with “levee-like” features. Multiple hydraulic models are developed to model “levee-in” and “levee-out” scenarios. The results of these models will bracket the flood hazard risk associated with these “levee-like” features. The modeling approach for the “levee-in” scenario assumes that the levee-like feature is structurally sound and will not be compromised during a 100-year event. The “levee-in” scenario sets the water surface elevation for the river side of the levee system. Two “levee-out” scenarios were developed for this project to estimate water surface elevations on the landward side of the levee. One scenario utilizes an unsteady flow model to estimate that amount of flow that would drain to the Buckeye Slough should the levee system fail. The results of the unsteady flow model are then used in a steady flow model that is used to estimate water surface elevations for the Buckeye Slough. Where the water surface elevations in the Buckeye Slough are greater than the associated water surface elevation in the Gila River and flow comingles, a model referred by FEMA as the Natural Valley Model was developed to estimate water surface elevations for the Gila River and Buckeye Slough. Ultimately, flow that overtops the South Extension Canal in the “levee-in” scenario and flow that overtops the alignment of the South Extension Canal in the “levee-out” scenario drains to the Buckeye Slough. Flow in the Buckeye Slough ultimately commingles with Gila River flow.

5.7.1 South Extension Canal

The South Extension Canal is a levee-like feature separating the Gila River from the Buckeye Slough (see Figure 5.3). Split flow occurs along the South Extension Canal, between Gila River RM 185.22 and RM 191.76 during the 100-year event. Flow overtops the canal at numerous locations and drains to the Buckeye Slough. The Buckeye Slough ultimately drains back to the Gila River. Figure 5.8 is a 1980 photograph depicting flood flows in the Gila River. At some locations flow is against the canal embankment and at another location flow has overtopped the canal.

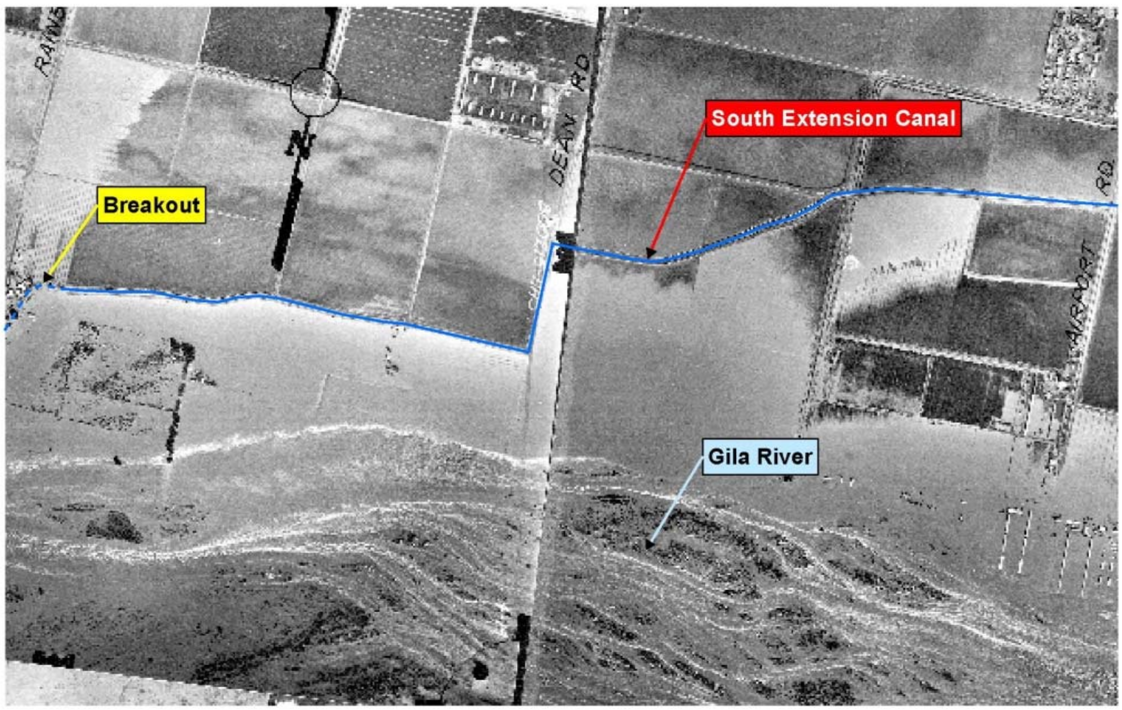


Figure 5.8 – 1980 Flood Photograph

The embankments of the South Extension Canal are non-engineered, do not have acceptable freeboard for the 100-year event and lack embankment armoring. The embankments would not meet 44 CFR 65.10 criteria for levee certification.

Two hydraulic models were developed to evaluate the effects of the South Extension Canal on hydraulic conditions of the Gila River and on flow draining to the Buckeye Slough. The first hydraulic model (“levee-in”), models the scenario that the canal embankments are structurally sound and do not fail in a 100-year event. The second hydraulic model (levee-out), models a scenario were the South Extension Canal has been removed and ground conditions (topography) are considered pre-canal. This model, an unsteady flow model, estimates the amount of flow draining to the Buckeye Slough. The hydraulic models were developed using the following procedures and analyses:

- Structurally sound canal embankments (levee-in scenario):
  - Model was developed to estimate Gila River 100-year water surface elevations.
    - Project File – LGR_FDS_R2
  - Geometry Considerations
    - At locations along the South Extension Canal cross sections terminate at the canal south embankment.
    - The levee option of the geometry editor is utilized to set levee stations on top of the canal embankment.
  - Lateral Weir Considerations
    - At locations where flows overtops the canal embankment lateral weirs are used to estimate the amount of flow draining from the Gila River.
      - Weir geometry along the length of the weir is based on the topographic profile of the canal embankment that is being overtopped. An average weir width of 15 feet was estimated from topographic and aerial data.
      - A stable broad crested weir configuration is assumed for the analysis.
      - Variable depth weir coefficients were estimated utilizing coefficients listed in the Handbook of Hydraulics (Barter and King, 1976, Table 5-3, Page 5-40). Weir coefficients varied from 2.63 to 2.70
      - The flow optimization option in the Lateral Structure Editor was toggled to optimize flow.
- South Extension Canal removed from topographic data (levee-out condition):
  - This model was developed to estimate the amount of flow that would drain to the Buckeye Slough from the Gila River during a 100-year event.
    - Project File - (LGR_FDS_R2B_USF (Gila River Unsteady Flow))
  - Hydrology Considerations

- Unsteady flow modeling was selected as the modeling preference to estimate the peak and volume of flow draining to the Buckeye Slough.

- Estimation of the 100 year hydrograph for this analysis was accomplished using stream flow records for the February 1980 flood and the estimated 100-year peak discharge at RM 192.33. Stream flow records for the February 1980 flood were obtained from Floods of February 1980 in Southern California and Central Arizona (USGS, 1991 Professional Paper 1494). The discharge measurements reported in that document were for the gaging station at the Gila River below Gillespie Dam from 15 February to 23 February. The last discharge reported on 23 February was 62,000 cfs. The receding limb of the hydrograph was completed using mean daily discharges for the same gage for a total duration of 25 days. That hydrograph was then proportioned by the ratio of the peak discharge for the February 1980 event (178,000 cfs) to the 100 year peak discharge at RM 192.33 (227,000 cfs).

o Geometry Considerations

- At locations along the South Extension Canal cross sections terminate at the canal south embankment.

- Topographic data along cross section alignments were modified to develop the levee-out condition geometry files. At locations the canal is either in a cut or fill section. Criteria for selecting pre-canal topography were developed for different conditions. The conditions determining the elevation where the cross section would be trimmed are:

  - If the right overbank is lower than the canal toe and the water surface elevation is higher that the toe elevation the end of cross section is set at the canal south embankment toe (Figure 5.9).

  - If the right overbank is near level with the canal toe and the water surface elevation is higher than the overbank area, a point on the south canal embankment that is consistent with the elevation of the level area is set for the end point of the cross section (Figure 5.10).

  - If the right overbank is higher than the canal toe and the water surface elevation is lower, a point on the south canal embankment that is above the water surface elevation is picked for the end of the cross section (Figure 5.11).

o Lateral Weir Considerations

- Lateral weirs were coded into the model to facilitate the estimation of flow draining to the Buckeye Slough.

    - Weir geometry is based on a topographic profile developed utilizing the same criteria for estimating the pre-canal topography. An average weir width of 15 feet was estimated from topographic and aerial data.

    - A stable broad-crested weir configuration is assumed for the analysis.

    - Variable depth weir coefficients were estimated utilizing coefficients listed in the Handbook of Hydraulics (Barter and King, 1976, Table 5-3, Page 5-40). Weir coefficients varied from 2.63 to 2.69.

    - The flow optimization window in the Lateral Structure Editor was toggled to optimize flow.

- Along the north overbank area between RM 188.03 to RM 188.95 flow is confined by the South Extension Canal, the approach to Tuthill Bridge and Jack Rabbit Road. The water surface elevation in this area would be the static backwater from cross section 188.03 which is 876.94 whereas the weir elevations for the levee-out condition along the South Extension Canal are higher than the static backwater water surface elevation. Due to limitations in the HEC-RAS model the levee-out model shows the water surface elevation increasing from RM 188.03 to RM 188.95 not the static water surface elevation and flow overtops the south extension canal. The weir elevations for the south extension canal were elevated so that flow would not break-out over the South Extension Canal Embankment.

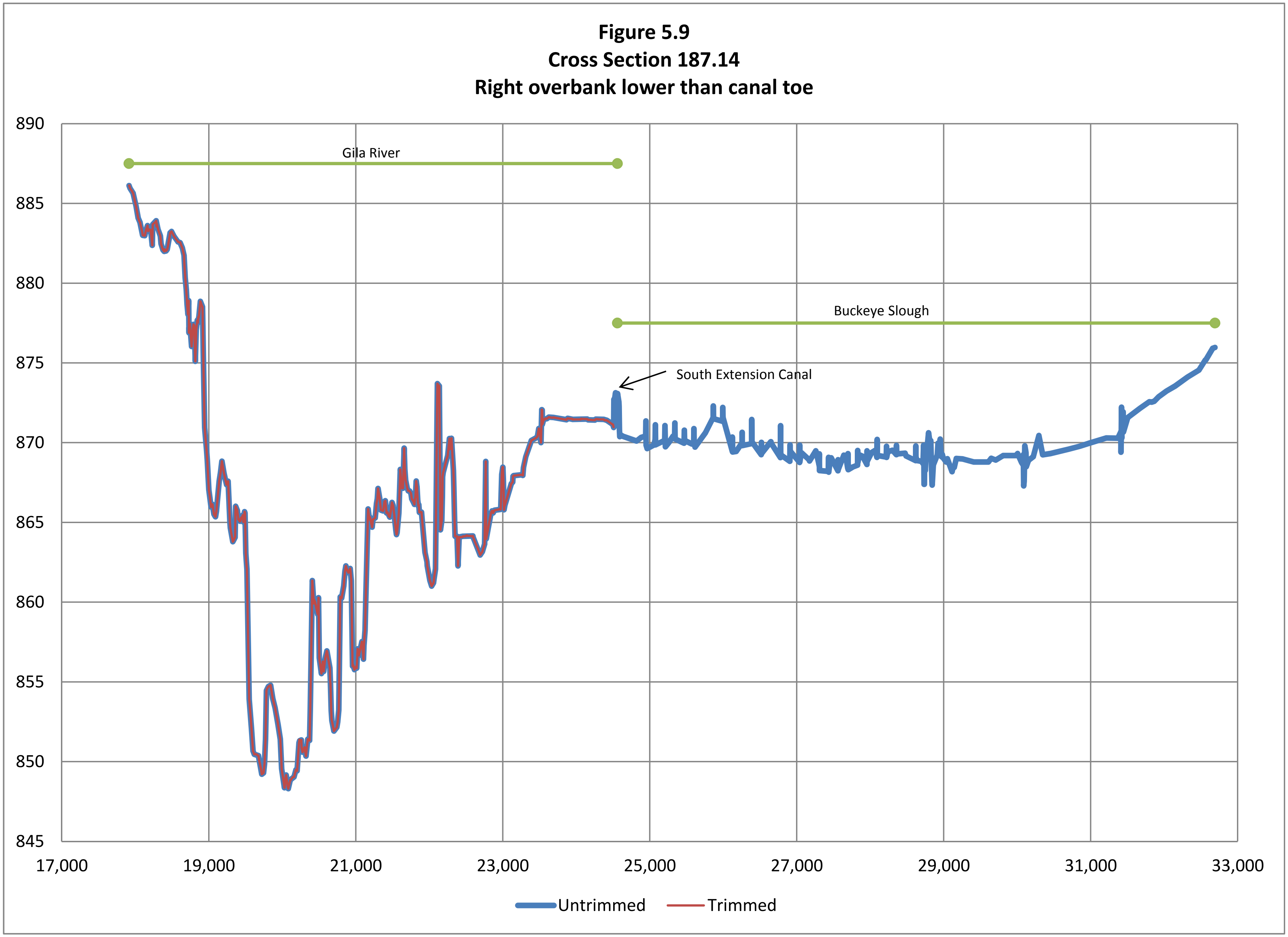


Figure 5.9
Cross Section 187.14
Right overbank lower than canal toe
890
885
880
875
870
865
860
855
850
845
17,000
19,000
21,000
23,000
25,000
27,000
29,000
31,000
33,000
Gila River
Buckeye Slough
South Extension Canal
Untrimmed
Trimmed

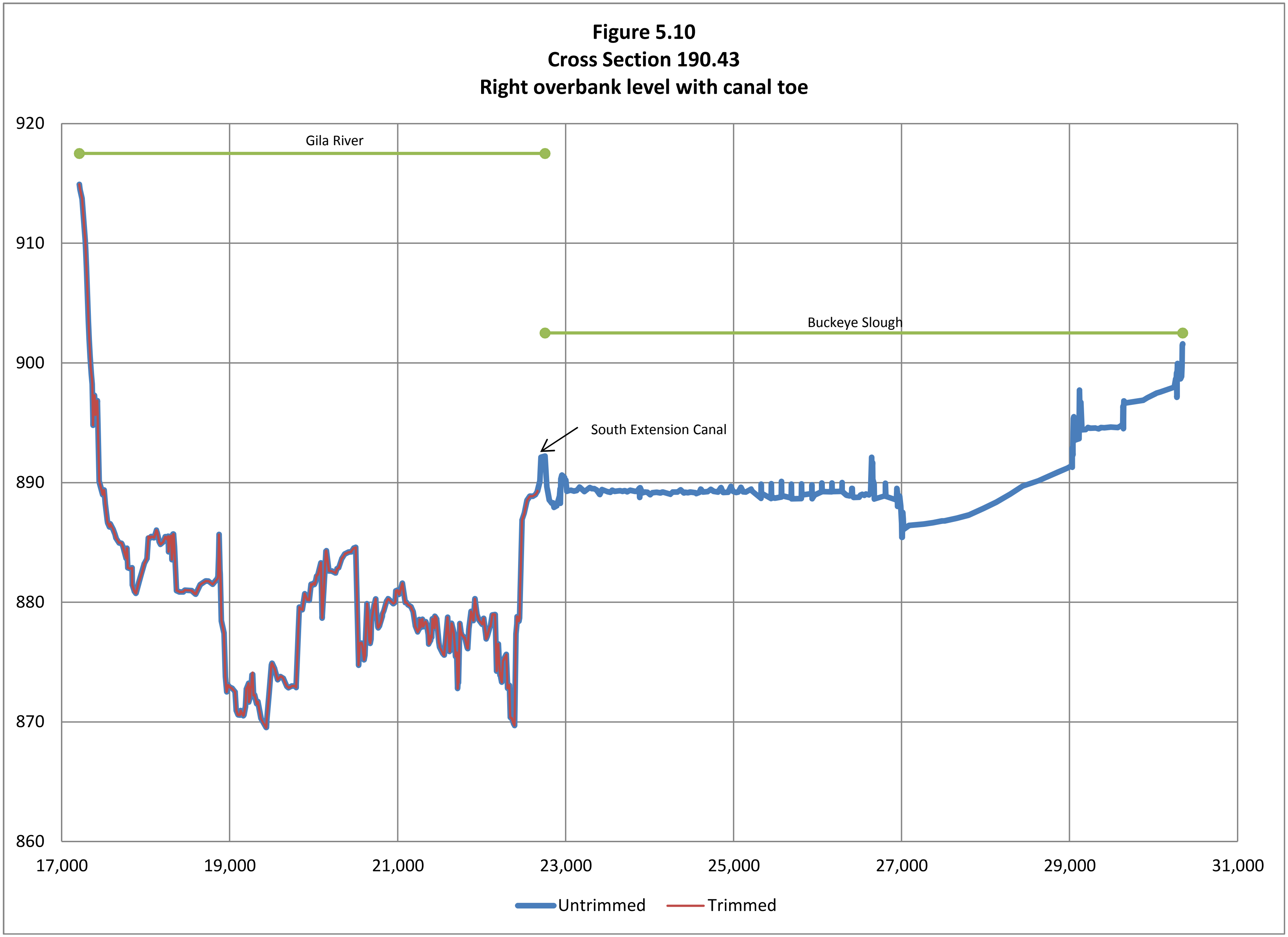
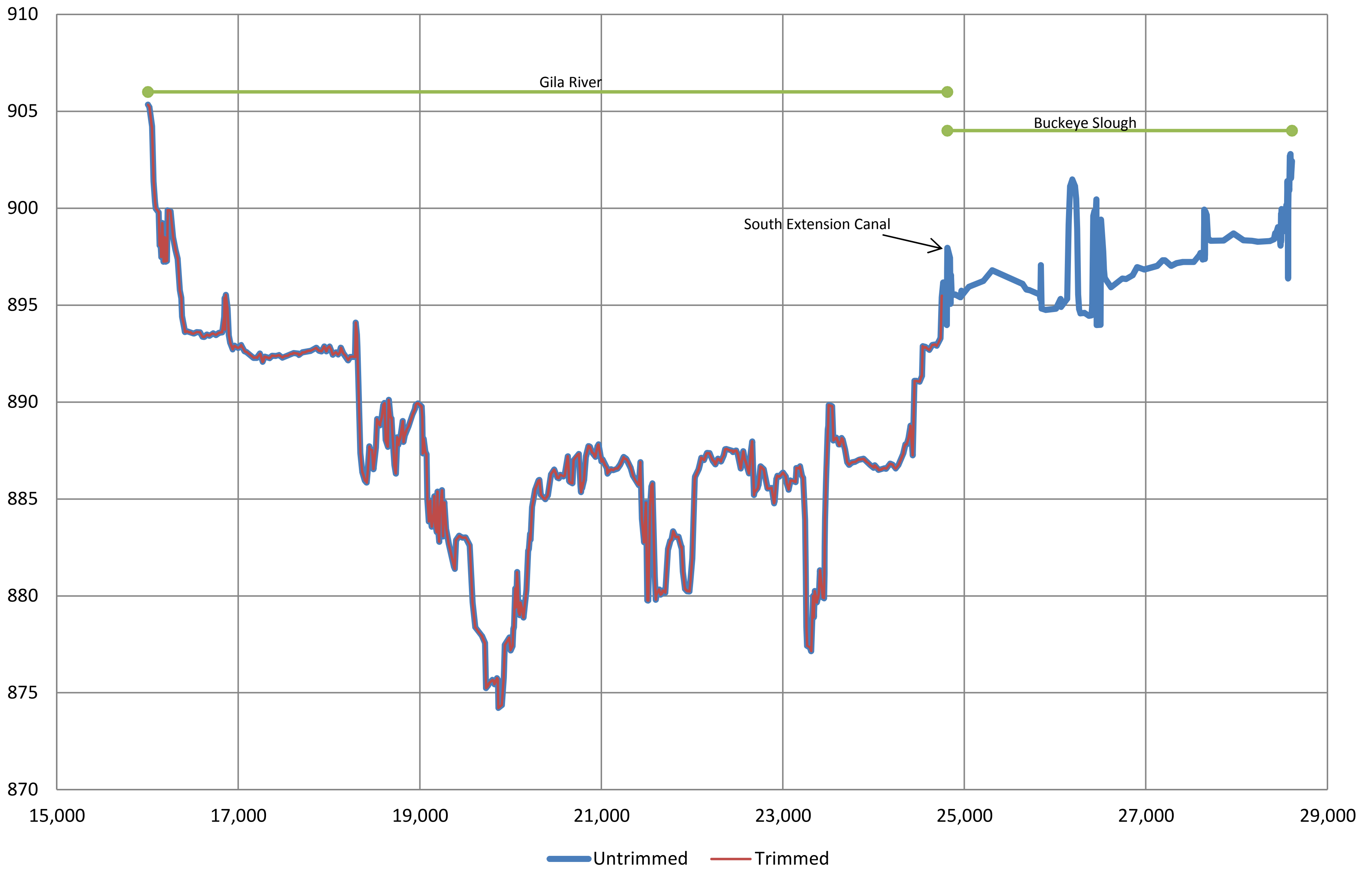


Figure 5.10
Cross Section 190.43
Right overbank level with canal toe
920
910
900
890
880
870
860
17,000
19,000
21,000
23,000
25,000
27,000
29,000
31,000
Gila River
Buckeye Slough
South Extension Canal
Untrimmed
Trimmed

Figure 5.11
Cross Section 191.57
Right overbank higher than canal toe



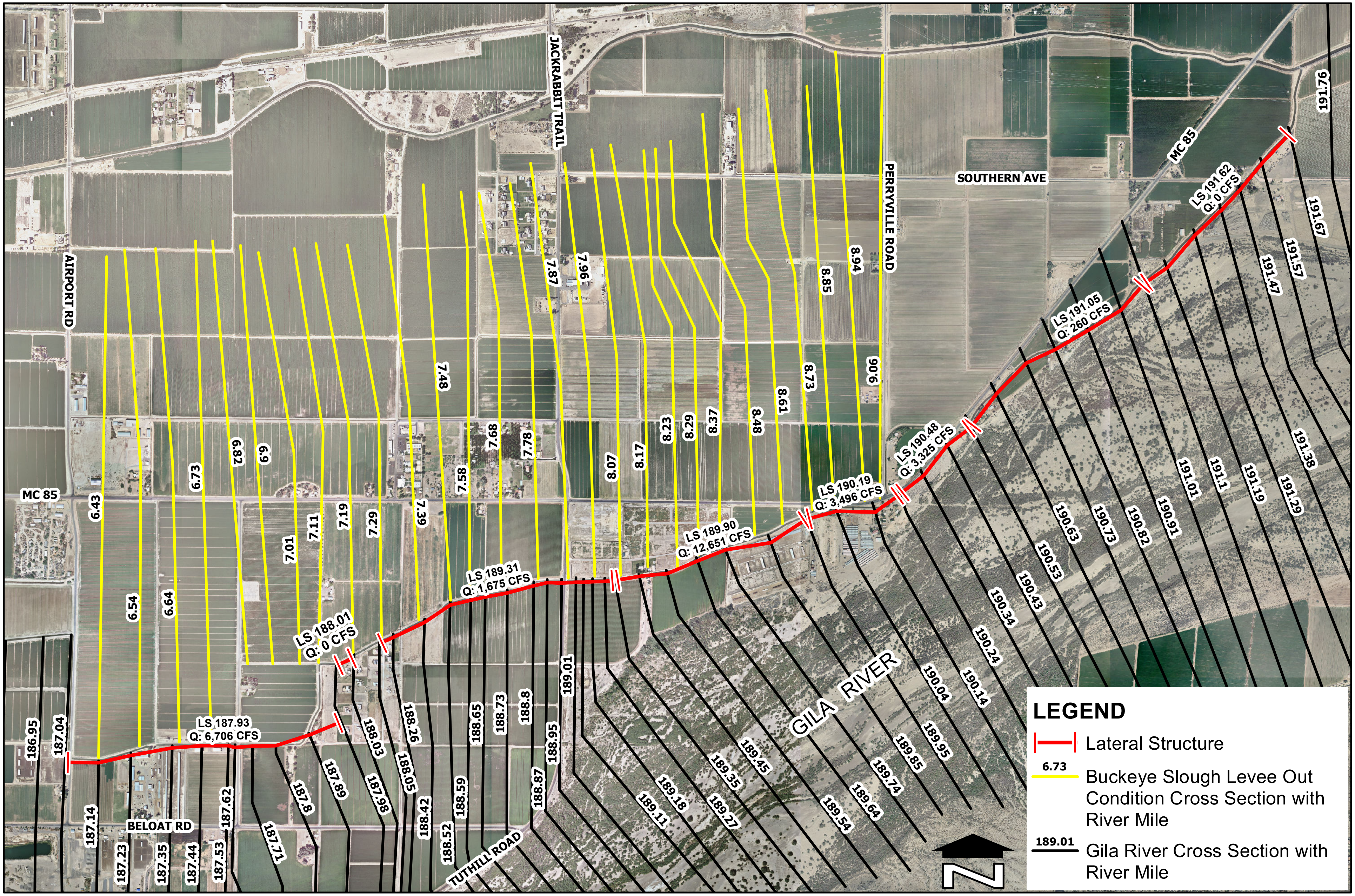
5.7.1.1 Summary of Results

- Table 5.3 list a summary of 100-year peak discharges draining to the Buckeye Slough.

Table 5.3
Summary of Peak Discharges Draining to the Buckeye Slough

Gila River RM Station	Peak Flow from Gila River Unsteady Flow Model (cfs)	Buckeye Slough RM Unsteady Flow Data Input Location
190.24	7026.56	9.06
189.95	12648.84	8.61
189.35	1670.64	8.07
187.89	6607.22	7.11

- Figure 5.12 depicts the location of lateral weirs associated with the peak discharges.
- Figures 5.13 through 5.16 depict lateral weir inflow hydrographs for the Buckeye Slough.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
DATE:	10-21-2015
SCALE:	N.T.S.
DRAWN BY:	AML

Figure 5.12
Lateral Structure Locations

LOWER GILA RIVER FDS
F.C.D. CONTRACT NO. 2012C017

Stantec

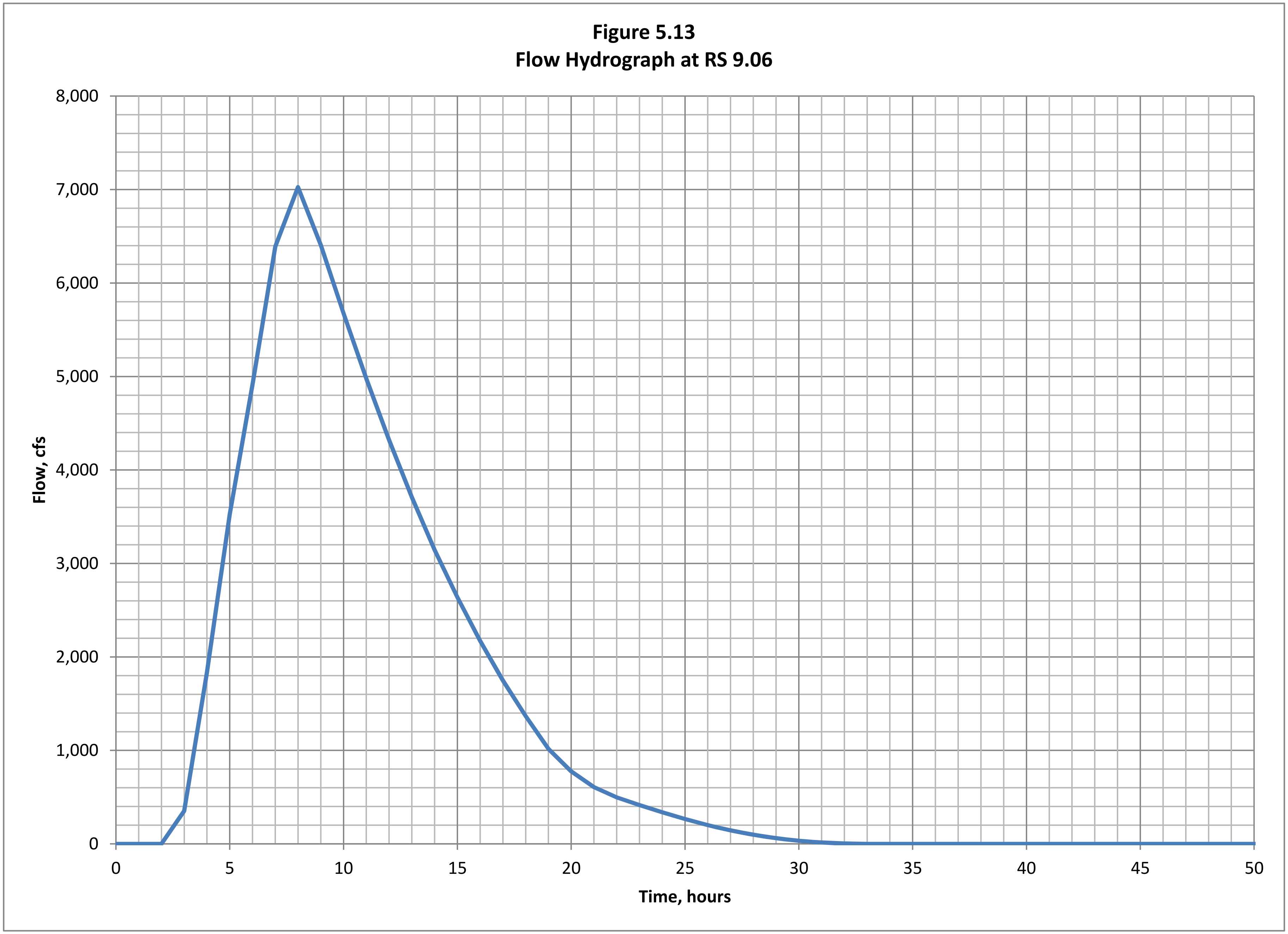


Figure 5.13
Flow Hydrograph at RS 9.06
Flow, cfs
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0
5
10
15
20
25
30
35
40
45
50
Time, hours

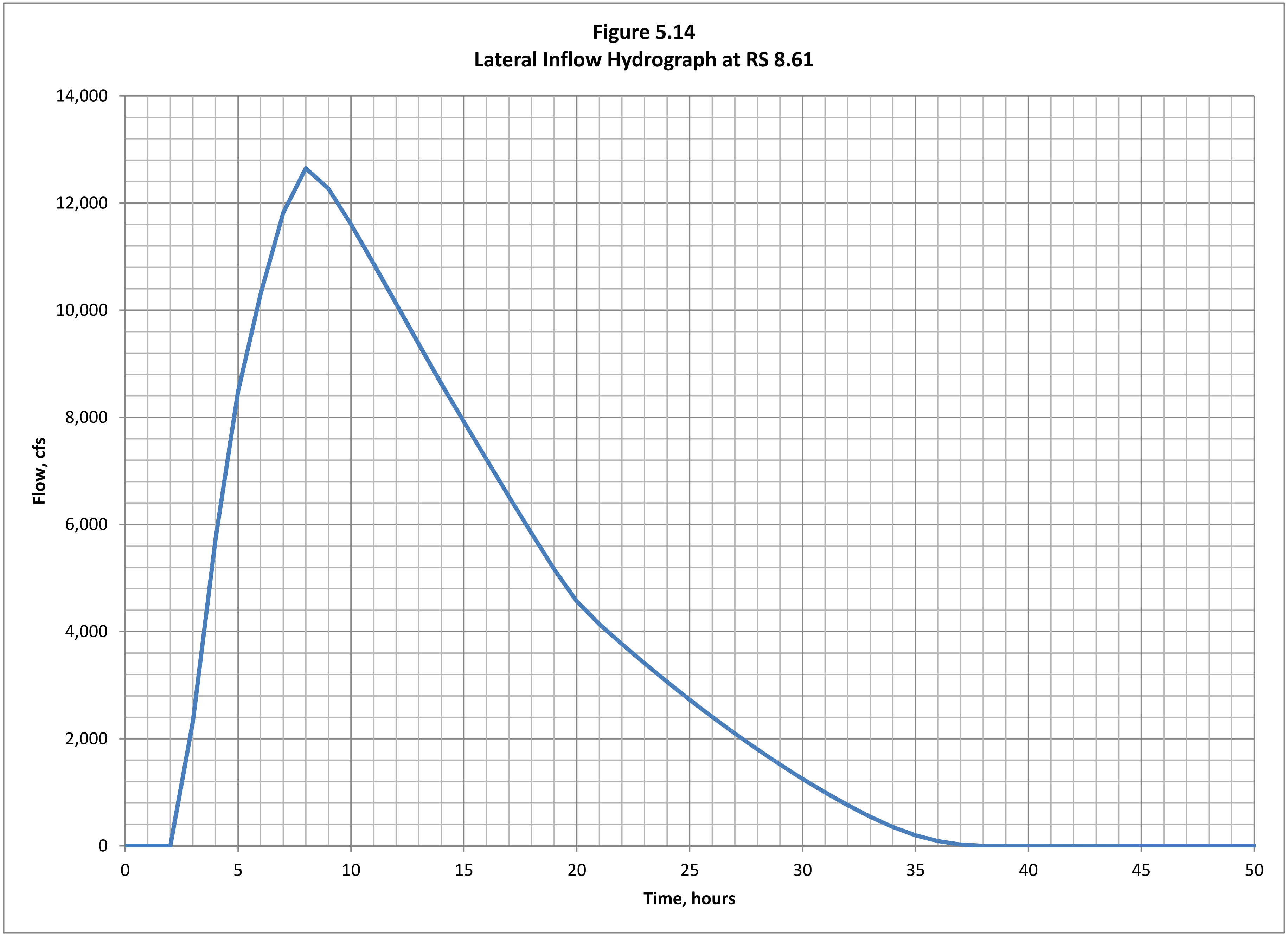
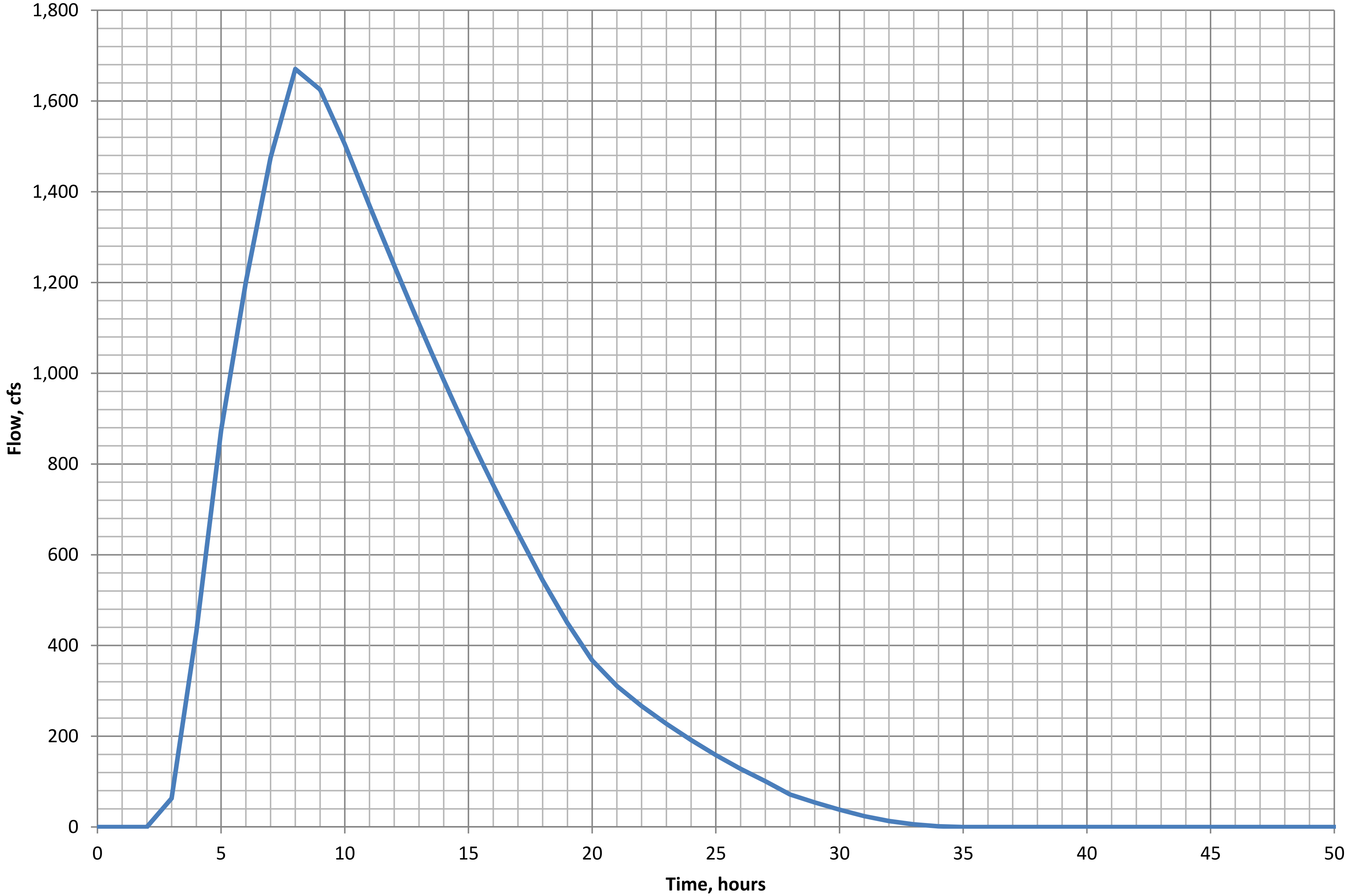


Figure 5.14
Lateral Inflow Hydrograph at RS 8.61
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Flow, cfs
0
5
10
15
20
25
30
35
40
45
50
Time, hours

Figure 5.15
Lateral Inflow Hydrograph at RS 8.07



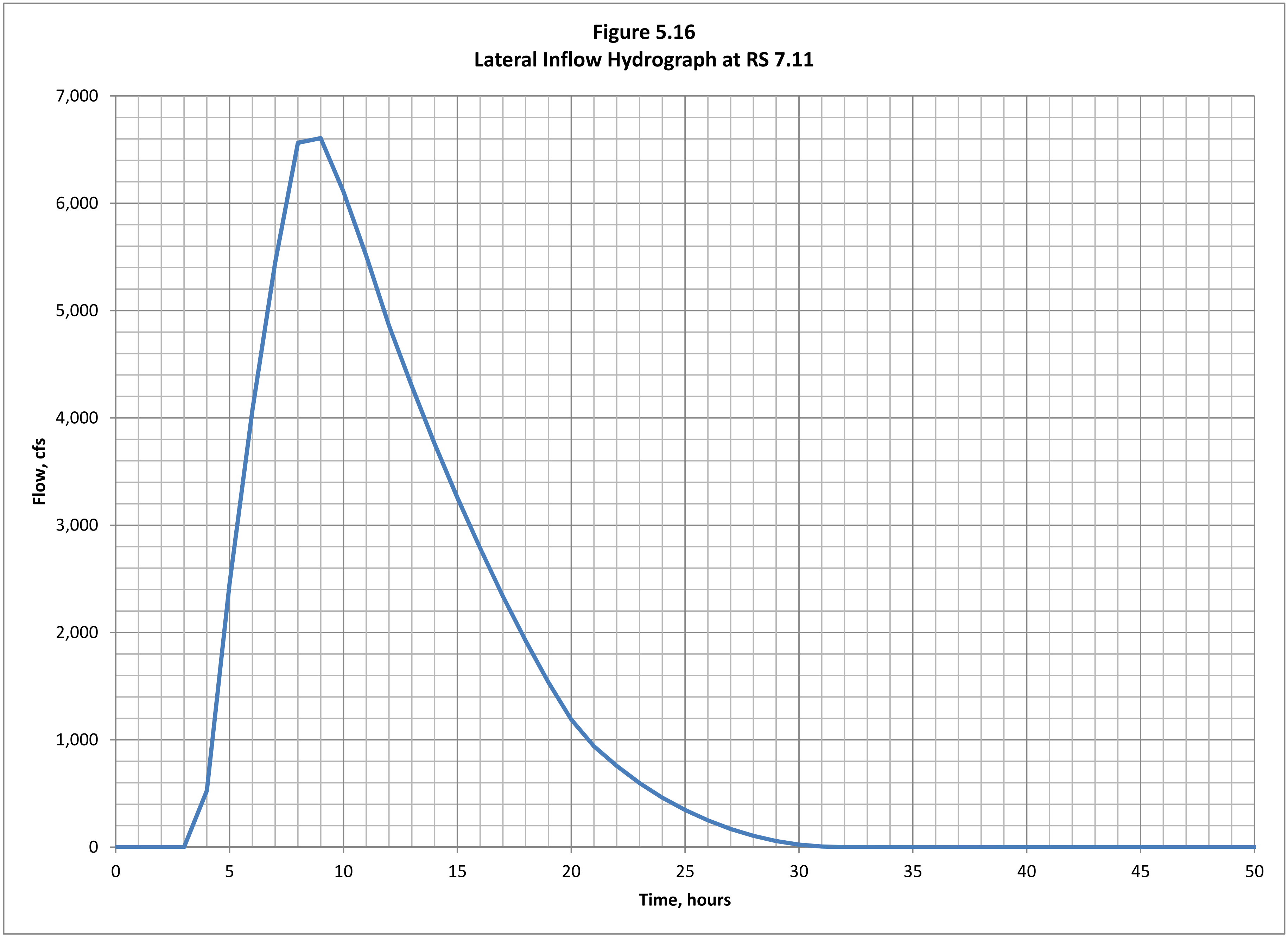


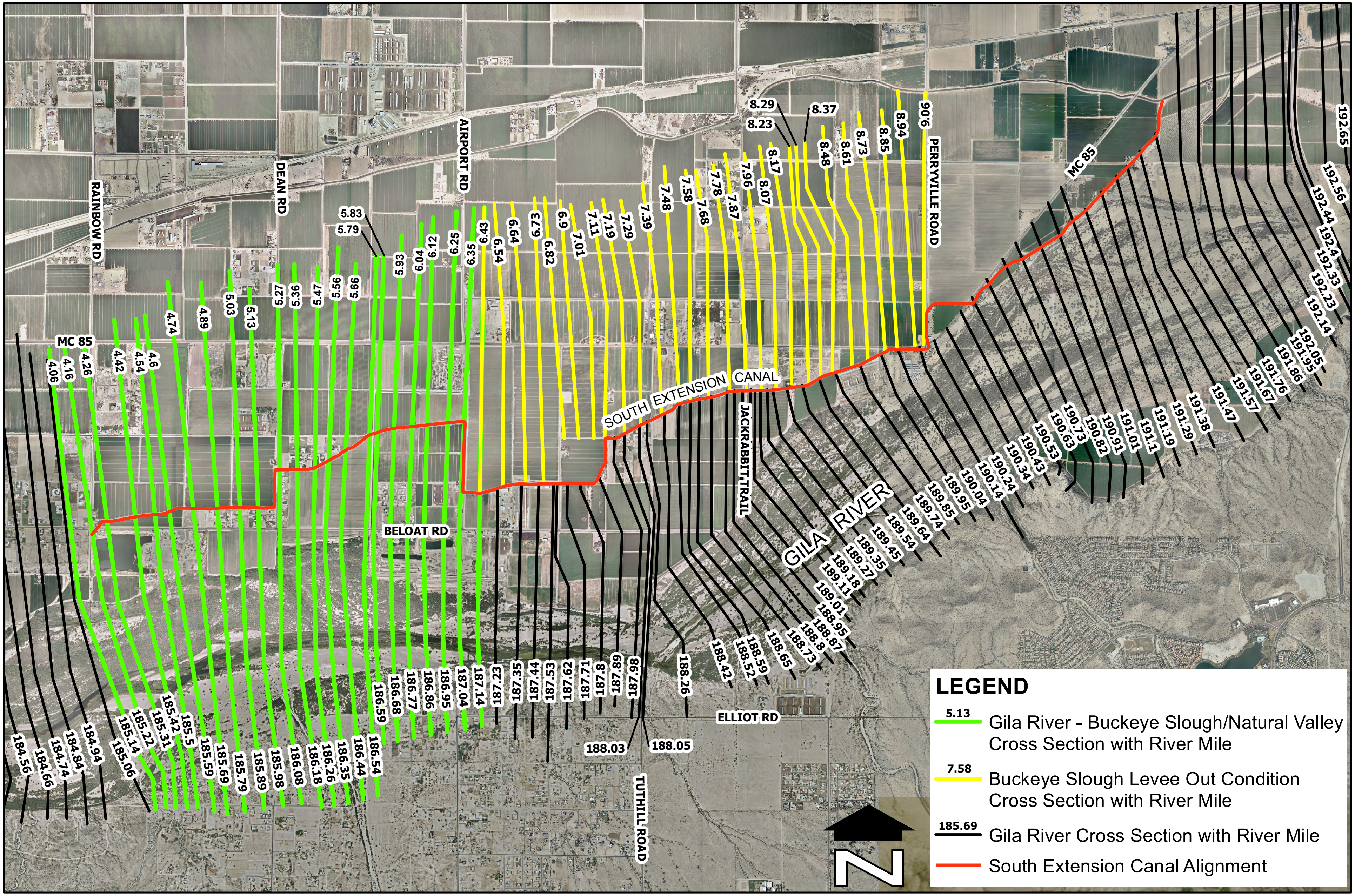
Figure 5.16
Lateral Inflow Hydrograph at RS 7.11
Flow, cfs
Time, hours
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
0
5
10
15
20
25
30
35
40
45
50

5.7.2 Buckeye Slough

The Buckeye Slough is a topographic low area located north and parallel to the Gila River between RM 185.22 and RM 191.76. The location of the Buckeye Slough is depicted in Figure 5.17. The southern boundary of the slough is the South Extension Canal.

The following procedures/analyses were utilized/conducted to develop the hydraulic models:

- Two HEC-RAS plans were developed to determine if there are attenuation of flows within the Buckeye Slough due to available storage and to determine the 100-year floodplain limits. The first plan (Unsteady Flow Buckeye Slough) is based on unsteady flow and the second (Buckeye Slough Steady Flow) is based on steady flow peak discharges determined from the first plan.
    - Project File – Buckeye Slough
- Hydrology Considerations
    - Hydrographs from the Gila River Unsteady Flow Model were incorporated into the Unsteady Flow Data Editor at cross section locations consistent with the locations of lateral weirs in the Gila River Unsteady Flow Model.
- Geometry Considerations
    - Cross sectional geometry for the Buckeye Slough were determined from a triangulated irregular network (TIN). The TIN was developed from a digital terrain model (DTM) supplied by the Flood Control District of Maricopa County using the 3D Analyst extension of ArcView GIS v10.1. Cross sections alignments from previous study's served as the initial cross section alignments. A channel centerline was established that followed topographic lows. The channel centerline approximates the flow alignments for the 100-year event.
        - Elevations of cross section endpoints terminating along the South Extension Canal were set at the corresponding weir elevation from the Gila River Unsteady Flow model.



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
DATE:	10-21-2015
SCALE:	N.T.S.
DRAWN BY:	AML

Figure 5.17
Buckeye Slough

LOWER GILA RIVER FDS
F.C.D. CONTRACT NO. 2012C017

- Buckeye Slough Study Reach Refinement

  - Initial results of the Buckeye Slough Unsteady Flow Model were compared with the results of the Gila River Unsteady Flow Model. The comparison showed that Buckeye Slough water surface elevations at equivalent locations to Gila River water surface elevations, for the majority of the cross sections downstream of Gila River RM 187.14 are higher than water surface elevations estimated with the Gila River Unsteady flow model. This indicates that potential weir flow from the Gila River is drowned out by flow from the Buckeye slough and flow between the Buckeye Slough and the Gila River has comingled. Because of this hydraulic condition the Buckeye Slough study reach was refined to extend from RM 187.14 to RM 191.76.

  - Water surface elevations for the "levee-out" scenario between RM 185.22 and 187.14 are estimated by developing a "Natural Valley" model where Gila River cross sections are extended through the South Extension Canal and across the Buckeye Slough. Figure 5.17 depicts the reach limits and cross sections for the Natural Valley model.

    - Project File – LGR_FDS_R2_Natural_Valley

5.7.2.1 Buckeye Slough Floodplain Upstream of RM 9.06

Flow from the Gila River Lateral Weir located between RM 190.24 to RM 190.53 (Figure 5.18) drains to a low area bounded by the South Extension Canal, MC 85 and Perryville Road. This area is considered part of the Buckeye Slough. Flow from the low area will pond and then drain to the west overtopping Perryville Road and to the north overtopping the South Extension Canal.

The following procedures/analyses were utilized/conducted to determine floodplain limits:

- The hydrograph peak discharge from the Gila River Unsteady Flow Model for Weirs 191.05 LS and 190.48 LS was used for the analysis.

  - 100-year peak discharge is equal to 3,585 cfs.

  - Two scenarios were developed. A "levee-in" scenario, where topographic data for a uneven weir analyses is taken from a profile alignment located on top of the South Extension Canal and Perryville Road embankments and a levee-out scenario where the profile alignment is at the toe of the of the South Extension Canal and Perryville Road embankments.

  - A weir programs developed based on coding by the Ohio Department of Natural Resources and the "Techniques of Water-Resources Investigation of the United

States Geological Survey, Book 3, Chapter A5, Measurement of Peak Discharge at Dams by Indirect Methods" was utilized for an uneven weir analysis.

- Uneven Weir Alignments are depicted on Figure 5.18.
- The weir discharge coefficient "C" value varies with depth. The value varied from 2.50 to 3.03.

5.7.2.1.1 Summary of Results

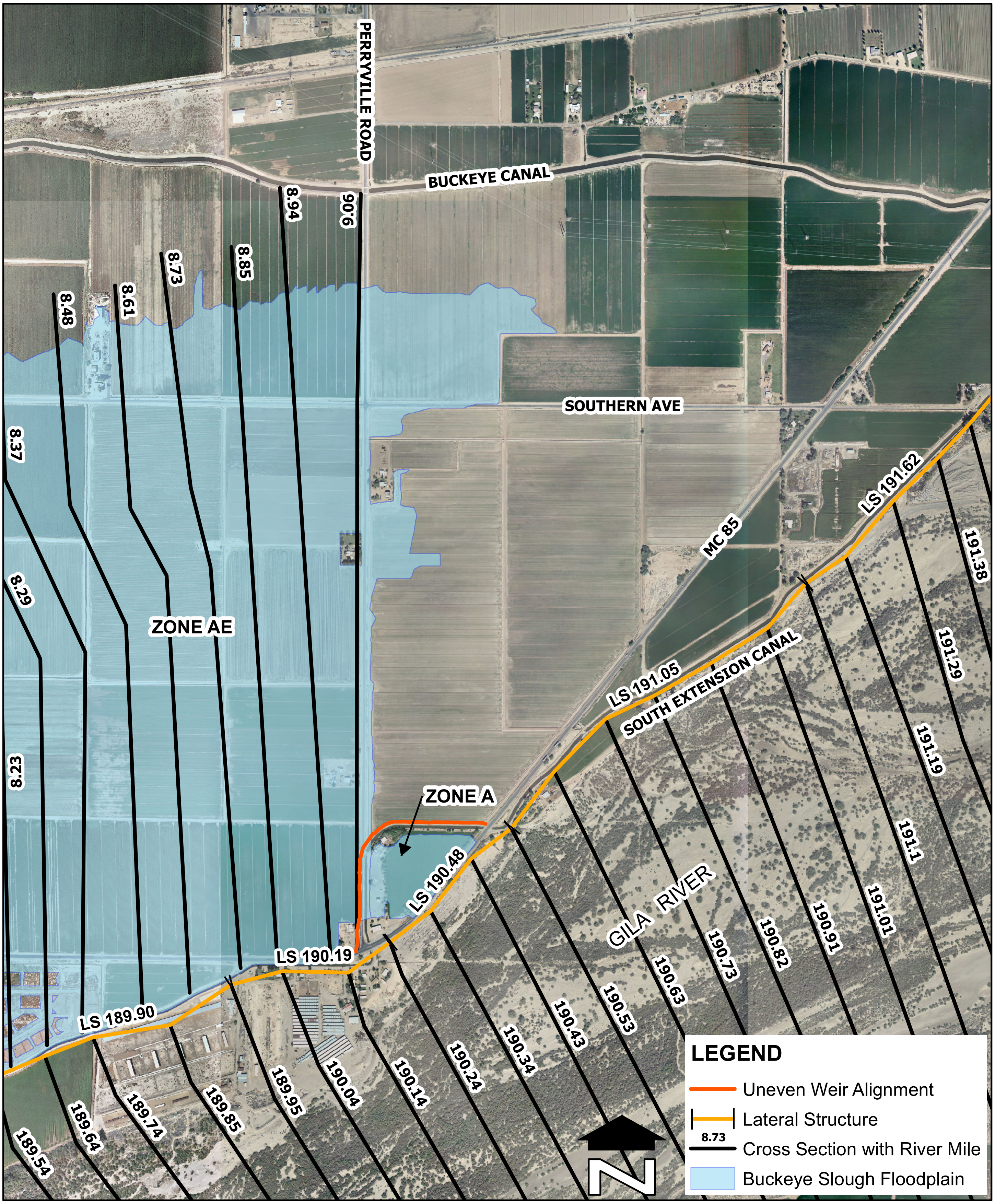
- Output files for the uneven weir evaluation are located in Appendix E.5.
- Results indicate for both scenarios that the majority of the flow drains to the west overtopping Perryville Road. About 44 cfs drains to the north.
- The results will be used to delineate a floodplain in the low area.
- Unsteady Flow Hydrographs for Lateral Weirs 191.05, 190.48, and 190.19 are combined. The resulting hydrograph is keyed in as the Flow Hydrograph at Buckeye Slough RM 9.06.
- The water surface elevation from Buckeye Slough RM 2.609 is used to delineate backwater upstream of RM 9.06 for flow that was not being conveyed through the low area.

5.7.2.2 Buckeye Slough Floodplain South of Buckeye Slough RM 6.90

Flow from the Gila River Lateral Weir located between Gila River RM 187.62 to RM 187.89 (Figure 5.19) drains to an area bounded by the South Extension Canal on the south and east, Tuthill Road on the west and a canal berm to the north. This area is considered part of the Buckeye Slough. Flow from the area will pond and then drain to the west overtopping Tuthill Road and to the north overtopping the canal.

The following procedures/analyses were utilized/conducted to determine floodplain limits:

- Using the maximum water surface elevation overtopping the Gila River Unsteady Flow Model for Weir 187.93 LS over the South Extension Canal stretch upstream of the Tuthill alignment, a peak discharge of flow overtopping that stretch was determined. This was done by uneven weir analysis found in the USGS Techniques of Water Resources Investigations, Book 3, Chapter A5 (Hulsing, 1967) and the calculation of the discharge is in Appendix E.5
    - o 100-year peak discharge is equal to 914 cfs, which was used in a HEC-RAS model (400-09-012 in Appendix E.4) to delineate the floodplain for this low area (Figure 5.19)

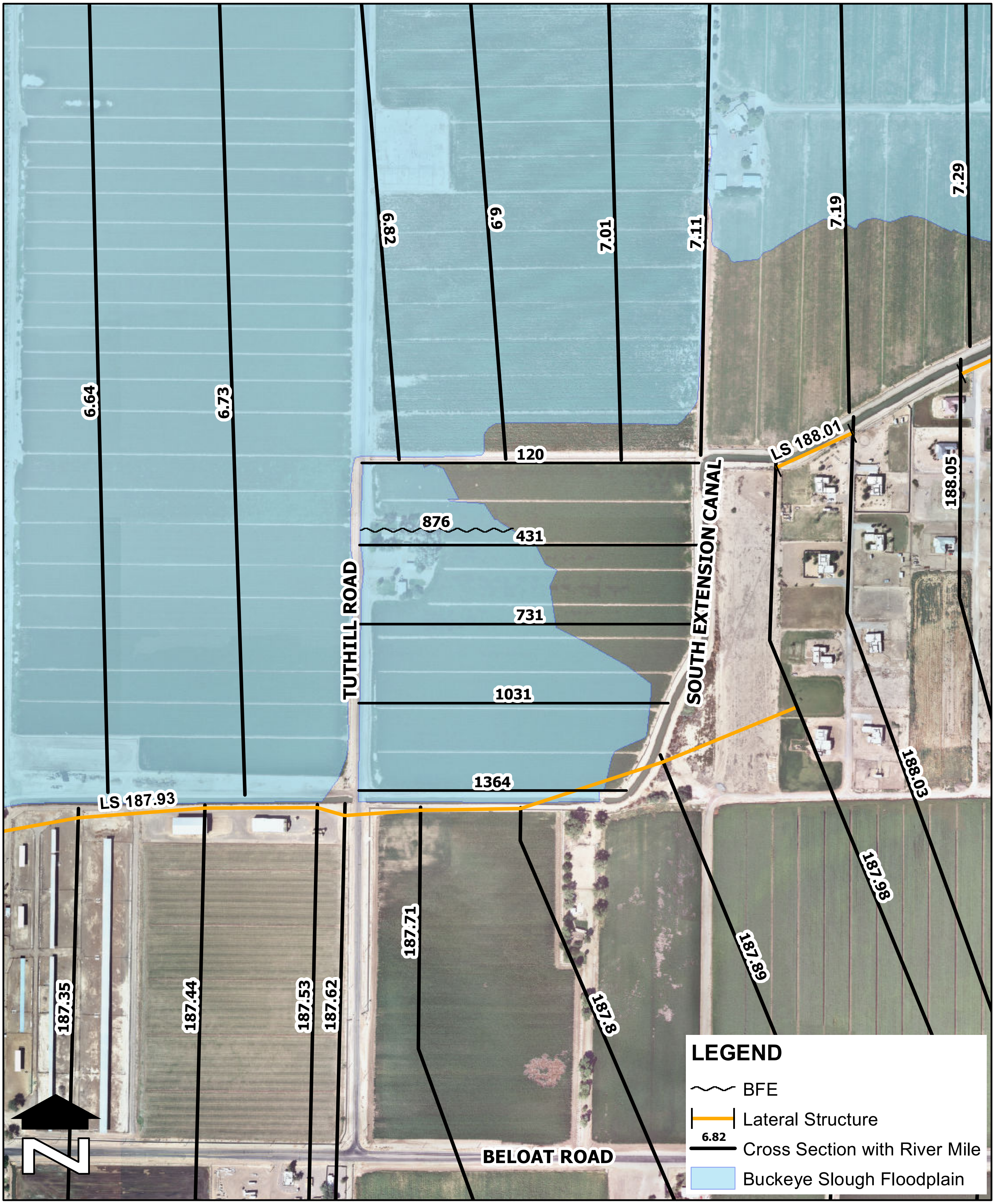


FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
DATE:	10-21-2015
SCALE:	N.T.S.
DRAWN BY:	AML

Figure 5.18
Buckeye Slough Floodplain Upstream of RM 9.06

LOWER GILA RIVER FDS
F.C.D. CONTRACT NO. 2012C017

Stantec



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
DATE:	06-24-2016
SCALE:	N.T.S.
DRAWN BY:	AML

Figure 5.19
Buckeye Slough Floodplain
South of RM 6.90

LOWER GILA RIVER FDS
F.C.D. CONTRACT NO. 2012C017

Stantec

5.7.3 Jackrabbit Trail / Tuthill Bridge Approach.

Jackrabbit Trail and the approach to the Tuthill Road Bridge (Figure 5.20) are levee-like features where two floodplain delineation scenarios were modeled, a “levee-in” and a “levee-out” scenario. The Gila River model (Project –LGR_FDS_R2) models the “levee-in” scenario. Project LGR_FDS_R2_TAO contains data for the Tuthill bridge approach and Jackrabbit Road “levee-out” condition. The results of the LGR_FDS_R2_TAO model are used to determine BFE’s between the Tuthill approach and the South Extension Canal

The following revisions were made to the LGR_FDS_R2 Project to develop the LGR_FDS_R2_TAO Project:

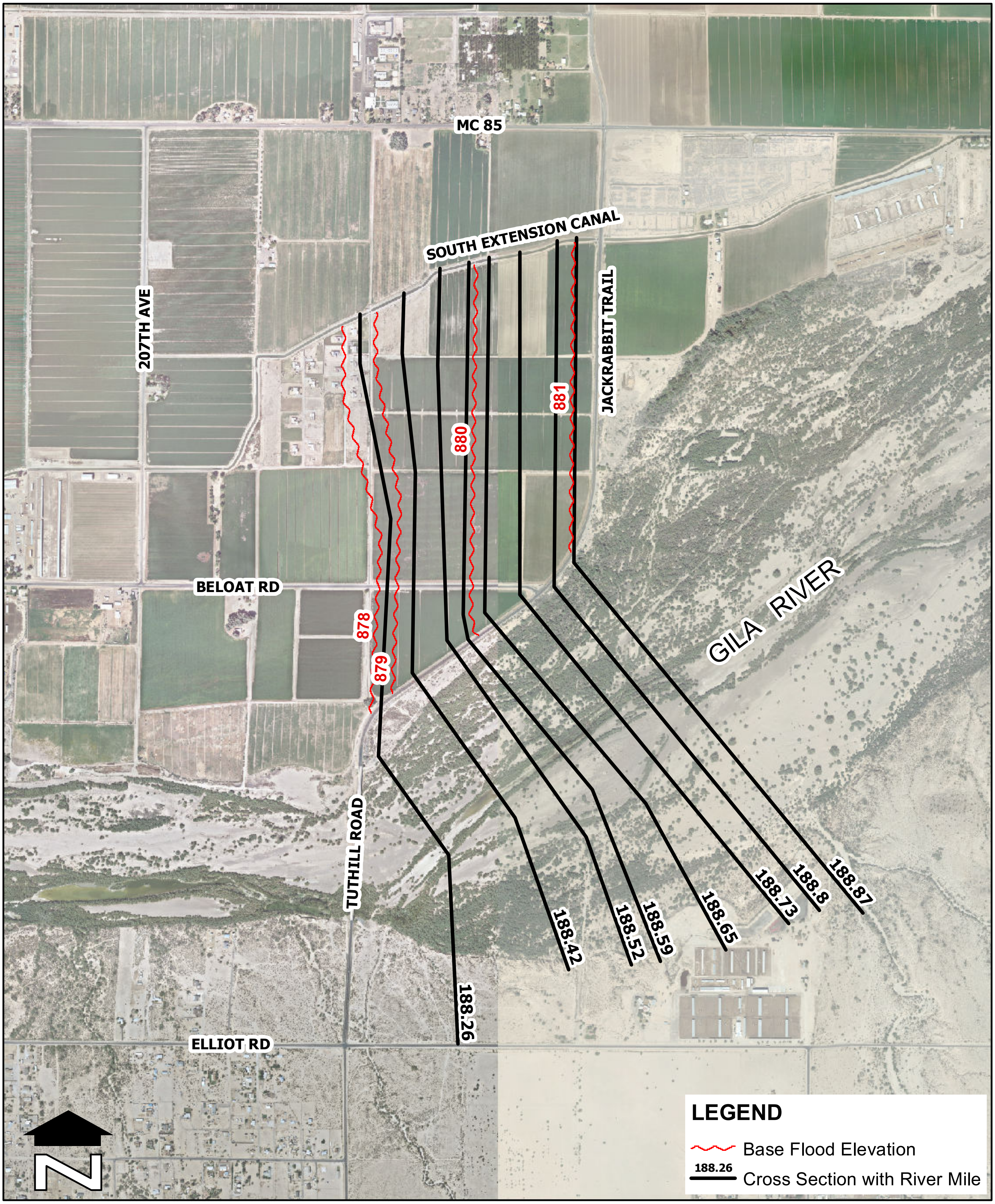
- Geometry
  - The levee-out condition allows the flow in the north overbank area south of Beloat Road to be modeled as effective flow where as in the “levee-in” condition flow is ineffective.
  - Right overbank distances were revised to be consistent with effective flow limits.

5.7.3.1 Summary of Results

Water surface elevations downstream from Tuthill Bridge RM 188.05 to downstream of Jackrabbit Trail (RM 188.87) from the LGR_FDS_R2_TAO Project were compared to the water surface elevation at RM 188.87 of LGR_FDS_R2 Project to determine which water surface elevations were higher. The water surface elevation at RM 188.87 of LGR_FDS_R2 Project is used as a backwater elevation for the north overbank area between RM 188.05 to RM 188.87. Table 5.4 list the results of the comparison. The water surface elevation from the RM 188.87 of LGR_FDS_R2 (“Levee-in”) is the governing water surface elevation for the 100-year event.

Table 5.4
Summary of 100-year Water Surface Elevation RM 188.05 to RM 188.87

River Mile	100-Year WSEL “Levee-out” (ft)	100-Year WSEL “Levee-in” (ft)
188.05	877.84	878.14
188.26	878.78	879.98
188.42	879.38	880.97
188.52	879.74	881.48
188.59	879.92	881.71
188.65	880.15	882.03
188.73	880.44	882.37
188.8	880.75	882.65
188.87	881.04	882.92



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY	
DATE:	10-14-2014
SCALE:	N.T.S.
DRAWN BY:	AML

Figure 5.20
Tuthill Road Area

LOWER GILA RIVER FDS
F.C.D. CONTRACT NO. 2012C017

5.7.4 Shallow Overbank Flooding between RM 164.19 and RM 162.75

Shallow flooding occurs in the right overbank area between RM 164.19 and RM 162.75 (Figure 5.21). Flow depth in the overbank area ranges from 0 to 3 feet for the 100-year event, however due to topography and an increase in channel conveyance the results of the hydraulic model indicates that flow is not continuous in a downstream direction and flow returns to the channel instantaneously. This characterization of overbank flow is one of the limitations of a one dimensional model. It is recommended that a Flood Hazard Zone A be delineated because:

- The HEC-RAS model does not adequately model the physical characteristics of the area.
- Flow draining from the west in multiple channels that have not been evaluated to determine the degree of flood impacts contributes to the flooding conditions of the area.

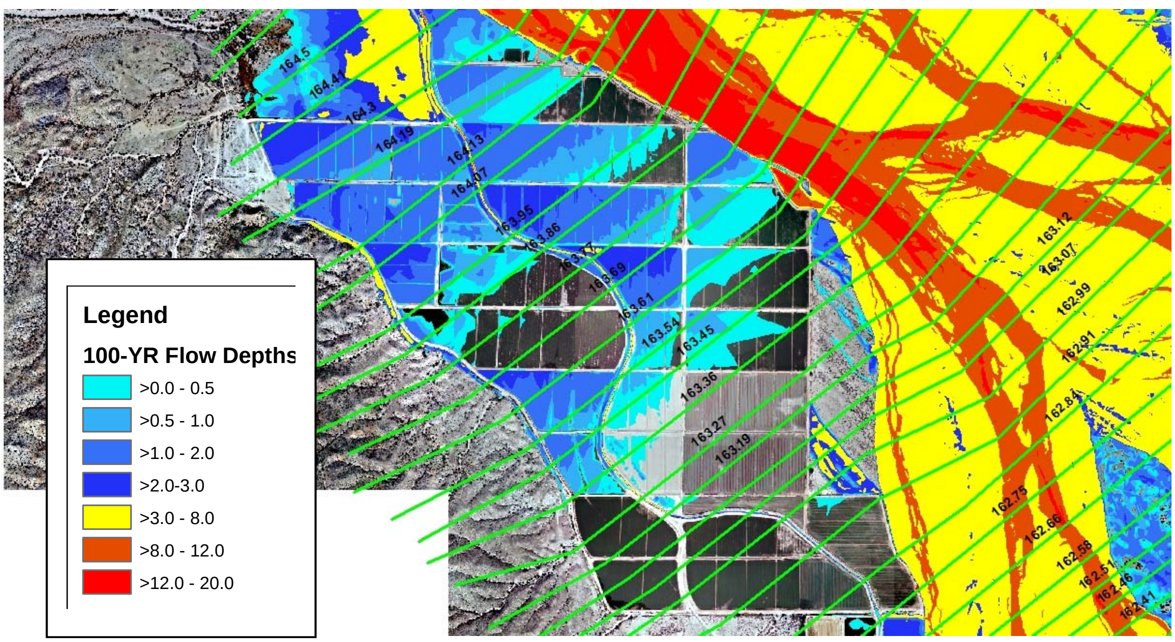


Figure 5.21 - Shallow Overbank Flooding

5.7.5 Tie-In to Existing Floodplain Delineations

Tributaries to the Gila River through the study reach are listed in Table 5.5.

Table 5.5
Tributary Washes

Sand Tank Wash
Rainbow Wash
Centennial Wash
Wash T1S-R5W-S29
Luke Wash
Wash T1S-R5W-S29
Hassayampa River
Waterman Wash
Wash T1S-R2W-S18B (J37)
Wash T1S-R2W-S17 (J38)
Lum Wash
Wash T1S-R2W-S9B (J40)
Wash T1S-R2W-S2A (J46)
Wash T1S-R2W-S2C (J47)
Wash T1S-R2W-S2B (J48)
Bullard Wash

Tie-in to the tributary flow was determined utilizing the following approach:

- At tributary locations, white gutter lines are displayed on the Effective FIRMS that designate the location of a tributary floodplain tie-in.
    - At locations where there was a gutter line and the tributary Special Flood Hazard Zone is Zone A the gutter line on the Effective Firm Panel was used for the tie-in location as long as the gutter line width matched the width of the backwater from the Gila River. Downstream of the gutter line BFEs from the Gila River are used to set the BFE elevation downstream of the gutter line.
    - At locations where the Tributary Special Flood Hazard Zone is a Zone AE and the tributary BFE is greater than the Gila River BFE the existing gutter line was used.
    - At locations where the tributary floodplain is large (Rainbow Wash, Centennial Wash and Waterman Wash) a gutter line was developed by connecting points where the BFEs for the tributary and the Gila River are of the same elevation.

  - The gutter line as depicted on the Effective Firm Panel for the Hassayampa River confluence no longer adequately ties in the Gila River with the Hassayampa River. The limits of the Gila River Floodplain are to the south of the gutter line depicted on the FIRM Panel. A new gutter line was set at the limits of the Gila River floodplain.

- Upstream Tie-in with the Gila River

  - The upstream tie-in the Gila River occurs at RM 194.81. Table 5.6 list 100-year water surface elevations and top widths from this study's HEC-RAS model and from the FEMA Effective Flood Profile and FIRM Panel data. Water surface elevations tie in within 0.23 feet and top widths tie in within 1.10 feet.

Table 5.6
100-yr WSEL & Top Widths

River Station	HEC-RAS 100-year WSEL (ft)	HEC-RAS Top Width (ft)	FIS Profile 100-year WSEL (ft)	Effective FIRM Panel Top Width (ft)
194.81	913.59	5,256.6	913.84	5,255.5

5.8 CALIBRATION

There are no stream gage data for the 100-year event within the study limits to use for HEC-RAS model calibration. The mapped floodplain limits were inspected for reasonableness and were accepted.

5.9 CHECKRAS MESSAGES

CHECK-RAS, Versions 1.4 (FEMA, 2005) was utilized to check the validity of input parameters in the HEC-RAS hydraulic models that were developed for the study watercourses. Copies of the CHECK-RAS output files are provided in Appendix E.6. Messages that merit comment are:

- Both right and left overbank distances are longer than the channel distance.

  - The message occurs in areas where the overbank floodplains (left and right) are wide and then transition to over bank floodplains that are smaller. The overbank flow path increase due to the transition.

- The channel n value of 0.035 for the upstream internal bridge opening section is equal or larger than the channel n value of 0.035 at Section 3. Usually, the channel n value of the bridge opening section is less than the channel n value of Section 3. The selection of the n value(s) should be reevaluated.

- The channel roughness through the bridge is the same as upstream and downstream roughness.

- Contraction and expansion loss coefficients are 0.3 and 0.5 respectively. However, this cross section is not at the structure. They should be equal to 0.1 and 0.3.
  - This occurs at natural constrictions. The contraction and expansion loss coefficients are 0.3 and 0.5, respectively, are merited.
- The right (or left) station effective of XXXX for 1% annual chance floodplain is greater than the right (or left) channel bank station (XXXX). The 1% annual chance floodplain is outside the channel. However, the right encroachment station (XXXX) is outside of 1% annual chance floodplain. The right encroachment station should be adjusted.
  - This message occurs at locations where there is high ground (berm) between the bank station and the overbank floodplain and the banks are very steep. The encroachment is being terminated within the berm.

5.10 MODEL WARNING AND ERROR MESSAGES

The HEC-RAS models for the Gila River and the Buckeye Slough executed without error messages for the floodplain/floodway profiles. However, the models do report several different warning messages. In general, the majority of these messages are to be expected given the hydraulic characteristics of these watercourses. Common messages are:

- "The conveyance ratio (upstream conveyance divided by downstream conveyance) was less than 0.7 or greater than 1.4." This is a common message received when modeling a river system that is characterized by changes in the conveyance capacity of the channel relative to the overbank area from cross section to cross section. This warning message was noted at cross sections between RM 183.32 to RM183.7 and Cross Section 187.35 where changes in flow conveyance in the right overbank occurs due to none uniform alternating topography between multiple cross sections. Divided flow is also common in this overbank area due to sand and gravel operations where material is stocked piled to a height greater than the 100-year water surface elevation. Other locations where the conveyance ratio message was noted are at lateral weir locations.
- Multiple critical depths were found at this location. The critical depth with the lowest energy was used. This message occurred at many of the cross sections, however critical water surface elevations were always less than the calculated water surface elevations and Froude numbers are not in the critical depth range, therefore this message is not applicable 100-year floodplain model.

- Divided flow computed for this cross section. This message is a common message occurring for any cross section where islands (areas higher than the 100-year water surface elevation) occur within the floodplain.

- "The energy loss was greater than 1.0 ft (0.3 m) between the current and previous cross section." The message pertaining to energy loss of greater than 1 foot occurred downstream of some bridges, natural constrictions and sand and gravel operations where ineffective flow areas are greater than those downstream. Greater energy loss would be expected at these locations.

- "The velocity head has changed by more than 0.5 ft (0.15 m)." This message occurred for cross section in the vicinity of Gillespie Dam. Due to changes in flow area, depth and flow regime (the only location where a Froude number of 1 is recorded) this message is expected.

- "The cross section end points had to be extended vertically for the computed water surface." This message occurred at lateral weir locations where an endpoint extension is expected.

5.11 FINAL RESULTS

The HEC-RAS model data files; both input and output, for each watercourse are provided digitally on CD that is located in Appendix E.4. Table 5.7 lists the organization of the HEC-RAS files. Work Maps that depict floodplain and floodway delineations from the Results of the HEC-RAS models are provided as hard copies (11"x17") in the back of this report and digitally in the Master Project CD (located behind the cover of this report) in a subfolder labeled Plates.

Table 5.7 HEC-RAS File Organization

Project Name	Plan Name	Geometry	Steady Flow	Unsteady Flow	Description
LGR_FDS_R1	LGR_FDS_R1	LGR_FDS_R1	LGR_FDS_R1		This project file contains HEC-RAS data for Reach 1 of the Lower Gila River FDS. The HEC-RAS data includes geometry files and steady flow files for the 10- year and 100-year events and plan data for Method 4 and Method 1 Floodway encroachments. Reach 1 extends from RM 147.44 to RM 166.25.
LGR_FDS_R2	LGR_FDS_R2_FP	LGR_FDS_R2_FP	LGR_FDS_R2_FP		This project file contains HEC-RAS data for Reach 2 of the Lower Gila River FDS. The HEC-RAS data includes geometry files and steady flow files for the 10-year and 100-year events. The levee option of the geometry file editor was used to define the top of the South Extension Canal which functions as a levee-like feature. At locations where the South Extension Canal was overtopped, for the 100-year event, lateral weirs were used to account for flow leaving the Gila River. Ultimately flow returns to the Gila River downstream of the break out area. The ineffective flow option in the geometry editor was used to model conditions in the vicinity of the Tuthill Bridge approach and Jackrabbit Road. Jackrabbit Road and the north approach to Tuthill Bridge are levee-like features. The project Plan is used to define the 100-year Floodplain Limits. Reach 2 extends from RM 166.24 to RM 195.09.

Table 5.7 – HEC-RAS File Organization (Continued)

Project Name	Plan Name	Geometry	Steady Flow	Unsteady Flow	Description
LGR_FDS_R2	LGR_FDS_R2_FW	LGR_FDS_R2_FW	LGR_FDS_R2_FW		These project files contains similar HEC-RAS data for Reach 2 as discussed in the previous row however the Plan is used to define the 100-year Floodway limits. Given that flow would not be allowed to breakout under the floodway condition, geometry files were modified to delete lateral weirs. Plan data incudes Method 4 and Method 1 Floodway encroachments.
LGR_FDS_R2_TAO	LGR_FDS_R2_TAO	LGR_FDS_R2_TAO	LGR_FDS_R2		These Reach 2 project files contain HEC-RAS data for the Tuthill bridge approach and Jackrabbit Trail levee-out condition. The levee-out condition allows the flow in the north overbank area south of Beloat Road to be modeled as effective flow where as in the levee-in condition flow is ineffective.

Table 5.7 – HEC-RAS File Organization (Continued)

Project Name	Plan Name	Geometry	Steady Flow	Unsteady Flow	Description
LGR_FDS_R2_Natural_Valley	LGR_FDS_R2_NV	LGR_FDS_R2_NV	LGR_FDS_R2	NA	This model the "Natural Valley" model estimates water surface elevations for the South Extension Canal "levee-out" scenario between RM 185.22 and 187.14. The initial results of the Buckeye Slough Unsteady Flow Model were compared with the results of the Gila River Unsteady Flow Model. The comparison showed that Buckeye Slough water surface elevations at equivalent locations to Gila River water surface elevations, for the majority of the cross sections downstream of Gila River RM 187.14 are higher than water surface elevations estimated with the Gila River Unsteady flow model. This indicates that potential weir flow from the Gila River is drowned-out by flow from the Buckeye slough and flow between the Buckeye Slough and the Gila River has comingled. Because of this hydraulic condition a "Natural Valley" model was developed.
LGR_FDS_R2B_USF	LGR_FDS_R2B_USF	LGR_FDS_R2B_USF	NA	LGR_FDS_R2B_USF	This Unsteady Flow Model for the Gila River is for a segment of Reach 2 (referred to as Reach 2B) to quantify flow leaving the Gila River along the South Extension Canal that drains to the Buckeye Slough. The Unsteady Flow model extends from RM 184.47 to RM 192.33.

Table 5.7 – HEC-RAS File Organization (Continued)

Project Name	Plan Name	Geometry	Steady Flow	Unsteady Flow	Description
Buckeye Slough	Unsteady Buckeye Slough	Buckeye Slough		Unsteady Buckeye Slough	These project files were developed to estimate 100-year peak discharges for the Buckeye Slough. Hydrographs at weir locations from the Unsteady Flow Model for the Gila River were coded into the Buckeye Slough, Unsteady Flow editor.
Buckeye Slough	BS Steady Flow		BS Steady Flow		These project files were developed to define the 100-year floodplain for the Buckeye Slough.
400-09-012	400-09-012	400-09-012	400-09-012		These project files were developed to define the 100-year floodplain for a portion of the Buckeye Slough area parcel in the northeast corner of Tuthill Road at the South Extension Canal

6.0 Erosion/Sediment Transport Analysis

Erosion/sediment transport analyses were not conducted as part of the floodplain delineation study.

7.0 FIS Report Data

This section of the report presents the results of the hydraulic computer modeling results in FEMA format.

7.1 SUMMARY OF DISCHARGES

A summary of peak discharges are provided in Table 7-1

Table 7.1 FEMA summary of discharges for the Lower Gila River

Flooding Source and Location	Drainage Area	Peak Discharges				Remarks
Lower Gila River		**10-Year**	**50-Year**	**100-Year**	**500-Year**	
River Miles	**sq. miles**	**cfs**	**cfs**	**cfs**	**cfs**	
195.09		57,000	185,000	227,000	285,000	
186.18		46,000	160,000	210,000	270,000	
174.75		42,000	153,000	203,000	270,000	
166.21		38,000	145,000	195,000	270,000	
161.72		37,600	143,500	192,900	270,000	
154.79		37,300	142,400	191,500	270,000	

7.2 FLOODWAY DATA

Floodway data is provided in Table 7-2

Table 7.2 Floodway Table for Lower Gila River

Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
147.44				662.98	662.98		
147.54				662.98	662.98		
147.67				662.98	662.98		
147.72				662.98	662.98		
147.79				662.98	662.98		
147.89				662.98	662.98		
147.99				662.98	662.98		
148.08				662.98	662.98		
148.18				662.98	662.98		
148.27				662.98	662.98		
148.36				662.98	662.98		
148.44				662.98	662.98		
148.53				662.98	662.98		
148.61				662.98	662.98		
148.69				662.98	662.98		
148.76				662.98	662.98		
148.84				662.98	662.98		
148.92				662.98	662.98		
149.01				662.98	662.98		
149.09				662.98	662.98		
149.17				662.98	662.98		
149.23				662.98	662.98		
149.30				662.98	662.98		
149.37				662.98	662.98		
149.45				662.98	662.98		

Painted Rock Dam
Pooling Area

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
149.53	Painted Rock Dam Pooling Area			662.98	662.98		
149.63				662.98	662.98		
149.72				662.98	662.98		
149.81				662.98	662.98		
149.89				662.98	662.98		
149.95				662.98	662.98		
150.03	4,759.62	36,634	6.2	663.13	663.13	663.9	0.77
150.12	5,034.78	41,096	5.3	663.47	663.47	664.43	0.96
150.22	5,236.68	44,004	5.5	663.77	663.77	664.77	1
150.31	5,357.14	43,641	5.4	664.04	664.04	665.02	0.98
150.40	5,601.67	42,435	5.7	664.31	664.31	665.3	0.99
150.49	5,908.07	45,285	5.6	664.71	664.71	665.66	0.95
150.58	6,051.25	44,082	6.0	664.98	664.98	665.93	0.95
150.67	6,089.31	44,463	6.3	665.27	665.27	666.21	0.94
150.77	6,254.58	45,967	6.6	665.61	665.61	666.54	0.93
150.84	6,239.14	42,951	7.0	665.8	665.8	666.71	0.91
150.92	6,098.44	43,008	6.8	666.19	666.19	667.02	0.83
151.01	5,978.04	44,466	5.9	666.6	666.6	667.38	0.78
151.10	5,805.95	39,749	6.7	666.84	666.84	667.65	0.81
151.20	5,598.71	38,471	6.9	667.34	667.34	668.06	0.72
151.30	5,265.85	36,493	7.1	667.76	667.76	668.52	0.76
151.37	4,838.20	38,232	6.6	668.14	668.14	668.99	0.85
151.44	4,605.58	37,847	6.4	668.49	668.49	669.3	0.81
151.54	4,488.11	35,627	6.8	668.82	668.82	669.6	0.78
151.66	4,216.85	33,741	6.9	669.2	669.2	670.04	0.84
151.76	4,020.29	34,034	6.7	669.78	669.78	670.54	0.76
151.84	3,859.71	32,872	6.8	670.15	670.15	670.93	0.78
151.91	3,807.56	31,696	7.0	670.47	670.47	671.21	0.74
152.03	3,901.40	31,963	7.1	671.1	671.1	671.85	0.75
152.11	4,131.55	36,976	5.9	671.61	671.61	672.42	0.81

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
152.20	4,210.54	36,758	6.0	671.98	671.98	672.76	0.78
152.31	4,189.69	35,123	6.5	672.4	672.4	673.17	0.77
152.43	4,253.97	36,282	6.4	672.87	672.87	673.77	0.9
152.56	4,087.68	36,229	6.4	673.4	673.4	674.31	0.91
152.64	3,951.86	33,451	7.1	673.72	673.72	674.63	0.91
152.72	3,874.00	33,032	7.1	674.15	674.15	675.03	0.88
152.79	3,736.79	28,316	8.3	674.42	674.42	675.29	0.87
152.89	3,450.02	29,485	7.7	675.52	675.52	676.2	0.68
152.97	3,772.70	33,795	6.5	676.05	676.05	676.82	0.77
153.05	4,352.08	38,342	5.5	676.45	676.45	677.29	0.84
153.13	4,313.52	37,791	5.5	676.7	676.7	677.58	0.88
153.20	4,109.31	37,322	5.5	676.99	676.99	677.83	0.84
153.29	3,913.43	40,342	5.0	677.37	677.37	678.2	0.83
153.40	3,864.82	40,906	4.7	677.69	677.69	678.54	0.85
153.51	4,478.90	47,265	4.1	678.11	678.11	678.91	0.8
153.63	4,400.71	46,234	4.1	678.43	678.43	679.19	0.76
153.72	4,299.62	42,060	4.6	678.67	678.67	679.41	0.74
153.81	4,124.14	39,393	4.8	678.97	678.97	679.71	0.74
153.91	3,987.30	38,517	5.0	679.33	679.33	680.11	0.78
154.02	3,973.13	39,794	4.8	679.7	679.7	680.58	0.88
154.12	4,130.19	43,042	4.5	680.04	680.04	681	0.96
154.22	4,126.67	42,193	4.6	680.34	680.34	681.30	0.96
154.31	4,177.50	40,872	4.7	680.65	680.65	681.62	0.97
154.41	4,078.77	39,016	5.0	680.97	680.97	681.95	0.98
154.51	3,813.43	36,567	5.4	681.41	681.41	682.32	0.91
154.60	3,613.34	35,292	5.8	681.86	681.86	682.74	0.88
154.70	3,309.96	30,484	6.8	682.53	682.53	683.29	0.76
154.79	3,085.07	28,180	7.2	683.20	683.20	683.89	0.69
154.85	2,880.74	26,617	7.9	683.60	683.60	684.31	0.71
154.88	2,660.75	24,618	8.5	683.69	683.69	684.55	0.86

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
154.99	2,581.71	25,169	8.1	685.01	685.01	685.74	0.73
155.09	2,987.06	30,016	6.8	685.79	685.79	686.70	0.91
155.18	3,425.25	39,847	4.9	686.46	686.46	687.41	0.95
155.27	3,760.59	42,304	4.6	686.79	686.79	687.72	0.93
155.38	4,031.99	44,187	4.4	687.12	687.12	688.01	0.89
155.48	4,237.31	44,729	4.3	687.43	687.43	688.28	0.85
155.56	4,251.54	44,728	4.3	687.67	687.67	688.50	0.83
155.64	4,191.84	42,158	4.6	687.86	687.86	688.68	0.82
155.71	4,183.45	42,035	4.6	688.06	688.06	688.88	0.82
155.81	4,022.33	37,737	5.1	688.38	688.38	689.17	0.79
155.89	3,685.41	33,257	5.8	688.74	688.74	689.46	0.72
155.98	3,911.78	34,678	5.6	689.32	689.32	689.97	0.65
156.08	3,974.60	32,384	6.0	689.90	689.90	690.47	0.57
156.16	3,940.02	32,219	6.0	690.49	690.49	690.99	0.50
156.24	3,804.34	32,530	5.9	691.05	691.05	691.55	0.50
156.33	3,767.18	33,918	5.7	691.62	691.62	692.16	0.54
156.43	3,698.98	34,072	5.7	692.09	692.09	692.66	0.57
156.52	3,530.98	33,247	5.8	692.54	692.54	693.12	0.58
156.61	3,443.40	32,710	5.9	692.99	692.99	693.61	0.62
156.71	3,322.74	30,813	6.3	693.45	693.45	694.12	0.67
156.80	3,237.63	30,975	6.3	693.91	693.91	694.64	0.73
156.87	3,163.78	29,990	6.5	694.32	694.32	695.04	0.72
156.98	3,532.49	37,156	5.2	694.94	694.94	695.78	0.84
157.07	4,020.33	39,882	4.8	695.37	695.37	696.16	0.79
157.16	4,242.49	40,128	4.8	695.77	695.77	696.47	0.70
157.25	4,337.13	39,269	4.9	696.18	696.18	696.80	0.62
157.34	4,117.11	36,083	5.4	696.63	696.63	697.16	0.53
157.43	3,755.30	34,187	5.6	697.19	697.19	697.62	0.43
157.53	3,324.36	28,099	6.9	697.86	697.86	698.18	0.32
157.62	3,185.45	27,482	7.0	698.78	698.78	698.98	0.20

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
157.72	3,099.66	28,132	6.9	699.53	699.53	699.72	0.19
157.81	3,104.77	28,441	6.8	700.28	700.28	700.42	0.14
157.91	3,103.62	30,246	6.4	701.03	701.03	701.14	0.11
157.98	3,022.73	29,497	6.6	701.44	701.44	701.55	0.11
158.06	2,879.81	30,347	6.4	701.91	701.91	702.01	0.10
158.17	2,687.19	31,347	6.2	702.46	702.46	702.56	0.10
158.27	2,348.57	25,604	7.5	702.83	702.83	702.90	0.07
158.38	2,065.57	22,624	8.6	703.42	703.42	703.55	0.13
158.47	1,999.12	22,382	8.7	704.18	704.18	704.40	0.22
158.56	2,015.53	23,028	8.4	704.82	704.82	705.22	0.40
158.63	1,954.36	22,652	8.5	705.26	705.26	705.77	0.51
158.71	1,922.19	22,474	8.6	705.74	705.74	706.36	0.62
158.79	1,805.04	21,593	9.0	706.26	706.26	707.00	0.74
158.88	1,854.39	23,042	8.5	707.09	707.09	707.81	0.72
158.97	2,024.64	24,406	8.2	707.66	707.66	708.49	0.83
159.07	2,132.75	25,240	7.9	708.28	708.28	709.21	0.93
159.15	2,159.78	27,923	7.1	708.98	708.98	709.87	0.89
159.25	2,308.30	28,030	7.0	709.54	709.54	710.43	0.89
159.33	2,533.65	30,568	6.4	709.98	709.98	710.97	0.99
159.42	2,775.19	35,556	5.4	710.58	710.58	711.52	0.94
159.51	3,078.65	36,813	5.3	710.96	710.96	711.85	0.89
159.61	3,082.63	36,604	5.3	711.30	711.30	712.13	0.83
159.68	3,080.77	35,872	5.4	711.56	711.56	712.36	0.80
159.74	3,082.86	35,270	5.5	711.76	711.76	712.52	0.76
159.82	2,961.66	32,277	6.0	712.11	712.11	712.81	0.70
159.91	2,915.57	30,674	6.3	712.58	712.58	713.20	0.62
159.99	2,755.55	30,315	6.4	713.03	713.03	713.65	0.62
160.09	2,727.42	31,500	6.1	713.43	713.43	714.15	0.72
160.19	2,721.36	30,662	6.3	713.76	713.76	714.58	0.82
160.28	2,933.25	32,713	6.0	714.19	714.19	715.11	0.92

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
160.38	3,033.66	35,621	5.5	714.65	714.65	715.61	0.96
160.48	3,228.52	36,467	5.5	714.97	714.97	715.95	0.98
160.59	3,549.60	38,480	5.2	715.40	715.40	716.37	0.97
160.67	3,725.31	40,154	4.9	715.72	715.72	716.69	0.97
160.77	3,672.46	41,717	4.7	716.08	716.08	716.98	0.90
160.86	3,360.91	37,952	5.1	716.35	716.35	717.18	0.83
160.97	3,367.37	36,082	5.4	716.71	716.71	717.49	0.78
161.05	3,496.83	36,288	5.3	717.04	717.04	717.80	0.76
161.15	4,008.44	40,320	4.8	717.44	717.44	718.24	0.80
161.24	4,620.30	44,026	4.4	717.78	717.78	718.57	0.79
161.34	5,162.51	46,468	4.2	718.17	718.17	718.90	0.73
161.46	5,770.45	49,923	3.9	718.62	718.62	719.27	0.65
161.55	6,443.00	55,217	3.5	718.95	718.95	719.54	0.59
161.63	7,016.57	55,977	3.5	719.21	719.21	719.74	0.53
161.72	7,438.08	54,458	3.5	719.49	719.49	719.97	0.48
161.80	7,734.54	51,119	3.8	719.78	719.78	720.20	0.42
161.89	7,946.45	46,683	4.2	720.17	720.17	720.52	0.35
161.96	7,729.24	44,315	4.4	720.59	720.59	720.86	0.27
162.02	7,658.81	42,967	4.5	720.97	720.97	721.20	0.23
162.10	7,723.58	44,006	4.4	721.58	721.58	721.73	0.15
162.15	7,770.37	44,122	4.4	721.93	721.93	722.05	0.12
162.23	7,528.54	46,669	4.2	722.42	722.42	722.52	0.10
162.29	7,546.63	45,150	4.3	722.75	722.75	722.83	0.08
162.34	7,403.54	44,008	4.4	723.02	723.02	723.10	0.08
162.41	6,987.10	41,091	4.8	723.41	723.41	723.49	0.08
162.46	6,943.37	39,988	4.9	723.79	723.79	723.87	0.08
162.51	6,437.35	38,672	5.0	724.10	724.10	724.19	0.09
162.58	6,465.78	39,833	4.9	724.60	724.60	724.69	0.09
162.66	6,191.23	39,008	5.0	725.25	725.25	725.32	0.07
162.75	5,929.33	41,719	4.7	725.92	725.92	725.98	0.06

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
162.84	5,954.87	40,753	4.8	726.44	726.44	726.49	0.05
162.91	5,851.33	37,942	5.1	726.86	726.86	726.90	0.04
162.99	5,541.67	35,962	5.4	727.40	727.40	727.43	0.03
163.07	5,195.28	36,230	5.4	727.99	727.99	728.01	0.02
163.12	4,984.27	35,545	5.5	728.31	728.31	728.33	0.02
163.19	4,712.58	32,835	5.9	728.78	728.78	728.80	0.02
163.27	4,603.26	32,339	6.0	729.49	729.49	729.52	0.03
163.36	4,161.70	33,710	5.8	730.27	730.27	730.29	0.02
163.45	3,761.65	30,861	6.3	730.87	730.87	730.90	0.03
163.54	3,740.62	29,268	6.7	731.48	731.48	731.55	0.07
163.61	3,561.65	27,047	7.3	732.08	732.08	732.14	0.06
163.69	3,725.61	27,655	7.2	732.78	732.78	732.97	0.19
163.77	3,883.62	29,557	6.8	733.64	733.64	733.86	0.22
163.86	3,860.32	29,434	6.8	734.39	734.39	734.63	0.24
163.95	3,802.88	30,143	6.6	735.03	735.03	735.31	0.28
164.07	3,643.06	30,942	6.5	735.98	735.98	736.25	0.27
164.13	3,631.56	30,923	6.5	736.40	736.40	736.66	0.26
164.19	3,576.46	32,119	6.2	736.97	736.97	737.30	0.33
164.3	4,012.61	34,769	5.7	737.96	737.96	738.38	0.42
164.41	4,156.59	40,139	5.0	738.92	738.92	739.56	0.64
164.5	3,940.95	40,371	5.0	739.59	739.59	740.30	0.71
164.63	3,927.91	41,053	4.9	740.37	740.37	741.20	0.83
164.67	3,911.65	40,324	5.0	740.58	740.58	741.42	0.84
164.74	4,108.37	42,564	4.8	740.94	740.94	741.83	0.89
164.85	4,114.76	41,451	4.9	741.51	741.51	742.43	0.92
164.98	4,467.63	43,445	4.8	742.25	742.25	743.24	0.99
165.09	4,728.28	47,837	4.0	742.85	742.85	743.85	1.00
165.18	4,435.03	45,606	4.3	743.33	743.33	744.27	0.94
165.28	3,988.11	43,475	4.5	743.92	743.92	744.79	0.87
165.38	3,597.54	39,831	4.9	744.51	744.51	745.29	0.78

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
165.48	3,196.69	35,077	5.6	745.22	745.22	745.89	0.67
165.58	2,809.14	31,056	6.3	746.08	746.08	746.61	0.53
165.63	2,728.44	30,613	6.4	746.73	746.73	747.13	0.40
165.71	2,517.33	30,051	6.5	747.44	747.44	747.86	0.42
165.81	2,272.62	27,352	7.1	748.17	748.17	748.64	0.47
165.92	2,103.96	27,147	7.2	749.23	749.23	749.78	0.55
166.02	2,033.39	27,223	7.2	750.99	750.99	751.45	0.46
166.09	1,665.69	26,008	7.5	752.54	752.54	752.92	0.38
166.11	1,676.99	28,705	6.8	754.06	754.06	754.42	0.36
166.15	1,785.78	32,088	6.1	754.57	754.57	754.93	0.36
166.19	1,698.50	28,808	6.8	754.81	754.81	755.14	0.33
166.21	1,719.97	31,347	6.2	755.28	755.28	755.59	0.31
166.22	1,725.85	29,579	6.6	755.26	755.26	755.57	0.31
166.23	1,730.95	12,714	15.3	758.83	758.83	758.92	0.09
166.24	1,733.43	15,269	12.8	760.34	760.34	760.39	0.05
166.25	1,727.45	34,668	5.6	762.94	762.94	763.05	0.11
166.27	1,838.10	29,978	8.0	762.67	762.67	762.77	0.10
166.31	1,933.78	30,437	9.1	762.74	762.74	762.82	0.08
166.34	2,108.07	32,145	8.6	763.05	763.05	763.14	0.09
166.44	2,566.28	36,345	7.8	763.83	763.83	763.93	0.10
166.53	2,548.16	36,721	7.4	764.43	764.43	764.48	0.05
166.62	2,832.31	38,847	7.2	764.89	764.89	764.97	0.08
166.71	3,068.88	40,861	7.1	765.40	765.40	765.47	0.07
166.82	3,520.94	42,384	6.4	766.18	766.18	766.24	0.06
166.86	3,767.65	44,645	6.1	766.47	766.47	766.54	0.07
166.91	4,021.05	45,724	5.7	766.66	766.66	766.79	0.13
167.00	4,075.96	43,687	5.9	766.93	766.93	767.12	0.19
167.09	4,041.41	39,920	6.5	767.19	767.19	767.50	0.31
167.19	4,216.89	43,793	6.0	767.50	767.50	768.03	0.53
167.29	4,591.86	73,449	2.9	767.86	767.86	768.61	0.75

Table 7.2 Floodway Table for Lower Gila River

Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
167.38	5,151.94	93,178	2.2	768.01	768.01	768.78	0.77
167.47	5,193.10	91,046	2.2	768.10	768.10	768.87	0.77
167.57	5,118.27	87,485	2.3	768.20	768.20	768.98	0.78
167.66	5,047.75	88,739	2.5	768.32	768.32	769.10	0.78
167.75	4,955.25	80,139	2.9	768.44	768.44	769.21	0.77
167.84	4,971.25	72,105	3.5	768.53	768.53	769.30	0.77
167.92	5,089.40	69,144	3.6	768.71	768.71	769.47	0.76
167.99	5,325.13	73,544	3.3	768.93	768.93	769.71	0.78
168.10	5,385.86	70,746	3.5	769.28	769.28	770.06	0.78
168.19	5,150.76	65,902	3.9	769.66	769.66	770.42	0.76
168.30	5,202.01	64,114	4.2	770.15	770.15	770.90	0.75
168.38	5,389.48	66,939	4.0	770.54	770.54	771.30	0.76
168.48	5,774.03	69,912	3.8	770.97	770.97	771.75	0.78
168.58	5,828.43	71,429	3.6	771.35	771.35	772.16	0.81
168.65	5,936.86	74,310	3.4	771.60	771.60	772.43	0.83
168.73	5,930.83	73,030	3.5	771.84	771.84	772.69	0.85
168.83	5,829.09	73,594	3.3	772.08	772.08	772.97	0.89
168.91	5,868.43	74,290	3.2	772.24	772.24	773.16	0.92
168.99	5,699.43	70,206	3.5	772.38	772.38	773.32	0.94
169.05	5,569.79	65,453	3.8	772.52	772.52	773.47	0.95
169.13	5,482.90	65,215	3.9	772.77	772.77	773.74	0.97
169.22	5,548.09	70,013	2.8	773.06	773.06	774.01	0.95
169.31	5,630.18	69,793	2.9	773.24	773.24	774.17	0.93
169.40	5,752.24	77,740	2.6	773.47	773.47	774.39	0.92
169.50	6,044.23	76,905	2.8	773.63	773.63	774.56	0.93
169.60	6,408.09	71,242	3.1	773.87	773.87	774.79	0.92
169.71	6,612.14	75,136	2.7	774.23	774.23	775.15	0.92
169.78	6,792.91	75,233	2.7	774.49	774.49	775.38	0.89
169.85	7,003.02	74,764	2.8	774.76	774.76	775.63	0.87
169.93	7,259.62	70,906	3.0	775.08	775.08	775.93	0.85

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
170.02	7,578.56	72,060	2.9	775.47	775.47	776.37	0.90
170.12	7,841.40	70,988	3.2	775.96	775.96	776.90	0.94
170.22	7,839.61	68,489	3.3	776.53	776.53	777.46	0.93
170.33	7,940.38	69,605	3.0	777.18	777.18	778.09	0.91
170.41	7,852.26	70,918	2.9	777.54	777.54	778.43	0.89
170.51	7,866.03	68,141	3.3	777.80	777.80	778.70	0.90
170.60	7,711.10	64,811	3.4	778.04	778.04	778.94	0.90
170.62	7,649.55	65,274	3.4	778.11	778.11	779.01	0.90
170.74	7,502.95	61,461	3.4	778.40	778.40	779.30	0.90
170.83	7,410.97	61,109	3.1	778.68	778.68	779.57	0.89
170.91	7,297.76	59,172	2.8	778.92	778.92	779.81	0.89
171.00	7,268.44	58,586	2.9	779.20	779.20	780.10	0.90
171.10	6,673.19	58,786	3.1	779.71	779.71	780.64	0.93
171.19	6,250.03	56,451	3.4	780.19	780.19	781.13	0.94
171.30	6,364.89	58,376	3.2	780.66	780.66	781.62	0.96
171.41	6,577.00	57,779	3.4	781.24	781.24	782.19	0.95
171.50	6,429.89	54,459	3.9	781.63	781.63	782.57	0.94
171.60	6,247.64	52,212	3.9	782.10	782.10	783.04	0.94
171.69	5,889.30	54,235	3.9	782.60	782.60	783.53	0.93
171.83	5,249.19	51,182	4.2	783.20	783.20	784.12	0.92
171.89	5,093.39	48,429	4.6	783.64	783.64	784.55	0.91
171.95	4,903.29	47,346	5.0	784.17	784.17	785.06	0.89
172.06	4,723.27	46,968	4.8	785.11	785.11	785.91	0.80
172.24	4,585.92	49,138	3.4	786.83	786.83	787.55	0.72
172.33	4,235.61	47,792	3.2	787.80	787.80	788.58	0.78
172.45	3,769.65	45,777	3.4	788.75	788.75	789.58	0.83
172.54	3,391.12	42,445	3.7	789.62	789.62	790.44	0.82
172.60	3,229.39	42,540	3.9	790.16	790.16	791.02	0.86
172.68	3,102.87	42,449	4.5	790.98	790.98	791.97	0.99
172.73	2,953.93	43,002	4.6	791.81	791.81	792.76	0.95

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
172.83	2,738.08	42,413	4.7	793.00	793.00	793.89	0.89
172.93	2,665.94	42,895	4.6	793.95	793.95	794.86	0.91
173.02	2,817.72	44,907	4.3	794.69	794.69	795.61	0.92
173.12	2,678.51	43,266	4.4	795.51	795.51	796.45	0.94
173.21	2,994.99	51,638	3.8	796.35	796.35	797.30	0.95
173.32	3,288.89	58,848	3.4	796.92	796.92	797.88	0.96
173.41	3,853.53	65,385	3.1	797.24	797.24	798.21	0.97
173.46	4,976.46	79,590	2.5	797.41	797.41	798.39	0.98
173.50	5,159.58	79,655	2.5	797.54	797.54	798.50	0.96
173.59	5,196.66	78,212	2.6	797.76	797.76	798.69	0.93
173.65	5,126.58	76,072	2.6	797.94	797.94	798.84	0.90
173.72	5,082.69	73,058	2.7	798.14	798.14	799.01	0.87
173.79	5,113.80	74,084	2.7	798.40	798.40	799.23	0.83
173.87	5,085.32	72,714	2.7	798.65	798.65	799.44	0.79
173.96	5,021.14	72,642	2.7	798.96	798.96	799.71	0.75
174.05	4,874.85	72,697	2.8	799.36	799.36	800.05	0.69
174.16	4,798.64	69,591	2.9	799.82	799.82	800.45	0.63
174.26	4,714.34	69,205	2.9	800.28	800.28	800.85	0.57
174.30	4,721.39	69,116	2.9	800.50	800.50	801.04	0.54
174.35	4,753.96	71,093	2.9	800.72	800.72	801.24	0.52
174.43	4,854.52	69,844	2.9	801.14	801.14	801.61	0.47
174.52	4,886.80	67,958	3.0	801.64	801.64	802.08	0.44
174.60	4,705.40	62,562	3.3	802.11	802.11	802.51	0.40
174.67	4,584.04	60,546	3.4	802.73	802.73	803.08	0.35
174.75	4,596.42	58,448	3.5	803.40	803.40	803.74	0.34
174.82	4,743.82	58,733	3.6	804.00	804.00	804.31	0.31
174.91	4,915.50	60,416	3.5	804.67	804.67	805.00	0.33
175.00	5,297.15	66,414	3.1	805.19	805.19	805.58	0.39
175.09	5,623.70	69,378	3.0	805.61	805.61	806.01	0.40
175.19	5,767.94	72,033	2.9	806.00	806.00	806.43	0.43

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
175.28	5,829.70	74,525	3.0	806.48	806.48	806.90	0.42
175.37	5,991.65	75,526	3.0	807.02	807.02	807.44	0.42
175.47	6,122.40	77,967	2.9	807.47	807.47	807.97	0.50
175.56	6,219.54	78,825	2.9	807.93	807.93	808.48	0.55
175.66	6,413.25	77,697	2.9	808.41	808.41	808.97	0.56
175.75	6,468.27	80,668	2.8	808.88	808.88	809.44	0.56
175.85	6,226.64	77,488	2.9	809.24	809.24	809.80	0.56
175.94	5,912.54	73,705	3.1	809.55	809.55	810.13	0.58
176.04	5,336.79	73,253	3.0	809.91	809.91	810.51	0.60
176.13	4,920.36	67,332	3.1	810.28	810.28	810.96	0.68
176.22	5,109.33	73,843	2.8	810.82	810.82	811.53	0.71
176.32	5,191.36	69,091	3.1	811.37	811.37	812.05	0.68
176.41	5,312.18	69,922	3.0	812.04	812.04	812.70	0.66
176.51	5,302.86	76,264	2.8	812.71	812.71	813.33	0.62
176.60	5,091.28	73,380	2.9	813.12	813.12	813.72	0.60
176.65	4,841.15	68,943	3.1	813.30	813.30	813.90	0.60
176.69	4,631.79	65,564	3.3	813.46	813.46	814.06	0.60
176.74	4,467.76	63,507	3.4	813.69	813.69	814.30	0.61
176.79	4,371.59	62,642	3.4	813.91	813.91	814.53	0.62
176.88	4,277.56	61,072	3.6	814.32	814.32	814.95	0.63
176.97	4,387.64	62,217	3.5	814.74	814.74	815.41	0.67
177.07	4,703.05	67,344	2.9	815.14	815.14	815.84	0.70
177.16	5,071.27	67,531	2.7	815.52	815.52	816.25	0.73
177.25	5,201.13	70,686	2.6	815.94	815.94	816.73	0.79
177.36	5,274.89	70,995	2.8	816.28	816.28	817.12	0.84
177.47	5,373.89	74,445	2.7	816.54	816.54	817.42	0.88
177.57	5,453.90	73,988	2.7	816.78	816.78	817.68	0.90
177.68	5,590.61	74,190	3.0	817.05	817.05	817.99	0.94
177.79	5,732.14	71,678	3.0	817.44	817.44	818.40	0.96
177.89	6,308.05	75,512	2.9	817.85	817.85	818.81	0.96

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
178.00	6,332.83	72,218	3.0	818.25	818.25	819.19	0.94
178.12	6,409.73	77,873	2.7	818.71	818.71	819.65	0.94
178.24	6,499.29	72,514	2.8	819.14	819.14	820.08	0.94
178.36	6,568.02	72,494	2.8	819.60	819.60	820.56	0.96
178.48	6,672.19	73,133	2.8	820.07	820.07	821.04	0.97
178.56	6,869.77	73,022	2.7	820.43	820.43	821.41	0.98
178.66	6,996.77	72,607	3.0	820.95	820.95	821.93	0.98
178.75	7,142.18	73,587	2.9	821.54	821.54	822.52	0.98
178.84	7,208.18	78,257	2.7	822.13	822.13	823.12	0.99
178.92	7,125.08	75,161	2.9	822.53	822.53	823.52	0.99
179.00	7,183.21	72,955	3.0	822.93	822.93	823.91	0.98
179.09	6,945.83	71,632	3.0	823.43	823.43	824.38	0.95
179.14	6,870.55	73,448	3.0	823.70	823.70	824.64	0.94
179.19	6,643.28	69,192	3.2	823.94	823.94	824.86	0.92
179.24	6,524.55	66,138	3.3	824.21	824.21	825.11	0.90
179.29	6,392.17	63,798	3.4	824.50	824.50	825.36	0.86
179.39	6,510.61	61,468	3.5	825.08	825.08	825.87	0.79
179.48	6,378.57	59,502	3.7	825.79	825.79	826.47	0.68
179.58	6,108.76	55,669	3.9	826.52	826.52	827.13	0.61
179.65	5,573.45	53,651	4.0	827.17	827.17	827.74	0.57
179.73	4,758.30	49,474	4.3	827.99	827.99	828.49	0.50
179.80	4,173.70	47,123	4.5	829.11	829.11	829.55	0.44
179.88	3,652.47	43,331	4.9	830.56	830.56	830.91	0.35
179.93	3,652.47	46,826	4.5	831.41	831.41	831.70	0.29
179.95	3,668.58	46,533	4.5	831.66	831.66	831.94	0.28
179.98	3,913.04	51,426	4.1	831.97	831.97	832.22	0.25
180.07	4,401.17	55,782	3.8	832.54	832.54	832.77	0.23
180.16	4,875.00	57,838	3.7	832.94	832.94	833.21	0.27
180.26	5,356.19	59,036	3.8	833.26	833.26	833.62	0.36
180.35	5,776.44	57,631	4.1	833.52	833.52	834.05	0.53

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
180.45	6,235.75	58,959	4.0	833.78	833.78	834.55	0.77
180.54	6,689.73	63,565	3.6	834.08	834.08	835.02	0.94
180.63	6,987.33	75,306	2.0	834.27	834.27	835.20	0.93
180.74	7,058.98	68,566	3.1	834.59	834.59	835.56	0.97
180.83	7,111.64	70,752	3.0	835.09	835.09	836.03	0.94
180.94	7,452.81	79,597	2.8	835.53	835.53	836.46	0.93
181.02	7,630.88	81,003	2.7	835.85	835.85	836.76	0.91
181.13	7,201.49	76,636	2.9	836.24	836.24	837.11	0.87
181.22	6,874.78	72,373	3.0	836.56	836.56	837.40	0.84
181.33	6,548.37	67,901	3.5	836.99	836.99	837.77	0.78
181.44	6,326.40	63,689	3.7	837.43	837.43	838.18	0.75
181.53	6,044.03	59,203	3.9	837.84	837.84	838.58	0.74
181.62	5,842.46	54,850	4.2	838.23	838.23	838.95	0.72
181.71	5,645.83	49,445	4.9	838.63	838.63	839.35	0.72
181.81	5,491.53	44,776	5.3	839.26	839.26	839.92	0.66
181.89	4,956.29	48,796	4.7	839.90	839.90	840.55	0.65
182.00	4,472.13	51,277	4.4	840.71	840.71	841.43	0.72
182.10	3,887.84	45,921	4.9	841.65	841.65	842.43	0.78
182.19	4,269.60	48,820	4.8	842.53	842.53	843.28	0.75
182.29	4,183.61	49,274	4.5	843.38	843.38	844.09	0.71
182.39	4,304.75	50,147	4.4	844.12	844.12	844.79	0.67
182.48	4,085.65	62,304	4.0	844.61	844.61	845.30	0.69
182.57	4,369.75	67,600	3.6	844.95	844.95	845.60	0.65
182.66	4,375.07	65,878	3.6	845.22	845.22	845.83	0.61
182.76	4,329.63	64,706	3.7	845.51	845.51	846.09	0.58
182.85	4,299.51	60,760	3.8	845.78	845.78	846.33	0.55
182.95	4,345.14	53,628	3.9	846.09	846.09	846.68	0.59
183.03	4,136.68	54,134	3.9	846.39	846.39	847.02	0.63
183.12	3,948.01	53,010	4.0	846.69	846.69	847.35	0.66
183.23	3,719.43	48,984	4.4	847.15	847.15	847.80	0.65

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
183.32	4,079.47	56,677	3.9	847.42	847.42	848.13	0.71
183.42	4,383.14	59,927	3.7	847.59	847.59	848.33	0.74
183.51	4,220.43	51,279	4.2	847.85	847.85	848.54	0.69
183.60	3,640.38	38,402	5.5	848.58	848.58	849.17	0.59
183.71	3,941.53	44,133	4.8	850.73	850.73	851.48	0.75
183.81	4,064.13	46,756	4.6	851.78	851.78	852.67	0.89
183.88	4,168.64	50,372	4.3	852.40	852.40	853.31	0.91
183.99	4,156.22	49,493	4.3	853.18	853.18	853.98	0.80
184.07	4,078.47	47,462	4.5	853.74	853.74	854.47	0.73
184.19	3,925.41	49,143	4.3	854.35	854.35	855.12	0.77
184.29	4,041.30	52,362	4.0	854.84	854.84	855.69	0.85
184.37	4,503.71	59,061	3.6	855.23	855.23	856.16	0.93
184.47	5,230.15	64,587	3.3	855.55	855.55	856.52	0.97
184.56	5,443.31	63,674	3.3	855.89	855.89	856.82	0.93
184.66	5,574.42	62,194	3.4	856.34	856.34	857.19	0.85
184.74	5,673.10	58,906	3.6	856.93	856.93	857.68	0.75
184.84	5,691.26	59,424	3.5	857.87	857.87	858.51	0.64
184.94	5,846.77	60,220	3.5	858.70	858.70	859.28	0.58
185.06	5,669.74	67,674	3.1	859.36	859.36	859.96	0.60
185.14	5,473.58	64,300	3.3	859.65	859.65	860.29	0.64
185.22	4,866.12	57,317	3.7	860.02	860.02	860.66	0.64
185.31	4,347.93	55,153	3.8	860.48	860.48	861.12	0.64
185.42	4,173.72	53,401	4.0	860.94	860.94	861.61	0.67
185.50	4,382.06	55,115	3.8	861.30	861.30	861.99	0.69
185.59	4,498.18	56,651	3.7	861.66	861.66	862.35	0.69
185.69	4,509.29	55,436	3.8	862.00	862.00	862.69	0.69
185.79	4,399.90	54,873	3.8	862.38	862.38	863.06	0.68
185.89	4,176.03	50,245	4.2	862.79	862.79	863.52	0.73
185.98	4,109.04	47,999	4.4	863.27	863.27	864.10	0.83
186.08	3,919.05	46,067	4.7	863.84	863.84	864.77	0.93

Table 7.2 Floodway Table for Lower Gila River

Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
186.18	3,719.13	42,738	5.1	864.65	864.65	865.52	0.87
186.26	3,546.93	43,846	5.4	865.39	865.39	866.20	0.81
186.35	3,382.93	42,406	5.6	866.01	866.01	866.80	0.79
186.44	3,252.07	41,888	6.1	866.72	866.72	867.47	0.75
186.54	3,063.45	39,911	6.6	867.67	867.67	868.38	0.71
186.59	2,884.64	36,734	7.1	868.24	868.24	868.96	0.72
186.68	2,783.37	34,926	7.5	869.31	869.31	870.02	0.71
186.77	2,865.00	38,462	7.0	870.15	870.15	870.98	0.83
186.86	2,793.06	37,146	6.8	870.76	870.76	871.58	0.82
186.95	2,826.47	37,729	6.7	871.36	871.36	872.15	0.79
187.04	2,874.14	41,078	6.6	871.77	871.77	872.75	0.98
187.14	2,860.00	41,583	6.2	872.53	872.53	873.50	0.97
187.23	2,866.08	41,602	6.2	873.52	873.52	874.40	0.88
187.35	2,775.72	42,581	5.4	874.63	874.63	875.40	0.77
187.44	2,961.91	42,266	5.5	875.05	875.05	875.83	0.78
187.53	3,133.27	44,051	5.2	875.42	875.42	876.21	0.79
187.62	3,213.85	42,918	5.8	875.66	875.66	876.51	0.85
187.71	3,372.73	43,235	5.7	875.95	875.95	876.86	0.91
187.80	3,140.91	39,441	6.2	876.27	876.27	877.27	1.00
187.89	2,512.50	36,148	6.9	876.84	876.84	877.68	0.84
187.98	1,946.98	31,581	7.8	877.35	877.35	878.11	0.76
188.03	1,827.00	32,208	7.1	877.72	877.72	878.48	0.76
188.05	1,758.29	33,661	6.7	878.14	878.14	878.86	0.72
188.26	3,020.30	50,085	5.6	879.98	879.98	880.55	0.57
188.42	3,542.00	58,302	4.8	880.97	880.97	881.48	0.51
188.52	3,738.00	60,115	4.3	881.48	881.48	881.96	0.48
188.59	3,830.00	59,671	4.4	881.71	881.71	882.18	0.47
188.65	3,915.00	60,341	4.0	882.03	882.03	882.49	0.46
188.73	4,039.00	60,010	4.1	882.37	882.37	882.81	0.44
188.80	4,109.00	61,466	3.9	882.65	882.65	883.07	0.42

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
188.87	4,177.00	61,508	3.9	882.92	882.92	883.33	0.41
188.95	4,721.64	63,852	3.9	883.22	883.22	883.62	0.40
189.01	4,810.28	67,104	3.6	883.52	883.52	883.90	0.38
189.11	4,634.73	65,294	3.6	883.93	883.93	884.29	0.36
189.18	4,589.60	64,801	3.5	884.28	884.28	884.62	0.34
189.27	4,566.17	64,748	3.6	884.77	884.77	885.08	0.31
189.35	4,579.98	66,702	3.6	885.16	885.16	885.46	0.30
189.45	4,690.66	67,912	3.6	885.54	885.54	885.83	0.29
189.54	4,811.21	67,278	3.9	885.88	885.88	886.16	0.28
189.64	4,699.48	64,506	4.0	886.32	886.32	886.58	0.26
189.74	4,560.06	63,811	4.3	886.72	886.72	886.99	0.27
189.85	4,263.24	58,032	4.7	887.13	887.13	887.39	0.26
189.95	3,992.33	54,264	4.8	887.59	887.59	887.86	0.27
190.04	3,791.18	49,958	5.1	888.12	888.12	888.37	0.25
190.14	3,627.83	47,332	5.3	888.80	888.80	889.08	0.28
190.24	3,524.26	48,397	4.9	889.59	889.59	889.87	0.28
190.34	3,698.62	50,714	4.7	890.22	890.22	890.55	0.33
190.43	3,877.46	52,504	4.5	890.84	890.84	891.19	0.35
190.53	4,016.32	53,676	4.3	891.46	891.46	891.84	0.38
190.63	4,286.55	55,868	4.2	891.96	891.96	892.46	0.50
190.73	4,574.93	58,192	4.0	892.36	892.36	892.96	0.60
190.82	4,770.05	58,342	4.0	892.69	892.69	893.38	0.69
190.91	5,000.21	61,220	3.9	893.02	893.02	893.79	0.77
191.01	5,180.21	63,162	3.8	893.33	893.33	894.16	0.83
191.10	5,551.31	67,624	3.5	893.61	893.61	894.48	0.87
191.19	5,711.10	67,034	3.5	893.90	893.90	894.77	0.87
191.29	5,820.03	67,926	3.5	894.19	894.19	895.06	0.87
191.38	5,725.52	64,578	3.7	894.48	894.48	895.34	0.86
191.47	5,689.27	66,269	3.7	894.78	894.78	895.65	0.87
191.57	5,415.53	60,279	4.0	895.02	895.02	895.89	0.87

Table 7.2 Floodway Table for Lower Gila River							
Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
191.67	5,005.42	55,600	4.2	895.33	895.33	896.22	0.89
191.76	4,612.40	52,137	4.7	895.67	895.67	896.59	0.92
191.86	4,402.98	49,408	4.8	896.02	896.02	896.98	0.96
191.95	4,155.92	47,725	5.0	896.42	896.42	897.39	0.97
192.05	3,881.63	44,240	5.3	896.81	896.81	897.79	0.98
192.14	3,687.61	41,995	5.7	897.39	897.39	898.37	0.98
192.23	3,218.23	39,109	6.2	897.87	897.87	898.81	0.94
192.33	2,550.79	32,843	7.3	898.10	898.10	899.01	0.91
192.40	2,080.70	30,102	7.5	898.43	898.43	899.29	0.86
192.44	2,097.93	30,921	7.3	898.84	898.84	899.63	0.79
192.56	2,326.31	32,409	7.0	899.71	899.71	900.25	0.54
192.65	2,358.45	29,036	7.8	900.36	900.36	900.75	0.39
192.73	2,578.39	31,018	7.4	901.14	901.14	901.72	0.58
192.83	2,833.12	34,486	6.6	901.86	901.86	902.68	0.82
192.93	3,253.05	38,814	5.9	902.56	902.56	903.53	0.97
193.02	3,555.24	43,628	5.2	903.30	903.30	904.25	0.95
193.13	3,891.09	46,469	4.9	903.97	903.97	904.85	0.88
193.22	3,857.49	45,372	5.0	904.48	904.48	905.27	0.79
193.30	3,612.46	45,461	5.0	904.91	904.91	905.63	0.72
193.41	3,397.05	41,842	5.4	905.36	905.36	906.02	0.66
193.51	3,012.24	38,312	5.9	905.70	905.70	906.31	0.61
193.60	2,688.79	34,350	6.6	906.06	906.06	906.62	0.56
193.71	2,760.05	36,044	6.3	906.63	906.63	907.20	0.57
193.78	2,871.35	36,928	6.2	907.04	907.04	907.58	0.54
193.85	2,903.03	38,194	6.0	907.46	907.46	907.95	0.49
193.93	2,915.26	37,316	6.1	907.81	907.81	908.31	0.50
194.00	2,834.92	35,577	6.4	908.12	908.12	908.61	0.49
194.07	2,678.46	32,409	7.0	908.44	908.44	908.90	0.46
194.18	2,527.06	29,891	7.6	909.04	909.04	909.50	0.46
194.25	2,132.82	26,409	8.6	909.54	909.54	909.96	0.42

Table 7.2 Floodway Table for Lower Gila River

Flooding Source	Floodway			Base Flood Water Surface Elevations			
Distance[1] (miles)	Width (feet)	Section Area (sq. feet)	Mean Velocity (fps)	Regulatory (feet)	Without Floodway (feet)	With Floodway (feet)	Increase (feet)
194.27	2,138.54	26,777	8.5	909.98	909.98	910.35	0.37
194.29	2,482.22	31,853	7.2	910.97	910.97	911.23	0.26
194.40	3,098.47	31,873	7.4	911.78	911.78	911.98	0.20
194.53	3,178.41	33,066	6.9	912.48	912.48	912.69	0.21
194.62	2,916.66	32,249	7.0	912.89	912.89	913.11	0.22
194.72	2,811.42	32,034	7.1	913.21	913.21	913.54	0.33
194.81	2,715.60	32,435	7.0	913.59	913.59	913.95	0.36
194.91	2,458.90	26,612	8.5	913.83	913.83	914.18	0.35
195.00	2,132.39	24,146	9.4	914.37	914.37	914.70	0.33
195.09	1,806.60	21,423	10.6	914.84	914.84	915.27	0.43

[1] Above confluence with Colorado River.

7.3 ANNOTATED FLOOD INSURANCE RATE MAPS

Annotated Flood Insurance Rate Maps follow this page.

See Annotated FIRM Panels Folder

7.4 FLOOD PROFILE

Flood profiles follow this page.

See Flood Profile Folder

Appendix A References

A.1 DATA COLLECTION SUMMARY

Cella Bar Associates, 1991, Gila River Flood Insurance Study, Final Report Consolidated Submittals and FEMA Correspondence.

Dames & Moore, 1988, Floodplain Delineation for a 30 Mile Reach of Gila River, Arizona for the Flood Control District of Maricopa County, Final Report.

Federal Emergency Management Agency, 2013, Flood Insurance Study, Maricopa County, Arizona, and Incorporated Areas.

Michael Baker Jr. Inc., 1994, Salt and Gila Rivers Flood Insurance Study, “n” value Report.

Michael Baker Jr. Inc., 1999, Salt-Gila River Floodplain Delineation Restudy Submitted to the Flood Control District of Maricopa County.

River Research & Design, Inc., 2007, Norte Vista / King Ranch Floodplain Redelineation, Gila River.

Stantec Consulting Services Inc., 2013, Unsteady Flow Routing for the Gila River Downstream of Gillespie Dam to the Painted Rock Dam storage pool

Stantec Consulting Services Inc., 2014, Draft Manning’s n Value Sensitivity Memo

USGS, 1991, Floods of February 1980 in Southern California and Central Arizona (Professional Paper 1494).

A.2 REFERENCED DOCUMENTS

Arizona Department of Water Resources, 2003, Hydraulic Modeling Guidelines (SS 9-02)

Arizona Department of Water Resources, 2004, Requirements for Flood Study Technical Documentation (SS 1-97): Engineering Division, Flood Management Section, CD Version 2.20.

Arizona Department of Water Resources, 2004, Delineation of Riverine Floodplains and Floodways in Arizona (SS 2-96): Engineering Division, Flood Management Section, CD Version 2.20.

Barter and King, 1976, Handbook of Hydraulics, Table 5-3

Federal Emergency Management Agency, October 2000, Title 44 – Emergency Management Assistance, Section 65.10 – Mapping of areas protected by levee systems

Federal Emergency Management Agency, April 2003, Guidelines and Specifications for Flood Hazard Mapping Partners.

Flood Control District of Maricopa County, 2003, Consultant Guidelines

Hulsing, H., 1967, Measurement of Peak Discharge at Dams by Indirect Method: USGS Techniques of Water-Resources Investigations, Book 3, Chapter A5

Phillps, J.V. and Tadayon S., 2006, Selection of Manning's Roughness Coefficient for Natural and Constructed Vegetated and Non-Vegetated Channels, and Vegetation Maintenance Plan Guidelines for Vegetated Channels in Central Arizona.

USACE, 1996, Gila River Basin, Arizona, Section 7 Study for Modified Roosevelt Dam, Arizona, Hydrologic Evaluation of Water Control Plans, Salt River Project to Gila River at Gillespie Dam, U.S. Army Corp of Engineers, Dated March 1996.

USACE, 2010, Hydrologic Engineering Center River Analysis System (HEC-RAS), Version 4.1.0.

USACE, 2010, HEC-RAS River Analysis System Hydraulic Reference Manual, Verision 4.1.

Appendix B General Documentation and Correspondence

B.1 LAND OWNER NOTIFICATION LETTER

B.2 PUBLIC MEETING ANNOUNCEMENT

B.3 PUBLIC MEETING MATERIALS

B.4 SCOPE OF WORK

B.5 PROGRESS MEETING MINUTES

B.6 REVIEW COMMENTS

B.7 FEMA CORRESPONDENCE *(To be incorporated after FEMA review)*

Appendix C Survey Field Notes

C.1 SURVEY REPORTS FROM DISTRICT

C.2 PAINTED ROCK DAM RESERVIOR SPILLWAY

C.3 OLD US 80 BRIDGE

C.4 SR 85 BRIDGE

C.5 TUTHILL ROAD BRIDGE

C.6 COTTON LANE BRIDGE

C.7 ESTRELLA PARKWAY BRIDGE

Appendix D Hydrologic Supporting Documentation

D.1 GILA RIVER BASIN, ARIZONA, SECTION 7 STUDY FOR MODIFIED ROOSEVELT DAM, ARIZONA, HYDROLOGIC EVALUATION OF WATER CONTROL PLANS, SALT RIVER PROJECT TO GILA RIVER AT GILLESPIE DAM

D.2 UNSTEADY FLOW ANALYSIS DOWNSTREAM OF GILLESPIE DAM

Appendix E Hydraulic Analysis Supporting Documentation

E.1 FIELD INVESTIGATION REPORT

E.2 CROSS SECTION PLOTS

E.3 BRIDGE AS BUILT OR CONSTRUCTION DRAWINGS

E.4 HEC-RAS HYDRAULIC CALCULATIONS

E.5 UNEVEN WEIR CALCULATIONS

E.6 CHECKRAS OUTPUT

Appendix F Manning's n Value Sensitivity Memo